Greater Cairo Earthquake Loss Assessment and its Implications on the Egyptian Economy

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by

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Abstract

This study develops a loss estimation model for assessing the seismic economic implications resulting from damage to Greater Cairo's building stock, as well as natural gas and electricity lifelines. The model estimates both the direct and indirect economic losses resulting from seismic occurrences.

The developed model is composed of three modules. The first of which is the ground shaking module which estimates ground-motion throughout Greater Cairo. This is done through investigating the seismicity of Egypt and its surroundings, in order to develop recurrence relationships. Furthermore, through the use of geological and geotechnical data, seismic geological classification is conducted. This investigation is used along with three attenuation relationships to estimate ground-motion throughout Greater Cairo.

The second module evaluates the damage to the building stock as well as natural gas and electricity lifelines. This is done through developing a building inventory database, and classifying structures in this database according to various classes. Moreover, data regarding components in the natural gas and electricity networks is collected, and through the use of minimum cut sets the networks' behaviour is assessed. Finally, through the use of fragility curves the vulnerability of structures and components is evaluated.

The final module estimates the direct economic losses associated with repairing damaged components. Furthermore, the indirect costs associated with business interruption resulting from disruption to elements in the built environment are also estimated.

This study will pave the way for developing countries to recognize the impacts of earthquakes on their economies. Moreover, it will be useful for countries that exhibit a centralized economy that is dependant on major cities. Furthermore it provides a step forward in earthquake loss estimation to model multiple lifelines, rather than past research which modelled each lifeline separately.

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I hope that this work can help Egypt in this wonderful new chapter of its glorious history. For I will continue to try to repay Egypt for all that it has given me.

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Notation

a_g	: ground acceleration
A_N	: proportion of area of building model j in district
atan2	: angle in radians between point and the positive x-axis
b	: slope of recurrence relationship
BCT_{ds}	: building construction and clean up time at district level
b_d	: smaller dimension of the building
$BRT_{district}$	: building recovery time at district level
$Buildings_P$	: damage probability of buildings in a district
C_i	: centroid of k-cluster
CPP	: cost per percentage of recovery
CR_{sector}	: cost of recovery for a given sector
DDP_i	: discrete damage probability
d_e	: displacement at d_s calculated through design spectrum
$DEP_{sector,buildings}$	: dependence of sector on buildings
$DEP_{occupancy,buildings}$	: dependence of occupancy class on buildings
$DEP_{sector,Electricity}$	: dependence of sector on natural gas
$DEP_{sector,Gas}$	: dependence of sector on natural gas
d_i	: distance from start of pipe link to the end
d_p	: diameter of pipe segement
$dF(e)$	: multivariate normal density with a mean of 0
$\frac{dF(e)}{dG(e)}$	: importance sampling inter-event variability
$\frac{dF(m)}{dG(m)}$	: importance sampling magnitude
$\frac{dF(t)}{dG(t)}$	: importance sampling intra-event variability
$\frac{\mathrm{dF(x)}}{\mathrm{dG(x)}}$	: importance sampling weight
$dG(e)$	: multivariate normal density with a mean of $ms_{\mathrm{int}ra}$

$dG(t)$	: univariate normal density with a mean of ms_{inter}
$District_p$	: supply of electricity to district for a single run
DL_B	: total direct loss to buildings
DL_E	: total direct loss to natural electricity network
DL_G	: total direct loss to natural gas network
DL_{Total}	: total direct loss
$DP_{DS,CB,Buses}$	: damage probability of electricity buses, disconnect switches and circuit breakers
DP_{pipe}	: damage probability of natural gas pipeline
$DP_{station}$	: damage probability of natural gas station
$DP_{Transformer}$	: damage probability of electricity transformers
d_r	: interstorey drift
d_{ri}	: damage ratio
d_s	: displacement due to seismic force at a structural element
$Efficiency$	: efficiency of recovery process
$Electricity_p$	: final supply of electricity to district
$Employment_{sector,district}$	: number of employees in a given sector at a district
$ERT_{district}$	: electricity recovery time at district level
F_{j_N}	: proportion of building model j in Mohorram (2006) geocodes
Gas_p	: percentage of natural gas supply to a given district
GMRotI50	: median value of the geometric mean at a constant axis orientation for all periods
Geom	: old geometric mean
GM_{xy}	: geometric mean of x and y spectra
$GRT_{district}$	: natural gas network recovery time at district level
h	: height of the column between centreline of beams
H	: height of the building
	: depth of soil layer
I_j	: proportion of building model j in district

L	: upper bound distance of the mainshock
L_B	: direct loss to buildings
L-Env	: envelope of x and y spectra
L_j	: $Vs(30)$ in district j
L_{jN}	: $Vs(30)$ of encapsulated area A_N in district j
L-PGA	: larger PGA
LOF_{ds}	: loss of function at district level
$LOF_{occupancy}$	: loss of function at occupancy level
$Loss_i$	: indirect loss for a given year of analysis
M	: magnitude
$\overline{m}$	: average magnitude of all events
m_b	: body wave magnitude
MDR	: mean damage ratio
m_{eff}	: effective modal mass
M_F	: felt magnitude
MJMA	: Japan Metrological Agency Magnitude
M_o	: seismic moment
MOD_{ds}	: construction modifier at district level
M_s	: surface wave magnitude
$ms_{\text{int}ra}$	: mean of importance sampling intra-event multivariate normal density
$ms_{\text{int}er}$	: mean of importance sampling inter-event univariate normal density
M_w	: moment magnitude
m_x	: estimated maximum magnitude
m_x^{obs}	: observed maximum magnitude
N	: total number of events
	: SPT count
N_{30}	: average SPT blow count over the uppermost 30 m
N_a	: actual annual earthquake event rate

N_{class}	: number of structures in building class
N_d	: average SPT blow count over depth (d)
NGA	: Next Generation Ground-motion Attenuation Relationships
n_i	: number of events in a magnitude range m_i
n_j	: number of events in a magnitude range m_j
$No_{B,DS,CB_{cutset}}$	: number of buses, disconnect switches and circuit breakers in a cut set
$NOB_{occupancy}$	: number of structures for each occupancy class
$P_{construction}$	: probability of damage of construction sector
$P_{f_{set}}$	: probability of failure of cut set
$P_{F_{B,DS,CB}}$	: probability of failure of buses, disconnect switches and circuit breakers
p_{f_i}	: probability of failure of each component in natural gas cut set
$P_{F_{Line}}$	: probability of failure of electricity line
$P_{f_{node}}$	: probability of failure of natural gas node
PGA	: peak ground acceleration
PGV	: peak Ground Velocity
PRS	: pressure reduction station
$P_{recovery}$	: percentage of recovery remaining for a given sector
P_{sector}	: probability of damage of each sector
$P_{sector,district}$	: probability of damage of each sector at each district
$P_{Scenario}$	: probability of electricity damage scenario occuring
$P_{Station_{Final}}$	: probability of damage to electricity station after natural gas dependency being accounted for
$P_{Station_{initial}}$	: probability of damage to electricity station prior to natural gas dependency being accounted for
P_{tot}	: total vertical force above storey being analysed
R	: goodness of fit
	: force reduction factor

R	: semivariogram range
RC	: replacement cost
$RC_{DS,CB,Buses}$	: replacement cost of electricity buses, disconnect switches and circuit breakers
RC_{pipe}	: replacement cost of natural gas pipe segement
$RC_{station}$	: replacement cost of natural gas pipe station
$RC_{Transformer}$	: replacement cost of electricity transformers
R_d	: design resistance of the element
R_E	: radius of the earth
$R_{i,j}$	: resulting column summation of minimum cut set
R_{hyp}	: hypocentral distance
R_{jb}	: Joyner-Boore distance
RPC_{sector}	: recovery cost of a given district
R_{rup}	: rupture distance
$RT_{district}$	: recovery time at a given district
$RT_{electricity\ station}$	: recovery time of electricity station
RT_{Pipe}	: recovery time of damage pipe segement
$RT_{compstation}$	: recovery time of natural gas compressor station
RT_{sector}	: recovery time of a given sector
$RT_{station}$	: recovery time of natural gas station
S_a	: spectral acceleration
$\hat{S}_{a_{GM}}$	: non-adjusted spectral acceleration for ground-motion
$\hat{S}_{a_i}$	: adjusted horizontal acceleration for horizontal component
S_{node}	: supply of natural gas to district
$S_{s,i,j}$	: spectral acceleration after variability is accounted for
$Supply_{station_{damaged}}$	: supply of electricity to a station after earthquake event
$Supply_{station_{intact}}$	: supply of electricity to a station before earthquake event
$\bar{s}_u(30)$	: undrained shear strength over the uppermost 30 m
$\bar{s}_u(d)$	: undrained shear strength over depth (d)

T	: upper bound duration after mainshock
T	: elastic period
T1	: fundamental period of the building
Tc	: upper limit of constant spectral acceleration in response spectra
t_i	: observational period for a magnitude range m_i
t_j	: observational period for a magnitude range m_j
T_k	: modal response period
T_{max}	: largest of the two periods being evaluated
TPP	: time per percentage of recovery
TR_{sector}	: time of recovery for a given sector
ν	: displacement reduction
V	: distance between cluster and centroid
$V_{damaged}$	: velocity at station after earthquake event takes place
V_{eff}	: velocity needed to raise the site class to the next stiffer class
V_{intact}	: original voltage at station prior to earthquake event
$\overline{V}_S(30)$	: average shear wave velocity over the uppermost 30 m
$\overline{V}_S(d)$	: average shear wave velocity at depth (d)
V_{tot}	: total seismic storey shear
γ_1	: importance factor for structure
ε_s	: inter-event residuals
$\varepsilon_{A_{i,j}}$	: intra-event variability
ε_{E_i}	: inter-event variability
$\varepsilon_{JB_{Rup}}$	: residual of rupture distance
σ	: standard deviation of least square curve fit
σ_A	: standard deviation of intra-event variability
σ_E	: standard deviation of inter-event variability
$\sigma_{Station}$	: standard deviation of probability of supply of electricity to station

$\sigma_{district}$	: standard deviation of probability of supply of electricity to district for a single run
$\sigma_{Electricity}$	: standard deviation of final supply of electricity to district
δ_i	: dependency index
η_i	: inter-event residuals
θ	: interstorey stability coefficient
Λ_i	: total likelihood of occurrence
Δ	: distance between two points
λ	: mean of lognormal distribution of fragility curve
ξ	: standard deviation of lognormal distribution of fragility curve
ρ_j	: influence gain
$\rho_{\varepsilon(T_1),\varepsilon(T_2)}$	: periods correlation
$\rho_{a(\Delta)}$	: spatial correlation

Chapter 1

Introduction

1.1 Prelude

Most of mainland Egypt is located at the northeast corner of the African continent, with only the Sinai Peninsula being a part of Asia. With an area of 1,001,449 km^2, Egypt is the 12th largest African country. Its longest distance from North to South being 1,024 km, and from East to West being 1,240 km. Egypt's eastern boundaries are shared with Libya, while Sudan lies to the south, the Mediterranean Sea to the North, the Gaza strip and Israel to the North East, and the Red Sea to the East.

Based on the 2006 census report published by the Central Agency for Population Mobilization and Statistics (CAPMAS, 2006) Egypt has a population of 76,699,427 making it the 16th most populated country in the World and this population is expected to grow to 113 million by 2036 (Khalifa et al., 2000). Since Egypt is largely a desert land, most of the Egyptian population live close to the Nile Valley, thus even though Egypt's population density of 74/km^2 appears relatively small (120th in the world) this number is misleading since most of Egypt is uninhabited, and the population is concentrated along the Nile Valley strip (Figure 1.1).

Egypt is divided at the sub-national level into 29 governorates, one of which is Cairo. Greater Cairo however consists of more than the governorate of Cairo, and also includes the governorates of Giza, and the new established (April 2008) governorates of "Helwan" and "6th of October City". The reason for this conglomeration of governorates is due to their proximity to one another, making their boundaries only of political use.

The population of Greater Cairo is approximately 14.2 million (CAPMAS, 2006), meaning that nearly 20 percent of the Egyptian population reside in Cairo and making Cairo the cultural, economic and political centre of Egypt. Furthermore this population is increasing steadily, not only due to the birth of new residents, but also due to the large rate of internal migration where the rural populace migrate to the urban cities; seeking a better standard of living, education or marriage. This increase in population means that Cairo's density is increasing every year beyond its current 35,020 people/km^2, meaning that one of the world's most densely populated cities will become even denser.

Greater Cairo is subdivided into 56 districts (Figure 1.2). Figure 1.2 represents the 56 districts included in this study. 37 of these belong to the Governorate of Cairo, 17 to the Governorate of Giza, one to 6th of October, and New Cairo district in the Governorate of Helwan. One area of Greater Cairo is known as "Old Cairo", which is the remains of previous capitals that existed prior to the existing city. Due to its age, most of the infrastructure in the region is relatively poor, and the buildings were designed with no consideration for seismic provisions.

Cairo experienced a damaging earthquake in October 1992 originating in Dahshour, 26 km southwest of Cairo, with a magnitude of M_s=5.4 that exposed Cairo's vulnerability to seismic activity. This occurrence, that would have caused minimal damage in economically developed countries with stringent seismic codes, caused physical damage estimated at about one billion U.S. Dollars (Badawai and Mourad, 1994). Greater Cairo's high density as well as a largely exposed building stock that is lacking seismic provisions suggests that it is vulnerable to the occurrence of a natural hazard. Furthermore, being at the heart of Egypt's economy, the economic implications of a sizeable event in Cairo are significant.

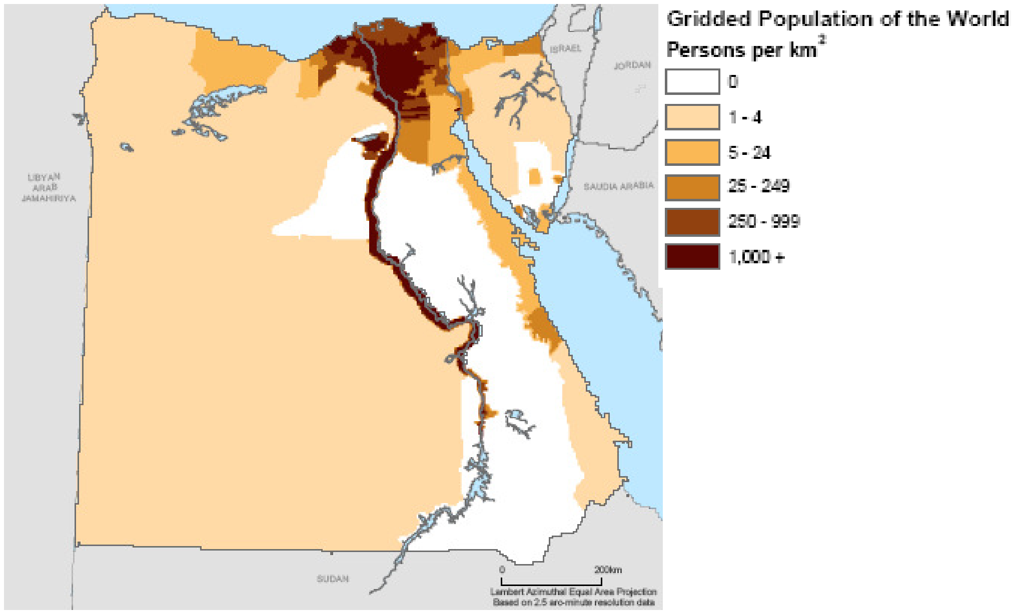


Figure 1.1 Map Showing Egypt's Population Density (CIESIN and CIAT, 2005)

1.2 Objectives and Scope

This study aims at developing an earthquake loss estimation model for Greater Cairo that takes into account both direct and indirect economic losses. The direct economic loss is estimated as a function of the physical damage to building inventory as well as electricity and natural gas networks. Furthermore, damage to lifeline networks will result in business interruption that will lead to indirect economic losses. The output will aid in the planning and mitigation of future earthquake events. After evaluating the possible economic losses from such events, measures can be taken to transfer the liability on to insurance and re-insurance companies. The overall scope and framework of the current study is shown in Figure 1.3.

In addition to the study serving as a tool for developing mitigation strategies, it also sets the ground for future work in the subject. Most previous studies in related topics account for economic losses through damage to one type of system while this investigation considers three systems at the same time (building inventory, electricity and natural gas), as well as their interaction with one another. This is more realistic since all possible systems are vulnerable and at risk during the occurrence of an earthquake. This approach can be built upon in further studies by the addition of other systems to the model such as transportation and sanitary networks. Moreover, even though the study models Greater Cairo, the same approach can be adopted to create similar models for other cities and other economies around the world.

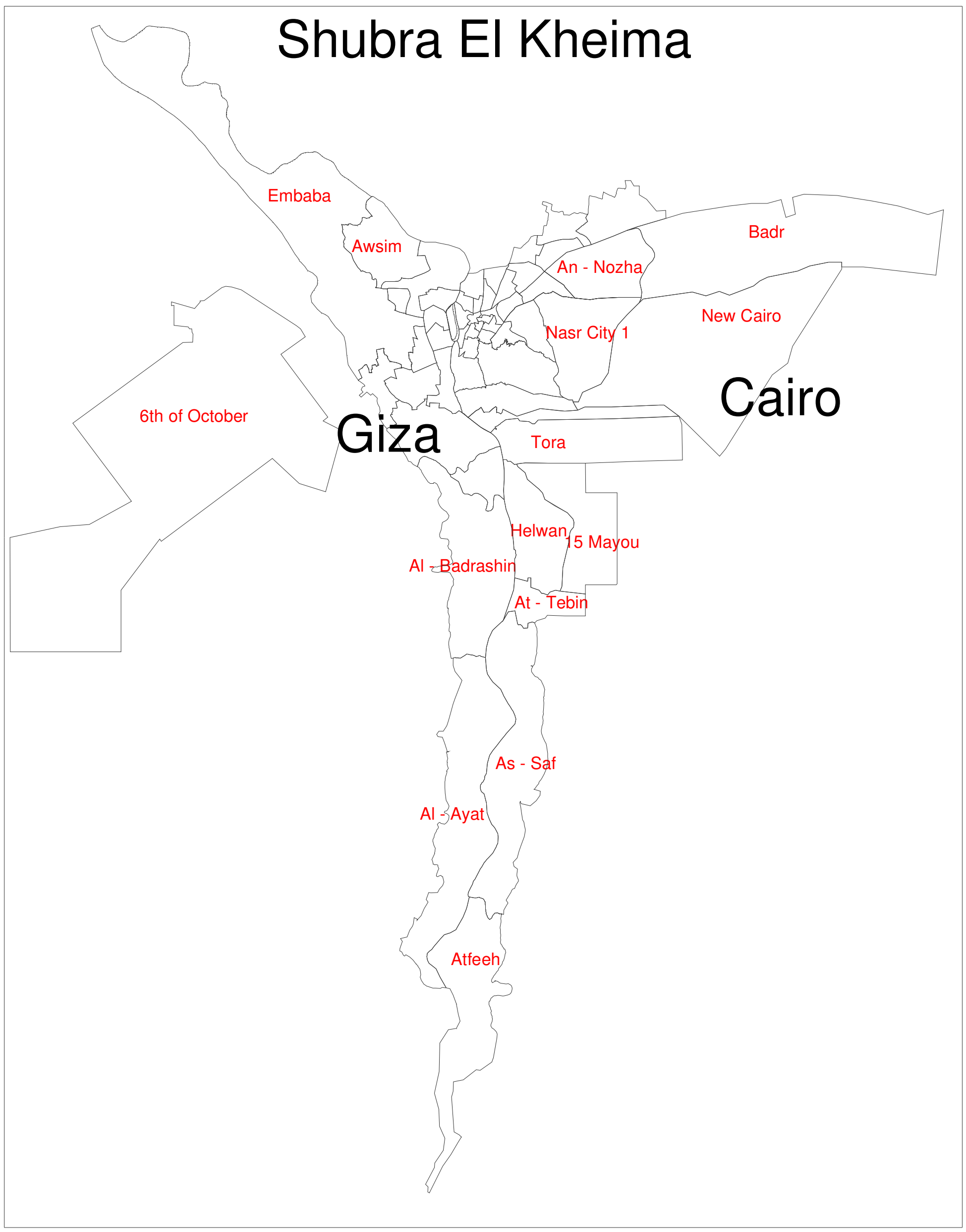


Figure 1.2 Map of Greater Cairo, including Cairo Governorate, Urban Giza, the district of Shubra El Kheima and Helwan (CAPMAS, 2006)

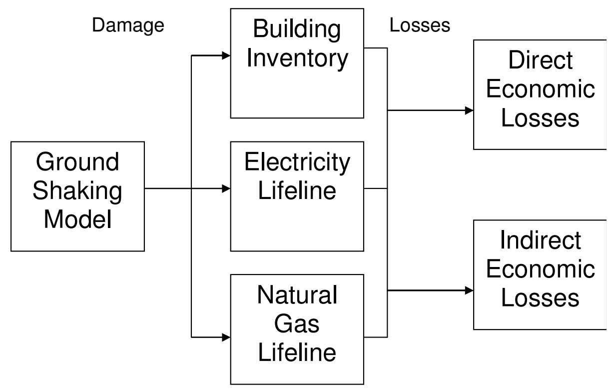


Figure 1.3 Overall scope and framework of study

In addition to the new seismic hazard and vulnerability assessments presented in this thesis, the financial and economic loss estimation studies represent more generic contributions since they are designed for a multi-layered system, as well as accounting for the direct loss of a large city, and for the indirect losses within an entire country. Moreover, due to the limited resources available, a number of novel approaches are considered to overcome these shortcomings, and which can be readily applied to similar situations in other parts of the world.

The main objectives of this study can be listed as follows:

- Development of a seismicity model that is able to provide a recurrence relationship for seismic activity in and around Greater Cairo. This is carried out through the identification of seismic sources and the compilation of an earthquake catalogue that can help characterize the surrounding seismic zones.
- Evaluation of the near-surface geology of Greater Cairo (including 6th of October and New Cairo) to aid in the soil classification of the sites.
- Classification of site classes based on available geological data and previously conducted work in the area as well as collation of geotechnical reports.
- Producing a ground shaking model that accounts for various ground-motion equations as well as inter-period, intra-period and spatial correlation.

- Evaluating the vulnerability of the building inventory, electricity and natural gas networks, through the expansion of existing building inventory databases, as well as conducting reliability modelling for the lifeline networks.
- Estimating damage to the building inventory, as well as the probability of failure of various aspects of lifeline networks.
- Modelling direct and indirect economic losses through various macroeconomic modelling systems.

1.3 Thesis Outline

Chapter 2 discusses the tectonics and seismicity of Egypt and its surroundings. This includes reviewing historical and instrumental recordings as well as previous seismicity catalogues that have included events in Egypt. Based on this a seismicity catalogue is compiled. This catalogue is then declustered to remove dependant events, and to produce a final catalogue. Events in this catalogue are then analysed according to their focal positions in order to identify sources of seismicity in the region. Finally, recurrence relationships are established for each of the identified source zones, taking into account catalogue completeness issues that exist.

The field of ground-motion specification is examined in Chapter 3 in order to create a seismic hazard model. Soil classification is initially determined through examining the geological composition of Greater Cairo, as well as geological studies that have been undertaken for several projects in the City. Several ground-motion models are then reviewed for their suitability in this study. The effects of ground-motion variability in the seismic hazard is also accounted for in this chapter through explicit treatment of intra-event and inter-event components. In order to optimise the computational time, several techniques are used in this chapter, including importance sampling and K-means clustering.

The first aspect of the built environment is examined in Chapter 4 and deals with the building inventory. In this chapter, the vulnerability of the existing building stock is explored by reviewing the seismic provisions throughout the history of Egyptian design codes. Previous building stock databases are used to produce an inventory database for this study. In order to overcome deficiencies in previous databases, field surveys are conducted for various areas around Greater Cairo. Based on these findings, geocodes are defined with their respective building stock inventory.

Chapter 5 evaluates the second aspect of the built environment that is assessed in the damage model, focusing on lifelines. The natural gas and electricity networkds are chosen due to their importance to the society and economy. In this chapter, information regarding the natural gas networks of Greater Cairo and Egypt, including network maps, is collected. These maps are used in order to identify cut sets for each of the compressor stations that distribute natural gas to the various districts within Greater Cairo. Fragility curves for compressor stations and pipes are then used alongside the identified cut sets in order to calculate the probability of each district being deprived of natural gas.

Chapter 5 also examines the electricity network of Greater Cairo. The state of each component of the electricity network is randomly generated and a power-flow analysis is conducted. This is repeated several times, and the results are evaluated with the use of fragility curves of network components in order to calculate the probability of each district being deprived of electricity. The dependency between both lifelines is accounted for through the use of natural gas in electricity stations.

After establishing the damage model for the building stock as well as natural gas and electricity lifelines, the next step is to assess the impact of this damage financially. This is addressed in Chapter 6 through determining means of calculating direct and indirect economic losses. Direct economic losses are accounted for implicitly through replacement cost, whereas indirect economic losses are accounted for through the use of a modified Input-Output (IO) model that reflects the resiliency of an economy to deal with natural disasters through import and export adjustments.

In Chapter 7, the seismic, damage and economic models are all merged together to produce a loss estimation model. Information regarding replacement costs for building and lifeline components are collected and used to calculate direct economic loss. Results from the model are analysed in this chapter in order to evaluate districts and aspects of the built environment that are more vulnerable to seismic events. Moreover, the resiliency and importance of each economic sector is evaluated. A sensitivity analysis is also presented in order to highlight the relative influence of various parameters on the results obtained.

In the final chapter, a summary of the main conclusions of the work is drawn alongside recommendations for future research on the topics addressed in this thesis.

Chapter 2

Tectonics and Seismicity of Egypt

2.1 Introduction

This chapter discusses the tectonics in the vicinity of Egypt, in order to provide the basis for a seismic source zonation model for the region. In order to develop a seismic source model, the seismic activity of the region is also reviewed, looking at historical seismicity catalogues, as well as instrumental recordings. Events from a compiled earthquake catalogue are then assigned to each of the identified seismic sources to estimate magnitude-frequency relationships for each source. Prior to developing these relationships, the catalogue of events first needs to be declustered to eliminate aftershocks, and completeness level issues are also addressed since not all magnitude ranges have been observed for the same time period. The scope in this chapter is illustrated in Figure 2.1.

2.2 Tectonics

Historical and instrumentally recorded seismic activity appears to be associated with six generic sources (Figure 2.2); Levant Aqaba Transform system, Hellenic Arcs, Cyprus Arc, Pelusiac Trend, Mediterranean Coastal Dislocations and Southern Egyptian Trends (Moharram, 2006).

The Levant Aqaba transform system is more than 1000 km in length running from the north of the Red Sea running through the East Anatolia Fault and Bitlis Zone.

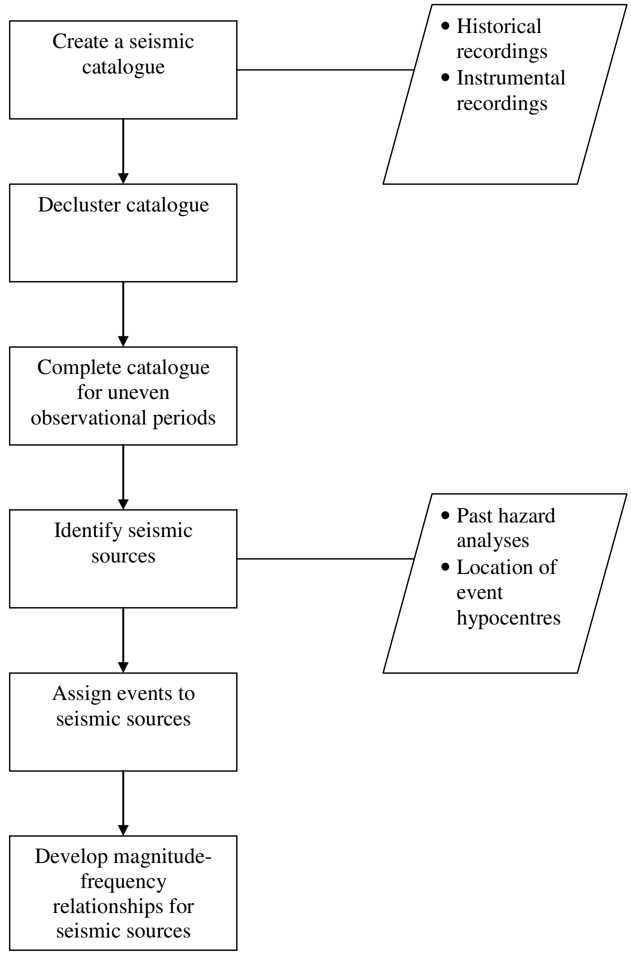


Figure 2.1 Outline of methodological approach of Chapter 2

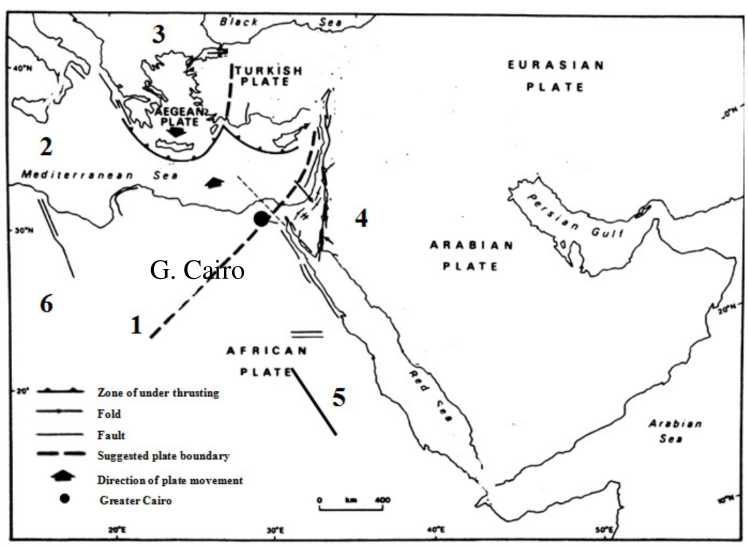


Figure 2.2 Sources of seismicity affecting Greater Cairo modified from Fat-Helbary and Tealab (2002); 1=Pelusiac Trend, 2=Hellenic Arc, 3=Cyprian Arc, 4=Levant Aqaba Transform System, 5= Southern Egyptian Trends and 6=Mediterranean Coastal Dislocations

The system is divided into three segments; Jordan rift, Lebanese fault, El Gharb Kara Su rift. The system has experienced a large M_w=7.3 event in 1995.

The Hellenic arc and Cyprian arc are located north of Egypt in the Mediterranean region. The Hellenic arc is characterised by seven major faults, one of which in West Crete has caused a strong earthquake (M≈8.3) on July 21st 365 A.D., illustrating the strong seismicity experienced in this region (Thommerete et al., 1981; Pirazzoli et al., 1992). The Cyprian arc on the other hand is characterised by four main faults; one of which the Paphos in southwest Cyprus caused a M_w=6.8 event in 1996.

The remaining three seismic sources are closer to Egypt and historically have been the source for the greatest damage to Egypt and Greater Cairo. One of the most notable earthquakes in recent times was the 1992 M_s=5.4 Dahshour earthquake that took place along the Pelusiac fault, and resulted in significant financial losses.

Appendix A discusses each of the six trends in detail, highlighting their physical characteristics, as well as notable events that have taken place along these trends. Table 2-1 summarizes Appendix A.

2.3 Seismic Activity

2.3.1 History

Seismic activity in Egypt has been recorded since ancient Egyptian times with the use of Greek Papyri. Such recordings are evident in papyri No. 5675 and No. 7259, copies of which were published by Preisigke (1915) and Bilabel (1926) respectively, which reveal the occurrences of earthquakes in 184 B.C. and 95 B.C. respectively (Mazza, 1998).

Table 2-1 Summary of seismic sources

Seismic Source	Zone within Source	Notable Earthquakes
Pelusiac (eastern Mediterranean Cairo Fayoum)		• M_s = 5.4, 1992 Dahshour
Hellenic arc	Cephalonia fault	• M_s=8.3 on July 21st 365 A.D
	Zante fault	
	Southwest of Pelopnnese	
	West of Crete	
	South east of Crete	
	South of Karpathos	
	East of Rhodes	
Cyprian Arc	Northwest of arc	• M_w = 6.8, 1996 Paphos • M_w = 6.2, 1998 Adana
	Southwest of arc	
	Northeast of arc	
	Southeast of arc	
Levant Aqaba transform system	Jordan rift	• M_s=7.3 November 22nd 1995 earthquake
	Lebanese fault	
	El Gharb Kara Su Rift	
Southern Egypt	Kalabsha fault	• M_s = 5.5, 1981 Aswan earthquake
	Kurkur fault	
	Khour El Ramla	
Mediterranean coastal dislocation	Rosetta fault	• M_s = 6.7 1955, Alexandria earthquake
	Temsah fault	

The Islamic period (after 622 A.D.) brought a greater interest in recording earthquake occurrences, with an abundance of data available. This is primarily due to religious reasons; since the Islamic faith and the Qur'an declares that judgement day involves the occurrence of a number of devastating natural hazards, including earthquakes. The greatest source of historical literature according to Ambraseys et al. (1994) occurred just prior to the Ottoman conquest (1517) when Egypt was ruled by the Mamaluks.

With the emergence of the Ottoman Empire, Egypt became just a province, and earthquake recordings became dependent on non-Arabic sources including European travel literature. These are lead by the Napoleonic expeditions in the 18th century (Ambraseys et al., 1994).

Based on all of these sources Ambraseys et al. (1994) compiled a historical catalogue which spans from 184 B.C.-1899 A.D. The magnitude of events in this catalogue are estimated based on descriptive accounts, which are subjective, and provide great room for uncertainty. The Ambraseys et al. (1994) catalogue contains 122 historical events affecting Egypt. Over 70 percent of these events lie in Lower Egypt, the Hellenic Arc and the Red Sea. Moreover, the magnitude of events are measured according to felt data magnitude M_F (Ambraseys et al., 1994), and range from M_F<5, to M_F =8, with most events of M_F=8 being located within the vicinity of Cairo. Since M_F is a measure of felt data, Cairo is expected to experience the greatest levels of M_F, since it would produce the most descriptive accounts of events, as well as experiencing the greatest levels of damage due to its urbanization, compared to other areas which would not have been as developed.

2.3.2 Egyptian Seismological Network

Instrumental recordings in Egypt can be traced back as early as 1899 at Helwan (HLW) by an E-W component Milne-Shaw seismograph. An N-S component (Milne-Shaw) began recording in 1922 and a vertical component of Galitzin-Willip seismographs began recording in 1938 (Hussein et al., 2008).

Nevertheless it was not until May 1962 that the Helwan system was replaced by Benioff short period and Sprengnether long period seismographs forming a World Wide Standardized Seismograph Network (WWSSN) station, that the information recorded from Egypt's network could be considered accurate. This station was bolstered in 1972 with the addition of a three-component short-wave seismograph with an ink writing stylus recording drum system. Similar stations with photographic recording systems were installed in 1975 at Aswan, Abu-Simbel and Mersa-Matrouh, with the Aswan station having an additional three component long period seismograph system (Hussein et al., 2008).

In order to monitor the micro-seismicity of the Lake Nasser area after the Kalabsha earthquake of November 14th 1981, a radio telemetered network with nine vertical short period stations was deployed in 1982, and was expanded in 1985 to thirteen stations. Moreover, an analogue strong-motion accelerograph network was deployed at different levels of both the High Dam and Aswan Dam (Badawy, 2005).

Finally the Egyptian government financed the construction of the Egyptian National Seismological Network (ENSN) after the 1992 Dahshour earthquake. The ENSN consists of 60 remote sites that transmit data to the Helwan centre and five other subcentres around Egypt. These stations contain 43 single component and 13 three component station (Badawy, 2005). The map of the ENSN is shown in Figure 2.3 (Hussein et al., 2008).

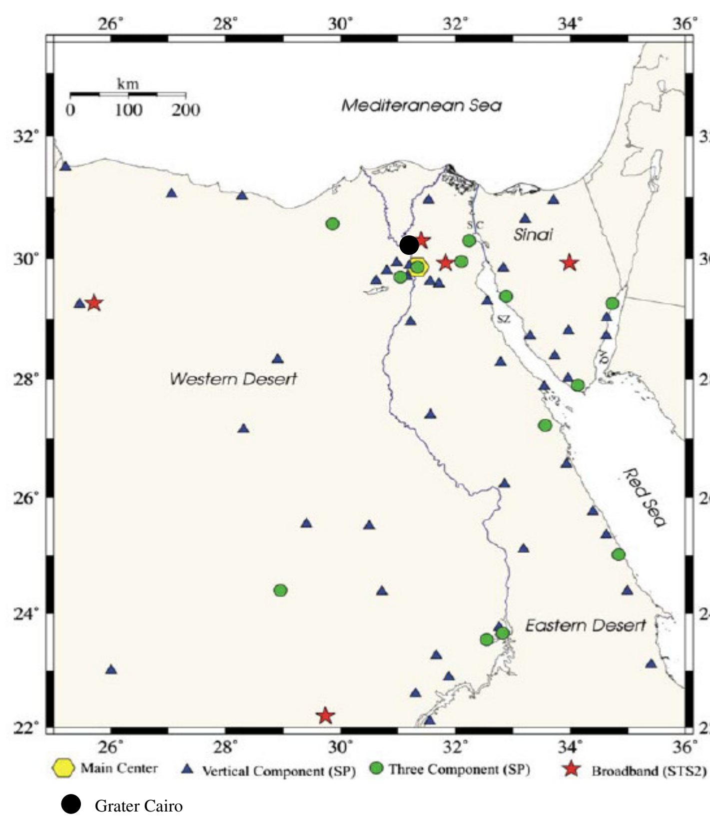


Figure 2.3 Distribution of the ENSN (Hussein et al., 2008)

2.3.3 Seismicity Catalogues and Patterns in Egypt

Hoff (1840) developed the first global seismicity catalogue in which he included some sources that referred to the occurrence of seismic events in the Middle East. This catalogue was used to develop more globally comprehensive catalogues such as those of Mallet (1852) and Tholozan (1879).

The first earthquake catalogue devoted to Egypt was compiled by Lyons in 1907, which includes 29 earthquakes from 27 B.C. to 1907 A.D. Further advancement in the compilation of regional earthquake catalogues was conducted by Willis (1928). However, his catalogue was flawed since he did not account for certain sources having earthquakes dated using the Muslim Hijri calendar which is lagging the Gregorian calendar by nearly 600 years.

Ambraseys and Melville (1982) and Ambraseys et al. (1994), produced catalogues based on macroseismic data in which epicentral location, maximum observed intensities and magnitudes of earthquakes are defined. In Ambraseys et al. (1994), a catalogue of earthquakes in Egypt, Arabia and the Red Sea is given for the period between 184 B.C.-A.D. 1899, which is defined as a pre-instrumental catalogue based on historical data. To compliment this catalogue an instrumental catalogue for the period between A.D. 1899-1992 is also given. A combined map showing earthquakes of the pre and post-instrumental periods is shown in Figure 2.4.

2.4 Seismic Catalogue Compilation

In order to perform earthquake loss estimation, a complete earthquake catalogue needs to be compiled. Earthquake catalogues can be compiled using historic and instrumental recordings. Historic earthquakes are accounted for based on the catalogues discussed previously, while instrumental recordings of earthquakes are kept in the form of bulletins by various societies.

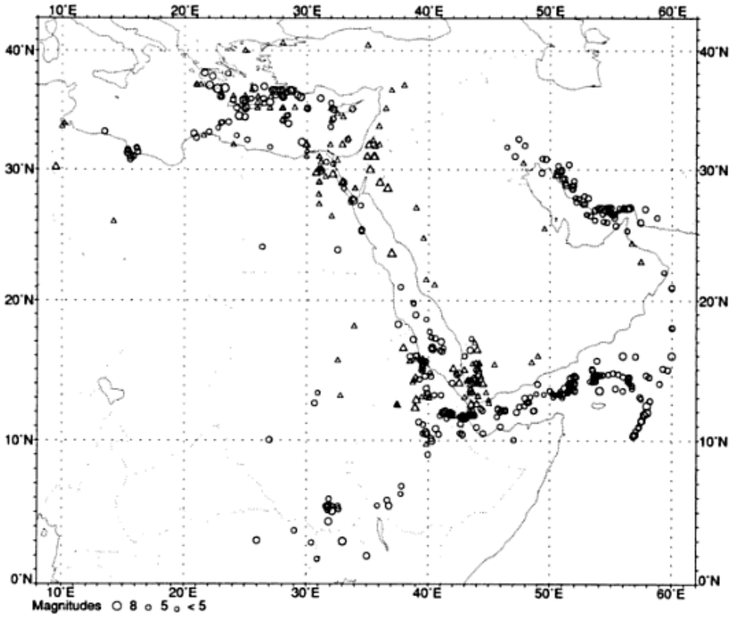


Figure 2.4 Map of earthquakes for pre (shown as triangles) and post (shown as circles) instrumental recordings (Ambraseys et al., 1994)

In order to compile a complete earthquake catalogue for use in this study, the bulletin of the International Seismological Centre (ISC) was used as the basis for the catalogue. To validate certain events, the bulletins from the National Earthquake Information Centre (NEIC) and the National Research Institute of Astronomy and Geophysics (NRIAG) were also used.

The catalogue is compiled using by using latitudinal and longitudinal bounds to create an area that encapsulated all relevant seismic sources based on the tectonic configuration and seismic activity of the surrounding area that was discussed previously. These sources are expected to produce earthquakes that have the greatest potential to cause damaging ground-motions in Cairo. This compilation resulted in the return of 527 earthquakes, whose geographical distribution is shown in Figure 2.5.

The ISC presents most earthquake magnitudes for the rectangular search criteria given in terms of body-wave magnitudes m_b, with 80 earthquake magnitudes also given in terms of surface-wave magnitude M_s. To attain a consistent, homogeneous catalogue, a relationship between body and surface wave magnitudes needs to be established. The 80 earthquakes that report both magnitudes are plotted in Figure 2.6, and a least-squares to the data resulted in the following relationship:

$$M_s = -1.564 + 1.235\, m_b \qquad \sigma = 0.51 \qquad R^2 = 0.649 \qquad (2.1)$$

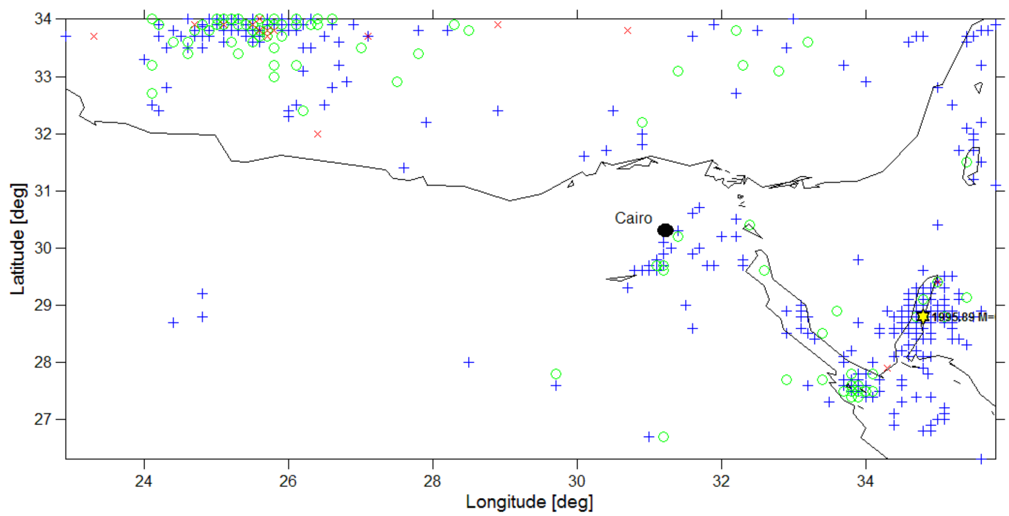


Figure 2.5 Earthquake events used in this study

Moharram (2006) obtained a similar relationship for earthquakes in Egypt that is plotted in Figure 2.6. However, a problem associated with this previous study is that it only uses 18 data points, whereas this study uses 80 data points.

Moreover moment magnitude M_w, is the most widely used parameter in seismic hazard analysis. In order to calculate moment magnitude Mw from seismic moment various equations exist. The most notable of these equations is that of Hanks and Kanamori (1979) which relates seismic moment to moment magnitude as follows:

$$M_W = (2/3)M_o - 10.7 \qquad (2.2)$$

Ekstrom and Dziewonski (1988) state that for larger magnitude earthquakes (Ms>6.7) Ms and Mw are considered equal. Okal and Romanowicz (1994) found that for smaller magnitude earthquakes (Ms<6.7):

$$M_W = (2/3)M_S + 2.24 \qquad (2.3)$$

Nonetheless Bungum et al. (2003) developed an orthogonal regression that reflects a deviation from equality for larger magnitudes for Southern Europe, where:

$$M_W = 0.796M_S + 1.28 \qquad (Ms \geq 5.4) \qquad (2.4)$$

$$M_W = 0.585M_S + 2.422 \qquad (Ms < 5.4) \qquad (2.5)$$

Another method of calculating moment magnitude was derived by Ambraseys and Free (1997) and Bungum et al. (2003) from European data. Ambraseys and Free (1997) used a dataset of 700 events including events from North Africa, making the study very applicable to Egypt. This relationship correlates seismic magnitude and surface wave magnitude through seismic moment, using the following equations:

$$M_S = -48.443 + 3.487\log(M_o) - 0.053\left[\log(M_o)\right]^2 - 0.0036(h-30)P \qquad (2.6)$$

$$\log(M_o) = 23.123 - 0.505M_s + 0.14M_s^{\ 2} + 0.0034(h-30)P \qquad (2.7)$$

where h is the focal depth in km, and P is equal to 0 when h≤30 and 1 when h>30, and a standard deviation of 0.225. In order to calculate moment magnitude from seismic moment, the Hanks and Kanamori (1979) Equation (2.2), would then be used.

Due to the size of the dataset used in the Ambraseys and Free (1997), and the fact that events from North Africa were used, Equations (2.2) and (2.7) will be used in this study to adjust surface wave magnitude into moment magnitude. In addition to those reasons, since most earthquakes in Egypt have a focal depth less than 30 km Equation (2.7) is further simplified, making its use more straightforward.

The final seismicity catalogue is presented in Table A-1 of Appendix A.

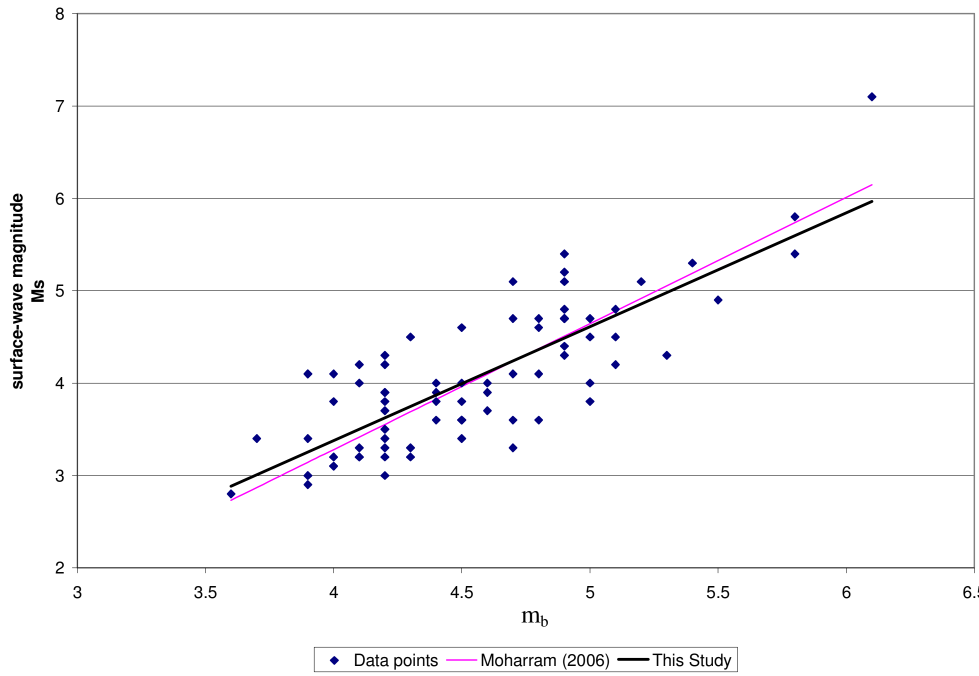


Figure 2.6 Relationship between surface wave magnitude M_s and body wave magnitude m_b

2.5 Declustering of the Catalogue

Bulletins presented by various institutions usually do not distinguish between mainshocks and aftershocks. Recurrence relationships are established on the assumption that seismicity follows a Poisson process where events are independent. Therefore, aftershocks need to be removed to ensure this assumption is valid. Several methods exist for declustering earthquake catalogues, the most commonly implemented of which are; Gardner and Knopoff (1974), Reasenberg (1985) and Knopoff (2000). Gardner and Knopoff (1974) and Knopoff (2000) used a windowed approach which classifies aftershocks through the identification of events within close proximity of the mainshock in terms of space and time. An upper bound of duration after the mainshock, T (M), where:

$$\log T = a_1 M + b_1 \qquad (2.8)$$

was used, where any event falling below this upper bound would be considered an aftershock, if it also falls below the upper bound of the distance from the mainshock L(M), where:

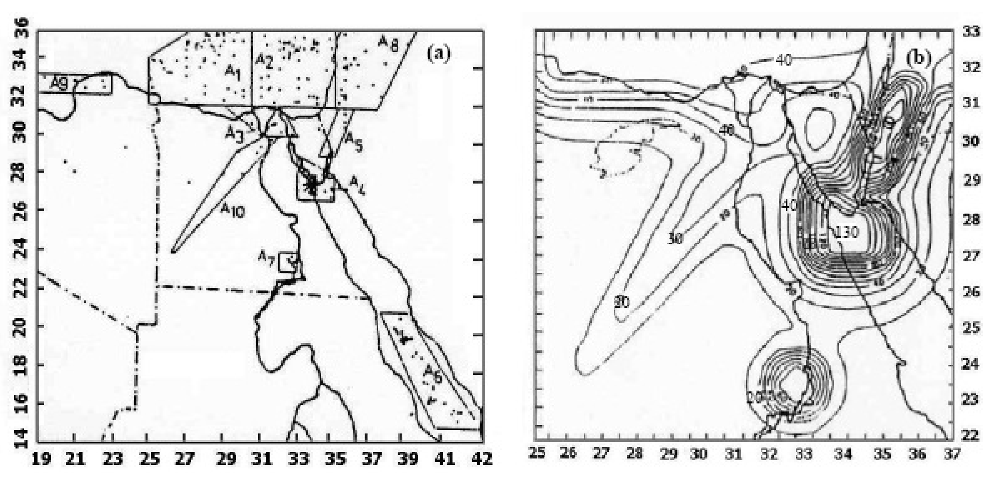
$$\log L = a_2 M + b_2 \tag{2.9}$$

This windowed approach was criticised by Reasenberg (1985) as overestimating the population of aftershocks, due to the fact that aftershocks vary widely with respect to the magnitude of the mainshock. Reasenberg (1985) proposed modelling an interaction zone for a given earthquake, where if an earthquake occurs within this zone it would be considered an aftershock. The interaction zones are dynamically modelled with a spatial and temporal parameter. The spatial parameter is based on the stress redistribution of the interaction zone, which is modelled by scaling the mainshock event by a factor that takes into account the source dimension. The temporal parameter is based on a probabilistic model, which tries to determine the time interval in which the next possible event whose magnitude is consistent with the expected aftershock sequence that should be experienced. If an earthquake occurs within this interval then it would be considered an aftershock. In this study Reasenberg's (1985) algorithm was used with the aid of ZMAP (2001), and it identified 15 clusters, returning 480 of the original 527 mainshocks.

2.6 Identifying Sources

In order to develop a recurrence relationship, seismic sources need to be defined. One methodology than can be used is to identify all possible faults that have been previously discussed and assign earthquakes from the catalogue to each of the faults based on the location of the hypocentre of the earthquake event. However, the main problem with conducting the research in this manner is that the earthquake catalogue will not contain enough events so that robust magnitude-frequency distributions can be obtained. Moreover, even when active faults are identified it is not possible to use these in risk analyses unless the rates of events on the fault can be quantified, which is not possible in this study due to the limited data available on each event in the catalogue. Thus it was decided that instead of assigning earthquakes to individual fault sources, earthquakes will be assigned to seismic source zones, for which a greater number of earthquakes for each source can be obtained.

Various seismic hazard analysis studies of Egypt have been conducted over the years, most of which are based on Probabilistic Seismic Hazard Analysis (PSHA). The first seismic hazard study that was conducted in Egypt was carried out by Ibrahim and Hattori (1982), where hazard was estimated in terms of peak ground acceleration (PGA) for various return periods. However this study did not include a seismic zonation map, which was first developed for Egypt in 1988 by the Egyptian Society of Earthquake Engineering (ESEE). Sobaih and Khaled (1990) conducted the first study, producing a seismic hazard map based on PGA, for a 1000 year return period. Sobaih et al. (1992) then produced a seismic hazard map dividing the region into 10 sources zones, Figure 2.7(a). This study produced a seismic hazard map for a PGA with 10 percent probability of exceedence in 100 years, Figure 2.7(b).

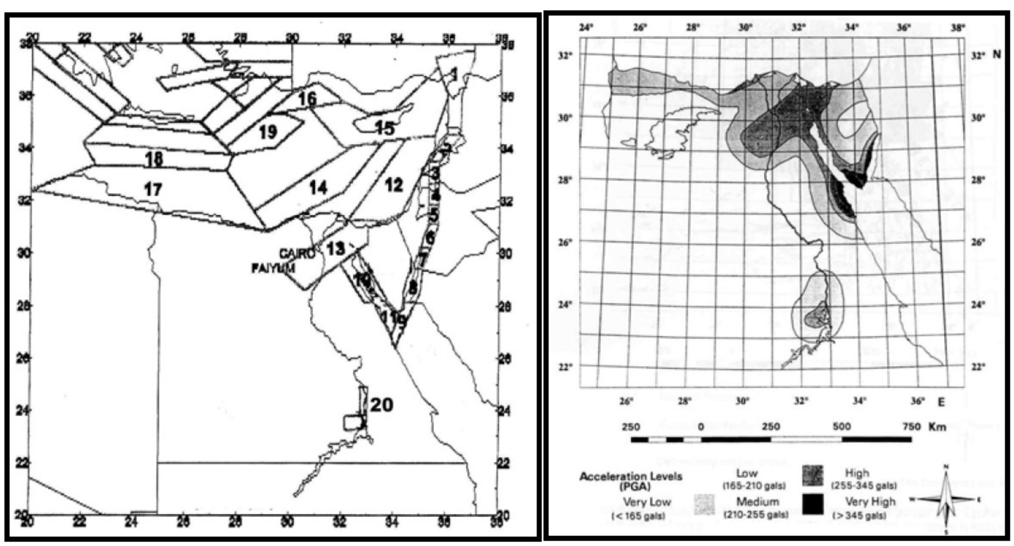


(a) (b)

Figure 2.7 a) Source zones and b) seismic hazard map, proposed by Sobaih et al. (1992) in terms of PGA (gals) for a return period of 100 years and a 10 percent probability of exceedance

.

It was not until the October 12th 1992 earthquake at Dahshour however that large-scale work on a national seismic hazard assessment took place. The most notable of these studies was El-Difraway et al. (1997), whose study was different from previous attempts that had been undertaken. El-Difraway et al. (1997) defined 20 main seismic zones based on surrounding tectonics, Figure 2.8(a). The 20 source zones describe the sources of earthquakes described in the previous sections. Zones 12 and 13 are based on the Pelusiac (Eastern Mediterranean Cairo Fayoum) trend, which begins in Eastern Anatolia, extends across the Nile delta and into Fayoum. Zones 1 to 9 describe the Levant Aqaba transform system, from the Jordan rift to the El Gharab rift that extends into eastern Anatolia. Sources 10 and 11 are based on the Gulf of Suez and Red Sea drifts, while Zone 20 describes the Southern Egyptian trends. The remaining sections describe the Hellenic and Cyprian Arcs as well as the Mediterranean Coastal Dislocation. These zones were then used by El-Araby and Sultan (2000) to produce a hazard map for Egypt based on 475-year return period. Figure 2.8(b).



(a) (b)

Figure 2.8 a) Source zones (El-Difraway et al. 1997) and b) seismic hazard map (El-Araby and Sultan, 2000)

Riad et al. (2000) used the same source zonation proposed by El-Difraway et al. (1997) in order to produce the hazard map shown in Figure 2.9. As can be seen, the hazard map produced by Riad et al. (2000) is very similar to that proposed by El-Araby and Sultan (2000), since both used the same source zonations. It should be noted that the source zonation map developed by El-Difraway et al. (1997) extends further than the area encapsulated in this study, meaning that more seismic sources could be defined.

The hazard map employed by the most recent 2008 Egyptian Loadings Code is that produced by El-Araby and Sultan (2000). This illustrates that the source zonation study conducted by El-Difraway et al. (1997) is recognized as the most acceptable study, and is therefore used in the present study as the basis for establishing recurrence relationships.

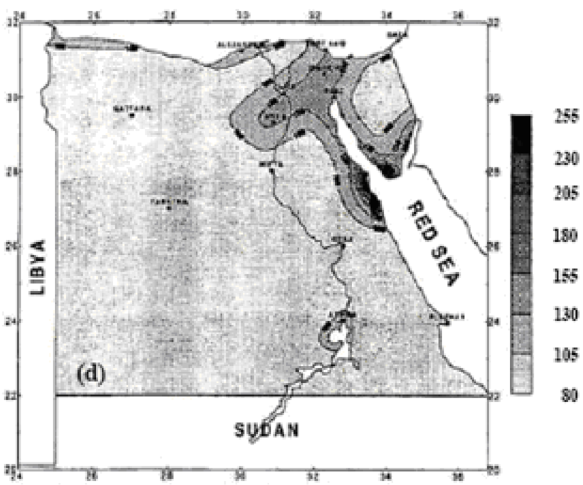


Figure 2.9 Seismic hazard map of PGA in gals for an exposure period of 50 years and a probability of exceedance of 10% (Riad et al., 2000)

The present study used El-Difraway et al. (1997) to establish the source zones shown in Figure 2.10. Figure 2.10 shows 5 zones which encapsulate the seismic sources discussed in the previous sections, but at a lower resolution, to ensure that each zone includes enough events to enable the development of recurrence curves. The coordinate delineation of the 5 sources is shown in Table 2-2. The 480 earthquakes that remain after declustering are assigned to each of the source zones based on the coordinates of the hypocentre of each earthquake. Any area outside of the defined zones in Figure 2.10 is defined as Background Seismicity “Bg”.

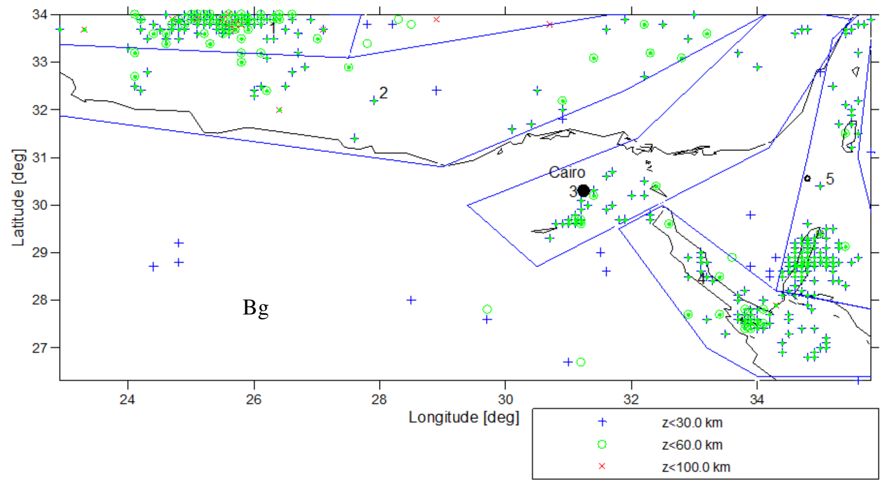


Figure 2.10 Six seismic zones (including background seismicity Bg) used in this study

Table 2-2 Source coordinate delineation

Source number	Segment Number	Segment Start lon. (°)	Segment Start lat. (°)	Segment End lon. (°)	Segment End lat. (°)
1	1	22.4	33.4	27.5	33.1
	2	27.5	33.1	27.7	34
	3	27.7	34	22	34.2
	4	22	34.2	22.4	33.4
2	1	22.4	33.4	27.5	33.1
	2	27.5	33.1	31.7	34
	3	31.7	34	34.3	34.2
	4	34.3	34.2	29	30.8
	5	29	30.8	20	32.4
	6	20	32.4	22.4	33.4
3	1	29.4	30	30.5	28.7
	2	30.5	28.7	34.2	31.2
	3	34.2	31.2	35.5	33.9
	4	35.5	33.9	34.3	34.2
	5	34.3	34.2	32.1	31.4
	6	32.1	31.4	29.4	30
4	1	31.8	29.5	32.5	30
	2	32.5	30	34.3	28.2
	3	34.3	28.2	36.2	27.7
	4	36.2	27.7	36.2	26.4
	5	36.2	26.4	34	26.4
	6	34	26.4	33.2	27
	7	33.2	27	31.8	29.5
5	1	36.4	34.3	36	34.5
	2	36	34.5	35.2	33.5
	3	35.2	33.5	34.8	31
	4	34.8	31	34.3	28.2
	5	34.3	28.2	34.7	28.1
	6	34.7	28.1	36.2	27.7
	7	36.2	27.7	35.6	31
	8	35.6	31	35.8	33.4
	9	35.8	33.4	36.4	34.3

2.7 Catalogue Completeness

Earthquake catalogues need to be "complete" in order to be usable in recurrence relationships. The issue here is that instrumental networks are able to record events above a threshold that depends on the sensitivity of the network. This threshold decreases in time as the network is upgraded. As already discussed, instrumental recordings began in Egypt at Helwan in 1899 using a Milne-Shaw seismograph which was only designed to measure large distant earthquakes (Lee and Benson, 2008), thus smaller magnitude events might not have been recorded at the time, unless they occurred close a recording station. Moreover the Benioff short period and Sprengnether long-period seismographs installed in 1962 increased the resolution of the network, and enabled the recording of a larger range of magnitudes, with the increase being at the lower end of the scale. Finally the last update to the networks which occurred following the October 12th 1992 Dahshour earthquake allowed the recording of yet smaller magnitude events. These recordings compliment the observations from the ISC and WWSSN stations, thus creating a more complete catalogue.

In order to account for discrepancies in the period of observation of various magnitudes, the number of events are not divided by the entire time period for which events in the catalogue exist, but rather a different approach is taken as proposed by Weichert (1980). Weichert (1980) developed a Maximum Likelihood Estimation (MLE) method for accounting for unequal observation periods, in which the slope 'b' of the doubly-bounded Gutenberg-Richter relationship can be calculated using the following equations:

$$\mathrm{b} = \frac{\beta}{\ln(10)} \tag{2.10}$$

$$\frac{\sum_i t_i m_i \exp(-\beta m_i)}{\sum_j t_j \exp(-\beta m_j)} = \frac{\sum_i n_i m_i}{N} = \overline{m} \tag{2.11}$$

where t_i is the period of observation for a magnitude range whose bin centre is m_i, t_j is the period of observation for a magnitude range whose bin centre m_j, n_i is the number of events in a magnitude range m_i, n_j is the number of events in a magnitude bin centred at m_j and N is the total number of events for the entire catalogue. Periods t_i and t_j are estimated by identifying in the catalogue how long events of magnitude ranges whose bin centres are m_i and m_j respectively have been observed. This accounts for completeness issues in the catalogue where unequal observational periods exist for various magnitudes. Based on this and using Equation (2.11), the value for β, and using this Equation (2.10) can be used to calculate the slope 'b'. The standard deviation of the slope of the doubly –bounded Gutenberg-Richter relationship is σ_b, while the annual event rate is expressed as N_a, whose standard variance is $\sigma^2{}_{N_a}$. Values for b, σ_b, actual annual event rate N_a and $\sigma^2{}_{N_a}$ were all calculated based on Weichert (1980), using Equations (2.12) through (2.15).

$$\mathrm{var}(\beta) = \frac{1}{N} \frac{\left[\sum_i t_i \exp(-\beta m_i)\right]^2}{\left[\sum_i t_i m_i \exp(-\beta m_i)\right]^2 - \sum_i t_i \exp(-\beta m_i) \sum_i t_i m_i^2 \exp(-\beta m_i)} \qquad (2.12)$$

$$\sigma_b = \frac{\sqrt{\mathrm{var}(\beta)}}{\ln(10)} \qquad (2.13)$$

$$N_a = N \frac{\sum_i \exp(-\beta m_i)}{\sum_j t_j \exp(-\beta m_j)} \qquad (2.14)$$

$$\sigma^2{}_{N_a} = \frac{N_a}{N} \qquad (2.15)$$

MLE is used to estimate the slope b rather than using the method of least squares (LSQ). Since the Gutenberg Richter relationship is cumulative, the points on the graph are not independent and thus the method of LSQ cannot be used since it is assumed that each point in the dataset is independent of all others. Moreover LSQ assumes that the error at each point is Gaussian, and provides equal weight for the error at each point, whereas, this is not required by MLE. Moreover, LSQ fits are disproportionately influenced by the largest earthquakes since the occurrence of large earthquakes tends to reduce the slope of the fit (Felzer, 2006). This takes place when the recurrence interval of the events is bigger than the total observation period. Thus, based on this MLE is used for calculation of the slope b.

In order to determine the period of observation for different magnitudes, a time series analysis is conducted in which graphs of the cumulative number of earthquakes against time, for various ranges of magnitude, for each of the source zones are generated as shown in Figure 2.11. Since the process is assumed to be Poissonian, a constant rate should be witnessed in the slopes of the curves (after declustering). However, the slope of the curves for each of the source zones changes sharply at various points in time, which can be interpreted as a change in the recorded magnitude range. Looking at Figure 2.11 it can be seen that a sharp change in slope occurs around 1995, which seems reasonable since an improvement to the Egyptian seismological network was made following the 1992 Dahshour earthquake. Furthermore another change in slope occurs around 1987, which corresponds to the deployment of the telemetered network in the south of Egypt between 1982 and 1985, as well as the addition of four stations around the Red Sea area beginning in 1986.

Prior to 1986 the Benioff short period and Sprengnether long-period seismographs that were installed in Egypt would not be capable of consistently recording magnitudes smaller than M_s=4.0 throughout the entire country. Lastly the ENSN which was set up after the 1992, resulted in a higher resolution and robust network that is capable of recording smaller magnitude events throughout the geographical region. Thus using these historical facts, and the information from the earthquake catalogue, the time intervals for recording various magnitudes can be established. The periods used in this study are shown in Table 2-3.

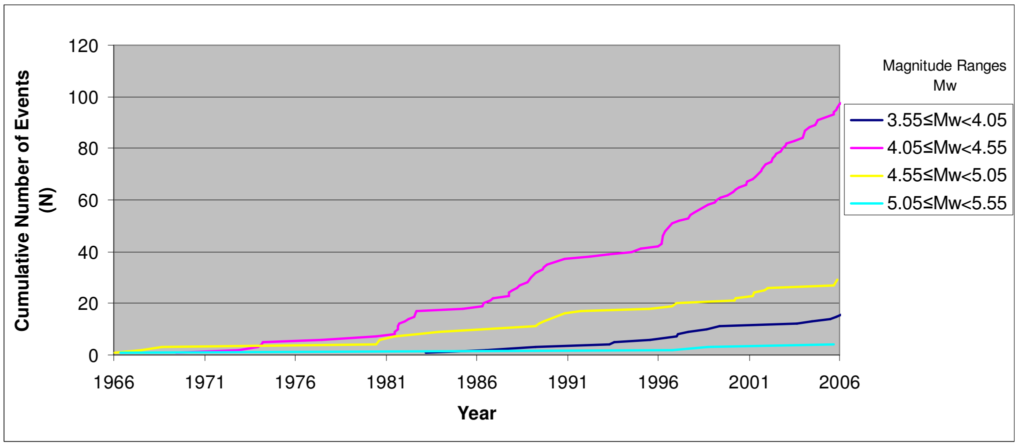


Figure 2.11 Cumulative number of events over the period of observation for different moment magnitude M_w ranges, for Zone 1

Table 2-3 Completeness levels, in years, of the earthquake catalogue by magnitude for the five zone model, Bg=background seismicity

		Zone					
		1	2	3	4	5	Bg
Magnitude	$3.5 \leq M_w < 4$	14	14	14	14	14	14
	$4 \leq M_w < 4.5$	21	21	21	21	21	21
	$M_w \geq 4.5$	41	43	23	28	37	33

2.8 Recurrence Relationship

In order to develop the magnitude frequency relationship, Equation (2.11) was used as previously discussed. Initially a number of zonation maps were identified and used to develop magnitude frequency relationships. Based on this analysis a final zonation map consisting of the six zones (including background seismicity Bg) was chosen as shown in Figure 2.10, for development of doubly-bounded Gutenberg-Richter relationships.

The problem that still exists in using the 6 zones model is that only a portion of some sources will be applicable in this study. Parts of zone 1, for example, are over 1000 km away from Cairo, meaning that this location will not lead to ground-motions of significance in Cairo. Thus a 300 km radius around Cairo was created, with the assumption that this radius provides a bound on locations of earthquakes that could create motions of interest for Cairo (Figure 2.12). The total areas of each zone were then calculated, and the area of the zones that lies within the 300 km radius were also calculated.

Calculating areas from latitude and longitude coordinates entails calculating areas from a curved surface, and thus an approximate method is used. By dividing the map into a grid of 0.5 x 0.5 degrees the approximate area of each cell can be calculated using the following equation (Schloss, 2000):

$$Area = \left[\pi {R_E}^2 (\cos(lat) - \cos(lat + \frac{0.5\pi}{180}))\frac{1}{360} \right] \frac{1}{1 \times 10^6} \qquad (2.16)$$

where R_E is the radius of the earth, and *lat* is the latitude of the centre of the cell in radians. Using Equation (2.16) the area of each cell can be approximated, and thus the total areas of each zone and the encapsulated areas can also be estimated.

Based on this process, the magnitude frequency relationship for each source can be calibrated. A maximum magnitude must exist for each source which cannot be exceeded due to the conservation of energy law in which the energy released from a fault is limited by the fault dimension, the stress lost through rupture and the extent of slip. One of the most widely used methods for estimating the maximum magnitude was developed by Kijko (2004).

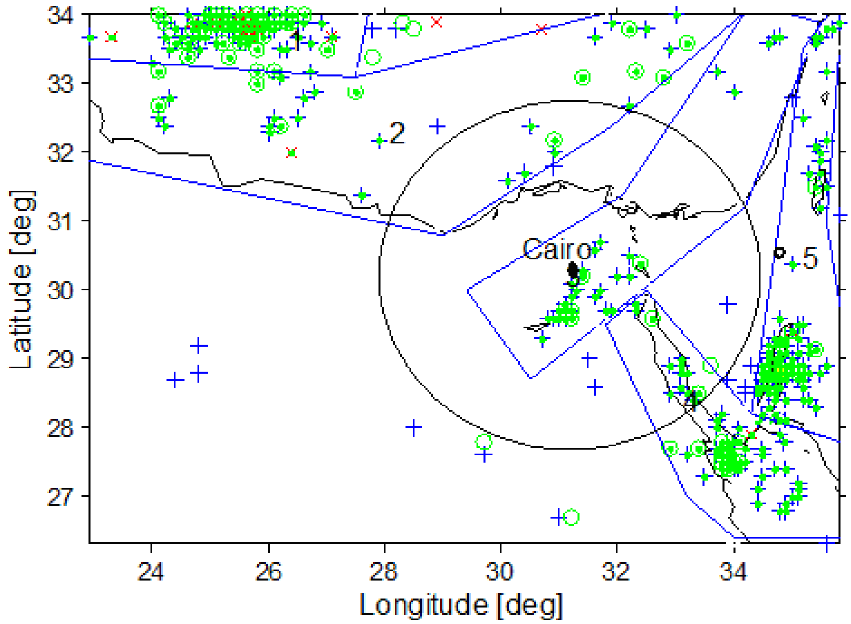


Figure 2.12 Map of radius of earthquake influence around Greater Cairo used in this study

The statistical method developed by Kijko (2004) is justified by the logic that the larger the number of observed events, the smaller the difference between the maximum observed magnitude m_x^{obs} and the estimated maximum magnitude m_x should be since there is an increase of confidence regarding the completeness of the available data. The maximum magnitude m_x is calculated as a function of the maximum observed magnitude m_x^{obs} and the number of events observed. The larger the number of events observed the smaller the difference between the maximum magnitude m_x and the maximum observed magnitude m_x^{obs} would be since there is a greater confidence in the estimated value of m_x. The method developed by Kijko (2004) is shown in Equations (2.17) through (2.20).

$$m_x = m_x^{obs} + E_1(n_2) - \frac{E_1(n_1)}{\beta \exp(n_2)} + m_{min}\exp(-n) \quad (2.17)$$

$$n_1 = n / \{1-\exp[-\beta(m_x - m_{min})]\} \quad (2.18)$$

$$n_2 = n_1 \exp[-\beta(m_x - m_{min})] \quad (2.19)$$

$$E_1(z) = (z^2 + a_1 z + a_2)/z(z^2 + b_1 z + b_2) \quad (2.20)$$

where m_x is the maximum magnitude, m_x^{obs} is the maximum observed magnitude in the earthquake catalogue, m_{min} is the minimum observed magnitude in the earthquake catalogue, n is the total number of events observed, and a_1, a_2, b_1 and b_2 are constants where:

$a_1 = 2.334733$
$a_2 = 0.250621$
$b_1 = 3.330657$
$b_2 = 1.681534$

Magnitude m_x in Equation (2.17) exists on both the right hand side (RHS) and left hand side (LHS). Thus an iterative method is used to estimate m_x. Using this method, the maximum magnitude m_x was calculated for all the zones as shown in Table 2-4.

As can be seen from Table 2-4 m_x could not be calculated using the statistical method for Zone 5 since no solution for the statistical method developed by Kijko (2004) exists. This occurs because in some cases no solution exists where the values for m_x in the RHS and LHS intersect to provide a solution. As can be seen in Figure 2.13 both curves do not intersect for Zone 5, clearly illustrating that this method cannot be used in this case.

Table 2-4 Maximum observed earthquake magnitude, and maximum estimated earthquake magnitude for each of the zones estimated using Kijko (2004)

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Background
m_x^{obs}	5.10	5.20	5.70	6.10	6.90	5.30
m_x	5.15	5.41	5.90	6.37	Diverges	5.65

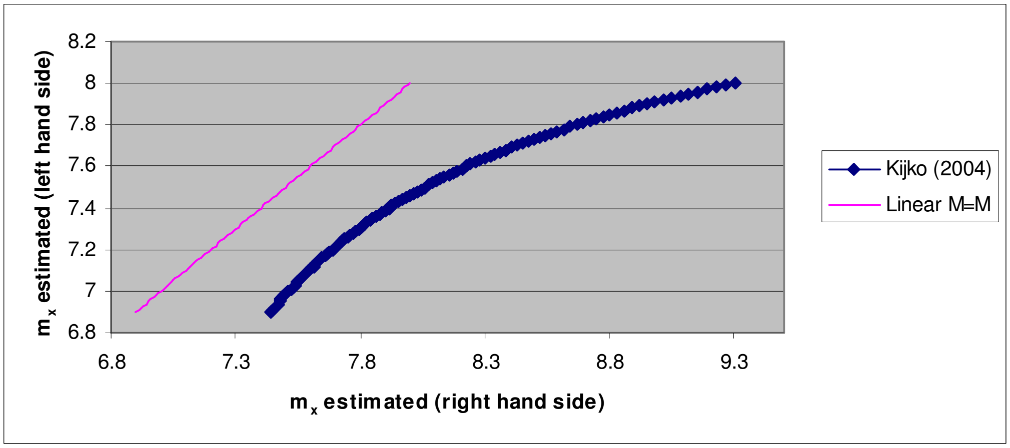


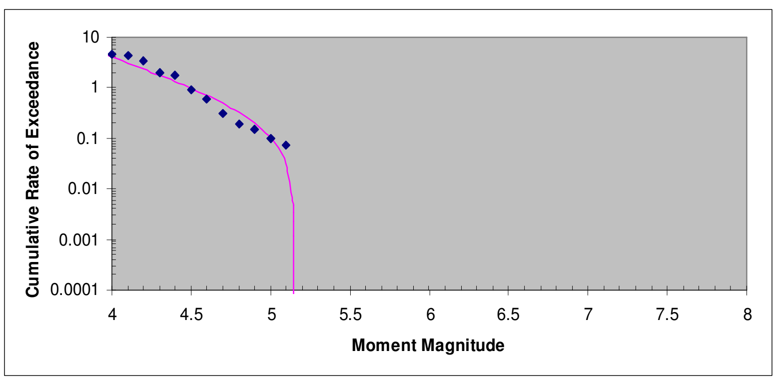
Figure 2.13 Divergence of maximum magnitude based on Kijko (2004) and linear methods

In order to calculate m_x for Zone 5 the magnitude will be based on the physical nature of the source zone. Source Zone 5 is based on the Levant transform system, which according to Salamon et al. (2003) a total length of 1000 km, with relative motion of 0.5 cm/year, while the longest fault, known as the Aqaba fault, is 200 km in length. Moreover the average slip per event is 3 m, and the average slip rate is 4.7 ± 1.3 mm/year (Niemi et al., 2001). According to this data the maximum moment magnitude m_x can be calculated through the use of the empirical correlation models of Wells and Coppersmith (1994), which correlate m_x to various parameters, including surface rupture length, subsurface rupture length, rupture area and average displacement. Using the regression relationship of Wells and Coppersmith (1994), m_x was calculated based on the source definition and dimension. Based on the maximum rupture area the corresponding m_x is 7.80, and thus this figure will be used in the remainder of this study.

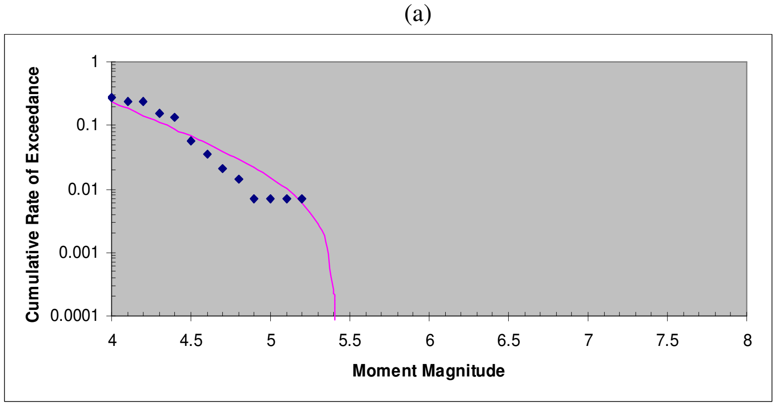
Based on the previous findings, the recurrence relationships for the 5 zones, as well as the background seismicity and entire region were calculated. These doubly-bounded Gutenberg-Richter relationships are shown in Figure 2.14, with the associated parameters of each zone shown in Table 2-5. As can be seen the b-values of the Gutenberg Richter relationships range between 0.69-1.11. The b-value of 1.11

is slightly larger than the value of 1.0 that is commonly expected; this is primarily due to the small range of magnitudes available in the catalogue. However, of greater concern are the smaller values, such as the b-value of 0.69 estimated in Zone 3, which is at the lower end of the scale and falls significantly below the expected value of 1.0. The b-values for these zones are small because there are a limited number of larger events recorded in the catalogue for these zones.

The recurrence relationships for the 5 zones and background seismicity are shown in Figure 2.14 . A large difference exists between the maximum magnitude earthquake m_x and the maximum observed magnitude earthquake m_x^{obs} for Zone 5. The reason for this is that the period of earthquake observation is not be long enough to experience earthquakes that are close in magnitude to the estimated m_x=7.8, creating the difference shown in Figure 2.14 (e).

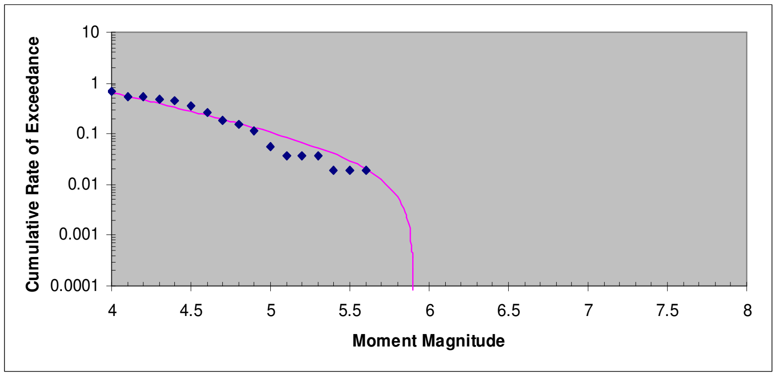


(a)



(b)

Figure 2.14 Recurrence relationships for a) Zone 1, b) Zone 2, c) Zone 3, d) Zone 4, e) Zone 5, and f) background seismicity Bg



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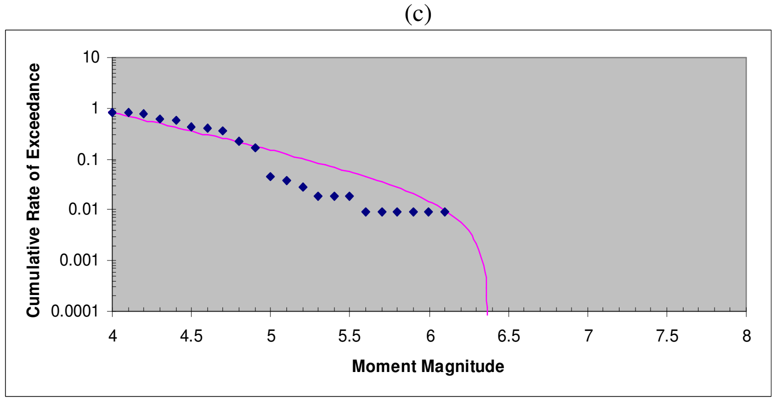

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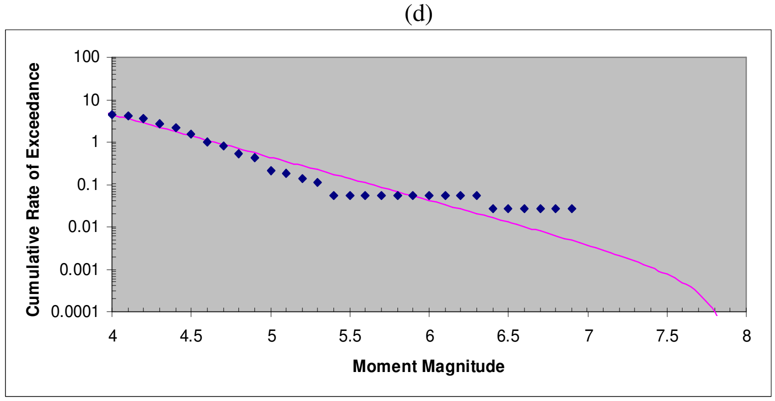
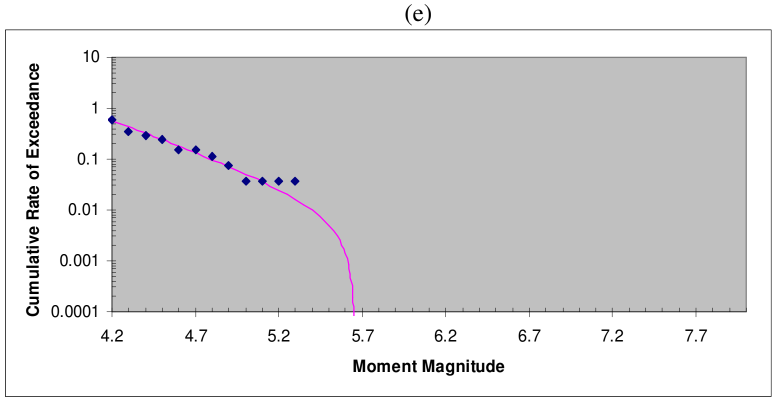


(e)



(f)

Figure 2.14 continued

Table 2-5 Recurrence data for the 5 zones being analysed, background seismicity as well as total seismicity

Zone	b	σ_b	N	$Na_{m,min=4}$	$\sigma_{Na\ m,min=4}$	m_x
1	1.11	0.12	135	4.56	0.39	5.15
2	0.99	0.02	33	0.28	0.01	5.41
3	0.69	0.02	27	0.71	0.14	5.9
4	0.71	0.10	73	0.93	0.11	6.37
5	0.87	0.08	117	5.13	0.47	7.80
Background	0.75	0.31	20	0.66	0.17	5.65
Total	0.95	0.05	405	17.91	0.89	7.80

2.9 Concluding Remarks

This chapter discusses the tectonics and seismicity of Greater Cairo and its surroundings. Based on a literature review, six major seismic sources were identified; Pelusiac trend, Hellenic arc, Cyprian arc, Levant Aqaba transform system, Southern Egypt trends, and the Mediterranean coastal dislocations. The physical parameters and historical events along each of these sources, indicate that each could generate earthquakes that may cause damage to Greater Cairo.

The next step was to create a catalogue of seismic events. A catalogue of 527 events was collected from the ISC, NEIC and NRIAG, along with their epicentral locations. A relationship between body wave magnitude m_b and surface wave magnitude M_s was derived to create a global magnitude parameter for all the events. Moreover since moment magnitude M_w is the most widely used parameter in seismic hazard analysis, and ground-motion models, it was decided to convert all M_s into M_w.

It is important to note that declustering of the catalogue was performed, in order to eliminate possible aftershocks that could be mistaken for main events, by clustering the main event and aftershocks into an equivalent event. This was done using Reasenberg's (1985) method where events area assigned a space and time interaction zone, and if another event occurs within this zone it is classified as an aftershock. If such a step would not have been taken there would have been an overestimation of event occurrences. The 527 events were then declustered to create a final catalogue of 480 events.

Finally recurrence relationships were estimated. According to this certain sources were determined to exhibit greater levels of seismicity than others. According to the recurrence relationships there is an event $M_w \geq 5$ approximately every 10, 66, 10, 7, 2 and 20 years for Zones 1, 2, 3, 4, 5 and Bg respectively. This illustrates that Zones 1, 2, 3 and Bg experience a lower levels of seismicity than the other sources. This is further reflected in considering events of $M_w \geq 6$ where Zones 1, 2, 3 and Bg are not expected to experience such events. Zones 4 and 5 experience greater levels of seismicity where, each will experience events of $M_w \geq 6$ every 68 and 24 years respectively. Moreover Zone 5 is expected to experience events of $M_w \geq 7$ every 272 years illustrating the high level of seismicity evident in the source.

Most previous seismic hazard studies dealing with Greater Cairo did not develop recurrence relationships for surrounding sources since deterministic events were chosen based on previous damaging events (Moharram et al. 2008; Moharram 2006). This study not only establishes recurrence relationships for sources, but also accounts for completeness issues and declustering of the seismicity catalogue that previous studies did not. Establishing a comprehensive seismicity study enables a more comprehensive seismic hazard analyses, as well as creating a foundation on which further work can be developed.

These recurrence relationships identified are used to create earthquake scenarios that are linked to the ground-motion models discussed in Chapter 3.

Chapter 3

Ground-Motion Specification

3.1 Overview

Ground-motion models deal with the evaluation of ground motion distribution for earthquake scenarios. To assess ground-motions in a given region three approaches have historically been used in earthquake loss estimation; deterministic, scenario and probabilistic approaches. Deterministic or scenario analyses deals with estimating ground-motion due to a single scenario whose magnitude and distance from the site are chosen to represent a worse-case scenario, or scenario of interest. Probabilistic analyses on the other hand, take into account all possible seismic scenarios that can affect a given site, covering the full range of magnitude. This chapter reviews the steps for conducting a seismic hazard analyses for the purpose of earthquake loss estimation, from using the seismicity catalogue developed in Chapter 2, to comparing both deterministic and probabilistic methods. It provides one of the first applications of novel work including Importance Sampling and K-means clustering.

In order to assess the ground-motion the first step that needs to be taken is to assess the near-surface geological characteristics throughout Greater Cairo. Since ground-motion at a site is a function of the site specification, the geological specification of the site needs to be investigated. This is done through the use of historical geological data, as well as geotechnical investigations.

Once this data is collected, attenuation relationships are selected for predicting ground-motion. These relationships are selected based on their applicability for use in Egypt. The relationships selected might employ different metrics for magnitude, distance and site specification variables, than the assembled data available from the seismicity and geological investigations. Therefore, the data available needs to be adjusted to conform to the data required for the attenuation relationships.

Each attenuation relationship estimates the median spectral acceleration as well as the standard deviation. However, the variability in ground-motion still needs to be taken into account in order to estimate the final spectral acceleration at each site. Variability in ground-motion is estimated in this chapter, accounting for variability between sites, based on both spatial and period-to-period correlations.

A major obstacle that exists in modelling ground-motion is the extensive computational time and resources required to simulate the large number of earthquake scenarios. In order to reduce the computational time of the model two methods are used, K-means clustering and Importance Sampling. Using these methods final estimates of ground-motion as well as scenario likelihoods are generated. The discussed scope of Chapter 3 is shown in Figure 3.1.

3.2 Near-Surface Geological Classification

3.2.1 Overview

In order to estimate ground-motion at a given site, the site specification needs to be known. Site specification involves classifying the near-surface geology. This is done using two methods, historical geological data and geotechnical investigations.

Historical geological data provides a means for estimating the soil characteristics at a given site, through the understanding of the historical formation of the near-surface geology throughout Greater Cairo. Moreover, geological data can be used to map the historical path of the Nile River, in order to locate areas of soft soil deposits.

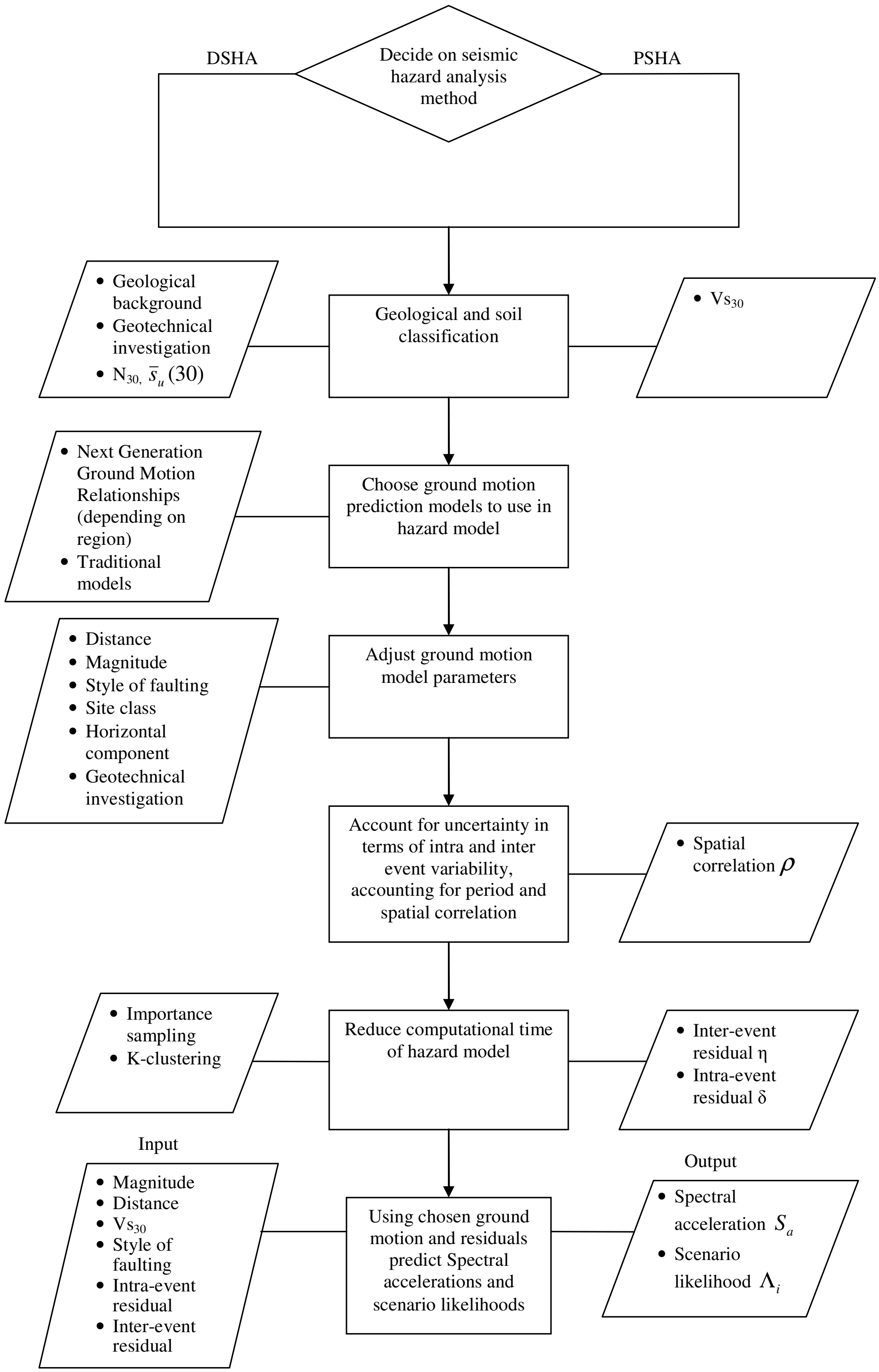


Figure 3.1 Scope of Chapter 3

Geotechnical investigations provide the most accurate method for classifying soil at a site. An extensive database of boreholes is used to categorise the soil at each site. This categorisation enables estimating the seismic amplification characteristics of the near surface geology.

3.2.2 Geological Overview

The Greater Cairo area that is used in this study encapsulates the governorates of Cairo and Giza which was used in the study conducted by Moharram (2006), as well as the urban area of 6th of October, and New Cairo which is part of the governorate of Helwan (Figure 3.2). The region is 100 km wide from the 6th of October to New Cairo, and 85 km in length from Atfeeh to Embaba. Moreover there is a great difference in elevation between different locations. The Nile valley lies at an elevation of 23 m above sea level, whereas 6th of October to the west and New Cairo to the east lie at elevations of 170 m and 260 m above sea level respectively. Due to the significant size of this area the near-surface geology differs greatly throughout. In order to better understand this diversity, one needs to take a closer look at the geological evolution, stratigraphy and palaeogeography of the study area.

Palaeogeography deals with the study of geography during the past, and it helps enable a better understanding of the geological formations that have taken place. Figure 3.3 reflects the palaeogeographical maps of the Mediterranean region. As can be seen most of northern Africa including Egypt was submerged in the Cretaceous period. With the passing of the Eocene epoch, Africa and Eurasia began to move closer to each other, until the Miocene epoch in which the modern Strait of Gibraltar closed up, and the Mediterranean Sea evaporated. This event is known as the Messinian Salinity Crisis. This lead many submerged regions to become exposed, moreover it lead to the sedimentation of marine deposits.

The effects of the Messinian Salinity Crisis can be seen in Figure 3.4, which represents a stratigraphic chart of the subsurface of the Nile. During this event a period of unconformity occurred (El Mahmoudi and Gabr, 2009). With the end of this event and the dawn of the Pliocene epoch, the Strait of Gibraltar opened, and the Atlantic Ocean poured once more into the Mediterranean. This lead to the formation of the Kafr el Sheikh formation beginning in the lower Pliocene epoch, which is characterized by carbonaceous and sandy shale (Zaghloul et al., 1976). Figure 3.4 also highlights the creation of other geological formations beginning in the Cretaceous period moving all the way to the Holocene. During the Lower Eocene period the formation of shelf carbonates began, leading to the creation of the Mokattam and Thebes formations. Both the Mokattam and Thebes formations are mainly limestone that is finely grained with occasional clayey mudstones, wackstones and packstones with mainly foraminifera (Harrell, 2007). Just prior to the Messinian Salinity Crisis a formation known as the Sidi Salem formation began to be formed during the middle Miocene period. This formation is represented by up to 931 m of shales, sandy shales and dolomites (Tawadros, 2001).

The Oligocene period involved the formation of two deposits around the Greater Cairo region; the Qatrani and Haddadin Basalt formations. Fayoum lies in the floodplain of the Nile and experienced periodic flooding, which lead to the formation of the Qatrani (Schlüter, 2008). The Haddadin Basalt formation was caused by the eruption of the Rainbow Volcano between Cairo and Suez (Kamel and Sokkary, 1996). Lastly the Upper Pliocene, Pleistocene and Holocene epochs, were the scene for the formation of the El-Wastany, Ghamr and Bilqas formations respectively, all of which are clayey sandstone.

This geological evolution is evident when a cross-section of the Nile valley is taken at Cairo (Figure 3.5). The upper Eocene layer conforms to the already mentioned Mokattam formation, which is shown on the east and west of the Nile Valley. In addition the Kafr El Sheikh and El-Wastany formations are also revealed in the valley in Figure 3.5.

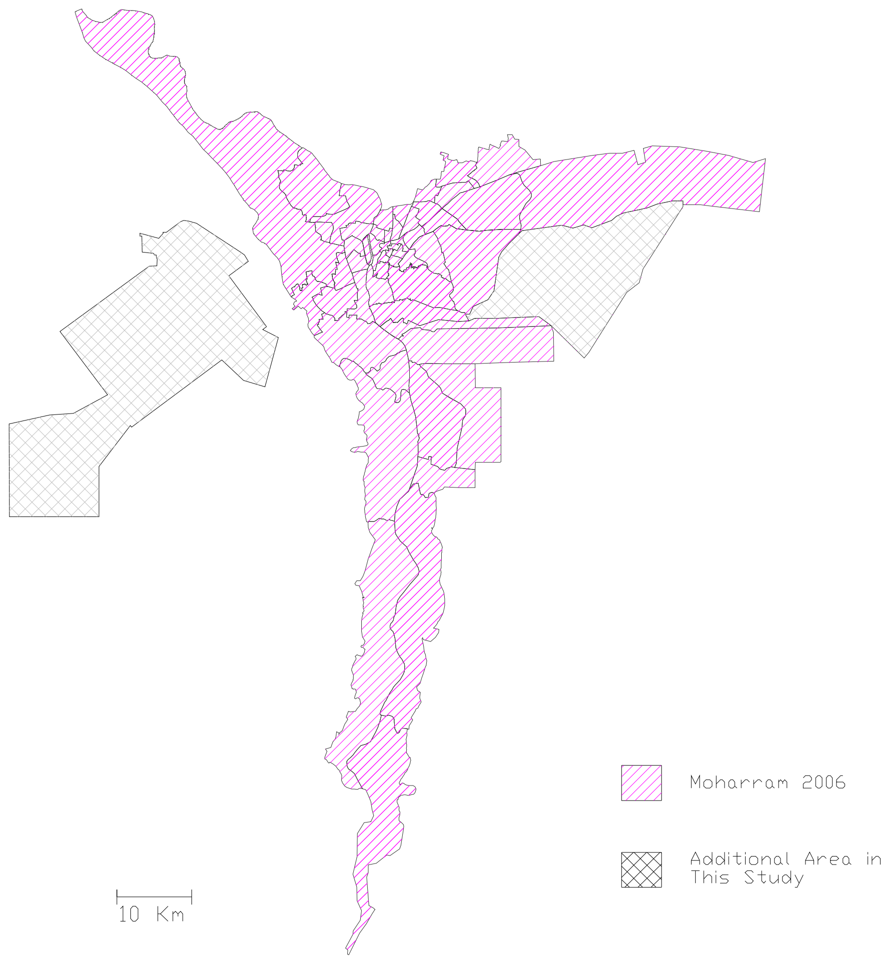


Figure 3.2 Original study area by Moharram (2006) and the additional area used in this study with 6th of October in the west and New Cairo in the East

Most of the study region being analysed was covered by Moharram (2006), and accounts for most of the layers of deposit shown in Figure 3.5. The regions that are not included are; Masr Il-Gedida, Nasr City and New Cairo in the east, and 6th of October in the west, which are shown in Figure 1.2. The following section analyses the Nile Valley area covered by Moharram extensively (2008), discussing each region, as well as examining the eastern and western areas.

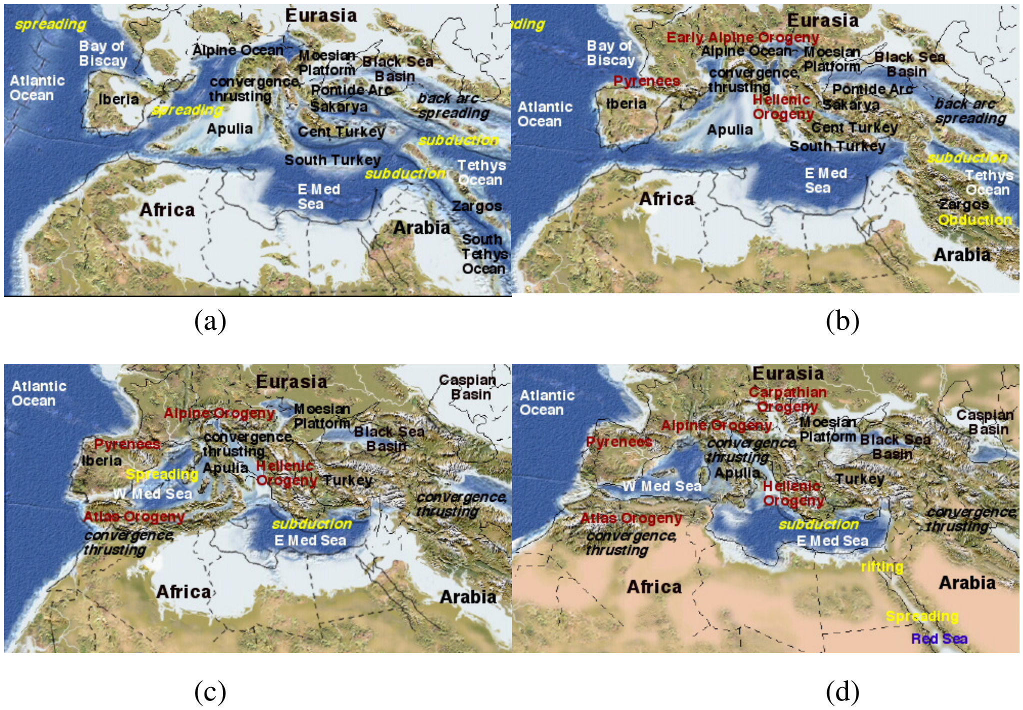


Figure 3.3 Sedimentation, Tectonics, and Paleogeography of the Mediterranean Region (Blakey, 2009), a) late Cretaceous- early Tertiary, b) Eocene, c) Oligocene-early Miocene and d) late Miocene

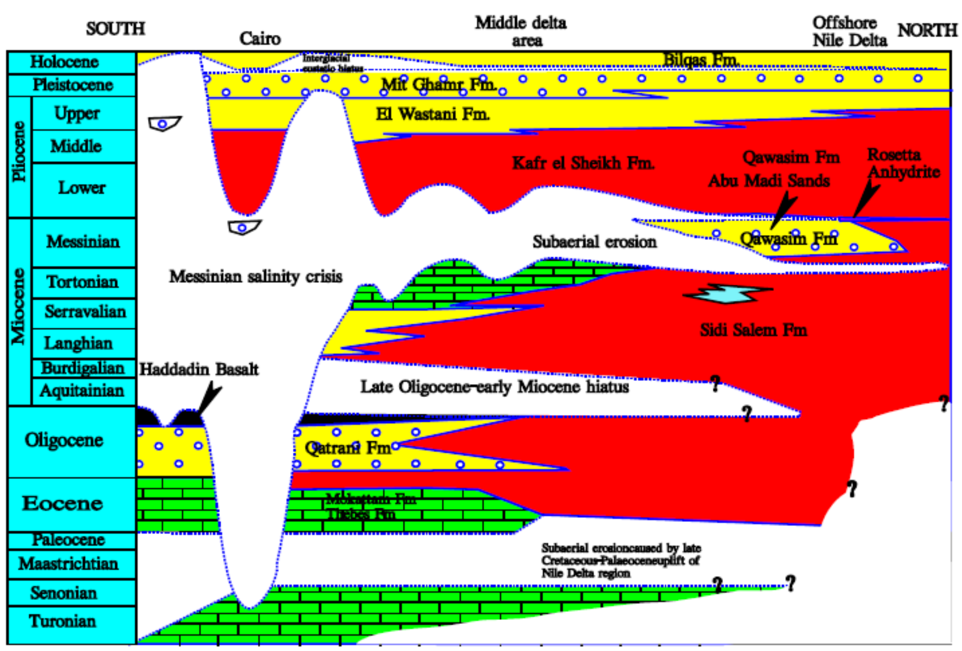


Figure 3.4 Diagrammatic stratigraphic chart for subsurface of the Nile Delta (El Mahmoudi and Gabr, 2009)

Nile Valley

The Nile Valley is extremely diverse in terms of its geology due to the many geological events that were discussed in the previous section. The west side of Nile is more homogeneous than its eastern counterpart, with mostly stiff silty clay with traces of sand and fine pieces of stone that exist in Mohandeseen and Embaba, while some areas closer to the bank of the Nile have soft to stiff silt clay with traces of sand and mica. This is typical of in areas such as Dokki and Waraq (Figure 3.6).

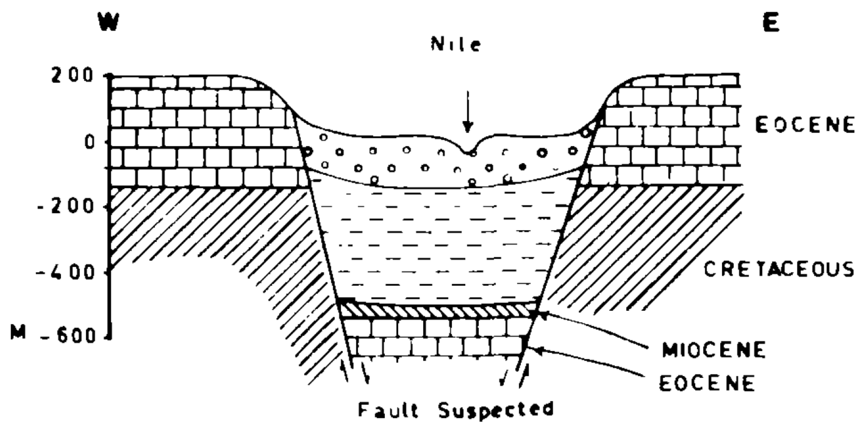


Figure 3.5 Geological cross section at Cairo (Shata and El-Fayoumy, 1970)

As the Nile passes through Cairo it does so in a meandering fashion, which over the years has lead to the erosion along the bank of the Nile in which the flow is faster. The eroded sediment is then deposited in the meander that follows along the bank of the river which exhibits a slower flow. This phenomenon resulted in the formation of many islands along the river’s paths, most notable of which are Zamalek and Roda, both of which are now important residential areas.

As already mentioned, the eastern side of the valley exhibits a more diverse geological setting, and includes the Mokattam and Sidi Salem formations. The diversity is clearly evident when looking at the Maadi region in the south which consists of alluvium, silt, sands and gravel, while its immediate neighbour Old Cairo to the east is composed mainly of yellowish white limestone that is part of the Mokattam formation.

Moving further north along the eastern bank of the Nile two regions of fill exist. The first of these regions is known as West il Balad (Centre of the City), which is an important commercial and political centre, and includes areas such as Ramsis and Tahrir. This area lies on thick fill, that is underlain by stiff silty-clay and sand. The second region which includes Shubra is an underdeveloped region with many poorly engineered structures. This region lies on fill underlain by thin silty clay and sand.

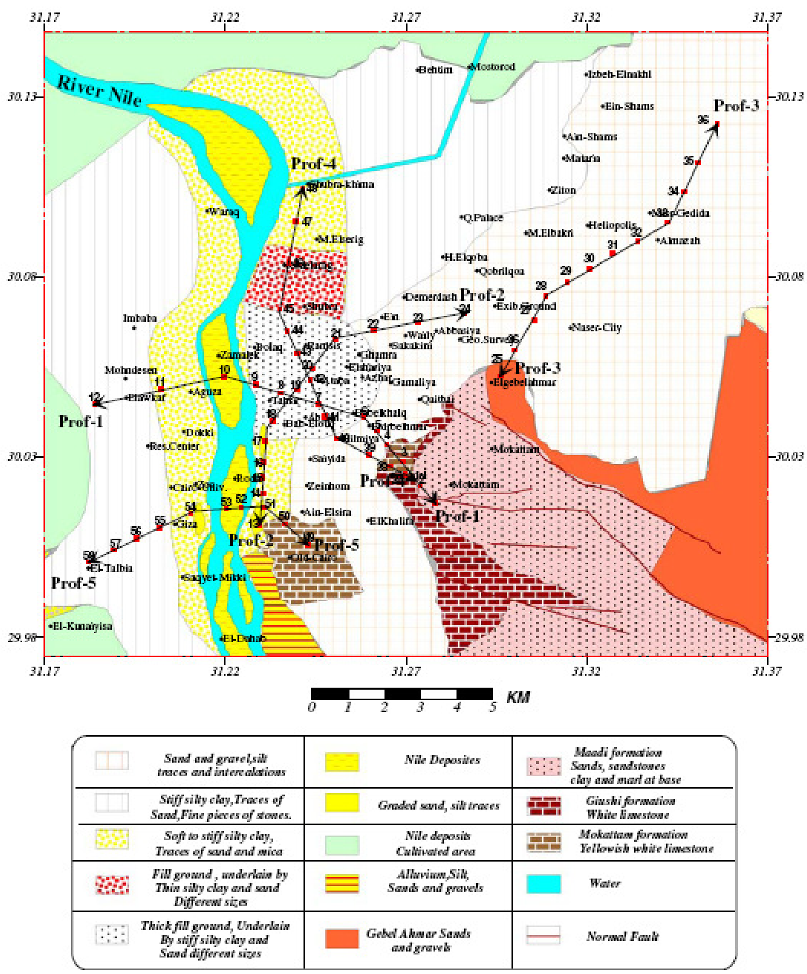


Figure 3.6 Local site geology in Cairo (Gamal, 2009)

<u>Eastern Cairo</u>

New site geology is witnessed when analysing the eastern regions of Greater Cairo, including; Masr Il Gedida, Nasr City and New Cairo. This region lies on a higher elevation than any other region in Cairo, as high as 260 m above sea level. This elevation is mainly due to the development of the Mokattam and Maadi formations, both of which took place in the Eocene period, as well as the Gebel Ahmar which took place in the Oligocene period. As mentioned previously, The Mokattam and Maadi formations are mainly limestone that is fine-grained with traces of clayey mudstones, wackstones and packstones which consists mainly of foraminifera, while the Gebel Ahmar formation is primarily sands and gravel. New Cairo lies in this area, with a small part of it lying on the Maadi formation, while most of it lies on the sands and gravels of the Gebel Ahmar formation.

Nasr City and Masr Il Gedida exist on a lower plateau, compared to Maadi, which consists of sand and gravel along with traces of silt. Nasr City lies on Oligocene sands and gravel from the Gebel Ahmar formation, and Masr Il Gedida lies on similar base, however with red Pleistocene subsoil.

<u>Western Cairo</u>

The area of study to the west of Cairo extends from the Giza plateau till 6th of October City. The area that extends up to the Giza plateau and lies at a lower elevation is mostly composed of sand and sandy shales that are part of the Sidi Salem lower Miocene formation. However, the Giza plateau consists of deposits composed over three different ages; Plicatula-bearing marl-limestone which was formed during the Santonian age, a combination of flint-bearing chalky limestone, actaeonella-bearing limestone-marl, limestone, rudist-bearing limestone-marl and basalt clastic that were all formed in the Turonian age, and chalk from the marine Pliocene epoch in the Zanclean age that occurred after the Messinian Salinity Crisis (Badawi, 2009). These are the main formations that exist in this region, however patches of the Mokattam and Maadi formations also appear, as shown in Figure 3.7.

The section of 6th of October City that lies closest to the Giza Plateau is composed mainly of plicatula-bearing marl-limestone which was formed during the Santonian age. While further west the formation changes to basalt that is part of the Haddadin basalt formation of the Oligocene epoch.

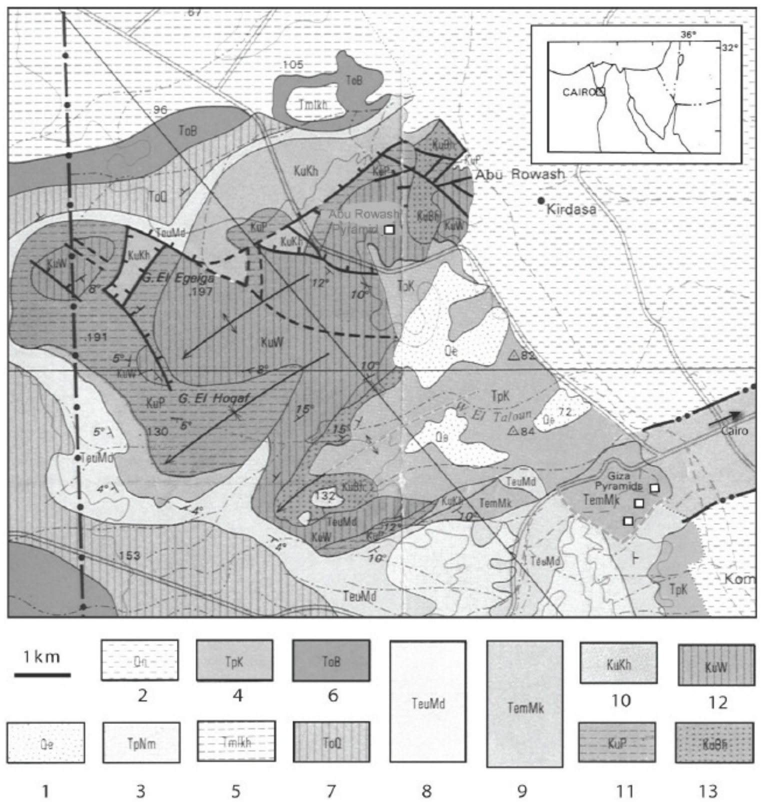


Figure 3.7 : 1. Eolian deposits – sand dunes and sheets; 2. Nile deposits – cultivated area. Tertiary: 3. Continental Pliocene; 4. Marine Pliocene; 5. Lower Miocene; 6. Oligocene basalt flows; 7. Basalt Oligocene; 8. Upper Eocene - Maadi Formation; 9. Middle Eocene – Mokattam Formation. Secondary: 10. Maastrichtian; 11. Santonian; 12. Turonian; 13. Cenomanian (Raynaud et al., 2008)

3.2.3 Geotechnical Study

Overview

In order to account for differences in site classes between one site and another when modelling ground-motions, site amplification parameters are often used. Site amplification takes place due to the soil characteristics of a given site. This takes place due to the impedance contrast between soil layers. When seismic waves reach a given soil layer some of the energy is reflected back, while some passes through the soil layer. The amount of energy that passes through the layer is a function of the soil layer characteristics, illustrating the effects of soil class on ground-motion levels. Moreover, the depth of the soil layer affects the natural period of the soil. The most widely used parameter to generically account for dynamic characteristics is the average shear wave velocity over the uppermost 30 m, $\overline{V_S}(30)$.

Average shear wave velocity $\overline{V_S}(30)$ values are usually not provided directly in geotechnical reports in Egypt, and must therefore be calculated through other means. Standard Penetration Tests (SPT) are performed in most geotechnical studies, and thus provide a good basis from which to infer $\overline{V_S}(30)$ values. SPT is performed in-situ by driving a slide hammer weighing 63.5 kg into the ground. The hammer is dropped a distance of 760 mm, to the base of the borehole, and is driven an initial 150 mm into the ground, with the number of blows required to penetrate each 150 mm of ground being recorded, up until 450 mm is penetrated. The initial blow count in the first 150 mm is not taken into account since the top layer is usually disturbed, and thus 300 mm that follow give a better indication of the soil parameters. If the hammer is unable to drive through the total 450 mm in 50 counts, then final blow count and the penetrated depth is recorded.

Variations of SPTs exist, thus corrections need to be made to the results to ensure their accuracy, and to enable direct comparison between tests. These corrections are discussed in Appendix B and highlighted in Table B-1.

After SPT results are provided at various depths from a borehole, the challenge remains to link SPT values to $\overline{V_S}(30)$. This is done through the use of the NEHRP soil classification scheme (NEHRP, 2000) as presented in Table 3-1. Since the NEHRP soil classification scheme encompasses all site classes relevant to this study, its use for Egypt is justified.

Table 3-1 Site classification based on the NEHRP provisions (NEHRP, 2000)

Site Class	**Description**	$\overline{V}_S$	***N* or *N*$_{ch}$**	$\overline{s}_u(30)$
A	Hard Rock	> 1500 m/s		
B	Rock	760 to 1500 m/s		
C	Very Dense Soil	360 to 760 m/s	> 50	> 100 kPa
D	Stiff Soil	180 to 360 m/s	15 to 50	50 to 100 kPa
E	Stiff Clay	< 180 m/s	< 15	< 50 kPa

N_{ch}= average SPT blow count for cohesionless soil layers over the uppermost 30 m of the soil, N=average SPT blow count over the uppermost 30 m of the soil, $\overline{s}_u(30)$= average shear strength for cohesive soils over the uppermost 30 m of soil,

A soil class F exists, which requires a site specific evaluation. This is done in the following situations:

1. Soils vulnerable to potential failure or collapse e.g. liquefiable soils
2. Peat and/or highly organic clays H >3 m of peat and/or highly organic clay, where H = thickness of soil)
3. Very high plasticity clays H > 8 m with PI > 75
4. Very thick, soft/medium stiff clays H > 36 m with $\overline{s}_u$ < 50 kPa

Thus through the site classification shown in Table 3-1, $\overline{V}_S$ can be estimated from the multiple SPT values evaluated from various depths throughout the borehole.

<u>Data Collection</u>

Greater Cairo encapsulates a very large area, and, as previously discussed, contains great diversity in its geology. For this reason it is important to collect as much geotechnical data as possible to ensure the accuracy of the results obtained. Nonetheless a problem that remains is that very few geotechnical reports that are available in Egypt provide SPT results for depths reaching or exceeding 30 m. This means that $\overline{V}_S(30)$ cannot be directly deduced from this data. Thus a method for correlating SPT results for depths less than 30 m to the 30 m reference depth needs to be established.

Boore (2004) proposed four methods for correlating between shallow velocity estimates and $\overline{V}_S(30)$. The methods are as follows:

(i) *Constant Velocity Extension:* This method assumes that the velocity at the lowermost depth extends to 30 m

(ii) Extrapolation Assuming Linear Increase in Velocity: assumes linear velocity increase between depth *d* where the velocity model is available, and 30 m

(iii) Extrapolation Using Correlation between $\overline{V}_S(30)$ and $V_S(d)$: Correlates $\overline{V}_S(30)$ and $V_S(d)$ for every 1 m based on collected sample data

(iv) *Extrapolation Based on Velocity Statistics to Determine Site Class:* This method calculates the velocity V_{eff} needed to raise the site class to the next stiffer class, and then calculates the ratio of $V_S(d)$ to V_{eff}.

All four methods have their advantages and disadvantages. Method (i) is the simplest requiring no computational analysis, however as in the case of method (ii), the $\overline{V}_S(30)$ is usually underestimated since they both assume that either the velocity does not increase with depth, or increases at a constant rate. Method (iv) shows improvement on method (iii), since it uses a probabilistic method of analysis. Moreover method (iii) is based on a fit with an associated error, meaning that values for $\overline{V}_S(30)$ are drawn from a Gaussian distribution, thus the $\overline{V}_S(30)$ values that are calculated using this method would not be perfectly correct. However, method (iv) takes into account the probability of being within a certain site class, therefore its final findings exhibit an improved capture of uncertainty. Due to these reasons method (iv) is to be used in this study to calculate $\overline{V}_S(30)$ throughout Greater Cairo.

The chosen method (iv) is probabilistic in nature, and was developed by Atkinson and Boore (2003). Since velocity generally increases with depth, then there is a possibility that the velocity between and the bottom of the borehole and 30 m is high enough that the site class should be classified according to the next stiffer class. This is done in a statistical manner, where the velocity V_{eff} needed to raise the site class to the next stiffer class, is first calculated, along with the ratio of $V_S(d)$ to V_{eff}. This analysis is done for every depth up to 30 m in increments of 1 m, with the ratio $V_{eff}/V_S(d)$ being tabulated in increments of 0.1, starting at 0.4 for every depth. These results are then computed in terms of a complementary cumulative distribution as a percentage and plotted. This plot is then fitted using a power law in the form of:

$$P\left[\zeta > \left(V_{eff}/V_s(d)\right)\right] = a(V_{eff}/V_S(d))^b \qquad (3.1)$$

If the probability calculated in Equation (3.1) is equal to 1, then the site class is changed to the next stiffer site class. If P < 1, then a random number *r* uniformly distributed between 0 to 1 is generated. If r ≤ P, then the site class is changed to the next stiffer class.

Calculating $\overline{V}_S(30)$ for the Greater Cairo area requires a very large sample of data. This data is collected from two main sources. The first of these sources is the study of Moharram (2006), which acquired data from 42 projects throughout Cairo, resulting in 511 borehole logs. The study of Moharram (2006) did not account for the areas of 6th of October, Masr Il Gedida, Nasr City and New Cairo. Thus a second source of data from geotechnical consultants who conducted various studies in these regions is used (Space Consultants, 2009). These studies are selected so as to provide data that is well distributed geographically. The locations of the boreholes used in these studies are shown in Figure B.1 (Appendix B).

A major obstacle that exists is correcting the available SPT data (Table B-2). The reason for this is that there is great inconsistency in the manner in which different geotechnical consultants conduct their studies. This means that no global correction exists for the entire compiled dataset. Not taking these corrections into account provides an added source of uncertainty and error. Based on the corrections shown in Table B-2 the corrected SPT values could range from 34 percent to 161 percent of the original SPT values. However, since there is no means of establishing the correction factors for each geotechnical investigation, attempting to estimate such corrections would lead to greater levels of uncertainty. Assuming the average correction levels for each factor would lead to the corrected SPT values being 99 percent of the original SPT values, thus the original SPT values are used.

Data Analysis

Method (iv), proposed by Boore (2004) was applied to the 511 borehole logs collected by Moharram (2006) and 46 other boreholes logs collected (from geotechnical consultants) as part of this study for 6th of October and New Cairo. The application of the method generated complementary cumulative distributions for the ratio of $V_{eff}/V_S(d)$ at each depth. However Equation (3.1) was modified from a power law fit to an exponential fit using Equation (3.1), since an exponential fit is simpler to analyse, and satisfies the condition set by Boore (2004) where the curve passes through the point (1,1).

$$P\left[\zeta > \left(V_{eff}/V_s(d)\right)\right] = \exp((V_{eff}/V_S(d))(a-1)) \qquad (3.2)$$

Figure 3.8 gives an example of fits of Equation (3.2) for two selected depths. The data points labelled as “used for fit” are the points collected from the 557 borehole logs collected and used to fit Equation (3.2), whereas for any point where $V_{eff}/V_s(d)<1$, P is assumed to be equal to 1. Since velocity usually increases with depth, then if $V_s(d)$ is already greater than V_{eff} then the site would be moved to the next stiffer site class. Therefore, even though using the method described by Boore (2004) results in Probability P for $V_{eff}/V_s(d)<1$ being less than 1, practically this is not logical, since such a case would result in the site being moved to the next stiffer site class, therefore P is assumed to equal 1. The coefficients for depth starting at 6m up to 29m are shown in Table 3-2. Depths below 6 m do not require analysis since all the boreholes exceed 6m in depth.

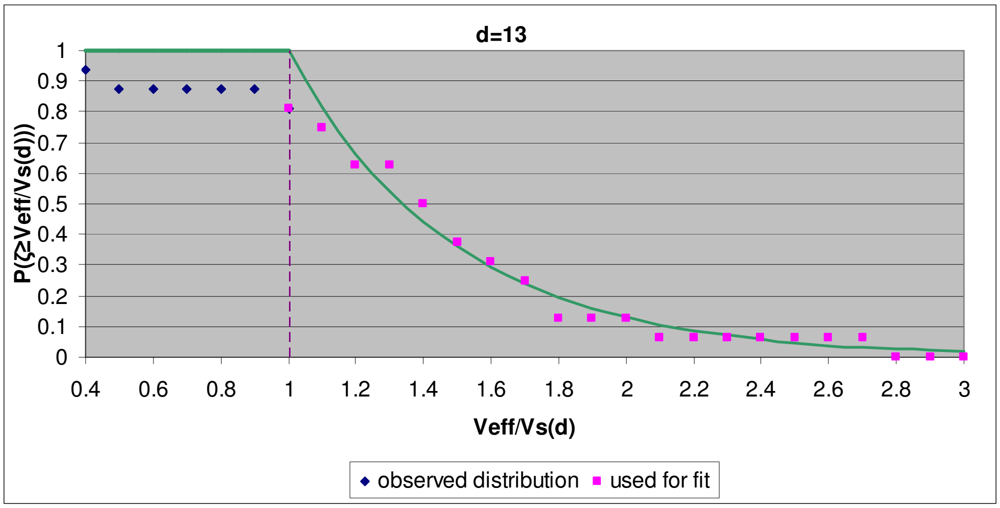


Figure 3.8 The complement of the cumulative probability of the ratio Veff /Vs(d), for bottom depths of 13m. Also shown are the exponential fit

Table 3-3 illustrates five examples of determining the NEHRP site class according to Equation (3.2). As can be seen three of the five site classifications are adjusted, whereas the remaining two remain the same.

<u>Soil Classification</u>

Through the data analysis conducted in the previous section, all sites in Greater Cairo can be classified according to the NEHRP site classification as shown in Figure 3.9. Most, if not all, of the sites on the west bank of the Nile are classified as class D, while class B and C sites are located on the east bank of the Nile. This is related to the previously mentioned formations that were created during the Oligocene period. Class E sites are located at close proximity to the Nile. This is expected since over the course of its history the Nile deposits a large amount of soft silt material which accumulates close to its banks. The concentration of class E sites is primarily on the east bank of the Nile rather than being evenly distributed. This is mainly due to the changes in the course of the River Nile over the years, which had a main channel running further east of its current path in the past (Figure B.2).

Table 3-2 Coefficients of Exponential Fit Equation (3.2) to the Complementary Cumulative Distribution of Values of Veff /Vs(d) for depths ranging from 6-29m

Depth (m)	a	σ_a	Depth (m)	a	σ_a
6	-2.46	0.15	18	-2.35	0.15
7	-1.45	0.10	19	-1.06	0.07
8	-1.93	0.13	20	-2.24	0.14
9	-1.80	0.12	21	-1.63	0.11
10	-1.68	0.12	22	-1.56	0.11
11	-2.16	0.14	23	-2.99	0.16
12	-2.21	0.14	24	-2.59	0.15
13	-2.05	0.13	25	-3.07	0.17
14	-2.40	0.15	26	-2.03	0.13
15	-2.34	0.15	27	-2.55	0.15
16	-1.74	0.12	28	-1.37	0.00
17	-2.53	0.15	29	-8.92	0.20

Table 3-3 Examples of Determination of NEHRP Site Class using Probability-Based Extrapolation

Area	Borehole No.	Borehole depth (m)	P [1]	Site Class	Adjusted site
6th of Oct	Fayoum Housing	9	99.22	C	D
New Cairo	Bloom Bank 1	9	80.97	C	D
Masr Ged	ESSO M. Bakry	6	100.00	C	D
Nasr City	Nasr City Block 13	10	0.33	B	B
Warrack Bridge	RRWB-1A	28.5	0.00	C	C

[1] $P = P\left[\zeta > \left(V_{eff} / V_s(d)\right)\right]$

3.3 Ground-Motion Model

3.3.1 Overview

Prior to estimating earthquake losses, levels of ground shaking need to be established. In order to establish such levels, two methodologies exist. The first of these methods is the scenario based loss estimation, which calculates anticipated ground-motion through a scenario based approach, and estimates the losses according to these ground-motions. In analysing the ground-motion at a given site, potential seismic sources are identified, and an earthquake scenario is chosen.

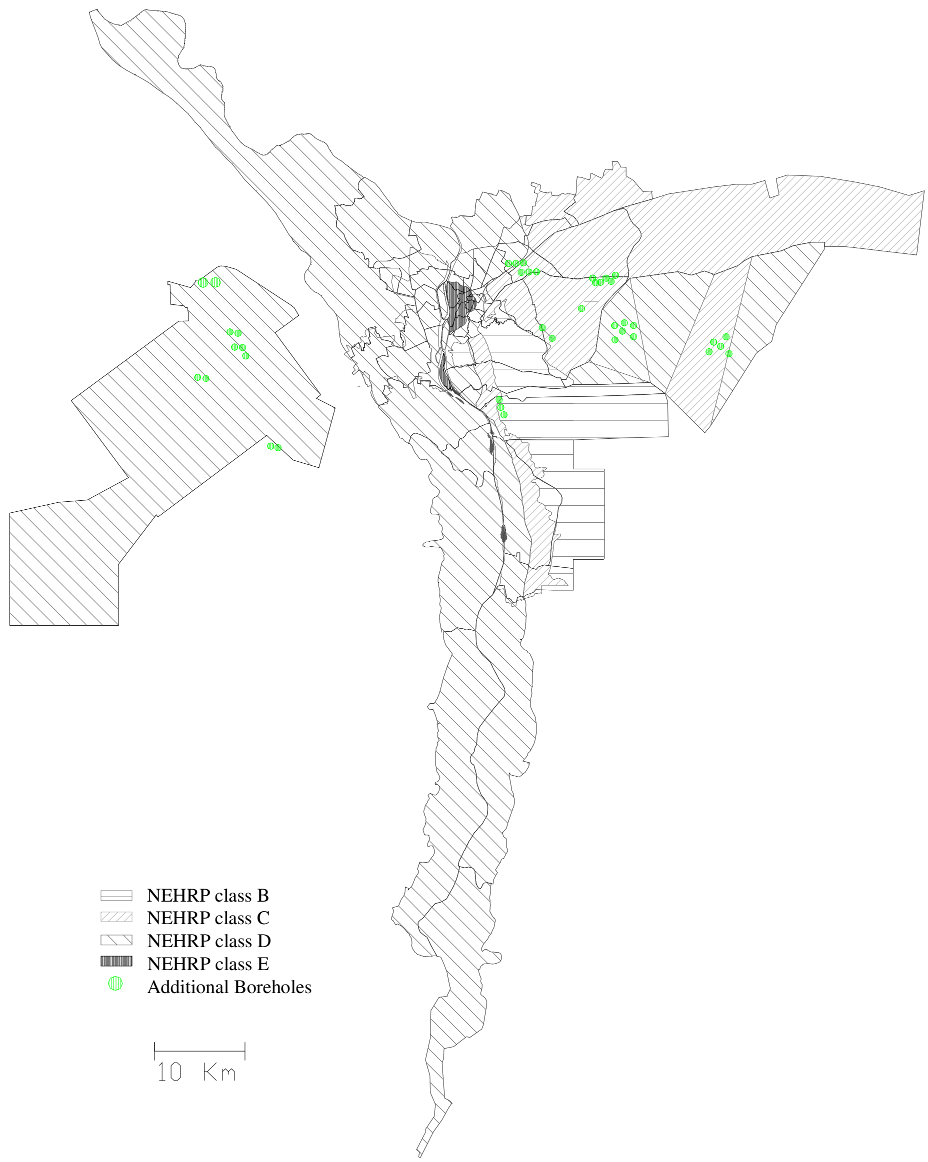


Figure 3.9 Classification of soil deposits in the study area according to the NEHRP classification system (NEHRP, 2000)

The second method that can be used in seismic hazard analysis is probabilistic loss estimation. This method identifies all possible scenarios and estimates the probability of each scenario taking place. The loss associated with each scenario is then estimated.

One cannot state that one seismic hazard analysis method is better than the other; however one method can have greater priority depending on the quantification of decisions needed, seismic environment and scope of project (McGuire, 2001).

The best method of mitigating the effects of an earthquake, is to provide adequate design codes that ensure that structures can respond to anticipated ground-motion levels. Using probabilistic loss estimation, seismic zonation maps and design levels can be established, for various return periods, which is not possible using a scenario based approach. However, if a quick estimate of damage is required in order to estimate aid to a region, a scenario based analysis would be more suitable.

Seismic activity and tectonic configuration in a region play an important role in choosing the most appropriate method of analysis. At the time of analysis, if a given site is close to a known active fault, then it is unlikely that another source would lead to a higher level of ground-motion at the site. Thus using a scenario based approach in which the active fault is used as the known source would be most appropriate, if the ground-motion for a particular return period is not required.

Lastly for specific sites in which various sources of seismicity occurs and one requires the computation of probability of exceedence of a given level of ground-motion, then a probabilistic approach is more suitable. Figure 3.10 illustrates the application of each of the discussed methods.

Since the goal of this study is to produce a loss-curve that estimates loss levels and the likelihoods of each level, then a probabilistic based approach is more appropriate, and is thus chosen for this study.

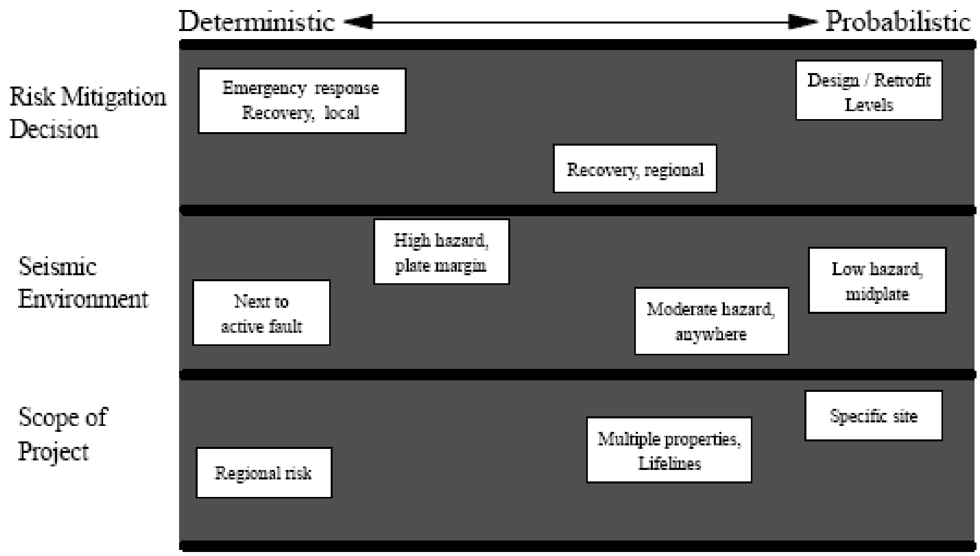


Figure 3.10 Seismic risk applications in the deterministic-probabilistic spectrum (McGuire, 2001)

3.3.2 Ground-Motion Prediction

Ground-motion prediction equations, also known as attenuation relationships, are a tool used within seismic hazard analysis to evaluate the physical nature of ground shaking at a given site. These equations include variables that account for the earthquake source (magnitude of earthquake), source to site path, and properties of the site. The common ground-motion prediction equation is given in the form of:

$$\log y_{ij} = \mu(M_{ij}, R_{ij}, \theta_{ij}) + \varepsilon_{E_i} + \varepsilon_{A_{ij}} \tag{3.3}$$

where $\mu(M_{ij}, R_{ij}, \theta_{ij})$ is the predicted mean of the natural log of spectral acceleration ε_{E_i} is a term which accounts for inter-event variability whose mean is zero, and variance is σ_E, and $\varepsilon_{A_{ij}}$ is a term which accounts for intra-event variability whose mean is zero, and variance is σ_A.

Different forms of this relationship exist for different regions around the world. This is primarily due to the differences in the characteristics of seismic behaviour in different regions, including depths and magnitudes of earthquakes. Table 3-4 presents a number of different ground-motion prediction equations. As can be seen different equations use different measures of magnitude and distance, and account for the combination of horizontal components and style of faulting differently. Moreover, the regions in which they are developed to limit their use for regions of similar characteristics.

Five of the ground-motion prediction equations shown in Table 3-4 are known as Next Generation Attenuation (NGA) relationships, which are a product of the NGA project implemented by the Lifelines Program of the Pacific Earthquake Research Centre (PEER), in collaboration with the US Geological Survey and the Southern California Research Centre (Power et al., 2008). The five equations are: Abrahamson and Silva, 2008 (AS08); Boore and Atkinson, 2008 (BA08); Campbell and Bozorgnia, 2008 (CB08); Chiou and Youngs, 2008 (CY08); and Idriss, 2008 (I08). These equations were developed by developers of five pre-existing and widely used ground-motion models, and include; Abrahamson and Silva (1997), Boore et al. (1997), Campbell (1997) and Campbell and Bozorgnia (2003), Sadigh et al. (1997), and Idriss (1991). These NGA models took into consideration new parameters that not all of the older ground-motion models accounted for, such as; depth to top, nonlinear site response, and other factors shown in Table 3-4. Other examples of ground-motion model include: Ambraseys et al. 2005 (A05), Berge-Thierry et al. 2003 (BT03), Lussou et al. 2001 (L01), Sabetta and Pugliese 1996 (SP96), Spudich et al. 1999 (S99), Toro et al. 1997 (T97) and Akkar and Bommer 2010 (AB10).

Egypt is characterised by shallow crustal seismicity, with the exception of the Gebel Marawa Zone on the Kalabsha fault (Fat-Helbary and Tealb, 2002), thus not all of the equations shown in Table 3-4 are applicable. However, all of the data used in the Akkar and Bommer (2010) was from seismically active parts of Europe and the Middle East, clearly illustrating its applicability for Egypt. Boore and Atkinson (2008) include earthquakes from the Middle East and Southern Europe in their database of recordings, further supporting their use for the study of Egypt. Abrahamson and Silva (2008) included events from southern Europe, in Greece, Italy and Turkey. Moreover according to Stafford et al. (2008) NGA models are applicable to the Euro-Mediterranean region.

In choosing a non-NGA model to use in this study, the choice was between AB10 and A05. AB10 corrected the problems that existed in Akkar and Bommer (2007), where the standard deviation was amplified at periods close to T=1s (Stafford et al., 2008). AB10 uses the dataset found in A05, however A05 only covers a range up to 2.5 seconds, whereas AB10 predicts ground-motions at longer periods. Moreover, AB10 predicts the geometric mean of the horizontal components, rather than the larger horizontal component found in A05, and includes a quadratic magnitude scaling term which A05 lacks.

Based on this the following equations are applicable for use in this study:

- Abrahamson and Silva 2008 (AS08)
- Akkar and Bommer 2010 (AB10)
- Boore and Atkinson 2008 (BA08)

Each of the equations shown is subject to modification to ensure that they are compatible with the data available for Egypt. The following sections discuss the different adjustments that need to be made to ensure such compatibility.

3.3.3 Adjustments

Since there are differences between the parameters used in the ground-motion models, adjustments are made. These adjustments are applied to distance, magnitude, style of faulting, site class and horizontal component parameters.

Table 3-4 Parameters used in ground-motion models (modified from Abrahamson et al., 2008 and Douglas, 2011)

Parameter	**AS08**[a]	**BA08**[a]	**CB08**[a]	**CY08**[a]	**I08**[a]	**A05**	**AB10**	**BT03**	**L01**	**SP96**	**T97**	**S99**
Magnitude	Mw	Mw	Mw	Mw	Mw	Mw	Mw	Ms	MJMA	Ms	Mw	Mw
Depth-to-top-of-rupture (km)	Z_{TOR}		Z_{TOR}	Z_{TOR}								
Reverse style-of-faulting flag	F_{RV}	RS	F_{RV}	F_{RV}	F							
Normal style-of-faulting flag	F_{NM}	NS	F_{NM}	F_{NM}								
Strike-slip style-of-faulting flag		SS										
Unspecified style-of-faulting flag		US										
After shock flag	F_{AS}			AS								
Dip(degrees)	δ^a		δ^a	δ^a								
Down-dip rupture width (km)	W^b											
Distance used to model ground-motion	R_{rup}	R_{jb}	R_{rup}	R_{rup}	R_{rup}	R_{jb}	R_{jb}	R_{hyp}	R_{hyp}	R_{jb}	R_{jb}	R_{jb}
Horizontal distance to the surface projection of the rupture (km)	R_{jb}	R_{jb}	R_{jb}	R_{jb}								
Horizontal distance to top edge of rupture measured perpendicular to strike (km)	R_{xa}			R_{xa}								
Hanging Wall Flag	F_{HW}			F_{HW}								
Avg. shear-wave vel. in top 30m (m/s)	V_{S30}	V_{S30}	V_{S30}	V_{S30}	V_{S30}							
Depth to $\bar{V}_s$ = 1.0km/s(km)		$Z_{1.0}$			$Z_{1.0}$							
Depth to $\bar{V}_s$ = 2.5km/s(km)				$Z_{2.5}$								
Rock PGA for nonlinear site response	PGA_{1100}	pga4nl	A_{1100}									
Rock Sa for nonlinear site response				y_{ref} (T)								
rock $\bar{V}_s(30)$ for nonlin. site response (m/s)	1100	760	1100	1130	900							
Region [c]	WUS	WUS	WUS	WUS	WUS	Eu+ME	Eu+ME	Eu+ME +WUS	Japan	Italy	CENA	Ext
Horizontal component [d]	GMRotI50	GMRotI50	GMRotI50	Geom	GMRotI50	L-Env	Geom	Both	Both	L-PGA	Geom	Geom

aNext Generation Ground-Motion Attenuation (NGA) relationships, bFor Hanging Wall scaling only cDominant region in data set for empirical equations or target for stochastic equations. WUA, Western United States; Eu, Europe; ME, Middle East; CENA, Central and Eastern North America; Ext, Extentional dDefinition of horizontal response spectral ordinates. GMRotI50, Geometric mean independent of sensor orientation; Geom, geometric mean; L-Env, larger ordinate at each frequency; L-PGA, ordinates of component with larger PGA, pga4nl, nonlinear site amplification term.

AS08, Ambraseys and Silva 2008, BA08, Boore and Atkinson 2008, CB08, Campbell and Bozorgnia 2008, CY08, Chiou and Youngs 2008 , IO08, Idriss 2008, A05, Ambraseys et al. 2005, AB10, Akkar and Bommer 2010, BT03, Berge-Thierry et al. 2003 L01, Lussou et al. 2001, SP96, Sabetta and Pugliese 1996, T97, Toro et al. 1997, S99, Spudich et al. 1999

Distance

Distance measures are the main parameters that characterise the path of seismic waves to the site, and different measures of this variable are used in various ground-motion equations. The different measures define various physical interpretations of the source. If the source is interpreted as a point then the hypocentral or epicentral distances can be used. The hypocentral distance is the distance from the hypocentre to the site, whereas the epicentral distance is the distance from the epicentre to the site, with the epicentre being the projection of the hypocentre to the surface. Nonetheless the use of points to define a source is not without controversy. Since the hypocentral distance measures the distance from the focal position to the site, there is a difficulty in measuring this distance due to the difficulty in measuring the focal depth. An example of this can clearly be seen when evaluating the focal depth of the November 3rd 2000 earthquake, where ISC measured the focal depth at 23 km, whereas the NEIC measured the same depth to be 10 km. This large deviation would lead to a large difference in measuring the hypocentral distance of such an event. This same problem exists in the measure of other distances that are depth dependant. Since most of the NGA relationships use rupture distance, using rupture distance in this study would reduce error associated with adjusting rupture distance to another metric of measurement. Nonetheless BA08 and AB10 use the Joyner Boore distance, which is defined as the shortest horizontal distance to the surface projection of the rupture plane. Thus Figure 3.11 illustrates how each of the distances discussed are measured.

Since AB10 uses a distance metric other than rupture distance, then an adjustment needs to be made to this model. In order to make the adjustment, the findings of Scherbaum et al. (2004) are used. Scherbaum et al. (2004) used regression analysis on simulated data in order to develop relationships between different distance metrics using the Joyner-Boore distance as the reference. This is modelled using gamma distributions that plot the residual function for different distance metrics relative to the Joyner-Boore distance. These residuals are a measure of the difference between the Joyner-Boore distance and other distance metrics. When converting Joyner-Boyner distance to rupture distance the following equation is used:

$$\varepsilon_{JB_{Rup}} = R_{rup} - R_{JB} \tag{3.4}$$

where ε_{JBrup} is the residual of rupture distance, R_{rup} is the rupture distance and R_{JB} is the Joyner-Boore distance. In order to estimate the residual Figure 3.12 is used, which correlates the residual to Joyner-Boore distance through the Joyner-Boore distance and magnitude. Conversion matrices are provided by Scherbaum et al. (2004) for three different scenarios to account for different faulting mechanisms, with SS, SHD and GEN accounting for strike slip, dipping faults excluding strike slip and a generic model respectively.

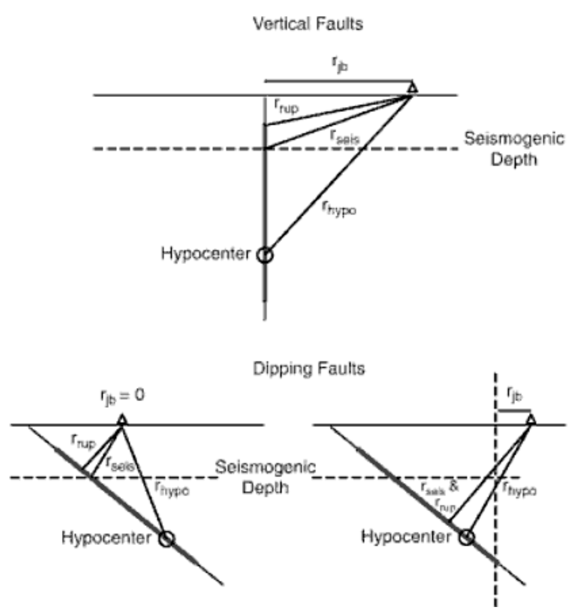


Figure 3.11 Source-to-site distance measures for ground-motion attenuation models (Bolt and Abrahamson, 2003)

Since the epicentral coordinates are available from the earthquake catalogue for each earthquake, Scherbaum et al. (2004) is used to convert epicentral distances, into Joyner-Boore distances for BA08 and AB10, and into Rupture distances for AS08, rather than simulating ruptures for each event.

In addition to a relationship for residuals of Joyner-Boore distance, Scherbaum et al. (2004) also provide matrices for sigma (σ) values for the estimated distances for the different faulting mechanisms. These values are propagated through the model and used along with other sources of error to account for uncertainty in the model, in order to calculate the final ground-motion at each site.

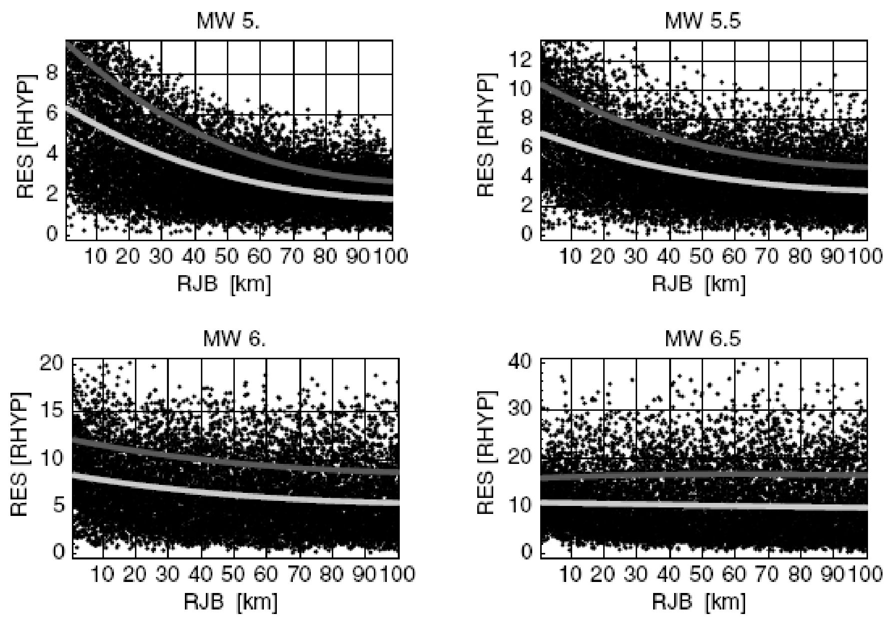


Figure 3.12 ε_{JBhyp} as a function of R_{JB} for different magnitude bins. The lower line corresponds to the expected mean values of the gamma distribution model, whereas the upper lines mark the 1 residual level (Scherbaum et al., 2004)

<u>Magnitude</u>

All of the ground-motion equations used in this study use moment magnitude scale Mw. Moment magnitude scale Mw is derived from the seismic moment Mo which is related to the product of the area of the earthquake fault and the average slip over the area and the shear modulus of the fault rock, and can also be estimated using long-period body waves. Most of the seismicity in Egypt is described in terms of surface wave magnitude, and the method for adjusting this data into moment magnitude Mw is described in Chapter 2.

Style of Faulting

All three ground-motion equations used in this study take into account style of faulting, and thus an adjustment for this criterion is not needed.

Site Class

Ground-motion equations are calibrated to be used for rock sites. AB10 accounts for site conditions as either being of soft soil or hard rock sites. NGA relationship equations on the other hand provide a more detailed account for site class with 30 m shear wave velocity V_{S30} being included into the equations. Different equations use different definitions of reference rock site. This is clearly shown in Table 3-4 where of the three equations used in this study each define reference rock using 30 m shear wave velocity V_{S30} differently, the values of V_{S30} rock motion used for site response being 1100 m/s, 760 m/s and 750 m/s for AS08, BA08 and A10 respectively. Since the three ground-motions used in this study define site classes in terms of V_{S30}, no adjustments need to be made. Therefore, the values for V_{S30} estimated earlier in this chapter for each district are directly used.

Horizontal Component

Different ground-motion equations use different horizontal components to calculate spectral accelerations. Older models used; the larger horizontal component, geometric mean of both horizontal components, a random component or both horizontal components. Whereas NGA equations mostly use what is known as the new geometric mean, referred to as “GMRotI50” by Boore et al. (2006). GMRotI50 is used to eliminate a minor issue related to the older measure of geometric mean since it was dependent on the orientation of the sensors in the field. GMRotI50 on the other hand is independent of sensor orientation, and thus provides a better estimate of “average” horizontal ground-motion component.

AS10 uses the older geometric mean, whereas AS08 and BA08 use GMRotI50, and thus AS10 needs to be adjusted to match the other two equations. The conversion is made according to Beyer and Bommer (2006) in which:

$$\hat{S}_{a_i} = \hat{S}_{a_{GM}} \left(\frac{S_{a_i}}{S_{a_{GM}}} \right)_{median} \tag{3.5}$$

where $\hat{S}_{a_i}$ is the adjusted spectral acceleration for horizontal component and $\hat{S}_{a_{GM}}$ is the non-adjusted spectral acceleration for ground-motion. Moreover the variation associated with the adjustment of horizontal component can be taken into account through error propagation using the following equation:

$$\sigma^2_{tot,\log_{Sai}} = \sigma^2_{\log_{SaGM}} (\sigma_{\log_{Sai}} / \sigma_{\log_{SaGM}})^2 + \sigma^2_{\log_{Sai/SaGM}} \tag{3.6}$$

where $\sigma_{logSai}/\sigma_{logSaGM}$ is the ratio of sigma values and $\sigma_{logSai}/_{SaGM}$ is the standard deviation that is calculated by fitting a normal distribution to the log ratios.

The ratio $\left(\frac{S_{a_i}}{S_{a_{GM}}} \right)_{median}$ is the adjusted ratio for the horizontal component and is calculated along with $\sigma_{logSai}/_{SaGM}$ based on Table 3-5 and Table 3-6.

Table 3-5 Adjusted ratio for the horizontal component $\left(\frac{S_{a_i}}{S_{a_{GM}}} \right)_{median}$ *and standard deviation* $\sigma_{logSai}/_{SaGM}$

Period (sec)	$\left(\frac{S_{a_i}}{S_{a_{GM}}} \right)_{median}$	$\sigma_{logSai}/_{SaGM}$
$T_j \le 0.15$	C_1	C_3
$0.15 < T_j < 0.8$	$C_1 + (C_2 - C_1) \log (T_j/0.15)/\log (0.8/0.15)$	$C_3 + (C_4 - C_3) \log (T_j/0.15)/\log (0.8/0.15)$
$0.8 \le T_j \le 5.0$	C_2	C_4

Table 3-6 Coefficients for approximate equations for median (C1, C2) and standard deviation (C3, C4) of log ratios of sigma values (R) (Beyer and Bommer, 2006)

	C_1	C_2	C_3	C_4	R
GMRotI50/ Geom	1.00	1.00	0.03	0.04	1.00

Thus using this information the horizontal component for AS10 can be adjusted from Geom to GMRotI50 in order to be compatible with the other two models used in this study. Moreover the error can be propagated through the model to take into account the variability and uncertainty in the data calculated. It should be noted that the correction for the horizontal component produces almost negligible differences in results due to the similarity between both horizontal components, and thus the correction could be ignored (Campbell and Bozorgnia, 2008).

3.3.4 Uncertainty

Overview

Three types of uncertainties exist in the evaluation of seismic hazard; aleatory, epistemic and ontological. Aleatory uncertainty deals with the inherent randomness in data and this cannot be ignored. This is evident through the scatter that exists in ground-motion values for a given scenario, and is represented by the standard deviation of the residuals in the models, which is assumed to follow a normal distribution (Scherbaum et al., 2005).

Ground-motion equations are published with their associated standard deviations at various response periods. Nonetheless conversions of equations are sometimes necessary in order to ensure that the equation reflects conditions of the seismic hazard analyses. Such conversions to the equation lead to changes in the standard deviation given in the ground-motion models. To account for these changes the total adjusted standard deviation σ_{Total} is calculated by adding the standard deviations associated with various variables in the ground-motion equations to the existing standard deviation associated with the ground-motion equation as follows:

$$\sigma_{\ln y,Total} = \sqrt{\sigma_{\ln y}{}^2 + (\partial \log(Y) / \partial X)^2 \sigma_x{}^2} \qquad (3.7)$$

Where σ_{Total} is the total standard deviation, $\sigma_{\ln y}$ is the given standard deviation of the ground-motion equation, $\partial \log(Y) / \partial X$ is the relationship between the ground-motion equation and the variable *X,* and σ_x is the standard deviation associated with conversion of the of independent parameter *X*

To account for lack of knowledge it is advisable to offer various estimates of a variable rather than provide one estimate whose accuracy is not exact. The uncertainty associated with a lack of knowledge is known as epistemic uncertainty. Through the use of various ground-motion equations and the provision of weights for each, various median predictions are calculated, to capture epistemic uncertainty.

To account for the various types of epistemic uncertainties logic trees are constructed. Every branch of the logic tree presents a different prediction of the ground-motion based on the use of different ground-motion models. Branches can also be used for alternate values for a given variable in the ground-motion equation to account for lack of knowledge in the value of the variable. Each section of a given branch is given a certain weight based on the confidence one has in the variable, with the addition of the weights from the branching of a given point in the logic tree adding up to 1. An example of a logic tree can be seen in Figure 3.13, where three ground-motion equations are used. In this example ground-motion model 3 (GM3) is given a larger weight compared to the other two models. Moreover the style of faulting is accounted for through normal and reverse faulting mechanism. The weight of each branch is calculated as the product of the weights along each branch, with the total of all the weights being 1, as shown in Figure 3.13. In this study logic trees are used to account for the use of the various ground-motion models mentioned earlier. Each of the three models is given equal weight.

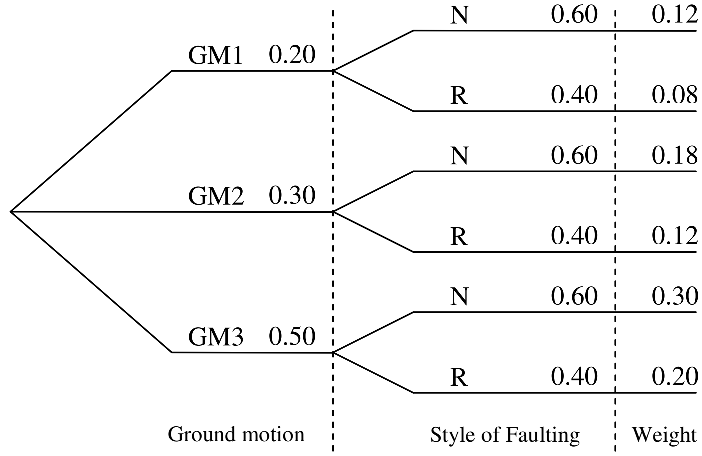


Figure 3.13 Logic tree example for three ground-motion models, GM=ground-motion equation, N=Normal, and R=Reverse

The final type of uncertainty is known as ontological uncertainty and this cannot be modelled since it arises from the unknown. This type of uncertainty however can be reduced through the use of peer review and quality control.

Spatial and Period-to-Period Correlation

The generic form of ground-motion model is shown in Equation (3.3). The variance term in Equation (3.3) is divided into two components ε_{E_i} and $\varepsilon_{A_{ij}}$ which represent the inter-event and intra-event residuals respectively. The inter-event term ε_{E_i} is the same for all analysed sites, from a given earthquake, at a given period T, whereas the intra-event term $\varepsilon_{A_{ij}}$ differs depending on the location of the site. The total difference between observation and prediction is given as:

$$\varepsilon_{F_S}\sigma_{T_S} = \varepsilon_{E_i} + \varepsilon_{A_{ij}} = \eta_s\sigma_{E,s} + \varepsilon_s\sigma_{A,s} \qquad (3.8)$$

where ε_{Fs} is the final value of epsilon for site "s", σ_{Ts} is total standard deviation for site "s", $\sigma_{A,s}$, is the intra-event standard deviation for site "s", $\sigma_{E,s}$, is the inter-event standard deviation for site "s", ε_s is the epsilon value associated with intra-event for site "s" and η_s is the eta value associated with inter-event for site "s".

The values of epsilon for intra-event variability ε_1 is spatially correlated as well as among periods. If the spectral acceleration at a site is stronger than expected, meaning ε_1 is greater than 0, then the value of ε_s also is likely to be stronger than anticipated at proximal sites. The same trend is evident when analysing ε_1 for similar response periods at a given site, where if an ε_s value for a given site at a given period is stronger than expected then the values for ε_s at the same site for similar response periods should also be stronger than anticipated. Eta values η_s for inter-event variability are correlated among periods.

The correlation between epsilon values for different periods at a single site can be calculated using the findings of Baker and Jayaram (2008). As can be seen in Figure 3.14 (a) the correlation coefficient ρ approaches 1 the closer two periods are to each other. Furthermore, the perfect correlation coefficient ρ equal to 1 can be seen in Figure 3.14 (b) when $T_{1[s]}$ is the same as $T_{2[s]}$.

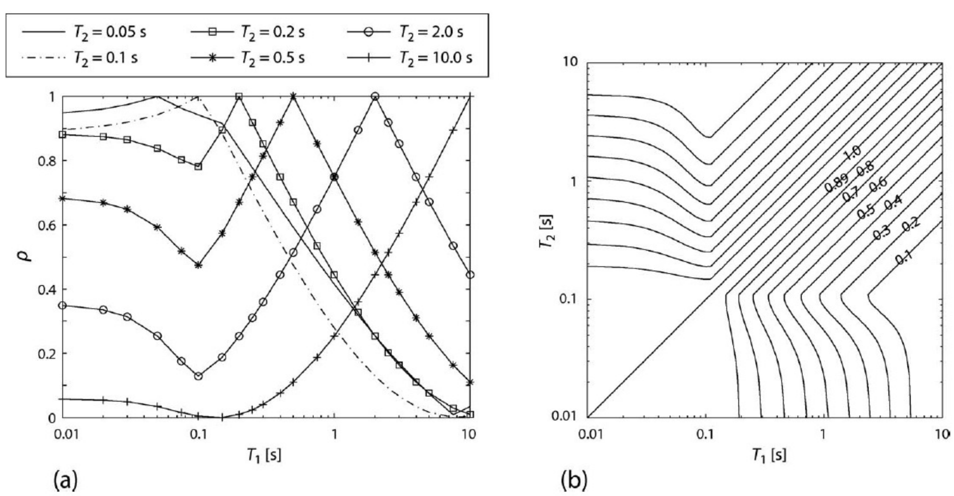


Figure 3.14 (a) Plots of correlation coefficients versus T_1, for several T_2 values. (b) Contours of correlation coefficients versus T_1 and T_2 (Baker and Jayaram, 2008)

In addition to the correlation between two vibration periods at a single site, the spatial correlation needs to be accounted for. According to Goda and Hong (2008) the spatial correlation $\rho_{a(\Delta)}$, (Δ being the distance between two points) can be expressed as:

$$\rho_{a(\Delta)} = \exp(-\alpha\Delta^{\beta}) \tag{3.9}$$

Equation (3.9) complies with the logic that $\rho_{a(\Delta)}$ is perfectly correlated and equal to 1 when Δ =0 and imperfectly correlated and equal to 0 when Δ=∞.

Based on least squares fitting, Goda and Hong (2008) provide estimates for α and β for two scenarios. The first of which being without accounting for aleatory uncertainty associated with ground-motion equations through the probabilistic characteristics of prediction models, for values of magnitude M, V_{s30} and the angle between the orientation of two sensors θ. The second scenario creates a least square fit for data that takes into account this aleatory uncertainty in M, V_{s30} and θ. Since it is impossible to ensure that the results obtained for M, V_{s30} and θ are without uncertainty, the second scenario is used where the values for α and β are:

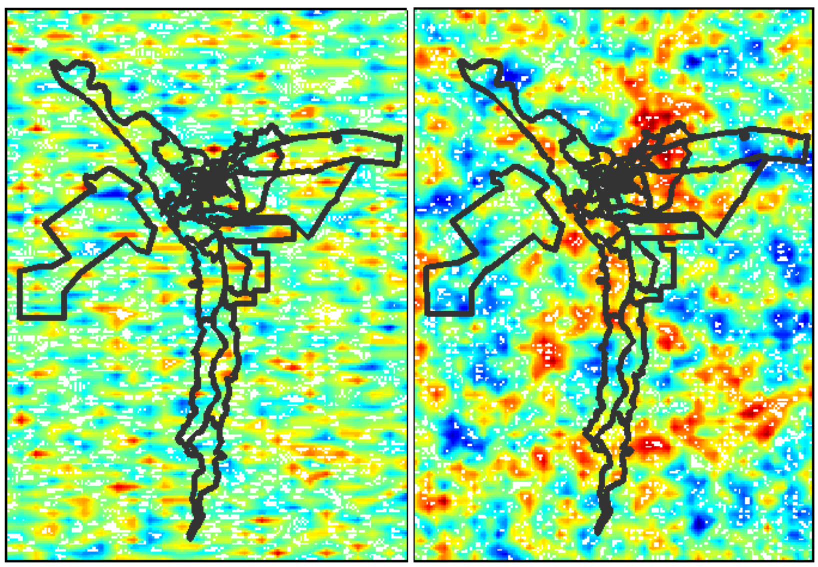
$$\begin{aligned} \alpha &= -0.16\ln(T_{\max}) + 0.68 \\ \beta &= 0.44 \end{aligned} \tag{3.10}$$

where $T_{\max}$ is the largest of the two periods being analysed. To illustrate the importance of taking spatial correlation into account, Equation (3.9) was evaluated for Greater Cairo, by dividing up Greater Cairo into its official districts and calculating the distance between the coordinates of each of the centres of these districts to provide values for Δ. A map of residuals for Greater Cairo not taking into account spatial correlation, as well as taking into account spatial correlation are shown in Figure 3.15(a) and Figure 3.15 (b) respectively. Sites in Figure 3.15 (b) are correlated using grid spacing of 1 km. As can be seen, when spatial correlation is not accounted for then no pattern for the residuals exists, whereas when spatial correlation is accounted for proximal sites have correlated residuals.

The total intra-event correlation $\rho_{T(\Delta,T_1,T_2)}$ can be approximated according to Goda and Hong (2008) as the product of the spatial $\rho_{a(\Delta)}$ and period $\rho_{\varepsilon(T_1),\varepsilon(T_2)}$ correlations such that:

$$\rho_{T(\Delta,T_1,T_2)} = \rho_{a(\Delta)} \times \rho_{\varepsilon(T_1),\varepsilon(T_2)} \qquad (3.11)$$

Since the inter-event variability only takes into account period correlation, then the inter-event correlation, can be expressed as $\rho_{\varepsilon(T_1),\varepsilon(T_2)}$.



(a) (b)

Figure 3.15 Aleatory variability showing epsilon values a) not taking into account spatial correlation, b) taking into account spatial correlation, for Greater Cairo for a T=0.01s

Using the correlations discussed, values for ε_s and η_s are then established through random vectors drawn from multivariate normal distributions. In order to ensure the accuracy of the results and to minimise the associated error, random vectors are evaluated more than once with the probability of achieving different values being tabulated. Since inter-event and intra-event variability differs, for each of the 56 sites (districts in Greater Cairo) "*s*" 100 random vectors are drawn for intra-event variability. This is expressed as follows:

$$S_{s,i,j} = Sa_s + \varepsilon_{E_{s,i}} + \varepsilon_{A_{s,i,j}} \qquad (s = 1......,56)$$

$$(i, j = 1......,100) \qquad (3.12)$$

where $S_{s,i,j}$ is the spectral acceleration after variability has been accounted for, for intra-event variability "i" and inter-event "j" corresponding to site "s" and Sa_s is the median spectral acceleration for site "s"

3.4 Importance Sampling

3.4.1 Overview

In order to ensure that every applicable earthquake scenario is taken into account, and that the uncertainty associated with each scenario is also included Monte Carlo Simulation (MCS) is usually used. This procedure is computationally intensive and results in an immense set of intensity maps. To speed up the procedure and ensure that it is computationally more efficient Importance Sampling (IS) can be used. The IS technique preferentially samples magnitudes, inter-event and intra-event residuals from the upper ranges of each of the samples, but also adjusts for the actual likelihood of sampling these values. The procedure for performing IS is outlined by Jayaram and Baker (2010). Let q(x) be a density function that is integrated over domain D, to calculate H as follows:

$$\mathrm{H} = \int_{\mathrm{D}} \mathrm{q(x)} \frac{\mathrm{dF(x)}}{\mathrm{dG(x)}} \mathrm{dG(x)} \qquad (3.13)$$

where q(x) is an arbitrary function of x. dG(x) is any probability density defined over the domain of D, and $\frac{\mathrm{dF(x)}}{\mathrm{dG(x)}}$ is called the IS weight. This weight is used to calculate the probability that this sample would actually be obtained.

The total IS weight $\frac{dFs(i)}{dGs(i)}$ is calculated as the product of all importance sampling weights (Equation ((3.14)).

$$\frac{dFs(i)}{dGs(i)} = \frac{dF(m)}{dG(m)}\frac{dF(e)}{dG(e)}\frac{dF(t)}{dG(t)} = \Lambda_i \qquad (3.14)$$

where Λ_i is the total likelihood of occurrence, $\frac{dF(m)}{dG(m)}$ is the IS magnitude weight, $\frac{dF(e)}{dG(e)}$ is the IS intra-event variability weight and $\frac{dF(t)}{dG(t)}$ is the IS inter-event variability weight. These weights are explained in the following sections.

3.4.2 Magnitude

Using Monte Carlo simulation a large number of smaller magnitude events are drawn before a larger event is, from the same source. The smaller number of events would all lead to similar levels of damage and loss, therefore needlessly increasing the running time of the model. In order to overcome this, IS is used.

Function dF(m) is the approximate probability of a magnitude of an earthquake on a given fault. A single magnitude is sampled from each partition of the density function dF(m). However, this will lead to a greater number of smaller magnitude events than larger magnitude events. In order to make it more likely to sample larger magnitudes, the magnitude range is partitioned into unequal number of partitions n_m, such that a greater number of large magnitude events are sampled. This new distribution is dG(m). The magnitude range between m_{min} and m_{max} is stratified into n_m partitions as follows:

$$\left[m_{\min}, m_{\max}\right] = [m_{\min}, m_2) \cup [m_2, m_3) \cup ... \cup [m_{n_m}, m_{\max}] \qquad (3.15)$$

For this study a partition size of 0.3 is used for magnitudes up to 5.5, and 0.1 for magnitudes greater than 5.5., ensuring that there is a greater likelihood of sampling larger magnitude events with new distribution dG(m).

The IS weight is calculated as follows:

$$\frac{dF(m)}{dG(m)} = \frac{\int_{m_k}^{m_{k+1}} dF(m)}{1/n_m} \tag{3.16}$$

where the partition (m_k, m_{k+1}) is the Kth partition in Equation (3.15).

3.4.3 Inter-event Variability

Inter-event residuals are the same for all sites for a given earthquake at a given period. This means that inter-event residuals can be sampled from a univariate normal distribution with a mean of 0 and standard deviation of 1. However using conventional Monte Carlo simulation to obtain realizations dF(t) of ε_{E_i} would lead to a large number of near-zero residuals. By shifting the distribution we ensure that greater numbers of inter-event residuals located at the upper-tails are sampled (Figure 3.16). Therefore, an alternate sampling density dG(t) is used, with the same variance as dF(t), but with a shifted mean, $\mathbf{ms}_{\text{inter}}$. Based on statistical analysis conducted by Jayaram and Baker (2010), this shift $\mathbf{ms}_{\text{inter}}$ should be between 0.5 and 1, and in this study is taken as 0.7. Using this shift, the IS weight for inter-event variability is calculated as follows:

$$\frac{dF(t)}{dG(t)} = \exp\left(\frac{1}{2}\left(\mathbf{t}-\mathbf{ms}_{\text{inter}}\right)^2 - \frac{1}{2}\mathbf{t}^2\right) \tag{3.17}$$

where $\mathbf{t}$ is the vector of sampled residuals.

3.4.4 Intra-event Variability

IS for Intra-event variability is conducted in a similar way to that for inter-event variability, where we preferentially sample the variability from the upper-tail.

Nonetheless instead of sampling from a univariate normal distribution like is done in the inter-event variability, a multivariate normal density is used instead. This is done since residuals are not only period-to-period correlated, but also spatially correlated between sites.

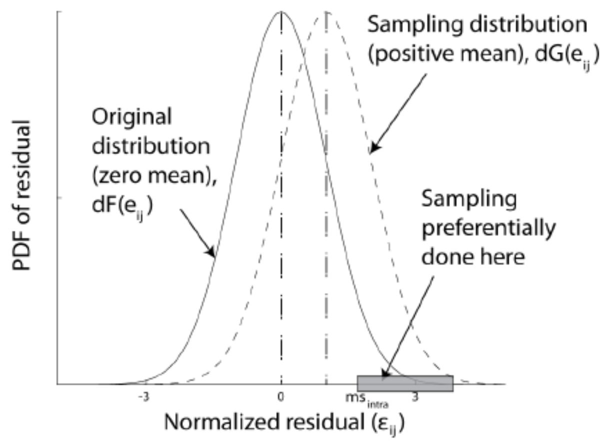


Figure 3.16 Importance sampling density functions for marginal distribution of the normalized intra-event residual (Jayaram and Baker, 2010)

dF(e) is a multivariate normal density with a mean of 0. Sampling residuals $\boldsymbol{\varepsilon}_j$ from dF(e) would lead to near zero values, therefore a sampling density is used. The sampling density dG(e) has the same variance and spatial correlation as dF(e), however has positive means for all $\varepsilon_{A_{i,j}}$. Thus the mean vector of the same size as the number of sites is:

$$\mathbf{ms}_{\text{intra}} = (\mathbf{ms}_{\text{intra}}, \mathbf{ms}_{\text{intra}} \ldots.., \mathbf{ms}_{\text{intra}}) \tag{3.18}$$

Meaning that the sampling density is:

$$dG(e) = \frac{1}{(2\pi)^{\frac{p}{2}}} \exp\left(-\frac{1}{2}(\mathbf{e} - \mathbf{ms}_{\text{intra}})'\Sigma^{-1}(\mathbf{e} - \mathbf{ms}_{\text{intra}}) \right) \tag{3.19}$$

And the IS weight is:

$$\frac{dF(e)}{dG(e)} = \exp\left(\frac{1}{2}(\mathbf{e} - \mathbf{ms}_{\text{intra}})'\Sigma^{-1}(\mathbf{e} - \mathbf{ms}_{\text{intra}}) - \frac{1}{2}\mathbf{e}'\Sigma^{-1}\mathbf{e} \right) \tag{3.20}$$

where Σ is the covariance matrix, which accounts for the spatial and period-to-period correlation in $\varepsilon_{A_{i,j}}$, which is an extension of the work conducted by Jayaram and Baker (2009 b).

The shift in dG(e) will ensure that there is a greater likelihood that values at the upper tail of the density function will be sampled. This shift ($\mathbf{ms}_{\text{intra}}$) is provided by Jayaram and Baker (2010) and shown in Figure 3.17.

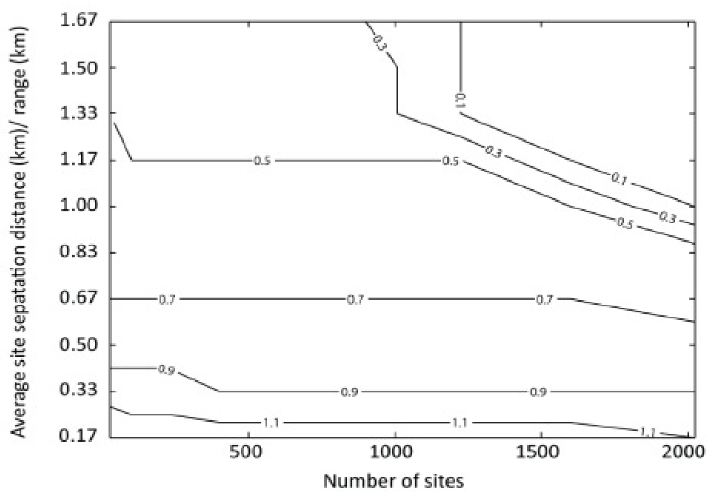


Figure 3.17 Recommended mean-shift $\mathbf{ms}_{\text{intra}}$, as a function of the average number of sites and the average site-to-site distance normalized by the range of the spatial correlation model (Jayaram and Baker, 2010)

As can be seen from Figure 3.17, $\mathbf{ms}_{\text{intra}}$ is based on the number of sites being analysed, the average separation distance between sites and the range. The range *R* is period dependant, and can be calculated based on Jayaram and Baker (2009) as follows:

At short periods (T<1s),

$$R = 40.7 - 15.0T \tag{3.21}$$

For longer periods (T≥1s),

$$R = 22.0 + 3.70T \tag{3.22}$$

Based on this, values of $\mathbf{ms}_{\text{intra}}$ are calculated and shown in Table 3-7.

Table 3-7 Values for range (R) and mean intra-event shift (ms_{intra}) calculated from Jayaram and Baker (2009) and Jayaram and Baker (2010) respectively

Period (s)	Range (R)	Mean Intra-Event Shift (ms_{intra})
0.01	0.81	0.67
0.1	0.83	0.65
0.3	0.90	0.60
0.5	0.98	0.59
1	1.27	0.50
2	1.11	0.52

3.5 K-means Clustering

Each scenario event will lead to different ground-motions at each district in Greater Cairo. The collection of all of these ground-motions for a given scenario is defined as an intensity map. In order to further increase the efficiency of the model Jayaram and Baker (2010) propose a method of grouping the intensity maps into clusters, with only one ground-motion map per cluster being used for the analyses, this method is known as K-means clustering. This is based on the fact that there is similarity between various ground-motion maps, so grouping such maps would still provide similar results yet with a smaller number of maps that ensures a more efficient model that is capable of conducting computations faster.

With 56 sites in Greater Cairo each ground-motion map Sa_j will be composed of a 56-dimensional vector defined by:

$$Sa_j = \left\{ Sa_{1j}, Sa_{2j}, \ldots, Sa_{56j} \right\} \tag{3.23}$$

The maps are then grouped together through minimizing the dissimilarity between maps. This is done by minimizing the distance between the centroids of the cluster maps using Equation (3.24).

$$V = \sum_{i=1}^{K} \sum_{Sa_j \in S_i} \left\| Sa_j - C_i \right\|^2 \tag{3.24}$$

where C_i is the centroid of the cluster . As can be seen from Equation (3.24) the right hand side obtains the distance between the cluster centroid and ground-motion map Sa_j being investigated. This value can be further broken down and calculated using Equation (3.25).

$$\left\| Sa_j - C_i \right\|^2 = \sum_{q=1}^{56} (Sa_{qj} - C_{qi})^2 \tag{3.25}$$

However Jayaram and Baker (2010) do not account for multi-response period analysis, and thus Equations (3.24) and (3.25) only minimises the dissimilarity between maps for a single response period. However, since different aspects of the built environment exhibit different physical characteristics, each have a different response period, and since this study is conducted for a multilayered physical environment, a modified version of the Jayaram and Baker (2010) algorithm needs to be established. Jayaram and Baker (2010), use Equation (3.25) in order to calculate the distance between the map Sa_j. However, this is only applicable to a single response period.

Equation (3.26) illustrates a modified version of the model in which a lognormal operation is introduced as opposed to the subtraction in the earlier version. This ensures that the summation of the equation is not dominated by a single period at which the absolute Sa values are largest, but is evenly weighted for each period of analysis. For various response periods, the maps are clustered by minimizing the distance between the maps in the cluster, *V*, which is defined as:

$$V = \sum_{i=1}^{K} \sum_{T_a} \sum_{Sa_j \in S_i} \ln\left(\frac{Sa_{jT_a}}{C_{iT_a}}\right)^2 \tag{3.26}$$

Where the distance between the map Sa_j and centroid C_i is calculated as follows:

$$\ln\left(\frac{Sa_{jT_a}}{C_{iT_a}}\right)^2 = \sum_{q=1}^{56} \ln\left(\frac{Sa_{qj}}{C_{qi}}\right)^2 \tag{3.27}$$

Equations (3.25) and (3.27) are equivalent, since both calculate the distance between the maps and the map Sa_j centroid C_i. The steps of conducting K-means clustering are shown in Figure 3.18.

The exceedence curve shown in Figure 3.18 is calculated based on Equation (3.28) where $I(l_{(c)} \geq u)$ which is equal to 1 if $l_{(c)} \geq u$ and 0 otherwise.

$$\hat{P}(L \geq u) = \frac{\sum_{c=1}^{K} I(l_{(c)} \geq u)(\sum_{i \in c} \Lambda_i)}{\sum_{c=1}^{K} (\sum_{i \in c} \Lambda_i)} \tag{3.28}$$

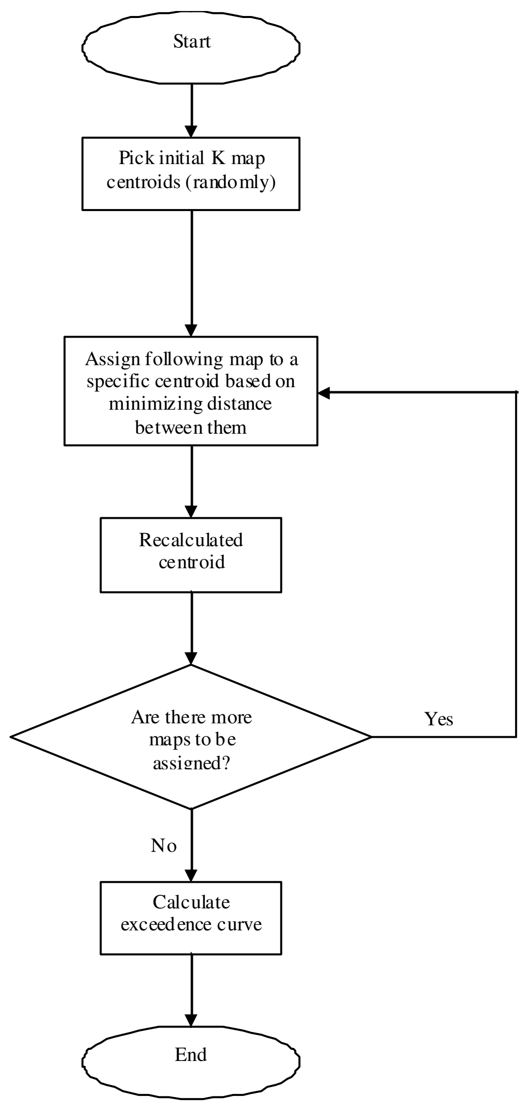


Figure 3.18 Methodology for K-means clustering

Based on implemnting both IS ans K-means clustering, the number of scenarios is reduced from 531,300 maps, to 1500 clusters. Each of these clusters represents a ground-motion map for the 56 districts.

3.6 Concluding Remarks

This chapter begins by analysing the geological and geotechnical conditions throughout Greater Cairo, in order to classify soil conditions. This classification is used to model ground-motion soil amplification characteristics. A collection of 511 borehole logs collected from Moharram's (2006) study, as well as geotechnical reports for various projects in the region, were used to classify the soil characteristics based on SPT data. While Moharram (2006) derived relationships to estimate

SPT-N values at a 30 m depth based on borehole logs that reached or exceeded 30 m for Greater Cairo, this analysis SPT data using the statistical probabilistic method developed by Boore (2004). A drawback in using the relationships derived by Moharram (2006) is that the scatter in results is not taken into account, which increases the level of uncertainty in estimating values of N_{30}. Using the statistical probabilistic method overcomes this drawback by accounting for the variability in results in a probabilistic manner. Moreover, since a probabilistic approach is used to estimate earthquake loss, using a probabilistic approach to classify soil conditions provides consistency.

Accounting for variability in ground-motion is an important aspect of this study, which was not taken into account in previous loss estimation studies dealing with Egypt. Moreover, most studies account for variability in ground-motion at each site and period independently, which means that proximal sites might experience large discrepancies in variability. To overcome this drawback, variability is correlated both spatially and period-to-period. This provides an important step in loss estimation, since ground-motion maps are able to reflect the true nature of events.

The problem when dealing with a large number of seismic events coupled with variability is that the size of the dataset grows tremendously, thus increasing computational time significantly. By employing importance sampling and K-clustering the number of ground-motion maps are reduced considerably, thus improving computational efficiency. Even though employing Monte-Carlo simulation is more accurate since all scenarios are accounted for, the computational time greatly outweighs the additional accuracy the method offer. Moreover, since importance sampling deals with sampling from the upper ranges of various parameters it offers more conservative estimates of spectral accelerations which ensure that the method will never underestimate the potential losses.

The ground-motion maps calculated in this chapter are then linked to the physical aspects of the built environment discussed in Chapters 4 and 5 in order to identify the potential damage to the building inventory as well as electricity and natural gas lifelines.

Chapter 4

Building Inventory

4.1 Introduction

Building stock inventory represents an important aspect of any earthquake loss study. Creating such a database is a complex task, made even more difficult in developing countries where information is scarce. Egypt represents such a scenario, in which information is difficult to collect due to the limited resources available to agencies that would be expected to posses such data, hence immense time and effort would be needed to conduct a study.

An inventory database for buildings would need to incorporate all the information required to conduct a loss estimation study, including that of structural system, height, material, age, cost of repair, and occupancy type. Collecting such information is also hampered by the use of diverse construction methods as well as the presence of large informal areas. These informal areas are constructed without building permits, with limited or no roads, sanitary systems and electricity, making it prohibitively difficult to collect information. Moreover surveying these areas is a challenge due to the absence of conventional road access in most places.

Seismic code provisions also account for an important aspect in an inventory database. The vulnerability of a building stock is directly related to the seismic provisions that are evident in a design code, provided codes are complied with. In countries where design codes are robust, and have existed for a long period of time, it is expected that buildings would be better equipped to deal with earthquake events.

This chapter discusses seismic code provisions available in current Egyptian guidelines, as well as previous codes. Moreover, a database of building inventory in the Greater Cairo area is collected and presented. For consistency with the Input Output (IO) economic model, described later in this thesis, the inventory database has been regionalized to specific areas. This enables the analysis to deal not only with direct economic loss resulting from physical damage, but also economic losses that take place due to the dependency of sectors of the economy on one another. The overall scope of Chapter 4 is shown in Figure 4.1.

4.2 Classification of Building Inventory

4.2.1 Seismic Provisions in Egyptian Code

Seismic provisions were not incorporated into Egyptian codes until 1989. Prior to this seismic loading was not taken into account, with buildings being designed to resist gravity loads, while lateral loads were only being taken into account in the form of wind load.

The Egyptian code for the Design and Construction of Reinforced Concrete (ESE, 1989) was based on the Regulations for Earthquake-Resistant Design of Buildings in Egypt (ESEE, 1988) which was published by the Egyptian Society for Earthquake Engineering. This publication divided Egypt up into four seismic zones (Figure 4.2), with the regions of high seismic activity being assigned to Zone 3. This zonation was intensity based, such that Zone 3 regions are assigned a value of VIII on the MMI, Zone 2 is assigned a Modified Mercalli Impact (MMI) value of VII, Zone 1 is assigned a MMI value of VI, while Zone 0 is assigned a MMI value ≤ 5 (Fouad, 1994). Nonetheless, using the zonation in ESEE (1988), the regions with high seismicity (Zone 3) were assigned a ground acceleration (a_g) of only 0.08g, with Cairo in Zone 2 being assigned an a_g value of 0.04g. These values are minimal and thus structures designed according to this would still be vulnerable. The Egyptian Society of Engineering (ESE) (1989) used the work conducted by the Egyptian Society of Earthquake Engineering (ESEE, 1988) in order to create a national seismic design code, however they did not use the zonation map provided by ESEE (1988) and instead assigned only two zones for Egypt that were described in words and not using a map. Zone 2 was composed of the Red Sea Region, South Sinai and Aswan, while all other regions were assigned to Zone 1.

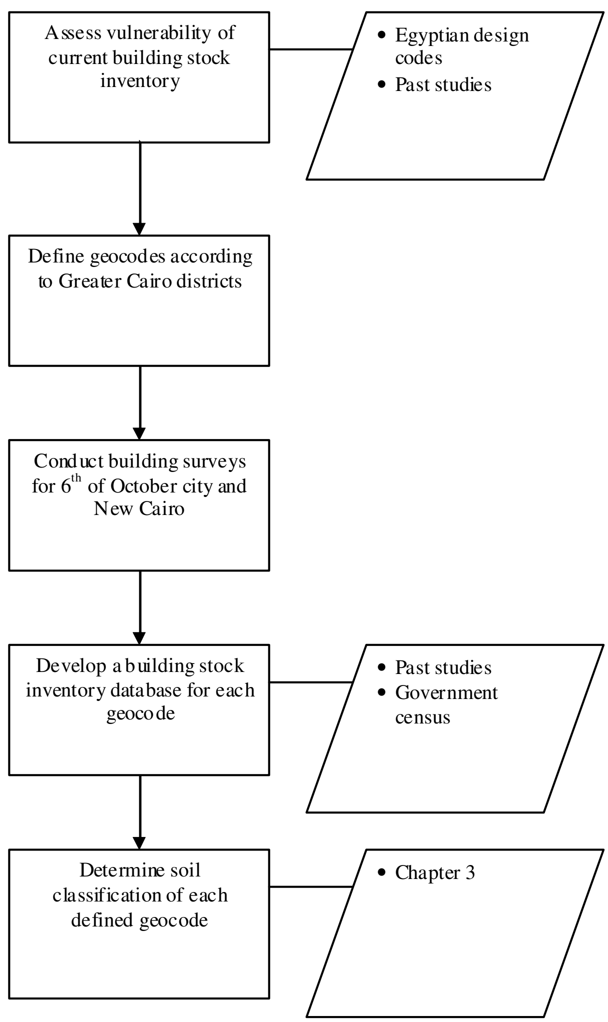


Figure 4.1 Scope of Chapter 4

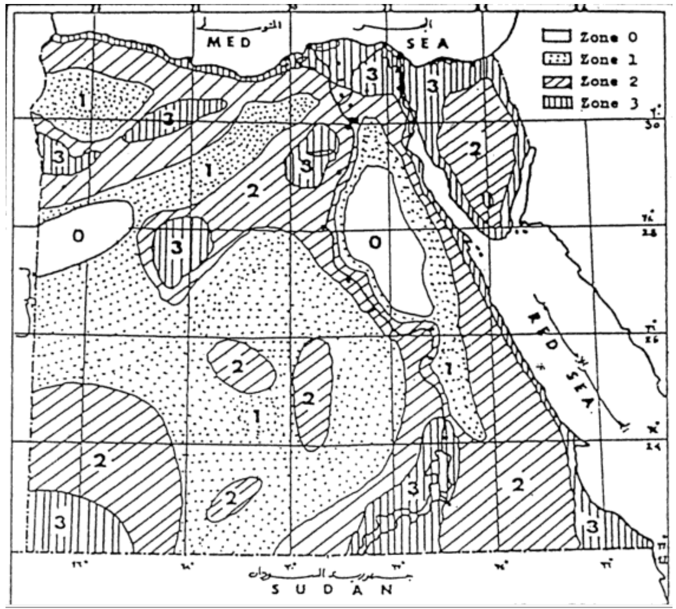


Figure 4.2 Seismic zoning map for Egypt (ESEE, 1988)

Two methods of analysis were specified in the ESE 1989 code: (1) equivalent static force method, and (2) the spectral modal analysis method. The equivalent static force method was widely used at the time, primarily due to its simplicity. The spectral modal analysis method was used only for irregular buildings or structures of significant importance.

The Foundations and Soil Mechanics code (FSM, 1990), was published only a year after the ESE (1989). It attempted to overcome shortcomings of the ESE (1989) which researchers had said underestimated seismic force values by a considerable margin (Montasser, 1995). In overcoming the downfalls of the ESE (1989), the FSM (1990) created confusion in the field due to the discrepancy between the two codes. Thus the Ministry of Housing addressed this problem by issuing the Egyptian Code for Loading in (ECL, 1994), reducing the inconsistency between both codes.

ECL (1994) adopted a seismic zonation map similar to the one found in ESEE (1988). However, the values for a_g increased considerably, with Zone 3 assigned a value of 0.3g, while Greater Cairo assigned a value of 0.2g.

According to ECL (1994), not all buildings need to take seismic provisions into account, with buildings in Zone 1 and less than 18m in height, in Zone 2 and less than 15m in height, and Zone 3 and less than 12m in height, not needing to consider seismic loads as long as these buildings fulfil certain requirements specified in the code. Moreover the method of analysis for the remaining structures is based on the various characteristics associated with the building. For regular buildings that are less than 100m in height (H) and with the ratio between the height (H) and smallest horizontal dimension (b_d) being less than 5, equivalent static load analysis is conducted. Moreover for structures that are between 100-150m in height (H), a modal analysis is used. Lastly, for irregular buildings and buildings with a height (H) greater than 150m dynamic time history analysis needs to be conducted.

Even though the ECL (1994) was an improvement on its predecessor in terms of introduction of a zonation map, conducting seismic design based on a more technical basis, considering the effect of soil conditions on seismic action, accounting for the influence of building characteristics, and the introduction of drift limitations (d_r), it still provided seismic provisions for buildings only, with several shortcomings, and with bridges and other structures not being accounted for.

The introduction of the 2003 Egyptian Code for Loads (ECL, 2003), represented a shift in seismic design provisions. It firmly introduced concepts such as response spectra and force reduction factors. The seismic map in this code differed from its predecessors since it included five regions. Moreover, provisions for the seismic design of bridges and other structures were introduced, thus creating a more comprehensive code, in which was largely based on an early draft of Eurocode 8-1 (EC8-1, 2003). The provisions set by this code were also compulsory for the design of all structures, which differs from its predecessor where some buildings were exempt. This code provided two response spectra. The first of which is for near-field seismic sources, while the second is to account for seismic activity that takes place in the Hellenic and Cyprian Arcs.

In order to provide greater ductility that aids in resisting seismic loads, the Ministry of Housing introduced detailing provisions to increase the ductility of structures. The ECL (2003) was linked to the detailing provisions by providing ductility checks. These provisions were not available in previous codes and thus this clearly represented a significant advancement in seismic design in Egypt.

In 2008 a new Egyptian Code for Loads (ECL, 2008), was established. This code is very similar to its predecessor ECL (2003), and references Eurocode 8-1 (2003) and Eurocode 8-3 (2004). Since both ECL (2008) and ECL (2003) are largely based on subsequent versions of the European Code, they are both very similar, with the ECL (2008) updating errors and ambiguities of its predecessor. The first correction is in relation to the load combination associated with the earthquake load. ECL (2003) stated that the design force calculated through the analysis results in a force that is taken as the load combination in the case of limit state design, whereas if elastic design is used this force needs to be reduced by a factor of 1.28. This factor was proven to be inconsistent with load combination requirements, and thus the load was amended to 1.40 in ECL (2008).

One of the major additions to ECL (2008) is evident in the classification of subsoil conditions. Previous Egyptian codes provided criteria for enabling the classification of soil in a given site, and if the site did not meet such classification then the codes specified that geotechnical investigations need to be conducted. Nonetheless the type of soil that needs to be investigated further was not specified, and no guidance was given on the information needed from such investigation. ECL (2008) overcomes these shortcomings by specifically detailing the conditions for conducting geotechnical investigations and the information needed from such investigations. Moreover the classification of soil for a given site is determined based on SPT count (N) or Undrained Shear Strength ($\bar{s}_u$). In ECL (2008), the table is updated to conform to NEHRP (2003), and corrected to provide values for $\overline{V}_S(30)$, N_{30}, and $\bar{s}_u(30)$ rather than values for $\overline{V}_S(d)$, N_d, and $\bar{s}_u(d)$ that the previous code provided.

Five other important features appear in ECL (2008). The first of these is an update to the Egyptian seismic hazard map, dividing the previously established fifth region, into two regions, 5A and 5B. The 5B region has a ground acceleration value of 0.3g, and includes the city of Taba in North Sinai, and the island of Shedwan in the Red Sea. The second improvement that is established in ECL (2008) is the removal of the importance factor in the final equation for calculating the Ultimate Base Shear Force, and inserting it instead in the equations for calculating the elastic response spectra.

The ECL (2003) faced significant resistance in practice, since many engineers felt that it considerably increased the percentage of steel in structures, and thus increased cost. Moreover, no buildings were exempted from needing to perform the analysis laid out in the earthquake resistant design section of the code, which was also met with opposition in practice. Thus, the third important change introduced in ECL (2008) establishes criteria that exempt certain structures from conducting the analysis.

Fourthly, for assessing displacements (d_s), ECL (2003) specified that the displacement value (d_s) is directly proportional to the design resistance R_d, without stipulating its relationship with the force reduction factor R for the structure. ECL (2008) goes a step further, specifying the value of R_d=0.7R, rather than leaving it ambiguously for the engineer to determine.

The last improvement that the code introduces, overcomes another ambiguity. ECL (2003) discussed resistance conditions, and the non-linear nature of the analysis, specifying a simplified means of taking into account the P-Δ effect; nonetheless, this is only applicable for a certain range of deflection, after which the code does not doffer guidance. ECL (2008) overcomes this by directly specifying that P-Δ analysis needs to be conducted if the displacement is outside the specified range. A summary of the main characteristics and differences between each code is shown in Table 4-1.

Each of the codes that were discussed has a significant bearing on the earthquake resistant nature of the Greater Cairo building inventory. It could easily be noted from these findings that buildings that were designed prior to 1989 are considered to have no seismic considerations, while structures designed between 1989 and 2003, that were designed according to ESE (1989) and ECL (1994), are considered to have moderate seismic considerations On the other hand, relatively new buildings that were constructed after 2003 according to ECL (2003) and ECL (2008) have been designed to reasonably good seismic provisions.

4.2.2 Overview of Existing Building Stock Inventory

The 1998 building census undertaken in 1996 Egyptian Building Census (CAPMAS, 1998) provides a foundation for analysing the building inventory for Greater Cairo. According to the census structures in Egypt can be classified according to the following:

- Reinforced Concrete Skeletal Type (RC)
- Precast Concrete (PC)
- Unreinforced Masonry with Concrete Floor Diaphragms (UMCD)
- Unreinforced Masonry with Other Types of Slab (UMOS)
- Adobe Masonry (AM)
- Other Types of Structures (OTS)
- Undefined (UN)

Table 4-1 Comparison between Egyptian Codes of Loading since the incorporation of Earthquake Resistance design into Egyptian Codes

	ESE (1989)	ECL (1994)	ECL (2003)	ECL (2008)
Seismic Zonation	2 Zones: G. Cairo = Zone 1	3 Zones: Zone 1 = 0.1g Zone 2 = 0.2g Zone 3 = 0.3g G. Cairo = Zone 2	5 Zones: Zone 1 = 0.1 Zone 2 = 0.125 Zone 3 = 0.15 Zone 4 = 0.2 Zone 5 = 0.25 G. Cairo = Zone 3	6 Zones: Zone 1 = 0.1 Zone 2 = 0.125 Zone 3 = 0.15 Zone 4 = 0.2 Zone 5a = 0.25 Zone 5b = 0.3 G. Cairo = Zone 3
Modes of Analysis	• Equivalent static force method • Spectral modal analysis method	• Equivalent static force method for: ○ H<100m ○ $H/b_d<5$ • Spectral modal analysis method for: ○ 100≤H<150m • Dynamic Time history analysis for other cases	• Simplified spectral modal analysis method for: ○ $T_1 \leq 4.0T_c$ ○ $T_1 \leq 2s$ ○ Regularity in plan and elevation • Multi-modal response spectrum method for: ○ $\Sigma m_{eff} \geqslant 90\%$ ○ $k_{min} \geqslant 3\sqrt{n}$ ○ $T_k \leqslant 0.2s$ ○ All modal masses of more than 5% of total are taken into consideration • Time history analysis for other cases	• Simplified spectral modal analysis method for: ○ $T_1 \leq 4.0T_c$ ○ $T_1 \leq 2s$ ○ Regularity in plan and elevation • Multi-modal response spectrum method for: ○ $\Sigma m_{eff} \geqslant 90\%$ ○ $k_{min} \geqslant 3\sqrt{n}$ ○ $T_k \leqslant 0.2s$ ○ All modal masses of more than 5% of total are taken into consideration • Time history analysis for other cases
Exemptions for not considering seismic loading		• H: ○ Zone 1<18m ○ Zone 2<15m ○ Zone 3<12m • $H/b_d<2.5$		All the following are fulfilled: • Residential • H: ○ Zone 1<12m ○ Zone 2<10m ○ Zone 3<8m • Columns aligned in 2 directions • External and core wall columns connected by beams of at least 25cm width
Soil classification		Phrasal description of soil types	According to: • $\overline{V}_S(d)$ • N_d • $\overline{s}_u(d)$	According to: • $\overline{V}_S(30)$ • N_{30} • $\overline{s}_u(30)$

Table 4-1 continued

Displacement evaluation			• $d_s = R_d\, d_e\, \gamma_1$	$d_s = 0.7\, d_e\, \gamma_1$
Resistance conditions			• (P-Δ) effect is not taken into account if: ○ $\theta = \frac{P_{tot} d_r}{V_{tot} h} \le 0.1$ • (P-Δ) = $\frac{1}{1-\theta}$ if $(0.1 \le \theta \le 0.2)$ • $\theta \le 0.3$	• (P-Δ) effect is not taken into account if: ○ $\theta = \frac{P_{tot} d_r}{V_{tot} h} \le 0.1$ • (P-Δ) = $\frac{1}{1-\theta}$ if $(0.1 \le \theta \le 0.2)$ • (P-Δ) analysis has to be conducted if $(0.2 \le \theta \le 0.3)$ • $\theta \le 0.3$
Ductility conditions			• Structural elements have to be erected as one unit with adequate ductility, according to specialized Egyptian codes, that provide Capacity Design Provisions	• Structural elements have to be erected as one unit with adequate ductility, according to specialized Egyptian codes, that provide Capacity Design Provisions
Interstorey drift		• $d_r \le 0.005h$	• $d_r/\nu \le 0.005h$, for buildings with brittle non-structural components • $d_r/\nu \le 0.0075h$, for buildings with ductile structural components • $d_r/\nu \le 0.01h$, for buildings with non-structural components designed to prevent interference with structural movement of building ν: • = 2, for residential buildings • = 2.5, for emergency structures (hospitals, fire stations, police stations,…etc) and important structures (schools, museums, tanks,…etc)	• $d_r/\nu \le 0.005h$, for buildings with brittle non-structural components • $d_r/\nu \le 0.0075h$, for buildings with ductile structural components • $d_r/\nu \le 0.01h$, for buildings with non-structural components designed to prevent interference with structural motion of building ν: • = 2, for residential buildings • = 2.5, for emergency structures (hospitals, fire stations, police stations,…etc) and important structures (schools, museums, tanks,…etc)

T_1=fundamental period of the building, T_c=upper limit of constant spectral acceleration, H= height of building, b_d= smaller dimension of building, $\Sigma\, m_{eff}$= total effective modal mass, k_{min}= minimum number of modes being analysed, T_k=modal response period, $\bar{V}_S(d)$=average shear wave velocity at depth d, N_d = average SPT blow count over depth d, $\bar{s}_u(d)$ = undrained shear strength over depth d, $\bar{V}_S(30)$ = average shear wave velocity over uppermost 30m, N_{30} = average SPT blow count over depth uppermost 30m, $\bar{s}_u(30)$ = undrained shear strength over uppermost 30m, d_s =displacement due to seismic force, d_r = interstory drift, R_d = design resistance, d_e =displacement at d_s calculated through spectrum , γ_1= structure importance factor, ν= displacement reduction, θ =interstorey stability coefficient, P_{tot}= total vertical force above storey, V_{tot}= total seismic storey shear, h= height of column between centrelines of beams

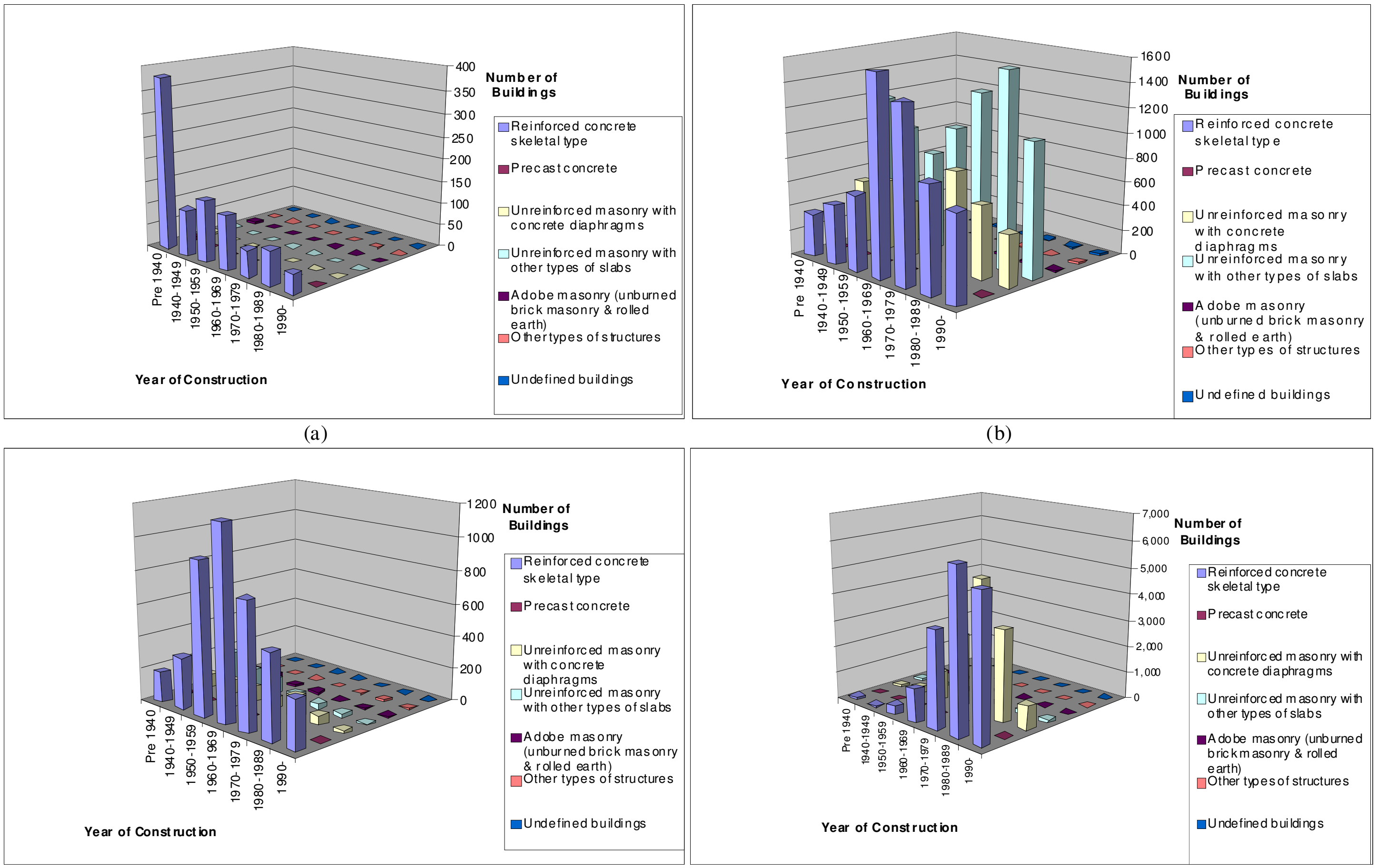
OTS represents the class that forms a minority of buildings. These can include a wide range of structures with varying levels of complexity, ranging from timber lodges to steel structures.

These classifications are provided on a national level, and further broken down for each Governorate (Mohafza), and within each Governorate are further broken down into districts (Markaz), which are broken down into neighbourhoods (Shiakha). Since the IO tables are provided by districts, then the building stock inventory should accordingly be analysed at the same level.

The building stock inventory of Greater Cairo is extremely diverse due to the large disparity in the Egyptian economy. Certain districts that are known to house wealthy communities contain buildings whose design and construction is more formal; these are mainly reinforced concrete structures that largely meet all formal codes and requirements. Other districts on the other hand, that house underprivileged families, are poorly constructed with no building permits, and are mostly unreinforced masonry structures (see Figure 4.3).

To further illustrate the relationship between building category and standard of living, two districts were chosen. The first district, Zamalek, is one that houses a wealthier population, whilst the second, Masr Il Adeema, houses underprivileged families.

As can be seen from Figure 4.3 (a) Zamalek which is considered one of the wealthiest districts in Cairo has a majority of structures falling in the RC category (96.7%), while each of the other categories compromise 1% or less. A similar feature can be seen when looking at Figure 4.3 (c) which is a wealthy residential district in Giza called Dokki. This district is composed of 78.3% RC structures, while 19.2% are divided between UMCD and UMOS structures. Unprivileged



(a) (b) (c) (d)

Figure 4.3 Number of Buildings Classified by Year of Construction and Building Classification Type for a) Zamalek ,b) Masr Il Adeema, c)Dokki and d) Boulaq (from CAPMAS, 1998) residential areas exhibit a very different breakdown, as can be seen from Figure 4.3 (b) and Figure 4.3 (d). In Figure 4.3 (b) Masr Il Adeema has the majority of buildings falling into the UMOS category (42.6%), while RC structures compose only 32%. Boulaq (Figure 4.3 (d)) on the other hand still presents a majority of buildings falling in the RC category; however this percentage drops down from its Giza neighbour Dokki's percentage of 78.3% to 53.2%, with a large percentage moving to the UMCD category (42.8%).

Greater Cairo, according to the census, is composed of the Governorates of Cairo and Giza, with the Governorate of 6th of October and Helwan (which were established in April 2008), being incorporated into Cairo and Giza respectively. This inclusion is of benefit to this study, since the IO tables provided are prior to April 2008, and thus their data is broken down into the same governorates and districts established in the Building Census of 1998.

The Governorates of Cairo and Giza are composed of 37 and 17 districts respectively, with two more districts found in 6th of October and New Cairo, meaning that Greater Cairo is composed of a total of 56 districts. Each of these districts has had varying levels of building construction within the past century, and this can be seen in the building census which presents the data by decade. The classification of building type by decade is shown in Table C-1 and Table C-2 of Appendix C for the Governorate of Giza, in Table C-3 and Table C-4 for the Governorate of Cairo, and combined in Table 4-2 and Table 4-3 for Greater Cairo. This information is also illustrated in Figure C.1 for Giza, in Figure C.2 for Cairo, and combined in Figure 4.4 for Greater Cairo.

For both Governorates there appears to be a steady increase in the number of buildings being constructed until 1990, after which a decline takes place. This can be attributed to the recession of the 1990s in which high rates of defaults on loans caused a shortage of liquidity in the banking system, which in turn resulted in fewer developments taking place (Hussein and Nos'hy, 2004). Nonetheless certain building types do not conform to this pattern. The number of new AM structures has declined since 1969, which corresponds to the period in time in which there was a large increase in the number of RC and UMCD structures. This is logical since after Egypt was involved in a war with Israel in 1973, Egypt opened its doors to foreign investment, which resulted in large developments taking place. These developments were mostly RC structures, thus causing an increase in this category, while resulting in a decrease in the unregulated AM structures.

RC structures comprise the largest percentage of total structures for Cairo (53.6%) and Greater Cairo (40.8%). This figure is less for the Governorate of Giza, with 30.6% of structures falling in this category. The largest percentage of buildings in the Governorate of Giza is UMCD structures (41.0%), which is a clear reflection of the standard of living in Giza, which contains a significant proportion of informal areas. This is further reflected when considering the percentage of AM structures (which is the least code complying category of structures); in Giza compared to Cairo. AM structures compromise 11.0% of structures in Giza, whereas only 1.4% of structures fall in the same category in Cairo.

Greater Cairo

Table 4-2 Total Number of Residential and Business Buildings Classified According to Decade of Construction and Building Classification System for the Governorate of Cairo (from CAPMAS, 1998)

Total number of buildings according to decade of construction and building class								
Year Group	RC	PC	UMCD	UMOS	AM	OTS	UN	Total
Pre-1940	12580	503	10789	16530	6537	197	175	47311
1940-1949	10228	365	13403	15185	10528	116	132	49957
1950-1959	21074	351	27049	14216	10440	79	147	73356
1960-1969	43500	325	49019	19257	12521	80	176	124878
1970-1979	74004	569	92859	27037	11744	103	256	206572
1980-1989	129026	1933	104495	40632	9751	283	449	286569
1990-	101262	1522	41570	21869	3160	270	927	170580
Total	391674	5568	339184	154726	64681	1128	2262	959223

Table 4-3 Percentage of Residential and Business Buildings According to Decade of Construction and Building Classification System for Greater Cairo (from CAPMAS, 1998)

Percentage of buildings according to decade of construction and building class								
Year Group	RC	PC	UMCD	UMOS	AM	OTS	UN	Total
Pre-1940	26.6	1.1	22.8	34.9	13.8	0.4	0.4	100.0
1940-1949	20.5	0.7	26.8	30.4	21.1	0.2	0.3	100.0
1950-1959	28.7	0.5	36.9	19.4	14.2	0.1	0.2	100.0
1960-1969	34.8	0.3	39.3	15.4	10.0	0.1	0.1	100.0
1970-1979	35.8	0.3	45.0	13.1	5.7	0.0	0.1	100.0
1980-1989	45.0	0.7	36.5	14.2	3.4	0.1	0.2	100.0
1990-	59.4	0.9	24.4	12.8	1.9	0.2	0.5	100.0
Total	40.8	0.6	35.4	16.1	6.7	0.1	0.2	100.0

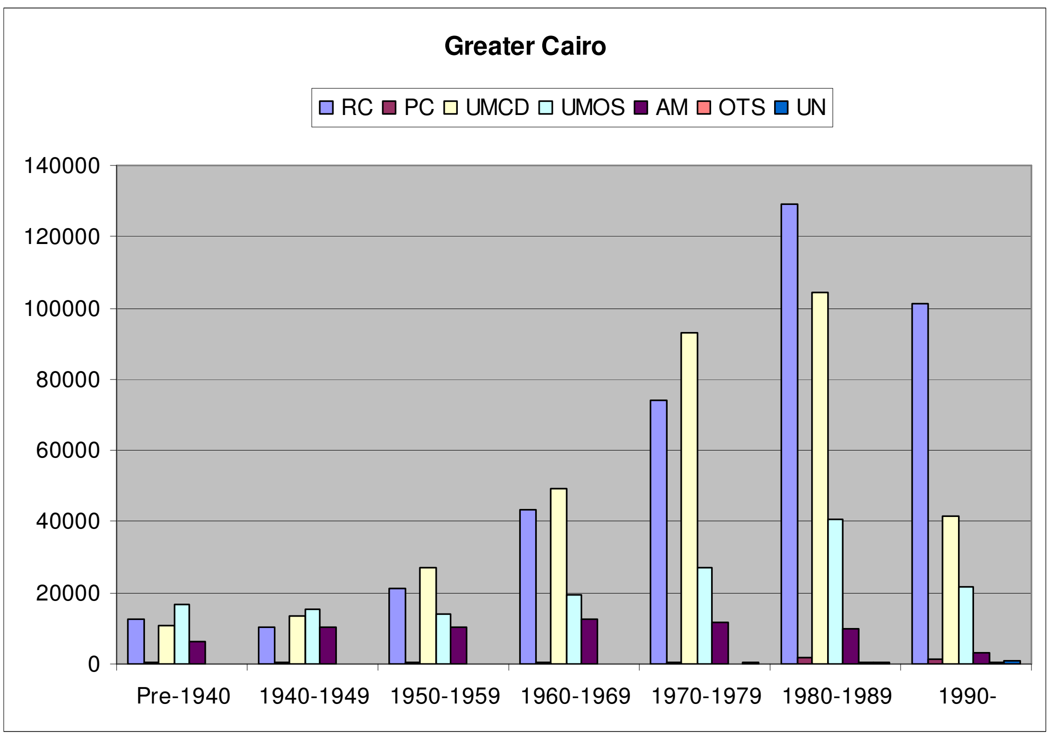


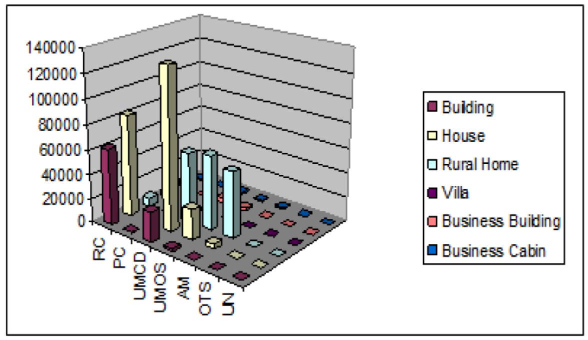
Figure 4.4 Number of Buildings According to Decade of Construction and Building Classification Type for Greater Cairo (from CAPMAS, 1998)

As previously stated, an important criteria that needs to be deduced is the number of stories associated with each building classification. The 1998 Building Census (CAPMAS, 1998) provides information regarding residential buildings by number of stories for each governorate, and districts within each governorate. The main problem associated with the available data is that it does not relate this information to the building classification data, thus making such a connection unavailable directly from the census data.

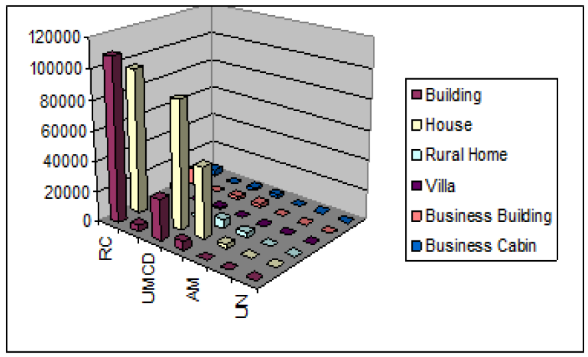
Even though the building classification information is available for all types of structures, including business buildings, the classification according to number of stories is available only for residential buildings; this can be assumed to be irrelevant since the non-residential buildings compromise a small minority of structures as can be seen in Table 4-4. Non-residential buildings only represent 3.24% and 6.51% for the Governorates of Giza and Cairo respectively. The distribution of these buildings is also similar to that of the residential buildings in terms of their building classification as can be seen in Figure 4.5 (a) through to Figure 4.5 (c). In building categories that exhibit large percentages in residential structures such as RC structures, the same large relative percentage is exhibited for non-residential structures. This further supports the assumption that even though the CAPMAS Building Census only classifies buildings according to their number of stories for residential structures, this can be considered to be largely similar to non-residential structures.

Table 4-4 Classification of Buildings According to their Use (from CAPMAS, 1998)

	Giza		**Cairo**		**Greater Cairo**	
	Number of Buildings	Percentage of Total	Number of Buildings	Percentage of Total	Number of Buildings	Percentage of Total
Residential	514769	96.76	399388	93.49	914157	95.30
Non-Residential	17256	3.24	27810	6.51	45066	4.70



(a)



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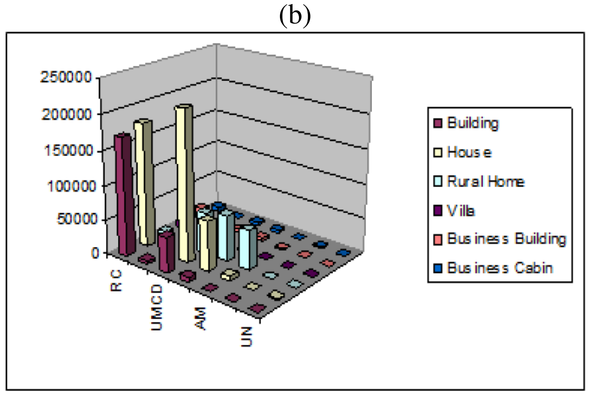


(c)

Figure 4.5 Number of buildings according to their structural type and functionality for a) Giza, b) Cairo, and c) Greater Cairo (from CAPMAS, 1998)

In order to establish a correlation between building classification and number of stories, the percentage of residential buildings with varying number of stories for each district needs to be tabulated and analysed. This data (shown in Table C-5 through Table C-8) is hence correlated to that in Table C-9 and Table C-10 (which illustrate the percentage of buildings structures within each district) in order to establish a relationship between the number of stories and building structure category.

The districts that are dominated by buildings of a given number of stories were listed in order to correlate the number of stories to the structural type. For the Governorate of Giza, 9 districts have 35% or more of their buildings being only 1 storey. Of these 9 districts, all but two are dominated by UMCD buildings, with only “Alwahat” and “Auseem” having less than 35% of their structures of the UMCD category. In the case of districts that are dominated by 2 storey buildings, 3 such districts exist, and all of which are dominated by UMCD structures. 6^{th} of October is the only other district in Giza that is dominated by buildings of a certain number of stories (5 stories) as can be seen from Table C-5. In this case, 6^{th} of October is dominated (over 80%) by RC structures.

Based on the above correlation similar findings for the Governorate of Cairo would be expected. However, upon examination, a different pattern is present. In Cairo, 5 districts are dominated by single storey buildings; however, unlike the Governorate of Giza, these districts are not dominated by UMCD but by RC structures. 3 districts are dominated by 5 storey buildings, and in this case (just as in Giza) these districts are dominated by RC structures. One of these districts “Badr” has an astounding 99.03% of its structures being categorized as RC, lying way above the average of 53.60% RC structures for the Governorate of Cairo.

The above information could be examined in a different manner by evaluating districts dominated by a given structural type, and assessing the number of stories for structures that dominate that district. For the Governorate of Giza 9 districts are dominated with over 35% by RC structures. Of the 9 districts, no dominance of structures with a given number of stories exists. However, when considering Table 9 it is clear that 9 districts all have a percentage of single storey structures that falls below the Governorate average of 44.15%. Moreover, 7 out of the 9 districts have a percentage of single 2 storey structures that falls below the average of 24.63%, while 7 out of the 9 districts have percentages of 3 storey building or greater that are above the Governorate average. This implies that for structures that are 3 stories or greater, it is expected that such structures are RC. UMCD structures dominate 12 districts in Giza, however no correlation can be made between this category and the number of stories associated with such structures. This can be illustrated by comparing "Qism Giza" and "Alsaf" each of which are dominated by UMCD structures. In the case of "Qism Giza" 57.50% of structures are 3 stories or greater, whereas this percentage falls to 1.75 % for "Alsaf". This illustrates the greater difference between structures that are dominated by UMCD, and the fact that little correlation can be made. UMOS and AM structures exhibit the largest percentage for the districts of "Alayat", "Markaz Embaba" and "Atfeeh". All of these districts are composed mainly of single or 2 storey buildings, which range between 82.19% and 97.74% of the total structures in each district.

Conducting the same analysis for Cairo produces different results. Only 3 districts have less than 35% of their structures being categorized as RC. For the remaining districts, it would be expected as in the case of Giza that districts with a high percentage of RC structures would be dominated by 3 and greater storey buildings, but this is not the case in Cairo. Four of these districts are composed of 35% or more structures that are single storey buildings, whereas 3 districts are composed of 35% or more structures that are 5 stories high. This illustrates that very little correlation can be made between RC structures and the number of stories associated with such structures. UMCD structures are expected to be low rise structures; however, in districts of Cairo whose structures are composed of 35% or greater UMCD structures, this hypothesis is not supported. Two such districts contain a percentage of structures having 7 or more stories greater than the Governorate average of 4.31%, which clearly does not back up the previously mentioned assumption that was supported in Giza. Finally, 4 districts in Cairo are composed mainly of UMOS structures. These 4 districts have a total percentage of structures that are 4 or less stories ranging from 71.74% to 85.30%, all falling above the Governorate average of 66.78%. This illustrates that districts with a large percentage of UMOS structures, tend to have structures that are less than 4 stories high.

The 1998 Building Census provides a good basis for conducting a building stock inventory. However, it is inadequate to complete such a database since no direct link can be established between number of stories and the structural types. Based on the analysis and correlation made between Table C-5 through Table C-8 and Table C-9 through Table C-10 , the following can be deduced:

- The Governorates of Cairo and Giza exhibit a different composition of building inventory, with Cairo having a majority of structures falling in the RC category, while Giza has the majority of its structures falling in the UMCD category. This makes it unfeasible to adopt any conclusions established for Giza's building inventory for use in Cairo, and vice versa.
- Correlations between number of stories and building category exists for Giza, with districts that have a majority of structures falling in the RC category exhibiting a majority of structures that are 4 or more stories high.
- For districts that are mainly composed of UMOS and AM structures in Giza the majority of structures are single or 2 storeys high.
- No correlation exists in Giza between UMCD and PC structures and the number of stories associated with these categories.
- No correlation exists in Cairo between RC, UMCD and PC structures and the number of stories associated with these categories.
- Districts in the Governorate of Cairo that are mainly UMOS or AM tend to be 4 stories or less.

Moharram (2006) created another building inventory database that is based upon the CAPMAS (1998) building census, in addition to using satellite images and conducting field surveys. Moharram's (2006) study divided Greater Cairo into four ages groups (Figure 4.6). This classification was undertaken through the use of historical maps that illustrate the timely expansion of Greater Cairo. Areas that were developed at the same time were grouped into the same age group.

With the aid of satellite images, Moharram (2006) was able to conduct building surveys for locations in each of the classified age groups. In total, 706 buildings were surveyed in each of the four age groups, of which 582 were in formal areas and the remaining 124 were conducted in informal areas that were identified through satellite images. According to this study a different classification of buildings was established (Table 4-5). This classification categorized buildings not only by structural type, as in the CAPMAS (1998) building census, but also subdivided each of the structural types into number of stories. The final building inventory database used by Moharram (2006) is shown in Table C-18 (Appendix C).

It is clear that correlations between building categories in the CAPMAS (1998) and the number of stories associated with them cannot be established directly from the data available from the building census. In order to reduce the ambiguity and clarify unknown correlations, the study of Moharram (2006) was used to construct new geocodes. Moharram (2006) already establishes a further set of building types that are categorized in terms of structure as well as height. Nonetheless, Moharram (2006) adopted geocodes that are not consistent with the districts that are evident in the building census or the IO tables. In order to overcome this problem, a map with the geocodes from Moharram (2006) is superimposed onto a map of the available districts (Figure 1.2), in order to establish the building classification using Moharram's (2006) work, yet preserving the districts as the basis for the creation of the new geocodes. Thus, the new geocodes are also the same as the districts shown in Figure 1.2 . The advantage of using the work of Moharram (2006) to define geocodes, is that it eliminates the need to conduct intensive field surveys for the entire Greater Cairo region in order to establish correlation between number of stories and structural type.

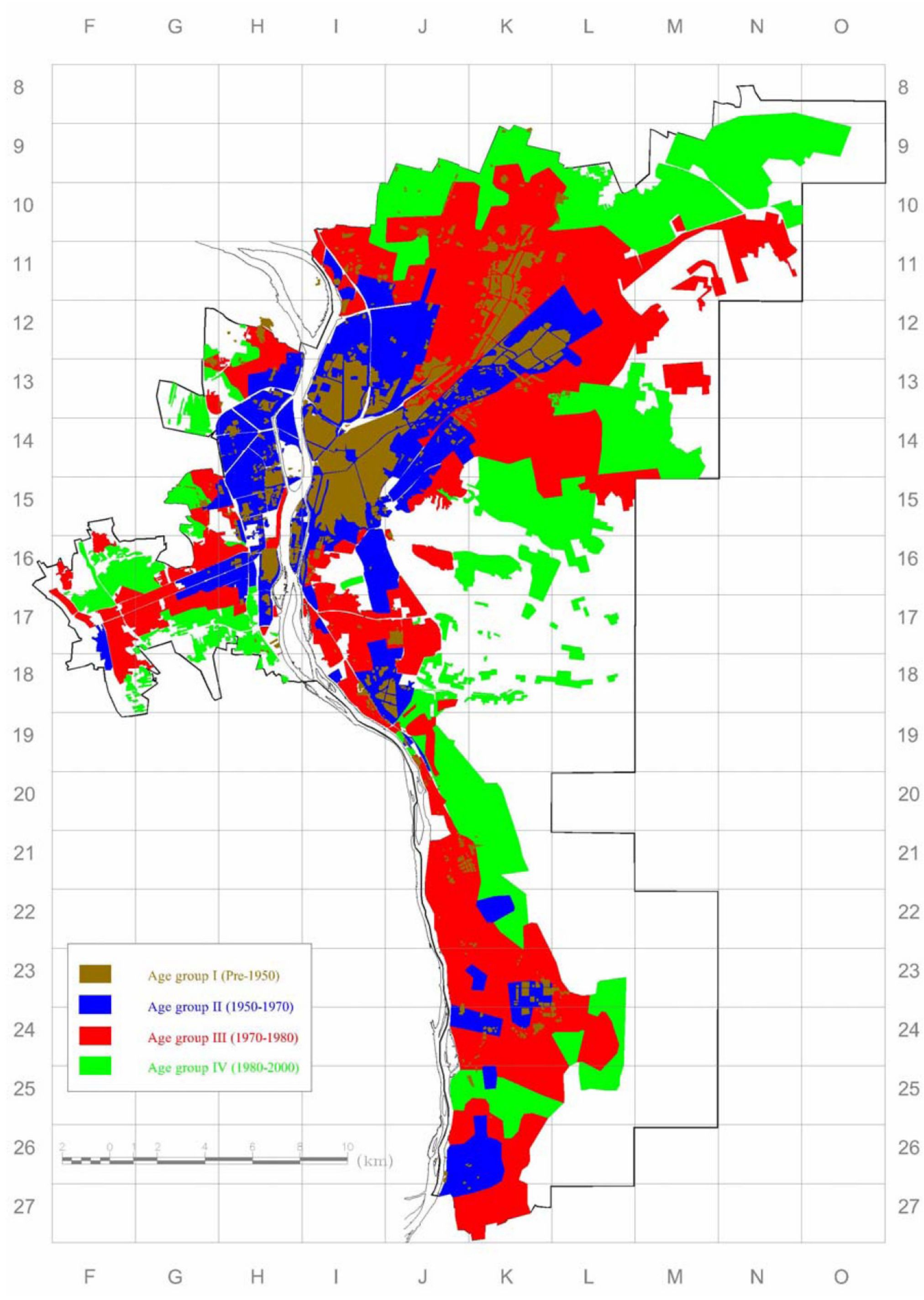


Figure 4.6 Building stock categorisation into four age groups; pre-1950 (I); 1950-1970 (II); 1970-1980 (III); 1980-2000 (IV) (Moharram, 2006)

Table 4-5 Building classification according to the basic structural system and height (Moharram, 2006)

Number	Label	Structural type	Number of storeys
1	EC1-LP	Reinforced concrete skeleton with masonry infill, pre-code	1-3
2	EC1-MP	Reinforced concrete skeleton with masonry infill, pre-code	4-7
3	EC1-HP	Reinforced concrete skeleton with masonry infill, pre-code	8+
4	EC1-LG	Reinforced concrete skeleton with masonry infill, seismically designed	1-3
5	EC1-MG	Reinforced concrete skeleton with masonry infill, seismically designed	4-7
6	EC1-HG	Reinforced concrete skeleton with masonry infill, seismically designed	8+
7	EC2-HG	Reinforced concrete skeleton with shear walls	8+
8	EC3-L	Reinforced concrete flat slab	1-3
9	EC3-H	Reinforced concrete flat slab- 8 or more storeys	8+
10	EC3-HG	Reinforced concrete flat slab with shear walls	8+
11	EC4-M	RC mixed system (flat slab + RC skeleton)	4-7
12	EC4-H	RC mixed system (flat slab + RC skeleton)	8+
13	EC4-HG	RC mixed system (flat slab+ RC skeleton + shear walls)	8+
14	EURM-L	Unreinforced masonry- 1 to 4 storeys	1-4
15	EURM-M	Unreinforced masonry- 5 or more storeys	5+

4.2.3 Field Surveys

Moharram (2006) conducted field surveys for most areas of Greater Cairo with the exception of 6th of October and New Cairo. These two areas are a product of the natural growth of Cairo's population that has expanded outwards to accommodate the rising population in the east with the development of New Cairo, and in the west with the development of 6th of October. Both these areas are primarily residential, however to accommodate an ever growing population, businesses and organizations have been established to provide necessary services.

In order to create a building inventory database for 6th of October and New Cairo, building surveys were necessary. Moreover, these surveys needed to be consistent with the surveys conducted by Moharram (2006), so that both sets of results can be merged together in order to establish a building stock inventory database for the entire area of Greater Cairo. Therefore, the same evaluation form (Figure C.3) used by Moharram (2006) was employed in this study.

Satellite images of 6th of October city and New Cairo were used to support the building surveys as well as locating informal areas. Informal areas can easily be distinguished since building density is comparatively high with roofs appearing close together such that streets are not visible. Moreover satellite images are also helpful in identifying the exact location of surveyed buildings. A sample of the satellite images used in this study is shown in Appendix C.

According to the surveys conducted and based on evidence from of satellite images, no informal areas exist in both 6th of October city and New Cairo. This is logical since the development of these two areas began in the late 1990s, under the guidance of the Ministry of Housing and Development that invested a considerable amount into their planning. Moreover, permits for development in these areas are difficult to obtain, requiring extensive regulations, thus curbing the possibility of informal structures being constructed in either location. Figure 4.7 (a) and (b) present satellite images of New Cairo and Downtown Cairo respectively. Roads in New Cairo are clearly evident, since the region is composed mainly of upscale residential units. Downtown Cairo on the other hand presents a different case, where an informal area exists and can be identified by the comparatively high density of buildings.

(a) (b)

Figure 4.7 Satellite images of a) New Cairo and b) Downtown Cairo

Since no informal areas exist, it was necessary to establish an approach to select survey areas. For New Cairo and 6th of October, this is carried out geographically with New Cairo being divided up into 6 zones, while 6th of October is divided up into 5 zones with each zone having a minimum of 5 surveyed buildings for a total of

61 surveyed buildings in both zones (Table 4-6). Moreover an existing study commissioned for the Ministry of Housing (2009) that classifies New Cairo spatially by use was also utilised in the analysis (Figure 4.8).

Table 4-6 Summary of surveyed buildings in New Cairo and 6th of October

	Number of buildings surveyed in each zone						Total
	1	2	3	4	5	6	
New Cairo	5	5	5	6	6	5	32
6th of October	5	6	6	6	6	-	29
Total							61

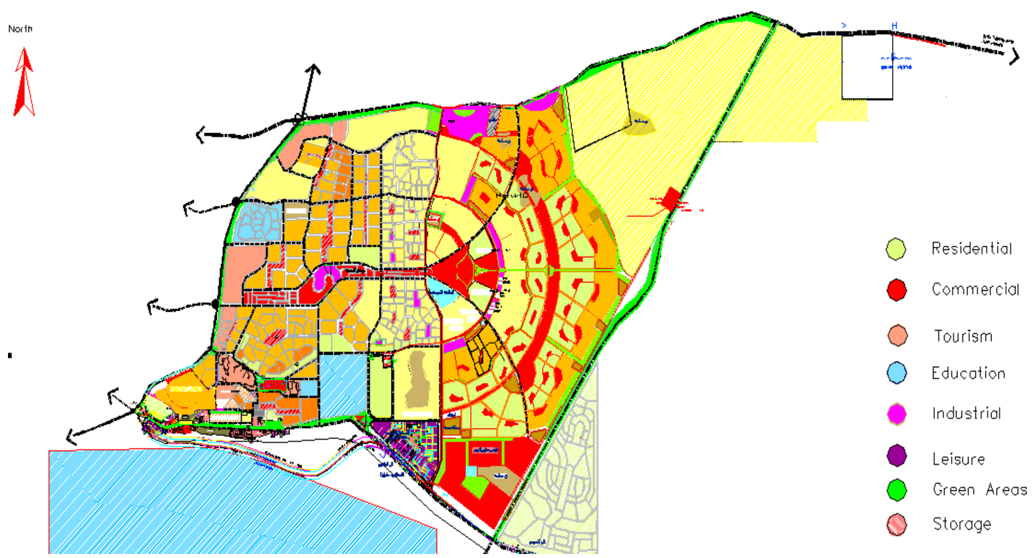


Figure 4.8 Map of New Cairo by land use created for the Ministry of Housing (2009)

Using the building classification of Moharram (2006), the surveyed buildings in New Cairo and 6th of October were categorized. This classification is shown in Table 4-7.

Table 4-7 Classification of buildings in 6th of October and New Cairo using conducted building surveys based on the classification established by Moharram (2006)

Building Classification According to Moharram (2006)	Percentage of buildings by classification	
	6th of October	New Cairo
EC1-LP	0.0	0.0
EC1-MP	0.0	0.0
EC1-HP	0.0	0.0
EC1-LG	25.0	15.6
EC1-MG	32.1	40.6
EC1-HG	0.0	0.0
EC2-HG	3.6	0.0
EC3-L	39.3	28.1
EC3-H	0.0	0.0
EC3-HG	0.0	15.6
EC4-M	0.0	0.0
EC4-H	0.0	0.0
EC4-HG	0.0	0.0
EURM-L	0.0	0.0
EURM-M	0.0	0.0
	100.0	100.0

4.3 Geocodes

Incurred loss is a function of the characteristics of the site under consideration, including the soil characteristics, building stock, and other geological features. In a large area like Greater Cairo, it is expected that there are differences in site characteristics between one location and another. To account for such differences, the analysed area is divided up into smaller areas. One way to divide up Greater Cairo in a grid like manner with each area being 1 x 1 km^2. This method is cumbersome since it requires establishing soil characteristics, geological features, and other necessary information for each of the squares of the grid. Another means of dividing up the area is according to areas of similar soil characteristics, and building stock. This is the method employed by Moharram (2006), and provides the best way of conducting such a study if the sole purpose is to conduct a direct loss estimation of building stock. However, in the current investigation this represents only a single objective of a multi purpose study, which includes conducting an indirect loss estimation based on IO analysis. Since the economic data is provided by districts of Greater Cairo, then the building inventory database should also be divided accordingly, in order to provide a basis for linking the building inventory to the economic data hence enabling a comprehensive loss estimation analysis.

The map shown in Figure 1.2 is compiled from maps found in CAPMAS (2008) and Elmokadem (2009) created for the Egyptian City Planning Authority (Appendix C). By superimposing these maps onto the geocode definition map created by Moharram (2006) (Figure C.4) new geocodes could be defined based on districts. In districts that encompass several previously defined geocodes, the new geocode is defined by determining the average weight by area using the following equation:

$$I_j = \frac{F_{j_1} A_1 + F_{j_2} A_2 + \ldots + F_{j_N} A_N}{\sum_1^N A_N} \tag{4.1}$$

where I_j is calculated as the proportion of building model j in the district being analysed, F_j is the proportion of building model j in the previously defined geocode, and A is the area of previously defined geocode encapsulated in the district being analysed.

Equation (4.1) implies that each district has a unique building stock classification, which is different from Moharram (2006) where only four building classifications were established for the four age groups. The building inventories for the districts of New Cairo and 6th of October are not determined based on Equation (4.1) but on the building surveys conducted and are thus taken directly from Table 4-7. The results of the superimposed analysis are shown in Table C-12 and Table C-14.

Similarly, the soil classification map depicted in Figure 3.9 also needs to be superimposed on top of the map of the districts to establish the soil classification of the each of the newly established geocodes. This procedure is performed in a similar way to that for the building inventory, but differs in the manner in which the weighted average is taken. For each event, the median ground-motion is modelled as the weighted average of the median ground-motion values for different $Vs(30)$ values as proposed by Bazzurro and Park (2007) and given in Equation (4.2).

$$L_j = \frac{L_{j_1} A_1 + L_{j_2} A_2 + \ldots + L_{j_N} A_N}{\sum_{i=1}^{N} A_i} \tag{4.2}$$

where L_j is the $Vs(30)$ in district *j* that is being analysed, L_{jN} is the $Vs(30)$ of the encapsulated area in district *j*, and *A* is the area of the previously defined geocode encapsulated in the district *j* with $Vs(30)_j = Vs(30)_{jN}$.

Table C-16 and Table C-17 illustrate the various values of $Vs(30)$ calculated for each district. As indicated the soil classification in the Governorate of Giza is mostly classified as Type D according to the NEHRP (2003) soil classes, and hence only two districts make use of Equation (4.2), whereas the remainder of the districts are classified only as Soil Class D. The Governorate of Cairo on the other hand has a larger diversity in soil characteristics and hence the loss model makes extensive use of Equation (4.2).

4.4 Building Vulnerability

The most common means of assessing the vulnerability of buildings is through the use of fragility curves. Fragility curves relate the probability of exceedance of different damage states to a ground-motion parameter, usually spectral displacement or acceleration. Every building class has a set of unique fragility curves, which helps determine the probability of being in different damage states, and therefore estimating the level of damage to the building class.

The building classes in this study are the same as the ones used in the Moharram (2006) study, and therefore the fragility curves derived by Moharram (2006) are also used. Moharram (2006) derived three log-normal fragility curves for the EC1-LP, EC1-MP, EC1-HP classes, whose means and standard deviations are shown in Table 4-8, and plots in Figure 4.9. These building classes represent the majority of reinforced concrete buildings in Greater Cairo, and thus are used to estimate the damage levels for concrete structures. EC1-HP structures perform better seismically than EC1-MP structures. This can be attributed to EC1-HP structures being newer in age, therefore use more advanced construction methods and better quality materials, as well as taking into account seismic provisions in their design.

Table 4-8 Mean and standard deviation for the fragility curves of the three prevailing concrete building classes

Model	EC1-LP		EC1-MP		EC1-HP	
Parameter	λ^*	ξ^*	λ	ξ	λ	ξ
Slight	0.052	0.365	0.005	0.365	0.298	0.356
Moderate	0.244	0.365	0.321	0.365	0.958	0.363
Extensive	0.689	0.367	0.630	0.366	1.223	0.380
Complete	0.901	0.374	0.786	0.369	1.412	0.410

λ and ξ are the mean and standard deviation of the lognormal distribution respectively

Moharram (2006) used fragility curves provided by HAZUS for masonry structures, rather than derived unique curves for Egypt. Due to the large variability in constructing masonry structures in Egypt, understanding their structural behaviour becomes complicated, and therefore deriving fragility curves for these classes becomes difficult. HAZUS provides fragility curves for ‘unreinforced masonry bearing wall’, ‘reinforced masonry bearing walls with wood or metal deck diaphragms’ and ‘reinforced masonry bearing walls with precast concrete diaphragms’ structures. Nonetheless, differences in construction methods and material characteristics between Egypt and the United States present a source of error for using the HAZUS models. Several studies exist that have adjusted the HAZUS model based on expert judgement to reflect the nature of building classes in the region of study. Of these studies some were conducted for the Turkish masonry building stock (Bommer et al., 2002; Spence et al., 2002; Spence et al., 2003). Even though Egypt and Turkey share several similarities between their building, the typical heights assigned to the masonry structures in Turkey are low compared to their Egyptian counterpart (Moharram, 2006). On the other hand, typical heights of Egyptian masonry structures are more similar to the URM-M model in HAZUS. Therefore, the HAZUS model is used to assess the vulnerability for the EURM-L and EURM-M classes in this study. The mean and standard deviation of the fragility curve for the EURM-L and EURM-M classes is shown in Table 4-9, and plot in Figure 4.10.

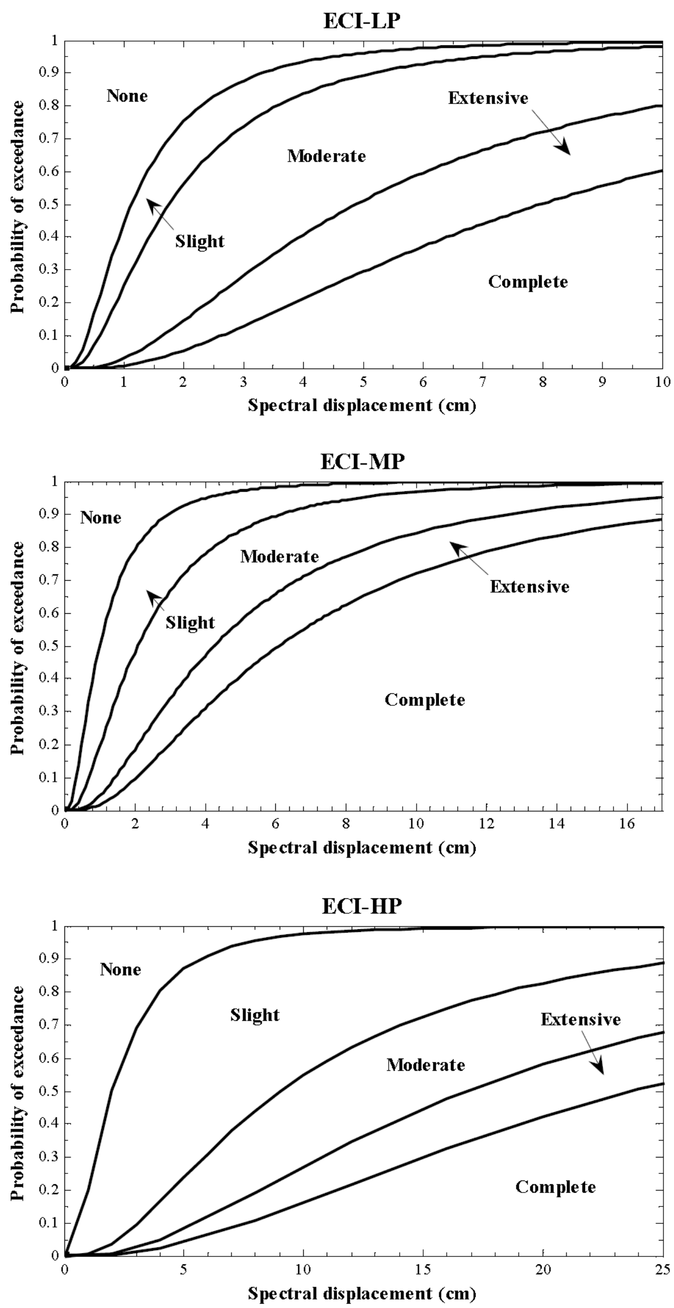


Figure 4.9 Fragility curves for the three prevailing concrete buildings in Greater Cairo (Moharram, 2006)

Table 4-9 Mean and standard deviation for the EURM fragility curves

Model	EURM-L and EURM-M	
Parameter	λ	ξ
Slight	1.27	0.99
Moderate	2.57	0.97
Extensive	6.40	0.90
Complete	14.94	0.88

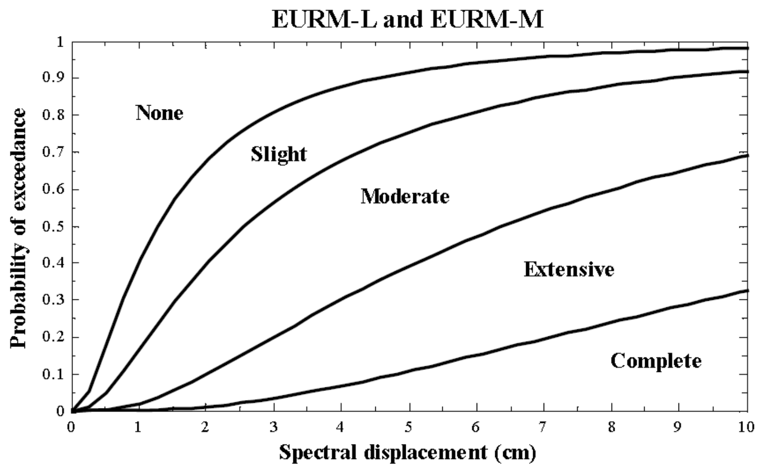


Figure 4.10 Fragility curve used in this study for masonry structures (HAZUS FEMA, 2003)

4.5 Concluding Remarks

Chapter 4 described the development of a building stock inventory database for Greater Cairo. This database is delineated in terms of geocodes, with boundaries which are defined in terms of Greater Cairo official census districts. Even though each district exhibits a wide range of building types, and in some cases a lack of homogeneity exists within districts, this is understandable due to the large disparity between social classes, in addition to the existence of new buildings at a close proximity to older ones. It is ideal to define geocodes based on similarity of buildings and soil classification within a geographical region if the sole purpose of the research is to analyse the physical damage to structures. However, since this study encompasses estimating the financial implications of seismic events, geocodes need to be based on administrative boundaries in order to link this work with financial data which are given in terms of such boundaries.

Some uncertainties exist in overlaying the geocodes defined by Moharram (2006) onto a map of Greater Cairo districts in order to define new geocodes. This method assumes that the building stock is evenly distributed within each geocode defined by Moharram (2006). This assumption seems valid since Moharram's (2006) geocode boundaries were defined according to similarity between buildings, and thus if an area exhibited different characteristics than its adjacent area, then each would be defined as two separate geocodes. An example of this is evident when considering the small island of Zamalek which is defined according to Moharram (2006) as two geocodes since its northern section is composed of an older age group of buildings, while its southern section is mainly of a more recent generation.

Conducting surveys and using the work of Moharram (2006) is believed to be more appropriate than using official census data in defining the building stock. The published census data was not collected with the purpose of conducting a loss estimation study. Hence, structural identification of buildings are vague and lack the sufficient data necessary for conducting such a study. By conducting field surveys and using previous work which has a similar purpose to one of the objectives of this study, the uncertainty in the building stock database is reduced. Furthermore, the accuracy of the official building census is questionable due to governmental intervention that attempts to euphemise the reality of the poor living standards that exist in large areas around the city.

This Chapter represents part of the inventory assessment which continues in Chapter 5 with the gas and electricity lifelines. These two chapters link the seismic hazard model discussed in Chapter 3, to the economic loss model presented in Chapters 6 and 7.

Chapter 5

Lifelines

5.1 Overview

Modern society is dependant on the proper functioning of its infrastructure and lifelines. With an increase in a nation's population and economic development, its infrastructure also needs to expand in order to maintain such development. This is carried out through expansion of lifeline systems, including; transportation, electricity, gas, oil, communication and water supply lifelines. During World War II, Germany recognized the importance of a robust infrastructure in its plans to be a world leader, and so took on one of the largest infrastructure improvement campaigns in its history, constructing the autobahns, railroads, and other civil projects (USDOT, 2011). This campaign bears fruit today, helping Germany drive its economy forward.

Egypt, and its African and Arab partners, recognize the importance of improving their infrastructure, and thus are undertaking a large scale infrastructure project aimed at creating international highways to connect the associated countries. The Arab Road Corridors project is divided into four phases, with the first phase aimed to be completed by 2012, and the last phase ending in 2025 (Figure 5.1) (Arab league, 2008). The main reason this project is being undertaken is to meet the rise in flow of trade within Arab countries, and between Arab countries and Europe whose flow of trade is estimated to be 108,329 tons by 2025 (Figure 5.2). The Trans-African Highway network's construction is also planned to meet the ever-rising economic needs of the continent.

This increase in trade between Egypt and its neighbours puts pressure on the government not only to commission improvements to the transportation system, but to all aspects of its infrastructure to meet such pressures.

Egypt's infrastructure is at a major crossroad with various projects being undertaken in an attempt to cater to the rising population and increase of trade. In February 2008, the government announced that 16.3 billion US Dollars would be invested into transportation and waterway networks (ADB, 2009), while the electricity infrastructure would be boosted with the enhancement and construction of 17 power plants, that include steam, combined cycle, solar and wind stations, and are expected to completed by 2012 (MOEE 2009; ADB, 2007). To finance these projects the Egyptian government has embraced the Build Operate Transfer (BOT) scheme, which shifts the financial burden onto the private sector. Most of the 17 power plants were awarded to Japanese companies following the BOT scheme. Infrastructure construction that employs BOT is an indication that a nation is in need of improvement to its networks to cope with rising population and trade demands, yet is unable to fund such ventures (MOEE, 2009).

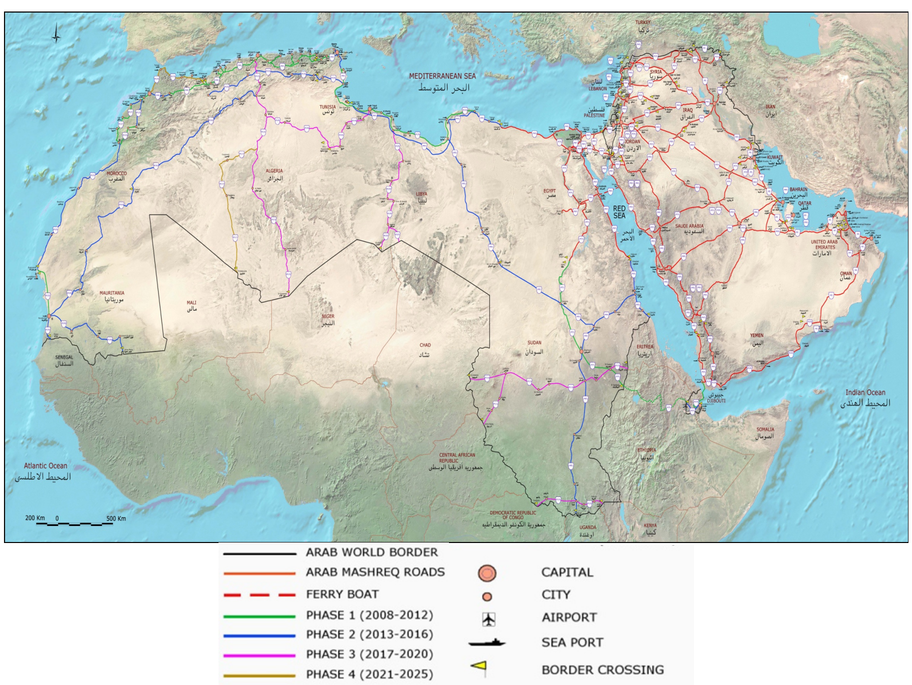
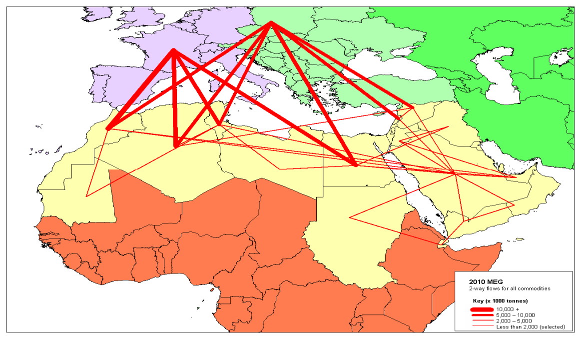
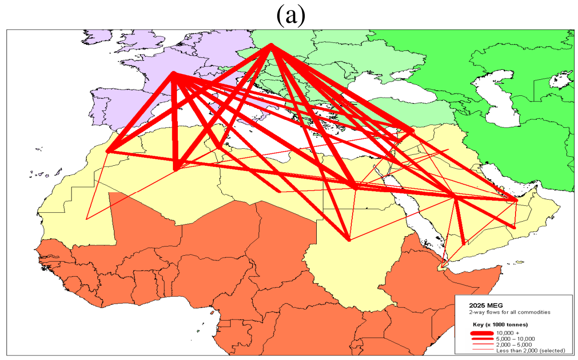


Figure 5.1 Current and proposed Arab road corridors (Arab League, 2008)

The impact of earthquakes on lifelines is usually not relevant in terms of causalities, but in terms of the economic damage associated with damage to the lifelines systems (Azevedo et al., 2010). Damage to lifelines leads to significantly large indirect economic losses, due to interruption of businesses, and the interrelation between various sectors in the economy. The Northridge 1994 earthquake resulted in large economic losses due to the interruption of communication and transportation systems (Torres-Vera and Canas, 2003).



(a)



(b)

Figure 5.2 a) Existing (2010) and b) expected (2025) trade flow patterns between Arab countries and Europe (Arab League, 2008)

Ideally, in assembling a loss estimation model, all lifelines should be included. However, in order to create such a model a large amount of information, a considerable amount of time and vast computational and manpower resources are required. This model would integrate all the lifelines, taking into account the dependencies between the various lifelines. Creating such a model for this study is not realistic, due to the limited amount of time and manpower available, thus not all lifelines are included. Even though including just one lifeline entails a large amount of effort, it is essential in creating a model that can be built upon in future research to take the model closer to the ideal situation where all lifelines are included. Incorporating two lifelines creates a strong base for such future research, because it sets forth a methodology for modelling the dependency between lifelines and how they react to one another in the event of an earthquake. This dependency has been overlooked in the past, where most research only includes one lifeline (Rose et al., 1997; Shinozuka et al., 2007; Song and Ok, 2009). Thus, this study sets a precedent in modelling damage to various lifelines, and the resulting economic consequences.

The choice of which two lifelines are included in this study is based on both the suspected importance of the lifelines to the social and economic welfare of Greater Cairo and Egypt, as well as the ability to collect sufficient information on the lifelines in order to conduct such a study. Evaluating the vulnerability of the Greater Cairo transportation network provides a great insight into the potential economic losses resulting from an earthquake event. Nonetheless, due to the limited availability of data regarding the flow of vehicles and trade throughout the region, conducting such a study becomes difficult. One of the most important resources available to Egypt is natural gas, which according to the Ministry of Finance (MOF) compromises over 50 percent of its energy consumption, as well as approximately 8 percent of its GDP (MOF, 2010), clearly illustrating the importance of natural gas to the economy and population. Due to the importance of the sector as well as being one of Egypt’s main exports, information on the lifeline is available. For this reason, the natural gas network was chosen as the first lifeline for this study.

The second lifeline chosen is electricity. A number of electricity generating stations in Egypt are fuelled by natural gas, which provides a strong case for developing a model that takes into account the dependency between different lifelines. Moreover it has clearly become evident recently that the electricity network in Egypt and especially Greater Cairo is extremely vulnerable, with several blackouts occurring over the summer of 2010, lasting in some places for several hours. This illustrates that in the event of an earthquake the electricity network might not be able to adequately handle such an occurrence, leaving the population lacking the required energy to drive the initial recovery and then the economy. Moreover with the ever increasing population of Egypt, energy and electricity supply has become a major cause for concern, further highlighting the vulnerability of the economy and its dependence on electricity.

Damage to either of the chosen lifelines could cripple business operation and cause significant economic losses. In the 1994 Northridge earthquake it is estimated that direct economic damage to lifelines compromised over 14 percent of direct losses, and resulted in a further 6.4 billion USD in indirect losses (Petak and Elahi, 2000). This illustrates that in any economy lifeline damage can no longer be dealt with as secondary to building damage, and should be clearly addressed. The following sections in this chapter discuss the electricity and natural gas lifeline systems and how damage to each is modelled.

5.2 Natural Gas

5.2.1 General

Natural gas compromises one of Egypt's main economic resources. According to the Egyptian Ministry of Petroleum (MOP), 2.135 trillion Cubic Feet (CF) of natural gas were produced in 2007, of which 1.52 trillion CF (71.2%) were used to meet local demand, while 0.615 trillion CF (28.8%) were exported (MOP, 2010).

Deposits of natural gas are located in the Western Desert, Nile Delta, and offshore in the Mediterranean (Figure 5.3), and form a reserve of 58.5 trillion CF (EIA, 2010). In order to export the natural gas produced from this reserve, the first phase of the Arab gas pipeline was inaugurated in 2003, which connects Arish in Sinai with Aqaba in Jordon through the "East Gas Pipeline" (Figure 5.4). The second phase then connected Aqaba with El-Rehab, Jordan, with the third phase connecting El-Rehab to Homs in Syria, and lastly the fourth phase connecting Homs to Tripoli in

Lebanon. Moreover a submarine pipeline connects the Arab gas pipeline to Israel from El Sheikh Zowayed in north Sinai. This enables Egypt to export natural gas to Jordan, Syria, Lebanon and Israel, and due to the proximity of Syria to Iraq and Turkey, Egypt has already signed contracts to export natural gas to Iraq and Turkey through Syria. With the construction of the Arab gas pipeline, natural gas presents Egypt with further economic benefits, clearly illustrating the economic importance of natural gas to Egypt.

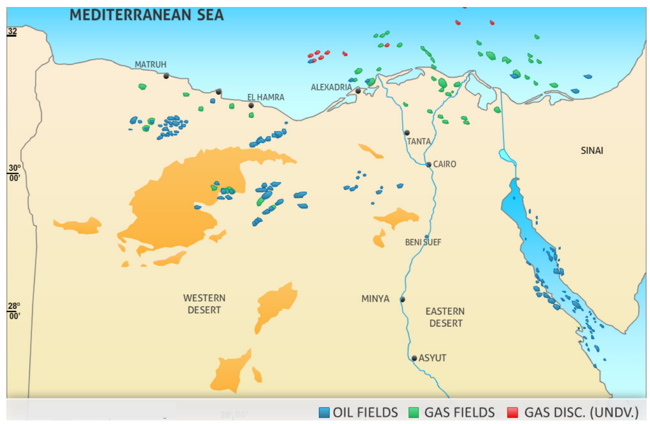


Figure 5.3 Oil fields, and current and discovered future natural gas fields, shown in blue, green and red respectively

In addition to natural gas being an important national export it is also an important domestic product required to maintain social welfare and drive the economy forward. According to the MOP, there are four main consumers of natural gas domestically; industry, electricity, petroleum and its derivatives, and fuelling cars and houses, with 56 percent of domestic consumption in the 2009/2010 fiscal year coming from electricity demand (MOP, 2010).

An important feature of natural gas domestic consumption is the rate of increase. Between 1980 and 1984 only 90,000 households had natural gas connected to them, but since then this number has exponentially risen (Table 5-1). Prior to the turn of the millennium natural gas was delivered to 930,000 households, and in the next ten years this number jumped to over 3.5 million (MOP, 2010). Moreover the number of cars running on natural gas has also seen a rate of increase over the past five years (Table 5-2).

Figure 5.4 Egypt's natural gas map

According to the *Egyptian Natural Gas Holding Company (EGAS)* 47 percent of the Egyptian national consumption of natural gas is carried out by Greater Cairo (EGAS, 2010). This along with the exponential rate of increase in natural gas consumption illustrates that Greater Cairo is becoming increasingly dependant on natural gas, which if disturbed could cause significant economic losses.

Table 5-1 Number of newly connected households with natural gas connections from 1980 to 2010 (MOP, 2010)

Year	Newly connected households with natural gas connection (Thousands)
1980-1984	90
1985-1989	140
1990-1994	220
1995-1999	480
2000-2010	2870

Table 5-2 Total number of cars running on natural gas from pre 2004 to 2010 (MOP, 2010)

Fiscal Year	Total number of cars running on natural gas (Thousand)
Pre 2004	53.6
2004/2005	60.9
2005/2006	69.4
2006/2007	80.8
2007/2008	92.5
2008/2009	110.1
2009/2010	133.7

5.2.2 Network Components

Modelling seismic damage to natural gas systems involves dealing with four main components; compressor stations, pressure reduction stations, regulator stations and pipelines. Since natural gas is pressurized throughout the system, compression is usually required periodically to ensure adequate pressure is maintained. This is undertaken through the use of turbines, motors or engines (USDOE, 2011). Turbine compressors are powered through the natural gas that they compress, by using a centrifugal compressor that employs a fan. Motor compressors also employ a centrifugal compressor, but instead of using the natural gas, they use electricity, and so have the disadvantage of requiring a constant source of electricity. The last type of compressor is the engine type which uses a reciprocating mechanism rather than the centrifugal type employed by the turbine and motor compressors (Natural Gas, 2011). The engine type compresses natural gas in a similar manner to the way an automobile operates, by combusting the natural gas to power pistons on the outside that compress the natural gas.

Pressure reduction stations (PRS) reduce the pressure of gas prior to supply to the local distribution network. The closer natural gas gets to the consumer, the lower the pressure is, and PRS performs the role of reducing the pressure.

Regulator stations are usually placed downstream of the PRS and serve the purpose of regulating the pressure into the distribution system from higher to lower pressures (Natural Gas, 2011). When pressure gets below a certain point regulators allow for more gas to flow thus increasing the pressure in the system. Moreover when pressure gets above a certain set point the regulators close to allow less gas through thus reducing the pressure.

The last component of the natural gas network is the pipeline. Pipelines are typically made of mild steel, with diameters as large as 42 inches and as small as 0.5 inches. Mainline transmission which transports natural gas to the local distribution system is typically between 16 and 48 inches in diameter, whereas local distribution pipelines are smaller than 16 inches (Natural Gas, 2011).

5.2.3 Greater Cairo Network

When analysing a natural gas network it is important to understand what the goals of the study are in order to be able to determine the level of detail and information required. For the purpose of conducting an earthquake loss assessment at a district level, the network detail requirements should be to a level capable of illustrating the gas distribution to each district. This means that smaller pipe diameters that present distribution to individual streets or houses are not necessary.

One of the main challenges in conducting this study is the ability to collect information whose source is governmental, and Greater Cairo's natural gas network presents such a case. Due to a high level of bureaucracy within government agencies, data is hard to collect. Nonetheless through the Ministry of Petroleum a map of Greater Cairo's natural gas network was obtained (Figure 5.5).

As can be seen in Figure 5.5 the network consists of four main pressure lines; 70, 30, 7 and 4 bars. The 70 and 30 bar lines are primarily, with a few exceptions, transmission lines and transport natural gas to the distribution network that operates through the 7 and 4 bar lines. Pipe diameters in the network range from 4 to 24 inches, with the 4, 6, 8, 10 and 12 primarily used as distribution lines, and the 16 and 24 lines used as transmission lines. Another important component of the network is the pressure stations that exist through pressure reduction and regulator stations. Twenty-nine such stations exist in Greater Cairo.

In order to assess the damage to each of the components in these networks the map of the natural gas network was overlaid onto a GIS map of Greater Cairo districts. This was done through georeferencing points of known coordinates in the network to enable both maps to overlay correctly onto one another. This enabled the determination of pipeline and station coordinates as well as determining which district each of these components was in. The coordinates of the 29 stations are thus determined and given in Table 5-3.

In addition to assessing damage to stations, damage to pipelines also needs to be modelled, and thus the start and end coordinates of each pipe segment is computed.

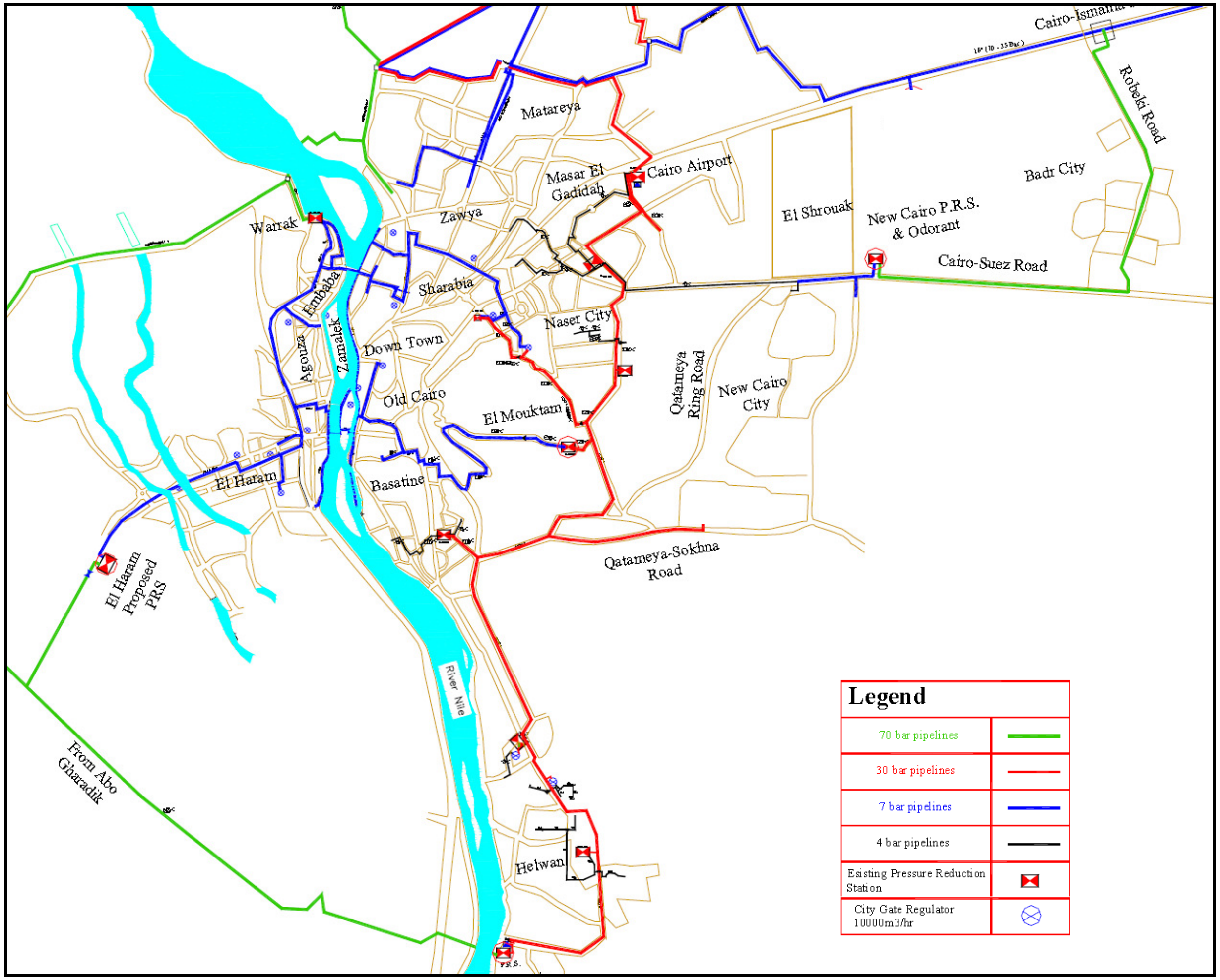


Figure 5.5 Greater Cairo's natural gas network, modified from EGAS (2007)

In order to keep track of each pipeline and station, each junction in the network was assigned a unique numerical ID. So a station was identified by a single numerical ID, whereas a pipeline was identified by two, one for its start and another for its end. This enables more efficient modelling of the system, since only IDs are needed to model each component rather than continuously inputting coordinates and visually not being able to locate the component. An example of numerical IDs for the district of Helwan is given in Figure 5.6.

Table 5-3 Pressure reduction and regulator station coordinates

Station	Latitude	Longitude
Helwan PRS	29.83258	31.34456
Helwan	29.86323	31.32961
Wadi Houf	29.87453	31.31083
Wadi Houf PRS	29.88078	31.30908
ElHaram	29.99085	31.14131
Alomeranya	30.00537	31.17038
Alomeranya	30.00548	31.18748
Alomeranya	29.98896	31.19293
Algiza	30.01632	31.20598
Alagouza	30.06339	31.19633
Zamalek	30.06629	31.21538
Masr Ilqadima	30.02751	31.22776
Qasr El Nil	30.03488	31.23143
Abdin	30.04474	31.24395
Shubra	30.07101	31.24972
Alsahel	30.10267	31.24900
Hadaq Elqouba	30.09162	31.28915
Thany Nasr City	30.06681	31.29868
Thany Nasr City	30.05298	31.31658
Thany Nasr City PRS	30.06549	31.29014
Maadi PRS	29.97093	31.27483
Mokatam PRS	30.00934	31.33662
Nasr City PRS	30.04288	31.36487
Masr ElG PRS	30.08948	31.34831
AlNozha PRS	30.12720	31.37069
Shorouk PRS	30.09184	31.49049
6th of October PRS	29.95844	31.10464
Tebeen	29.79453	31.30693
Warrak	30.10869	31.21036

5.2.4 Discretization of Network

Conducting a network loss assessment involves assessing damage to all components of the network, as well as the cross-component. The probability of damage to the stations is computationally straightforward, if fragility curves are available, and involves identifying the location of each station in order to be able to calculate the spectral acceleration at each station location. Knowing the spectral acceleration, fragility curves are then used to determine the probability of damage to the station.

Modelling damage to pipelines on the other hand is more complex. Since pipelines span a large distance, and a single pipeline segment could span over various districts, calculating the damage to each pipeline segment becomes computationally intensive. One method that can be used to calculate the damage to pipelines involves dealing with each pipe segment in its entirety, and knowing the Peak Ground Velocity (PGV) at the midpoint of the entire pipe segment is then the primary basis for computing the probability of damage to the pipe segment (Pineda and Ordaz, 2003; Pineda and Ordaz, 2007). This method, though simple, ignores the fact that due to the large distance which pipe segments span across, there is a variation in seismic intensities across the pipe segment. To overcome this, Song and Ok (2009) propose decomposing the pipe segment into smaller segments and computing the PGV at the midpoint of each of the discretised segments (Figure 5.7), after which the joint probability for the failure of the segments is computed. This enables reducing the variation in seismic intensity across the pipe length. It should be noted that evaluating the vulnerability of the pipe segments through the use of PGV only takes into account damage due to ground shaking, while ignoring damage caused by ground deformation. Nonetheless, due to the existence of the Mokattam and Maadi formations, liquefaction in these areas is not expected to take place. Moreover, in areas where sand and gravel exists, the ground-water table falls significantly below the surface level, making liequefaction unlikely to take place. This implies that not taking into account ground deformation due to liquefaction is a valid assumption. However, damage due to lateral spreading and settlement needs to be evaluated in later studies.

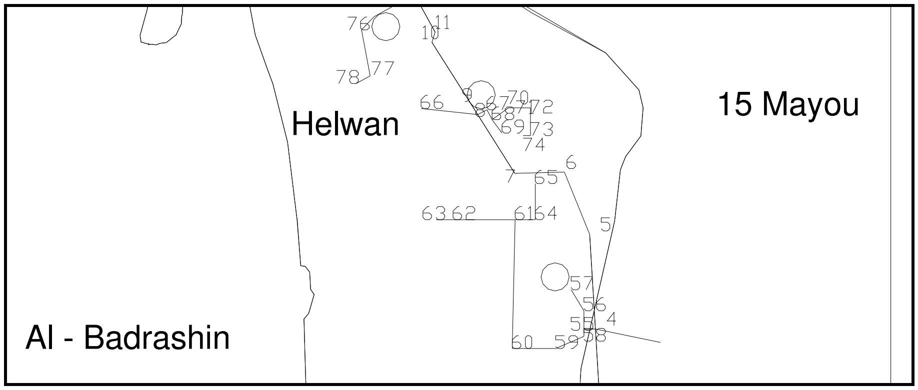


Figure 5.6 Numberical IDs for network components in the district of Helwan

Knowing the start and end coordinates of the pipe link enables decomposing the link into smaller segments. The first step to accomplish this is through calculating the bearing of the link, as shown in Equation (5.1) (UOT, 2007).

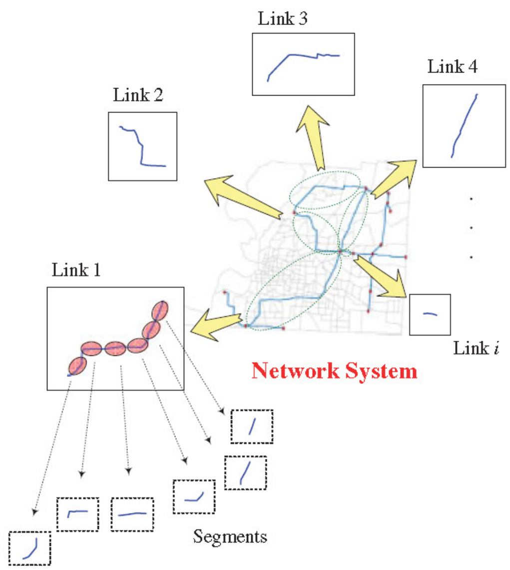


Figure 5.7 Decomposition of pipeline network (Song and Ok, 2009)

$$Bearing = \operatorname{atan2}\begin{pmatrix} \sin(\Delta long)\times\cos(lat2), \\ \cos(lat1)\times\sin(lat2)- \\ \sin(lat1)\times\cos(lat2)\times\cos(\Delta long) \end{pmatrix} \tag{5.1}$$

where *lat1* and *lat2* are the latitude of the start and end coordinates respectively, and *Δlong* is the difference between the longitude coordinates of the start and end points of the pipe link.

Each link is segmented into a 1 km length, and hence based on the bearing of the pipe link, the coordinates of each 1 km segment in the link could be calculated. Based on this, the coordinates of each segment can be determined as follows:

$$latitude = \sin^{-1}\left(\sin(lat1)\times\cos\left(\frac{di}{R_E}\right) + \cos(lat1)\times\sin\left(\frac{di}{R_E}\right)\times\cos(Bearing)\right) \quad (5.2)$$

$$longitude = long1 + \operatorname{atan2}\left(\begin{array}{l}\sin(Bearing)\times\sin\left(\frac{di}{R_E}\right)\times\cos(lat1),\\ \cos\left(\frac{di}{R_E}\right)\text{-}\sin(lat1)\times\sin(latitude)\end{array}\right) \quad (5.3)$$

where R_E is the radius of the earth at 6371 km, long1 is the longitudinal coordinate of the start of the link, and *di* is calculated as the distance from the start of the link to the start of the segment. Equations (5.2) and (5.3) provide the start and end coordinates of each pipe segment. Nonetheless, in order to calculate the probability of damage to each segment, the midpoint of the segment is used. This is calculated through Equations (5.4) through (5.7).

$$Bx = \cos(lat1)\times\cos(\Delta long) \quad (5.4)$$

$$By = \cos(lat2)\times\sin(\Delta long) \quad (5.5)$$

$$mlat = \operatorname{atan2}(\sin(lat1)+\sin(lat2), \sqrt{\left((\cos(lat1)+Bx)^2+By^2\right)} \quad (5.6)$$

$$mlong = long1 + \operatorname{atan2}(By, \cos(lat1)+Bx) \quad (5.7)$$

where *long1* is the longitudinal coordinate of the start of the segment and *mlat* and *mlong* are the midpoint coordinates of the decomposed segment.

5.2.5 Component Damage

Computing the damage to components of the natural gas involves a process of calculating the probability of damage to the discretized network components, and then grouping the damage of these components together in order to calculate the probability of damage to the network.

Contrary to other aspects of the built environment that are analysed in this study, damage to natural gas pipelines is best analysed through the use of peak ground velocity PGV, rather than peak ground acceleration PGA (Bommer and Alaracón, 2006). The reason for this is that peak horizontal strain in the soil due to seismic waves is proportional to PGV (Newmark and Rosenblueth, 1971; St. John and Zahrah, 1987). For this reason studies such as HAZUS (FEMA, 2003), Song and Ok (2009), and Tromans (2004) whose purpose was to calculate damage to buried pipelines, have used PGV.

Even though NGA models compute values of PGV, older ground-motion models do not. Ambraseys et al. (2005) is an example of such a model that does not compute PGV values. Various studies exist that attempt to estimate PGV values from spectral acceleration values. According to Bommer and Alarcón (2006), the ratio between PGV and spectral acceleration exhibits the least scatter at around a period 0.5s, and has a value of approximately 0.05. These findings were inferred from various published ground-motion equations. Bommer and Alarcón (2006) discovered that even though the notion that PGV and the response spectral ordinates at 1 second are closely related is widespread, the ratio between PGV and spectral acceleration at a period of 1 second is 0.096, but exhibits a significant scatter. Since the ratio between PGV and spectral acceleration is smaller at 0.5s and experiences less scatter, it is preferable for correlating between spectral acceleration and PGV. Accordingly PGV is a calculated as:

$$PGV\,(cm\,/\,s) = \frac{SA[0.5](cm\,/\,s^2)}{20} \tag{5.8}$$

Since uncertainty has been accounted for and propagated through the model propagation of uncertainty associated with PGV-SA conversion can be neglected. This is due to the fact that the standard deviation associated with predicting PGV values is consistently smaller that the standard deviation associated with 0.5 second spectral acceleration. Hence, the higher standard deviation values associated with predicting spectral acceleration at 0.5 seconds are assumed to account for the uncertainty in the PGV-SA conversion that is not propagated (Bommer and Alarcón, 2006).

For each of the 1500 ground-motion maps generated, PGV values are computed at the midpoint of each decomposed pipe segment. Based on this, the probability of failure of each segment can be calculated using Equations (5.9) and (5.10) as proposed by Song and Ok (2009).

$$P = 1 - \exp(-\nu \cdot \Delta l) \tag{5.9}$$

$$\nu = k \cdot PGV^{\gamma} \tag{5.10}$$

where *Δl* is the length of the segment being analysed, which is typically 1 km, and k and γ are model parameters. *v* is a measure of the repair rate of the pipe segment, and thus accordingly the values of k and γ are considered as 0.0001 and 2.25 respectively. These values are taken from HAZUS (FEMA, 2003), which employs these parameters to calculate repair rates based on PGV for brittle and ductile pipelines, with Equation (5.10) being multiplied by 0.3 for ductile pipelines. Since the pipe segments in Egypt are either steel, ductile iron or PVC, ductile characteristics are assumed.

Even though Song and Ok (2009) develop a method for evaluating the variability and correlation between the probabilities of failure of the different segments, the present study does not employ their method. The reason for this is that Song and Ok (2009) account for variability in PGV through the spatial correlation, whereas this study already accounts for variability in spectral acceleration through both spatial and temporal correlation, as described in Chapter 3. Taking into account the method proposed by Song and Ok (2009) would mean that spatial correlation is accounted for twice in the model.

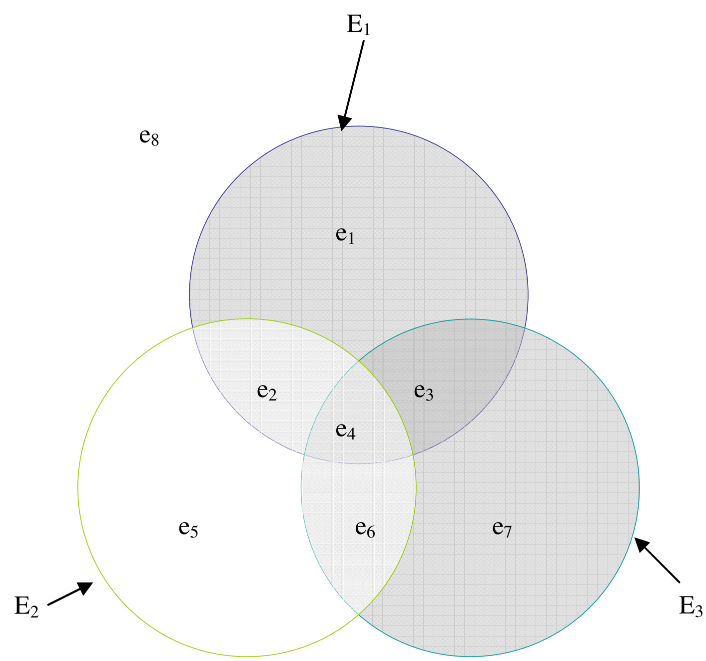
Equations (5.9) and (5.10) enable the modelling of damage to pipe segments, but do not allow for estimating the probability of damage to entire pipe links. Estimating the damage to the network through pipe segments without grouping these into links means that the model becomes computationally intensive, inefficient, and complicates the analysis of the network, since it becomes more difficult to assess the reliability of the network through decomposed segments. To overcome this problem Song and Kang (2007) propose the matrix-based system reliability method (MSR), which estimates the reliability of a system based on a matrix based system.

If each pipe link is treated as a system E_{sys} with i segments, and each segment could have two distinct states; failure E_i and non-failure $\bar{E}_i$, then the state space of E_{sys} can be divided into 2_i^n events with each event being denoted by e_j, j=1,…,n. If we take an example of a pipe link composed of three segments, then the space of the system is composed of $n=2^3=8$ events, $e_1,\ldots,e_8$. This space is shown in Figure 5.8. Each system event can then be described through component events. If for example we have a system where the third component fails then e_1, e_2, e_5 and e_8 all exist, and the system is then described through an event system vector **c**, where in this example $\mathbf{c} = [1 \quad 1 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 0]^T$. Since a link is composed of pipe segments connected in series where the failure of one of the segments would lead to the failure of the link, then the event system vector is defined as.

$$\begin{aligned}&\mathbf{c}_i = 1\\ &i = 1,\ldots,2^n - 1\\ &\mathbf{c}_j = 0\\ &j = 2^n\end{aligned} \qquad (5.11)$$

Using the event system vector the probability of failure of the system can then be calculated using Equation (5.12).

$$P(E_{sys}) = \mathbf{c}^T\mathbf{p} \qquad (5.12)$$



$$e_1 = E_1 - E_1 \cap E_2 - E_1 \cap E_3 + E_1 \cap E_2 \cap E_3$$

$$e_8 = \cup \tilde{E}_i$$

Figure 5.8 Space for a three segment system

where p is the probability vector. The probability vector p is a vector which describes the probability of each component in the system. In the example described in Figure 5.8 the probability vector $\mathbf{p} = [\mathbf{p}_1 \quad \mathbf{p}_2 \quad . \quad . \quad . \quad . \quad . \quad \mathbf{p}_8]$ describes the probability of each event, where p_1 is the probability of event e_1.

Knowing the probability of failure of each pipe segment calculated from Equation (5.9), a probability vector can be constructed. Instead of trying to generate all possible event scenarios and their probabilities by element-wise computations, an algorithm was developed by Kang et al. (2008), to calculate the probabilities of all the events through knowing the probability of failure of each of the individual segments. If the probability vector for a single segment system is denoted as:

$$\mathbf{p}_{[1]} = \begin{bmatrix} P_1 & \overline{P}_1 \end{bmatrix}^T \tag{5.13}$$

where $\overline{P}_1$=1-P_1, then the probability vector for a two segment system can also be generated in a similar manner, such that:

$$\mathbf{p}_{[2]} = \begin{bmatrix} \mathbf{p}_{[1]}P_2 \\ \mathbf{p}_{[1]}\overline{P}_2 \end{bmatrix} = \begin{bmatrix} P_1 & P_2 \\ \overline{P}_1 & P_2 \\ P_1 & \overline{P}_2 \\ \overline{P}_1 & \overline{P}_2 \end{bmatrix} \tag{5.14}$$

This leads to the generic form of generating the probability vector shown in Equation (5.15).

$$\mathbf{p}_{[i+1]} = \begin{bmatrix} \mathbf{p}_{[i]}P_{[i+1]} \\ \mathbf{p}_{[i]}\overline{P}_{[i+1]} \end{bmatrix} \tag{5.15}$$

where i=1,2,….,(n-1). Using the MSR approach to generate the probability vector greatly reduces the computational time, since the time of conducting element-wise computations increases exponentially with the number of segments in a given pipe link. Based on this, the probability of failures of all the links in the system $P(E_{sys})$ can be calculated.

In addition to calculating the probability of failure of the links in the system, the probability of failure of the stations also needs to be evaluated. By determining the coordinates of each station as previously mentioned, the spectral accelerations at each station can be computed. Based on the computed PGA values at each station, fragility curves can be used to determine the probability of failure at each station. No direct fragility curves exist for pressure controlling stations, but they do exist for compressor stations. According to Song and Ok (2009) fragility curves for compressor stations could be used for pressure controlling stations. Since pressure controlling stations such as PRS and regulator stations contain many of the physical components found in a compressor stations, this is a valid assumption. According to this, the fragility curve in Figure 5.9 is used in this study to estimate the probability of failure of PRS and regulator stations.

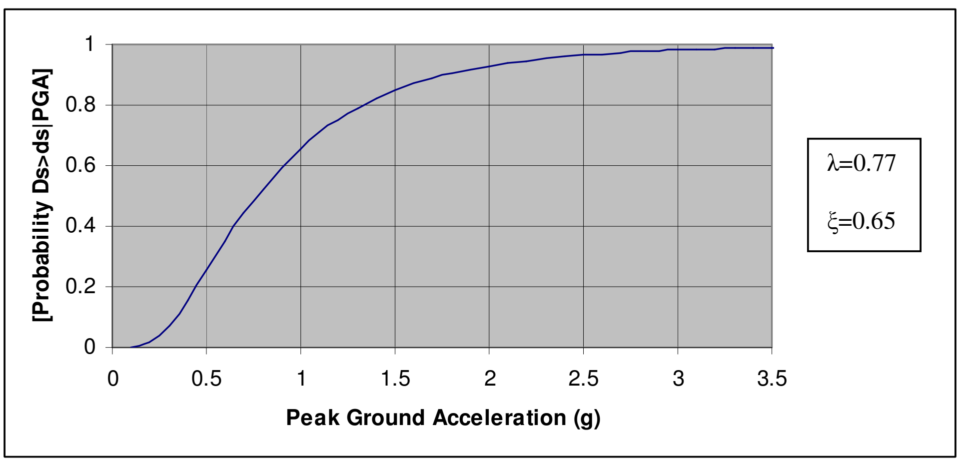


Figure 5.9 Fragility curve for PRS and regulator stations, λ and ξ are the mean and standard deviation of the lognormal distribution respectively (Song and Ok, 2009)

5.2.6 Network Reliability

Computing probabilities of failure for pipelines and stations does not reflect the behaviour of the network. Networks are generally designed with a certain amount of redundancy to allow for the possibility of failure of components without greatly affecting the performance of the network. The amount of redundancy is weighed up economically since the more redundancy that exists in the network the greater the cost of construction and operation of the network. Nonetheless redundancy also reduces potential economic losses that could take place due to unavailability of natural gas, thus creating an economic benefit. Therefore the amount of redundancy in the network is usually determined as a measure of the cost versus economic benefit created by the proposed redundancy.

In determining the behaviour of the network it is therefore essential to account for the redundancy in the network, and examine the network as a whole rather than look at individual components separately. Several methods exist to analyse the flow of natural gas in the network, and determine the final supply of natural gas to the end users. The first of these methods involves specialized computer software of which there are two types; pipe flow and natural gas software. Pipe flow software involves analysing networks of pipes through network algorithms such as the classical Hardy Cross method. This type of software is applicable to all pipe networks, rather than only natural gas networks. Examples of this type of software include *KYPipe 2010* (KYPIPE4, 2010) and *Pipe-Flo* (Engineered Software, 2011), which have been used in both academic and industry settings (Kim et al., 2004; Simpson et al., 1994). One of the main solutions this type of software offers is computing pipe diameters based on the expected flows and pressures in the pipes. Natural gas network analysing software are more specialized and deal only with natural gas networks. Since this type of software is more specialized, it provides a variety of solutions that are more applicable to natural gas networks, including designing transmission and distribution, network tracing and facility layout. An example of specialized natural gas network software is *Bentley Gas V8i* (Bentley Gas, 2008), which could be used along with other solutions offered by *Bentley* to provide comprehensive analysis of all lifelines.

The main problem with using software available in the market is that they do not always provide the end solution required. Since a large number of ground-motion maps are computed in this study, each would result in different components experiencing different probabilities of failure. If generic industry software is used it would require manual input of component proprieties for each ground-motion map, which is a cumbersome and unrealistic task, given the timeframe of this study. A possible way to overcome this problem is to develop customized software that is capable of analysing the natural gas network in a modelling environment, so that it can be integrated with the ground-motion model that was developed in Matlab. This would eliminate the need for data input with every ground-motion model, since the model would generate the network proprieties. Nonetheless developing software that is capable of analysing natural gas networks extends beyond the scope of this study, requiring more time and resources than is available, and would thus greatly hinder other features of this study.

The second type of analysis available determines the performance of the network through reliability analysis and identification of cut sets and path sets. Cut sets and path sets are based on Boolean algebra and set theory. For a given node, its cut sets are the set of components in the network that when in a state of failure will lead to the node failing or becoming redundant. Conversely, a node's path sets are the set of components in the network that when in a state of operation will lead to the node operating.

Figure 5.10 illustrates an example of a four node network that is connected through four unidirectional links. Various examples of cut sets for node 4 can be seen in Table 5-4. Failure of any of the sets shown, will lead to node 4 not functioning. Nonetheless some of the sets in Table 5-4 are subsets of other sets in Table 5-4. This means that failure to a select number of components in the superset is necessary to cause node 4 to fail. Looking at set {A,C,D}, two subsets of the set given will lead to failure of node 4; {A,D} and {C,D}. Since set {A,C,D} contains subsets which cause failure to node 4, then set {A,C,D} is defined as a *cut set* but not a *minimal cut set*.

Minimum cut sets are cut sets that do not contain any subsets that are cut sets. Eleven minimum cut sets exist for node 4 and are shown in Table 5-5. Minimum cut sets are helpful since they can aid in computing the probability of failure of nodes in a network. If the probability of failure of each component in the network is known, then the probability of occurrence of each set ($P_{f_{set}}$) can also be computed as shown in Equation .

$$P_{f_{set}} = \prod_{i=1}^{n} p_{f_i} \tag{5.16}$$

where p_{f_i} is the probability of failure of each component in the *minimum cut set.* Since the probability of failure of a given node could be possible by the occurrence of more than one *minimum cut set,* then the total probability of failure ($P_{f_{node}}$) of a given node can be calculated using Equation

$$P_{f_{node}} = \sum_{set=1}^{n} P_{f_{set}} \tag{5.17}$$

Based on the above, the probability of failure of each node in the network can be calculated by computing the probabilities of failure of each individual component, as well as identifying all the minimum cut sets for each node. The method for computing the probabilities of failure for the links and stations has already been discussed, and so a method for identifying minimum cut sets needs to be proposed.

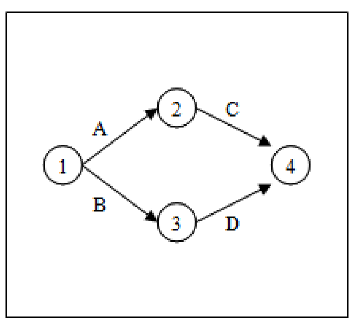


Figure 5.10 Network example

Table 5-4 Selected cut sets for node 4 in example shown in Figure 5.10

{1,2,3,4}	{B,1,3,4}	{A,D}	{C,D}
{1,2,3}	{2,3}	{1}	{B,D,3}
{A,1,2,3}	{A,C,D}	{4}	{A,B,C,D}

Table 5-5 Minimum cut sets for node 4 shown in example shown in Figure 5.10

{A,D}	{C,D}	{B,2}	{4}
{A,B}	{A,3}	{D,2}	{2,3}
{B,C}	{C,3}	{1}	

Visually identifying minimum cut sets is possible for a small network such as the one shown in Figure 5.10, but becomes impractical for larger networks. Various algorithms exist that identify minimum cut sets in a network (Ahmad, 1988; Javanbarg et al., 2009; Yeh, 2006). Nonetheless each of these methods has inherent disadvantages in their applicability to this study, where some provide minimum cut sets of a predetermined size (Yeh, 2006), and others, such as Javanbarg et al. (2009) require determining node paths and creating search and swap procedure which for a large network can be unrealistic. A search and swap procedures involves tracing through each node and searching for its predecessors in order to determine each node's paths. Allan et al. (1976) provide a simple yet effective method for identifying minimum cut sets that is ideal for use in this study. The advantages of the algorithm proposed by Allan et al. (1976) is that it can be used for any network configuration; the network can have a number of supply and demand nodes, can employ unidirectional or bidirectional links, and most importantly it is simple to program, and thus can be linked to the ground-motion model discussed previously.

The first step in applying the algorithm proposed by Allan et al. (1976) is to create a connection matrix $\mathbf{A}_c$. As shown in matrix form in Equation (5.18), $\mathbf{A}_c$ represents the connection between the nodes and links in the four node network example in Figure 5.10, as well as the direction of connection. According to the matrix $\mathbf{A}_c$ station 1 is connected to the network through two pipe segments, A and B as shown in the first row of the matrix. Moreover, pipe segment A is then connected to station 2, as shown in the fifth row. This means that station 1 and 2 are connected through pipe segment A.

$$A_c = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccccccc} 1 & 2 & 3 & 4 & A & B & C & D \end{array} \\ \begin{bmatrix} 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array} \tag{5.18}$$

A matrix of A_c is built for the entire natural gas network with the network's 216 links and 29 nodes; this matrix is shown in Appendix D. This matrix is then used in determining the path of natural gas from the sources that feed the network to each individual demand station.

Creating a connection matrix does not however identify minimum cut sets. In order to identify the minimum cut sets for a given node all the paths that supply that node need to be identified through a tracing algorithm of the connection matrix that identifies the paths from the node being analysed, to the supply nodes in the network. An example of the paths for Mokattam PRS is shown in Table 5-6. The table presents all the paths that supply Mokattam PRS in binary form, where a "1" is an indication of the component being in the supply path.

The first step is to identify first order minimum cut sets. These are sets of only one component, where failure to that component will result in failure of the node. First order minimum cut sets are identified through searching for columns in Table 5-6 in which every element is unity. As can be seen from Table 5-6, only component A creates a *minimum cut set*. Once all the first order minimum cut sets are identified, their values in Table 5-6 are replaced with "0", as not to double count them in other minimum cut sets later on.

Table 5-6 Minimum paths for Mokattam PRS in binary form

	Component	1	2	3	4	5	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mokatam PRS	Cutset I	1	1	1	1	1	1	1	1	1															
	Cutset II		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				
	Cutset III																					1	1	1	1
	Component	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	A	B	C
	Cutset I																						1	1	
	Cutset II																						1	1	1
	Cutset III	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		

The next step is to identify second order minimum cut sets. By adding two columns at a time, and if any resulting column is unity then this would be identified as a second order minimum cut sets. If any resulting column $R_{i,j}$ as described in Equation (5.19) is unity, then components described by *i* and *j* are second order minimum cut sets.

$$R_{i,j} = Col_i + Col_j \qquad \text{where: } \begin{cases} i = 1,\ldots,n-1 \\ j = i+1,\ldots,n \end{cases} \tag{5.19}$$

A similar approach is used to identify third order minimum cut sets. Here three columns are added at a time as shown in Equation (5.20). If the resulting column $R_{i,j,k}$ is unity, then the components described by *i, j* and *k* are minimum cut sets. This process is repeated up to order *n*.

$$R_{i,j,k} = Col_i + Col_j + Col_k \qquad \text{where: } \begin{cases} i = 1,\ldots,n-2 \\ j = i+1,\ldots,n-1 \\ k = i+1,\ldots,n \end{cases} \tag{5.20}$$

To ensure that each cut set is minimum and not a subset of another, a small check is conducted. Considering two cut sets *i* and *j*, of order n_i and n_j respectively where $n_i<n_j$, then if the number of non-zero elements in $\{A\}=\{I\}\cap\{J\}$ is equal to n_i then the set is considered a *non-minimum cut set* and is discarded. This process is repeated for all stations in the network. There are 17931 minimum cut sets in total, thus a sample of minimum cut sets for each station are shown in Appendix D. Based

on the minimum cut sets found, and the probability of failure of each component computed from Equation (5.8) through (5.15) and fragility curves for station, the probability of failure of each node can be calculated using Equation (5.17).

5.2.7 Supply to Districts

Each of the 56 districts discussed in this study are supplied by one or more of the 29 stations shown in Table 5-3. This implies that certain districts receive their natural gas supply from more than one station. An example of that is Al-Khalifa district which is supplied by natural gas from *Abdin station* and *Mokattam PRS*. Common reasons for this are due to a district's size, population or economic importance.

To determine the percentage of supply a given district receives from each station compared to its total supply, the supplying pipe diameter is evaluated. Larger pipe diameters transport a greater flow of natural gas at greater pressures. Thus, if a district is receiving natural gas from two different pipe links in which one pipe is of a larger diameter than the other, it is expected that the larger diameter pipe supplies a greater percentage of the district's supply. This forms the basis for evaluating the percentage of supply of natural gas for each district from the 29 stations.

Taking Al-Khalifa district as a continued example, the two pipe diameters supplying the district from *Abdin* and *Mokattam* stations are both 12 inches in diameter. Since flow in a pipeline is proportional to the cross-sectional area of the pipe, then the supply from each pipe is evaluated as shown in Equation (5.21). Thus in the case of Al-Khalifa, the supply of natural gas is evenly distributed between *Abdin* and *Mokattam* stations.

$$S_{node} = \frac{d_p^{\ 2}}{\sum_{i=1}^{n} d_p^{\ 2}} \tag{5.21}$$

where S_{node} is the ratio of supply for a given district from a node, whose supply diameter is d_p.

Based on this the supply of natural gas to a given district can be calculated. Knowing the probability of failure of each node $P_{f_{node}}$ calculated from Equation (5.17), and the supply a given station receives from each node S_{node} calculated from Equation (5.21), the percentage of natural gas supply is such calculated as:

$$Gas_p = \sum_{node=1}^{n} S_{node} P_{f_{node}} \tag{5.22}$$

where Gas_p is the percentage of gas supply to a given district. This process is repeated for all districts in the network for each of the 1500 ground-motion maps.

The probability of failure of nodes that are used to feed the electricity network is used in the following section to assess the probability of failure of electricity stations. Moreover, the percentage of gas supply to a given district Gas_p is used in Chapter 6 in order to evaluate the economic losses incurred through disruption to the natural gas network.

5.3 Electricity

5.3.1 Electricity in Egypt

Electricity is essential in driving any economy forward, with its usage spanning domestic, commercial and industrial processes. In order to meet electricity demands the Egyptian Electricity Production Authority, Electricity Distribution Authority and Electricity Projects Implementation Authority were formed in 1962. The three companies were merged into the Egyptian Electricity Authority (EEA) in 1965, which offered a centralized structure to Egypt's electricity sector. During the 1970's Egypt entered an era of capitalism and free-market economy, which resulted in increased trade agreements. This meant that demand for electricity was greater than ever, and in order to deal with this increased demand the EEA created seven regional companies of electricity distribution in 1978, and due to the increased responsibility that the EEA was bearing, an independent company in charge of distribution was established in 1983. Due to the dramatic increase in the population of the Delta and Greater Cairo regions, each of the regional companies responsible for electricity distribution in these areas was divided into two companies. Moreover in 2000 electricity production was separated from distribution with both being under the control of the EEA (MOEE, 2009). The current structure of the electricity industry in Egypt is shown in Figure 5.11.

The increase in electricity demand has not only put added pressure on the Egyptian government to restructure its divisions over the years, but also on being able to produce electricity to meet the demand. Moreover, due to the limited resources available at its disposal financially, the Ministry of Electricity and Energy (MOEE) has opted to enter into joint venture agreements with multinational companies in order to shift the capital costs and risk onto other entities (CARANA, 2002). An example of this joint venture is seen in the Power Generation Engineering and Service Company (PGESCo), which carries out the role of consultant for the MEO, overseeing tendering and construction of electricity substation and generator stations. PGESCo is 40 percent owned by the MOEE, with 40 percent owned by international engineering service company Bechtel Corporation, and 20 percent by the Commercial International Bank (CIB) (PGESCo, 2011). The government's need to shift the costs and risk onto other entities highlights the fact that damage to components of the electricity network represents a burden on the MOEE that it might not be able to handle.

The demand for electricity is expected to continue to rise over the next decade as can be seen in Figure 5.12. According to a study conducted by the MOEE (2009), electricity demand is expected to rise on average at a rate of 5.03 percent annually between 2009 and 2022. The MOEE has tendered projects including the Banha 750 MW power station to meet this anticipated increase in demand; however, these projects are considered as short term solutions and incapable of maintaining the long-term electricity demand for Egypt. For this reason the Egyptian government has began planning for the construction of nuclear power stations capable of generating 1800 MW.

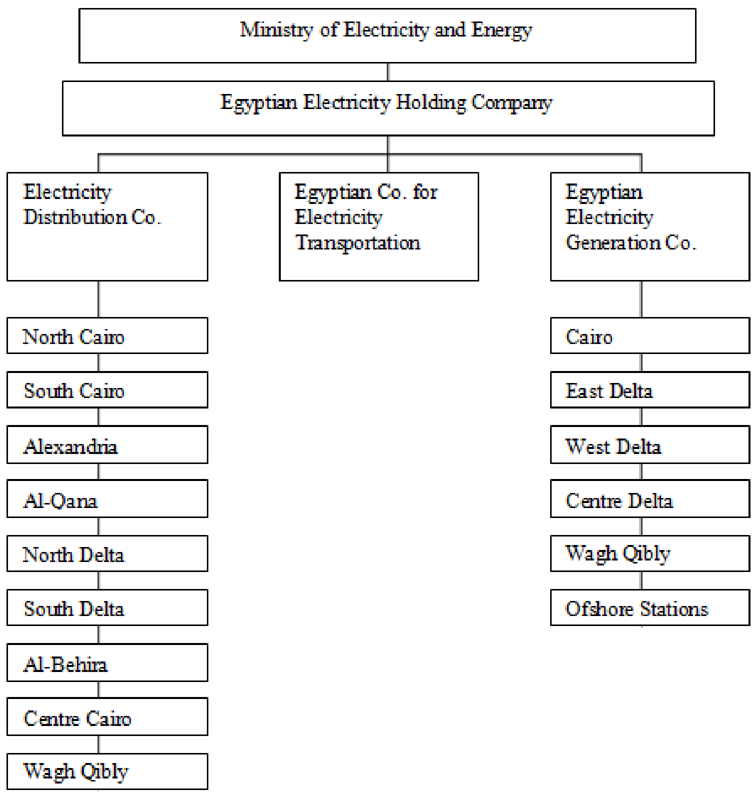


Figure 5.11 Structure of the electricity industry in Egypt (MOEE, 2009)

The use of electricity in Egypt is dominated by the industrial and residential sectors which constitute just over 78 percent of Egypt's electricity usage (Figure 5.13). This illustrates that in a highly populated region such as Greater Cairo, electricity outages can result in large economic losses, further illustrating the high seismic risk posed to the electricity lifeline.

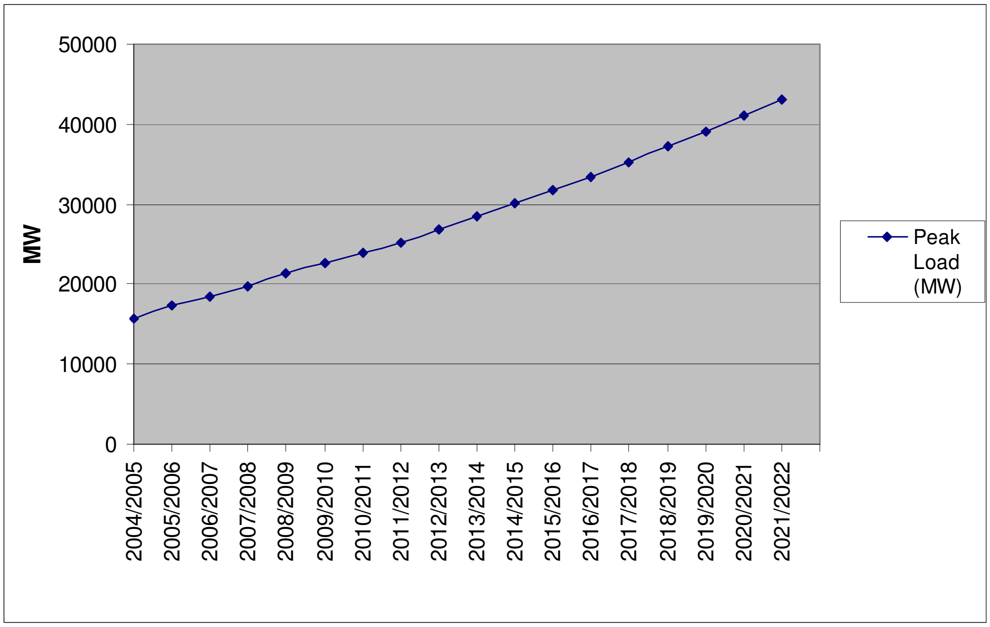


Figure 5.12 Peak load demand in MW between 2004 and 2022 (MOEE, 2009)

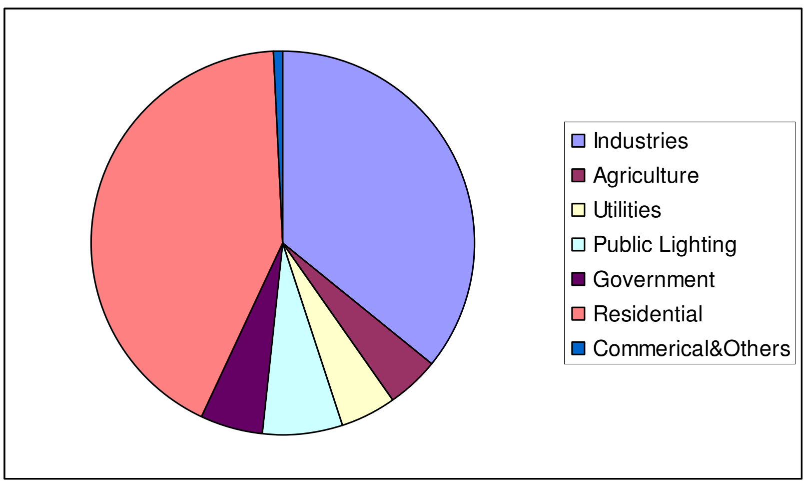


Figure 5.13 Egypt's electricity usage by end user (MOEE, 2009)

5.3.2 Electricity Network and Components

Egypt’s electricity network consists of a number of generating stations that produce electricity for the country. These stations are either fuelled by natural gas, light fuel oil, heavy fuel oil, wind, hydropower or a combination of more than one fuel source. These fuels are then used to power turbines that are either run by steam, gas, hydropower, or combined cycle turbines. A description of all of Egypt’s power stations along with their capacity, fuel type and commissioning dates are shown in

Table 5-7. According to Table 5-7 just under 50 percent of Egypt's electricity is generated through steam turbines, with just over 30 percent generated through combined cycle turbines (MOEE, 2009). These figures are reflective of generation of electricity in Greater Cairo, where steam and combined cycle turbine stations dominate Greater Cairo's electricity generation (MOEE, 2009).

The power generated by stations shown in Table 5-7 is then transported using high voltage transmission lines. These are typically 500 KV and 220 KV transmission lines made of copper or aluminium conductors. Voltage lines below 110 KV are considered sub-transmission. The voltage in the network is then reduced the closer electricity gets to the end user. The drop down in electricity is achieved through transforming stations known as substations. Substations consist of circuit breakers, disconnect switches, lightening arresters, wave trap, buses, current transformer, potential transformers, coupling voltage transformers and circuit switches. Nonetheless for assessing seismic losses and the reliability of the system, circuit breakers, transformers, disconnect switches and buses constitute the critical components (Shinozuka et al., 2007).

The Egyptian electricity network is dominated by 500 KV and 220 KV transmission lines in north, 132 KV transmission lines in the south, and 66 KV lines at a sub-transmission level (Table 5-8). The main substations in Egypt thus transform electricity from 500 KV to 220 KV, 500 KV to 132 KV, 220 KV to 66 KV, and 132 KV to 66 KV.

5.3.3 Greater Cairo Network

The Greater Cairo network consists of six main generating station complexes, with some of these complexes housing more than one station, making up the nine stations shown in Table 5-7 for the Cairo region. Transmission of electricity in Greater Cairo consists of 500 KV and 220 KV lines, where generating stations transport electricity to the network at 500 KV and substations transform the electricity to 220 KV. All of Greater Cairo's substations with their coordinates are shown in Table 5-9, and the interconnection between the stations is shown in Figure 5.14.

Table 5-7 General Power stations statistics for the fiscal year 2008-2009 (MOEE, 2009)

General Power stations statistics (30/6/2009)

Region	Station	Type	Capacity (MW)	Fuel	Commissioning Date
Cairo	Shoubra El-Kheima 1	(G)	35	N.G-H.F.O	2009
	Shoubra El-Kheima 2	(St)	1260	N.G-H.F.O	84-85-1988
	Cairo West	(St)	350	N.G-H.F.O	66-1979
	Cairo West Ext	(St)	660	N.G-H.F.O	1995
	Cairo South 1	(CC)	570	N.G-H.F.O	57-65-1989
	Cairo South 2	(CC)	165	N.G	1995
	Cairo North	(CC)	1250	N.G-L.F.O	2005-2006-2008
	Wadi Hof	(G)	100	N.G-L.F.O	1985
	Tebeen	(G)	46	N.G-L.F.O	2009
East Delta	Damietta	(CC)	1200	N.G-L.F.O	89-1993
	Ataka	(St)	900	N.G-H.F.O	85-86-1987
	Abu Sultan	(St)	600	N.G-H.F.O	83-84-1986
	Shabab	(G)	100.5	N.G-L.F.O	1982
	Port Said	(G)	73	N.G-L.F.O	77-1984
	Arish	(St)	66	H.F.O	2000
	Oyoun Mousa	(St)	640	N.G-H.F.O	2000
	Sharm El-Sheikh	(G)	178	L.F.O	--
	Hurghada	(G)	143	L.F.O	--
	Zafarana (wind)	(W)	425	Wind	2000-2003-2004-2006-2007-2008-2009
	BOOT				
	Suez Gulf	(St)	682.5	N.G-H.F.O	2002
	Port Said East	(St)	682.5	N.G-H.F.O	2003
Middle Delta	Talkha	(CC)	290	N.G-L.F.O	79-80-1989
	Talkha 750	(CC)	750	N.G-L.F.O	2006-2008
	Talkha 210	(St)	420	N.G-H.F.O	93-1995
	Nubaria 1,2	(CC)	1500	N.G-L.F.O	2005-2006
	Nubaria 3	(CC)	500	N.G-L.F.O	2009
	Mahmoudia	(G)	50	N.G-L.F.O	81-1982
	Mahmoudia	(CC)	317	N.G-L.F.O	83-1995
West Delta	Kafr El-Dawar	(St)	440	N.G-H.F.O	80-84-1986
	Damanhour Ext	(St)	300	N.G-H.F.O	1991
	Damanhour (Old)	(St)	195	N.G-H.F.O	68-1969
	Damanhour	(CC)	156.5	N.G-L.F.O	1985-1995
	El-Seiuf	(G)	200	N.G-L.F.O	81-82-83-1984
	El-Seiuf	(St)	113	H.F.O	61-1969
	Karmouz	(G)	23.1	L.F.O	1980
	Abu Kir	(St)	911	N.G-H.F.O	83-84-1991
	Abu Kir	(G)	24.3	N.G.-L.F.O	1983
	Sidi Krir 1.2	(St)	640	N.G-H.F.O	99-2000
	Matrouh	(st)	60	N.G-H.F.O	1990
	Sidi Krir 3,4 (Boot)	(St)	682.5	N.G-H.F.O	2002
Upper Egypt	Walidia	(St)	624	H.F.O	92-1997
	Kuriemat	(St)	1254	N.G-H.F.O	98-1999
	Kuriemat 2	(CC)	750	N.G-H.F.O	2007,2009
	Kuriemat 3	(CC)	500	N.G-H.F.O	2009
	Assiut	(St)	90	H.F.O	66-1967
Hydro-plants	High Dam	(H)	2100	Hydro	1967
	Aswan Dam I	(H)	280	Hydro	1960
	Aswan Dam II	(H)	270	Hydro	85-1986
	Esna	(H)	86	Hydro	1993
	New Naga Hamadi	(H)	64	Hydro	2008

St=steam, CC=combined cycle, G=Gas, W=Wind, H=Hydro plants, N.G=natural gas, H.F.O= heavy fuel oil, L.F.O= light fuel oil, hydro=hydropower, BOOT=build operate own transfer

Table 5-8 Length of transmission line by KV rating in Egypt (MOEE, 2009)

Transmission Line	km
500 KV	2479
400 KV	33
220 KV	15647
132 KV	2504
66 KV	17515
33 KV	2838

Table 5-9 Greater Cairo substations

	Latitude	Longitude
Abu Zaabal	30.26662	31.39579
Basoos	30.14535	31.20431
West Cairo	30.13889	31.16819
Cairo	30.13636	31.21858
Eltebin 500	29.77377	31.33301
Wadi Houf	29.87544	31.31812
South Cairo	29.86608	31.29464
Katameya	29.97594	31.39404
6th of October	29.94718	30.94731
Elharam	29.97997	31.11198
Elmoatamadeya	30.05012	31.17893
South Eltebin	29.7802	31.2975
Elbasateen	29.99211	31.27026
Ein Elseera	30.01645	31.25186
North Cairo	30.10813	31.26622
Bahteem	31.13992	31.27482
East Cairo	30.04204	31.35811
Heliopolis	30.13218	31.35681
Sakr Quraish	30.09754	31.38129
Alestad	30.07105	31.31502
Alsabteya 1	30.06298	31.23592
Alsabteya 2	30.05861	31.23812
Sheikh Zayed	30.01967	30.97615
New Cairo	30.02315	31.4347
Suez	29.95904	32.52663
Sumuelat	28.30881	30.7132
Kurimat	29.27474	31.22225
10th of Ramadan	30.24551	31.73275
Shubra Kheima	30.12356	31.23748

The importance of Greater Cairo's electricity network in relation to the national network is evident in a study conducted by the MOEE (2009), where the average *per capita* use of electricity in Greater Cairo exceeds that of the national level (Table 5-10). This implies that since approximately 78 percent of electricity in Egypt is used by residents and industry, Greater Cairo carries a greater share of Egypt's population and economy. Moreover, as can be seen from Table 5-10, Greater Cairo's electricity usage constitutes 30 percent of the national level for 2006-2007, while only housing 22 percent of the population, further highlighting the importance of Greater Cairo's electricity network to the national economy.

5.3.4 Network Reliability

Analysing the reliability of the electricity network initially involves a methodology that is different to that used in the natural gas network. The reason for this is that the electricity network is more complex than that of the natural gas.

Electricity substations can be described visually using a single line diagram. Single line diagrams are used in power flow applications to present the paths for power flow in the system for a three-phase power system. The advantage of using this type of diagram is that it provides a simple tool for visualizing the system, as well as leaving space for other information, such as economic data, to be included.

Single line diagrams of various configurations of substations are shown in Figure 5.15. The choice of configuration of a substation is dependant on the redundancy needed in the system in order to minimise the risk of electricity outage. In the case of a single bus configuration if any of the circuit breakers, disconnect switches or the buses in the substation are damaged, the entire substation fails. The double-bus and double-breaker configuration, offers greater reliability. However, having two separate buses requires a higher capital cost. The main and transfer bus configuration offers limited reliability since all components are connected to a main bus, however the transfer bus presents flexibility during maintenance since the transfer bus can be used. In the double-bus and single breaker configuration, the substation will continue to function if a bus fails. The penultimate configuration is the ring bus which will not trip if two adjacent circuit breakers fail. However in order to isolate failure to a circuit breaker, the adjacent circuit breaker will also need to be disconnected. The final configuration is the breaker and a half configuration which presents the highest network reliability, during operation and maintenance, since it allows for the greater number of component failures without affecting the functionality of the substation. The main disadvantage with the breaker and a half configuration is that it is the most expensive.

Table 5-10 Electricity usage of Greater Cairo relative to national level

		Year			
	Unit	2006-2007	2011-2012	2016-2017	2021-2022
Egypt's Population	Million	74.1	81.4	88.5	94.1
Electricity Power Generation in Egypt	GWH	115581	157750	210317	273680
Per capita electricity use for Egypt	KWH	1559	1938	2377	2902
Greater Cairo's population	Thousand	16464	18411	20369	22334
Per capita electricity use for Greater Cairo	KWH	2106	2570	3098	3668
Power Usage for Greater Cairo	GWH	34674	47325	63095	81920

The Abu Zaabal substation offers an example of a substation that merges a double-bus and single breaker configuration with a breaker and a half configuration. As can be seen in Figure 5.16, the 500 KV lines connected to the station are arranged in a double-bus and single breaker configuration, whereas the 220 KV lines connected to the station are arranged in two breaker and a half configurations connected in series, thus offering greater reliability. The breaker and a half configuration changes based on the number of stations connected to the station being analysed. In the case of Abu Zaabal, the substation is connected to Heliopolis and 10th of Ramadan through 220 KV lines, and Basoos, Suez and Eltebin 500 through 500 KV lines. Being connected to three 220 KV lines offers the configuration seen in Figure 5.16, however in the case of Cairo station the station is only connected to two others through 220 KV lines. This means that for Cairo station the breaker and a half configuration changes to only include three output lines. Thus the breaker and a half configuration for each of the substations in Greater Cairo differ according to how many substations they are connected to through 220 KV lines. Three examples are shown in Figure 5.17 (a)-(c), for three, four and five lines respectively. Since the circuit breaker is connected to two disconnect switches, one on either side of the breaker in a series connection, then failure to any of the three components affects the substation in the same way, thus the three can be modelled as one component as shown in Figure 5.17.

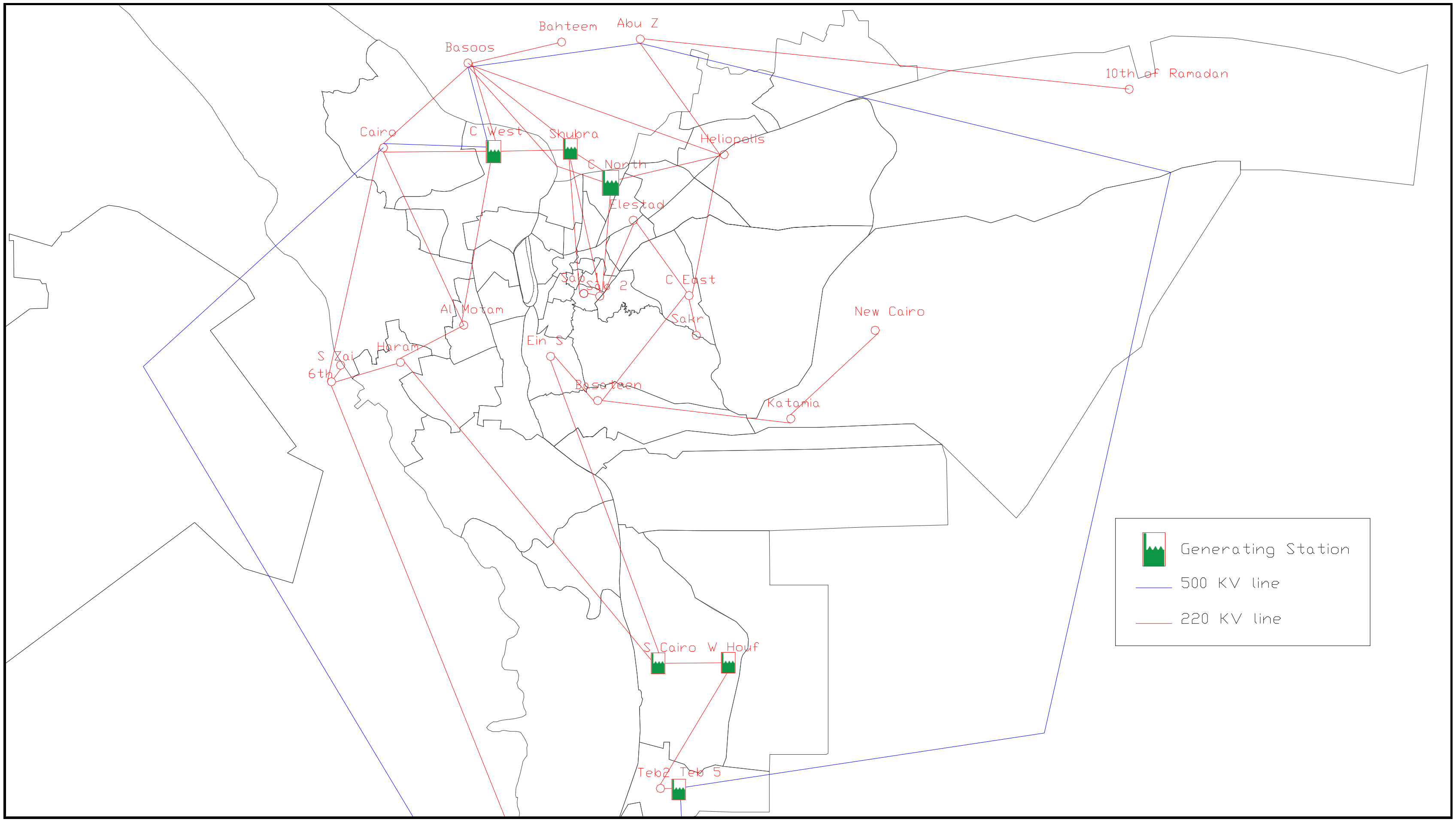


Figure 5.14 Greater Cairo electricity network (modified from MOEE, 2009)

Accordingly the diagrams in Figure 5.17 can be used to assess the reliability of each line in the substation. For each line at each substation the minimum cut sets are identified.

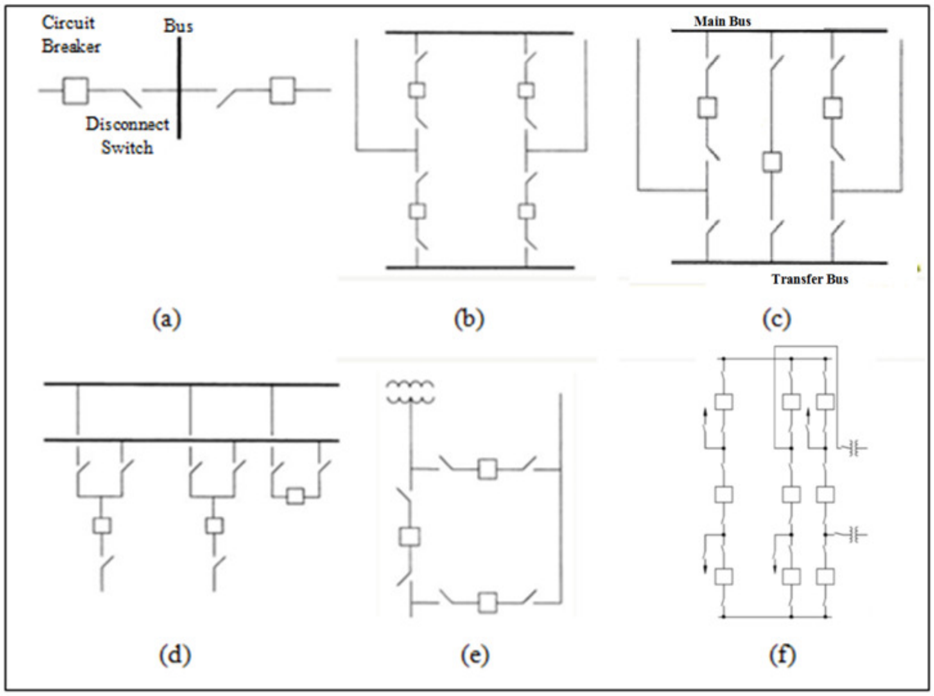


Figure 5.15 Single line configurations of a) single bus, b) double-bus double-breaker, c) main and transfer bus, d) double-bus single breaker, e) ring bus and f) breaker and a half substation (Nack, 2005; JCMIRAS, 2009)

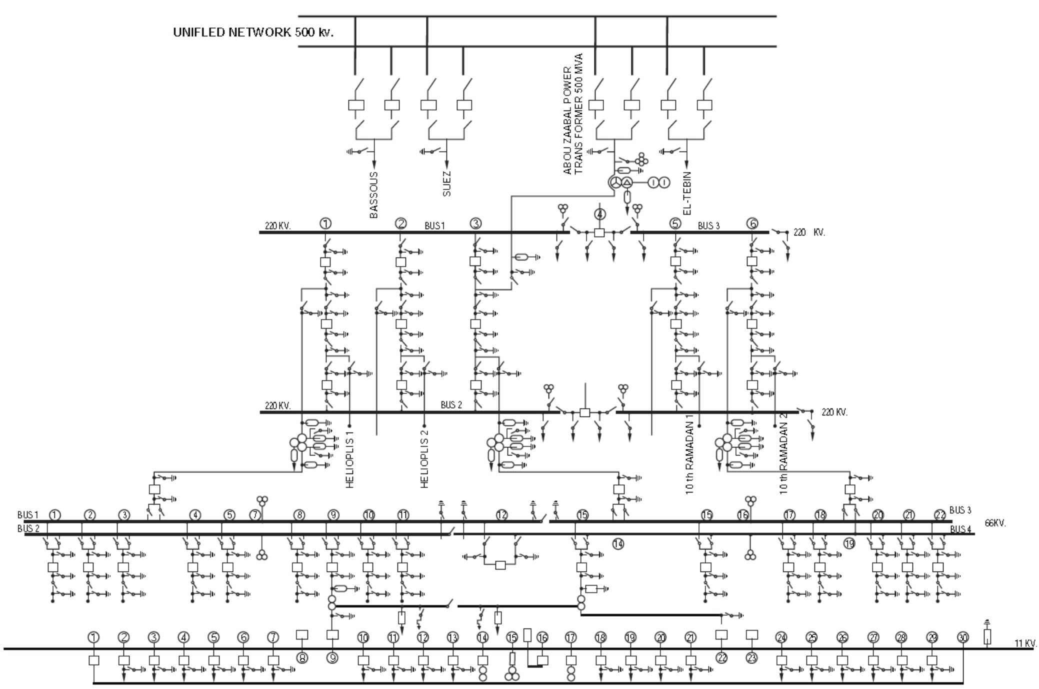


Figure 5.16 Single line diagram of Abu Zaabal substation (JICA, 2000)

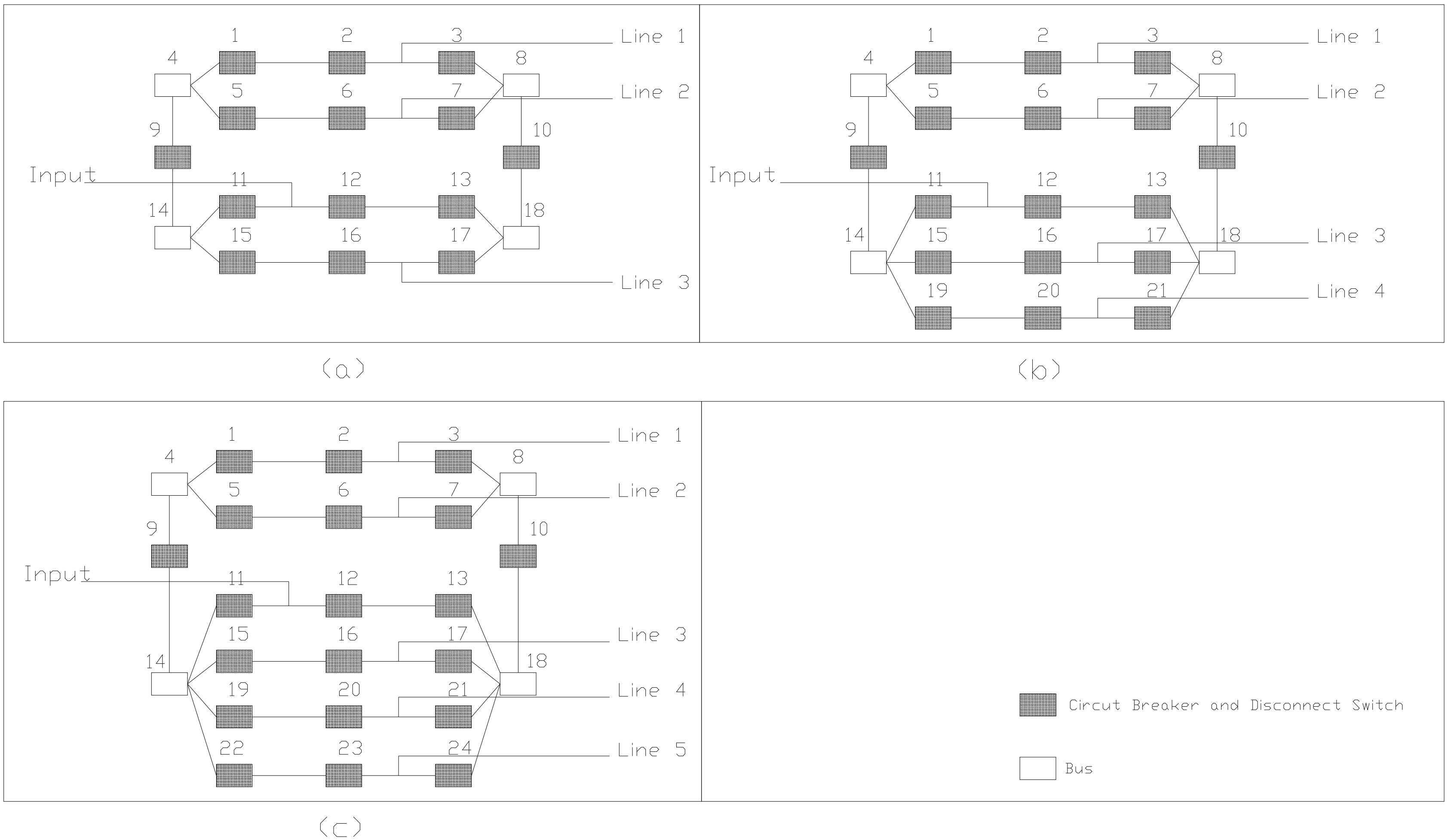


Figure 5.17 Diagram representing three substations connected to a) three, b) four, and c) five 220 KV substations, based on JICA (2010)

An example of a *minimum cut set* can be seen in Figure 5.17 (a)-(c), where if components “11” and “12” fail this will lead to all the lines failing since they will not receive electric power. Thus for each line all the minimum cut sets are identified using the method proposed by Allan et al. (1976). According to this, 1032 minimum cut sets are identified for stations connected to one or two stations, and 1140 minimum cut sets are identified for stations connected to three to six stations, creating a total of 6624 minimum cut sets combinations for 220 KV lines for the Greater Cairo network.

Since the coordinates of each substation are known, the spectral accelerations at each location can be computed using the ground-motion models discussed in Chapter 3. Knowing the spectral accelerations at each station, the probability of damage of circuit breakers, disconnect switches and transformers are computed based on the fragility curves shown in Figure 5.18. These curves were developed by Shinozuka et al. (2007) based on data collected and fragility curves developed by the Pacific Earthquake Engineering Research Centre (PEER) (Anagnos, 2001). The curves have been developed for a 500 KV and 220 KV electricity network, making them applicable for use in Greater Cairo.

Knowing the probability of damage of the components based on the fragility curves and the minimum cut sets of each line, the probability of failure of each line at a given station can be computed as shown in Equation (5.23).

$$P_{F_{Line}} = \sum_{cutset=1}^{n} P_{F_{B,DS,CB}} No_{B,DS,CB_{cutset}} \qquad (5.23)$$

where $P_{F_{B,DS,CB}}$ is the probability of failure of buses, disconnect switches and circuit breakers and $No_{B,DS,CB_{cutset}}$ is the number of buses, disconnect switches and circuit breakers in a given *minimum cut set*. The $No_{B,DS,CB_{cutset}}$ values differ based on the number of substation connected to the substation being analysed. Thus when analysing the failure of a line at a given substation the minimum cut sets that are used are the subset of the 6624 minimum cut sets that have been identified for a given number of substations connected to the station through 220 KV lines.

Analysing 500 KV lines are much simpler since the double-bus and single breaker configuration that connects these lines offers less reliability than the breaker and a half configuration that connects 220 KV lines. Since the failure of a 500 KV line requires two breakers to fail, the probability of failure of the lines is calculated as:

$$P_{F_{Line}} = P^2{}_{F_{B,DS,CB}} \tag{5.24}$$

Since a line connecting two substations can fail at either substations then the failure of the line is calculated as:

$$P_{F_{Line}} = 1 - \left(1 - P_{F_{Line1}}\right)\left(1 - P_{F_{Line2}}\right) \tag{5.25}$$

where $P_{F_{Line1}}$ is the probability of failure of the line at the first substation, and $P_{F_{Line2}}$ is the probability of failure of the line at the second substation.

In order to link the 500 KV and 220 KV networks to one another, substations that are connected to both networks are modelled as two separate stations connected by a power line. The connection between both stations consists of power line connected through two circuit breakers and a transformer. For the line to fail, both circuit breakers have to fail or the transformer has to fail. Thus the probability of failure of the interconnecting line between the 500 KV and 220 KV network can be calculated according to Equation (5.26).

$$P_{F_{Line}} = 1 - \left(1 - P_{F_{Transformer}}\right)\left(1 - P^2{}_{F_{B,DS,CB}}\right) \tag{5.26}$$

where $P_{F_{Transformer}}$ is the probability of failure of transformers. Thus using Equations (5.23) through (5.26) the probability of failure of each line in the network can be calculated.

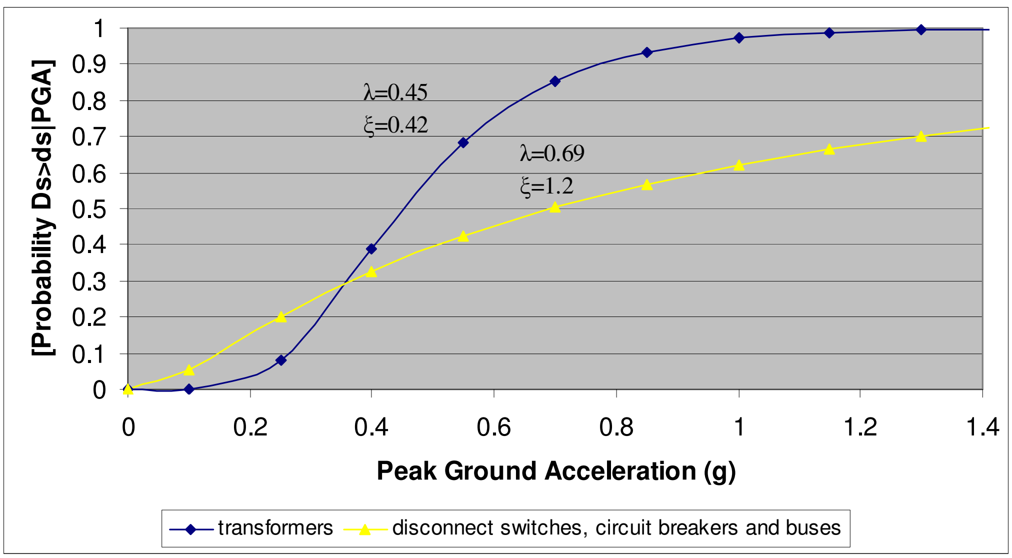


Figure 5.18 Fragility curves for transformers, disconnect switches, circuit breakers and buses

Knowing the probability of failure of each line does not provide insight into the behaviour of the network. A line connected to a substation could be out yet the substation could continue to operate fully. Moreover it is not possible to identify minimum cut sets since electricity power flow differs from that of other networks due to the fact that node connectivity is not the only criterion that is used to determine the failure of a node. A line could be connected to the network yet not function. In order for an electricity line to function it has to not only be connected to the network, but also be transporting electricity with a percentage difference not greater than 10 percent of the original voltage, moreover the supply to each substation cannot be greater than 110 percent or less than 105 percent of the demand (Shinozuka et al., 2007). These criteria are network dependant, and can be adjusted to meet the characteristics of each network. Based on meetings conducted with Tech Group Consultancy CEO (Abdou, 2009), the criteria employed by Shinozuka et al. (2007), are the same as the ones used in the design of the Greater Cairo electricity network. These criteria summarized in Equations (5.27) and (5.28) need to be met or else the network becomes unstable and unmanageable, if any of these criteria are not met, or no connectivity to the line exists, the line becomes out of service.

$$\text{Imbalance of Power}: 1.05 > \frac{\text{total supply}}{\text{total demand}} \text{ or } \frac{\text{total supply}}{\text{total demand}} > 1.1 \qquad (5.27)$$

$$\text{Abnormal Voltage:} \left| \frac{V_{intact} - V_{damaged}}{V_{intact}} \right| > 0.1 \qquad (5.28)$$

Since it is not possible to identify minimum cut sets, another method needs to be established that is capable of solving power flow network problems. Various licensed software exist that analyse electricity networks, including; PowerWorld Simulator 15 developed at the University of Illinois Urbana Champaign (PowerWorld, 2010), Interactive Power Flow (IPFLOW) developed by the Electric Power Research Institute (EPRI) (IPFLOW, 1997), and Matpower developed by the Power Systems Engineering Center (PSERC) at Cornell University (Zimmerman et al., 2011). PowerWorld is a powerful tool capable of dealing with large systems with up to 100,000 buses, producing contingency analysis, contour maps and a number of other features. The disadvantage with using PowerWorld is its inability to link with Matlab, meaning that data would have to be input manually into the program, making its use impractical. IPFLOW overcomes PowerWorld’s shortcomings by offering a source code, thus enabling linking to other coding languages such as Matlab. Nonetheless IPFLOW was developed with Western United States as its area of analysis, making its applicability to the Egyptian network poor. Matpower is an open source code, developed in Matlab code with the aim of conducting power flow simulations, while offering simple code that can be understood and modified easily. This provides the advantage of being customizable to meet the requirements of the task at hand. Thus Matpower (Zimmerman et al., 2011) is used to link the electricity network to the ground-motion model discussed in Chapter 4, in order to identify the behaviour of the electricity network due to an earthquake occurrence.

The intact Greater Cairo electricity network is initially input into Matpower. This includes inputting data regarding stations (buses in Matpower), generator stations, and lines (or branch data in Matpower). Accordingly 33 buses are input which include substations (with substations that include 500 KV and 220 KV lines separated as two stations) and generating stations. The generator data includes capacitates of stations shown in Table 5-7 for Greater Cairo. Lastly the 48 lines that connect the network are also input through three matrices of interconnection, one for each of the 500 KV lines, 220 KV lines and inter-station connections for stations that include both 500 KV and 220 KV lines. Input data for the buses, generator stations and interconnection matrices are shown in Appendix D.

In order to input the damaged network the failed lines need to be identified. Equations (5.23) through (5.26) only provide the probabilities of failure of each of the 48 lines, but do not state which of these lines have actually failed. Ideally, every scenario should be analysed, and since each line has two possible states; in service or out of service, then there are 2^{48}=2.815 E14 scenarios. Running every possible scenario would be computationally impractical, and so a subset of these scenarios are sampled and assumed to be reflective of the entire set. For each ground-motion map, 100 network scenarios are sampled at random with each scenario describing the state of each line in the network, through a 1 for in service, or a 0 for out of service. This method was used in Shinozuka et al. (2007) to conduct a similar study for the Los Angeles area. The estimated damage to the network could be sensitive to the 100 sampled scenarios since they compose a small percentage of the 2.815 E14 scenarios. Therefore the 100 scenarios are sampled 10 times, in order to decrease the associated uncertainty. Moreover, to ensure that the most damaging events are not overlooked, one of the 100 sampled scenarios is always fixed as the most

conservative event, where all lines in the network fail. The framework for repeating the process 10 times is discussed in greater depth later on in this chapter.
For each of the scenarios sampled, a new "damaged" network is input into Matpower. Since the damaged network eliminates lines that were initially operational, some substations can become isolated and not connected to any generating station. Thus each of the substations in the network are checked for connectivity to a generating station through the power lines that are still in service. If any substation is identified as isolated, and not connected through the network to a generating station, the substation is considered out of service. Once all the isolated substations are described as not operating and the lines that are out of service are input as such in Matpower, the code is run and a power flow analysis is conducted. If any line or node do not meet the criteria given in Equations (5.27) and (5.28), they are identified as being out of service, and power flow analysis is re-conducted until network equilibrium for the remaining lines and substations occurs.

The probability of occurrence of each of the 100 scenarios is calculated based on the probabilities of failure of each line $P_{F_{Line}}$ calculated from Equations (5.23) through (5.26). Knowing $P_{F_{Line}}$,the probability of each scenario is calculated as:

$$\begin{aligned} &\text{if } s_{Line}=1,\ P_{Line}=1-P_{F_{Line}} \\ &\text{if } s_{Line}=0,\ P_{Line}=P_{F_{Line}} \end{aligned} \tag{5.29}$$

$$P_{Scenario}=\prod_{Line=1}^{48} P_{Line} \tag{5.30}$$

where s_{Line} is the state of a given line, being either 1 for in service or 0 for out of service. $P_{Scenario}$ is the probability of occurrence for a given scenario. If all 2^{48} scenarios are analysed, the summation of all scenarios $P_{Scenario}$ would be equal to 1. Nonetheless since only 100 scenarios are identified, $P_{Scenario}$ needs to be weighted by the summation of the probabilities of all the 100 scenarios, such that:

$$P_{Scenario_i} = \frac{P_{Scenario_i}}{\sum_{i=1}^{100} P_{Scenario_i}},\ i = 1,\ldots,100 \tag{5.31}$$

The probability of occurrence of each of the scenarios $P_{Scenario_i}$ calculated from Equation (5.31) provides a method for computing the percentage of supply of electricity for each substation, and subsequently each district. With each scenario, a power flow analysis is conducted using Matpower, which finally provides outputs on the substations that are still operating, and the supply of electricity to these substations. Consequently, knowing the supply of electricity to a given substation for every scenario and the probability of occurrence of each scenario, the total percentage and standard deviation of supply to the substation can be calculated as shown in Equation (5.32) and Equation (5.33) respectively.

$$P_{Station_{initial}} = \sum_{Scenario=1}^{100} P_{Scenario} \times \frac{Supply_{station_{damaged}}}{Supply_{station_{intact}}} \tag{5.32}$$

$$\sigma^2{}_{Station} = \frac{1}{100} \sum_{scenario=1}^{100} (P_{scenario} - \overline{P}_{scenario})^2 \tag{5.33}$$

where $Supply_{station_{damaged}}$ and $Supply_{station_{intact}}$ are the supply of electricity to the station after the earthquake and before the earthquake respectively. Evaluating Equations (5.32) and (5.33) for each station would thus provide the percentage supply of electricity at each station. This procedure is repeated 100 times, as previously mentioned, and the supply to the station $P_{Station_{initial}}$ is estimated as the average supply of each of the 100 scenarios. The percentage of electricity supply $P_{Station_{initial}}$ in Equation (5.32) is labelled “initial”, since it still has not accounted for the link between the electricity and natural gas networks which bears an influence on the probability of failure of electricity substations. It is important to note that the standard deviation is computed and tracked throughout the entire model and the uncertainty associated with damage computed for the electricity network is propagated to Chapter 6, where this uncertainty will be added to the uncertainty from the ground-motion model described in Chapter 4 and the uncertainty associated with the economic model which will be described in Chapter 6.

5.3.5 Link to Natural Gas Network

One of the main novel features of this study is the integration of lifelines with one another and modelling the inter-dependency between the lifelines. Typically earthquake loss studies tackle one aspect of the built environment and in later studies deal with a second aspect independently. In doing so the dependency between different features of the built environment is lost, thus presenting unreliable results.

Linking natural gas and electricity lifelines presents a basis for future work where other lifelines can be linked along with their interdependencies to the current model. Since some of the electricity stations are powered by natural gas, the supply of natural gas to these stations becomes essential in providing electricity to the districts they serve. Six electricity generating stations are run by natural gas, and these are shown in Table 5-11 along with the natural gas stations that serve these stations. Thus for the stations that are powered by natural gas, their ability to provide electricity to the districts they serve $P_{Station_{Final}}$ is a function of the probability of failure of the electricity station $P_{Station_{initial}}$ and the natural gas stations Gas_p that service them, and is shown in Equation (5.34).

$$P_{Station_{Final}} = 1 - \left(1 - P_{Station_{initial}}\right) \times \left(1 - \prod_{i=1}^{n} Gas_{p_i}\right) \tag{5.34}$$

Table 5-11 Electricity stations that are powered by natural gas, and the natural gas nodes that serve them

Electricity Station	Natural Gas Stations	
Shubra Elkheima	Alsahel	
West Cairo	Supply node 113	
Wadi Houf	Helwan PRS	
Tebeen	Tebeen	
South Cairo	Wadi Houf	
North Cairo	Alsahel	Hadaq Elqouba

where n is the number of gas stations connected to the electricity generating station, the probability of failure of the gas station Gas_p is calculated from Equation (5.22) and the probability of failure of the electricity generating station $P_{Station_{Final}}$ is calculated from Equation (5.32). Equation is evaluated for each of the electricity stations shown in Table 5-11. Finally the supply of electricity to each of the stations is known, and used to compute the percentage of electricity supply to each district in Greater Cairo.

The dependency of the electricity network on natural gas illustrates the need to ensure that the natural gas network exhibits high levels of reliability. Moreover if the MOP is incapable of providing such levels of reliability for its entire network, it is essential that the stations shown in Table 5-11 are prioritised.

5.3.6 Supply to Districts

Computing the probability of supplying electricity to individual stations $P_{Station_{Final}}$ differs from calculating the supply of electricity to each district. In order to increase the reliability of the network, districts can be supplied by more than one station; this adds another level of redundancy to the network since failure to a station supplying electricity to a district does not necessarily mean that the district would not be supplied with electricity.

In order to assess the probability of supply to each district, the stations supplying each district need to be identified. Table 5-12 lists the districts and the stations that supply them. As can be seen, some districts are supplied by either one, two or three stations. The number of stations that supply each district is typically dependant on the distance of districts from each station, as well as the economic importance of each district.

Since failure to deliver electricity to a district entails failure of all stations that supply the district, then the probability of supplying the district and its associated standard deviation can be calculated as follows:

$$District_p = 1 - \prod_{Station=1}^{n} \left(1 - P_{Station_{Final}}\right) \tag{5.35}$$

$$\sigma^2{}_{district} = \sum_{station=1}^{n} \left(\frac{\partial District_p}{\partial P_{Station_{Final}}}\right)^2 \sigma_{Station}{}^2 \tag{5.36}$$

$$\frac{\partial District_p}{\partial P_{Station_{Final}}} = \prod_{Station \neq station}^{n-1} \left(1 - P_{Station_{Final}}\right) \tag{5.37}$$

where $P_{Station_{Final}}$ is calculated from Equation (5.34) and n is the number of stations connected to the district taken from Table 5-12.

Since only 100 random samples are chosen from a possible 2^{48}, the entire model is run ten times in order to ensure that results are realistic, since the sample might not be indicative of the true nature of the network. Moreover, this process helps gain an understanding of the sensitivity of the results with respect to the 100 sampled scenarios. Thus the final probability of supplying each district and its associated standard deviation can be calculated by taking the average of the ten model runs as shown in Equation (5.38) and (5.39) respectively.

$$Electricity_p = \frac{1}{10} \sum_{run=1}^{10} District_{p_{run}} \tag{5.38}$$

$$\sigma_{Electricity} = \frac{1}{10} \sum_{run=1}^{10} \sigma_{district_{run}} \tag{5.39}$$

The most important feature of Equation (5.38) and the methodology for analysing the electricity network set forth in this study is that the output from the electricity analysis $Electricity_p$ is consistent with the output from the natural gas network

Table 5-12 Stations supplying each district (MOEE)

District	Electricity Station		
Tebeen	Eltebin		
Helwan	Wadi Houf		
15th of May	Wadi Houf		
Maadi	Katameya		
Torah	Katameya		
Masr Il Adeema	Ein Elseera		
Sayeda Zeinab	Ein Elseera		
Al Khalifa	Elbasateen		
Abdeen	Alsabteya 2		
Al Mosky	Alsabteya 1	Alsabteya 2	
Kasr El Nil	Alsabteya 2		
Boulaq	Alsabteya 1	Alsabteya 2	
Alazbakeya	Alsabteya 1	Alsabteya 2	
Darb Al Ahmar	Alsabteya 2		
Algamalaya	Alsabteya 2		
Bab Al Shearia	Alsabteya 2		
Al Zahir	Alsabteya 1	Alsabteya 2	
Al Sharabia	North Cairo	Alsabteya 1	
Shubra	Alsabteya 1		
Rod Al Farag	Shubra Kheima	Basoos	
Al Sahel	North Cairo		
Al Waly	Alestad		
Hadaq Al Quba	North Cairo		
Al Zaytoon	North Cairo		
Al Matarya	Bahteem		
Nasr City	East Cairo		
Nasr City 2	Alestad		
Masr Il Gedida	Alestad		
Alnozha	Sakr Quraish		
Badr	10th of Ramadan		
Ain Shams	Heliopolis		
Alzawaya Al Hamra	North Cairo		
Alsalam	Heliopolis	Abu Zaabal	
El Zamalek	Alsabteya 1	Alsabteya 2	
Mansheit Nasr	Ein Elseera		
Albasateen	Elbasateen		
Al Morg	Heliopolis		
New Cairo	New Cairo		
Qism Embaba	Alsabteya 1		
Agouza	Elmoatamadeya		
Dokki	Elmoatamadeya		
Markaz Giza	Elbasateen		
Boulaq Dakrour	Elmoatamadeya		
Haram	Elharam		
Al Hawamdia	South Cairo		
Qism Giza	Ein Elseera		
Albadrasheen	South Eltebin		
Alsaf	Eltebin		
Alayat	South Eltebin		
Markaz Embaba	West Cairo		
Alwahat	10th of Ramadan		
Atfeeh	Kurimat		
Auseem	West Cairo	Basoos	
Alwarak	Cairo	Basoos	Shubra Kheima
Alomranya	Elmoatamadeya		
6th of October	6th of October	Sheikh Zayed	

analysis Gas_p. Even though the method for linking the dependency between the electricity and natural gas networks has already been established, consistency in output is another important condition that needs to be met. Since the damage model described in Chapters 4 and 5 are to be linked to the economic model in Chapter 6, it is essential that the outputs from these chapters are consistent with one another in order to facilitate the development of a model that is capable of calculating financial losses in a similar and consistent manner for each aspect of the built environment.

5.4 Concluding Remarks

Evaluating the vulnerability of lifelines poses a challenge due to the interdependencies that exist between the lifelines, and the difficulty in modelling these relationships. Each lifeline depends on each of the other lifelines in a different way, and identifying this dependency enables modelling of the lifeline vulnerability. In the case of natural gas and electricity lifelines, this correlation exists largely in the electricity network's use of natural gas to generate energy. Ideally, vulnerability and loss to all the lifelines should be evaluated simultaneously, however this is not possible in the time frame of this study and with the resources available. If all lifelines are evaluated simultaneously then an interesting problem would arise since the lifelines are correlated, such that a loss to one of the lifelines would lead to losses in the other lifelines which would in turn lead to further losses to the initially damaged lifeline.

A major obstacle that exists in evaluating the vulnerability of lifeline networks is the limited computational capabilities available that restrict the possible methodologies that can be used in modelling network vulnerability. In the case of the electricity network, it is not possible to identify minimum cut sets, and thus the most accurate method would be to evaluate every possible state in the network. Nonetheless this would result in 2^{48}=2.815 E14 scenarios, which is unfeasible with the computational resources currently available, and thus a number of scenarios were sampled at random and were assumed to represent the entire set of scenarios. Even though the 100 samples might not present extreme cases, it will nonetheless portray the expected losses, which is the basis of this model. It should be noted that with the improvement of computational resources in the future, modelling the losses by evaluating every possible scenario may become feasible, and provide a more accurate method of modelling the vulnerability of the network.

Chapter 6

Economic Model

6.1 Overview

This chapter proposes a macroeconomic model for calculating direct and indirect economic losses. Most studies have chosen to overlook indirect economic losses, while only focusing on direct losses. Moreover the studies that have included indirect economic losses have chosen to focus on one aspect of the built environment (Rose et al., 2007; Tatano and Tsuchiya, 2008; Rose et al., 1997). This only provides a limited insight into the effect of earthquake occurrence on the economy, since it fails to include all aspects of the built environment, and instead models each independently. Even when a study requires understanding the effect of damage to a single aspect of the built environment, isolating that aspect and studying it independently does not provide accurate results, since it ignores the interdependencies between the networks in the built environment that could significantly alter the results.

The model described in this chapter provides a methodology that estimates direct and indirect losses for buildings, as well as natural gas and electricity networks. Although there clearly are other networks that exist in Greater Cairo, this model is expandable and other networks can be included in further studies.

Even though damage to Greater Cairo is analysed in this study, the economic effect of this occurrence is analysed nationally. This provides an insight into the importance of Greater Cairo to the national economy, as well as establishing a methodology for understanding the macroeconomic consequences of local damage. It is noteworthy that although this model is used to estimate losses for the national economy of Egypt, the same methodology can be adapted for use in many other countries.

Lastly it must be mentioned that conducting an extensive economic study becomes a powerful tool in mitigating the economic impact of an earthquake. The reason for this is that if policy makers are able to forecast losses prior to their occurrence, they can mitigate against these or transfer the losses to other entities, helping maintain the flow of the economy in the case an event does occur.

6.2 Direct and Indirect Losses

Economic impacts of natural disasters had received little attention in the research community up until the 1990s (Okuyama, 2007). The initiation in concerted interest was primarily associated with the occurrence of several natural hazards that resulted in severe economic losses, most notable of which are Hurricane Andrew in 1992, the Northridge earthquake in 1994 and the Kobe earthquake in 1995. The 2004 Indian Ocean earthquake that led to the Asian Tsunami, Hurricane Katrina in 2005, and 2011 Tōhoku earthquake in Japan have lead to even greater economic losses on a regional scale and continental scale. Such events have driven the community to pursue research in the estimation of the economic impacts of natural hazards.

Recent advancements in the field of natural hazard economic modelling have been towards empirical analysis. This is primarily due to the increase in the availability of disaster damage and loss data, as well as increased research dealing with disasters (Okuyama, 2007). Such economic losses could be divided into; direct and indirect losses.

Direct losses relate to damage that is generated directly by an occurrence of a natural hazard event and causes damage to building, roads, lifeline facilities and other structures (Tirasirichai and Enke, 2007). These losses can be directly measured by the repair or replacement costs of damaged structure and building contents (Brookshire et al, 1997).

Indirect losses on the other hand are much more complex to define and even harder to calculate. Nonetheless their estimation is extremely important since they could account for very large losses. In the case of the Northridge 1994 earthquake it is estimated that the indirect losses accounted for 7.74 Billion USD (Gordon et al., 1996). Definitions of indirect losses include:

- Losses that extend beyond the direct physical impact such as income and business inventory losses (Brookshire et al., 1997)
- Losses that result from the multiplier, or ripple, effect throughout the entire economy that result in supply bottleneck and a reduction in demand as a result of direct economic loss (Boisvert, 1992)
- Losses that result in the reduction of economic output due to business disruption (Burrus et al., 1992)

Due to the complexity in defining indirect losses the boundaries to which they pertain differ according to each definition, and thus creating a general framework for defining these losses becomes difficult. Nonetheless attempts to establish such models have been ongoing since the 1960s.

6.3 Approaches to Economic Modelling

6.3.1 Overview

The destruction to the built environment caused by natural hazards leads to interruption to business and production as well as loss of income; such losses are defined as indirect losses. In this study, due to the dependence of indirect losses on direct losses, and the complex relationship between each of the losses upon one another (Figure 6.1), these losses become difficult to model.

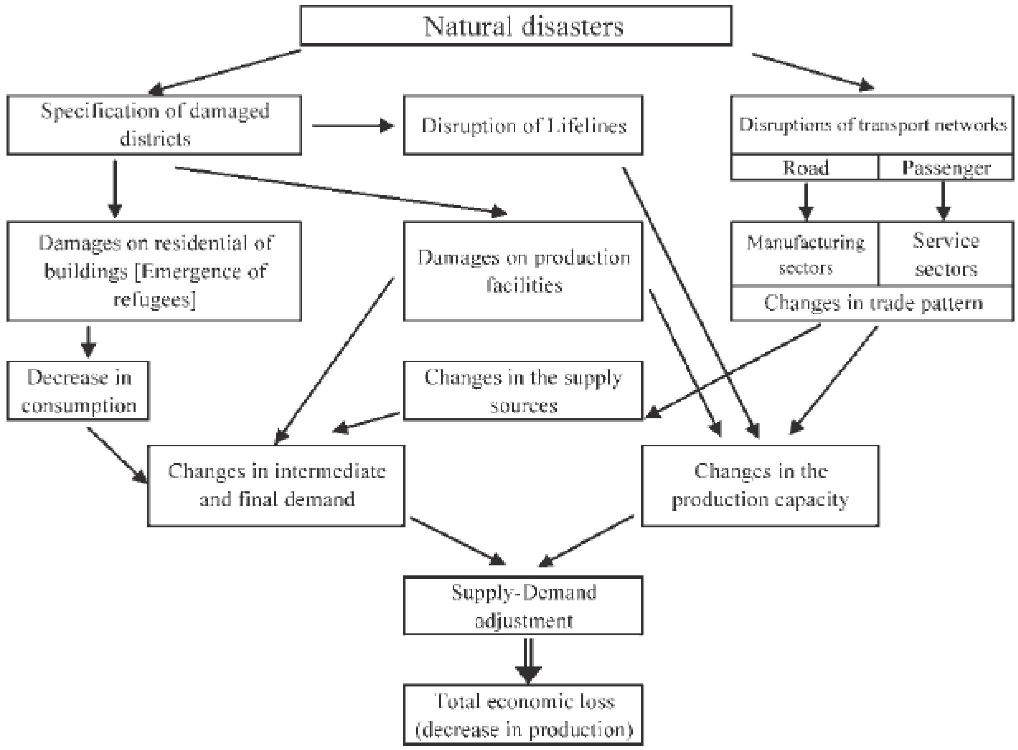


Figure 6.1 Procedure for Estimating Economic Loss (Yomana et al., 2007)

The most widely used model to estimate such losses is the Input-Output (IO) model (Leontief, 1966). This model has been used in disaster modelling since the Second World War to estimate the effect of strategic bombings (Rose, 2004). IO models have been used extensively, some examples of which are links with transportation network models (Gordon et al., 1998, 2004; Cho et al., 2001) and links with lifeline systems (Rose 1981, Rose et al., 1997).

Another widely used approach to economic modelling of natural hazards is the Computable General Equilibrium (CGE) model. This model differs from IO models in the sense that it is non-linear and can incorporate input-output substations (Okuyama, 2007). Nonetheless the approach tends to underestimate the economic impact due to the model being intended for long run equilibrium, rather than over the earthquake occurrence and short-term recovery period (Rose and Liao, 2005).

The last widely used approach is the Social Accounting Matrix (SAM) (Pyatt and Thorbecke, 1976). The advantage in using SAM is that it provides analysis for the distribution impact of earthquakes, which is extremely useful for mitigation and policy decision purposes.

Most published research concentrates on IO and CGE models. In order to be able to develop a comprehensive economic loss model for Egypt, it is essential that sufficient literature is available in order to provide a strong background for developing this model. Since SAM research is limited in the field, it would be unreasonable to attempt to pursue the methodology and so it is not considered further. The following two sections will help shed light on IO and CGE models, explaining both methodologies as well as highlighting the advantages and disadvantages of using each method.

6.3.2 Computable General Equilibrium (CGE) Model

Computable General Equilibrium models are gaining popularity in risk analyses (Rose and Guha, 2002). CGE models revolve around the simultaneous optimization of the behaviour and demands of individual consumers and firms, taking into account economic balance and resource constraints (Shoven and Whalley, 1992). The basis of the model is that all markets of the entire economy have to be in equilibrium, which differs from partial equilibrium which only requires a single market of the economy to be in equilibrium (Nicholson, 1994). In this theory it is assumed that all goods are interrelated, and a change in one will create a change in all other goods. If, for example, the price of fuel were to go up, then transportation might also go up, which would in turn affect the demand for public transportation, further creating a change to the price of fuel (Tirasirichai and Enke, 2007). Thus to calculate the equilibrium demand and price of one good, one would need to calculate the equilibrium demand and price of every good jointly.

Calculating equilibriums of all goods would be unpractical, and so certain constraints would need to be made to enable such a calculation. These constraints are:

1. Following the Arrow-Debreu model (Arrow and Debreu, 1954)
2. All markets of the model must satisfy Walras's law (Walras, 1954)

The Arrow-Debreu (AD) model was developed in the 1950's by Kenneth Arrow and Gerard Debreu (Arrow and Debreu, 1954). The model requires the specification of:

1. The economic environment
2. A resource allocation mechanism
3. A system of property rights

According to Tirasirichai and Enke (2007), the AD model considers the economy consisting of a number of consumers and commodities. The consumers initially begin with a set of commodities, preferences and an income, and the consumer tries to maximize their value depending on the initial state. In this model the:

- Market demand is the sum of consumer demands
- Commodity market depends on all prices
- Producers maximize their profits
- Production levels are a function of commodity prices and demand

Walras's law is a mathematical law which was developed by Leon Walras in the 19th century (Walras, 1954), and is based on:

1. Excess demand across the entire economy is equal to zero. Thus, if there is positive demand in one market, then there must be negative demand in another such that the summation of demand is equal to zero. This entails that if all markets in an economy are in

equilibrium but one, then that last market must also be in equilibrium,

2. Zero net profit (perfect competitive market), where all producers do no better than break even at equilibrium prices
3. Consumer's income must equal the value of commodities bought by the consumer

In order to conduct CGE analysis both the AD and Walrus constraints must be met. Prior to the occurrence of external disturbances, while the economy is in equilibrium, the state is labelled as the benchmark scenario. When an earthquake occurs, changes will occur to demand, thus resulting in the CGE model readjusting itself in order to reach a new state of equilibrium. This second state is labelled as the counterfactual scenario. Analyzing the difference between both states in terms of economic indicators such as employment, production activity level, welfare and relative prices, indirect losses due to the event can be calculated (Bohringer et al. 2003, Francois and Reinert, 1997).

Developing the regional CGE model to estimate the indirect losses will require the performing the steps described in Appendix E, summarizing the work done by Tirasirichai and Enke (2007).

6.3.3 Input Output (IO) Model

Input Output modelling was developed by Wassily Leontief and resulted in him being awarded a Nobel Prize in Economic Science in 1973. The method is one of the earliest in empirically modelling the interrelation between industries in a region's economy, whether that be national, continental or international (Mercado, 2003). Leontief (1941) defined the model as "An attempt to apply the economic theory of general equilibrium – or better, general interdependence – to an empirical study of interrelations among the different parts of a national economy as revealed through covariations of prices, outputs, investments, and incomes". It is designed in a way to illustrate the interactions between sectors in the economy, and when one sector's activity declines it ripples effects through the rest of the sectors of the economy. Due to its ability to model the ripple effect, it has been widely used in modelling the impact of catastrophes such as earthquakes and hurricanes.

IO analysis can be understood when looking at Table 6-1, which shows a simplified IO table. The table shows only 6 sectors of the economy of the Netherlands in 1956. This is extremely simplified since the tables can be as detailed as having up to 500 sectors. The horizontal rows show how the outputs of the economy are distributed among each sector. The vertical columns on the other hand show how each sector obtains its inputs. Thus the output of one sector is the input into another. This illustrates how the different sectors of the economy are intertwined through the flow of trade and links all sectors together. If for example we look at the sector labelled "Metals and Construction" we can see that the total output of the sector is 1,902 million Guilders. These outputs are distributed as inputs into the other 5 sectors, an example of which is "Trade" using 163 million Guilders of the output of "Metals and Construction" as an input into its sector to enable it to produce its own 1,583 million Guilders of outputs.

Table 6-1 Simplified Input-Output Table, Units Millions of Guilders (Netherlands, 1956) (Source: Problems of Input output Tables and Analysis, United Nations, 1966)

Intermediate Inputs \ Intermediate Demand	1. Agriculture, Fishing, Food	2. Metals and Construction	3. Textiles and Apparel	4. Mining, Construction, and Utilities	5. Trade	6. Services	Total
1. Agriculture, Fishing, Food	–	0	39	175	1	352	567
2. Metals and Construction	422	–	62	399	163	856	1,902
3. Textiles and Apparel	25	38	–	55	21	39	178
4. Mining, Chemicals, and Utilities	700	1,438	322	–	448	704	3,612
5. Trade	404	685	131	274	–	89	1,583
6. Services	268	516	141	417	1,241	–	2,583
Total	1,819	2,677	695	1,320	1,874	2,020	

The following are inherent characteristics of the IO analysis (Rose, 1995):

1. IO is based on quantities that are feasible and can be quantified.
2. Provides a uniform framework that enables all parties in the system to be able to communicate with one another
3. Are able to analyze the potential of private sector decision and public sector policies
4. It is politically neutral and thus can model different economies, whether they are mixed economies such as the United States or centrally planned economies such as the former Soviet Union.
5. The entire production and all its inputs are accounted for.

The computational methods of IO analysis are described in Appendix E.

6.3.4 CGE vs IO Models

Both IO and CGE analysis can be used to model disaster-related economic consequences. Nonetheless there are advantages and disadvantages to using each. Table 6-2 highlights the main advantages and disadvantages of using both methods.

Table 6-2 Advantages and Disadvantages of IO and CGE Analysis

	Advantages	Disadvantages
Input Output	• Ability to model interdependencies with a region's economy • Its simplicity enables its combination with engineering models to estimate effects of physical damage	• Linearity • Rigid structure in substituting inputs and outputs • Lack of resource constraints • Lack of responses to price changes
Computable General Equilibrium	• Nonlinear • Can respond to price changes • Can incorporate input and import substitution • Can explicitly handle supply constraints	• Intended for long run equilibrium thus, underestimates economic impact • Optimization behaviour is questionable during disaster situation • Requires extensive data

One main advantage of CGE analysis is the fact that it employs a non-linear analysis, thus overcoming the limitation of IO analysis in being rigid due to its linear approach. In addition, due to the CGE model being based on social accounts they can incorporate resource constraints, allowing for input and import substitution (Rose, 1995). Since IO models are more established, research in the field is extensive and available for application purposes. CGE on the other hand is a more recent approach, and so research in the field is limited, thus applications of the model become more difficult. A disadvantage for using both CGE and IO analysis in third-world countries, where poorly developed economies, black markets and corruption exit, is that collecting accurate data is difficult.

Modelling of indirect losses has been a challenge and many analysts remain hesitant to conduct such an analysis. This is primarily down to four reasons (Rose and Lim, 2002):

1. Cannot be verified in a similar manner to direct losses
2. Requires utilization of economic models, which analysts might not be aware of, or be comfortable dealing with
3. Size of the indirect effects can vary tremendously depending on the resiliency of the economy.
4. Indirect loss results can be manipulated for political purposes.

One of the main reasons mentioned is “resiliency”, which is defined as the economy’s ability to maintain function (Rose, 2007). Thus in the event of an earthquake occurring, users will attempt to resist changes occurring to their demand due to the event, meaning that estimating the losses that could occur due to a disaster become very difficult. In order to understand resiliency of users, one needs to understand the psychology of the user to try to understand how they will behave during such an event. Of course this is a difficult process, driving away analysts from attempting to calculate indirect losses.

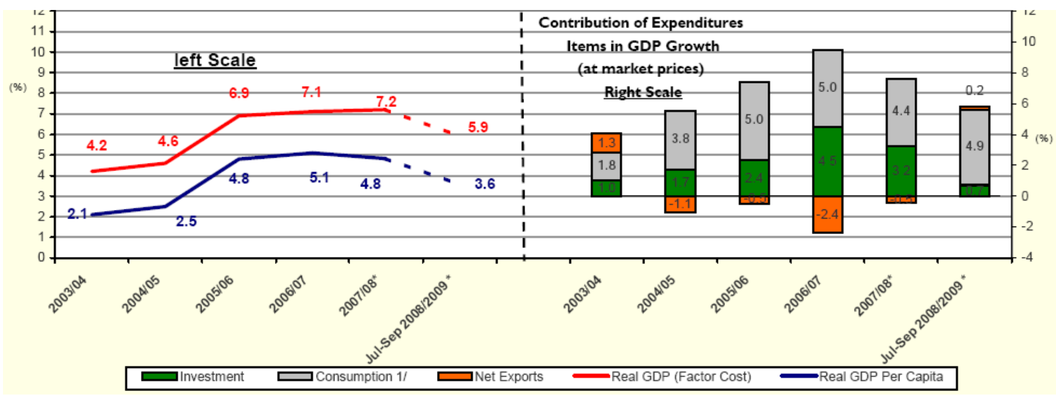
Even though there are many obstacles to calculating indirect costs, and the general impact of an earthquake on the economy, this does not mean that such an analysis should not be performed. In the Nihonkai 1983 earthquake, it is estimated the direct damage in the Akita region was 145.7 billion Yen, while indirect damage due to loss of productivity was 371.0 billion Yen, 2.5 times greater than the direct damage (Kawashima et al., 1990). This clearly illustrates the importance of conducting such a study.

6.4 Egyptian Economy

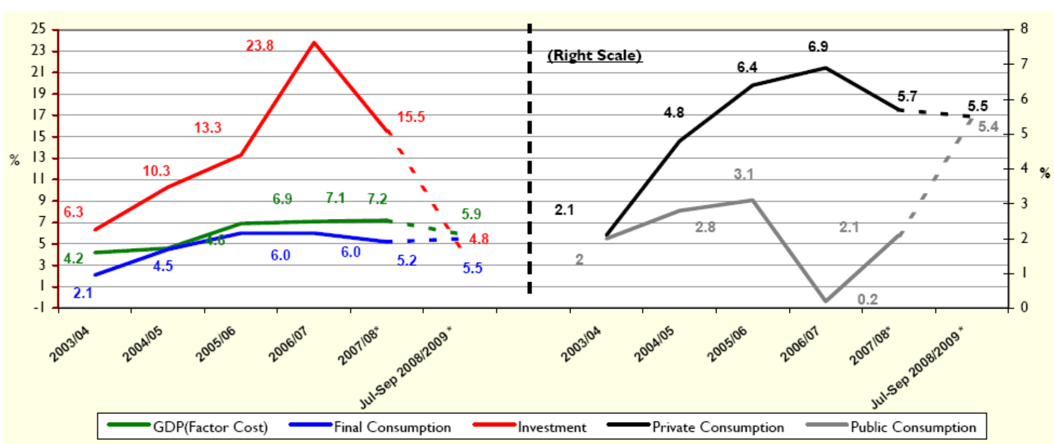
6.4.1 Overview

In order to create an economic loss mode for Egypt, a closer look at the economy of Egypt needs to be undertaken. The Egyptian economy has attempted, over the past half century, to establish an identity. After the revolution of 1952, Egypt's economy was reformed to adhere to socialist guidelines, with the implementation of land reforms, and nationalization policies (Kerr, 1962). After a period of war including the 1967 and October 6th 1973 wars, Egypt needed economic reforms to escape the adverse economic impacts of the war, and so the socialist ideals were replaced with open economic policies, promoting foreign investment through incentives and liberalizing trade and payment (Weiss and Wurzel, 1998). Nonetheless it was not until economic reforms of the early 1990s that Egypt's economy prospered. By offering to be part of the Gulf War Coalition, Egypt received great external debt relief, and this enabled it to stimulate and improve its economy (Weiss and Wurzel, 1998). With the aid of the World Bank and International Monetary Fund (IMF), Egypt introduced international institution and banks that promoted lending to help galvanize the economy (Weiss and Wurzel, 1998). Furthermore the government has privatised governmental institutions such as Egypt's telecommunication network Telecom Egypt in December 2005 selling a 20 percent stake in the company (ESIS, 2011). Through privatisation policies the government earned revenue of 1.9 billion U.S. dollars between June and December of 2006 (Zawaya, 2005).

Today Egypt's economy has been growing at an average rate of 6 percent per year; see Figure 6.2 (a), reaching a 2007/2008 Gross Domestic Product (GDP) of 869.5 billion LE (146.1 billion USD according to the National Bank of Egypt April 2011). Nonetheless, the rate of increase of final consumption, investment, private consumption and public consumption appears to be decreasing (Figure 6.2 b).



(a)



(b)

Figure 6.2 a) Annual GDP and expenditure, and b) Real GDP for Egypt 2003-2009 (Ministry of Finance, 2009)

A good measure of a country's development is evident through the United Nations Development Program and its use of the Human Development Index (HDI). This index combines a normalized measure of life expectancy, literacy, education and

GDP. Furthermore the index is then categorized into high, medium and low, with high being the most developed. According to this index Egypt has a HDI of 0.62 and lies in the medium category, and is ranked as the 7th most developed country in Africa (UNDP, 2010).

6.4.2 Major Industries

Agriculture

Egypt has the distinct advantage of being at the end of the river Nile's path. This has enabled it to cultivate the land along the Nile valley as well as the delta region. To further cultivate as much of the desert as possible, canals were built in the 19th century under the orders of Muhamed Ali Pacha, stemming out of the Nile providing irrigation to areas that had previously been lacking such resources (Abu-Zeid, 1995). Moreover in 1997 the Egyptian government decided to initiate a plan known as the "New Valley Project", whose short term aim was to increase Egypt's arable land by 10 percent through pumping water from Lake Nasser to the western deserts of the New Valley to irrigate the land (Dixon and Burhman, 2005).

The agriculture sector plays an important role in the economy, providing 13.2 percent of the GDP in 2008 (MOF, 2008). This is further supported by looking at employment figures, where 10.48 percent of the Egyptian workforce was employed in agriculture and hunting in 2006 (MOF, 2008).

Inflation in producers' prices was 24.8 percent for the agricultural sector in 2008 according to the Ministry of Finance (MOF, 2009). With a population of 80 million of which a significant percentage struggles financially, such inflation is translated to an increase in food prices, which hinders the ability of a large percentage of the population to purchase necessities. This phenomenon illustrates the sensitivity of the sector, and supports the previously established findings of the sector's inability to accommodate a shock to its system.

<u>Tourism</u>

Tourism is one of Egypt's greatest sources of revenue. Having two shorelines along the Mediterranean and Red Seas, as well as historical monuments that span over thousands of years, Egypt has become a tourist attraction bringing in 9.8 million tourists in 2006/2007, and revenue of over 8 billion LE (MOF, 2008).

Even though tourism (through the foods and accommodations sector) employed only 0.8 percent of the workforce in 2003/2004 it accounted for 2.7 percent of the GDP in the same year. Today, the industry accounts for 3.7 percent of the GDP and clearly plays an influential role in the country's economy.

<u>Real Estate and Construction</u>

The construction and real estate markets are extremely dependent on one another since one of the foundations of construction is to meet real estate needs. According to the Ministry of Finance (MOF, 2009), the construction, building, housing and real estate activities accounted for 7.7 percent of the total investment between July and September 2008/2009. This investment is met with a corresponding return of 7 percent of the GDP. The combined industry is also one of the biggest employers, employing 3.82 percent of the workforce in 2006. The industry has entered an economic boom in 2005, with the construction industry reflecting an increase of 35.4 percent between 2005/2006 and 2007/2008 in its GDP.

<u>Manufacturing</u>

Manufacturing industries employed 4.7 percent of the workforce in 2006 ranking as the third biggest employer after agriculture and public government (MOF, 2008). Furthermore the industry was one of the biggest contributors to the GDP in 2007/2008 accounting for 16.3 percent, and receiving the second biggest investment in the same time period of 17 percent (MOF, 2008).

The industry has experienced great inflation increases in recent times with an average inflation in producer prices of 28.6 percent in September 2008, with Basic Metals production having an inflation rate of 89.1 percent (MOF, 2008).

6.4.3 Employment

Employment statistics are essential for conducting economic loss modelling. Analysing these statistics aids in understanding the distribution of labour over Greater Cairo, thus pinpointing the economic characteristics of each district. CAPMAS categorises employment into 24 categories according to the 2006 census (Table 6-3).

Table 6-3 Employment sectors according to CAPMAS (2006) census

Code	Economic Sector	Code	Economic Sector
A	Agriculture and hunting	M	Scientific and technical activities
B	Mining and querying	N	Administrative activities and supporting services
C	Manufacturing	O	Public administration, defence and compulsory social security
D	Electricity, gas lines and water	P	Education
E	Water supply activities and sewage networks and management and treatment of sewage and waste	Q	Health and social work activities
F	Construction	R	Arts, culture and entertainment
G	Total trade of the retail and repair of motor vehicles and motorcycles	S	Other services
H	Transport and storage	T	Personal services for domestic services for the family
I	The activities of food and accommodation services	U	Activities of International organizations and bodies, regional and foreign embassies and consulates
J	Information and communication activities	V	Incomplete activities description
K	Insurance and Financial Intermediaries	W	Unstated
L	Real estate and leasing activities	X	Unattached

The breakdown of the population above fifteen years old (working population) is classified in the Egyptian 2006 census according to their employment sector. Furthermore this information is further broken down geographically. Appendix E illustrates the break down of population by employment sector for Greater Cairo.

The sector with greatest employment in Greater Cairo is the "unattached" sector. This reflects a growing trend in Egypt, where many of the lower and middle social classes prefer to work in the informal sectors such as independent street valets, due to the poor wage rates in other sectors. This sector is extremely difficult to monitor and figures regarding the number of people in this category are debatable.

The formal sector with the greatest percentage of employment is the "agricultural and hunting" sector, followed by "total trade of the retail and repair of motor vehicles and motorcycles", "manufacturing", "construction", "education" and "Public administration, defence and compulsory social security".

6.4.4 Foreign and Domestic Trade

Egypt's dependence on foreign imports is increasing every year. In 2003/2004, net exports were at -6.6 billion LE (-1.1 billion USD in May 2003, OANDA, 2011), with Egypt's exports of goods and services reaching 137 billion LE, while its imports amount to 143.6 billion LE. In 2007/2008 the export deficit increased to -54 billion LE (-9.3 billion USD in May 2007, OANDA, 2011), clearly illustrating Egypt's increasing dependence on imports (MOF, 2008).

According to the Ministry of Finance and the United Nations Broad Economic Category Classification, the number one source of imports in 2007/2008 in Egypt is "Primary Manufactured Inputs" which includes inputs that are used in the manufacturing of other goods. This is followed by "Primary Foodstuffs (For Industry)" which includes products that are used in the manufacturing of food related items. The imported "Primary Foodstuffs (For Industry)" appears to be used efficiently and translated to "Primary Foodstuffs (For Consumption)" which is one the country's leading exports. According to the United Nation's classification, the only other source of greater exports is the "Primary Manufactured Inputs" which accounts for nearly 39 percent of Egypt's exports (MOF, 2008).

In July-Sep 2008/2009, Egypt's greatest receipts arrived from Non-Oil Exports and Petroleum which combined to form about 46.5 percent of the total receipts (Figure 6.3). This is primarily due to Egypt having the 19th largest natural gas reserves, enabling it to use this resource to acquire revenue (MOF, 2009).

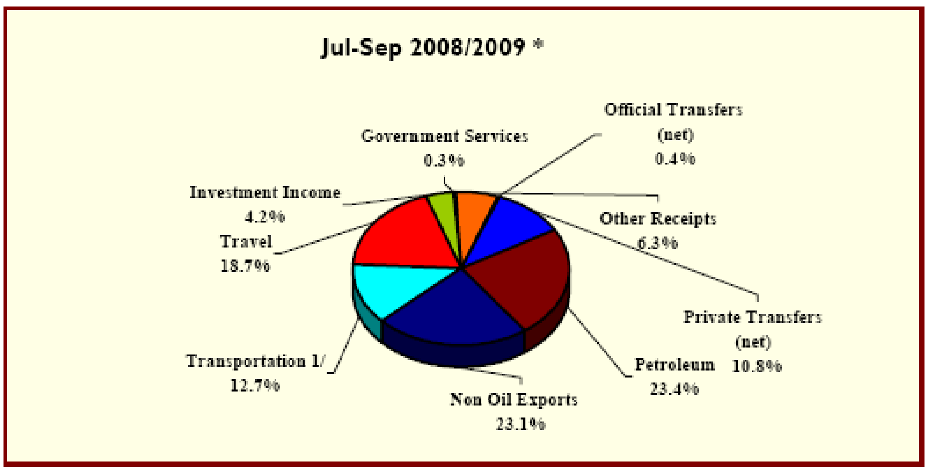


Figure 6.3 Expenditure and receipts for Egypt for July-September 2008/2009 (Ministry of Finance, 2009)

With the deficit in trade experienced by the Egyptian economy, changes in exchange rates have adversely affected the economy. As can be seen from Figure 6.4, the value of the Pound Sterling increased from 5.381 (January 2000) to 9.66 (March 2011) LE/Pound Sterling which represents a 74 percent increase, whereas the value of the Euro increased from 3.274 (January 2000) to 8.42 (March 2011) LE/Euro, representing an increase of 144 percent (OANDA, 2011). Additionally the U.S dollar has shown an increase in value against the Egyptian pound of 75 percent between 2000 and 2011. This change is the most influential of all due to the U.S being Egypt's biggest source of foreign imports and greatest source of private transfers with such transfers accounting for 36 percent of total private transfers in 2007 (MOF, 2010). This increase in the value of foreign currency against the Egyptian Pound has an adverse impact on the economy.

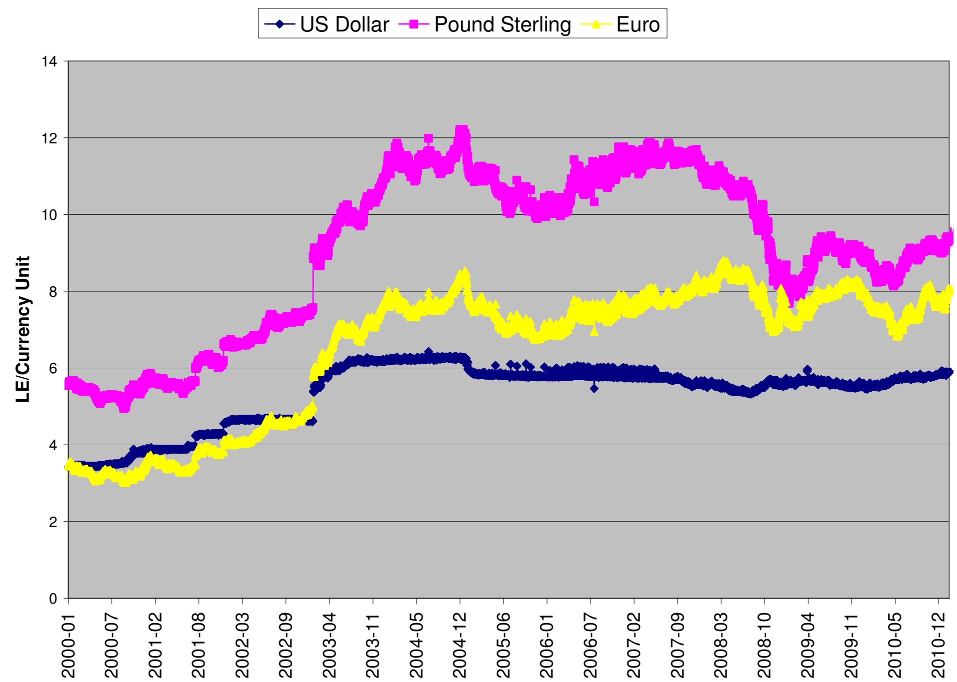


Figure 6.4 Value of major foreign currency against the Egyptian Pound (OANDA, 2011)

6.5 Direct Economic Model

Direct economic losses, as already stated, are much simpler to calculate than indirect losses. This is primarily due to the fact that they require less data than needed to calculate indirect losses, and are linear, where the losses are directly proportional to the amount of damage experienced by the built environment.

Calculating direct economic losses involves calculating the replacement cost of damaged components. Since the study involves analysing damage to the building inventory, as well as electricity and natural gas lifelines, evaluating direct economic losses involve estimating the replacement cost of damaged components of these features.

In order to calculate direct losses to buildings, L_B, the probability of damage to buildings calculated from fragility curves in Chapter 4 is used. This produces probabilities of damage for four damage states; slight, moderate, extensive and complete. Thus the direct loss to buildings, L_B, is calculated based on the discrete states of building classes in each district. Knowing the discrete probabilities of each of the damage states, the direct losses to buildings L_B can be calculated as shown in Equation (6.1).

$$L_B = \sum_i RC_i \cdot MDR_i = \sum_i RC_i \cdot DDP_i \cdot d_{ri} \qquad (6.1)$$

where MDR_i is the mean damage ratio for damage state "i", calculated for each district, and is proportional to the discrete damage probability DDP_i of damage state "i", and the damage ratio d_{ri}. The damage ratio d_{ri} is a measure of the cost of investment required in order to repair and restore the building to its original state. The d_{ri} values are typically region specific since they are a function of the building classes found in the region, design codes, as well as the cost of repair and restoration in a region. In order to determine region specific values of d_{ri}, a database of damage statistics is required in order to understand the replacement values of buildings relative to their state of damage. Various databases exist for regions in Europe and the US (Masi et al., 2002; Dolce at al., 2006), however not for Egypt. HAZUS (FEMA, 2003) and Crowley et al. (2005) both independently propose values for d_{ri}. HAZUS proposes using values of 2% for slight damage, 10% for moderate damage, 50% for extensive damage, and 100% for complete damage. Crowley et al. (2005) on the other hand propose values of 15% for slight damage, 30% for moderate damage, 100% for extensive damage and 100% for complete damage. Crowley et al. (2005) proposed these values based on the Turkish building inventory, where the authors believed that building owners would be more inclined to completely tear down buildings experiencing extensive damage than to repair them. This however would not be the case in Egypt since insurance considerations, and retrofitting strategies are not established to the same extent as Turkey, making the values not applicable to the Egyptian building inventory (Moharram, 2006). The ratio between Crowley et al. (2005) and HAZUS damage ratio decreases with increasing damage states. This illustrates that for small and moderate levels of ground-motion Crowley et al. (2005) will produce greater levels of damage than HAZUS, whereas for more severe levels of ground-motion the damage levels for both models will be closer. Assaad (1993) observed that the Egyptian construction industry is plagued by an informal labour market, where owners could attempt to use this informal sector to minimise the repair cost of damage buildings. Accordingly, the damage ratios presented by Crowley et al. (2005) would overestimate the repair cost for Egypt. Moharram (2006) conducted a similar study in which direct economic losses were calculated for building damage, where the HAZUS values for d_{ri} where used, illustrating the applicability of using the values for the Egyptian building inventory. Based on this, the values of HAZUS for d_{ri} are used in this study.

Replacement cost, RC_i, is a measure of value of the building. Each building class has a replacement value, which is calculated as the value of buildings within the building class. In this study, four main building classes are used to estimate economic losses; EC1-LP, EC1-MP, EC1-HP and EURM-L. Since EC1-LP, EC1-MP and EC1-HP are all concrete buildings with similar structural configurations, the value of materials used to construct them would be the same, with the quantities differing. EURM-L on the other hand uses different materials and thus will have different construction material costs. The study conducted by Moharram (2006) provided quantities and unit costs for each of the materials used in each building class. Since the same building classes are used in this study, the same quantities apply. Nonetheless since the study of Moharram (2006), unit prices of items have changed. In order to estimate the unit prices of items used to construct the building classes analysed in this study, typical market prices were collected from consultants and contractors in Egypt. The typical costs of the four building classes are shown in Table 6-4.

Table 6-4 Typical values of replacement for the four building classes based on Moharram (2006)

Item	Unit	Quanitity	Unit Price (US $)	Item Price ($)
EC1-LP				
Concrete for slabs	m3	235	82	19270
Concrete for columns	m3	31	100	3100
Steel Reinforcement	ton	25	693	17325
Finishing Including Electrical and plumbing	m2	1587	90	142830
			Total	**$182,525.00**
EC1-MP				
Concrete for slabs	m3	389	82	31898
Concrete for columns	m3	47	100	4700
Steel Reinforcement	ton	41	693	28413
Finishing Including Electrical and plumbing	m2	2645	90	238050
			Total	**$303,061.00**
EC1-HP				
Concrete for slabs	m3	622	82	51004
Concrete for columns	m3	61	100	6100
Steel Reinforcement	ton	64	693	44352
Finishing Including Electrical and plumbing	m2	4232	90	380880
			Total	**$482,336.00**
EURM				
Unreinforced Masonry	m3	2625	13	34125
RC Lintels	m3	8	125	1000
Finishing Including Electrical and plumbing	m2	2817	90	253530
			Total	**$288,655.00**

Equation (6.1) estimates the value of damage to individual buildings in each district. In order to calculate the total value of damage, the number of buildings in each building class needs to be established. Knowing the total number of buildings in each district and the distribution of buildings for the various building classes for each district calculated in Chapter 4, the total direct building loss, DL_B, can be calculated based on Equation (6.2).

$$DL_B = \sum_{class=1}^{4} L_{B_{class}} \times N_{class} \tag{6.2}$$

where N_{class} is the number of buildings for each building class at each district. Thus, through Equation (6.2), direct economic loss to the first component of the built environment in this study is estimated.

Estimating direct economic losses to the natural gas and electricity lifelines is conducted in a similar manner to that of buildings. Since fragility curves are used to compute the probability of damage to components in both networks, then the direct economic loss is also computed through damage probability *DP* and replacement cost *RC*. Since only two damage states exist; damaged and not damaged, then no damage ratio is required, since damaged is equivalent to being in the complete damage state, therefore requiring repairing the component. Therefore the direct economic losses for both natural gas, DL_G, and electricity, DL_E, can be calculated using Equation (6.3) and (6.4) respectively.

$$DL_G = \sum_{pipe=1}^{n} DP_{pipe} \times RC_{pipe} + \sum_{station=1}^{n} DP_{station} \times RC_{station} \tag{6.3}$$

$$\begin{aligned} DL_E = & \sum_{DS,CB,Buses=1}^{n} DP_{DS,CB,Buses} \times RC_{DS,CB,Buses} + \\ & \sum_{Transformer=1}^{n} DP_{Transformer} \times RC_{Transformer} \end{aligned} \tag{6.4}$$

where RC_{pipe} is the replacement cost of natural gas pipes, $RC_{station}$ denotes the replacement cost of natural gas stations, $RC_{DS,CB,Buses}$ is the replacement cost of disconnect switches, circuit breakers and buses, and $RC_{Transformer}$ represents the replacement cost of transformers. While, DP_{pipe} is the damage probability for natural gas pipes, $DP_{station}$ denotes the damage probability of natural gas stations, $DP_{DS,CB,Buses}$ is the damage probability of disconnect switches, circuit breakers and buses, and $DP_{Transformer}$ indicates the damage probability of transformers. Therefore, the direct loss is calculated through identifying the components in each district, and calculating the direct losses to each of the components for each network in each district as shown in Equations (6.3) and (6.4).

Knowing the direct loss for each of the three aspects of the built environment at each district, the total direct loss DL_{Total} can be calculated as shown in Equation (6.5).

$$DL_{Total} = DL_B + DL_G + DL_E \tag{6.5}$$

6.6 Indirect Economic Adjusted IO Loss Model

6.6.1 Overview

Estimating indirect loss, as previously stated, is more complicated than direct loss. This is true not just due to the complexity and non-linearity of the model, but also due to the large amount of data needed to conduct such as study. Collecting data in Egypt poses an obstacle both in terms of availability of data and the quality of the available data. Data regarding employment, trade, economic sectors and other aspects of the economy is not freely available, and locating this data is challenging. The Egyptian government established the Information Centre operated by CAPMAS and under the supervision of the Office of the Prime Minister, in order to create a centralized agency responsible for collecting national data, as well as conducting research relating to the data. The problem with the data published by the Information Centre is the lack of coherence and consistency, where the data has been collected from various tributary agencies who have not been given a template for this collection. Therefore, each agency collects data that is not consistent with the other. This creates another obstacle to the data collection process, where not only does the data need to be located, but also filtered and made consistent with other collected data.

Creating an indirect economic loss model involves firstly identifying the best macroeconomic methodology to follow. Two such methodologies have been discussed comprehensively in Appendix E; IO and CGE models. The main disadvantage with using the CGE model is the lack of literature, and applications in the field of earthquake loss estimation, whereas IO modelling has been used extensively in similar studies. Nonetheless the disadvantage with using traditional IO modelling is its static approach to modelling economic loss, where loss is calculated instantaneously after the disaster without accounting for the resiliency of the economy and its attempts to try to minimise the losses in both the short and long term.

In order to illustrate the shortcoming of a static IO model the example in Table 6-5 is used. Table 6-5 gives an example of an economy composed of three sectors; manufacturing, construction and tourism. As can be seen from Table 6-5, the economy is balanced and undamaged prior to the occurrence of an earthquake.

Table 6-5 Example of a three sector intact economy, MFG= manufacturing, CON=construction, TOUR= tourism, HH= households, IMP= imports and EXP= exports

	MFG	CON	TOUR	HH	EXP	Output
MFG	15	35	10	30	5	95
CON	40	15	35	30	20	140
TOUR	10	30	20	20	35	115
HH	10	30	40			80
IMP	20	30	10			60
Outlay	95	140	115	80	60	

If an earthquake occurs that damages the construction sector such that the sector is operating at 90 percent of its original capacity, then one would expect that the economy would behave in a similar fashion to what is shown in Table 6-6. Nonetheless Table 6-6 ignores the interdependency between sectors in the economy where damage to one sector would not only cause damage to other sectors, but force other sectors to alter their production. This is known as forward and backward linkage (Rose and Lim, 2002).

Table 6-6 Three sector economy with construction operating at 90 percent prior to rebalancing, MFG= manufacturing, CON=construction, TOUR= tourism, HH= households, IMP= imports and EXP= exports

	MFG	CON	TOUR	HH	EXP	Output
MFG	15	**31.5**	10	30	5	91.5
CON	**36**	**13.5**	**31.5**	**27**	**18**	**126**
TOUR	10	**27**	20	20	35	112
HH	10	**27**	40	0	0	77
IMP	20	**27**	10	0	0	57
Outlay	91	**126**	111.5	77	58	

When a natural disaster occurs that damages an economic sector A, the production of sector A will decrease, therefore reducing its supply to other sectors. Since other sectors require output from sector A as input for producing their supplies, the decrease in supply of outputs from sector A will mean that other sectors will need to reduce their production since they do not have enough of sector A output to reach their full production. Moreover when these sectors reduce their production other sectors will follow suit. This is known as forward linkage or downstream linkage (Rose and Lim, 2002). On the other hand, backward linkage or upstream linkage refers to sectors reducing their purchase of other products due to their inability to operate at full capacity. In turn, this will force other sectors to follow suit and reduce their purchase of products from other sectors.

The effect of forward and backward linkages is that it creates what are known as “bottlenecks”. Since sectors have to adjust their production and purchases in order to balance the economy, then the economy will be restricted by the greatest damaged sector. This sector will thus create a bottleneck in the economy, and all other sectors will operate at the same level as the bottleneck sector. Thus, in the example shown in Table 6-6 the construction sector becomes the bottleneck sector, forcing other sectors to produce and purchase at a level of 90 percent, and creating the balanced economy shown in Table 6-7.

Table 6-7 Three sector fully constrained economy illustrating the bottleneck effect, MFG= manufacturing, CON=construction, TOUR= tourism, HH= households, IMP= imports and EXP= exports

	MFG	CON	TOUR	HH	EXP	Output
MFG	13.5	**31.5**	9	27	4.5	85.5
CON	**36**	**13.5**	**31.5**	**27**	**18**	**126**
TOUR	9	**27**	18	18	31.5	103.5
HH	9	**27**	36	0	0	72
IMP	18	**27**	9	0	0	54
Outlay	85.5	**126**	103.5	72	54	

The economy shown in Table 6-7 is known as a fully constrained economy. Production and purchases of all sectors is dominated by damage to the construction sector, since other sectors are unable to find a substitute for the production offered by the construction sector.

The fully constrained economic model is primarily the static restricted form of the IO model. This has widely been used in seismic risk analysis as the typical model for estimating indirect economic losses (Rose et al., 1997; Rose and Lim, 2002). Nonetheless, when a natural disaster occurs that creates damage to the economy, the economy does not remain static, but attempts to resist and minimise the economic losses through various means. This is known as the “resiliency” of the economy. Most models fail to reflect the true nature of an economy by overlooking the economy’s resiliency, which leads to an overestimation of the economic losses.

One of the main features that aid in the resiliency of an economy is its ability to adjust its imports and exports at the time of a disaster. When a sector experiences damage such that it cannot supply other sectors, the remaining sectors might be able to import the lost production, therefore limiting the forward linkage losses. Moreover since the damaged sector is unable to purchase supplies from other sectors, then other sectors might opt not to reduce their production but instead export their surplus thus limiting the losses due to backward linkage. Table 6-8 provides an example of an economy that is able to adjust its exports by up to 60 percent and imports by 35 percent. This enables the sectors that have not experienced any physical damage to operate at full capacity, importing the supplies that the damaged construction sector is unable to produce, and exporting the products that the construction sector is unable to purchase.

Table 6-8 Three sector relaxed economy, MFG= manufacturing, CON=construction, TOUR= tourism, HH= households, IMP= imports and EXP= exports

	MFG	CON	TOUR	HH	EXP	Output
MFG	15	**31.5**	10	30	8.5	95
CON	**36**	**13.5**	**31.5**	**27**	**18**	**126**
TOUR	10	**27**	20	20	38	115
HH	10	**27**	40	0	0	77
IMP	24	**27**	13.5	0	0	64.5
Outlay	95	**126**	115	77	64.5	

The example provided in Table 6-8 illustrates the basis for the adjusted IO model that is used in this study to estimate indirect economic losses. By accounting for import and export flexibility, the model is able to offer a more realistic reflection of the economy at the time of a crisis.

Figure 6.5 presents a flowchart of the overall indirect economic model. The steps shown in Figure 6.5 are described in more depth in the following sections.

6.6.2 Egypt's Input Output Table

The Egyptian IO table is constructed by the Ministry of Planning and published by CAPMAS, with the latest tables having been published in 2004. The tables are only available at a national level and thus limit the ability to conduct regional economic analysis. The interdependence that lies within the Egyptian economy is represented through a 32 sector economy. Table 6-9 lists the sectors that are shown in Egypt's IO table.

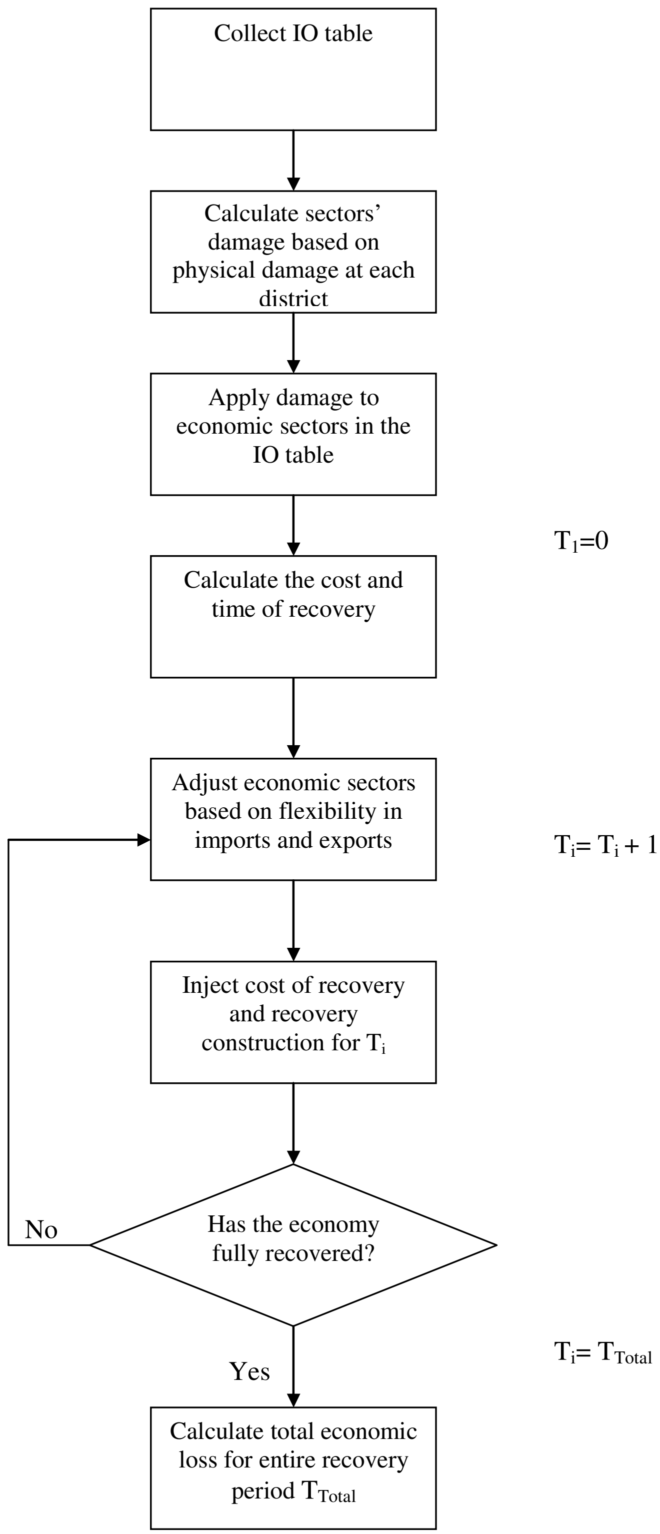


Figure 6.5 Overview of indirect economic model

Table 6-9 Economic sectors in Egyptian IO table (CAPMAS, 2004)

Sector Number	Sector Name	Sector Number	Sector Name
1	crop agriculture	17	petroleum products
2	animal agriculture	18	coal refining products
3	cotton ginning	19	non-metal industrial products
4	mining and quarries	20	basic metal industries
5	crude petroleum and natural gas	21	metal products
6	food industries	22	non-electric machines
7	beverages	23	electric machines
8	cigarettes and cigars	24	transportation industry
9	spinning and weaving	25	miscellaneous industries
10	ready-made clothing and leather shoes	26	Electricity
11	wood and wooden furniture	27	construction and maintenance
12	paper, cardboard, and related products	28	transportation and communications
13	printing and publishing	29	trade, finance, and insurance
14	leathers and leather industries	30	restaurants and hotels
15	rubber and related products	31	housing and facilities
16	chemical industries	32	other personal services

The Input-Output table can be used to construct a technical coefficient matrix, **A** (Appendix E), that can be used to analyse the interdependencies between various sectors in the economy. The Egyptian IO table and technical coefficient matrix **A** are shown in Appendix E.

According to the coefficient matrix table, the "dependency index" (DI) and "influence gain" (IG) can be calculated, which can establish the most important sectors in the economy. To determine an industry's resiliency the "dependency index", DI, is used (Setola, 2008), this is defined as the summation of the Leontief coefficients along a single row:

$$\delta_i = \sum_{i \neq j} a_{i,j} \qquad (row \quad summation) \qquad (6.6)$$

The resiliency measure is a measure of how much an industry is able to operate and preserve working capabilities when an shock to the system occurs. When $\delta_i < 1$, the sector is able to continue working when a shock to the system occurs, whereas when $\delta_i > 1$ the sector becomes inoperable and might be nullified.

In addition to the DI, another index known as the "influence gain" IG (Setola, 2008) also exists, in which the influence of a sector on the entire economy is calculated. This is defined as the summation of the column vector of the Leontief coefficients:

$$\rho_j = \sum_{i \neq j} a_{i,j} \qquad (column \quad summation) \qquad (6.7)$$

The larger the value of ρ_j the larger the economic impact to the system that will occur due to a shock to the sector. The calculated DI and IG are plotted in Figure 6.6. According to Figure 6.6, three sectors have a DI > 1, and these are the "crop agriculture" (Sector 1), "crude petroleum and natural gas" (Sector 5) and "trade, finance and insurance" (Sector 29) sectors, each of which has a DI of 1.449, 1.022 and 1.669 respectively. In addition the "cotton ginning" (Sector 3), "food industries" (Sector 6) and "petroleum products" (Sector 17) sectors, have the greatest IG of 0.896, 0.582 and 0.700 respectively. These findings illustrate that an impact to the "crop agriculture" (Sector 1), "crude petroleum and natural gas" (Sector 5) and "trade, finance and insurance" (Sector 29) sectors would lead to a complete halt of the sectors with minimum resiliency, while an impact to the "cotton ginning" (Sector 3), "food industries" (Sector 6) and "petroleum products" (Sector 17) sectors would lead to the greatest impact on the economy.

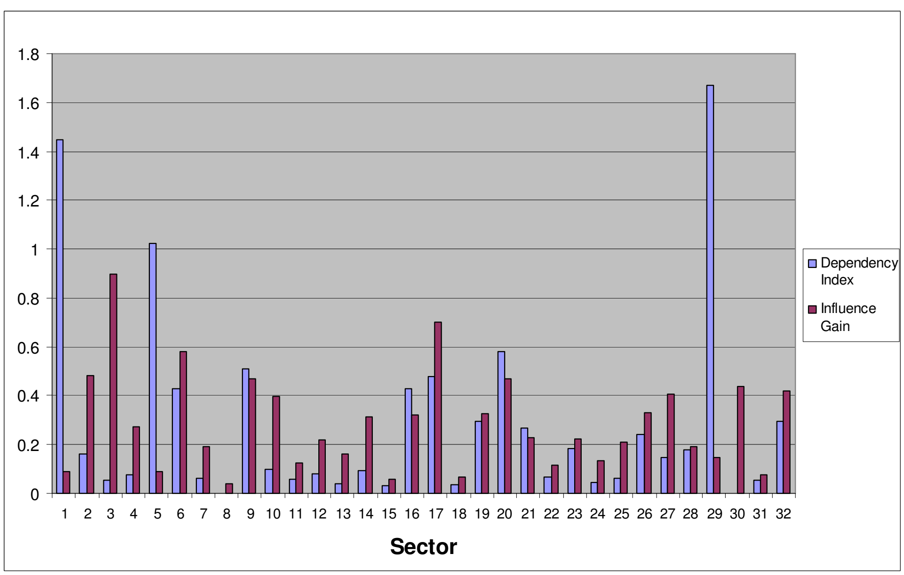


Figure 6.6 Dependency indexes and influence gains for Egyptian IO sector

From the above, the “crop agriculture”, “crude petroleum and natural gas”, and “trade, finance and insurance” sectors will not be able to cope with a shock due to their low resiliency. Moreover, a shock to the sectors of cotton ginning, food industries and petroleum industries would have a significant impact on the rest of the economy. This phenomenon corresponds to previously established data regarding trade balance, where “Primary Foodstuff (for industry)” and “Primary Foodstuff (for consumption)” account for a large percentage of Egypt’s imports and exports respectively. Moreover, petroleum industries are essential for the day to day running of the entire economy, and provide means of energy for manufacturing and consumers, and hence a shock to these sectors would lead to a negative impact on the entire economy.

A significant problem that exists in the available IO data is the fact that employment is categorised according to 24 sectors (Table 6-3), while the national IO table (Table 6-9) is categorised into 32 sectors. To complicate matters even more, many of the sectors in both tables do not match. In order to conduct a thorough analysis of the impact of a seismic event on the Egyptian economy, the sectors in both tables need to be mapped to one another.

Table 6-10 maps both tables to one another. As can be seen, some sectors such as “Agriculture and Hunting” (sector A) in the employment table is mapped to “crop agriculture” (sector 1), “animal agriculture” (sector 2) and “cotton ginning” (sector 3). This is due to the “agriculture and hunting” sector being employed in the three economic sectors. Furthermore certain sectors in the IO table are mapped to many employment sectors. An example of this can be seen in the “food industries” sector (Sector 6) which is mapped to both “manufacturing” (Sector C) and “the activities of food and accommodation services” (Sector I).

Table 6-10 Mapping of CAPMAS (2006) economic sectors onto CAPMAS (2004) IO sectors

Agriculture and hunting	1,2,3
Mining and querying	4
Manufacturing	6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,25
Electricity, gas and water	5,26
Water supply activities and sewage networks and management and treatment of sewage and waste	27,31
Construction	27
Total trade of the retail and repair of motor vehicles and motorcycles	1,6,7,8,10,11,12,13,14,15,16,17,19,20,21,22,23,24,29
Transport and storage	24,28
The activities of food and accommodation services	5,6,30
Information and communication activities	28
Insurance and Financial Intermediaries	29
Real estate and leasing activities	27,31
Scientific and technical activities	16,17
Administrative activities and supporting services	1-32
Public administration, defence and compulsory social security	32
Education	32
Health and social work activities	32
Arts, culture and entertainment	32
Other services	32
Personal services for domestic services for the family	32
Activities of International organizations and bodies, regional and foreign embassies and consulates	1-32
Incomplete activities description	1-32
Unstated	1-32
Unattached	1-32

Nonetheless, a problem still exists of trying to translate the employment tables which are constructed as a 56 x 24 (district x employment sectors) matrix [A] (Appendix E) into a 56 x 32 (district x IO sectors). The problem exists in trying to map one-to-many and many-to-one sectors. An example has already been mentioned in the “agriculture and hunting” sector, which maps 3 sectors to this single sector. This means that employees in this sector are distributed among three sectors in the IO tables. However, this is not equally distributed with each IO sector being assigned one third of the employees, but a different criterion for distribution exists.

One method of distributing the employment among the newly mapped sectors is through each sector’s “Value Added” (VA) contribution. VA is defined as the difference between the output and intermediate consumption, which occurs due to the contribution of factors of production, i.e. land, labour and capital goods, to raise the value of sector (Palmer, 1966). If the “Agriculture and Hunting” sector is again taken as an example, this is mapped onto three sectors, these three sectors along with their VA contribution are shown in Table 6-11.

Table 6-11 Example of calculation of mapping sectors according to the method of "Value Added"

Sector	Value Added ('000 LE)	Percentage of Total
1 (Crop Agriculture)	56056534	64.6
2 (Animal Agriculture)	27386966	31.5
3 (Cotton Ginning)	3369160	3.9
Total	86812660	100

Based on Table 6-10 the employees of Sector A (Agriculture and Hunting) can be distributed among the three IO sectors shown in Table 6-11 according to their value added contribution. Thus 64.6 percent of sector A's employees will be mapped to "Crop Agriculture", 31.5 percent to "Animal Agriculture" and 3.9 percent to "Cotton Ginning".

Even though this mapping has no effect on evaluating direct loss, it can affect the estimation of indirect loss. Indirect loss is expected to comprise a larger percentage of the total loss for more severe levels of ground-motion, than for small and moderate levels of ground-motion. This is the case since small and moderate levels of ground-motion are not expected to halt the economy in the same manner that severe levels of ground-motion does. Since Egypt is dominated by small and moderate levels of seismicity, even though the mapping can effect indirect loss, it should not significantly effect the total loss for more likely earthquake events.

Matrix [B] (Appendix E) presents a 24 x 32 matrix of employment sector contribution (Employment Sector Contribution x IO Sector). Based on this, the following matrix operation can be performed.

$$[A][B]=[C] \qquad (6.8)$$

Here, [C] is the translated matrix, which illustrates the distribution of geographical employees by economic sectors of the IO table. This is a 56 x 32 matrix and is shown in Appendix E.

Adjusting the employment data in this manner enables the identification of the geographical distribution of workers throughout the economy. This aids in understanding how each economic sector will experience losses based on the physical damage in each geographical district.

6.6.3 Adjusting for Sector Dependence

The three sector economy example illustrated in Table 6-5 through Table 6-8 describes an economy whose construction sector is damaged by 10 percent, and therefore is operating at 90 percent of its capacity. Nonetheless the output from the damage modules outlined in Chapters 4 and 5 are not sector based but district based. The methods in Chapter 4 compute the percentage of buildings that are damaged in each district for each ground-motion map. Moreover for each ground-motion map, the approaches outlined in Chapter 5 produce damages maps for each of the lifelines being analysed, which outlines the percentage of users receiving natural gas and electricity in each district. Nonetheless knowing the probability of failure of a feature of the built environment at a given district does not reflect the damage to the economic sectors.

The first step in adjusting the district damage into economic sector damage is to find a criterion that allows for mapping the district damage onto sectors. The most widely used criterion is employment (Rose et al., 1997). According to Hallegatte (2008), employment is proportional to the production of the sector in a given geographical area. Therefore, if a district is dominated by employment from a given sector, then one would expect that damage in that district would greatly affect the economic sector whose employment dominates the district. An example of this is the district of “Torah”, where just over 7 percent of workforce in the district are employed in the “spinning and weaving” sector. Therefore damage to “Torah” would affect the “spinning and weaving” sector more than any other. Therefore by weighing up the damage in each district by the ratio of employment of each economic sector in the district compared to the total employment of each sector, the probability of damage to each sector can be calculated P_{sector}. Equation (6.9) presents the method for calculating the probability of damage of each sector P_{sector}, based on the probability of damage of each sector at each district $P_{sector,district}$.

$$P_{sector} = \sum_{district=1}^{56} \frac{P_{sector,district} \times Employment_{sector,district}}{\sum_{district=1}^{56} \sum_{sector=1}^{32} Employment_{sector,district}} \tag{6.9}$$

Nonetheless, the damage model described in Chapters 4 and 5 computes the probability of damage to buildings $Buildings_P$, natural gas Gas_P and electricity $Electricity_P$ at each district, and not for the damage of each sector at each district $P_{sector,district}$. To overcome this problem, a method needs to be established that translates the probability of damage at district level, into the probability of damage of each sector at a district.

Each sector has different needs in terms of physical buildings, and natural gas and electricity supply. A financial trading firm for example can continue to operate even if its buildings are damaged since it can easily relocate its operations since it is not necessarily location dependant. A heavy industrial factory on the other hand is very dependent on its physical assets, and damage to these assets would completely halt operations. The same could be said of a cement factory and its need for natural gas and electricity for production. If the natural gas and electricity networks are incapable of supplying the factory with either natural gas or electricity then the factory's production would be halted. On the other hand crop agriculture's need for natural gas and electricity in Egypt is limited, therefore not supplying either to an agricultural area would not greatly affect the crop agriculture industry. Thus, in order to translate the damage at district level for each component analysed in the built environment into sector damage, one must first establish a method for evaluating the importance of each aspect of the built environment to each economic sector.

Some of the 32 economic sectors need their physical assets more than others. There are two methods that can be used to assess the importance of a sector's physical assets for its operation. The first of these is through analysing the balance sheets of companies that operate in each financial sector. The total value of fixed assets that a company possesses compared to its total assets can give an indication of the importance of physical assets to the company and the sector that the company operates in. Nonetheless, this analysis can be misleading. The reason for this is that a sector can have high value assets that are not essential to the operation of the sector. Moreover, collecting a large set of balance sheets for various economic sectors in Egypt poses an obstacle since availability of information is scarce. As opposed to more developed economies whose publically traded companies publish their financial statements on their websites, most publically traded companies do not do so in Egypt. The second methodology available is to use the method found in HAZUS, in which relocation expenses are computed as a function of disruption cost of each occupancy class. According to HAZUS, 33 occupancy classes exist, and the disruption costs range from 0.61-1.21 $\$/ft^2$ for the various occupancy classes with the exception of entertainment, theatre, parking facilities and heavy industries that cannot be relocated, and would remain non-operational until they are fully restored. The occupancy classes that cannot be located are thus assumed to be 100 percent dependant on their physical assets. Each of the occupancy classes and their translated dependency percentage is shown in Table 6-12. The translated dependency percentage is calculated as a function of the disruption cost, such that two occupancy classes with the same disruption cost would translate to the same dependency percentage. Accordingly, based on mapping the HAZUS occupancy classes onto the 32 economic sectors available in Egypt (Table 6-13), the dependency percentage of each sector can be calculated as the average of the dependency percentages of the occupancy classes that are mapped onto each sector as shown in Equation (6.10).

$$DEP_{sector,buildings} = \frac{1}{n} \sum_{occupancy=1}^{n} DEP_{occupancy,buildings} \qquad (6.10)$$

Table 6-12 HAZUS relocation expenses by occupancy class

		Residential	Distruption Cost ($/ft2)	Dependency (Percentage)
1	RES1	Single Family Dwelling	0.73	30
2	RES2	Mobile Home	0.73	30
3	RES3a-f	Multi Family Dwelling	0.73	30
4	RES4	Temporary Lodging	0.73	30
5	RES5	Institutional Dormitory	0.73	30
6	RES6	Nursing Home	0.73	30
		Commercial		
7	COM1	Retail Trade	0.97	80
8	COM2	Wholesale Trade	0.85	60
9	COM3	Personal and Repair Services	0.85	60
10	COM4	Professional/Technical/ Business Services	0.85	60
11	COM5	Banks	0.85	60
12	COM6	Hospital	1.21	90
13	COM7	Medical Office/Clinic	1.21	90
14	COM8	Entertainment & Recreation	N/A	100
15	COM9	Theaters	N/A	100
16	COM10	Parking	N/A	100
		Industrial		
17	IND1	Heavy	N/A	100
18	IND2	Light	0.85	60
19	IND3	Food/Drugs/Chemicals	0.85	60
20	IND4	Metals/Minerals Processing	0.85	60
21	IND5	High Technology	0.85	60
22	IND6	Construction	0.85	60
		Agriculture		
23	AGR1	Agriculture	0.61	30
		Religion/Non/Profit		
24	REL1	Church/Membership Organization	0.85	60
		Government		
25	GOV1	General Services	0.85	60
26	GOV2	Emergency Response	0.85	60
		Education		
27	EDU1	Schools/Libraries	0.85	60
28	EDU2	Colleges/Universities	0.85	60

where *n* is the number of occupancy classes that are mapped onto a sector. The final dependency of each sector on its physical assets is shown in Table 6-14. Using the findings from HAZUS provides a reliable method that is applicable even outside of the US. The reason for this is that even though the economies of Egypt and the US differ greatly, the dependency of each of the sectors in each nation on their physical assets remains essentially universal, and thus the use of HAZUS becomes applicable.

Table 6-13 Mapping of HAZUS occupancy classes onto economic sectors

Egyptian Economic Sectors	HAZUS MAPPED OCCUPANCY CLASSES			
crop agriculture	AGR1			
animal agriculture	AGR1			
cotton ginning	IND1			
mining and quarries	IND4			
crude petroleum and natural gas	IND4			
food industries	IND3			
beverages	IND3			
cigarettes and cigars	IND1			
spinning and weaving	IND1			
ready-made clothing and leather shoes	IND1	COM1	COM2	
wood and wooden furniture	IND1	COM1	COM2	
paper, cardboard, and related products	IND1	COM1	COM2	
printing and publishing	COM4	IND2		
leathers and leather industries	IND2	COM1	COM2	
rubber and related products	IND2	COM1	COM2	IND1
chemical industries	IND3			
petroleum products	IND3	IND4		
coal refining products	IND4			
non-metal industrial products	IND2	IND1		
basic metal industries	IND4			
metal products	IND4			
non-electric machines	IND1			
electric machines	IND1			
transportation industry	COM10	IND1		
miscellaneous industries	IND1	IND2		
electricity	IND1	IND2		
construction and maintenance	IND6			
communications	IND5			
trade, finance, and insurance	COM5	COM4		
restaurants and hotels	COM8			
housing and facilities	RES1-RES6			
other personal services	COM3			

Evaluating the dependency of each sector on natural gas provides a simpler challenge from that of the building inventory. The reason for this is that natural gas is not an essential commodity in all sectors. According to a report published by the United Nations Economic Commission for Europe (Korkor, 2007), natural gas is used internally within Egypt by only eight facets of economy; electricity, fertilizers, cement, petroleum, residential, heavy industry and vehicles, with electricity being the largest consumer. The agriculture sector is also dependent on natural gas through its use of fertilizers that require natural gas in their production. Moreover according to CAPMAS (2006), less than 5 percent of vehicle owners have opted to replace gasoline as their vehicle fuel source with natural gas, making natural gas important for a limited number of vehicles. Natural gas is also used residentially; where according to CAPMAS (2006), 20 percent of residential homes in Egypt are connected to the natural gas network, making 20 percent of the housing sector dependant on the lifeline. The cement industry in Egypt depends on natural gas as the main raw material for producing clinker, making it essential for the industry's production. Moreover, due to the availability of natural gas in Egypt, heavy industry prefers using natural gas as their main source of raw material. Based on this, the dependency of each sector on natural gas can be illustrated as shown in Table 6-15.

Table 6-14 Dependency of sectors on building inventory

Egyptian Economic Sectors	Building Inventory Dependency Percentage
crop agriculture	30%
animal agriculture	30%
cotton ginning	100%
mining and quarries	60%
crude petroleum and natural gas	60%
food industries	60%
beverages	60%
cigarettes and cigars	100%
spinning and weaving	100%
ready-made clothing and leather shoes	80%
wood and wooden furniture	80%
paper, cardboard, and related products	80%
printing and publishing	60%
leathers and leather industries	67%
rubber and related products	75%
chemical industries	60%
petroleum products	60%
coal refining products	60%
non-metal industrial products	80%
basic metal industries	60%
metal products	60%
non-electric machines	100%
electric machines	100%
transportation industry	100%
miscellaneous industries	80%
electricity	80%
construction and maintenance	60%
communications	60%
trade, finance, and insurance	60%
restaurants and hotels	100%
housing and facilities	50%
other personal services	60%

Table 6-15 Dependency of economic sectors on natural gas

Egyptian Economic Sectors	Natural Gas Depedency Percentage
crop agriculture	30
animal agriculture	30
cotton ginning	50
mining and quarries	50
crude petroleum and natural gas	100
food industries	50
beverages	50
cigarettes and cigars	50
spinning and weaving	50
ready-made clothing and leather shoes	50
wood and wooden furniture	50
paper, cardboard, and related products	50
printing and publishing	0
leathers and leather industries	50
rubber and related products	50
chemical industries	50
petroleum products	100
coal refining products	50
non-metal industrial products	50
basic metal industries	50
metal products	50
non-electric machines	50
electric machines	50
transportation industry	35
miscellaneous industries	50
electricity	70
construction and maintenance	0
communications	0
trade, finance, and insurance	0
restaurants and hotels	0
housing and facilities	50
other personal services	0

The last aspect of the built environment is the electricity network. According to the Applied Technology Council (ATC, 1991), "electricity importance" is defined as the percentage reduction in output caused by a 1 percent reduction in availability of electricity. Rose and Lim (2002) computed electricity importance percentages for the 22 sector economy of Northridge, Los Angeles (Table 6-16). The problem with using the data collected by Rose and Lim (2002) is that Egypt's economy is described through a 32 sector economy, rather than the 22 sector economy shown in Table 6-16. To overcome this problem, the Northridge economic sectors are mapped onto their Egyptian equivalent as shown in Table 6-17. Since some Egyptian sectors are mapped onto more than one Northridge sector, the average of the electricity importance percentage is taken for that sector. Moreover due to the broad scope that the *miscellaneous industry* sector entails, it is assumed that all Northridge sectors are mapped on this sector, and thus the average of all the electricity importance percentages shown Table 6-16 is taken for the sector. Since Egypt's economy in the past decade has focused on privatisation policies in most of its sectors, with many of the acquiring entities being composed of joint-ventures of local and foreign corporations (Ismail, 2009; Mohieldin and Nasr, 2006), the behaviour of these sectors have become increasingly similar in nature to their counterparts in Europe and North America. Accordingly, it can be reasonably assumed that the electricity importance percentages for Northridge are applicable to Greater Cairo.

Table 6-16 Electricity importance of Northridge, Los Angeles economy (Rose and Lim, 2002)

	Sector	Electricity Importance (Percentage)
1	Agriculture	50
2	Mining	90
3	Construction	40
4	Food processing	90
5	N-durable manufac	98
6	Durable manufac	100
7	Petroleum refining	100
8	Transportation	30
9	Communication	90
10	Private Elec Util	80
11	Gas utilities	80
12	Water utilities	80
13	Wholesale trade	90
14	Retail trade	90
15	FIN, INS, Real estate	90
16	Personal services	86
17	Business services	90
18	Entertainment	80
19	Health & socserv	80
20	Education	80
21	Government	60
22	S & L Electric util	80

Table 6-17 Mapping of Northridge economic sectors to Egypt's economic sectors, and computed electricity dependency percentage

Egyptian economic sectors	Mapped Rose and Lim (2002) sectors		Electricity Depedency (Percentage)
crop agriculture	1		50
animal agriculture	1		50
cotton ginning	1		50
mining and quarries	2		90
crude petroleum and natural gas	7	11	90
food industries	4		90
beverages	4		90
cigarettes and cigars	6		100
spinning and weaving	6		100
ready-made clothing and leather shoes	14		90
wood and wooden furniture	6		100
paper, cardboard, and related products	6		100
printing and publishing	5		98
leathers and leather industries	6		100
rubber and related products	6		100
chemical industries	5		98
petroleum products	7		100
coal refining products	2		90
non-metal industrial products	6		100
basic metal industries	6		100
metal products	6		100
non-electric machines	6		100
electric machines	6		100
transportation industry	8		30
miscellaneous industries	ALL		80
electricity	22		80
construction and maintenance	3		40
transportation and communications	9		90
trade, finance, and insurance	15		90
restaurants and hotels	18		80
housing and facilities	15		90
other personal services	16		86

Knowing the dependency of each sector on each aspect of the built environment being analysed, the probability of damage of each sector at each district $P_{sector,district}$ can be calculated. For each district, the percentage damage of each of the aspects of the built environment in the district is multiplied by the sector's dependence on the aspect, thus producing three values. These values indicate the effect that each of the damage to buildings, natural gas and electricity networks would have on the economic sectors. The largest of these three values then becomes the probability of damage of each sector at each district $P_{sector,district}$. The reason the largest value is taken is that if a sector at a given district is said to be 50 percent damaged due to damage to the natural gas network, but 90 percent damaged due to damage to the electricity network, the sector will not be able to operate at a capacity greater than 10 percent (compliment of 90 percent), and thus the damage to each sector is dominated by the damage to the aspect of the built environment that inflicts the greatest damage to the production of the sector, as shown in Equation (6.11). Thus using Equation (6.11), Equation (6.9) can then be computed in order establish the probability of damage of each sector in the economy for each ground-motion map.

$$\begin{aligned} P_{sector,district} = \max\{ & DEP_{sector,buildings} \times Buildings_P, DEP_{sector,Gas} \times Gas_p, \\ & DEP_{sector,Electricity} \times Electricity_p \} \end{aligned} \tag{6.11}$$

6.6.4 Recovery Time and Cost

Computing the probability of damage to each sector of the economy provides the first step in calculating indirect loss. However, it does not indicate the amount of time or money needed to recover the economy to its full capacity. Since economic loss occurs due to physical damage to the built environment that hinders the ability of economic sectors to perform, physically recovering the built environment would consequently lead to the recovery of the economy. Therefore in order to calculate the recovery time and cost for the economy to return to its full capacity, the time needed to repair the physical damage needs to be calculated.

Physical damage to each of the aspects of the built environment being analysed occurs due to physical damage to their components. Therefore, recovering the physical damage can be achieved through repairing the damaged components in each district. Thus the recovery cost of each district can be taken as the direct economic loss DL_{Total} calculated from Equation (6.5), which computes direct loss as a function of repair cost.

Nonetheless, using direct economic loss DL_{Total} presents the loss to each district and not to each economic sector. To overcome this, employment is used in a similar manner to decompose district damage into sector damage P_{sector} in Equation (6.9), in order to alter district repair cost into sector repair cost RPC_{sector} as shown in Equation (6.12). Thus, in order to recover a sector to its full capacity, RPC_{sector} needs to be invested into the sector.

$$RPC_{sector} = \sum_{district=1}^{56} \frac{DL_{Total} \times Employment_{sector,district}}{\sum_{district=1}^{56} \sum_{sector=1}^{32} Employment_{sector,district}} \tag{6.12}$$

RPC_{sector} provides the present day value of the recovery cost, but the recovery time needs to be calculated in order to adjust RPC_{sector} for inflation to take into account the time-value of money. Time value of money accounts for the decrease in monetary value over time due to changes in inflation rates. Thus the longer the recovery time the greater the injection of money needed to recover the economy.

Similarly to calculating the recovery cost, recovery time is calculated as the time needed to recover each individually damaged component. The first component damage that is analysed is that to buildings. According to HAZUS, the time of recovery is known as loss of function LOF_{ds} and is computed as a function of the damaged building's construction and clean up time BCT_{ds}, and a construction time modifier MOD_{ds}, as shown in Equation (6.13). Nonetheless, values for MOD_{ds} and BCT_{ds} published in HAZUS are only applicable to the US, since the construction industry in the US differs greatly from that of Egypt. Moreover, the building classes described in HAZUS differ from those in Egypt. Therefore, values for MOD_{ds} and BCT_{ds} need to be established for Egypt.

$$LOF_{ds} = BCT_{ds} \times MOD_{ds} \tag{6.13}$$

CAPMAS (1998) classifies building occupancy in Greater Cairo according to six occupancy classes; building, house, rural house, villa, office or shop. Moreover HAZUS categorizes each of the six building occupancy classes into five structural systems; reinforced concrete, precast, masonry with concrete slabs, masonry with other slabs, and masonry or adobe buildings. The distribution of buildings at each district according to the six occupancy classes and their structural systems is published in CAPMAS. In order to establish building construction time BCT_{ds} and MOD_{ds} construction time modifiers for each building occupancy class, the expertise of various engineering consultancies in Egypt were used. Meetings were conducted with engineering consultancies (Space Consultants, 2010; Dar El Handasa, 2010), and according to their experience in building various occupancy classes, the building construction time BCT_{ds} and construction time modifiers MOD_{ds}, shown Table 6-18 and Table 6-19 respectively, can be established.

Table 6-18 Building construction time (days)

	None	Slight	Moderate	Extensive	Complete
Building	0	90	240	450	720
House	0	60	180	210	330
Rural House	0	60	150	180	270
Villa	0	60	180	240	360
Office	0	90	240	450	720
Shop	0	60	180	240	360

Table 6-19 Construction time modifier

	None	Slight	Moderate	Extensive	Complete
Building	0	0	0.5	1	1
House	0	0	0.5	1	1
Rural House	0	0	0.5	1	1
Villa	0	0	0.5	1	1
Office	0	0.1	5	0.6	0.7
Shop	0	0.1	0.1	0.3	0.4

According to HAZUS most businesses that experience slight damage will continue to operate, whereas businesses that experience moderate damage might take a day to clean up after which they will continue to operate as normal. This assertion is valid for Egypt especially due to the casual nature at which most businesses operate, and which applies also to safety and security aspects. It is expected that unless extensive or complete damage is experienced, most businesses will continue to operate. Therefore, the business loss of function for each occupancy class can be calculated based on Equation (6.14)

$$LOF_{occupancy} = \sum_{ds=4}^{5} LOF_{ds} \times DDP_{ds} \tag{6.14}$$

Knowing the probability of damage as well as the loss of function of each occupancy, $LOF_{occupancy}$, allows for computation of total recovery time. CAPMAS (1998) provides the number of buildings in each occupancy class in each district. Therefore, knowing the number of buildings in each district according to occupancy, the total recovery time can be calculated as shown in Equation (6.15). Equation (6.15) computes the building recovery time at district level.

$$BRT_{district} = \frac{\sum_{occupancy=1}^{6} LOF_{occupancy} \times NOB_{occupancy}}{\sum_{occupancy=1}^{6} NOB_{occupancy}} \tag{6.15}$$

In addition to building recovery time $BRT_{district}$, natural gas and electricity recovery time also needs to be calculated. Recovery time for natural gas and electricity is simpler to establish since large civil lifeline projects in Egypt are typically constructed or designed by international companies with the aid of Egyptian partners, following international standards, making data easier to find. Examples of international companies carrying out large lifeline projects include; the Greater Cairo metro carried out by French group Vinci, and design and construction of all Egyptian electricity stations carried out by US based company Bechtel. Due to the added levels of quality control and safety procedures that take place in the design and construction of lifelines in Egypt, restoration functions found in HAZUS for natural gas and electricity components can be considered applicable for use in Egypt.

According to HAZUS natural gas pipelines and compressor stations are assumed to recover when experiencing total damage in 30 and 100 days respectively. Since the damage to pipelines and compressor stations are assumed as complete, and not allowing for any functionality, then the restoration time for natural gas pipelines and compressor stations RT_{Pipe} and $RT_{compstation}$, can be calculated as a linear function of the probability of damage of the pipeline and stations respectively as shown in Equations (6.16) and (6.17).

$$RT_{Pipe} = 30 \times P_{pipe} \quad \text{(days)} \tag{6.16}$$

$$RT_{compstation} = 100 \times P_{station} \quad \text{(days)} \tag{6.17}$$

Using a linear recovery function assumes the availability of unlimited resources. This assumption is valid if the damage in the network does not exceed the resources available to repair it. However, if this is not the case then resources are assigned to repair components that optimise the recovery of the economy, thus creating a non-linear recovery process. The non-linear recovery can be accounted for through either the repair of the damaged components in the built environment, or through the recovery of economic sectors. Accounting for the non-linearity through the repair of the damaged components entails linking the recovery of all aspects of the built environment, as well as re-evaluating the damage model at every recovery step, which is computationally impractical within the time frame of this study and the available computational resources. Accordingly, the non-linearity is accounted for through optimising the recovery of the economic sectors, and this process is discussed later in this chapter.

When damage occurs to a component in the natural gas network, the damage will not necessarily cause losses in the district in which the component physically lies, but through the identification of minimum cut sets as described in Chapter 5 and the stations that feed each district, losses at district level can be estimated. Recovery time at district level needs to be calculated in a similar manner. Each station has a number of minimum cut sets, and when damage to any component in a stations' minimum cut sets takes place, the station is out of service. Accordingly, recovery of a station to its full capacity will only take place when the component in its minimum cut sets that requires the greatest recovery time is fully recovered as shown in Equation (6.18). Moreover, districts will only receive their full natural gas supply, when their supplying stations are operating at fully capacity. Therefore, the recovery time of each district in terms of natural gas supply $GRT_{district}$ is dominated by the maximum recovery time of the stations that supply them as shown in Equation (6.19).

$$RT_{station} = \max\left(RT_{compstation}, RT_{pipe}\right)_{\text{minimum cutsets}} \tag{6.18}$$

$$GRT_{district} = \max\left(RT_{station}\right)_{\text{supply}} \tag{6.19}$$

Analysing the electricity network involves a more complicated procedure than that of the natural gas network. The reason for this is that, as previously stated, minimum cut sets cannot be identified for each substation since other criteria exist in evaluating the functionality of the substation. Therefore, conducting a full electricity network power flow analysis is mandatory. Evaluating the electricity network in this manner prevents the model from being able to estimate the recovery time of the network based on damage to the lower level components; transformers, buses, circuit breakers and disconnect switches. The reason for this is that the model is incapable of tracing back and identifying which components directly led to a given station being out of service. To overcome this problem, the restoration of the electricity network is evaluated at station level rather than component level.

Since the design and construction of substations and generating stations in Egypt is conducted by PGESCo, and as previously stated PGESCo is a Bechtel affiliated company, specifications relating to design and construction are usually based on US standards. Moreover, components operating in the stations are not produced in Egypt, but simply imported and installed. Examples of these include German based company Siemens's turbine at Sidi Krir station, and French based company Alstom's turbine at Eltebeen station. Accordingly, due to the influence of US standards on the electricity network in Egypt, use of HAZUS becomes applicable.

Figure 6.7 presents the restoration curve for electricity substations in HAZUS. Since the probability of failure of each station $P_{Station_{Final}}$ is calculated in Chapter 5, Figure 6.7 can be used to estimate the restoration time of each station. Figure 6.7 is based on complete damage of the substation, which is a valid assumption since the probability of damage to the station components is calculated assuming no functionality of the component. It should be noted that the restoration curve developed by HAZUS, and shown in Figure 6.7 assumes that electricity component stock is available. Nonetheless, since new components might not be available to replace damaged ones, a lag could take place. Moreover, since Egypt imports most of the components of the electricity network, this lag is expected to be greater than that associated with the US. Accordingly, further studies need to be conducted to ensure that the restoration curves better reflect the true nature of an earthquake event.

Similarly to the natural gas network, individual districts will not necessarily experience electricity outages if a substation located in the district fails. Since the district needs only one station to supply it, then the recovery time of the district is the minimum recovery time of the stations that supply it as shown in Equation

$$ERT_{district} = \min(RT_{electricity\ station}) \tag{6.20}$$

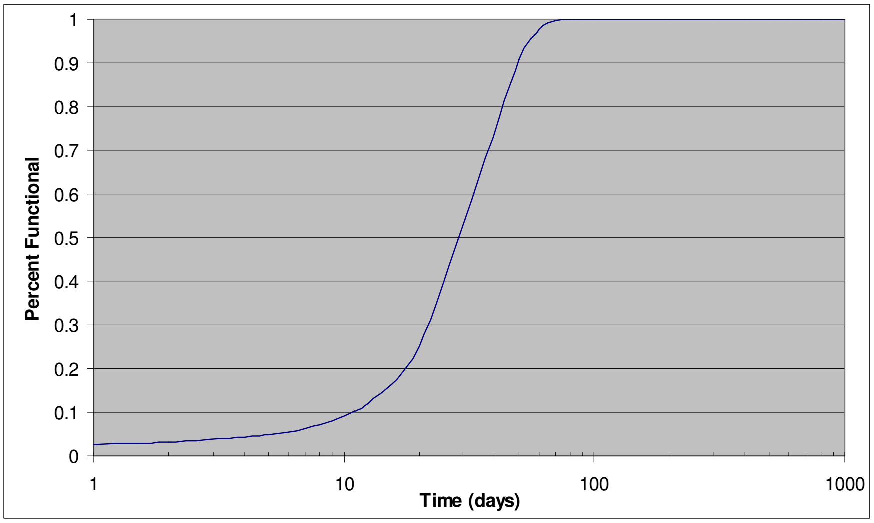


Figure 6.7 Restoration curve for electricity substation (HAZUS FEMA, 2003)

Knowing the restoration time of each aspect of the built environment at each district, the restoration time of the economic sectors can be calculated. Each district will only be able to operate fully once the district's buildings have fully recovered, and its supply of electricity and natural gas is up to demand. Therefore the total recovery time of each district is calculated as the maximum recovery time of each aspect of the built environment.

$$RT_{district} = \max(BRT_{district,} GRT_{district,} ERT_{district,}) \tag{6.21}$$

Nonetheless, the recovery time for each district $RT_{district}$ needs to be translated into a recovery time for each economic sector. Similarly to translating the replacement cost RPC_{sector} from district level to sector level, employment weight in each district is used to translate recovery time in a similar fashion, as shown in Equation (6.22).

$$RT_{sector} = \sum_{district=1}^{56} \frac{RT_{district} \times Employment_{sector,district}}{\sum_{district=1}^{56} \sum_{sector=1}^{32} Employment_{sector,district}} \tag{6.22}$$

The recovery time provides the model a basis for computing the distribution of recovery cost over the entire recovery time period. Moreover, it presents a method for accounting for the time value of money, throughout the recovery process. Both of these observations and procedures for accounting for them in the model are described in the following sections.

6.6.5 Import and Export Adjustment

Allowing for flexibility in import and export adjustments conveys the inherent resiliency in an economy. Once a natural disaster occurs, the economy will attempt to readjust itself to minimise the losses it experiences. In order to minimise the losses resulting from forward linkages, sectors will attempt to increase their imports of goods usually provided by damaged sectors. Moreover, certain sectors will also attempt to increase their exports in order to minimise losses occurring from backward linkages. Table 6-8 provided an example of a flexible economy, where an economy reduces its expected losses through adjusting its exports by 60 percent, and its imports by 35 percent. These values are arbitrary and chosen to illustrate the example. In reality, these values are not adjusted as fixed values, but the adjustments take place over time. This reflects the true nature of the economy where sectors are incapable of increasing their imports and exports within an unconstrained manner. Each sector will gradually increase its imports and exports over the recovery period.

In order to compute the maximum limits for import and export increases, the trade history of each economic sector needs to be analysed. Import and export data for the Egyptian economy is collected from the International Trade Centre (ITC) for a 5 year period (2005-2009). The trend for the value of exports in crop agriculture is shown in Figure 6.8. Up until 2008 there has been a general increase in the value of exports in crop agriculture, however this trend changes in 2009 when export values decrease by just over 20 percent. This large drop occurs in 2009 in most economic sectors in Egypt. This drop can be attributed to the global financial crisis that began in 2007 with the collapse of various large financial institutions. The Egyptian stock market index EGX30 had reached 11922 points in May of 2008, and in less than one year the index had plummeted to 3473 points by February 2009, losing over 70 percent of its value (Figure 6.9). This clearly illustrates that Egypt has not been immune to the financial crisis, and drops in import and export values that took place during that period can be directly attributed to the financial crisis.

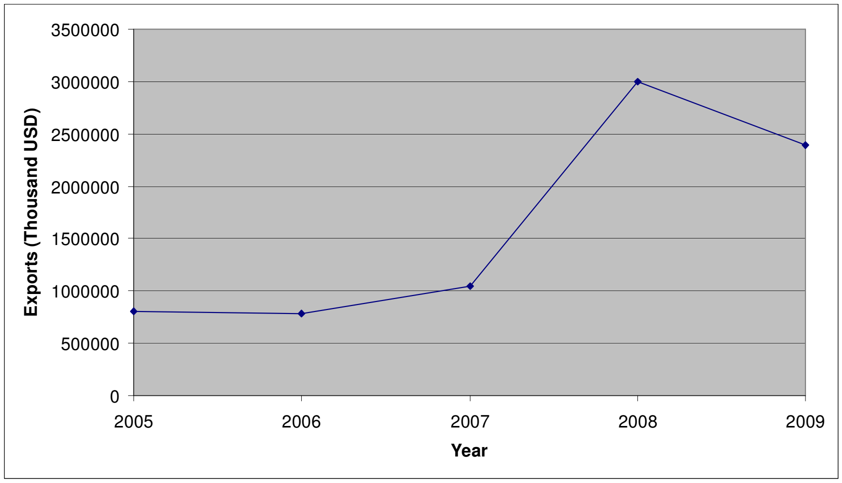


Figure 6.8 Export value for crop agriculture for the years between 2005 and 2009

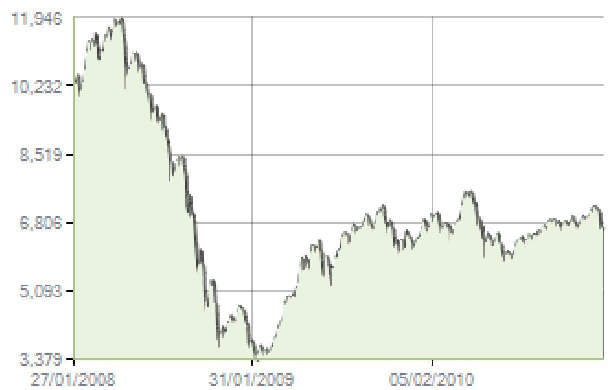


Figure 6.9 Egyptian financial market EGX30 index from 2008 to 2011

Egypt's ability to increase its import and export levels is hindered by its main import and export partners; the United States and the European Union. According to the MOF (2010), 60 percent of Egypt's exports in the fiscal year 2008/2009 was to the US and EU. The US has experienced a loss in real GDP of 2.6 percent in 2009 (World Bank, 2010), whereas the EU has experienced a GDP loss of 4.2 percent in the same year (Eurostat, 2010). This means that even though the economy might have the capability to increase its production in an attempt to increase exports, due to backward linkages to the US and EU it is incapable of doing so.

The maximum limit for imports and exports is shown in Table 6-20. These limits are calculated based on the trends of each sector, and their previous high levels prior to the occurrence of the financial crisis. Moreover the GDP losses of the US and EU are accounted for by subtracting a conservative 5 percent from each sector's potential maximum imports and exports. The 5 percent was chosen based on the EU's 4.2 percent GDP loss in 2009. These values are conservative and will not lead to an underestimation of the financial losses since the recovery of these percentages will not take place instantaneously at the onset of the event, but gradually over the entire recovery period.

The process for recovering the economy in terms of how the adjustments in imports and exports will be applied, as well as the injection of recovery cost is described in the following section.

Table 6-20 Export and import limit percentages

Egyptian Economic Sectors	Exports (Percentage)	Imports (Percentage)
crop agriculture	15.35	20.41
animal agriculture	0.86	20.68
cotton ginning	33.10	0.00
mining and quarries	73.08	100.00
crude petroleum and natural gas	65.12	100.00
food industries	10.22	33.29
beverages	0.00	100.00
cigarettes and cigars	100.00	0.00
spinning and weaving	18.71	0.00
ready-made clothing and leather shoes	0.00	0.00
wood and wooden furniture	65.28	0.00
paper, cardboard, and related products	80.86	29.79
printing and publishing	0.00	5.99
leathers and leather industries	0.00	0.00
rubber and related products	49.07	40.39
chemical industries	75.06	63.23
petroleum products	70.83	100.00
coal refining products	100.00	37.71
non-metal industrial products	0.00	77.48
basic metal industries	100.00	100.00
metal products	100.00	100.00
non-electric machines	0.00	0.00
electric machines	97.14	0.00
transportation industry	31.23	0.00
miscellaneous industries	100.00	89.86
Electricity	0.00	0.00
construction and maintenance	100.00	0.00
transportation and communications	0.00	0.00
trade, finance, and insurance	0.00	0.00
restaurants and hotels	0.00	0.00
housing and facilities	0.00	0.00
other personal services	0.00	0.00

6.6.6 Recovery Process

Recovery from natural disasters involves more than just replacing and reconstructing damaged components at random, but involves a detailed methodology that highlights the order in which sectors should be recovered. Due to backward and forward linkages, recovering a sector could lead to zero, or suboptimal, recovery of the economy.

To illustrate this notion, the example in Table 6-8 could be used. The example is given for an economy whose construction sector is operating at 90 percent. If the manufacturing sector is assumed to be operating at 95 percent, due to backward and forward linkages, the manufacturing sector will have to drop its production to the 90 percent level since the construction sector acts as a bottleneck. If the government initially attempts to recover the manufacturing sector, the physical components of the sector might be fully recovered; however, the sector will have to continue to operate at 90 percent since the construction sector continues to act as a bottleneck. This will lead to further losses in the economy since a GDP loss is still taking place. However, if the available recovery money is used to recover the construction sector, then the economy will be operating at 95 percent after the first round of recovery, rather than 90 percent. This example highlights the importance of creating a system that not only notes which sectors need recovery, but the order in which they should be recovered.

The recovery process is designed to optimize the performance of the economy, and minimise losses. This is done by systematically recovering the sectors that are creating bottlenecks in the economy due to backward and forward linkages. Once a sector no longer acts as bottleneck, the sector that replaces it is then recovered. This process is repeated until the economy is fully recovered. Even though this framework presents governments with an optimal recovery process, a government's decision making might be influenced by other factors, such as political motives. The exact steps for undergoing this process are described below.

Step 1

The first step in recovering the economy is to compute the cost per percentage and time per percentage of recovery for each sector.

$$CPP = \frac{RPC_{sector}}{(1 - P_{sector})100} \tag{6.23}$$

$$TPP = \frac{RT_{sector}}{(1 - P_{sector})100} \times P_{construction} \times Efficiency \tag{6.24}$$

where CPP and TPP are the cost per percentage recovery and time per percentage recovery respectively. This assumes that the cost and time recovery is linear for each sector. Since the construction sector plays an essential part in the recovery of other sectors, the level of damage to the sector $P_{construction}$ affects the recovery time of other sectors, as can be seen from Equation (6.24). The *Efficiency* term accounts for the efficiency in recovering the sector, and is further discussed in Chapter 7.

Step 2

Once the cost per percentage recovery and time per percentage recovery are computed, the percentage recovery needed to lift the most damaged sector to the level of damage of the second most damaged sector is calculated.

$$P_{recovery} = P_n - P_{n-1} \tag{6.25}$$

where the sectors are sorted in order of least to most damaged, such that *n* is the most damaged sector, and *n-1* is the second most damaged. Based on the recovery percentage calculated in Equation (6.25), the time of recovery of the sector associated with the most damaged TR_{sector} and cost of recovery of the sector CR_{sector} is calculated using Equations (6.26) and (6.27) respectively.

$$TR_{sector} = P_{recovery} \times TPP_{sector} \tag{6.26}$$

$$CR_{sector} = P_{recovery} \times CPP_{sector} \tag{6.27}$$

Moreover, the probability of damage of the recovered sector is adjusted according to the level of recovery as shown in Equation (6.28).

$$P_{sector_{i+1}} = P_{recovery_i} + P_{n_i} \tag{6.28}$$

This initial recovery is shown in Figure 6.10 (a). This recovery is linear in nature and illustrates the recovery of the economy through the recovery of the most damaged sector to reach the damage level of the next most damaged sector.

<u>Step 3</u>

The total recovery time and cost of the adjusted sector is recalculated based on the time and financial investments already put into the sector.

$$TPP_{sector_{i+1}} = TPP_{sector_i} - TR_{sector_i} \tag{6.29}$$

$$CPP_{sector_{i+1}} = CPP_{sector_i} - CR_{sector_i} \tag{6.30}$$

<u>Step 4</u>

The IO table is adjusted based on the damage levels after recovery $P_{sector_{i+1}}$, and import and export adjustments are conducted. This adjustment in economic sectors based on import and export lead to a non-linear recovery of the economic sectors as shown in Figure 6.10 (b).

<u>Step 5</u>

The total output level is calculated after recovery from the IO table, and is subtracted from the expected GDP level at the same time period.

$$Loss_i = GDP_i - Total\ Output_i \tag{6.31}$$

Step 6

The recovery cost per sector per time interval is noted. Steps 1 to 5 are then repeated until all sectors are fully recovered. Figure 6.10 (c) illustrates the recovery of the now most damaged economic sectors to reach the level of the currently second most damage sector. This is repeated until the economy is completely recovered as shown in Figure 6.10 (d). The total loss over the recovery period is calculated based on Equation (6.32).

$$Total\ Indirect\ Loss = \sum_{i=1}^{n} Output_{original} - Output_i \tag{6.32}$$

where n denotes the number of time intervals needed to achieve full recovery of the economy, the $Output_{original}$ indicates the total economic output prior to the occurrence of an earthquake, and $Output_i$ is the total economic output at time i after the event.

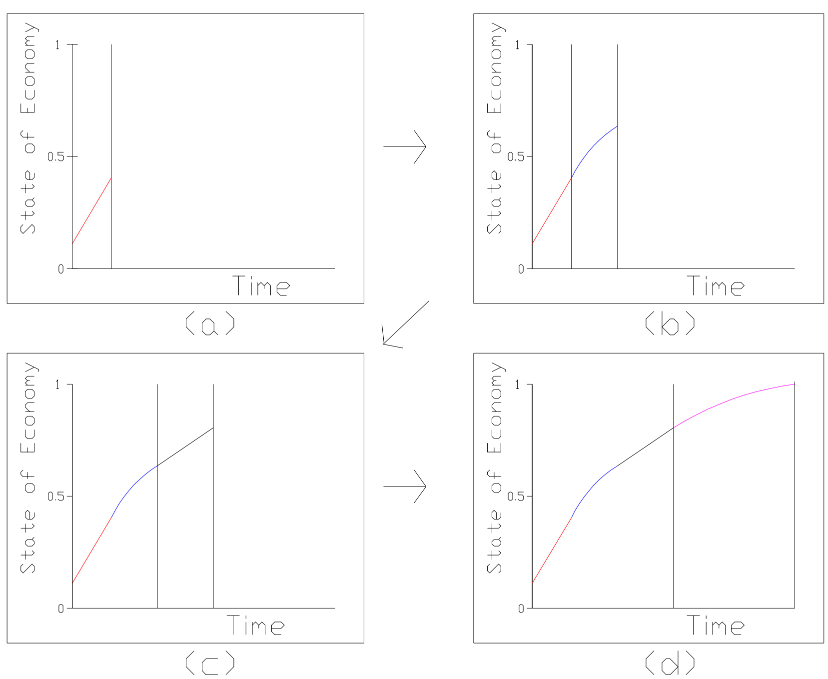


Figure 6.10 Schematic diagram illustrating the economic recovery process

This process not only calculates the total indirect financial loss through Equation (6.32), but also offers a way of mitigating the potential losses. During the occurrence of a natural disaster a lot of investments are randomly dispersed, however this model highlights the importance of systematically investing the available resources, in order to minimise potential losses.

6.7 Concluding Remarks

The model described in this chapter provides a novel approach to loss modelling. Not only are indirect losses accounted for rather than being overlooked as in most studies, but losses are also estimated for damage to various aspects of the built environment rather than just a single aspect.

The process for modelling the recovery is unique since it was developed for the first time for this study. Importantly, its applications span beyond Egypt, and can be used in any economy. However, a couple of problems exist with the development of a novel model. The first of which is the lack of case studies available to test the model. This stems from the fact that in the 1992 Dahshour earthquake there was limited information regarding the resultant economic losses, therefore eliminating the possibility of testing the model to ensure that the estimated financial losses are similar to the realised losses.

The second problem that exists is convincing decision makers that creating a system that controls the destination of investments after the occurrence of natural disasters mitigates the potential losses. Post-disaster political motives play an important role in decision making, especially regarding financial decisions. Governments focus on recovering aspects of the economy that might appear important to the economy due to the attention they receive. Moreover, national aspects that receive more media attention than others, might also receive greater governmental focus than their counterparts. Thus, convincing government entities and decision makers that the recovery process should not be driven by political motives also poses a challenge.

Creating a flexible model for the economy that is capable of adjusting its inputs and outputs based on flexibility in imports and exports is an important step in conveying the resilient nature of the economy. Other variables exist that convey the resiliency of the economy, including working overtime, shifting production, as well as utilising the unemployed population and importing workers to speed up the recovery process and minimise losses. Accounting for imports and exports provides a first step in building a novel model that can be expanded to account for other variables in future studies. Additionally, the model assumes that the recovery will start immediately after the occurrence of an earthquake, even though there is a chance that building standards and design codes might be modified. Estimating the lag time between the occurrence of an earthquake and the initiation of the recovery process can be explored in future studies.

Chapter 7

Loss Estimation

7.1 Overview

This chapter evaluates the financial losses in the Egyptian economy resulting from earthquake induced damage to three features of the built environment; the building stock and the electricity and natural gas lifelines. Thus, the work presented in the previous chapters forms the basis from which this chapter evaluates losses. Losses are estimated for each of the 1500 ground-motion scenarios evaluated in Chapter 3, with the likelihood of each scenario used in order to create an annual loss recurrence relationship.

Losses, as previously stated, can be classified as being either direct or indirect. This chapter estimates each of these types of loss, comparing the contribution of each to the total loss. This provides a means for evaluating the relationship between direct and indirect losses, and assessing for each scenario which type of loss dominates the total loss estimation. Moreover, direct losses are evaluated according to the replacement cost of the building inventory, and electricity and natural gas lifelines, in order to understand which of the features of the built environment is most vulnerable, and poses the greatest potential loss for the Egyptian economy. Moreover, the direct losses are evaluated by district. This can be used to prioritise districts according to their vulnerability, in order to identify districts that are in need of infrastructure improvements. The direct losses are integrated over each district and type, in order to estimate a total direct loss. Indirect losses are evaluated according to economic sectors. This aids in mitigating potential losses by highlighting the sectors that are most dependent on the different features of the built environment, and recommending methods of reducing this dependency.

In order to assess the influence of the efficiency of the recovery process, the efficiency of the reconstruction process is adjusted systematically and a sensitivity analysis is conducted. This highlights the importance of organizing the workforce as quickly as possible to ensure swift recovery of the economic sectors.

One of the most challenging elements of this study is ensuring that the evaluated losses are reflective of the nature of damage and the Egyptian economy. In order to accomplish this task two sources are used as benchmarks to compare the evaluated losses to. The first of these sources is the findings of Moharram (2006), who conducted an earthquake loss estimation study for Greater Cairo. This study only took into account direct economic losses caused by damage to buildings in a scenario based approach. The second method involves examining notable events in recent history that have affected the Egyptian economy, and evaluating the losses that resulted from these events. The most notable of these events is the 2011 Egyptian revolution, that began on the 25th of January 2011 and resulted in the overthrow of Egyptian president Hosni Mubarak on February 11th 2011. During this 18 day period the economy was at a near standstill, resulting in significant financial losses. This event provides an insight into the potential economic losses that could take place.

The findings in this chapter present policy makers with an important tool for reducing potential earthquake loss by highlighting features of the built environment that require upgrading. Moreover, insurance companies are able to use these findings to mitigate their risk, or transfer the risk to another entity.

7.2 Hazard Assessment

In order to estimate direct economic losses in Greater Cairo, and indirect economic losses affecting the Egyptian economy, an assessment of ground motion is required. Developing hazard curves for Greater Cairo districts aids in understanding the expected losses in each district for various ground-motion levels and event likelihoods.

Figure 7.1 presents the map of Greater Cairo showing the districts of Al Zawya Alhamra, Al Mosky and Khalifa that are analysed in this section. Figure 7.2 presents the hazard curves for Al Zawya Alhamra district in the governorate of Cairo. It is clear that the differences in hazard estimates found from the different ground-motion models vary with the response period being analysed. For shorter response periods the variability in the hazard curves between the three ground-motion models are small, where at 0.01 seconds response period the difference in ground-motion between the largest estimates of ground-motion and the smallest does not exceed 20 percent. On the other hand, for longer response periods the variability increases drastically, with the difference between the smallest and largest estimates of ground-motion reaching up to 250 percent. Moreover, it is evident from Figure 7.2 that AS08 estimates lower levels of ground-motion for longer response periods. On the other hand, for response periods of 0.3 and 0.5 seconds, BA08 estimates higher ground-motion levels than the other two ground-motion models for moderate-to-high seismicity level events that have a higher return period.

According to Figure 7.2, the PGA level for a 475 year return period is 0.1g for the district of El Zawya Al Hamra. This value is lower than the Egyptian code estimation of 0.27g. This could be attributed to the inclusion of events from the Hellenic and Cyprian arcs in the earthquake catalogue for this study which produce low ground-motion levels. The Egyptian code on the other hand uses two elastic response spectrums, one for the northern Mediterranean region which includes events from the Hellenic and Cyprian arcs, while another for the rest of Egypt and Cairo which does not include events from these sources. This leads to the increase in the estimation of ground-motion levels due to the exclusion of events from the Hellenic and Cyprian arcs which increase ground-motion levels throughout Greater Cairo.

Figure 7.3 presents hazard curves for Al Zawya Alhamra, Al Mosky and Khalifa districts using AB10. It is clear that Khalifa district experiences lower levels of ground-motion than the other districts. This is primarily attributed to Khalifa district having stiffer soil and being classified as a site class B according to the NEHRP (2000), whereas Al Mosky and Al Zawya Alhamra are classified as site classes E and D respectively. Moreover, since Al Mosky has softer soil than Al Zawya Alhamra, it experiences greater levels of ground-motion throughout its hazard curve.

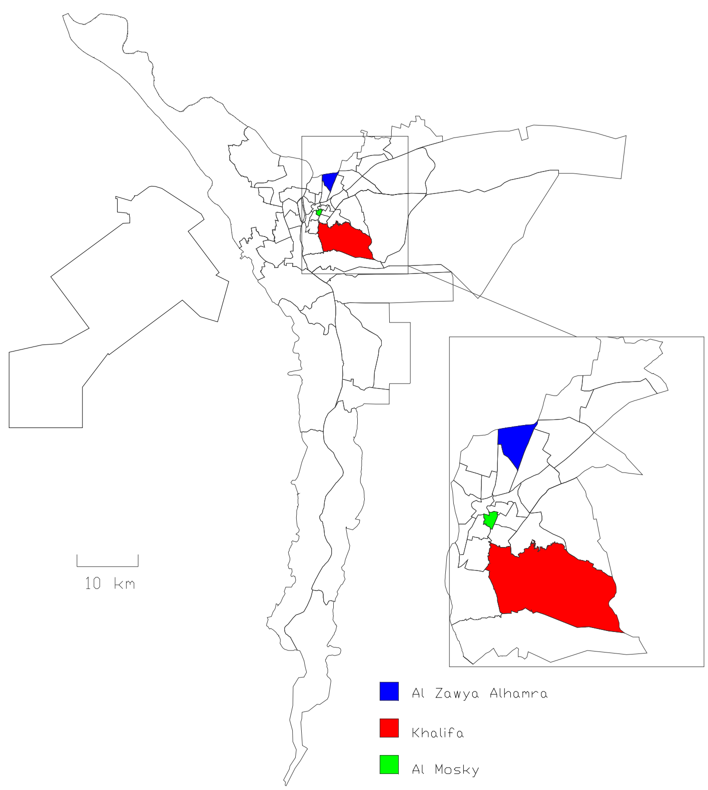


Figure 7.1 Map of Greater Cairo showing the districts of Al Zawya Alhamra, Khalifa and Al Mosky

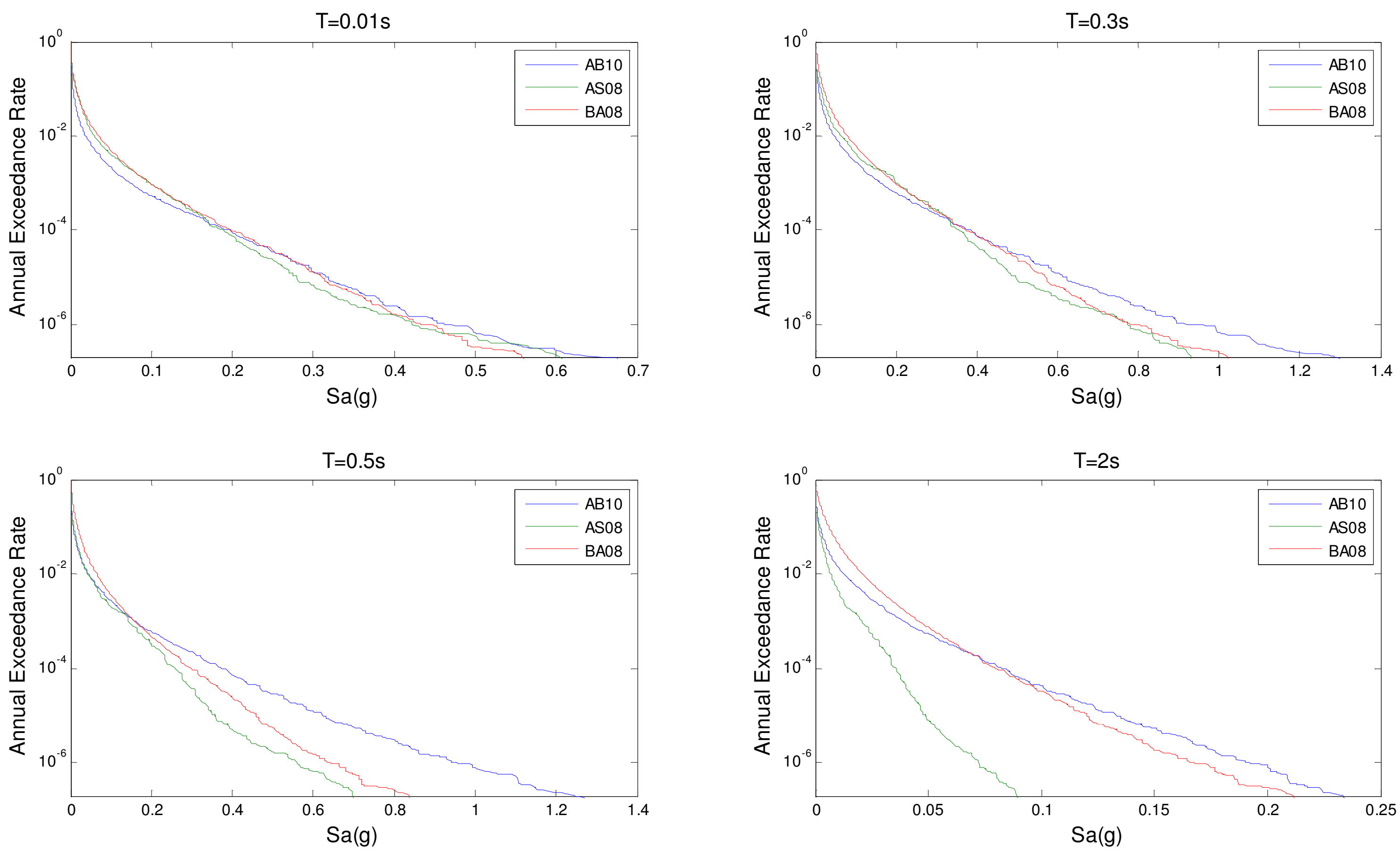


Figure 7.2 Hazard curve for El Zawya Al Hamra district for all three ground-motion maps, for a) 0.01, b) 0.3, c) 0.5 and d) 2 seconds periods

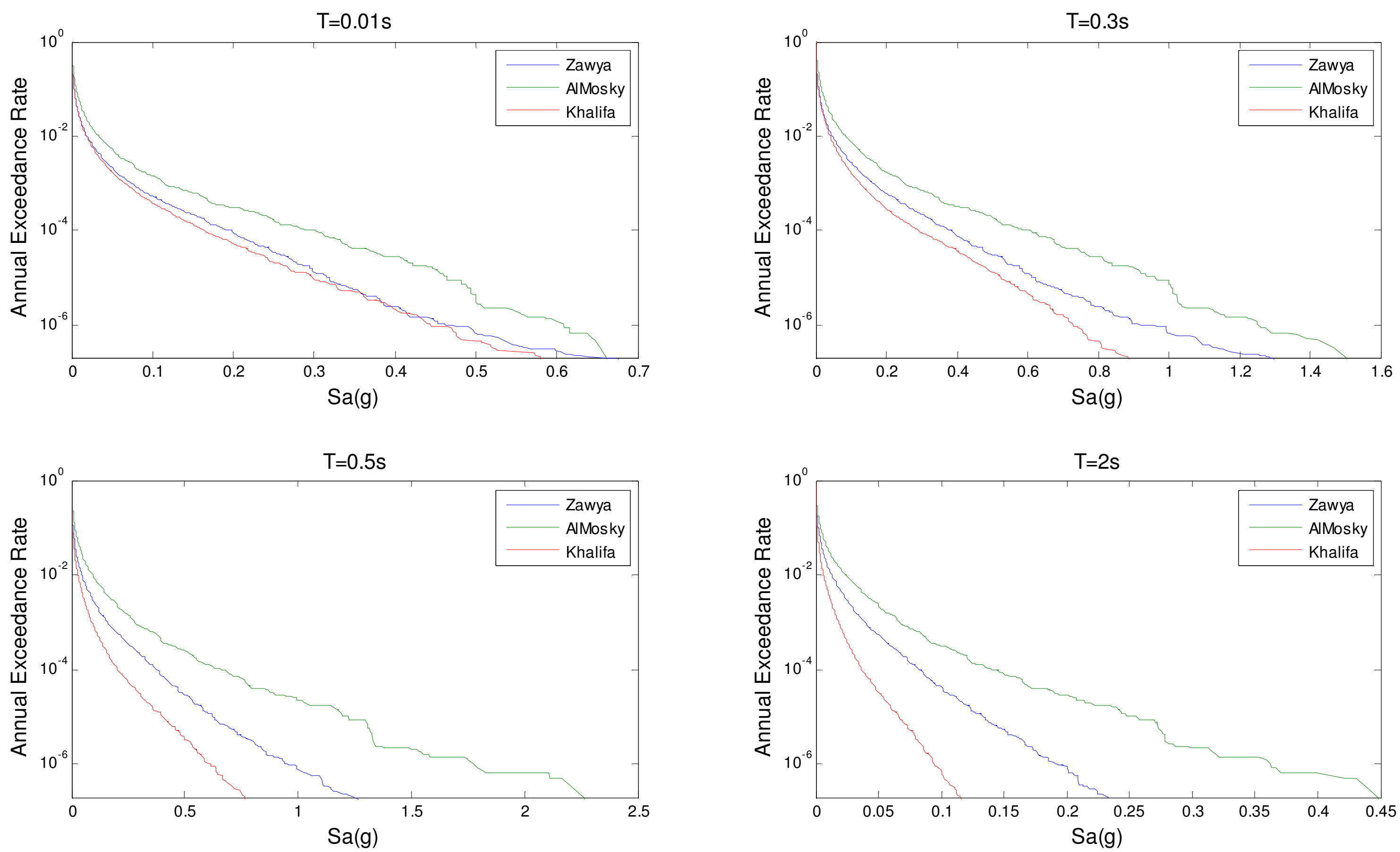


Figure 7.3 Hazard curve for El Zawya Al Hamra, Al Mosky and Khalifa districts,using AB10 for a) 0.01, b) 0.3, c) 0.5 and d) 2 seconds periods

7.3 Direct Losses

7.3.1 Overview

Direct economic losses are estimated based on the replacement cost of damaged elements of the built environment. In this study these elements are attributed to the building stock, natural gas or electricity lifelines. Damage to elements in the built environment is estimated using fragility curves, based on ground-motion of sites in Greater Cairo. This estimation takes place for each of the 1500 ground-motion map clusters, computed in Chapter 3.

Throughout this chapter, cluster map 323 is treated as a scenario, and the same analysis could be conducted for any cluster. Figure 7.4 illustrates the ground-motion for cluster map 323 for a response period of T=0 .01 seconds, i.e., PGA. The average spectral acceleration of cluster map 323 is one of the largest of the 1500 maps, and the spectral accelerations for all the districts in the map are shown numerically in Appendix F. This cluster has a return period of approximately 10,000 years. The reason for this is that it is dominated by earthquake scenarios from Zone 3, which represents the Pelusiac trend, which is the zone closest to Greater Cairo, and the source of the most damaging event in Greater Cairo in the 20th century, the 1992 Dahshour earthquake. Moreover, cluster map 323 encapsulates the larger magnitude events from Zone 3, of approximately M_w =5.9. Since the distance metric R_{jb} is at a minimum level, and for some events less than 1 km, and the magnitude metric M_w is at the maximum level possible for the corresponding R_{jb} values, the spectral accelerations at the sites are expected to be at a maximum possible level, therefore the expected loss levels are also expected to be greater than other clusters.

The spectral accelerations at each site are estimated for each of the three ground-motion models used in this study, as shown in Figure 7.4 (a), (b), and (c) for AB10, AS08 and BA08 respectively, and the losses are estimated for each of the models.

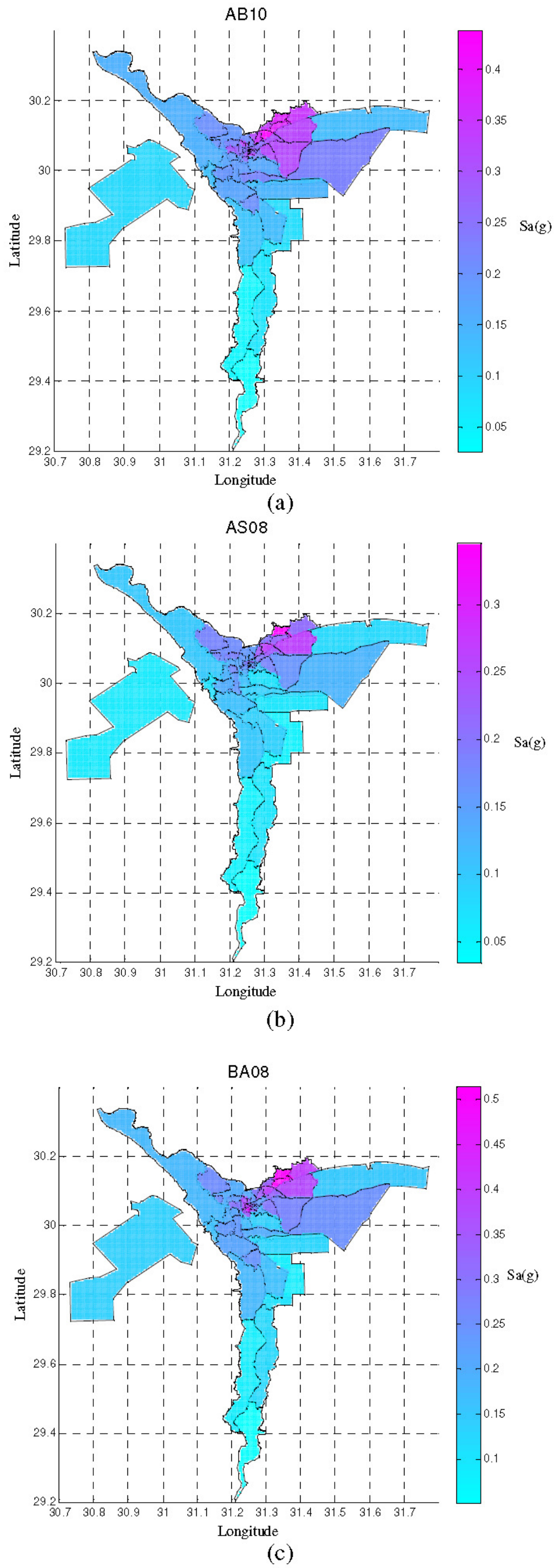


Figure 7.4 Ground-motion maps for cluster 323, for T=0.01 seconds for a) AB10, b) AS08 and c) BA08

7.3.2 Building Inventory

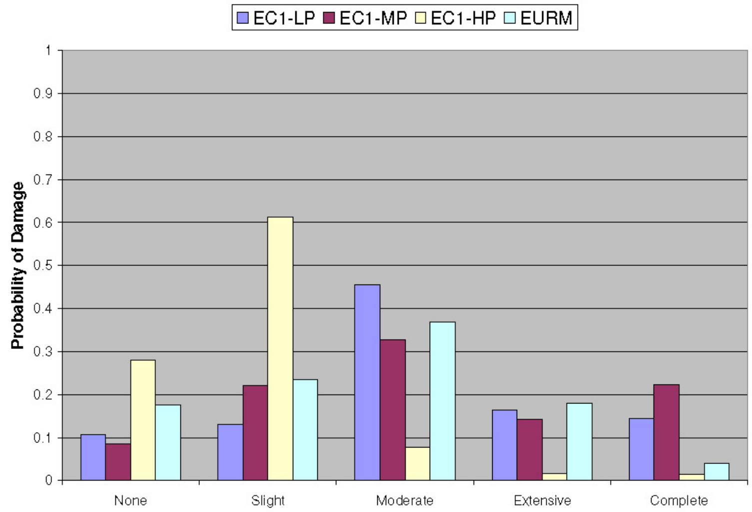
Damage to the building inventory is expected to comprise the greatest levels of direct economic loss, and therefore deserves comprehensive analysis. The reason for this is the extensive number of structures in this feature of the built environment compared to lifeline systems. Moreover, as discussed previously the building stock inventory in Greater Cairo is compromised mostly of structures that have been designed with little or no seismic provisions, and are thus vulnerable to seismic events.

Each of the building classes in Greater Cairo experience different levels of damage. Figure 7.5 illustrates the probability of falling in each of the damage states for Rod Al Farag district for cluster map 323 for each of the three ground-motion models. Of the three reinforced concrete building classes, the Mean Damage Ratio (MDR) is greatest for the medium rise RC building class EC1-MP, while the high rise class EC1-HP performs the best and has the lowest MDR. This could be attributed to the fact that high rise RC structures are designed to withstand greater gravity loads, therefore have larger column dimensions, which in turn will perform better under seismic loads. Moreover, most of these buildings are more recently designed, and therefore take into account seismic provisions that EC1-MP and EC1-LP might not. The MDR values for EC1-LP and EC1-MP are significantly higher than the EC1-HP, with the EC1-LP experiencing a 38 percent MDR, and EC1-MP experiencing a 41 percent MDR compared to 11 percent MDR for EC1-HP for the AB10 ground-motion model. The high MDR for EC1-LP and EC1-MP reflects the fact that most structures in Egypt were designed prior to the introduction of seismic provisions. Furthermore, due to the longer natural period of EC1-HP buildings relative to EC1-LP and EC1-MP buildings, the associated spectral acceleration for this building class is lower than for EC1-LP and EC1-MP structures, therefore resulting in lower MDR for EC1-HP structures. Moreover, since most RC structures in Greater Cairo fall in these two categories, the vulnerability of the building stock inventory is high.

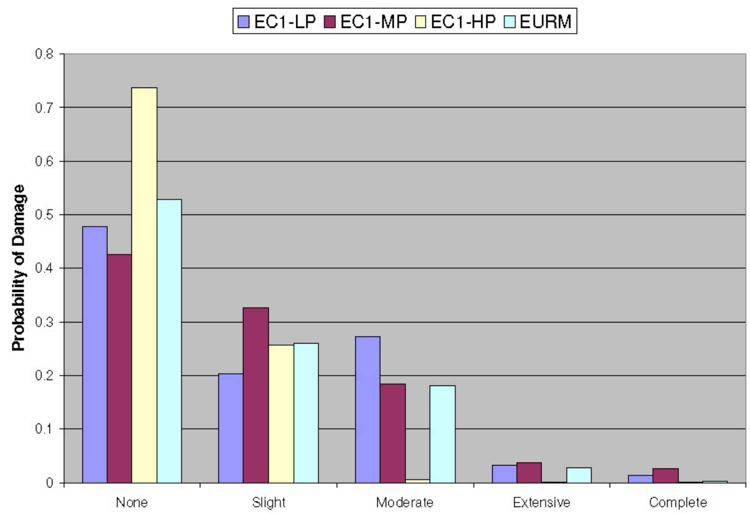
The MDR for the masonry structures EURM is 26 percent, 10 percent and 25 percent for the same cluster map for Rod Al Farag district for AB10, AS08 and BA08 respectively. This MDR is larger than its EC1-HP counterpart, illustrating that masonry structures are more vulnerable than high rise concrete structures. Nonetheless, the MDR values for EC1-LP and EC1-MP are larger than those associated with EURM, illustrating that low and medium rise concrete structures are more vulnerable than masonry structures. However, considering that masonry structures in Greater Cairo are poorly designed and constructed, the fragility curves used for HAZUS might not accurately reflect the behaviour of the structures. Masonry structures in Egypt lack adequate anchorage, connections between slabs and walls, as well as having small wall thickness, considering that most of these structures are load bearing. Since the fragility curves used in this study for masonry structures were derived for structures in the US that take into account seismic provisions in their design, they will not reflect the true damage to structures in Egypt. Therefore, a detailed study needs to be conducted, whose purpose is to derive fragility curves for the EURM building class in Greater Cairo. This task is beyond the scope of this study, whose primary focus is to develop an overall probabilistic earthquake loss assessment framework.

To account for the uncertainty in the vulnerability of the EURM building class in this study, a sensitivity analysis is conducted. The building losses are evaluated for various EURM fragility parameters. The EURM fragility curves are adjusted using 75 and 50 percent of the original mean levels as shown in Table 7-1. Based on this, exceedance curves for overall building losses are evaluated for each of the three EURM fragility curves as shown in Figure 7.6. According to Figure 7.6, the variability in building loss is greatest for slight to moderate annual exceedance rates. For a 10 year return period, the building loss for 50 percent of the HAZUS EURM mean for AB10 is 600 percent greater than that for the original HAZUS EURM fragility, whereas for a 10,000 year return period this percentage drops to 30 percent. This observation can be attributed to EURM structures experiencing severe damage for slight and moderate ground-motion levels at 50 percent of the HAZUS mean. At slight and moderate ground-motion levels concrete structures experience lower levels of damage, and therefore EURM will dominate overall building losses. For high ground-motion levels concrete structures experience severe damage, and due to the higher replacement value and number of concrete structures at this level of ground-motion building losses will be dominated by damage to concrete structures, therefore reducing the variability in loss estimation using various EURM fragility parameters. Since seismicity in Egypt is characterised by slight to moderate levels of ground-motion, it is therefore essential that further studies be conducted in evaluating the vulnerability of EURM structures. Nonetheless, for mitigating the potential losses associated with severe levels of ground-motion, accounting for variability in EURM vulnerability is less significant.

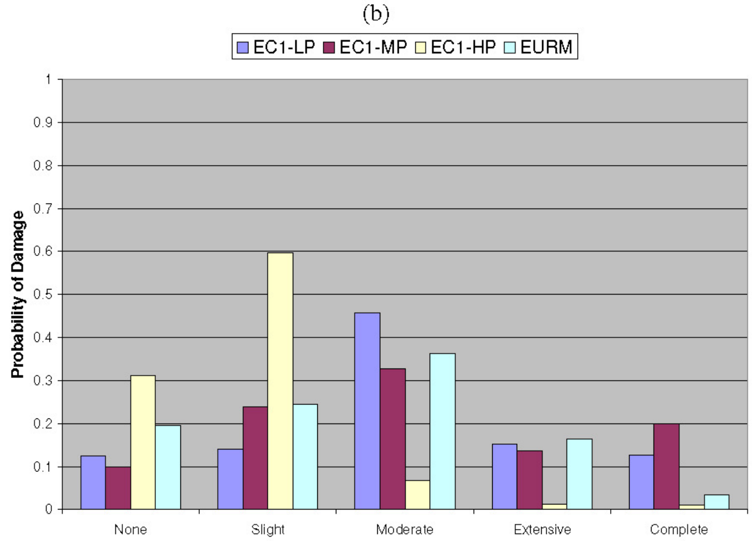
Each district experiences different levels of damage to its building stock, and in turn different levels of building loss. Figure 7.7 presents the direct economic loss caused by damage to the building stock in a) Markaz Embaba, b) Zamalek and c) Alayat as well as d) total loss for cluster map 323. Markaz Embaba is dominated by EC1-MP and EURM structures, forming over 80 percent of the district's building stock. Moreover, Markaz Embaba houses more structures than any other district in Greater Cairo, with nearly 60,000 structures. Due to the large number of EC1-MP and EURM structures in the district as well as the high MDR for the EC1-MP building class, for AB10, approximately 2.2 billion USD or 88 percent of the losses in the district takes place due to damage to these two building classes, with nearly 1.2 billion USD or 50 percent being attributed to losses to the EC1-MP building class. Moreover, even though approximately 10 percent of structures in the district are EC1-HP structures, the loss attributed to damage to this building class is just over 121 million USD, forming nearly 5 percent of the losses in the district, clearly reflecting the relatively good seismic performance of the EC1-HP building class.



(a)



(b)

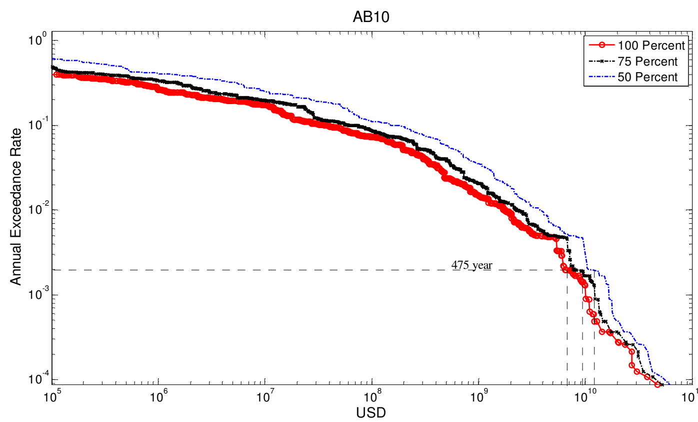


(c)

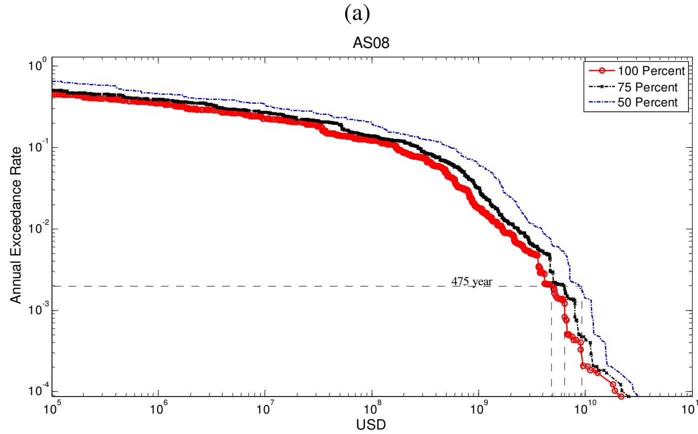
Figure 7.5 Damage probabilities for each damage state for 'Rod Al Farag' district for cluster map 323 for a) AB10, b) AS08 and c) BA08

Table 7-1 Mean values for EURM fragility curves

Parameter	λ		
	100%	75%	50%
Slight	1.27	0.95	0.64
Moderate	2.57	1.93	1.29
Extensive	6.40	4.80	3.20
Complete	14.94	11.21	7.47



(a)



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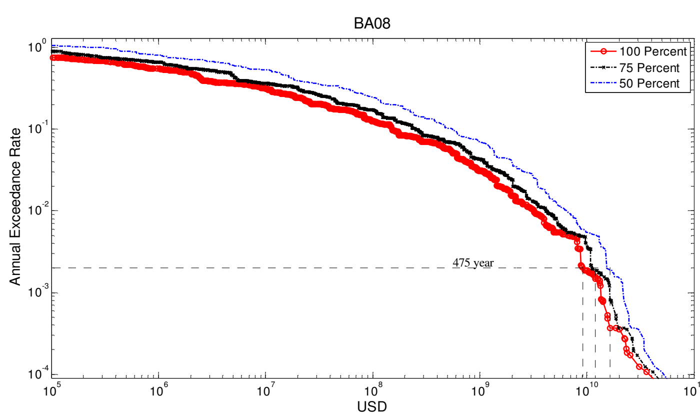

(c)

Figure 7.6 Exceedance curves for building losses, adjusting for EURM vulnerability, for a) AB10, b) AS08 and BA08

In addition to the variability in the losses to each building class, variability exists between loss estimates for each ground-motion model as shown in Figure 7.7. AB10 and BA08 produce very similar levels of loss, clearly reflecting the similarity in ground-motion levels estimated using both models. AS08 on the other hand produces significantly lower levels of damage than the other two models. An example of this is clearly shown for the EC1-HP building class, which experiences nearly 30 percent no damage level for AB10, will for AS08 70 percent is experienced for the same damage state. Moreover, complete damage compromises approximately 22 and 20 percent for the EC1-MP building class for AB10 and BA respectively, while for the same building class AS08 experiences 3 percent complete damage. This clearly reflects the lower ground-motion levels estimated using AS08 with respect to those estimated using the AB10 and BA08 models, as shown in Figure 7.4.

The building stock for the district of Zamalek is similar to that for Markaz Embaba, with EC1-MP and EURM forming just over 90 percent of the structures in the district. This is reflected in Figure 7.7 (b), which illustrates that for AB10, of the total 92 million USD of losses in the district, over 87 million USD, or 95 percent, are attributed to damage to the EC1-MP and EURM classes. Nonetheless, the total loss in the district is relatively small, constituting, on average, for the three ground-motion models, 0.18 percent of the total building losses. This is due to Zamalek housing only 0.11 percent of Greater Cairo's building stock. Even though Zamalek houses 0.11 percent of Greater Cairo's building stock, its losses constitutes 0.18 percent Greater Cairo's building losses, illustrating Zamalek's aging building stock.

Alayat district, Figure 7.7 (c), represents a different constitution of building stock compared to that in Markaz Embaba and Zamalek. This is due to Alayat being primarily an agricultural region, and therefore very few medium and high rise structures exist in the district. Of the total 48,550 structures in the district, just seven are in the EC1-MP building class and only four are in the EC1-HP building class.

Moreover, most agricultural homes in Egypt are masonry structures, accordingly over 98 percent of the structures in Alayat are EURM structures. This is also reflected in the building losses in the district, where nearly 99 percent of the losses in the district on average for the three ground-motion models are attributed to the EURM building class. Even though Alayat has a small number of concrete structures, that are most vulnerable, the losses in the district forms on average 1.6 percent of the total losses throughout Greater Cairo. This is primarily attributed to Alayat having the second largest building stock inventory in Greater Cairo.

The total loss presented in Figure 7.7 (d) reflects the dominance of EC1-MP and EURM buildings throughout Greater Cairo, where approximately 36 percent and 50 percent of Greater Cairo's building stock is attributed to these two building classes respectively. According to this, on average, 52 percent of the losses are attributed to the EC1-MP building class, while 39 percent is attributed to the EURM class.

These findings illustrate that seismic improvements need to be made to both the EC1-MP and EURM since they constitute the majority of buildings in Greater Cairo, and therefore result in the most direct losses. This is further reflected in the building loss maps for cluster map 323 shown in Figure 7.8. In each of the maps losses appear greater in certain districts than others. The highest levels of losses take place in the districts of Markaz Embaba, Qism Embaba, Basateen, Almorg and Almatarya. These districts are characterised by large number of structures in the districts, where the number of structures in these districts exceeds 23,000, while the average number of structures per district is approximately 15,000. Moreover, the percentage of EC1-MP structures in these districts compared to the total number of structures in all districts exceeds the average percentage of EC1-MP structures in Greater Cairo. These districts are also characterised by a high population and structural density, as well as a large number of informal areas.

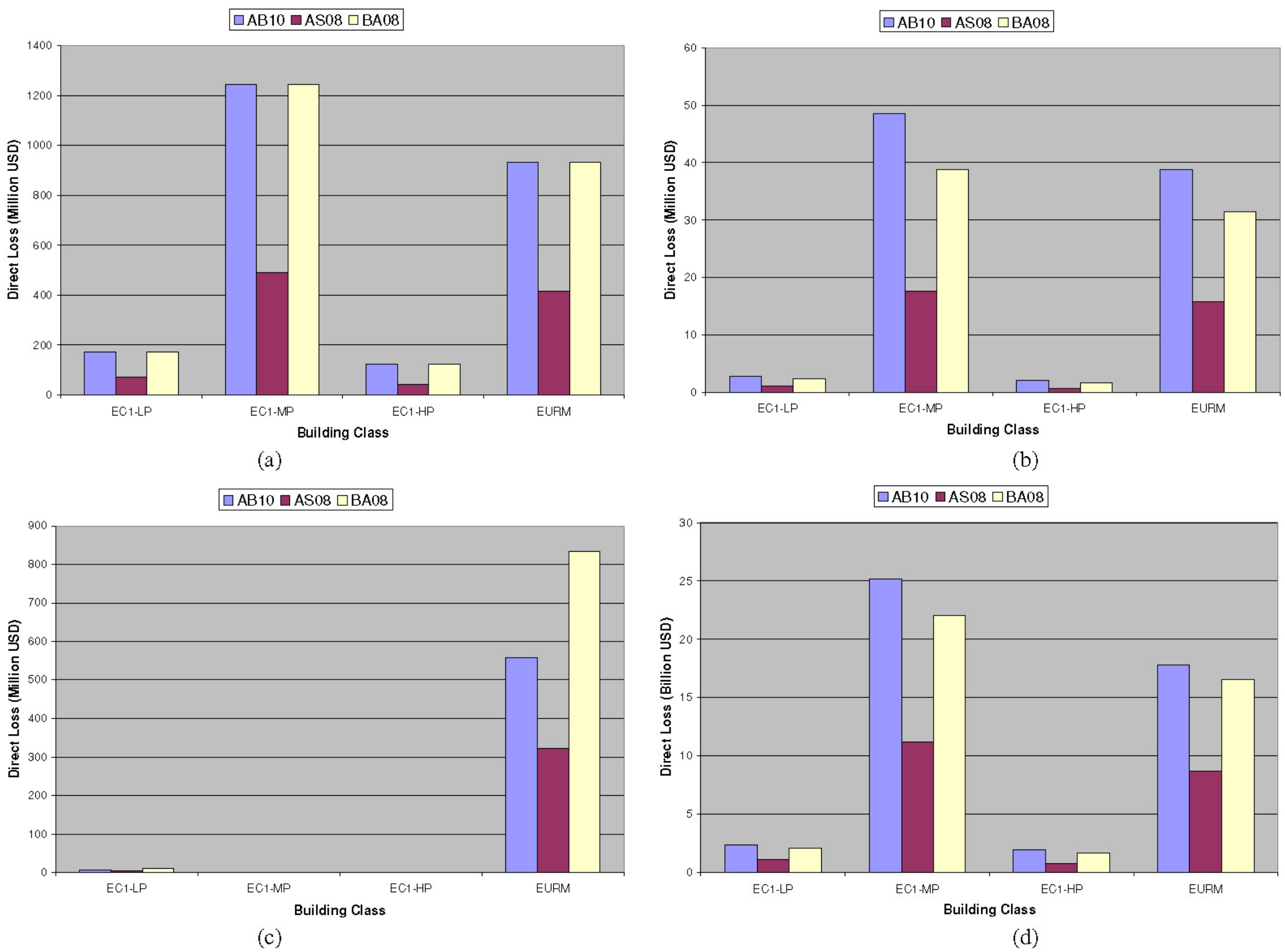

Figure 7.7 Building loss classified according to building class for cluster map 323 for a) Markaz Embaba, b) Zamalek, and c) Alayat districts as well as for d) Greater Cairo

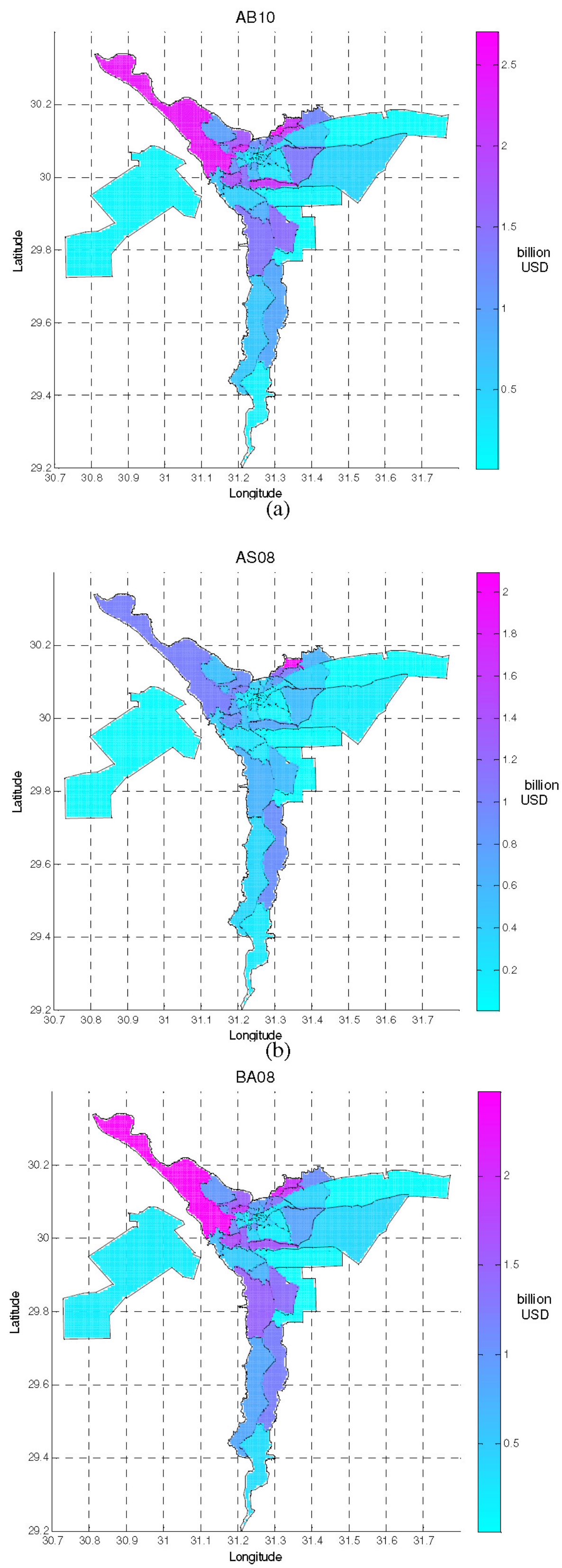

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Figure 7.8 Direct loss district based map due to damage to the building stock inventory for cluster map 323 for a) AB10, b) AS08 and c) BA08

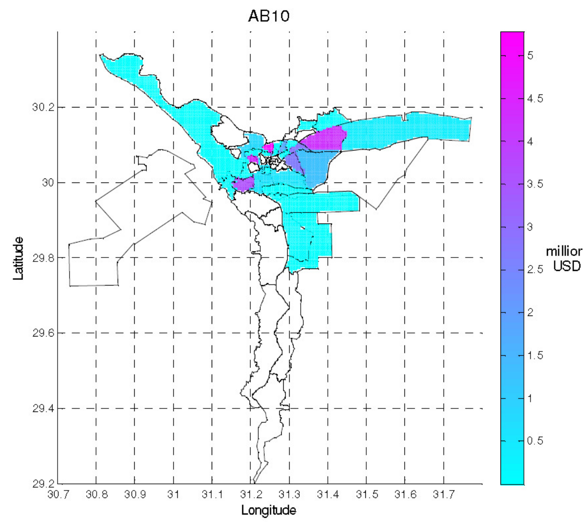
The newly constructed developments in the west of the city located in 6th of October, and in the east of the city located in the region of New Cairo both experience less building loss than other districts. This is attributed to both districts containing approximately 50 percent of the average number of structures in each of Greater Cairo's districts and less vulnerable structures. Both districts are dominated by EC1-LP structures, with EC1-LP compromising approximately 44 percent and 64 percent of the building stock in New Cairo and 6th of October respectively. EC1-LP structures have better seismic performance than EC1-MP and EURM structures, thus leading to both districts experiencing lower losses than other districts.

These findings further emphasize the need to prioritise improving the seismic performance of the EC1-MP building class, in order to reduce the building losses throughout Greater Cairo. Moreover, informal areas need to be replaced with formal housing, whose design and construction take into account seismic provisions. Making these improvements would reduce the direct economic losses resulting from damage to the building stock.

7.3.3 Natural Gas Network

Lifelines form an integral part of the built environment. They are essential for the running of residential homes, as well as businesses. Natural gas, as previously stated, is one of Egypt's main economic resources, and therefore is essential for the wellbeing of the economy. Over the past decade the Egyptian government has increased the number of homes and businesses connected to the natural gas network. This helps ensure a consistent supply of energy, but also provides a safer means of transporting the natural gas than the method previously used. Prior to homes and businesses being connected to the natural gas network, refillable natural gas containers were used, which posed a safety hazard. Even though the establishment of the natural gas network has reduced the safety hazard associated with a decentralization of the natural gas system, it has increased the potential economic losses. This occurs due to the fact that damage to a natural gas station affects the region the station supplies. Nonetheless, due to the small number of elements in the natural gas network compared to the building loss, the associated direct loss is expected to be significantly smaller.

Figure 7.9 illustrates a direct loss estimate map due to damage to the natural gas network, for cluster map 323. This same analysis can be repeated for any of the 1500 cluster maps. The losses in each district range from just under 0.5 million USD to over 5 million USD for AB10. The losses associated with building losses on the other hand range from just under 0.1 billion USD to over 1.7 billion USD for the same ground-motion map. This large difference in direct loss between the two aspects of the built environment can be attributed to two reasons. Firstly, the seismic performance of PRS and regulator stations is extremely good, as shown in the fragility curve in Figure 5.9, where a PGA greater than 1.0g is required to cause near 70 percent damage to the station. Since the earthquake events are mostly consisting of small seismicity events, and the elements in the natural gas network perform well seismically, the damage is expected to be small. The second reason the direct natural gas loss is small compared to the building losses is due to the vastly lower number of elements. The natural gas network consists of 216 links and 29 stations, with a total replacement cost of less than 1 billion USD, whereas the building stock inventory for the four building classes being analysed consists of over 800,000 structures, with a replacement cost of just under 250 billion USD. Therefore, even though each of the 29 stations is expected to have a higher replacement cost than the average building, this is insignificant due to the small number of stations compared to buildings.



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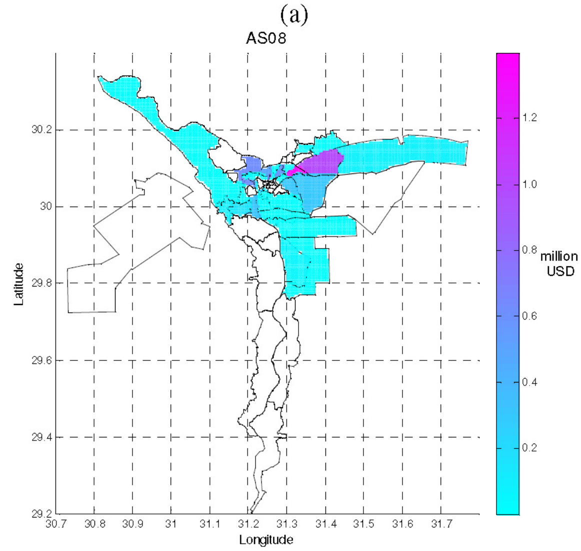

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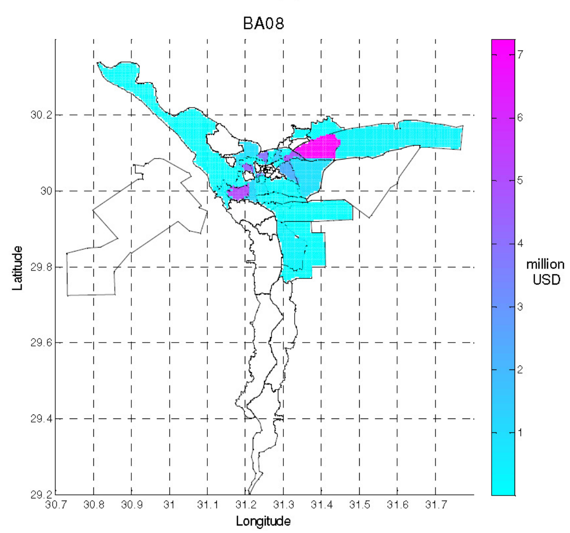

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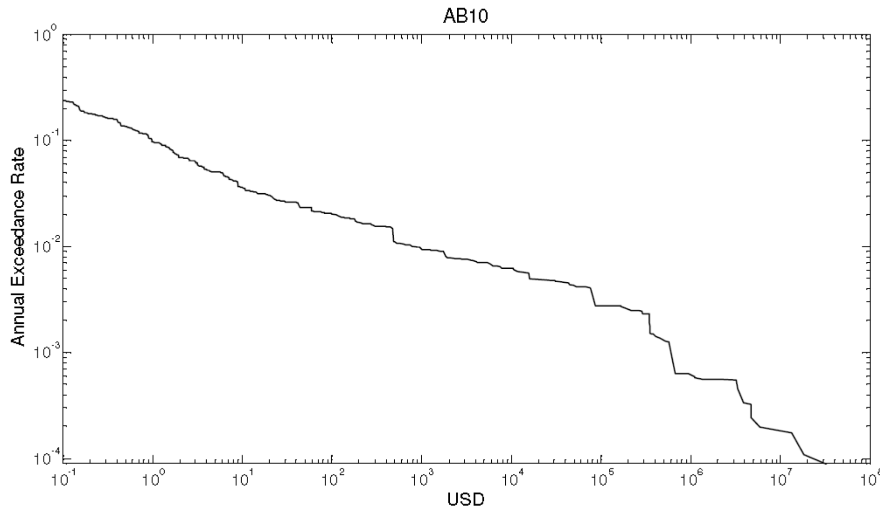
Figure 7.9 Direct loss map due to damage to the natural gas network for cluster map 323 for a) AB10, b) AS08 and c) BA08



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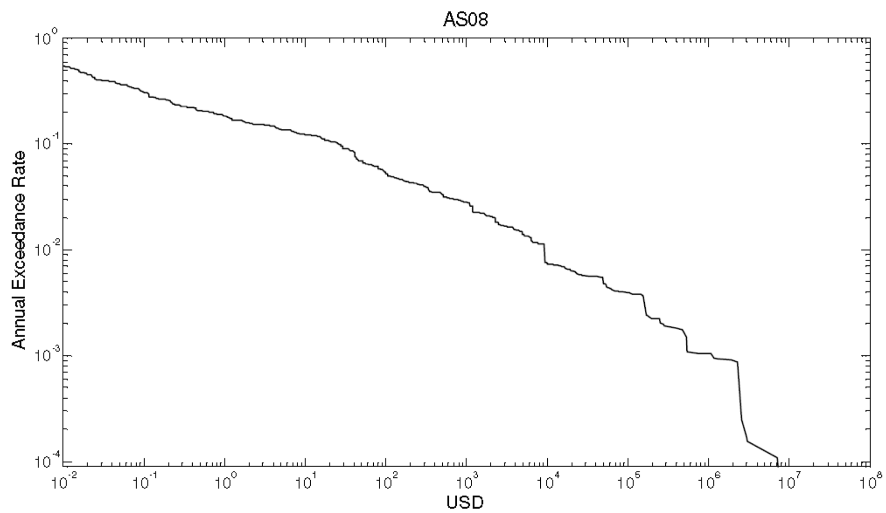

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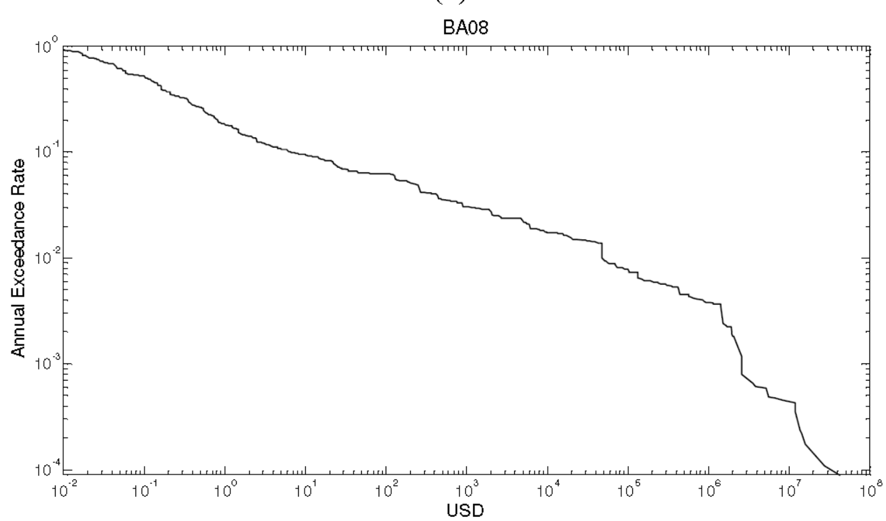

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Figure 7.10 Annual exceedance curves for natural gas loss for a) AB10, b) AS08 and c) BA08

These findings are further reflected in the annual exceedance curve shown in Figure 7.10. The largest expected loss is just above 14 million USD, 3 million USD and 21 million USD for AB10, AS08 and BA08 respectively. These losses have a probability of exceedance of 1E-4 for any given year. Moreover, losses of 0.75 million USD, 0.6 million USD and 2 million USD are expected to take place in any given year with a probability of occurrence of 1E-3 for AB10, AS08 and BA08 respectively. This reflects the seismic performance of the network, and at first glance appears that the network needs no seismic performance improvements.

Nonetheless, even though the direct losses due to the natural gas network are relatively small, this does not necessarily imply that the indirect losses due to damage to the natural gas network should be ignored. The reason for this is that even though the direct natural gas loss is small, the recovery time can be significantly large. As previously stated, recovery time corresponding to complete damage to natural gas pipelines and compressor stations are 30 and 100 days respectively. Therefore, even though the recovery cost is relatively small, the recovery time can cause significant indirect economic damage. This is clearly reflected in the losses incurred by the Kingdom of Jordan, when the country was facing losses of 28 million USD a week due to damage to the Arab gas pipeline which took place in February 2011 and resulted in Jordan being left without natural gas for two weeks (JMOE, 2011). This indirect economic loss is significantly greater than the direct cost of repair, and thus cannot be ignored.

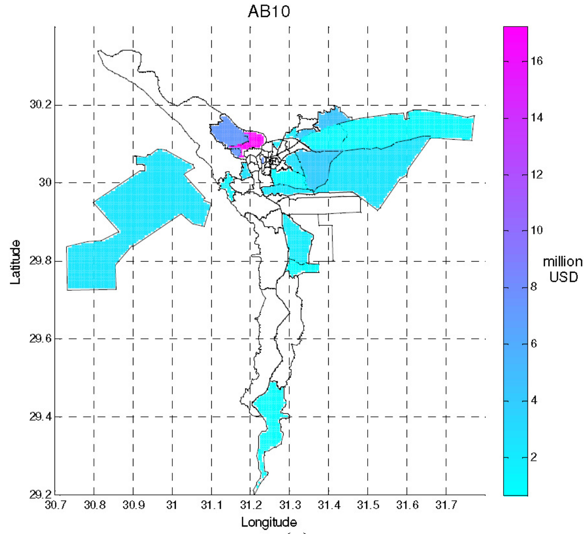
7.3.4 Electricity Network

Electricity is another essential lifeline for domestic use and for the running of businesses. Since electricity loss is studied through damage to components of electrical substations, the direct losses will only exist in areas where substations are located. Figure 7.11 illustrates this fact, where direct electricity loss for cluster map

323, does not exist in each district, but only in the districts that house the 27 electricity substations.

The districts of Awsim and Al-Warraq experience higher levels of loss with approximately 10 million USD and 16 million USD respectively (for AS10), than other districts. On the other hand the district of Alzawya Alhamra experiences losses of approximately 3 million USD, even though the 0.35g PGA in the districts is higher than the 0.25g PGA values at Awsim and Al-Awarraq. This takes place because the district of Alzawya Alhamra houses only "North Cairo" substation, while the district of Awsim houses the "Cairo", and "Basoos" substation whose losses are attributed to Awsim which is the closest district to the station. Moreover, the district of Al-Warraq houses the "West Cairo" station, as well as "Shubra" and "Bahteem" station whose losses are attributed to Al-Warraq since it is the closest district to the station. Since both the district of Awsim and Al-Warraq house more than one district, the losses in these districts is expected to be greater.

The electricity losses in the earthquake scenario shown in Figure 7.11 are greater than the natural gas losses shown in Figure 7.9 for the same scenario. This is primarily due to natural gas stations performing better seismically where a PGA of 1g is required for nearly 70 percent probability of failure, while transformers in electricity substations only require a PGA of 0.5g to occur to cause 65 percent probability of failure. Moreover, the numbers of stations in each network are nearly identical, with the natural gas network being composed of 29 stations, while the electricity network includes 27 stations. This supports the notion that the relatively inferior seismic performance and the greater replacement cost of transformers are the primary reasons for the electricity network suffering more losses than the natural gas network.



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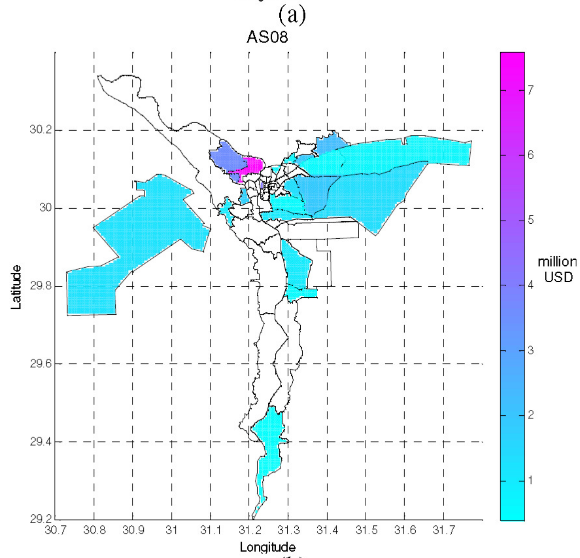

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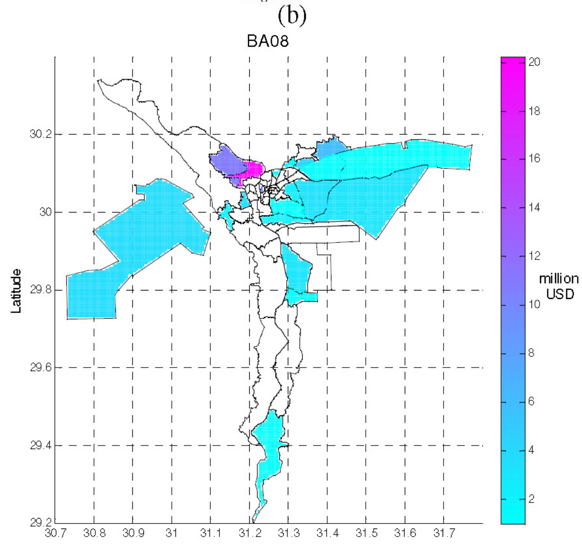

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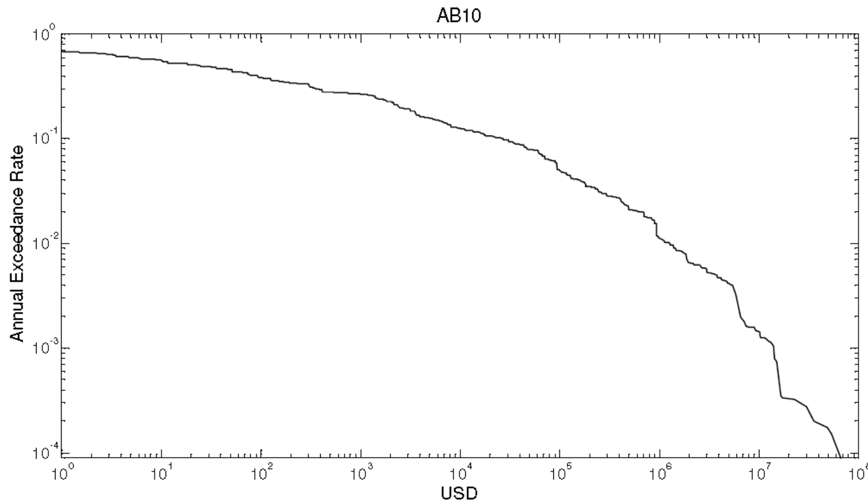
Figure 7.11 Direct loss map due to damage to the electricity network for cluster map 323 for a) AB10, b) AS08 and c) BA08



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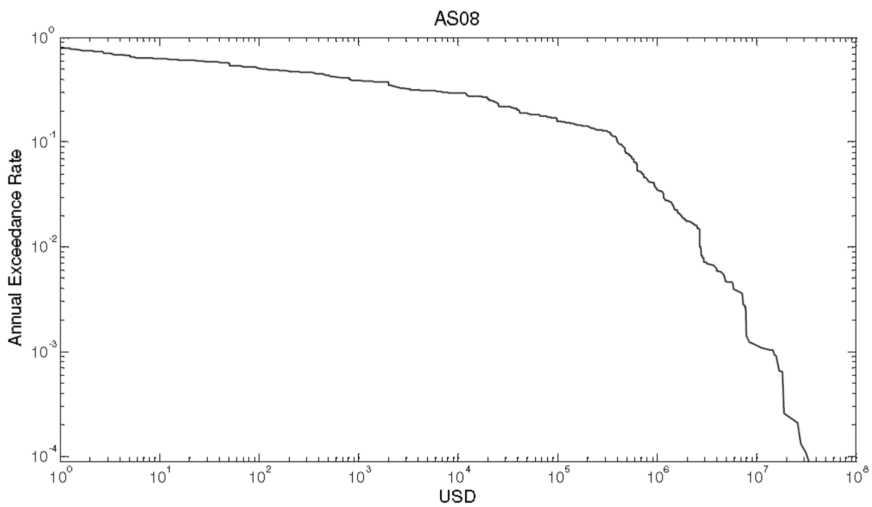

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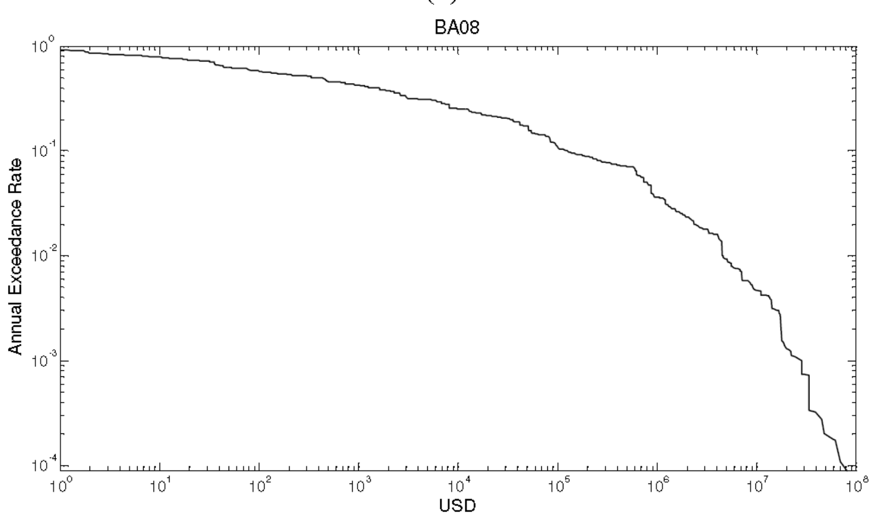

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Figure 7.12 Annual exceedance curves for electricity loss for a) AB10, b) AS08 and c) BA08

The higher losses experienced by the electricity network compared to the natural gas network is further emphasised when comparing the annual exceedance curve for the electricity network shown in Figure 7.12, to the annual exceedance curve for the natural gas network shown in Figure 7.10. For the AB10 ground-motion model, the electricity network is expected to experience a loss of approximately 0.7 billion USD in any given year with a probability of occurrence of 1E-4, whereas for the same probability a 0.3 billion USD in natural gas loss is expected in any given year.

The vulnerability of the transformers highlights the need to improve their seismic performance in order to reduce the direct loss experienced by the network. According to Shinozuka et al. (2007), transformers are the most logical choice for seismic retrofit due to their high cost, poor performance, limited availability of spare parts, and long replacement time. Azevedo et al. (2010) proposed fixing the transformer connection to the ground in order to confine, the component, and therefore reduce the expected deformation during an earthquake. Moreover, Saadeghvaziri and Feng (2001) developed a method for using base-isolation in order to improve the seismic performance of electricity network transformers. This method has been deemed to improve the seismic performance of transformers by up to 100 percent (in terms of the median value of the fragility curve). The fragility curves for transformers with 0, 50 percent, and 100 percent seismic enhancement are shown in Figure 7.13. Table 7-2 presents the estimated electricity losses for map 323 for no seismic enhancement, 50 percent enhancement and 100 percent enhancement to transformers. The difference in losses between 0 and 50 percent enhancement is far greater than that between 50 percent and 100 percent enhancement. 50 percent enhancement leads to nearly 6 million USD in savings for the motions predicted by BA08, while 100 percent enhancement only saves an additional 0.6 million USD. This is primarily due to Greater Cairo experiencing low-to-medium levels of ground-motion, and therefore 50 percent enhancement is useful, while 100 percent enhancement is unnecessary.

As with the natural gas network, the losses experienced by the electricity network are relatively small compared to the loss experienced by the building stock. This again occurs due to the large number of buildings, compared to the number of electricity substations in Greater Cairo. The electricity losses are, on average, only 0.15 percent of the losses experienced by the building stock. However, the number of electricity stations is approximately 0.003 percent of the number of structures in Greater Cairo. This reflects the high value of electricity stations relative to typical buildings. Moreover, as in the case of the natural gas, the smaller direct economic loss experienced by the electricity network does not imply that the network needs no improvements, and that the losses should be ignored. This is due to the fact that electricity plays an important role in the running of the economy, and therefore the time needed to recover the damage to the electricity network could result in high indirect losses.

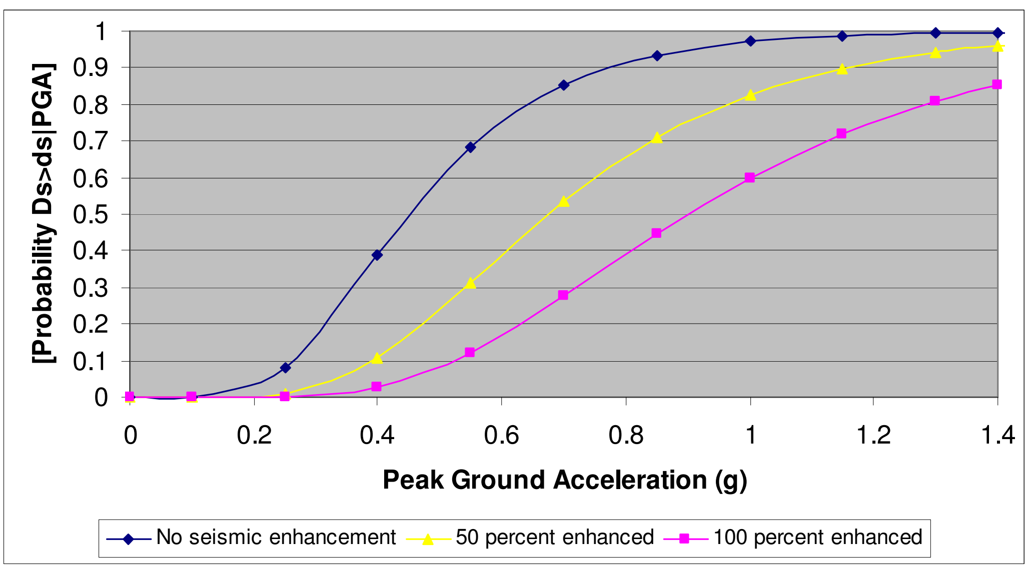


Figure 7.13 Fragility curves for transformers with and without seismic enhancement

Table 7-2 Electricity loss for map 323 for no transformer enhancement, 50% enhancement and 100% enhancement in USD

	No enhancement	50% enhancement	100% enhancement
AB10	6.80E+07	6.51E+07	6.49E+07
AS08	3.43E+07	3.40E+07	3.40E+07
BA08	8.34E+07	7.75E+07	7.69E+07

7.3.5 Total Direct Loss

Total direct loss is estimated by aggregating the losses from the building inventory, as well as natural gas and electricity networks. For map 323, the total direct losses are dominated by losses to the building inventory, which constitutes, on average for the three ground-motion models, 99.8 percent of the total direct losses.

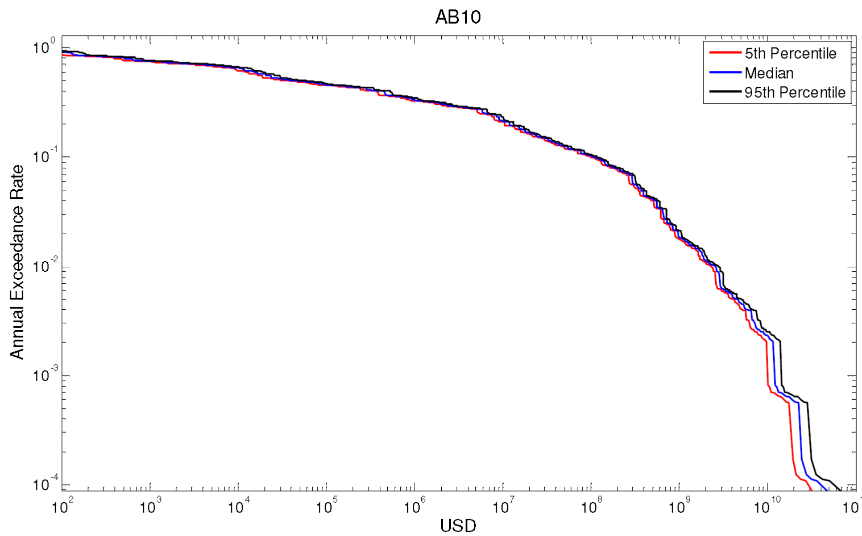
Figure 7.14 illustrates the direct economic losses for Greater Cairo. For AB10 in any given year a loss of 2 billion USD is expected with a probability of exceedance of 1E-2, a 10 billion USD loss is expected with a probability of exceedance of 1E-3, and a 47 billion USD loss is expected with a probability of exceedance of 1E-4. For AS08 in any given year a 2 billion loss is expected with a probability of exceedance of 1E-2, while a 6 billion loss is expected with a probability of exceedance of 1E-3, and a 21 billion loss expected with a probability of exceedance of 1E-4. Finally, for BA08 in any given year a 3 billion USD loss is expected with a probability of exceedance of 1E-2, a 14 billion USD loss is expected with a probability of exceedance of 1E-3, and a 42 billion USD loss is expected with a probability of exceedance of 1E-4.

The range of direct loss estimates can be attributed to the differences in spectral accelerations calculated by each model, as shown in Figure 7.4. Comparing the spectral accelerations between map 323 and other maps shown in Appendix F, it is apparent that different ground-motion models result in varying relative levels of loss depending on the earthquake scenario. The estimates of spectral accelerations are higher using BA08 for small magnitude events that are more likely to occur. This is reflected in Figure 7.14 where a loss level of 3 billion USD is expected in any given year with a probability of 1E-2, while for the other two ground-motion models 2 billion USD in losses are expected at the same probability. On the other hand, for large magnitude, small distance events, as in the case of map 323, AB10 estimates higher levels of ground-motion at the sites compared to AS08 and BA08. This is reflected in the losses experienced by cluster map 323, and by the higher levels of losses for a 10,000 year return period (Figure 7.15).

Analysing direct losses according to the economic sectors they affect is essential for highlighting the sectors that are most vulnerable to earthquake occurrence. This is done by distributing the losses in each sector by the economic sector distribution of the labour force in each district. In doing so, the recovery cost of each sector can be identified since the recovery of each sector takes place through the recovery of the physical damage in the built environment.

Figure 7.16 presents the direct loss distribution by economic sector for map 323. Four sectors experience significantly greater losses in this scenario than others, and these are, “construction and maintenance”, “transportation and communications”, “trade, finance and insurance” and “other personal services”, which are represented by sectors 27, 28, 29 and 32 respectively. These sectors experience greater levels of losses primarily due to the fact that they include more employees than the remaining sectors, with sectors 27, 28, 29 and 32 employing 8.34 percent, 8.55 percent, 13.26 percent and 12.63 percent of the population respectively. The losses experienced by these four sectors compromises, on average for the three ground-motion models, approximately 43 percent of the total direct loss for map 323, clearly illustrating the damage incurred by these sectors. Moreover, what is clear is that the “trade, finance and insurance” sector which is Egypt’s highest grossing sector compromising 16.5 percent of Egypt’s output, is concentrated in Greater Cairo, and thus damage to Greater Cairo’s built environment will cause significant economic losses. Moreover, the crop agriculture compromises nearly 10 percent of Egypt’s output, however only 8 percent of its losses, illustrating the urban nature of the region, and the fact that the agriculture industry is concentrated in other regions of Egypt.

Lastly, Figure 7.16 highlights the importance of the “other personal services” sector. This sector accounts for the large informal sector in Greater Cairo, which cannot be classified under one of the other formal 31 sectors, and is thus difficult to monitor. Due to the informal nature of this sector, and, at times, illegal conduct, this sector might struggle to repair buildings and structures that are used in running businesses within this sector, possibly leading to an increase in unemployment rate, and loss of output. It is therefore essential to shift the people employed in these sectors beforehand, in order to mitigate the potential sudden effect of damage to the sector.



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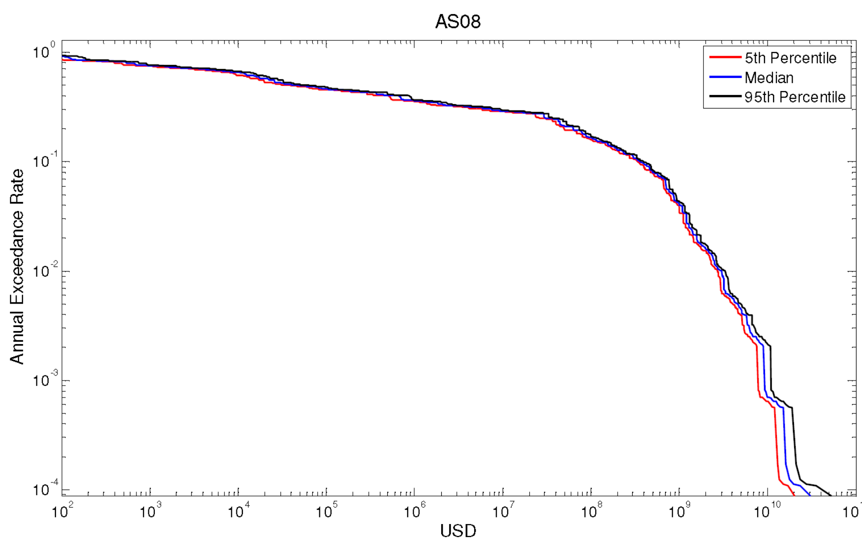

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Figure 7.14 Total annual exceedance curves for direct loss for a) AB10, b) AS08 and c) BA08

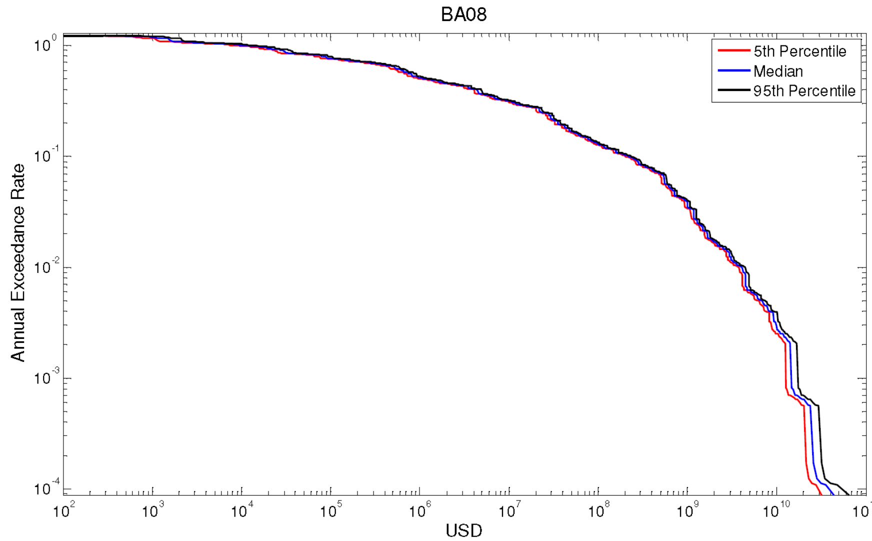

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Figure 7.14 continued

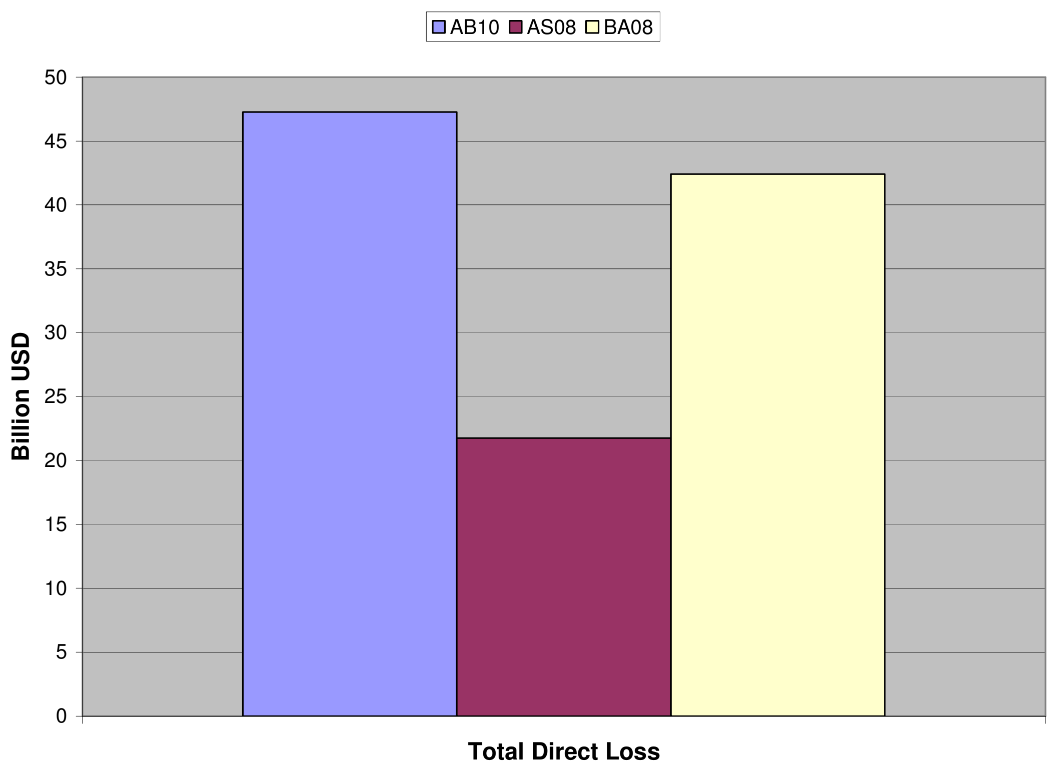


Figure 7.15 Total direct loss for a) AB10, b) AS08 and c) BA08

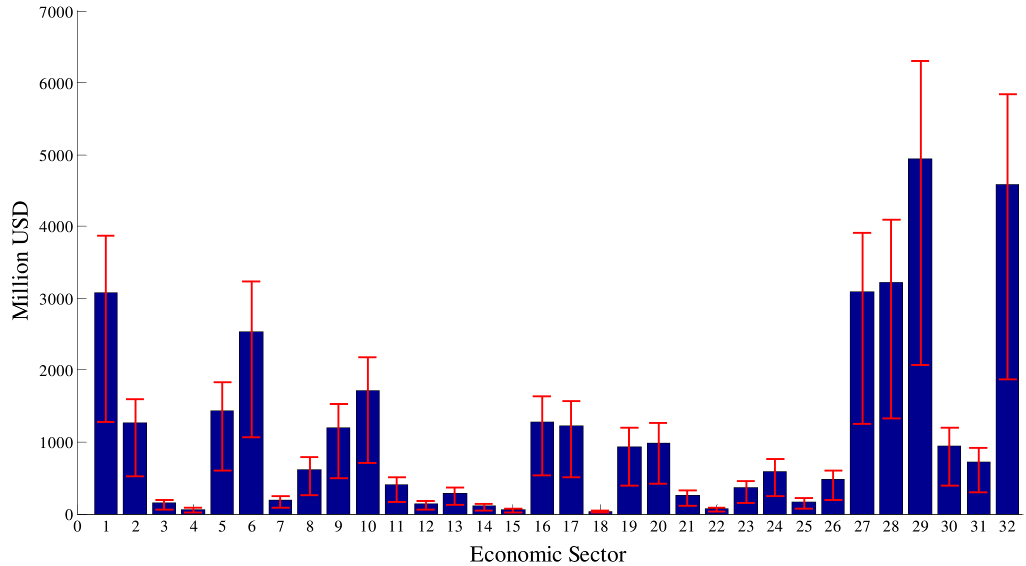


Figure 7.16 Total mean direct loss by economic sector for three ground-motion models and the associated variability

To get a better understanding of the epistemic uncertainty associated with using different ground-motion models, the annual exceedance rates for direct loss for all three ground-motion models used in this study are combined and shown in Figure 7.17. It is evident that for low seismic events that are more likely to occur, AB10 estimates lower levels of direct loss than the other two ground-motion models. On the other hand, for unlikely events that have a high return period, AB10 estimates higher levels of direct loss than the other two ground-motion models. Moreover, for low seismicity events that are likely to occur, AS08 estimates direct loss levels that are slightly greater than AB10, however, as the return periods of the events increase, AS08 estimates direct loss levels that are closer to BA08. Nonetheless, for unlikely events that have a high return period AS08 estimates direct loss levels that are significantly less than those associated with the other two ground-motion models. This variability in results clearly illustrates the need to use more than one ground-motion model, in order to be able to appreciate the epistemic uncertainty associated with ground-motion models.

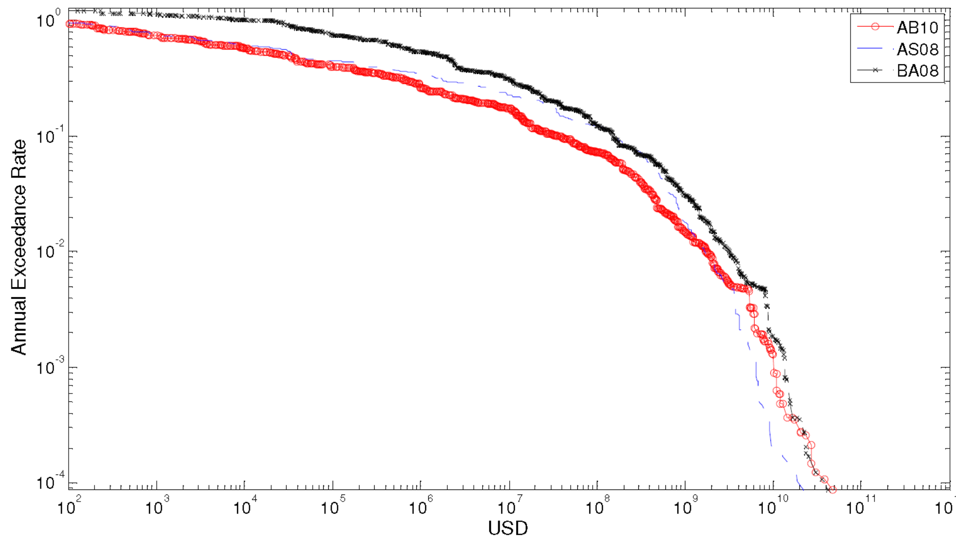


Figure 7.17 Median annual exceedance rates for direct loss for all three ground-motion models used in this study

7.4 Indirect Losses

Indirect loss is an important yet often neglected aspect of earthquake loss estimation. Most previous studies focus on direct losses, ignoring the associated business interruption losses, and the losses caused by bottlenecks in the economy due to the interdependencies between economic sectors. Indirect losses are overlooked for two main reasons. Firstly, indirect losses are far more complicated to estimate and model, and require economic expertise that is not commonly possessed by engineers (who perform the loss analysis). Secondly, indirect losses are closely associated with damage to lifelines, and most previous studies, especially those dealing with Egypt, have focused only on damage to the building stock.

Estimating indirect loss deals with assessing business interruption that is caused by damage to components of the built environment throughout Greater Cairo. Business interruption is estimated as a function of the recovery time needed to repair the damaged items. The efficiency of repairing the damaged components is based on the unemployment rate, and the speed in which the labour force is mobilised. Even though a high unemployment rate is undesirable, during disaster recovery the unemployed population could be hired to help recover damaged components, and to make up the shortfall in output. According to CAPMAS (2006), 60 percent of Greater Cairo's population is unemployed. However, this includes all the population above the age of 15, where a large number of them are still pursuing their education. Furthermore, due to the complexity in assessing the informal sector it is sometimes difficult for census agencies to distinguish between people working in informal sectors, and unemployed individuals. Evaluating the true employment statistics throughout Greater Cairo for each district, as well as the ability to mobilise the workforce is beyond the scope of this study and involves assessing the social, political and a psychological mindset of the population. Nonetheless, the efficiency of the recovery process, shown in Equation (6.24), could have a significant impact on the associated indirect loss. In order to assess the impact of efficiency on the indirect loss, a sensitivity analysis study is conducted that systematically adjusts the recovery efficiency and estimates the associated indirect loss. It is important to note that only two lifeline networks are considered in this study, therefore the expected real losses could, and should exceed the losses reported in this study.

Figure 7.18 illustrates the indirect loss estimated for cluster map 323, for each of the three ground-motion maps and various efficiency rates. The efficiency ranges between 40 percent and 160 percent, where 40 percent would reflect a lack of resiliency and productivity in the economy, whereas 160 percent reflects the ability to utilise the unemployed as well as import workers to help in the recovery process. At 40 percent efficiency AB10 experiences indirect losses of 130 billion USD over the entire recovery period. This compromises 72 percent of the Egyptian annual GDP. If a static IO model had been used, the losses would have been 138 billion USD or 77 percent of the Egyptian economy. This illustrates how a dynamic IO model reflects the inherent resiliency in the economy. Moreover, it reflects how optimising the recovery process helps minimise the indirect losses. For the same cluster map at 100 percent efficiency, indirect losses are approximately 50 billion USD, which comprises nearly 27 percent of the annual GDP. Moreover, if a static IO model was used, these losses would have amounted to 51 billion USD, which comprises 28 percent of the annual GDP. Additionally, for the same cluster map and ground-motion map at 160 percent efficiency, indirect losses are approximately 29 billion USD, which comprises 16 percent of the annual GDP. Moreover, if a static IO model was used, these losses would be 30 billion USD. Clearly, the recovery efficiency affects the indirect loss significantly, with the indirect loss rising exponentially with the decrease in efficiency. This illustrates the importance of ensuring that efficiency is maximised in order to mitigate the potential indirect losses associated with earthquake occurrences. Government agencies could be established whose goal is to set up labour mobilisation strategies to ensure that in the case of disaster occurrences recovery efficiency is maximised.

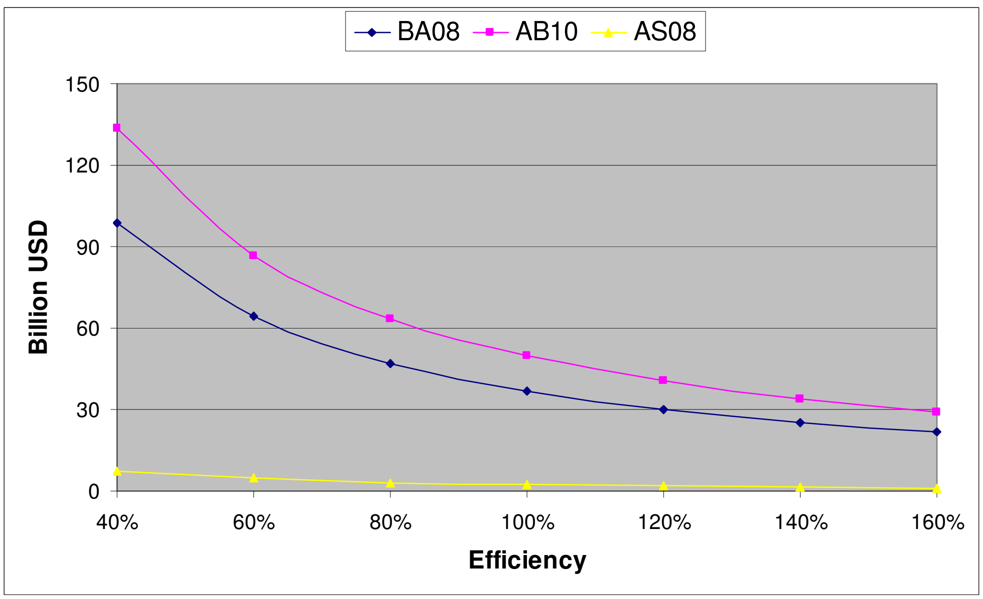


Figure 7.18 Indirect loss for map 323 for various efficiency rates

In addition to setting up a strategy to ensure efficient mobilization of the labour force, the government should try to ensure that the recovery process is conducted in a systematic manner. In the event of the occurrence of a natural disaster, governments usually make decisions regarding the recovery process based on political or social motives without necessarily assessing the economic consequences of these decisions. This primarily occurs because no existing strategy exists to control how money is spent in recovering the economy. With the exception of cases that require immediate unplanned actions to minimise social loss, the government should inject money in the recovery process based on a planned strategy whose aim is to minimise the indirect losses. Table 7-3 presents the sequence in which the recovery process is conducted for cluster map 323 for ground-motion map AB10, for 100 percent recovery efficiency. The recovery process takes 16 years to recover the economy completely, for the rare 10,000 year event represented by cluster map 323. Nonetheless, the recovery process assumes that money is immedietly available for investment and to recover the economy, and if this is not the case the recovery process will be further extended. Moreover, money is not immediately injected in recovering all the sectors, such as sector 1. This is due to the fact that not all sectors experience equal levels of damage, therefore due to the bottleneck effect, injection of money is optimised to ensure that the sectors that are most affected are recovered first. This optimisation technique, described in Chapter 6, should therefore be adopted by government agencies to form the basis for the disaster recovery strategy, to minimise indirect losses. Accordingly, this process presents a methodology for recovering the full economy, rather than targeting the recovery of individual sectors that will lead to the suboptimal recovery of the entire economy.

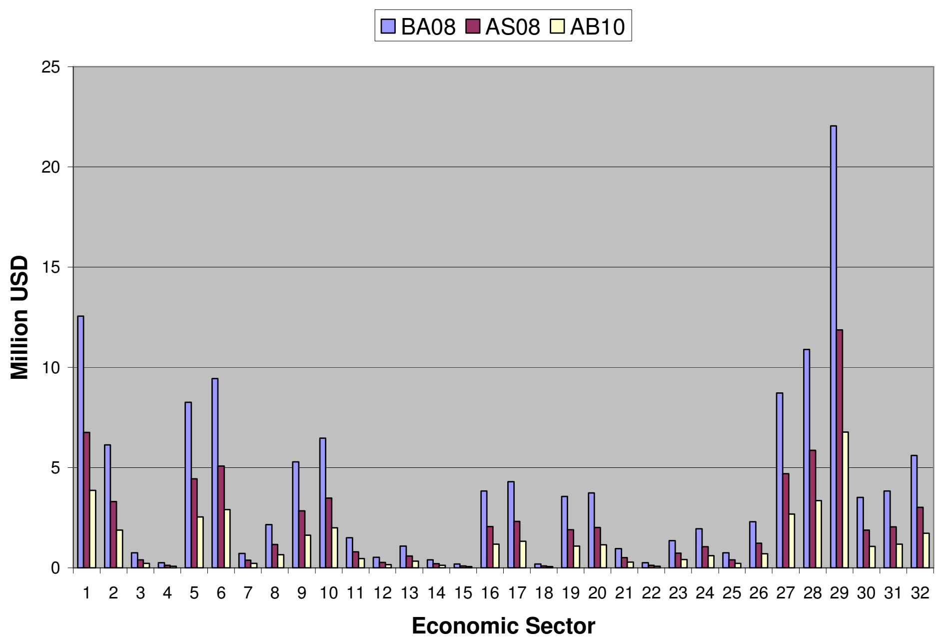
The indirect economic losses for cluster map 323 and map 1445 for each sector are shown in Figure 7.19 (a) and (b) respectively. Cluster map 1445 has a return period of 500 years, which is the typical hazard level which the Egyptian code uses for design purposes. Due to the bottleneck effect, the economic loss in all the sectors is governed by the sector that experiences the greatest levels of damage. Moreover, the optimisation technique used to minimise economic losses through import and export adjustments maximises the output of individual economic sectors. However, it does not significantly affect the relative percentage of loss of each sector. This results in losses directly being a function of the output of each sector. This is reflected in Figure 7.19 (a) and (b), where the loss trend is the same in each scenario, with sector 29 dominating the indirect losses. This is because the “trade, finance, and insurance” sector denoted by sector 29, is the largest contributor to the Egyptian economy, and therefore due to the effect of bottlenecks, it is expected to experience the greatest

Table 7-3 Recovery process of cluster map 323 for AB10, illustrating the money invested in each sector (million USD)

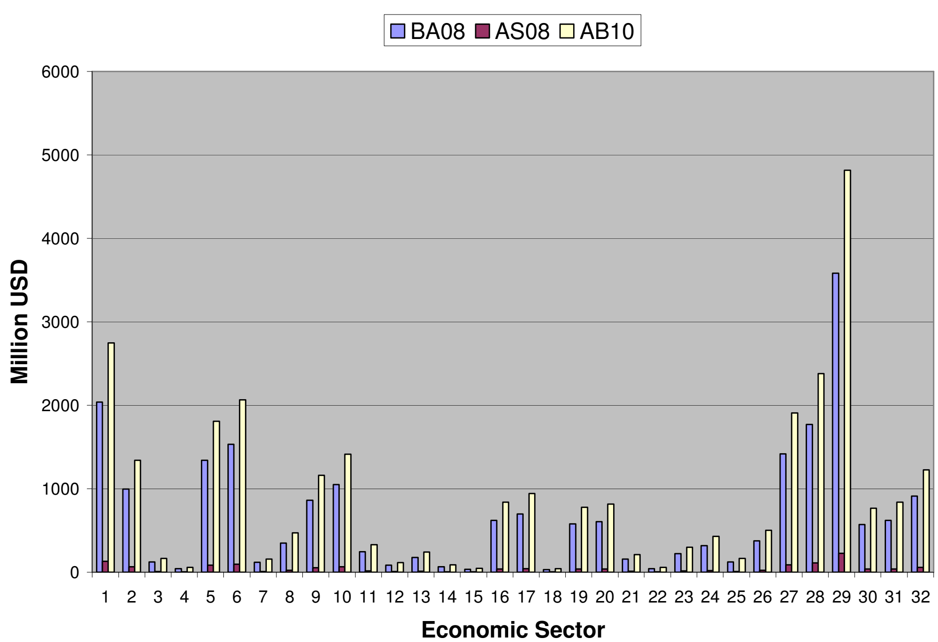
Economic Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Year 1	0.00	0.00	0.00	0.00	740.02	247.56	16.23	90.35	100.61	155.06	55.03	19.31	0.00	14.24	7.38	295.63
Year 2	0.00	0.00	0.00	3.65	207.91	566.27	44.47	132.63	269.58	383.64	86.29	30.27	0.00	23.25	11.74	253.82
Year 3	0.00	0.00	0.00	17.57	202.56	551.73	43.32	129.22	262.66	373.78	84.07	29.49	0.00	22.65	11.44	247.30
Year 4	0.00	0.00	0.00	14.07	162.28	442.01	34.71	103.53	210.43	299.45	67.35	23.62	37.17	18.15	9.16	198.12
Year 5	0.00	0.00	23.75	6.80	78.43	213.63	16.77	50.04	101.70	144.73	32.55	11.42	49.55	8.77	4.43	95.75
Year 6	0.00	0.00	22.73	5.11	58.98	160.64	12.61	37.63	76.48	108.83	24.48	8.59	37.26	6.60	3.33	72.00
Year 7	415.88	0.00	19.80	4.46	51.38	139.93	10.99	32.77	66.62	94.80	21.32	7.48	32.46	5.74	2.90	62.72
Year 8	476.80	217.50	17.86	4.02	46.36	126.27	9.92	29.58	60.11	85.55	19.24	6.75	29.29	5.18	2.62	56.60
Year 9	438.86	202.44	16.44	3.70	42.67	116.22	9.13	27.22	55.33	78.74	17.71	6.21	26.96	4.77	2.41	52.09
Year 10	394.78	182.11	14.79	3.33	38.39	104.55	8.21	24.49	49.77	70.83	15.93	5.59	24.25	4.29	2.17	46.86
Year 11	395.56	182.47	14.82	3.34	38.46	104.76	8.23	24.54	49.87	70.97	15.96	5.60	24.30	4.30	2.17	46.96
Year 12	396.34	182.83	14.85	3.34	38.54	104.97	8.24	24.58	49.97	71.11	15.99	5.61	24.35	4.31	2.18	47.05
Year 13	397.13	183.19	14.88	3.35	38.61	105.17	8.26	24.63	50.07	71.25	16.03	5.62	24.40	4.32	2.18	47.14
Year 14	397.92	183.56	14.91	3.36	38.69	105.38	8.28	24.68	50.17	71.39	16.06	5.63	24.45	4.33	2.18	47.24
Year 15	398.71	183.92	14.94	3.36	38.77	105.59	8.29	24.73	50.27	71.54	16.09	5.64	24.49	4.34	2.19	47.33
Year 16	156.52	72.20	5.86	1.32	15.22	41.45	3.25	9.71	19.73	28.08	6.32	2.22	9.62	1.70	0.86	18.58

Economic Sector	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Year 1	794.19	0.54	128.93	128.51	33.41	9.92	52.89	0.00	0.00	99.22	0.00	0.00	0.00	0.00	0.00	0.00
Year 2	145.77	8.37	202.15	214.47	55.76	14.55	77.64	0.00	37.14	96.28	0.00	0.00	0.00	0.00	160.24	0.00
Year 3	142.02	8.16	196.95	208.96	54.32	14.18	75.65	44.24	40.96	93.80	0.00	0.00	0.00	0.00	172.62	0.00
Year 4	113.78	6.54	157.79	167.41	43.52	11.36	60.60	168.49	32.81	75.15	0.00	285.27	154.91	0.00	138.29	0.00
Year 5	54.99	3.16	76.26	80.91	21.03	5.49	29.29	81.43	15.86	36.32	0.00	570.48	920.08	150.23	66.84	79.30
Year 6	41.35	2.38	57.35	60.84	15.82	4.13	22.03	61.24	11.92	27.31	0.00	428.99	691.87	138.78	50.26	762.77
Year 7	36.02	2.07	49.95	53.00	13.78	3.60	19.19	53.34	10.39	23.79	0.00	373.68	602.68	120.89	43.78	664.44
Year 8	32.51	1.87	45.08	47.83	12.43	3.25	17.31	48.14	9.37	21.47	0.00	337.21	543.85	109.09	39.51	599.58
Year 9	29.92	1.72	41.49	44.02	11.44	2.99	15.94	44.30	8.63	19.76	260.22	310.37	500.57	100.41	36.36	551.87
Year 10	26.91	1.55	37.32	39.60	10.29	2.69	14.33	39.85	7.76	17.78	568.33	279.20	450.29	90.32	32.71	496.44
Year 11	26.97	1.55	37.40	39.68	10.31	2.69	14.36	39.93	7.78	17.81	569.46	279.75	451.18	90.50	32.78	497.42
Year 12	27.02	1.55	37.47	39.76	10.34	2.70	14.39	40.01	7.79	17.85	570.58	280.30	452.08	90.68	32.84	498.41
Year 13	27.07	1.56	37.54	39.83	10.36	2.70	14.42	40.09	7.81	17.88	571.72	280.86	452.97	90.86	32.91	499.39
Year 14	27.13	1.56	37.62	39.91	10.38	2.71	14.45	40.17	7.82	17.92	572.85	281.42	453.87	91.04	32.97	500.38
Year 15	27.18	1.56	37.69	39.99	10.40	2.71	14.48	40.25	7.84	17.95	573.98	281.97	454.77	91.22	33.04	501.37
Year 16	10.67	0.61	14.80	15.70	4.08	1.07	5.68	15.80	3.08	7.05	225.32	110.69	178.53	35.81	12.97	196.82

levels of loss. The difference between Figure 7.19 (a) and (b) is that cluster map 323 experiences greater levels of ground-motion than cluster map 1445, and the level of indirect loss reflects this, with cluster map 323 experiencing significantly greater levels of indirect losses than map 1445.



(a)

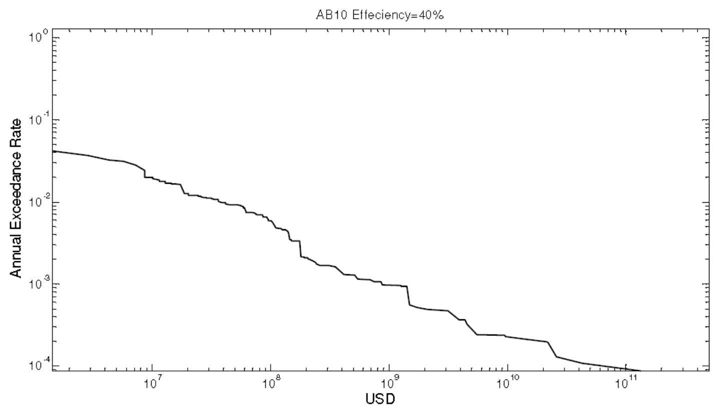


(b)

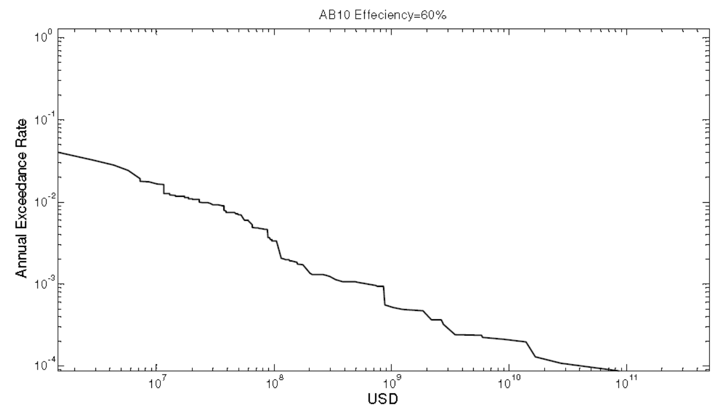
Figure 7.19 Indirect losses by economic sector for cluster map a) 1445 and b) 323

Since indirect loss is a function of the recovery time associated with repairing the damaged components throughout Greater Cairo, for indirect loss to occur damage needs to be significant enough to result in recovery being needed. Due to the low-to-moderate nature of the seismicity surrounding Greater Cairo most events cause insignificant damage to the lifelines. Since business interruption is caused by damage to buildings and lifelines, when lifelines are unaffected, business interruption is significantly reduced since it is only caused by damage to buildings. This reflects the true nature of earthquake events, where not all earthquake cause disruption to people's daily lives. An example of such an occurrence took place on the 1st of April 2011, when an M_w=5.9 earthquake in the Hellenic arc, was felt in Greater Cairo, with no recorded disruptions to lifelines or businesses being cited. Of the 1500 cluster maps, when analysing a recovery efficiency of 100 percent, 1196 of them experience negligible indirect losses for AB10, 980 experience negligible indirect losses for AS08 and 1171 experience negligible indirect losses for BA08. The loss level in each of these maps is presented in Appendix F.

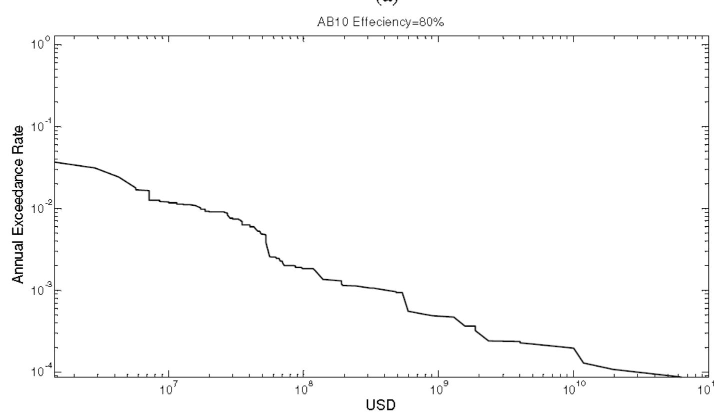
The indirect loss exceedance curves also reflects the fact that indirect loss is not experienced in every scenario. Figure 7.20 (a) through (g) present the indirect loss exceedance curves for AB10 for recovery efficiency 40 percent, 60 percent, 80 percent, 100 percent, 120 percent, 140 percent and 160 percent. Each of the curves initially experiences a small gradient, which indicates that most of the cluster maps experience no or insignificant indirect losses. This further supports the hypothesis that the recovery of damaged features in the built environment is usually negligible, due to the low to moderate nature of the seismicity surrounding Greater Cairo. Moreover, for any given year according to Figure 7.20, an indirect loss of approximately 1 million USD is experienced with a probability of 1E-1, 15 million is experienced with a probability of 1E-2, 250 million USD is experienced with a probability of 1E-3, and 40 billion USD is experienced with a probability of 1E-4, for AB10 for 100 percent recovery efficiency. The indirect loss exceedance curves for each of the ground-motion models are shown in Appendix F.



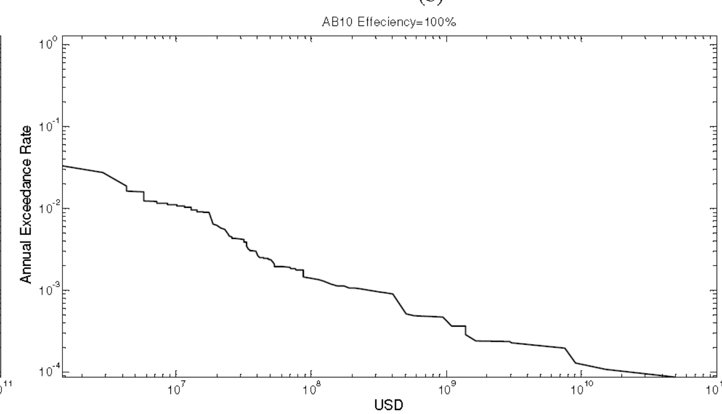
(a)



(b)

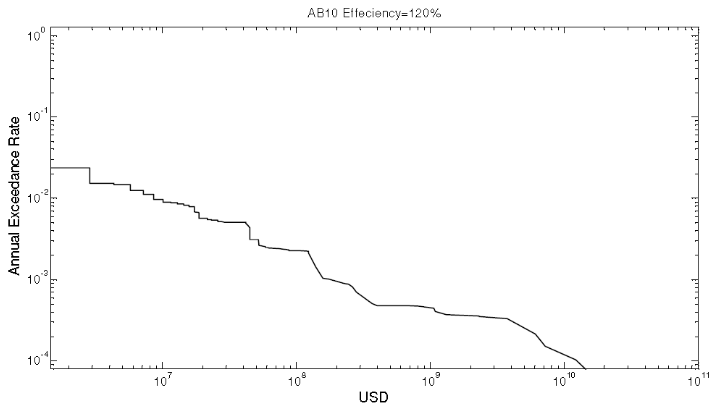


(c)

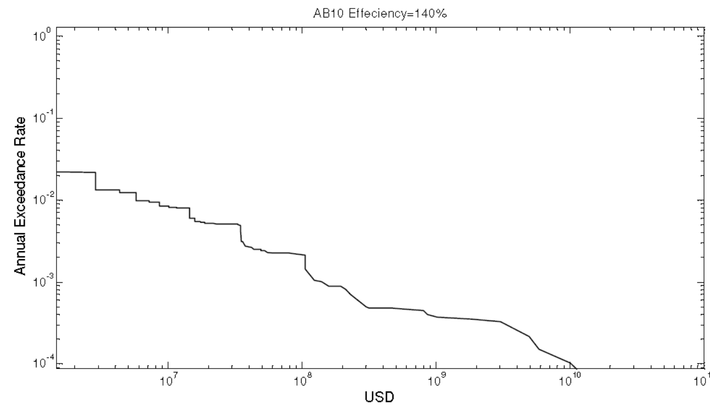


(d)

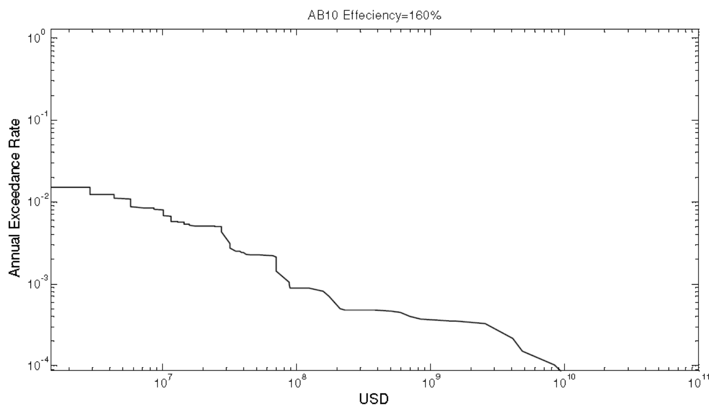
Figure 7.20 Exceedance curve for indirect loss for AB10 for a) 40%, b) 60%, c) 80%, d) 100%, e) 120%, f) 140% and g) 160% efficiencies



(e)



(f)



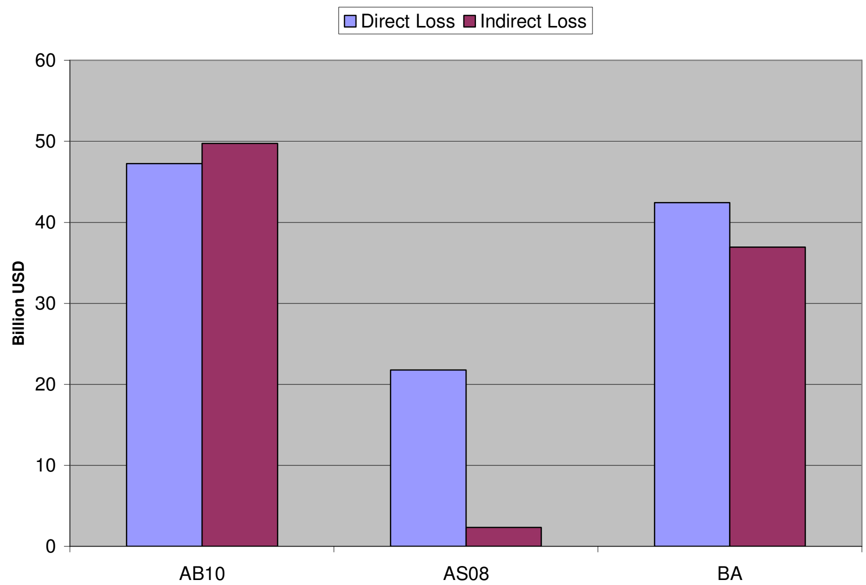
(g)

Figure 7.20 Continued

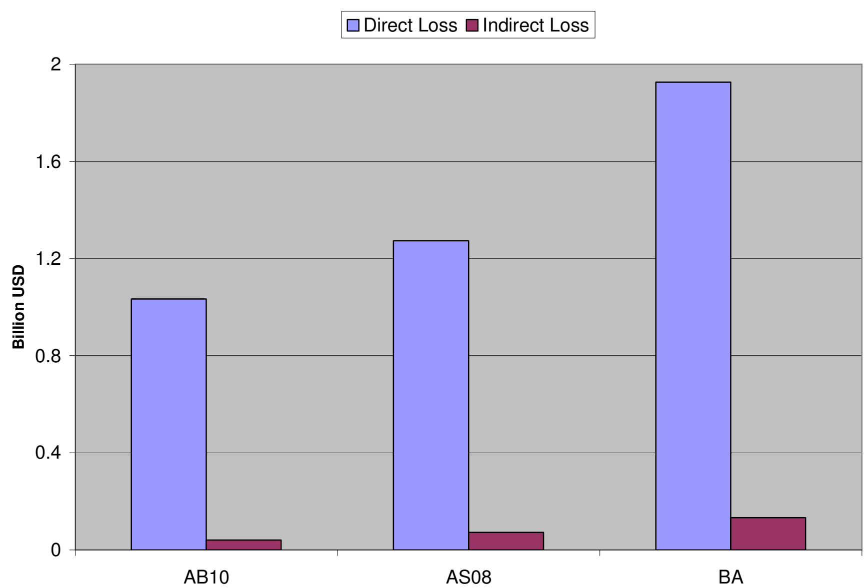
7.5 Total Losses

The total loss is simply calculated as the summation of the direct and indirect losses for each cluster map. Figure 7.21 presents the direct and indirect losses for cluster map 323 and 1445 for a recovery efficiency of 100 percent. In the case of map 323 it is evident that for AB10 the indirect loss can exceed the direct loss. This takes place due to the high levels of ground-motion that causes significant damage to the lifeline components. Since lifeline components perform better seismically than structures in the building stock, a high level of ground-motion is required to cause significant damage to the lifelines. In the case of map 323, Figure 7.21 (a), the damage to the lifelines causes severe business interruption, which leads to a high level of indirect loss. Other cluster maps, such as 1445, Figure 7.21 (b), do not experience such high levels of ground-motion, therefore, leading to less damage to the lifeline networks, consequently causing direct loss to significantly exceed indirect loss.

This direct relationship between high levels of ground-motion and indirect losses is again evident in the total loss exceedance curves presented in Figure 7.22. Figure 7.22 (a) presents the total loss annual exceedance curve for AB10 according to 40 percent recovery efficiency. If this curve is compared to the annual exceedance curve for AB10 for 160 percent recovery efficiency shown in Figure 7.22 (b), it is clear that the total losses for shorter return periods are similar in both cases, while those for longer return period losses differ dramatically. This illustrates that the majority of events affecting Greater Cairo which are low-to-moderate in nature, cause low levels of indirect loss relative to the direct loss, while more unlikely larger events cause high levels of indirect loss relative to the direct loss. This is further emphasised when comparing the total loss shown in Figure 7.22 to the exceedance curves for direct loss shown in Figure 7.14. At 10 and 100 year return periods the losses in both cases do not differ significantly, while at larger return periods the losses differ considerably.



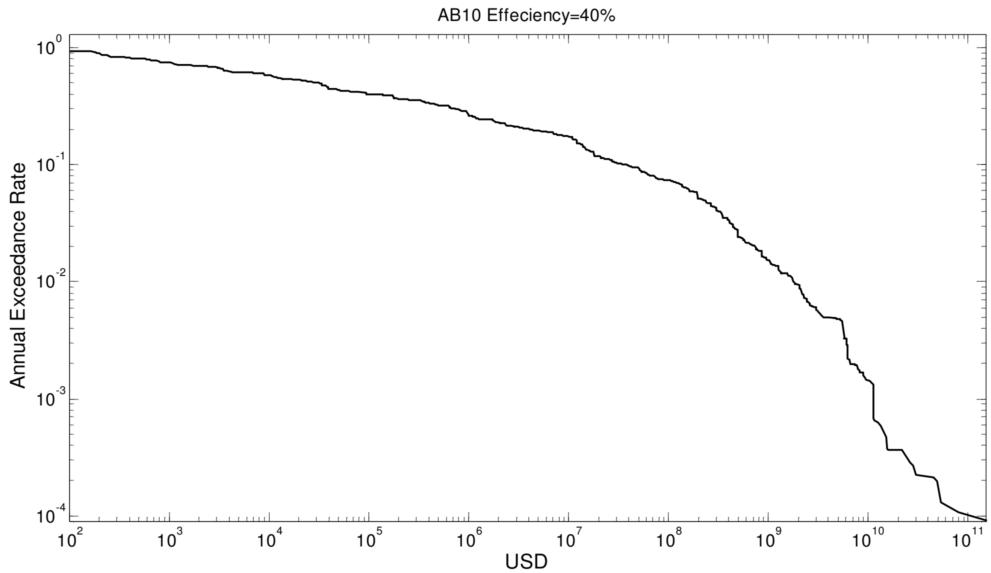
(a)



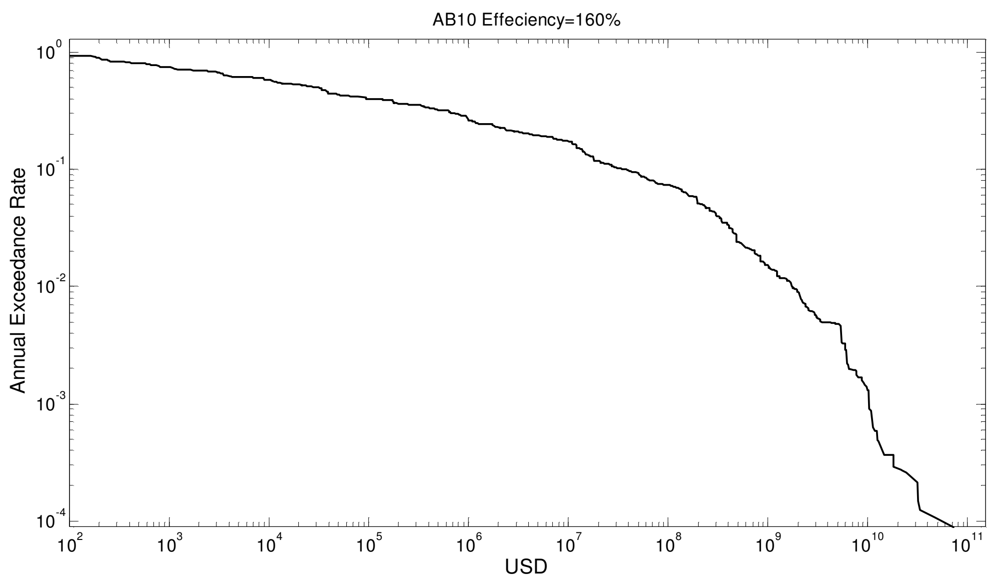
(b)

Figure 7.21 Direct and indirect losses for cluster map a) 323 and b) 1445 for 100 percent recovery efficiency

These estimations of total losses are considered unreliable unless they are compared to benchmarks that help highlight the legitimacy of the developed model. Two such sources exist for comparing the results of this study to. The first of which is the study conducted by Moharram (2006). The latter study estimated direct earthquake loss using a scenario-based approach which evaluated losses according to four scenarios each of a M_s=5.9 whose origin was randomly chosen. The location of scenarios 1, 2 and 3 were chosen within the boundaries of Greater Cairo, while scenario 4 was located further away at the origin of the Dahshour 1992 earthquake.

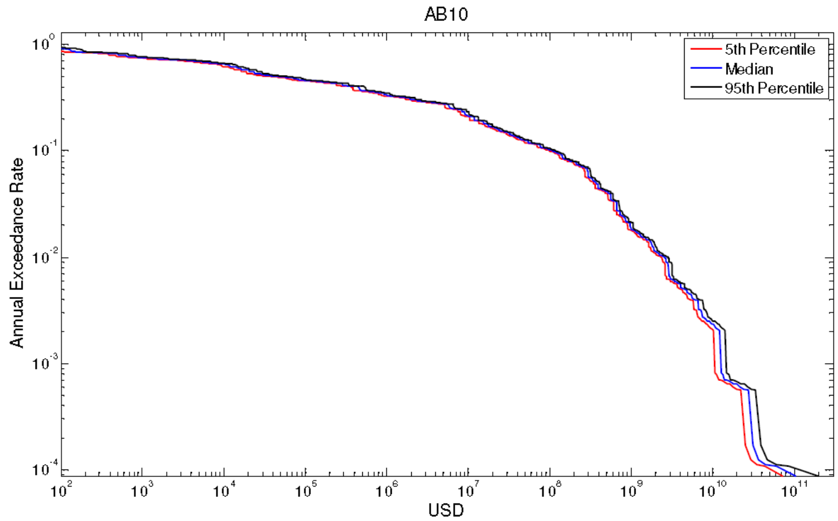


(a)

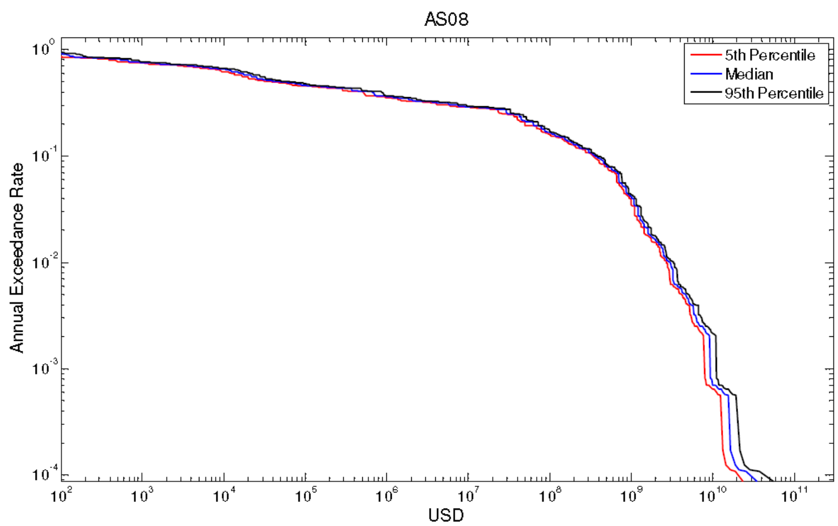


(b)

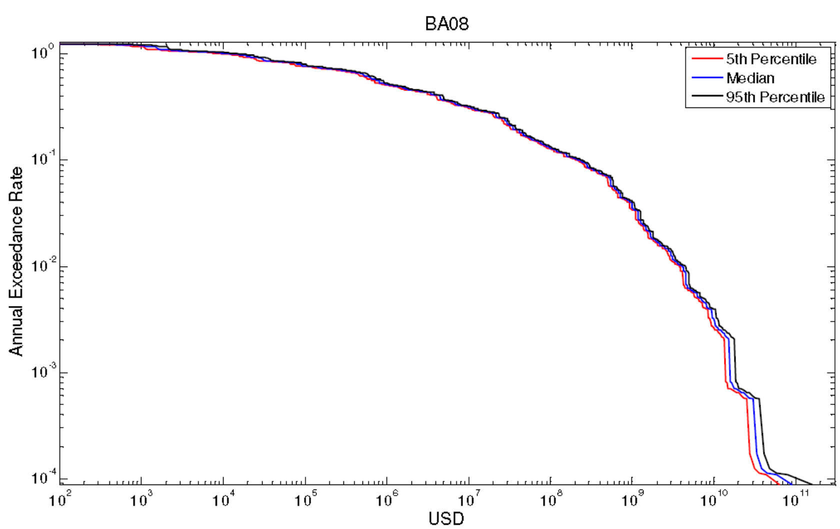
Figure 7.22 Total loss exceedance curves for AB10 for a) 40 percent and b) 160 percent recovery efficiency



(a)



(b)



(c)

Figure 7.23 Total loss accounting for a) AB10, b) AS08 and c) BA08

Cluster map 323 presents the highest levels of ground-motions throughout Greater Cairo, and can be used to compare with Moharram's (2006) 'worst case' scenario-based approach. Table 7-4 presents a comparison between Moharram's (2006) four scenario cases and cluster map 323. Scenarios 1, 2 and 3 are all of a magnitude of M_s =5.8, whose locations were randomly selected as shown in Figure 7.24, while scenario 4 is also of a magnitude of M_s =5.8, and occurs at the location of the 1992 Dahshour earthquake, 26 km from the centre of the city. Each of the four scenarios in Moharram (2006) experience less direct loss than that in cluster map 323.

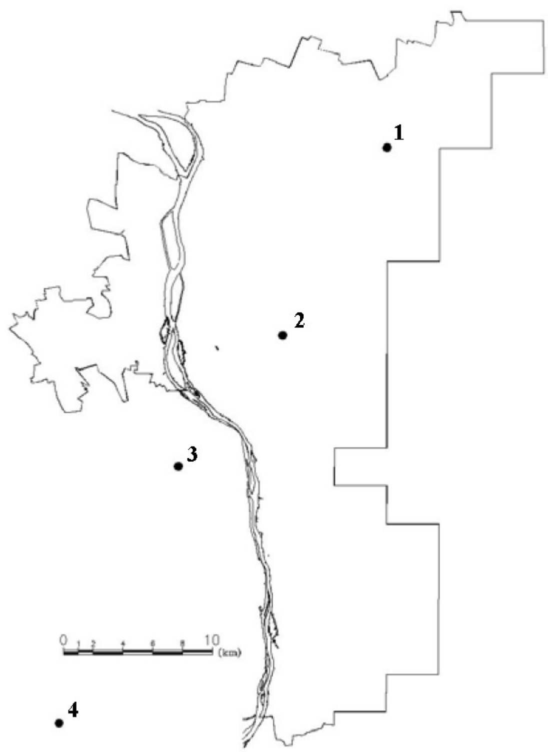


Figure 7.24 Geographical locations of the earthquake scenarios used in Moharram (2006)

Even though Moharram (2006) only evaluated building loss, while this study evaluates losses to the building stock as well as natural gas and electricity networks, this does not affect the results greatly, since, as previously mentioned, lifeline direct losses comprise a small percentage of total direct losses. The additional direct loss can therefore be attributed to one reason. The total land area included in this study is significantly larger than that in Moharram (2006), being nearly seven times larger in area. This means that the building stock evaluated in this study is significantly larger than that in Moharram (2006). This is clearly illustrated in Table 7-4, where even though the total direct loss estimation for cluster map 323 exceeds those losses estimated by Moharram (2006), the direct loss per unit area is less than that for scenarios 1, 2 and 3. Nonetheless, even though the area encompassed in this study is nearly seven times that in Moharram's (2006), the direct losses are not seven times greater. This is because a large portion of the district of 6th of October and New Cairo, not included in Moharram (2006), are uninhabited desert lands that experience no loss. This is further illustrated by the direct losses per building, where on average for the three ground-motion models being used the direct losses are more than 38,000 USD per building, which is more than double the losses per building of any of the scenarios analysed by Moharram (2006). This illustrates that cluster map 323 is more critical and unlikely to occur than the scenarios used in Moharram (2006), as well as the fact that the losses per unit area might not truly reflect the true nature of the losses due to the large uninhibited desert land in 6th of October and New Cairo.

Table 7-4 Comparing results between cluster map 323 in this study for 100 percent recovery and Moharram (2006)

			Total Loss billion USD	Losses/Unit area (million USD/km2)	Losses/building (thousand USD/building)
Moharram (2006)	**Scenario 1**		**16.07**	**37**	**16.76**
	Scenario 2		**17.39**	**40.00**	**18.13**
	Scenario 3		**11.00**	**25.00**	**11.47**
	Scenario 4		**2.97**	**7.00**	**3.10**
This Study	AB10	Direct Loss	47.26	15.95	49.27
		Indirect Loss	49.72	16.79	51.84
		Total Loss	**96.98**	**32.74**	**101.11**
	AS08	Direct Loss	21.76	7.35	22.69
		Indirect Loss	2.31	0.78	2.41
		Total Loss	**24.07**	**8.13**	**25.09**
	BA10	Direct Loss	42.41	14.32	44.21
		Indirect Loss	36.95	12.47	38.52
		Total Loss	**79.36**	**26.79**	**82.73**

The difference in results between this study and that of Moharram (2006) can further be attributed to two reasons: the use of different ground-motion models and accounting for spatial correlations. Moharram (2006) used Ambraseys et al. (1996) to estimate ground-motion levels throughout Greater Cairo, whereas this study used

AB10, AS08 and BA08. As has been previously highlighted, the choice of ground-motion model can significantly influence the results, and thus since Moharram (2006) used a different ground-motion model than those used in this study, results can significantly vary. Furthermore, spatial correlation, which was accounted for in this study, can increase the variance in loss estimates. Since this was not taken into account in Moharram (2006), differences in results are expected.

The second source that can be used to evaluate the results is the economic data published following the January 2011 Egyptian revolution. Between January 25th and February 11th 2011 Egypt came to a near standstill with people revolting throughout the nation, which resulted in Hosni Mubarak stepping down as president after 30 years of power. This event offers an insight into the potential economic losses that could be experienced in Egypt in the event of the economy shutting down. According to CAPMAS (2011) the Ministry of Tourism lost 440 million USD in the month of February 2011 compared to the same month in 2010. Furthermore, the Egyptian Stock Exchange has lost nearly 13.5 billion USD in the first quarter of 2011. These losses only account for two of Egypt's economic sectors, with other sectors being affected as well. These losses are also expected to increase further. Comparing these losses to the largest estimated indirect losses in the model for cluster map 323 at 100 percent efficiency for AB10, it is evident that the 49.72 billion USD seems reasonable when taking into account that these losses take place over a 16 year recovery period. During the first year of recovery, losses are expected to amount to nearly 9.8 billion USD, which is significantly less that the losses experienced by the economy during the first quarter of 2011. This again is reasonable since cluster map 323 does not lead to the entire economy coming to a near standstill, as in the case of the revolution.

7.6 Conclusion

This chapter evaluates the direct and indirect losses associated with damage to structures in the building stock, and components in the natural gas and electricity networks. Most previous studies have only assessed direct losses while overlooking indirect losses. This is primarily due to the complexity associated with evaluating indirect losses, and the fact that it required both economic and engineering expertise, which deters most engineers. Moreover, even though some studies have attempted to evaluate indirect losses, most have used static models that do not take into account the inherent resiliency in the economy. Nonetheless, evaluating both losses is essential in ensuring that mitigation strategies account for all types of losses, and do not fall short of providing sufficient assistance and guidance in the occurrence of earthquakes. It should be noted that the estimated losses are based on damage for two networks only; therefore, it is possible that the real losses could exceed the losses estimated in this study. This study undertakes the difficult challenge in evaluating indirect loss. Furthermore, it proposes a novel approach to evaluating indirect losses based on a dynamic rather than static IO model.

In addition to this study providing a novel approach for evaluating indirect loss, it also proposes a method for systematically recovering the damaged components. This method eliminates the randomness associated with repairing damaged components after a disaster. Moreover, it creates a strategy for repairing the damaged components that is based on minimising the losses rather than random social and political motives.

The relative ratio between direct and indirect losses depends greatly on the level of ground-motion. For low levels of ground-motion indirect loss is smaller since the indirect losses is caused primarily by damage to buildings, with little or no repair needed to the lifeline networks. With the increase in ground-motion, damage to lifelines increases, this increases the indirect losses since they are now caused by damage to both buildings and lifeline networks, which leads to a decrease in the ratio between direct and indirect losses. This is clearly witnessed in the annual exceedance curves for indirect losses, where small losses are far more likely to occur than much larger losses.

Indirect losses are directly related to the recovery time of damaged components. Moreover, the recovery time of damaged components is associated with the seismic performance of the components. In order to mitigate the potential indirect losses, the seismic performance of the most vulnerable components needs to be improved through retrofitting or replacement. Transformers have been deemed to be the most vulnerable component in either of the electricity or natural gas lifelines. Base isolation would significantly improve the seismic performance of transformers, reducing the direct loses associated with the electricity network by up to 8 percent. Even though this percentage appears small, it only accounts for direct loss savings, with further significant indirect loss savings expected.

Retrofitting of buildings would also help mitigate potential direct and indirect losses. Nonetheless, retrofitting the entire building stock is costly, and therefore building classes need to be prioritised in order to understand which building classes require urgent retrofitting. According to the finding in this chapter the EC1-MP and EURM classes are most vulnerable. Nonetheless, since masonry structures are not generally used in businesses, retrofitting these sectors would reduce direct losses, however will have less bearing on indirect losses. Thus, investing in retrofitting the EC1-MP is essential from an economic perspective, leading to the reduction of direct losses, and mitigating potential indirect losses.

In order to better represent the true nature of the built environment and the economy in the event of an earthquake, further studies need to be conducted whose purpose is to add more layers to the proposed model. These layers could include modelling more lifelines such as water, waste water and transportation networks, or further development of the economic model to include other resiliencies in the economy such as product substitution or use of excess inventory.

Chapter 8

Closure

8.1 Summary

This study presents a framework for developing a loss estimation model for Greater Cairo. The model estimates losses based on damage to the building stock, as well as the natural gas and electricity networks. Moreover, both direct and indirect losses are estimated. The model is composed of three modules, the first of which is the ground shaking module, whose purpose it is to estimate the ground-motion at various sites throughout Greater Cairo. The second module is the damage module, which uses the ground-motion maps developed from the ground shaking module to estimate damage to the building stock, as well as natural gas and electricity networks. Finally, the third module, the economic module, employs the damage estimates to calculate the cost of replacement or repair of damaged buildings and facilities, and the indirect cost associated with the downtime of various aspects of the built environment throughout the city.

In order to develop a ground shaking module, the seismicity surrounding Greater Cairo is first analysed. This is carried out by assessing the tectonic setting of the region, as well as reviewing historical and instrumental recordings of earthquake events. This provided an earthquake catalogue of events, within five earthquake zones, with events falling outside these zones being assigned to a background seismicity zone. Based on this, recurrence relationships for each of the five source zones and background seismicity zone are developed.

Prior to estimating the ground-motion, the seismic geological classification at each site needs to be determined. This is conducted through the use of geotechnical reports collected from the study by Moharram (2006) and other geotechnical data from projects in the eastern region of New Cairo, and the western region of 6th of October. Using this data, the soil is classified according to the NEHRP classification, based on the method developed by Boore et al. (2004) using a statistical probabilistic method that estimates the probability of the soil being within a given soil class. Based on this, the average shear wave velocity over the uppermost 30m, $\overline{V}_S(30)$, is estimated.

Using the obtained soil classification, the median spectral acceleration at each site is estimated using three ground-motion models: Akkar and Bommer (2010), Abrahamson and Silva (2008), and Boore and Atkinson (2008). In order to account for the inherent variability in results, the spectral accelerations were calculated by individually sampling both inter and intra event components of variability. Inter event residuals are period-to-period correlated, while intra event residuals are both period-to-period and spatially correlated. Using these correlations, inter and intra event residuals are sampled randomly, and used to estimate the final ground-motion at each site.

One of the main challenges in developing the ground shaking model is the computational time needed to execute the model. In order to reduce the model's computational time two methods are used. The first of these methods is Importance Sampling (IS) which reduces the number of scenarios by preferentially sampling magnitudes, inter-event and intra-event residuals from the upper ranges of each of the samples, but also adjusts for the actual likelihood of sampling these values. This method produces a smaller sample size than that associated with crude Monte Carlo Simulation (MCS), thus creating a more time efficient model. The second method used to minimise the computational time is K-means clustering, which groups the ground-motion maps into clusters, with only one ground-motion map per cluster being used for the analyses. Following this approach, 1500 ground-motion clusters were used, further increasing the efficiency of the model, and reducing the computational time.

Assessment of the building stock was first conducted by developing a building stock database. In order to develop a building stock database, three sources were used. The first of these was the Central Agency for Public Mobilization and Statistics (CAPMAS), which periodically develops a census of all structures throughout Egypt. The second source was the study conducted by Moharram (2006), who developed a building stock database for Greater Cairo with the exception of 6th of October and New Cairo. Finally, to account for the regions of 6th of October and New Cairo, field surveys were conducted. The building stock inventory was classified according to four main building classes, EC1-LP, EC1-MP, EC1-HP and EURM, for each district in Greater Cairo. Even though previous studies classified geocodes, this geocode classification was not according to districts since estimating indirect losses was not their goal. Since one of the goals of this study is to estimate indirect loss, it is essential that the geocodes be defined according to districts, since the available economic data is presented at district level.

Previous studies have assessed the damage to one aspect of the built environment. However, treating each of these aspects independently ignores the inherent interdependency and relationships between each of these components. This study not only assessed damage to the building stock, but also to the natural gas and electricity network, and models the relationship between each. This provides an important step into creating a comprehensive loss model that takes into account all aspects of the built environment.

Analysing the natural gas and electricity networks differed significantly. This is primarily due to the difficulty in identifying minimum cut sets for the electricity networks, which meant that random samples of the possible states of the network components had to be conducted. On the other hand, due to the nature of the natural gas network, where maintaining pressure in the system is the most essential aspect, minimum cut sets were identified and used in assessing the vulnerability of the network. Fragility and recovery curves from HAZUS were used to estimate the probability of damage of components in the lifeline networks and the downtime of these components respectively.

Most studies evaluate the direct economic loss resulting from an earthquake occurrence but ignore the indirect loss. This study develops a comprehensive loss estimation model, accounting for both types of losses. Direct loss is simpler to define, and is estimated as the repair cost of damaged components. This is conducted for all three aspects of the built environment analysed in this study. Indirect loss on the other hand is estimated based on business interruption and economic output loss due to downtime of various aspects of the built environment. This study employs Input-Output (IO) modelling in order to estimate the indirect loss. Even though the Egyptian IO table is based on 32 economic sectors, the employment statistics are published according to 29 economic sectors. Therefore, the employment data was mapped onto the IO table in order to establish employment statistics based on 32 economic sectors. Moreover, while previous indirect economic models used a static IO modelling approach, this study develops a novel approach of estimating losses based on a dynamic IO model. This is based on accounting for bottlenecks in the economy and adjusting imports and exports to try to minimise the effect of bottlenecks.

Direct building, natural gas and electricity losses, as well as indirect economic losses for each sector were estimated for each of the 1500 cluster maps. Based on these, exceedance curves were developed for direct loss for each aspect of the built environment, as well as for indirect loss. The estimated direct losses are dominated by building losses. This is due to the superior seismic performance of the lifelines compared to the building stock, as well as the large number of structures in the building stock inventory compared to those in the lifeline networks. Moreover, direct lifeline losses are greater for the electricity network than the natural gas network. This is primarily due to the poor performance of electricity transformers in the system, as well as the robust seismic performance of the natural gas stations. Indirect losses on the other hand are largest for cluster maps that experience relatively large lifeline losses. This is primarily due to business interruption being dependant on lifeline services, especially electricity to maintain operation.

8.2 Conclusions and Recommendations for Future Work

This study provides the framework for developing a loss estimation model that takes into account damage to various aspects of the built environment, as well as estimating both direct and indirect losses. One of the most important aspects of this study is that the developed model could be expanded to include additional aspects of the built environment, as well as further losses. Below is a summary of the most important observations and conclusions made in this study, as well as recommendations for future development and work:

- This study provides a framework for developing an earthquake loss estimation model. Moreover, it provides a means for developing such a model when information is scarce. Therefore, this framework can be implemented directly in regions that share similar characteristics. Additionally, the framework for the damage and economic modules of the model are universal, and can be used in any region.

- The seismicity data available is limited, which creates completeness issues, as well as problems developing recurrence relationships. Moreover, due to the limited information available regarding each event, events in the catalogue are not assigned to individual faults, but rather to seismic zones.

Further studies could be undertaken to improve the quality of the seismicity data available, especially in gathering information regarding smaller magnitude events prior to the development of the Egyptian National Seismological Network (ENSN), which would significantly improve the completeness of the earthquake catalogue.

- The seismicity surrounding Greater Cairo is characterised by low to moderate seismicity, with the Hellenic arc, Cyprian arc, Mediterranean coastal dislocation, Pelusiac (eastern Mediterranean Cairo Fayoum) trend, providing lower levels of seismicity, while the Levant Aqaba transform system experiences greater levels of seismicity. Nonetheless, due to the proximity of the Pelusiac trend to Greater Cairo, it has historically been the source of the most devastating earthquakes to affect Greater Cairo.

- The soil classification throughout Greater Cairo is dominated by NEHRP class D to the west of the Nile valley, and class C at the north east of the city. Stiffer NEHRP classes are evident in the east of the city, due to the existence of the Mokattam and Maadi formations which are composed mainly of limestone. Furthermore, softer NEHRP classes are located near the Nile valley, and older parts of Cairo, since these areas are underlain by a large layer of fill.

- Geotechnical data was collected from the study conducted by Moharram (2006) as well as geotechnical reports for projects in 6th of October in the west and New Cairo in the east of the city. However, not enough geotechnical data was available regarding the south of the city, in the districts of Atfeeh, Al-Ayat, and Al-Saf. Collecting geotechnical data regarding these areas will improve the classification of soil, and provide a more accurate assessment of ground-motions in these regions.

- In order to classify soil throughout Greater Cairo, a probabilistic method was used. Even though this method has been proven to provide reliable estimates of soil characteristics, it is still approximate in nature. To overcome this shortcoming, more boreholes reaching or exceeding 30m need to be drilled and logged. Furthermore, these borehole logs need to be well distributed throughout Greater Cairo, to provide good assessment of soil characteristics throughout the city.

- There is a significant discrepancy between ground-motion estimates for each ground-motion model. This is attributed to the intrinsic characteristics of the ground-motion models, as well as the adjustments that are made to variables in each model. In addition to the three ground-motion models used, more NGA and non-NGA models can be employed to better constrain the degree of epistemic uncertainty.

- Importance sampling and K-means clustering are used to minimise the computational time associated with executing the model. These methods helped reduce the earthquake scenarios to 1500 ground-motion maps, from the original 531,300 maps. Moreover, due to the need to estimate losses for each cluster, the procedure becomes massively parallel, thus suited for parallel grid computing, which enables the reduction in computational time extensively. Nonetheless, even though these methods are capable of reducing the number of scenarios being analysed, they still produce results that are based on approximations. If time and resources are not of the essence, and with advancements in the computational power of processors, these methods would become unnecessary, and every identified earthquake scenario can be analysed, thus increasing the stability and completeness of results.

- The fragility curves used in this study for concrete structures were derived by Moharram (2006) for three building classes, EC1-LP, EC1-MP and EC1-HP.

These account for the major concrete structures throughout Greater Cairo. However, in the case of masonry structures fragility curves from HAZUS were used. It is clear from the sensitivity analysis conducted for the vulnerability of masonry structures that the total direct loss varies greatly for low-to-moderate seismicity levels. Therefore, fragility curves need to be derived for the EURM building class to provide better estimates of building losses. Furthermore, with the improvements of seismic provisions in the design codes, new building classes are being developed, therefore, more fragility curves need to be developed to account for the increasing number of structures in Greater Cairo within these new building classes.

- According to estimates of building losses, the EC1-MP and EURM classes are most vulnerable to earthquake occurrences. On the other hand, EC1-HP is the least vulnerable building class and experiences the lowest losses. This is due to the fact that structures with higher numbers of stories, exhibit improved lateral resistance, owing to larger column dimensions at lower stores as well as longer response period. Moreover, most of these structures are younger in age, and have taken into account more seismic provisions in their design, as well as improved construction procedures. The EC1-LP and EC1-MP concrete classes on the other hand, experience higher levels of damage than the EC1-HP class, which is consistent with the reported damage after the 1992 Dahshour earthquake where low and mid rise structures experienced column hinging in the ground storey (Khater, 1993). Based on this, buildings within the EC1-MP and EURM building classes should be prioritised above others for requiring seismic retrofitting.

- In addition to retrofitting building classes that are deemed to be most vulnerable, other methods could be implemented to improve the seismic performance of the building stock. One of these methods involves conducting improvements to seismic provisions in the Egyptian code, to ensure that structures perform better during earthquakes. Moreover, in addition to enhancing structural performance, preparedness strategies could be developed to reduce the social and economic impact of earthquake occurrences.

- In order to reduce the potential impact of earthquake losses on the Egyptian government, insurance schemes could be introduced that offer homeowners a means for recouping the potential losses they could experience. Insurance premiums could be estimated based on the building class the homeowner occupies, the soil classification on which the structure stands, and the value of the structure. This is a good method for mitigating the potential seismic risk, by transferring the liability from the government entities, onto private insurance companies.

- Losses to electricity lifelines are estimated based on damage to elements of the electricity substations. This means that direct losses are concentrated in the areas in which substations exist. Nonetheless, in addition to analysing the distribution network, further work could be undertaken to analyse the transmission network, which would lead to loss estimates throughout Greater Cairo. Moreover, in the case of the natural gas network, only damage to the 70 bar, 30 bar and 7 bar networks could is analysed. This leads to losses taking place in only areas in which these elements exist. A higher resolution study could be undertaken to include the 4 bar and 0.7 bar network pipelines, which would enable calculating natural gas direct losses up to street level.

- This study takes into account damage to the lifeline networks through analysing the electricity and natural gas networks. Nonetheless, more lifeline networks such as waste water, water and transportation, could be added to the damage module. Moreover, the interdependencies between each of the networks can also be modelled in order to present a comprehensive and complete damage model, which reflects the true nature of the built environment.

- In addition to the electricity network being dependant on the natural gas network, the opposite is also true since many of the components in the natural gas network require electricity. Therefore, further evaluating the interdependencies between both networks presents a better assessment of the network, and provides more accurate loss estimates.

- The electricity network is analysed based on sample runs of the network components' possible states, rather than using minimum cut sets. This is due to the difficulty in identifying minimum cut sets for the electricity network. A study could be undertaken, whose goal is to enable the identification of minimum cut sets for the electricity network. This will increase the accuracy of results, as well as reducing the computational time associated with sampling possible states of the network's components.

- Transformers are the most vulnerable component of either of the electricity and natural gas networks. This vulnerability leads to the electricity network exhibiting greater losses than the natural gas network. In order to reduce these losses, transformers could be retrofitted using base-isolation in order to improve their seismic performance. If this is not economically feasible, then simply fixing the transformer connections to the ground could be implemented, in order to reduce deformation at a minimum cost. The natural gas network, on the other hand, performs very well seismically, with direct losses that are almost negligible compared to the losses associated with building damage. This limited damage is associated with taking into account only ground shaking, while further damage could occur due to ground deformation. Therefore, further analysis of potential damage due to ground deformation needs to be conducted.

- The electricity network is dependant on the natural gas network through the use of natural gas in a number of stations to generate electricity. It is therefore essential that the Ministry of Petroleum prioritise the natural gas stations that supply the electricity network, in any retrofitting projects.

- Computational General Equilibrium (CGE) economic models provide a more comprehensive method for analysing potential indirect economic losses, than Input-Output (IO) models. However, due to the amount of information needed to develop such a model, developing a CGE model would have been beyond the scope of this study. A further study could be undertaken whose goal is to develop an economic CGE model capable of capturing the indirect economic losses caused by damage to the built environment. This would help shed light on the changes in consumer and business behaviour following an earthquake event.

- The financial benefits of conducting seismic retrofits needs to be studied along with the cost of conducting such retrofits in order to develop a cost-benefit analysis. This cost-benefit analysis helps shed light on the fact that 100 percent retrofitting to transformers is not financially recommended, with 50 percent retrofitting being preferable. This is due to Greater Cairo experiencing low to moderate levels of seismicity, where 50 percent retrofitting to transformers leads to significant savings, while 100 percent retrofitting produces relatively insignificant additional savings. Therefore, 50 percent retrofitting to transformers is recommended based on this cost-benefit analysis. Similar studies could be conducted for other elements of the built environment that require seismic retrofitting. Moreover, the budgets of the Ministry of Electricity and Energy and Ministry of Petroleum and Mineral Resources needs to be analysed, in order to check the feasibility of conducting such retrofits.

- The Egyptian “other personal services” economic sector is one of the most impacted sectors during the event of an earthquake. This is primarily due to the large number of people employed in this sector throughout Greater Cairo. The “other personal services” sector is primarily an informal economic sector, and thus monitoring this sector is extremely difficult. Moreover, due to the informal nature of this sector, mitigating the potential impact of earthquakes to this sector is a challenge. Furthermore, the sudden impact of an earthquake on this sector could lead to a high level of unemployment. In order to mitigate this risk, employees in this sector should steadily be transferred to other sectors which are better monitored, and better equipped to deal with potential hazards.

- In order to assess the potential economic impact of an earthquake at a national level, the seismic hazard and damage module could also be expanded to cover the entirety of Egypt. This will help provide a more comprehensive economic model, as well as shedding light on the concentration of various sector losses in different regions throughout the nation.

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Appendix A

Tectonics and Seismicity

A.1 Description of Faults

<u>Levant Aqaba Transform System</u>

The Levant Aqaba transform system is more than 1000 km in length running from the north of the Red Sea running through the East Anatolia Fault and Bitlis Zone. The most notable of events along this system was the November 22nd 1995 M_w=7.3 earthquake (Dahy, 2010). The system is divided into three segments (Figure A.1):

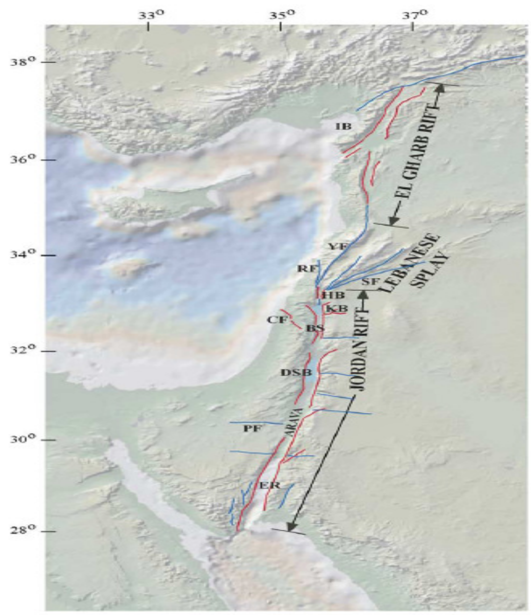


Figure A.1 Levant Aqaba Transform System (Mart et al., 2005)

- **Jordan Rift**

The Jordan rift extends 600 km from the north Red Sea to the Hula Valley. The 200 km at the south of the rift is known as the Aqaba rift and is submerged under the water of the Red Sea. The Aqaba rift is composed of three rifted basins with the southern most basin reaching 1800 m in depth, while the northern most basin is less than 1000 m deep (Ben Avraham et al., 1979; Mart, 1982). The Jordan Rift is composed of a series of basins that are bounded by N-S trending normal faults, and interspaced by structural thresholds (Picard, 1987; Mart, 1991; Horowitz, 2001). This section of the Levant-Aqaba Transform system is the closest to Greater Cairo, yet remains over 290 km away from Greater Cairo. Thus even though this source might pose a threat this threat remains unlikely due to the distance between the source and Greater Cairo.

- **Lebanese Fault**

The Lebanese fault splay is composed of faults that constrain the mountainous terrain of Lebanon and Anti-Lebanon, and the Baqa'a Valley. The faults appear to be oriented in a fan-shaped manner, with the trend being from N-S in the west, and SW-NE in the east (Mart et al., 2005)

- **El Gharb Kara Su Rift**

The El Gharb Kara Su Rift is nearly 200 km in length and 10 km wide, and connects the Yammouneh with the East Anatolia Fault. The rift propagates southwards (Ben Avraham and Lyakhovsky, 1992), and its structural faulting began in the Miocene period.

The Levant Aqaba transform system links the spreading of the red sea, and can be credited with the westbound movement of Anatolia (Turkey) and the eastern closure of the eastern Mediterranean. According to Mart et al. (2005), the spread of the gulf of Aden and the Red Sea in the Miocene period lead to the Arabian plate being push northward, and leading to a left lateral displacement along the Levant rift. This movement caused the Anatolian plate to be pushed westwards. The general trending of the faults is NNE-SSW.

Hellenic Arc

The African plate subducts beneath the Aegean Sea plate along the Hellenic Arc, this occurs at a rate of nearly 20-40 mm yr^{-1}. The Hellenic trench can be divided into seven different regions (Papazachos, 1996):

- **Cephalonia Transform Fault**

The 100 km Cephalonia strike slip fault strikes in the NE-SW direction and dominates this region (Scordilis et al, 1985).

- **Zante**

The Zante region is a small region no longer than 70 km, however it has historically been responsible for strong earthquakes such as the 1953 M_s=7.2 earthquake.. The region is dominated by a thrust fault which strikes in the NW-SE direction.

- **Southwest of Peloponnese**

The total length of this region is 170 km, and according to Galanopoulos and Xanthakis (1988) there is historical evidence this fault produced an earthquake of magnitude M_s=8.0 or larger about 1200 B.C.

- **West of Crete**

The West of Crete region with a length of 300 km is characterized by an ESE-WNW thrust fault. This fault caused a strong earthquake (M_s=8.3) on July 21st 365 A.D., illustrating the strong seismicity experienced in this region (Thommerete et al., 1981; Pirazzoli et al., 1992).

- **South East of Crete**

This region is characterized by more frequent smaller shocks with only one earthquake with an $M_s \geq 6.5$ occurring in the past two centuries (Papazochos and Papazachou, 1998). Moreover this boundary coincides with a change in the seas bathymetry from west-east to south-west-northeast.

- **South of Karpathos**

This region is characterized by thrust faults that cause higher frequency smaller earthquakes (M_s= 5.5-5.9) (Papazachos, 1996).

- **East of Rhodes**

The East Rhodes region is a submerged area with a length of 170 km, that has lead to the generation of a Tsunami in 1303 (Papazachos, 1996).

The average distance between the Hellenic Arc and Greater Cairo is over 700 km, thus it is not expected that this source will pose a great threat.

<u>Cyprian Arc</u>

The Cyprian Arc forms the plate boundary between the Anatolian plate in the north and the Sinai plates in the south, which is a continuation of under thrusting of the African lithosphere under the Eurasian lithosphere (Papazachos and Comninakis, 1972). Earthquakes that have occurred along the Cyprian Arc have been known to create damage, even at great distances, with its effects reaching Egypt (Moharram, 2006). The direction of faulting along the arc can be characterized as follows (Wdowinski et al., 2006):

- **Northwestern corner of the arc**

This section of the arc exhibits normal, reverse and strike slip faulting

- **Southwestern Cyprus**

The Southwestern section of the Cyprian arc is characterized by strike slip and thrust faulting, that were responsible for the $M_w = 6.8$, 1996 Paphos earthquake with a NW-SE faulting direction (Arvidsson et al., 1998; Pilidou et al., 2004).

- **South-eastern Cyprus**

N-S and NW-SE thrust fault are evident in this section of the arc.

- **North-eastern Cyprus**

The North-eastern section of the arc is characterized by NW-SE strike slip and normal fault events, of which the $M_w= 6.2$, 1998 Adana earthquake is the largest known.

The Cyprian and Hellenic Arc are often compared; however the Hellenic Arc yields a higher level of seismicity at deeper levels of up to 300 km, due to having a higher convergence of 20-40 mm yr^{-1}, two to three times greater than across the Cyprian Arc (Wdowinski et al., 2006).

The average distance between the Cyprian Arc and Greater Cairo is over 500 km, thus it is not expected that this source will pose a great threat.

Pelusiac (Eastern Mediterranean Cairo Fayoum) Trend

The Pelusiac trend extends from the eastern Mediterranean Anatolia zone across the Nile Delta and Fayoum to the gulf of Genuea, and appears to extend as far as the Amazon basin (Neev et al., 1982). The Pelusium Megashear as defined by Neev et al. (1982) exhibits a north-eastward convergence suggesting a counter clockwise rotation of the crust. The most well known event attributed to this trend was the October 12th 1992 Dahshour earthquake, which shook the heart of Cairo.

The shortest distance between the Pelusiac Trent and Greater Cairo is nearly 10 km, and for this reason this trend poses a great threat to Greater Cairo.

Mediterranean Coastal Dislocations

The Mediterranean Coastal Dislocations are located offshore of Alexandria and have resulted in the occurrence of 9 damaging earthquakes spanning from 320-2000 A.D., including the most recent event (M_s = 6.7) in 1955 (Maamoun et al., 1984; Ambraseys et al., 1994). Part of this dislocation includes the Rosetta fault trend which is a few kilometres off the coast of Alexandria (Hussein and Abdallah, 2001), as well as the Temsah fault trend to the north-east of the Nile delta. Seismic activity in this area appears to exhibit reverse fault mechanisms (El-Sayed et al., 2004), with Mahmoud (2003) believing that these faults are part of the Syrian Arc and that they exhibit a NE-SW trend.

The average distance between the Mediterranean Coastal Dislocation and Greater Cairo is over 120 km, and thus it is not expected that this source will pose a moderate threat to Greater Cairo.

Southern Egyptian Trends

Most of the seismic activity in the south of Egypt is dominated by the active faults around the Aswan area. Known faults in this area include Kalabsha, Kurkur and

Khour El Ramla. The majority of faulting in this region is oriented in the E-W direction, consistent with the Kalabsha fault, and was the source of the November 14th 1981 $M_s = 5.5$ earthquake that caused damage in the Aswan area (Mahmoud, 2003). The existence of active faults in this region is of great national security due to the location of the Aswan High Dam in the proximity of these faults, as presented by Fat-Helbary and Tealb (2002) (Figure A.2).

The average distance between the Southern Egyptian trends and Greater Cairo is over 500 km, and thus it is not expected that this source will pose a great threat.

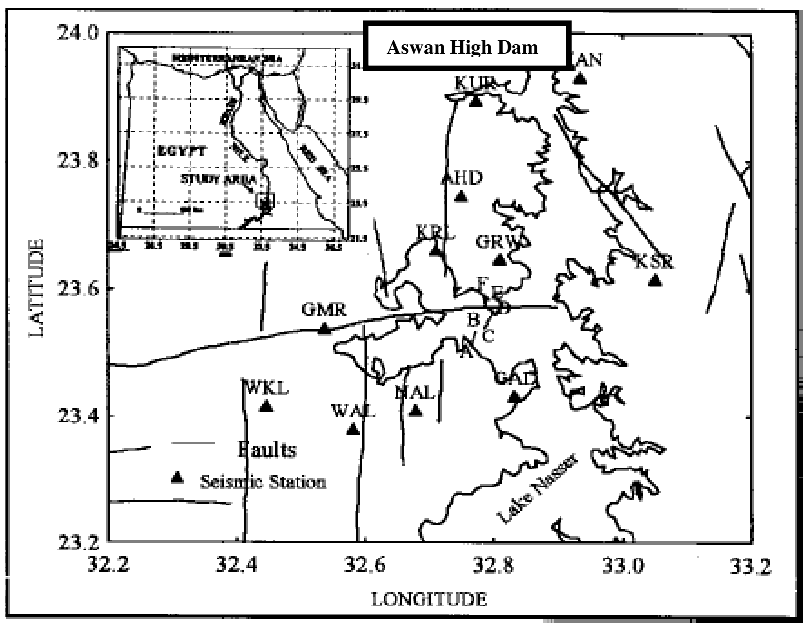


Figure A.2 Faults around the Aswan High Dam area (Fat-Helbary and Tealb, 2002)

A.2 Seismicity Catalogue

Table A-1 Seismic catalogue used in this study

Long	Lat	Date			M_w	Depth
		Year	Month	Day		
27.5	32.9	1964	8	25	4.54	33
28.2	33.8	1964	9	19	4.69	0
26.1	33.2	1966	1	16	4.97	33
24.1	34.0	1966	5	26	5.19	33
25.1	34.0	1967	7	8	4.61	0
25.7	33.7	1968	8	19	5.05	33
33.9	27.5	1969	3	24	5.05	16
33.8	27.5	1969	3	24	4.97	43
33.8	27.5	1969	3	27	4.90	29
33.9	27.6	1969	3	31	6.03	33
34.1	27.5	1969	3	31	4.97	57
34.1	27.8	1969	3	31	4.83	56
33.9	27.5	1969	3	31	4.97	40
33.7	27.5	1969	3	31	4.90	33
33.8	27.4	1969	4	3	4.83	33
32.9	27.7	1969	4	4	4.76	33
33.8	27.7	1969	4	4	4.83	29
34.0	27.5	1969	4	5	4.76	33
33.8	27.5	1969	4	8	5.12	24
33.8	27.8	1969	4	13	4.97	36
33.5	27.3	1969	4	14	4.97	16
33.9	27.4	1969	4	16	5.05	33
33.9	27.6	1969	4	17	4.90	42
33.7	27.6	1969	4	23	4.97	18
34.1	27.5	1969	5	10	4.90	33
33.8	27.5	1969	5	24	4.90	32
33.9	27.6	1969	5	25	4.97	33
25.0	34.0	1969	6	17	4.54	0
33.8	27.8	1969	8	3	4.83	55
34.0	27.5	1969	8	19	4.76	33
33.8	27.6	1969	9	26	5.26	33
33.9	27.5	1969	12	30	4.97	15
33.8	27.6	1970	4	28	4.97	28
35.3	31.7	1970	10	8	5.05	0
33.9	27.4	1970	12	19	4.97	39
33.9	27.6	1970	12	19	4.76	40
35.4	33.6	1971	4	16	4.76	8.4
33.8	27.6	1971	7	8	4.97	35.4
33.8	27.6	1972	1	12	5.19	36.4
33.9	27.8	1972	6	28	4.54	0
33.8	27.7	1972	6	28	5.48	16.5
27.8	33.8	1972	11	28	4.90	2
25.8	33.9	1972	11	29	4.47	43
33.4	27.7	1973	3	5	4.83	36.3
24.7	33.9	1973	12	22	4.18	87.8
25.7	33.9	1974	3	7	4.47	48.9
25.7	33.9	1974	3	19	4.47	39.5
31.6	30.6	1974	4	29	4.97	12.2
29.7	27.8	1974	9	7	4.47	33
34.0	27.8	1975	5	12	4.54	0

Table A-1 continued

26.4	32.0	1976	3	6	4.40	77
25.6	33.8	1977	6	14	4.40	2.3
35.5	31.2	1979	4	23	5.05	10
34.6	33.6	1979	8	14	4.61	10
32.6	29.6	1980	5	3	4.54	33
24.9	33.7	1980	6	15	4.61	0
24.6	33.5	1980	6	24	4.54	0
25.8	34.0	1980	8	8	4.70	33.2
26.1	34.0	1980	8	14	4.65	55.7
24.2	33.7	1981	6	24	4.47	0
24.5	33.7	1981	7	5	4.61	0
24.8	33.7	1981	7	9	4.25	0
25.3	33.8	1981	8	25	4.40	27.8
26.0	33.8	1981	9	14	4.47	0
24.9	33.8	1981	9	28	4.54	10
25.1	34.0	1982	1	9	4.32	0
34.3	27.9	1982	3	23	4.90	66.6
26.7	33.2	1982	4	5	4.40	0
25.6	33.8	1982	7	29	4.32	62.7
25.8	33.9	1982	8	22	4.11	0
24.8	33.5	1982	9	7	4.32	0
26.2	33.9	1982	9	21	4.61	10
34.8	26.8	1982	10	14	4.97	10
33.8	27.6	1982	10	30	4.83	10
34.7	29.2	1983	1	21	4.97	3.3
35.0	29.0	1983	1	25	4.90	21
34.2	28.5	1983	1	31	4.61	21
35.0	28.9	1983	1	31	4.61	1
33.9	29.8	1983	1	31	4.76	21
34.8	29.2	1983	2	3	5.05	24.1
34.9	29.3	1983	2	3	4.83	10
34.6	29.2	1983	2	3	4.76	10
34.8	29.3	1983	2	3	4.97	23.8
34.8	29.1	1983	2	4	4.61	33
35.6	28.9	1983	2	10	4.61	21
26.3	33.9	1983	3	27	4.04	51.7
35.7	33.8	1983	6	3	4.70	7.7
33.1	28.6	1983	6	12	4.65	28.9
33.4	28.5	1983	6	12	4.76	33
25.2	34.0	1983	11	17	4.76	33
32.2	30.2	1984	3	29	4.97	7.6
32.2	33.8	1984	4	7	4.76	48.3
35.0	32.8	1984	8	24	4.88	0
35.6	33.2	1984	10	18	4.18	17.8
35.4	32.1	1984	11	5	4.69	4
34.1	28.0	1984	12	8	4.69	10
35.5	31.9	1985	1	25	4.83	26.8
33.7	27.7	1985	2	28	4.65	10
25.1	33.9	1985	4	11	4.18	64.8
34.9	29.1	1985	12	31	4.97	8.6
34.4	27.1	1986	4	8	4.69	10
25.5	33.7	1986	4	17	4.69	16.5
25.6	33.6	1986	4	24	4.18	18.4
22.9	33.7	1986	5	19	4.32	10
26.8	32.9	1986	7	1	4.32	10

Table A-1 continued

25.1	33.8	1986	7	1	3.96	23
30.5	32.4	1986	7	12	4.47	10
24.8	33.9	1986	9	27	4.25	33
31.8	29.7	1986	10	18	4.69	10
26.0	32.4	1986	11	10	4.11	10
26.5	33.7	1986	11	30	4.32	10
32.2	30.5	1987	1	2	5.12	20.9
32.2	32.7	1987	2	16	4.40	10
28.9	32.4	1987	4	9	4.83	10
24.3	32.8	1987	6	28	4.94	10
35.1	27.1	1987	9	6	4.90	10
24.2	32.4	1987	9	13	4.54	10
26.0	32.3	1987	9	21	4.25	10
24.2	33.9	1987	9	29	4.25	33
24.9	33.8	1987	10	14	4.47	33
26.2	32.4	1987	11	1	4.29	33
26.1	32.5	1987	12	11	4.47	13
31.7	30.7	1987	12	14	4.47	10
26.4	33.9	1987	12	29	4.25	57
34.9	26.8	1988	3	4	4.25	10
26.1	33.8	1988	3	13	4.40	4.9
25.1	34.0	1988	5	9	4.40	43.3
33.7	28.0	1988	6	5	4.76	9.2
27.9	32.2	1988	6	9	4.35	10
24.8	33.87	1988	11	3	4.25	26.8
25.0	33.9	1989	1	6	4.47	33
25.1	33.8	1989	1	6	4.18	10
24.7	33.8	1989	3	29	4.54	10
34.9	26.9	1989	4	4	4.54	10
24.8	33.9	1989	4	6	4.90	33
24.7	33.8	1989	4	6	3.96	27
24.6	34.0	1989	4	8	4.32	17.4
26.1	34.0	1989	6	14	4.61	9.4
25.8	33.8	1989	8	18	4.18	76.7
24.7	33.7	1989	9	18	4.54	10
24.6	33.6	1989	9	18	4.69	33
34.8	33.7	1989	10	2	4.11	26.1
31.4	33.1	1989	11	12	4.61	33
25.4	33.7	1989	12	1	4.11	10
33.3	28.4	1989	12	18	4.61	25
35.1	27.2	1990	9	13	4.83	10
25.9	33.9	1990	10	26	4.69	10
25.9	34.0	1990	10	26	4.76	6.8
25.9	33.8	1990	10	26	4.54	20.8
26.1	33.8	1990	10	26	4.69	10
25.9	33.9	1990	10	28	4.47	23.3
28.5	28.0	1991	2	18	4.40	10
24.9	34.0	1991	9	15	4.69	2.8
32.9	28.5	1991	12	5	3.82	21.2
25.9	34.0	1992	3	29	4.11	1
32.0	30.2	1992	5	22	4.76	8.1
26.5	32.5	1992	6	20	4.47	10
34.7	27.4	1992	9	3	4.25	10
34.1	27.4	1992	9	25	4.25	10
34.1	27.4	1992	9	25	4.25	10

Table A-1 continued

33.9	27.5	1992	9	25	4.32	10
33.8	28.2	1992	9	26	4.04	10
34.9	27.8	1992	9	27	4.61	10
31.1	29.8	1992	10	12	5.58	21.5
31.1	29.6	1992	10	12	4.35	28.7
31.2	29.7	1992	10	13	3.67	32.4
31.2	29.7	1992	10	14	4.11	10
31.2	30.1	1992	10	14	3.89	10
33.2	28.5	1992	10	20	4.25	10
31.6	29.9	1992	10	22	4.41	3.4
33.1	28.9	1992	10	27	4.32	18.7
33.1	28.8	1992	10	27	3.96	10
31.0	29.7	1992	11	5	4.83	16.4
31.0	29.7	1992	11	5	4.76	10.3
31.2	29.6	1992	11	6	3.67	32.4
31.0	29.6	1992	11	10	4.69	24.7
33.2	28.8	1993	1	2	3.96	7
32.2	33.8	1993	2	17	4.69	38.2
31.7	30.0	1993	3	10	4.76	10
25.2	34.0	1993	3	22	4.40	42.9
33.1	29.0	1993	3	29	4.18	10.8
26.1	33.9	1993	4	20	3.96	26.9
35.6	33.2	1993	4	24	3.67	18.6
30.7	29.3	1993	5	4	3.75	10
30.8	29.6	1993	6	13	4.47	10
34.7	33.7	1993	6	20	4.61	9.4
34.7	28.7	1993	7	30	4.90	10.4
34.8	29.3	1993	7	31	4.61	6
34.8	27.9	1993	7	31	3.89	5
35.4	31.5	1993	8	2	4.25	30.5
35.8	31.1	1993	8	2	3.67	10
34.7	28.8	1993	8	3	4.76	16
34.6	28.8	1993	8	3	5.90	10
34.8	28.7	1993	8	3	5.58	10
34.7	28.5	1993	8	3	5.46	10
34.4	28.8	1993	8	3	4.76	10
34.7	28.2	1993	8	3	5.05	10
34.6	28.6	1993	8	3	5.41	10
34.6	28.8	1993	8	3	5.52	12.6
35.4	29.1	1993	8	3	4.69	33
34.8	28.6	1993	8	3	4.76	10
34.5	28.9	1993	8	3	4.76	14
34.6	28.8	1993	8	3	5.17	1.5
34.6	28.5	1993	8	3	4.25	1
34.6	28.7	1993	8	3	4.11	23
34.9	28.1	1993	8	3	4.25	13
34.9	27.4	1993	8	3	4.18	10
34.6	28.7	1993	8	3	4.11	9.5
34.4	28.6	1993	8	3	4.32	6
34.7	28.6	1993	8	3	4.04	7
34.9	28.4	1993	8	3	4.04	6
35.4	28.3	1993	8	3	3.89	15
35.1	28.8	1993	8	3	3.89	17
35.2	28.6	1993	8	3	3.82	17
34.8	28.4	1993	8	3	3.96	6

Table A-1 continued

25.5	33.6	1993	8	4	3.82	21.8
34.4	28.5	1993	8	4	3.96	1
34.5	28.8	1993	8	5	4.04	14
34.5	28.8	1993	8	5	3.96	10
34.5	28.6	1993	8	6	3.75	16
34.6	28.6	1993	8	6	4.04	2
34.5	28.9	1993	8	7	4.61	22.6
34.6	28.8	1993	8	9	4.76	10
35.0	29.0	1993	8	12	3.89	5
34.7	28.5	1993	8	13	4.83	5.8
34.6	29.0	1993	8	13	4.54	25.2
34.7	28.8	1993	8	15	4.47	10.2
34.7	28.6	1993	8	16	4.18	22.7
34.7	28.8	1993	8	20	4.69	6
34.6	28.8	1993	8	21	3.67	10
34.5	28.7	1993	8	22	4.47	2.6
24.4	28.7	1993	8	29	3.67	13
35.2	28.4	1993	9	6	4.40	5
34.7	28.6	1993	9	6	3.96	15
24.8	28.8	1993	9	6	3.82	10.1
34.6	28.6	1993	9	6	4.04	8
34.7	28.7	1993	9	7	4.04	7
34.7	28.6	1993	9	9	3.82	7
34.6	28.7	1993	9	12	3.89	7
34.0	32.9	1993	9	13	4.69	10
34.5	28.8	1993	9	13	4.04	7
34.7	28.6	1993	9	20	4.25	10
34.6	28.7	1993	10	3	4.11	5.6
34.6	28.7	1993	10	10	4.11	10
34.6	28.7	1993	10	18	4.59	7.6
34.7	28.8	1993	10	21	4.61	27.4
34.9	28.7	1993	11	1	3.82	5
34.7	28.7	1993	11	3	5.11	6.6
34.6	28.5	1993	11	3	4.32	0.1
34.6	28.6	1993	11	7	3.89	1
34.6	28.7	1993	11	8	4.82	8.4
35.5	33.7	1993	11	12	4.40	10
34.7	28.6	1993	11	20	4.04	3
34.9	28.7	1993	12	4	5.05	19.2
34.5	28.6	1993	12	31	4.25	2
34.5	28.2	1994	1	1	4.32	10
34.6	28.8	1994	1	3	4.47	12.1
34.6	29.1	1994	1	3	4.18	24.1
31.3	30.0	1994	1	13	3.96	25.5
34.6	28.9	1994	2	17	4.25	11.2
34.6	28.8	1994	4	6	4.76	8.6
30.1	31.6	1994	5	25	3.89	10
34.6	28.7	1994	7	3	4.69	0.6
34.7	28.7	1994	7	4	4.04	13.5
34.7	28.7	1994	7	5	4.40	20.4
25.6	34.0	1994	7	17	4.18	56.8
35.6	33.8	1994	8	6	4.04	2.5
35.6	32.2	1994	9	16	4.04	24.7
25.5	33.9	1995	1	19	4.32	75.6
34.0	27.6	1995	3	15	4.11	10

Table A-1 continued

34.9	29.2	1995	3	17	4.04	19.9
26.2	33.1	1995	3	23	4.69	10
35.4	33.7	1995	4	23	4.18	1.1
25.8	33.0	1995	4	24	4.61	33
34.7	28.4	1995	5	14	4.32	3
34.3	28.9	1995	6	9	3.82	2.8
24.6	33.4	1995	7	26	4.69	50.6
25.3	33.4	1995	8	2	3.96	33
32.3	29.8	1995	9	8	4.25	10
34.8	28.8	1995	11	22	6.93	9
34.5	28.9	1995	11	22	4.40	4
34.7	29.0	1995	11	22	4.97	4.6
34.9	28.8	1995	11	22	4.69	8
34.9	28.5	1995	11	22	5.05	5
34.8	28.9	1995	11	22	4.83	0
34.8	29.1	1995	11	22	4.40	0
34.8	29.0	1995	11	22	4.69	1
34.8	28.6	1995	11	22	5.17	10
34.5	28.6	1995	11	22	4.11	7
34.5	28.8	1995	11	22	4.25	6
35.0	29.0	1995	11	22	4.32	0
34.8	28.9	1995	11	22	4.32	0
34.8	29.0	1995	11	22	4.32	2
34.8	29.0	1995	11	22	4.32	0
34.8	29.1	1995	11	22	4.11	5
35.1	29.0	1995	11	22	4.18	5
34.6	29.1	1995	11	22	4.32	0
34.5	28.8	1995	11	22	4.25	3
35.2	28.8	1995	11	22	4.25	5
34.8	28.8	1995	11	23	4.83	4
34.7	29.2	1995	11	23	5.41	0
34.8	28.8	1995	11	23	4.25	0
35.1	29.3	1995	11	24	4.40	0
34.7	29.0	1995	11	24	4.94	10
30.4	31.7	1995	11	24	4.32	10
34.7	29.0	1995	11	24	4.18	0
24.8	29.2	1995	11	25	4.97	7
34.9	28.8	1995	11	25	4.25	14
34.8	29.1	1995	11	25	3.89	1
35.1	28.7	1995	11	26	4.25	10
35.0	28.8	1995	11	26	4.04	4
34.6	28.8	1995	11	27	4.40	5
34.6	28.6	1995	11	28	4.25	5
34.8	29.2	1995	11	28	4.18	5
34.9	29.2	1995	11	28	4.04	5
35.0	29.4	1995	11	28	3.96	23.5
34.6	29.1	1995	11	29	4.40	0
35.2	28.8	1995	12	1	4.69	9.5
34.9	29.1	1995	12	1	4.61	0.8
35.3	29.1	1995	12	1	4.32	10
35.1	29.1	1995	12	2	4.69	1.2
35.1	28.9	1995	12	4	3.96	9.3
34.7	28.9	1995	12	6	4.54	4
34.8	29.0	1995	12	8	4.61	23
33.6	28.9	1995	12	10	4.40	33

Table A-1 continued

35.0	28.8	1995	12	10	4.25	20.7
34.8	28.9	1995	12	11	5.23	19.3
34.8	28.9	1995	12	11	4.32	25.1
34.8	28.7	1995	12	11	3.96	6.6
34.7	28.9	1995	12	14	4.54	17.8
35.2	28.7	1995	12	15	4.18	17.5
35.1	28.8	1995	12	19	4.40	36.5
35.1	29.5	1995	12	23	4.61	8.2
35.3	29.2	1995	12	26	4.53	8.5
25.2	34.0	1995	12	27	4.47	41
35.5	28.8	1995	12	30	4.32	29
34.2	28.6	1996	1	2	4.32	10
34.9	28.7	1996	1	3	4.53	8.7
34.8	28.7	1996	1	4	4.47	11.1
34.8	28.7	1996	1	4	4.11	10
34.7	28.7	1996	1	4	4.04	12.6
34.9	28.9	1996	1	6	4.32	5
35.1	29.3	1996	1	8	4.40	4.8
34.9	29.3	1996	2	2	4.54	11.8
35.2	28.9	1996	2	2	4.32	2.9
35.1	29.1	1996	2	4	4.18	0.4
34.8	29.6	1996	2	8	4.18	5
33.9	28.7	1996	2	8	4.11	5
35.3	28.4	1996	2	9	4.18	4
34.6	28.7	1996	2	12	3.82	10
34.6	28.9	1996	2	21	5.17	22.4
34.6	28.8	1996	2	21	4.11	5
34.8	28.8	1996	2	26	4.40	30.5
34.8	28.7	1996	2	26	5.00	10
34.5	28.9	1996	3	16	3.96	3
25.7	33.8	1996	3	17	4.11	55.7
25.6	33.7	1996	3	30	4.24	45.4
26.9	33.9	1996	3	30	4.18	10
25.5	33.8	1996	3	30	4.32	46.6
30.7	33.8	1996	4	11	4.18	64.4
34.7	28.9	1996	4	16	4.47	18.6
34.5	27.6	1996	4	25	4.11	10.9
34.8	29.3	1996	4	28	4.04	9.3
25.3	33.9	1996	5	19	4.11	52.8
25.2	33.8	1996	5	20	4.54	8.8
35.2	29.5	1996	5	24	4.04	3.4
35.0	29.4	1996	5	29	4.04	33
34.7	28.8	1996	6	1	4.18	31.6
34.7	28.2	1996	6	13	4.40	23.7
32.3	29.7	1996	8	21	3.75	30
34.5	28.7	1996	9	4	4.25	0
34.8	29.0	1996	9	15	4.47	8
25.5	33.7	1996	9	30	4.32	10
25.5	33.8	1996	10	3	4.69	10
25.6	33.7	1996	10	3	4.82	57.7
25.5	33.6	1996	10	3	4.32	38.8
25.6	34.0	1996	10	3	4.18	74.1
25.6	33.7	1996	10	3	4.82	57.7
35.4	33.6	1996	10	4	4.61	3.5
30.9	32.0	1996	10	12	4.54	10

Table A-1 continued

33.7	33.2	1996	10	19	3.89	25
31.9	33.9	1996	10	28	4.32	1
32.9	33.5	1996	11	2	3.75	5
32.4	30.4	1996	12	1	4.11	49.8
35.4	33.7	1996	12	3	3.82	1.7
33.9	27.7	1996	12	17	4.32	14.3
33.2	27.6	1996	12	20	4.47	25
33.9	27.6	1996	12	23	4.18	26.6
26.6	32.8	1997	1	5	4.25	10
25.7	33.7	1997	1	10	4.04	70.9
26.6	34.0	1997	1	11	4.61	39
23.3	33.7	1997	2	17	3.89	100
34.7	29.2	1997	2	21	4.25	10
26.3	33.5	1997	2	24	4.25	10
34.2	27.5	1997	3	8	4.76	1
35.4	33.7	1997	3	26	5.17	5
35.4	33.7	1997	3	26	5.11	4.3
34.7	29.3	1997	4	13	4.25	5
34.6	28.3	1997	5	10	4.53	10
34.8	28.8	1997	6	14	3.96	1.9
28.3	33.9	1997	7	17	4.25	57.9
25.4	33.8	1997	8	22	4.24	29.2
25.0	34.0	1997	9	3	4.04	52
24.4	33.6	1997	10	4	4.18	33
27.0	33.5	1997	12	20	4.25	33
33.7	28.1	1998	1	1	4.69	25
27.6	31.4	1998	5	28	5.29	10
24.3	33.5	1998	8	21	3.96	22.7
25.6	33.8	1998	10	7	5.17	10
25.7	33.7	1998	10	7	4.32	45.3
25.7	33.8	1998	10	7	4.25	50.1
25.7	33.9	1998	10	10	4.40	33
34.2	27.7	1998	11	20	4.25	12
31.0	26.7	1998	12	14	4.61	10
25.5	33.8	1999	2	3	4.47	3.1
25.9	33.9	1999	3	28	4.25	18.5
31.2	26.7	1999	4	30	4.25	49.8
25.9	33.7	1999	5	15	3.89	33
26.7	33.6	1999	6	6	4.32	28.3
24.1	32.5	1999	6	17	4.61	10
34.6	28.1	1999	6	17	4.47	10
35.0	29.4	1999	10	5	4.40	62.7
31.5	29.0	1999	10	11	4.41	12.1
35.0	30.4	1999	10	28	4.47	13.9
25.6	33.7	1999	11	3	4.32	53.3
35.6	31.5	1999	11	11	4.25	2.7
33.0	34.0	1999	11	25	4.25	10
34.8	29.2	1999	12	21	4.76	11.2
31.4	30.2	1999	12	28	4.32	34.1
25.3	34.0	2000	2	19	4.29	4
34.7	28.8	2000	3	8	4.53	7
26.0	33.9	2000	3	13	4.59	8.2
25.2	33.8	2000	3	31	4.18	27.6
34.7	28.8	2000	4	6	4.29	9.4
25.7	34.0	2000	4	7	4.61	10

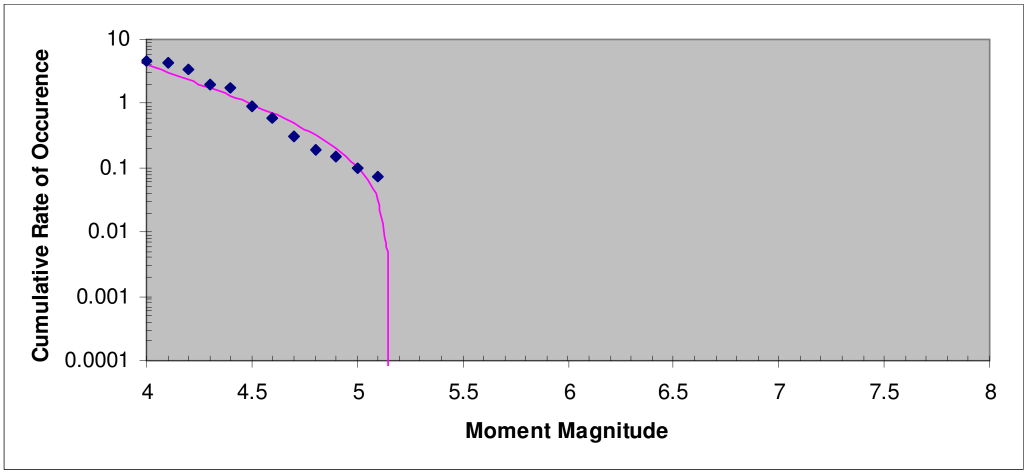
Table A-1 continued

32.5	33.8	2000	5	9	4.47	25
25.7	33.9	2000	7	2	4.32	5
32.9	28.9	2000	11	3	4.29	23
27.1	33.7	2000	11	10	4.11	67.3
24.8	33.9	2000	11	29	4.32	33
33.2	33.6	2000	12	16	4.35	37.3
34.8	28.6	2000	12	25	4.18	17.6
24.1	32.7	2001	2	27	4.47	33
25.6	33.7	2001	3	13	4.61	33
25.0	33.9	2001	3	19	4.47	33
30.9	31.8	2001	4	2	4.32	25
25.5	33.7	2001	4	20	4.69	16.3
35.8	33.9	2001	4	29	4.40	5
27.1	33.7	2001	5	20	4.25	15.5
35.0	27.0	2001	5	26	3.96	10
31.2	29.9	2001	6	12	4.54	10
25.4	33.9	2001	8	16	4.29	37.6
25.5	33.8	2001	8	16	4.18	50.1
25.5	33.9	2001	8	16	4.25	49.2
25.5	33.9	2001	8	16	4.25	41.5
28.9	33.9	2001	8	18	4.41	63.9
34.0	27.4	2001	8	20	4.41	10
25.9	33.8	2001	10	8	4.47	5
25.4	33.9	2001	11	4	4.76	10
34.5	27.7	2001	11	7	4.47	10
25.0	33.9	2001	12	12	4.18	21.8
30.9	29.6	2001	12	17	4.61	10
24.4	33.8	2001	12	18	4.54	10
24.8	33.9	2002	1	20	4.82	10
32.3	33.2	2002	2	21	4.18	44
25.8	33.9	2002	3	21	4.32	37.1
26.6	33.9	2002	4	21	4.18	5
34.9	26.9	2002	6	3	4.32	2.6
25.2	34.0	2002	6	13	4.18	5
24.2	33.9	2002	7	16	4.53	10
31.4	30.3	2002	8	24	4.70	18.4
29.7	27.6	2002	9	18	4.25	10
35.1	27.0	2002	9	23	4.54	3
26.4	34.0	2002	9	25	4.32	45.8
25.8	33.2	2002	11	12	4.25	56.3
34.8	28.1	2002	11	19	4.18	10
24.2	33.9	2002	12	21	4.25	33.9
25.2	33.6	2003	2	1	4.18	55.5
24.1	33.2	2003	3	10	4.47	35.1
25.0	34.0	2003	7	5	4.06	22
34.7	28.8	2003	7	23	4.25	1.4
28.5	33.8	2003	7	24	4.32	36.3
25.5	34.0	2003	8	16	3.96	15
25.0	34.0	2003	12	27	4.18	4
31.6	33.7	2003	12	30	4.54	27.3
26.2	33.5	2004	2	5	4.25	9
25.2	33.9	2004	2	6	4.47	17.8
25.3	34.0	2004	2	6	4.18	44.8
35.5	31.7	2004	2	11	5.23	26.2
24.2	33.7	2004	5	12	4.24	4

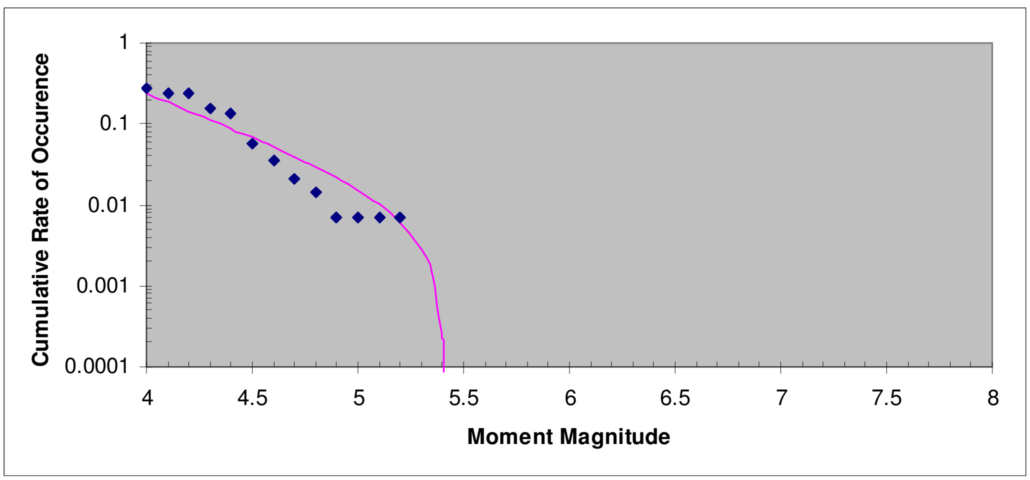
Table A-1 continued

27.8	33.4	2004	5	15	4.18	48.8
34.4	26.9	2004	6	3	4.82	10
25.1	33.6	2004	6	27	3.96	10
35.5	32.0	2004	7	7	4.65	23.8
35.2	32.5	2004	8	8	4.76	10.7
25.0	33.9	2004	9	4	4.18	18.8
25.1	33.9	2004	9	25	4.25	60.3
25.1	33.9	2004	9	25	4.25	56.4
24.0	33.3	2004	10	7	4.25	15
25.1	33.9	2004	10	20	4.25	57.9
35.3	28.8	2005	2	26	4.18	4.1
32.8	33.1	2005	4	15	4.12	39.5
31.9	29.7	2005	4	16	4.88	4.9
25.6	33.8	2005	6	23	4.04	33
31.1	29.7	2005	7	31	4.88	32.6
25.9	33.9	2005	9	2	5.17	10
25.9	33.9	2005	9	3	4.65	37
25.9	34.0	2005	9	3	4.53	23.1
25.7	33.8	2005	9	4	4.18	67.3
25.9	33.9	2005	9	15	4.32	50.6
25.9	33.9	2005	10	14	4.04	0.6
26.3	34.0	2005	10	28	4.25	6
34.5	27.3	2005	11	11	4.25	18.3
26.1	33.9	2005	11	24	4.76	30.4
25.9	33.9	2005	11	24	4.76	33
25.8	33.9	2005	11	24	4.35	26.8
25.6	33.7	2005	11	24	4.11	1.1
25.8	33.5	2006	1	11	4.25	51.5
30.9	32.2	2006	1	29	3.96	35
34.4	28.1	2006	2	2	4.70	2
25.8	33.9	2006	3	14	4.25	23.2
24.7	33.8	2006	4	10	4.04	10
25.0	34.0	2006	5	27	4.18	52.4
35.6	26.3	2006	7	30	5.41	12
24.7	33.8	2006	7	31	4.18	36.5
35.5	32.0	2006	9	9	4.94	10
31.6	28.6	2006	11	8	4.29	10

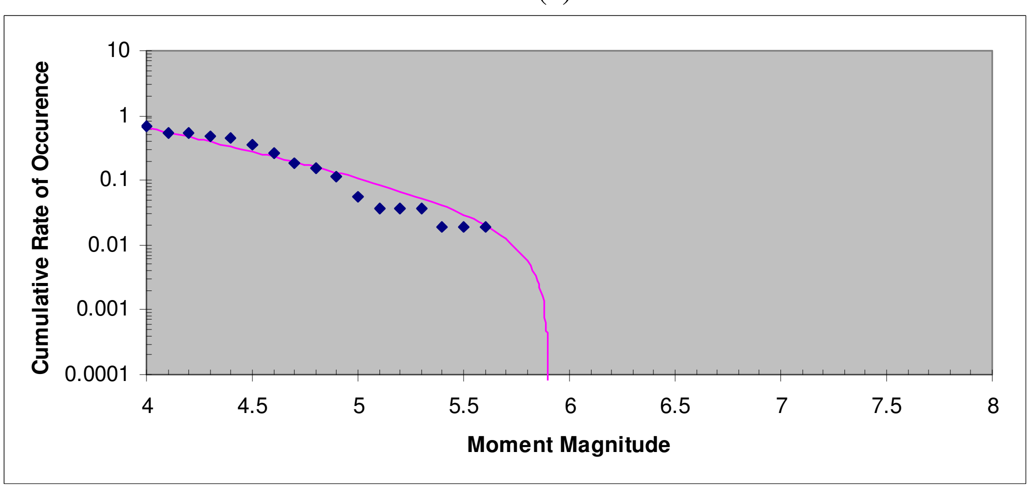
A.3 Recurrence Relationships



(a)

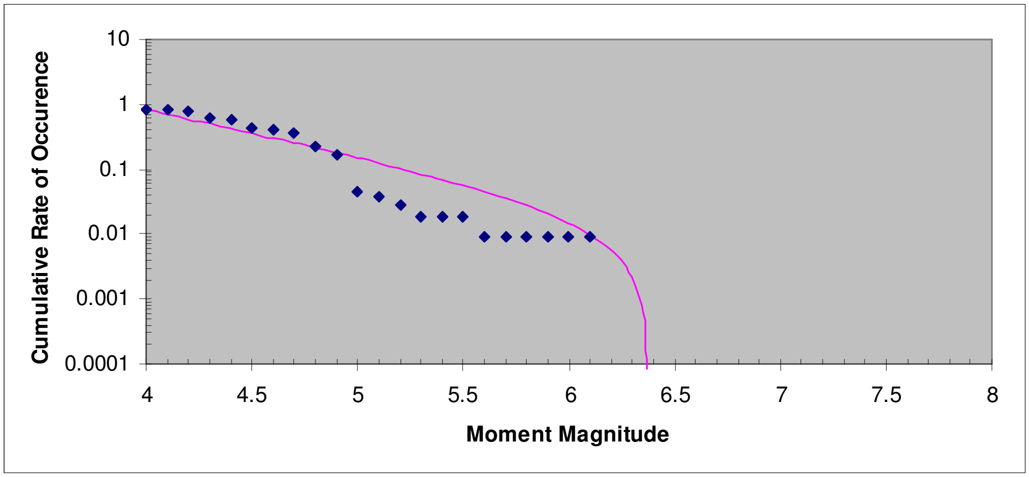


(b)

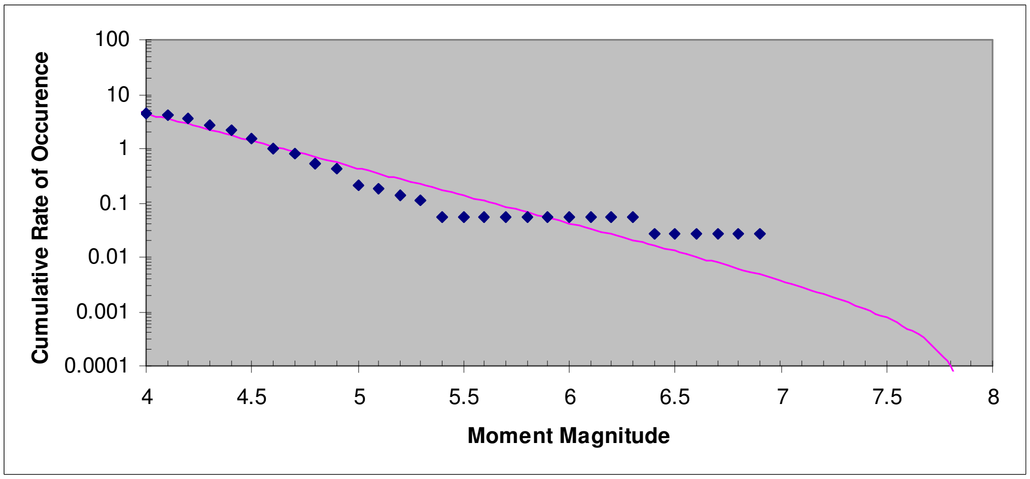


(c)

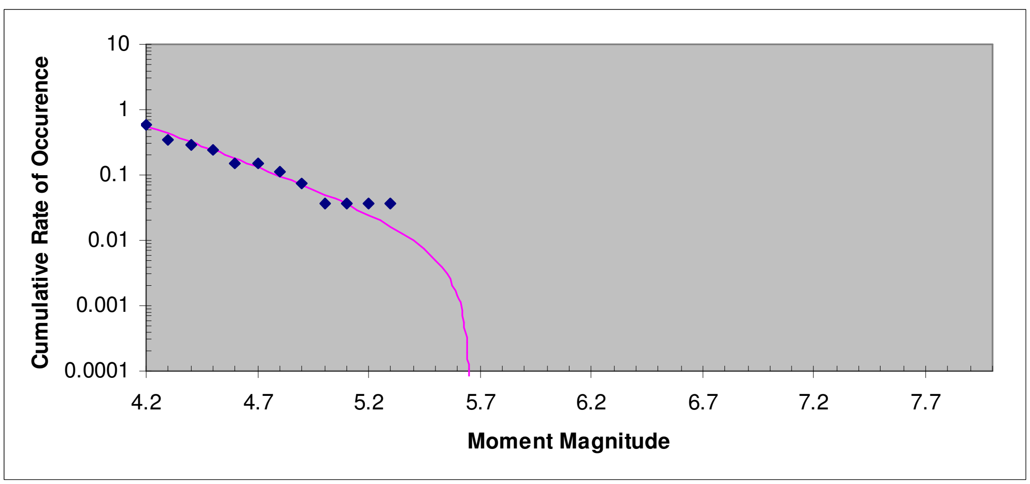
Figure A.3 Recurrence relationships for zones 1-5, a-e respectively and background seismicity f



(d)



(e)



(f)

Figure A.3 continued

Appendix B

Seismic Geological Classification

B.1 Standard Penetration Test (SPT) Correction

In Egyptian geotechnical studies, SPT is performed on site by driving a slide hammer usually weighing 63.5 kg in to the ground. The hammer is dropped a distance of 760 mm, and is driven an initial 150 mm into the ground, with the number of blows required to penetrate each 150 mm of ground being recorded, up until 450 mm is penetrated. The initial blow count in the first 150 mm is not taken into account since the top layer is usually disturbed, and thus 300 mm that follow give a better indication of the soil parameters. If the hammer is unable to drive through the total 450 mm in 50 counts, then final blow count and the penetrated depth is recorded.

SPTs are not standardized and make various assumptions, and thus corrections need to be made to the results to ensure their consistency, and to enable direct comparison between tests. Five corrections exist for; overburden pressure C_N, hammer energy C_E, borehole diameter C_B, rod length C_R, and samplers with or without liners C_S. The most important of these corrections is the energy correction factor C_E (Lunne et al., 1997). This is due to the fact that uncorrected the SPT assumes that the hammer is 100% efficient, and that the energy of the entire 63.5 kg is used, which is not the case, and thus this factor accounts for such inefficiency in the equipment. Another important correction is the overburden pressure correction C_N, which is calculated through the following formula:

$$C_N = \sqrt{\frac{P_a}{\sigma'_{vo}}} \tag{K.1}$$

Where P_a is 100 kPa, and σ'_{vo} is the effective vertical overburden pressure at the depth of the sample. All the correction factors are given in Table B-1.

Table B-1 Corrections for SPT (Youd and Idriss, 1997)

Factor	Equipment Variable	Term	Correction
Overburden Pressure		C_N	$(P_a/\sigma'_{vo})^{0.5}$
Energy Ratio	Safety Hammer Donut Hammer	C_E	0.6-1.17 0.45-1.00
Borehole Diameter	65 to 115 mm 150 mm 200 mm	C_B	1.0 1.05 1.15
Rod Length	3 to 4 m 4 to 6 m 6 to 10 m 10 to 30 m > 30 m	C_R	0.75 0.85 0.95 1.00 >1.0
Sampling Method	Standard Sampler Without liners	C_S	1.0 1.2

B.2 Borehole Logs

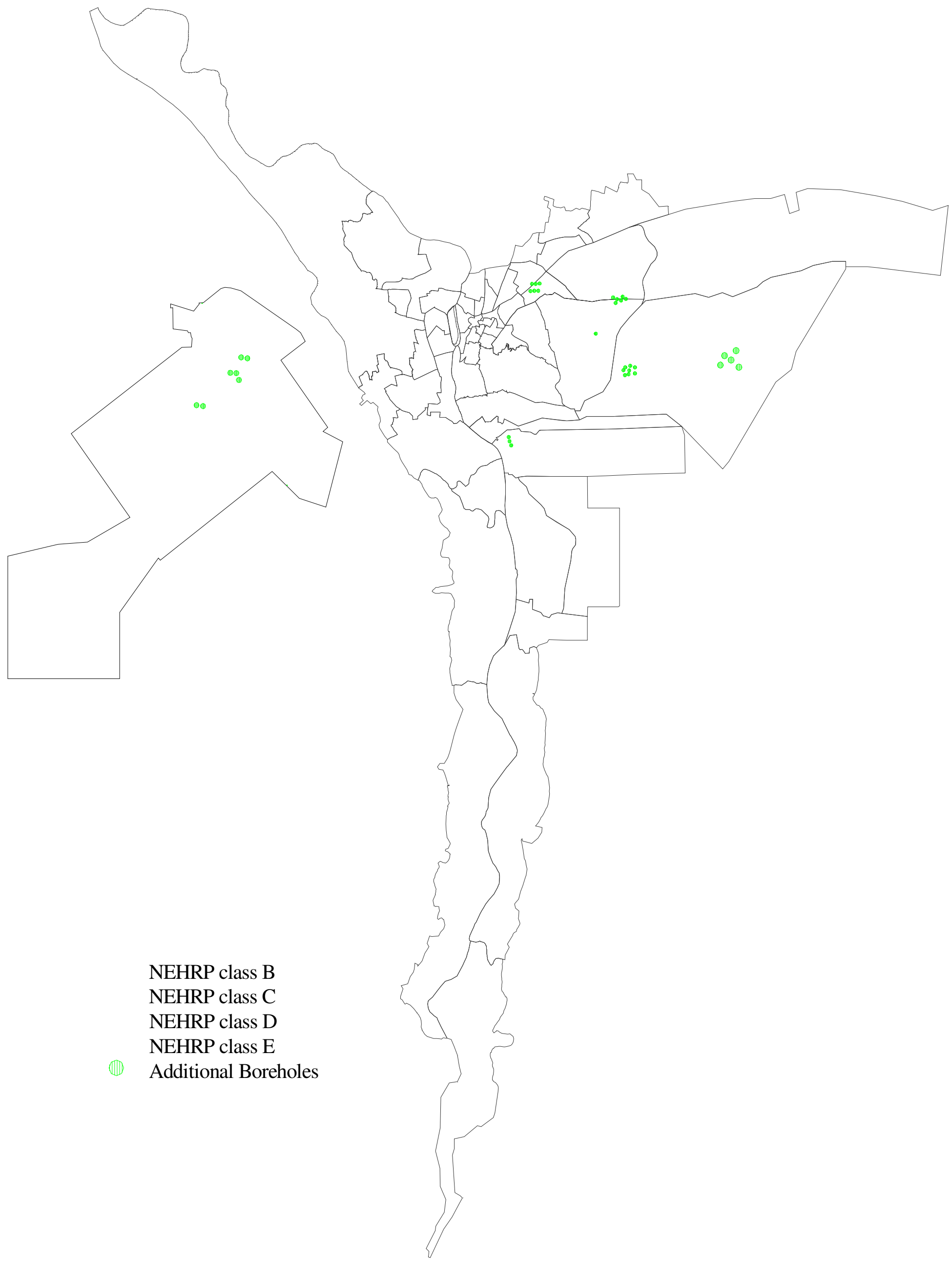


Figure B.1 Location of additional borehole logs used in this study to compliment borehole log data found in Moharram (2006)

B.3 Borehole SPT data

Table B-2 Borehole SPT data used in this study

Borehole No.	Depth (m)		SPT
Metro Line 3			
L3 BHM-11	0	3	100
	3	4.5	27
	4.5	7.5	30
	7.5	9	150
	9	10.5	200
	10.5	18	120
Metro Line 2			
L2 BH30	0	0	0
	0	1	0
	1	3	8
	3	4.5	8
	4.5	6	25
	6	7.5	32
	7.5	9	13
	9	10.5	35
	10.5	12	52
	12	13.5	19
	13.5	15	42
	15	16.5	65
	16.5	18	54
	18	19.5	40
	19.5	21	38
	21	22.5	62
	22.5	24	42
	24	25.5	64
	25.5	27	110
	27	28.5	65
	28.5	29.5	56
L2 BH31	0	0	0
	0	3	7
	3	4.5	12
	4.5	6	21
	6	7.5	26
	7.5	9	39
	9	10.5	25
	10.5	12	34
	12	13.5	30
	13.5	15	40
	15	16.5	56
	16.5	18	44
	18	19.5	59
	19.5	21	53

Table B-2 continued

	21	22.5	30
	22.5	24	48
	24	25.5	106
	25.5	27	104
	27	28.5	89
	28.5	29.5	43
L2 BH32	0	4.5	3
	4.5	6	3
	6	7.5	10
	7.5	9	26
	9	10.5	33
	10.5	12	60
	12	13.5	130
	13.5	15	28
	15	16.5	52
	16.5	18	66
	18	19.5	47
	19.5	21	57
	21	22.5	100
	22.5	24	53
	24	25.5	77
	25.5	27	160
	27	28.5	75
	28.5	29.5	85
L2 BH33	0	3	7
	3	7.5	22
	7.5	9	26
	9	10.5	27
	10.5	12	28
	12	13.5	34
	13.5	15	38
	15	16.5	72
	16.5	18	53
	18	19.5	59
	19.5	21	63
	21	22.5	100
	22.5	24	80
	24	25.5	108
	25.5	27	160
	27	28.5	106
	28.5	29.5	142
L2 BH34	0	3	2
	3	9	20
	9	10.5	20
	10.5	12	27
	12	13.5	29
	13.5	15	40
	15	16.5	25

Table B-2 continued

	16.5	18	28
	18	19.5	28
	19.5	21	36
	21	22.5	61
	22.5	24	41
	24	25.5	150
	25.5	27	200
	27	28.5	400
	28.5	29.5	600
L2 BH39	0	3	3
	3	4.5	5
	4.5	6	5
	6	7.5	5
	7.5	9	14
	9	10.5	19
	10.5	12	24
	12	13.5	64
	13.5	15	75
	15	16.5	100
	16.5	18	100
	18	19.5	73
	19.5	21	100
	21	22.5	100
	22.5	24	1200
L2 BH16	0	3	6
	3	6	6
	6	9	17
	9	11	27
	11	12.5	22
	12.5	14	47
	14	15.5	37
	15.5	17	62
	17	18.5	62
	18.5	19.7	35
	19.7	20.5	64
	20.5	22	66
	22	23.5	100
	23.5	25	47
	25	26.5	100
	26.5	28	58
	28	29.5	112
Ring Road			
RRWB-1A	0	7.5	14
	7.5	9	18
	9	10.5	27
	10.5	12	34
	12	13.5	40

Table B-2 continued

	13.5	15	47
	15	16.5	47
	16.5	18	55
	18	19.5	58
	19.5	21	57
	21	22.5	60
	22.5	24	115.4
	24	25.5	135
	25.5	27	136.4
	27	28.5	166.7
Bloom Bank			
Bloom Bank 1	0	5	45
	5	7	45
	7	9	45
Bloom Bank 2	0	5	43
	5	7	45
	7	10	46
Bloom Bank 3	0	4	50
	4	6	50
	6	8	47
Bloom Bank 4	0	6	46
	6	9	48
Bloom Bank 5	0	5	47
	5	7	45
	7	10	45
Amal Towers			
Amal Towers N Towers 1	0	5	44
	5	8	45
	8	11	47
Amal Towers N Towers 2	0	2	35
	2	4	50
	4	6	50
Amal Towers N Towers 3	0	2	32
	2	4	50
Amal Towers N Towers 4	0	2	37

Table B-2 continued

	2	4	46
	4	6	50
<u>Fayoum Road</u>			
Youth Housing Fayoum Road 224	0	2	50
	2	5	48
	5	9	50
Youth Housing Fayoum Road 215	0	2	50
	2	5	50
	5	8	50
<u>New Cairo City Villas</u>			
Five Model Villas New Cairo City 6	0	2	10
	2	3	15
	3	4	50
	4	5	50
	5	6	49
	6	8	48
	8	9	50
	9	10	50
Five Model Villas New Cairo City 5	0	1	14
	1	2	20
	2	3	50
	3	5	50
	5	6	47
	6	8	64
	8	9	50
	9	10	50
<u>New Cairo Lotus Villas</u>			
New Cairo Villa Lotus 193	0	1	50
	1	3	51
	3	5	51
	5	7	51
	7	9	50
New Cairo Villa Lotus 194	0	1	43
	1	3	47
	3	5	50
	5	9	50
New Cairo Villa Lotus 263	0	1	43
	1	3	51
	3	7	52

Table B-2 continued

	7	9	51
New Cairo Villa Lotus 264	0	1	51
	1	3	50
	3	5	51
	5	7	50
	7	9	50
Wick Park			
Wick Park 1	0	2	50
Wick Park 2	0	4	50
Police Housing			
Police Housing Nasr City 1	0	3	46
	3	6	48
ESSO Manchiet Bakry			
ESSO Manchiet Bakry 1	0	4	50
	4	6	50
ESSO Manchiet Bakry 2	0	4	50
ESSO Manchiet Bakry 3	0	5	50
Mobil Roxy			
Mobil Roxy 1	0	11	37
	11	13	40
	13	14	44
Mobil Roxy 2	0	11	38
	11	13	38
	13	14	46
Mobil Roxy 3	0	11	36
	11	13	40
	13	14	41
Cairo International Airport			
Sahargeen Cairo International Airport 1	0	2	50

Table B-2 continued

	2	4	50
Sahargeen Cairo International Airport 2	0	2	50
Sahargeen Cairo International Airport 1	0	2	50
Mobil 6th of October			
Mobil 6th of October 1	0	2	41
Mobil 6th of October 2	0	2	38
Mobil 6th of October 3	0	2	32
Border Guard			
Border Guard - Yellow Mountain 1	0	2	22
	2	7	37
	7	9	42
Border Guard - Yellow Mountain 2	0	2	28
	2	7	35
	7	9	40
Children's Hospital			
Children's Heart Rhomatism Hospital 6 Oct 1	0	3	39
	3	5	50
	5	8	50
Children's Heart Rhomatism Hospital 6 Oct 2	0	3	36
	3	6	50
	6	9	50
Suez Road			
Suez Road Land 4H 1	0	4	47
	4	6	50
	6	9	50
Suez Road Land 4H 2	0	3	50
	3	6	50

Table B-2 continued

Suez Road Land 4H 3	0	3	50
	3	5	50
	5	8	50
<u>Nasr City Project</u>			
Nasr City Land 13 Block 18 1	0	1	34
	1	2	31
	2	3	40
	3	4	53
	4	5	65
	5	6	89
	6	7	84
	7	8	50
	8	9	50
	9	10	50
Nasr City Land 13 Block 18 2	0	1	31
	1	2	37
	2	3	44
	3	4	62
	4	5	70
	5	6	50
	6	7	50
	7	8	50
	8	9	50
	9	10	50
Nasr City Land 9 Block 35 Area 9 1	0	1	28
	1	2	29
	2	3	21
	3	4	24
	4	5	29
	5	6	24
	6	7	29
	7	8	27
	8	9	28
	9	10	31
Nasr City Land 9 Block 35 Area 9 2	0	1	20
	1	2	24
	2	3	31
	3	4	29
	4	5	28
	5	6	29
	6	7	28
	7	8	32
	8	9	29

Table B-2 continued

	9	10	32
<u>Mohandeseen Gardens</u>			
Mohandeseen Gardens 250	0	2	33
Mohandeseen Gardens 237	0	3	36
	3	8	32

B.4 Historical Course of the Nile

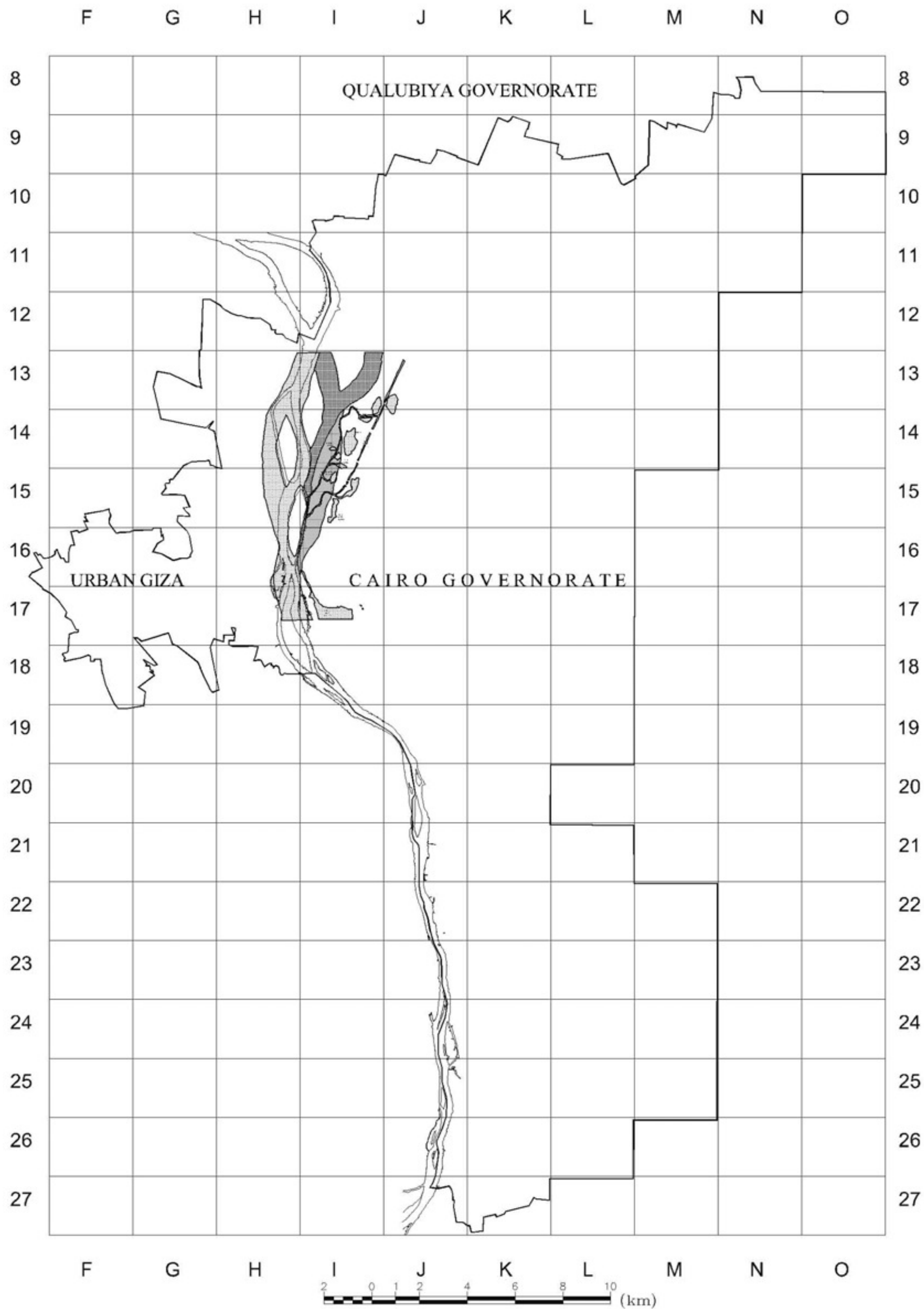


Figure B.2 Map showing the course of the river along the past 1100 years (Moharram, 2006)

Appendix C

Building Stock

C.1 Building Stock Analysis

Giza

Table C-1 Total Number of Residential and Business Buildings Classified According to Decade of Construction and Building Classification System for the Governorate of Giza (from CAPMAS, 1998)

Total number of buildings according to decade of construction and building class								
Year Group	RC	PC	UMCD	UMOS	AM	OTS	UN	Total
Pre-1940	2451	53	2848	3656	5648	7	27	14690
1940-1949	2063	32	4229	5346	8724	10	35	20439
1950-1959	5844	68	12781	6931	9822	14	26	35486
1960-1969	13028	80	25550	12684	11443	14	37	62836
1970-1979	27901	235	60310	20131	11059	17	99	119752
1980-1989	60681	207	79489	28403	9034	123	175	178112
1990-	50718	135	32771	13569	2855	102	560	100710
Total	162686	810	217978	90720	58585	287	959	532025

Table C-2 Percentage of Residential and Business Buildings According to Decade of Construction and Building Classification System for the Governorate of Giza (from CAPMAS, 1998)

Percentage of buildings according to decade of construction and building class								
Year Group	RC	PC	UMCD	UMOS	AM	OTS	UN	Total
Pre-1940	16.7	0.4	19.4	24.9	38.4	0.0	0.2	100.0
1940-1949	10.1	0.2	20.7	26.2	42.7	0.0	0.2	100.0
1950-1959	16.5	0.2	36.0	19.5	27.7	0.0	0.1	100.0
1960-1969	20.7	0.1	40.7	20.2	18.2	0.0	0.1	100.0
1970-1979	23.3	0.2	50.4	16.8	9.2	0.0	0.1	100.0
1980-1989	34.1	0.1	44.6	15.9	5.1	0.1	0.1	100.0
1990-	50.4	0.1	32.5	13.5	2.8	0.1	0.6	100.0
Total	30.6	0.2	41.0	17.1	11.0	0.1	0.2	100.0

Cairo

Table C-3 Total Number of Residential and Business Buildings Classified According to Decade of Construction and Building Classification System for the Governorate of Cairo (from CAPMAS, 1998)

Total number of buildings according to decade of construction and building class								
Year Group	RC	PC	UMCD	UMOS	AM	OTS	UN	Total
Pre-1940	10129	450	7941	12874	889	190	148	32621
1940-1949	8165	333	9174	9839	1804	106	97	29518
1950-1959	15230	283	14268	7285	618	65	121	37870
1960-1969	30472	245	23469	6573	1078	66	139	62042
1970-1979	46103	334	32549	6906	685	86	157	86820
1980-1989	68345	1726	25006	12229	717	160	274	108457
1990-	50544	1387	8799	8300	305	168	367	69870
Total	228988	4758	121206	64006	6096	841	1303	427198

Table C-4 Percentage of Residential and Business Buildings According to Decade of Construction and Building Classification System for the Governorate of Cairo (from CAPMAS, 1998)

Percentage of buildings according to decade of construction and building class								
Year Group	RC	PC	UMCD	UMOS	AM	OTS	UN	Total
Pre-1940	31.1	1.4	24.3	39.5	2.7	0.6	0.5	100.0
1940-1949	27.7	1.1	31.1	33.3	6.1	0.4	0.3	100.0
1950-1959	40.2	0.7	37.7	19.2	1.6	0.2	0.3	100.0
1960-1969	49.1	0.4	37.8	10.6	1.7	0.1	0.2	100.0
1970-1979	53.1	0.4	37.5	8.0	0.8	0.1	0.2	100.0
1980-1989	63.0	1.6	23.1	11.3	0.7	0.1	0.3	100.0
1990-	72.3	2.0	12.6	11.9	0.4	0.2	0.5	100.0
Total	53.6	1.1	28.4	15.0	1.4	0.2	0.3	100.0

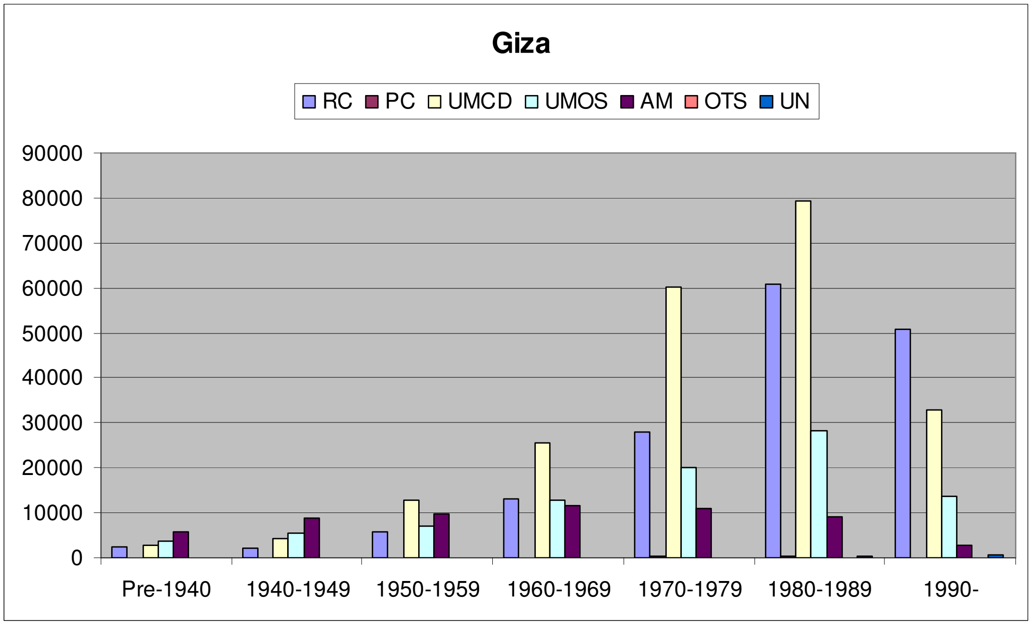


Figure C.1 Number of Buildings According to Decade of Construction and Building Classification Type for the Governorate of Giza (from CAPMAS, 1998)

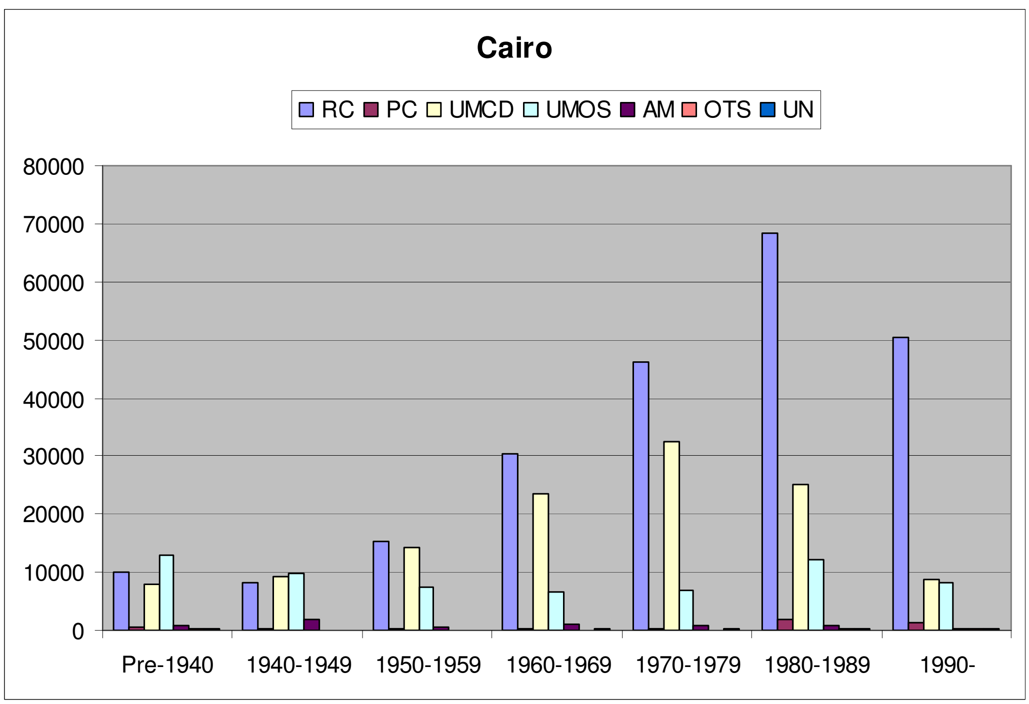


Figure C.2 Number of Buildings According to Decade of Construction and Building Classification Type for the Governorate of Giza (from CAPMAS, 1998)

Table C-5 Number of Residential Buildings for Each District in the Governorate of Giza Classified by Number of Stories (from CAPMAS, 1998)

	Number of Stories								
District	**1**	**2**	**3**	**4**	**5**	**6**	**7+**	**Unknown**	**Total**
Qism Embaba	2,395	4,801	6,857	8,617	5,631	1,907	695	265	**31,168**
Agouza	1,034	1,116	1,448	1,470	1,312	772	935	102	**8,189**
Dokki	766	702	886	745	629	409	726	160	**5,023**
Qism Giza	3,039	4,407	4,414	3,601	1,697	599	331	420	**18,508**
Boulaq Dakrour	3,811	5,796	7,077	7,242	4,436	2,120	1,318	1,433	**33,233**
Haram	7,160	8,441	4,195	1,679	944	754	411	2,172	**25,756**
6th of October	508	483	289	294	3,407	162	78	1,300	**6,521**
Al Hawamdia	5,246	6,419	2,815	529	239	118	17	97	**15,480**
Markaz Giza	12,727	10,263	2,627	430	155	45	21	340	**26,608**
Albadrasheen	25,812	14,381	2,593	490	160	49	15	283	**43,783**
Alsaf	33,584	5,851	483	70	46	81	22	288	**40,425**
Alayat	37,605	10,745	537	80	49	65	5	635	**49,721**
Markaz Embaba	48,275	23,412	7,071	2,718	1,350	857	629	2,906	**87,218**
Alwahat	4,838	34	53	34	0	0	0	445	**5,404**
Atfeeh	26,609	7,880	203	43	9	20	2	1,637	**36,403**
Auseem	10,678	10,237	2,617	784	321	115	19	541	**25,312**
Alwarak	6,724	8,805	6,954	5,079	3,036	1,565	820	1,070	**34,053**
Alomranya	5,192	7,887	8,524	7,689	4,770	3,503	2,055	2,064	**41,684**
Total	**236,003**	**131,660**	**59,643**	**41,594**	**28,191**	**13,141**	**8,099**	**16,158**	**534,489**

Table C-6 Percentage of Residential Buildings for Each District in the Governorate of Giza Classified by Number of Stories (from CAPMAS, 1998)

	Number of Stories								
District	**1**	**2**	**3**	**4**	**5**	**6**	**7+**	**Unknown**	**Total**
Qism Embaba	7.68	15.40	22.00	27.65	18.07	6.12	2.23	0.85	**100.00**
Agouza	12.63	13.63	17.68	17.95	16.02	9.43	11.42	1.25	**100.00**
Dokki	15.25	13.98	17.64	14.83	12.52	8.14	14.45	3.19	**100.00**
Qism Giza	16.42	23.81	23.85	19.46	9.17	3.24	1.79	2.27	**100.00**
Boulaq Dakrour	11.47	17.44	21.30	21.79	13.35	6.38	3.97	4.31	**100.00**
Haram	27.80	32.77	16.29	6.52	3.67	2.93	1.60	8.43	**100.00**
6th of October	7.79	7.41	4.43	4.51	52.25	2.48	1.20	19.94	**100.00**
Al Hawamdia	33.89	41.47	18.18	3.42	1.54	0.76	0.11	0.63	**100.00**
Markaz Giza	47.83	38.57	9.87	1.62	0.58	0.17	0.08	1.28	**100.00**
Albadrasheen	58.95	32.85	5.92	1.12	0.37	0.11	0.03	0.65	**100.00**
Alsaf	83.08	14.47	1.19	0.17	0.11	0.20	0.05	0.71	**100.00**
Alayat	75.63	21.61	1.08	0.16	0.10	0.13	0.01	1.28	**100.00**
Markaz Embaba	55.35	26.84	8.11	3.12	1.55	0.98	0.72	3.33	**100.00**
Alwahat	89.53	0.63	0.98	0.63	0.00	0.00	0.00	8.23	**100.00**
Atfeeh	73.10	21.65	0.56	0.12	0.02	0.05	0.01	4.50	**100.00**
Auseem	42.19	40.44	10.34	3.10	1.27	0.45	0.08	2.14	**100.00**
Alwarak	19.75	25.86	20.42	14.91	8.92	4.60	2.41	3.14	**100.00**
Alomranya	12.46	18.92	20.45	18.45	11.44	8.40	4.93	4.95	**100.00**
Total	**44.15**	**24.63**	**11.16**	**7.78**	**5.27**	**2.46**	**1.52**	**3.02**	**100.00**

Table C-7 Number of Residential Buildings for Each District in the Governorate of Cairo Classified by Number of Stories (from CAPMAS, 1998)

	Number of Stories								
District	**1**	**2**	**3**	**4**	**5**	**6**	**7+**	**Unknown**	**Total**
Tebeen	1,995	1,211	341	235	262	82	4	15	**4,145**
Helwan	16,890	12,810	8,678	4,285	2,683	1,162	240	966	**47,714**
15th of May	210	103	16	301	1,769	3	8	42	**2,452**
Maadi	891	782	760	535	578	436	359	240	**4,581**
Torah	1,488	1,910	1,505	737	295	83	86	404	**6,508**
Masr Il Adeema	6,723	3,711	2,503	1,481	879	431	465	710	**16,903**
Sayeda Zeinab	2,895	1,927	1,446	1,113	782	526	459	424	**9,572**
Al Khalifa	2,663	2,328	2,157	1,375	1,180	1,261	255	1,054	**12,273**
Abdeen	334	331	408	396	366	309	388	127	**2,659**
Al Mosky	339	380	402	349	228	135	84	132	**2,049**
Kasr El Nil	92	66	65	27	36	52	117	84	**539**
Boulaq	1,195	1,512	1,503	735	337	80	44	429	**5,835**
Alazbakeya	144	181	285	290	232	141	185	43	**1,501**
Darb Al Ahmar	753	753	783	744	497	218	185	286	**4,219**
Algamalaya	751	714	871	660	415	211	133	186	**3,941**
Bab Al Shearia	530	564	617	572	415	314	216	85	**3,313**
Al Zahir	163	118	217	311	361	364	358	26	**1,918**
Al Sharabia	1,153	1,680	2,506	2,701	2,140	510	165	324	**11,179**
Shubra	522	625	989	930	618	233	128	144	**4,189**
Rod Al Farag	762	1,446	2,260	2,091	1,325	549	283	236	**8,952**
Al Sahel	1,575	1,455	2,547	3,517	2,473	1,118	735	544	**13,964**
Al Waly	697	720	769	658	493	278	255	356	**4,226**
Hadaq Al Quba	937	1,778	3,322	4,361	2,704	899	460	113	**14,574**
Al Zaytoon	2,018	1,518	2,807	3,752	2,486	1,095	774	475	**14,925**
Al Matarya	3,630	4,830	6,848	7,812	4,075	1,471	817	403	**29,886**
Nasr City	7,041	1,202	789	920	1,974	2,398	2,676	396	**17,396**

Table C-7 continued

Nasr City 2	1,004	239	138	98	1,774	821	235	61	**4,370**
Masr Il Gedida	633	438	738	610	1,001	538	698	206	**4,862**
Alnozha	731	294	444	691	1,140	1,148	1,311	144	**5,903**
Badr	30	2	50	18	579	0	0	58	**737**
Ain Shams	3,552	4,506	4,219	4,117	3,351	1,847	1,949	345	**23,886**
Alzawaya Al Hamra	1,020	986	2,290	3,724	3,729	1,155	501	16	**13,421**
Alsalam	5,200	2,996	2,022	1,445	4,635	1,062	960	1,732	**20,052**
El Zamalek	163	75	78	58	52	65	222	77	**790**
Mansheit Nasr	6,046	2,795	1,739	918	391	260	55	164	**12,368**
Albasateen	9,590	7,869	9,476	8,536	5,277	3,109	1,658	750	**46,265**
Al Morg	10,672	9,478	5,298	2,698	1,438	891	474	2,817	**33,766**
Total	**95,032**	**74,333**	**71,886**	**63,801**	**52,970**	**25,255**	**17,942**	**14,614**	**415,833**

Table C-8 Percentage of Residential Buildings for Each District in the Governorate of Cairo Classified by Number of Stories (from CAPMAS, 1998)

	Number of Stories								
District	**1**	**2**	**3**	**4**	**5**	**6**	**7+**	**Unknown**	**Total**
Tebeen	48.13	29.22	8.23	5.67	6.32	1.98	0.10	0.36	**100**
Helwan	35.40	26.85	18.19	8.98	5.62	2.44	0.50	2.02	**100**
15th of May	8.56	4.20	0.65	12.28	72.15	0.12	0.33	1.71	**100**
Maadi	19.45	17.07	16.59	11.68	12.62	9.52	7.84	5.24	**100**
Torah	22.86	29.35	23.13	11.32	4.53	1.28	1.32	6.21	**100**
Masr Il Adeema	39.77	21.95	14.81	8.76	5.20	2.55	2.75	4.20	**100**
Sayeda Zeinab	30.24	20.13	15.11	11.63	8.17	5.50	4.80	4.43	**100**
Al Khalifa	21.70	18.97	17.58	11.20	9.61	10.27	2.08	8.59	**100**
Abdeen	12.56	12.45	15.34	14.89	13.76	11.62	14.59	4.78	**100**
Al Mosky	16.54	18.55	19.62	17.03	11.13	6.59	4.10	6.44	**100**
Kasr El Nil	17.07	12.24	12.06	5.01	6.68	9.65	21.71	15.58	**100**

Table C-8 continued

Boulaq	20.48	25.91	25.76	12.60	5.78	1.37	0.75	7.35	**100**
Alazbakeya	9.59	12.06	18.99	19.32	15.46	9.39	12.33	2.86	**100**
Darb Al Ahmar	17.85	17.85	18.56	17.63	11.78	5.17	4.38	6.78	**100**
Algamalaya	19.06	18.12	22.10	16.75	10.53	5.35	3.37	4.72	**100**
Bab Al Shearia	16.00	17.02	18.62	17.27	12.53	9.48	6.52	2.57	**100**
Al Zahir	8.50	6.15	11.31	16.21	18.82	18.98	18.67	1.36	**100**
Al Sharabia	10.31	15.03	22.42	24.16	19.14	4.56	1.48	2.90	**100**
Shubra	12.46	14.92	23.61	22.20	14.75	5.56	3.06	3.44	**100**
Rod Al Farag	8.51	16.15	25.25	23.36	14.80	6.13	3.16	2.64	**100**
Al Sahel	11.28	10.42	18.24	25.19	17.71	8.01	5.26	3.90	**100**
Al Waly	16.49	17.04	18.20	15.57	11.67	6.58	6.03	8.42	**100**
Hadaq Al Quba	6.43	12.20	22.79	29.92	18.55	6.17	3.16	0.78	**100**
Al Zaytoon	13.52	10.17	18.81	25.14	16.66	7.34	5.19	3.18	**100**
Al Matarya	12.15	16.16	22.91	26.14	13.64	4.92	2.73	1.35	**100**
Nasr City	40.47	6.91	4.54	5.29	11.35	13.78	15.38	2.28	**100**
Nasr City 2	22.97	5.47	3.16	2.24	40.59	18.79	5.38	1.40	**100**
Masr Il Gedida	13.02	9.01	15.18	12.55	20.59	11.07	14.36	4.24	**100**
Alnozha	12.38	4.98	7.52	11.71	19.31	19.45	22.21	2.44	**100**
Badr	4.07	0.27	6.78	2.44	78.56	0.00	0.00	7.87	**100**
Ain Shams	14.87	18.86	17.66	17.24	14.03	7.73	8.16	1.44	**100**
Alzawaya Al Hamra	7.60	7.35	17.06	27.75	27.78	8.61	3.73	0.12	**100**
Alsalam	25.93	14.94	10.08	7.21	23.11	5.30	4.79	8.64	**100**
El Zamalek	20.63	9.49	9.87	7.34	6.58	8.23	28.10	9.75	**100**
Mansheit Nasr	48.88	22.60	14.06	7.42	3.16	2.10	0.44	1.33	**100**
Albasateen	20.73	17.01	20.48	18.45	11.41	6.72	3.58	1.62	**100**
Al Morg	31.61	28.07	15.69	7.99	4.26	2.64	1.40	8.34	**100**
Total	**22.85**	**17.88**	**17.29**	**15.34**	**12.74**	**6.07**	**4.31**	**3.51**	**100**

Table C-9 Percentage of Residential Buildings for Each District in the Governorate of Giza Classified by Structure Type (from CAPMAS, 1998)

	Percentage of Building Structure Type							
District	RC	PC	UMCD	UMOS	AM	OTS	UN	Total
Qism Embaba	45.95	0.21	46.95	6.57	0.20	0.04	0.08	**100.00**
Agouza	63.06	0.14	27.84	7.96	0.84	0.12	0.04	**100.00**
Dokki	78.27	0.26	9.93	9.28	1.76	0.39	0.11	**100.00**
Qism Giza	35.87	0.41	44.89	16.51	2.04	0.07	0.20	**100.00**
Boulaq Dakrour	53.22	0.12	42.76	3.10	0.58	0.02	0.20	**100.00**
Haram	66.20	0.16	25.78	5.74	1.55	0.07	0.49	**100.00**
6th of October	94.34	0.23	2.33	1.45	0.03	1.14	0.48	**100.00**
Al Hawamdia	18.54	0.10	65.13	7.99	8.19	0.02	0.03	**100.00**
Markaz Giza	15.40	0.10	67.35	13.67	3.33	0.00	0.15	**100.00**
Albadrasheen	9.06	0.07	58.80	20.70	11.18	0.05	0.13	**100.00**
Alsaf	8.33	0.06	38.39	29.80	23.27	0.05	0.10	**100.00**
Alayat	5.00	0.06	35.22	39.29	20.27	0.02	0.14	**100.00**
Markaz Embaba	29.49	0.13	44.04	13.25	12.87	0.02	0.20	**100.00**
Alwahat	5.75	0.00	1.75	10.67	80.70	0.55	0.58	**100.00**
Atfeeh	4.62	0.04	19.20	37.93	38.14	0.01	0.06	**100.00**
Auseem	25.52	0.04	49.76	23.11	1.52	0.01	0.04	**100.00**
Alwarak	53.21	0.14	36.34	8.36	1.86	0.02	0.07	**100.00**
Alomranya	59.93	0.59	35.54	3.17	0.24	0.04	0.49	**100.00**
Total	**30.58**	**0.15**	**40.97**	**17.05**	**11.01**	**0.05**	**0.18**	**100.00**

Table C-10 Percentage of Residential Buildings for Each District in the Governorate of Cairo Classified by Structure Type (from CAPMAS, 1998)

	Percentage of Building Structure Type							
District	RC	PC	UMCD	UMOS	AM	OTS	UN	**Total**
Tebeen	48.32	0.21	33.82	10.96	6.52	0.14	0.02	**100.00**
Helwan	50.45	0.21	31.97	15.51	1.45	0.20	0.20	**100.00**
15th of May	58.94	30.92	7.39	2.20	0.03	0.03	0.49	**100.00**
Maadi	71.56	1.08	17.61	8.84	0.36	0.06	0.49	**100.00**
Torah	41.00	0.17	37.08	19.01	2.44	0.03	0.28	**100.00**
Masr Il Adeema	32.00	0.15	21.36	42.65	3.23	0.21	0.40	**100.00**
Sayeda Zeinab	53.00	0.92	17.74	22.36	5.03	0.44	0.51	**100.00**
Al Khalifa	45.14	0.25	19.64	31.83	2.28	0.42	0.44	**100.00**
Abdeen	55.11	0.69	21.47	21.96	0.36	0.23	0.17	**100.00**
Al Mosky	49.09	0.87	8.16	39.92	0.68	0.72	0.57	**100.00**
Kasr El Nil	75.88	0.56	13.82	6.49	0.00	0.28	2.96	**100.00**
Boulaq	23.14	3.13	28.22	42.68	0.70	1.69	0.44	**100.00**
Alazbakeya	58.63	0.98	14.17	25.08	0.26	0.78	0.10	**100.00**
Darb Al Ahmar	46.17	2.16	28.04	21.08	1.35	0.98	0.21	**100.00**
Algamalaya	38.96	1.30	26.94	29.41	0.86	2.16	0.37	**100.00**
Bab Al Shearia	41.95	0.44	28.35	27.88	1.28	0.05	0.05	**100.00**
Al Zahir	72.13	0.51	14.26	11.44	0.79	0.65	0.23	**100.00**
Al Sharabia	41.72	0.45	39.15	16.95	0.68	0.41	0.63	**100.00**
Shubra	36.38	1.90	34.54	24.63	2.00	0.09	0.46	**100.00**
Rod Al Farag	32.76	1.02	28.85	36.83	0.26	0.12	0.16	**100.00**
Al Sahel	43.12	0.56	38.19	17.29	0.36	0.10	0.37	**100.00**
Al Waly	49.85	0.53	25.71	21.81	1.39	0.08	0.63	**100.00**
Hadaq Al Quba	40.04	0.18	50.70	8.57	0.27	0.22	0.03	**100.00**
Al Zaytoon	52.44	0.45	41.46	4.66	0.51	0.08	0.40	**100.00**
Al Matarya	58.38	0.19	35.27	3.68	2.11	0.03	0.33	**100.00**
Nasr City	64.13	4.45	9.15	21.54	0.43	0.14	0.16	**100.00**
Nasr City 2	57.20	15.82	16.39	10.00	0.55	0.02	0.02	**100.00**

Table C-11 continued

Masr Il Gedida	87.73	1.81	7.20	1.96	0.33	0.14	0.82	**100.00**
Alnozha	94.76	0.21	0.76	3.83	0.11	0.13	0.19	**100.00**
Badr	99.03	0.00	0.70	0.14	0.00	0.00	0.14	**100.00**
Ain Shams	65.71	0.76	25.96	3.76	3.17	0.09	0.56	**100.00**
Alzawaya Al Hamra	49.95	0.24	46.90	2.68	0.18	0.03	0.01	**100.00**
Alsalam	73.62	1.97	14.01	8.95	0.82	0.17	0.46	**100.00**
El Zamalek	96.73	1.05	1.05	0.74	0.11	0.21	0.11	**100.00**
Mansheit Nasr	43.45	0.95	34.33	18.88	2.07	0.18	0.14	**100.00**
Albasateen	50.13	0.13	36.51	12.39	0.73	0.02	0.09	**100.00**
Al Morg	70.99	0.36	18.55	7.90	1.76	0.01	0.42	**100.00**
Total	**53.60**	**1.11**	**28.37**	**14.98**	**1.43**	**0.20**	**0.31**	**100.00**

C.2 Building Stock Final Results

Table C-12 breakdown of all CAPMAS districts in the governorate of Giza by their classified areas of Moharram (2006) age groups, and age group percentage

	Area (m) by Age Group				Age Group by percentage of area			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
Qism Embaba	254674.6	3213308.0	1907916.0	463087.8	0.0	0.6	0.3	0.1
Agouza	388811.8	4609244.0	0.0	0.0	0.1	0.9	0.0	0.0
Dokki	1391562.0	3518115.0	155932.7	0.0	0.3	0.7	0.0	0.0
Markaz Giza	0.0		17155.3	432814.5	0.0	0.0	0.0	1.0
Boulaq Dakrour	0.0	1180256.0	13795813.0	1071410.0	0.0	0.1	0.9	0.1
Haram	0.0	720066.3	4610342.0	5639783.0	0.0	0.1	0.4	0.5
Al Hawamdia	0.0	0.0	0.0	0.0				
Qism Giza	1101192.0	1804029.0	425028.9	1281294.0	0.2	0.4	0.1	0.3
Albadrasheen	0.0	610.5	52847.6	83942.8	0.0	0.0	0.4	0.6
Alsaf	1128733.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Alayat	0.0	0.0	0.0	0.0				
Markaz Embaba	0.0	0.0	403030.4	1409353.0	0.0	0.0	0.2	0.8
Alwahat	0.0	0.0	0.0	0.0				
Atfeeh	0.0	0.0	0.0	0.0				
Auseem	0.0	0.0	0.0	156442.1	0.0	0.0	0.0	1.0
Alwarak	374247.5	394883.1	2027181.0	2674672.0	0.1	0.1	0.4	0.5
Alomranya	152195.8	3545661	6456036	5509516	0.009717	0.226366	0.412173	0.351744
6^{th} of October	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table C-13 Classification of buildings in all districts in the governorate of Giza based on superimposing the geocode map established by Moharram (2006) on top of CAPMAS (2008) districts maps

	EC1-LP	EC1-MP	EC1-HP	EC1-LG	EC1-MG	EC1-HG	EC2-HG	EC3-L
Qism Embaba	4.70	40.51	8.86	0.58	6.29	1.37	1.39	0.05
Agouza	4.41	43.51	10.64	0.00	3.29	0.97	0.82	0.00
Dokki	4.34	42.33	9.07	0.01	2.86	0.88	0.83	0.00
Markaz Giza	6.51	23.27	7.56	5.71	15.67	2.60	8.25	0.63
Boulaq Dakrour	4.86	38.56	6.38	0.69	9.39	1.79	1.22	0.04
Haram	5.67	31.05	7.12	3.19	12.36	2.17	4.73	0.34
Al Hawamdia	5.94	0.38	0.02	11.54	0.74	0.03	0.00	0.00
Qism Giza	4.97	36.33	8.01	1.68	6.78	1.40	2.97	0.18
Albadrasheen	5.87	29.15	6.97	3.75	13.35	2.30	5.49	0.40
Alsaf	4.05	38.66	4.05	0.00	0.45	0.45	0.90	0.00
Alayat	1.54	0.01	0.01	3.46	0.03	0.02	0.00	0.00
Markaz Embaba	6.18	26.35	7.24	4.68	14.47	2.44	6.80	0.51
Alwahat	1.21	0.04	0.04	4.19	0.15	0.12	0.00	0.00
Atfeeh	1.01	0.02	0.02	3.50	0.06	0.05	0.00	0.00
Auseem	6.58	22.63	7.63	5.92	15.92	2.63	8.55	0.66
Alwarak	5.58	31.45	6.99	3.02	11.55	2.05	4.55	0.32
Alomranya	5.32	34.49	7.68	2.22	10.27	1.90	3.48	0.23
6th of October	0.00	0.00	0.00	15.63	40.63	0.00	0.00	28.13
	EC3-H	**EC3-HG**	**EC4-M**	**EC4-H**	**EC4-HG**	**EURM-L**	**EURM-M**	**Total**
Qism Embaba	0.24	0.55	0.05	0.22	0.45	21.05	13.69	100
Agouza	0.40	0.75	0.00	0.37	0.75	20.09	14.00	100
Dokki	0.40	0.56	0.00	0.28	0.56	26.41	11.44	100
Markaz Giza	0.00	1.27	0.63	0.00	0.00	17.74	10.15	100
Boulaq Dakrour	0.03	0.15	0.04	0.03	0.06	23.01	13.74	100
Haram	0.03	0.73	0.34	0.03	0.05	20.20	11.98	100
Al Hawamdia	0.00	0.00	0.00	0.00	0.00	76.28	5.09	100
Qism Giza	0.26	0.68	0.18	0.16	0.32	25.63	10.45	100
Albadrasheen	0.00	0.81	0.40	0.00	0.00	19.96	11.53	100

Table C-13 continued

Alsaf	0.45	0.00	0.00	0.00	0.00	48.80	2.17	100
Alayat	0.00	0.00	0.00	0.00	0.00	93.75	1.19	100
Markaz Embaba	0.00	1.03	0.51	0.00	0.00	18.92	10.87	100
Alwahat	0.00	0.00	0.00	0.00	0.00	88.48	5.77	100
Atfeeh	0.00	0.00	0.00	0.00	0.00	92.29	3.05	100
Auseem	0.00	1.32	0.66	0.00	0.00	17.50	10.00	100
Alwarak	0.06	0.70	0.32	0.03	0.06	22.02	11.28	100
Alomranya	0.09	0.65	0.23	0.09	0.18	20.48	12.67	100
6^{th} of October	0.00	15.63	0.00	0.00	0.00	0.00	0.00	100

Table C-14 breakdown of all CAPMAS districts in the governorate of Cairo by their classified areas of Moharram (2006) age groups, and age group percentage

	Area (m) by Age Group				**Age Group by percentage of area**			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
Tebeen	0.00	5404612.00	7654993.00	447773.40	0.00	0.40	0.57	0.03
Helwan	5273604.00	4616892.00	33403720.00	12118804.00	0.10	0.08	0.60	0.22
15th of May	0.00	0.00	2708474.00	8675538.00	0.00	0.00	0.24	0.76
Maadi	2561675.00	1285140.00	1312685.00	2685909.00	0.33	0.16	0.17	0.34
Torah	0.00	640978.90	2573176.00	6673915.00	0.00	0.06	0.26	0.67
Masr Il Adeema	1394271.00	1866242.00	3670150.00	275872.70	0.19	0.26	0.51	0.04
Sayeda Zeinab	2776494.00	1001209.00	0.00	0.00	0.73	0.27	0.00	0.00
Al Khalifa	825885.70	4114832.00	2285146.00	5382755.00	0.07	0.33	0.18	0.43
Abdeen	1662459.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Al Mosky	762045.10	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Kasr El Nil	1112746.00	71294.43	0.00	0.00	0.94	0.06	0.00	0.00
Boulaq	1951815.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Alazbakeya	980610.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Darb Al Ahmar	1437770.00	544917.00	0.00	0.00	0.73	0.27	0.00	0.00
Algamalaya	1022583.00	922798.00	0.00	0.00	0.53	0.47	0.00	0.00
Bab Al Shearia	1943611.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Al Zahir	1169435.00	613014.40	0.00	0.00	0.66	0.34	0.00	0.00

Table C-14 continued

Al Sharabia	1401674.00	1445949.00	0.00	0.00	0.49	0.51	0.00	0.00
Shubra	1266010.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Rod Al Farag	2154521.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Al Sahel	1956569.00	3222369.00	0.00	0.00	0.38	0.62	0.00	0.00

Table C-15 Classification of buildings in all districts in the governorate of Cairo based on superimposing the geocode map established by Moharram (2006) on top of CAPMAS (2008) districts maps

	EC1-LP	EC1-MP	EC1-HP	EC1-LG	EC1-MG	EC1-HG	EC2-HG	EC3-L
Tebeen	4.69	40.62	8.06	0.39	7.26	1.51	0.99	0.02
Helwan	5.06	36.00	6.53	1.50	9.48	1.78	2.43	0.14
15th of May	6.15	26.61	7.21	4.59	14.37	2.43	6.68	0.50
Maadi	5.10	34.15	6.75	2.08	7.75	1.51	3.47	0.23
Torah	5.97	28.36	7.40	4.08	13.42	2.31	6.00	0.45
Masr Il Adeema	4.61	39.75	6.97	0.40	6.39	1.36	1.06	0.03
Sayeda Zeinab	4.15	40.05	5.94	0.00	1.27	0.60	0.88	0.00
Al Khalifa	5.39	33.66	8.24	2.59	9.68	1.81	4.10	0.28
Abdeen	4.05	38.66	4.05	0.00	0.45	0.45	0.90	0.00
Al Mosky	4.05	38.66	4.05	0.00	0.45	0.45	0.90	0.00
Kasr El Nil	4.07	38.98	4.48	0.00	0.64	0.48	0.89	0.00
Boulaq	4.05	38.66	4.05	0.00	0.45	0.45	0.90	0.00
Alazbakeya	4.05	38.66	4.05	0.00	0.45	0.45	0.90	0.00
Darb Al Ahmar	4.16	40.11	6.02	0.00	1.30	0.60	0.88	0.00
Algamalaya	4.23	41.16	7.44	0.00	1.91	0.72	0.86	0.00
Bab Al Shearia	4.05	38.66	4.05	0.00	0.45	0.45	0.90	0.00
Al Zahir	4.18	40.47	6.51	0.00	1.51	0.64	0.87	0.00
Al Sharabia	4.25	41.33	7.68	0.00	2.01	0.73	0.85	0.00
Shubra	4.05	38.66	4.05	0.00	0.45	0.45	0.90	0.00
Rod Al Farag	4.05	38.66	4.05	0.00	0.45	0.45	0.90	0.00

Table C-17 continued

Al Sahel	4.29	41.93	8.50	0.00	2.37	0.80	0.84	0.00
Al Waly	4.38	41.76	8.40	0.05	3.58	0.98	0.81	0.00
Hadaq Al Quba	4.43	40.43	6.80	0.13	4.68	1.11	0.79	0.00
Al Zaytoon	4.42	39.17	5.18	0.17	4.99	1.13	0.79	0.00
Al Matarya	4.43	39.03	5.03	0.18	5.29	1.17	0.78	0.00
Nasr City	5.74	30.39	7.01	3.37	12.67	2.21	4.98	0.36
Nasr City 2	5.47	32.61	7.21	2.71	10.93	1.97	4.14	0.29
Masr Il Gedida	4.31	40.85	7.16	0.05	3.05	0.88	0.83	0.00
Alnozha	4.77	39.30	6.57	0.49	8.73	1.70	0.98	0.02
Badr	6.32	24.97	7.38	5.14	15.00	2.51	7.45	0.57
Ain Shams	4.64	39.25	5.65	0.29	7.84	1.56	0.74	0.00
Alzawaya Al Hamra	4.44	43.89	11.17	0.00	3.57	1.01	0.81	0.00
Alsalam	6.57	22.75	7.62	5.88	15.87	2.62	8.49	0.66
El Zamalek	4.05	38.66	4.05	0.00	0.45	0.45	0.90	0.00
Mansheit Nasr	4.60	41.83	9.18	0.24	5.92	1.33	0.91	0.01
Albasateen	4.99	37.17	6.78	1.19	9.30	1.77	2.00	0.11
Al Morg	5.76	29.57	6.75	3.56	12.49	2.17	5.27	0.38
New Cairo	0.00	0.00	0.00	15.63	40.63	0.00	0.00	28.13
	EC3-H	**EC3-HG**	**EC4-M**	**EC4-H**	**EC4-HG**	**EURM-L**	**EURM-M**	**Total**
Tebeen	0.16	0.37	0.02	0.16	0.32	21.20	14.22	100
Helwan	0.08	0.36	0.14	0.03	0.07	24.35	12.03	100
15th of May	0.00	1.01	0.50	0.00	0.00	19.02	10.93	100
Maadi	0.21	0.58	0.23	0.07	0.13	28.82	8.92	100
Torah	0.03	0.94	0.45	0.03	0.05	19.18	11.34	100
Masr Il Adeema	0.19	0.26	0.03	0.10	0.21	26.86	11.78	100
Sayeda Zeinab	0.44	0.21	0.00	0.11	0.21	40.55	5.57	100
Al Khalifa	0.16	0.83	0.28	0.13	0.26	20.77	11.83	100

Table C-17 continued

Abdeen	0.45	0.00	0.00	0.00	0.00	48.80	2.17	100
Al Mosky	0.45	0.00	0.00	0.00	0.00	48.80	2.17	100
Kasr El Nil	0.45	0.05	0.00	0.02	0.05	46.93	2.94	100
Boulaq	0.45	0.00	0.00	0.00	0.00	48.80	2.17	100
Alazbakeya	0.45	0.00	0.00	0.00	0.00	48.80	2.17	100
Darb Al Ahmar	0.44	0.22	0.00	0.11	0.22	40.24	5.70	100
Algamalaya	0.43	0.38	0.00	0.19	0.38	34.03	8.26	100
Bab Al Shearia	0.45	0.00	0.00	0.00	0.00	48.80	2.17	100
Al Zahir	0.43	0.28	0.00	0.14	0.28	38.09	6.58	100
Al Sharabia	0.42	0.41	0.00	0.20	0.41	32.99	8.68	100
Shubra	0.45	0.00	0.00	0.00	0.00	48.80	2.17	100
Rod Al Farag	0.45	0.00	0.00	0.00	0.00	48.80	2.17	100
Al Sahel	0.42	0.50	0.00	0.25	0.50	29.43	10.15	100
Al Waly	0.35	0.46	0.00	0.23	0.46	27.23	11.29	100
Hadaq Al Quba	0.27	0.23	0.00	0.12	0.23	30.51	10.26	100
Al Zaytoon	0.22	0.03	0.00	0.01	0.03	35.43	8.42	100
Al Matarya	0.21	0.00	0.00	0.00	0.00	35.33	8.52	100
Nasr City	0.02	0.75	0.36	0.01	0.03	20.37	11.73	100
Nasr City 2	0.08	0.68	0.29	0.05	0.10	21.84	11.63	100
Masr II Gedida	0.36	0.32	0.00	0.16	0.32	32.64	9.06	100
Alnozha	0.06	0.15	0.02	0.05	0.10	23.32	13.71	100
Badr	0.00	1.13	0.57	0.00	0.00	18.40	10.55	100
Ain Shams	0.08	0.01	0.00	0.01	0.01	27.94	11.97	100
Alzawaya Al Hamra	0.40	0.81	0.00	0.40	0.81	17.71	14.99	100
Alsalam	0.00	1.31	0.66	0.00	0.00	17.55	10.03	100
El Zamalek	0.45	0.00	0.00	0.00	0.00	48.80	2.17	100
Mansheit Nasr	0.25	0.52	0.01	0.25	0.50	19.95	14.51	100

Table C-17 continued

Albasateen	0.07	0.32	0.11	0.05	0.11	23.12	12.91	100
Al Morg	0.04	0.77	0.38	0.00	0.00	22.13	10.72	100
New Cairo	0.00	15.63	0.00	0.00	0.00	0.00	0.00	100

Table C-16 Classification of soil in all districts in the governorate of Giza based on superimposing the soil classification map on top of CAPMAS (2008) districts maps

	Total Area (m)	Area by Soil Type			
		B	C	D	E
Qism Embaba	7709873.643	0	0	7153354	0
Agouza	5365886.286	0	0	5160190.26	0
Dokki	5728875.977	0	0	5295650.9	0
Markaz Giza	57738511.96	0	0	2720374.52	58001.3925
Boulaq Dakrour	9096518.559	0	0	7887736.95	0
Haram	18070023.44	0	0	16865023.9	0
Al Hawamdia	21871063.51	0	0	432106.995	0
Qism Giza	13008810.85	0	0	8387767.76	1868766.87
Albadrasheen	121252062.1	0	0	622599.713	0
Alsaf	140597688.4	0	0	1251240.33	0
Alayat	164673616.3	0	0	164673616	0
Markaz Embaba	289744789.8	0	0	4207681.29	0
Alwahat	71761831.5	0	0	71761831.5	0
Atfeeh	117852679.4	0	0	117852679	0
Auseem	55676362.3	0	0	1281230.02	0
Alwarak	31264794.34	0	0	9095025.44	0
Alomranya	18620207.65	0	0	18208162	0
6th of October	612577251.2	0	0	612577251	0

Table C-17 Classification of soil in all districts in the governorate of Cairo based on superimposing the soil classification map on top of CAPMAS (2008) districts maps

	Area (m)	Soil Type			
		B	C	D	E
Tebeen	26032628.67	3911400.52	8153648.56	11579539.6	0
Helwan	66544361.47	7340400.18	27575357.6	30266145.9	0
15th of May	79833993.82	67889879	7199764.38	0	0
Maadi	31472088.94	7889809.84	3573285.13	3213347.44	0
Torah	92565275.64	31094716.7	5627798.98	1381649.67	0
Masr Il Adeema	12271786	5156895.35	589876.091	5371510.03	43936.9207
Sayeda Zeinab	3777796.54	0	0	1995971.38	1773172.38
Al Khalifa	37204179.09	29545567.5	5360424.49	2107242.03	0
Abdeen	1662463.265	0	0	107526.06	1545699.93
Al Mosky	762045.0977	0	0	0	762045.098
Kasr El Nil	1520780.814	0	0	0	1411784.01
Boulaq	3111098.129	0	0	0	2771766.03
Alazbakeya	1279343.816	0	0	7283.3496	1272060.47
Darb Al Ahmar	2007318.972	0	13753.8457	1827813.53	141955.49
Algamalaya	1943610.524	0	658345.229	1007908.65	275324.127
Bab Al Shearia	1052106.355	0	0	639025.381	412395.9
Al Zahir	1929151.157	0	883384.53	960930.135	84597.5425
Al Sharabia	3249622.075	0	0	3249622.07	0
Shubra	1463380.944	0	0	1098788.43	352668.952
Rod Al Farag	2686886.645	0	0	1486859.35	982516.365
Al Sahel	5961815.425	0	0	5464700.3	0
Al Waly	4703471.449	0	4429958.39	263415.229	0
Hadaq Al Quba	5197597.481	0	3417.6847	5194179.8	0

Table C-17 continued

Al Zaytoon	7610944.047	0	1182752.21	6428191.43	0
Al Matarya	6367496.819	0	1464407.88	4903088.79	0
Nasr City	76923909.19	4534119.04	54192335.7	0	0
Nasr City 2	18273742.34	680151.74	16522766.5	6058775.18	0
Masr Il Gedida	8682542.513	0	8594111.76	85646.8882	0
Alnozha	58369475.57	0	49152146.3	0	0
Badr	252564374.8	0	2134779.24	0	0
Ain Shams	8917358.67	0	8496228.71	419894.742	0
Alzawaya Al Hamra	4567119.991	0	0	4567119.99	0
Alsalam	33243507.51	0	30965675.7	0	0
El Zamalek	3521359.766	0	0	2540081.52	0
Mansheit Nasr	5572063.527	3162657.98	2102514.22	182521.771	0
Albasateen	28676992.54	14785756.4	5189437.36	8246373.68	0
Al Morg	14416480.63	0	13297370.2	0	0
New Cairo	283562886.5	947101.795	473415.267	48976852.9	0

C.3 Moharram (2006) Building Stock Distribution

Table C-18 building stock distribution. The typical values for the number of storeys, typical height and height of first storey are median values. (Moharram, 2006)

Label	Percentage	Typical number of storeys	Typical storey height	Typical height of first storey
		I		
EC1-LP	4.05	3	4	5
EC1-MP	38.66	5	3	4
EC1-HP	4.05	9	3	4
EC1-LG	–	–	–	–
EC1-MG	0.45	4	3	4
EC1-HG	0.45	14	3	3.5
EC2-HG	0.90	13	3	3.5
EC3-L	–	–	–	–
EC3-H	0.45	11	3	5
EC3-HG	–	–	–	–
EC4-M	–	–	–	–
EC4-H	–	–	–	–
EC4-HG	–	–	–	–
EURM-L	48.80	3	4	4
EURM-M	2.17	5	3	3.5
		II		
EC1-LP	4.44	3	3	4
EC1-MP	43.92	6	3	3
EC1-HP	11.20	11	3	4
EC1-LG	–	–	–	–
EC1-MG	3.53	6	3	4
EC1-HG	1.01	10	3	3
EC2-HG	0.81	15.5	3	3
EC3-L	–	–	–	–
EC3-H	0.40	12.5	3	4
EC3-HG	0.81	12	3	3
EC4-M	–	–	–	–
EC4-H	0.40	14	3	3
EC4-HG	0.81	11.5	3	3
EURM-L	17.67	3	3	3
EURM-M	15.00	5	3	3
		III		
EC1-LP	4.76	3	3	3.5
EC1-MP	39.34	6	3	3
EC1-HP	5.87	8	3	3
EC1-LG	0.34	3	3	3
EC1-MG	9.39	7	3	3
EC1-HG	1.79	9	3	3
EC2-HG	0.68	11	3	3
EC3-L	–	–	–	–
EC3-H	–	–	–	–
EC3-HG	–	–	–	–

Table C-18 continued

EC4-M	–	–	–	–
EC4-H	–	–	–	–
EC4-HG	–	–	–	–
EURM-L	23.90	4	3	3
EURM-M	13.92	5	3	3
Label	**Percentage**	**Typical number of storeys**	**Typical storey height**	**Typical height of first storey**
		IV		
EC1-LP	6.58	3	3	4
EC1-MP	22.63	5	3	3
EC1-HP	7.63	9	3	3.5
EC1-LG	5.92	2	3	4
EC1-MG	15.92	5	3	4.00
EC1-HG	2.63	9.5	3	4.50
EC2-HG	8.55	12	3	4
EC3-L	0.66	3	3	5
EC3-H	–	–	–	–
EC3-HG	1.32	11	3	4
EC4-M	0.66	5	3	5
EC4-H	–	–	–	–
EC4-HG	–	–	–	–
EURM-L	17.50	3	3	3
EURM-M	10.00	5	3	3

C.4 Building Survey

BUILDING NUMBER:	11
Coordinates (UTM) : 36R, 306996 E, 3323122 N	

Function:

Residential	☐
Commercial	■
Office	■
Industrial	☐
School	☐
Government Building	☐
Emergency Service	☐
Historical	☐

Non-Structural Falling hazard: ☐	Daytime occupancy:	Night time occupancy
Characteristics:	Construction year: 2000s	
	Length: 55 m	Width: 35 m
	System: Reinforced concrete flat slab	
	Number of storeys (+basement): 3	

Seismic deficiencies:

Poor Condition	☐
Vertical Irregularity	☐
Plan Irregularity	☐
Pounding	☐
Short Columns	☐

Picture(s):

Comments:	

Figure C.3 Survey Example

C.5 Definition of Geocodes According to Moharram (2006)

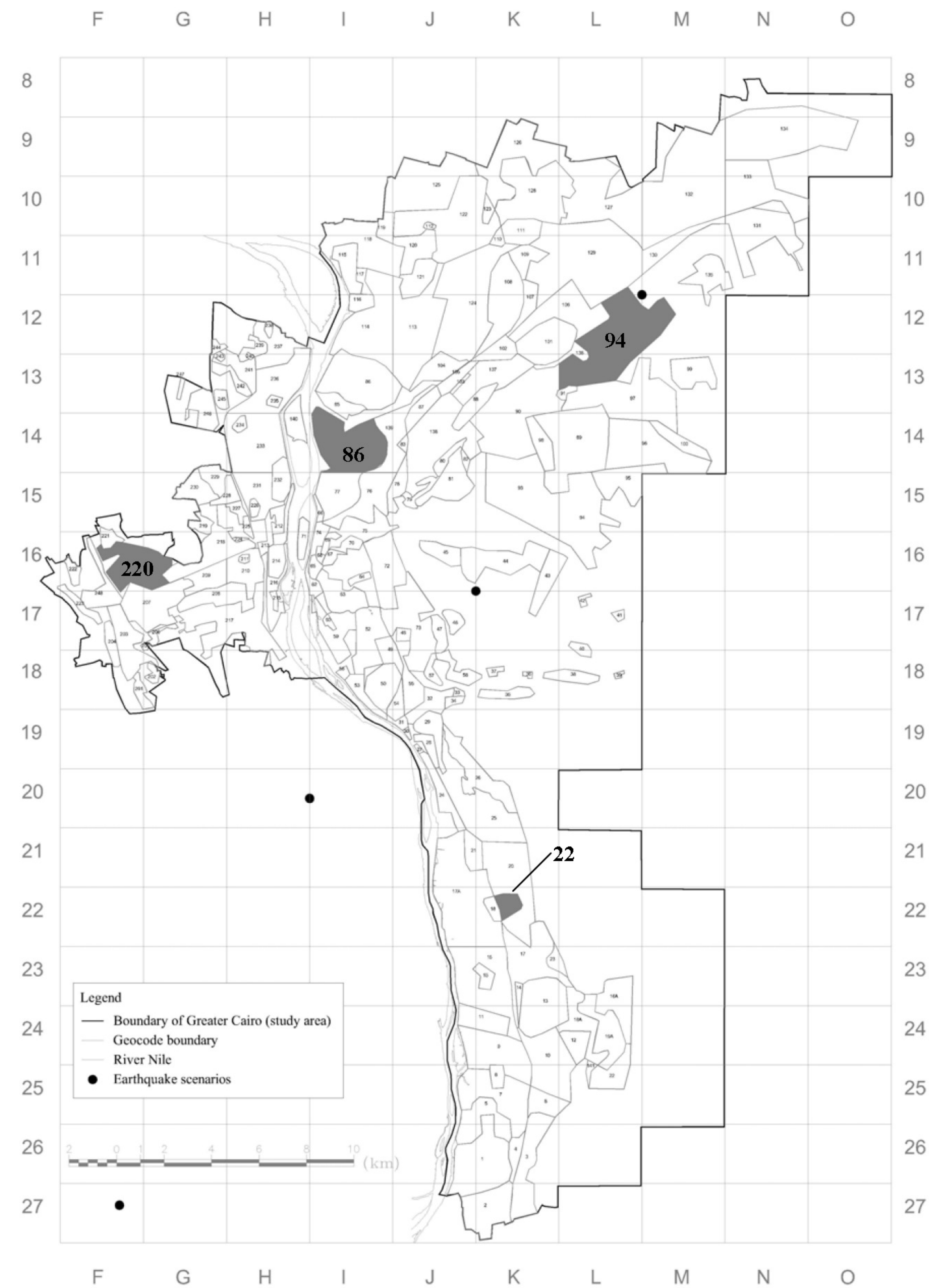


Figure C.4 Definition of geocodes according to Moharram (2006)

C.6 Sample of Satellite Images

Figure C.5 Satellite Image of New Cairo

Figure C.6 Satellite image of Giza region

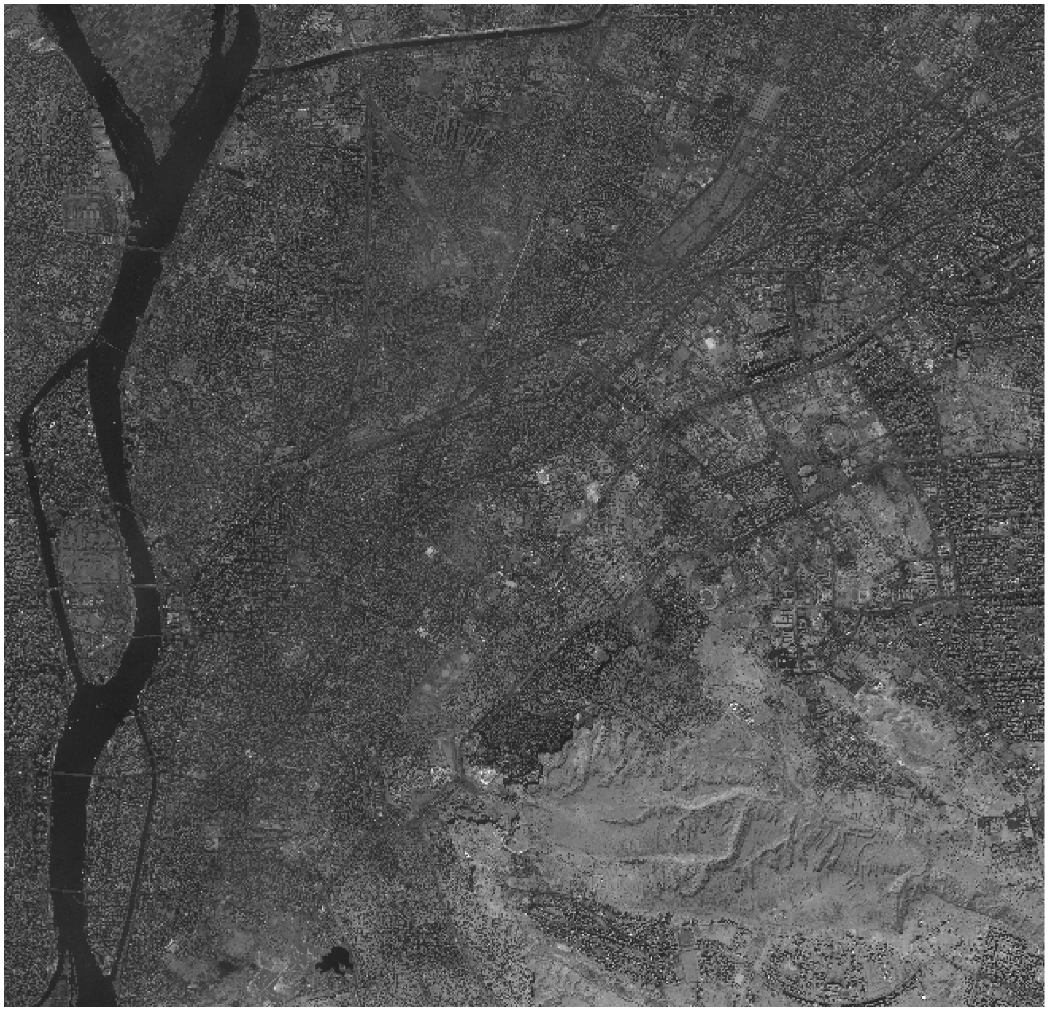
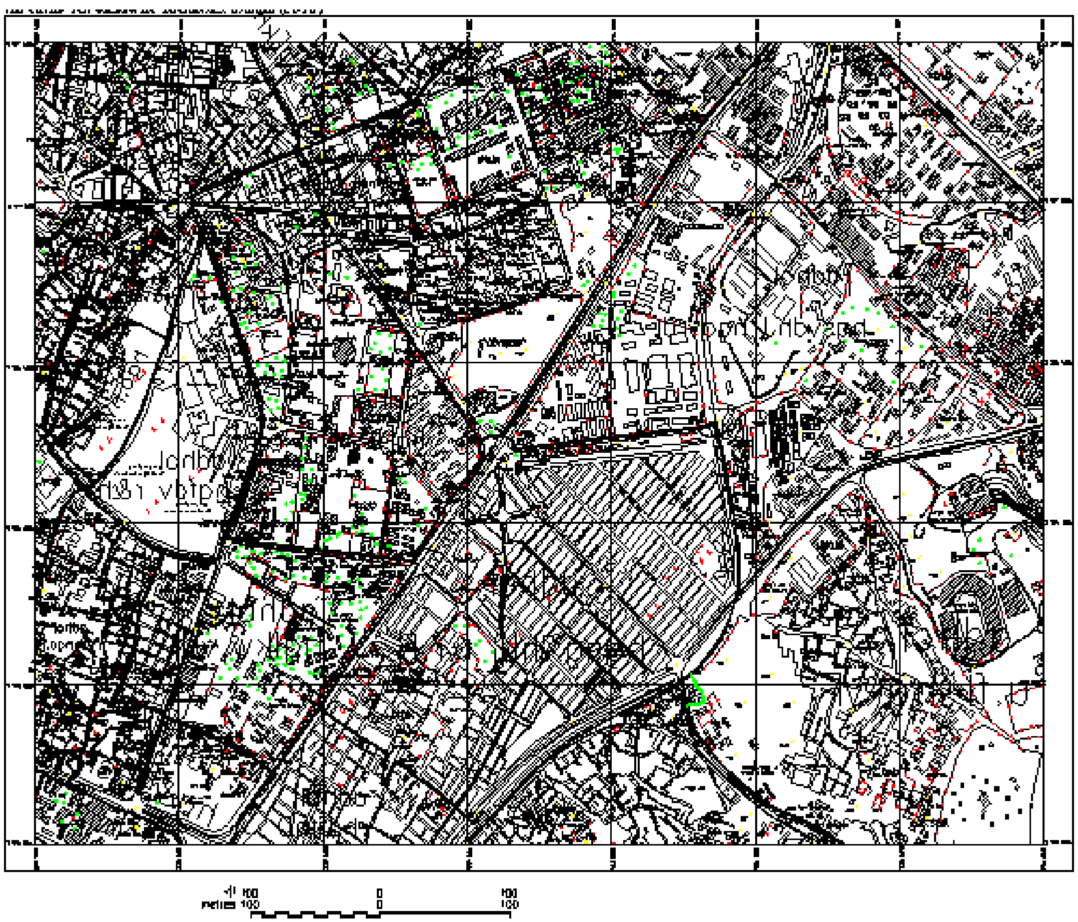


Figure C.7 Satellite image of Cairo region

C.7 Sample of Maps Used

Figure C.8 Map of region H-16 (Elmokadem, 2009)



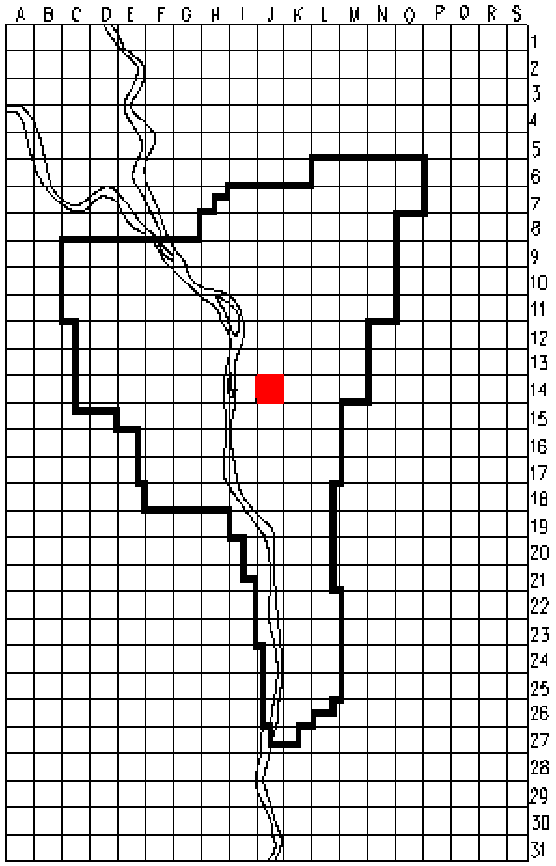


Figure C.9 Map of region J-14 (Elmokadem, 2009)

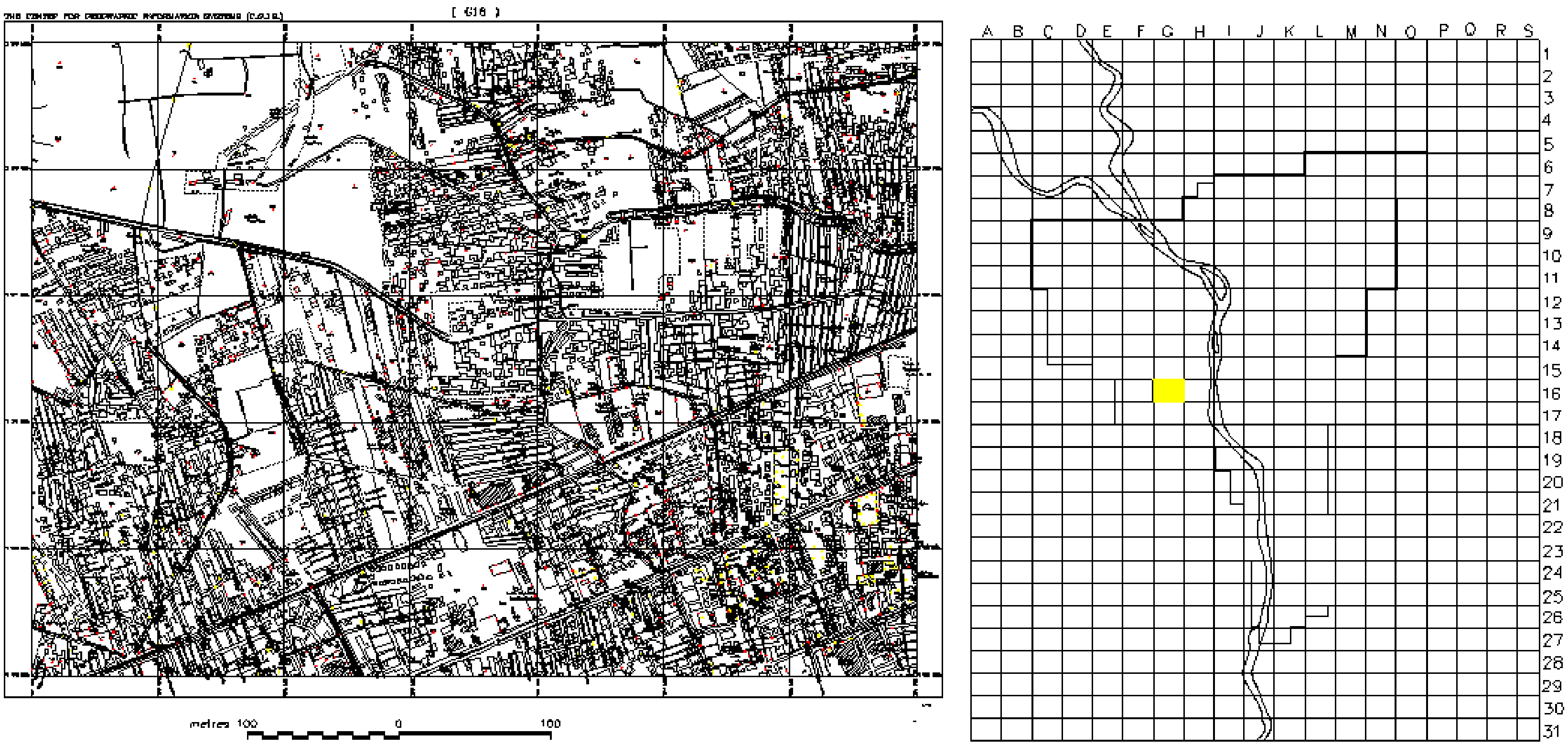


Figure C.10 Map of region G-16 (Elmokadem, 200

Appendix D

Lifelines

D.1 Natural Gas Network Connection Matrix

Table D-1 Natural gas connection succesor table

Node	Succesor		
1	2		
2	3		
3	4		
4	5	155	216
5	6		
6	7		
7	8		
8	9	166	167
9	10		
10	11		
11	12	175	
12	13		
13	14		
14	15		
15	16		
16	17		
17	18	19	
18	179	181	
19	20		
20	21		
21	22		
22	23		
23	24		
24	25		
25	26	29	
26	27		
27	28		
28	59		
29	30	41	
30	31		
31	32		
32	33		
33	34		
34	35		
35	36	37	
36	87		
37	38		
38	39		
39	40	87	
40			
41	42		
42	43		
43	44	189	
44	45		
45	46		
46	47		
47	48		
48	49	195	
49	50		
50	51		
51	52		
52	53	215	
53	54		
54	56		
55	57		
56	58		
57	58		
58			
59	60		
60	61		
61	62		
62	63		
63	64		
64	65		
65	66		
66	67		
67	68		
68	69		
69	70		
70	71		
71	72		

Table D-1 continued

72	73			
73	74			
74	75			
75	76			
76	77			
77	78			
78	79	80		
79				
80	81			
81	82			
82	83			
83	84	85	86	150
84				
85				
86				
87	88			
88	89			
89	90			
90	91			
91	92			
92	93			
93	94			
94	95			
95	96	99		
96	97			
97	98			
98				
99	100			
100	101			
101	102			
102	103			
103	104	105		
104				
105	106	107		
106				
107	108			
108	109	117		
109	110			
110	111			
111	112			
112	113			
113	114			
114	115			
115	116			
116	117			
117	108	118		
118	119			
119	120	123		
120	121			
121	122			
122				
123	124			
124	125			
125	126			
126	127			
127	128	140		
128	129	131		
129	130			
130				
131	132			
132	133	134		
133	137			
134	135			
135	136			
136				
137	138			
138	139			
139				
140	141			
141	142			
142	143			
143	144			
144	145	150		

Table D-1 continued

145	146	
146	147	
147	148	
148	149	
149		
150	151	
151	152	
152	153	
153	154	
154		
155	156	158
156	157	
157		
158	159	
159	160	
160	161	
161	162	164
162	163	
163		
164	165	
165		
166		
167	168	
168	169	170
169		
170	171	
171	172	
172	173	
173	174	
174		
175	176	
176	177	
177	178	
178		
179	180	
180		
181	182	
182	183	
183	184	
184	185	
185	186	
186	187	
187	188	
188		
189	189	
190	191	
191	192	
192	193	194
193		
194		
195	196	211
196	203	
197	198	
198	199	
199	200	
200	201	
201	202	
202		
203	197	204
204	205	
205	206	
206	207	
207	208	
208	209	
209	210	
210		
211	212	
212	213	
213	214	
214	215	
215		
216		
217	46	
218	139	

D.2 Natural Gas Network Minimum Cut sets

Table D-2 Sample of minimum cut sets

Station Node	Cutsets
1	1
9	1
	2
	3
	4
	5
	6
	7
	8
	9
18	17
	18
	1 19
	1 20
	1 21
	1 22
	1 41 47
	1 41 48
	1 41 49
	1 41 50
	1 41 51
	1 41 52
	1 41 53
	1 41 54
28	25
	26
	27
	28
	29
	41 47
	41 48
	41 49
	41 50
	41 51
	41 52
	41 53
	41 54
36	29 87
	29 88
	29 89
	29 90
	29 91
	29 92
	29 93
	29 94
	41 47 87
	41 47 88
	41 47 89
	41 47 90
	41 47 91
	41 47 92
	41 47 93
	41 47 94
39	29 87
	29 88
	29 89
	29 90
	29 91
	29 92
	29 93
	29 94
	41 47 87
	41 47 88
	41 47 89
	41 47 90
	41 47 91
	41 47 92
	41 47 93
	41 47 94
217	48
	195
	46 49
	46 50
	46 51
	46 52
	46 53
	46 54
	46 55
	46 56
	46 57
	46 58
	47 49
	47 50
	47 51
	47 52
	47 53
84	83
	85
	25 127
	25 140
	25 141
	25 142
	25 143
	25 113 129
	25 113 131
	25 113 132
	25 113 133
	25 113 137
	41 47 113 129
	41 47 113 131
	41 47 113 132
	41 47 113 133
	41 47 113 137
86	83
	86
	25 127
	25 140
	25 141
	25 142
	25 143
	25 113 129
	25 113 131
	25 113 132
	25 113 133
	25 113 137
	41 47 113 129
	41 47 113 131
	41 47 113 132
	41 47 113 133
	41 47 113 137
90	90
	29 91
	29 92
	29 93
	29 94
	29 95
	29 99
	41 47 91
	41 47 92
	41 47 93
	41 47 94
	41 47 95
	41 47 99
98	95
	96
	97
	98
	99
195	53
	46 54
	46 55
	46 56
	46 57
	46 58
53	83
	84
	25 127
	25 140
	25 141
	25 142
	25 143
	25 144
	25 150
	25 113 129
	25 113 131
	25 113 132
	25 113 133
	25 113 137
	25 113 138
	25 113 139
	41 47 113 129
	41 47 113 131
	41 47 113 132
	41 47 113 133
	41 47 113 137
	41 47 113 138
	41 47 113 139
136	133
	113 137
	113 138
	113 139
	114 137
	114 138
138	132
	134
	135
	136
	113 133
	113 137
	113 138
	113 139
	114 133
139	138
	113 139
	114 139
	115 139
	116 139
	117 139
157	139
175	1
	2
	3
	4
	55
113	217
42	42
	43
	44
	45
	46
	47 217
	48 217
	49 217
	50 217
	51 217
	52 217
	53 217

Table D-2 continued

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<tr><td>33</td><td>105</td><td>113 123</td></tr>
<tr><td>34</td><td>120</td><td>113</td><td>113 124</td></tr>
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</table>

D.3 Matpower Network Input

Table D-3 Input data to matpower

	Bus #	Gen Cap	Power Fac	Qmax	Qmin	mbase	Type	Pd	baseKV	Vmax	Vmin
Abu Zaabal (200)	1	0	0.9	0	0	100	1	100	200	1.1	0.9
Abu Zaabal (500)	2	0	0.9	0	0	100	1	100	500	1.1	0.9
Basoos (200)	3	0	0.9	0	0	100	1	100	200	1.1	0.9
Basoos (500)	4	0	0.9	0	0	100	1	100	500	1.1	0.9
West Cairo (200)	5	0	0.9	0	0	100	1	100	200	1.1	0.9
West Cairo (500)	6	1152	0.9	557.9391	-557.9391	100	2	100	500	1.1	0.9
Cairo (200)	7	0	0.9	0	0	100	1	100	200	1.1	0.9
Cairo (500)	8	0	0.9	0	0	100	1	100	500	1.1	0.9
Eltebin 500 (200)	9	0	0.9	0	0	100	1	100	200	1.1	0.9
Eltebin 500 (500)	10	0	0.9	0	0	100	1	100	500	1.1	0.9
Wadi Houf	11	100	0.9	48.43221	-48.43221	100	2	100	500	1.1	0.9
South Cairo	12	735	0.9	355.9767	-355.9767	100	2	100	500	1.1	0.9
Katameya	13	0	0.9	0	0	100	1	100	200	1.1	0.9
6th of October	14	0	0.9	0	0	100	1	100	200	1.1	0.9
Elharam	15	0	0.9	0	0	100	1	100	200	1.1	0.9
Elmoatamadeya	16	0	0.9	0	0	100	1	100	200	1.1	0.9
South Eltebin	17	46	0.9	22.27882	-22.27882	100	2	100	200	1.1	0.9
Elbasateen	18	0	0.9	0	0	100	1	100	200	1.1	0.9
Ein Elseera	19	0	0.9	0	0	100	1	100	200	1.1	0.9
North Cairo	20	1250	0.9	605.4026	-605.4026	100	2	100	200	1.1	0.9
Bahteem	21	0	0.9	0	0	100	1	100	200	1.1	0.9
East Cairo	22	0	0.9	0	0	100	1	100	200	1.1	0.9
Heliopolis	23	0	0.9	0	0	100	1	100	200	1.1	0.9
Sakr Quraish	24	0	0.9	0	0	100	1	100	200	1.1	0.9
Alestad	25	0	0.9	0	0	100	1	100	200	1.1	0.9
Alsabteya 1	26	0	0.9	0	0	100	1	100	200	1.1	0.9
Alsabteya 2	27	0	0.9	0	0	100	1	100	200	1.1	0.9
Sheikh Zayed	28	0	0.9	0	0	100	1	100	200	1.1	0.9
New Cairo	29	0	0.9	0	0	100	1	100	200	1.1	0.9
Kurimat (200)	30	0	0.9	0	0	100	1	100	200	1.1	0.9
Kurimat (500)	31	2600	0.9	1259.237	-1259.237	100	2	100	500	1.1	0.9
10th of Ramadan	32	0	0.9	0	0	100	1	100	200	1.1	0.9
Shubra Kheima	33	1295	0.9	627.1971	-627.1971	100	3	100	200	1.1	0.9

Gen cap = generating capacity of station, Power Fac= Power Factor, Qmax= maximum reactive power, Qmin= minimum reactive power, Type=1 if substation and 2 if generating station, baseKV= base voltage of station in KV, Vmax= minimum voltage (per unit), Vmin= maximum voltage (per unit)

D.4 Electricity Network Connection Matrices

Table D-4 Station number labels

	Station No
Abu Zaabal (200)	1
Abu Zaabal (500)	2
Basoos (200)	3
Basoos (500)	4
West Cairo (200)	5
West Cairo (500)	6
Cairo (200)	7
Cairo (500)	8
Eltebin 500 (200)	9
Eltebin 500 (500)	10
Wadi Houf	11
South Cairo	12
Katameya	13
6th of October	14
Elharam	15
Elmoatamadeya	16
South Eltebin	17
Elbasateen	18
Ein Elseera	19
North Cairo	20
Bahteem	21
East Cairo	22
Heliopolis	23
Sakr Quraish	24
Alestad	25
Alsabteya 1	26
Alsabteya 2	27
Sheikh Zayed	28
New Cairo	29
Kurimat (200)	30
Kurimat (500)	31
10th of Ramadan	32
Shubra Kheima	33

Table D-5 Matrix of interconnection for 500 KV network

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1																																	
2				1						1																							
3																																	
4						1																											
5								1																									
6																																	
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Table D-6 Matrix of interconnection for 200 KV network

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1																							1									1	
2																																	
3					1		1													1	1		1										1
4																																	
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27																																	1
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33																																	

Table D-7 Matrix of interconnection for inter-station connections

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1		1																															
2																																	
3				1																													
4																																	
5						1																											
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Appendix E

Economic Data

E.1 Detailed Description of CGE

Producers

According to Tirasirichai and Enke (2006) as inputs for their production processes producers

Utilize:

- Labour and capital of domestic households
- Commodities from their sector and other sectors
- Imported commodities from foreign households

Pay:

- Wages and capital cost to domestic households
- Intermediate costs for imported goods to foreign households
- Output taxes to the government

Generate Income:

- By selling their goods and services to the markets as intermediate goods and finally demand driven commodities

For the production of a particular commodity the inputs can be divided into aggregated materials and value added inputs. The aggregated materials include all but the labour and capital supply which is categorized as value added inputs. Assuming there are *N* commodities in a system, the production function of a particular commodity is categorized by the function X_i:

$$X_i = (1+T_i)\left[B_{m,i} M_i^{p_{p,i}} + \beta_{v,i} V_i^{p_{p,i}}\right]^{1/P_{p,i}} \qquad (E.1)$$

where

X_i	- Output commodity from sector *i*
Ti	- Output tax of commodity *i*
$\beta_{m,i}$	- Aggregated material share factor in producing Xi

M_i - Aggregated material required to produce Xi

$\beta_{v,i}$ - Value added share factor in producing Xi

V_i - Value added required to produce Xi

$P_{p,i}$ - degree of sustainability between value added and aggregated material

in order to produce Xi

where:

$$P_{p,i} = 1 - \sigma_{p,i} \tag{E.2}$$

$\sigma_{p,I}$ - Constant Elasticity of Substitution (CES) to produce Xi

CES is a property of production and utility functions that refers to an aggregation of two or more types of consumptions or inputs. A special case of a CES is the Cobb Douglas function. Such factors can be calculated through econometric approaches or taken from the literature.

The aggregated material function can further be expressed as:

$$M_i = (\beta_{1,i} X_1 + \beta_{2,i} X_2 + \ldots + \beta_{N,i} X_N + \beta_{FX,i} FX_i) = \sum_{j=1}^{N} (\beta_{j,i} X_j + \beta_{FX,i} FX_i) \tag{E.3}$$

$\beta_{j,i}$ - Commodity Xj share factor in aggregated material Mi

X_j - Commodity from sector j used as input in material Mi

$\beta_{FX,i}$ - Non-comparable import share factor in material Mi

FX_i - Non-comparable import required in material Mi

In addition the value added term in Equation (E.3) can be further calculated as:

$$V_i = (L_i^{\alpha v,i} K_{i,v}^{1-\alpha v,i}) \tag{E.4}$$

L_i - Labour supply required as input for value added Vi

$K_{i,v}$ - Capital required as input for value added Vi

$\alpha v,i$ - Labour supply share factor in Vi

Furthermore as already mentioned producers attempt to maximize their profits by minimizing their costs. The production cost is calculated as:

$$c_{xi} = \sum_{j=1}^{N} (p_{xi} b_{j,i} + p_{FX} b_{FXi}) + p_L l_i + p_K k_i \qquad (E.5)$$

c_{Xi} - Cost of commodity Xi

p_{Xj} - Price of commodity Xi

$b_{j,i}$ - Number of units of commodity Xj required to produce one unit of Xi

p_{FX} - Price per unit of non-comparable imports

$b_{FX,i}$ - Number of units of non-comparable imports required to produce one unit of Xi

p_L - Wage rate per unit labour supply

l_i - Number of units of labour supply required to produce one unit of Xi

p_K - Capital cost per unit of capital

k_i - Number of units of capital required to produce one unit of Xi

where

$$p_x = (1 + T_i) c_{xi} \qquad (E.6)$$

All of which have been previously defined.

Households

Households can be divided into two types, domestic and foreign. Domestic households provide the labour and capital supply. Their income come from wages and capital received from producers, as well as taxes from governments, and is spent acquiring commodities provided by producers based on their preferences. In addition based on their preferences they choose between providing labour, capital and/or consuming commodities and leisure time based on their preferences. Foreign households provide non-comparable imported commodities or materials not available domestically.

The utility function for domestic households is given as:

$$U_d = (\beta_{Leis} Leis^{pu,d} + \beta_{c,d} C_d^{pu,d})^{1/p_{u,d}} \qquad (E.7)$$

U_d - Utility function of domestic households

β_{Leis} - Leisure time share factor in U_d

Leis - Leisure time consumed by domestic households

$\rho_{u,d}$ - Degree of sustainability of the consumption between leisure time and

aggregated consumption for households with U_d

$\beta_{c,d}$ - Aggregated consumption factor in domestic households with U_d

C_d - Aggregated consumption consumed by domestic households

where:

$$\rho_{u,d} = 1 - \sigma_{u,d} \qquad (E.8)$$

$\sigma_{u,d}$ - Constant Elasticity of Substitution (CES) for domestic households with U_d

C_d follows a Cobb Douglas relationship and is defined as:

$$C_d = \prod X_{i,d}^{\alpha_{cd,i}} \qquad (E.9)$$

$X_{i,d}$ - Commodity from sector i consumed by domestic households

$\alpha_{cd,i}$ - Commodity X_i share factor in C_d

Since domestic households attempt to maximize their utility based on their income, it is important to define the income:

$$I_d = \sum_{j=1}^{N} \left(p_L L_i + p_K k_i + \frac{T_i X_i}{1+T_i} \right) \qquad (E.10)$$

I_d - Domestic household income

L_i - Labour supply required as input to produce X_i

The utility function for foreign households differs from that for domestic households and is given by the Cobb Douglas function:

$$U_f = \prod X_{i,f}{}^{a_{f,i}} \qquad \sum_{i=1}^{N} a_{f,i} = 1 \qquad (E.11)$$

U_f - Utility function for foreign households

$X_{i,f}$ - Commodity from sector i consumed by foreign households

$\alpha_{f,i}$ - Commodity X_i share factor in U_f

The income function for foreign households is given by:

$$I_f = \sum_{j=1}^{N} p_{FX} FX_i \qquad (E.12)$$

l_f - Foreign households income

As already mentioned previously mentioned constraints need to be created in order to enable CGE modelling. One of these constrains is the satisfaction of Walrasian equilibrium. The method of ensuring this occurs is explained in the following section.

Zero Net Profit

It is assumed that in a perfectly competitive market excess profit over the long run equilibrium is zero. In addition the cost of production must be less than or equal to the market price of the output, and this is given by:

$$-\prod = (1+T_i)\left[\beta_{m,i}\left(\sum_{j=1}^{N} px_i b_{j,i} + p_{FX} b_{FX,i}\right) + \beta_{v,i}\left(p_L{}^{a_{v,i}} + p_K{}^{(1-a_{v,i})}\right)^{P_{p,i}}\right]^{1/P_{p,i}} - p_{x,i} = 0 \qquad (E.13)$$

$\prod_i$ - Unit profit of commodity X_i

Demand and Supply Balance

To satisfy this second requirement of the Warasian equilibrium it is assumed that there is no excess demand in the system, and that all supply is consumed as either a final commodity or intermediate material. Thus the output from each sector must equal the consumed good, which is expressed as:

$$X_i = \sum_{j=1}^{N} \beta_{i,j} X_i + X_{i,d} + X_{i,f} \qquad (E.14)$$

Since the output has to balance, so does the demand and use of such a supply. These commodities can be categorized as:

1. Labour time

$$Total \quad Labour \quad Time \quad (LT) = Leis + \sum_{j=1}^{N} L_i \qquad (E.15)$$

2. Capital

$$Captial \quad (K) = \sum_{j=1}^{N} K_i \qquad (E.16)$$

K – Total capital from domestic households

3. Non-comparable import

$$FX = \sum_{j=1}^{N} FX_i + Left \qquad (E.17)$$

FX – Total non-comparable import of intermediate endowments from foreign households

Left (Slack) – Left over non-comparable imports

<u>Income Balance</u>

The last of the conditions that needs to be met is income balance. At equilibrium both domestic and foreign households is spent to maximize their preferences and is expressed as:

$$I_d - \sum_{j=1}^{N} X_{i,,d} = 0 \qquad \textit{(E.18)}$$

$$I_f - \sum_{j=1}^{N} X_{i,,f} = 0 \qquad \textit{(E.19)}$$

E.2 Detailed Description of IO

IO analysis can be understood when looking at Table E-1, which shows a simplified IO table. The table shows only 6 sectors of the economy of the Netherlands in 1956. This is extremely simplified since the tables can be as detailed as having up to 500 sectors. The horizontal rows show how the outputs of the economy is distributed among each sector. The vertical columns on the other hand show how each sector obtains its inputs. Thus the output of one sector is the input into another. This illustrates how the different sectors of the economy are intertwined through the flow of trade and links all sectors together. If for example we look at the sector labelled "Metals and Construction" we can see that the total output of the sector is 1,902 million guilders. These outputs are distributed as inputs into the other 5 sectors, an example of which is "Trade" using 163 million guilders of "Metals and Construction's" output as an input into its sector to enable it to produce its 1,583 million guilders of outputs.

Table E-1 Simplified Input-Output Table, Units Millions of Guilders (Netherlands, 1956) (Source: Problems of Input output Tables and Analysis, United Nations, 1966)

Intermediate Inputs \ Intermediate Demand	1. Agriculture, Fishing, Food	2. Metals and Construction	3. Textiles and Apparel	4. Mining, Construction, and Utilities	5. Trade	6. Services	Total
1. Agriculture, Fishing, Food	–	0	39	175	1	352	567
2. Metals and Construction	422	–	62	399	163	856	1,902
3. Textiles and Apparel	25	38	–	55	21	39	178
4. Mining, Chemicals, and Utilities	700	1,438	322	–	448	704	3,612
5. Trade	404	685	131	274	–	89	1,583
6. Services	268	516	141	417	1,241	–	2,583
Total	1,819	2,677	695	1,320	1,874	2,020	

The following are inherent characteristics of the IO analysis (Rose, 1995):

1. IO is based on quantities that are feasible and can be quantified.
2. Provides a uniform framework that enables all parties in the system to be able to communicate with one another
3. Are able to analyze the potential of private sector decision and public sector policies
4. It is politically neutral and thus can model different economies, whether they be mixed economies such as the United States to centrally planned economies of the former Soviet Union.
5. The entire production and all its inputs are accounted for.

The computational methods of IO analysis is described in the following section.

Methodology

IO analysis uses matrix computations as its basis. Looking at Leontief's example (1986) for explaining IO analysis one can get a better understanding of the methodology.

Table E-2 Simplified Input-Output expressed in value terms (Leontief, 1966)

into from	Agriculture ($)	Manufacture ($)	Households ($)	Total Output ($)
Agriculture	50	40	110	200
Manufacturing	70	30	150	250
Households	80	180	40	300
Total Input ($)	200	250	300	

Looking at Table E-2 we see a simplified IO table of a three sector economy. IO states that:

$$X = \underline{\underline{X}} + Y \qquad (E.20)$$

X – is the total industry output

$\underline{\underline{X}}$ – is the inter-industry demands

Y – is the final demand for each commodity

Thus the demand industry can be written as:

$$X_i = x_{i,1} + x_{i,2} + x_{i,3} + \ldots + x_{i,N} + Y_i \qquad (E.21)$$

Furthermore:

$$\underline{\underline{X}} = AX \qquad (E.22)$$

where:

A – is the coefficient matrix

Substituting Equation (E.22) into Equation (E.20):

$$X = AX + Y \qquad (E.23)$$

In the example above the first thing that needs to be done is to calculate the coefficient matrix. This coefficient is a measure of the quantity of the output of sector *i* absorbed by sector *j* per unit of its total output *j*.

$$a_{ij} = \frac{x_{ij}}{x_j} \tag{E.24}$$

Thus the coefficient matrix in the example above would look as follows:

$$\begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$$

From the values in Table E-2 we can calculate the following:

$a_{11} = 50/200 = 0.25$ $a_{12} = 40/250 = 0.16$ ect.

Finally giving a coefficient matrix of:

$$\begin{pmatrix} 0.25 & 0.16 \\ 0.35 & 0.12 \end{pmatrix}$$

Rearranging Equation (E.23):

$$(1 - A)X = Y \tag{E.25}$$

Using the inverse matrix:

$$X = (1 - A)^{-1} Y \tag{E.26}$$

And:

$$\Delta X = (1 - A)^{-1} \Delta Y \tag{E.27}$$

The expression $(1\text{-A})^{-1}$ is known as the Leontief Inverse.

Thus continuing with the example we would need to calculate $(1\text{-A})^{-1}$:

$$\begin{pmatrix} 1.46 & 0.27 \\ 0.58 & 1.24 \end{pmatrix}$$

Using Equation (E.26), the following system of equations is established for calculating the inputs for Agriculture and Manufacturing:

$$x_1 = 1.46 y_1 + 0.27 y_2 \qquad (E.28)$$

$$x_2 = 0.58 y_1 + 1.24 y_2 \qquad (E.29)$$

Not including households in the coefficient matrix means that the IO model is not closed, and in order to close the model households need to be included. This is the basis for calculating Type I multipliers and Type II multipliers.

Multipliers indicate the effect of increasing a certain sectors output by 1 unit on the rest of the economy. Multipliers are calculated as follows:

Type I = (Direct Effect + Indirect Effect)/ Direct Effect

Type II= (Direct Effect + Indirect Effect + Induced Effect)/ Direct Effect

Where direct effect is the direct change in the output of a certain sector of the economy, and indirect effect being the effect of this change on other sectors of the economy. While Induced effect is the effect of the direct change on the households. Type I multipliers are calculated for open models where households are not included, whereas Type II multipliers are calculated for models where households are included. Type I multipliers appear to underestimate the impact of changes to the system, while Type II multipliers overestimate this impact.

The simplified analysis can be taken a step further to incorporate imports and exports.

Table E-3 Input Output Introducing Exports/Imports (Leontief, 1966)

			Final Demand			
into from	Agriculture ($)	Manufacture ($)	Households ($)	Exports (+) or Imports (-)	Total Final Demand	Total Output ($)
Agriculture	A_{11}	A_{12}	110	-40	70	X_1
Manufacturing	A_{21}	A_{22}	150	+50	100	X_2
Households	A_{31}	A_{32}	40		40	300

With the change in Total Final Demand the Total Output changes as well. In order to calculate such a change it is assumed that the coefficient matrix remains unchanged, thus substituting into Equations (E.28) and (E.29), the following is calculated:

$x_1 = 129$ $\quad\quad$ $x_2 = 165$

In calculating the impact of a shock to the economic system due to the occurrence of an earthquake we assume that the system goes through two phases:

1) The system is originally assumed to be rigid and the technical coefficient remains unchanged. Loss of production is experienced in section i and is denoted by γ_i,. Thus rewriting Equation (E.27):

$$(1-\gamma)x^0 = A^0(1-\gamma)x^0 + Y^1 \tag{E.30}$$

Or:

$$Y^1 = (1-\gamma)x^0 - A^0(1-\gamma)x^0 \tag{E.31}$$

Where A^0, X^0 and Y^0 denote the original matrices prior to the occurrence of an earthquake.

2) In this phase the final demand is modelled as εf^o

Thus

$$x^2 = A^0 x^2 + \varepsilon f^0 \tag{E.32}$$

Where $0 \leq \varepsilon 1 \leq 1$

According to Bockarjova (2004) in a post disaster situation governments attempt to minimizing changing in demand, and thus maximizing demand, thus max$\{\varepsilon f^o\}$ is introduced into Equation (E.32).

It can also be assumed that the decrease in output it equal to the decrease in final demand, thus:

$$x^2 = \varepsilon x^0 \tag{E.33}$$

Substituting in Equation (E.32):

$$\varepsilon x^2 = A^0 x^2 + \varepsilon f^0 \tag{E.34}$$

Since the system is optimized such that max $\{\varepsilon f^o\}$is achieved, then:

$$\varepsilon = \max\{(1-\gamma)\} \tag{E.35}$$

Meaning that after a shock output and final demand will decrease by the proportion of the mostly disrupted sector, and this sector will act as a "bottleneck" for the entire economy (Bockarjova, 2004).

E.3 Egypt's Input Output Table

Table E-4 Demand Table

	Economic Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
01	crop agriculture	955647	8278920	2240500	0	0	13683390	115371	0	44389	0	144643	17202	0	0	0	131772	0
02	animal agriculture	523980	156039	0	0	0	4642934	0	0	37527	0	0	0	0	0	0	0	0
03	cotton ginning	70287	0	0	0	0	353533	0	0	533274	0	0	0	0	0	0	0	0
04	mining and quarries	0	0	0	35431	16403	19102	0	0	0	0	0	2076	0	20689	0	57737	1037
05	crude petroleum and	0	0	0	0	1105758	625283	0	0	58757	0	0	0	44	0	0	271647	9563802
06	food industries	0	2948962	0	0	56107	854494	175770	6351	44741	0	4572	24440	0	67073	0	178199	3982
07	beverages	0	0	0	0	19788	0	17500	0	0	0	0	0	0	0	0	0	0
08	cigarettes and cigars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09	spinning and weaving	103950	27044	19396	0	0	87784	0	0	4717912	4851975	54774	0	9123	53655	18672	4985	0
10	ready-made clothing and	0	0	0	0	114635	102940	8172	0	0	0	0	0	0	0	0	59644	2962
11	wood and wooden	0	2429	0	6546	21133	5593	6068	0	341	218	177	249	57	151	14	3600	2468
12	paper, cardboard, and	1552	4993	1384	3499	9418	130795	5251	72201	39244	48854	4175	63430	51562	6794	750	85294	1413
13	printing and publishing	6763	1030	1823	13745	7047	27249	4224	9729	51246	20498	3773	8323	2939	5010	450	28089	4042
14	leathers and leather	0	0	0	0	10660	7481	0	0	0	759720	30410	0	0	89210	174	1248	0
15	rubber and related	1717	4158	8771	4482	20106	9296	5215	5721	9542	5127	1381	2302	4903	8160	2875	8670	2012
16	chemical industries	1767799	92141	0	11327	78078	93293	8867	6067	441821	950584	69861	79087	38598	44530	7476	1586443	49553
17	petroluem products	255365	65083	113808	80725	188293	1297744	11514	4169	140307	3144	45766	10123	16437	4841	3714	587423	100258
18	coal refining products	0	0	0	1569	0	0	0	0	2417	0	0	0	0	0	0	52574	0
19	non-metal industrial	24445	0	0	9815	42307	44297	17461	0	21850	0	5367	41	0	156	0	305916	2821
20	basic metal industries	9802	13723	6005	13872	178721	120393	6602	10596	72191	77050	8330	5406	5736	4203	2715	253381	8495
21	metal products	34156	13702	6248	4564	176916	119128	27151	71811	207822	102194	79540	11222	5819	33622	66	220927	11096
22	non-electric machines	6142	15	574	10339	55311	11059	7583	11661	11914	129022	9809	15759	19024	11140	1064	89471	9054
23	electric machines	499	131	2389	11668	107933	13893	15073	16978	70205	80581	8849	12950	15473	9176	696	79243	8476
24	transportation industry	2495	114665	87	2816	18287	11379	2336	6097	4009	2568	530	3495	9805	7408	70	16880	6309
25	miscellaneous industries	2409	10490	187	352	53064	12061	0	0	3150	67252	9158	1048	7929	392	26	6242	21273
26	electricity	124385	222722	48485	11143	48205	387530	3396	8885	972484	340679	43534	17858	58105	1065	459	281186	45035
27	construction and	67476	6628	1536	2818	44401	65285	31089	18125	66660	106873	18569	5395	21412	1291	117	150220	5336
28	transportation and	57747	66894	2227	14181	71761	47113	11426	21522	99122	74767	34109	6654	16625	12337	1106	74166	28950
29	trade, finance, and	968820	1111403	523003	71915	72464	531283	120407	131851	2823338	1913608	167076	199737	506443	161439	10522	832332	1606343
30	restaurants and hotels	4821	2511	0	5	0	894	0	0	15	0	0	2	3	0	1	18	73
31	housing and facilities	690	1134	5031	4364	44884	31589	28013	1902	30559	37519	3160	6452	853	8412	852	48895	1910
32	other personal services	20417	45220	38544	7218	143826	159895	13748	4378	687829	2051562	98764	27692	3860	24674	1194	121882	1911
	domestic inputs	5011364	13190037	3019996	322392	2705506	23496710	642237	408044	11192665	11623796	846326	520943	794752	575428	53011	5538083	11488613
	imported inputs	1835212	168487	214284	118908	221494	11194222	448830	1347643	2388640	3424836	2459409	686759	1361471	297928	340680	4661435	100387
	total inputs	6846576	13358524	3234280	441300	2927000	34690932	1091068	1755687	13581305	15048632	3305735	1207703	2156222	873355	393691	10199518	11589000
	Value added at market pric	49209958	14028442	134880	748748	27909453	5665589	2261364	8803636	10258462	14074245	3514205	1184116	2767911	955855	532600	6965982	4823774
	Output at market prices	56056534	27386966	3369160	1190048	30836453	40356522	3352432	10559323	23839766	29122877	6819940	2391818	4924133	1829210	926291	17165500	16412774
	productivity: VA / output v	87.79	51.22	4.00	62.92	90.51	14.04	67.45	83.37	43.03	48.33	51.53	49.51	56.21	52.26	57.50	40.58	29.39

Table E-4 Demand Table continued

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Intermediate Demand	Final Demand	Total Output
0	2666	0	0	0	0	7305	0	0	0	88731	0	736333	0	455678	26,902,545	29,153,988	56,056,534
0	0	0	0	0	0	0	0	0	0	170561	0	419521	0	225368	6,175,931	21,211,036	27,386,966
0	0	0	0	0	0	0	0	0	0	0	0	0	0	527143	1,484,236	1,884,924	3,369,160
2395	192607	24739	1915	0	0	0	0	0	371394	1667	0	8208	0	8015	763,415	426,633	1,190,048
0	177576	214060	0	0	0	0	0	2611198	0	1062661	0	1484190	0	616499	17,791,476	13,044,977	30,836,453
0	0	0	0	0	0	0	0	0	0	593754	0	2971259	0	1015323	8,945,027	31,411,495	40,356,522
0	0	0	0	0	0	0	0	0	0	448859	0	1071339	0	0	1,557,487	1,794,945	3,352,432
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,559,323	10,559,323
944	3141	0	20496	0	7161	1452	5476	0	41820	15047	57203	121584	0	1596085	11,819,678	12,020,088	23,839,766
1242	71499	73883	1840	0	0	0	0	0	0	96816	17627	517551	0	1345092	2,413,904	26,708,973	29,122,877
5	748	1302	13045	17421	15479	55975	2721	1695	758839	14467	2913	0	1028	18407	953,087	5,866,853	6,819,940
826	82351	8855	11355	370	3829	4980	8708	7154	7559	1329	9531	13958	7993	10266	709,675	1,682,143	2,391,818
157	13859	42263	1736	1154	1324	12347	1340	21087	7934	53240	41677	17454	2933	56443	470,925	4,453,208	4,924,133
0	0	0	20301	1821	0	8837	9294	0	0	0	0	20376	0	115413	1,074,945	754,265	1,829,210
688	9244	3357	4782	694	10615	11522	2338	2948	10152	13283	9356	19225	5049	5725	213,417	712,874	926,291
4529	346900	72860	94520	4642	59044	87603	77608	0	358321	46634	43648	114998	75576	670168	7,382,574	9,782,926	17,165,500
4146	1653660	855786	8435	1844	2646	24000	17571	287015	114706	2042867	27943	21793	19731	362092	8,372,946	8,039,828	16,412,774
0	2	533351	1212	0	0	0	0	0	0	1101	528	0	0	1292	594,046	106,296	700,341
0	59177	35657	126304	0	76935	8839	29132	0	7373606	2210	0	178124	0	38503	8,402,963	7,573,610	15,976,573
3786	20001	2853638	377277	27315	186739	60412	213352	40663	4571453	531748	63844	5253	29047	99660	9,881,411	6,958,900	16,840,311
3702	26765	56755	40465	15581	101498	311842	147802	107671	144862	219255	31354	56759	75584	608798	3,074,677	1,303,228	4,377,905
1318	42459	35512	5105	4072	3143	48323	1682	7154	1993	17981	104403	281	11141	5460	688,969	469,712	1,158,681
523	156415	56437	20705	10215	322789	35096	1935	43892	9954	179415	85011	94154	62183	951827	2,484,764	3,696,713	6,181,477
66	5098	24480	1427	168	879	67196	466	23535	19899	692912	29712	5746	5533	10378	1,096,732	7,753,690	8,850,423
826	23281	54569	1309	10860	502	25778	46565	10920	7959	7008	1134437	2550	20200	168793	1,710,590	1,684,679	3,395,269
2597	118980	24928	46543	7103	39636	17000	12859	1389	21662	161251	1120357	403085	102878	357523	5,052,947	6,144,517	11,197,464
902	113201	244642	10700	1847	8970	15291	5444	122143	4350	461794	198609	215110	711258	31267	2,758,762	35,690,679	38,449,441
388	90742	22002	90242	3936	61589	9716	30963	5000	4776	591193	3861291	231684	2698	226323	5,873,249	43,666,642	49,539,892
15103	1958869	2341682	95641	15275	419549	350183	39809	366728	1760481	1610399	7136782	710379	231904	657865	29,462,635	69,340,510	98,803,144
1	2	4	6	0	0	0	0	5	1	0	0	4	0	20	8,385	21,899,256	21,907,641
2030	21851	38128	1707	1054	2182	5528	18685	2517	7302	26511	44012	85745	4603	48095	566,167	17,093,865	17,660,032
777	42231	289084	9571	9630	58637	17961	33936	26271	17717	343487	641553	66761	10404	1088295	6,108,926	20,779,881	26,888,807
46951	5233329	7907974	1006636	135000	1383145	1187187	707687	3688987	15616741	9496180	14661790	9593425	1379742	11321816	174,796,492	423,670,658	598,467,150
368678	3109284	2381712	1302109	445783	2043560	3516007	1438480	671013	6551259	3740920	7567410	1015075	12358	2123184	67,557,458	44,042,542	111,600,000
415629	8342612	10289686	2308745	580783	3426705	4703194	2146167	4360000	22168000	13237100	22229200	10608500	1392100	13445000	242,353,950	467,713,200	710,067,150
284712	7633961	6550625	2069160	577897	2754772	4147228	1249102	6837464	16281441	36302792	76573944	11299141	16267932	13443807	356113200		
700341	15976573	16840311	4377905	1158681	6181477	8850423	3395269	11197464	38449441	49539892	98803144	21907641	17660032	26888807	598467150		
40.65	47.78	38.90	47.26	49.88	44.56	46.86	36.79	61.06	42.35	73.28	77.50	51.58	92.12	50.00	59.50		

E.4 Egypt's Technical Coefficient (Leontief) Matrix

Table E-5 Leontief coefficient table

	النشلط الأقتصادى	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
01	crop agriculture	0.017048	0.302294	0.665002	0.000000	0.000000	0.339063	0.034414	0.000000	0.001862	0.000000	0.021209	0.007192	0.000000	0.000000	0.000000	0.007677
02	animal agriculture	0.009347	0.005698	0.000000	0.000000	0.000000	0.115048	0.000000	0.000000	0.001574	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
03	cotton ginning	0.001254	0.000000	0.000000	0.000000	0.000000	0.008760	0.000000	0.000000	0.022369	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
04	mining and quarries	0.000000	0.000000	0.000000	0.029773	0.000532	0.000473	0.000000	0.000000	0.000000	0.000000	0.000000	0.000868	0.000000	0.011310	0.000000	0.003364
05	crude petroleum and	0.000000	0.000000	0.000000	0.000000	0.035859	0.015494	0.000000	0.000000	0.002465	0.000000	0.000000	0.000000	0.000009	0.000000	0.000000	0.015825
06	food industries	0.000000	0.107678	0.000000	0.000000	0.001819	0.021174	0.052431	0.000601	0.001877	0.000000	0.000670	0.010218	0.000000	0.036668	0.000000	0.010381
07	beverages	0.000000	0.000000	0.000000	0.000000	0.000642	0.000000	0.005220	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
08	cigarettes and cigars	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
09	spinning and weaving	0.001854	0.000987	0.005757	0.000000	0.000000	0.002175	0.000000	0.000000	0.197901	0.166604	0.008031	0.000000	0.001853	0.029332	0.020157	0.000290
10	ready-made clothing and	0.000000	0.000000	0.000000	0.000000	0.003718	0.002551	0.002438	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.003475
11	wood and wooden	0.000000	0.000089	0.000000	0.005500	0.000685	0.000139	0.001810	0.000000	0.000014	0.000007	0.000026	0.000104	0.000012	0.000082	0.000015	0.000210
12	paper, cardboard, and	0.000028	0.000182	0.000411	0.002940	0.000305	0.003241	0.001566	0.006838	0.001646	0.001677	0.000612	0.026520	0.010471	0.003714	0.000809	0.004969
13	printing and publishing	0.000121	0.000038	0.000541	0.011550	0.000229	0.000675	0.001260	0.000921	0.002150	0.000704	0.000553	0.003480	0.000597	0.002739	0.000486	0.001636
14	leathers and leather	0.000000	0.000000	0.000000	0.000000	0.000346	0.000185	0.000000	0.000000	0.000000	0.026087	0.004459	0.000000	0.000000	0.048770	0.000187	0.000073
15	rubber and related	0.000031	0.000152	0.002603	0.003766	0.000652	0.000230	0.001556	0.000542	0.000400	0.000176	0.000203	0.000963	0.000996	0.004461	0.003104	0.000505
16	chemical industries	0.031536	0.003364	0.000000	0.009518	0.002532	0.002312	0.002645	0.000575	0.018533	0.032640	0.010244	0.033065	0.007839	0.024344	0.008070	0.092420
17	petroluem products	0.004555	0.002376	0.033779	0.067833	0.006106	0.032157	0.003435	0.000395	0.005885	0.000108	0.006711	0.004232	0.003338	0.002646	0.004010	0.034221
18	coal refining products	0.000000	0.000000	0.000000	0.001318	0.000000	0.000000	0.000000	0.000000	0.000101	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.003063
19	non-metal industrial	0.000436	0.000000	0.000000	0.008247	0.001372	0.001098	0.005209	0.000000	0.000917	0.000000	0.000787	0.000017	0.000000	0.000085	0.000000	0.017822
20	basic metal industries	0.000175	0.000501	0.001782	0.011657	0.005796	0.002983	0.001969	0.001003	0.003028	0.002646	0.001221	0.002260	0.001165	0.002298	0.002931	0.014761
21	metal products	0.000609	0.000500	0.001854	0.003835	0.005737	0.002952	0.008099	0.006801	0.008717	0.003509	0.011663	0.004692	0.001182	0.018380	0.000072	0.012870
22	non-electric machines	0.000110	0.000001	0.000170	0.008688	0.001794	0.000274	0.002262	0.001104	0.000500	0.004430	0.001438	0.006589	0.003863	0.006090	0.001149	0.005212
23	electric machines	0.000009	0.000005	0.000709	0.009804	0.003500	0.000344	0.004496	0.001608	0.002945	0.002767	0.001297	0.005414	0.003142	0.005017	0.000752	0.004616
24	transportation industry	0.000045	0.004187	0.000026	0.002366	0.000593	0.000282	0.000697	0.000577	0.000168	0.000088	0.000078	0.001461	0.001991	0.004050	0.000076	0.000983
25	miscellaneous industries	0.000043	0.000383	0.000055	0.000295	0.001721	0.000299	0.000000	0.000000	0.000132	0.002309	0.001343	0.000438	0.001610	0.000214	0.000028	0.000364
26	electricity	0.002219	0.008132	0.014391	0.009364	0.001563	0.009603	0.001013	0.000841	0.040793	0.011698	0.006383	0.007466	0.011800	0.000582	0.000495	0.016381
27	construction and	0.001204	0.000242	0.000456	0.002368	0.001440	0.001618	0.009274	0.001717	0.002796	0.003670	0.002723	0.002256	0.004348	0.000706	0.000126	0.008751
28	transportation and	0.001030	0.002443	0.000661	0.011917	0.002327	0.001167	0.003408	0.002038	0.004158	0.002567	0.005001	0.002782	0.003376	0.006744	0.001194	0.004321
29	trade, finance, and	0.017283	0.040581	0.155232	0.060431	0.002350	0.013165	0.035916	0.012487	0.118430	0.065708	0.024498	0.083509	0.102849	0.088256	0.011359	0.048489
30	restaurants and hotels	0.000086	0.000092	0.000000	0.000004	0.000000	0.000022	0.000000	0.000000	0.000001	0.000000	0.000000	0.000001	0.000001	0.000000	0.000001	0.000001
31	housing and facilities	0.000012	0.000041	0.001493	0.003667	0.001456	0.000783	0.008356	0.000180	0.001282	0.001288	0.000463	0.002697	0.000173	0.004599	0.000920	0.002848
32	other personal services	0.000364	0.001651	0.011440	0.006065	0.004664	0.003962	0.004101	0.000415	0.028852	0.070445	0.014482	0.011578	0.000784	0.013489	0.001288	0.007100
	Total Domestic Goods	0.089398	0.481617	0.896365	0.270907	0.087737	0.582228	0.191574	0.038643	0.469496	0.399129	0.124096	0.217802	0.161399	0.314577	0.057230	0.322629
	Total Imported Goods	0.032739	0.006152	0.063602	0.099919	0.007183	0.277383	0.133882	0.127626	0.100196	0.117600	0.360620	0.287129	0.276489	0.162872	0.367789	0.271558
	Total Goods	0.122137	0.487769	0.959966	0.370825	0.094920	0.859612	0.325456	0.166269	0.569691	0.516729	0.484716	0.504931	0.437889	0.477449	0.425019	0.594187
	Value Added	0.877863	0.512231	0.040034	0.629175	0.905080	0.140388	0.674544	0.833731	0.430309	0.483271	0.515284	0.495069	0.562111	0.522551	0.574981	0.405813
	Market Production Price	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

Table E-5 continued

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
0.000000	0.000000	0.000167	0.000000	0.000000	0.000000	0.000000	0.000825	0.000000	0.000000	0.000000	0.001791	0.000000	0.033611	0.000000	0.016947
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.003443	0.000000	0.019150	0.000000	0.008381
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.019605
0.000063	0.003420	0.012056	0.001469	0.000437	0.000000	0.000000	0.000000	0.000000	0.000000	0.009659	0.000034	0.000000	0.000375	0.000000	0.000298
0.582705	0.000000	0.011115	0.012711	0.000000	0.000000	0.000000	0.000000	0.000000	0.233195	0.000000	0.021451	0.000000	0.067748	0.000000	0.022928
0.000243	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.011985	0.000000	0.135627	0.000000	0.037760
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.009061	0.000000	0.048903	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.001348	0.000197	0.000000	0.004682	0.000000	0.001158	0.000164	0.001613	0.000000	0.001088	0.000304	0.000579	0.005550	0.000000	0.059359
0.000180	0.001774	0.004475	0.004387	0.000420	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.001954	0.000178	0.023624	0.000000	0.050024
0.000150	0.000007	0.000047	0.000077	0.002980	0.015035	0.002504	0.006325	0.000802	0.000151	0.019736	0.000292	0.000029	0.000000	0.000058	0.000685
0.000086	0.001179	0.005154	0.000526	0.002594	0.000319	0.000619	0.000563	0.002565	0.000639	0.000197	0.000027	0.000096	0.000637	0.000453	0.000382
0.000246	0.000225	0.000867	0.002510	0.000396	0.000996	0.000214	0.001395	0.000395	0.001883	0.000206	0.001075	0.000422	0.000797	0.000166	0.002099
0.000000	0.000000	0.000000	0.000000	0.004637	0.001572	0.000000	0.000999	0.002737	0.000000	0.000000	0.000000	0.000000	0.000930	0.000000	0.004292
0.000123	0.000982	0.000579	0.000199	0.001092	0.000599	0.001717	0.001302	0.000689	0.000263	0.000264	0.000268	0.000095	0.000878	0.000286	0.000213
0.003019	0.006467	0.021713	0.004327	0.021590	0.004006	0.009552	0.009898	0.022858	0.000000	0.009319	0.000941	0.000442	0.005249	0.004280	0.024924
0.006109	0.005919	0.103505	0.050818	0.001927	0.001591	0.000428	0.002712	0.005175	0.025632	0.002983	0.041237	0.000283	0.000995	0.001117	0.013466
0.000000	0.000000	0.000000	0.031671	0.000277	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000022	0.000005	0.000000	0.000000	0.000048
0.000172	0.000000	0.003704	0.002117	0.028850	0.000000	0.012446	0.000999	0.008580	0.000000	0.191774	0.000045	0.000000	0.008131	0.000000	0.001432
0.000518	0.005406	0.001252	0.169453	0.086178	0.023574	0.030209	0.006826	0.062838	0.003631	0.118895	0.010734	0.000646	0.000240	0.001645	0.003706
0.000676	0.005285	0.001675	0.003370	0.009243	0.013447	0.016420	0.035235	0.043532	0.009616	0.003768	0.004426	0.000317	0.002591	0.004280	0.022641
0.000552	0.001882	0.002658	0.002109	0.001166	0.003514	0.000508	0.005460	0.000495	0.000639	0.000052	0.000363	0.001057	0.000013	0.000631	0.000203
0.000516	0.000747	0.009790	0.003351	0.004729	0.008816	0.052219	0.003966	0.000570	0.003920	0.000259	0.003622	0.000860	0.004298	0.003521	0.035399
0.000384	0.000094	0.000319	0.001454	0.000326	0.000145	0.000142	0.007592	0.000137	0.002102	0.000518	0.013987	0.000301	0.000262	0.000313	0.000386
0.001296	0.001179	0.001457	0.003240	0.000299	0.009373	0.000081	0.002913	0.013715	0.000975	0.000207	0.000141	0.011482	0.000116	0.001144	0.006277
0.002744	0.003709	0.007447	0.001480	0.010631	0.006130	0.006412	0.001921	0.003787	0.000124	0.000563	0.003255	0.011339	0.018399	0.005825	0.013296
0.000325	0.001288	0.007085	0.014527	0.002444	0.001594	0.001451	0.001728	0.001603	0.010908	0.000113	0.009322	0.002010	0.009819	0.040275	0.001163
0.001764	0.000554	0.005680	0.001307	0.020613	0.003397	0.009963	0.001098	0.009120	0.000447	0.000124	0.011934	0.039081	0.010575	0.000153	0.008417
0.097871	0.021565	0.122609	0.139052	0.021846	0.013183	0.067872	0.039567	0.011725	0.032751	0.045787	0.032507	0.072232	0.032426	0.013132	0.024466
0.000004	0.000001	0.000000	0.000000	0.000001	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000001
0.000116	0.002898	0.001368	0.002264	0.000390	0.000909	0.000353	0.000625	0.005503	0.000225	0.000190	0.000535	0.000445	0.003914	0.000261	0.001789
0.000116	0.001109	0.002643	0.017166	0.002186	0.008311	0.009486	0.002029	0.009995	0.002346	0.000461	0.006934	0.006493	0.003047	0.000589	0.040474
0.699980	0.067040	0.327563	0.469586	0.229936	0.116512	0.223756	0.134139	0.208433	0.329448	0.406163	0.191688	0.148394	0.437903	0.078128	0.421061
0.006116	0.526426	0.194615	0.141429	0.297427	0.384733	0.330594	0.397270	0.423672	0.059925	0.170386	0.075513	0.076591	0.046334	0.000700	0.078962
0.706096	0.593466	0.522178	0.611015	0.527363	0.501245	0.554350	0.531409	0.632105	0.389374	0.576549	0.267201	0.224985	0.484237	0.078828	0.500022
0.293904	0.406534	0.477822	0.388985	0.472637	0.498755	0.445650	0.468591	0.367895	0.610626	0.423451	0.732799	0.775015	0.515763	0.921172	0.499978
1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

E.5 Greater Cairo's Population by CAPMAS Economic Sectors and Geographical Districts

Table E-6 Working population in Greater Cairo by economic sector (CAPMAS, 2006)

	1	2	3	4	5	6	7	8	9	10	11	12	13
Tebeen	115	40	4977	339	189	2533	3158	1344	302	140	64	6	242
Helwan	960	219	42025	2162	1451	21842	20288	12253	4040	2693	2118	166	4112
15th of May	96	68	7457	585	418	1195	3069	1776	386	573	525	18	808
Maadi	111	71	2391	342	61	1637	4211	899	361	1127	1116	75	2198
Torah	96	219	4913	238	433	2669	3098	2161	542	627	666	68	1015
Masr Il Adeema	197	67	11569	388	263	9416	11261	4519	1895	1354	1542	53	2049
Sayeda Zeinab	124	26	5436	402	126	2768	7799	2427	1492	1302	1359	28	1732
Al Khalifa	183	109	11904	825	230	11016	12074	5551	2107	1567	1265	91	2297
Abdeen	35	7	1566	100	31	693	2829	746	513	507	624	17	867
Al Mosky	42	2	1338	29	14	327	2680	429	192	128	95	4	271
Kasr El Nil	13	2	177	16	2	193	859	60	82	143	141	4	595
Boulaq	59	14	3377	319	72	1650	5027	1644	723	664	212	10	457
Alazbakeya	163	7	1144	75	43	829	2421	728	275	265	246	4	540
Darb Al Ahmar	46	8	4366	110	41	881	4474	1227	675	376	306	12	561
Algamalaya	61	9	3740	68	38	611	4362	892	608	224	170	0	433
Bab Al Shearia	45	7	3871	120	75	618	3474	1008	636	365	290	3	565
Al Zahir	51	33	1806	203	65	773	3812	761	480	626	627	17	1316
Al Sharabia	254	48	9954	640	468	6397	13151	6437	1887	1348	843	28	1560
Shubra	82	23	2574	173	131	1291	5766	1579	585	681	575	12	989
Rod Al Farag	113	25	5373	500	323	3092	11373	3449	1337	1395	1042	28	1702
Al Sahel	261	57	10621	1227	672	5559	21376	7531	2201	2746	2620	73	4728
Al Waly	51	24	2533	260	93	1635	4817	1437	664	613	677	19	1232
Hadaq Al Quba	328	78	11629	1015	432	6338	16223	6342	2197	2022	1700	68	3416
Al Zaytoon	361	91	13347	1316	675	5702	17412	6843	1867	2438	2302	98	4791
Al Matarya	722	128	22570	2132	776	12144	26281	14248	3357	2609	1845	144	4234
Nasr City	498	325	12416	2194	321	11895	37995	5531	2646	4902	6109	289	13993
Nasr City 2	68	43	1826	222	64	1298	2768	997	320	564	516	25	1246
Masr Il Gedida	165	72	3148	559	89	1657	7045	1817	617	1348	1535	70	2888
Alnozha	284	77	4178	563	88	2411	11216	2532	796	1752	2078	78	4487
Badr	37	3	1341	35	10	698	563	474	155	58	30	5	97
Ain Shams	491	152	19515	1903	574	13142	33004	13190	3824	3089	3032	170	6755
Alzawaya Al Hamra	233	61	17440	1466	877	6354	20607	8589	2579	1967	1182	55	2248
Alsalam	718	152	30505	1706	1053	15247	26047	15205	4704	3062	2095	249	5040
El Zamalek	34	8	383	35	2	452	1740	101	106	328	300	12	501
Mansheit Nasr	141	40	18614	151	2714	11295	26618	5850	2743	373	169	24	684
Albasateen	953	699	44731	1964	921	33917	54679	15655	6526	4939	4297	255	7567
Al Morg	1436	90	24581	1476	1556	22298	20569	15984	3449	2524	1579	142	3827
New Cairo	376	79	4180	906	145	3584	7451	2491	843	1318	1143	118	2369
Qism Embaba	801	141	27214	2026	972	18845	36480	17824	6646	4285	2999	165	4992
Agouza	293	97	4762	434	209	3236	11206	1959	1480	2214	2327	105	3781
Dokki	170	47	2105	195	98	1424	6140	800	1054	1260	1490	64	2829

Table E-6 continued

	14	15	16	17	18	19	20	21	22	23	Unemployed	G Total
Tebeen	119	616	820	314	37	231	17	1	478	611	30851	47544
Helwan	1710	11898	12966	4722	757	13204	735	73	3710	2885	291242	458231
15th of May	383	3311	3317	943	120	319	8	7	396	172	39171	65121
Maadi	623	2534	2942	1587	177	393	1047	124	1467	660	35230	61384
Torah	511	2841	1951	782	109	584	402	42	654	441	40421	65483
Masr Il Adeema	702	5222	3802	2431	333	4683	745	34	1245	1358	97569	162697
Sayeda Zeinab	502	6227	3579	1756	278	851	480	38	629	322	64312	103995
Al Khalifa	1027	6278	4922	2424	470	2254	1631	46	1584	1035	102926	173816
Abdeen	302	1891	1188	475	145	280	330	20	147	43	21606	34962
Al Mosky	77	477	341	142	41	195	49	3	29	24	11196	18125
Kasr El Nil	117	263	285	375	31	42	192	13	122	80	5234	9041
Boulaq	217	1231	657	393	78	531	101	7	409	1653	30851	50356
Alazbakeya	193	897	653	276	44	219	117	4	1073	189	13837	24242
Darb Al Ahmar	157	1734	1219	534	118	657	114	5	257	97	29319	47294
Algamalaya	104	1165	840	396	73	448	101	1	277	308	24188	39117
Bab Al Shearia	168	1483	1018	348	99	431	161	8	331	94	26903	42121
Al Zahir	458	2303	2179	655	126	359	486	23	350	130	33550	51189
Al Sharabia	578	5744	3674	1392	280	1648	114	11	1925	2467	105477	166325
Shubra	384	2682	1878	768	104	462	153	20	699	808	35236	57655
Rod Al Farag	606	4912	3451	1483	240	1043	299	30	1453	1442	72084	116795
Al Sahel	1350	11150	8577	3113	441	1740	706	47	1659	1001	155840	245296
Al Waly	428	2772	2831	1243	169	480	318	13	441	109	40161	63020
Hadaq Al Quba	1199	8812	7641	2791	519	2107	891	38	2924	2379	143026	224115
Al Zaytoon	1416	10861	9907	3319	581	1848	1116	47	3818	2728	157778	250662
Al Matarya	1593	13139	11408	3581	888	3796	558	30	6125	5127	226159	363594
Nasr City	2870	17364	18567	8514	933	2335	6350	224	14294	3248	205545	379358
Nasr City 2	354	2476	1841	761	139	244	548	10	1121	428	43259	61138
Masr Il Gedida	974	3625	3663	2215	267	623	1999	118	2585	875	56236	94190
Alnozha	1319	5728	5617	3320	309	681	3210	99	5558	1687	73873	131941
Badr	63	323	246	111	41	155	28	1	157	170	6009	10810
Ain Shams	1975	15710	15981	4110	1165	3460	2066	69	8922	4432	233496	390227
Alzawaya Al Hamra	816	8615	6381	2377	422	2625	132	24	2831	2861	146966	237708
Alsalam	2063	12840	12004	4561	797	13712	2186	29	5630	4530	218664	382799
El Zamalek	244	349	581	382	67	110	601	103	298	584	8262	15583
Mansheit Nasr	881	2141	1601	1374	207	2569	220	3	869	1426	93667	174374
Albasateen	2468	21120	17879	6835	1698	5960	3120	241	9012	6179	328542	580157
Al Morg	1423	10596	10437	3434	643	14586	418	26	2250	1564	197701	342589
New Cairo	916	4042	4989	1370	343	782	798	66	2691	478	40595	82073
Qism Embaba	1907	12792	10748	4499	1392	4624	736	95	1886	2373	270676	435118
Agouza	1046	5007	4260	2840	766	1176	1596	164	1380	911	78130	129379
Dokki	738	3347	3503	3017	265	430	1001	123	858	335	48972	80265

Table E-6 continued

	1	2	3	4	5	6	7	8	9	10	11	12	13
Markaz Giza	1144	52	9801	499	350	6501	23334	6556	2382	1399	1128	45	2581
Boulaq Dakrour	1031	116	21099	1460	1145	15799	46243	11287	5750	3943	3432	186	6924
Haram	1112	71	5317	346	155	5118	10455	3097	4265	1212	1112	64	2552
6th of October	564	79	14710	471	157	5404	12882	2669	1359	1953	1328	239	2332
Al Hawamdia	1410	40	10583	253	123	3945	5131	2249	607	337	322	14	635
Qism Giza	8207	48	11131	347	368	7271	20972	5476	1598	371	468	65	1118
Albadrasheen	18475	304	22721	418	436	20175	13122	7704	1126	437	401	35	1641
Alsaf	12711	148	14267	669	821	12513	6009	6194	565	278	246	142	863
Alayat	34801	83	12142	876	2204	6359	6212	4451	754	404	346	9	792
Markaz Embaba	37219	186	18521	1484	1979	16883	23414	14054	3508	3433	1940	151	3744
Alwahat	1549	409	431	137	16	305	328	268	48	148	58	1	88
Atfeeh	21431	199	16022	1111	138	10041	4352	2847	326	204	155	7	422
Auseem	12437	23	13287	1531	897	8031	12665	8153	1523	778	580	48	1048
Alwarak	1501	59	18858	1095	617	14586	17920	9057	2919	1939	1057	77	2243
Alomranya	1778	250	29657	2055	701	20234	43506	13292	5896	6484	6426	310	12857

	14	15	16	17	18	19	20	21	22	23	Unemployed	G Total
Markaz Giza	837	6378	5193	2185	461	1857	461	35	1656	1576	110103	186514
Boulaq Dakrour	2065	15414	15003	4793	1243	4231	1948	148	6886	8212	228199	406557
Haram	1620	3711	3827	1393	650	1015	1007	28	1052	704	72163	122046
6th of October	1667	5231	5162	1614	604	831	1223	51	3196	993	58962	123681
Al Hawamdia	233	2117	2074	826	194	616	39	6	363	380	61673	94170
Qism Giza	662	2942	2622	898	327	1320	315	13	1536	1069	89286	158430
Albadrasheen	778	3567	3708	904	229	1695	99	2	294	439	148203	246913
Alsaf	439	2493	4751	1006	99	6427	73	1	699	1350	118693	191457
Alayat	1030	5533	4752	1102	237	4816	111	3	567	1064	137300	225948
Markaz Embaba	2049	11407	10336	3601	885	11485	893	78	3058	2258	239694	412260
Alwahat	75	2148	1103	373	22	1020	8	0	24	175	13684	22418
Atfeeh	161	2416	3816	782	79	3322	74	0	200	603	95680	164388
Auseem	408	3962	3117	1048	268	1443	57	12	253	294	107035	178898
Alwarak	774	5169	4358	1876	549	2430	273	17	1399	1124	139266	229163
Alomranya	3313	23410	22229	7505	1652	4669	3743	131	7364	4384	302513	524359

E.6 Economic Sector Contributions According to Value Added

Table E-7 Mapping of CAPMAS (2006) sectors onto IO sectors according to the "Value Added" method

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
			Percent									
Economic Sectors	Mapped IO sectors	Summation of Value Added (VA) of Mapped Sectors (Σ VA Column II)	1	2	3	4	5	6	7	8	9	10
Agriculture and hunting	1,2,3	86812660.18	64.572	31.547	3.881	0	0	0	0	0	0	0
Mining and querying	4	1190047.722	0	0	0	100	0	0	0	0	0	0
Manufacturing	6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,25	206331144.3	0	0	0	0	0	19.559	1.6248	5.1177	11.554	14.115
Electricity, gas and water	5,26	42033917	0	0	0	0	73.361	0	0	0	0	0
Water supply activities and sewage networks and management and treatment of sewage and waste	27,31	56109473.52	0	0	0	0	0	0	0	0	0	0
Construction	27	38449441.45	0	0	0	0	0	0	0	0	0	0
Total trade of the retail and repair of motor vehicles and motorcycles	1,6,7,8,10,11,12,13,14,15,16,17,19,20,21,22,23,24,29	342105868	16.386	0	0	0	0	11.797	0.9799	3.0866	0	8.5128
Transport and storage	24,28	58390314.55	0	0	0	0	0	0	0	0	0	0
The activities of food and accommodation services	5,6,30	93100615.5	0	0	0	0	33.122	43.347	0	0	0	0
Information and communication activities	28	49539891.76	0	0	0	0	0	0	0	0	0	0
Insurance and Financial Intermediaries	29	98803144.28	0	0	0	0	0	0	0	0	0	0
Real estate and leasing activities	27,31	56109473.52	0	0	0	0	0	0	0	0	0	0
Scientific and technical activities	16,17	33578274.38	0	0	0	0	0	0	0	0	0	0
Administrative activities and supporting services	1-32	598467149.7	9.3667	4.5762	0.563	0.1988	5.1526	6.7433	0.5602	1.7644	3.9835	4.8662
Public administration, defence and compulsory social security	32	26888807.04	0	0	0	0	0	0	0	0	0	0
Education	32	26888807.04	0	0	0	0	0	0	0	0	0	0
Health and social work activities	32	26888807.04	0	0	0	0	0	0	0	0	0	0
Arts, culture and entertainment	32	26888807.04	0	0	0	0	0	0	0	0	0	0
Other services	32	26888807.04	0	0	0	0	0	0	0	0	0	0
Personal services for domestic services for the family	32	26888807.04	0	0	0	0	0	0	0	0	0	0
Activities of International organizations and bodies, regional and foreign embassies and consulates	1-32	598467149.7	9.3667	4.5762	0.563	0.1988	5.1526	6.7433	0.5602	1.7644	3.9835	4.8662
Incomplete activities description	1-32	598467149.7	9.3667	4.5762	0.563	0.1988	5.1526	6.7433	0.5602	1.7644	3.9835	4.8662
Unstated	1-32	598467149.7	9.3667	4.5762	0.563	0.1988	5.1526	6.7433	0.5602	1.7644	3.9835	4.8662
Unattached	1-32	598467149.7	9.3667	4.5762	0.563	0.1988	5.1526	6.7433	0.5602	1.7644	3.9835	4.8662

Table E-7 continued

XIV	XV	XVI	XVII	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII	XXVIII	XXIX	XXX	XXXI	XXXII	XXXIII	XXXIV	XXXV	XXXVI	XXXVII
Percent																						
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Total Percent
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
3.3053	1.1592	2.3865	0.8865	0.4489	8.3194	7.9546	0.3394	7.7432	8.1618	2.1218	0.5616	2.9959	0	1.6455	0	0	0	0	0	0	0	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26.639	0	0	0	0	0	0	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68.526	0	0	0	31.474	0	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	100
1.9935	0.6991	1.4394	0.5347	0.2708	5.0176	4.7976	0	4.6701	4.9225	1.2797	0.3387	1.8069	2.587	0	0	0	0	28.881	0	0	0	100
0	0	0	0	0	0	0	0	0	0	0	0	0	15.157	0	0	0	84.843	0	0	0	0	100
0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	23.531	0	0	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68.526	0	0	0	31.474	0	100
0	0	0	0	0	51.121	48.879	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
1.1396	0.3997	0.8228	0.3056	0.1548	2.8682	2.7425	0.117	2.6696	2.8139	0.7315	0.1936	1.0329	1.4788	0.5673	1.871	6.4247	8.2778	16.509	3.6606	2.9509	4.4929	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100
1.1396	0.3997	0.8228	0.3056	0.1548	2.8682	2.7425	0.117	2.6696	2.8139	0.7315	0.1936	1.0329	1.4788	0.5673	1.871	6.4247	8.2778	16.509	3.6606	2.9509	4.4929	100
1.1396	0.3997	0.8228	0.3056	0.1548	2.8682	2.7425	0.117	2.6696	2.8139	0.7315	0.1936	1.0329	1.4788	0.5673	1.871	6.4247	8.2778	16.509	3.6606	2.9509	4.4929	100
1.1396	0.3997	0.8228	0.3056	0.1548	2.8682	2.7425	0.117	2.6696	2.8139	0.7315	0.1936	1.0329	1.4788	0.5673	1.871	6.4247	8.2778	16.509	3.6606	2.9509	4.4929	100
1.1396	0.3997	0.8228	0.3056	0.1548	2.8682	2.7425	0.117	2.6696	2.8139	0.7315	0.1936	1.0329	1.4788	0.5673	1.871	6.4247	8.2778	16.509	3.6606	2.9509	4.4929	100

E.7 Greater Cairo’s Population by IO Economic Sectors and Geographical Districts

Table E-8 Working population in Greater Cairo by input output economic sectors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Tebeen	3594.678	1503.404	184.9497	103.7511	2000.635	3638.805	291.40234	917.8446	1852.15	2531.438	592.8074	207.9032	428.0188	158.9998	80.51567	1615.784	1544.93
Helwan	32008.69	14014.02	1724.013	814.7923	18362.31	32568.53	2560.0056	8063.378	16790.9	22239	5207.887	1826.455	3760.198	1396.833	707.3401	15210.12	14543.14
15th of May	4323.624	1866.663	229.6379	147.7962	2624.686	4693.902	376.02489	1184.384	2460.119	3266.562	764.9573	268.2778	552.3144	205.173	103.8972	2338.422	2235.879
Maadi	4330.759	1778.727	218.82	146.7695	2333.8	3690.365	293.5609	924.6435	1794.121	2550.19	597.1986	209.4433	431.1893	160.1776	81.11209	2626.76	2511.574
Torah	4510.09	1955.441	240.5594	302.6539	2521.754	4398.181	345.84191	1089.316	2243.461	3004.36	703.5553	246.7435	507.9809	188.7041	95.55755	2289.695	2189.29
Masr Il Adeema	11424.14	4679.885	575.7221	267.6548	6111.653	11217.17	863.5782	2720.056	5356.338	7501.981	1756.8	616.1264	1268.445	471.2001	238.6102	5469.257	5229.424
Sayeda Zeinab	7521.552	3050.386	375.2602	156.8488	4179.633	7067.286	533.35718	1679.942	3249.326	4633.322	1085.023	380.5277	783.4079	291.0193	147.3688	3616.369	3457.787
Al Khalifa	12083.15	4936.769	607.3241	321.0091	6796.67	11855.54	908.97382	2863.041	5622.501	7896.337	1849.149	648.5143	1335.123	495.9696	251.1532	5828.476	5572.891
Abdeen	2557.876	1023.202	125.8749	50.98149	1382.921	2353.876	177.06494	557.7103	1062.002	1538.179	360.2078	126.3283	260.0773	96.61315	48.92377	1349.846	1290.653
Al Mosky	1527.409	531.6859	65.4083	24.52764	668.6031	1425.024	111.46361	351.0825	605.8817	968.2944	226.7533	79.52456	163.7204	60.81865	30.79786	709.266	678.164
Kasr El Nil	670.4974	258.8116	31.83915	13.06795	325.6897	546.8292	42.472597	133.7781	242.1708	368.9633	86.40312	30.3024	62.38478	23.17461	11.73535	521.6421	498.7675
Boulaq	3965.646	1535.023	188.8395	79.89269	2180.899	3801.453	289.75393	912.6525	1710.186	2517.118	589.454	206.7271	425.5976	158.1004	80.06021	1717.253	1641.95
Alazbakeya	1934.679	751.3953	92.43707	37.41599	934.2426	1660.012	127.99542	403.1536	741.491	1111.908	260.3844	91.31931	188.0028	69.83901	35.36566	931.4292	890.585
Darb Al Ahmar	3557.351	1379.817	169.7458	67.32669	1841.538	3686.187	281.90715	887.9371	1692.922	2448.953	573.4911	201.1288	414.072	153.8189	77.89211	1730.241	1654.368
Algamalaya	3084.378	1157.707	142.4218	58.46973	1533.122	3187.227	242.87087	764.9826	1423.132	2109.841	494.0786	173.2781	356.7346	132.5193	67.10622	1464.928	1400.689
Bab Al Shearia	3174.511	1272.83	156.5843	61.69151	1715.85	3297.313	251.00753	790.611	1542.874	2180.525	510.6312	179.0832	368.6859	136.9589	69.35442	1574.07	1505.045
Al Zahir	3890.092	1595.376	196.2641	101.6249	2086.111	3338.172	260.01906	818.9951	1583.403	2258.809	528.9636	185.5126	381.9223	141.876	71.84434	2004.129	1916.246
Al Sharabia	12665.15	5134.893	631.6974	267.645	6785.943	11764.76	909.35504	2864.241	5550.161	7899.649	1849.925	648.7863	1335.683	496.1776	251.2586	5453.667	5214.518
Shubra	4477.192	1725.784	212.307	96.86655	2234.702	3942.158	306.41149	965.1197	1777.143	2661.824	623.3409	218.6116	450.0646	167.1894	84.66276	2074.508	1983.538
Rod Al Farag	9019.134	3495.931	430.0714	175.3599	4705.758	8071.036	622.32048	1960.154	3632.905	5406.154	1266.003	443.9993	914.0793	339.561	171.9497	4056.552	3878.668
Al Sahel	18648.19	7399.521	910.2933	374.9541	9867.954	16335.42	1277.7347	4024.545	7596.615	11099.8	2599.329	911.6096	1876.768	697.1791	353.0434	8959.395	8566.516
Al Waly	4676.81	1899.281	233.6506	105.8305	2531.053	4126.504	318.8805	1004.394	1931.944	2770.144	648.707	227.5077	468.3794	173.9929	88.108	2262.577	2163.36
Hadaq Al Quba	16879.43	6947.892	854.7337	375.4109	9178.792	15226.32	1185.7451	3734.801	7301.548	10300.67	2412.192	845.9789	1741.651	646.9862	327.6263	7817.674	7474.86
Al Zaytoon	18614.93	7700.606	947.3329	420.6663	10126.11	16653.39	1316.1755	4145.624	8146.207	11433.73	2677.53	939.0354	1933.23	718.1538	363.6647	9188.43	8785.507
Al Matarya	27162.1	11166.41	1373.698	603.3174	14992.35	25088.71	1963.2475	6183.739	12129.62	17054.91	3993.886	1400.694	2883.665	1071.22	542.4534	12216.9	11681.17
Nasr City	27732.99	10507.57	1292.647	774.7593	14140.08	23309.6	1841.0587	5798.875	10444.42	15993.44	3745.314	1313.517	2704.191	1004.549	508.6921	16580.14	15853.08
Nasr City 2	4728.585	2088.607	256.9416	132.8242	2596.37	3868.477	309.83314	975.897	2010.392	2691.548	630.3017	221.0528	455.0904	169.0564	85.60818	2223.408	2125.91
Masr Il Gedida	6954.739	2833.824	348.6187	192.8765	3746.594	5813.362	460.7009	1451.093	2785.196	4002.15	937.2159	328.6906	676.6886	251.3754	127.2936	3835.303	3667.121

Table E-8 continued

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Alnozha	9752.094	3866.594	475.6706	241.1223	4929.397	8050.981	640.13517	2016.266	3770.529	5560.912	1302.244	456.7093	940.246	349.2813	176.872	5571.485	5327.169
Badr	715.6111	304.5483	37.46571	15.72636	406.7795	827.4622	63.156257	198.9264	409.883	548.6441	128.4804	45.05931	92.76544	34.46038	17.45033	372.967	356.612
Ain Shams	29038.11	11544.75	1420.241	646.924	15487.07	26151.58	2034.7245	6408.874	12169.41	17675.83	4139.294	1451.69	2988.653	1110.221	562.2028	13871.64	13263.35
Alzawaya Al Hamra	17904.73	7097.858	873.1825	366.2297	9838.773	17310.79	1345.1476	4236.879	8129.589	11685.42	2736.469	959.7058	1975.785	733.9621	371.6698	8036.773	7684.352
Alsalam	26360.79	10793.65	1327.841	611.1748	14707.69	26649.58	2044.4064	6439.369	12723.06	17759.94	4158.99	1458.597	3002.873	1115.503	564.8779	13044.49	12472.48
El Zamalek	1196.058	445.0518	54.75053	26.87279	549.8159	966.1265	76.439582	240.7656	422.3236	664.0375	155.503	54.5364	112.2763	41.70825	21.12057	647.51	619.116
Mansheit Nasr	13523.86	4476.334	550.6812	232.5776	6009.362	14500.37	1105.7794	3482.929	6008.518	9606.005	2249.516	788.9267	1624.195	603.3539	305.5314	6011.603	5747.988
Albasateen	42025.05	16154.47	1987.332	1387.897	21453	41389.7	3203.266	10089.49	18968.69	27827.06	6516.488	2285.395	4705.034	1747.82	885.0756	20270.04	19381.18
Al Morg	23308.63	9741.027	1198.347	493.5925	12683.04	22415.79	1737.8945	5473.934	10925.13	15097.25	3535.444	1239.914	2552.661	948.2592	480.1874	10854.96	10378.96
New Cairo	5654.908	2166.277	266.4967	167.9771	3249.435	5079.308	391.58478	1233.394	2265.407	3401.732	796.6112	279.3791	575.1692	213.6631	108.1965	3216.09	3075.061
Qism Embaba	32434.55	12925.84	1590.145	691.6873	17956.93	31181.77	2350.9677	7404.961	14176.05	20423.07	4782.635	1677.316	3453.158	1282.775	649.5821	14589.64	13949.87
Agouza	9671.499	3828.019	470.9251	259.3227	5014.683	8399.494	644.45637	2029.877	3801.955	5598.45	1311.034	459.7923	946.5931	351.6391	178.066	5232.698	5003.238
Dokki	5895.301	2388.675	293.8561	148.4648	3121.307	5033.748	380.2022	1197.542	2275.82	3302.851	773.4553	271.2582	558.4502	207.4523	105.0514	3392.963	3244.178
Markaz Giza	15259.56	5587.224	687.3435	279.0998	7039.627	13403.45	1027.6572	3236.863	5681.823	8927.35	2090.59	733.1898	1509.448	560.7276	283.9459	6581.355	6292.756
Boulaq Dakrour	31239.14	11560.24	1422.148	604.1949	15625.64	28629.81	2171.2392	6838.861	12217.63	18861.75	4417.009	1549.087	3189.169	1184.708	599.9224	14657.03	14014.3
Haram	9509.29	3808.891	468.5719	221.2644	5560.111	9217.761	612.14587	1928.107	3624.523	5317.766	1245.304	436.7401	899.1346	334.0093	169.1384	4438.982	4244.328
6th of October	8551.07	3146.452	387.0783	207.9916	4138.075	9360.179	728.61786	2294.964	4283.65	6329.569	1482.246	519.838	1070.212	397.5607	201.3201	4922.89	4707.016
Al Hawamdia	7619.911	3312.025	407.4471	164.589	3614.996	7163.36	573.20579	1805.455	3718.617	4979.49	1166.088	408.958	841.9385	312.7622	158.3791	3259.61	3116.673
Qism Giza	17406.19	6825.071	839.6241	232.0668	5553.376	11585.79	904.89425	2850.191	4973.43	7860.898	1840.85	645.6037	1329.131	493.7436	250.026	5204.873	4976.633
Albadrasheen	28103.21	12679.63	1559.855	601.7092	8393.823	16575.87	1336.4183	4209.384	8589.107	11609.59	2718.711	953.4778	1962.963	729.199	369.2579	7681.773	7344.919
Alsaf	20543.08	9555.478	1175.52	388.9696	6921.912	11915.94	969.51719	3053.737	6475.678	8422.283	1972.314	691.7094	1424.05	529.0043	267.8816	5405.404	5168.371
Alayat	36599.52	17383.75	2138.559	361.3174	8104.125	12872.72	1042.1909	3282.641	6978.328	9053.606	2120.156	743.5591	1530.795	568.6577	287.9617	5741.221	5489.462
Markaz Embaba	51018.09	23051	2835.747	677.4302	14984.5	24570.42	1914.7558	6031.002	11984.57	16633.66	3895.238	1366.097	2812.44	1044.761	529.0549	11718.11	11204.26
Alwahat	2361.365	1127.41	138.6946	436.7554	835.5988	1085.031	88.405509	278.4553	605.8112	767.9866	179.8456	63.07358	129.8521	48.2373	24.42681	497.6502	475.8277
Atfeeh	23603.84	11183.49	1375.799	391.1759	5902.668	10305.46	844.34007	2659.46	5700.988	7334.858	1717.663	602.4009	1240.187	460.703	233.2946	4539.015	4339.974
Auseem	20222.26	8865.897	1090.688	237.7612	7192.479	12035.94	944.98876	2976.479	5837.426	8209.202	1922.415	674.2094	1388.022	515.6207	261.1043	5374.385	5138.712
Alwarak	17260.57	6998.249	860.9285	342.5193	9116.66	16682.31	1280.6967	4033.875	7858.511	11125.53	2605.355	913.7228	1881.118	698.7953	353.8618	7704.208	7366.371
Alomranya	38035.29	15099.68	1857.571	881.7542	19830.4	34912.43	2687.8817	8466.156	16082.3	23349.87	5468.028	1917.69	3948.025	1466.607	742.6728	20335.4	19443.67

Table E-8 continued

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Total
Tebeen	54.41064	1388.726	1463.805	380.5392	100.7156	537.3105	759.532384	263.7839	690.1569	4726.369	3934.147	6268.961	1244.661	1007.426	3475.439	47544
Helwan	493.2666	12200.13	12859.71	3343.084	884.7991	4720.339	6813.01491	2391.367	6181.9	42199.61	37890.7	57442.72	11918.62	9350.357	57743.77	458231
15th of May	72.27095	1792.009	1888.89	491.0469	129.9632	693.3442	942.037947	350.3711	906.6621	4071.922	5401.602	8036.398	1559.803	1321.385	9820.974	65121
Maadi	52.70593	1399.013	1474.648	383.3581	101.4617	541.2906	808.705348	255.5195	804.0408	4178.245	5043.907	8622.903	1479.792	1167.207	10391.99	61384
Torah	65.90619	1648.167	1737.272	451.6313	119.5312	637.6904	1029.83364	319.5146	850.5222	5715.102	5942.836	8506.055	1667.527	1399.091	8559.138	65483
Masr Il Adeema	157.3533	4115.526	4338.022	1127.738	298.4732	1592.333	2468.56384	762.8519	1991.373	16115.53	13541	21453.55	4139.779	3077.13	21749.74	162697
Sayeda Zeinab	95.45551	2541.803	2679.219	696.5055	184.341	983.4457	1542.75895	462.7703	1338.279	7101.144	8808.169	14475.08	2759.886	1990.236	16127.49	103995
Al Khalifa	165.1723	4331.866	4566.059	1187.019	314.1631	1676.037	2730.46256	800.7588	2214.621	18085.8	15102.24	22354.03	4398.687	3247.199	22769.29	173816
Abdeen	31.19845	843.8325	889.4524	231.2272	61.19787	326.4862	513.352955	151.2507	440.4722	2146.897	2970.809	5092.582	930.3719	667.7827	5302.75	34962
Al Mosky	17.799	531.1984	559.9165	145.5591	38.52449	205.5253	301.896501	86.28992	219.6937	1067.184	1429.767	2739.354	459.8921	339.9703	1754.006	18125
Kasr El Nil	7.114257	202.4102	213.3531	55.46451	14.67954	78.3143	113.62981	34.49007	108.4035	554.7078	654.6477	1307.998	223.046	166.1343	1438.077	9041
Boulaq	50.24016	1380.871	1455.524	378.3866	100.1459	534.271	869.283442	243.5654	704.98	3835.129	4801.827	7134.551	1383.152	1003.641	4479.828	50356
Alazbakeya	21.78279	609.9835	642.9609	167.1479	44.23827	236.008	399.182453	105.6034	306.1712	1843.922	2148.826	3470.479	624.6399	466.1591	2893.241	24242
Darb Al Ahmar	49.733	1343.476	1416.108	368.1396	97.43385	519.8025	742.939381	241.1066	587.5231	2834.114	3886.7	6523.7	1250.983	897.0756	5716.47	47294
Algamalaya	41.80739	1157.442	1220.016	317.1625	83.94197	447.8243	615.958258	202.6831	483.588	2235.365	3040.147	5536.984	1053.76	746.0795	4140.755	39117
Bab Al Shearia	45.32505	1196.218	1260.889	327.7881	86.7542	462.8273	649.40241	219.7368	546.5734	2438.487	3496.939	5834.058	1156.477	836.1592	4775.74	42121
Al Zahir	46.51567	1239.164	1306.157	339.5561	89.8688	479.4435	724.330882	225.5089	699.7865	3046.403	4128.403	7425.487	1376.268	1044.186	7658.561	51189
Al Sharabia	163.0472	4333.683	4567.974	1187.517	314.2948	1676.74	2949.40689	790.4561	2237.186	13833.43	15952.81	22877.04	4487.486	3415.592	17814.82	166325
Shubra	52.20717	1460.255	1539.2	400.1395	105.9031	564.9855	937.851234	253.1015	741.115	3775.558	5095.618	8373.006	1497.47	1141.171	7715.995	57655
Rod Al Farag	106.7239	2965.772	3126.11	812.6817	215.0888	1147.483	1935.23254	517.3998	1547.97	8190.527	10580.48	16810.18	3082.593	2341.781	14825.34	116795
Al Sahel	223.1659	6089.258	6418.46	1668.58	441.6156	2355.987	4059.14042	1081.913	3318.573	16342.35	22371.45	35191.56	6371.151	4952.848	32911.09	245296
Al Waly	56.75476	1519.678	1601.836	416.4226	110.2127	587.9768	951.004656	275.1483	839.2255	4355.622	5238.668	8862.127	1662.667	1249.596	9661.937	63020
Hadaq Al Quba	214.4977	5650.866	5956.367	1548.452	409.8218	2186.37	3592.82944	1039.889	3068.803	16289.73	19783.49	31077.74	5992.03	4570.881	29480.92	224115
Al Zaytoon	239.3113	6272.453	6611.56	1718.78	454.9017	2426.867	3939.4117	1160.186	3452.485	16882.94	21967.29	34701.12	6508.168	5135.467	35080.72	250662
Al Matarya	356.332	9356.183	9862.004	2563.784	678.5452	3619.99	6374.47023	1727.505	5040.33	28131.54	34484.13	48898.18	9540.08	7343.163	44109.67	363594
Nasr City	306.8258	8773.872	9248.212	2404.219	636.3139	3394.688	5166.17397	1487.498	4816.363	26844.35	28317.45	54423.34	8902.273	6866.317	64225.19	379358
Nasr City 2	59.05932	1476.561	1556.388	404.6078	107.0857	571.2946	890.753547	286.3208	904.3178	4261.132	5149.127	8773.034	1728.877	1360.982	8038.554	61138
Masr Il Gedida	81.82077	2195.547	2314.244	601.6244	159.2292	849.4764	1356.62858	396.6688	1286.271	5671.374	7921.498	13605.37	2370.408	1843.823	15123.17	94190

Table E-8 continued

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Total
Alnozha	110.7669	3050.671	3215.599	835.9457	221.246	1180.331	1894.52912	537.0003	1694.247	7827.405	10732.38	18943.45	3208.642	2487.783	22573.3	131941
Badr	12.04114	300.9817	317.2536	82.47508	21.82831	116.4525	181.057181	58.37571	129.0692	1119.457	989.9331	1249.199	270.7533	193.5773	1191.549	10810
Ain Shams	357.501	9696.819	10221.06	2657.125	703.2494	3751.784	6533.84681	1733.172	5163.809	29642.41	34882.68	53654.67	10010.91	7578.725	53674.67	390227
Alzawaya Al Hamra	238.8231	6410.525	6757.096	1756.614	464.9151	2480.289	4104.97928	1157.819	3262.514	16854.37	21960.39	32475.03	6225.855	4822.878	27448.58	237708
Alsalam	373.7656	9742.959	10269.69	2669.769	706.5957	3769.637	6393.41944	1812.023	4774.957	30974.76	35077.08	47740.37	9559.875	7223.843	56474.93	382799
El Zamalek	12.40661	364.2856	383.9799	99.82164	26.41935	140.9453	200.680969	60.14749	186.9026	1071.357	1199.337	2369.431	372.373	284.4742	2516.426	15583
Mansheit Nasr	176.5123	5269.776	5554.675	1444.026	382.1838	2038.923	3007.52935	855.7356	1852.237	19393.26	13353.01	23845.17	4190.629	3719.572	12463.24	174374
Albasateen	557.2437	15265.7	16091	4183.111	1107.125	5906.433	8910.80398	2701.529	7005.205	56980.56	46898.88	77284.15	14217.59	10593.22	72177.45	580157
Al Morg	320.9478	8282.226	8729.986	2269.498	600.6579	3204.466	5956.40927	1555.962	4190.699	36501.3	32886.2	41027.58	8241.341	6523.652	49233.06	342589
New Cairo	66.55089	1866.163	1967.052	511.3664	135.3411	722.0347	1232.0556	322.6401	1078.559	6638.998	7135.413	10682.2	1836.351	1403.177	14334.41	82073
Qism Embaba	416.45	11203.93	11809.64	3070.104	812.5506	4334.898	7740.87737	2018.958	5721.266	37416.38	42331.64	59255.29	11701.51	8529.934	47233.63	435118
Agouza	111.6901	3071.264	3237.305	841.5887	222.7395	1188.299	1794.03523	541.476	1642.949	8695.68	10633.32	19040.15	3336.466	2507.66	19312.64	129379
Dokki	66.85682	1811.917	1909.874	496.502	131.407	701.0466	1034.70043	324.1233	1006.655	4813.255	6162.57	11687.36	2115.889	1556.703	13855.57	80265
Markaz Giza	166.915	4897.471	5162.242	1342.007	355.1829	1894.875	3286.32466	809.2076	2269.77	14109.08	16415.11	26721.92	4741.202	3494.432	21666.26	186514
Boulaq Dakrour	358.9174	10347.4	10906.81	2835.398	750.4321	4003.501	6537.85675	1740.039	4982.482	32484.24	33842.01	57319.53	10340.24	7663.621	53662.63	406557
Haram	106.4777	2917.283	3075	799.3948	211.5722	1128.723	1857.41978	516.206	1506.048	10122.99	10094.86	16607.13	3769.828	2298.818	14998.18	122046
6th of October	125.8409	3472.35	3660.075	951.4943	251.8277	1343.483	1697.12663	610.0792	1339.185	9842.971	9587.174	15757.9	2694.399	2038.843	17579.53	123681
Al Hawamdia	109.2419	2731.708	2879.391	748.5433	198.1136	1056.922	1400.20243	529.607	1239.687	8064.247	7431.565	12147.82	2436.399	1891.992	8681.055	94170
Qism Giza	146.1045	4312.424	4545.566	1181.692	312.7531	1668.515	2741.48176	708.3179	1824.37	13514.76	12679.41	21806.96	3764.522	2867.793	12582.94	158430
Albadrasheen	252.3224	6368.924	6713.246	1745.214	461.8981	2464.193	3721.2666	1223.264	2912.574	30116.49	19366.46	28907.91	5745.503	4566.179	16928.66	246913
Alsaf	190.2361	4620.396	4870.187	1266.082	335.0883	1787.672	2886.39971	922.2686	2445.56	20958.43	15564.35	21987.83	4568.97	3879.029	20293.64	191457
Alayat	205.0025	4966.735	5235.25	1360.986	360.2061	1921.673	2905.21618	993.8563	2852.119	16867.68	15766.28	25247.25	5300.983	4826.691	22839.51	225948
Markaz Embaba	352.071	9125.088	9618.415	2500.459	661.7853	3530.577	6390.72558	1706.848	5019.317	34220.29	35814.28	49502.92	9872.233	7963.111	49710.73	412260
Alwahat	17.79693	421.3112	444.0884	115.4478	30.55506	163.009	255.52487	86.27988	297.6531	1213.403	1530.793	2457.107	522.2451	417.2341	5301.125	22418
Atfeeh	167.478	4023.843	4241.383	1102.615	291.8241	1556.86	1973.33615	811.9371	2104.193	16349.4	10619.46	17367.21	3614.486	2897.484	14831.16	164388
Auseem	171.4862	4503.501	4746.973	1234.051	326.6107	1742.444	3160.61343	831.3685	2428.588	15617.32	16635.41	22068.21	4311.928	3484.438	14747.47	178898
Alwarak	230.8596	6103.374	6433.339	1672.448	442.6394	2361.449	3944.94116	1119.212	2959.404	24221.84	21425.68	29771.51	5906.194	4425.792	21061.04	229163
Alomranya	472.4499	12809.55	13502.07	3510.076	928.9961	4956.127	7838.60894	2290.447	6491.771	41338.24	44060.26	71442	13017.39	9693.29	77482.31	524359

Appendix F

Loss Estimates

F.1 Ground-Motions

Table F-1 Ground-motion for cluster map 323 Sa(g)

	AB10					AS08					BA08				
T(sec)	PGA	0.3	0.5	1	2	PGA	0.3	0.5	1	2	PGA	0.3	0.5	1	2
District															
Tebeen	0.077	0.160	0.133	0.070	0.031	0.051	0.084	0.062	0.035	0.018	0.104	0.190	0.126	0.067	0.034
Helwan	0.132	0.227	0.218	0.108	0.040	0.091	0.159	0.110	0.063	0.027	0.165	0.255	0.200	0.102	0.044
15th of May	0.079	0.153	0.125	0.047	0.027	0.051	0.099	0.076	0.033	0.020	0.081	0.140	0.100	0.042	0.025
Maadi	0.124	0.236	0.191	0.072	0.045	0.085	0.156	0.108	0.045	0.023	0.117	0.205	0.152	0.069	0.042
Torah	0.145	0.246	0.159	0.062	0.029	0.066	0.126	0.081	0.035	0.021	0.129	0.202	0.122	0.053	0.025
Masr Il Adeema	0.181	0.289	0.233	0.131	0.073	0.112	0.179	0.117	0.062	0.022	0.168	0.244	0.157	0.086	0.051
Sayeda Zeinab	0.260	0.554	0.519	0.246	0.088	0.138	0.279	0.153	0.062	0.027	0.337	0.656	0.556	0.285	0.117
Al Khalifa	0.167	0.291	0.189	0.073	0.033	0.070	0.113	0.089	0.041	0.020	0.136	0.216	0.133	0.060	0.027
Abdeen	0.301	0.744	0.660	0.292	0.081	0.169	0.268	0.164	0.043	0.024	0.462	1.060	0.920	0.508	0.170
Al Mosky	0.255	0.517	0.486	0.222	0.119	0.153	0.192	0.150	0.052	0.032	0.401	0.818	0.774	0.406	0.256
Kasr El Nil	0.224	0.470	0.458	0.262	0.102	0.169	0.217	0.152	0.045	0.029	0.367	0.779	0.713	0.445	0.218
Boulaq	0.235	0.511	0.567	0.278	0.113	0.160	0.216	0.173	0.051	0.030	0.378	0.807	0.864	0.519	0.248
Alazbakeya	0.249	0.534	0.472	0.253	0.124	0.191	0.238	0.165	0.048	0.029	0.387	0.826	0.755	0.452	0.262
Darb Al Ahmar	0.328	0.551	0.503	0.258	0.098	0.168	0.243	0.159	0.049	0.022	0.337	0.534	0.406	0.217	0.096
Algamalaya	0.272	0.536	0.506	0.262	0.108	0.151	0.279	0.224	0.079	0.034	0.256	0.460	0.352	0.187	0.089
Bab Al Shearia	0.289	0.442	0.411	0.253	0.089	0.216	0.344	0.232	0.103	0.034	0.311	0.457	0.396	0.250	0.107
Al Zahir	0.250	0.450	0.407	0.157	0.054	0.147	0.239	0.178	0.074	0.033	0.244	0.407	0.329	0.150	0.060
Al Sharabia	0.232	0.416	0.447	0.262	0.120	0.162	0.296	0.230	0.070	0.031	0.232	0.387	0.363	0.217	0.116
Shubra	0.251	0.467	0.408	0.214	0.084	0.134	0.246	0.161	0.052	0.027	0.257	0.446	0.354	0.197	0.092
Rod Al Farag	0.329	0.539	0.515	0.255	0.088	0.161	0.275	0.190	0.063	0.031	0.360	0.558	0.479	0.255	0.101
Al Sahel	0.208	0.422	0.465	0.221	0.094	0.157	0.294	0.177	0.060	0.033	0.207	0.399	0.372	0.180	0.088
Al Waly	0.253	0.515	0.500	0.187	0.085	0.198	0.333	0.210	0.077	0.033	0.228	0.401	0.333	0.136	0.074
Hadaq Al Quba	0.362	0.722	0.609	0.367	0.109	0.236	0.343	0.240	0.086	0.033	0.344	0.613	0.474	0.284	0.106
Al Zaytoon	0.438	0.725	0.673	0.369	0.097	0.271	0.497	0.300	0.067	0.024	0.394	0.582	0.511	0.269	0.096
Al Matarya	0.337	0.573	0.532	0.351	0.124	0.196	0.298	0.247	0.074	0.034	0.328	0.466	0.420	0.251	0.114
Nasr City	0.316	0.539	0.602	0.219	0.082	0.164	0.291	0.236	0.070	0.030	0.273	0.416	0.376	0.151	0.066
Nasr City 2	0.318	0.530	0.445	0.162	0.061	0.183	0.311	0.188	0.069	0.030	0.293	0.447	0.328	0.135	0.059
Masr Il Gedida	0.299	0.453	0.393	0.216	0.079	0.238	0.383	0.272	0.097	0.037	0.327	0.406	0.331	0.172	0.082
Alnozha	0.324	0.580	0.478	0.338	0.088	0.263	0.543	0.343	0.131	0.052	0.379	0.511	0.409	0.269	0.097
Badr	0.131	0.265	0.177	0.085	0.033	0.078	0.157	0.115	0.050	0.018	0.149	0.262	0.147	0.072	0.030
Ain Shams	0.389	0.649	0.529	0.309	0.103	0.217	0.433	0.267	0.088	0.037	0.513	0.599	0.474	0.254	0.119
Alzawaya Al Hamra	0.319	0.553	0.548	0.320	0.117	0.154	0.259	0.163	0.056	0.025	0.290	0.470	0.399	0.244	0.111
Alsalam	0.349	0.742	0.544	0.278	0.099	0.213	0.426	0.258	0.095	0.044	0.401	0.610	0.448	0.222	0.107
El Zamalek	0.263	0.380	0.546	0.319	0.122	0.141	0.207	0.216	0.064	0.029	0.275	0.388	0.428	0.264	0.118
Mansheit Nasr	0.232	0.358	0.274	0.093	0.040	0.107	0.198	0.149	0.060	0.027	0.186	0.270	0.199	0.082	0.035
Albasateen	0.223	0.335	0.292	0.103	0.049	0.090	0.186	0.128	0.046	0.019	0.199	0.287	0.227	0.098	0.048
Al Morg	0.382	0.663	0.501	0.285	0.072	0.345	0.656	0.486	0.138	0.039	0.503	0.612	0.450	0.238	0.085

Table F-1 continued

	AB10					AS08					BA08				
T(sec)	PGA	0.3	0.5	1	2	PGA	0.3	0.5	1	2	PGA	0.3	0.5	1	2
District															
New Cairo	0.232	0.426	0.333	0.141	0.063	0.126	0.235	0.145	0.041	0.019	0.252	0.430	0.275	0.121	0.059
Qism Embaba	0.220	0.419	0.428	0.234	0.085	0.189	0.330	0.213	0.077	0.028	0.230	0.408	0.360	0.199	0.083
Agouza	0.294	0.542	0.415	0.217	0.087	0.141	0.307	0.233	0.070	0.044	0.297	0.509	0.340	0.183	0.084
Dokki	0.190	0.433	0.461	0.236	0.087	0.178	0.358	0.256	0.081	0.032	0.213	0.427	0.373	0.201	0.086
Markaz Giza	0.173	0.243	0.237	0.129	0.087	0.112	0.217	0.134	0.038	0.030	0.214	0.301	0.238	0.125	0.090
Boulaq Dakrour	0.168	0.238	0.238	0.171	0.090	0.127	0.200	0.164	0.051	0.030	0.196	0.272	0.230	0.154	0.089
Haram	0.129	0.254	0.199	0.138	0.086	0.073	0.141	0.139	0.044	0.019	0.166	0.305	0.204	0.126	0.082
Al Hawamdia	0.200	0.455	0.389	0.162	0.058	0.092	0.172	0.120	0.037	0.016	0.246	0.482	0.346	0.154	0.063
Qism Giza	0.186	0.342	0.362	0.162	0.071	0.160	0.229	0.144	0.049	0.020	0.238	0.408	0.351	0.165	0.081
Albadrasheen	0.117	0.232	0.248	0.116	0.044	0.099	0.193	0.133	0.052	0.018	0.176	0.312	0.255	0.120	0.053
Alsaf	0.067	0.186	0.148	0.072	0.033	0.064	0.175	0.148	0.075	0.022	0.118	0.275	0.180	0.083	0.043
Alayat	0.044	0.111	0.103	0.062	0.022	0.053	0.119	0.074	0.025	0.017	0.083	0.181	0.134	0.073	0.030
Markaz Embaba	0.150	0.345	0.239	0.130	0.066	0.100	0.167	0.127	0.052	0.024	0.180	0.371	0.239	0.124	0.073
Alwahat	0.004	0.012	0.009	0.007	0.002	0.018	0.042	0.025	0.009	0.004	0.001	0.005	0.006	0.005	0.003
Atfeeh	0.026	0.070	0.064	0.030	0.016	0.034	0.113	0.067	0.019	0.009	0.051	0.123	0.093	0.038	0.024
Auseem	0.202	0.358	0.348	0.201	0.080	0.182	0.270	0.196	0.053	0.031	0.255	0.385	0.338	0.187	0.092
Alwarak	0.188	0.426	0.367	0.146	0.076	0.174	0.311	0.207	0.073	0.034	0.203	0.416	0.320	0.129	0.077
Alomranya	0.195	0.474	0.310	0.146	0.061	0.134	0.308	0.175	0.064	0.037	0.232	0.492	0.289	0.139	0.065
6th of October	0.085	0.160	0.154	0.084	0.040	0.059	0.119	0.083	0.029	0.015	0.134	0.235	0.173	0.088	0.047

F.2 Indirect Loss Exceedance Curves

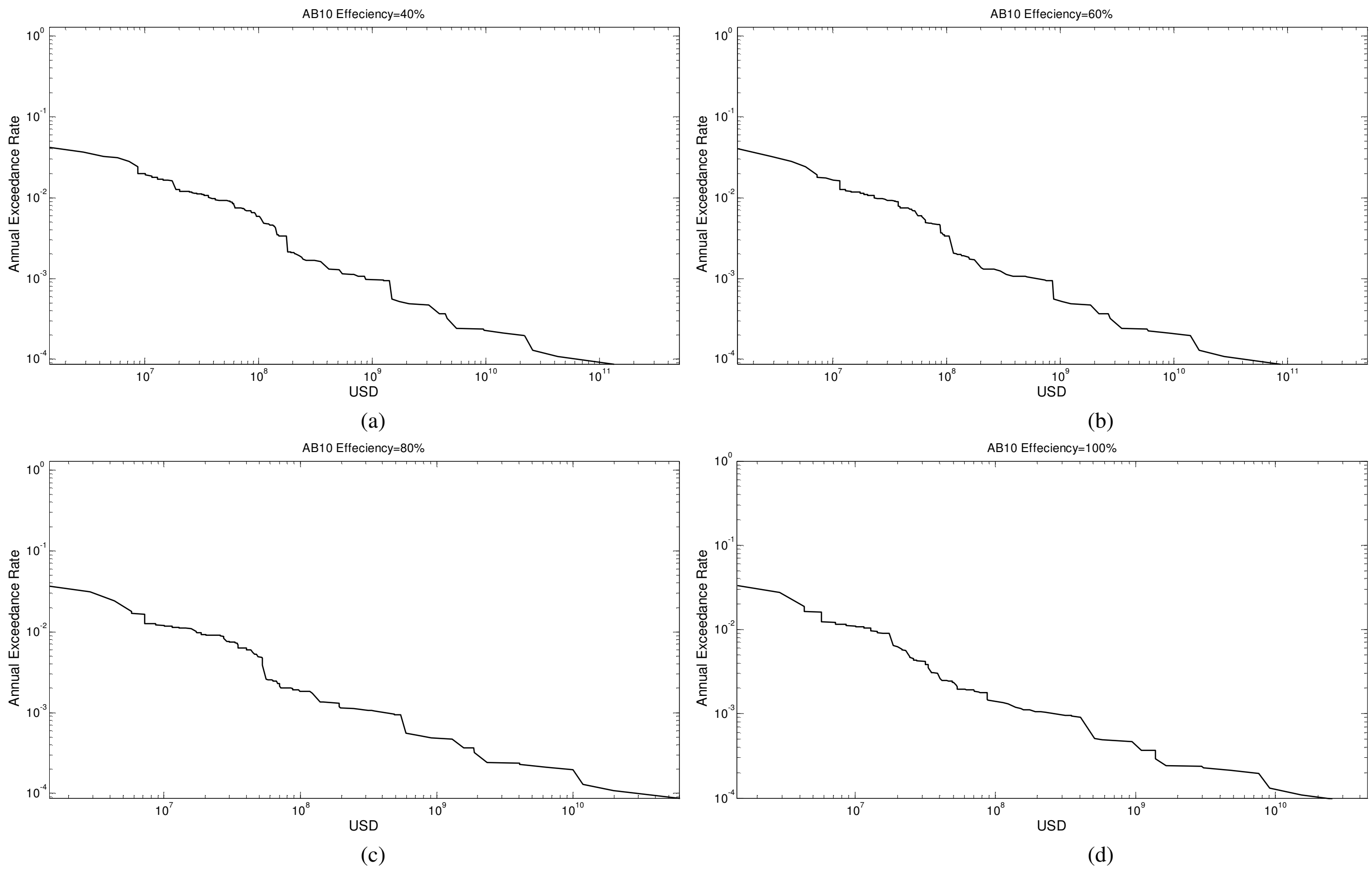
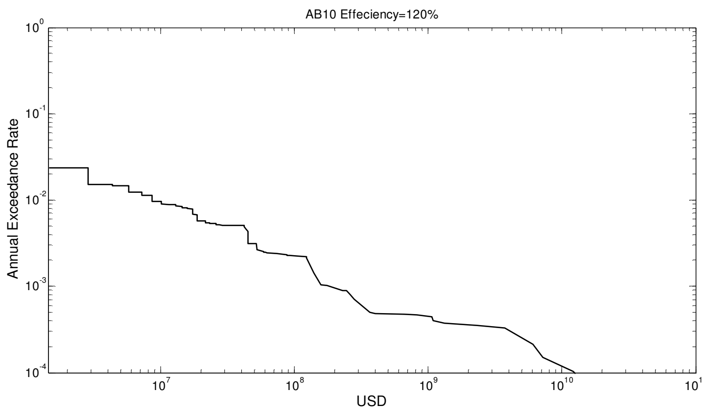
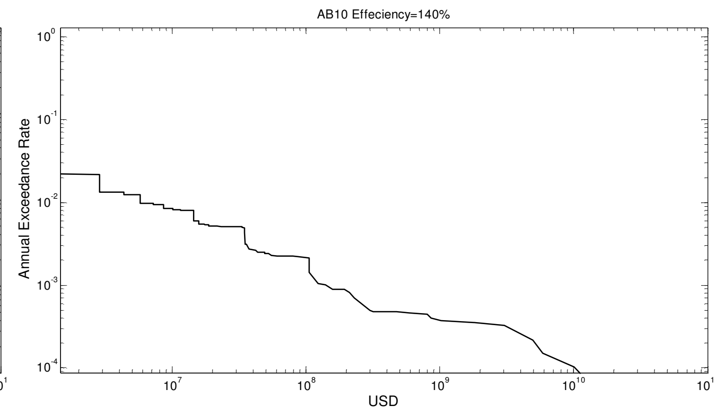


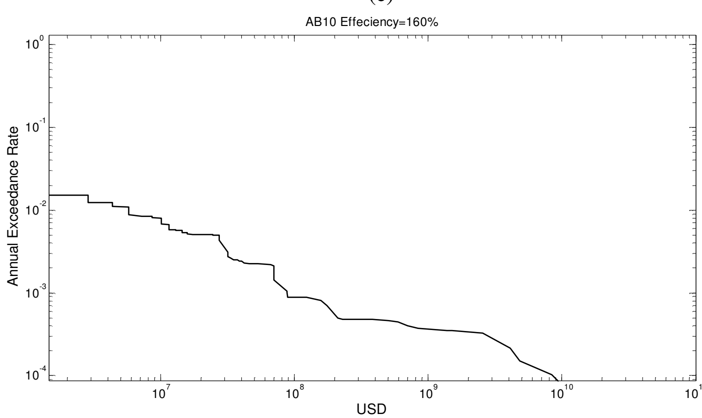
Figure F.1 Annual cxceedance curves for the three ground-motion models, for each of the analysed efficiency rates



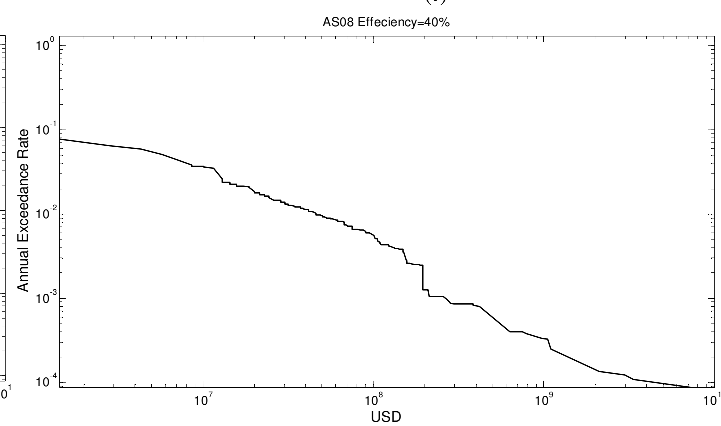
(e)



(f)

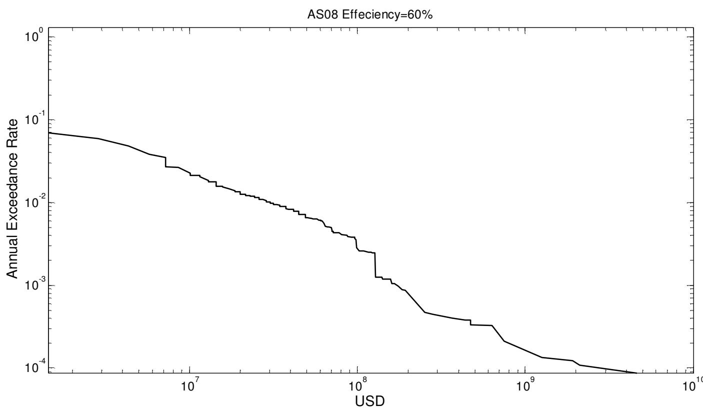


(g)

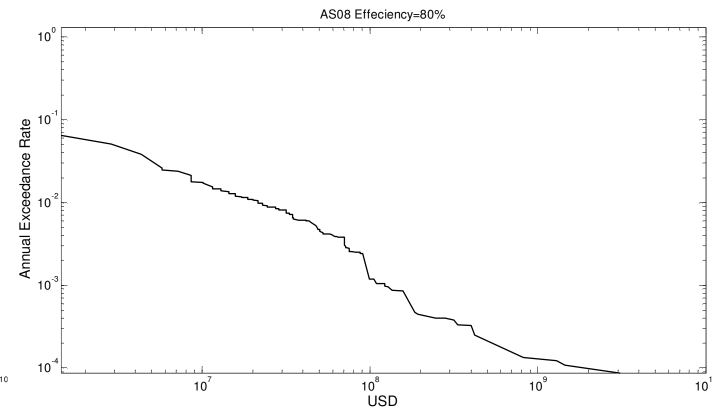


(h)

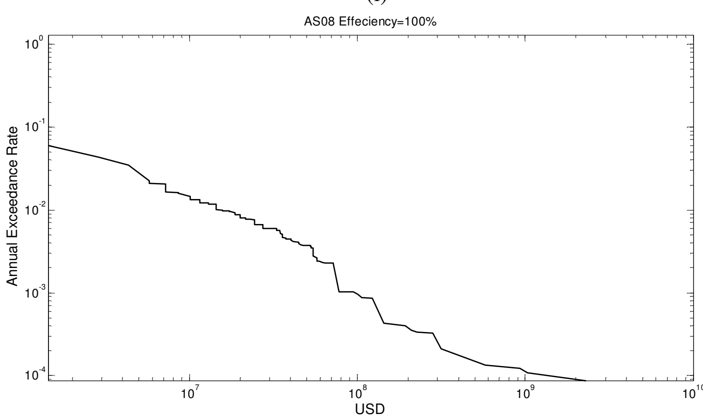
Figure F.1 continued



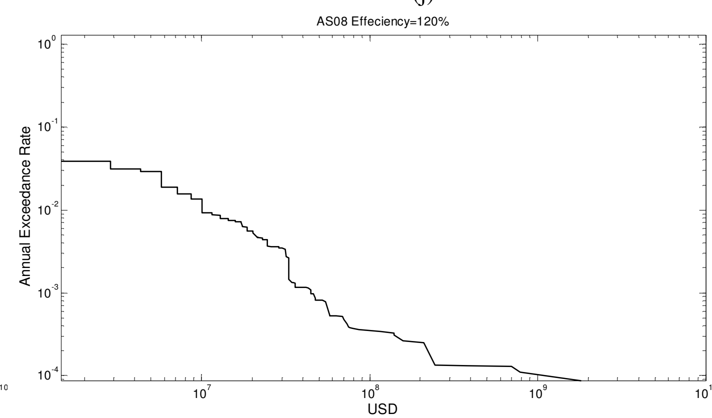
(i)



(j)

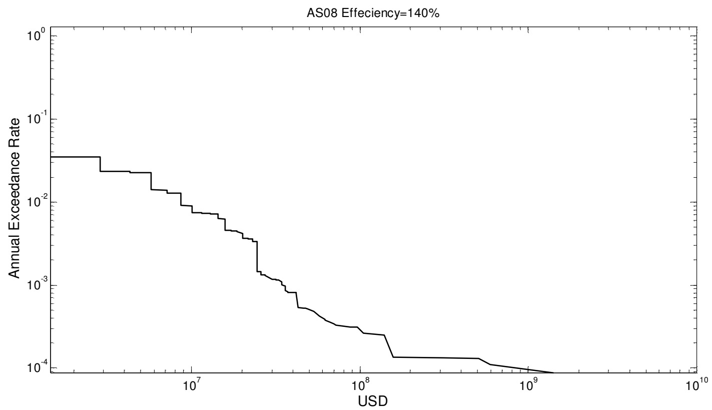


(k)

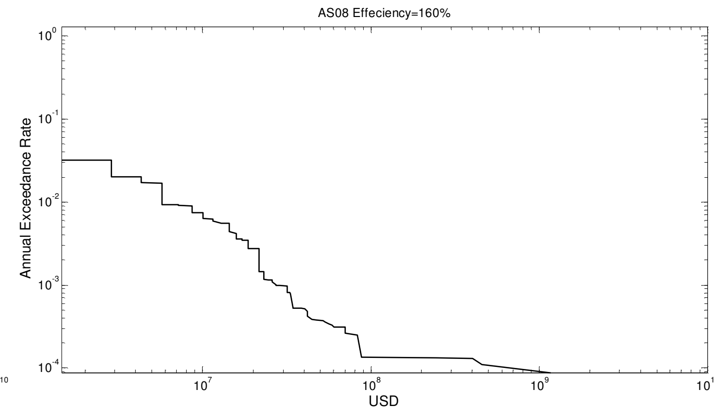


(l)

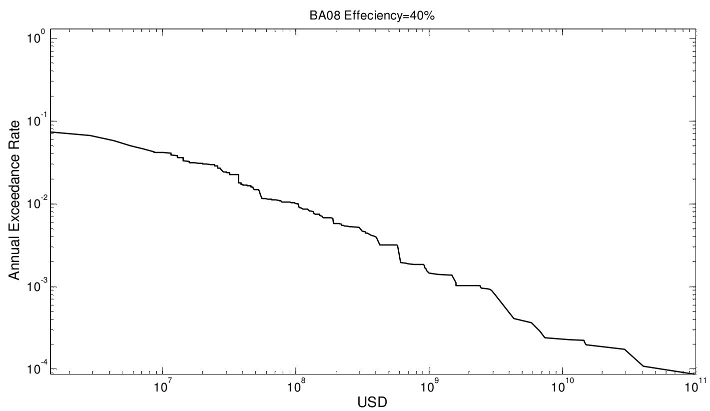
Figure F.1 continued



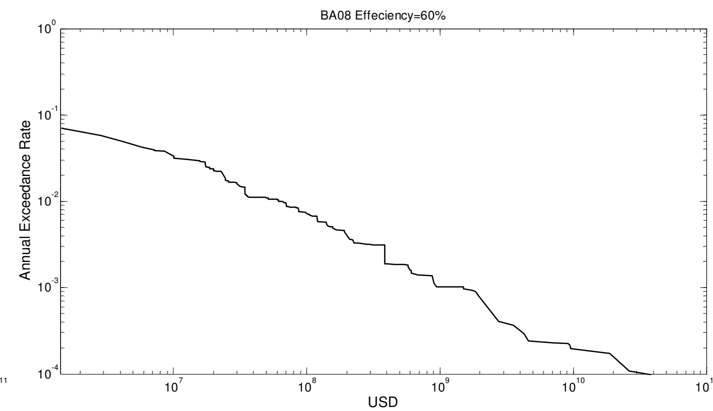
(m)



(n)



(o)



(p)

Figure F.1 continued

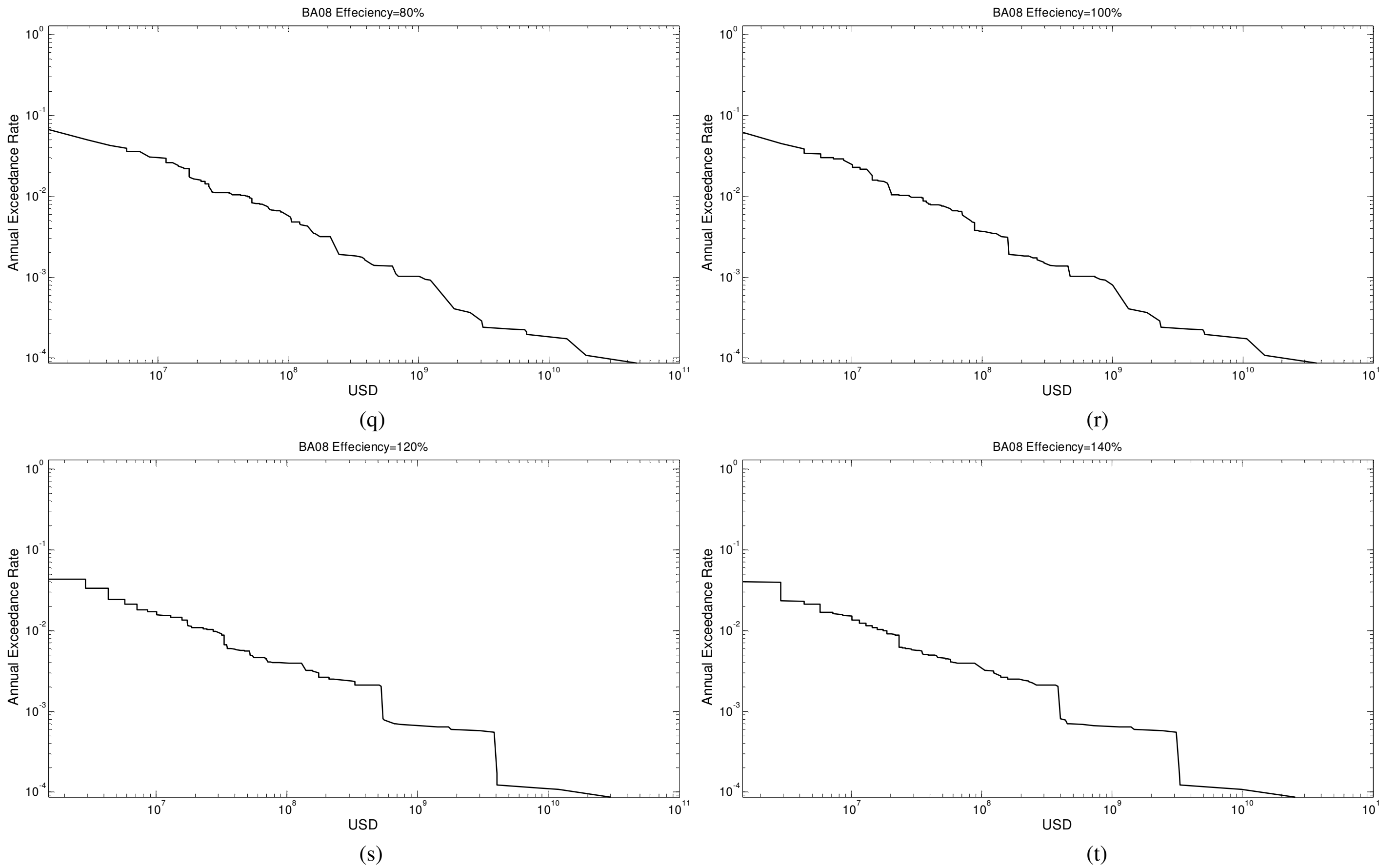
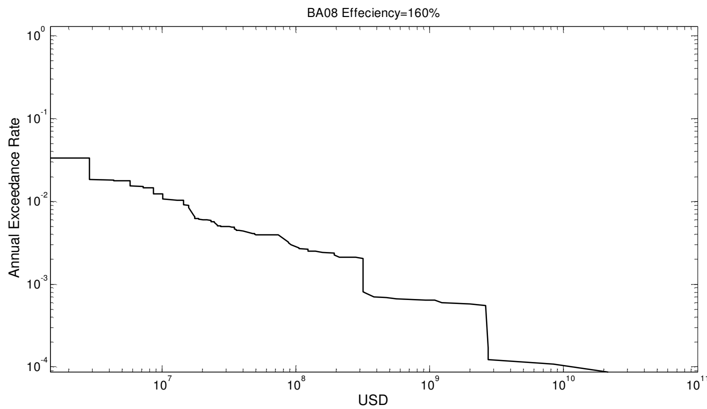


Figure F.1 continued



(u)

Figure F.1 continued

F.3 Direct Loss By Type

Table F-2 Building loss in USD for each cluster map

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
1	9.10E+03	4.99E+03	1.27E+05	51	1.37E+07	8.51E+07	4.73E+07	101	7.55E+04	3.51E+04	8.43E+05	151	8.60E-02	4.42E-01	1.26E+02	201	1.01E+07	2.54E+06	8.83E+07	251	3.16E+08	6.03E+08	8.41E+08
2	2.45E+03	1.22E+03	2.20E+05	52	8.66E+06	2.90E+08	1.09E+07	102	1.33E+03	4.23E+03	2.83E+05	152	5.86E+06	8.21E+06	4.85E+06	202	2.70E+10	6.42E+09	2.26E+10	252	1.49E+07	9.55E+08	1.43E+07
3	2.14E+02	2.16E+02	6.26E+04	53	4.13E+05	1.12E+06	2.20E+06	103	2.11E+07	2.87E+08	2.84E+07	153	3.09E+06	2.26E+06	2.87E+06	203	7.76E+08	1.14E+08	1.13E+09	253	1.15E+08	8.84E+08	2.62E+08
4	7.98E+01	4.60E+01	1.77E+04	54	1.12E+07	7.06E+07	3.68E+07	104	4.98E+07	3.52E+08	5.50E+07	154	2.47E+06	1.53E+06	2.70E+06	204	4.69E+08	1.07E+08	1.05E+09	254	7.16E+07	1.07E+09	1.21E+08
5	1.80E+06	3.99E+06	4.88E+07	55	2.00E+07	2.81E+08	3.11E+07	105	3.52E+05	7.61E+05	5.91E+06	155	3.83E+09	3.28E+08	4.23E+09	205	2.47E+09	3.56E+08	3.20E+09	255	4.85E+08	9.30E+08	6.48E+08
6	6.15E+05	3.04E+05	6.34E+06	56	1.86E+08	1.14E+08	4.54E+08	106	4.50E+07	1.64E+08	1.03E+08	156	8.65E+09	1.10E+09	8.96E+09	206	8.23E+08	2.55E+08	1.00E+09	256	1.77E+01	1.01E+04	7.28E+03
7	1.49E+02	1.71E+02	5.19E+04	57	1.22E+08	2.85E+08	1.91E+08	107	4.11E+08	4.14E+08	8.37E+08	157	6.48E+08	1.27E+08	6.37E+08	207	3.78E+07	9.07E+07	2.38E+07	257	5.18E+08	1.04E+09	1.44E+09
8	5.07E+08	1.19E+09	3.36E+08	58	1.61E+05	2.38E+07	4.08E+05	108	3.71E+05	9.45E+05	1.12E+06	158	5.69E+07	3.80E+07	5.50E+07	208	6.47E+00	5.03E-02	1.48E+03	258	7.81E+06	1.70E+08	1.56E+08
9	4.71E+03	3.73E+03	1.55E+05	59	1.71E+09	1.15E+09	2.29E+09	109	4.31E+08	3.42E+08	8.80E+08	159	1.04E+09	5.89E+08	5.70E+08	209	3.43E+01	2.75E-01	7.98E+03	259	2.32E+09	2.71E+09	4.27E+09
10	4.29E+07	2.51E+08	2.91E+07	60	2.32E+08	4.42E+08	4.31E+08	110	1.60E+07	3.72E+08	1.65E+07	160	4.01E+08	4.83E+07	5.61E+08	210	1.22E+08	9.00E+07	1.37E+08	260	8.96E+08	1.36E+09	1.56E+09
11	1.52E+08	2.64E+08	1.07E+08	61	2.18E+07	4.06E+08	1.67E+07	111	1.79E+08	1.73E+08	3.94E+08	161	3.11E+09	7.61E+08	2.46E+09	211	3.17E+08	9.10E+07	3.86E+08	261	5.99E+08	1.85E+09	4.22E+08
12	2.97E+08	1.86E+08	2.34E+08	62	1.84E+06	2.01E+08	1.92E+06	112	3.30E+09	1.89E+09	4.34E+09	162	9.41E+08	5.81E+07	1.32E+09	212	1.00E+06	1.35E+05	2.54E+06	262	1.37E+01	3.46E+03	8.92E+03
13	9.86E+01	7.41E+01	2.08E+04	63	6.33E+06	3.24E+08	6.02E+06	113	1.05E+06	1.16E+06	1.82E+07	163	3.21E+09	5.29E+08	3.50E+09	213	1.85E+08	4.70E+07	3.65E+08	263	1.34E+00	2.40E+03	8.60E+02
14	1.76E+07	6.33E+06	1.37E+08	64	1.54E+05	2.69E+07	2.99E+05	114	6.51E+08	3.42E+08	1.02E+09	164	8.90E+08	1.14E+08	1.03E+09	214	2.39E+01	6.22E+00	3.29E+02	264	7.23E+07	8.98E+08	1.45E+08
15	5.29E+03	1.91E+03	6.07E+05	65	5.65E+06	2.36E+08	5.86E+06	115	2.28E+05	4.68E+04	2.44E+06	165	1.65E+09	2.25E+08	1.49E+09	215	6.68E+06	9.95E+07	2.43E+06	265	2.03E+04	3.93E+05	5.07E+05
16	4.13E+07	4.64E+08	3.14E+07	66	2.45E+05	2.05E+04	2.96E+06	116	6.27E+07	2.13E+08	1.17E+08	166	4.60E+05	3.90E+03	8.41E+05	216	5.49E-03	2.62E-03	3.51E+00	266	3.15E+09	2.82E+09	5.26E+09
17	3.79E+04	2.24E+04	3.85E+05	67	9.97E+05	2.85E+06	3.06E+06	117	3.25E+06	1.15E+08	3.28E+06	167	6.24E+02	1.73E+00	6.55E+04	217	3.50E+08	2.21E+08	4.58E+08	267	2.49E+08	1.02E+09	4.38E+08
18	1.15E+06	9.95E+07	1.75E+06	68	6.55E+09	2.63E+09	8.21E+09	118	3.06E+08	1.30E+09	2.09E+08	168	7.86E+05	1.95E+04	1.37E+07	218	2.87E+02	9.37E+01	3.28E+03	268	6.64E+02	1.06E+05	1.25E+05
19	9.72E-01	6.75E+00	1.34E+03	69	9.65E+03	1.44E+03	7.91E+05	119	1.13E+08	4.85E+08	9.64E+07	169	2.87E+08	1.28E+08	2.18E+08	219	2.50E+08	9.89E+08	1.48E+08	269	1.45E+02	1.23E+04	1.70E+04
20	1.19E+10	3.64E+09	1.15E+10	70	9.99E+07	3.17E+08	7.45E+07	120	4.76E+06	1.98E+07	2.07E+07	170	3.14E+05	1.10E+04	3.59E+06	220	1.34E+09	8.15E+08	1.44E+09	270	9.53E+06	4.73E+08	4.27E+07
21	1.23E+09	5.66E+08	2.01E+09	71	1.53E+09	1.96E+09	1.56E+09	121	1.77E+07	1.69E+08	1.51E+07	171	4.13E+07	3.53E+07	2.59E+07	221	4.71E+08	9.06E+08	4.01E+08	271	8.49E+06	4.23E+07	1.12E+08
22	8.57E+07	4.31E+08	9.32E+07	72	4.22E+09	2.28E+09	5.58E+09	122	7.51E+07	2.91E+08	1.05E+08	172	8.88E+07	4.98E+07	1.26E+08	222	5.51E+08	6.62E+08	6.04E+08	272	1.09E+08	1.10E+09	7.58E+08
23	4.33E+00	1.65E+01	7.35E+03	73	1.97E+08	2.59E+08	4.13E+08	123	2.74E+07	1.59E+08	3.67E+07	173	3.13E+08	1.64E+08	3.41E+08	223	1.87E+00	5.18E-01	3.71E+02	273	5.18E+08	2.09E+09	1.61E+09
24	8.62E+08	1.46E+09	6.76E+08	74	1.94E+02	1.29E+01	1.31E+04	124	1.16E+08	2.43E+08	2.08E+08	174	2.27E+08	1.76E+08	1.71E+08	224	5.85E+06	5.76E+07	4.78E+06	274	2.10E+05	7.84E+06	9.80E+06
25	2.07E+07	4.01E+08	1.83E+07	75	7.66E+06	4.84E+06	8.87E+07	125	1.91E+03	2.06E+02	5.90E+04	175	5.44E+07	1.20E+08	2.88E+07	225	2.42E+07	1.38E+08	1.44E+07	275	2.36E+09	3.87E+09	3.68E+09
26	3.32E+03	1.12E+04	4.74E+05	76	3.36E+06	6.58E+05	2.68E+07	126	1.78E+00	9.91E-01	1.34E+03	176	2.64E+04	1.19E+02	4.10E+05	226	4.06E+07	2.04E+08	3.92E+07	276	5.99E+09	4.36E+09	8.63E+09
27	1.76E+08	2.58E+08	3.23E+08	77	7.88E+01	3.17E+01	1.95E+04	127	1.36E+07	1.48E+08	1.86E+07	177	1.44E+09	6.90E+08	1.13E+09	227	5.23E+05	2.24E+07	2.98E+05	277	3.64E+08	1.06E+09	7.23E+08
28	3.37E+08	2.10E+08	7.48E+08	78	2.24E+04	1.11E+03	1.69E+05	128	2.21E+07	2.52E+08	1.86E+07	178	3.45E+07	2.80E+07	2.66E+07	228	3.41E+02	3.08E+01	6.44E+04	278	1.44E+08	1.21E+09	2.06E+08
29	1.77E+05	4.68E+05	6.38E+06	79	2.71E+10	1.05E+10	2.34E+10	129	5.87E+06	1.44E+08	4.61E+06	179	6.39E+07	6.49E+06	1.65E+08	229	1.11E+05	4.66E+05	2.93E+05	279	1.66E+01	2.00E+03	4.95E+03
30	5.35E+06	1.37E+07	3.36E+07	80	4.11E+08	3.83E+08	8.86E+08	130	4.05E+07	3.82E+08	3.75E+07	180	1.14E+02	1.59E+01	9.67E+03	230	6.72E+03	1.80E+02	4.01E+04	280	1.17E+08	7.10E+08	3.43E+08
31	1.50E+07	6.19E+07	6.10E+07	81	2.21E+06	2.88E+07	5.56E+06	131	1.14E+04	1.39E+03	7.34E+04	181	7.46E+07	7.54E+07	5.36E+07	231	4.83E+03	1.40E+02	4.10E+04	281	3.25E+06	2.05E+08	1.17E+07
32	9.28E+01	2.82E+02	1.14E+05	82	1.88E+09	1.01E+09	2.78E+09	132	2.62E+07	4.31E+08	2.04E+07	182	4.65E+02	2.08E+00	2.49E+04	232	9.54E+04	8.76E+04	8.97E+05	282	2.17E+05	2.95E+06	7.05E+06
33	3.32E+06	1.01E+08	6.44E+06	83	3.93E+06	4.48E+06	3.07E+07	133	2.99E+05	2.25E+05	7.78E+06	183	3.00E+03	2.84E+01	1.79E+04	233	8.65E+05	9.74E+06	6.16E+05	283	2.66E+03	7.34E+05	1.27E+06
34	5.59E+03	4.07E+03	2.20E+05	84	7.59E+07	1.33E+08	2.23E+08	134	1.73E+07	1.22E+08	2.73E+07	184	1.47E+08	6.12E+07	1.75E+08	234	6.82E+06	9.51E+07	3.06E+06	284	4.65E+08	1.33E+09	1.07E+09
35	6.71E+06	1.38E+08	1.09E+07	85	3.18E+04	1.08E+05	3.42E+06	135	3.08E+01	6.22E+01	1.71E+03	185	2.11E+00	2.14E-02	2.95E+02	235	2.09E+06	1.11E+08	6.10E+05	285	4.55E+04	1.47E+06	1.61E+06
36	2.74E+07	2.07E+08	3.49E+07	86	2.20E+06	1.23E+07	7.28E+06	136	2.02E+03	1.88E+03	1.46E+04	186	4.11E+00	2.04E-01	1.09E+03	236	1.18E+08	7.86E+08	1.57E+08	286	2.22E+04	9.84E+05	5.11E+05
37	5.81E+07	2.64E+08	1.10E+08	87	7.60E+06	2.45E+07	7.98E+07	137	9.28E+02	4.58E+04	2.88E+05	187	2.05E+08	4.19E+08	6.75E+08	237	4.72E+03	8.41E+04	2.85E+05	287	2.94E+05	2.20E+07	9.81E+05
38	3.91E+07	4.07E+08	3.67E+07	88	8.32E+02	6.05E+02	1.37E+05	138	4.37E+07	2.38E+08	8.38E+07	188	2.85E+09	6.23E+08	3.43E+09	238	2.96E+09	7.08E+08	4.22E+09	288	1.67E+07	9.18E+08	2.72E+07
39	2.79E+04	1.31E+05	2.66E+06	89	5.52E+03	8.40E+03	8.84E+05	139	6.60E+08	6.99E+08	1.04E+09	189	2.17E+07	8.65E+06	4.34E+07	239	7.31E+09	2.50E+09	9.61E+09	289	6.05E+05	6.84E+07	2.58E+06
40	2.61E+08	3.57E+08	4.40E+08	90	4.37E+07	1.93E+08	9.28E+07	140	1.21E+10	6.96E+09	1.04E+10	190	1.80E+06	1.13E+05	8.90E+06	240	1.43E+10	6.39E+09	1.65E+10	290	3.26E+04	1.51E+06	4.46E+06
41	1.64E+08	2.58E+08	2.88E+08	91	2.62E+00	2.17E+00	2.66E+03	141	6.09E+08	9.92E+08	9.41E+08	191	3.65E+06	2.47E+05	4.00E+07	241	4.89E+05	7.89E+06	2.92E+07	291	2.13E+07	2.50E+08	9.30E+07
42	5.67E+07	2.74E+08	7.79E+07	92	5.10E+05	8.23E+05	1.86E+07	142	4.11E+06	3.10E+08	2.76E+06	192	4.25E+08	7.38E+07	6.02E+08	242	1.67E+09	1.82E+09	3.34E+09	292	2.35E+06	4.70E+07	1.51E+07
43	3.43E+03	1.35E+04	1.33E+06	93	1.11E+07	1.69E+08	9.71E+06	143	1.33E+00	1.64E+01	5.10E+02	193	2.44E+09	3.57E+08	3.07E+09	243	3.91E+09	4.71E+08	5.17E+09	293	3.95E+07	8.30E+08	4.14E+07
44	3.83E+06	3.15E+07	1.55E+07	94	1.92E+02	1.31E+02	6.42E+04	144	5.14E+01	1.58E+02	2.12E+04	194	1.77E+04	8.15E+02	1.14E+06	244	2.62E+08	7.61E+08	1.86E+08	294	1.69E+00	3.85E+03	1.44E+03
45	2.00E+05	1.23E+06	1.85E+06	95	2.15E+04	4.15E+03	4.19E+05	145	3.67E+06	1.87E+08	3.77E+06	195	4.56E+07	8.94E+06	1.41E+08	245	2.88E+02	2.62E+03	4.01E+04	295	3.07E+05	1.24E+06	1.60E+06
46	3.50E+06	8.11E+06	3.51E+07	96	2.51E+04	9.97E+03	6.93E+05	146	1.14E+04	7.79E+03	1.43E+05	196	6.12E+07	4.82E+07	7.96E+07	246	4.50E+09	1.63E+09	3.48E+09	296	2.41E+07	1.44E+08	2.06E+08
47	6.77E+08	5.32E+08	9.46E+08	97	3.49E+05	4.81E+06	1.61E+07	147	3.91E+02	1.61E+03	9.34E+03	197	1.03E+02	1.19E+00	4.06E+03	247	5.52E+09	1.67E+09	6.63E+09	297	9.36E+08	2.87E+09	1.52E+09
48	1.57E+08	9.25E+08	1.31E+08	98	5.18E+08	1.58E+09	7.02E+08	148	4.99E+05	7.66E+07	4.65E+05	198	3.54E+04	1.16E+03	3.23E+05	248	1.96E+09	1.09E+09	3.49E+09	298	2.97E+07	1.01E+09	3.42E+07
49	6.51E+09	2.49E+09	7.47E+09	99	8.37E+05	3.10E+07	1.57E+06	149	1.62E+08	4.15E+08	2.69E+08	199	3.44E+08	1.38E+07	6.97E+08	249	1.84E+06	1.64E+06	1.61E+07	299	2.31E+03	3.89E+05	9.03E+05
50	5.76E+07	3.53E+08	7.32E+07	100	1.09E+08	5.61E+08	1.21E+08	150	2.84E+04	2.14E+06	1.23E+05	200	8.98E+08	8.45E+07	1.23E+09	250	1.17E+07	1.19E+08	5.84E+07	300	3.72E+02	3.52E+04	1.56E+05

Table F-2 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
301	1.13E+06	1.50E+07	1.76E+07	351	1.61E+06	2.15E+07	1.90E+07	401	9.18E+08	6.75E+08	2.01E+09	451	8.05E+09	4.78E+08	8.56E+09	501	5.77E+08	6.18E+08	1.35E+09	551	1.10E+07	4.78E+08	1.05E+07
302	1.06E+04	1.34E+05	1.82E+05	352	7.14E+04	1.33E+05	4.73E+06	402	1.40E+04	2.11E+04	2.83E+06	452	6.75E+06	1.30E+07	5.46E+07	502	7.64E+05	1.37E+07	3.14E+06	552	6.47E+07	3.69E+08	2.01E+08
303	5.29E+04	1.59E+07	1.72E+05	353	4.05E+07	6.03E+08	1.46E+08	403	7.17E+09	3.70E+09	1.06E+10	453	6.88E+07	6.85E+07	9.51E+07	503	2.87E+06	1.43E+06	3.37E+07	553	5.13E+07	7.01E+08	5.57E+07
304	7.31E+05	1.82E+08	2.04E+06	354	2.57E+01	6.68E+01	3.44E+04	404	4.48E+08	4.97E+08	1.40E+09	454	8.83E+06	8.28E+07	2.01E+07	504	4.00E+08	6.67E+08	8.59E+08	554	8.45E+07	3.90E+08	2.41E+08
305	5.08E-01	3.22E+02	2.37E+02	355	1.11E+09	1.26E+09	2.87E+09	405	3.03E+06	4.63E+06	3.66E+07	455	3.06E+07	4.49E+07	3.16E+07	505	3.28E+07	4.99E+08	3.77E+07	555	2.80E+03	2.24E+03	1.63E+05
306	2.47E+09	6.12E+09	4.24E+09	356	3.68E+05	6.56E+06	5.15E+06	406	3.33E+08	5.25E+08	7.11E+08	456	1.92E+08	4.66E+07	2.28E+08	506	1.31E+04	1.82E+05	2.96E+06	556	1.39E+05	1.41E+05	1.98E+06
307	3.78E+05	3.61E+07	2.38E+07	357	4.50E+08	2.41E+09	6.01E+08	407	2.47E+04	4.01E+03	8.34E+05	457	4.60E+07	5.90E+07	7.60E+07	507	1.09E+08	7.01E+08	2.11E+08	557	1.10E+06	5.57E+07	3.27E+06
308	7.17E+02	4.26E+04	3.08E+04	358	5.12E+07	7.68E+08	1.37E+08	408	2.95E+07	3.33E+08	4.22E+07	458	9.66E+03	5.10E+01	1.99E+05	508	2.19E+08	4.66E+08	7.80E+08	558	8.34E+07	4.22E+08	3.69E+08
309	4.50E+07	6.91E+08	6.09E+07	359	4.13E+08	1.28E+09	1.20E+09	409	8.57E+08	2.08E+09	8.30E+08	459	1.17E+08	5.98E+07	2.75E+08	509	7.75E+05	1.50E+08	1.25E+06	559	1.79E+08	6.50E+08	4.79E+08
310	5.17E+05	7.95E+07	2.59E+06	360	7.39E+08	1.97E+09	2.03E+09	410	2.99E+09	1.44E+09	4.75E+09	460	3.19E+04	1.95E+03	1.47E+05	510	2.98E+08	8.70E+08	6.62E+08	560	5.81E+08	5.66E+08	1.67E+09
311	2.15E+05	7.28E+07	6.88E+05	361	2.04E+05	7.81E+06	2.39E+06	411	3.70E+08	4.58E+08	8.47E+08	461	1.69E+03	7.18E+02	2.68E+05	511	1.55E+09	2.18E+09	3.15E+09	561	1.31E+09	8.67E+08	2.90E+09
312	5.84E+04	2.17E+06	4.51E+06	362	1.40E+08	7.88E+08	4.76E+08	412	2.39E+07	1.06E+07	1.68E+08	462	6.79E+06	1.43E+07	8.50E+06	512	8.46E+05	7.22E+06	3.70E+07	562	1.47E+07	4.54E+07	1.49E+08
313	8.12E+08	1.09E+09	1.80E+09	363	5.12E+02	3.03E+03	7.39E+05	413	8.66E+05	3.68E+05	1.94E+07	463	1.95E+06	7.33E+05	1.08E+07	513	5.65E+08	1.06E+09	1.35E+09	563	1.49E+08	5.05E+08	3.56E+08
314	3.73E-01	6.74E+01	2.49E+02	364	9.70E+03	7.60E+03	1.28E+06	414	8.89E+05	5.47E+05	8.06E+06	464	4.31E+07	3.72E+07	2.71E+08	514	6.34E+04	7.80E+04	1.04E+06	564	1.55E+07	4.46E+08	1.90E+07
315	4.22E+06	3.91E+08	4.55E+06	365	2.28E+01	1.54E+02	4.25E+04	415	2.19E+07	3.01E+08	2.54E+07	465	6.18E+09	3.68E+09	8.84E+09	515	4.80E+08	9.10E+08	9.46E+08	565	1.41E+00	9.57E+01	7.14E+02
316	5.20E+03	6.76E+04	3.11E+05	366	1.41E+07	5.77E+08	4.24E+07	416	1.04E+08	3.61E+08	2.70E+08	466	1.29E+10	9.11E+09	1.57E+10	516	9.36E+07	1.08E+09	1.60E+08	566	4.84E+05	5.89E+06	6.21E+06
317	1.49E+06	3.22E+08	3.71E+06	367	4.42E+02	6.46E+02	1.60E+05	417	2.11E+04	1.05E+04	1.16E+06	467	1.10E+04	3.38E+05	3.41E+06	517	4.81E+02	1.05E+03	6.88E+04	567	3.53E+03	7.20E+04	1.26E+06
318	4.14E+00	9.09E+02	1.11E+03	368	6.53E+06	8.05E+07	1.40E+08	418	3.50E+07	5.82E+07	2.68E+08	468	7.30E+04	3.53E+05	3.42E+06	518	5.72E+02	2.52E+03	1.69E+04	568	2.09E+03	9.05E+04	2.35E+05
319	1.07E+02	1.33E+04	2.80E+04	369	9.24E+09	8.16E+09	1.26E+10	419	2.12E+09	1.30E+09	4.14E+09	469	2.17E+08	4.80E+08	1.64E+08	519	1.20E+07	5.71E+08	1.05E+07	569	1.94E+09	2.49E+09	4.14E+09
320	5.48E+03	3.36E+05	6.78E+05	370	4.84E+05	6.87E+06	3.70E+07	420	1.56E+05	1.14E+06	2.16E+07	470	4.03E+02	4.31E+02	6.19E+04	520	2.30E+04	1.30E+05	7.70E+05	570	6.70E+08	9.53E+08	1.79E+09
321	3.22E+08	7.64E+08	8.17E+08	371	1.76E+03	4.88E+03	4.27E+05	421	5.49E+08	2.51E+09	4.63E+08	471	1.04E+09	2.15E+09	1.21E+09	521	6.04E+03	2.43E+04	1.04E+05	571	7.57E+01	9.88E+02	4.42E+04
322	5.20E+08	9.87E+08	1.55E+09	372	1.70E+07	7.51E+08	3.56E+07	422	4.47E+06	5.59E+07	1.37E+07	472	5.74E+07	6.39E+08	7.33E+07	522	7.35E+06	1.47E+08	3.42E+07	572	3.12E+03	2.50E+04	1.99E+05
323	4.72E+10	2.17E+10	4.23E+10	373	2.84E+08	2.75E+09	2.99E+08	423	1.33E+07	1.04E+07	1.56E+08	473	4.23E+06	7.78E+07	1.29E+07	523	1.36E+08	6.93E+08	2.71E+08	573	3.29E+07	3.52E+08	7.91E+07
324	1.30E+06	1.78E+07	9.51E+07	374	2.49E+03	1.28E+05	7.97E+05	424	8.00E+09	4.21E+09	1.20E+10	474	1.30E+09	1.48E+09	2.22E+09	524	5.10E+07	1.07E+09	6.25E+07	574	7.68E+06	3.86E+08	9.33E+06
325	4.70E+09	3.31E+09	8.49E+09	375	3.23E+07	8.48E+08	6.12E+07	425	8.63E+05	1.12E+06	5.65E+06	475	3.80E+00	6.80E+01	1.37E+03	525	1.39E+02	2.77E+03	2.86E+03	575	7.64E+06	1.88E+08	2.06E+07
326	4.93E+04	4.15E+05	7.32E+06	376	1.01E+08	1.07E+09	1.95E+08	426	4.50E+07	3.34E+08	6.79E+07	476	5.29E+04	2.12E+05	2.25E+05	526	6.23E-02	3.37E+00	3.94E+01	576	9.75E+07	2.19E+08	3.94E+08
327	5.46E+08	9.59E+08	1.57E+09	377	3.96E+07	6.20E+08	1.38E+08	427	1.08E+04	4.53E+03	1.15E+06	477	2.38E+06	2.43E+08	4.55E+06	527	2.08E+06	9.63E+06	3.45E+07	577	1.13E+08	5.74E+08	2.04E+08
328	3.45E+07	7.85E+08	6.07E+07	378	2.99E+08	1.12E+09	7.60E+08	428	6.20E+08	4.71E+08	1.42E+09	478	5.18E+09	5.02E+09	8.04E+09	528	3.06E+07	9.24E+08	3.23E+07	578	8.45E+05	2.57E+06	2.45E+07
329	1.02E+09	1.53E+09	2.27E+09	379	1.95E+00	3.37E+01	5.45E+03	429	1.97E+08	4.78E+08	4.71E+08	479	1.57E+08	1.64E+09	7.56E+08	529	1.37E+08	7.94E+08	2.24E+08	579	3.01E+06	3.80E+06	3.27E+07
330	2.54E+04	7.70E+04	1.64E+06	380	3.47E+06	7.23E+06	1.24E+08	430	2.81E+00	1.45E-01	2.35E+03	480	1.41E+07	4.99E+07	1.65E+08	530	1.45E+08	1.22E+09	2.47E+08	580	2.37E+07	5.35E+08	2.54E+07
331	3.45E+06	6.78E+07	3.59E+07	381	2.35E+03	1.54E+03	4.01E+05	431	8.39E+01	3.42E+01	2.59E+04	481	1.45E+08	5.71E+08	3.46E+08	531	1.42E+08	1.95E+09	1.53E+08	581	6.00E+07	6.53E+08	7.11E+07
332	2.33E+07	7.88E+08	3.76E+07	382	1.02E+10	7.09E+09	1.41E+10	432	8.12E+07	4.08E+08	1.88E+08	482	5.31E+08	1.00E+09	1.25E+09	532	8.63E+05	1.69E+08	1.37E+06	582	3.63E+08	2.07E+09	3.34E+08
333	2.78E+03	6.97E+03	4.68E+05	383	1.21E+03	2.12E+04	9.79E+05	433	1.31E+05	6.48E+04	3.63E+06	483	1.47E+03	1.25E+04	1.93E+05	533	5.87E+07	4.90E+08	1.44E+08	583	1.82E+09	2.29E+09	3.35E+09
334	9.56E+03	3.41E+04	5.23E+06	384	1.62E+08	1.43E+09	3.25E+08	434	8.88E+07	5.26E+08	1.35E+08	484	2.04E+09	2.68E+09	3.31E+09	534	1.80E+04	1.83E+06	7.25E+04	584	9.72E+06	3.94E+08	1.39E+07
335	2.25E+02	7.59E+01	1.44E+05	385	8.06E+06	6.20E+08	2.04E+07	435	1.87E+07	2.67E+08	3.34E+07	485	9.78E+04	4.73E+04	8.92E+05	535	2.92E+07	5.87E+08	6.79E+07	585	4.16E+07	4.24E+08	6.71E+07
336	1.28E+06	4.41E+07	1.17E+07	386	1.32E+02	7.02E+03	1.01E+05	436	4.72E+05	1.96E+06	1.92E+06	486	4.94E+07	3.82E+08	1.06E+08	536	5.21E+04	3.95E+04	7.41E+05	586	1.84E+03	2.54E+04	7.56E+04
337	1.79E+09	2.63E+09	3.92E+09	387	6.84E+07	7.01E+08	2.33E+08	437	6.70E+08	4.89E+08	1.42E+09	487	3.53E+03	5.27E+03	6.12E+05	537	3.46E+07	3.47E+08	9.16E+07	587	1.24E+07	1.74E+08	7.02E+07
338	3.11E+09	2.92E+09	6.20E+09	388	2.84E+01	2.34E+02	8.34E+03	438	2.39E+09	1.52E+09	4.72E+09	488	1.80E+08	4.68E+08	3.13E+08	538	3.54E+06	3.21E+08	4.41E+06	588	8.33E+06	1.30E+08	3.78E+07
339	5.96E+06	1.10E+08	4.89E+07	389	2.52E+06	7.38E+06	5.17E+07	439	1.53E+08	4.22E+08	2.75E+08	489	1.30E+07	4.69E+08	1.75E+07	539	3.94E+08	7.45E+08	1.07E+09	589	1.19E+06	1.74E+07	1.91E+07
340	1.29E+08	1.63E+09	1.65E+08	390	9.01E+03	3.44E+04	2.88E+05	440	1.15E+08	6.73E+08	1.56E+08	490	4.03E+05	9.01E+05	1.22E+07	540	3.48E+09	2.97E+09	6.70E+09	590	5.83E+07	4.41E+08	1.22E+08
341	1.10E+09	3.36E+09	1.58E+09	391	1.85E+08	1.85E+08	7.93E+08	441	1.59E+08	5.40E+08	2.95E+08	491	6.45E+07	2.20E+08	2.56E+08	541	8.05E+08	1.52E+09	1.49E+09	591	8.33E+07	3.86E+08	2.71E+08
342	7.81E+07	4.59E+08	4.76E+08	392	2.03E+10	9.54E+09	2.23E+10	442	4.84E+06	6.20E+07	9.73E+06	492	3.00E+06	2.23E+07	2.13E+07	542	9.59E+09	5.21E+09	1.32E+10	592	2.34E+08	3.64E+08	7.77E+08
343	1.61E+09	2.66E+09	3.15E+09	393	8.62E+08	1.67E+09	1.17E+09	443	1.01E+08	1.61E+08	3.39E+08	493	1.63E+01	5.26E+02	6.82E+03	543	3.06E+08	7.46E+08	7.00E+08	593	9.73E+01	1.03E+03	1.21E+04
344	1.90E+06	3.01E+08	7.15E+06	394	1.91E+09	2.20E+09	2.46E+09	444	1.59E+09	9.65E+08	3.03E+09	494	3.53E+07	4.11E+08	6.57E+07	544	1.90E+05	9.01E+06	1.77E+07	594	5.53E+04	2.09E+05	2.47E+05
345	7.10E+07	8.19E+08	1.65E+08	395	1.41E+09	2.25E+09	1.76E+09	445	4.04E+07	2.50E+08	8.21E+07	495	1.53E+08	6.49E+08	3.82E+08	545	5.08E+09	2.44E+09	8.03E+09	595	7.87E+00	2.86E+01	2.96E+03
346	1.30E+08	8.79E+08	3.47E+08	396	1.59E+08	6.26E+08	1.58E+08	446	3.92E+02	3.11E+02	1.51E+05	496	6.56E+01	4.83E+03	5.65E+04	546	1.35E+02	2.47E+03	4.70E+04	596	5.44E+08	1.11E+09	1.10E+09
347	2.61E+05	2.10E+06	6.79E+06	397	3.70E+08	8.00E+08	5.67E+08	447	3.11E+07	6.11E+07	2.54E+08	497	1.50E+08	9.96E+08	2.07E+08	547	1.28E+05	4.54E+05	2.33E+06	597	1.61E+07	3.34E+08	3.62E+07
348	3.34E+07	5.62E+08	1.15E+08	398	3.96E+07	3.62E+08	3.58E+07	448	1.04E+02	3.00E+01	3.28E+04	498	6.33E+08	3.97E+09	5.66E+08	548	1.25E+08	6.95E+08	2.11E+08	598	1.51E+03	1.49E+03	3.85E+04
349	2.28E+05	2.22E+06	1.94E+07	399	5.02E+04	8.63E+04	6.40E+06	449	1.13E+04	8.85E+02	2.07E+05	499	1.88E+05	1.70E+05	3.23E+06	549	9.17E+07	7.68E+08	1.12E+08	599	1.40E+08	1.67E+09	1.18E+08
350	1.61E+08	7.29E+08	5.36E+08	400	2.81E+07	2.43E+07	2.14E+08	450	6.02E+05	5.31E+05	2.60E+07	500	3.05E+09	2.59E+09	4.77E+09	550	2.28E+08	8.35E+08	4.49E+08	600	8.08E+07	7.73E+08	1.15E+08

Table F-2 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
601	2.13E+07	4.21E+08	4.30E+07	651	5.26E+05	2.33E+05	5.91E+06	701	1.26E+08	6.26E+08	2.89E+08	751	2.05E-04	1.90E-05	6.53E+00	801	1.17E+10	7.82E+09	1.35E+10	851	2.59E+07	5.80E+07	2.36E+08
602	1.36E+06	2.27E+08	1.72E+06	652	2.57E+07	1.19E+08	9.21E+07	702	1.92E+08	5.97E+08	5.92E+08	752	3.53E+05	5.27E+06	8.67E+05	802	4.69E+09	3.12E+09	5.98E+09	852	5.31E+02	2.76E+03	4.22E+05
603	3.05E+05	1.55E+07	1.12E+06	653	4.96E+01	3.49E+01	9.94E+03	703	5.78E+01	2.96E+01	2.62E+04	753	8.43E+06	6.12E+07	2.18E+07	803	2.07E+08	1.37E+09	1.05E+08	853	1.74E+05	1.21E+06	2.47E+07
604	2.35E+08	8.16E+08	4.71E+08	654	2.36E+08	5.07E+08	4.57E+08	704	3.94E+07	2.19E+08	1.91E+08	754	1.40E+01	2.80E-01	3.08E+03	804	4.23E+08	1.56E+09	4.75E+08	854	1.34E+08	1.60E+09	1.90E+08
605	1.54E+07	2.77E+08	3.82E+07	655	6.67E+08	1.48E+09	7.66E+08	705	2.81E+04	6.22E+04	3.84E+06	755	6.00E+04	1.53E+06	3.39E+05	805	9.85E+08	3.08E+09	5.01E+08	855	3.88E+07	3.84E+08	9.20E+07
606	3.04E+08	5.09E+08	8.04E+08	656	1.96E+03	1.69E+03	1.73E+05	706	1.83E+05	1.50E+07	1.47E+06	756	5.38E+05	2.52E+06	2.50E+06	806	1.32E+09	3.28E+09	1.04E+09	856	1.91E+01	2.93E+01	2.00E+04
607	1.17E+04	6.35E+05	4.14E+04	657	7.92E+07	3.53E+08	1.05E+08	707	5.64E+06	5.01E+07	1.04E+08	757	1.16E-01	1.17E-02	3.93E+02	807	2.36E+07	2.83E+08	2.06E+07	857	8.44E+05	5.14E+06	3.43E+07
608	2.35E+04	1.42E+06	1.53E+06	658	2.12E+07	2.35E+08	2.55E+07	708	2.07E+03	2.51E+03	5.69E+05	758	1.27E+00	7.36E-01	1.63E+03	808	2.36E+08	1.27E+09	1.44E+08	858	3.68E+08	8.27E+08	8.41E+08
609	2.32E+03	1.28E+04	5.55E+05	659	1.41E+08	6.18E+08	1.59E+08	709	1.86E+06	3.38E+07	8.13E+06	759	8.89E+05	4.30E+06	5.68E+06	809	4.57E+04	1.80E+05	2.71E+06	859	4.98E+08	6.83E+08	1.36E+09
610	2.03E+07	2.10E+08	9.17E+07	660	2.67E+07	2.51E+08	3.09E+07	710	3.23E+08	3.12E+08	1.12E+09	760	1.33E+06	1.62E+07	5.06E+06	810	1.41E+09	1.96E+09	1.98E+09	860	6.67E+07	8.19E+08	8.31E+07
611	5.85E+02	1.12E+04	2.26E+04	661	6.93E+03	2.32E+04	1.18E+06	711	9.19E+08	5.65E+08	2.46E+09	761	1.89E+02	1.41E+02	1.24E+05	811	8.77E+06	1.74E+07	7.59E+07	861	1.03E+07	2.71E+08	1.83E+07
612	1.65E+07	3.62E+08	4.26E+07	662	1.98E+03	1.25E+04	7.80E+05	712	3.15E+03	2.80E+03	2.08E+05	762	2.57E+05	1.65E+06	8.37E+05	812	2.69E+06	2.33E+06	1.64E+07	862	6.40E+08	2.75E+09	6.49E+08
613	2.58E+05	1.21E+08	3.95E+05	663	7.69E+08	5.19E+08	1.70E+09	713	1.18E+04	2.06E+04	2.19E+06	763	9.52E+03	1.72E+05	3.37E+05	813	5.07E+08	1.43E+09	4.67E+08	863	3.39E+08	4.77E+08	9.58E+08
614	5.15E+00	1.15E+02	5.50E+02	664	3.01E+09	1.55E+09	5.11E+09	714	9.85E-03	8.20E-03	2.03E+02	764	4.50E+04	1.19E+06	2.51E+05	814	5.71E+07	6.75E+08	4.78E+07	864	4.28E+03	3.43E+03	3.43E+05
615	2.94E+03	5.54E+03	1.32E+05	665	9.78E+09	4.61E+09	1.37E+10	715	2.29E+02	2.76E+03	6.41E+05	765	1.05E+04	2.38E+04	4.69E+05	815	1.98E+09	1.84E+09	3.02E+09	865	4.28E-01	2.90E-01	1.24E+03
616	5.10E+02	4.46E+03	1.03E+04	666	6.57E+04	1.27E+05	6.08E+06	716	1.59E+07	3.96E+07	1.24E+08	766	7.10E+04	3.43E+04	4.90E+05	816	2.68E+09	2.08E+09	3.53E+09	866	8.47E+08	1.08E+09	1.87E+09
617	5.70E+07	2.89E+08	1.01E+08	667	2.45E+02	1.70E+01	5.42E+03	717	1.52E+05	4.17E+06	1.25E+06	767	6.50E+09	6.73E+09	7.93E+09	817	2.25E+09	2.11E+09	3.02E+09	867	1.31E+07	2.64E+08	1.90E+07
618	3.37E+04	2.06E+04	1.16E+06	668	1.40E+07	3.16E+08	1.31E+07	718	5.34E+06	6.54E+07	2.53E+07	768	7.48E+09	5.21E+09	9.88E+09	818	1.24E+09	3.46E+09	1.05E+09	868	9.40E+03	1.44E+04	1.21E+06
619	3.90E+06	9.29E+07	4.17E+06	669	1.38E+08	4.18E+08	2.63E+08	719	1.25E+05	1.15E+06	3.24E+06	769	2.54E+09	2.82E+09	4.48E+09	819	7.55E+08	1.53E+09	1.06E+09	869	3.05E+07	5.13E+08	5.79E+07
620	1.43E+07	2.23E+08	2.41E+07	670	9.47E+04	2.84E+04	8.35E+05	720	9.40E+05	4.73E+07	3.70E+06	770	3.06E+10	1.88E+10	3.06E+10	820	1.83E+09	4.56E+09	9.52E+08	870	4.42E+06	1.62E+08	9.82E+06
621	7.14E+07	1.02E+08	3.21E+08	671	4.36E+07	2.97E+08	8.21E+07	721	7.56E-01	5.97E-01	2.46E+03	771	5.51E+09	4.46E+09	6.98E+09	821	6.27E+07	5.58E+08	7.11E+07	871	2.08E+06	2.97E+06	3.98E+07
622	1.91E+09	8.90E+08	3.55E+09	672	1.06E+07	1.52E+07	7.53E+07	722	3.35E+05	3.15E+07	1.22E+06	772	4.69E+09	6.02E+09	5.87E+09	822	4.89E+08	1.64E+09	4.56E+08	872	1.97E+04	9.73E+03	7.13E+05
623	8.15E+08	6.84E+08	1.54E+09	673	3.43E+08	4.96E+08	7.06E+08	723	3.39E+08	2.20E+08	1.12E+09	773	2.04E+09	4.16E+09	2.05E+09	823	6.46E+06	1.44E+07	1.14E+07	873	4.67E+09	3.34E+09	7.67E+09
624	7.66E+04	2.67E+04	2.18E+06	674	1.91E+07	2.59E+07	1.46E+08	724	3.99E+07	4.42E+07	2.88E+08	774	6.12E+08	3.34E+09	4.26E+08	824	7.94E+02	1.24E+03	5.54E+04	874	1.72E+09	1.64E+09	3.75E+09
625	1.60E+08	6.04E+08	1.21E+08	675	6.26E+08	4.54E+08	1.38E+09	725	7.34E+05	6.33E+06	3.87E+07	775	3.26E+09	1.12E+10	1.83E+09	825	1.08E+08	3.98E+08	1.87E+08	875	2.06E+10	1.25E+10	2.35E+10
626	1.83E+09	1.47E+09	2.53E+09	676	3.98E+08	3.73E+08	9.04E+08	726	1.23E+09	7.24E+08	2.99E+09	776	4.44E+09	6.55E+09	4.61E+09	826	7.89E+07	5.39E+08	1.03E+08	876	7.50E+09	4.90E+09	1.13E+10
627	6.90E+08	1.61E+09	5.28E+08	677	2.05E+08	3.31E+08	5.09E+08	727	1.88E+05	3.63E+05	1.54E+07	777	2.84E+09	5.94E+09	2.51E+09	827	1.62E+03	2.92E+02	3.65E+04	877	2.12E+04	5.30E+04	3.77E+06
628	1.76E+08	5.91E+08	1.77E+08	678	1.86E+02	2.99E+01	1.16E+04	728	8.73E+03	1.26E+04	1.94E+06	778	6.42E+05	2.91E+05	2.18E+06	828	9.60E+07	1.10E+08	1.73E+08	878	1.68E+07	3.36E+08	2.86E+07
629	1.75E+08	4.58E+08	2.71E+08	679	7.16E+03	1.97E+03	1.29E+05	729	3.74E+01	7.29E+01	5.66E+04	779	7.36E+07	1.13E+09	4.57E+07	829	6.63E+07	4.89E+07	2.19E+08	879	2.28E+08	5.04E+08	6.00E+08
630	2.09E+08	4.69E+08	3.76E+08	680	6.23E+02	8.40E+02	1.16E+05	730	4.53E+00	2.11E+00	7.17E+03	780	1.63E+06	5.57E+06	3.13E+07	830	2.15E+04	4.81E+04	1.42E+06	880	2.11E+05	1.99E+05	1.59E+06
631	2.57E+07	4.04E+07	1.38E+08	681	2.25E+05	1.18E+05	4.79E+06	731	8.61E-01	1.93E+00	6.58E+03	781	4.89E+08	3.49E+09	2.42E+08	831	2.32E+08	5.10E+08	1.05E+08	881	1.76E+09	1.57E+09	3.52E+09
632	1.76E+04	5.87E+04	3.04E+06	682	6.02E+05	1.56E+07	4.66E+05	732	9.10E+04	4.22E+05	1.18E+07	782	8.66E+08	4.46E+09	6.68E+08	832	7.05E+08	4.50E+08	7.57E+08	882	7.66E+08	8.16E+08	1.88E+09
633	2.52E+09	1.50E+09	4.17E+09	683	3.09E+08	3.07E+08	7.67E+08	733	1.50E+04	9.52E+04	5.85E+05	783	1.34E+09	3.10E+09	1.41E+09	833	1.73E+09	6.70E+08	2.17E+09	883	2.51E+05	5.30E+05	2.78E+06
634	4.95E+05	7.66E+05	2.19E+07	684	4.76E+04	5.72E+03	2.49E+05	734	3.46E+06	4.77E+07	1.83E+07	784	1.07E+08	1.97E+08	4.18E+08	834	8.12E+02	9.55E+01	1.74E+04	884	1.44E+05	1.17E+05	5.17E+06
635	4.88E+08	5.67E+08	1.06E+09	685	2.27E+07	1.46E+08	1.86E+07	735	4.37E+05	1.89E+06	1.10E+07	785	8.61E+08	1.25E+09	1.30E+09	835	2.83E+07	2.01E+08	1.30E+07	885	1.25E+02	1.51E+02	6.48E+04
636	3.01E+06	1.19E+07	5.43E+07	686	8.07E+06	4.04E+07	1.14E+07	736	1.17E+07	5.81E+07	6.31E+07	786	6.20E+06	4.80E+06	1.44E+07	836	1.03E+08	3.75E+08	6.07E+07	886	2.89E+06	4.23E+07	1.15E+07
637	1.67E+10	6.94E+09	1.87E+10	687	1.62E+08	7.13E+07	3.68E+08	737	2.32E-02	8.86E-02	1.10E+03	787	2.13E+05	6.35E+05	5.75E+06	837	3.05E+08	2.93E+08	4.13E+08	887	4.76E+07	4.81E+08	7.91E+07
638	4.52E+07	3.90E+08	6.60E+07	688	2.79E+04	5.21E+03	2.31E+05	738	7.76E+06	1.79E+07	6.13E+07	788	1.22E+04	3.42E+04	8.00E+05	838	5.92E+06	1.64E+06	2.77E+07	888	1.24E+08	6.68E+08	2.29E+08
639	1.32E+08	5.33E+08	2.19E+08	689	7.38E+05	8.50E+06	2.69E+06	739	3.31E+03	7.66E+04	7.37E+04	789	2.99E+08	1.70E+09	2.19E+08	839	6.93E+07	3.31E+08	7.83E+07	889	1.60E+06	1.73E+07	6.81E+06
640	6.50E+04	5.80E+03	2.50E+05	690	7.90E+03	3.80E+03	2.74E+05	740	3.71E+01	2.16E+02	1.52E+05	790	7.42E+06	1.87E+07	1.63E+07	840	6.08E+07	3.15E+08	3.36E+07	890	1.25E+06	4.05E+07	3.70E+06
641	3.42E+06	1.26E+08	3.84E+06	691	1.26E+06	9.25E+06	7.06E+06	741	2.13E+09	1.20E+09	4.46E+09	791	1.12E+09	2.04E+09	1.38E+09	841	1.37E+08	2.09E+08	1.32E+08	891	7.39E+02	1.26E+02	5.06E+04
642	5.08E+02	3.69E+02	5.45E+04	692	2.30E+06	2.88E+07	1.82E+06	742	1.78E-02	2.16E-02	1.51E+02	792	3.34E+08	1.69E+09	2.74E+08	842	2.84E+05	1.23E+05	2.49E+06	892	3.42E+03	7.81E+02	1.67E+05
643	3.11E+07	3.19E+08	4.31E+07	693	2.54E+06	5.27E+07	2.26E+07	743	2.45E+06	8.33E+07	9.46E+06	793	1.51E+08	8.37E+08	1.90E+08	843	5.44E+06	4.50E+07	4.31E+06	893	2.00E+08	8.58E+08	3.62E+08
644	8.80E+05	1.08E+06	5.94E+06	694	1.73E+10	9.10E+09	2.00E+10	744	7.37E+05	4.22E+07	2.22E+06	794	3.08E+08	2.28E+09	1.89E+08	844	1.56E+08	3.02E+08	9.04E+08	894	7.02E+04	4.33E+04	2.43E+06
645	1.33E+05	3.83E+05	7.39E+06	695	3.28E+09	2.16E+09	6.70E+09	745	8.64E-04	1.02E-03	6.71E+01	795	5.44E+08	1.35E+09	7.29E+08	845	8.14E+03	1.18E+05	4.62E+06	895	1.42E+08	5.38E+08	4.20E+08
646	7.80E+07	1.14E+08	4.16E+08	696	5.40E+07	2.51E+08	2.36E+08	746	1.53E+06	2.54E+07	4.56E+06	796	8.75E+07	1.67E+08	4.32E+08	846	6.88E+06	2.22E+07	6.41E+07	896	3.86E+04	3.97E+04	2.94E+06
647	1.41E+07	3.16E+08	1.01E+07	697	6.89E+06	2.14E+08	1.72E+07	747	1.01E+05	1.10E+06	2.11E+06	797	4.71E+08	1.47E+09	4.85E+08	847	7.13E+07	1.20E+09	8.21E+07	897	1.23E+09	8.77E+08	2.12E+09
648	1.32E+06	4.14E+07	2.31E+06	698	6.56E+00	4.09E+01	6.09E+03	748	6.15E+05	2.80E+06	1.39E+07	798	4.66E+05	3.32E+06	2.16E+07	848	1.25E+06	1.70E+06	2.33E+07	898	3.09E+09	1.29E+09	4.93E+09
649	4.62E+00	1.59E+00	8.35E+02	699	1.18E+08	7.80E+08	1.99E+08	749	5.61E+07	2.59E+07	2.64E+08	799	1.31E+06	6.11E+05	3.11E+06	849	3.16E+08	2.72E+09	3.57E+08	899	4.36E+07	1.64E+08	1.35E+08
650	8.25E+06	9.09E+07	2.58E+07	700	5.46E+07	5.03E+08	9.66E+07	750	4.50E+05	5.89E+06	1.70E+06	800	4.19E+02	6.84E+02	3.02E+04	850	1.01E+09	3.05E+09	1.39E+09	900	1.66E+08	1.03E+08	4.23E+08

Table F-2 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
901	6.19E+06	4.61E+07	7.66E+06	951	1.53E+07	1.76E+08	5.99E+07	1001	6.91E+07	5.29E+07	3.06E+08	1051	3.33E+07	3.84E+08	3.61E+07	1101	5.99E+09	3.75E+09	8.10E+09	1151	4.78E+08	4.87E+08	1.44E+09
902	1.17E+07	6.25E+07	1.75E+07	952	2.63E+07	7.97E+07	2.26E+08	1002	2.41E+02	8.09E+02	8.37E+04	1052	6.00E+06	1.20E+08	8.46E+06	1102	1.33E+08	4.43E+08	1.60E+08	1152	6.33E+05	1.14E+06	2.28E+07
903	1.15E+08	2.00E+08	1.70E+08	953	1.06E+08	6.11E+08	2.50E+08	1003	3.20E+04	6.10E+03	1.98E+05	1053	4.79E+04	2.95E+04	1.07E+06	1103	3.18E+08	9.22E+08	2.70E+08	1153	7.99E+02	2.59E+03	4.13E+05
904	1.41E+07	6.28E+07	2.65E+07	954	1.75E+08	6.37E+08	4.62E+08	1004	1.24E+06	9.19E+06	5.71E+07	1054	6.43E+02	8.49E+02	9.73E+04	1104	2.09E+08	6.00E+08	2.64E+08	1154	2.31E+06	3.84E+06	3.93E+07
905	4.73E+08	2.66E+08	9.38E+08	955	7.64E+09	5.07E+09	1.01E+10	1005	3.27E+08	5.11E+08	9.44E+08	1055	3.10E+07	2.89E+08	6.04E+07	1105	1.96E+08	8.00E+08	1.45E+08	1155	1.07E+07	3.69E+07	1.50E+08
906	1.25E+02	4.82E+00	9.85E+03	956	2.38E+10	1.30E+10	2.53E+10	1006	2.32E+02	4.78E+02	5.25E+04	1056	3.76E+03	5.41E+03	3.15E+05	1106	1.40E+07	3.34E+07	7.06E+07	1156	1.46E+07	1.26E+08	4.38E+07
907	3.18E+04	4.32E+04	3.10E+05	957	2.66E+08	1.11E+09	4.18E+08	1007	1.43E+02	1.93E+02	2.09E+04	1057	9.97E+05	2.28E+06	1.15E+07	1107	1.77E+07	3.43E+07	8.27E+07	1157	2.69E+07	2.46E+08	3.96E+07
908	2.64E+06	3.17E+07	3.47E+06	958	1.77E+09	1.36E+09	3.24E+09	1008	1.67E+04	1.82E+04	5.51E+05	1058	5.95E+07	2.10E+08	1.58E+08	1108	6.07E+09	4.12E+09	8.12E+09	1158	1.04E+01	6.14E+01	3.83E+04
909	5.25E+05	1.46E+07	1.19E+06	959	2.09E+08	6.61E+08	4.55E+08	1009	2.73E+08	1.67E+09	2.53E+08	1059	1.81E+07	2.29E+08	3.05E+07	1109	1.24E+09	8.57E+08	2.15E+09	1159	2.04E+09	1.07E+09	3.96E+09
910	3.58E+07	1.00E+08	6.39E+07	960	7.53E+07	4.29E+08	2.31E+08	1010	6.87E+05	2.80E+06	3.66E+06	1060	2.35E+08	3.59E+08	9.20E+08	1110	4.55E+08	1.18E+09	4.26E+08	1160	1.09E+03	1.14E+03	2.03E+05
911	2.53E+05	2.50E+05	3.72E+06	961	1.88E+06	4.79E+06	1.97E+07	1011	1.05E+08	5.28E+08	2.79E+08	1061	4.23E+08	3.70E+08	1.07E+09	1111	2.12E+04	1.94E+04	3.54E+05	1161	2.71E+07	1.19E+08	8.59E+07
912	5.40E+06	7.15E+07	1.73E+07	962	1.10E+09	9.21E+08	2.30E+09	1012	3.98E+07	5.94E+08	6.23E+07	1062	7.84E+05	1.13E+06	9.31E+06	1112	2.12E+07	1.69E+08	2.44E+07	1162	2.69E+04	3.70E+04	2.21E+06
913	6.79E-01	2.49E-01	1.95E+03	963	2.18E+07	6.53E+07	2.38E+08	1013	2.17E+08	9.96E+08	4.14E+08	1063	1.52E+09	3.55E+08	2.55E+09	1113	8.55E+07	4.40E+08	7.23E+07	1163	1.63E+08	1.89E+08	5.59E+08
914	2.53E+06	5.05E+06	3.73E+07	964	6.66E+07	1.05E+08	4.00E+08	1014	8.10E+07	9.25E+08	1.48E+08	1064	2.60E+06	1.99E+07	2.77E+06	1114	4.09E+08	8.01E+08	5.18E+08	1164	4.07E+06	8.85E+07	8.49E+06
915	6.89E+07	7.66E+08	1.40E+08	965	9.14E+04	1.18E+05	3.75E+06	1015	2.60E+08	6.91E+08	6.12E+08	1065	6.04E+06	2.36E+07	1.04E+07	1115	9.42E+04	2.15E+05	2.42E+06	1165	2.56E+02	4.07E+02	9.63E+04
916	1.91E+07	4.43E+08	4.98E+07	966	1.24E+08	8.57E+08	1.88E+08	1016	1.16E+03	3.14E+02	3.59E+04	1066	1.94E+04	1.76E+03	1.78E+05	1116	1.73E+06	7.17E+06	2.47E+06	1166	3.38E+05	2.28E+07	1.10E+06
917	8.78E+09	6.20E+09	1.31E+10	967	1.11E+05	4.68E+05	1.16E+07	1017	4.82E+05	3.58E+06	1.72E+06	1067	3.05E+06	2.26E+07	1.62E+07	1117	3.76E+04	3.67E+03	1.08E+05	1167	3.45E+03	4.36E+04	2.02E+06
918	5.07E+06	3.66E+07	3.34E+07	968	4.88E+04	7.45E+04	2.70E+06	1018	7.59E+06	1.56E+07	7.36E+07	1068	2.53E+07	2.89E+07	6.41E+07	1118	1.74E+06	3.56E+06	7.00E+06	1168	1.19E+07	6.57E+07	1.53E+08
919	4.07E+08	2.06E+09	4.07E+08	969	1.18E+06	2.37E+07	8.46E+06	1019	9.95E+09	6.36E+09	1.33E+10	1069	2.50E+05	3.13E+06	5.28E+05	1119	6.56E+08	2.73E+08	9.62E+08	1169	2.62E+08	1.69E+08	8.30E+08
920	2.68E+09	5.78E+09	3.30E+09	970	3.03E+01	1.51E+02	6.00E+04	1020	9.88E+08	8.26E+08	2.50E+09	1070	9.92E+05	9.31E+05	4.83E+06	1120	1.05E+06	6.04E+06	1.02E+06	1170	4.99E+07	1.77E+08	1.73E+08
921	4.57E+08	1.96E+09	7.73E+08	971	1.09E+06	6.09E+06	6.63E+07	1021	7.44E+07	1.59E+08	2.71E+08	1071	3.08E+07	5.06E+08	1.62E+07	1121	3.54E+07	1.93E+08	2.25E+07	1171	1.10E+04	6.73E+03	7.56E+05
922	1.15E+09	3.78E+09	1.56E+09	972	1.34E+08	2.71E+08	8.66E+08	1022	7.17E+06	1.71E+08	1.12E+07	1072	2.89E+08	6.28E+08	5.60E+08	1122	6.37E+05	9.98E+05	8.46E+05	1172	1.12E+00	2.78E+00	4.23E+03
923	8.93E+08	3.46E+09	9.93E+08	973	4.74E+07	3.40E+08	1.88E+08	1023	8.66E+03	3.03E+03	1.46E+05	1073	6.31E+09	5.13E+09	9.06E+09	1123	3.06E+08	2.65E+08	4.70E+08	1173	5.79E+05	1.59E+07	1.69E+06
924	4.11E+08	8.78E+08	1.09E+09	974	1.39E+08	5.89E+08	4.54E+08	1024	4.45E+06	2.94E+07	2.37E+07	1074	7.50E+08	1.32E+09	1.16E+09	1124	5.45E+07	1.31E+08	4.78E+07	1174	6.28E+07	4.23E+08	1.08E+08
925	6.56E+05	1.04E+06	1.29E+07	975	7.62E+07	5.96E+08	1.74E+08	1025	5.51E+08	1.70E+09	8.82E+08	1075	9.40E+08	1.50E+09	1.21E+09	1125	1.53E+08	5.66E+08	1.32E+08	1175	1.83E+02	9.01E+01	2.81E+04
926	1.10E+05	7.20E+05	1.01E+07	976	3.43E+08	8.87E+08	7.47E+08	1026	7.10E+01	3.31E+01	8.08E+03	1076	9.70E+05	1.75E+06	1.14E+07	1126	4.07E+03	9.17E+02	3.12E+04	1176	1.43E+04	1.45E+04	1.36E+05
927	8.41E+03	6.45E+04	3.23E+06	977	3.43E+07	2.60E+08	7.53E+07	1027	2.48E+05	6.83E+05	1.39E+07	1077	6.94E+06	1.08E+07	1.78E+07	1127	4.04E+06	1.85E+08	7.48E+06	1177	1.57E+07	1.76E+08	2.59E+07
928	1.40E+04	2.61E+05	7.96E+06	978	2.42E+05	2.40E+05	5.66E+06	1028	7.35E+05	1.92E+06	2.62E+07	1078	3.28E+08	1.88E+09	2.64E+08	1128	5.71E+08	9.06E+08	1.48E+09	1178	5.93E+02	8.95E+02	7.73E+04
929	3.67E+03	2.36E+04	1.36E+06	979	5.01E+02	3.45E+03	4.79E+05	1029	2.51E+09	1.69E+09	4.82E+09	1079	1.18E+09	1.33E+09	1.77E+09	1129	5.33E+09	3.57E+09	8.72E+09	1179	1.48E+07	1.73E+08	3.73E+07
930	3.58E+09	3.25E+09	5.86E+09	980	2.36E+04	7.86E+04	4.34E+06	1030	8.92E+03	3.75E+04	1.57E+06	1080	1.70E+09	1.32E+09	2.74E+09	1130	7.27E+07	5.99E+08	1.12E+08	1180	1.66E+02	4.26E+02	9.98E+04
931	7.66E+07	8.85E+08	1.11E+08	981	7.58E+08	9.00E+08	1.59E+09	1031	7.28E+07	3.53E+08	1.79E+08	1081	7.74E+07	6.42E+08	3.70E+07	1131	3.44E+08	8.73E+08	7.17E+08	1181	3.29E+06	6.85E+07	8.20E+06
932	4.72E+08	2.57E+09	8.54E+08	982	5.63E+06	1.48E+08	1.95E+07	1032	1.69E+06	3.16E+07	4.08E+06	1082	2.94E+09	2.29E+09	4.93E+09	1132	4.37E+08	3.71E+08	1.26E+09	1182	1.37E+08	1.69E+08	4.10E+08
933	1.12E+07	2.73E+07	1.15E+08	983	1.37E+04	1.53E+05	6.89E+06	1033	8.77E+06	3.06E+07	6.42E+07	1083	1.64E+03	8.06E+03	1.39E+05	1133	1.16E+07	3.61E+08	2.72E+07	1183	1.77E+05	1.50E+06	2.08E+06
934	1.92E+09	2.55E+09	3.93E+09	984	6.32E+05	8.41E+05	1.68E+07	1034	2.49E+05	1.90E+05	2.94E+06	1084	1.06E+09	1.28E+09	1.79E+09	1134	3.24E+07	5.24E+08	5.05E+07	1184	1.27E+07	1.23E+08	2.32E+07
935	8.51E+08	2.00E+09	1.81E+09	985	1.66E+09	1.22E+09	3.58E+09	1035	5.18E+00	3.76E+00	1.69E+03	1085	3.22E+04	3.26E+04	4.68E+05	1135	3.68E+05	1.35E+06	2.90E+06	1185	3.39E+04	3.30E+04	2.35E+06
936	3.08E+09	3.41E+09	6.09E+09	986	3.48E+08	9.37E+08	8.43E+08	1036	1.94E+09	1.26E+09	3.81E+09	1086	9.03E+06	9.74E+07	7.57E+06	1136	3.81E+04	3.00E+04	6.01E+05	1186	5.16E+07	2.33E+08	1.44E+08
937	3.92E+08	6.86E+08	1.27E+09	987	5.25E+08	6.38E+08	1.24E+09	1037	1.41E+07	1.43E+08	3.47E+07	1087	1.55E+08	8.19E+08	1.09E+08	1137	1.21E+08	3.15E+08	4.44E+08	1187	1.60E+07	1.22E+08	4.61E+07
938	6.03E+06	1.73E+08	2.49E+07	988	3.35E+06	1.11E+07	6.51E+07	1038	6.94E+07	5.44E+08	1.01E+08	1088	2.37E+09	2.14E+09	3.23E+09	1138	2.50E+06	2.27E+07	2.19E+07	1188	4.22E+03	2.69E+03	3.40E+05
939	2.67E+03	1.02E+04	8.14E+05	989	5.29E+08	2.56E+08	1.23E+09	1039	5.35E+08	2.22E+09	5.74E+08	1089	3.03E+03	3.02E+03	7.42E+04	1139	1.99E+04	8.09E+03	2.51E+05	1189	3.14E+00	3.20E-01	8.31E+02
940	3.92E+04	1.48E+05	4.57E+06	990	1.84E+05	3.61E+05	2.21E+06	1040	3.72E+08	5.51E+08	7.01E+08	1090	3.86E+08	5.01E+08	6.46E+08	1140	6.70E-02	5.25E-02	2.33E+02	1190	3.53E+05	9.08E+06	6.14E+05
941	4.90E+05	3.45E+05	6.75E+06	991	2.41E+08	1.00E+08	6.15E+08	1041	2.15E+09	2.15E+09	4.00E+09	1091	1.13E+08	7.51E+08	8.93E+07	1141	1.75E+05	4.82E+05	1.04E+07	1191	6.27E+03	7.19E+04	5.53E+04
942	4.39E+06	4.18E+07	1.46E+08	992	2.69E+08	3.36E+08	4.40E+08	1042	1.96E+08	3.07E+08	6.22E+08	1092	3.02E+08	5.16E+08	5.38E+08	1142	4.62E+05	6.22E+05	8.81E+06	1192	6.64E+01	1.61E+02	9.02E+04
943	1.55E+08	3.34E+08	7.04E+08	993	5.61E+07	3.63E+07	2.75E+08	1043	6.31E+08	5.94E+08	1.64E+09	1093	3.92E+04	1.91E+05	2.52E+06	1143	1.21E+07	1.92E+08	2.25E+07	1193	7.76E+07	1.38E+08	1.76E+08
944	2.40E+07	1.61E+08	1.49E+08	994	6.51E+01	1.63E+02	7.47E+04	1044	1.47E+07	3.03E+07	1.76E+08	1094	1.16E+03	8.40E+02	3.34E+04	1144	1.16E+06	9.31E+06	9.06E+06	1194	9.49E+07	4.19E+07	2.96E+08
945	1.21E+09	2.64E+09	1.52E+09	995	2.34E+04	1.46E+04	1.40E+06	1045	3.19E+07	1.53E+08	8.52E+07	1095	2.29E+07	2.02E+08	2.64E+07	1145	8.31E+08	6.03E+08	1.93E+09	1195	7.93E+05	1.22E+07	1.49E+06
946	2.76E+09	2.69E+09	4.38E+09	996	2.15E+05	1.57E+05	7.33E+06	1046	4.45E+07	3.64E+08	5.61E+07	1096	1.75E+05	8.67E+04	6.53E+05	1146	1.03E+03	1.71E+02	4.10E+04	1196	2.45E+07	7.37E+07	3.63E+07
947	1.75E+08	9.24E+08	3.05E+08	997	2.15E+03	1.34E+04	1.72E+06	1047	6.66E+04	7.85E+04	2.48E+06	1097	3.57E+02	5.05E+02	2.31E+04	1147	2.01E+02	4.22E+02	2.78E+04	1197	7.23E+03	6.78E+03	1.43E+06
948	1.18E+05	8.66E+05	1.89E+07	998	6.34E+06	6.48E+07	1.78E+07	1048	4.17E+06	9.34E+07	6.48E+06	1098	1.95E+08	3.30E+08	6.15E+08	1148	1.21E+07	2.45E+07	9.72E+07	1198	3.70E+03	2.70E+03	3.81E+04
949	7.35E+08	9.13E+08	1.86E+09	999	5.45E+02	4.39E+02	1.64E+05	1049	5.39E+04	2.78E+05	6.17E+06	1099	2.16E+09	1.46E+09	3.49E+09	1149	2.64E+07	1.93E+08	8.34E+07	1199	1.87E+06	1.47E+07	3.60E+06
950	1.20E+08	5.11E+08	3.60E+08	1000	3.82E+06	5.91E+07	9.37E+06	1050	6.08E+06	1.13E+08	1.14E+07	1100	1.77E+09	2.58E+09	1.88E+09	1150	9.61E+05	6.45E+06	1.86E+07	1200	1.16E+06	2.64E+06	9.08E+06

Table F-2 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
1201	7.23E+02	2.49E+02	3.42E+04	1251	3.38E+08	5.12E+08	8.63E+08	1301	9.69E+07	2.90E+08	2.91E+08	1351	5.97E+05	1.73E+06	2.07E+07	1401	3.88E+06	7.88E+07	4.65E+06	1451	8.90E+07	1.04E+09	7.64E+07
1202	1.45E+01	9.46E+00	1.04E+04	1252	1.11E+04	3.48E+04	2.47E+06	1302	3.15E+06	2.82E+07	1.67E+07	1352	2.64E+08	2.27E+09	2.37E+08	1402	2.43E+07	4.78E+08	2.23E+07	1452	1.89E+02	3.40E+02	2.40E+04
1203	7.44E+06	7.35E+06	3.21E+07	1253	4.08E+03	9.73E+02	1.29E+05	1303	1.66E+09	1.63E+09	2.91E+09	1353	9.98E+03	2.12E+04	7.08E+05	1403	6.42E+03	2.77E+04	1.27E+06	1453	1.83E+08	1.15E+09	1.79E+08
1204	3.10E+06	8.51E+06	1.02E+07	1254	2.32E+01	3.11E+01	1.86E+04	1304	1.45E+09	1.40E+09	3.20E+09	1354	9.45E+08	3.22E+09	1.21E+09	1404	9.81E+06	9.75E+07	3.45E+07	1454	8.51E+06	8.42E+07	1.45E+07
1205	3.32E+09	2.19E+09	5.87E+09	1255	8.20E+05	1.89E+07	2.91E+06	1305	1.77E+09	1.50E+09	3.67E+09	1355	1.68E+08	1.83E+09	1.57E+08	1405	3.38E+07	3.42E+08	6.54E+07	1455	2.49E+01	1.93E+01	2.62E+03
1206	6.09E+07	1.36E+08	4.58E+08	1256	4.44E+08	4.64E+08	1.36E+09	1306	1.75E+08	6.93E+08	3.39E+08	1356	1.35E+08	9.56E+08	1.66E+08	1406	6.88E+04	1.34E+05	1.52E+05	1456	9.15E+08	1.13E+09	1.84E+09
1207	1.09E+10	6.66E+09	1.42E+10	1257	9.63E+08	8.99E+08	2.12E+09	1307	5.21E+03	8.63E+03	6.94E+05	1357	2.77E+05	3.42E+05	4.96E+06	1407	2.47E+08	1.01E+08	4.95E+08	1457	1.33E+08	2.45E+08	6.76E+08
1208	2.98E+09	2.02E+09	5.74E+09	1258	1.69E+08	4.87E+08	4.50E+08	1308	1.49E+08	4.03E+08	3.62E+08	1358	3.90E+07	1.23E+08	1.27E+08	1408	4.10E+07	2.72E+07	1.47E+08	1458	9.02E+09	6.10E+09	1.27E+10
1209	1.53E+09	1.49E+09	3.34E+09	1259	1.51E+08	7.95E+08	2.51E+08	1309	1.36E+04	1.52E+04	1.07E+06	1359	3.85E+07	6.28E+07	2.11E+08	1409	4.98E+08	4.68E+08	1.05E+09	1459	1.81E+09	1.70E+09	3.81E+09
1210	7.74E+09	5.30E+09	1.19E+10	1260	4.05E+06	6.96E+07	1.08E+07	1310	2.89E+07	2.91E+08	4.37E+07	1360	2.85E+06	4.42E+06	3.61E+07	1410	3.76E+02	1.83E+02	4.50E+04	1460	5.85E+07	3.70E+08	6.30E+07
1211	3.70E+05	7.19E+05	3.17E+06	1261	2.83E+07	4.72E+07	2.68E+08	1311	2.29E+09	1.57E+09	4.12E+09	1361	3.24E+05	9.65E+05	1.12E+07	1411	1.23E+08	6.26E+07	3.31E+08	1461	1.14E+03	5.53E+02	3.48E+04
1212	1.19E+06	1.49E+06	2.67E+07	1262	1.14E+06	2.19E+06	1.38E+07	1312	1.82E+07	1.38E+08	6.23E+07	1362	6.98E+02	7.34E+02	4.67E+04	1412	6.05E+05	5.33E+06	1.14E+06	1462	3.70E+04	7.92E+03	2.89E+05
1213	3.25E+02	6.14E+02	1.08E+05	1263	1.30E+07	1.99E+08	1.86E+07	1313	4.03E+08	5.25E+08	9.78E+08	1363	7.78E+07	1.77E+08	6.08E+08	1413	1.84E+08	5.12E+08	1.54E+08	1463	8.79E+05	3.99E+05	5.57E+06
1214	2.00E+07	4.24E+08	2.89E+07	1264	6.92E-01	3.83E-02	5.29E+02	1314	8.87E+05	2.45E+07	2.59E+06	1364	2.81E+08	1.94E+09	3.85E+08	1414	5.96E+08	2.04E+09	5.30E+08	1464	2.38E+09	5.45E+09	2.52E+09
1215	2.11E+02	4.15E+02	1.04E+05	1265	8.34E+06	1.97E+07	6.32E+07	1315	2.71E+07	2.13E+08	4.76E+07	1365	1.38E+08	5.35E+08	2.98E+08	1415	3.61E+08	1.39E+08	6.62E+08	1465	2.77E+08	4.20E+08	7.72E+08
1216	9.98E+07	1.19E+09	9.32E+07	1266	2.27E+04	3.15E+04	1.75E+05	1316	9.24E+07	1.63E+08	4.57E+08	1366	3.10E+08	8.33E+08	6.18E+08	1416	1.18E+09	4.79E+08	1.97E+09	1466	2.26E+08	9.56E+08	3.60E+08
1217	1.25E+08	8.13E+08	3.88E+08	1267	5.38E+08	1.65E+08	1.17E+09	1317	3.41E+04	4.29E+04	2.27E+06	1367	9.04E+05	3.90E+06	5.00E+06	1417	1.31E+07	3.36E+07	2.14E+07	1467	3.20E+04	8.20E+04	2.62E+06
1218	1.20E+08	5.17E+08	3.46E+08	1268	6.43E+02	1.26E+02	6.20E+04	1318	2.30E+07	2.34E+08	3.64E+07	1368	1.57E+09	3.47E+09	2.05E+09	1418	1.48E+08	3.90E+08	2.49E+08	1468	1.24E+09	1.49E+09	2.20E+09
1219	6.16E+07	4.24E+08	1.82E+08	1269	1.84E+06	5.22E+06	4.80E+07	1319	7.50E+04	2.32E+04	8.88E+05	1369	1.58E+01	1.69E+01	6.25E+03	1419	9.67E+06	4.67E+07	9.27E+06	1469	7.81E+05	1.14E+06	2.03E+06
1220	1.35E+04	4.44E+03	4.77E+05	1270	2.16E+06	2.53E+07	2.93E+06	1320	2.14E+08	1.07E+09	2.82E+08	1370	3.72E+06	1.05E+07	1.14E+07	1420	3.25E+07	1.49E+08	4.02E+07	1470	3.93E+06	8.94E+06	1.85E+07
1221	2.51E+00	2.20E+00	3.46E+03	1271	9.61E+01	1.03E+01	1.25E+04	1321	4.30E+09	3.07E+09	7.40E+09	1371	3.03E+07	3.86E+08	2.60E+07	1421	1.09E+07	5.72E+07	2.98E+07	1471	2.37E+05	5.86E+05	9.09E+06
1222	3.29E+05	1.41E+06	2.57E+07	1272	8.68E+06	3.60E+07	1.96E+07	1322	1.64E+06	1.21E+07	8.81E+06	1372	3.77E+00	1.38E+00	1.03E+03	1422	8.88E+07	2.71E+08	1.46E+08	1472	2.90E+05	1.76E+05	2.67E+06
1223	1.07E+04	9.85E+03	8.01E+05	1273	3.94E+07	5.17E+07	1.10E+08	1323	7.56E+07	3.89E+08	1.64E+08	1373	2.72E+07	4.57E+08	2.79E+07	1423	2.15E+07	1.22E+08	1.80E+07	1473	3.02E+07	9.35E+07	1.11E+08
1224	4.38E+07	4.87E+08	7.67E+07	1274	2.74E+03	2.07E+03	1.69E+05	1324	8.51E+07	2.30E+08	2.50E+08	1374	1.96E+04	6.13E+03	2.32E+05	1424	6.89E+03	3.50E+03	3.59E+05	1474	2.64E+09	2.18E+09	4.68E+09
1225	2.26E+05	9.90E+04	2.46E+06	1275	1.41E+06	1.66E+07	6.99E+06	1325	4.98E+03	3.50E+04	1.83E+06	1375	1.64E+08	6.68E+08	3.45E+08	1425	7.26E+05	7.96E+06	2.07E+06	1475	2.48E+08	4.39E+08	6.23E+08
1226	2.03E+09	1.72E+09	3.72E+09	1276	1.59E+07	4.58E+07	2.04E+08	1326	1.05E+07	2.14E+08	1.69E+07	1376	8.20E+07	6.45E+08	1.12E+08	1426	2.58E+08	4.58E+08	1.04E+09	1476	3.81E+08	1.76E+09	2.72E+08
1227	8.50E+00	1.01E+01	9.13E+03	1277	1.37E+05	4.59E+05	9.99E+06	1327	1.19E+07	2.33E+08	9.86E+06	1377	7.71E+09	5.15E+09	1.10E+10	1427	2.19E+04	1.53E+04	2.85E+05	1477	9.53E+07	2.24E+08	3.26E+08
1228	2.30E+07	3.20E+08	3.34E+07	1278	1.06E+08	9.89E+08	1.24E+08	1328	8.41E+06	2.81E+08	1.04E+07	1378	1.88E+07	1.09E+08	1.83E+08	1428	8.17E+06	1.21E+07	3.65E+07	1478	2.51E+06	2.36E+07	4.31E+06
1229	3.52E+05	7.69E+05	1.66E+07	1279	6.98E+05	3.01E+06	4.16E+06	1329	6.38E+07	4.05E+08	1.23E+08	1379	2.77E+08	3.53E+08	1.01E+09	1429	9.30E+07	1.37E+09	6.25E+07	1479	1.19E+07	2.50E+08	8.45E+06
1230	5.68E+07	5.43E+08	1.11E+08	1280	7.34E+08	2.12E+09	1.03E+09	1330	1.86E+07	2.60E+08	3.43E+07	1380	4.31E+07	6.30E+07	2.93E+08	1430	5.72E+07	1.13E+09	3.88E+07	1480	2.08E+07	1.96E+08	3.30E+07
1231	9.39E+06	1.34E+07	1.08E+08	1281	5.75E+07	1.09E+09	5.92E+07	1331	7.17E+06	1.34E+07	7.09E+07	1381	4.42E+09	3.18E+09	7.44E+09	1431	7.47E+07	6.66E+08	9.74E+07	1481	3.85E+07	5.96E+08	2.16E+07
1232	5.36E+07	4.55E+08	9.26E+07	1282	3.09E+08	1.26E+09	6.35E+08	1332	3.28E+07	1.95E+08	1.18E+08	1382	1.55E+09	1.30E+09	3.48E+09	1432	3.79E+07	5.34E+08	4.43E+07	1482	6.60E+07	1.67E+08	2.10E+08
1233	1.22E+07	3.59E+08	1.67E+07	1283	2.41E+03	9.92E+02	9.02E+04	1333	6.40E+01	4.77E+01	1.79E+04	1383	6.45E+07	4.46E+08	7.48E+07	1433	9.77E+07	1.21E+09	6.18E+07	1483	3.30E+08	1.14E+09	5.10E+08
1234	7.39E+02	5.57E+03	7.34E+05	1284	8.20E+02	1.64E+03	1.18E+05	1334	7.72E+03	8.01E+04	3.37E+06	1384	2.99E+07	3.16E+08	3.83E+07	1434	7.38E+08	1.79E+09	1.37E+09	1484	1.24E+03	2.96E+03	1.42E+05
1235	5.30E+08	1.01E+09	1.45E+09	1285	1.42E+06	1.53E+06	2.04E+07	1335	3.95E+06	3.13E+07	7.83E+06	1385	2.22E+09	2.11E+09	3.73E+09	1435	2.43E+05	7.43E+05	9.91E+06	1485	4.06E+08	3.52E+08	7.55E+08
1236	7.80E+04	3.92E+04	6.67E+05	1286	9.23E+04	2.63E+04	8.98E+05	1336	1.44E+08	8.52E+07	3.59E+08	1386	2.59E+08	4.87E+08	5.69E+08	1436	9.71E+04	3.38E+05	5.07E+06	1486	3.04E+08	2.35E+08	5.58E+08
1237	6.49E+01	8.99E+01	4.61E+04	1287	6.90E+07	9.17E+08	7.47E+07	1337	2.59E+02	3.85E+02	1.29E+05	1387	4.88E+08	8.88E+08	9.76E+08	1437	8.36E+05	6.48E+05	2.81E+06	1487	5.56E+09	2.37E+09	7.19E+09
1238	7.95E+08	8.48E+08	1.96E+09	1288	5.41E+09	3.47E+09	8.25E+09	1338	3.80E+05	1.64E+06	1.72E+07	1388	8.36E+08	9.03E+08	1.75E+09	1438	2.43E+08	3.43E+09	1.39E+08	1488	1.89E+07	7.66E+07	1.17E+07
1239	6.77E+06	6.39E+07	3.07E+07	1289	1.04E+09	9.26E+08	2.44E+09	1339	6.97E+08	2.00E+08	1.49E+09	1389	7.63E+07	6.54E+08	8.79E+07	1439	1.37E+05	5.43E+04	7.66E+05	1489	1.55E+09	6.69E+08	2.42E+09
1240	1.66E+08	9.63E+08	2.06E+08	1290	4.53E+08	6.74E+08	1.19E+09	1340	1.63E+09	5.32E+08	2.99E+09	1390	4.63E+06	6.30E+06	8.78E+07	1440	5.51E+08	2.33E+09	6.11E+08	1490	4.35E+05	6.78E+04	3.03E+06
1241	1.02E+09	3.03E+09	1.32E+09	1291	3.32E+06	7.64E+06	7.52E+07	1341	9.28E+09	3.73E+09	1.08E+10	1391	2.81E+08	5.66E+08	7.08E+08	1441	8.06E+06	7.67E+07	1.38E+07	1491	5.45E+03	1.08E+04	4.80E+05
1242	2.49E+06	1.67E+07	1.50E+07	1292	3.13E+03	1.01E+03	1.45E+05	1342	4.80E+06	3.99E+07	5.89E+06	1392	3.88E+08	6.83E+08	1.01E+09	1442	4.55E+06	1.70E+07	8.78E+07	1492	5.73E+09	4.35E+09	8.02E+09
1243	3.89E+07	5.04E+08	5.14E+07	1293	2.75E+08	4.71E+08	7.08E+08	1343	4.14E+06	4.69E+06	4.35E+07	1393	1.78E+02	3.28E+02	5.40E+04	1443	1.61E+07	3.96E+08	1.14E+07	1493	6.72E+05	6.67E+06	6.57E+05
1244	7.36E+08	7.27E+08	2.14E+09	1294	4.20E+02	2.00E+03	2.98E+05	1344	2.40E+06	2.39E+07	3.04E+06	1394	5.67E+01	3.35E+01	6.91E+03	1444	3.82E+10	1.81E+10	3.60E+10	1494	4.32E+07	1.23E+08	3.73E+07
1245	2.28E+08	6.33E+08	5.36E+08	1295	1.10E+10	7.57E+09	1.55E+10	1345	7.77E+06	4.54E+07	1.33E+07	1395	3.85E+07	1.27E+08	1.55E+08	1445	1.03E+09	1.27E+09	1.92E+09	1495	2.83E+05	5.06E+04	1.85E+06
1246	4.39E+05	8.71E+05	4.35E+06	1296	1.33E+02	1.87E+02	5.27E+04	1346	4.29E+04	1.25E+05	2.53E+05	1396	1.28E+07	2.24E+08	1.40E+07	1446	7.65E+06	1.22E+07	5.16E+07	1496	9.72E+07	1.01E+08	1.55E+08
1247	2.46E+02	6.46E+02	2.22E+05	1297	5.88E+07	4.77E+08	1.06E+08	1347	3.38E+00	1.52E+00	2.00E+03	1397	7.94E+02	1.58E+02	3.03E+04	1447	1.17E+08	9.32E+08	1.02E+08	1497	9.02E+07	9.87E+07	1.42E+08
1248	1.23E+08	3.25E+08	3.54E+08	1298	1.06E+08	4.47E+08	2.78E+08	1348	4.44E+07	2.09E+08	6.18E+07	1398	9.36E+06	4.80E+07	2.90E+07	1448	9.83E+00	4.82E+00	1.45E+03	1498	1.80E+03	1.47E+02	1.69E+04
1249	1.17E+09	1.01E+09	2.83E+09	1299	6.84E+08	5.73E+08	1.61E+09	1349	5.63E+07	3.44E+07	1.98E+08	1399	4.89E+02	1.50E+03	1.28E+05	1449	1.04E+08	8.29E+08	1.29E+08	1499	4.85E+06	4.36E+07	2.80E+06
1250	7.74E+08	6.28E+08	2.10E+09	1300	1.09E+08	1.54E+08	4.83E+08	1350	1.53E+05	5.17E+04	8.98E+05	1400	3.78E+02	3.98E+02	4.95E+04	1450	1.01E+06	9.93E+05	1.43E+07	1500	2.88E+07	6.81E+07	3.64E+07

Table F-3 Natural gas loss in USD for each cluster map

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
1	1.81E-02	8.44E-03	4.45E-02	51	8.82E-01	2.45E+02	1.93E+00	101	6.21E-02	3.09E-02	1.39E-01	151	2.31E-04	3.16E-04	1.68E-03	201	3.02E+00	8.07E-01	2.32E+02	251	2.19E+02	1.73E+01	3.27E+03
2	9.74E-03	5.21E-03	6.25E-02	52	5.19E-01	2.43E+03	4.49E-01	102	1.09E-02	1.25E-02	8.16E-02	152	3.75E-01	1.30E+00	3.58E-01	202	1.32E+07	3.99E+05	1.59E+07	252	1.09E+00	2.88E+01	8.59E-01
3	3.21E-03	2.31E-03	2.91E-02	53	1.09E-01	1.41E-01	2.41E-01	103	1.55E+00	4.35E+02	1.18E+00	153	2.84E-01	4.73E-01	3.06E-01	203	1.25E+03	8.17E+01	7.39E+03	253	1.34E+01	2.64E+01	2.83E+01
4	2.09E-03	1.12E-03	1.41E-02	54	8.92E-01	1.36E+02	1.95E+00	104	2.56E+00	3.16E+02	1.79E+00	154	2.46E-01	3.59E-01	2.91E-01	204	1.08E+04	3.27E+02	7.31E+04	254	4.73E+00	3.27E+01	4.40E+00
5	2.76E-01	2.04E+01	2.68E+01	55	1.36E+00	2.43E+03	1.73E+00	105	1.09E-01	1.18E-01	3.84E-01	155	1.59E+04	2.80E+02	6.98E+04	205	2.28E+04	9.44E+02	1.35E+05	255	1.36E+02	2.82E+01	1.04E+02
6	1.37E-01	5.19E-02	4.63E-01	56	2.27E+01	5.85E+02	2.07E+02	106	2.25E+00	1.57E+02	2.86E+00	156	3.84E+05	5.28E+03	1.13E+06	206	4.90E+02	2.93E+02	1.06E+03	256	1.16E-03	6.02E-03	1.32E-02
7	2.36E-03	1.40E-03	2.39E-02	57	6.41E+00	2.08E+03	7.94E+00	107	1.20E+01	8.29E+02	3.67E+01	157	9.39E+01	1.94E+02	4.68E+01	207	1.11E+00	2.81E+01	7.03E-01	257	1.89E+02	2.80E+01	4.61E+03
8	3.06E+01	1.36E+04	9.18E+00	58	7.74E-02	7.95E+00	9.29E-02	108	1.09E-01	1.89E-01	1.40E-01	158	2.17E+00	8.73E+00	2.07E+00	208	3.13E-04	1.68E-04	2.60E-03	258	4.67E+00	4.38E+00	1.04E+03
9	1.23E-02	5.60E-03	4.66E-02	59	2.69E+03	1.96E+04	1.12E+04	109	2.75E+01	1.77E+03	2.79E+02	159	1.60E+02	8.47E+02	8.14E+00	209	5.28E-04	3.30E-04	4.91E-03	259	5.38E+04	1.09E+02	3.60E+05
10	2.23E+00	1.28E+03	1.57E+00	60	3.32E+01	4.54E+03	1.28E+02	110	1.35E+00	8.93E+01	9.62E-01	160	1.89E+01	3.09E+01	1.84E+01	210	2.52E+00	2.80E+01	1.99E+00	260	1.61E+03	4.36E+01	6.13E+03
11	5.56E+00	8.83E+02	3.82E+00	61	1.18E+00	1.73E+03	8.45E-01	111	6.61E+00	1.37E+02	1.12E+01	161	3.64E+03	2.67E+03	2.44E+02	211	1.01E+01	3.22E+01	5.73E+00	261	6.26E+01	6.89E+01	9.67E+00
12	1.22E+01	4.08E+02	8.40E+00	62	2.78E-01	9.80E+02	2.24E-01	112	2.82E+03	2.66E+04	3.81E+04	162	1.94E+02	2.77E+01	6.07E+02	212	1.01E-01	9.12E-02	1.67E-01	262	1.16E-03	3.98E-03	1.42E-02
13	1.93E-03	1.19E-03	1.43E-02	63	6.17E-01	2.04E+03	5.14E-01	113	3.14E-01	2.65E-01	1.16E+00	163	1.05E+04	8.63E+02	1.63E+04	213	5.42E+01	8.41E+00	4.77E+02	263	4.56E-04	3.19E-03	4.98E-03
14	1.36E+00	5.27E+00	2.18E+01	64	7.41E-02	8.81E+00	7.40E-02	114	3.13E+01	4.18E+02	4.80E+01	164	1.53E+02	9.65E+01	1.06E+02	214	8.22E-04	9.90E-04	2.69E-03	264	3.27E+00	2.67E+01	3.74E+00
15	1.41E-02	6.62E-03	1.19E-01	65	5.84E-01	9.96E+02	5.31E-01	115	1.18E-01	4.51E-02	2.91E-01	165	4.48E+02	6.13E+02	7.87E+01	215	3.62E-01	4.66E+01	1.97E-01	265	2.73E-02	4.96E-02	1.11E-01
16	2.25E+00	3.74E+03	1.78E+00	66	8.17E-02	2.58E-02	2.57E-01	116	3.52E+00	2.41E+02	4.14E+00	166	5.99E-02	1.56E-02	7.90E-02	216	5.79E-05	7.37E-05	5.53E-04	266	1.17E+04	2.18E+02	1.33E+05
17	3.69E-02	1.91E-02	8.92E-02	67	2.20E-01	3.97E-01	2.96E-01	117	4.97E-01	1.36E+01	3.38E-01	167	1.68E-03	6.21E-04	1.36E-02	217	1.30E+01	3.41E+02	3.03E+01	267	3.30E+01	3.11E+01	3.07E+01
18	2.28E-01	3.04E+02	2.33E-01	68	3.08E+04	7.31E+04	2.58E+05	118	1.30E+01	2.12E+03	6.01E+00	168	8.05E-02	3.61E-02	5.12E-01	218	2.60E-03	3.15E-03	8.64E-03	268	5.63E-03	2.17E-02	5.76E-02
19	3.46E-04	4.89E-04	3.52E-03	69	2.47E-02	8.97E-03	1.46E-01	119	5.70E+00	5.93E+02	3.25E+00	169	9.32E+00	7.40E+01	3.79E+00	219	6.53E+00	2.81E+03	2.58E+00	269	2.98E-03	7.19E-03	2.08E-02
20	3.24E+06	1.06E+06	5.17E+06	70	5.43E+00	4.83E+02	3.06E+00	120	6.96E-01	2.03E+00	1.20E+00	170	8.08E-02	2.47E-02	3.40E-01	220	4.50E+02	3.34E+03	6.97E+02	270	8.38E-01	1.33E+01	1.95E+00
21	3.75E+03	1.47E+04	2.98E+04	71	7.20E+01	1.01E+04	4.20E+01	121	1.30E+00	7.77E+01	7.31E-01	171	1.58E+00	2.07E+01	1.22E+00	221	2.62E+01	3.08E+03	7.03E+00	271	3.17E-01	8.63E-01	8.60E+00
22	4.10E+00	3.53E+03	4.08E+00	72	1.46E+03	1.58E+04	9.17E+03	122	3.74E+00	3.43E+02	3.03E+00	172	3.37E+00	8.22E+00	3.72E+00	222	5.90E+01	2.27E+03	3.68E+01	272	4.75E+03	5.06E+02	4.41E+04
23	6.25E-04	6.85E-04	8.68E-03	73	9.52E+00	3.66E+02	1.23E+01	123	1.58E+00	1.20E+02	1.36E+00	173	3.63E+01	4.65E+01	2.00E+01	223	1.96E-04	4.08E-04	1.45E-03	273	7.77E+03	9.17E+01	1.03E+05
24	1.64E+02	2.30E+04	2.04E+01	74	3.48E-03	9.93E-04	1.35E-02	124	4.90E+00	1.47E+02	5.45E+00	174	1.20E+01	1.10E+02	4.99E+00	224	2.50E-01	1.84E+01	1.79E-01	274	8.63E-02	3.25E-01	7.58E-01
25	1.20E+00	3.60E+03	9.43E-01	75	5.73E-01	3.66E+00	3.80E+00	125	1.07E-02	3.23E-03	2.91E-02	175	1.91E+00	5.68E+01	1.22E+00	225	7.61E-01	8.87E+01	4.78E-01	275	6.82E+03	2.34E+02	9.85E+03
26	9.58E-03	8.85E-03	8.72E-02	76	3.89E-01	1.63E-01	1.20E+00	126	6.09E-04	3.93E-04	4.61E-03	176	1.16E-02	3.48E-03	4.49E-02	226	9.91E-01	3.58E+02	8.27E-01	276	1.23E+05	3.27E+02	4.44E+05
27	8.77E+00	1.62E+03	1.51E+01	77	2.52E-03	1.54E-03	1.67E-02	127	1.25E+00	1.06E+02	1.01E+00	177	8.90E+02	5.27E+02	5.12E+01	227	7.58E-02	5.11E+00	5.76E-02	277	3.74E+01	3.22E+01	4.55E+01
28	1.18E+02	1.52E+03	1.91E+03	78	3.11E-02	7.30E-03	5.48E-02	128	1.39E+00	1.97E+02	8.50E-01	178	8.81E-01	8.55E+00	5.95E-01	228	1.86E-03	1.91E-03	2.26E-02	278	9.21E+00	3.76E+01	5.81E+00
29	7.45E-02	8.64E-02	5.33E-01	79	5.88E+06	1.31E+06	8.36E+06	129	5.69E-01	4.77E+01	3.37E-01	179	1.22E+00	8.82E-01	3.76E+00	229	3.22E-02	1.79E-01	5.39E-02	279	1.19E-03	2.99E-03	1.08E-02
30	5.67E-01	6.12E+00	1.81E+00	80	2.27E+01	1.07E+03	1.26E+02	130	2.74E+00	4.52E+02	1.76E+00	180	1.05E-03	6.71E-04	6.93E-03	230	7.45E-03	3.82E-03	1.81E-02	280	1.30E+01	2.05E+01	4.74E+01
31	1.16E+00	2.24E+02	3.22E+00	81	3.98E-01	5.90E+00	4.75E-01	131	1.83E-02	7.07E-03	3.06E-02	181	2.00E+00	2.01E+01	1.30E+00	231	9.14E-03	3.49E-03	2.88E-02	281	4.19E-01	5.73E+00	7.43E-01
32	2.24E-03	2.89E-03	4.19E-02	82	1.52E+02	2.73E+03	1.17E+03	132	2.05E+00	3.28E+02	1.20E+00	182	2.52E-03	7.45E-04	1.63E-02	232	4.72E-02	7.14E-02	1.63E-01	282	8.59E-02	1.73E-01	5.30E-01
33	4.27E-01	3.46E+02	5.68E-01	83	3.93E-01	3.47E-01	1.09E+00	133	1.20E-01	9.85E-02	5.66E-01	183	5.00E-03	1.81E-03	1.17E-02	233	1.32E-01	1.31E+00	1.24E-01	283	9.83E-03	6.75E-02	1.96E-01
34	1.08E-02	6.53E-03	5.42E-02	84	3.23E+00	1.22E+02	5.34E+00	134	1.39E+00	6.88E+01	1.35E+00	184	8.49E+00	3.07E+01	7.66E+00	234	4.56E-01	5.87E+01	3.10E-01	284	3.46E+02	4.12E+01	1.59E+03
35	5.94E-01	7.33E+02	6.91E-01	85	3.30E-02	4.56E-02	2.85E-01	135	1.89E-03	2.18E-03	5.35E-03	185	3.44E-04	1.29E-04	2.71E-03	235	2.09E-01	1.56E+02	1.16E-01	285	3.97E-02	1.03E-01	2.30E-01
36	1.46E+00	1.21E+03	1.51E+00	86	2.92E-01	1.10E+00	4.45E-01	136	1.03E-02	9.13E-03	1.51E-02	186	5.24E-04	2.87E-04	5.47E-03	236	6.62E+00	2.33E+01	4.81E+00	286	2.76E-02	7.89E-02	1.18E-01
37	2.57E+00	2.21E+03	3.70E+00	87	8.06E-01	2.13E+00	2.91E+00	137	5.80E-03	2.17E-02	5.89E-02	187	2.86E+05	1.20E+04	1.86E+05	237	1.28E-02	1.85E-02	8.38E-02	287	1.03E-01	7.80E-01	1.63E-01
38	1.85E+00	3.79E+03	1.60E+00	88	5.74E-03	4.43E-03	4.29E-02	138	2.14E+00	1.09E+01	2.56E+00	188	4.07E+05	4.77E+03	8.73E+05	238	4.27E+03	2.09E+01	1.20E+04	288	1.19E+00	2.75E+01	1.33E+00
39	2.47E-02	3.25E-02	2.69E-01	89	1.14E-02	1.56E-02	1.20E-01	139	2.04E+01	2.61E+02	3.92E+01	189	5.57E-01	1.12E+00	7.91E-01	239	8.59E+04	3.62E+02	5.78E+05	289	1.56E-01	2.01E+00	3.00E-01
40	2.38E+01	3.02E+03	4.53E+01	90	3.10E+00	2.11E+02	3.68E+00	140	2.92E+05	1.16E+05	3.61E+05	190	1.26E-01	7.99E-02	3.35E-01	240	2.25E+06	5.36E+03	5.51E+06	290	3.10E-02	1.18E-01	3.58E-01
41	1.10E+01	1.56E+03	1.72E+01	91	8.63E-04	5.99E-04	7.28E-03	141	2.98E+01	1.12E+02	8.07E+01	191	1.55E-01	1.25E-01	6.24E+00	241	1.42E-01	3.59E-01	4.04E+00	291	1.75E+00	6.91E+00	5.98E+00
42	2.89E+00	1.65E+03	3.37E+00	92	1.04E-01	3.01E-01	9.49E-01	142	5.81E-01	1.22E+01	3.03E-01	192	6.18E+01	2.08E+01	1.55E+02	242	1.04E+04	5.60E+01	9.13E+04	292	3.49E-01	1.43E+00	9.39E-01
43	1.14E-02	1.77E-02	1.96E-01	93	1.09E+00	1.00E+02	6.67E-01	143	6.46E-04	1.15E-03	3.25E-03	193	5.13E+04	6.73E+02	2.34E+05	243	3.09E+04	1.49E+01	1.11E+05	293	2.29E+00	2.47E+01	1.89E+00
44	4.73E-01	2.55E+01	1.06E+00	94	4.07E-03	2.97E-03	3.32E-02	144	2.74E-03	2.95E-03	2.04E-02	194	1.15E-02	8.25E-03	1.13E-01	244	1.74E+01	2.32E+01	5.97E+00	294	5.21E-04	3.96E-03	6.23E-03
45	8.71E-02	1.64E-01	2.42E-01	95	2.67E-02	1.25E-02	8.43E-02	145	4.45E-01	8.23E+00	2.91E-01	195	4.01E+00	1.57E+00	5.54E+01	245	3.76E-03	3.17E-03	3.12E-02	295	1.07E-01	9.96E-02	2.04E-01
46	2.76E-01	5.87E-01	1.57E+00	96	3.22E-02	1.98E-02	1.20E-01	146	2.15E-02	1.29E-02	4.59E-02	196	2.95E+00	1.08E+01	3.25E+00	246	8.62E+03	9.96E+01	4.06E+02	296	2.03E+00	4.14E+00	8.37E+01
47	1.39E+02	4.13E+03	2.13E+02	97	7.17E-02	2.29E-01	6.72E-01	147	5.90E-03	7.99E-03	1.31E-02	197	1.66E-03	5.27E-04	9.19E-03	247	3.20E+04	6.69E+01	5.60E+04	297	6.65E+02	1.09E+02	6.67E+02
48	6.16E+00	9.74E+03	4.28E+00	98	2.62E+01	1.13E+04	2.87E+01	148	1.39E-01	3.71E+00	9.05E-02	198	2.28E-02	8.55E-03	7.87E-02	248	7.84E+03	3.84E+01	5.84E+04	298	1.64E+00	3.06E+01	1.33E+00
49	2.60E+05	1.76E+05	8.89E+05	99	2.24E-01	3.71E+00	2.09E-01	149	8.00E+00	1.34E+02	8.89E+00	199	1.01E+02	1.18E+00	2.09E+03	249	2.69E-01	1.26E-01	7.70E-01	299	9.08E-03	5.19E-02	1.33E-01
50	2.51E+00	2.66E+03	2.61E+00	100	5.99E+00	5.75E+02	4.63E+00	150	3.75E-02	3.28E-01	4.85E-02	200	6.23E+02	2.44E+01	2.86E+03	250	9.01E-01	3.33E+00	2.21E+00	300	4.33E-03	1.32E-02	5.47E-02

Table F-3 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
301	2.03E-01	5.86E-01	8.49E-01	351	2.81E-01	4.45E-01	9.45E-01	401	2.20E+01	2.57E+02	6.48E+01	451	1.43E+05	2.54E+01	1.08E+05	501	1.18E+02	3.61E+01	4.81E+04	551	9.15E-01	1.74E+01	6.89E-01
302	1.91E-02	2.56E-02	6.41E-02	352	3.98E-02	2.11E-02	2.96E-01	402	1.16E-02	1.35E-02	2.10E-01	452	4.19E-01	5.28E-01	1.89E+00	502	5.20E-02	1.35E+00	1.13E-01	552	3.22E+00	8.22E+00	6.06E+00
303	4.27E-02	6.21E-01	6.40E-02	353	2.73E+00	9.21E+01	5.92E+00	403	3.57E+03	3.72E+04	7.37E+04	453	2.11E+00	1.80E+00	2.98E+00	503	6.90E-02	2.47E-01	3.81E-01	553	3.02E+00	3.78E+01	2.43E+00
304	1.72E-01	5.04E+00	2.54E-01	354	7.85E-04	4.72E-04	1.12E-02	404	1.97E+01	1.01E+03	1.92E+02	454	4.66E-01	2.04E+00	8.73E-01	504	7.63E+00	4.36E+01	4.46E+02	554	4.17E+00	9.46E+00	7.46E+00
305	3.14E-04	1.21E-03	2.93E-03	355	2.73E+03	3.25E+03	1.49E+05	405	2.31E-01	2.72E-01	1.34E+00	455	8.75E-01	1.31E+00	8.93E-01	505	7.43E-01	2.96E+01	7.87E-01	555	8.92E-03	2.21E-03	5.83E-02
306	1.36E+06	3.92E+03	1.88E+06	356	1.09E-01	1.27E-01	3.25E-01	406	8.45E+00	3.18E+01	1.86E+01	456	3.69E+00	1.37E+00	4.24E+00	506	5.45E-03	1.02E-01	1.22E-01	556	6.36E-02	1.89E-02	2.40E-01
307	1.19E-01	1.09E+00	1.29E+01	357	2.43E+01	1.96E+03	1.98E+01	407	1.32E-02	6.00E-03	8.88E-02	457	9.99E-01	1.59E+00	1.46E+00	507	2.91E+00	4.84E+01	1.62E+01	557	2.10E-01	6.74E-01	3.29E-01
308	5.63E-03	1.30E-02	2.72E-02	358	2.80E+00	1.70E+02	4.54E+00	408	8.42E-01	8.64E+01	1.11E+00	458	6.65E-03	8.76E-04	3.06E-02	508	8.33E+01	3.36E+01	1.99E+04	558	4.04E+00	4.70E+00	1.40E+01
309	2.27E+00	2.12E+01	2.11E+00	359	3.05E+01	2.06E+02	1.20E+03	409	1.57E+01	1.19E+03	1.45E+01	459	2.22E+00	1.60E+00	5.03E+00	509	8.69E-02	8.63E+00	1.29E-01	559	7.36E+00	3.46E+01	1.46E+01
310	1.36E-01	2.35E+00	2.50E-01	360	2.76E+02	4.81E+02	2.77E+04	410	8.80E+01	3.43E+02	2.76E+02	460	1.45E-02	4.40E-03	3.09E-02	510	1.29E+01	5.76E+01	7.69E+02	560	3.93E+01	8.34E+01	1.79E+03
311	9.02E-02	2.18E+00	1.33E-01	361	7.40E-02	1.78E-01	1.79E-01	411	5.45E+00	1.05E+02	1.33E+01	461	4.40E-03	2.64E-03	4.88E-02	511	5.38E+03	5.15E+02	2.91E+05	561	4.07E+02	3.28E+02	9.19E+03
312	4.46E-02	1.55E-01	3.82E-01	362	7.89E+00	1.77E+02	7.95E+01	412	3.60E-01	3.39E-01	2.32E+00	462	3.74E-01	5.75E-01	4.56E-01	512	5.86E-02	9.58E-01	4.41E+01	562	1.27E+00	8.02E-01	7.66E+00
313	4.05E+02	3.83E+01	3.48E+03	363	2.95E-03	2.95E-03	7.56E-02	413	6.42E-02	5.43E-02	5.54E-01	463	1.45E-01	1.93E-01	4.47E-01	513	8.12E+02	9.45E+01	3.36E+04	563	7.19E+00	1.73E+01	1.14E+01
314	2.97E-04	6.78E-04	2.92E-03	364	1.36E-02	6.42E-03	1.14E-01	414	8.86E-02	7.16E-02	3.70E-01	464	3.39E-01	1.84E+00	1.80E+02	514	1.43E-02	6.37E-02	6.30E-02	564	1.26E+00	1.38E+01	1.15E+00
315	4.79E-01	1.13E+01	3.95E-01	365	8.06E-04	6.09E-04	1.33E-02	415	7.06E-01	2.82E+01	8.15E-01	465	1.60E+04	1.02E+03	6.51E+05	515	1.80E+01	5.65E+01	7.49E+02	565	3.90E-04	1.89E-04	4.51E-03
316	1.35E-02	1.90E-02	7.36E-02	366	1.16E+00	7.35E+01	1.77E+00	416	2.99E+00	6.21E+01	7.27E+00	466	3.34E+06	1.44E+05	1.19E+07	516	1.27E+00	6.29E+01	1.79E+00	566	1.41E-01	8.68E-02	5.35E-01
317	2.69E-01	8.94E+00	3.77E-01	367	2.86E-03	1.51E-03	2.82E-02	417	1.43E-02	9.17E-03	1.19E-01	467	1.35E-02	1.14E-01	4.49E-01	517	1.33E-03	6.12E-03	1.34E-02	567	1.11E-02	8.48E-03	2.04E-01
318	7.17E-04	2.02E-03	6.01E-03	368	5.97E-01	3.66E-01	2.84E+01	418	2.44E-01	1.33E+00	3.61E+00	468	2.83E-02	1.42E-01	2.46E-01	518	1.87E-03	9.00E-03	9.24E-03	568	8.16E-03	3.34E-03	7.36E-02
319	2.47E-03	7.36E-03	2.49E-02	369	3.52E+05	1.06E+05	3.88E+06	419	3.31E+02	2.37E+03	3.86E+03	469	5.33E+00	6.49E+01	3.30E+00	519	3.85E-01	3.20E+01	3.53E-01	569	3.27E+03	2.97E+02	4.39E+04
320	1.36E-02	4.24E-02	1.33E-01	370	1.35E-01	1.49E-01	2.35E+00	420	4.41E-02	1.16E-01	9.06E-01	470	1.27E-03	4.94E-03	1.22E-02	520	1.08E-02	6.72E-02	7.26E-02	570	7.21E+01	3.44E+01	1.16E+03
321	2.35E+02	2.26E+01	1.72E+03	371	6.12E-03	3.56E-03	5.65E-02	421	9.88E+00	2.15E+03	7.83E+00	471	1.29E+02	6.10E+02	7.52E+01	521	6.13E-03	2.69E-02	2.74E-02	571	1.71E-03	1.00E-03	2.87E-02
322	1.40E+02	6.55E+02	8.09E+03	372	1.43E+00	1.51E+02	1.63E+00	422	2.24E-01	1.59E+00	4.90E-01	472	8.71E-01	4.23E+01	8.41E-01	522	4.10E-01	8.60E+00	1.80E+00	572	1.05E-02	3.69E-03	7.32E-02
323	3.40E+07	7.19E+06	4.41E+07	373	1.29E+01	4.21E+03	9.21E+00	423	4.55E-01	5.55E-01	3.55E+00	473	1.31E-01	4.99E+00	2.32E-01	523	7.43E+00	4.81E+01	5.96E+01	573	2.05E+00	7.81E+00	3.05E+00
324	2.84E-01	5.89E-01	7.94E+01	374	6.90E-03	4.48E-03	8.30E-02	424	4.21E+03	1.53E+04	4.51E+04	474	2.90E+02	1.86E+02	7.91E+03	524	1.60E+00	7.26E+01	1.78E+00	574	7.50E-01	1.17E+01	6.75E-01
325	3.26E+04	1.95E+04	9.28E+05	375	2.09E+00	2.61E+02	2.29E+00	425	6.69E-02	1.09E-01	2.17E-01	475	3.02E-04	1.67E-03	3.54E-03	525	1.31E-03	9.38E-03	5.46E-03	575	7.13E-01	2.67E+00	1.10E+00
326	3.50E-02	2.10E-02	4.35E-01	376	5.59E+00	3.29E+02	7.42E+00	426	9.61E-01	1.20E+01	1.26E+00	476	2.02E-02	9.24E-02	4.89E-02	526	6.64E-05	5.43E-04	7.75E-04	576	5.67E+00	4.20E+00	2.15E+01
327	1.14E+02	6.24E+02	1.07E+04	377	2.42E+00	9.18E+01	4.99E+00	427	6.02E-03	5.84E-03	7.96E-02	477	1.71E-01	1.32E+01	2.78E-01	527	9.54E-02	9.15E-01	5.07E+00	577	5.70E+00	2.47E+01	6.99E+00
328	2.38E+00	3.18E+02	2.56E+00	378	2.00E+01	2.95E+02	2.13E+02	428	9.10E+00	4.58E+01	2.65E+01	478	3.47E+05	1.00E+04	2.59E+06	528	7.25E-01	5.47E+01	7.02E-01	578	1.84E-01	1.16E-01	1.30E+00
329	1.58E+02	8.73E+02	4.27E+03	379	2.78E-04	2.60E-04	4.13E-03	429	4.73E+00	4.28E+01	1.12E+01	479	5.69E+05	2.30E+06	2.06E+06	529	2.53E+00	5.56E+01	3.87E+00	579	4.03E-01	1.40E-01	1.60E+00
330	2.20E-02	5.25E-03	1.34E-01	380	4.39E-01	1.14E+00	1.16E+02	430	2.56E-04	9.53E-05	3.58E-03	480	3.75E+00	4.34E+00	1.93E+03	530	3.34E+00	7.36E+01	7.78E+00	580	1.70E+00	2.67E+01	1.40E+00
331	4.17E-01	6.91E-01	1.43E+00	381	6.53E-03	2.82E-03	5.12E-02	431	9.76E-04	7.31E-04	1.20E-02	481	7.59E+00	3.71E+01	1.17E+02	531	2.14E+00	1.69E+02	1.76E+00	581	3.34E+00	3.90E+01	2.91E+00
332	1.63E+00	2.96E+02	1.56E+00	382	1.12E+06	2.58E+05	6.65E+06	432	2.11E+00	4.45E+01	4.56E+00	482	7.27E+02	8.85E+01	2.70E+04	532	6.12E-02	9.50E+00	7.37E-02	582	1.54E+01	7.17E+02	9.88E+00
333	7.54E-03	2.37E-03	5.91E-02	383	5.17E-03	8.06E-03	9.91E-02	433	3.73E-02	2.37E-02	2.54E-01	483	4.07E-03	2.28E-02	4.52E-02	533	1.04E+00	2.48E+01	3.97E+00	583	3.85E+02	7.99E+02	1.87E+03
334	1.32E-02	1.55E-02	3.21E-01	384	8.46E+00	6.22E+02	1.28E+01	434	2.60E+00	5.65E+01	4.05E+00	484	4.11E+03	6.04E+02	5.64E+04	534	9.99E-03	3.75E-01	2.11E-02	584	8.87E-01	1.20E+01	8.74E-01
335	2.13E-03	6.28E-04	2.68E-02	385	7.50E-01	1.01E+02	9.12E-01	435	7.58E-01	3.08E+01	1.24E+00	485	1.40E-02	4.19E-02	4.10E-02	535	1.11E+00	2.97E+01	2.78E+00	585	2.43E+00	1.17E+01	2.56E+00
336	2.31E-01	7.14E-01	6.10E-01	386	1.70E-03	1.13E-03	2.20E-02	436	6.94E-02	1.58E-01	1.59E-01	486	7.10E-01	2.23E+01	1.12E+00	536	3.75E-02	6.20E-03	1.33E-01	586	8.06E-03	2.14E-03	4.29E-02
337	2.08E+03	1.33E+03	1.05E+05	387	4.22E+00	1.20E+02	1.14E+01	437	1.04E+01	3.10E+01	2.57E+01	487	2.28E-03	1.38E-02	3.12E-02	537	2.04E+00	7.01E+00	3.26E+00	587	1.00E+00	1.38E+00	2.58E+00
338	7.45E+04	2.41E+04	1.52E+06	388	9.62E-04	7.46E-04	5.90E-03	438	3.01E+02	3.43E+03	5.14E+03	488	2.37E+00	3.59E+01	3.80E+00	538	4.47E-01	7.64E+00	4.10E-01	588	8.23E-01	1.24E+00	1.77E+00
339	6.83E-01	1.99E+00	2.15E+00	389	3.54E-01	2.89E-01	2.38E+00	439	4.03E+00	3.15E+01	7.33E+00	489	3.75E-01	2.68E+01	4.24E-01	539	1.62E+01	3.13E+01	5.13E+01	589	2.23E-01	1.40E-01	1.03E+00
340	6.22E+00	1.20E+03	5.45E+00	390	1.35E-02	7.98E-03	4.27E-02	440	2.49E+00	1.02E+02	3.30E+00	490	2.95E-02	1.98E-01	2.77E-01	540	4.94E+03	1.84E+03	1.02E+05	590	3.30E+00	1.25E+01	4.28E+00
341	1.64E+02	4.11E+03	1.90E+02	391	2.29E+00	1.07E+02	2.83E+01	441	2.62E+00	6.33E+01	4.48E+00	491	1.02E+00	1.13E+01	1.25E+02	541	3.42E+01	2.76E+02	5.33E+01	591	3.90E+00	1.02E+01	8.14E+00
342	4.48E+00	2.47E+01	5.02E+02	392	6.65E+05	7.38E+05	2.00E+06	442	2.19E-01	2.11E+00	3.48E-01	492	1.53E-01	2.06E+00	5.77E-01	542	4.51E+05	4.70E+04	1.96E+06	592	1.07E+01	1.76E+01	1.39E+02
343	1.01E+03	2.93E+03	2.71E+04	393	1.60E+01	1.77E+03	2.18E+01	443	1.43E+00	7.31E+00	4.85E+00	493	5.64E-04	4.87E-03	7.74E-03	543	1.20E+01	4.31E+01	1.90E+01	593	2.18E-03	7.31E-04	1.72E-02
344	2.90E-01	2.23E+01	4.06E-01	394	4.03E+01	2.53E+03	5.07E+01	444	3.16E+01	1.78E+02	1.91E+02	494	9.94E-01	2.58E+01	1.69E+00	544	7.53E-02	6.87E-02	1.00E+00	594	3.93E-02	1.56E-02	7.25E-02
345	3.58E+00	2.12E+02	5.09E+00	395	2.88E+01	2.99E+03	3.60E+01	445	1.11E+00	9.36E+00	2.04E+00	495	2.07E+01	4.34E+01	5.95E+02	545	2.72E+04	2.34E+04	3.59E+05	595	7.02E-04	2.90E-04	7.80E-03
346	5.89E+00	1.89E+02	1.11E+01	396	3.40E+00	6.65E+02	3.52E+00	446	1.89E-03	1.89E-03	3.18E-02	496	1.14E-03	1.24E-02	2.41E-02	546	2.54E-03	9.60E-04	3.41E-02	596	2.93E+01	1.28E+02	5.84E+01
347	8.20E-02	3.92E-02	3.82E-01	397	6.82E+00	5.52E+02	1.04E+01	447	1.25E+00	1.85E+00	7.12E+00	497	8.72E+00	8.63E+01	1.21E+01	547	6.81E-02	1.38E-02	2.96E-01	597	1.27E+00	7.42E+00	1.77E+00
348	2.24E+00	6.97E+01	4.26E+00	398	1.10E+00	1.53E+02	1.05E+00	448	1.08E-03	7.16E-04	1.38E-02	498	3.31E+01	1.36E+03	6.89E+00	548	6.19E+00	3.47E+01	7.08E+00	598	6.74E-03	1.67E-03	2.76E-02
349	7.51E-02	5.54E-02	9.11E-01	399	1.97E-02	2.59E-02	3.32E-01	449	9.22E-03	2.89E-03	3.91E-02	499	2.31E-02	9.63E-02	1.15E-01	549	4.43E+00	4.51E+01	3.80E+00	599	6.61E+00	5.02E+02	4.15E+00
350	9.87E+00	1.78E+02	1.47E+02	400	9.23E-01	1.10E+00	5.11E+00	450	2.65E-02	4.25E-02	5.25E-01	500	1.17E+04	8.62E+02	5.73E+05	550	9.79E+00	5.51E+01	1.23E+01	600	4.37E+00	5.62E+01	4.35E+00

Table F-3 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
601	1.46E+00	1.21E+01	1.83E+00	651	1.85E-01	8.10E-02	6.37E-01	701	5.94E+00	2.47E+02	7.05E+00	751	3.06E-05	1.25E-05	4.65E-04	801	5.39E+04	1.98E+05	1.70E+06	851	1.79E+00	4.68E+00	9.72E+00
602	2.46E-01	4.19E+00	2.27E-01	652	2.32E+00	6.51E+00	4.48E+00	702	9.62E+00	2.51E+02	1.58E+01	752	1.83E-01	7.49E-01	1.65E-01	802	7.94E+02	1.20E+04	1.11E+05	852	6.39E-03	1.25E-02	8.45E-02
603	1.09E-01	2.31E-01	1.91E-01	653	1.93E-03	1.18E-03	2.08E-02	703	3.20E-03	2.04E-03	1.90E-02	753	8.00E-01	4.80E+00	8.78E-01	803	1.96E+00	6.64E+02	1.34E+00	853	1.03E-01	2.92E-01	1.30E+00
604	1.11E+01	6.22E+01	1.50E+01	654	1.25E+01	6.90E+01	1.75E+01	704	2.42E+00	2.84E+01	5.05E+00	754	1.80E-03	3.56E-04	6.51E-03	804	4.66E+00	2.00E+03	6.90E+00	854	6.79E+00	1.74E+03	6.31E+00
605	1.29E+00	4.79E+00	1.93E+00	655	2.31E+01	6.82E+02	1.62E+01	705	5.26E-02	7.49E-02	4.01E-01	755	5.77E-02	3.65E-01	7.04E-02	805	1.11E+01	5.70E+03	6.33E+00	855	2.40E+00	1.77E+02	3.11E+00
606	1.33E+01	2.19E+01	4.14E+01	656	7.19E-03	3.39E-03	4.83E-02	706	1.22E-01	1.78E+00	2.04E-01	756	1.53E-01	4.84E-01	2.11E-01	806	1.65E+01	1.79E+04	1.78E+01	856	1.61E-03	1.64E-03	1.48E-02
607	1.82E-02	2.98E-02	2.88E-02	657	3.23E+00	2.04E+01	2.43E+00	707	8.00E+00	4.88E+03	4.18E+02	757	3.36E-04	1.09E-04	2.36E-03	807	3.25E-01	5.74E+00	3.70E-01	857	9.02E-02	2.65E-01	1.10E+00
608	2.60E-02	1.91E-02	2.10E-01	658	1.45E+00	9.59E+00	1.11E+00	708	1.66E-02	1.71E-02	1.28E-01	758	3.47E-04	2.09E-04	4.44E-03	808	2.22E+00	4.97E+02	1.69E+00	858	1.76E+01	7.55E+02	4.87E+01
609	7.72E-03	5.62E-03	1.11E-01	659	6.22E+00	1.02E+02	4.68E+00	709	3.02E-01	3.68E+00	4.56E-01	759	2.56E-01	6.67E-01	4.45E-01	809	8.19E-03	1.65E-02	1.02E-01	859	2.66E+01	6.30E+02	6.41E+02
610	1.60E+00	3.48E+00	3.70E+00	660	1.80E+00	1.21E+01	1.49E+00	710	2.25E+01	9.10E+01	2.15E+02	760	3.80E-01	1.60E+00	5.13E-01	810	1.67E+01	2.44E+03	4.57E+02	860	4.03E+00	6.99E+02	3.27E+00
611	4.44E-03	1.68E-03	2.15E-02	661	1.74E-02	2.01E-02	2.20E-01	711	2.72E+02	4.81E+02	5.89E+03	761	5.44E-03	3.92E-03	4.63E-02	811	1.28E-01	1.92E-01	8.25E-01	861	9.68E-01	6.30E+01	9.04E-01
612	1.27E+00	1.48E+01	1.89E+00	662	1.18E-02	2.00E-02	2.04E-01	712	1.47E-02	1.38E-02	5.44E-02	762	7.94E-02	3.76E-01	8.31E-02	812	5.60E-02	4.39E-02	2.28E-01	862	2.40E+01	6.97E+03	1.61E+01
613	9.35E-02	1.64E+00	9.76E-02	663	2.85E+01	6.54E+01	4.74E+02	713	2.22E-02	2.63E-02	1.88E-01	763	3.06E-02	1.17E-01	8.62E-02	813	4.23E+00	7.52E+02	4.50E+00	863	1.32E+01	2.35E+02	6.43E+01
614	6.00E-04	3.46E-04	3.67E-03	664	1.22E+03	1.63E+03	2.07E+04	714	1.50E-04	9.19E-05	1.67E-03	764	6.25E-02	3.15E-01	7.31E-02	814	5.42E-01	8.04E+01	5.48E-01	864	1.23E-02	9.86E-03	6.23E-02
615	9.18E-03	4.02E-03	5.21E-02	665	2.18E+05	1.51E+05	1.40E+06	715	5.80E-03	1.47E-02	1.22E-01	765	2.59E-03	3.21E-03	2.28E-02	815	3.84E+01	2.07E+03	6.01E+03	865	3.61E-04	2.62E-04	3.64E-03
616	4.31E-03	2.31E-03	1.49E-02	666	6.70E-02	5.43E-02	6.94E-01	716	1.87E+00	5.49E+00	6.20E+00	766	7.56E-03	4.36E-03	2.64E-02	816	9.61E+01	2.72E+03	1.37E+04	866	2.91E+01	8.06E+02	2.06E+02
617	3.45E+00	3.18E+01	4.02E+00	667	3.70E-03	9.72E-04	1.50E-02	717	8.64E-02	6.77E-01	1.67E-01	767	8.99E+02	3.99E+04	3.61E+04	817	3.45E+01	2.21E+03	4.76E+03	867	1.13E+00	5.39E+01	9.35E-01
618	3.94E-02	1.58E-02	2.27E-01	668	1.38E+00	1.50E+01	1.11E+00	718	8.66E-01	7.41E+00	1.49E+00	768	4.35E+03	3.47E+04	3.49E+05	818	1.46E+01	7.73E+03	1.40E+01	868	1.97E-02	2.23E-02	1.45E-01
619	5.65E-01	3.05E+00	4.95E-01	669	5.93E+00	4.35E+01	6.86E+00	719	1.09E-01	3.40E-01	3.61E-01	769	5.25E+02	2.47E+04	1.28E+05	819	7.79E+00	9.10E+02	5.03E+01	869	2.29E+00	2.54E+02	2.42E+00
620	1.33E+00	2.07E+01	1.51E+00	670	4.59E-02	1.46E-02	9.76E-02	720	3.11E-01	5.60E+00	4.00E-01	770	3.89E+06	2.97E+06	1.37E+07	820	2.54E+01	2.02E+04	1.22E+01	870	6.39E-01	1.92E+01	6.53E-01
621	2.92E+00	3.92E+00	7.48E+00	671	2.07E+00	1.81E+01	2.15E+00	721	6.77E-04	4.43E-04	5.70E-03	771	1.43E+03	2.38E+04	1.58E+05	821	6.42E-01	3.04E+01	8.53E-01	871	3.88E-01	4.81E-01	1.73E+00
622	3.07E+02	6.82E+02	5.57E+03	672	6.39E-01	5.26E-01	1.83E+00	722	1.78E-01	3.15E+00	1.97E-01	772	1.81E+02	2.63E+04	1.47E+04	822	5.09E+00	9.62E+02	5.93E+00	872	3.48E-02	2.32E-02	1.18E-01
623	4.45E+01	5.20E+02	1.32E+02	673	1.06E+01	1.04E+02	1.40E+01	723	4.12E+01	3.48E+02	1.27E+03	773	2.46E+01	9.84E+03	7.17E+01	823	1.38E-01	2.20E-01	2.68E-01	873	1.92E+03	1.28E+04	7.58E+04
624	6.77E-02	1.78E-02	3.75E-01	674	9.82E-01	7.55E-01	3.74E+00	724	3.14E+00	1.73E+01	3.43E+01	774	6.35E+00	6.29E+03	5.12E+00	824	1.10E-03	1.27E-03	1.10E-02	874	1.28E+03	2.02E+04	6.87E+04
625	8.30E+00	5.88E+02	5.33E+00	675	1.90E+01	3.54E+01	7.84E+01	725	1.75E-01	7.60E+00	1.00E+01	775	5.55E+01	1.33E+05	2.49E+01	825	9.01E-01	1.05E+01	1.76E+00	875	1.10E+06	1.18E+06	5.73E+06
626	8.34E+01	1.16E+03	7.70E+01	676	1.46E+01	4.80E+01	2.58E+01	726	5.86E+03	2.21E+04	6.95E+04	776	2.18E+02	4.80E+04	2.68E+03	826	7.12E-01	2.68E+01	1.06E+00	876	4.98E+04	1.08E+05	7.35E+05
627	2.40E+01	1.23E+03	1.13E+01	677	7.61E+00	3.46E+01	1.20E+01	727	1.01E-01	1.52E-01	8.30E-01	777	5.53E+01	3.41E+04	1.31E+02	827	1.09E-03	4.13E-04	5.65E-03	877	3.65E-02	5.58E-02	3.44E-01
628	6.50E+00	2.01E+03	3.93E+00	678	2.62E-03	9.46E-04	1.30E-02	728	3.22E-02	3.71E-02	2.71E-01	778	2.80E-02	1.58E-02	7.34E-02	828	8.08E-01	1.11E+00	1.61E+00	878	1.52E+00	1.02E+02	1.44E+00
629	6.14E+00	3.08E+02	5.43E+00	679	1.70E-02	4.83E-03	6.52E-02	729	2.93E-03	3.45E-03	3.31E-02	779	6.51E-01	1.85E+02	5.00E-01	829	6.24E-01	5.04E-01	4.04E+00	879	7.82E+00	2.52E+02	1.48E+01
630	6.78E+00	9.01E+01	7.00E+00	680	5.56E-03	4.49E-03	6.29E-02	730	1.30E-03	7.68E-04	1.04E-02	780	6.44E-02	1.44E-01	5.50E-01	830	4.06E-03	5.47E-03	5.06E-02	880	9.70E-02	9.29E-02	1.74E-01
631	1.35E+00	1.15E+00	3.33E+00	681	1.10E-01	5.45E-02	5.23E-01	731	5.40E-04	6.81E-04	9.32E-03	781	4.96E+00	7.77E+03	3.12E+00	831	2.48E+00	9.34E+00	1.57E+00	881	1.81E+02	2.33E+03	6.14E+03
632	1.62E-02	9.52E-03	1.99E-01	682	1.63E-01	1.38E+00	1.16E-01	732	7.91E-02	1.82E-01	7.63E-01	782	7.27E+00	1.17E+04	5.78E+00	832	7.44E+00	7.20E+00	1.15E+01	882	5.97E+01	1.27E+03	2.13E+03
633	2.89E+02	6.87E+02	9.32E+03	683	1.89E+01	2.79E+01	1.19E+02	733	3.19E-02	8.25E-02	1.03E-01	783	1.20E+01	4.99E+03	2.01E+01	833	2.53E+01	1.89E+01	8.98E+02	883	1.19E-01	1.78E-01	2.77E-01
634	2.12E-01	1.52E-01	1.59E+00	684	5.11E-02	1.63E-02	1.12E-01	734	5.18E-01	5.09E+00	8.65E-01	784	6.94E-01	1.60E+00	1.10E+01	834	1.11E-03	4.20E-04	6.10E-03	884	9.37E-02	7.95E-02	4.15E-01
635	1.63E+01	1.43E+02	3.88E+01	685	1.89E+00	6.88E+00	1.36E+00	735	1.59E-01	4.14E-01	6.16E-01	785	6.80E+00	6.21E+02	1.84E+02	835	4.02E-01	2.13E+00	3.02E-01	885	3.64E-03	3.51E-03	2.91E-02
636	1.78E-01	1.52E-01	1.20E+00	686	6.68E-01	2.71E+00	5.53E-01	736	1.26E+00	6.74E+00	2.47E+00	786	9.96E-02	7.05E-02	2.09E-01	836	1.00E+00	7.08E+00	7.80E-01	886	3.89E-01	2.97E+00	5.78E-01
637	2.83E+05	1.54E+05	1.65E+06	687	5.09E+00	3.61E+00	7.31E+00	737	1.97E-04	2.11E-04	3.74E-03	787	1.22E-02	1.92E-02	1.09E-01	837	2.82E+00	4.32E+00	4.57E+00	887	2.63E+00	2.00E+02	2.51E+00
638	2.97E+00	2.93E+01	2.99E+00	688	3.14E-02	1.14E-02	7.87E-02	738	8.49E-01	1.90E+00	2.21E+00	788	3.28E-03	4.90E-03	3.83E-02	838	1.13E-01	4.71E-02	4.05E-01	888	5.38E+00	5.38E+02	5.98E+00
639	7.33E+00	1.00E+02	8.44E+00	689	2.04E-01	6.38E-01	3.60E-01	739	1.84E-02	7.50E-02	3.57E-02	789	2.96E+00	1.64E+03	2.75E+00	839	5.93E-01	7.33E+00	7.56E-01	889	2.68E-01	1.44E+00	3.94E-01
640	5.69E-02	9.81E-03	1.07E-01	690	2.04E-02	1.38E-02	1.10E-01	740	2.31E-03	4.20E-03	4.57E-02	790	1.64E-01	2.84E-01	3.72E-01	840	5.64E-01	4.44E+00	4.01E-01	890	2.61E-01	2.90E+00	3.00E-01
641	5.38E-01	3.08E+00	4.96E-01	691	3.23E-01	7.85E-01	7.47E-01	741	1.66E+05	2.50E+05	5.91E+05	791	1.43E+01	2.70E+03	1.58E+02	841	1.42E+00	2.34E+00	1.69E+00	891	6.77E-03	2.80E-03	2.38E-02
642	4.07E-03	1.48E-03	2.79E-02	692	4.30E-01	2.12E+00	3.29E-01	742	8.06E-05	6.04E-05	1.33E-03	792	3.12E+00	1.52E+03	2.97E+00	842	1.56E-02	8.56E-03	6.90E-02	892	1.42E-02	6.49E-03	4.73E-02
643	1.59E+00	1.64E+01	1.20E+00	693	5.03E-01	4.92E+00	1.22E+00	743	4.12E-01	1.00E+01	5.04E-01	793	1.38E+00	1.15E+02	2.00E+00	843	9.71E-02	4.96E-01	9.78E-02	893	9.77E+00	7.37E+02	1.15E+01
644	1.66E-01	1.18E-01	3.57E-01	694	4.71E+06	2.56E+06	1.18E+07	744	2.25E-01	4.03E+00	2.28E-01	794	2.42E+00	2.88E+03	1.69E+00	844	1.19E+01	7.59E+02	2.65E+03	894	6.20E-02	4.54E-02	2.45E-01
645	3.84E-02	3.24E-02	3.25E-01	695	1.05E+04	1.92E+04	2.38E+05	745	6.70E-05	4.55E-05	1.02E-03	795	4.39E+00	7.60E+02	9.84E+00	845	2.17E-02	8.02E-02	3.81E-01	895	7.05E+00	2.62E+02	1.43E+01
646	2.98E+00	3.80E+00	6.09E+01	696	4.06E+00	4.50E+01	8.31E+00	746	2.18E-01	2.33E+00	2.35E-01	796	1.15E+00	1.59E+01	1.43E+02	846	8.67E-01	1.89E+00	2.64E+00	896	3.03E-02	2.80E-02	2.19E-01
647	1.13E+00	1.64E+01	6.66E-01	697	9.76E-01	3.64E+01	1.14E+00	747	8.19E-02	3.10E-01	2.34E-01	797	3.43E+00	1.08E+03	3.90E+00	847	3.46E+00	1.21E+03	2.50E+00	897	5.54E+01	1.51E+02	2.69E+02
648	2.54E-01	1.14E+00	2.78E-01	698	4.21E-04	4.91E-04	5.34E-03	748	2.55E-01	6.11E-01	9.62E-01	798	1.80E-02	5.36E-02	2.76E-01	848	2.24E-01	2.65E-01	9.65E-01	898	3.88E+03	6.61E+03	8.29E+04
649	6.69E-04	2.84E-04	6.09E-03	699	5.32E+00	3.40E+02	4.87E+00	749	4.33E+00	2.31E+00	1.26E+01	799	4.97E-02	3.02E-02	1.13E-01	849	1.29E+01	4.90E+03	9.90E+00	899	2.92E+00	2.15E+01	4.71E+00
650	1.01E+00	3.85E+00	1.72E+00	700	2.80E+00	1.47E+02	2.54E+00	750	2.11E-01	8.09E-01	2.53E-01	800	6.21E-04	6.23E-04	5.52E-03	850	4.11E+01	8.19E+03	3.99E+01	900	8.17E+00	5.86E+00	1.41E+01

Table F-3 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
901	7.57E-01	2.99E+00	5.43E-01	951	2.29E-01	2.09E+01	4.37E-01	1001	8.43E-01	6.58E-01	7.68E+00	1051	1.82E+00	9.59E+01	1.46E+00	1101	9.57E+02	5.17E+03	1.00E+05	1151	4.80E+02	9.26E+03	4.72E+04
902	1.21E+00	3.78E+00	1.02E+00	952	3.88E-01	6.10E+00	7.52E+00	1002	1.69E-03	2.59E-03	2.78E-02	1052	4.77E-01	9.73E+00	4.50E-01	1102	4.81E-01	4.46E+00	9.07E-01	1152	5.91E-02	8.81E-02	7.41E-01
903	5.07E+00	1.06E+01	4.67E+00	953	1.18E+00	9.14E+02	2.07E+00	1003	1.96E-02	7.05E-03	4.52E-02	1053	2.57E-02	1.83E-02	1.24E-01	1103	1.32E+00	3.52E+01	1.63E+00	1153	2.78E-03	4.55E-03	5.90E-02
904	1.08E+00	3.88E+00	1.05E+00	954	1.77E+00	2.08E+03	1.11E+01	1004	1.24E-01	5.13E-01	2.54E+00	1054	3.23E-03	3.53E-03	3.52E-02	1104	9.09E-01	6.78E+00	1.87E+00	1154	1.51E-01	2.14E-01	1.49E+00
905	1.98E+01	1.76E+01	3.95E+01	955	3.71E+04	1.79E+05	8.54E+05	1005	1.43E+01	2.94E+02	1.36E+02	1055	1.72E+00	1.04E+02	2.15E+00	1105	9.80E-01	2.66E+01	1.23E+00	1155	4.40E-01	4.10E+01	2.54E+02
906	3.27E-03	7.85E-04	1.05E-02	956	4.72E+06	3.01E+06	1.42E+07	1006	1.83E-03	2.31E-03	2.29E-02	1056	6.02E-03	6.23E-03	5.64E-02	1106	1.31E-01	2.21E-01	8.23E-01	1156	6.41E-01	4.02E+01	1.41E+00
907	3.94E-02	4.53E-02	6.83E-02	957	3.00E+00	3.00E+03	4.36E+00	1007	1.58E-03	1.68E-03	1.54E-02	1057	1.33E-01	2.36E-01	5.51E-01	1107	8.17E-02	1.16E-01	5.53E-01	1157	9.22E-01	4.39E+01	1.28E+00
908	4.04E-01	2.27E+00	2.86E-01	958	9.78E+01	7.20E+03	2.28E+04	1008	1.58E-02	1.57E-02	9.33E-02	1058	3.02E+00	6.09E+01	5.23E+00	1108	1.58E+04	4.86E+04	4.21E+05	1158	6.06E-04	1.23E-03	1.94E-02
909	1.79E-01	1.33E+00	1.59E-01	959	1.41E+00	1.40E+03	2.72E+00	1009	1.02E+01	2.22E+03	7.04E+00	1059	1.04E+00	3.55E+01	1.19E+00	1109	2.10E+01	9.11E+01	2.51E+03	1159	1.73E+03	6.27E+03	1.31E+05
910	2.51E+00	5.72E+00	2.58E+00	960	5.83E-01	7.39E+02	1.26E+00	1010	1.19E-01	2.96E-01	2.63E-01	1060	5.91E+01	2.26E+03	4.82E+03	1110	2.57E+00	4.65E+01	3.69E+00	1160	2.53E-03	2.08E-03	2.87E-02
911	1.26E-01	1.20E-01	3.35E-01	961	3.97E-02	4.86E-02	1.24E-01	1011	4.06E+00	2.43E+02	6.66E+00	1061	1.85E+01	1.17E+02	3.68E+02	1111	1.20E-03	7.16E-04	1.00E-02	1161	7.09E-01	2.91E+01	1.57E+00
912	7.31E-01	5.41E+00	9.74E-01	962	1.75E+01	3.40E+03	5.62E+03	1012	1.88E+00	2.55E+02	1.94E+00	1062	1.38E-01	1.70E-01	5.61E-01	1112	9.89E-02	7.53E-01	1.85E-01	1162	1.16E-02	1.22E-02	1.34E-01
913	5.03E-04	2.80E-04	4.64E-03	963	1.58E-01	1.10E+00	1.51E+01	1013	8.71E+00	9.15E+02	1.20E+01	1063	2.75E+02	3.58E+01	5.25E+03	1113	3.40E-01	4.03E+00	4.75E-01	1163	3.84E+00	1.05E+02	2.00E+02
914	6.53E-02	5.00E-02	2.69E-01	964	3.67E-01	4.42E+00	2.35E+01	1014	3.77E+00	5.79E+02	4.88E+00	1064	2.99E-01	1.35E+00	2.49E-01	1114	1.68E+00	1.99E+01	3.25E+00	1164	2.59E-01	8.43E+00	4.18E-01
915	8.47E-01	1.12E+03	1.13E+00	965	7.89E-03	4.02E-03	3.82E-02	1015	9.50E+00	2.90E+02	2.16E+01	1065	5.27E-01	1.52E+00	5.90E-01	1115	3.11E-03	3.60E-03	4.33E-02	1165	1.63E-03	1.75E-03	2.62E-02
916	2.88E-01	3.51E+02	3.71E-01	966	1.27E+00	2.44E+03	1.44E+00	1016	3.55E-03	1.63E-03	1.74E-02	1066	1.63E-02	4.45E-03	4.56E-02	1116	2.36E-02	5.05E-02	6.21E-02	1166	5.55E-02	1.08E+00	1.04E-01
917	4.32E+04	2.84E+05	1.97E+06	967	9.09E-03	8.95E-03	8.97E-02	1017	9.56E-02	3.53E-01	1.71E-01	1067	3.02E-01	1.48E+00	7.69E-01	1117	2.34E-03	5.25E-04	8.65E-03	1167	4.75E-03	1.58E-02	1.47E-01
918	8.63E-02	3.22E-01	2.20E-01	968	5.81E-03	2.81E-03	2.83E-02	1018	5.28E-01	9.61E-01	2.23E+00	1068	1.44E+00	1.81E+00	2.31E+00	1118	1.74E-02	2.36E-02	8.30E-02	1168	8.80E+00	1.18E+03	4.39E+02
919	3.25E+00	7.25E+03	2.56E+00	969	4.11E-02	2.35E-01	7.34E-02	1019	3.42E+05	5.35E+05	2.59E+06	1069	6.45E-02	3.42E-01	8.15E-02	1119	3.88E+00	1.77E+00	1.84E+01	1169	6.06E+00	4.25E+01	8.86E+02
920	7.07E+01	6.90E+04	3.23E+02	970	1.50E-04	1.03E-04	2.17E-03	1020	1.88E+02	1.70E+03	1.56E+04	1070	1.79E-02	1.41E-02	1.04E-01	1120	1.57E-02	4.69E-02	2.99E-02	1170	1.52E+00	5.14E+01	4.57E+00
921	3.19E+00	1.03E+04	4.90E+00	971	2.91E-02	5.83E-02	5.20E-01	1021	3.29E+00	4.09E+01	1.07E+01	1071	1.96E-01	3.55E+00	2.40E-01	1121	1.93E-01	1.09E+00	2.40E-01	1171	1.15E-02	9.28E-03	1.00E-01
922	1.14E+01	2.88E+04	2.99E+01	972	6.88E+00	3.81E+03	1.73E+04	1022	5.87E-01	2.62E+01	6.40E-01	1072	1.04E+00	4.73E+00	3.57E+00	1122	9.78E-03	1.18E-02	2.15E-02	1172	2.54E-04	3.46E-04	6.95E-03
923	8.03E+00	2.72E+04	7.82E+00	973	6.54E-01	2.70E+02	1.72E+00	1023	1.08E-02	5.83E-03	4.12E-02	1073	2.09E+02	2.58E+03	4.17E+04	1123	1.82E+00	1.88E+00	4.78E+00	1173	6.40E-02	7.32E-01	1.28E-01
924	4.48E+00	2.27E+03	3.35E+02	974	1.75E+00	1.05E+03	1.99E+01	1024	4.19E-01	1.73E+00	1.01E+00	1074	4.57E+00	6.65E+01	1.81E+01	1124	3.37E-01	8.36E-01	5.62E-01	1174	1.70E+00	1.28E+02	2.67E+00
925	2.11E-02	1.41E-02	9.07E-02	975	6.66E-01	1.11E+03	1.04E+00	1025	2.07E+01	1.96E+03	2.48E+01	1075	6.29E+00	1.44E+02	1.54E+01	1125	9.25E-01	8.05E+00	1.43E+00	1175	1.78E-03	1.28E-03	1.69E-02
926	6.86E-03	9.75E-03	6.90E-02	976	2.60E+00	4.43E+03	1.45E+01	1026	1.03E-03	6.36E-04	8.40E-03	1076	1.65E-02	1.96E-02	1.64E-01	1126	8.69E-04	3.42E-04	5.48E-03	1176	1.21E-02	1.22E-02	4.05E-02
927	1.70E-03	2.35E-03	2.88E-02	977	3.41E-01	6.74E+01	4.41E-01	1027	5.74E-02	9.97E-02	5.81E-01	1077	4.39E-02	4.72E-02	1.56E-01	1127	2.36E-01	3.62E+01	3.38E-01	1177	4.73E-01	3.55E+01	6.09E-01
928	2.23E-03	5.71E-03	5.84E-02	978	1.14E-02	5.17E-03	4.54E-02	1028	1.45E-01	2.72E-01	1.24E+00	1078	1.42E+00	1.46E+02	1.73E+00	1128	1.27E+01	6.18E+02	4.92E+02	1178	1.37E-03	1.18E-03	1.63E-02
929	1.37E-03	1.52E-03	1.74E-02	979	4.74E-04	4.88E-04	7.96E-03	1029	7.46E+02	5.81E+03	5.38E+04	1079	5.99E+00	8.31E+01	3.09E+01	1129	7.61E+04	1.56E+05	1.42E+06	1179	4.86E-01	3.74E+01	8.22E-01
930	1.85E+02	1.31E+04	3.26E+04	980	3.02E-03	2.68E-03	3.65E-02	1030	1.10E-02	2.24E-02	1.66E-01	1080	9.04E+00	4.34E+01	6.28E+02	1130	1.48E+00	3.31E+02	1.95E+00	1180	1.10E-03	1.28E-03	1.92E-02
931	8.09E-01	1.22E+03	7.87E-01	981	5.79E+00	2.50E+03	3.41E+02	1031	3.01E+00	1.16E+02	4.96E+00	1081	3.65E-01	6.96E+00	3.45E-01	1131	7.15E+00	1.08E+03	2.50E+01	1181	1.97E-01	8.15E+00	3.32E-01
932	3.99E+00	1.56E+04	9.09E+00	982	9.71E-02	1.49E+01	1.36E-01	1032	2.32E-01	1.87E+00	3.30E-01	1082	1.40E+02	1.05E+03	2.03E+04	1132	1.08E+01	1.60E+02	2.03E+03	1182	1.95E+00	2.77E+01	1.46E+01
933	1.72E-01	2.17E-01	8.11E-01	983	2.68E-03	4.29E-03	5.58E-02	1033	5.98E-01	1.83E+00	2.17E+00	1083	4.45E-04	6.97E-04	8.51E-03	1133	4.40E-01	9.66E+01	7.45E-01	1183	3.63E-02	1.29E-01	1.37E-01
934	7.31E+01	1.43E+04	2.74E+04	984	2.49E-02	1.29E-02	1.23E-01	1034	5.91E-02	4.57E-02	2.24E-01	1084	9.54E+00	8.79E+01	2.35E+02	1134	7.18E-01	2.31E+02	9.54E-01	1184	3.10E-01	2.55E+01	4.28E-01
935	1.08E+01	9.42E+03	1.22E+03	985	4.94E+02	1.65E+04	1.50E+05	1035	3.38E-04	2.54E-04	3.96E-03	1085	1.97E-03	1.46E-03	1.73E-02	1135	4.66E-02	1.14E-01	1.71E-01	1185	2.23E-02	2.42E-02	2.09E-01
936	4.90E+02	3.57E+04	1.70E+05	986	4.00E+00	3.25E+03	1.34E+02	1036	1.84E+03	6.44E+03	7.04E+04	1086	7.43E-02	4.49E-01	1.31E-01	1136	1.01E-02	6.27E-03	5.25E-02	1186	1.40E+00	7.97E+01	3.09E+00
937	6.23E+00	2.11E+03	3.90E+03	987	8.73E+00	1.72E+03	1.86E+03	1037	9.75E-01	2.52E+01	1.50E+00	1087	6.89E-01	1.74E+01	8.00E-01	1137	2.55E+00	9.98E+01	2.48E+01	1187	6.38E-01	2.21E+01	1.40E+00
938	1.17E-01	3.96E+01	1.84E-01	988	8.11E-02	1.14E-01	4.85E-01	1038	3.26E+00	3.70E+02	3.50E+00	1088	2.33E+01	3.46E+02	3.68E+02	1138	1.72E-01	1.17E+00	7.07E-01	1188	5.91E-03	4.31E-03	5.32E-02
939	1.18E-03	8.31E-04	1.13E-02	989	7.35E+00	2.75E+01	9.62E+02	1039	1.97E+01	4.27E+03	1.50E+01	1089	5.35E-04	3.53E-04	5.33E-03	1139	1.27E-02	7.95E-03	4.46E-02	1189	3.30E-04	1.33E-04	3.02E-03
940	4.91E-03	4.02E-03	4.07E-02	990	1.12E-02	9.67E-03	2.50E-02	1040	1.48E+01	3.06E+02	2.28E+01	1090	1.78E+00	6.59E+00	6.33E+00	1140	8.29E-05	6.88E-05	1.71E-03	1190	5.72E-02	4.23E-01	7.51E-02
941	2.26E-02	7.34E-03	5.91E-02	991	1.63E+00	1.42E+00	1.04E+01	1041	4.52E+02	7.71E+03	9.04E+03	1091	6.01E-01	1.61E+01	8.75E-01	1141	2.61E-02	4.41E-02	3.56E-01	1191	7.73E-03	2.50E-02	2.13E-02
942	4.07E-02	2.65E+00	3.10E+01	992	2.14E+00	3.10E+01	2.95E+00	1042	6.54E+00	1.26E+02	2.66E+01	1092	1.67E+00	7.28E+00	6.05E+00	1142	5.88E-02	7.37E-02	3.54E-01	1192	8.83E-04	1.19E-03	2.44E-02
943	1.44E+00	3.70E+02	3.04E+02	993	3.54E-01	2.45E-01	5.99E+00	1043	2.62E+01	5.01E+02	7.58E+02	1093	1.95E-03	3.63E-03	4.42E-02	1143	5.32E-01	6.88E+01	8.44E-01	1193	1.95E+00	6.89E+00	3.79E+00
944	3.76E-01	3.00E+01	1.30E+00	994	1.98E-04	1.08E-04	2.52E-03	1044	9.94E-01	4.23E+00	2.21E+01	1094	3.80E-04	2.33E-04	3.89E-03	1144	9.97E-02	4.48E-01	3.49E-01	1194	2.25E+00	1.36E+00	1.07E+01
945	1.31E+01	2.03E+04	2.44E+01	995	3.16E-03	1.07E-03	1.66E-02	1045	1.55E+00	2.88E+01	2.49E+00	1095	1.60E-01	9.87E-01	3.50E-01	1145	4.21E+01	5.17E+02	6.05E+03	1195	1.00E-01	5.42E-01	1.48E-01
946	1.73E+02	1.68E+04	1.37E+04	996	1.14E-02	4.80E-03	6.07E-02	1046	2.34E+00	1.23E+02	2.20E+00	1096	5.61E-03	2.85E-03	2.58E-02	1146	3.15E-03	1.33E-03	1.57E-02	1196	6.51E-01	2.58E+00	8.08E-01
947	1.21E+00	2.72E+03	1.55E+00	997	9.85E-04	9.88E-04	1.87E-02	1047	3.00E-02	3.03E-02	2.16E-01	1097	2.80E-04	2.61E-04	4.57E-03	1147	6.12E-04	5.14E-04	7.77E-03	1197	1.26E-02	1.40E-02	1.68E-01
948	7.25E-03	1.25E-02	1.21E-01	998	1.13E-01	8.38E-01	1.35E-01	1048	3.63E-01	7.15E+00	3.81E-01	1098	9.06E-01	1.53E+01	1.29E+02	1148	4.05E-01	1.22E+00	2.52E+00	1198	4.34E-03	4.22E-03	1.32E-02
949	3.04E+01	1.75E+03	9.87E+03	999	5.77E-04	1.99E-04	4.40E-03	1049	2.63E-02	6.43E-02	3.94E-01	1099	8.88E+01	7.46E+02	1.09E+04	1149	7.68E-01	4.50E+01	1.77E+00	1199	1.20E-01	6.24E-01	1.66E-01
950	1.11E+00	7.87E+02	3.26E+00	1000	8.31E-02	7.04E-01	7.80E-02	1050	5.25E-01	1.33E+01	6.18E-01	1100	1.28E+01	8.78E+02	1.92E+01	1150	1.81E-02	6.18E-02	3.83E-01	1200	9.42E-02	1.87E-01	3.25E-01

Table F-3 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
1201	1.64E-03	6.22E-04	1.20E-02	1251	8.96E+00	1.76E+02	3.45E+01	1301	3.06E+00	5.70E+01	8.20E+00	1351	6.63E-02	1.28E-01	7.89E-01	1401	1.77E-01	1.74E+00	2.38E-01	1451	3.85E+00	7.34E+04	2.37E+00
1202	5.06E-04	3.70E-04	8.46E-03	1252	6.63E-03	1.05E-02	1.13E-01	1302	2.74E-01	1.27E+00	8.47E-01	1352	5.18E+00	9.18E+02	5.04E+00	1402	7.48E-01	3.38E+01	8.53E-01	1452	1.64E-03	2.13E-03	2.07E-02
1203	3.30E-01	3.89E-01	8.88E-01	1253	4.12E-03	1.77E-03	1.92E-02	1303	7.78E+01	1.35E+03	4.09E+02	1353	4.25E-03	4.82E-03	5.06E-02	1403	5.88E-03	1.18E-02	1.27E-01	1453	1.18E+01	8.56E+04	4.78E+00
1204	2.08E-01	4.33E-01	4.37E-01	1254	4.28E-04	3.98E-04	6.75E-03	1304	7.53E+03	5.36E+04	8.56E+04	1354	1.57E+01	2.37E+03	1.95E+01	1404	4.76E-01	2.45E+00	1.34E+00	1454	4.31E-01	6.33E+02	7.48E-01
1205	3.97E+02	1.67E+03	1.35E+04	1255	6.62E-02	4.69E-01	1.27E-01	1305	7.36E+02	4.08E+03	1.71E+04	1355	2.76E+00	5.60E+02	2.62E+00	1405	1.14E+00	1.51E+01	2.13E+00	1455	6.59E-04	5.76E-04	7.26E-03
1206	6.01E-01	3.29E+00	1.75E+01	1256	7.42E+01	4.67E+02	8.84E+02	1306	5.66E+00	3.26E+02	1.08E+01	1356	1.94E+00	1.83E+02	2.21E+00	1406	2.02E-02	2.60E-02	4.30E-02	1456	3.79E+03	7.64E+04	3.15E+04
1207	3.48E+05	4.89E+05	1.91E+06	1257	2.26E+02	6.21E+02	1.43E+03	1307	9.18E-03	1.07E-02	1.18E-01	1357	2.03E-02	1.66E-02	1.42E-01	1407	3.06E+00	2.06E+00	6.71E+00	1457	1.48E+03	6.24E+04	3.86E+04
1208	3.05E+03	6.16E+03	5.24E+04	1258	1.80E+00	1.08E+02	3.98E+00	1308	3.90E+00	1.91E+02	8.43E+00	1358	5.76E-01	2.53E+00	1.71E+00	1408	1.39E+00	8.52E-01	3.91E+00	1458	9.29E+05	1.89E+06	3.62E+06
1209	9.98E+01	9.72E+02	2.18E+03	1259	1.91E+00	2.65E+02	2.65E+00	1309	1.03E-02	8.93E-03	9.72E-02	1359	3.73E-01	5.35E-01	2.40E+00	1409	1.22E+01	1.89E+01	5.39E+01	1459	6.81E+04	5.48E+05	5.26E+05
1210	4.47E+04	5.90E+04	3.23E+05	1260	1.62E-01	1.66E+00	2.82E-01	1310	1.05E+00	6.02E+01	1.34E+00	1360	1.01E-01	1.19E-01	8.33E-01	1410	1.92E-03	1.48E-03	2.45E-02	1460	2.13E+00	1.16E+04	2.19E+00
1211	3.44E-02	4.92E-02	1.04E-01	1261	9.08E-01	1.19E+01	2.35E+01	1311	3.29E+02	1.92E+03	7.79E+03	1361	2.71E-02	4.73E-02	3.54E-01	1411	3.73E+00	1.66E+00	8.80E+00	1461	3.50E-03	2.54E-03	2.56E-02
1212	7.45E-02	7.72E-02	5.21E-01	1262	8.01E-02	1.12E-01	3.61E-01	1312	9.07E-01	1.46E+01	2.31E+00	1362	1.77E-03	1.52E-03	1.58E-02	1412	6.68E-02	2.35E-01	1.26E-01	1462	1.98E-02	9.61E-03	7.41E-02
1213	1.24E-03	1.39E-03	1.68E-02	1263	3.93E-01	7.32E+00	4.86E-01	1313	1.22E+01	1.53E+02	5.25E+01	1363	2.58E+00	3.42E+01	1.69E+02	1413	2.95E+00	1.79E+01	2.40E+00	1463	1.12E-01	7.55E-02	3.95E-01
1214	4.91E-01	4.99E+01	6.12E-01	1264	1.12E-04	3.26E-05	1.19E-03	1314	1.32E-01	1.15E+00	2.56E-01	1364	6.32E+00	6.96E+02	8.96E+00	1414	9.28E+00	9.73E+02	7.68E+00	1464	6.87E+03	4.75E+05	9.66E+02
1215	1.03E-03	1.15E-03	1.58E-02	1265	2.38E-01	4.80E-01	9.61E-01	1315	1.21E+00	1.95E+01	1.94E+00	1365	3.47E+00	6.46E+01	7.10E+00	1415	5.26E+00	2.87E+00	1.03E+01	1465	1.29E+02	3.51E+04	2.17E+03
1216	1.62E+00	2.96E+02	1.50E+00	1266	8.79E-03	1.01E-02	2.09E-02	1316	3.62E+00	7.40E+01	8.20E+01	1366	7.15E+00	2.02E+02	1.51E+01	1416	1.80E+01	1.13E+01	1.08E+02	1466	3.38E+01	5.78E+04	2.62E+01
1217	1.96E+00	2.00E+02	5.05E+00	1267	4.55E+00	2.25E+00	1.72E+01	1317	2.21E-02	2.28E-02	2.34E-01	1367	9.90E-02	2.15E-01	3.61E-01	1417	2.70E-01	9.38E-01	3.96E-01	1467	1.81E-02	3.00E-02	2.26E-01
1218	2.27E+00	1.10E+02	5.52E+00	1268	1.63E-03	6.66E-04	1.18E-02	1318	8.99E-01	2.81E+01	1.14E+00	1368	2.78E+01	4.27E+03	3.64E+01	1418	1.98E+00	1.87E+01	3.24E+00	1468	2.41E+03	7.73E+04	9.88E+03
1219	1.22E+00	8.65E+01	2.84E+00	1269	3.70E-02	5.40E-02	4.88E-01	1319	3.12E-02	1.61E-02	1.14E-01	1369	2.73E-04	2.08E-04	4.19E-03	1419	3.23E-01	1.26E+00	3.55E-01	1469	9.90E-02	1.34E-01	2.20E-01
1220	7.14E-03	3.56E-03	3.97E-02	1270	1.10E-01	6.11E-01	1.19E-01	1320	5.64E+00	6.99E+02	7.03E+00	1370	1.22E-01	2.94E-01	2.78E-01	1420	7.82E-01	3.81E+00	1.04E+00	1470	2.76E-01	2.39E+00	9.04E-01
1221	1.79E-04	1.37E-04	2.82E-03	1271	7.59E-04	2.51E-04	5.25E-03	1321	3.08E+04	5.48E+04	2.09E+05	1371	6.46E-01	1.77E+01	5.98E-01	1421	3.21E-01	1.36E+00	7.81E-01	1471	4.83E-02	1.16E-01	6.97E-01
1222	4.20E-02	9.61E-02	6.11E-01	1272	2.73E-01	8.10E-01	4.44E-01	1322	1.49E-01	6.31E-01	3.89E-01	1372	2.56E-04	1.64E-04	3.47E-03	1422	1.87E+00	1.08E+01	3.03E+00	1472	5.39E-02	4.13E-02	2.65E-01
1223	6.27E-03	5.25E-03	5.48E-02	1273	8.67E-01	1.09E+00	1.84E+00	1323	1.93E+00	9.58E+01	3.36E+00	1373	8.20E-01	2.83E+01	9.81E-01	1423	7.40E-01	2.93E+00	7.95E-01	1473	1.42E+00	1.21E+03	1.29E+01
1224	9.39E-01	1.28E+02	1.42E+00	1274	6.54E-03	5.05E-03	5.08E-02	1324	1.92E+00	3.14E+01	4.64E+00	1374	8.61E-03	4.32E-03	4.12E-02	1424	7.27E-03	5.59E-03	7.39E-02	1474	4.96E+04	2.80E+05	4.12E+05
1225	3.26E-02	1.85E-02	1.18E-01	1275	1.76E-01	8.48E-01	4.97E-01	1325	6.20E-03	1.39E-02	1.52E-01	1375	3.36E+00	1.07E+02	6.90E+00	1425	8.76E-02	3.21E-01	2.15E-01	1475	8.67E+01	2.64E+04	1.30E+03
1226	5.68E+02	2.10E+03	2.48E+03	1276	6.65E-01	2.06E+00	8.52E+00	1326	6.20E-01	2.81E+01	8.83E-01	1376	2.27E+00	9.92E+01	3.28E+00	1426	1.74E+02	1.53E+04	1.61E+04	1476	4.55E+01	7.28E+04	6.81E+00
1227	2.58E-04	2.17E-04	4.06E-03	1277	4.71E-02	8.74E-02	6.35E-01	1327	6.43E-01	1.74E+01	5.82E-01	1377	1.04E+04	3.39E+04	3.03E+05	1427	1.40E-02	1.18E-02	7.47E-02	1477	9.51E+00	6.06E+03	1.43E+02
1228	4.49E-01	2.17E+01	5.08E-01	1278	3.02E+00	4.52E+02	3.23E+00	1328	5.21E-01	4.47E+01	6.24E-01	1378	4.38E-01	2.38E+01	2.34E+01	1428	4.11E-01	5.99E-01	1.41E+00	1478	2.08E-01	1.13E+01	3.08E-01
1229	2.64E-02	3.35E-02	2.75E-01	1279	1.08E-01	2.62E-01	3.08E-01	1329	2.26E+00	8.53E+01	3.99E+00	1379	5.28E+00	1.38E+02	9.56E+02	1429	2.93E+00	8.51E+04	2.14E+00	1479	5.68E-01	3.23E+03	5.17E-01
1230	8.95E-01	1.15E+02	1.40E+00	1280	1.99E+01	3.19E+03	2.53E+01	1330	9.13E-01	4.42E+01	1.49E+00	1380	7.60E-01	2.02E+00	1.69E+01	1430	1.81E+00	5.98E+04	1.49E+00	1480	8.65E-01	2.33E+03	1.18E+00
1231	2.13E-01	2.83E-01	1.29E+00	1281	1.86E+00	5.35E+02	1.83E+00	1331	4.62E-01	7.11E-01	2.50E+00	1381	1.38E+03	7.70E+03	6.56E+04	1431	2.71E+00	2.90E+04	2.71E+00	1481	1.37E+00	1.51E+04	9.59E-01
1232	9.19E-01	9.76E+01	1.31E+00	1282	6.99E+00	7.21E+02	1.35E+01	1332	1.47E+00	2.37E+01	4.16E+00	1382	1.55E+02	1.43E+03	1.44E+04	1432	1.37E+00	2.21E+04	1.56E+00	1482	3.61E+00	2.94E+03	3.02E+01
1233	3.31E-01	6.72E+01	3.82E-01	1283	6.05E-03	3.65E-03	3.52E-02	1333	1.30E-03	1.00E-03	1.59E-02	1383	1.13E+00	3.51E+01	1.25E+00	1433	3.17E+00	5.18E+04	2.03E+00	1483	6.81E+01	6.13E+04	7.52E+01
1234	1.67E-03	3.58E-03	4.65E-02	1284	3.82E-03	4.66E-03	3.87E-02	1334	1.04E-02	3.18E-02	3.01E-01	1384	6.42E-01	2.46E+01	7.68E-01	1434	3.26E+02	1.00E+05	9.96E+02	1484	3.43E-03	5.08E-03	5.02E-02
1235	1.45E+01	4.10E+02	1.23E+02	1285	1.79E-01	1.80E-01	1.06E+00	1335	3.23E-01	1.38E+00	5.20E-01	1385	5.09E+01	1.07E+03	1.07E+03	1435	5.39E-02	1.15E-01	6.27E-01	1485	1.49E+02	3.03E+03	4.64E+02
1236	1.75E-02	1.12E-02	5.03E-02	1286	3.77E-02	1.79E-02	1.35E-01	1336	3.11E+00	2.89E+00	7.48E+00	1386	3.94E+00	5.33E+01	8.96E+00	1436	3.27E-02	6.67E-02	3.47E-01	1486	1.13E+02	1.55E+03	4.39E+02
1237	6.55E-04	6.27E-04	1.10E-02	1287	2.54E+00	4.42E+02	2.89E+00	1337	2.26E-03	2.43E-03	4.32E-02	1387	5.53E+00	1.58E+02	1.24E+01	1437	1.07E-01	9.64E-02	2.73E-01	1487	3.65E+05	2.18E+05	1.01E+06
1238	1.00E+01	3.61E+02	1.11E+02	1288	6.19E+03	1.93E+04	1.10E+05	1338	3.55E-02	6.83E-02	5.74E-01	1388	9.69E+00	1.55E+02	8.27E+01	1438	1.02E+01	2.51E+05	3.60E+00	1488	7.86E-01	2.64E+01	6.79E-01
1239	2.50E-01	2.27E+00	6.82E-01	1289	1.13E+02	8.61E+02	3.05E+03	1339	6.58E+01	1.16E+01	7.20E+02	1389	1.64E+00	1.01E+02	1.99E+00	1439	3.71E-02	2.27E-02	1.26E-01	1489	3.75E+03	3.21E+03	1.15E+04
1240	2.64E+00	3.08E+02	3.10E+00	1290	2.10E+01	4.85E+02	3.24E+02	1340	3.75E+02	9.68E+01	4.53E+03	1390	4.10E-01	5.51E-01	3.53E+00	1440	1.14E+02	1.54E+05	2.11E+01	1490	7.46E-02	2.91E-02	2.78E-01
1241	1.92E+01	4.55E+03	1.39E+01	1291	2.96E-01	6.34E-01	3.78E+00	1341	5.28E+05	1.70E+05	1.03E+06	1391	5.99E+00	6.03E+01	2.26E+01	1441	4.40E-01	3.19E+02	7.40E-01	1491	7.28E-03	1.05E-02	9.82E-02
1242	9.83E-02	4.06E-01	2.78E-01	1292	6.67E-03	3.64E-03	4.21E-02	1342	3.86E-01	1.67E+00	4.57E-01	1392	9.43E+00	1.32E+02	8.97E+01	1442	4.01E-01	1.04E+02	1.46E+02	1492	1.06E+05	2.81E+05	2.53E+05
1243	7.19E-01	1.06E+02	8.28E-01	1293	6.51E+00	2.08E+02	1.81E+01	1343	1.53E-01	1.28E-01	1.06E+00	1393	1.66E-03	2.38E-03	3.10E-02	1443	6.99E-01	9.86E+03	6.67E-01	1493	9.50E-02	5.34E-01	1.16E-01
1244	1.78E+02	2.49E+03	5.39E+03	1294	2.84E-03	5.27E-03	6.73E-02	1344	2.13E-01	1.13E+00	2.31E-01	1394	8.98E-04	7.61E-04	1.07E-02	1444	1.80E+07	9.33E+06	2.77E+07	1494	1.49E+00	6.94E+01	1.32E+00
1245	3.61E+00	2.22E+02	7.26E+00	1295	1.66E+05	2.59E+05	1.14E+06	1345	4.15E-01	1.85E+00	5.33E-01	1395	1.16E+00	3.33E+00	3.83E+00	1445	2.40E+03	1.01E+05	1.69E+04	1495	5.88E-02	2.47E-02	1.88E-01
1246	4.47E-02	6.18E-02	1.62E-01	1296	1.48E-03	1.43E-03	2.06E-02	1346	2.44E-02	4.26E-02	6.09E-02	1396	3.70E-01	6.42E+00	4.15E-01	1446	4.23E-01	2.97E+00	2.60E+00	1496	4.57E+00	5.54E+01	5.19E+00
1247	1.14E-03	1.49E-03	2.56E-02	1297	1.67E+00	1.49E+02	2.40E+00	1347	3.99E-04	2.57E-04	5.36E-03	1397	1.51E-03	5.69E-04	9.98E-03	1447	4.71E+00	5.04E+04	3.08E+00	1497	3.30E+00	6.17E+01	4.19E+00
1248	1.90E+00	5.18E+01	4.56E+00	1298	2.62E+00	1.81E+02	5.77E+00	1348	1.70E+00	1.63E+01	2.24E+00	1398	2.10E-01	1.04E+00	5.18E-01	1448	5.06E-04	3.95E-04	5.75E-03	1498	4.39E-03	1.46E-03	1.77E-02
1249	5.61E+02	2.82E+03	1.04E+04	1299	1.47E+01	1.77E+02	2.13E+02	1349	2.16E+00	1.49E+00	6.63E+00	1399	8.89E-04	1.03E-03	1.54E-02	1449	4.99E+00	4.17E+04	3.28E+00	1499	3.12E-01	1.26E+01	2.77E-01
1250	2.12E+02	1.02E+03	4.67E+03	1300	1.66E+00	4.74E+00	1.19E+01	1350	3.42E-02	2.03E-02	1.28E-01	1400	1.26E-03	1.09E-03	1.56E-02	1450	1.17E-01	1.20E-01	6.29E-01	1500	1.05E+00	3.56E+01	1.41E+00

Table F-4 Electricity loss in USD for each cluster map

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
1	3.47E+00	8.66E-01	4.86E+00	51	2.75E+03	2.21E+05	1.68E+04	101	3.87E+01	3.63E+01	2.28E+01	151	0.00E+00	0.00E+00	0.00E+00	201	4.37E+05	1.52E+04	1.74E+06	251	1.41E+05	2.39E+05	1.07E+06
2	4.49E+00	2.74E+00	1.02E+02	52	6.83E+02	6.03E+05	2.30E+02	102	3.11E+00	4.72E+01	4.47E+01	152	7.25E+04	2.00E+04	6.01E+04	202	5.41E+07	1.12E+07	6.23E+07	252	2.36E+03	1.81E+05	8.11E+02
3	3.07E-01	4.76E-01	2.05E+01	53	8.60E+01	1.81E+03	2.59E+02	103	4.72E+03	7.18E+05	6.39E+02	153	1.28E+05	9.45E+03	2.08E+05	203	4.21E+06	1.53E+05	5.75E+06	253	3.87E+04	2.33E+05	1.80E+05
4	0.00E+00	0.00E+00	9.29E-01	54	3.09E+03	1.79E+05	2.11E+04	104	9.85E+03	6.61E+05	1.58E+03	154	6.81E+04	6.42E+03	8.99E+04	204	3.83E+06	2.82E+05	9.16E+06	254	1.78E+04	2.50E+05	3.72E+04
5	6.51E+03	1.11E+05	2.32E+05	55	6.09E+03	6.11E+05	1.29E+04	105	1.72E+02	8.25E+02	8.78E+02	155	2.25E+06	2.93E+05	4.91E+06	205	1.44E+07	4.89E+05	2.13E+07	255	1.11E+05	3.82E+05	2.95E+05
6	1.62E+02	2.45E+02	1.55E+03	56	4.57E+05	3.61E+05	1.25E+06	106	1.31E+04	4.88E+05	1.51E+04	156	1.02E+07	1.02E+06	1.92E+07	206	9.44E+06	3.62E+05	8.74E+06	256	0.00E+00	0.00E+00	1.53E+00
7	0.00E+00	2.77E-01	6.36E+00	57	6.76E+04	6.27E+05	2.16E+05	107	1.38E+05	9.64E+05	4.37E+05	157	4.68E+06	2.60E+05	6.40E+06	207	4.94E+04	1.00E+05	3.42E+03	257	2.16E+05	3.31E+05	1.59E+06
8	5.95E+04	1.71E+06	2.54E+04	58	3.41E+01	5.63E+04	1.89E+01	108	9.87E+01	3.92E+03	1.38E+01	158	7.55E+05	6.00E+04	1.16E+06	208	0.00E+00	0.00E+00	1.23E-01	258	2.94E+04	6.97E+04	6.79E+05
9	2.04E+00	7.62E-01	9.18E+00	59	4.19E+05	1.82E+06	1.71E+06	109	1.86E+06	1.52E+06	3.34E+06	159	7.81E+05	4.66E+05	6.48E+04	209	0.00E+00	0.00E+00	1.03E+00	259	1.55E+06	9.97E+05	7.29E+06
10	4.73E+03	5.14E+05	1.40E+03	60	8.47E+04	9.37E+05	4.19E+05	110	2.15E+04	4.04E+05	2.62E+04	160	2.53E+05	1.04E+05	2.57E+05	210	8.44E+04	9.92E+04	3.34E+04	260	3.31E+05	5.22E+05	1.38E+06
11	1.39E+04	4.84E+05	5.80E+03	61	1.94E+03	6.68E+05	6.11E+02	111	1.05E+05	4.85E+05	2.81E+05	161	2.16E+06	7.62E+05	7.31E+05	211	1.83E+05	1.08E+05	1.17E+05	261	8.86E+04	8.26E+05	2.44E+04
12	3.27E+04	3.60E+05	2.65E+04	62	2.30E+02	4.17E+05	4.75E+01	112	2.65E+06	4.02E+06	6.46E+06	162	5.08E+05	1.05E+05	8.88E+05	212	3.03E+03	1.27E+02	8.55E+02	262	0.00E+00	0.00E+00	1.02E+00
13	0.00E+00	0.00E+00	9.50E-01	63	9.32E+02	6.24E+05	3.69E+02	113	1.75E+03	9.57E+03	1.61E+04	163	2.71E+06	5.02E+05	3.58E+06	213	6.62E+06	7.76E+04	8.65E+06	263	0.00E+00	0.00E+00	0.00E+00
14	4.97E+04	5.01E+04	3.51E+05	64	2.30E+01	6.02E+04	5.11E+00	114	3.90E+05	7.72E+05	7.64E+05	164	7.59E+05	1.77E+05	7.14E+05	214	9.76E+00	0.00E+00	6.92E+00	264	1.36E+04	2.03E+05	2.40E+04
15	2.40E+01	9.32E+00	6.62E+02	65	9.60E+02	4.63E+05	5.88E+02	115	5.16E+02	1.80E+02	1.83E+03	165	1.14E+06	3.90E+05	5.88E+05	215	2.16E+04	1.21E+05	1.02E+03	265	8.93E+00	0.00E+00	5.97E+01
16	7.85E+03	8.35E+05	5.81E+03	66	3.56E+02	1.48E+02	1.99E+03	116	2.23E+05	5.89E+05	4.57E+05	166	1.72E+03	1.76E+01	1.92E+02	216	0.00E+00	0.00E+00	0.00E+00	266	1.41E+06	8.31E+05	6.18E+06
17	2.22E+01	7.99E+00	6.24E+01	67	2.71E+03	1.72E+04	9.45E+03	117	1.97E+03	1.79E+05	7.83E+02	167	3.33E+00	0.00E+00	1.42E+01	217	1.84E+05	3.04E+05	3.34E+05	267	6.17E+04	3.51E+05	1.76E+05
18	2.42E+02	2.41E+05	9.79E+01	68	7.91E+06	6.38E+06	1.47E+07	118	7.18E+04	1.52E+06	4.91E+03	168	1.61E+04	2.51E+02	9.13E+04	218	2.29E+02	0.00E+00	7.23E+02	268	4.83E-01	0.00E+00	7.05E+01
19	0.00E+00	0.00E+00	0.00E+00	69	2.03E+02	4.29E+01	2.03E+03	119	2.39E+04	8.88E+05	2.30E+03	169	2.58E+05	1.58E+05	4.72E+04	219	1.96E+05	7.69E+05	1.93E+04	269	0.00E+00	0.00E+00	1.86E+00
20	1.32E+07	1.46E+07	2.20E+07	70	2.90E+04	7.87E+05	7.09E+03	120	2.38E+03	7.39E+04	3.58E+03	170	3.36E+05	2.59E+02	8.05E+05	220	6.62E+05	8.29E+05	9.94E+05	270	3.70E+03	6.95E+04	2.59E+04
21	6.29E+05	1.53E+06	2.89E+06	71	4.31E+05	2.84E+06	1.88E+05	121	2.74E+03	3.86E+05	9.38E+01	171	4.71E+05	8.67E+04	5.77E+05	221	3.83E+05	7.93E+05	1.35E+05	271	4.54E+03	1.40E+04	1.54E+05
22	1.92E+04	8.34E+05	3.03E+04	72	2.04E+06	3.36E+06	3.73E+06	122	1.40E+04	6.81E+05	3.85E+03	172	2.25E+05	5.56E+04	2.30E+05	222	5.19E+05	7.16E+05	5.05E+05	272	1.28E+06	2.01E+06	4.56E+06
23	0.00E+00	0.00E+00	9.38E-01	73	7.09E+04	6.97E+05	1.38E+05	123	6.98E+03	4.48E+05	2.08E+03	173	1.10E+06	1.31E+05	1.28E+06	223	0.00E+00	0.00E+00	0.00E+00	273	5.77E+05	4.39E+05	4.02E+06
24	1.34E+05	2.18E+06	1.09E+05	74	0.00E+00	0.00E+00	0.00E+00	124	3.35E+04	4.92E+05	3.86E+04	174	1.12E+06	1.89E+05	1.13E+06	224	4.66E+03	8.12E+04	2.22E+02	274	6.52E+02	1.49E+04	2.24E+04
25	2.22E+03	7.72E+05	7.27E+02	75	1.18E+05	1.74E+05	4.95E+05	125	4.96E-01	2.99E-01	0.00E+00	175	2.98E+05	1.38E+05	1.59E+05	225	3.22E+04	1.63E+05	2.44E+03	275	7.81E+05	1.37E+06	2.04E+06
26	3.20E+00	3.67E+01	2.19E+02	76	2.73E+04	6.68E+03	9.52E+04	126	0.00E+00	0.00E+00	0.00E+00	176	1.05E+02	2.07E-01	1.30E+02	226	3.10E+04	2.94E+05	7.21E+03	276	2.72E+06	1.38E+06	8.84E+06
27	3.03E+04	5.61E+05	1.37E+05	77	1.76E+00	4.01E-01	3.51E+01	127	3.63E+03	4.24E+05	5.16E+02	177	1.29E+06	3.85E+05	3.98E+05	227	3.80E+03	4.51E+04	5.20E+02	277	7.94E+04	3.19E+05	2.67E+05
28	1.03E+05	5.81E+05	8.06E+05	78	6.31E+01	1.74E+00	1.39E+02	128	6.00E+03	5.50E+05	5.51E+02	178	2.97E+04	5.98E+04	2.20E+03	228	1.73E+02	2.10E-01	2.49E+03	278	3.19E+04	3.64E+05	3.47E+04
29	1.92E+02	2.56E+03	1.03E+04	79	3.68E+07	2.78E+07	4.85E+07	129	1.67E+03	3.10E+05	1.01E+02	179	4.73E+04	1.24E+04	1.31E+05	229	8.20E+02	1.53E+03	2.86E+02	279	0.00E+00	0.00E+00	3.50E-01
30	2.14E+03	4.72E+04	2.91E+04	80	2.62E+05	1.02E+06	8.24E+05	130	1.44E+04	7.77E+05	1.91E+03	180	1.05E+00	0.00E+00	1.33E+00	230	1.52E+02	0.00E+00	5.57E+01	280	4.45E+04	2.42E+05	2.53E+05
31	1.36E+04	2.15E+05	1.07E+05	81	2.23E+03	1.36E+05	2.91E+03	131	4.59E+00	4.08E-01	0.00E+00	181	1.22E+05	8.57E+04	2.40E+04	231	3.17E+03	5.31E-01	1.19E+04	281	7.48E+02	1.19E+04	1.74E+03
32	5.33E+00	5.90E+00	3.75E+02	82	8.81E+05	1.58E+06	1.99E+06	132	1.21E+04	6.91E+05	1.63E+03	182	4.37E+01	0.00E+00	1.09E+02	232	2.86E+05	5.83E+03	4.90E+05	282	2.38E+02	9.72E+02	9.40E+03
33	1.03E+03	2.57E+05	1.69E+03	83	1.20E+03	8.12E+05	5.64E+03	133	6.35E+04	1.15E+04	2.02E+05	183	5.76E+01	0.00E+00	9.75E+00	233	4.48E+04	1.79E+04	4.75E+04	283	1.37E+01	4.12E+02	4.03E+03
34	2.10E+00	3.56E+00	3.18E+01	84	2.46E+04	4.37E+05	6.93E+04	134	4.20E+04	3.62E+05	8.04E+04	184	8.07E+05	1.06E+05	1.07E+06	234	1.08E+05	1.33E+05	7.06E+04	284	1.95E+05	4.03E+05	9.56E+05
35	1.14E+03	3.56E+05	1.08E+03	85	5.43E+01	1.28E+03	1.55E+03	135	0.00E+00	0.00E+00	0.00E+00	185	6.52E+00	0.00E+00	2.55E+01	235	2.35E+04	1.95E+05	5.49E+03	285	3.45E+01	7.00E+01	9.84E+02
36	3.82E+03	4.81E+05	3.62E+03	86	7.02E+02	4.63E+04	4.81E+02	136	5.80E+00	0.00E+00	9.03E+00	186	1.03E+02	0.00E+00	1.54E+03	236	2.36E+04	2.75E+05	3.30E+04	286	1.34E+01	7.67E+00	1.55E+02
37	1.06E+04	5.97E+05	3.42E+04	87	7.59E+03	9.17E+04	7.93E+04	137	1.59E+00	5.16E+01	5.53E+01	187	2.90E+06	3.30E+06	5.39E+06	237	2.94E+00	4.44E+00	9.66E+01	287	6.68E+01	3.82E+02	5.72E+01
38	5.30E+03	8.16E+05	3.39E+03	88	6.71E-01	6.08E+00	1.03E+01	138	1.20E+04	1.19E+05	1.41E+04	188	1.03E+07	1.21E+06	1.79E+07	238	6.83E+05	4.30E+05	2.36E+06	288	3.71E+03	2.11E+05	4.14E+03
39	3.91E+01	1.16E+03	4.33E+03	89	1.46E+03	4.93E+02	5.12E+03	139	1.99E+05	6.40E+05	4.40E+05	189	1.82E+04	1.47E+04	1.35E+04	239	3.11E+06	1.12E+06	1.11E+07	289	1.82E+02	1.85E+03	3.72E+02
40	6.22E+04	7.49E+05	2.90E+05	90	1.84E+04	5.45E+05	1.90E+04	140	1.03E+07	8.69E+06	1.28E+07	190	7.53E+03	3.36E+02	1.49E+04	240	1.29E+07	4.70E+06	2.87E+07	290	5.54E+01	3.81E+02	6.19E+03
41	3.45E+04	5.59E+05	1.52E+05	91	0.00E+00	0.00E+00	0.00E+00	141	4.96E+05	4.39E+05	9.69E+05	191	3.92E+04	2.03E+03	3.38E+05	241	1.00E+03	9.99E+02	8.12E+04	291	1.01E+04	8.04E+04	8.01E+04
42	1.13E+04	5.78E+05	2.32E+04	92	6.28E+03	4.59E+04	9.86E+04	142	1.36E+03	9.81E+04	1.33E+02	192	4.49E+05	8.75E+04	6.44E+05	242	9.11E+05	8.39E+05	4.65E+06	292	9.05E+02	2.06E+03	6.89E+03
43	2.36E+03	7.35E+02	1.32E+04	93	3.85E+03	4.18E+05	3.87E+02	143	0.00E+00	0.00E+00	0.00E+00	193	5.13E+06	3.45E+05	1.09E+07	243	1.38E+06	7.79E+05	4.86E+06	293	6.87E+03	2.70E+05	4.08E+03
44	5.91E+03	8.98E+04	2.76E+04	94	3.67E+01	4.46E+00	1.01E+03	144	0.00E+00	7.59E-01	0.00E+00	194	6.21E+03	1.55E+01	3.37E+04	244	3.78E+04	3.95E+05	1.83E+04	294	0.00E+00	0.00E+00	0.00E+00
45	1.31E+02	2.44E+03	8.57E+02	95	1.87E+02	2.08E+01	9.62E+02	145	5.00E+02	8.95E+04	1.94E+01	195	4.79E+06	3.92E+04	5.68E+06	245	0.00E+00	0.00E+00	6.20E+00	295	5.73E+01	3.92E-01	7.05E+01
46	1.45E+03	2.34E+04	4.00E+04	96	1.67E+03	1.42E+02	1.33E+04	146	3.73E+00	1.52E+00	5.90E-01	196	3.01E+06	8.10E+04	4.03E+06	246	8.16E+05	1.33E+06	5.90E+05	296	1.55E+04	1.45E+04	2.93E+05
47	1.77E+05	9.41E+05	6.23E+05	97	5.81E+02	2.13E+04	1.82E+04	147	0.00E+00	0.00E+00	0.00E+00	197	1.90E+02	0.00E+00	1.09E+03	247	1.51E+06	8.69E+05	3.89E+06	297	2.64E+05	7.97E+05	6.91E+05
48	1.98E+04	1.42E+06	1.45E+04	98	4.15E+05	2.78E+06	5.96E+05	148	1.56E+02	4.87E+04	1.12E+01	198	1.38E+04	5.47E+00	5.45E+04	248	7.59E+05	3.53E+05	3.66E+06	298	4.56E+03	2.59E+05	1.60E+03
49	3.20E+06	4.92E+06	9.03E+06	99	4.54E+02	1.04E+05	1.24E+02	149	6.36E+05	5.16E+05	9.10E+05	199	1.54E+05	3.57E+04	1.15E+06	249	4.12E+02	5.59E+01	3.10E+03	299	4.82E+00	1.71E+01	7.42E+02
50	7.29E+03	7.02E+05	8.85E+03	100	8.14E+04	8.68E+05	7.69E+04	150	4.69E+01	9.51E+02	5.42E+01	200	9.39E+05	1.08E+05	2.06E+06	250	3.01E+03	1.15E+04	2.51E+04	300	4.65E-01	3.42E-01	5.36E+01

Table F-4 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
301	5.69E+02	1.76E+03	9.98E+03	351	8.64E+02	8.68E+02	2.60E+03	401	1.50E+06	1.60E+06	3.66E+06	451	1.30E+07	1.49E+05	1.61E+07	501	9.32E+04	6.12E+05	6.44E+05	551	2.35E+03	6.99E+05	1.81E+02
302	4.50E+00	5.29E-01	1.77E+01	352	6.94E+01	9.04E-01	5.10E+02	402	1.17E+03	3.27E+02	1.75E+04	452	6.87E+04	2.46E+04	2.79E+05	502	1.37E+01	7.92E+03	4.68E+00	552	2.94E+04	5.15E+05	8.98E+04
303	1.07E+01	3.61E+03	5.21E+00	353	2.62E+04	7.30E+04	6.71E+04	403	9.86E+06	7.61E+06	2.30E+07	453	4.29E+04	6.11E+04	4.55E+04	503	7.54E+01	7.85E+02	7.59E+02	553	1.21E+04	9.01E+05	1.91E+03
304	1.81E+02	4.56E+04	2.04E+02	354	0.00E+00	0.00E+00	0.00E+00	404	2.23E+06	1.84E+06	5.47E+06	454	1.10E+04	9.47E+04	2.10E+04	504	2.16E+04	6.07E+05	6.53E+04	554	7.78E+04	5.75E+05	3.38E+05
305	0.00E+00	0.00E+00	0.00E+00	355	2.02E+06	3.58E+05	5.61E+06	405	1.53E+04	2.20E+04	9.53E+04	455	4.97E+03	2.49E+04	2.62E+02	505	1.15E+03	4.76E+05	2.18E+02	555	1.43E+00	8.65E+00	2.76E+01
306	7.48E+06	7.71E+06	1.49E+07	356	8.52E+01	6.55E+01	3.31E+01	406	7.46E+05	7.43E+05	1.63E+06	456	3.50E+04	1.01E+04	6.45E+03	506	2.66E+00	8.34E+02	3.34E+02	556	1.26E+02	7.02E+02	1.15E+03
307	1.88E+03	1.09E+04	1.23E+05	357	1.03E+05	4.12E+05	2.57E+04	407	1.38E+01	6.20E+00	3.33E+01	457	6.71E+03	4.48E+04	1.91E+03	507	9.89E+03	6.33E+05	1.89E+04	557	3.12E+02	9.24E+04	2.66E+02
308	2.30E-01	0.00E+00	4.32E+00	358	1.37E+04	1.10E+05	9.14E+03	408	5.41E+03	1.08E+06	5.68E+02	458	1.05E+00	0.00E+00	1.84E-01	508	7.23E+04	6.15E+05	5.01E+05	558	7.47E+04	4.01E+05	3.51E+05
309	6.46E+03	4.07E+05	4.06E+03	359	1.58E+05	1.21E+05	4.56E+05	409	2.46E+05	2.31E+06	3.93E+04	459	3.64E+04	4.95E+04	6.66E+04	509	4.64E+01	9.86E+04	5.64E+01	559	9.51E+04	8.85E+05	3.14E+05
310	1.15E+02	6.14E+03	1.54E+02	360	3.80E+05	1.93E+05	1.41E+06	410	1.30E+06	1.52E+06	2.74E+06	460	8.76E+00	3.90E-01	9.93E-01	510	2.58E+04	6.55E+05	8.47E+04	560	5.62E+05	1.40E+06	2.85E+06
311	3.92E+01	2.08E+04	2.27E+01	361	6.11E+01	2.06E+02	1.33E+01	411	1.14E+05	1.15E+06	2.82E+05	461	1.46E+02	4.89E-01	2.65E+03	511	4.49E+05	1.71E+06	1.93E+06	561	1.14E+06	2.26E+06	4.75E+06
312	7.87E+01	8.08E+01	4.67E+03	362	7.34E+04	1.06E+05	1.90E+05	412	8.54E+03	1.03E+05	7.11E+04	462	3.10E+03	1.76E+04	1.47E+03	512	4.76E+02	4.06E+04	2.21E+04	562	2.62E+04	3.20E+05	2.99E+05
313	2.61E+05	5.10E+05	1.42E+06	363	1.43E+00	0.00E+00	7.34E+01	413	4.30E+02	7.63E+03	5.26E+03	463	1.32E+02	1.12E+03	8.35E+02	513	1.14E+05	8.63E+05	5.79E+05	563	9.03E+04	7.24E+05	2.90E+05
314	0.00E+00	0.00E+00	0.00E+00	364	8.73E+00	0.00E+00	7.35E+01	414	5.25E+02	6.80E+03	1.27E+03	464	3.29E+03	5.37E+04	4.28E+04	514	1.25E+00	1.82E+01	2.18E+00	564	4.05E+03	6.42E+05	7.70E+02
315	5.72E+02	2.17E+05	1.13E+02	365	0.00E+00	0.00E+00	0.00E+00	415	5.94E+03	7.48E+05	6.02E+02	465	8.17E+05	1.91E+06	2.93E+06	515	3.10E+04	6.54E+05	9.21E+04	565	0.00E+00	0.00E+00	0.00E+00
316	3.55E+00	2.20E+00	4.91E+01	366	4.70E+03	5.93E+04	1.67E+03	416	3.79E+05	9.76E+05	1.04E+06	466	8.95E+06	8.90E+06	1.85E+07	516	2.78E+03	6.07E+05	1.73E+03	566	4.10E+02	4.21E+03	2.08E+03
317	3.09E+02	7.04E+04	2.88E+02	367	0.00E+00	0.00E+00	6.57E-01	417	2.16E+02	3.41E+01	3.99E+03	467	6.66E+03	2.40E+04	3.82E+04	517	0.00E+00	6.28E-01	0.00E+00	567	2.34E+01	1.11E+03	1.68E+03
318	0.00E+00	0.00E+00	0.00E+00	368	9.58E+03	2.64E+03	1.08E+05	418	4.91E+04	7.22E+05	5.64E+05	468	3.18E+02	2.15E+03	5.77E+03	518	0.00E+00	0.00E+00	0.00E+00	568	4.82E+00	1.45E+01	7.21E+01
319	0.00E+00	3.43E-01	9.68E+00	369	4.39E+06	1.78E+06	1.27E+07	419	2.79E+06	1.36E+06	7.88E+06	469	9.49E+03	8.16E+05	2.26E+03	519	3.29E+02	4.57E+05	2.94E+01	569	2.05E+06	1.54E+06	6.49E+06
320	1.08E+01	5.20E+02	9.65E+02	370	3.06E+03	1.05E+03	3.74E+04	420	2.08E+04	2.24E+04	1.66E+05	470	0.00E+00	0.00E+00	0.00E+00	520	1.78E+00	7.31E+01	2.20E+01	570	5.36E+05	8.12E+05	1.96E+06
321	1.46E+05	6.57E+05	8.68E+05	371	1.09E+00	0.00E+00	2.98E+00	421	1.57E+05	2.77E+06	1.20E+04	471	6.41E+04	1.70E+06	2.95E+04	521	9.33E-02	2.97E+00	4.98E-01	571	0.00E+00	2.83E+00	1.02E+01
322	3.55E+05	1.86E+05	1.21E+06	372	5.10E+03	1.00E+05	8.76E+02	422	9.65E+02	1.68E+05	2.89E+02	472	1.02E+03	5.91E+05	1.10E+02	522	8.58E+03	1.74E+05	5.02E+04	572	4.21E+00	2.80E+01	3.21E+01
323	6.80E+07	3.43E+07	8.34E+07	373	5.71E+04	6.15E+05	4.45E+03	423	1.10E+04	4.84E+04	1.60E+05	473	6.71E+01	7.58E+04	1.86E+01	523	7.16E+04	6.88E+05	2.78E+05	573	1.77E+04	5.12E+05	5.16E+04
324	4.55E+03	5.82E+03	1.21E+05	374	2.08E+00	0.00E+00	3.39E+01	424	5.37E+06	3.33E+06	1.43E+07	474	1.05E+05	1.12E+06	2.66E+05	524	5.73E+03	7.07E+05	9.39E+03	574	1.70E+03	6.10E+05	4.09E+02
325	2.74E+06	9.80E+05	8.00E+06	375	6.33E+03	1.28E+05	6.28E+02	425	1.26E+02	5.68E+03	8.65E+01	475	0.00E+00	0.00E+00	0.00E+00	525	0.00E+00	2.12E-01	0.00E+00	575	2.77E+03	3.11E+05	4.96E+03
326	4.12E+01	2.68E+00	7.17E+02	376	2.71E+04	1.53E+05	1.05E+04	426	7.83E+03	5.05E+05	1.65E+03	476	3.89E+00	4.13E+01	1.26E+01	526	0.00E+00	0.00E+00	0.00E+00	576	7.87E+04	4.94E+05	4.29E+05
327	5.10E+05	2.03E+05	1.70E+06	377	1.55E+04	7.00E+04	1.76E+04	427	5.89E+00	1.35E+02	1.03E+02	477	3.09E+02	2.11E+05	7.73E+02	527	2.95E+02	1.94E+04	7.30E+03	577	4.63E+04	7.78E+05	6.16E+04
328	6.19E+03	1.22E+05	6.11E+02	378	1.13E+05	1.48E+05	2.03E+05	428	2.39E+05	8.46E+05	8.05E+05	478	2.20E+06	4.08E+06	6.80E+06	528	1.02E+03	5.87E+05	1.26E+02	578	2.67E+03	5.32E+04	5.16E+04
329	2.74E+05	2.59E+05	5.88E+05	379	0.00E+00	0.00E+00	0.00E+00	429	9.80E+04	8.38E+05	2.08E+05	479	1.39E+06	5.79E+06	3.31E+06	529	6.41E+03	6.61E+05	4.88E+03	579	7.77E+03	2.76E+04	4.56E+04
330	8.64E+00	0.00E+00	1.37E+01	380	2.44E+04	6.60E+03	2.98E+05	430	0.00E+00	0.00E+00	0.00E+00	480	1.87E+04	2.03E+05	1.86E+05	530	7.65E+03	6.51E+05	9.24E+03	580	6.26E+03	7.96E+05	1.14E+03
331	1.01E+03	2.45E+03	2.07E+03	381	1.56E+00	0.00E+00	6.03E+00	431	0.00E+00	4.50E-01	2.11E+00	481	1.33E+04	5.57E+05	3.83E+04	531	4.60E+03	9.85E+05	7.30E+02	581	1.53E+04	9.08E+05	9.96E+03
332	4.39E+03	1.27E+05	2.55E+02	382	9.91E+06	3.19E+06	1.99E+07	432	4.89E+04	8.65E+05	7.48E+04	482	1.90E+06	1.82E+06	3.14E+06	532	9.74E+00	1.40E+05	0.00E+00	582	1.17E+05	2.30E+06	2.41E+04
333	7.96E-01	0.00E+00	6.52E-01	383	2.11E+00	2.29E-01	6.64E+01	433	1.09E+03	8.59E+01	1.13E+04	483	1.15E+00	2.81E+01	8.65E+01	533	2.34E+03	3.36E+05	5.54E+03	583	9.95E+05	2.37E+06	2.28E+06
334	1.40E+02	7.90E+01	4.89E+03	384	4.89E+04	2.46E+05	4.24E+04	434	9.54E+04	9.19E+05	1.76E+05	484	2.85E+05	1.67E+06	7.62E+05	534	1.26E-01	1.13E+03	0.00E+00	584	3.14E+03	6.11E+05	6.47E+02
335	0.00E+00	0.00E+00	0.00E+00	385	1.58E+03	8.25E+04	2.07E+02	435	1.59E+04	7.84E+05	2.55E+04	485	8.95E-01	3.78E+00	4.98E-02	535	1.98E+04	4.14E+05	6.68E+04	585	1.82E+04	5.75E+05	8.68E+03
336	5.82E+02	1.96E+03	6.56E+02	386	0.00E+00	0.00E+00	5.40E-01	436	3.79E+02	2.33E+04	5.52E+02	486	1.24E+03	4.19E+05	8.70E+02	536	2.07E+01	1.13E+01	3.67E+01	586	2.44E+00	1.29E+00	5.32E+00
337	8.56E+05	3.18E+05	2.83E+06	387	2.52E+04	8.74E+04	4.05E+04	437	3.10E+05	8.03E+05	8.76E+05	487	0.00E+00	8.66E+00	2.72E+00	537	9.60E+03	4.90E+05	1.98E+04	587	9.05E+03	1.71E+05	3.69E+04
338	3.49E+06	8.68E+05	9.37E+06	388	0.00E+00	0.00E+00	0.00E+00	438	4.74E+06	3.39E+06	1.28E+07	488	5.67E+03	6.03E+05	4.13E+03	538	6.69E+02	5.31E+05	2.12E+02	588	5.30E+03	1.52E+05	1.22E+04
339	3.04E+03	6.96E+03	7.72E+03	389	3.72E+03	7.30E+02	3.03E+04	439	1.00E+05	7.55E+05	1.55E+05	489	3.22E+02	4.36E+05	3.43E+01	539	1.95E+05	8.60E+05	6.27E+05	589	1.42E+03	9.22E+03	1.39E+04
340	2.29E+04	3.21E+05	1.85E+03	390	2.14E+00	0.00E+00	0.00E+00	440	2.75E+04	1.11E+06	6.27E+03	490	2.10E+01	1.33E+03	5.52E+02	540	3.46E+06	2.99E+06	9.91E+06	590	2.83E+04	5.99E+05	2.79E+04
341	2.85E+05	6.10E+05	1.58E+05	391	2.83E+05	1.79E+06	1.62E+06	441	3.61E+04	9.56E+05	2.75E+04	491	4.41E+03	2.32E+05	3.28E+04	541	2.83E+05	1.71E+06	5.62E+05	591	5.57E+04	5.71E+05	1.99E+05
342	4.47E+04	4.03E+04	2.61E+05	392	3.59E+07	1.40E+07	5.93E+07	442	8.45E+02	2.66E+05	1.17E+02	492	1.94E+02	2.03E+04	9.47E+02	542	1.14E+07	7.67E+06	2.45E+07	592	2.47E+05	7.09E+05	1.17E+06
343	5.95E+05	4.82E+05	1.35E+06	393	2.59E+05	2.62E+06	1.40E+05	443	2.63E+04	4.79E+05	9.83E+04	493	0.00E+00	3.07E-01	0.00E+00	543	9.27E+04	9.41E+05	2.33E+05	593	0.00E+00	5.46E-01	1.87E-01
344	3.97E+02	3.32E+04	3.06E+01	394	6.50E+05	2.90E+06	4.04E+05	444	8.56E+05	1.27E+06	2.76E+06	494	2.68E+03	4.79E+05	4.29E+03	544	1.47E+03	1.73E+04	5.59E+04	594	1.76E+01	9.90E+01	3.36E+00
345	1.39E+04	1.11E+05	6.53E+03	395	4.64E+05	3.06E+06	2.43E+05	445	1.45E+04	4.75E+05	9.90E+03	495	2.59E+05	7.92E+05	7.82E+05	545	6.77E+06	7.31E+06	1.71E+07	595	0.00E+00	0.00E+00	0.00E+00
346	3.36E+04	1.11E+05	3.54E+04	396	3.14E+04	1.97E+06	4.44E+03	446	1.03E+00	1.18E+00	4.54E+01	496	0.00E+00	1.54E+01	3.82E+01	546	2.47E-01	1.76E+00	5.95E+00	596	2.70E+05	1.37E+06	6.09E+05
347	1.07E+02	6.02E+00	2.38E+02	397	8.10E+04	1.86E+06	4.21E+04	447	2.08E+05	1.95E+05	1.10E+06	497	2.24E+04	8.23E+05	5.10E+04	547	8.56E+01	8.72E+01	3.22E+02	597	5.57E+03	5.11E+05	8.71E+03
348	9.05E+03	6.31E+04	5.94E+03	398	7.01E+03	1.28E+06	3.59E+02	448	0.00E+00	0.00E+00	2.13E+00	498	3.50E+04	2.18E+06	4.96E+03	548	2.83E+04	8.78E+05	1.94E+04	598	6.08E-01	2.22E+00	1.58E+00
349	3.92E+02	7.11E+01	8.23E+03	399	4.71E+02	4.24E+03	1.06E+04	449	9.97E+00	2.76E+00	1.39E+01	499	6.13E+00	8.64E+01	2.53E+01	549	1.75E+04	9.58E+05	4.24E+03	599	3.71E+04	2.06E+06	4.34E+03
350	1.69E+05	1.13E+05	5.42E+05	400	4.35E+04	3.44E+05	2.53E+05	450	1.01E+03	1.27E+04	2.36E+04	500	6.61E+05	1.79E+06	2.69E+06	550	8.09E+04	1.01E+06	9.91E+04	600	3.07E+04	1.02E+06	1.53E+04

Table F-4 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
601	8.50E+03	6.12E+05	5.69E+03	651	3.36E+02	2.71E+02	3.02E+03	701	7.85E+04	1.76E+06	7.05E+04	751	0.00E+00	0.00E+00	0.00E+00	801	2.30E+06	3.04E+06	7.93E+06	851	4.95E+03	4.39E+04	8.24E+04
602	3.39E+02	4.04E+05	2.30E+01	652	1.48E+04	2.11E+05	8.64E+04	702	1.46E+05	1.77E+06	3.60E+05	752	8.60E+02	2.94E+04	3.31E+02	802	1.16E+06	1.61E+06	3.16E+06	852	0.00E+00	3.61E-01	1.24E+01
603	1.18E+02	2.00E+04	3.64E+01	653	0.00E+00	0.00E+00	1.98E+00	703	4.44E-01	3.97E-01	6.27E+00	753	5.64E+03	3.47E+05	2.42E+03	803	1.33E+03	2.22E+05	4.54E+02	853	8.33E+02	1.07E+04	2.81E+04
604	9.33E+04	1.08E+06	1.59E+05	654	8.92E+04	5.80E+05	2.97E+05	704	3.16E+04	7.99E+05	1.14E+05	754	0.00E+00	0.00E+00	0.00E+00	804	8.65E+03	3.39E+05	1.94E+04	854	9.86E+03	9.02E+05	1.53E+04
605	6.00E+03	4.16E+05	5.96E+03	655	1.06E+05	1.37E+06	6.48E+04	705	2.18E+04	8.33E+04	1.04E+05	755	6.74E+01	1.82E+04	1.09E+01	805	1.60E+04	7.26E+05	4.24E+03	855	3.42E+03	3.34E+05	4.50E+03
606	6.08E+05	1.03E+06	1.61E+06	656	6.23E-01	5.12E-02	7.51E+00	706	8.78E+02	2.05E+05	1.72E+03	756	3.51E+02	1.91E+04	1.78E+02	806	3.32E+04	1.14E+06	2.74E+04	856	0.00E+00	0.00E+00	0.00E+00
607	1.97E+00	8.84E+02	0.00E+00	657	8.24E+03	3.63E+05	3.21E+03	707	1.10E+05	8.06E+05	8.09E+05	757	0.00E+00	0.00E+00	0.00E+00	807	1.73E+02	2.21E+04	2.45E+02	857	4.88E+02	5.79E+03	1.67E+04
608	6.47E+01	8.14E+02	1.25E+03	658	2.51E+03	2.22E+05	5.65E+02	708	7.53E+01	3.37E+02	2.09E+03	758	0.00E+00	0.00E+00	3.49E-01	808	2.42E+03	2.05E+05	1.92E+03	858	5.15E+04	6.63E+05	2.05E+05
609	2.42E+01	4.69E+02	9.18E+02	659	2.20E+04	7.18E+05	1.03E+04	709	1.50E+03	3.25E+05	1.05E+03	759	1.65E+03	3.94E+04	2.80E+03	809	3.06E+00	5.77E+01	1.82E+02	859	7.54E+05	1.17E+06	1.86E+06
610	1.26E+04	4.05E+05	5.53E+04	660	3.79E+03	2.79E+05	1.93E+03	710	4.11E+05	1.39E+06	1.78E+06	760	3.38E+03	1.47E+05	3.39E+03	810	7.85E+04	4.44E+05	2.86E+05	860	4.31E+03	6.40E+05	1.37E+03
611	3.87E-01	6.23E-01	4.44E-01	661	2.05E+01	1.32E+02	1.53E+03	711	1.07E+06	2.07E+06	4.61E+06	761	6.49E+01	2.06E+02	1.36E+03	811	1.72E+02	1.04E+03	4.02E+03	861	4.42E+02	1.97E+05	7.15E+01
612	5.73E+03	6.67E+05	7.24E+03	662	5.37E+01	1.60E+03	3.65E+03	712	1.17E+01	3.55E+01	3.31E+01	762	1.24E+02	1.36E+04	1.40E+01	812	1.97E+01	3.00E+01	1.95E+02	862	4.92E+04	1.92E+06	1.54E+04
613	5.02E+01	2.55E+05	2.32E+00	663	1.89E+05	5.27E+05	1.07E+06	713	7.54E+01	5.17E+02	3.08E+03	763	6.07E+02	1.01E+04	3.14E+03	813	1.17E+04	2.47E+05	4.57E+04	863	4.49E+04	3.80E+05	2.40E+05
614	0.00E+00	0.00E+00	0.00E+00	664	1.51E+06	1.93E+06	5.38E+06	714	0.00E+00	0.00E+00	0.00E+00	764	1.63E+02	1.12E+04	1.02E+02	814	3.27E+02	7.72E+04	7.71E+02	864	1.90E-01	0.00E+00	1.48E+00
615	9.31E+00	1.61E+02	1.75E+02	665	1.05E+07	8.61E+06	2.34E+07	715	2.45E+03	2.46E+04	3.17E+04	765	0.00E+00	0.00E+00	1.92E+00	815	1.87E+05	4.68E+05	7.18E+05	865	0.00E+00	0.00E+00	0.00E+00
616	0.00E+00	6.01E+00	0.00E+00	666	2.60E+02	2.00E+03	1.60E+04	716	9.05E+05	1.19E+06	1.91E+06	766	0.00E+00	0.00E+00	3.78E-01	816	1.55E+05	4.65E+05	7.33E+05	866	1.15E+05	7.12E+05	4.93E+05
617	1.06E+04	2.93E+05	1.78E+04	667	0.00E+00	0.00E+00	0.00E+00	717	2.49E+02	6.84E+04	2.04E+02	767	5.09E+05	1.84E+06	1.42E+06	817	4.56E+05	7.15E+05	1.21E+06	867	7.07E+02	1.98E+05	1.24E+02
618	2.02E+01	1.39E+01	4.31E+02	668	2.81E+03	2.26E+05	9.25E+02	718	2.17E+04	4.84E+05	6.79E+04	768	1.24E+06	1.70E+06	4.59E+06	818	2.80E+04	7.66E+05	3.51E+04	868	1.67E+00	3.53E+00	4.22E+01
619	4.98E+02	6.23E+04	1.04E+02	669	2.42E+04	4.66E+05	3.96E+04	719	6.03E+03	5.11E+04	4.42E+04	769	4.53E+05	1.15E+06	2.07E+06	819	2.13E+04	2.42E+05	8.31E+04	869	4.02E+03	3.77E+05	1.16E+04
620	2.49E+03	1.76E+05	2.41E+03	670	9.94E+00	9.78E-01	8.78E+00	720	4.11E+03	4.10E+05	7.70E+03	770	1.66E+07	1.51E+07	3.04E+07	820	4.86E+04	1.37E+06	1.04E+04	870	2.88E+02	1.08E+05	2.54E+02
621	1.21E+04	9.53E+04	1.04E+05	671	5.21E+03	3.40E+05	4.67E+03	721	0.00E+00	8.69E-01	1.07E+01	771	4.20E+05	1.04E+06	2.44E+06	821	3.80E+02	4.82E+04	5.67E+02	871	2.62E+03	9.80E+03	2.22E+04
622	6.20E+05	1.08E+06	2.68E+06	672	1.84E+03	6.97E+03	1.60E+04	722	1.41E+03	2.78E+05	1.55E+03	772	7.15E+05	1.93E+06	1.66E+06	822	5.61E+03	2.68E+05	7.49E+03	872	2.68E+00	3.02E+00	3.57E+01
623	2.67E+05	7.09E+05	9.84E+05	673	5.00E+04	6.49E+05	1.35E+05	723	4.22E+05	1.14E+06	2.53E+06	773	1.18E+05	9.23E+05	2.87E+05	823	1.71E+01	1.39E+02	2.00E+01	873	1.21E+06	2.38E+06	4.90E+06
624	5.57E+01	7.27E+01	1.01E+03	674	6.55E+03	2.08E+04	9.52E+04	724	1.29E+05	5.84E+05	9.20E+05	774	7.35E+03	6.16E+05	6.39E+03	824	0.00E+00	0.00E+00	0.00E+00	874	9.02E+05	2.23E+06	4.21E+06
625	2.38E+04	6.19E+05	8.05E+03	675	1.57E+05	5.07E+05	7.84E+05	725	6.72E+04	5.82E+05	6.90E+05	775	7.02E+04	3.08E+06	1.65E+04	825	1.99E+03	3.25E+04	1.59E+04	875	1.73E+07	1.71E+07	3.37E+07
626	3.46E+05	1.41E+06	5.56E+05	676	9.26E+04	4.76E+05	3.77E+05	726	2.61E+06	4.45E+06	9.10E+06	776	2.28E+05	1.94E+06	4.04E+05	826	6.63E+02	4.75E+04	3.18E+03	876	4.90E+06	5.90E+06	1.35E+07
627	8.33E+04	1.25E+06	1.27E+04	677	4.16E+04	4.40E+05	1.57E+05	727	2.44E+03	2.18E+04	8.38E+04	777	9.33E+04	1.59E+06	1.03E+05	827	0.00E+00	0.00E+00	0.00E+00	877	1.75E+01	1.40E+02	7.34E+02
628	1.12E+04	6.15E+05	2.01E+03	678	0.00E+00	0.00E+00	0.00E+00	728	3.70E+02	2.37E+03	1.36E+04	778	1.79E+00	9.24E-01	5.79E+00	828	8.67E+02	4.14E+03	4.16E+03	878	9.81E+02	2.55E+05	3.20E+02
629	1.48E+04	4.50E+05	1.08E+04	679	2.55E+00	0.00E+00	8.62E+00	729	1.17E+01	1.15E+02	3.37E+02	779	1.56E+02	1.06E+05	1.56E+01	829	8.92E+02	1.54E+03	1.61E+04	879	2.45E+04	3.98E+05	9.43E+04
630	2.24E+04	4.88E+05	2.92E+04	680	6.90E-01	1.75E+00	6.09E+01	730	6.20E-01	1.39E+00	2.46E+01	780	3.92E+02	3.96E+03	5.94E+03	830	1.53E+01	8.03E+01	3.52E+02	880	1.18E+01	1.66E+01	4.52E+00
631	3.36E+03	2.87E+04	2.34E+04	681	1.62E+02	2.36E+02	3.67E+03	731	0.00E+00	0.00E+00	3.02E+00	781	3.56E+03	6.78E+05	5.84E+02	831	1.55E+03	3.39E+04	3.54E+02	881	3.56E+05	1.16E+06	1.68E+06
632	7.36E+00	3.06E+01	6.14E+02	682	5.32E+01	1.40E+04	2.88E+00	732	1.86E+03	2.55E+04	7.51E+04	782	5.28E+03	7.86E+05	2.43E+03	832	1.14E+04	2.88E+04	2.57E+04	882	1.79E+05	7.89E+05	1.02E+06
633	7.80E+05	1.26E+06	3.50E+06	683	2.42E+05	4.95E+05	1.06E+06	733	5.63E+01	3.33E+03	2.00E+02	783	2.14E+04	5.67E+05	5.70E+04	833	6.52E+04	5.37E+04	2.35E+05	883	1.73E+01	9.92E+01	2.07E+01
634	1.67E+03	9.66E+03	6.06E+04	684	2.06E+01	1.54E+00	3.21E+01	734	4.06E+03	3.89E+05	5.89E+03	784	3.36E+04	1.24E+05	1.56E+05	834	0.00E+00	0.00E+00	5.90E-02	884	1.02E+02	3.17E+02	1.86E+03
635	8.66E+04	5.69E+05	3.37E+05	685	3.99E+03	1.37E+05	1.32E+03	735	1.31E+03	5.05E+04	1.31E+04	785	9.83E+04	2.97E+05	4.12E+05	835	8.67E+01	7.55E+03	1.61E+01	885	0.00E+00	0.00E+00	6.99E-01
636	1.13E+03	4.62E+03	2.93E+04	686	6.06E+02	3.67E+04	1.58E+02	736	1.61E+04	4.55E+05	4.82E+04	786	1.85E+01	2.67E+01	1.56E+02	836	5.47E+02	2.79E+04	2.75E+02	886	1.37E+02	2.38E+04	8.42E+01
637	1.05E+07	7.58E+06	2.23E+07	687	1.95E+04	5.66E+04	7.25E+04	737	0.00E+00	0.00E+00	1.18E+00	787	1.27E+00	1.42E+01	9.43E+01	837	8.30E+03	2.20E+04	2.54E+04	887	2.60E+03	3.68E+05	1.07E+03
638	9.94E+03	4.04E+05	9.07E+03	688	7.17E+00	3.94E-01	1.32E+01	738	1.75E+04	2.19E+05	1.03E+05	788	8.00E-02	4.26E-01	3.98E+00	838	1.76E+02	9.72E+01	1.13E+03	888	9.03E+03	5.79E+05	8.35E+03
639	3.68E+04	5.32E+05	7.97E+04	689	2.04E+02	1.10E+04	3.92E+02	739	2.53E+01	2.56E+03	2.33E+01	789	2.55E+03	3.18E+05	1.43E+03	839	2.16E+02	2.50E+04	2.41E+02	889	6.93E+01	8.13E+03	2.97E+01
640	1.73E+01	2.29E-01	1.08E+01	690	8.79E+00	9.18E+00	1.80E+02	740	2.22E+00	4.84E+01	4.41E+02	790	3.96E+01	2.74E+02	9.59E+01	840	1.34E+02	1.79E+04	2.68E+01	890	5.41E+01	2.43E+04	9.27E+00
641	6.37E+02	6.46E+04	1.64E+02	691	7.04E+02	1.58E+04	4.36E+03	741	7.04E+06	7.86E+06	1.66E+07	791	2.96E+04	4.22E+05	1.00E+05	841	8.06E+02	8.26E+03	1.33E+03	891	0.00E+00	0.00E+00	0.00E+00
642	0.00E+00	0.00E+00	1.08E+00	692	3.43E+02	2.41E+04	5.89E+01	742	0.00E+00	0.00E+00	0.00E+00	792	5.01E+03	3.11E+05	7.66E+03	842	1.69E+00	1.70E+00	4.36E+01	892	0.00E+00	0.00E+00	1.16E-01
643	2.66E+03	2.59E+05	6.44E+02	693	7.21E+03	3.38E+05	3.59E+04	743	1.96E+03	5.28E+05	8.22E+02	793	1.54E+03	9.22E+04	4.04E+03	843	5.58E+00	8.55E+02	3.30E+00	893	1.96E+04	6.79E+05	3.20E+04
644	1.32E+02	2.86E+02	2.38E+02	694	3.03E+07	2.61E+07	4.50E+07	744	8.40E+02	3.26E+05	1.36E+02	794	1.53E+03	3.98E+05	3.07E+02	844	1.54E+05	7.43E+05	1.18E+06	894	1.06E+01	8.18E+00	1.02E+02
645	4.95E+01	1.79E+02	2.09E+03	695	4.78E+06	6.63E+06	1.50E+07	745	0.00E+00	0.00E+00	0.00E+00	795	8.57E+03	2.17E+05	3.25E+04	845	4.54E+00	1.34E+02	8.24E+02	895	7.32E+04	4.83E+05	2.55E+05
646	5.99E+04	1.75E+05	6.37E+05	696	9.90E+04	1.03E+06	3.85E+05	746	8.19E+02	2.07E+05	1.56E+02	796	1.29E+04	6.31E+04	1.23E+05	846	8.52E+02	1.04E+04	8.51E+03	896	7.82E+00	1.40E+01	1.96E+02
647	1.48E+03	2.29E+05	1.29E+02	697	1.02E+04	8.91E+05	8.95E+03	747	3.84E+02	2.54E+04	1.59E+03	797	3.68E+03	2.64E+05	5.03E+03	847	3.07E+03	7.77E+05	4.78E+02	897	1.67E+05	4.03E+05	4.83E+05
648	1.75E+02	1.62E+04	5.29E+01	698	0.00E+00	0.00E+00	0.00E+00	748	3.60E+04	1.55E+05	1.85E+05	798	1.67E+03	1.63E+04	1.35E+04	848	1.19E+02	2.71E+02	1.30E+03	898	1.44E+06	1.64E+06	4.89E+06
649	0.00E+00	0.00E+00	0.00E+00	699	6.50E+04	1.95E+06	2.43E+04	749	1.22E+05	2.03E+05	5.88E+05	799	2.33E+00	5.34E-01	2.24E+00	849	1.44E+04	1.48E+06	4.41E+03	899	6.25E+03	1.36E+05	2.39E+04
650	3.45E+03	1.30E+05	1.11E+04	700	2.74E+04	1.48E+06	7.66E+03	750	1.42E+03	4.22E+04	1.44E+03	800	0.00E+00	0.00E+00	0.00E+00	850	9.04E+04	1.98E+06	9.48E+04	900	7.47E+04	6.80E+04	1.44E+05

Table F-4 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
901	2.03E+02	1.71E+04	1.35E+01	951	9.58E+02	9.94E+04	1.30E+03	1001	1.69E+04	2.03E+04	8.58E+04	1051	9.17E+03	1.10E+06	2.46E+03	1101	1.90E+06	2.95E+06	7.09E+06	1151	9.36E+05	2.68E+06	4.42E+06
902	5.58E+02	2.47E+04	2.03E+02	952	2.36E+05	7.20E+05	5.32E+05	1002	6.29E-01	1.15E+01	1.00E+02	1052	1.32E+03	4.53E+05	4.31E+02	1102	1.66E+03	1.70E+05	1.90E+03	1152	1.41E+03	1.23E+04	5.15E+04
903	6.21E+03	7.88E+04	3.71E+03	953	2.33E+04	4.98E+05	5.88E+04	1003	9.41E+00	1.14E+00	1.02E+01	1053	2.31E+01	4.82E+01	3.02E+02	1103	5.82E+03	4.63E+05	2.37E+03	1153	3.52E+00	5.04E+01	4.62E+02
904	5.52E+02	2.90E+04	1.89E+02	954	2.99E+04	6.69E+05	9.70E+04	1004	4.89E+03	1.19E+05	2.70E+05	1054	7.49E-01	5.10E+00	4.72E+01	1104	4.65E+03	2.01E+05	1.11E+04	1154	3.58E+03	2.54E+04	8.44E+04
905	5.16E+04	1.26E+05	1.57E+05	955	1.70E+06	3.67E+06	6.85E+06	1005	2.26E+05	1.60E+06	1.38E+06	1055	1.12E+04	1.13E+06	1.27E+04	1105	4.16E+03	4.09E+05	1.86E+03	1155	9.36E+04	6.32E+05	8.69E+05
906	0.00E+00	0.00E+00	0.00E+00	956	2.29E+07	1.91E+07	3.90E+07	1006	0.00E+00	1.27E+00	1.16E+01	1056	3.11E+00	2.54E+01	1.93E+02	1106	3.17E+03	2.03E+04	4.22E+04	1156	9.92E+03	4.34E+05	2.26E+04
907	5.97E-01	4.13E+00	1.08E-01	957	8.19E+04	9.45E+05	1.55E+05	1007	0.00E+00	1.80E-01	1.72E+00	1057	5.55E+02	1.22E+04	9.66E+03	1107	3.10E+02	2.16E+03	6.84E+03	1157	8.81E+03	4.62E+05	5.44E+03
908	8.01E+01	1.06E+04	3.39E+00	958	2.20E+05	1.10E+06	1.35E+06	1008	8.89E+00	2.15E+01	1.10E+02	1058	3.51E+04	9.52E+05	1.20E+05	1108	5.50E+06	7.24E+06	1.42E+07	1158	0.00E+00	2.69E+00	3.58E+01
909	1.94E+01	4.68E+03	2.11E+00	959	7.05E+03	5.86E+05	1.40E+04	1009	8.60E+04	3.11E+06	2.49E+04	1059	5.61E+03	7.71E+05	5.10E+03	1109	4.09E+05	7.34E+05	2.17E+06	1159	1.87E+06	2.69E+06	7.09E+06
910	2.07E+03	4.57E+04	1.56E+03	960	2.19E+03	3.98E+05	5.74E+03	1010	1.98E+02	1.04E+04	4.22E+02	1060	7.07E+05	2.77E+06	4.04E+06	1110	1.75E+04	5.18E+05	2.46E+04	1160	7.24E-01	3.36E+00	3.66E+01
911	4.34E+01	6.95E+01	3.78E+02	961	2.30E+01	2.69E+02	6.41E+01	1011	3.41E+04	1.49E+06	1.04E+05	1061	5.84E+05	1.44E+06	2.51E+06	1111	0.00E+00	0.00E+00	0.00E+00	1161	7.45E+03	3.90E+05	1.73E+04
912	6.46E+02	4.94E+04	2.14E+03	962	1.12E+05	8.48E+05	6.49E+05	1012	9.02E+03	1.50E+06	6.18E+03	1062	1.46E+03	7.76E+03	1.52E+04	1112	9.23E+01	2.48E+04	4.23E+01	1162	3.18E+01	1.56E+02	1.25E+03
913	0.00E+00	0.00E+00	0.00E+00	963	1.82E+03	1.97E+04	6.42E+04	1013	8.52E+04	2.30E+06	1.76E+05	1063	1.36E+06	7.39E+05	4.23E+06	1113	7.63E+02	1.55E+05	2.79E+02	1163	2.97E+05	7.95E+05	1.28E+06
914	1.00E+03	3.79E+03	9.90E+03	964	3.84E+03	3.27E+04	7.01E+04	1014	2.32E+04	1.96E+06	3.41E+04	1064	5.55E+02	5.47E+04	9.26E+01	1114	1.05E+04	3.53E+05	2.18E+04	1164	1.72E+03	2.36E+05	1.14E+03
915	1.44E+04	5.13E+05	2.84E+04	965	1.69E+00	2.91E-01	4.36E+00	1015	1.51E+05	1.62E+06	6.52E+05	1065	1.40E+03	6.20E+04	8.92E+02	1115	2.14E-01	1.52E+00	3.66E+01	1165	5.10E-01	3.28E+00	4.41E+01
916	2.40E+03	2.93E+05	3.12E+03	966	8.18E+03	7.80E+05	3.30E+03	1016	1.72E-01	1.48E-01	2.53E+00	1066	5.45E+00	4.31E-01	1.27E+01	1116	1.06E+01	2.10E+02	1.93E+01	1166	1.27E+02	8.61E+04	4.25E+01
917	3.88E+06	6.30E+06	1.34E+07	967	7.20E+02	4.43E+03	8.73E+03	1017	1.72E+02	1.37E+04	2.01E+02	1067	4.38E+03	1.67E+05	2.53E+04	1117	0.00E+00	0.00E+00	0.00E+00	1167	5.18E+01	2.00E+03	8.17E+03
918	8.16E+01	7.12E+03	1.10E+02	968	2.00E+01	2.92E+01	2.16E+02	1018	5.37E+03	9.65E+04	1.01E+05	1068	1.56E+04	7.75E+04	5.46E+04	1118	8.92E+00	6.59E+01	5.30E+01	1168	7.06E+04	4.82E+05	6.02E+05
919	1.52E+04	1.36E+06	2.06E+03	969	1.71E+02	6.43E+03	3.43E+02	1019	1.51E+07	1.82E+07	3.37E+07	1069	5.24E+01	1.07E+04	2.27E+01	1119	5.26E+04	5.85E+04	2.62E+05	1169	1.80E+05	4.68E+05	1.21E+06
920	2.42E+05	3.95E+06	2.25E+05	970	0.00E+00	0.00E+00	0.00E+00	1020	9.73E+05	2.65E+06	5.61E+06	1070	8.31E+01	2.42E+02	9.25E+02	1120	1.48E+00	1.06E+02	0.00E+00	1170	3.06E+04	4.78E+05	1.26E+05
921	1.53E+04	1.38E+06	1.67E+04	971	1.22E+03	1.26E+04	1.94E+04	1021	1.62E+05	9.95E+05	8.14E+05	1071	2.96E+02	1.25E+05	1.48E+02	1121	2.36E+02	3.55E+04	3.92E+01	1171	3.58E+01	9.64E+01	7.37E+02
922	7.90E+04	2.44E+06	8.30E+04	972	1.21E+05	6.94E+05	1.22E+06	1022	2.77E+03	6.95E+05	1.85E+03	1072	7.04E+03	1.44E+05	5.63E+04	1122	3.14E-01	3.56E+00	0.00E+00	1172	0.00E+00	0.00E+00	1.74E+00
923	5.23E+04	2.45E+06	2.03E+04	973	1.46E+04	2.69E+05	6.15E+04	1023	2.73E+00	1.36E+00	8.66E+00	1073	1.13E+06	2.32E+06	5.08E+06	1123	8.45E+04	1.27E+05	2.63E+05	1173	1.59E+02	6.55E+04	7.97E+01
924	5.36E+04	6.71E+05	2.89E+05	974	7.35E+05	1.34E+06	1.45E+06	1024	1.72E+03	1.34E+05	7.96E+03	1074	5.89E+04	5.93E+05	2.96E+05	1124	1.14E+03	2.11E+04	2.36E+03	1174	2.17E+04	6.80E+05	2.49E+04
925	4.79E+00	2.04E+00	1.64E+01	975	2.20E+03	4.86E+05	1.92E+03	1025	2.08E+05	2.97E+06	3.48E+05	1075	6.52E+04	8.16E+05	1.93E+05	1125	1.16E+04	2.40E+05	3.49E+04	1175	4.53E-01	2.44E-01	6.63E+00
926	2.69E-01	2.80E+00	1.72E+01	976	2.17E+04	9.26E+05	5.88E+04	1026	0.00E+00	0.00E+00	3.64E-01	1076	1.26E+02	8.14E+02	2.26E+03	1126	0.00E+00	0.00E+00	2.92E-01	1176	1.14E+01	5.07E+01	1.27E+01
927	0.00E+00	1.32E+00	1.46E+01	977	6.18E+02	1.63E+05	2.60E+02	1027	3.37E+02	6.92E+03	2.71E+04	1077	2.46E+01	3.86E+01	4.11E+01	1127	1.02E+03	4.00E+05	3.15E+02	1177	2.57E+03	4.17E+05	7.61E+02
928	1.30E-01	1.48E+01	1.18E+02	978	1.89E+00	5.91E-01	6.01E+00	1028	2.39E+03	3.63E+04	9.99E+04	1078	3.99E+03	7.69E+05	1.44E+03	1128	1.79E+05	1.18E+06	8.47E+05	1178	0.00E+00	6.88E-02	3.11E+00
929	0.00E+00	1.30E-01	1.61E+00	979	0.00E+00	0.00E+00	3.27E-01	1029	1.74E+06	3.92E+06	8.29E+06	1079	7.16E+04	6.50E+05	3.12E+05	1129	5.94E+06	7.84E+06	1.72E+07	1179	3.04E+03	4.20E+05	2.86E+03
930	3.20E+05	1.52E+06	1.54E+06	980	2.01E-01	1.49E+00	2.45E+01	1030	1.82E+01	5.28E+02	2.99E+03	1080	1.74E+05	5.06E+05	1.06E+06	1130	1.12E+04	9.38E+05	4.90E+03	1180	1.24E-01	1.48E+00	1.68E+01
931	3.20E+03	5.63E+05	6.31E+02	981	4.94E+04	7.57E+05	2.23E+05	1031	3.42E+04	1.17E+06	1.14E+05	1081	5.92E+02	1.97E+05	4.67E+01	1131	1.18E+05	1.48E+06	2.52E+05	1181	9.24E+02	2.34E+05	5.03E+02
932	2.40E+04	1.62E+06	3.79E+04	982	8.19E+01	7.97E+04	1.45E+01	1032	5.40E+02	1.49E+05	3.73E+02	1082	9.06E+05	1.77E+06	4.68E+06	1132	2.44E+05	7.36E+05	1.51E+06	1182	4.65E+04	3.88E+05	2.26E+05
933	6.80E+02	3.12E+03	6.26E+03	983	1.85E+01	2.44E+02	9.05E+02	1033	1.33E+04	2.12E+05	1.29E+05	1083	0.00E+00	0.00E+00	0.00E+00	1133	1.70E+03	5.67E+05	1.05E+03	1183	6.76E+01	5.94E+03	2.15E+02
934	4.68E+05	1.92E+06	2.02E+06	984	6.31E+01	6.22E+01	4.53E+02	1034	1.13E+02	3.33E+02	1.09E+03	1084	1.43E+06	1.81E+06	2.96E+06	1134	3.50E+03	7.96E+05	1.03E+03	1184	1.69E+03	3.64E+05	4.57E+02
935	1.93E+05	1.51E+06	7.42E+05	985	1.04E+06	1.98E+06	4.42E+06	1035	0.00E+00	0.00E+00	0.00E+00	1085	0.00E+00	0.00E+00	3.00E-01	1135	7.57E+01	1.48E+03	1.55E+02	1185	9.45E+01	4.41E+02	2.62E+03
936	3.95E+06	5.26E+06	8.09E+06	986	2.90E+05	1.10E+06	9.34E+05	1036	3.00E+06	4.84E+06	1.10E+07	1086	6.27E+01	1.21E+04	2.72E+01	1136	5.89E+00	2.10E+00	1.71E+01	1186	1.76E+04	5.59E+05	4.19E+04
937	4.28E+06	4.39E+06	6.25E+06	987	3.55E+05	9.25E+05	1.34E+06	1037	8.01E+03	6.98E+05	1.77E+04	1087	1.82E+03	3.26E+05	3.79E+02	1137	6.75E+04	6.23E+05	4.20E+05	1187	6.54E+03	3.45E+05	1.28E+04
938	5.89E+02	1.24E+05	7.05E+02	988	3.14E+04	1.24E+05	1.15E+05	1038	3.49E+04	1.73E+06	4.36E+04	1088	2.64E+05	1.16E+06	8.18E+05	1138	2.18E+03	9.86E+04	1.69E+04	1188	7.97E+00	1.28E+01	1.49E+02
939	9.72E-01	3.88E+00	2.75E+01	989	7.65E+05	4.08E+05	1.27E+06	1039	1.95E+05	3.84E+06	1.01E+05	1089	0.00E+00	0.00E+00	0.00E+00	1139	1.04E+01	8.47E+00	1.07E+01	1189	0.00E+00	0.00E+00	0.00E+00
940	6.18E+01	3.66E+02	1.17E+03	990	8.13E-01	6.60E+00	3.12E-01	1040	2.02E+05	1.64E+06	4.81E+05	1090	2.29E+04	2.18E+05	1.43E+05	1140	0.00E+00	0.00E+00	0.00E+00	1190	7.90E+01	2.18E+04	8.13E+00
941	7.03E+01	2.80E+01	2.06E+02	991	8.89E+03	2.71E+04	4.86E+04	1041	1.47E+06	4.70E+06	5.10E+06	1091	2.44E+03	3.16E+05	2.60E+03	1141	3.04E+02	2.91E+03	1.29E+04	1191	3.31E+00	2.61E+02	1.66E+00
942	1.32E+03	3.26E+04	8.21E+04	992	1.02E+04	1.48E+05	1.00E+04	1042	1.00E+05	1.20E+06	5.95E+05	1092	2.71E+04	2.43E+05	1.58E+05	1142	4.11E+02	3.33E+03	5.97E+03	1192	9.73E-02	4.47E+00	9.97E+01
943	2.28E+04	3.12E+05	2.44E+05	993	2.79E+03	5.27E+03	4.45E+04	1043	3.79E+05	1.89E+06	2.10E+06	1093	2.19E-01	5.05E+00	7.44E+01	1143	5.21E+03	5.27E+05	3.93E+03	1193	2.64E+04	2.12E+05	5.62E+04
944	3.51E+04	2.07E+05	2.14E+05	994	0.00E+00	0.00E+00	0.00E+00	1044	4.35E+04	3.98E+05	7.33E+05	1094	0.00E+00	0.00E+00	0.00E+00	1144	4.17E+02	4.12E+04	1.64E+03	1194	5.97E+04	7.35E+04	2.68E+05
945	9.11E+04	2.26E+06	6.71E+04	995	0.00E+00	0.00E+00	6.72E-01	1045	1.28E+04	7.34E+05	3.56E+04	1095	4.58E+02	4.34E+04	1.63E+03	1145	4.93E+05	1.17E+06	2.34E+06	1195	2.85E+02	2.98E+04	8.52E+01
946	3.52E+05	1.98E+06	1.12E+06	996	2.88E+00	8.25E-01	2.77E+01	1046	1.66E+04	1.21E+06	9.33E+03	1096	1.98E-01	0.00E+00	3.21E+00	1146	1.67E-01	0.00E+00	7.76E-01	1196	3.71E+03	1.08E+05	1.22E+03
947	4.50E+03	7.82E+05	3.08E+03	997	0.00E+00	2.99E-01	1.03E+01	1047	1.99E+02	1.11E+03	5.80E+03	1097	0.00E+00	0.00E+00	6.75E-01	1147	0.00E+00	0.00E+00	3.62E-01	1197	1.53E+02	5.18E+02	6.66E+03
948	4.69E+00	9.22E+01	6.69E+02	998	1.13E+02	1.82E+04	1.66E+01	1048	1.11E+03	3.98E+05	5.20E+02	1098	6.17E+04	3.46E+05	6.21E+05	1148	8.12E+03	9.88E+04	9.61E+04	1198	1.94E-01	3.30E+00	2.90E-01
949	8.07E+04	3.81E+05	8.36E+05	999	0.00E+00	0.00E+00	0.00E+00	1049	3.90E+03	3.90E+04	5.03E+04	1099	2.48E+06	3.22E+06	6.88E+06	1149	9.19E+03	4.43E+05	2.27E+04	1199	2.46E+02	3.21E+04	5.65E+01
950	7.22E+03	4.12E+05	2.38E+04	1000	7.98E+01	1.50E+04	4.91E+00	1050	1.86E+03	5.40E+05	1.12E+03	1100	1.36E+05	1.69E+06	1.49E+05	1150	2.18E+03	1.96E+04	3.56E+04	1200	3.20E+02	8.66E+03	1.73E+03

Table F-4 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
1201	0.00E+00	0.00E+00	9.08E-01	1251	2.63E+05	1.24E+06	8.14E+05	1301	8.99E+03	1.64E+05	2.79E+04	1351	6.70E+02	6.75E+03	1.99E+04	1401	3.69E+02	6.97E+04	3.61E+01	1451	1.47E+04	1.47E+06	4.36E+03
1202	0.00E+00	0.00E+00	1.93E+00	1252	4.68E+01	3.64E+02	1.62E+03	1302	1.79E+02	1.24E+04	2.50E+02	1352	2.83E+04	1.59E+06	6.25E+03	1402	3.25E+03	5.17E+05	5.42E+02	1452	0.00E+00	0.00E+00	8.08E-01
1203	2.43E+03	1.31E+04	9.14E+03	1253	3.10E+00	0.00E+00	1.27E+00	1303	2.26E+05	8.11E+05	5.96E+05	1353	3.16E+00	5.96E+00	2.89E+01	1403	1.43E+01	1.81E+02	8.10E+02	1453	2.79E+04	1.71E+06	1.08E+04
1204	1.15E+03	1.48E+04	1.89E+03	1254	0.00E+00	0.00E+00	3.58E-01	1304	1.26E+06	2.84E+06	4.27E+06	1354	1.32E+05	2.19E+06	1.07E+05	1404	3.18E+03	1.30E+05	1.08E+04	1454	2.49E+03	1.58E+05	5.54E+03
1205	1.57E+06	2.86E+06	5.19E+06	1255	3.36E+02	5.27E+04	7.29E+01	1305	4.90E+05	1.03E+06	2.29E+06	1355	1.44E+04	1.34E+06	2.30E+03	1405	7.00E+03	3.76E+05	1.12E+04	1455	0.00E+00	0.00E+00	0.00E+00
1206	9.02E+04	4.88E+05	5.97E+05	1256	4.69E+05	1.35E+06	1.74E+06	1306	1.50E+04	3.89E+05	2.38E+04	1356	1.37E+04	9.28E+05	4.24E+03	1406	9.55E+00	5.79E+01	9.72E-01	1456	3.10E+05	1.51E+06	1.23E+06
1207	1.42E+07	1.59E+07	2.84E+07	1257	7.05E+05	1.75E+06	2.12E+06	1307	4.36E-01	4.66E-01	1.12E+01	1357	5.07E+01	8.00E+01	2.95E+02	1407	3.77E+04	5.19E+04	9.83E+04	1457	4.09E+05	1.91E+06	1.64E+06
1208	3.28E+06	4.65E+06	9.60E+06	1258	5.53E+04	1.00E+06	1.08E+05	1308	1.40E+04	2.87E+05	2.37E+04	1358	5.18E+03	1.39E+05	1.38E+04	1408	1.40E+04	2.08E+04	6.60E+04	1458	4.23E+06	7.01E+06	1.38E+07
1209	1.15E+06	2.57E+06	3.72E+06	1259	3.51E+04	1.40E+06	1.37E+04	1309	1.03E+00	8.85E-01	9.91E+00	1359	9.90E+03	4.94E+04	8.64E+04	1409	1.46E+05	3.74E+05	5.20E+05	1459	6.96E+05	2.15E+06	3.79E+06
1210	5.38E+06	7.42E+06	1.36E+07	1260	9.61E+02	1.65E+05	1.63E+02	1310	1.27E+03	1.76E+05	2.20E+02	1360	1.17E+03	5.01E+03	1.66E+04	1410	4.32E-01	1.89E-01	4.85E+00	1460	8.99E+03	6.52E+05	4.24E+03
1211	1.54E+02	9.18E+02	1.08E+02	1261	1.01E+05	4.71E+05	6.78E+05	1311	4.69E+05	8.84E+05	1.81E+06	1361	1.60E+02	1.35E+03	3.81E+03	1411	2.56E+05	8.17E+04	3.99E+05	1461	0.00E+00	0.00E+00	1.15E+00
1212	1.47E+03	5.19E+03	1.39E+04	1262	1.08E+03	6.79E+03	4.27E+03	1312	1.43E+03	8.20E+04	1.92E+03	1362	1.26E-01	0.00E+00	4.22E-02	1412	8.05E+01	4.06E+03	1.37E+01	1462	6.30E+00	5.09E-01	4.85E+00
1213	0.00E+00	0.00E+00	1.82E+00	1263	3.89E+03	3.59E+05	7.64E+02	1313	5.23E+04	2.80E+05	1.95E+05	1363	7.62E+04	4.61E+05	7.94E+05	1413	2.04E+04	3.55E+05	2.54E+03	1463	1.71E+02	8.93E+01	3.26E+02
1214	4.33E+03	7.43E+05	4.47E+02	1264	0.00E+00	0.00E+00	0.00E+00	1314	3.09E+01	1.04E+04	5.00E+00	1364	4.25E+04	1.45E+06	5.06E+04	1414	8.80E+04	1.65E+06	1.94E+04	1464	4.42E+05	5.06E+06	3.15E+05
1215	6.42E-01	1.37E+00	8.26E+00	1265	7.89E+03	7.23E+04	3.64E+04	1315	1.32E+03	1.07E+05	4.86E+02	1365	3.44E+04	6.62E+05	7.69E+04	1415	5.99E+04	6.68E+04	1.33E+05	1465	7.43E+04	8.64E+05	4.10E+05
1216	1.83E+04	1.46E+06	1.44E+03	1266	8.58E+00	3.30E+01	1.09E+00	1316	3.58E+04	1.87E+05	2.50E+05	1366	8.13E+04	9.70E+05	1.99E+05	1416	2.77E+05	2.87E+05	7.21E+05	1466	3.75E+04	1.38E+06	4.59E+04
1217	5.05E+04	1.19E+06	1.31E+05	1267	1.77E+05	1.78E+05	5.03E+05	1317	3.70E+00	5.54E+00	6.89E+01	1367	2.64E+02	4.71E+03	6.71E+02	1417	8.73E+02	2.17E+04	2.92E+02	1467	2.35E+01	1.60E+02	8.48E+02
1218	6.21E+04	9.66E+05	1.71E+05	1268	0.00E+00	0.00E+00	0.00E+00	1318	9.63E+02	1.23E+05	1.46E+02	1368	2.93E+05	2.70E+06	2.96E+05	1418	1.89E+04	4.03E+05	2.01E+04	1468	2.30E+05	1.74E+06	6.70E+05
1219	3.31E+04	8.94E+05	8.57E+04	1269	5.20E+03	2.29E+04	5.39E+04	1319	3.62E+00	3.79E-01	1.39E+00	1369	0.00E+00	0.00E+00	0.00E+00	1419	7.67E+02	2.85E+04	6.76E+01	1469	1.59E+02	8.03E+02	1.37E+02
1220	1.59E+01	4.43E+00	2.66E+01	1270	4.77E+02	3.51E+04	1.88E+01	1320	1.36E+04	5.64E+05	4.44E+03	1370	3.74E+02	6.14E+03	1.87E+02	1420	4.14E+03	1.59E+05	1.40E+03	1470	8.74E+02	1.30E+04	2.87E+03
1221	0.00E+00	0.00E+00	0.00E+00	1271	0.00E+00	0.00E+00	0.00E+00	1321	1.89E+06	2.76E+06	5.90E+06	1371	2.80E+03	3.95E+05	2.03E+02	1421	1.80E+03	7.88E+04	2.73E+03	1471	1.02E+03	8.75E+03	1.80E+04
1222	2.07E+03	2.33E+04	5.44E+04	1272	2.95E+03	5.16E+04	1.30E+03	1322	5.53E+01	2.51E+03	3.85E+01	1372	0.00E+00	0.00E+00	0.00E+00	1422	1.48E+04	3.22E+05	1.38E+04	1472	1.48E+02	2.81E+02	1.53E+03
1223	1.00E+01	7.78E+00	4.36E+01	1273	1.84E+04	7.45E+04	3.38E+04	1323	3.85E+03	2.14E+05	3.05E+03	1373	3.42E+03	4.83E+05	5.89E+02	1423	2.60E+03	9.47E+04	4.24E+02	1473	5.54E+04	3.50E+05	2.44E+05
1224	1.72E+04	1.06E+06	1.00E+04	1274	0.00E+00	0.00E+00	0.00E+00	1324	5.50E+03	1.31E+05	1.24E+04	1374	4.43E+00	6.12E-01	3.04E+00	1424	7.88E+00	1.11E+01	1.07E+02	1474	2.09E+06	3.99E+06	7.06E+06
1225	1.48E+02	6.45E+01	1.61E+02	1275	4.80E+01	3.17E+03	2.81E+01	1325	1.10E+00	1.41E+01	1.02E+02	1375	3.65E+04	7.82E+05	7.73E+04	1425	1.76E+02	9.37E+03	1.81E+02	1475	1.11E+06	2.26E+06	2.53E+06
1226	8.92E+05	2.57E+06	2.14E+06	1276	5.71E+03	3.40E+04	8.03E+04	1326	4.88E+02	1.14E+05	6.03E+01	1376	1.77E+04	7.62E+05	1.99E+04	1426	1.61E+05	8.24E+05	1.46E+06	1476	6.82E+04	1.94E+06	2.83E+04
1227	0.00E+00	0.00E+00	0.00E+00	1277	2.85E+01	2.03E+02	1.07E+03	1327	3.69E+02	9.94E+04	8.07E+00	1377	4.22E+06	5.73E+06	1.18E+07	1427	5.49E+00	2.94E+00	1.87E+01	1477	1.95E+04	3.58E+05	1.02E+05
1228	4.51E+03	5.60E+05	5.03E+02	1278	4.33E+03	4.42E+05	5.29E+02	1328	2.85E+02	1.34E+05	1.36E+01	1378	8.96E+04	5.61E+05	5.06E+05	1428	2.18E+03	1.07E+04	1.73E+04	1478	2.42E+02	2.65E+04	3.59E+01
1229	3.54E+02	2.00E+03	6.08E+03	1279	3.21E+01	5.12E+02	1.28E+01	1329	3.70E+03	2.07E+05	2.63E+03	1379	2.72E+05	1.00E+06	1.60E+06	1429	1.26E+04	1.53E+06	4.19E+03	1479	1.32E+03	3.25E+05	1.13E+02
1230	1.72E+04	1.01E+06	9.94E+03	1280	6.40E+04	1.11E+06	4.50E+04	1330	9.00E+02	1.42E+05	2.66E+02	1380	4.03E+04	1.94E+05	3.88E+05	1430	8.17E+03	1.25E+06	3.76E+03	1480	2.83E+03	2.79E+05	1.57E+03
1231	6.96E+03	4.06E+04	6.22E+04	1281	1.58E+03	4.33E+05	9.43E+01	1331	1.04E+03	6.30E+03	9.77E+03	1381	1.96E+06	3.29E+06	6.41E+06	1431	8.62E+03	9.11E+05	3.65E+03	1481	4.53E+03	7.17E+05	3.39E+02
1232	1.29E+04	9.72E+05	3.34E+03	1282	1.66E+04	5.10E+05	2.44E+04	1332	2.77E+03	1.01E+05	6.93E+03	1382	8.50E+05	1.83E+06	3.85E+06	1432	4.08E+03	7.41E+05	1.04E+03	1482	1.79E+04	2.99E+05	9.49E+04
1233	4.21E+03	8.21E+05	5.53E+02	1283	0.00E+00	0.00E+00	0.00E+00	1333	0.00E+00	0.00E+00	0.00E+00	1383	7.32E+03	5.27E+05	1.56E+03	1433	9.05E+03	1.31E+06	6.86E+02	1483	1.45E+05	1.48E+06	3.83E+05
1234	5.70E+00	8.47E+01	3.77E+02	1284	0.00E+00	0.00E+00	0.00E+00	1334	4.12E+00	1.01E+02	6.00E+02	1384	3.63E+03	4.73E+05	6.55E+02	1434	1.23E+05	1.76E+06	3.35E+05	1484	2.19E+00	2.02E+01	1.29E+02
1235	4.67E+05	1.75E+06	1.66E+06	1285	1.24E+02	1.87E+02	1.02E+03	1335	1.23E+02	8.83E+03	2.17E+01	1385	6.03E+05	1.76E+06	1.68E+06	1435	1.18E+02	1.13E+03	4.67E+03	1485	6.77E+04	4.00E+05	1.73E+05
1236	2.64E+01	1.47E+01	5.27E+00	1286	3.19E+00	0.00E+00	4.62E-01	1336	1.02E+04	2.69E+04	2.70E+04	1386	5.66E+04	6.26E+05	1.46E+05	1436	2.39E+01	1.30E+02	5.38E+02	1486	9.86E+04	3.30E+05	2.88E+05
1237	0.00E+00	2.75E-01	4.54E+00	1287	2.89E+03	4.28E+05	3.73E+02	1337	0.00E+00	0.00E+00	1.45E+00	1387	8.16E+04	8.93E+05	2.04E+05	1437	8.76E+01	7.85E+01	4.13E+01	1487	5.02E+06	3.98E+06	1.09E+07
1238	3.90E+05	1.65E+06	1.30E+06	1288	1.82E+06	2.49E+06	5.67E+06	1338	9.51E+01	8.00E+02	3.11E+03	1388	2.00E+05	9.31E+05	7.25E+05	1438	2.07E+04	2.99E+06	1.58E+03	1488	1.81E+03	5.80E+04	2.61E+02
1239	3.51E+03	2.07E+05	5.45E+03	1289	2.21E+05	5.42E+05	1.12E+06	1339	2.68E+05	1.08E+05	7.72E+05	1389	1.08E+04	7.66E+05	3.28E+03	1439	2.95E+01	1.05E+01	4.84E+01	1489	3.29E+05	4.51E+05	8.83E+05
1240	4.95E+04	1.52E+06	1.74E+04	1290	9.23E+04	4.27E+05	4.59E+05	1340	4.21E+05	2.37E+05	1.39E+06	1390	1.36E+04	7.07E+04	1.83E+05	1440	8.23E+04	2.46E+06	5.74E+04	1490	8.03E+01	1.31E+01	2.58E+02
1241	2.63E+05	3.82E+06	1.17E+05	1291	1.80E+03	1.24E+04	4.12E+04	1341	7.71E+06	5.03E+06	1.33E+07	1391	8.68E+04	6.39E+05	3.29E+05	1441	8.90E+02	1.11E+05	3.26E+02	1491	5.96E+00	3.26E+01	2.02E+02
1242	9.87E+02	5.53E+04	1.17E+03	1292	0.00E+00	0.00E+00	0.00E+00	1342	1.36E+02	8.96E+03	6.78E+00	1392	2.64E+05	9.85E+05	1.00E+06	1442	6.73E+03	7.88E+04	1.56E+05	1492	1.56E+06	3.75E+06	3.79E+06
1243	1.23E+04	1.01E+06	2.68E+03	1293	3.01E+04	2.99E+05	8.87E+04	1343	3.66E+02	8.06E+02	3.74E+03	1393	4.38E-01	2.08E+00	1.79E+01	1443	1.68E+03	5.12E+05	1.61E+02	1493	5.50E+01	4.97E+03	3.14E+00
1244	8.37E+05	2.56E+06	3.24E+06	1294	0.00E+00	8.70E-01	7.65E+00	1344	5.21E+01	4.57E+03	1.03E+00	1394	0.00E+00	0.00E+00	1.27E-01	1444	4.88E+07	3.11E+07	7.01E+07	1494	3.69E+03	9.17E+04	5.87E+02
1245	8.33E+04	1.29E+06	1.44E+05	1295	5.31E+06	6.51E+06	1.34E+07	1345	2.17E+02	1.19E+04	2.50E+01	1395	1.20E+04	1.78E+05	6.03E+04	1445	9.61E+05	2.54E+06	2.68E+06	1495	5.00E+01	6.51E+00	6.98E+01
1246	1.87E+02	1.11E+03	1.92E+02	1296	0.00E+00	0.00E+00	0.00E+00	1346	8.80E-01	9.29E+00	0.00E+00	1396	1.20E+03	2.46E+05	9.71E+01	1446	2.62E+03	1.60E+04	2.52E+04	1496	1.44E+04	8.30E+04	1.98E+04
1247	1.68E+00	7.81E+00	7.14E+01	1297	2.58E+03	2.57E+05	9.65E+02	1347	0.00E+00	0.00E+00	0.00E+00	1397	1.45E-01	0.00E+00	0.00E+00	1447	2.52E+04	1.27E+06	2.41E+04	1497	1.11E+04	8.36E+04	1.51E+04
1248	7.90E+04	7.86E+05	1.95E+05	1298	6.97E+03	2.56E+05	1.06E+04	1348	2.36E+03	1.07E+05	5.25E+02	1398	1.05E+03	5.38E+04	1.19E+03	1448	0.00E+00	0.00E+00	0.00E+00	1498	3.59E-01	0.00E+00	0.00E+00
1249	2.57E+06	4.23E+06	7.00E+06	1299	1.30E+05	3.61E+05	5.12E+05	1349	6.27E+03	1.04E+04	3.05E+04	1399	2.48E-01	4.59E-01	2.79E+00	1449	1.37E+04	1.15E+06	6.42E+03	1499	4.18E+02	3.42E+04	3.29E+01
1250	1.13E+06	2.39E+06	4.34E+06	1300	1.57E+04	6.81E+04	1.22E+05	1350	3.34E+01	8.36E+00	3.43E+01	1400	1.73E-01	1.21E-01	1.03E+00	1450	2.26E+02	3.97E+02	1.79E+03	1500	6.53E+03	5.91E+04	1.21E+04

Table F-5 Electricity loss in USD for each cluster map

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
1	9.10E+03	4.99E+03	1.27E+05	51	1.37E+07	8.53E+07	4.74E+07	101	7.55E+04	3.51E+04	8.43E+05	151	8.63E-02	4.43E-01	1.26E+02	201	1.05E+07	2.56E+06	9.00E+07	251	3.16E+08	6.03E+08	8.42E+08
2	2.45E+03	1.23E+03	2.20E+05	52	8.67E+06	2.90E+08	1.09E+07	102	1.34E+03	4.28E+03	2.83E+05	152	5.94E+06	8.23E+06	4.91E+06	202	2.71E+10	6.43E+09	2.27E+10	252	1.49E+07	9.55E+08	1.43E+07
3	2.15E+02	2.16E+02	6.26E+04	53	4.13E+05	1.12E+06	2.20E+06	103	2.11E+07	2.88E+08	2.84E+07	153	3.22E+06	2.27E+06	3.08E+06	203	7.80E+08	1.14E+08	1.13E+09	253	1.15E+08	8.84E+08	2.62E+08
4	7.98E+01	4.60E+01	1.77E+04	54	1.12E+07	7.08E+07	3.69E+07	104	4.98E+07	3.53E+08	5.50E+07	154	2.54E+06	1.53E+06	2.79E+06	204	4.73E+08	1.07E+08	1.06E+09	254	7.16E+07	1.07E+09	1.21E+08
5	1.81E+06	4.10E+06	4.91E+07	55	2.00E+07	2.81E+08	3.11E+07	105	3.53E+05	7.62E+05	5.91E+06	155	3.83E+09	3.29E+08	4.23E+09	205	2.48E+09	3.56E+08	3.22E+09	255	4.86E+08	9.31E+08	6.49E+08
6	6.16E+05	3.05E+05	6.34E+06	56	1.86E+08	1.14E+08	4.55E+08	106	4.50E+07	1.64E+08	1.03E+08	156	8.66E+09	1.10E+09	8.98E+09	206	8.32E+08	2.55E+08	1.01E+09	256	1.77E+01	1.01E+04	7.28E+03
7	1.49E+02	1.72E+02	5.19E+04	57	1.22E+08	2.85E+08	1.92E+08	107	4.11E+08	4.15E+08	8.37E+08	157	6.52E+08	1.27E+08	6.43E+08	207	3.79E+07	9.08E+07	2.38E+07	257	5.18E+08	1.04E+09	1.44E+09
8	5.07E+08	1.19E+09	3.36E+08	58	1.61E+05	2.38E+07	4.08E+05	108	3.71E+05	9.49E+05	1.12E+06	158	5.77E+07	3.80E+07	5.61E+07	208	6.47E+00	5.04E-02	1.48E+03	258	7.84E+06	1.70E+08	1.57E+08
9	4.71E+03	3.73E+03	1.55E+05	59	1.71E+09	1.15E+09	2.29E+09	109	4.32E+08	3.44E+08	8.83E+08	159	1.04E+09	5.90E+08	5.70E+08	209	3.43E+01	2.75E-01	7.98E+03	259	2.32E+09	2.71E+09	4.27E+09
10	4.29E+07	2.51E+08	2.91E+07	60	2.32E+08	4.42E+08	4.32E+08	110	1.60E+07	3.72E+08	1.66E+07	160	4.01E+08	4.84E+07	5.61E+08	210	1.22E+08	9.01E+07	1.38E+08	260	8.96E+08	1.36E+09	1.56E+09
11	1.52E+08	2.64E+08	1.07E+08	61	2.18E+07	4.07E+08	1.67E+07	111	1.79E+08	1.74E+08	3.95E+08	161	3.11E+09	7.62E+08	2.47E+09	211	3.17E+08	9.11E+07	3.86E+08	261	5.99E+08	1.85E+09	4.22E+08
12	2.97E+08	1.86E+08	2.34E+08	62	1.84E+06	2.02E+08	1.92E+06	112	3.31E+09	1.89E+09	4.35E+09	162	9.41E+08	5.83E+07	1.32E+09	212	1.00E+06	1.35E+05	2.54E+06	262	1.37E+01	3.46E+03	8.92E+03
13	9.86E+01	7.41E+01	2.08E+04	63	6.33E+06	3.24E+08	6.02E+06	113	1.06E+06	1.17E+06	1.82E+07	163	3.21E+09	5.29E+08	3.50E+09	213	1.92E+08	4.71E+07	3.74E+08	263	1.34E+00	2.40E+03	8.60E+02
14	1.77E+07	6.38E+06	1.38E+08	64	1.55E+05	2.70E+07	2.99E+05	114	6.52E+08	3.43E+08	1.02E+09	164	8.91E+08	1.14E+08	1.03E+09	214	3.36E+01	6.22E+00	3.36E+02	264	7.23E+07	8.98E+08	1.45E+08
15	5.31E+03	1.92E+03	6.07E+05	65	5.65E+06	2.37E+08	5.86E+06	115	2.28E+05	4.70E+04	2.44E+06	165	1.65E+09	2.25E+08	1.49E+09	215	6.70E+06	9.97E+07	2.43E+06	265	2.03E+04	3.93E+05	5.07E+05
16	4.13E+07	4.65E+08	3.14E+07	66	2.45E+05	2.07E+04	2.96E+06	116	6.30E+07	2.13E+08	1.18E+08	166	4.61E+05	3.91E+03	8.41E+05	216	5.55E-03	2.69E-03	3.51E+00	266	3.15E+09	2.82E+09	5.27E+09
17	3.80E+04	2.24E+04	3.85E+05	67	1.00E+06	2.86E+06	3.07E+06	117	3.25E+06	1.15E+08	3.28E+06	167	6.27E+02	1.73E+00	6.55E+04	217	3.50E+08	2.21E+08	4.59E+08	267	2.49E+08	1.02E+09	4.39E+08
18	1.15E+06	9.98E+07	1.75E+06	68	6.55E+09	2.64E+09	8.22E+09	118	3.06E+08	1.30E+09	2.09E+08	168	8.03E+05	1.98E+04	1.38E+07	218	5.16E+02	9.37E+01	4.01E+03	268	6.65E+02	1.06E+05	1.25E+05
19	9.73E-01	6.75E+00	1.34E+03	69	9.85E+03	1.48E+03	7.93E+05	119	1.13E+08	4.86E+08	9.64E+07	169	2.87E+08	1.28E+08	2.18E+08	219	2.50E+08	9.90E+08	1.48E+08	269	1.45E+02	1.23E+04	1.70E+04
20	1.19E+10	3.66E+09	1.15E+10	70	1.00E+08	3.18E+08	7.45E+07	120	4.77E+06	1.99E+07	2.07E+07	170	6.50E+05	1.12E+04	4.40E+06	220	1.34E+09	8.16E+08	1.44E+09	270	9.53E+06	4.73E+08	4.27E+07
21	1.23E+09	5.67E+08	2.01E+09	71	1.53E+09	1.96E+09	1.56E+09	121	1.77E+07	1.70E+08	1.51E+07	171	4.18E+07	3.53E+07	2.65E+07	221	4.72E+08	9.07E+08	4.01E+08	271	8.50E+06	4.23E+07	1.12E+08
22	8.58E+07	4.32E+08	9.32E+07	72	4.22E+09	2.29E+09	5.59E+09	122	7.51E+07	2.92E+08	1.05E+08	172	8.90E+07	4.98E+07	1.26E+08	222	5.51E+08	6.62E+08	6.04E+08	272	1.11E+08	1.10E+09	7.62E+08
23	4.34E+00	1.65E+01	7.35E+03	73	1.97E+08	2.60E+08	4.13E+08	123	2.75E+07	1.59E+08	3.67E+07	173	3.14E+08	1.64E+08	3.43E+08	223	1.87E+00	5.18E-01	3.71E+02	273	5.19E+08	2.09E+09	1.62E+09
24	8.62E+08	1.47E+09	6.76E+08	74	1.94E+02	1.29E+01	1.31E+04	124	1.16E+08	2.43E+08	2.08E+08	174	2.28E+08	1.76E+08	1.72E+08	224	5.86E+06	5.76E+07	4.78E+06	274	2.11E+05	7.86E+06	9.82E+06
25	2.07E+07	4.01E+08	1.83E+07	75	7.77E+06	5.02E+06	8.92E+07	125	1.91E+03	2.06E+02	5.90E+04	175	5.47E+07	1.20E+08	2.90E+07	225	2.42E+07	1.38E+08	1.44E+07	275	2.37E+09	3.88E+09	3.68E+09
26	3.33E+03	1.13E+04	4.74E+05	76	3.39E+06	6.64E+05	2.69E+07	126	1.79E+00	9.92E-01	1.34E+03	176	2.65E+04	1.20E+02	4.10E+05	226	4.07E+07	2.05E+08	3.93E+07	276	5.99E+09	4.36E+09	8.64E+09
27	1.76E+08	2.59E+08	3.23E+08	77	8.06E+01	3.21E+01	1.96E+04	127	1.36E+07	1.49E+08	1.86E+07	177	1.44E+09	6.90E+08	1.13E+09	227	5.27E+05	2.25E+07	2.98E+05	277	3.64E+08	1.06E+09	7.23E+08
28	3.37E+08	2.11E+08	7.49E+08	78	2.24E+04	1.11E+03	1.69E+05	128	2.21E+07	2.52E+08	1.86E+07	178	3.45E+07	2.80E+07	2.66E+07	228	5.14E+02	3.10E+01	6.69E+04	278	1.44E+08	1.21E+09	2.06E+08
29	1.77E+05	4.71E+05	6.39E+06	79	2.71E+10	1.05E+10	2.34E+10	129	5.88E+06	1.45E+08	4.61E+06	179	6.40E+07	6.51E+06	1.65E+08	229	1.12E+05	4.68E+05	2.94E+05	279	1.67E+01	2.00E+03	4.95E+03
30	5.35E+06	1.38E+07	3.37E+07	80	4.11E+08	3.84E+08	8.87E+08	130	4.05E+07	3.82E+08	3.75E+07	180	1.15E+02	1.59E+01	9.68E+03	230	6.87E+03	1.80E+02	4.02E+04	280	1.17E+08	7.10E+08	3.43E+08
31	1.50E+07	6.21E+07	6.11E+07	81	2.21E+06	2.89E+07	5.56E+06	131	1.14E+04	1.39E+03	7.34E+04	181	7.47E+07	7.55E+07	5.36E+07	231	8.00E+03	1.40E+02	5.29E+04	281	3.25E+06	2.05E+08	1.17E+07
32	9.81E+01	2.88E+02	1.14E+05	82	1.89E+09	1.01E+09	2.78E+09	132	2.62E+07	4.32E+08	2.04E+07	182	5.08E+02	2.08E+00	2.50E+04	232	3.82E+05	9.34E+04	1.39E+06	282	2.18E+05	2.95E+06	7.06E+06
33	3.32E+06	1.01E+08	6.44E+06	83	3.93E+06	4.49E+06	3.07E+07	133	3.63E+05	2.36E+05	7.98E+06	183	3.05E+03	2.84E+01	1.80E+04	233	9.10E+05	9.76E+06	6.64E+05	283	2.67E+03	7.34E+05	1.28E+06
34	5.59E+03	4.08E+03	2.20E+05	84	7.60E+07	1.34E+08	2.23E+08	134	1.73E+07	1.22E+08	2.74E+07	184	1.48E+08	6.13E+07	1.76E+08	234	6.92E+06	9.53E+07	3.13E+06	284	4.65E+08	1.33E+09	1.07E+09
35	6.71E+06	1.38E+08	1.09E+07	85	3.19E+04	1.09E+05	3.43E+06	135	3.08E+01	6.22E+01	1.71E+03	185	8.63E+00	2.15E-02	3.20E+02	235	2.11E+06	1.11E+08	6.16E+05	285	4.55E+04	1.47E+06	1.61E+06
36	2.74E+07	2.08E+08	3.49E+07	86	2.20E+06	1.24E+07	7.28E+06	136	2.02E+03	1.88E+03	1.46E+04	186	1.07E+02	2.04E-01	2.63E+03	236	1.18E+08	7.87E+08	1.57E+08	286	2.22E+04	9.84E+05	5.11E+05
37	5.81E+07	2.64E+08	1.10E+08	87	7.61E+06	2.46E+07	7.98E+07	137	9.30E+02	4.58E+04	2.88E+05	187	2.08E+08	4.23E+08	6.80E+08	237	4.72E+03	8.41E+04	2.85E+05	287	2.94E+05	2.20E+07	9.81E+05
38	3.91E+07	4.08E+08	3.67E+07	88	8.32E+02	6.11E+02	1.37E+05	138	4.37E+07	2.38E+08	8.38E+07	188	2.86E+09	6.24E+08	3.44E+09	238	2.96E+09	7.09E+08	4.22E+09	288	1.67E+07	9.18E+08	2.72E+07
39	2.79E+04	1.32E+05	2.67E+06	89	6.98E+03	8.90E+03	8.89E+05	139	6.60E+08	7.00E+08	1.04E+09	189	2.17E+07	8.66E+06	4.34E+07	239	7.31E+09	2.50E+09	9.63E+09	289	6.05E+05	6.84E+07	2.58E+06
40	2.61E+08	3.58E+08	4.40E+08	90	4.37E+07	1.94E+08	9.28E+07	140	1.21E+10	6.97E+09	1.04E+10	190	1.81E+06	1.13E+05	8.92E+06	240	1.43E+10	6.40E+09	1.65E+10	290	3.27E+04	1.51E+06	4.47E+06
41	1.64E+08	2.58E+08	2.88E+08	91	2.62E+00	2.17E+00	2.66E+03	141	6.09E+08	9.93E+08	9.42E+08	191	3.68E+06	2.49E+05	4.03E+07	241	4.90E+05	7.89E+06	2.93E+07	291	2.13E+07	2.50E+08	9.31E+07
42	5.67E+07	2.74E+08	7.79E+07	92	5.16E+05	8.69E+05	1.87E+07	142	4.11E+06	3.10E+08	2.76E+06	192	4.25E+08	7.38E+07	6.03E+08	242	1.67E+09	1.83E+09	3.34E+09	292	2.35E+06	4.70E+07	1.51E+07
43	5.79E+03	1.43E+04	1.34E+06	93	1.11E+07	1.70E+08	9.71E+06	143	1.33E+00	1.64E+01	5.10E+02	193	2.44E+09	3.57E+08	3.08E+09	243	3.91E+09	4.71E+08	5.18E+09	293	3.95E+07	8.30E+08	4.14E+07
44	3.84E+06	3.16E+07	1.56E+07	94	2.29E+02	1.36E+02	6.52E+04	144	5.14E+01	1.59E+02	2.12E+04	194	2.39E+04	8.30E+02	1.18E+06	244	2.62E+08	7.62E+08	1.86E+08	294	1.69E+00	3.85E+03	1.44E+03
45	2.00E+05	1.24E+06	1.85E+06	95	2.17E+04	4.17E+03	4.20E+05	145	3.67E+06	1.87E+08	3.77E+06	195	5.04E+07	8.98E+06	1.47E+08	245	2.88E+02	2.62E+03	4.01E+04	295	3.07E+05	1.24E+06	1.60E+06
46	3.50E+06	8.14E+06	3.51E+07	96	2.68E+04	1.01E+04	7.06E+05	146	1.14E+04	7.79E+03	1.43E+05	196	6.42E+07	4.83E+07	8.36E+07	246	4.50E+09	1.63E+09	3.48E+09	296	2.41E+07	1.44E+08	2.06E+08
47	6.78E+08	5.33E+08	9.47E+08	97	3.50E+05	4.84E+06	1.61E+07	147	3.91E+02	1.61E+03	9.34E+03	197	2.93E+02	1.19E+00	5.15E+03	247	5.52E+09	1.67E+09	6.63E+09	297	9.37E+08	2.87E+09	1.52E+09
48	1.57E+08	9.26E+08	1.31E+08	98	5.18E+08	1.58E+09	7.03E+08	148	4.99E+05	7.66E+07	4.65E+05	198	4.92E+04	1.16E+03	3.77E+05	248	1.97E+09	1.09E+09	3.49E+09	298	2.97E+07	1.01E+09	3.42E+07
49	6.51E+09	2.49E+09	7.48E+09	99	8.38E+05	3.11E+07	1.57E+06	149	1.63E+08	4.15E+08	2.70E+08	199	3.45E+08	1.38E+07	6.98E+08	249	1.84E+06	1.64E+06	1.61E+07	299	2.31E+03	3.89E+05	9.04E+05
50	5.76E+07	3.53E+08	7.32E+07	100	1.09E+08	5.62E+08	1.21E+08	150	2.84E+04	2.14E+06	1.23E+05	200	8.99E+08	8.46E+07	1.23E+09	250	1.17E+07	1.19E+08	5.84E+07	300	3.73E+02	3.52E+04	1.56E+05

Table F-5 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
301	1.13E+06	1.50E+07	1.76E+07	351	1.61E+06	2.15E+07	1.90E+07	401	9.19E+08	6.77E+08	2.02E+09	451	8.07E+09	4.79E+08	8.58E+09	501	5.77E+08	6.19E+08	1.35E+09	551	1.10E+07	4.78E+08	1.05E+07
302	1.06E+04	1.34E+05	1.82E+05	352	7.14E+04	1.33E+05	4.73E+06	402	1.52E+04	2.14E+04	2.85E+06	452	6.82E+06	1.30E+07	5.49E+07	502	7.64E+05	1.37E+07	3.14E+06	552	6.48E+07	3.70E+08	2.02E+08
303	5.29E+04	1.59E+07	1.72E+05	353	4.05E+07	6.04E+08	1.46E+08	403	7.18E+09	3.71E+09	1.07E+10	453	6.88E+07	6.86E+07	9.51E+07	503	2.87E+06	1.43E+06	3.37E+07	553	5.14E+07	7.02E+08	5.57E+07
304	7.31E+05	1.82E+08	2.04E+06	354	2.57E+01	6.68E+01	3.44E+04	404	4.50E+08	4.99E+08	1.40E+09	454	8.84E+06	8.29E+07	2.01E+07	504	4.00E+08	6.68E+08	8.59E+08	554	8.45E+07	3.90E+08	2.41E+08
305	5.09E-01	3.22E+02	2.37E+02	355	1.11E+09	1.26E+09	2.88E+09	405	3.05E+06	4.65E+06	3.67E+07	455	3.06E+07	4.50E+07	3.16E+07	505	3.28E+07	5.00E+08	3.77E+07	555	2.80E+03	2.25E+03	1.63E+05
306	2.48E+09	6.12E+09	4.26E+09	356	3.68E+05	6.56E+06	5.15E+06	406	3.34E+08	5.26E+08	7.13E+08	456	1.92E+08	4.66E+07	2.28E+08	506	1.31E+04	1.83E+05	2.96E+06	556	1.39E+05	1.41E+05	1.98E+06
307	3.80E+05	3.61E+07	2.39E+07	357	4.50E+08	2.41E+09	6.01E+08	407	2.47E+04	4.02E+03	8.34E+05	457	4.60E+07	5.90E+07	7.60E+07	507	1.09E+08	7.02E+08	2.11E+08	557	1.10E+06	5.58E+07	3.27E+06
308	7.17E+02	4.26E+04	3.08E+04	358	5.12E+07	7.68E+08	1.37E+08	408	2.95E+07	3.34E+08	4.22E+07	458	9.66E+03	5.10E+01	1.99E+05	508	2.19E+08	4.67E+08	7.81E+08	558	8.35E+07	4.23E+08	3.70E+08
309	4.50E+07	6.91E+08	6.09E+07	359	4.13E+08	1.28E+09	1.20E+09	409	8.57E+08	2.09E+09	8.30E+08	459	1.17E+08	5.99E+07	2.75E+08	509	7.75E+05	1.50E+08	1.25E+06	559	1.79E+08	6.51E+08	4.79E+08
310	5.17E+05	7.95E+07	2.59E+06	360	7.39E+08	1.97E+09	2.03E+09	410	2.99E+09	1.44E+09	4.75E+09	460	3.20E+04	1.95E+03	1.47E+05	510	2.98E+08	8.70E+08	6.62E+08	560	5.82E+08	5.67E+08	1.67E+09
311	2.15E+05	7.28E+07	6.88E+05	361	2.04E+05	7.81E+06	2.39E+06	411	3.70E+08	4.59E+08	8.47E+08	461	1.84E+03	7.18E+02	2.71E+05	511	1.55E+09	2.18E+09	3.15E+09	561	1.31E+09	8.69E+08	2.91E+09
312	5.85E+04	2.17E+06	4.52E+06	362	1.40E+08	7.89E+08	4.76E+08	412	2.39E+07	1.07E+07	1.68E+08	462	6.80E+06	1.43E+07	8.50E+06	512	8.47E+05	7.26E+06	3.71E+07	562	1.47E+07	4.57E+07	1.49E+08
313	8.13E+08	1.09E+09	1.80E+09	363	5.14E+02	3.03E+03	7.39E+05	413	8.66E+05	3.76E+05	1.94E+07	463	1.95E+06	7.34E+05	1.08E+07	513	5.65E+08	1.06E+09	1.35E+09	563	1.50E+08	5.06E+08	3.57E+08
314	3.73E-01	6.74E+01	2.49E+02	364	9.71E+03	7.60E+03	1.28E+06	414	8.89E+05	5.54E+05	8.07E+06	464	4.31E+07	3.72E+07	2.71E+08	514	6.34E+04	7.80E+04	1.04E+06	564	1.55E+07	4.47E+08	1.90E+07
315	4.22E+06	3.91E+08	4.55E+06	365	2.28E+01	1.54E+02	4.25E+04	415	2.20E+07	3.02E+08	2.54E+07	465	6.18E+09	3.69E+09	8.84E+09	515	4.80E+08	9.10E+08	9.46E+08	565	1.41E+00	9.57E+01	7.14E+02
316	5.20E+03	6.76E+04	3.11E+05	366	1.41E+07	5.77E+08	4.25E+07	416	1.04E+08	3.62E+08	2.71E+08	466	1.29E+10	9.12E+09	1.57E+10	516	9.36E+07	1.08E+09	1.60E+08	566	4.84E+05	5.89E+06	6.21E+06
317	1.50E+06	3.22E+08	3.71E+06	367	4.42E+02	6.46E+02	1.60E+05	417	2.13E+04	1.06E+04	1.16E+06	467	1.77E+04	3.62E+05	3.44E+06	517	4.81E+02	1.06E+03	6.88E+04	567	3.55E+03	7.31E+04	1.26E+06
318	4.14E+00	9.09E+02	1.11E+03	368	6.54E+06	8.05E+07	1.40E+08	418	3.51E+07	5.89E+07	2.68E+08	468	7.33E+04	3.55E+05	3.42E+06	518	5.72E+02	2.52E+03	1.69E+04	568	2.09E+03	9.05E+04	2.35E+05
319	1.07E+02	1.33E+04	2.80E+04	369	9.24E+09	8.16E+09	1.27E+10	419	2.13E+09	1.31E+09	4.15E+09	469	2.17E+08	4.81E+08	1.64E+08	519	1.20E+07	5.72E+08	1.05E+07	569	1.94E+09	2.49E+09	4.15E+09
320	5.49E+03	3.37E+05	6.79E+05	370	4.87E+05	6.87E+06	3.71E+07	420	1.77E+05	1.16E+06	2.17E+07	470	4.03E+02	4.31E+02	6.19E+04	520	2.30E+04	1.30E+05	7.70E+05	570	6.71E+08	9.54E+08	1.79E+09
321	3.22E+08	7.65E+08	8.17E+08	371	1.76E+03	4.88E+03	4.27E+05	421	5.49E+08	2.51E+09	4.63E+08	471	1.04E+09	2.15E+09	1.21E+09	521	6.04E+03	2.43E+04	1.04E+05	571	7.57E+01	9.90E+02	4.42E+04
322	5.20E+08	9.87E+08	1.55E+09	372	1.70E+07	7.51E+08	3.56E+07	422	4.47E+06	5.61E+07	1.37E+07	472	5.74E+07	6.40E+08	7.33E+07	522	7.36E+06	1.47E+08	3.43E+07	572	3.13E+03	2.50E+04	1.99E+05
323	4.73E+10	2.18E+10	4.24E+10	373	2.84E+08	2.75E+09	2.99E+08	423	1.33E+07	1.05E+07	1.56E+08	473	4.23E+06	7.78E+07	1.29E+07	523	1.36E+08	6.94E+08	2.71E+08	573	3.29E+07	3.53E+08	7.92E+07
324	1.30E+06	1.78E+07	9.52E+07	374	2.49E+03	1.28E+05	7.97E+05	424	8.00E+09	4.21E+09	1.20E+10	474	1.30E+09	1.48E+09	2.22E+09	524	5.10E+07	1.07E+09	6.25E+07	574	7.68E+06	3.87E+08	9.33E+06
325	4.71E+09	3.31E+09	8.50E+09	375	3.23E+07	8.48E+08	6.12E+07	425	8.63E+05	1.13E+06	5.65E+06	475	3.80E+00	6.80E+01	1.37E+03	525	1.39E+02	2.77E+03	2.86E+03	575	7.64E+06	1.89E+08	2.06E+07
326	4.93E+04	4.15E+05	7.32E+06	376	1.01E+08	1.07E+09	1.95E+08	426	4.50E+07	3.35E+08	6.79E+07	476	5.29E+04	2.12E+05	2.25E+05	526	6.24E-02	3.37E+00	3.94E+01	576	9.76E+07	2.20E+08	3.95E+08
327	5.46E+08	9.59E+08	1.57E+09	377	3.96E+07	6.20E+08	1.38E+08	427	1.08E+04	4.66E+03	1.15E+06	477	2.38E+06	2.44E+08	4.55E+06	527	2.08E+06	9.65E+06	3.46E+07	577	1.13E+08	5.75E+08	2.04E+08
328	3.45E+07	7.85E+08	6.07E+07	378	3.00E+08	1.12E+09	7.61E+08	428	6.21E+08	4.72E+08	1.42E+09	478	5.18E+09	5.03E+09	8.05E+09	528	3.06E+07	9.25E+08	3.23E+07	578	8.48E+05	2.62E+06	2.45E+07
329	1.02E+09	1.53E+09	2.27E+09	379	1.95E+00	3.37E+01	5.45E+03	429	1.97E+08	4.79E+08	4.71E+08	479	1.59E+08	1.65E+09	7.61E+08	529	1.37E+08	7.95E+08	2.24E+08	579	3.02E+06	3.83E+06	3.27E+07
330	2.54E+04	7.70E+04	1.64E+06	380	3.50E+06	7.24E+06	1.24E+08	430	2.81E+00	1.45E-01	2.35E+03	480	1.41E+07	5.01E+07	1.65E+08	530	1.45E+08	1.22E+09	2.47E+08	580	2.37E+07	5.36E+08	2.54E+07
331	3.45E+06	6.78E+07	3.59E+07	381	2.36E+03	1.54E+03	4.01E+05	431	8.39E+01	3.47E+01	2.59E+04	481	1.45E+08	5.71E+08	3.46E+08	531	1.42E+08	1.95E+09	1.53E+08	581	6.00E+07	6.54E+08	7.11E+07
332	2.33E+07	7.88E+08	3.76E+07	382	1.02E+10	7.09E+09	1.41E+10	432	8.12E+07	4.09E+08	1.88E+08	482	5.33E+08	1.01E+09	1.25E+09	532	8.63E+05	1.69E+08	1.37E+06	582	3.63E+08	2.07E+09	3.34E+08
333	2.78E+03	6.97E+03	4.68E+05	383	1.21E+03	2.12E+04	9.79E+05	433	1.32E+05	6.49E+04	3.64E+06	483	1.47E+03	1.25E+04	1.93E+05	533	5.87E+07	4.90E+08	1.44E+08	583	1.82E+09	2.29E+09	3.35E+09
334	9.70E+03	3.42E+04	5.23E+06	384	1.62E+08	1.43E+09	3.25E+08	434	8.89E+07	5.27E+08	1.35E+08	484	2.04E+09	2.68E+09	3.32E+09	534	1.80E+04	1.83E+06	7.25E+04	584	9.72E+06	3.94E+08	1.39E+07
335	2.25E+02	7.59E+01	1.44E+05	385	8.06E+06	6.20E+08	2.04E+07	435	1.87E+07	2.68E+08	3.34E+07	485	9.78E+04	4.73E+04	8.92E+05	535	2.92E+07	5.88E+08	6.80E+07	585	4.16E+07	4.25E+08	6.71E+07
336	1.28E+06	4.41E+07	1.17E+07	386	1.32E+02	7.02E+03	1.01E+05	436	4.72E+05	1.98E+06	1.92E+06	486	4.94E+07	3.82E+08	1.06E+08	536	5.22E+04	3.96E+04	7.41E+05	586	1.84E+03	2.54E+04	7.56E+04
337	1.79E+09	2.63E+09	3.93E+09	387	6.85E+07	7.01E+08	2.33E+08	437	6.70E+08	4.90E+08	1.42E+09	487	3.53E+03	5.28E+03	6.12E+05	537	3.46E+07	3.48E+08	9.16E+07	587	1.24E+07	1.74E+08	7.03E+07
338	3.12E+09	2.92E+09	6.21E+09	388	2.84E+01	2.34E+02	8.34E+03	438	2.40E+09	1.52E+09	4.73E+09	488	1.80E+08	4.69E+08	3.13E+08	538	3.54E+06	3.22E+08	4.41E+06	588	8.33E+06	1.30E+08	3.78E+07
339	5.96E+06	1.10E+08	4.89E+07	389	2.53E+06	7.38E+06	5.17E+07	439	1.53E+08	4.23E+08	2.75E+08	489	1.30E+07	4.69E+08	1.75E+07	539	3.94E+08	7.45E+08	1.07E+09	589	1.19E+06	1.74E+07	1.92E+07
340	1.29E+08	1.63E+09	1.65E+08	390	9.01E+03	3.44E+04	2.88E+05	440	1.15E+08	6.74E+08	1.56E+08	490	4.03E+05	9.02E+05	1.22E+07	540	3.48E+09	2.97E+09	6.71E+09	590	5.83E+07	4.41E+08	1.22E+08
341	1.10E+09	3.36E+09	1.58E+09	391	1.85E+08	1.87E+08	7.95E+08	441	1.59E+08	5.41E+08	2.95E+08	491	6.45E+07	2.20E+08	2.56E+08	541	8.05E+08	1.52E+09	1.49E+09	591	8.34E+07	3.87E+08	2.72E+08
342	7.81E+07	4.59E+08	4.76E+08	392	2.03E+10	9.56E+09	2.24E+10	442	4.84E+06	6.23E+07	9.73E+06	492	3.00E+06	2.23E+07	2.13E+07	542	9.60E+09	5.22E+09	1.32E+10	592	2.34E+08	3.65E+08	7.79E+08
343	1.61E+09	2.66E+09	3.15E+09	393	8.62E+08	1.68E+09	1.17E+09	443	1.01E+08	1.62E+08	3.39E+08	493	1.63E+01	5.26E+02	6.82E+03	543	3.07E+08	7.47E+08	7.00E+08	593	9.73E+01	1.03E+03	1.21E+04
344	1.90E+06	3.01E+08	7.15E+06	394	1.91E+09	2.20E+09	2.46E+09	444	1.60E+09	9.67E+08	3.03E+09	494	3.53E+07	4.12E+08	6.57E+07	544	1.91E+05	9.02E+06	1.77E+07	594	5.53E+04	2.09E+05	2.47E+05
345	7.10E+07	8.19E+08	1.65E+08	395	1.41E+09	2.25E+09	1.76E+09	445	4.04E+07	2.50E+08	8.21E+07	495	1.53E+08	6.50E+08	3.83E+08	545	5.08E+09	2.45E+09	8.04E+09	595	7.87E+00	2.86E+01	2.96E+03
346	1.30E+08	8.79E+08	3.47E+08	396	1.59E+08	6.28E+08	1.58E+08	446	3.93E+02	3.12E+02	1.51E+05	496	6.56E+01	4.85E+03	5.65E+04	546	1.35E+02	2.47E+03	4.70E+04	596	5.45E+08	1.11E+09	1.10E+09
347	2.61E+05	2.10E+06	6.79E+06	397	3.70E+08	8.02E+08	5.67E+08	447	3.13E+07	6.13E+07	2.55E+08	497	1.50E+08	9.97E+08	2.07E+08	547	1.28E+05	4.54E+05	2.33E+06	597	1.61E+07	3.34E+08	3.63E+07
348	3.35E+07	5.62E+08	1.15E+08	398	3.96E+07	3.63E+08	3.58E+07	448	1.04E+02	3.00E+01	3.28E+04	498	6.33E+08	3.97E+09	5.66E+08	548	1.25E+08	6.96E+08	2.11E+08	598	1.51E+03	1.49E+03	3.85E+04
349	2.28E+05	2.22E+06	1.94E+07	399	5.06E+04	9.05E+04	6.41E+06	449	1.14E+04	8.88E+02	2.07E+05	499	1.88E+05	1.70E+05	3.23E+06	549	9.17E+07	7.69E+08	1.12E+08	599	1.40E+08	1.67E+09	1.18E+08
350	1.61E+08	7.30E+08	5.36E+08	400	2.81E+07	2.46E+07	2.14E+08	450	6.03E+05	5.44E+05	2.60E+07	500	3.05E+09	2.59E+09	4.77E+09	550	2.28E+08	8.36E+08	4.49E+08	600	8.08E+07	7.74E+08	1.15E+08

Table F-5 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
601	2.13E+07	4.21E+08	4.30E+07	651	5.26E+05	2.33E+05	5.91E+06	701	1.26E+08	6.28E+08	2.89E+08	751	2.36E-04	3.14E-05	6.53E+00	801	1.17E+10	7.82E+09	1.35E+10	851	2.59E+07	5.81E+07	2.36E+08
602	1.36E+06	2.27E+08	1.72E+06	652	2.58E+07	1.19E+08	9.22E+07	702	1.92E+08	5.99E+08	5.93E+08	752	3.54E+05	5.30E+06	8.67E+05	802	4.69E+09	3.12E+09	5.99E+09	852	5.31E+02	2.76E+03	4.22E+05
603	3.05E+05	1.55E+07	1.12E+06	653	4.96E+01	3.49E+01	9.94E+03	703	5.82E+01	3.00E+01	2.62E+04	753	8.43E+06	6.16E+07	2.18E+07	803	2.07E+08	1.37E+09	1.05E+08	853	1.75E+05	1.22E+06	2.48E+07
604	2.35E+08	8.17E+08	4.71E+08	654	2.36E+08	5.07E+08	4.57E+08	704	3.95E+07	2.20E+08	1.91E+08	754	1.40E+01	2.81E-01	3.08E+03	804	4.23E+08	1.56E+09	4.75E+08	854	1.34E+08	1.60E+09	1.90E+08
605	1.54E+07	2.78E+08	3.82E+07	655	6.67E+08	1.48E+09	7.66E+08	705	4.99E+04	1.46E+05	3.95E+06	755	6.00E+04	1.55E+06	3.39E+05	805	9.85E+08	3.08E+09	5.01E+08	855	3.88E+07	3.85E+08	9.20E+07
606	3.05E+08	5.10E+08	8.05E+08	656	1.96E+03	1.69E+03	1.73E+05	706	1.84E+05	1.52E+07	1.47E+06	756	5.38E+05	2.54E+06	2.50E+06	806	1.32E+09	3.28E+09	1.04E+09	856	1.91E+01	2.93E+01	2.00E+04
607	1.17E+04	6.36E+05	4.14E+04	657	7.92E+07	3.53E+08	1.05E+08	707	5.75E+06	5.09E+07	1.04E+08	757	1.17E-01	1.18E-02	3.93E+02	807	2.36E+07	2.83E+08	2.06E+07	857	8.44E+05	5.14E+06	3.43E+07
608	2.36E+04	1.42E+06	1.53E+06	658	2.12E+07	2.35E+08	2.55E+07	708	2.15E+03	2.85E+03	5.71E+05	758	1.27E+00	7.36E-01	1.64E+03	808	2.36E+08	1.27E+09	1.44E+08	858	3.68E+08	8.28E+08	8.41E+08
609	2.34E+03	1.33E+04	5.55E+05	659	1.41E+08	6.19E+08	1.59E+08	709	1.86E+06	3.41E+07	8.13E+06	759	8.91E+05	4.34E+06	5.69E+06	809	4.57E+04	1.80E+05	2.71E+06	859	4.99E+08	6.85E+08	1.36E+09
610	2.03E+07	2.10E+08	9.18E+07	660	2.67E+07	2.51E+08	3.09E+07	710	3.23E+08	3.14E+08	1.12E+09	760	1.33E+06	1.63E+07	5.06E+06	810	1.41E+09	1.96E+09	1.98E+09	860	6.67E+07	8.20E+08	8.31E+07
611	5.86E+02	1.12E+04	2.26E+04	661	6.95E+03	2.33E+04	1.18E+06	711	9.20E+08	5.67E+08	2.46E+09	761	2.54E+02	3.46E+02	1.26E+05	811	8.77E+06	1.74E+07	7.59E+07	861	1.03E+07	2.71E+08	1.83E+07
612	1.65E+07	3.62E+08	4.26E+07	662	2.03E+03	1.41E+04	7.83E+05	712	3.16E+03	2.84E+03	2.08E+05	762	2.57E+05	1.66E+06	8.37E+05	812	2.69E+06	2.33E+06	1.64E+07	862	6.40E+08	2.75E+09	6.49E+08
613	2.58E+05	1.21E+08	3.95E+05	663	7.69E+08	5.19E+08	1.70E+09	713	1.18E+04	2.12E+04	2.19E+06	763	1.01E+04	1.82E+05	3.41E+05	813	5.07E+08	1.43E+09	4.67E+08	863	3.40E+08	4.77E+08	9.58E+08
614	5.15E+00	1.15E+02	5.50E+02	664	3.01E+09	1.55E+09	5.12E+09	714	1.00E-02	8.29E-03	2.03E+02	764	4.52E+04	1.21E+06	2.51E+05	814	5.71E+07	6.75E+08	4.78E+07	864	4.28E+03	3.43E+03	3.43E+05
615	2.95E+03	5.70E+03	1.32E+05	665	9.80E+09	4.62E+09	1.37E+10	715	2.68E+03	2.73E+04	6.73E+05	765	1.05E+04	2.38E+04	4.69E+05	815	1.98E+09	1.84E+09	3.02E+09	865	4.28E-01	2.90E-01	1.24E+03
616	5.10E+02	4.47E+03	1.03E+04	666	6.60E+04	1.29E+05	6.09E+06	716	1.68E+07	4.08E+07	1.26E+08	766	7.10E+04	3.43E+04	4.90E+05	816	2.68E+09	2.08E+09	3.53E+09	866	8.47E+08	1.08E+09	1.87E+09
617	5.70E+07	2.89E+08	1.01E+08	667	2.45E+02	1.70E+01	5.42E+03	717	1.52E+05	4.23E+06	1.25E+06	767	6.50E+09	6.73E+09	7.93E+09	817	2.25E+09	2.11E+09	3.02E+09	867	1.31E+07	2.64E+08	1.90E+07
618	3.37E+04	2.07E+04	1.16E+06	668	1.40E+07	3.16E+08	1.31E+07	718	5.36E+06	6.59E+07	2.54E+07	768	7.49E+09	5.21E+09	9.88E+09	818	1.24E+09	3.46E+09	1.05E+09	868	9.40E+03	1.44E+04	1.21E+06
619	3.90E+06	9.30E+07	4.17E+06	669	1.38E+08	4.18E+08	2.63E+08	719	1.31E+05	1.20E+06	3.28E+06	769	2.54E+09	2.82E+09	4.48E+09	819	7.55E+08	1.53E+09	1.06E+09	869	3.05E+07	5.14E+08	5.79E+07
620	1.43E+07	2.24E+08	2.41E+07	670	9.47E+04	2.84E+04	8.35E+05	720	9.45E+05	4.77E+07	3.71E+06	770	3.06E+10	1.88E+10	3.07E+10	820	1.83E+09	4.57E+09	9.52E+08	870	4.42E+06	1.62E+08	9.82E+06
621	7.14E+07	1.02E+08	3.21E+08	671	4.36E+07	2.97E+08	8.21E+07	721	7.57E-01	1.47E+00	2.47E+03	771	5.51E+09	4.46E+09	6.99E+09	821	6.27E+07	5.58E+08	7.11E+07	871	2.08E+06	2.98E+06	3.99E+07
622	1.91E+09	8.92E+08	3.55E+09	672	1.06E+07	1.52E+07	7.53E+07	722	3.37E+05	3.18E+07	1.22E+06	772	4.69E+09	6.02E+09	5.87E+09	822	4.89E+08	1.64E+09	4.56E+08	872	1.97E+04	9.73E+03	7.13E+05
623	8.15E+08	6.85E+08	1.54E+09	673	3.43E+08	4.97E+08	7.07E+08	723	3.40E+08	2.21E+08	1.12E+09	773	2.04E+09	4.17E+09	2.05E+09	823	6.46E+06	1.44E+07	1.14E+07	873	4.67E+09	3.34E+09	7.68E+09
624	7.67E+04	2.68E+04	2.18E+06	674	1.91E+07	2.59E+07	1.46E+08	724	4.00E+07	4.48E+07	2.88E+08	774	6.12E+08	3.34E+09	4.26E+08	824	7.94E+02	1.24E+03	5.54E+04	874	1.72E+09	1.64E+09	3.75E+09
625	1.60E+08	6.04E+08	1.21E+08	675	6.26E+08	4.55E+08	1.39E+09	725	8.01E+05	6.91E+06	3.94E+07	775	3.26E+09	1.12E+10	1.83E+09	825	1.08E+08	3.98E+08	1.87E+08	875	2.06E+10	1.25E+10	2.36E+10
626	1.83E+09	1.47E+09	2.53E+09	676	3.98E+08	3.74E+08	9.04E+08	726	1.23E+09	7.28E+08	3.00E+09	776	4.44E+09	6.55E+09	4.61E+09	826	7.89E+07	5.39E+08	1.03E+08	876	7.51E+09	4.91E+09	1.13E+10
627	6.90E+08	1.61E+09	5.28E+08	677	2.05E+08	3.31E+08	5.09E+08	727	1.91E+05	3.84E+05	1.55E+07	777	2.84E+09	5.94E+09	2.51E+09	827	1.62E+03	2.92E+02	3.65E+04	877	2.12E+04	5.32E+04	3.77E+06
628	1.76E+08	5.91E+08	1.77E+08	678	1.86E+02	2.99E+01	1.16E+04	728	9.10E+03	1.49E+04	1.95E+06	778	6.42E+05	2.91E+05	2.18E+06	828	9.60E+07	1.10E+08	1.73E+08	878	1.68E+07	3.36E+08	2.86E+07
629	1.75E+08	4.59E+08	2.71E+08	679	7.16E+03	1.97E+03	1.29E+05	729	4.92E+01	1.88E+02	5.69E+04	779	7.36E+07	1.13E+09	4.57E+07	829	6.63E+07	4.89E+07	2.19E+08	879	2.28E+08	5.04E+08	6.00E+08
630	2.09E+08	4.70E+08	3.76E+08	680	6.24E+02	8.41E+02	1.16E+05	730	5.15E+00	3.50E+00	7.20E+03	780	1.63E+06	5.58E+06	3.13E+07	830	2.15E+04	4.81E+04	1.42E+06	880	2.11E+05	1.99E+05	1.59E+06
631	2.57E+07	4.05E+07	1.38E+08	681	2.25E+05	1.18E+05	4.79E+06	731	8.61E-01	1.93E+00	6.58E+03	781	4.89E+08	3.49E+09	2.42E+08	831	2.32E+08	5.10E+08	1.05E+08	881	1.76E+09	1.57E+09	3.52E+09
632	1.76E+04	5.87E+04	3.04E+06	682	6.02E+05	1.56E+07	4.66E+05	732	9.29E+04	4.47E+05	1.19E+07	782	8.66E+08	4.46E+09	6.68E+08	832	7.05E+08	4.50E+08	7.57E+08	882	7.66E+08	8.17E+08	1.88E+09
633	2.52E+09	1.51E+09	4.18E+09	683	3.09E+08	3.08E+08	7.68E+08	733	1.51E+04	9.85E+04	5.85E+05	783	1.34E+09	3.10E+09	1.41E+09	833	1.73E+09	6.70E+08	2.17E+09	883	2.51E+05	5.30E+05	2.78E+06
634	4.96E+05	7.76E+05	2.19E+07	684	4.76E+04	5.72E+03	2.49E+05	734	3.47E+06	4.81E+07	1.83E+07	784	1.07E+08	1.97E+08	4.18E+08	834	8.12E+02	9.55E+01	1.74E+04	884	1.44E+05	1.17E+05	5.18E+06
635	4.88E+08	5.67E+08	1.06E+09	685	2.27E+07	1.46E+08	1.86E+07	735	4.39E+05	1.94E+06	1.10E+07	785	8.61E+08	1.25E+09	1.30E+09	835	2.83E+07	2.01E+08	1.30E+07	885	1.25E+02	1.51E+02	6.48E+04
636	3.01E+06	1.19E+07	5.43E+07	686	8.07E+06	4.04E+07	1.14E+07	736	1.17E+07	5.85E+07	6.31E+07	786	6.20E+06	4.80E+06	1.44E+07	836	1.03E+08	3.75E+08	6.07E+07	886	2.89E+06	4.24E+07	1.15E+07
637	1.67E+10	6.95E+09	1.87E+10	687	1.62E+08	7.14E+07	3.68E+08	737	2.34E-02	8.88E-02	1.10E+03	787	2.13E+05	6.35E+05	5.75E+06	837	3.05E+08	2.93E+08	4.13E+08	887	4.76E+07	4.82E+08	7.91E+07
638	4.52E+07	3.90E+08	6.60E+07	688	2.79E+04	5.21E+03	2.31E+05	738	7.78E+06	1.81E+07	6.14E+07	788	1.22E+04	3.42E+04	8.00E+05	838	5.92E+06	1.64E+06	2.77E+07	888	1.24E+08	6.69E+08	2.29E+08
639	1.32E+08	5.34E+08	2.19E+08	689	7.38E+05	8.51E+06	2.69E+06	739	3.33E+03	7.92E+04	7.37E+04	789	2.99E+08	1.70E+09	2.19E+08	839	6.93E+07	3.31E+08	7.83E+07	889	1.60E+06	1.74E+07	6.81E+06
640	6.50E+04	5.80E+03	2.50E+05	690	7.90E+03	3.81E+03	2.74E+05	740	3.94E+01	2.64E+02	1.52E+05	790	7.42E+06	1.87E+07	1.63E+07	840	6.08E+07	3.15E+08	3.36E+07	890	1.25E+06	4.05E+07	3.70E+06
641	3.42E+06	1.26E+08	3.84E+06	691	1.26E+06	9.27E+06	7.06E+06	741	2.13E+09	1.21E+09	4.48E+09	791	1.12E+09	2.04E+09	1.38E+09	841	1.37E+08	2.09E+08	1.32E+08	891	7.39E+02	1.26E+02	5.06E+04
642	5.08E+02	3.69E+02	5.45E+04	692	2.30E+06	2.88E+07	1.82E+06	742	1.79E-02	2.17E-02	1.51E+02	792	3.34E+08	1.69E+09	2.74E+08	842	2.84E+05	1.23E+05	2.49E+06	892	3.42E+03	7.81E+02	1.67E+05
643	3.11E+07	3.19E+08	4.31E+07	693	2.54E+06	5.30E+07	2.26E+07	743	2.46E+06	8.38E+07	9.46E+06	793	1.51E+08	8.37E+08	1.90E+08	843	5.44E+06	4.50E+07	4.31E+06	893	2.00E+08	8.59E+08	3.62E+08
644	8.80E+05	1.08E+06	5.94E+06	694	1.73E+10	9.13E+09	2.00E+10	744	7.38E+05	4.25E+07	2.22E+06	794	3.08E+08	2.28E+09	1.89E+08	844	1.56E+08	3.03E+08	9.05E+08	894	7.02E+04	4.33E+04	2.43E+06
645	1.33E+05	3.84E+05	7.39E+06	695	3.29E+09	2.17E+09	6.71E+09	745	9.31E-04	1.06E-03	6.71E+01	795	5.44E+08	1.35E+09	7.29E+08	845	8.14E+03	1.19E+05	4.62E+06	895	1.42E+08	5.38E+08	4.20E+08
646	7.81E+07	1.15E+08	4.17E+08	696	5.41E+07	2.52E+08	2.36E+08	746	1.53E+06	2.56E+07	4.56E+06	796	8.76E+07	1.67E+08	4.32E+08	846	6.88E+06	2.22E+07	6.42E+07	896	3.86E+04	3.97E+04	2.94E+06
647	1.41E+07	3.16E+08	1.01E+07	697	6.90E+06	2.15E+08	1.72E+07	747	1.01E+05	1.13E+06	2.11E+06	797	4.71E+08	1.47E+09	4.85E+08	847	7.13E+07	1.20E+09	8.21E+07	897	1.23E+09	8.77E+08	2.12E+09
648	1.32E+06	4.14E+07	2.31E+06	698	6.56E+00	4.09E+01	6.09E+03	748	6.51E+05	2.95E+06	1.40E+07	798	4.67E+05	3.33E+06	2.16E+07	848	1.25E+06	1.70E+06	2.33E+07	898	3.09E+09	1.29E+09	4.94E+09
649	4.62E+00	1.59E+00	8.35E+02	699	1.18E+08	7.82E+08	1.99E+08	749	5.62E+07	2.61E+07	2.64E+08	799	1.31E+06	6.11E+05	3.11E+06	849	3.16E+08	2.72E+09	3.57E+08	899	4.36E+07	1.65E+08	1.35E+08
650	8.25E+06	9.11E+07	2.58E+07	700	5.46E+07	5.05E+08	9.66E+07	750	4.52E+05	5.94E+06	1.70E+06	800	4.19E+02	6.84E+02	3.02E+04	850	1.01E+09	3.05E+09	1.39E+09	900	1.66E+08	1.03E+08	4.23E+08

Table F-5 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
901	6.19E+06	4.61E+07	7.66E+06	951	1.53E+07	1.76E+08	5.99E+07	1001	6.92E+07	5.29E+07	3.06E+08	1051	3.33E+07	3.85E+08	3.61E+07	1101	5.99E+09	3.76E+09	8.11E+09	1151	4.79E+08	4.90E+08	1.45E+09
902	1.17E+07	6.25E+07	1.75E+07	952	2.65E+07	8.04E+07	2.27E+08	1002	2.42E+02	8.21E+02	8.38E+04	1052	6.00E+06	1.21E+08	8.46E+06	1102	1.33E+08	4.43E+08	1.60E+08	1152	6.34E+05	1.15E+06	2.28E+07
903	1.15E+08	2.00E+08	1.70E+08	953	1.06E+08	6.12E+08	2.50E+08	1003	3.20E+04	6.10E+03	1.98E+05	1053	4.79E+04	2.96E+04	1.07E+06	1103	3.18E+08	9.23E+08	2.70E+08	1153	8.02E+02	2.64E+03	4.13E+05
904	1.41E+07	6.28E+07	2.65E+07	954	1.75E+08	6.37E+08	4.62E+08	1004	1.25E+06	9.31E+06	5.74E+07	1054	6.43E+02	8.54E+02	9.73E+04	1104	2.09E+08	6.00E+08	2.64E+08	1154	2.31E+06	3.86E+06	3.94E+07
905	4.73E+08	2.66E+08	9.38E+08	955	7.65E+09	5.07E+09	1.01E+10	1005	3.27E+08	5.13E+08	9.45E+08	1055	3.10E+07	2.90E+08	6.04E+07	1105	1.96E+08	8.00E+08	1.45E+08	1155	1.08E+07	3.75E+07	1.50E+08
906	1.25E+02	4.82E+00	9.85E+03	956	2.38E+10	1.30E+10	2.54E+10	1006	2.32E+02	4.80E+02	5.25E+04	1056	3.76E+03	5.44E+03	3.15E+05	1106	1.40E+07	3.34E+07	7.06E+07	1156	1.46E+07	1.26E+08	4.38E+07
907	3.18E+04	4.32E+04	3.10E+05	957	2.66E+08	1.11E+09	4.18E+08	1007	1.43E+02	1.93E+02	2.09E+04	1057	9.97E+05	2.29E+06	1.15E+07	1107	1.77E+07	3.43E+07	8.28E+07	1157	2.69E+07	2.46E+08	3.96E+07
908	2.64E+06	3.17E+07	3.47E+06	958	1.78E+09	1.36E+09	3.25E+09	1008	1.67E+04	1.83E+04	5.51E+05	1058	5.95E+07	2.11E+08	1.58E+08	1108	6.07E+09	4.13E+09	8.14E+09	1158	1.04E+01	6.41E+01	3.83E+04
909	5.25E+05	1.46E+07	1.19E+06	959	2.09E+08	6.62E+08	4.55E+08	1009	2.73E+08	1.68E+09	2.53E+08	1059	1.81E+07	2.30E+08	3.05E+07	1109	1.24E+09	8.57E+08	2.15E+09	1159	2.04E+09	1.07E+09	3.96E+09
910	3.58E+07	1.00E+08	6.39E+07	960	7.53E+07	4.29E+08	2.31E+08	1010	6.88E+05	2.81E+06	3.66E+06	1060	2.36E+08	3.62E+08	9.24E+08	1110	4.55E+08	1.18E+09	4.26E+08	1160	1.09E+03	1.14E+03	2.03E+05
911	2.53E+05	2.50E+05	3.72E+06	961	1.88E+06	4.79E+06	1.97E+07	1011	1.05E+08	5.29E+08	2.79E+08	1061	4.24E+08	3.72E+08	1.07E+09	1111	2.12E+04	1.94E+04	3.54E+05	1161	2.71E+07	1.19E+08	8.59E+07
912	5.41E+06	7.15E+07	1.73E+07	962	1.10E+09	9.22E+08	2.30E+09	1012	3.98E+07	5.95E+08	6.23E+07	1062	7.85E+05	1.14E+06	9.33E+06	1112	2.12E+07	1.69E+08	2.44E+07	1162	2.69E+04	3.72E+04	2.21E+06
913	6.80E-01	2.50E-01	1.95E+03	963	2.18E+07	6.54E+07	2.38E+08	1013	2.17E+08	9.98E+08	4.14E+08	1063	1.53E+09	3.55E+08	2.55E+09	1113	8.55E+07	4.41E+08	7.23E+07	1163	1.63E+08	1.90E+08	5.60E+08
914	2.53E+06	5.05E+06	3.73E+07	964	6.66E+07	1.05E+08	4.00E+08	1014	8.10E+07	9.27E+08	1.48E+08	1064	2.60E+06	2.00E+07	2.77E+06	1114	4.09E+08	8.01E+08	5.18E+08	1164	4.07E+06	8.87E+07	8.49E+06
915	6.89E+07	7.67E+08	1.40E+08	965	9.14E+04	1.18E+05	3.75E+06	1015	2.61E+08	6.92E+08	6.12E+08	1065	6.04E+06	2.36E+07	1.04E+07	1115	9.42E+04	2.15E+05	2.42E+06	1165	2.57E+02	4.10E+02	9.63E+04
916	1.92E+07	4.43E+08	4.98E+07	966	1.24E+08	8.58E+08	1.88E+08	1016	1.16E+03	3.14E+02	3.59E+04	1066	1.94E+04	1.76E+03	1.78E+05	1116	1.73E+06	7.17E+06	2.47E+06	1166	3.38E+05	2.29E+07	1.10E+06
917	8.79E+09	6.21E+09	1.31E+10	967	1.12E+05	4.73E+05	1.16E+07	1017	4.82E+05	3.59E+06	1.72E+06	1067	3.06E+06	2.27E+07	1.62E+07	1117	3.76E+04	3.67E+03	1.08E+05	1167	3.50E+03	4.56E+04	2.03E+06
918	5.07E+06	3.66E+07	3.34E+07	968	4.88E+04	7.46E+04	2.70E+06	1018	7.60E+06	1.56E+07	7.37E+07	1068	2.53E+07	2.90E+07	6.41E+07	1118	1.74E+06	3.56E+06	7.00E+06	1168	1.20E+07	6.62E+07	1.53E+08
919	4.07E+08	2.06E+09	4.07E+08	969	1.18E+06	2.37E+07	8.47E+06	1019	9.97E+09	6.37E+09	1.34E+10	1069	2.50E+05	3.14E+06	5.28E+05	1119	6.56E+08	2.73E+08	9.63E+08	1169	2.62E+08	1.69E+08	8.32E+08
920	2.68E+09	5.78E+09	3.30E+09	970	3.03E+01	1.51E+02	6.00E+04	1020	9.88E+08	8.29E+08	2.51E+09	1070	9.92E+05	9.31E+05	4.83E+06	1120	1.05E+06	6.04E+06	1.02E+06	1170	4.99E+07	1.77E+08	1.73E+08
921	4.57E+08	1.96E+09	7.73E+08	971	1.09E+06	6.10E+06	6.63E+07	1021	7.46E+07	1.60E+08	2.72E+08	1071	3.08E+07	5.06E+08	1.62E+07	1121	3.54E+07	1.93E+08	2.25E+07	1171	1.11E+04	6.83E+03	7.56E+05
922	1.15E+09	3.78E+09	1.56E+09	972	1.34E+08	2.72E+08	8.67E+08	1022	7.17E+06	1.71E+08	1.12E+07	1072	2.89E+08	6.29E+08	5.60E+08	1122	6.37E+05	9.98E+05	8.46E+05	1172	1.12E+00	2.79E+00	4.24E+03
923	8.93E+08	3.46E+09	9.93E+08	973	4.74E+07	3.41E+08	1.88E+08	1023	8.66E+03	3.03E+03	1.46E+05	1073	6.31E+09	5.14E+09	9.06E+09	1123	3.06E+08	2.65E+08	4.71E+08	1173	5.80E+05	1.60E+07	1.69E+06
924	4.11E+08	8.79E+08	1.09E+09	974	1.40E+08	5.90E+08	4.56E+08	1024	4.45E+06	2.95E+07	2.37E+07	1074	7.50E+08	1.32E+09	1.16E+09	1124	5.45E+07	1.31E+08	4.78E+07	1174	6.28E+07	4.24E+08	1.08E+08
925	6.56E+05	1.04E+06	1.29E+07	975	7.62E+07	5.96E+08	1.74E+08	1025	5.51E+08	1.70E+09	8.82E+08	1075	9.40E+08	1.50E+09	1.21E+09	1125	1.53E+08	5.67E+08	1.32E+08	1175	1.84E+02	9.04E+01	2.81E+04
926	1.10E+05	7.20E+05	1.01E+07	976	3.43E+08	8.88E+08	7.47E+08	1026	7.10E+01	3.31E+01	8.08E+03	1076	9.70E+05	1.75E+06	1.14E+07	1126	4.07E+03	9.17E+02	3.12E+04	1176	1.43E+04	1.45E+04	1.36E+05
927	8.41E+03	6.45E+04	3.23E+06	977	3.43E+07	2.60E+08	7.53E+07	1027	2.49E+05	6.89E+05	1.39E+07	1077	6.94E+06	1.08E+07	1.78E+07	1127	4.04E+06	1.86E+08	7.48E+06	1177	1.57E+07	1.76E+08	2.59E+07
928	1.40E+04	2.61E+05	7.96E+06	978	2.42E+05	2.40E+05	5.66E+06	1028	7.38E+05	1.96E+06	2.63E+07	1078	3.28E+08	1.89E+09	2.64E+08	1128	5.71E+08	9.07E+08	1.48E+09	1178	5.93E+02	8.95E+02	7.73E+04
929	3.67E+03	2.36E+04	1.36E+06	979	5.01E+02	3.45E+03	4.79E+05	1029	2.52E+09	1.69E+09	4.83E+09	1079	1.18E+09	1.33E+09	1.77E+09	1129	5.33E+09	3.58E+09	8.74E+09	1179	1.48E+07	1.73E+08	3.73E+07
930	3.58E+09	3.25E+09	5.86E+09	980	2.36E+04	7.86E+04	4.34E+06	1030	8.93E+03	3.80E+04	1.57E+06	1080	1.70E+09	1.32E+09	2.74E+09	1130	7.27E+07	6.00E+08	1.12E+08	1180	1.66E+02	4.28E+02	9.98E+04
931	7.66E+07	8.86E+08	1.11E+08	981	7.58E+08	9.01E+08	1.59E+09	1031	7.28E+07	3.55E+08	1.79E+08	1081	7.74E+07	6.42E+08	3.70E+07	1131	3.44E+08	8.75E+08	7.17E+08	1181	3.29E+06	6.87E+07	8.20E+06
932	4.72E+08	2.58E+09	8.54E+08	982	5.63E+06	1.48E+08	1.95E+07	1032	1.69E+06	3.18E+07	4.08E+06	1082	2.95E+09	2.29E+09	4.93E+09	1132	4.38E+08	3.72E+08	1.26E+09	1182	1.37E+08	1.70E+08	4.11E+08
933	1.12E+07	2.73E+07	1.15E+08	983	1.37E+04	1.53E+05	6.89E+06	1033	8.78E+06	3.08E+07	6.43E+07	1083	1.64E+03	8.06E+03	1.39E+05	1133	1.16E+07	3.62E+08	2.72E+07	1183	1.77E+05	1.50E+06	2.08E+06
934	1.92E+09	2.55E+09	3.93E+09	984	6.32E+05	8.41E+05	1.68E+07	1034	2.49E+05	1.90E+05	2.95E+06	1084	1.06E+09	1.28E+09	1.80E+09	1134	3.24E+07	5.25E+08	5.05E+07	1184	1.27E+07	1.23E+08	2.32E+07
935	8.51E+08	2.00E+09	1.81E+09	985	1.66E+09	1.22E+09	3.58E+09	1035	5.18E+00	3.76E+00	1.69E+03	1085	3.22E+04	3.26E+04	4.68E+05	1135	3.68E+05	1.35E+06	2.90E+06	1185	3.40E+04	3.34E+04	2.35E+06
936	3.09E+09	3.41E+09	6.10E+09	986	3.49E+08	9.38E+08	8.44E+08	1036	1.95E+09	1.27E+09	3.82E+09	1086	9.03E+06	9.74E+07	7.57E+06	1136	3.82E+04	3.00E+04	6.01E+05	1186	5.16E+07	2.33E+08	1.44E+08
937	3.96E+08	6.90E+08	1.28E+09	987	5.25E+08	6.39E+08	1.24E+09	1037	1.41E+07	1.44E+08	3.47E+07	1087	1.55E+08	8.20E+08	1.09E+08	1137	1.21E+08	3.16E+08	4.44E+08	1187	1.60E+07	1.22E+08	4.61E+07
938	6.03E+06	1.73E+08	2.49E+07	988	3.38E+06	1.12E+07	6.52E+07	1038	6.94E+07	5.46E+08	1.01E+08	1088	2.37E+09	2.14E+09	3.23E+09	1138	2.50E+06	2.28E+07	2.19E+07	1188	4.23E+03	2.71E+03	3.40E+05
939	2.67E+03	1.02E+04	8.14E+05	989	5.30E+08	2.57E+08	1.23E+09	1039	5.35E+08	2.23E+09	5.74E+08	1089	3.03E+03	3.02E+03	7.42E+04	1139	1.99E+04	8.10E+03	2.51E+05	1189	3.14E+00	3.21E-01	8.31E+02
940	3.93E+04	1.48E+05	4.57E+06	990	1.84E+05	3.61E+05	2.21E+06	1040	3.72E+08	5.53E+08	7.02E+08	1090	3.86E+08	5.01E+08	6.46E+08	1140	6.71E-02	5.25E-02	2.33E+02	1190	3.53E+05	9.10E+06	6.14E+05
941	4.90E+05	3.46E+05	6.75E+06	991	2.41E+08	1.00E+08	6.15E+08	1041	2.15E+09	2.16E+09	4.00E+09	1091	1.13E+08	7.52E+08	8.93E+07	1141	1.75E+05	4.85E+05	1.04E+07	1191	6.27E+03	7.21E+04	5.53E+04
942	4.39E+06	4.18E+07	1.46E+08	992	2.69E+08	3.36E+08	4.40E+08	1042	1.96E+08	3.08E+08	6.22E+08	1092	3.02E+08	5.16E+08	5.38E+08	1142	4.63E+05	6.25E+05	8.81E+06	1192	6.65E+01	1.66E+02	9.03E+04
943	1.55E+08	3.35E+08	7.04E+08	993	5.61E+07	3.63E+07	2.75E+08	1043	6.31E+08	5.95E+08	1.65E+09	1093	3.92E+04	1.91E+05	2.52E+06	1143	1.21E+07	1.92E+08	2.25E+07	1193	7.76E+07	1.39E+08	1.77E+08
944	2.40E+07	1.61E+08	1.49E+08	994	6.51E+01	1.63E+02	7.47E+04	1044	1.47E+07	3.07E+07	1.77E+08	1094	1.16E+03	8.40E+02	3.34E+04	1144	1.16E+06	9.35E+06	9.06E+06	1194	9.50E+07	4.20E+07	2.97E+08
945	1.21E+09	2.64E+09	1.52E+09	995	2.34E+04	1.46E+04	1.40E+06	1045	3.19E+07	1.54E+08	8.52E+07	1095	2.29E+07	2.02E+08	2.64E+07	1145	8.32E+08	6.04E+08	1.93E+09	1195	7.93E+05	1.22E+07	1.49E+06
946	2.76E+09	2.69E+09	4.38E+09	996	2.15E+05	1.57E+05	7.33E+06	1046	4.45E+07	3.66E+08	5.61E+07	1096	1.75E+05	8.67E+04	6.53E+05	1146	1.03E+03	1.71E+02	4.10E+04	1196	2.45E+07	7.38E+07	3.63E+07
947	1.75E+08	9.25E+08	3.05E+08	997	2.15E+03	1.34E+04	1.72E+06	1047	6.68E+04	7.96E+04	2.49E+06	1097	3.57E+02	5.05E+02	2.31E+04	1147	2.01E+02	4.22E+02	2.78E+04	1197	7.38E+03	7.30E+03	1.44E+06
948	1.18E+05	8.66E+05	1.89E+07	998	6.34E+06	6.48E+07	1.78E+07	1048	4.17E+06	9.38E+07	6.48E+06	1098	1.95E+08	3.30E+08	6.16E+08	1148	1.21E+07	2.46E+07	9.73E+07	1198	3.71E+03	2.70E+03	3.81E+04
949	7.35E+08	9.14E+08	1.86E+09	999	5.45E+02	4.39E+02	1.64E+05	1049	5.78E+04	3.17E+05	6.22E+06	1099	2.16E+09	1.46E+09	3.50E+09	1149	2.64E+07	1.93E+08	8.34E+07	1199	1.87E+06	1.47E+07	3.60E+06
950	1.20E+08	5.11E+08	3.60E+08	1000	3.82E+06	5.92E+07	9.37E+06	1050	6.08E+06	1.13E+08	1.14E+07	1100	1.77E+09	2.59E+09	1.88E+09	1150	9.63E+05	6.47E+06	1.86E+07	1200	1.16E+06	2.65E+06	9.09E+06

Table F-5 continued

Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08	Map	AB10	AS08	BA08
1201	7.23E+02	2.49E+02	3.42E+04	1251	3.38E+08	5.13E+08	8.64E+08	1301	9.69E+07	2.90E+08	2.91E+08	1351	5.98E+05	1.74E+06	2.07E+07	1401	3.88E+06	7.88E+07	4.65E+06	1451	8.90E+07	1.04E+09	7.64E+07
1202	1.45E+01	9.46E+00	1.04E+04	1252	1.12E+04	3.51E+04	2.48E+06	1302	3.15E+06	2.82E+07	1.67E+07	1352	2.64E+08	2.28E+09	2.37E+08	1402	2.43E+07	4.79E+08	2.23E+07	1452	1.89E+02	3.40E+02	2.40E+04
1203	7.44E+06	7.36E+06	3.21E+07	1253	4.09E+03	9.73E+02	1.29E+05	1303	1.66E+09	1.64E+09	2.92E+09	1353	9.98E+03	2.12E+04	7.08E+05	1403	6.43E+03	2.79E+04	1.27E+06	1453	1.83E+08	1.15E+09	1.79E+08
1204	3.10E+06	8.52E+06	1.02E+07	1254	2.32E+01	3.11E+01	1.86E+04	1304	1.45E+09	1.40E+09	3.20E+09	1354	9.45E+08	3.23E+09	1.21E+09	1404	9.82E+06	9.76E+07	3.46E+07	1454	8.52E+06	8.43E+07	1.45E+07
1205	3.33E+09	2.19E+09	5.88E+09	1255	8.20E+05	1.89E+07	2.91E+06	1305	1.77E+09	1.51E+09	3.67E+09	1355	1.68E+08	1.83E+09	1.57E+08	1405	3.38E+07	3.43E+08	6.54E+07	1455	2.49E+01	1.93E+01	2.62E+03
1206	6.10E+07	1.36E+08	4.58E+08	1256	4.45E+08	4.65E+08	1.36E+09	1306	1.75E+08	6.93E+08	3.39E+08	1356	1.35E+08	9.57E+08	1.66E+08	1406	6.88E+04	1.34E+05	1.52E+05	1456	9.15E+08	1.14E+09	1.84E+09
1207	1.09E+10	6.67E+09	1.43E+10	1257	9.63E+08	9.00E+08	2.13E+09	1307	5.21E+03	8.63E+03	6.94E+05	1357	2.77E+05	3.42E+05	4.96E+06	1407	2.47E+08	1.01E+08	4.95E+08	1457	1.33E+08	2.47E+08	6.78E+08
1208	2.98E+09	2.02E+09	5.75E+09	1258	1.69E+08	4.88E+08	4.50E+08	1308	1.49E+08	4.03E+08	3.62E+08	1358	3.90E+07	1.23E+08	1.27E+08	1408	4.10E+07	2.72E+07	1.47E+08	1458	9.03E+09	6.11E+09	1.27E+10
1209	1.53E+09	1.49E+09	3.34E+09	1259	1.51E+08	7.96E+08	2.51E+08	1309	1.36E+04	1.52E+04	1.07E+06	1359	3.85E+07	6.29E+07	2.11E+08	1409	4.98E+08	4.68E+08	1.05E+09	1459	1.81E+09	1.70E+09	3.81E+09
1210	7.74E+09	5.31E+09	1.19E+10	1260	4.05E+06	6.97E+07	1.08E+07	1310	2.89E+07	2.91E+08	4.37E+07	1360	2.85E+06	4.42E+06	3.62E+07	1410	3.76E+02	1.83E+02	4.50E+04	1460	5.85E+07	3.71E+08	6.30E+07
1211	3.70E+05	7.20E+05	3.17E+06	1261	2.84E+07	4.76E+07	2.68E+08	1311	2.29E+09	1.57E+09	4.13E+09	1361	3.24E+05	9.66E+05	1.12E+07	1411	1.23E+08	6.27E+07	3.32E+08	1461	1.14E+03	5.53E+02	3.48E+04
1212	1.19E+06	1.49E+06	2.68E+07	1262	1.14E+06	2.20E+06	1.38E+07	1312	1.82E+07	1.38E+08	6.23E+07	1362	6.98E+02	7.34E+02	4.67E+04	1412	6.05E+05	5.34E+06	1.14E+06	1462	3.70E+04	7.92E+03	2.89E+05
1213	3.25E+02	6.14E+02	1.08E+05	1263	1.30E+07	1.99E+08	1.86E+07	1313	4.03E+08	5.26E+08	9.78E+08	1363	7.79E+07	1.77E+08	6.09E+08	1413	1.84E+08	5.12E+08	1.54E+08	1463	8.80E+05	4.00E+05	5.57E+06
1214	2.00E+07	4.25E+08	2.89E+07	1264	6.92E-01	3.83E-02	5.29E+02	1314	8.88E+05	2.45E+07	2.59E+06	1364	2.81E+08	1.94E+09	3.85E+08	1414	5.96E+08	2.04E+09	5.30E+08	1464	2.38E+09	5.46E+09	2.52E+09
1215	2.12E+02	4.17E+02	1.04E+05	1265	8.35E+06	1.98E+07	6.32E+07	1315	2.71E+07	2.14E+08	4.76E+07	1365	1.38E+08	5.36E+08	2.98E+08	1415	3.61E+08	1.40E+08	6.62E+08	1465	2.77E+08	4.21E+08	7.72E+08
1216	9.98E+07	1.19E+09	9.32E+07	1266	2.27E+04	3.15E+04	1.75E+05	1316	9.24E+07	1.63E+08	4.57E+08	1366	3.10E+08	8.33E+08	6.18E+08	1416	1.18E+09	4.79E+08	1.97E+09	1466	2.26E+08	9.58E+08	3.60E+08
1217	1.25E+08	8.14E+08	3.89E+08	1267	5.39E+08	1.65E+08	1.17E+09	1317	3.41E+04	4.29E+04	2.27E+06	1367	9.05E+05	3.91E+06	5.00E+06	1417	1.31E+07	3.36E+07	2.14E+07	1467	3.20E+04	8.22E+04	2.62E+06
1218	1.20E+08	5.18E+08	3.47E+08	1268	6.43E+02	1.26E+02	6.20E+04	1318	2.30E+07	2.34E+08	3.64E+07	1368	1.57E+09	3.47E+09	2.05E+09	1418	1.48E+08	3.90E+08	2.49E+08	1468	1.24E+09	1.49E+09	2.20E+09
1219	6.17E+07	4.25E+08	1.82E+08	1269	1.85E+06	5.24E+06	4.80E+07	1319	7.51E+04	2.32E+04	8.88E+05	1369	1.58E+01	1.69E+01	6.25E+03	1419	9.67E+06	4.67E+07	9.27E+06	1469	7.82E+05	1.14E+06	2.03E+06
1220	1.36E+04	4.44E+03	4.77E+05	1270	2.16E+06	2.53E+07	2.93E+06	1320	2.14E+08	1.07E+09	2.82E+08	1370	3.72E+06	1.05E+07	1.14E+07	1420	3.25E+07	1.50E+08	4.02E+07	1470	3.93E+06	8.96E+06	1.85E+07
1221	2.51E+00	2.20E+00	3.46E+03	1271	9.61E+01	1.03E+01	1.25E+04	1321	4.30E+09	3.08E+09	7.41E+09	1371	3.03E+07	3.86E+08	2.60E+07	1421	1.09E+07	5.73E+07	2.98E+07	1471	2.38E+05	5.94E+05	9.11E+06
1222	3.31E+05	1.43E+06	2.57E+07	1272	8.68E+06	3.60E+07	1.96E+07	1322	1.64E+06	1.21E+07	8.81E+06	1372	3.77E+00	1.38E+00	1.03E+03	1422	8.88E+07	2.71E+08	1.46E+08	1472	2.90E+05	1.77E+05	2.67E+06
1223	1.07E+04	9.85E+03	8.01E+05	1273	3.94E+07	5.17E+07	1.10E+08	1323	7.56E+07	3.89E+08	1.64E+08	1373	2.72E+07	4.58E+08	2.79E+07	1423	2.15E+07	1.22E+08	1.80E+07	1473	3.02E+07	9.39E+07	1.11E+08
1224	4.38E+07	4.88E+08	7.67E+07	1274	2.74E+03	2.07E+03	1.69E+05	1324	8.51E+07	2.30E+08	2.50E+08	1374	1.97E+04	6.14E+03	2.32E+05	1424	6.89E+03	3.51E+03	3.59E+05	1474	2.64E+09	2.18E+09	4.68E+09
1225	2.26E+05	9.91E+04	2.46E+06	1275	1.41E+06	1.66E+07	6.99E+06	1325	4.98E+03	3.51E+04	1.83E+06	1375	1.64E+08	6.68E+08	3.45E+08	1425	7.26E+05	7.97E+06	2.07E+06	1475	2.49E+08	4.42E+08	6.26E+08
1226	2.03E+09	1.72E+09	3.72E+09	1276	1.59E+07	4.59E+07	2.04E+08	1326	1.05E+07	2.14E+08	1.69E+07	1376	8.21E+07	6.46E+08	1.12E+08	1426	2.58E+08	4.59E+08	1.04E+09	1476	3.81E+08	1.76E+09	2.72E+08
1227	8.50E+00	1.01E+01	9.13E+03	1277	1.37E+05	4.59E+05	9.99E+06	1327	1.19E+07	2.33E+08	9.86E+06	1377	7.71E+09	5.16E+09	1.10E+10	1427	2.19E+04	1.53E+04	2.85E+05	1477	9.54E+07	2.24E+08	3.26E+08
1228	2.30E+07	3.21E+08	3.34E+07	1278	1.06E+08	9.89E+08	1.24E+08	1328	8.41E+06	2.82E+08	1.04E+07	1378	1.88E+07	1.10E+08	1.83E+08	1428	8.17E+06	1.21E+07	3.65E+07	1478	2.51E+06	2.37E+07	4.31E+06
1229	3.52E+05	7.71E+05	1.67E+07	1279	6.98E+05	3.01E+06	4.16E+06	1329	6.38E+07	4.05E+08	1.23E+08	1379	2.78E+08	3.54E+08	1.02E+09	1429	9.30E+07	1.37E+09	6.25E+07	1479	1.19E+07	2.51E+08	8.45E+06
1230	5.68E+07	5.44E+08	1.11E+08	1280	7.35E+08	2.12E+09	1.03E+09	1330	1.86E+07	2.60E+08	3.43E+07	1380	4.32E+07	6.32E+07	2.93E+08	1430	5.72E+07	1.13E+09	3.88E+07	1480	2.08E+07	1.96E+08	3.30E+07
1231	9.40E+06	1.35E+07	1.09E+08	1281	5.75E+07	1.09E+09	5.92E+07	1331	7.18E+06	1.34E+07	7.09E+07	1381	4.42E+09	3.18E+09	7.45E+09	1431	7.47E+07	6.67E+08	9.74E+07	1481	3.85E+07	5.97E+08	2.16E+07
1232	5.36E+07	4.56E+08	9.26E+07	1282	3.09E+08	1.26E+09	6.35E+08	1332	3.28E+07	1.96E+08	1.18E+08	1382	1.55E+09	1.30E+09	3.49E+09	1432	3.79E+07	5.35E+08	4.43E+07	1482	6.60E+07	1.67E+08	2.10E+08
1233	1.22E+07	3.59E+08	1.67E+07	1283	2.41E+03	9.92E+02	9.02E+04	1333	6.40E+01	4.77E+01	1.79E+04	1383	6.45E+07	4.47E+08	7.48E+07	1433	9.77E+07	1.22E+09	6.18E+07	1483	3.30E+08	1.14E+09	5.11E+08
1234	7.45E+02	5.65E+03	7.34E+05	1284	8.20E+02	1.64E+03	1.18E+05	1334	7.73E+03	8.03E+04	3.37E+06	1384	2.99E+07	3.17E+08	3.83E+07	1434	7.38E+08	1.79E+09	1.37E+09	1484	1.24E+03	2.98E+03	1.43E+05
1235	5.31E+08	1.01E+09	1.45E+09	1285	1.42E+06	1.53E+06	2.04E+07	1335	3.95E+06	3.13E+07	7.83E+06	1385	2.22E+09	2.11E+09	3.73E+09	1435	2.43E+05	7.45E+05	9.91E+06	1485	4.06E+08	3.52E+08	7.55E+08
1236	7.80E+04	3.93E+04	6.67E+05	1286	9.23E+04	2.63E+04	8.98E+05	1336	1.44E+08	8.52E+07	3.59E+08	1386	2.59E+08	4.87E+08	5.69E+08	1436	9.72E+04	3.38E+05	5.07E+06	1486	3.04E+08	2.35E+08	5.59E+08
1237	6.49E+01	9.01E+01	4.61E+04	1287	6.90E+07	9.17E+08	7.47E+07	1337	2.59E+02	3.85E+02	1.29E+05	1387	4.88E+08	8.89E+08	9.77E+08	1437	8.36E+05	6.48E+05	2.81E+06	1487	5.56E+09	2.38E+09	7.20E+09
1238	7.96E+08	8.50E+08	1.96E+09	1288	5.41E+09	3.48E+09	8.25E+09	1338	3.80E+05	1.64E+06	1.72E+07	1388	8.36E+08	9.04E+08	1.75E+09	1438	2.43E+08	3.44E+09	1.39E+08	1488	1.89E+07	7.67E+07	1.17E+07
1239	6.77E+06	6.41E+07	3.07E+07	1289	1.04E+09	9.26E+08	2.44E+09	1339	6.97E+08	2.01E+08	1.49E+09	1389	7.63E+07	6.55E+08	8.79E+07	1439	1.37E+05	5.43E+04	7.66E+05	1489	1.55E+09	6.69E+08	2.42E+09
1240	1.66E+08	9.65E+08	2.06E+08	1290	4.53E+08	6.74E+08	1.19E+09	1340	1.63E+09	5.32E+08	3.00E+09	1390	4.64E+06	6.37E+06	8.80E+07	1440	5.51E+08	2.33E+09	6.12E+08	1490	4.35E+05	6.78E+04	3.03E+06
1241	1.02E+09	3.03E+09	1.32E+09	1291	3.32E+06	7.65E+06	7.52E+07	1341	9.28E+09	3.74E+09	1.08E+10	1391	2.81E+08	5.67E+08	7.08E+08	1441	8.06E+06	7.68E+07	1.38E+07	1491	5.45E+03	1.08E+04	4.80E+05
1242	2.49E+06	1.67E+07	1.50E+07	1292	3.13E+03	1.01E+03	1.45E+05	1342	4.80E+06	3.99E+07	5.89E+06	1392	3.88E+08	6.84E+08	1.01E+09	1442	4.56E+06	1.71E+07	8.80E+07	1492	5.74E+09	4.36E+09	8.02E+09
1243	3.89E+07	5.05E+08	5.15E+07	1293	2.75E+08	4.71E+08	7.08E+08	1343	4.14E+06	4.70E+06	4.35E+07	1393	1.78E+02	3.30E+02	5.41E+04	1443	1.61E+07	3.96E+08	1.14E+07	1493	6.72E+05	6.67E+06	6.57E+05
1244	7.37E+08	7.30E+08	2.14E+09	1294	4.20E+02	2.01E+03	2.98E+05	1344	2.40E+06	2.39E+07	3.04E+06	1394	5.67E+01	3.35E+01	6.91E+03	1444	3.83E+10	1.81E+10	3.61E+10	1494	4.32E+07	1.23E+08	3.73E+07
1245	2.28E+08	6.34E+08	5.36E+08	1295	1.11E+10	7.58E+09	1.55E+10	1345	7.77E+06	4.54E+07	1.33E+07	1395	3.85E+07	1.27E+08	1.55E+08	1445	1.03E+09	1.27E+09	1.93E+09	1495	2.83E+05	5.06E+04	1.85E+06
1246	4.39E+05	8.72E+05	4.35E+06	1296	1.33E+02	1.87E+02	5.27E+04	1346	4.29E+04	1.25E+05	2.53E+05	1396	1.28E+07	2.24E+08	1.40E+07	1446	7.65E+06	1.23E+07	5.16E+07	1496	9.72E+07	1.01E+08	1.55E+08
1247	2.48E+02	6.53E+02	2.22E+05	1297	5.88E+07	4.77E+08	1.06E+08	1347	3.38E+00	1.52E+00	2.00E+03	1397	7.94E+02	1.58E+02	3.03E+04	1447	1.17E+08	9.33E+08	1.02E+08	1497	9.03E+07	9.87E+07	1.42E+08
1248	1.23E+08	3.25E+08	3.54E+08	1298	1.06E+08	4.47E+08	2.78E+08	1348	4.44E+07	2.10E+08	6.18E+07	1398	9.36E+06	4.81E+07	2.90E+07	1448	9.83E+00	4.82E+00	1.45E+03	1498	1.80E+03	1.47E+02	1.69E+04
1249	1.18E+09	1.02E+09	2.84E+09	1299	6.85E+08	5.74E+08	1.61E+09	1349	5.63E+07	3.44E+07	1.98E+08	1399	4.89E+02	1.50E+03	1.28E+05	1449	1.04E+08	8.30E+08	1.29E+08	1499	4.85E+06	4.37E+07	2.80E+06
1250	7.75E+08	6.30E+08	2.11E+09	1300	1.09E+08	1.54E+08	4.83E+08	1350	1.53E+05	5.17E+04	8.98E+05	1400	3.78E+02	3.98E+02	4.95E+04	1450	1.01E+06	9.93E+05	1.43E+07	1500	2.88E+07	6.82E+07	3.64E+07

Table F-6 Indirect economic loss

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
8	1.37E+08	6.00E+07	4.28E+07	2.57E+07	1.71E+07	2.31E+08	1.11E+08	7.71E+07	5.14E+07	4.28E+07	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
11	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
12	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
20	4.02E+10	1.86E+10	1.10E+10	7.72E+09	5.63E+09	1.52E+09	7.29E+08	4.80E+08	3.43E+08	2.66E+08	3.89E+10	1.76E+10	1.11E+10	7.51E+09	5.42E+09
21	7.11E+08	3.34E+08	2.23E+08	1.54E+08	1.29E+08	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	1.69E+09	8.14E+08	5.31E+08	3.77E+08	2.91E+08
22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24	3.09E+08	1.37E+08	8.57E+07	6.00E+07	5.14E+07	3.26E+08	1.54E+08	9.42E+07	6.85E+07	6.00E+07	2.06E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07
25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
27	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
28	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07
29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
33	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
36	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
37	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
38	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
39	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
40	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	1.37E+08	6.00E+07	4.28E+07	2.57E+07	1.71E+07
41	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
42	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
43	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
44	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
45	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
46	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
47	2.66E+08	1.20E+08	8.57E+07	5.14E+07	3.43E+07	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	4.37E+08	2.06E+08	1.37E+08	9.43E+07	6.86E+07
48	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
49	7.61E+09	3.23E+09	1.56E+09	1.15E+09	8.34E+08	6.26E+08	2.91E+08	1.97E+08	1.46E+08	1.11E+08	1.17E+10	5.53E+09	3.23E+09	2.29E+09	1.36E+09
50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
51	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
52	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
53	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
56	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+08	6.00E+07	4.28E+07	2.57E+07	1.71E+07
57	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
59	8.74E+08	4.29E+08	2.74E+08	1.97E+08	1.46E+08	1.88E+08	8.57E+07	6.00E+07	3.43E+07	2.57E+07	1.56E+09	7.54E+08	4.71E+08	3.51E+08	2.74E+08
60	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07
61	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
62	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
64	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
66	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
67	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
68	1.60E+10	7.51E+09	4.38E+09	2.92E+09	1.88E+09	1.76E+09	8.40E+08	5.49E+08	3.86E+08	3.17E+08	1.94E+10	8.55E+09	5.11E+09	3.65E+09	2.19E+09
69	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
70	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
71	1.86E+09	9.00E+08	5.74E+08	4.29E+08	3.34E+08	1.04E+09	5.06E+08	3.17E+08	2.40E+08	1.71E+08	1.17E+09	5.57E+08	3.60E+08	2.66E+08	2.06E+08
72	5.53E+09	1.77E+09	1.25E+09	8.34E+08	5.22E+08	1.31E+09	6.26E+08	4.20E+08	3.00E+08	2.31E+08	5.95E+09	1.98E+09	1.36E+09	9.39E+08	6.26E+08
73	1.71E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	2.40E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07
74	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
76	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
77	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
78	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
79	3.23E+11	1.54E+11	9.91E+10	7.07E+10	5.41E+10	8.97E+09	4.49E+09	2.19E+09	1.67E+09	1.25E+09	1.88E+11	9.00E+10	5.71E+10	4.04E+10	3.06E+10
80	4.28E+08	2.06E+08	1.37E+08	8.57E+07	7.71E+07	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	6.26E+08	3.00E+08	1.97E+08	1.37E+08	1.11E+08
81	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
82	2.38E+09	1.17E+09	7.63E+08	5.40E+08	4.29E+08	3.43E+08	1.54E+08	9.43E+07	6.86E+07	6.00E+07	2.81E+09	1.38E+09	8.92E+08	6.43E+08	5.23E+08
83	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
84	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
86	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
87	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
89	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
90	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
92	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
93	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
94	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
95	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
96	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
97	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
98	5.66E+08	2.66E+08	1.63E+08	1.20E+08	9.43E+07	6.94E+08	3.26E+08	2.14E+08	1.54E+08	1.20E+08	4.97E+08	2.31E+08	1.54E+08	1.11E+08	7.71E+07
99	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
100	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
101	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
102	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
103	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
104	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
105	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
106	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
107	3.09E+08	1.46E+08	8.57E+07	6.86E+07	5.14E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	5.06E+08	2.40E+08	1.54E+08	1.11E+08	8.57E+07
108	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
109	5.06E+08	2.40E+08	1.54E+08	1.11E+08	8.57E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	7.71E+08	3.69E+08	2.40E+08	1.63E+08	1.37E+08
110	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
111	1.37E+08	6.85E+07	4.28E+07	3.43E+07	1.71E+07	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	2.06E+08	9.43E+07	6.00E+07	3.43E+07	3.43E+07
112	2.71E+09	1.15E+09	7.30E+08	4.17E+08	1.04E+08	8.74E+08	4.20E+08	2.66E+08	1.89E+08	1.54E+08	3.86E+09	1.25E+09	8.34E+08	5.22E+08	2.09E+08
113	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
114	7.63E+08	3.69E+08	2.23E+08	1.71E+08	1.37E+08	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	8.14E+08	3.86E+08	2.57E+08	1.80E+08	1.37E+08
115	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
116	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
117	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
118	3.08E+08	1.46E+08	9.43E+07	6.00E+07	5.14E+07	5.14E+08	2.40E+08	1.54E+08	1.11E+08	8.57E+07	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
119	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
120	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
121	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
122	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
123	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
124	8.57E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	8.57E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
127	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
128	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
129	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
130	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
131	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
132	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
133	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
135	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
136	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
138	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
139	6.26E+08	2.91E+08	1.89E+08	1.37E+08	1.03E+08	2.06E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07	6.94E+08	3.34E+08	2.23E+08	1.54E+08	1.20E+08
140	4.98E+10	2.33E+10	1.30E+10	9.39E+09	6.57E+09	5.74E+09	2.19E+09	1.67E+09	1.15E+09	7.30E+08	2.16E+10	9.49E+09	5.63E+09	4.17E+09	2.61E+09
141	7.54E+08	3.60E+08	2.23E+08	1.63E+08	1.37E+08	4.03E+08	1.89E+08	1.29E+08	8.57E+07	6.86E+07	7.89E+08	3.77E+08	2.40E+08	1.71E+08	1.37E+08
142	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
143	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
144	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
145	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
146	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
147	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
148	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
149	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	1.11E+08	5.14E+07	2.57E+07	1.71E+07	1.71E+07
150	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
151	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
152	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
153	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
154	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
155	9.34E+08	4.46E+08	3.00E+08	2.06E+08	1.54E+08	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	1.27E+09	6.17E+08	3.94E+08	2.91E+08	2.23E+08
156	4.49E+09	1.46E+09	1.04E+09	7.30E+08	4.17E+08	2.91E+08	1.46E+08	8.57E+07	6.85E+07	4.28E+07	5.01E+09	2.40E+09	1.25E+09	8.34E+08	6.26E+08
157	1.80E+08	8.57E+07	6.00E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07
158	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
159	2.23E+08	1.03E+08	6.85E+07	5.14E+07	4.28E+07	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
160	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
161	1.09E+09	5.23E+08	3.51E+08	2.40E+08	1.97E+08	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	6.51E+08	3.26E+08	2.06E+08	1.46E+08	1.11E+08
162	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07
163	1.18E+09	5.74E+08	3.60E+08	2.74E+08	2.06E+08	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.28E+09	6.17E+08	4.03E+08	2.91E+08	2.23E+08
164	1.97E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07
165	4.46E+08	2.14E+08	1.37E+08	9.43E+07	7.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+08	1.63E+08	1.03E+08	6.85E+07	6.00E+07
166	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
167	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
168	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
169	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
170	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
171	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
172	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
173	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
174	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
175	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
176	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
177	3.43E+08	1.63E+08	1.03E+08	6.85E+07	6.00E+07	1.37E+08	6.00E+07	4.28E+07	2.57E+07	2.57E+07	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07
178	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
179	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
180	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
181	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
182	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
183	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
184	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
185	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
186	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
187	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	2.66E+08	1.20E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07
188	1.66E+09	7.97E+08	5.31E+08	3.77E+08	2.91E+08	2.23E+08	1.03E+08	6.85E+07	5.14E+07	4.28E+07	1.95E+09	9.60E+08	6.26E+08	4.54E+08	3.51E+08
189	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
190	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
191	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
192	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
193	8.83E+08	4.29E+08	2.91E+08	1.97E+08	1.54E+08	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	1.34E+09	6.51E+08	4.20E+08	3.00E+08	2.31E+08
194	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
195	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
196	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
197	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
198	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
199	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
200	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
201	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
202	2.71E+11	1.30E+11	8.30E+10	5.96E+10	4.52E+10	2.61E+09	8.34E+08	5.22E+08	3.13E+08	1.04E+08	3.58E+11	1.74E+11	1.12E+11	8.22E+10	6.38E+10
203	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+08	1.29E+08	7.71E+07	6.00E+07	4.28E+07
204	1.63E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.94E+08	1.80E+08	1.20E+08	8.57E+07	6.86E+07
205	1.23E+09	6.00E+08	3.86E+08	2.91E+08	2.14E+08	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.92E+09	9.34E+08	6.09E+08	4.46E+08	3.34E+08
206	2.40E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	3.17E+08	1.54E+08	9.42E+07	6.85E+07	6.00E+07
207	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
208	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
209	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
210	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
211	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
212	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
213	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
214	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
215	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
216	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
217	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
218	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
219	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.23E+08	1.03E+08	6.85E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
220	2.23E+08	1.03E+08	6.85E+07	5.14E+07	4.28E+07	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	2.06E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07
221	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	2.06E+08	1.03E+08	6.00E+07	5.14E+07	3.43E+07	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
222	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.37E+08	6.00E+07	4.28E+07	2.57E+07	2.57E+07	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07
223	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
224	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
225	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
226	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
227	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
228	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
229	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
230	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
231	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
232	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
233	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
234	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
235	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
236	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
237	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
238	7.29E+08	3.51E+08	2.31E+08	1.71E+08	1.20E+08	1.54E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07	1.16E+09	5.57E+08	3.69E+08	2.66E+08	1.97E+08
239	1.67E+09	6.26E+08	4.17E+08	2.09E+08	1.04E+08	1.07E+09	5.31E+08	3.26E+08	2.49E+08	1.80E+08	3.65E+09	1.77E+09	8.34E+08	6.26E+08	4.17E+08
240	1.60E+10	7.51E+09	4.49E+09	2.92E+09	2.09E+09	4.80E+09	1.98E+09	1.04E+09	7.30E+08	5.22E+08	2.87E+10	1.35E+10	8.14E+09	5.53E+09	3.96E+09
241	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
242	4.03E+08	1.89E+08	1.20E+08	9.43E+07	6.86E+07	6.43E+08	3.17E+08	1.97E+08	1.46E+08	1.11E+08	1.10E+09	5.31E+08	3.34E+08	2.49E+08	1.89E+08
243	1.45E+09	7.11E+08	4.46E+08	3.34E+08	2.49E+08	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.36E+09	5.22E+08	3.13E+08	2.09E+08	0.00E+00
244	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
245	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
246	1.70E+09	8.23E+08	5.31E+08	4.03E+08	2.91E+08	5.40E+08	2.57E+08	1.71E+08	1.20E+08	8.57E+07	9.77E+08	4.71E+08	3.09E+08	2.23E+08	1.71E+08
247	2.54E+09	1.23E+09	8.06E+08	5.92E+08	4.63E+08	5.83E+08	2.83E+08	1.80E+08	1.37E+08	1.03E+08	1.77E+09	7.30E+08	5.22E+08	3.13E+08	1.04E+08
248	5.57E+08	2.66E+08	1.80E+08	1.29E+08	8.57E+07	3.51E+08	1.71E+08	1.11E+08	7.71E+07	6.00E+07	1.21E+09	5.91E+08	3.86E+08	2.83E+08	2.14E+08
249	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
250	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
251	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	1.54E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07
252	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.48E+08	1.11E+08	7.71E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
253	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E+08	1.03E+08	6.00E+07	5.14E+07	4.28E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.17E+08	1.54E+08	9.42E+07	6.85E+07	6.00E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
255	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	2.48E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07
256	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
257	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	2.66E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07
258	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
259	6.86E+08	3.34E+08	2.23E+08	1.54E+08	1.20E+08	1.31E+09	6.34E+08	4.20E+08	3.00E+08	2.31E+08	1.94E+09	9.34E+08	6.26E+08	4.46E+08	3.69E+08
260	1.88E+08	8.57E+07	6.00E+07	3.43E+07	2.57E+07	4.37E+08	2.06E+08	1.29E+08	1.03E+08	7.71E+07	3.77E+08	1.89E+08	1.20E+08	9.43E+07	6.00E+07
261	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	6.77E+08	3.26E+08	2.06E+08	1.46E+08	1.20E+08	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
262	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
263	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
264	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E+08	1.03E+08	6.00E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
265	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
266	6.34E+08	3.09E+08	1.97E+08	1.37E+08	1.11E+08	1.15E+09	5.49E+08	3.69E+08	2.57E+08	1.97E+08	1.56E+09	7.54E+08	4.97E+08	3.51E+08	2.91E+08
267	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E+08	1.37E+08	9.42E+07	6.85E+07	4.28E+07	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
268	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
269	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
270	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
271	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
272	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E+08	1.80E+08	1.20E+08	8.57E+07	6.00E+07	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07
273	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	8.74E+08	4.20E+08	2.74E+08	1.89E+08	1.54E+08	4.03E+08	1.89E+08	1.20E+08	9.43E+07	6.86E+07
274	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
275	6.34E+08	3.09E+08	1.97E+08	1.37E+08	1.11E+08	1.56E+09	5.22E+08	3.13E+08	1.04E+08	0.00E+00	1.13E+09	5.49E+08	3.60E+08	2.57E+08	1.89E+08
276	1.67E+09	6.26E+08	4.17E+08	3.13E+08	1.04E+08	2.19E+09	7.30E+08	5.22E+08	3.13E+08	1.04E+08	3.96E+09	1.98E+09	9.39E+08	7.30E+08	5.22E+08
277	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	3.08E+08	1.54E+08	9.42E+07	6.85E+07	5.14E+07	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
278	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E+08	1.80E+08	1.20E+08	8.57E+07	6.00E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
279	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
280	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
281	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
282	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
283	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
284	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	4.28E+08	1.97E+08	1.29E+08	9.43E+07	7.71E+07	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07
285	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
286	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
287	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
288	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.23E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
289	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
290	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
291	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
292	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
293	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
294	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
295	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
296	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
297	1.97E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	1.35E+09	6.60E+08	4.20E+08	3.17E+08	2.49E+08	3.08E+08	1.46E+08	9.42E+07	6.85E+07	5.14E+07
298	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E+08	1.37E+08	9.42E+07	6.85E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
299	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
300	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
301	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
302	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
303	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
304	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
305	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
306	7.46E+08	3.60E+08	2.31E+08	1.71E+08	1.20E+08	4.38E+09	1.77E+09	9.39E+08	6.26E+08	4.17E+08	2.11E+09	1.03E+09	6.60E+08	4.89E+08	3.77E+08
307	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
308	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
309	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
310	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
311	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
312	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
313	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	3.17E+08	1.54E+08	9.42E+07	6.85E+07	6.00E+07	3.34E+08	1.63E+08	1.03E+08	6.85E+07	6.00E+07
314	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
315	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
316	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
317	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
318	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
319	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
320	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
321	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	1.54E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07
322	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	5.31E+08	2.57E+08	1.54E+08	1.29E+08	8.57E+07
323	1.64E+12	7.96E+11	5.16E+11	3.79E+11	2.96E+11	9.31E+10	4.33E+10	2.74E+10	1.85E+10	1.38E+10	1.21E+12	5.88E+11	3.83E+11	2.81E+11	2.20E+11
324	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
325	2.09E+09	7.30E+08	5.22E+08	3.13E+08	1.04E+08	5.74E+08	2.83E+08	1.71E+08	1.37E+08	1.03E+08	9.70E+09	4.17E+09	2.40E+09	1.77E+09	1.15E+09
326	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
327	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	6.43E+08	3.17E+08	1.97E+08	1.46E+08	1.20E+08
328	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
329	3.34E+08	1.54E+08	1.03E+08	7.71E+07	5.14E+07	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	9.34E+08	4.54E+08	2.91E+08	2.14E+08	1.63E+08
330	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
331	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
332	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
333	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
334	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
335	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
336	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
337	5.14E+08	2.49E+08	1.54E+08	1.20E+08	8.57E+07	1.63E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07	1.04E+09	4.17E+08	3.13E+08	1.04E+08	0.00E+00
338	1.84E+09	8.83E+08	5.74E+08	4.20E+08	3.17E+08	4.63E+08	2.23E+08	1.37E+08	1.03E+08	7.71E+07	4.28E+09	1.77E+09	1.15E+09	6.26E+08	5.22E+08
339	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
340	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
341	3.60E+08	1.71E+08	1.03E+08	7.71E+07	6.86E+07	5.14E+08	2.49E+08	1.71E+08	1.11E+08	8.57E+07	4.97E+08	2.31E+08	1.63E+08	1.03E+08	8.57E+07
342	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
343	6.77E+08	3.26E+08	2.06E+08	1.46E+08	1.11E+08	3.34E+08	1.54E+08	1.03E+08	6.85E+07	6.00E+07	9.39E+08	3.13E+08	2.09E+08	1.04E+08	0.00E+00
344	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
345	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
346	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
347	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
348	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
349	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
350	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
351	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
352	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
353	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
354	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
355	3.86E+08	1.89E+08	1.20E+08	8.57E+07	6.86E+07	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	9.39E+08	3.13E+08	2.09E+08	1.04E+08	0.00E+00
356	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
357	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	3.00E+08	1.46E+08	9.42E+07	6.85E+07	4.28E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07
358	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
359	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	2.48E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07
360	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	6.00E+08	2.83E+08	1.89E+08	1.37E+08	1.03E+08
361	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
362	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
363	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
364	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
365	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
366	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
367	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
368	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
369	4.59E+09	2.09E+09	1.04E+09	7.30E+08	5.22E+08	8.34E+08	3.13E+08	0.00E+00	1.04E+08	0.00E+00	1.55E+10	6.88E+09	4.17E+09	2.71E+09	1.98E+09
370	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
371	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
372	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
373	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	3.68E+08	1.80E+08	1.11E+08	8.57E+07	6.00E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
374	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
375	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
376	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
377	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
378	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07
379	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
380	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
381	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
382	1.15E+10	5.22E+09	2.92E+09	1.98E+09	1.25E+09	1.88E+09	6.26E+08	4.17E+08	2.09E+08	0.00E+00	3.23E+10	1.47E+10	8.97E+09	5.95E+09	4.38E+09
383	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
384	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
385	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
386	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
387	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
388	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
389	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
390	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
391	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
392	7.08E+10	3.29E+10	2.05E+10	1.40E+10	9.91E+09	1.37E+10	5.84E+09	2.82E+09	1.98E+09	1.36E+09	1.41E+11	6.73E+10	4.22E+10	3.05E+10	2.29E+10
393	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	7.80E+08	3.69E+08	2.40E+08	1.63E+08	1.37E+08	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07
394	3.94E+08	1.89E+08	1.20E+08	9.43E+07	6.86E+07	1.12E+09	5.40E+08	3.51E+08	2.57E+08	1.97E+08	7.03E+08	3.34E+08	2.23E+08	1.54E+08	1.20E+08
395	2.57E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	1.16E+09	5.57E+08	3.60E+08	2.57E+08	1.97E+08	4.28E+08	2.06E+08	1.29E+08	9.43E+07	6.86E+07
396	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
397	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+08	1.20E+08	8.57E+07	5.14E+07	3.43E+07	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
398	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
399	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
400	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
401	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	2.14E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07	7.89E+08	3.77E+08	2.40E+08	1.80E+08	1.46E+08
402	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
403	2.92E+09	9.39E+08	6.26E+08	4.17E+08	2.09E+08	2.63E+09	1.27E+09	8.40E+08	5.92E+08	4.63E+08	1.18E+10	5.11E+09	3.02E+09	2.19E+09	1.46E+09
404	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	4.63E+08	2.14E+08	1.46E+08	9.43E+07	7.71E+07
405	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
406	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	1.46E+08	6.85E+07	4.28E+07	2.57E+07	1.71E+07
407	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
408	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
409	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.04E+09	4.97E+08	3.26E+08	2.23E+08	1.80E+08	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07
410	7.71E+08	3.77E+08	2.31E+08	1.80E+08	1.29E+08	5.23E+08	2.49E+08	1.54E+08	1.11E+08	9.43E+07	1.25E+09	5.22E+08	3.13E+08	2.09E+08	1.04E+08
411	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
412	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
413	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
414	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
415	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
416	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
417	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
418	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
419	6.51E+08	3.09E+08	2.06E+08	1.37E+08	1.11E+08	6.34E+08	3.00E+08	1.89E+08	1.46E+08	1.03E+08	1.36E+09	5.22E+08	3.13E+08	2.09E+08	1.04E+08
420	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
421	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	1.38E+09	6.69E+08	4.37E+08	3.17E+08	2.49E+08	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
422	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
423	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
424	3.34E+09	1.56E+09	7.30E+08	5.22E+08	4.17E+08	2.88E+09	1.41E+09	9.00E+08	6.52E+08	5.23E+08	1.56E+10	6.88E+09	4.07E+09	2.71E+09	1.98E+09
425	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
426	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
427	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
428	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	2.14E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07
429	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E+08	6.85E+07	4.28E+07	2.57E+07	1.71E+07	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
430	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
431	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
432	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
433	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
434	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
435	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
436	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
437	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07	2.48E+08	1.20E+08	6.85E+07	5.14E+07	4.28E+07
438	8.31E+08	3.94E+08	2.66E+08	1.89E+08	1.46E+08	7.97E+08	3.86E+08	2.49E+08	1.80E+08	1.37E+08	2.40E+09	7.30E+08	5.22E+08	3.13E+08	2.09E+08
439	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
440	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
441	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
442	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
443	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
444	2.40E+08	1.11E+08	7.71E+07	5.14E+07	4.28E+07	2.83E+08	1.37E+08	8.57E+07	6.00E+07	5.14E+07	9.51E+08	4.63E+08	3.00E+08	2.14E+08	1.63E+08
445	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
446	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
447	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
448	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
449	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
450	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

	AB10					AS08					BA08				
Map	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
451	8.55E+09	3.86E+09	2.29E+09	1.46E+09	9.39E+08	1.97E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07	1.06E+10	4.59E+09	2.71E+09	1.98E+09	1.25E+09
452	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
453	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
454	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
455	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
456	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
457	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
458	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
459	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
460	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
461	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
462	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
463	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
464	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
465	9.26E+08	4.46E+08	2.83E+08	2.06E+08	1.63E+08	2.19E+09	1.06E+09	6.94E+08	4.89E+08	3.86E+08	1.56E+09	5.22E+08	3.13E+08	2.09E+08	1.04E+08
466	6.78E+09	3.02E+09	1.77E+09	1.15E+09	7.30E+08	1.45E+10	6.57E+09	3.76E+09	2.50E+09	1.67E+09	1.21E+10	5.74E+09	3.44E+09	2.29E+09	1.56E+09
467	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
468	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
469	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
470	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
471	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.29E+09	6.34E+08	4.03E+08	3.00E+08	2.23E+08	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
472	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E+08	1.29E+08	7.71E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
473	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
474	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	7.54E+08	3.69E+08	2.23E+08	1.71E+08	1.29E+08	1.97E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07
475	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
476	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
477	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
478	1.36E+09	6.60E+08	4.37E+08	3.09E+08	2.40E+08	3.44E+09	1.25E+09	9.39E+08	6.26E+08	3.13E+08	1.98E+09	6.26E+08	4.17E+08	3.13E+08	2.09E+08
479	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.34E+08	4.46E+08	2.91E+08	2.06E+08	1.63E+08	1.97E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07
480	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
481	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
482	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	4.88E+08	2.31E+08	1.54E+08	1.03E+08	8.57E+07	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07
483	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
484	1.97E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	1.87E+09	8.92E+08	5.74E+08	4.20E+08	3.26E+08	4.71E+08	2.31E+08	1.46E+08	1.03E+08	8.57E+07
485	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
486	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
487	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
488	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
489	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
490	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
491	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
492	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
493	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
494	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
495	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E+08	1.29E+08	7.71E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
496	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
497	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.71E+08	2.23E+08	1.54E+08	9.43E+07	8.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
498	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.30E+09	1.59E+09	1.05E+09	7.63E+08	6.00E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
499	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
500	2.57E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	1.52E+09	7.37E+08	4.63E+08	3.51E+08	2.66E+08	6.94E+08	3.34E+08	2.14E+08	1.54E+08	1.20E+08

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
501	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
502	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
503	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
504	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E+08	1.29E+08	7.71E+07	5.14E+07	4.28E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
505	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
506	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
507	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E+08	1.46E+08	9.42E+07	6.85E+07	5.14E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
508	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
509	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
510	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.94E+08	1.89E+08	1.20E+08	9.43E+07	6.86E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
511	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07	1.38E+09	6.51E+08	4.29E+08	3.00E+08	2.40E+08	4.88E+08	2.31E+08	1.54E+08	1.03E+08	8.57E+07
512	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
513	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.66E+08	2.74E+08	1.71E+08	1.29E+08	9.43E+07	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07
514	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
515	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.86E+08	1.80E+08	1.20E+08	8.57E+07	6.86E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
516	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+08	2.49E+08	1.54E+08	1.20E+08	8.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
517	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
518	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
519	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
520	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
521	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
522	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
523	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E+08	1.46E+08	9.42E+07	6.85E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
524	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.23E+08	2.49E+08	1.54E+08	1.20E+08	8.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
525	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
526	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
527	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
528	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+08	2.06E+08	1.29E+08	9.43E+07	6.86E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
529	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.51E+08	1.71E+08	1.03E+08	7.71E+07	6.00E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
530	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.08E+08	2.91E+08	1.97E+08	1.29E+08	1.03E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
531	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E+09	5.40E+08	3.60E+08	2.49E+08	2.06E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
532	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
533	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
534	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
535	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
536	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
537	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
538	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
539	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	2.23E+08	1.03E+08	6.85E+07	5.14E+07	4.28E+07
540	1.55E+09	7.46E+08	4.97E+08	3.43E+08	2.83E+08	4.37E+08	2.06E+08	1.37E+08	9.43E+07	8.57E+07	2.61E+09	8.34E+08	6.26E+08	4.17E+08	2.09E+08
541	2.06E+08	1.03E+08	6.00E+07	5.14E+07	3.43E+07	2.06E+08	1.03E+08	6.00E+07	5.14E+07	3.43E+07	3.77E+08	1.89E+08	1.20E+08	9.43E+07	6.00E+07
542	1.18E+10	5.11E+09	3.02E+09	2.09E+09	1.36E+09	1.83E+09	8.92E+08	5.74E+08	4.29E+08	3.17E+08	2.03E+10	9.49E+09	5.42E+09	3.96E+09	2.71E+09
543	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07
544	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
545	2.29E+09	7.30E+08	5.22E+08	3.13E+08	1.04E+08	6.17E+08	2.91E+08	1.89E+08	1.37E+08	1.11E+08	5.74E+09	2.19E+09	1.46E+09	8.34E+08	6.26E+08
546	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
547	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
548	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
549	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
550	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
551	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
552	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
553	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
554	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
555	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
556	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
557	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
558	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
559	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
560	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	4.54E+08	2.23E+08	1.46E+08	9.43E+07	8.57E+07
561	4.20E+08	1.97E+08	1.20E+08	9.43E+07	6.86E+07	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	1.15E+09	5.40E+08	3.69E+08	2.57E+08	2.06E+08
562	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
563	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
564	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
565	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
566	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
567	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
568	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
569	6.08E+08	3.00E+08	1.80E+08	1.37E+08	1.11E+08	2.31E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	1.60E+09	7.71E+08	4.97E+08	3.60E+08	3.00E+08
570	1.80E+08	8.57E+07	6.00E+07	3.43E+07	2.57E+07	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	4.88E+08	2.31E+08	1.46E+08	1.03E+08	8.57E+07
571	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
572	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
573	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
574	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
575	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
576	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
577	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
578	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
579	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
580	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
581	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
582	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	3.68E+08	1.80E+08	1.20E+08	8.57E+07	6.00E+07	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
583	7.20E+08	3.34E+08	2.23E+08	1.54E+08	1.20E+08	4.20E+08	1.97E+08	1.20E+08	9.43E+07	6.86E+07	1.38E+09	6.60E+08	4.37E+08	3.17E+08	2.40E+08
584	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
585	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
586	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
587	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
588	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
589	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
590	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
591	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
592	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07
593	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
594	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
595	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
596	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	2.74E+08	1.29E+08	8.57E+07	6.00E+07	4.28E+07
597	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
598	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
599	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
600	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
601	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
602	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
603	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
604	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
605	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
606	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07
607	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
608	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
609	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
610	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
611	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
612	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
613	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
614	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
615	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
616	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
617	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
618	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
619	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
620	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
621	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
622	2.20E+09	1.07E+09	6.86E+08	5.06E+08	3.69E+08	2.66E+08	1.29E+08	7.71E+07	6.00E+07	4.28E+07	2.95E+09	1.44E+09	9.34E+08	6.77E+08	5.32E+08
623	8.40E+08	4.11E+08	2.57E+08	1.89E+08	1.46E+08	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	1.00E+09	4.80E+08	3.00E+08	2.31E+08	1.71E+08
624	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
625	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
626	2.15E+09	1.04E+09	6.86E+08	4.97E+08	3.60E+08	5.91E+08	2.83E+08	1.71E+08	1.29E+08	1.11E+08	1.59E+09	7.63E+08	4.97E+08	3.60E+08	2.74E+08
627	4.89E+08	2.31E+08	1.46E+08	1.11E+08	8.57E+07	4.97E+08	2.31E+08	1.54E+08	1.11E+08	7.71E+07	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07
628	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
629	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
630	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
631	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
632	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
633	2.52E+09	1.23E+09	7.97E+08	5.74E+08	4.54E+08	4.37E+08	1.97E+08	1.37E+08	8.57E+07	7.71E+07	3.11E+09	1.52E+09	9.77E+08	7.29E+08	5.49E+08
634	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
635	3.00E+08	1.37E+08	9.43E+07	6.86E+07	4.28E+07	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	3.77E+08	1.80E+08	1.11E+08	8.57E+07	6.00E+07
636	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
637	1.24E+11	5.74E+10	3.47E+10	2.41E+10	1.83E+10	4.07E+09	1.67E+09	1.15E+09	7.30E+08	3.13E+08	9.39E+10	4.42E+10	2.74E+10	1.87E+10	1.40E+10
638	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
639	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
640	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
641	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
642	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
643	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
644	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
645	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
646	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07
647	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
648	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
649	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
650	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
651	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
652	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
653	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
654	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07
655	4.63E+08	2.23E+08	1.37E+08	1.03E+08	7.71E+07	6.77E+08	3.26E+08	2.06E+08	1.54E+08	1.11E+08	2.48E+08	1.20E+08	6.85E+07	5.14E+07	4.28E+07
656	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
657	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
658	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
659	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	2.23E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
660	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
661	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
662	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
663	4.63E+08	2.23E+08	1.37E+08	1.03E+08	7.71E+07	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	7.97E+08	3.77E+08	2.49E+08	1.80E+08	1.37E+08
664	5.08E+09	2.47E+09	1.61E+09	1.17E+09	9.09E+08	7.80E+08	3.69E+08	2.49E+08	1.71E+08	1.29E+08	3.02E+09	1.25E+09	8.34E+08	5.22E+08	2.09E+08
665	2.37E+10	1.03E+10	6.15E+09	4.49E+09	3.02E+09	3.45E+09	1.69E+09	1.10E+09	8.06E+08	6.34E+08	3.76E+10	1.71E+10	1.07E+10	7.30E+09	5.22E+09
666	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
667	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
668	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
669	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
670	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
671	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
672	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
673	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07	1.97E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07
674	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
675	3.68E+08	1.71E+08	1.11E+08	7.71E+07	6.00E+07	1.46E+08	6.85E+07	4.28E+07	2.57E+07	1.71E+07	6.09E+08	2.91E+08	1.89E+08	1.29E+08	1.11E+08
676	2.66E+08	1.29E+08	7.71E+07	6.00E+07	4.28E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	3.34E+08	1.54E+08	9.43E+07	6.86E+07	5.14E+07
677	1.03E+08	4.28E+07	2.57E+07	1.71E+07	1.71E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07
678	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
679	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
680	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
681	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
682	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
683	2.31E+08	1.11E+08	6.85E+07	4.28E+07	3.43E+07	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07	4.03E+08	1.89E+08	1.20E+08	9.43E+07	6.86E+07
684	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
685	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
686	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
687	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
688	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
689	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
690	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
691	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
692	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
693	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
694	5.71E+10	2.70E+10	1.64E+10	1.13E+10	8.24E+09	1.49E+10	6.26E+09	4.49E+09	2.40E+09	1.88E+09	7.35E+10	3.49E+10	2.12E+10	1.49E+10	1.10E+10
695	2.92E+09	1.43E+09	9.26E+08	7.03E+08	5.23E+08	1.62E+09	7.89E+08	5.14E+08	3.77E+08	2.74E+08	5.42E+09	2.29E+09	1.15E+09	7.30E+08	5.22E+08
696	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
697	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
698	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
699	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.86E+08	1.89E+08	1.20E+08	9.43E+07	6.00E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
700	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.31E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
701	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	3.00E+08	1.37E+08	9.42E+07	6.85E+07	5.14E+07	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
702	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	2.83E+08	1.37E+08	8.57E+07	6.85E+07	4.28E+07	1.88E+08	8.57E+07	6.00E+07	3.43E+07	2.57E+07
703	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
704	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
705	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
706	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
707	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
708	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
709	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
710	1.28E+08	6.00E+07	4.28E+07	2.57E+07	2.57E+07	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	4.54E+08	2.23E+08	1.46E+08	1.03E+08	8.57E+07
711	4.46E+08	2.14E+08	1.37E+08	1.03E+08	7.71E+07	2.74E+08	1.29E+08	8.57E+07	6.00E+07	4.28E+07	1.29E+09	6.34E+08	3.94E+08	3.00E+08	2.23E+08
712	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
713	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
714	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
715	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
716	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
717	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
718	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
719	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
720	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
721	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
722	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
723	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	3.51E+08	1.63E+08	1.11E+08	6.85E+07	6.00E+07
724	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07
725	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
726	7.29E+08	3.51E+08	2.31E+08	1.63E+08	1.20E+08	4.63E+08	2.23E+08	1.46E+08	9.43E+07	8.57E+07	1.86E+09	9.00E+08	5.91E+08	4.20E+08	3.43E+08
727	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
728	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
729	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
730	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
731	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
732	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
733	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
734	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
735	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
736	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
737	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
738	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
739	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
740	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
741	1.71E+09	8.23E+08	5.40E+08	3.94E+08	3.00E+08	8.40E+08	4.03E+08	2.66E+08	1.97E+08	1.46E+08	2.82E+09	9.39E+08	6.26E+08	4.17E+08	2.09E+08
742	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
743	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
744	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
745	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
746	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
747	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
748	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
749	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
750	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
751	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
752	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
753	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
754	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
755	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
756	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
757	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
758	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
759	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
760	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
761	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
762	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
763	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
764	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
765	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
766	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
767	1.98E+09	8.34E+08	5.22E+08	2.09E+08	0.00E+00	2.19E+09	9.39E+08	6.26E+08	3.13E+08	1.04E+08	3.86E+09	1.98E+09	9.39E+08	7.30E+08	4.17E+08
768	2.29E+09	9.39E+08	6.26E+08	4.17E+08	1.04E+08	2.40E+09	1.17E+09	7.63E+08	5.40E+08	4.29E+08	6.26E+09	2.71E+09	1.88E+09	1.04E+09	7.30E+08
769	8.23E+08	3.86E+08	2.57E+08	1.80E+08	1.46E+08	1.09E+09	5.31E+08	3.34E+08	2.49E+08	1.89E+08	2.17E+09	1.05E+09	6.77E+08	4.97E+08	4.03E+08
770	1.78E+11	8.46E+10	5.35E+10	3.80E+10	2.85E+10	3.91E+10	1.77E+10	1.14E+10	7.72E+09	5.53E+09	1.84E+11	8.78E+10	5.63E+10	4.02E+10	3.03E+10
771	1.77E+09	8.66E+08	5.57E+08	4.11E+08	3.26E+08	1.27E+09	6.09E+08	3.94E+08	2.91E+08	2.23E+08	2.82E+09	9.39E+08	6.26E+08	4.17E+08	2.09E+08
772	1.64E+09	8.06E+08	5.14E+08	3.77E+08	2.83E+08	2.99E+09	1.47E+09	9.52E+08	7.12E+08	5.49E+08	2.29E+09	7.30E+08	5.22E+08	3.13E+08	1.04E+08
773	3.68E+08	1.71E+08	1.11E+08	8.57E+07	6.00E+07	1.47E+09	7.12E+08	4.54E+08	3.43E+08	2.66E+08	4.54E+08	2.23E+08	1.37E+08	1.03E+08	7.71E+07
774	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	9.69E+08	4.71E+08	2.91E+08	2.23E+08	1.71E+08	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
775	9.26E+08	4.46E+08	2.83E+08	2.06E+08	1.54E+08	8.55E+09	3.76E+09	2.61E+09	1.46E+09	1.15E+09	4.46E+08	2.14E+08	1.37E+08	9.43E+07	7.71E+07
776	1.69E+09	8.06E+08	5.31E+08	3.77E+08	3.17E+08	2.09E+09	8.34E+08	5.22E+08	3.13E+08	1.04E+08	2.12E+09	1.02E+09	6.77E+08	4.80E+08	3.94E+08
777	7.63E+08	3.77E+08	2.31E+08	1.80E+08	1.37E+08	2.92E+09	1.43E+09	9.26E+08	6.86E+08	5.14E+08	7.37E+08	3.51E+08	2.40E+08	1.71E+08	1.20E+08
778	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
779	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
780	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
781	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.05E+09	5.06E+08	3.34E+08	2.40E+08	1.89E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
782	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.63E+09	7.97E+08	5.14E+08	3.69E+08	2.83E+08	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
783	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	8.66E+08	4.20E+08	2.74E+08	1.89E+08	1.46E+08	2.23E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07
784	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
785	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	1.97E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07
786	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
787	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
788	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
789	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.17E+08	1.46E+08	9.43E+07	6.00E+07	5.14E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
790	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
791	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	4.28E+08	2.06E+08	1.29E+08	8.57E+07	7.71E+07	3.00E+08	1.46E+08	8.57E+07	6.00E+07	5.14E+07
792	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.17E+08	1.46E+08	9.43E+07	6.00E+07	5.14E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
793	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
794	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.89E+08	2.23E+08	1.54E+08	1.03E+08	7.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
795	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	2.14E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07
796	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
797	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	2.57E+08	1.20E+08	7.71E+07	6.00E+07	4.28E+07	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
798	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
799	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
800	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
801	9.28E+09	4.49E+09	2.61E+09	1.88E+09	1.15E+09	3.34E+09	1.04E+09	8.34E+08	5.22E+08	3.13E+08	1.88E+10	8.45E+09	5.42E+09	3.55E+09	2.82E+09
802	1.63E+09	7.97E+08	5.14E+08	3.77E+08	2.74E+08	8.66E+08	4.20E+08	2.74E+08	1.89E+08	1.46E+08	2.50E+09	8.34E+08	5.22E+08	3.13E+08	2.09E+08
803	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
804	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	2.83E+08	1.37E+08	8.57E+07	6.00E+07	5.14E+07	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
805	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07	8.91E+08	4.29E+08	2.74E+08	1.97E+08	1.46E+08	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
806	2.23E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	9.77E+08	4.71E+08	2.91E+08	2.23E+08	1.71E+08	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07
807	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
808	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
809	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
810	2.40E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	4.03E+08	1.97E+08	1.20E+08	8.57E+07	6.86E+07	4.46E+08	2.14E+08	1.37E+08	9.43E+07	7.71E+07
811	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
812	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
813	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	2.48E+08	1.20E+08	6.85E+07	6.00E+07	4.28E+07	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
814	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
815	4.03E+08	1.97E+08	1.20E+08	8.57E+07	6.86E+07	3.77E+08	1.80E+08	1.11E+08	8.57E+07	6.00E+07	8.66E+08	4.20E+08	2.74E+08	1.89E+08	1.54E+08
816	6.77E+08	3.26E+08	2.06E+08	1.46E+08	1.11E+08	4.63E+08	2.23E+08	1.46E+08	1.03E+08	7.71E+07	1.35E+09	6.43E+08	4.20E+08	3.00E+08	2.40E+08
817	3.86E+08	1.89E+08	1.20E+08	8.57E+07	6.00E+07	4.20E+08	1.97E+08	1.29E+08	8.57E+07	7.71E+07	8.14E+08	3.94E+08	2.49E+08	1.80E+08	1.46E+08
818	2.14E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	1.05E+09	5.14E+08	3.34E+08	2.40E+08	1.89E+08	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07
819	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	2.74E+08	1.29E+08	8.57E+07	6.00E+07	4.28E+07	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07
820	3.68E+08	1.71E+08	1.11E+08	8.57E+07	6.00E+07	1.79E+09	8.92E+08	5.57E+08	4.29E+08	3.17E+08	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07
821	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
822	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	3.08E+08	1.46E+08	9.43E+07	6.00E+07	5.14E+07	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
823	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
824	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
825	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
826	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
827	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
828	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
829	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
830	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
831	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
832	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07
833	3.34E+08	1.63E+08	1.03E+08	7.71E+07	5.14E+07	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	5.57E+08	2.66E+08	1.71E+08	1.20E+08	9.43E+07
834	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
835	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
836	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
837	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
838	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
839	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
840	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
841	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
842	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
843	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
844	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	3.43E+08	1.63E+08	1.03E+08	6.85E+07	6.00E+07
845	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
846	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
847	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.17E+08	3.00E+08	1.89E+08	1.37E+08	1.11E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
848	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
849	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.99E+09	9.69E+08	6.34E+08	4.54E+08	3.51E+08	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
850	4.37E+08	2.14E+08	1.37E+08	9.43E+07	6.86E+07	2.32E+09	1.12E+09	7.29E+08	5.32E+08	4.29E+08	5.74E+08	2.74E+08	1.80E+08	1.29E+08	9.43E+07

Table F-6 continued

	AB10					AS08					BA08				
Map	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
851	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
852	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
853	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
854	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	9.17E+08	4.46E+08	2.91E+08	2.06E+08	1.54E+08	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
855	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
856	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
857	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
858	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07	3.86E+08	1.80E+08	1.20E+08	8.57E+07	6.86E+07	3.60E+08	1.80E+08	1.11E+08	8.57E+07	6.00E+07
859	2.23E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	3.08E+08	1.46E+08	1.03E+08	6.85E+07	4.28E+07	7.54E+08	3.69E+08	2.40E+08	1.80E+08	1.29E+08
860	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E+08	1.80E+08	1.11E+08	8.57E+07	6.86E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
861	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
862	2.40E+08	1.11E+08	7.71E+07	5.14E+07	4.28E+07	1.93E+09	9.34E+08	6.09E+08	4.46E+08	3.43E+08	1.80E+08	8.57E+07	6.00E+07	3.43E+07	2.57E+07
863	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	3.08E+08	1.46E+08	9.42E+07	6.85E+07	5.14E+07
864	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
865	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
866	3.00E+08	1.46E+08	9.42E+07	6.85E+07	4.28E+07	5.06E+08	2.49E+08	1.54E+08	1.20E+08	8.57E+07	7.97E+08	3.86E+08	2.49E+08	1.89E+08	1.37E+08
867	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
868	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
869	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
870	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
871	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
872	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
873	1.88E+09	7.30E+08	5.22E+08	2.09E+08	0.00E+00	2.26E+09	1.11E+09	7.20E+08	5.32E+08	4.03E+08	8.34E+09	3.96E+09	2.29E+09	1.46E+09	9.39E+08
874	8.23E+08	3.94E+08	2.66E+08	1.89E+08	1.46E+08	9.09E+08	4.37E+08	2.74E+08	1.97E+08	1.54E+08	1.98E+09	6.26E+08	4.17E+08	3.13E+08	1.04E+08
875	1.21E+11	5.61E+10	3.57E+10	2.40E+10	1.76E+10	2.71E+10	1.25E+10	7.51E+09	4.90E+09	3.44E+09	1.82E+11	8.65E+10	5.47E+10	3.90E+10	2.95E+10
876	9.81E+09	4.07E+09	1.98E+09	1.46E+09	1.04E+09	3.96E+09	1.25E+09	8.34E+08	5.22E+08	2.09E+08	3.17E+10	1.44E+10	8.97E+09	6.15E+09	4.38E+09
877	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
878	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
879	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	1.97E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07
880	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
881	9.77E+08	4.63E+08	3.00E+08	2.23E+08	1.63E+08	8.40E+08	4.03E+08	2.66E+08	1.89E+08	1.54E+08	1.98E+09	6.26E+08	4.17E+08	2.09E+08	1.04E+08
882	3.77E+08	1.80E+08	1.11E+08	8.57E+07	6.86E+07	3.94E+08	1.80E+08	1.20E+08	8.57E+07	6.86E+07	1.15E+09	5.57E+08	3.60E+08	2.57E+08	2.06E+08
883	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
884	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
885	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
886	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
887	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
888	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E+08	1.37E+08	7.71E+07	6.00E+07	4.28E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
889	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
890	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
891	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
892	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
893	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	3.94E+08	1.80E+08	1.20E+08	8.57E+07	6.86E+07	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07
894	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
895	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	2.14E+08	1.03E+08	6.00E+07	5.14E+07	4.28E+07	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07
896	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
897	5.57E+08	2.66E+08	1.71E+08	1.20E+08	9.43E+07	3.94E+08	1.80E+08	1.20E+08	8.57E+07	6.86E+07	1.11E+09	5.31E+08	3.51E+08	2.49E+08	1.97E+08
898	2.34E+09	1.14E+09	7.37E+08	5.40E+08	4.20E+08	7.54E+08	3.60E+08	2.31E+08	1.63E+08	1.29E+08	4.49E+09	1.88E+09	9.39E+08	6.26E+08	4.17E+08
899	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
900	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
901	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
902	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
903	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
904	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
905	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	3.43E+08	1.63E+08	1.03E+08	6.85E+07	6.00E+07
906	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
907	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
908	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
909	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
910	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
911	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
912	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
913	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
914	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
915	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
916	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
917	3.02E+09	1.25E+09	6.26E+08	4.17E+08	3.13E+08	1.56E+09	5.22E+08	3.13E+08	2.09E+08	1.04E+08	1.25E+10	5.63E+09	3.65E+09	2.29E+09	1.77E+09
918	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
919	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.17E+08	1.54E+08	9.42E+07	6.85E+07	5.14E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
920	3.60E+08	1.71E+08	1.11E+08	7.71E+07	6.00E+07	1.93E+09	9.43E+08	6.17E+08	4.46E+08	3.60E+08	6.26E+08	3.09E+08	1.97E+08	1.46E+08	1.11E+08
921	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E+08	1.29E+08	8.57E+07	6.00E+07	5.14E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
922	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	8.74E+08	4.29E+08	2.83E+08	2.06E+08	1.46E+08	1.54E+08	6.85E+07	4.28E+07	3.43E+07	2.57E+07
923	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	7.63E+08	3.60E+08	2.49E+08	1.63E+08	1.37E+08	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
924	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07
925	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
926	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
927	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
928	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
929	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
930	2.48E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	3.86E+08	1.89E+08	1.29E+08	8.57E+07	6.85E+07	9.39E+08	3.13E+08	2.09E+08	1.04E+08	0.00E+00
931	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
932	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.46E+08	2.14E+08	1.37E+08	1.03E+08	8.57E+07	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
933	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
934	2.57E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	4.20E+08	2.06E+08	1.29E+08	9.43E+07	6.85E+07	9.39E+08	3.13E+08	2.09E+08	1.04E+08	0.00E+00
935	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	2.91E+08	1.37E+08	8.57E+07	6.85E+07	5.14E+07	2.91E+08	1.37E+08	8.57E+07	6.85E+07	5.14E+07
936	7.20E+08	3.60E+08	2.23E+08	1.63E+08	1.20E+08	7.80E+08	3.77E+08	2.49E+08	1.71E+08	1.46E+08	2.61E+09	1.15E+09	5.22E+08	4.17E+08	2.09E+08
937	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	1.88E+08	8.57E+07	6.00E+07	3.43E+07	2.57E+07
938	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
939	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
940	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
941	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
942	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
943	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
944	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
945	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	4.80E+08	2.31E+08	1.46E+08	1.11E+08	8.57E+07	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07
946	3.60E+08	1.71E+08	1.11E+08	7.71E+07	6.00E+07	4.71E+08	2.31E+08	1.46E+08	1.11E+08	8.57E+07	7.30E+08	2.09E+08	1.04E+08	1.04E+08	0.00E+00
947	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
948	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
949	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E+08	6.85E+07	4.28E+07	3.43E+07	2.57E+07
950	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
951	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
952	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
953	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
954	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
955	7.30E+08	3.13E+08	2.09E+08	1.04E+08	0.00E+00	8.31E+08	4.03E+08	2.66E+08	1.89E+08	1.46E+08	3.02E+09	1.36E+09	9.39E+08	5.22E+08	4.17E+08
956	5.49E+10	2.61E+10	1.59E+10	1.12E+10	8.24E+09	9.81E+09	4.69E+09	2.82E+09	1.88E+09	1.15E+09	8.48E+10	4.06E+10	2.55E+10	1.83E+10	1.37E+10
957	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
958	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	5.06E+08	2.40E+08	1.54E+08	1.20E+08	9.43E+07
959	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
960	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
961	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
962	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	2.83E+08	1.37E+08	8.57E+07	6.85E+07	5.14E+07
963	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
964	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
965	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
966	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
967	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
968	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
969	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
970	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
971	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
972	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
973	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
974	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
975	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
976	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
977	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
978	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
979	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
980	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
981	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07
982	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
983	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
984	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
985	2.57E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	1.63E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07	9.39E+08	3.13E+08	2.09E+08	1.04E+08	0.00E+00
986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
987	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	1.71E+08	8.57E+07	5.14E+07	3.43E+07	2.57E+07
988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
989	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07
990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
992	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
993	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
994	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
995	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
996	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
997	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
998	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
999	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1001	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1003	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1004	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1005	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07	3.08E+08	1.46E+08	9.42E+07	6.85E+07	5.14E+07
1006	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1007	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1009	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	8.23E+08	4.03E+08	2.49E+08	1.89E+08	1.46E+08	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1010	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1011	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
1012	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1013	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	4.03E+08	1.89E+08	1.20E+08	9.43E+07	6.86E+07	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
1014	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E+08	1.71E+08	1.11E+08	7.71E+07	6.00E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1015	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	2.48E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07
1016	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1018	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1019	1.89E+10	8.34E+09	5.11E+09	3.23E+09	2.40E+09	5.01E+09	2.50E+09	1.15E+09	9.39E+08	7.30E+08	4.01E+10	1.86E+10	1.16E+10	7.93E+09	5.95E+09
1020	4.37E+08	2.14E+08	1.37E+08	9.43E+07	7.71E+07	3.51E+08	1.71E+08	1.03E+08	7.71E+07	6.00E+07	1.65E+09	8.06E+08	5.14E+08	3.86E+08	3.00E+08
1021	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
1022	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1024	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1025	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	8.49E+08	4.11E+08	2.66E+08	1.89E+08	1.46E+08	2.40E+08	1.11E+08	7.71E+07	5.14E+07	4.28E+07
1026	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1027	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1028	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1029	1.05E+09	5.06E+08	3.26E+08	2.40E+08	1.89E+08	6.51E+08	3.09E+08	2.06E+08	1.37E+08	1.20E+08	1.98E+09	6.26E+08	4.17E+08	3.13E+08	1.04E+08
1030	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1031	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1032	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1033	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1034	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1035	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1036	1.15E+09	5.49E+08	3.69E+08	2.57E+08	1.97E+08	5.66E+08	2.66E+08	1.80E+08	1.29E+08	8.57E+07	2.19E+09	7.30E+08	5.22E+08	3.13E+08	2.09E+08
1037	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1038	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1039	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07	1.25E+09	6.00E+08	3.86E+08	2.83E+08	2.14E+08	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07
1040	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07
1041	1.25E+09	6.09E+08	3.86E+08	2.83E+08	2.31E+08	1.22E+09	6.00E+08	3.77E+08	2.83E+08	2.06E+08	1.98E+09	6.26E+08	4.17E+08	3.13E+08	1.04E+08
1042	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07
1043	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	1.71E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	5.74E+08	2.74E+08	1.80E+08	1.29E+08	8.57E+07
1044	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1045	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1046	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1047	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1048	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1049	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1050	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1051	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1052	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1053	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1054	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1055	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1056	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1057	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1058	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1059	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1060	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	3.17E+08	1.54E+08	1.03E+08	6.85E+07	5.14E+07
1061	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	3.77E+08	1.80E+08	1.20E+08	8.57E+07	6.00E+07
1062	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1063	7.54E+08	3.69E+08	2.31E+08	1.80E+08	1.20E+08	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.42E+09	6.94E+08	4.37E+08	3.34E+08	2.57E+08
1064	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1065	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1066	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1067	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1068	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1069	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1070	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1071	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1072	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
1073	1.77E+09	6.26E+08	3.13E+08	2.09E+08	0.00E+00	1.93E+09	9.34E+08	5.91E+08	4.46E+08	3.43E+08	4.49E+09	1.98E+09	9.39E+08	7.30E+08	4.17E+08
1074	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	2.23E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	1.80E+08	8.57E+07	6.00E+07	3.43E+07	3.43E+07
1075	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	2.91E+08	1.46E+08	8.57E+07	6.00E+07	5.14E+07	1.71E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07
1076	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1077	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1078	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.11E+08	1.97E+08	1.29E+08	8.57E+07	7.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1079	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	2.31E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	3.00E+08	1.37E+08	9.43E+07	6.00E+07	5.14E+07
1080	2.23E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	6.69E+08	3.26E+08	2.06E+08	1.46E+08	1.11E+08
1081	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1082	9.00E+08	4.37E+08	2.74E+08	1.97E+08	1.46E+08	6.09E+08	3.00E+08	1.89E+08	1.37E+08	1.11E+08	2.66E+09	1.30E+09	8.49E+08	6.17E+08	4.89E+08
1083	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1084	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	2.14E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	4.54E+08	2.23E+08	1.37E+08	1.03E+08	7.71E+07
1085	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1086	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1087	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1088	5.14E+08	2.49E+08	1.71E+08	1.11E+08	8.57E+07	5.31E+08	2.49E+08	1.63E+08	1.11E+08	8.57E+07	9.77E+08	4.63E+08	3.09E+08	2.14E+08	1.63E+08
1089	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1090	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
1091	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1092	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
1093	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1094	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1095	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1096	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1097	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1098	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
1099	5.14E+08	2.49E+08	1.63E+08	1.11E+08	8.57E+07	3.00E+08	1.46E+08	8.57E+07	6.00E+07	5.14E+07	1.40E+09	6.77E+08	4.46E+08	3.09E+08	2.57E+08
1100	3.08E+08	1.46E+08	8.57E+07	6.00E+07	5.14E+07	7.20E+08	3.43E+08	2.23E+08	1.63E+08	1.20E+08	3.77E+08	1.89E+08	1.11E+08	8.57E+07	6.00E+07

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1101	1.77E+09	6.26E+08	3.13E+08	2.09E+08	1.04E+08	1.18E+09	5.66E+08	3.69E+08	2.66E+08	2.14E+08	4.07E+09	1.77E+09	8.34E+08	6.26E+08	4.17E+08
1102	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1103	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1104	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1105	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1106	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1107	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1108	2.50E+09	8.34E+08	5.22E+08	3.13E+08	1.04E+08	1.85E+09	9.00E+08	5.83E+08	4.20E+08	3.26E+08	5.53E+09	2.40E+09	1.15E+09	8.34E+08	5.22E+08
1109	2.06E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	5.91E+08	2.83E+08	1.80E+08	1.37E+08	1.11E+08
1110	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1111	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1112	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1113	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1114	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
1115	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1116	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1117	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1118	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1119	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	4.28E+07	2.57E+07	1.71E+07	1.71E+07
1120	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1121	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1122	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1123	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
1124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1126	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1127	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1128	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	2.48E+08	1.20E+08	6.85E+07	6.00E+07	4.28E+07	4.03E+08	1.97E+08	1.20E+08	8.57E+07	6.00E+07
1129	2.50E+09	1.04E+09	6.26E+08	3.13E+08	1.04E+08	2.38E+09	1.17E+09	7.54E+08	5.40E+08	4.29E+08	8.03E+09	3.44E+09	2.29E+09	1.25E+09	9.39E+08
1130	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1131	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	2.40E+08	1.11E+08	6.85E+07	5.14E+07	4.28E+07	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07
1132	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	3.43E+08	1.63E+08	1.03E+08	7.71E+07	5.14E+07
1133	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1135	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1136	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
1138	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1139	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1140	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1141	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1142	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1143	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1144	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1145	2.14E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07	6.60E+08	3.17E+08	2.06E+08	1.46E+08	1.11E+08
1146	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1147	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1148	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1149	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1150	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1151	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07	4.54E+08	2.23E+08	1.37E+08	1.03E+08	7.71E+07
1152	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1153	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1154	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1155	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1156	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1157	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1158	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1159	7.46E+08	3.60E+08	2.23E+08	1.63E+08	1.37E+08	3.17E+08	1.46E+08	9.43E+07	6.00E+07	5.14E+07	2.31E+09	1.13E+09	7.12E+08	5.32E+08	4.20E+08
1160	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1161	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1162	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1163	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	1.37E+08	6.85E+07	3.43E+07	2.57E+07	1.71E+07
1164	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1165	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1166	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1167	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1168	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1169	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+08	8.57E+07	5.14E+07	4.28E+07	3.43E+07
1170	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1171	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1172	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1173	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1174	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1175	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1176	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1177	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1178	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1179	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1180	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1181	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1182	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
1183	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1184	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1185	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1186	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1187	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1188	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1189	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1190	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1191	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1192	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1193	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1194	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
1195	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1196	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1197	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1198	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1199	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1200	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1201	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1202	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1203	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1204	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1205	3.86E+08	1.89E+08	1.11E+08	8.57E+07	6.86E+07	2.40E+08	1.11E+08	7.71E+07	5.14E+07	4.28E+07	1.25E+09	4.17E+08	2.09E+08	1.04E+08	0.00E+00
1206	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1207	4.80E+09	2.09E+09	1.04E+09	7.30E+08	5.22E+08	1.98E+09	6.26E+08	4.17E+08	2.09E+08	1.04E+08	1.87E+10	8.87E+09	5.22E+09	3.76E+09	2.71E+09
1208	6.77E+08	3.34E+08	2.06E+08	1.54E+08	1.11E+08	3.77E+08	1.80E+08	1.11E+08	8.57E+07	6.86E+07	2.29E+09	7.30E+08	5.22E+08	3.13E+08	2.09E+08
1209	2.14E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	2.14E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	1.05E+09	5.06E+08	3.34E+08	2.40E+08	1.89E+08
1210	2.40E+09	8.34E+08	5.22E+08	3.13E+08	2.09E+08	1.89E+09	9.26E+08	5.91E+08	4.37E+08	3.43E+08	1.18E+10	5.53E+09	3.44E+09	2.19E+09	1.56E+09
1211	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1212	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1213	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1214	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1215	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1216	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1217	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1218	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1219	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1220	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1221	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1222	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1223	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1224	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1225	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1226	3.26E+08	1.54E+08	1.03E+08	6.85E+07	5.14E+07	2.74E+08	1.29E+08	8.57E+07	6.00E+07	4.28E+07	1.19E+09	5.83E+08	3.69E+08	2.74E+08	2.23E+08
1227	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1228	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1229	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1230	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1231	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1232	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1233	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1234	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1235	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	2.74E+08	1.29E+08	8.57E+07	6.00E+07	4.28E+07
1236	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1237	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1238	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	2.31E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07
1239	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1240	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1241	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	7.03E+08	3.34E+08	2.23E+08	1.46E+08	1.20E+08	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07
1242	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1243	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1244	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	3.94E+08	1.89E+08	1.20E+08	8.57E+07	6.86E+07
1245	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
1246	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1247	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1248	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1249	1.54E+08	6.85E+07	5.14E+07	2.57E+07	2.57E+07	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	9.60E+08	4.54E+08	3.00E+08	2.14E+08	1.63E+08
1250	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	5.66E+08	2.66E+08	1.71E+08	1.20E+08	9.43E+07

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1251	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	1.03E+08	4.28E+07	2.57E+07	1.71E+07	1.71E+07
1252	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1253	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1254	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1255	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1256	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	2.74E+08	1.29E+08	8.57E+07	6.00E+07	4.28E+07
1257	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	5.83E+08	2.83E+08	1.71E+08	1.37E+08	1.03E+08
1258	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1259	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1260	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1261	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1262	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1263	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1264	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1265	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1266	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1267	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.42E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07
1268	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1269	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1270	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1271	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1272	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1273	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1274	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1275	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1276	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
1277	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1278	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.89E+08	2.31E+08	1.54E+08	1.11E+08	7.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1279	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1280	2.57E+08	1.20E+08	7.71E+07	5.14E+07	3.43E+07	1.35E+09	6.51E+08	4.20E+08	3.00E+08	2.40E+08	3.94E+08	1.80E+08	1.20E+08	7.71E+07	6.00E+07
1281	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.66E+08	2.74E+08	1.71E+08	1.20E+08	9.43E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1282	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	6.86E+08	3.34E+08	2.06E+08	1.54E+08	1.11E+08	1.54E+08	7.71E+07	4.28E+07	3.43E+07	1.71E+07
1283	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1284	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1285	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1286	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1287	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E+08	1.80E+08	1.11E+08	7.71E+07	6.00E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1288	3.76E+09	1.83E+09	1.20E+09	8.74E+08	6.77E+08	2.02E+09	9.69E+08	6.52E+08	4.46E+08	3.60E+08	8.55E+09	3.65E+09	1.77E+09	1.25E+09	8.34E+08
1289	5.40E+08	2.49E+08	1.63E+08	1.11E+08	9.43E+07	4.20E+08	1.97E+08	1.20E+08	8.57E+07	6.00E+07	2.25E+09	1.09E+09	7.20E+08	5.14E+08	3.86E+08
1290	1.54E+08	6.85E+07	4.28E+07	3.43E+07	2.57E+07	2.66E+08	1.20E+08	8.57E+07	5.14E+07	3.43E+07	7.20E+08	3.51E+08	2.14E+08	1.54E+08	1.20E+08
1291	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1292	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1293	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.37E+08	6.00E+07	4.28E+07	2.57E+07	1.71E+07	1.97E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07
1294	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1295	1.87E+10	8.87E+09	5.22E+09	3.55E+09	2.09E+09	7.09E+09	2.29E+09	1.67E+09	1.15E+09	7.30E+08	5.64E+10	2.57E+10	1.64E+10	1.12E+10	7.93E+09
1296	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1297	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E+08	7.71E+07	4.28E+07	3.43E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1298	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+08	6.00E+07	4.28E+07	2.57E+07	1.71E+07	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06
1299	1.03E+08	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	4.97E+08	2.40E+08	1.46E+08	1.11E+08	9.43E+07
1300	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1301	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
1302	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1303	7.29E+08	3.51E+08	2.23E+08	1.63E+08	1.29E+08	8.23E+08	3.94E+08	2.57E+08	1.89E+08	1.37E+08	1.87E+09	9.00E+08	5.83E+08	4.29E+08	3.34E+08
1304	1.17E+09	5.66E+08	3.60E+08	2.66E+08	1.97E+08	1.11E+09	5.31E+08	3.43E+08	2.57E+08	1.97E+08	4.18E+09	2.05E+09	1.33E+09	9.60E+08	7.63E+08
1305	1.49E+09	7.20E+08	4.54E+08	3.34E+08	2.66E+08	9.77E+08	4.80E+08	3.00E+08	2.06E+08	1.63E+08	5.22E+09	2.53E+09	1.67E+09	1.20E+09	9.52E+08
1306	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	2.66E+08	1.20E+08	8.57E+07	5.14E+07	3.43E+07	1.11E+08	5.14E+07	2.57E+07	1.71E+07	1.71E+07
1307	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1308	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
1309	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1310	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1311	9.51E+08	4.46E+08	2.91E+08	2.06E+08	1.63E+08	6.43E+08	3.00E+08	1.97E+08	1.37E+08	1.11E+08	3.15E+09	1.54E+09	1.00E+09	7.46E+08	5.66E+08
1312	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1313	1.11E+08	5.14E+07	2.57E+07	1.71E+07	1.71E+07	1.71E+08	7.71E+07	5.14E+07	3.43E+07	3.43E+07	4.03E+08	1.89E+08	1.20E+08	9.43E+07	6.00E+07
1314	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1315	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1316	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	1.63E+08	6.85E+07	4.28E+07	3.43E+07	2.57E+07
1317	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1318	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1319	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1320	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	5.23E+08	2.57E+08	1.54E+08	1.20E+08	8.57E+07	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
1321	4.17E+09	1.36E+09	8.34E+08	5.22E+08	1.04E+08	3.13E+09	1.53E+09	9.86E+08	7.29E+08	5.66E+08	1.26E+10	5.42E+09	3.65E+09	1.98E+09	1.36E+09
1322	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1323	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	5.14E+07	2.57E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1324	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00
1325	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1326	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1327	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1328	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1329	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1330	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1331	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1332	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1333	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1334	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1335	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1336	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
1337	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1338	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1339	2.40E+08	1.11E+08	6.86E+07	5.14E+07	3.43E+07	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	7.11E+08	3.51E+08	2.06E+08	1.54E+08	1.20E+08
1340	1.08E+09	5.14E+08	3.34E+08	2.40E+08	1.89E+08	1.80E+08	7.71E+07	5.14E+07	3.43E+07	3.43E+07	2.91E+09	1.41E+09	9.17E+08	6.69E+08	5.23E+08
1341	2.85E+10	1.25E+10	7.41E+09	5.42E+09	3.44E+09	4.68E+09	2.28E+09	1.50E+09	1.10E+09	8.57E+08	3.49E+10	1.65E+10	1.01E+10	6.78E+09	4.80E+09
1342	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1343	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1344	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1345	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1346	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1347	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1348	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1349	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
1350	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1351	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1352	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.88E+08	2.31E+08	1.46E+08	1.11E+08	7.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1353	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1354	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	8.31E+08	3.86E+08	2.49E+08	1.80E+08	1.54E+08	1.54E+08	7.71E+07	4.28E+07	3.43E+07	2.57E+07
1355	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.34E+08	1.54E+08	1.03E+08	6.85E+07	6.00E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1356	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1357	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1358	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1359	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1360	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1361	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1362	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1363	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
1364	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.77E+08	1.80E+08	1.11E+08	8.57E+07	6.00E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1365	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1366	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
1367	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1368	2.14E+08	1.03E+08	6.00E+07	5.14E+07	4.28E+07	9.51E+08	4.63E+08	2.91E+08	2.23E+08	1.63E+08	3.34E+08	1.54E+08	1.03E+08	6.85E+07	6.00E+07
1369	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1370	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1371	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1372	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1373	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1374	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1375	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1376	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1377	1.67E+09	5.22E+08	3.13E+08	2.09E+08	0.00E+00	1.26E+09	6.17E+08	3.94E+08	2.91E+08	2.14E+08	4.49E+09	1.88E+09	9.39E+08	6.26E+08	4.17E+08
1378	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1379	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07
1380	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1381	1.58E+09	7.72E+08	4.97E+08	3.69E+08	2.66E+08	9.26E+08	4.46E+08	2.91E+08	2.06E+08	1.54E+08	2.82E+09	9.39E+08	6.26E+08	4.17E+08	1.04E+08
1382	3.43E+08	1.71E+08	1.11E+08	8.57E+07	5.14E+07	2.40E+08	1.11E+08	7.71E+07	5.14E+07	4.28E+07	1.17E+09	5.57E+08	3.60E+08	2.57E+08	1.97E+08
1383	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1384	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1385	3.34E+08	1.54E+08	1.03E+08	6.85E+07	6.00E+07	4.03E+08	1.89E+08	1.20E+08	8.57E+07	6.86E+07	8.31E+08	4.11E+08	2.57E+08	1.89E+08	1.54E+08
1386	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1387	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06
1388	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	1.97E+08	9.42E+07	6.00E+07	4.28E+07	2.57E+07
1389	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1390	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1391	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
1392	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07
1393	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1394	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1395	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1396	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1397	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1398	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1399	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1400	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

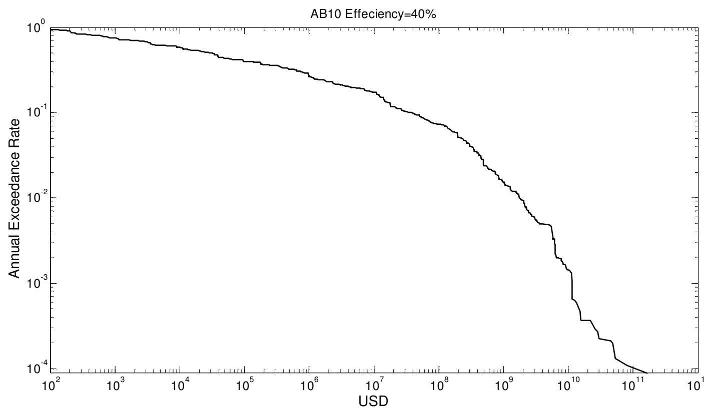
Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1401	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1402	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1403	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1404	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1405	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1406	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1407	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1408	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1409	5.14E+07	2.57E+07	1.71E+07	8.56E+06	8.56E+06	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	2.06E+08	9.42E+07	6.00E+07	4.28E+07	3.43E+07
1410	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1411	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1412	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1413	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1414	2.57E+07	8.56E+06	8.56E+06	0.00E+00	0.00E+00	4.28E+08	2.06E+08	1.37E+08	9.43E+07	7.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1415	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
1416	1.11E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	3.08E+08	1.54E+08	9.42E+07	6.85E+07	5.14E+07
1417	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1418	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1419	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1420	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1421	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1422	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1423	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1424	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1425	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1426	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	2.57E+08	1.20E+08	7.71E+07	6.00E+07	4.28E+07
1427	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1428	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1429	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E+08	1.80E+08	1.11E+08	8.57E+07	6.00E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1430	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E+08	1.29E+08	7.71E+07	6.00E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1431	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1432	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1433	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E+08	1.54E+08	9.42E+07	6.85E+07	5.14E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1434	1.28E+08	6.00E+07	3.43E+07	2.57E+07	1.71E+07	5.23E+08	2.49E+08	1.71E+08	1.11E+08	8.57E+07	3.51E+08	1.71E+08	1.11E+08	8.57E+07	6.00E+07
1435	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1436	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1437	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1438	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.38E+09	6.77E+08	4.29E+08	3.17E+08	2.40E+08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1439	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1440	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07	7.63E+08	3.69E+08	2.40E+08	1.71E+08	1.29E+08	8.56E+07	4.28E+07	2.57E+07	1.71E+07	1.71E+07
1441	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1442	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1443	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1444	5.26E+11	2.53E+11	1.63E+11	1.18E+11	9.12E+10	4.36E+10	1.99E+10	1.25E+10	8.66E+09	6.15E+09	5.01E+11	2.42E+11	1.56E+11	1.14E+11	8.80E+10
1445	2.14E+08	1.03E+08	6.85E+07	4.28E+07	3.43E+07	3.34E+08	1.54E+08	1.03E+08	6.85E+07	6.00E+07	6.17E+08	3.09E+08	1.89E+08	1.46E+08	1.11E+08
1446	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1447	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E+08	1.03E+08	6.00E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1448	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1449	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E+08	7.71E+07	5.14E+07	3.43E+07	2.57E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1450	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

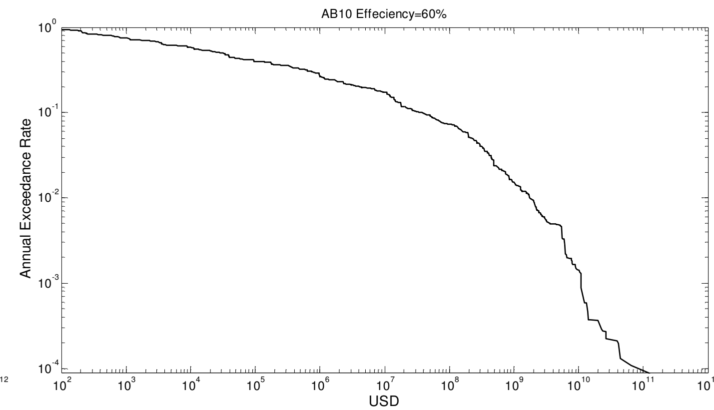
Table F-6 continued

Map	AB10					AS08					BA08				
	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%	20%	40%	60%	80%	100%
1451	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1452	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1453	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E+08	1.37E+08	8.57E+07	6.00E+07	4.28E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1454	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1455	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1456	1.80E+08	8.57E+07	5.14E+07	4.28E+07	2.57E+07	2.74E+08	1.29E+08	7.71E+07	6.00E+07	4.28E+07	5.31E+08	2.57E+08	1.63E+08	1.20E+08	8.57E+07
1457	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	4.28E+07	2.57E+07	1.71E+07	1.71E+07
1458	4.17E+09	2.09E+09	9.39E+08	7.30E+08	5.22E+08	1.77E+09	7.30E+08	5.22E+08	3.13E+08	1.04E+08	1.35E+10	5.95E+09	3.55E+09	2.61E+09	1.77E+09
1459	4.11E+08	1.97E+08	1.20E+08	9.43E+07	6.86E+07	4.63E+08	2.14E+08	1.46E+08	9.43E+07	7.71E+07	1.35E+09	6.60E+08	4.20E+08	3.00E+08	2.31E+08
1460	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1461	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1462	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1463	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1464	7.29E+08	3.51E+08	2.14E+08	1.63E+08	1.20E+08	1.67E+09	6.26E+08	4.17E+08	2.09E+08	0.00E+00	8.06E+08	3.94E+08	2.49E+08	1.89E+08	1.54E+08
1465	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	4.28E+07	1.71E+07	8.56E+06	8.56E+06	8.56E+06	1.46E+08	6.85E+07	4.28E+07	2.57E+07	2.57E+07
1466	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E+08	1.03E+08	6.00E+07	5.14E+07	4.28E+07	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00
1467	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1468	2.57E+08	1.20E+08	7.71E+07	5.14E+07	4.28E+07	3.94E+08	1.80E+08	1.20E+08	8.57E+07	6.86E+07	5.57E+08	2.66E+08	1.71E+08	1.20E+08	9.43E+07
1469	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1470	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1471	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1472	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1473	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1474	9.26E+08	4.46E+08	2.91E+08	2.06E+08	1.54E+08	7.11E+08	3.34E+08	2.14E+08	1.46E+08	1.20E+08	2.72E+09	1.31E+09	8.66E+08	6.34E+08	4.97E+08
1475	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07
1476	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	5.23E+08	2.49E+08	1.71E+08	1.11E+08	8.57E+07	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1477	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00
1478	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1479	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1480	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1481	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1482	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1483	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	2.83E+08	1.37E+08	7.71E+07	6.00E+07	4.28E+07	6.85E+07	3.43E+07	1.71E+07	1.71E+07	8.56E+06
1484	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1485	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	3.43E+07	1.71E+07	8.56E+06	8.56E+06	0.00E+00	1.03E+08	4.28E+07	2.57E+07	1.71E+07	1.71E+07
1486	1.71E+07	8.56E+06	0.00E+00	0.00E+00	0.00E+00	8.56E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.71E+07	3.43E+07	2.57E+07	1.71E+07	8.56E+06
1487	2.40E+09	7.30E+08	5.22E+08	3.13E+08	1.04E+08	8.14E+08	3.94E+08	2.49E+08	1.89E+08	1.54E+08	4.69E+09	1.98E+09	9.39E+08	6.26E+08	4.17E+08
1488	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1489	3.86E+08	1.80E+08	1.20E+08	8.57E+07	6.00E+07	1.20E+08	5.14E+07	3.43E+07	2.57E+07	1.71E+07	7.37E+08	3.51E+08	2.23E+08	1.63E+08	1.29E+08
1490	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1491	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1492	1.77E+09	7.30E+08	4.17E+08	2.09E+08	1.04E+08	2.06E+09	9.94E+08	6.43E+08	4.63E+08	3.69E+08	3.96E+09	1.25E+09	9.39E+08	6.26E+08	4.17E+08
1493	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1494	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1495	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1496	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1497	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1498	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1499	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1500	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

F.4 Total Loss



(a)



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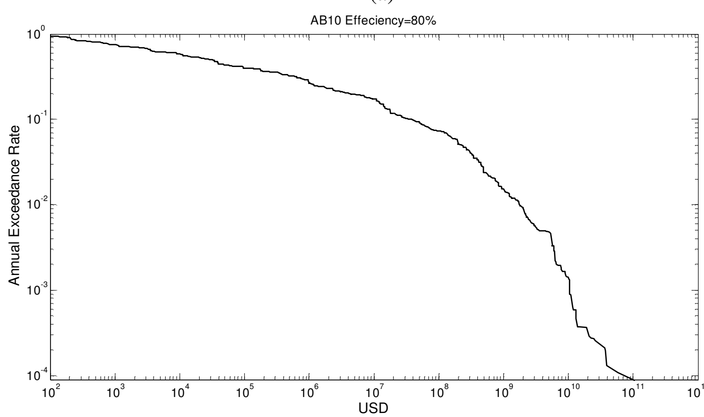
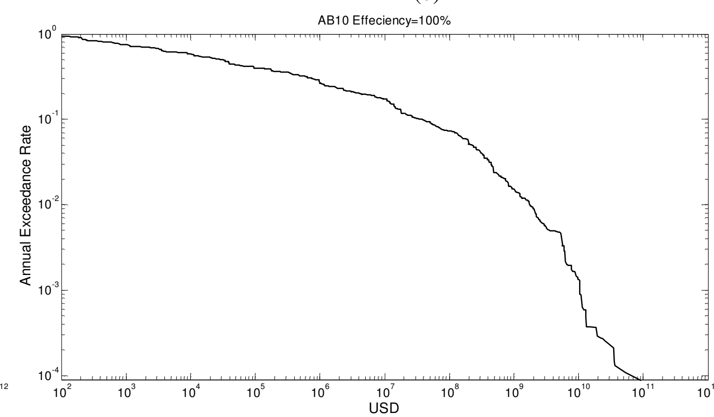


(c)



(d)

Figure F.2 Exceedance curves for total loss according to ground-motion model and recovery efficiency

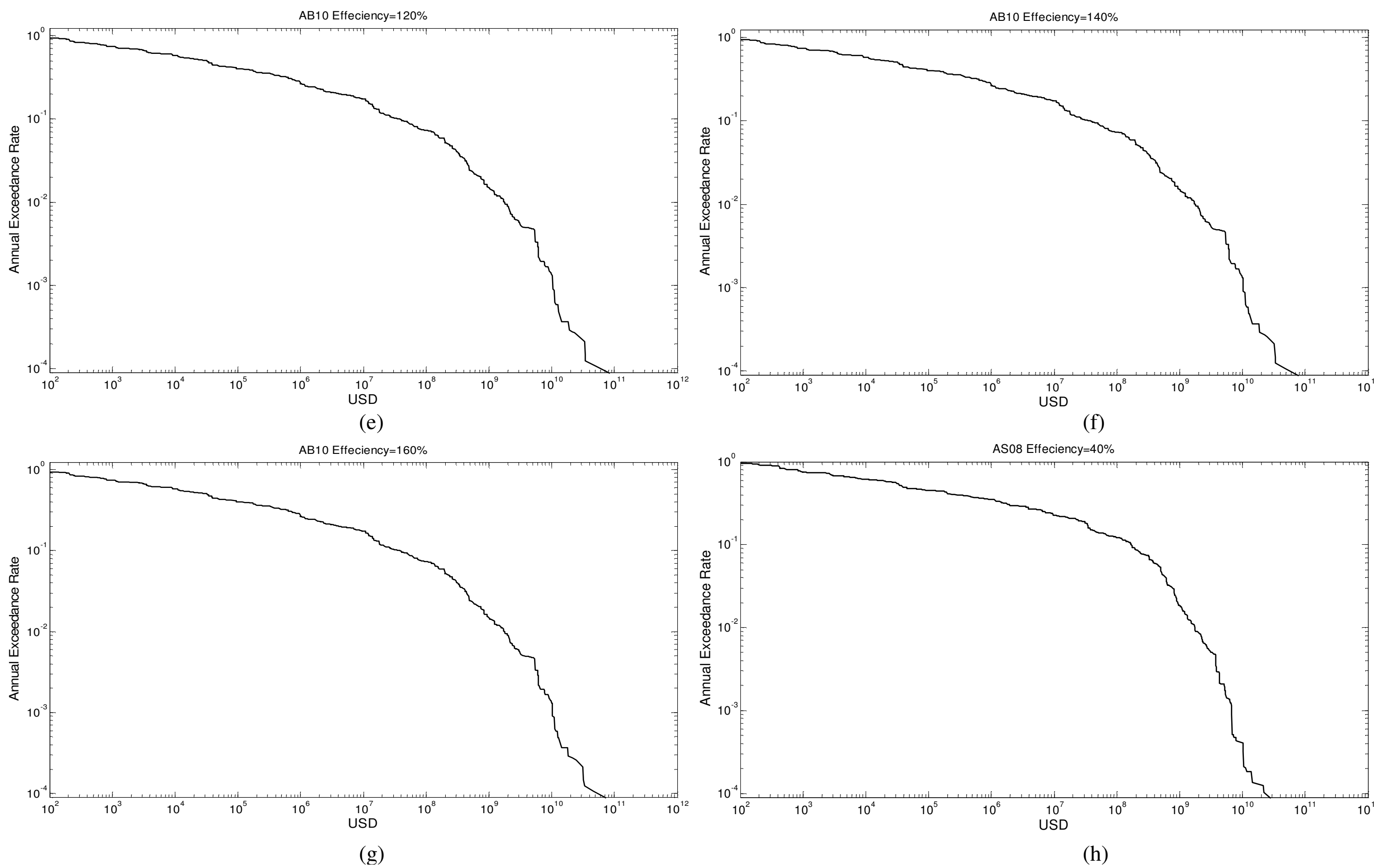
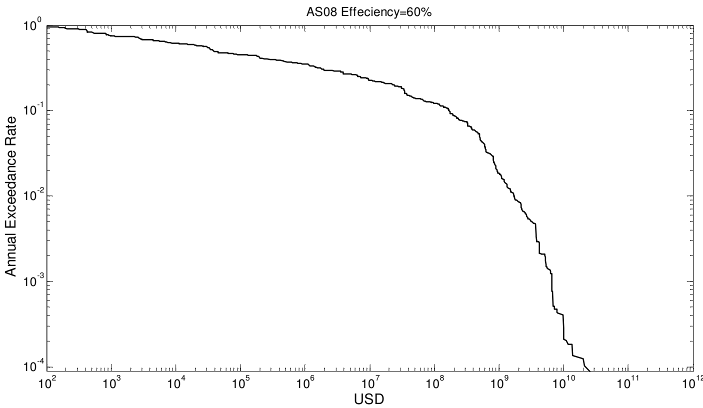
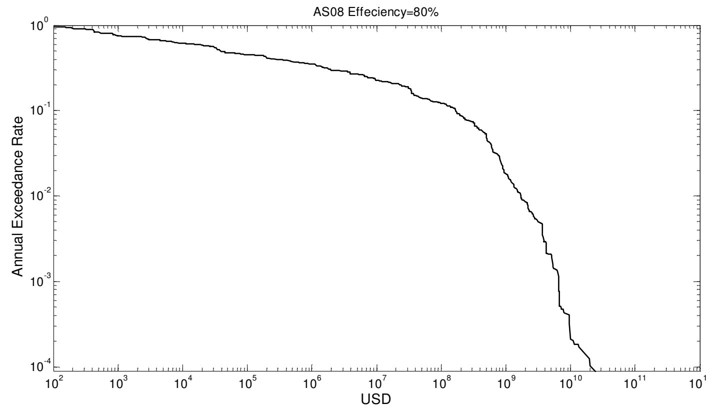


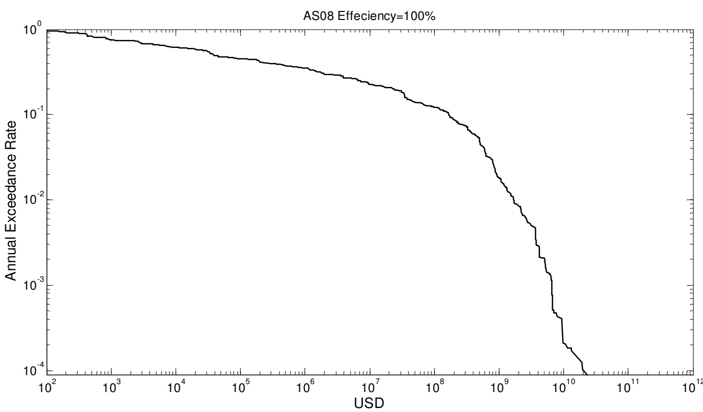
Figure F.2 continued



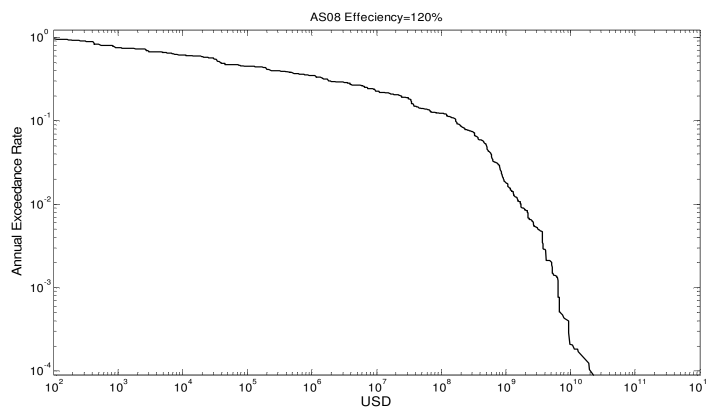
(i)



(j)

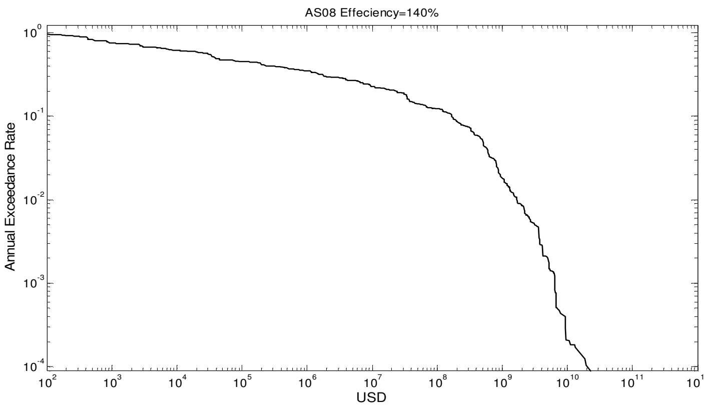


(k)

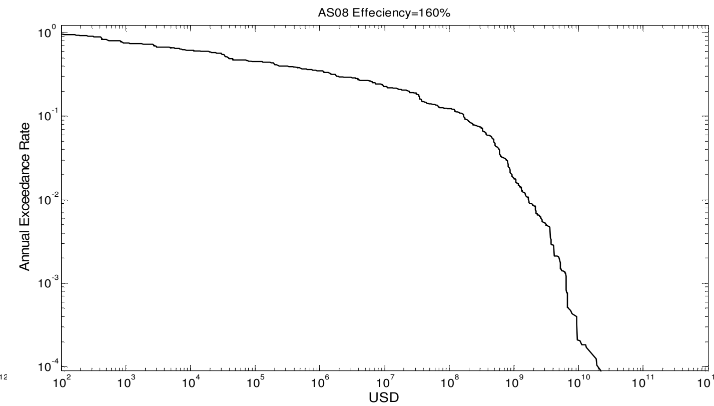


(l)

Figure F.2 continued



(m)



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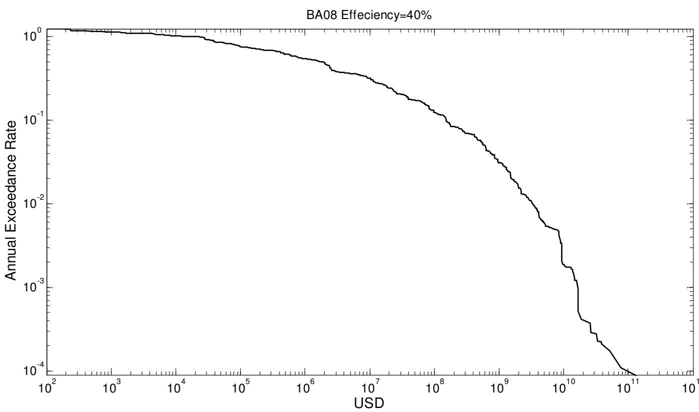
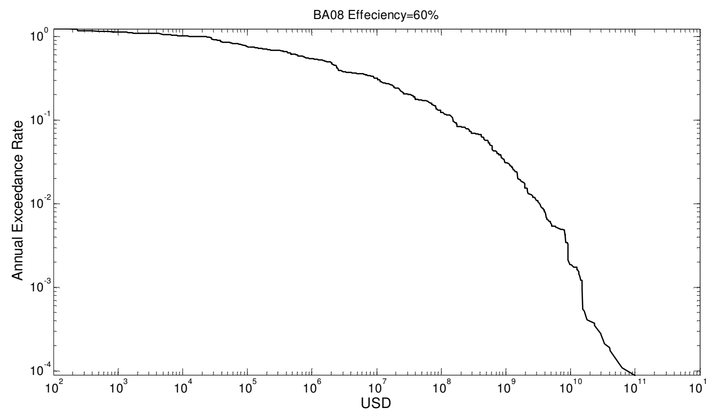
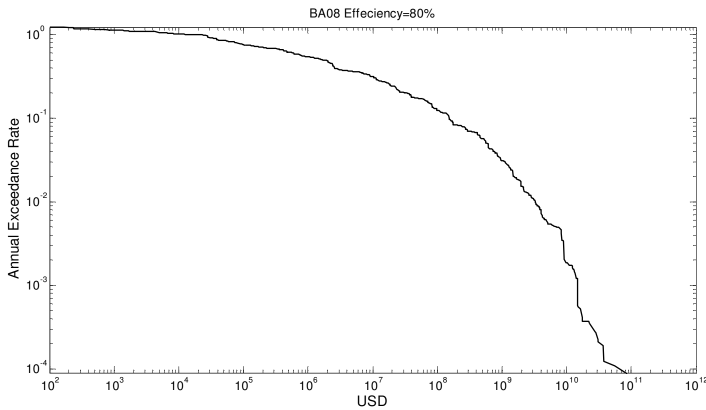


(o)

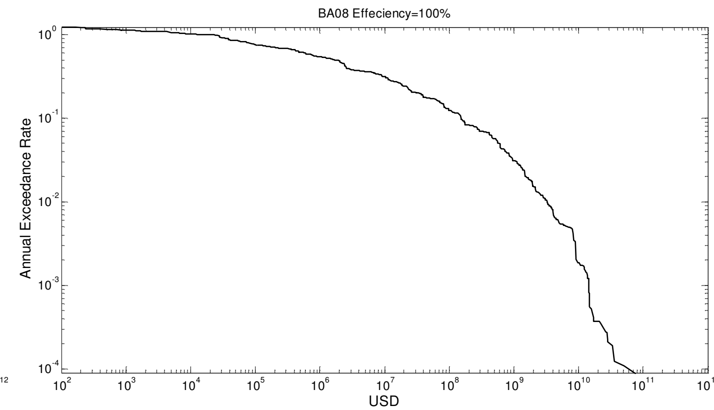


(p)

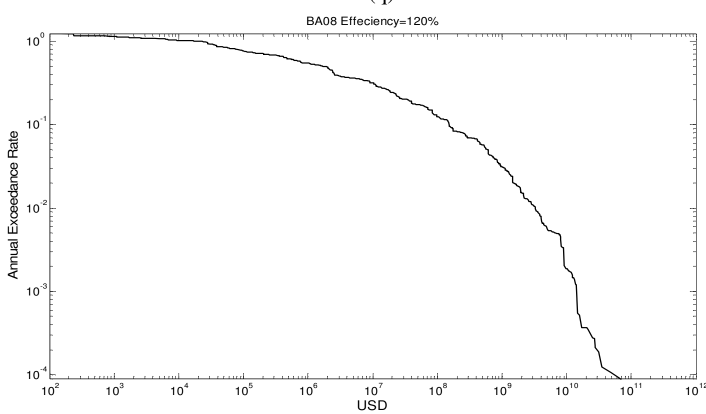
Figure F.2 continued



(q)



(r)



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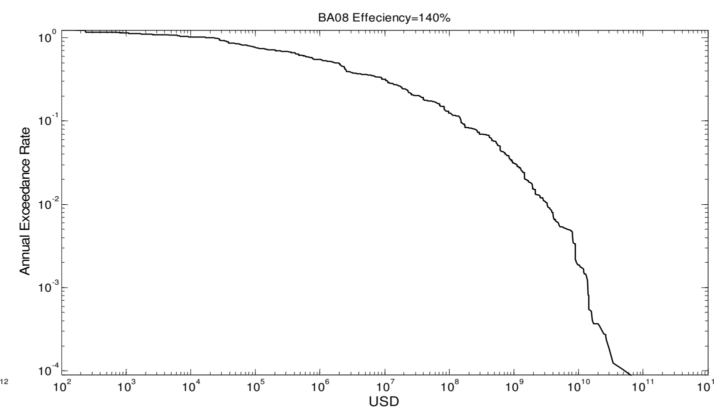
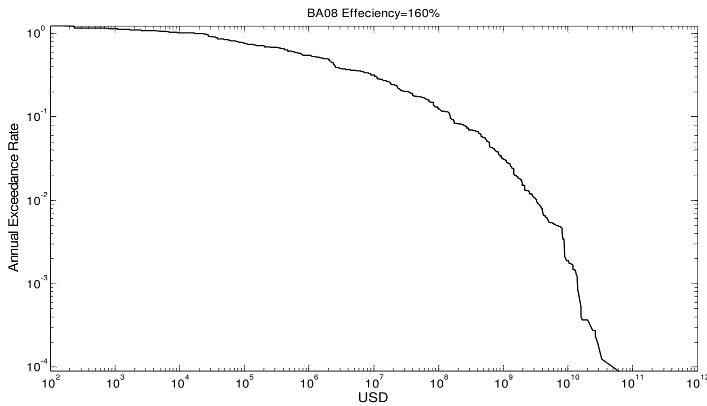


(t)

Figure F.2 continued



(u)

Figure F.2 continued