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Designing an Environmental Strategy Model for the Emirate of Abu Dhabi

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DESIGNING AN ENVIRONMENTAL STRATEGY MODEL FOR THE EMIRATE OF ABU DHABI

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ABSTRACT

The formulation of environmental strategies is now a major concern around the world. The Rio Earth Summit (Agenda 21) has led to local authorities taking responsibility for preparing and developing such strategies for sustainable development and the integration of environmental considerations into all development planning activities and projects by taking current economic, social and environmental policies and plans into account.

This research has developed an environmental strategy model for the Emirate of Abu Dhabi by identifying environmental problems and concerns and defining environmental priorities. It has, also, developed a framework and organisational structure for environmental institutions in the Emirate of Abu Dhabi.

To achieve sustainable development and, by taking Agenda 21 as a framework, the research includes a review of sustainable development, Agenda 21, Local Agenda 21 and environmental strategy concepts and the links between these four main concepts. A review of different strategy models is also provided in this research. Examples of other countries' experiences of developing environmental strategies, (UK, Jordan and Oman) are examined and evaluated. This review improves the understanding of the problems faced at each stage of the strategy and it also provides insights into the strengths and weaknesses of each strategy component. The lessons from these experiences are used to reduce the weaknesses in achieving a well-designed environmental strategy model for the Emirate. This review also suggests the need for a comprehensive approach to the environmental strategy model to overcome some or all of these constraints.

This research was developed to gain a better understanding of the Emirate's environmental condition, to provide a new and suitable institutional framework, and to provide an environmental strategy model for the Emirate of Abu Dhabi. The designed model was tested through conducting questionnaire surveys and a series of interviews with selected professionals and decision-makers in the environmental field. These techniques were used to test the research hypothesis and the analysis was used to provide an indication of any weaknesses in the proposed model. The conclusions show that the proposed model is both innovative and appropriate for implementation as an environmental strategy model for the Emirate of Abu Dhabi and recommendations are made for additional research to further improve the model.

DEDICATION

To my mother and father,

and to my wife and children

with love and gratitude.

ACKNOWLEDGEMENTS

DECLARATION

This is to certify that, except where specific reference is made, the work described in this thesis is the result of the candidate. Neither this thesis, nor any part of it, has been presented, or is currently submitted, in candidature for any degree at any other University.

Signed _____

Candidate

Signed _____

Director of Study

Date 5ᵗʰ OCTOBER 2000

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ABBREVIATIONS

ADNOC	Abu Dhabi National Oil Company
ADM	Abu Dhabi Municipality
ALM	Al Ain Municipality
BSI	British Standards Institution
CBD	Convention on Biological Diversity
CIMOP	Country Innovation Military Offset Programme
CSD	Commission on Sustainable Development
DoE	Department of Environment
DP	Department of Planning
EA	External Audit
EEU	Environment and Economics Unit (UNEP)
EFS	Environment Friends Society
EIA	Environmental Impact Assessment
EMAS	Eco-Management and Audit Scheme
EMB	Environmental Management Board
EMS	Environmental Management System
EPS	Environment Protection Section
ERC	Environmental Research Committee
ERWDA	Environment Research Wildlife and Development Agency
ESCWA	Economic and Social Commission for Western Asia
ESD	Environmentally Sustainable Development
FAO	Food and Agriculture Organization
FCCC	Framework Convention on Climate Change
FEA	Federal Environmental Agency
FECC	Food and Environment Control Centre
FG	Federal Government
FNC	Federation National Council
FSC	Federal Supreme Court
GDP	Gross Domestic Product
GFG	Going for Green
GIC	General Industry Corporation
IA	Internal Audit
ICLEI	International Council for Local Environmental Initiatives
IDRC	International Department Research Centre
IIED	International Institute for Environment and Development
IUCN	International Union for Conservation of Nature and Natural Resources (the World Conservation Union)
ISO	International Standards Organization
LA21	Local Agenda 21
LAA	Local Authorities Association
LCA	Life Cycle Analysis
LG	Local Government
LGMB	Local Government Management Board
LUP	Land Use Planning
MG	Major Groups
NCS	National Conservation Strategy
NCC	National Consultative Council

NEAP	National Environmental Action Plan
NEPA	National Environmental Policy Act
NESO	National Environmental Strategy for Oman
NESJ	National Environmental Strategy for Jordan
NGO	Non-Governmental Organisation
NSDP	National Sustainable Development Plan
NSDS	National Sustainable Development Strategy
OECD	Organization for Economic Cooperation and Development
RDP	Regional Development Plan
RLUP	Regional Land Use Plan
RSD	Research and Studies Department
SEA	Strategic Environmental Assessment
SCF	Supreme Council of the Federation
SD	Sustainable Development
SDI	Sustainable Development Indicators
SoE	State of the Environment
SWOT	Strengths, Weaknesses, Opportunities and Threats
TEC	Technical Environmental Committee
TFAP	Tropical Forestry Action Plan
TPD	Town Planning Department
UAE	United Arab Emirates
UIA	Union International Association
UK	United Kingdom
UKSDS	United Kingdom Sustainable Development Strategy
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGASS	United Nations General Assembly Special Session
UNIDO	United Nations Industrial Development Organization
USA	United State of America
USAID	United States Agency for International Development
WCED	World Commission on Environment and Development
WCS	World Conservation Strategy
WHO	World Health Organization
WRI	World Resources Institute
WWF	World Wildlife Fund

CHAPTER ONE

GENERAL INTRODUCTION

CHAPTER ONE

GENERAL INTRODUCTION

1.1   INTRODUCTION

Since the publication of the first World Conservation Strategy (WCS) in 1980 and the Brundtland Report in 1987, many countries have become more aware of the concept of sustainable development and have increased their concern about environment protection. The United Nations Conference on Environment and Development (UNCED), held in 1992, called on all countries and local authorities to integrate environmental considerations into all development planning activities and to prepare sustainable development strategies. This concept became more understandable after the Rio Summit, because it provides a comprehensive action plan for achieving sustainable development. Over the last two decades, many countries have formulated environmental strategies and have started to integrate environmental concerns into development projects and policy making.

This chapter provides a clear view of the purpose of the research, the research aim and objectives, the importance and contribution of the research, a review of literature regarding developing environmental strategy and finally the research structure.

1.2   PURPOSE OF THE RESEARCH

The preparation of environmental strategies and the formulation of action plans are now major concerns around the world. The Rio Earth Summit and the world governments' commitment to Agenda 21 have led to local authorities taking responsibility for preparing and developing strategies aimed at achieving sustainable development and integrating environmental considerations into all development planning activities and decision-making processes. These should build upon and harmonise the various sectors such as economic, social and environmental policies and plans.

The research focuses on designing and developing an environmental strategy model that can be applied and implemented in the Emirate of Abu Dhabi. Abu Dhabi

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Emirate, like other Emirates, and, also, like many other countries, is facing conflict between economic and development growth and environmental protection and management. Rapid and accelerating economic growth, development and urbanisation in the Emirate are evidently putting pressure on the Emirate's natural resources, and thereby causing stress on the environment. The experiences of other countries' experiences in formulating and developing environmental strategies will be examined and lessons learned from these examples will be taken into consideration in designing the proposed model.

This study is the first to deal with the formulation of an environmental strategy model in the Emirate of Abu Dhabi and therefore the development of such a model in this thesis represents an original contribution to knowledge.

1.3   RESEARCH AIM AND OBJECTIVES

The following section outlines the aim and objectives of the research.

Aim

To design a conceptual framework for developing a local environmental strategy for Abu Dhabi Emirate in the United Arab Emirates.

Objectives:

To achieve the above aim, the following research objectives must be achieved:

- Analyse the concept of sustainable development and review of Agenda 21 and Local Agenda 21 (Chapter Two).

- Discuss the definition of strategy and evaluate the different strategy models (Chapter Three).

- Develop the environmental strategy for the Emirate of Abu Dhabi (Chapter Six).

- Identify environmental problems and causes in the Emirate of Abu Dhabi (Chapter Five and Eight)

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- Define environmental problem priorities in the Emirate of Abu Dhabi (Chapter Five and Eight).

- Provide a State of the Environment Report for the Emirate of Abu Dhabi (Chapter Five).

- Propose a suitable environmental institutions framework in the Emirate of Abu Dhabi (Chapter Six and Eight).

- Test the applicability of the proposed model by conducting questionnaire and interview surveys (Chapter Seven and Eight).

- Formulate the Emirate environmental action plans as recommendations (Chapter Nine).

1.4   LIMITATIONS OF THE RESEARCH

This study is important in terms of being the first of its kind to be undertaken in the Emirate of Abu Dhabi. There are, however, certain problems and limitations in this study that have to be taken into consideration and it is necessary to identify these in order to achieve the preceding objectives of this study. These limitations are summarised as follows:

- There is a deficiency of relevant literature. This absence of a priori literature relating to the development of environmental strategies has hindered the investigation of the study.

- The study is based on a questionnaire survey which is used to test the proposed environmental strategy model and, therefore, the results reflect only the views, experience and opinions of the respondents, as restricted by the choice of questions used and respondents selected.

- The study includes only the main environmental departments and organisations in the Emirate of Abu Dhabi. Other organisations and departments such as the planning department, the water and electricity agency, the forest department, and

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some of the private sectors were excluded from this study because of the constraints of time and cost.

- Government documents were not updated. For example, the last statistical book for the Emirate of Abu Dhabi was published in 1999 but the data covered, related to 1997 (see Chapter Five).

- Communication with some of respondents to the questionnaire and the interview survey caused some difficulties in collecting some of the questionnaires and also in conducting some interviews.

- The culture differences of the respondents to the questionnaire survey have caused some of effect on the response rate. Because of that the self-administration method was used for distributing the questionnaire.

Despite these obstacles, this thesis makes a valuable contribution to our knowledge of the issue of developing an environmental strategy.

1.5   IMPORTANCE AND CONTRIBUTION OF THE RESEARCH

This research is considered as pioneering research in the field of the environment in the United Arab Emirates (UAE), in general, and in the Emirate of Abu Dhabi in particular, though the research is meant essentially to develop an effective and efficient environmental strategy model for the Emirate of Abu Dhabi. This research provides and contributes to knowledge in the field of the environment as follows:

- This research explains the concept of sustainable development and review Agenda 21 document and Local Agenda 21 programmes and also illustrates some difficulties faced in attempting to achieve sustainable development and implement environmental strategies.

- This research provides a conceptual framework for developing environmental strategy model for the Emirate of Abu Dhabi and testing the applicability of this model by conducting questionnaire and interview survey.

- This is the first research that has been carried out in order to design and develop an environmental strategy for the Emirate of Abu Dhabi.

- This research has also identifies, for the first time, the main environmental problems and their causes and has also defined the environmental problem priorities in the Emirate of Abu Dhabi. In general, it provides the information regarding the state of the Emirate's environment.

- The research identifies the main problems facing the present environmental institutional structure and also provides a new framework to avoid conflict and the overlapping of authority in order to ensure the effective implementation and monitoring of environmental policies, plans and programmes towards achieving sustainable development.

- The research shows how the formulation and preparation of the "State of the Environment Report" is important in providing comprehensive and up-to-date information and data regarding environmental conditions.

- This research establishes how the participation and involvement of the major groups (eg. Non-Government Organisations (NGOs), private sector, and women's group) can have a positive impact on the successful delivery of the strategy.

1.6   REVIEW OF ACADEMIC RESEARCH REGARDING ENVIRONMENTAL STRATEGY

A review of research regarding an environmental strategy in the Emirate of Abu Dhabi reveals a general lack of systematic studies on developing and formulating an environmental strategy for the Emirate of Abu Dhabi. There is no study available that adopts a theoretical and analytical approach, such as will be used in this study.

The researcher undertook a comprehensive search concerning the development and formulation of an environmental strategy. This review reveals that research on environmental strategy is sparse and fragmentary. Nevertheless, three main subject areas can be identified: sustainable development, Agenda 21 and Local Agenda 21

(LA21). The following paragraphs summarise the academic literature under these main headings. A deeper review of literature regarding these concept and programmes is presented and examined in the following chapters (Chapters Two and Three).

Al Attar's (1997) dissertation formulated a sustainable development strategy model for Kuwait. In this dissertation the author tested the applicability of the proposed model on the United Kingdom Sustainable Development Strategy. This evaluation provides insights in the strengths and weakness of the proposed model. The lessons learned from this review provides particular ideas as to what should be considered when a sustainable development strategy for Kuwait is formulated and developed.

Barrett (1997) was concerned with LA21 and environmental management in Japan and the United Kingdom. This study examined LA21 within the context of existing and emerging integrative approaches to the implementation of environmental management in both countries. The study highlighted how existing local environmental management systems in both Japan and UK remain fragmented. The study concluded that public participation is important to pre-determined policies rather than shape policy formulation and implementation.

Silengo's (1996) dissertation developed a framework for environmental management and protection in Zambia. He paid particular attention to an examination of the status of the Zambian environment, and developed an overview of environmental protection. He took the UK as an example of a developed country to provide a background for a discussion of environmental policy. Hashim (1994) developed a framework and system for integrating strategic environmental assessment into Malaysian land use planning to achieve sustainable development. The development of his proposed model was based on three main concepts: sustainable development, land use planning and strategic environmental assessment.

Joels (1994) examined the appropriateness and effectiveness of environmental Impact Assessment (EIA) to achieve sustainable forms of development in Amazonia. The study concluded that EIA is appropriate for mitigating the negative impacts of certain types of development. It also concluded that EIA is not effective in ensuring sound environmental management to the projects to which it is applied, as it has no

influence on project design. It was found that the EIA had a significant influence on the development of environmental management system and structure.

Dodge's (1995) dissertation integrated the organisational perspectives on strategic environmental management and performance. This study investigated how an organisation practices deal with the external and internal environmental condition such as natural resources, government capability, interest groups, financial, and local community where these responses have implications for environmental performance. The study established links among external environmental pressure, administrative system, and environmental performance. Ward's (1994) study concluded that more attention needs to be given to a variety of agenda processes, including issue clustering, management and transference.

From the above review, it appears that no single study has ever attempted to investigate the development of an environmental strategy in the Emirate of Abu Dhabi. There is, therefore, a lack of research and debate on this subject. This shortage or absence of previous work provides a strong justification for the present research. In short, this study is the first to deal with developing an environmental strategy model in the Emirate of Abu Dhabi and also with defining and identifying environmental problem priorities and their causes and formulating a new environmental institutional framework.

1.7   STRUCTURE OF THE RESEARCH

In addition to this chapter, the study comprises eight further chapters; details of these are given below.

Chapter Two demonstrates and discusses the concepts and principles of sustainable development, Agenda 21, and Local Agenda 21. It provides a literature review, the conceptual background and the development of these definitions. It identifies the development of the concept of sustainable development and provides an overview of Agenda 21. It also describes the development, the contents and the importance of Local Agenda 21.

Chapter Three deals with environmental strategy. It explains and discusses the concept of strategy and presents the needs for and types of strategy models. A number of environmental strategies are also presented and discussed in this chapter.

Chapter Four presents and reviews other countries' experiences in developing and formulating environmental strategies. This review improves the understanding of the problems faced at each stage of the strategy development. This information provides insights into the strengths and weaknesses of each strategy component and the lessons that can be learnt to reduce the mistakes and weaknesses in achieving the proper design model for the Emirate.

In Chapter Five, the background of the Emirate will be discussed. It also provides descriptive information regarding the present state of the environment in the Emirate. Based on this review, environmental problem priorities and causes are identified. This chapter works as a baseline for the proposed environmental strategy for the Emirate of Abu Dhabi.

In Chapter Six the proposed environmental strategy model for the Emirate of Abu Dhabi is designed. This model is built up directly from the information presented in the previous chapters.

Chapter Seven explains and describes the main research methods and methodology. It provides an overview of various research techniques, and data that have been used to gather information and data regarding the proposed model. It also focuses on the main statistical methods that are used to test the research hypothesis.

Chapter Eight presents the results of the fieldwork and examines and tests the applicability of the proposed model to be implemented in the Emirate of Abu Dhabi.

Chapter Nine presents the summary and conclusions. Conclusions are drawn as to whether the model is sufficient to be acted upon and implemented as an environmental strategy for Abu Dhabi Emirate. It also suggests recommendations for further research and development for effective integration of environmental strategy and action plans.

Chapter Two
Sustainable Development, Agenda 21 and Local Agenda 21

Chapter Three
Environmental strategies and models

Chapter Four
A review of environmental strategy experiences in other countries

Chapter Six
Designing an environmental strategy model

Chapter Five
Identifying environmental problems and priorities

Chapter Seven
Research methods and methodology

Chapter Nine
Research conclusions and recommendations

Chapter Eight
Research analysis and discussion

AL JABERI, 1999

Figure 1.1   The Research Structure

LITERATURE REVIEW OF SUSTAINABLE DEVELOPMENT, AGENDA 21 AND LOCAL AGENDA 21

CHAPTER TWO

LITERATURE REVIEW OF SUSTAINABLE DEVELOPMENT, AGENDA 21 AND LOCAL AGENDA 21

2.1   INTRODUCTION

The main purpose of this chapter is to describe, analyse and evaluate the concept of sustainable development, and the Agenda 21 document and Local Agenda 21 programme. This chapter explains the definition of sustainable development and illustrates some difficulties that will be faced in attempting to achieve sustainable development and implement environmental strategies. Such illustration will provide information regarding the elements required to achieve sustainable development, which need to be considered when designing an environmental strategy model for the Emirate of Abu Dhabi. The reviews of Agenda 21 and Local Agenda 21 are also important in achieving sustainable development.

This literature review is necessary to design environmental strategy model for the Emirate of Abu Dhabi as an approach to achieve sustainable development and by taking Agenda 21 as a framework and following Local Agenda 21 programmes. The chapter contains three main parts. The first part of the chapter discusses the concept of sustainable development and provides the conceptual background and the development of its definition. It also outlines the challenge of defining sustainable development.

The second part looks critically at the Rio Declaration and the conceptual background of Agenda 21. It also provides an overview of this document. The third part provides the definition of Local Agenda 21 (LA21) and describes the need for and the importance of LA21.

2.2   SUSTAINABLE DEVELOPMENT

2.2.1   Introduction

The term sustainable development is difficult to define. It may mean different things to different people, depending on which field it is used. It deals with the relationship between development and the environment. It is used to ensure that development is achieved by minimising harm to the environment. As Blowers (1993: 5) suggests:

> *Sustainable development requires that we have regard to the Earth's regenerative capacity, the ability of its systems to recuperate and maintain productivity. Thus, the conservation of resources is a strong component of sustainable development.*

The idea of sustainable development is derived from science, but at the same time the world 'sustainable' is derived from the Latin *sustenere*, meaning to uphold (Redclift, 1997). As De Vries (1989) reminds us, 'sustaining' can mean "supporting a desired state of some kind" or, conversely, "enduring an undesired state". Also Frazier (1997) explained that the word "sustainable" is derived from the verb "to sustain", and refers to holding up, supporting, supplying or providing for.

Sustainable development has become the guiding principle of environmental policy and international development (IUCN, 1995). Bergh and Straaten (1994) argued that the use of the concept of sustainable development has become more accepted as an extensive examination of economic, environment and development factors. The Organization of Economic Cooperation and Development (OECD) (1995) pointed out that sustainability is not, however, based on fixed relationships. There are two main variables influencing it: the first one is human ambition; and the second is technology. Also Freeman et al. (1996) commented that sustainable development has produced many policy and political challenges between political decision-making, communities and business. But Ghai and Vivian (1995) argued that no agreement exists regarding what exactly is to be sustained. Because sustainability sometimes refers to the resources themselves and sometimes to the livelihoods which are derived from them.

Welford (1995) argues that sustainable development is made up of three related issues. Firstly, the environment must be valued and not treated as a free good. It must be protected by the minimum use of non-renewable resources and by the reduction in emission of pollutants. Secondly, there is a need to deal with the issue of quality. Thirdly, sustainable development requires that all non-governmental sectors and groups operate on a different time scale than at present.

Discussion the concept of sustainable development is important to ensure that it is properly explored before the strategy formulated.

2.2.2   Development of the Concept

In 1968 the Club of Rome was founded, which in 1972 published its first report *Limits to Growth* (Meadows et al., 1972; and Jischa, 1998). This was the first to give consideration to the links between industrial growth and the environment. This report was designed to promote and encourage public interest and sounded the alarm of increasing population (Ness and Golay, 1997). The choice had to be made to continue with economic growth and create future environmental degradation or to halt further economic activity and preserve the environment. The report concluded that economic development could be continued, as long as ecological interests were unharmed; so balance was required (Ratcliffe and Stubbs, 1996).

The book *Only One Earth* by Barbara Ward and Rene Dubos, also written in 1972, discusses the links between natural resources and development. It considers the problems associated with economic growth, and stresses that present human needs must be met without compromising the needs of future generations (Hardoy et al., 1992).

The above work laid the foundation for the United Nations Conference on Human Environment Declaration, which was adopted at Stockholm in June 1972. This conference concentrated on the concept of sustainable development. It was a set of principles that placed environmental issues on the international agenda and represented the links between economic growth, population and the related well-being of people in all parts of the world (McCoy and McCully, 1993).

This declaration was carried by the World Conservation Strategy (WCS) (IUCN, 1980). The publication of the World Conservation Strategy (WCS) in 1980, which was prepared by the International Union for Conservation of Nature and Natural Resources (IUCN), with finance provided by the United Nations Environment Programme (UNEP) and the World Wildlife Fund (WWF) (IUCN, 1980; IUCN, 1995; and Achterberg, 1993).

This called on governments to develop national and subnational conservation strategies. This document stressed sustainability in ecological terms and was less concerned with economic development (Soussan, 1992). It had been presented to the Food and Agriculture Organization (FAO) and United Nations Educational, Scientific and Cultural Organization (UNESCO), and publication had been delayed to include amendments from these bodies (McCormick, 1986). The concept of sustainable development in this document was intended to link the ideas of development and conservation.

Sir Peter Scott, the chairman of the WWF, mentioned that the WCS was intended to present 'how conservation can contribute to the development objectives of governments, industry and commerce, organised labour and professions', as well as being the first time that development was suggested '*as a major means of achieving conservation, instead of being viewed as an obstruction to it*' (Allen, 1980: 7).

There are three main objectives for conservation stated in the *World Conservation Strategy*: (1) to maintain and preserve the essential ecological process and life support systems; (2) to preserve genetic diversity and protect biological diversity; and (3) to ensure the sustainable utilisation of species and ecosystems (IUCN, 1980, Nelson, 1995 and Christopher, 1995).

Redclift (1992) and Munasinghe (1993) mentioned that to explore the idea of sustainable development, there is a need to identify the multiple dimensions of the concept. The International Council for Local Environmental Initiatives (ICLEI) and the International Department Research Centre (IDRC) (1996) defined sustainable development as the interface between policies for economic development, community development and ecological development.

As a result of the above events, the Report of the World Commission on Environment and Development (WCED) was published in 1987 (Hens, 1996). The WCED in its report *Our Common Future* (The Brundtland Report) emphasised the relationship between the issue of environmental protection to environmental economic growth and development and the need to deal with world poverty (Keating, 1994). It put the issue of sustainable development more firmly on the international political agenda and provides the most commonly used and accepted definition (see next section) (Bishop, 1996). The concept of sustainable development received wide international attention following its endorsement by the WCED (UNDP, 1992; and Flomer, et al., 1995). In the same year, the United Nations General Assembly adopted the Environmental Perspective to the Year 2000 and Beyond (United Nations General Assembly Resolution 42/186), which is to be a wide framework to guide national and international co-operation for environment (IUCN et al., 1991). This report also claimed a very specific heritage. The Chairman wrote '*After Brandt's Program for Survival and Common Crises, and after Palme's Common Security, would come Common Future*' (Brundtland, 1987: x). The aim of the sustainable development strategy outlined by *Our Common Future* is '*to promote harmony among human beings and between humanity and nature*' (Brundtland, 1987: 65). This report concluded that the world was threatened by serious environmental problems, which were leaving an increasing number of people poor (Haman and Brown, 1994). Its goals were to assess and change global relationships (Lafferty, 1996).

The Brundtland Commission also highlighted '*the essential needs of the world's poor, to which overriding priority should be given*', and '*the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs*'. Turner (1997) believes that the central idea for sustainable development is to increase the living standards and the well-being of the poor.

The term of sustainable development has been further elaborated in two other major documents, *Caring for the Earth* (1991) (see section 2.1.4), and Agenda 21 (1992). These will be described later in section 2.2.3. After the first conference on the Environment in 1972 in Stockholm, the United Nations had planned a second

conference for 1992. In 1989 the decision had been taken by the UN General Assembly to call an Earth Summit in Rio de Janeiro in 1992. In June 1992, 154 countries in the United Nations Conference on Environment and Development (UNCED) signed the Rio Declaration on Environment and Development and reaffirmed the Stockholm Declaration (for more details see section 2.3).

2.2.3   Sustainable Development Definition

The definition of sustainable development is still the subject of much debate, nevertheless, the concept of sustainable development has become a guiding principle for most local and international governments in the past few years (WCED, 1987). Atkinson et al. (1997) argued that defining sustainable development is not too difficult but the determination of what has to be done to achieve it is a more difficult issue.

Pronk and Haq (1992) considered that sustainable development is a process designed to bring about development that is economically, socially and ecologically sustainable. This means that investment must be made in the education and health of the present population, so as not to create a social debt for future generations; and natural resources must be used in ways that do not create ecological debts by over-exploiting the carrying and productive capacity of the earth.

Sustainable development is such a wide-ranging concept that there have been more than 160 definitions relating to its interpretation implementation (Hardoy et al., 1992). None of them are wrong, but they vary in stressing different elements of sustainability according to the values of the author (Hill, 1998). Some definitions of sustainable development are as follows:

- *Implies increasing human productivity and the quality of life while living within the caring capacity of supporting ecosystems (IUCN et al., 1991: 10).*

- *A change in consumption patterns towards environmentally more benign products, and a change in investment patterns towards augmenting environmental capital (Pearce et al. 1989: xiv).*

- *A development strategy that manages all assets, natural resources, and human resources, as well as financial and physical assets, for increasing long-term wealth and well-being. It rejects policies and practices that support current living standards by depleting the productive base...to leave future generations with poorer prospects and greater risks than our own (Reppetto 1986: 15).*

Selman (1996) suggested that sustainable development is now conventionally associated with three fundamental principles. Firstly, the concept of "intra-generational equity", which requires containing the principle of human needs in sustainable development. Secondly, the principle of "transfrontier responsibility"; sustainable development cannot be achieved at the expense of environmental conditions elsewhere. Finally, the principle of "inter-generation equity" implies that the present generation should hand on the earth to the following generation in at least as good a condition as it inherited it.

These principles are contained succinctly in the two most widely used definitions of sustainable development, being those in *Our Common Future* and in *Caring for the Earth* (IUCN, 1995 and Achterberg, 1993). Sustainable development may be best defined by the Brundtland Commission (WECD 1987: 43) namely, *"development that meet the needs of the present without compromising the ability of future generations to meet their own needs.* It contains within it two key concepts:

- *the concept of 'needs', in particular the essential needs of the World's poor, to which overriding priority should be given; and*

- *the idea of 'limitation' imposed by the state of technology and social organization on the environment's ability to meet present and future needs".*

The above definitions of sustainable development identify what needs to be done to protect the environment. They also emphasise the overriding priority of responding to the attending needs to the poor within society (Pearce, 1993). WCED mentioned that the goals of economic and social development must be defined in terms of sustainability (UNDP, 1992).

Caring for the Earth, published in 1991, defines sustainable development as *"improving the quality of human life while living within the caring capacity of supporting ecosystems"* (IUCN, 1995: 10). It provides a statement of what needs to be done to achieve sustainable development. Redclift (1992) argued that this document emphasised the need to conserve the biological system, without showing much concern for the human population, which depends on it. The basic message of this document was reflected in both Agenda 21 and in the UN International Conference on Population and Development (Ness and Golay, 1997).

The Brundtland Report (1987a) concluded that it is possible for development to gratify present needs without compromising the chances of future generations to meet their own needs. It also implied that future generations would still be able to use and benefit from environmental resources. Also Brundtland (1987a) in *Toward Sustainable Development* defined sustainable development as a way of progressing, which meets the needs and aspiration of the present generation, without compromising the ability of future generations to meet their needs. The elements of the sustainable development ideas in *Our Common Future* are listed in Table 2.1 and represent an interesting blend of environmental and development concerns (Adams, 1990).

Table 2.1   Critical Objectives for Environment and Development Policies that follow from the Concept of Sustainable Development (Soussan, 1992).

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1. Reviving growth

2. Changing the quality of growth

3. Meeting essential needs for jobs, food, energy, water and sanitation

4. Ensuring a sustainable level of population

5. Conserving technology and managing risk

6. Merging environment and economics in decision-making

Hutchcroft (1996: 222) defined sustainable development as:

> *a collective system, which meets the diversity of human needs without in turn damaging any or all of those present or future needs.*

Ratcliffe and Stubbs (1996) concluded that sustainable development is a programme of action for local and global economic reform - a programme that has yet to be fully defined. The challenge of this new programme is to develop, test, and disseminate ways to change the process of economic development and to make sure that it does not destroy the ecosystems and community systems (e.g., cities, villages, neighbourhood, and families) which make life possible. Hams (1994) commented that sustainable development was concerned with protecting life from damage that can have serious effects on the quality of life on present and future generations.

In line with the above conclusion, Atchia et al. (1995) believe that choosing to move towards a sustainable development will require changes in many ways of thinking, deciding and doing, both within and outside government. In thinking, it means breaking the old attitudes and approaches. In deciding, it means that all sectors must work on narrow mandates with high decision making support. This will require comprehensive approaches and public participation, and in so doing, developing and practising new approaches to improve the state of the environment and natural resources depending on human health and development.

It is argued that the above definitions of sustainable development are too general and provide various ideas, opinions and methods concerning provision for future and present generations. The goals need to be more specific because they will vary to reflect the different condition across countries (Hoole and Milne, 1995). Although no clear guidance is given as to how these two ideas can be dealt with and separated. The Brundtland Commission placed the emphasis on meeting human needs rather than the protection of the environment (Redclift, 1992). It is difficult to provide guidance, because people or generations differ in their culture and income levels which result in differing needs. The sustainable principle is the cornerstone of Agenda 21 and all international agreements.

Also, this research argues that sustainable development is the solution to achieve successful strategy formulation and development. However, in order to achieve sustainable development a number of problems may be faced. One of these problems is that many countries are at different stages of economic development, so their needs and priorities differ. This can be achieved by changing life style and adopting more environmental friendly technologies for a better future.

2.3   AGENDA 21

In 1992, the United Nations Conference on Environment and Development (UNCED) took place in Rio de Janeiro. This was one of the most important conferences that had ever been organised by the UN (McCoy and McCully, 1993). The document from the Rio Conference was prepared by the UNCED; it was the result of more than two years work by the UNCED Preparatory Committee and the Inter-Governmental Negotiator Committees.

The Earth Summit II was held in USA, June 1997 and more than 100 heads of state or government participated. The main target of this Summit was to review the progress on the Rio Agreement after five years. It set a programme of work for the Commission on Sustainable Development (CSD) for the period 1998-2002 (see section 2.2.3).

The review of Agenda 21 is essential to be taken as a framework when designing environmental strategy model in Chapter Seven.

2.3.1 Background to Rio

The Rio Conference was the third main conference on the environment organised by the UN. The first was the "Conference on the Human Environment" organised in 1972 in Stockholm (see section 2.2.3). The second conference was organised in 1982 in Nairobi, and the main outcome here was an increase in awareness of environmental problems.

As a result of the above events, the Report of the World Commission on Environment and Development (WCED) was published in 1987 (Hens, 1996) (see section 2.2.3). In 1989, the United Nations began planning a Conference on Environment and Development to spell out how to achieve sustainable development. The General Assembly of the United Nations called for a meeting of the nations, many representatives of non-governmental organisations and groups, and the private sectors (Keating, 1994 and Haman and Brown, 1994).

In 1992, the UNCED was held and 172 member states of the United Nations took part. The "Earth Summit" was organised during the last two days of the conference (June 12-13). Also the attendance of more than 1,100 Non-Governmental Organisations (NGOs) and groups shows that the Rio Conference was not just a conference of governments (ICLEI, 1997).

The document from the Rio Conference was prepared by the UNCED; it was the result of more than two year's work by the UNCED Preparatory Committee and the Inter-Governmental Negotiator Committees. Rio produced the following main documents: A Convention on Climate Change, A Convention on Biodiversity, A Statement on Desertification, A Statement on Forest Principles, The Rio Declaration, and Agenda 21, which are recognised as the most important documents to come from Rio (Hams, 1994). In outline they are:

2.3.1.1 The Rio Declaration on Environment and Development

The Rio Declaration was previously known as the Earth Charter, which identifies a series of 27 principles for the interrelationship over the coming decades of environmental issues and economic development (Spedding, 1996). The declaration reflects the general principles of Agenda 21 and the conventions of Forest Statement (see Appendix A). It defines the rights and responsibilities of each government (McCoy and McCully, 1993). This declaration focuses on the following:

- Humans and their rights to a healthy and productive life in harmony with nature.

- Development must not undermine the environment needs of present and future generations.

- Integrate environmental consideration into the development process to achieve sustainable development.

- Decrease the disparities in living standards to meet the needs of the majority of people in different parts of the world and to eradicate poverty.

- Peace, development and environmental protection are interdependent and indivisible.

- The polluter should bear the cost of pollution.

The Rio Declaration states that the only way to achieve long-term economic progress is to link it with environmental protection. To achieve this, nations should take into consideration the importance of establishing the Rio Declaration objectives (see Appendix A).

2.3.1.2 Earth Summit (Agenda 21)

The Rio Earth Summit (UNCED) was a conference entitled Agenda 21, which is a comprehensive plan for global action and addresses the issues of sustainable development. Agenda 21 is considered to be one of the most important and significant outcomes of the Rio Summit (Tuxworth, 1996). It identified actions at all

levels of government to promote sustainable development (Hill, 1998). It runs to 40 chapters (WCED, 1987). The progress on the implementation of commitments in it was reviewed by the United Nations General Assembly Special Session (UNGASS) in 1997. This review is called Earth Summit II (see section 2.3.3).

2.3.1.3 Forest Principles Agreement

This agreement was published to guide the management of the conservation and sustainable development and management of all types of forests which are essential to economic development and the maintenance of all forms of life (Keating, 1994).

2.3.1.4 Framework Convention on Climate Change (FCCC)

This convention deals with the most serious problem facing the world. It aims to stabilise greenhouse gases in the atmosphere and offers an international framework for reducing gas emissions to levels that will not dangerously upset the global climate system and to combat climate change (Keating, 1994; Hens, 1996; Dodds, 1997; and Bromely, 1997).

2.3.1.5 Convention on Biological Diversity (CBD)

This calls on all countries to adopt ways and means to conserve and protect the variety of living species. The main objective of this convention is to ensure that the planet's diverse biological heritage is preserved. It consists of two parts: the first deals with macroscopic biodiversity and the second with the genetic basis of biodiversity (Hens, 1996). Its aim is to maintain a sustainable diversity and spread of flora and fauna across the world (Bromely, 1997).

2.3.2   Overview of Agenda 21

Agenda 21 is one of five documents agreed during the United Nations Conference on Environment and Development (UNCED), as adopted at the Earth Summit on 14 June 1992. It is a comprehensive blueprint or action plan for achieving sustainable development and it was to be taken globally from then to the Twenty-First Century by governments, United Nations (UN) organisations, development agencies, NGOs, and independent sectors and groups, in every area on the environment (UNCED,

1992; Price and Probert, 1997; and McCoy and McCully, 1993). It calls on them to contribute in different ways to implement and cover all the issues referred to UNCED by the UN General Assembly in its resolution 44/228 of 1989.

Agenda 21 represents the international consensus on action necessary to move the world towards sustainable development. As Redclift (1995) mentioned, Agenda 21 was the document, which paid most attention to sustainable development. It also explains that population, consumption and technology are the driving force in environmental change and that each sector in the community has a significant role to play (Jones and Welford, 1997). The major theme of Agenda 21 is to give poor people more access to the resources which allows them to live sustainably (Welford, 1995). Governments are not required to follow each programme and recommendation (Koch and Grubb, 1997). Haman and Brown (1994) identified that Agenda 21 will be carried out by different countries according to their situation, capacities and priorities in full respect of all Rio Declaration Principles.

Agenda 21 provides a framework for national sustainable development plans (Collier, 1997) and states that every local authority should develop an action programme towards a sustainable development for the 21st century (Redclift and Sage, 1994; Koch and Grubb, 1997). This should be achieved in co-operation with NGOs, academia, business, scientific, community and women's organisations, youth and indigenous people. Jones and Welford (1997) described that there are significant roles to be played by governments and the above organisations and groups in environmental change such as population, consumption and technology. Agenda 21 emphasised the importance and the need to involve all sectors in the community in the implementation of strategy plans (Hams, 1994). Also Curran (1998) explained that Agenda 21 is organised around 13 core themes: the atmosphere, desertification, mountain, land management, agricultural development, biological diversity, biotechnology, ocean and coastal zones, water resources, toxic chemicals, hazardous wastes, solid wastes and sewage, and radioactive waste.

Agenda 21 contains four sections and 40 chapters. An overview of the document is provided in Appendix B. Most programme areas have the following structure:

- basis for action, called a preamble;
- set of required objectives;
- list of activities;
- programmes' costs; and
- means of implementation (financial cost evaluation, scientific technical means, human resources development and capacity building).

Chapter One of Agenda 21 is the preamble containing seven paragraphs and gives an introduction and description of the Agenda 21 contents and the structure of the document. The preamble concludes, *"Agenda 21 is a dynamic programme. It will be carried out by the various actors according to the different situations, capacities and priorities of countries and regions...This process marks the beginning of a new global partnership for sustainable development"*.

Section One "Social and Economic Dimensions", discusses the way that environmental problems and solutions are interrelated with poverty, health, trade, consumption patterns and population. It also stresses how environment and development issues must be integrated into decision-making processes. This section contains seven chapters. These cover international co-operation; combating poverty; changing consumption patterns; demographic dynamics; protecting human health; human settlement development; and integrating environment and development in decision-making.

Section Two of Agenda 21 is "Conservation and Management of Resources for Development". This section is about how resources including land, energy, seas and waste must be sustainably managed. It deals with the conservation and management of resources for development and the results of different types of human activities.

Section Three is "Strengthening the Role of Major Groups". This section deals with strengthening the role of nine stakeholders groups, which are playing a major part in implementing Agenda 21 to achieve sustainable development. These groups are women, children and youth, indigenous people, NGOs, local authorities, workers and trade unions, business and industry, scientific and technology, and farmers. This

section also covers the issue of how people are to be mobilised and empowered for their roles in sustainable development.

Section Four is "Means of Implementation". It covers the concept of "Capacity Building", including the promotion and transfer of technology, education and public awareness. It covers a number of instruments such as financial resources, technology transfer, international co-operation, institutional arrangements, information and the development of environmental indicators towards achieving effective implementation.

Agenda 21 calls for 2,500 actions and targets. The summary of the target to be achieved by 2000 and beyond is presented in Appendix B. Based on the previous overview of the Agenda 21 document, there are a number of major and important issues, which have been observed and concluded as follows:

- Some targets are not defined by a certain date.

- The encouragement for all local authorities to adopt "Local Agenda 21".

- Governments should adopt national strategies for development in co-operation with international and regional organisations and the strategy should depend on harmonising the various sectoral economic, social and environmental policies and plans after thorough assessment of the current situation. Union International Association (UIA) (1998) held that Agenda 21 also recommends that countries should develop systems for monitoring and evaluation of progress towards achieving sustainable development.

- The definition of "sustainable consumption", "sustainable consumption patterns", "lifestyle changes" and "polluter pays" are not identified.

- There is encouragement for countries and international organisations to exchange information, though government secrecy may make this difficult to implement. The techniques, which are to be used for information and data collection, are not provided and explained.

- The importance of the contribution and participation of major groups (women, children and youth, indigenous people, NGOs, local authorities, trade unions, workers, businesses and industry, the scientific and technical community, and farmers) in the decision-making process, implementation, and monitoring that will affect and influence their environment and development.

- Dodds (1997) concluded that the vision for youth in Agenda 21 is still far from being a reality. Only a few countries include youth in their delegation to UN conferences.

- The importance of providing collaboration and co-operation between international and regional organisations to collect data and information, information and experience exchange, to promote research and surveys, to encourage the contribution of major groups, and to adopt strategies and action and policy plans.

- It explains that population, consumption and technology are the driving force of environmental change.

- The importance of providing human resources and capacity building for implementation.

- There is a call for better information collection, monitoring and exchange of data in all Agenda 21 programmes.

In summary, Figure 2.1 shows the framework of Agenda 21, as presented by the author. This framework is based on the information, which has been presented in the previous sections. The framework depends on the following key elements: co-operation and collaboration between governments, international and UN organisations and the major groups (women, children and youth, indigenous people, business and industry, scientific and technical community, farmers, and workers); participation and involvement of major groups in development projects and decision-making processes; and development of information.
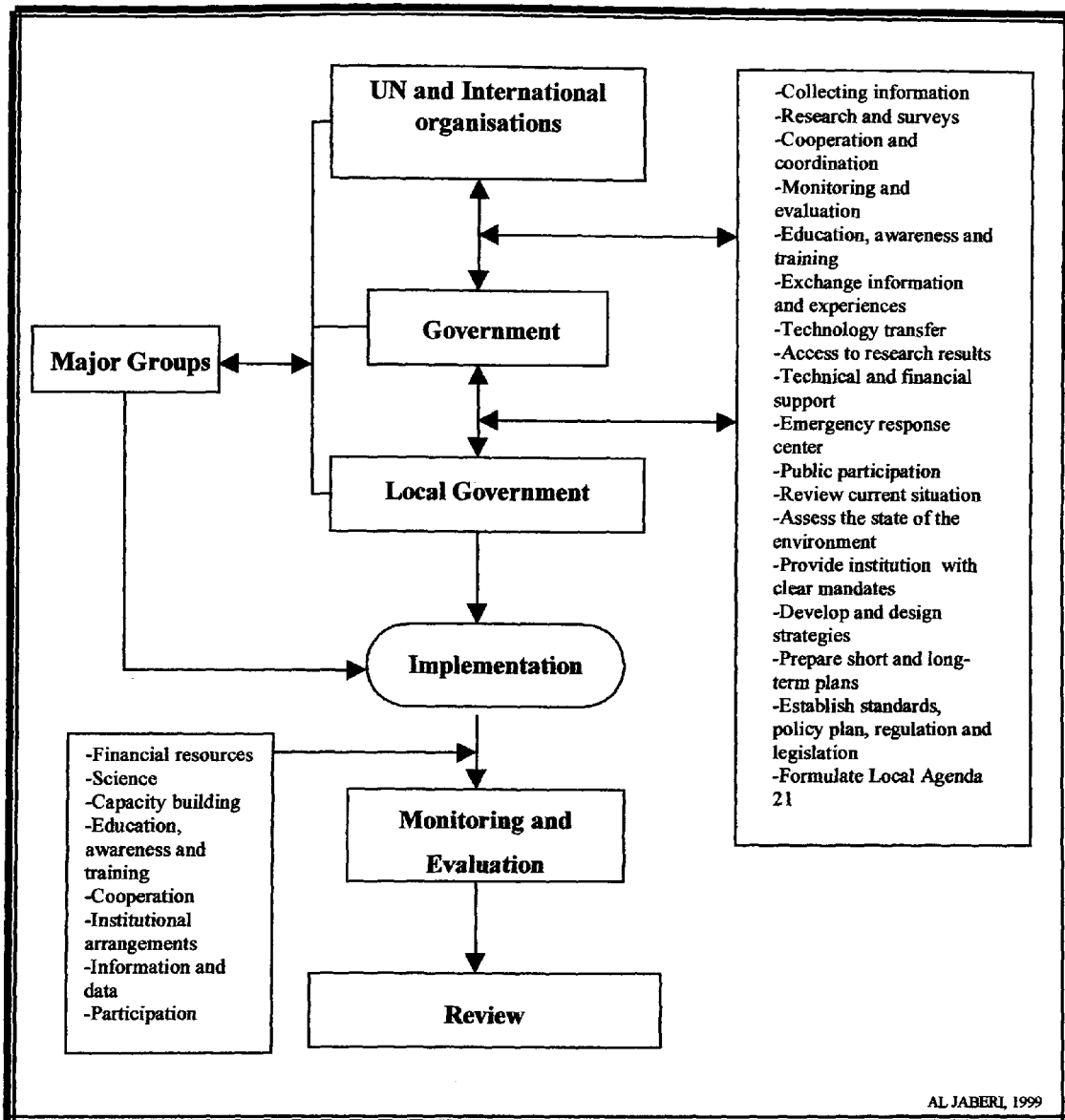
Figure 2.1   Overview of Agenda 21

These elements are used to achieve the following activities: (1) developing research and surveys; (2) collecting information and data; (3) transfer of information and experience; (4) technology transfer; (5) participate and involve major groups in each and every stage concerning environment and development; (6) review and assess the current state of the environment; (7) develop and design a national sustainable development strategy; (8) developing action plans; (9) establish standards, policy plans, regulation and legislation; and (10) develop education, awareness and training programmes and plans.

In order to achieve effective implementation of the above activities and objectives towards achieving sustainable development, it is important to take into consideration the implementation instruments, which are provided in Figure 2.2. These elements have been provided in section four of Agenda 21 (see Appendix B).

2.3.3   Earth Summit II

Since Rio, the UN General Assembly has held a Special Session in New York, 1997 called "Earth Summit II" or "Earth Summit+5". It is officially known as the United Nations General Assembly Special Session (UNGASS). This was intended to review the progress made in meeting the commitments identified at the first Earth Summit five years previously (Barrow, 1999). The review report of this Summit concluded that many countries have established environmental ministries and departments for the environment. Also many countries have formulated their environmental strategies and policies and adopted environmental impact assessment and a range of economic instruments. Some countries are working on improving the participation of the public in the decision-making process (McIver et al., 1997).
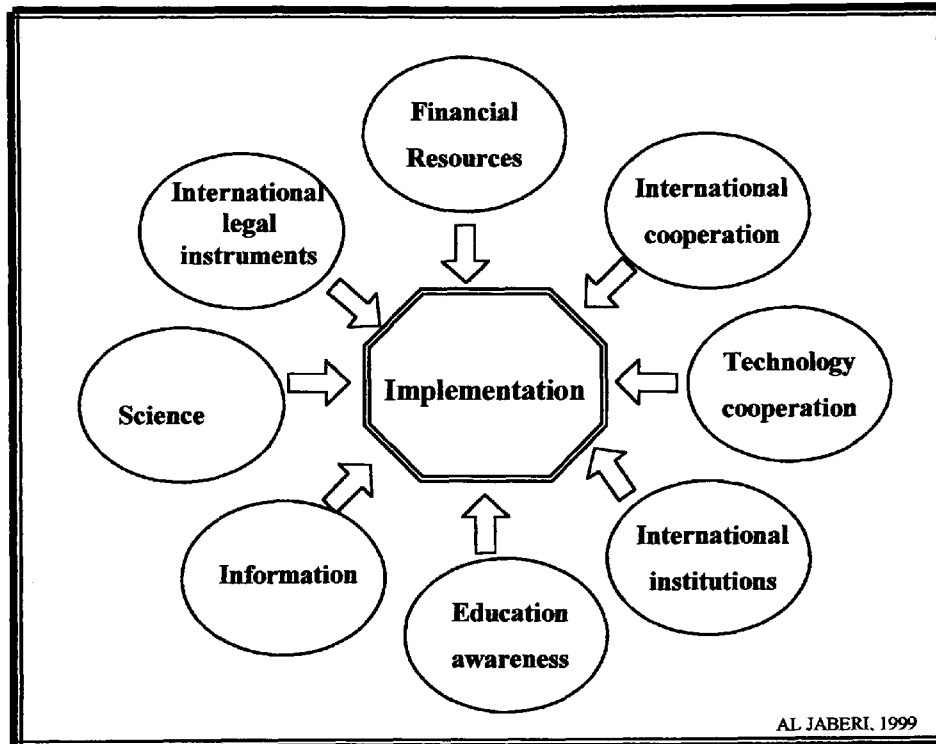
Figure 2.2   Implementation Elements in Agenda 21 to Achieve Sustainable
               Development

2.4   LOCAL AGENDA 21

2.4.1   Introduction

The processes of Agenda 21 document encourage local authorities and communities
to work together towards achieving an effective implementation of their programmes
and plans through developing Local Agenda 21. It also encourages local authorities
to establish comprehensive sustainable development strategies. Chapter 28 of
Agenda 21 discussed the particular role of local authorities in promoting and
implementing sustainable development strategies (Theobald and Patterson, 1996).
Entitled "Local Authorities: Initiation with Support of Agenda 21", it contains a
direct call to all local governments to create their own action plans for sustainable
development (Cullingworth and Nadin, 1997). This chapter puts a number of
objectives for the implementation of sustainable development at the local level. The

first objective set out in this chapter states that, *by 1996, most local authorities in each country should have undertaken a consultative process with their populations and achieved a consensus on a "Local Agenda 21" for the community* (see Appendix B). This objective gives an account of how local authorities have moved towards achieving sustainable development, in the form of their own LA21. In addition, the local authorities should elaborate their plans and programmes through consultation with all sectors of their communities (O'Riordan and Voisey, 1997; Grochowalska, 1998; and LAA, 1992).

The second is a call for all local authorities worldwide to implement and monitor schemes aimed at ensuring that all groups in the community, especially women and youth, participate in decision-making and planning. The third objective encourages co-operation and co-ordination between local authority institutions and the strengthening of such ties (DeWeerdt, et al., 1996 and Gilbert et al., 1996).

Chapter 28 contained a set-up of how to carry forward Agenda 21. It encourages each local authority to formulate, establish and adopt its individually comprehensive environmental strategies and action plans for sustainable development (Hams, 1994). It also observes that:

> *"Because so many of the problems and solutions being addressed by Agenda 21 have their roots in local activities, the participation and cooperation of local authorities will be a determining factor in fulfilling its objectives. Local authorities construct, operate and maintain economic, social and environmental infrastructure, oversee planning processes, establish local environmental policies and regulations, and assist in implementing national and sub-national environmental policies".*

Furthermore, local authorities can effectively deal with public involvement and participation *"As the level of governance closest to the people, they play a vital role in educating, mobilizing and responding to the public to promote sustainable development"* (Agenda 21, Chapter 28).

2.4.2 Local Agenda 21 Definition

The definition of LA21 was released by the International Council for Local Environmental Initiatives (ICLEI) in 1991 as a framework for local governments worldwide to use it in implementing the outcomes of the United Nations Conference on Environment and Development (UNCED) (ICLEI, 1997). ICLEI defined the LA21 process as follows:

> *"Local Agenda 21 is a participatory, multi-sectoral process to achieve the goals of Agenda 21 at the local level through the preparation and implementation of a long-term, strategic action plan that addresses priority local sustainable development concerns"* (ICLEI, 1997: 25).

Grochowalska (1998: 30) defined LA21 as *"the process of developing local policies for sustainable development and building partnerships between local authorities and other sectors to ensure that they are effectively formulated and implemented"*. DeWeerdt et al. (1996: 294) also defined Local Agenda 21 as *"the introduction of the objectives of Agenda 21 at the local level"*.

From the above, it can be concluded that there are no clear procedures for formulating and making LA21, which means that all local authorities can adopt Agenda 21 principles and recommendation based on their environmental condition and priorities. Coenen (1998) argued that Chapter 28 of Agenda 21 does not contain what an LA21 should consist.

2.4.3 Development and Content of a Local Agenda 21

Counsell (1999) argued that the LA21 is the most significant outcome of the Rio Summit in 1992, offering a comprehensive approach to incorporating the principle of sustainable development into local decision-making. LA21 was established and implemented at the local level in more than 1,800 local governments in 64 countries and more than 900 municipalities are just starting to establish the process (ICLEI, 1997). There is no detailed procedure for making a LA21. The development of a LA21 should start with a local environmental policy plan, with the participation of

all target groups and non-governmental organisations within the community. The first step proposed by DeWeerdt et al. (1996) is to prepare a scientific report on the state of the environment and develop a set of policies, which is reviewed every two years. The second step is to prepare an environmental plan every five years. The final stage is the preparation of environmental action programmes, which must be focused on putting policy measures into practice, which should be reviewed yearly.

Hams (1994) described ICLEI as the international driving force behind LA21, and has suggested that four basic elements should be taken into account to achieve an effective LA21 towards achieving sustainable development. These include:

1. a consultation process, to make sure that all sectors and organisations are fully involved in the process;

2. auditing, to measure changes in conditions over time and to assess the success of action taken;

3. setting goals and targets, these targets should be cited by all sectors; and

4. sustainable development indicators, which should be clear and achievable.

Agenda 21 and LA21 are programmes used to achieve sustainable development. Those attempting to achieve sustainable development can expect to face many difficulties, whether at international, national and local level (see Chapters Three, Four and Five). Therefore, it is important to understand the different problems, which may be faced when policy, plans and programmes are being implemented. One major issue is the difficulty of achieving a precise balance between the economic, social and environment dimensions of sustainable development. Sustainable development may face institutional constraints, especially in developing countries. Environmental strategy, for example, requires an institutional framework to ensure effective formulation, implementation and monitoring (see Chapters Three, Four and Six) and this depends on effective planning competence and financial and human resources. Improving communication channels between all agencies involved in the process is also required. Therefore, achieving sustainable development need overcoming these problems and the problems described in Chapter three and four to formulate a successful strategy.

2.5 CONCLUSION

This chapter has provided a comprehensive introduction to the concepts of sustainable development, Agenda 21, and LA21. It has also outlined the historical development of the above concepts and provides various ideas and methods relating to the importance of providing the present generations with their needs without harming and compromising the chances of future generations to meet their own needs. It is difficult to define sustainable development because it can mean different things, given the context in which is used.

Due to the absence of clear guidance of how to develop strategies towards achieving sustainable development, it is found that it is difficult to provide universal guidance because goals and objectives vary between countries and also people differ in their culture and income level, which results in differing needs.

From this chapter the following conclusion may be drawn. Development today must integrate environmental considerations to reduce their damage to the environment. Future generations must be able to use, and benefit from environmental resources. Sustainable development requires better scientific understanding of environmental problems. The participation of major groups is important in the decision-making process. Agenda 21 calls all local authorities to create and implement their own environmental strategies for development in co-operation with international and regional organisations and the strategy should depend on harmonising the various sectoral economic, social and environmental policies and plans after thorough assessment of the current situation. To achieve sustainable development, environmental considerations should be integrated into all development projects and decision-making processes concerning the environment. Different countries according to their situation, capacities and priorities should carry out Agenda 21, and they are not required to follow each Agenda 21 recommendations.

Agenda 21 calls for the use of the following elements to achieve successful environmental planning and strategies for sustainable development:

• promotion of international co-operation;

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- integration of environment consideration into decision-making;

- active involvement and participation of major groups in economic, environmental development and political decision-making, and in the implementation and evaluation activities, to carry out and review the implementation process and to make an effective contribution to the decision-making process concerning the environment;

- promotion of technology co-operation and transfer;

- increase of public awareness and promotion of training; and

- the importance of information availability to make sure that decisions are based on sound information.

LA21 should cover and contain all environmental areas of action such as urban and town planning, infrastructure and transport, pollution permits, nature conservation, energy and water supply, and waste management. It also should identify specific target groups for each aspect.

In order to achieve an effective and implementable environmental strategy, all the above conclusions will be taken into account when designing and developing an environmental strategy model for the Emirate of Abu Dhabi. These findings and conclusions will be also used as a cornerstone and framework for the proposed environmental strategy model, which will be designed in Chapter Six.

CHAPTER THREE

ENVIRONMENTAL STRATEGIES AND MODELS

CHAPTER THREE

ENVIRONMENTAL STRATEGIES AND MODELS

3.1   INTRODUCTION

The purpose of this chapter is to provide a conceptual background to the strategy. It also explains and discusses the need for and the level of strategies. The achievement of sustainable development requires the development of a framework for an appropriate strategy model. Therefore, this chapter will outline and examine a number of relevant strategies making models. Based on this review and examination, the strategy component will be provided and discussed. The final section focuses on the different types of sustainable development strategies.

3.2   STRATEGY BACKGROUND

"Strategy" is a word derived the Greek *strategos*, meaning, "general", literally, "the art of the general" (Miner and Steiner, 1977). "Strategy" refers to the formulation of the strategy missions, purposes, and objectives; the strategy policies and programmes to achieve them; and the methods needed to assure that strategies are implemented to achieve strategy objectives (ibid).

This subject has received a great deal of attention by various authors in the last few decades. The early work was undertaken at the Harvard Business School in the early 1960s, and was introduced as a conceptual decision-making process (Hrebiniak et al., 1989). This began with the publication of "Business Policy: Text and Cases" in 1965, which became the most popular textbook on strategy (Mintzberg et al., 1998). Hrebiniak et al. (1989) described the Harvard view as normative, where strategy was treated as a managerial art. Chandler (1962) was the first to employ strategy as a descriptive concept and he concluded that strategy was the key mechanism used for charting a new direction. It was led by Kenneth R. Andrews and C. Roland Christensen. They articulated the concept of strategy as a tool for pressing need for a holistic way of thinking (Montgomery and Porter, 1991).

A strategy is not an isolated event and it is not trying to do everything at once. Strategy is a continuous process. It depends on the participants' values, knowledge and resources. For a successful outcome, the participants need a common understanding of purpose, problems and solutions and it should also contain and include local interest and concern on environmental objectives (Carew-Reid et. al., 1994).

In 1980 the WCS called on all countries to integrate and undertake national and sub-national conservation strategies. Chapter Eight of Agenda 21 states that Governments *".....should adopt a national strategy for sustainable development.....national plans for sustainable development......should build upon and harmonise the various sectoral, economic, social and environmental policies and plans that are operating in the country"*. Many countries and communities have developed and implemented strategies. Some of them have been based upon the WCS, and *Our Common Future* (WCED, 1987), *Caring for the Earth* (IUCN et al., 1991) and Agenda 21. Some have been supported and motivated by international organisations such as the World Bank, UNESCO, UNEP, International Institute for Environment and Development (IIED), World Resources Institute (WRI) and IUCN. Other countries have developed strategies and implemented them on their own initiative, reflecting their own different and specific histories (IUCN et al., 1991).

There are many varieties of environmental strategies which have a range of titles and names such as, national sustainable development strategies; national sustainable development plans; Agenda 21; national conservation strategies; national environmental action plans; and environmental policy plans. All these kinds of strategies could be built into a national or local environmental strategy.

3.3 STRATEGY DEFINITION

Webber (1994: 47) defined environmental strategy as:

> *A set of broad environmental priorities and principles, which act as*
> *a framework for action and activity, together with a description of*
> *the resources, needed to implement it.*

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It was defined also by Hofer and Schendel (1978: 25) as the:

> *fundamental pattern of present and planned resource deployments*
> *and environmental interactions that indicates how the organisation*
> *will achieve its objectives.*

They also defined it as the match between an organisation's resources and skills and the environmental opportunities and risks it faces and purposes it wishes to accomplish. The Local Authorities Association (LAA) (1992: A1) defined environmental strategy as *a set of broad environmental priorities and principles which act as a framework for action and activities*. The strategy is the major link between goals and objectives and it is the means of achieving given objectives (Luffman et al., 1996).

Grant (1999: 3) defines environmental strategy as:

> *"the match an organization makes between its internal resources*
> *and skills....and the opportunities and risks created by its external*
> *environment".*

Therefore, the main purpose of an environmental strategy is to set environmental priorities for action, based upon what the organisations consider is most important. A strategy framework enables a local authority and organisation to monitor progress in the strategy process. According to Carew-Reid, et al. (1994), the strategy should be built on priority areas of actions, which are defined by local authorities and major groups in the community. A strategy also provides a mechanism for encouraging major groups and authorities to make changes in their values, knowledge, technologies and legislative framework. Welford (1994) suggested that the strategy must begin with real commitment from all organisations in every aspect of the environment.

A strategy, is a fundamental framework through which organisations can assess their capabilities given available resources and additional ones that may be requires. In the attempt to link strategies with sustainable development, environmental strategies are

processes of planning and action to improve and maintain the well-being of people and the ecosystem (see Chapter Two).

Although it is difficult for the analyst to predict all the possible forces in the socio-economic environment that interact with each other and their effect on the implementation of the strategy, it is essential to be able to respond to future events (see Chapter Two). When changes in circumstances and conditions in the environment occur, the strategy must be able to accommodate these changes. For example, environmental strategies should be able to cope with sudden institutional or legislative changes, such as the establishment of new authority bodies.

According to the World Bank and Environmentally Sustainable Development (ESD) (1995), successful strategies should include three elements: identifying priority problems; defining priority actions; and ensuring effective implementation. Atchia et al. (1995) argued that strategies should also include the following specific measures:

- setting environmental standards, and formulating regulations and effective enforcement measures to protect humans and the environment;

- ensuring sustainable use in the decision-making process and institutional arrangements within the government;

- adjusting and modifying the mandates and policies of the major economic and other sectors to comply with the sustainable development goals, guidelines and priorities; and

- applying and integrating the sustainable guidelines to new policies, programmes, technologies, and projects.

Strategies, with their integrated approach, enable countries to act on the basis of understanding of how environment, economic and development related to each other. Strategies also provide a review and analysis of key environment and development issues. They can also help to overcome problems of organisational and help to overcome problems face achieving sustainable development such as policy and organisational fragmentation by developing institutions to be better equipped.

3.4   NEEDS AND TYPES OF STRATEGIES

Mintzberg et al. (1998) explained that the main role of a strategy is to set direction, promote co-ordination of activities, provide people with information to understand their environmental condition, and reduce ambiguity and provide consistency. The main purpose of an environmental strategy is to set priorities for action (LAA, 1992). Strategies require special management skills in order to develop and formulate a successful strategy and to get positive results. Carew-Reid et al. (1994) considered that strategies needed to:

- provide a framework on sustainable development;

- help countries to solve inter-related economic, social and environmental problems by developing their capacities to treat them in an integrated fashion; and

- overcome the obstacles to sustainable development and make the necessary key changes.

Carew-Reid, et al. (1994) suggested three types of strategy: international, national and local. International strategies can be global, for two or more countries grouped politically, or by natural regions. National strategies focus on a single nation. Local or regional strategies cover parts of a country, being defined politically or administratively, for example, municipalities, counties, regional districts or naturally, for example, coastal zones, drainage basins, mountain ranges, forests.

It is argued that the Carew-Reid et al. (1994) approach didn't consider the possibility that formulating both national and local strategies at the same time would save time, money and effort. The effort of collection and analysis of information would be saved if this were carried out at the same time at both levels, there would be similar cost saving in the reporting on awareness and education programmes, organising conferences, workshops and seminars. There would be one steering committee and one technical consultation. Also, the local and national priorities need to be inter-related, as the national priorities will be achieved when the local priority actions are achieved.

3.5   STRATEGY MODELS

According to Barrow (1999: 64), a model is defined as:

A caricature or simplification of reality: often a set of equations,
used to predict the behavior of a variable or variables.

There are many types, such as conceptual models, which are used to check hypotheses and to organise ideas; or simulation or predictive models, which are used in EIA with an indication of what may happen in the future, and to see how the system is proceeding. Scale models are used to set up by hydrologists, for example, to study tides and flooding. The model's input and output are used by environmental planners and managers to integrate environmental management and strategic environmental management. Other models or world models were used to produce *The Limit to Growth* which was used to understand complex situations, predict future scenarios, and assess the impacts of a wide range of developments (Barrow, 1999).

This section illustrates a number of strategy making models. These models have been discussed by many authors with expertise in management, such as Chaffee (1985), Hunger and Wheelen (1995) and Mintzberg and Quinn (1998). Although strategies have proposed various models dependant on what they are to be used for such as business, military or environment, they generally share certain common features (i.e., set of objectives, formulation and implementation.

Accordingly to Chaffee (1985), there are three models of strategy making: linear, adaptive and interpretative. Although they are similar in a number of aspects, they differ in their approach. As the third model of strategy making is more concerned with business enterprise, only two basic models of strategy formulation will be discussed. In addition, other models developed by various authors will be considered so as to explore differences and similarities to assist in formulating an environmental strategy model for sustainable development.

3.5.1   The Basic Design School Model

The first model was developed by Andrews in 1965 as shown in Figure 3.1 (Hofer and Schendel, 1978), which he called the simple model and is taken as a primary source for all the following models. He described the experience of single product business and felt that the political and social aspects were as important to look at as the economic and technological parts of the strategy process (ibid). However, this model ignores an important component of strategy, which is monitoring and evaluation. Figure 3.2 shows the basic design school model, which was developed by Mintzberg (1994). It shows that strategy is created at the intersection of an external and internal appraisal. The external appraisal of the threats and opportunities facing an organisation in its environment are considered in terms of key factors for success. The internal appraisal indicates the strength and weaknesses of the organisation itself, distilled into a set of distinctive competence.

There are two other factors, which are important in strategy making, provided in the model. The first factor, is a managerial value and the other is social responsibility. Having identified and determined the alternative strategies, the next step in the model is evaluation in order to choose the best. Once a strategy has been chosen, it is then implemented. Mintzberg et al. (1998) mentioned that most authors associated with this school do not pay a great deal of attention to values and ethics. Also he mentioned that the strategy formulation in this model is a process of conception rather than of learning. The organisation's capabilities and structure is a significant part of strategy and is shown as an important element in the strategy formulation.
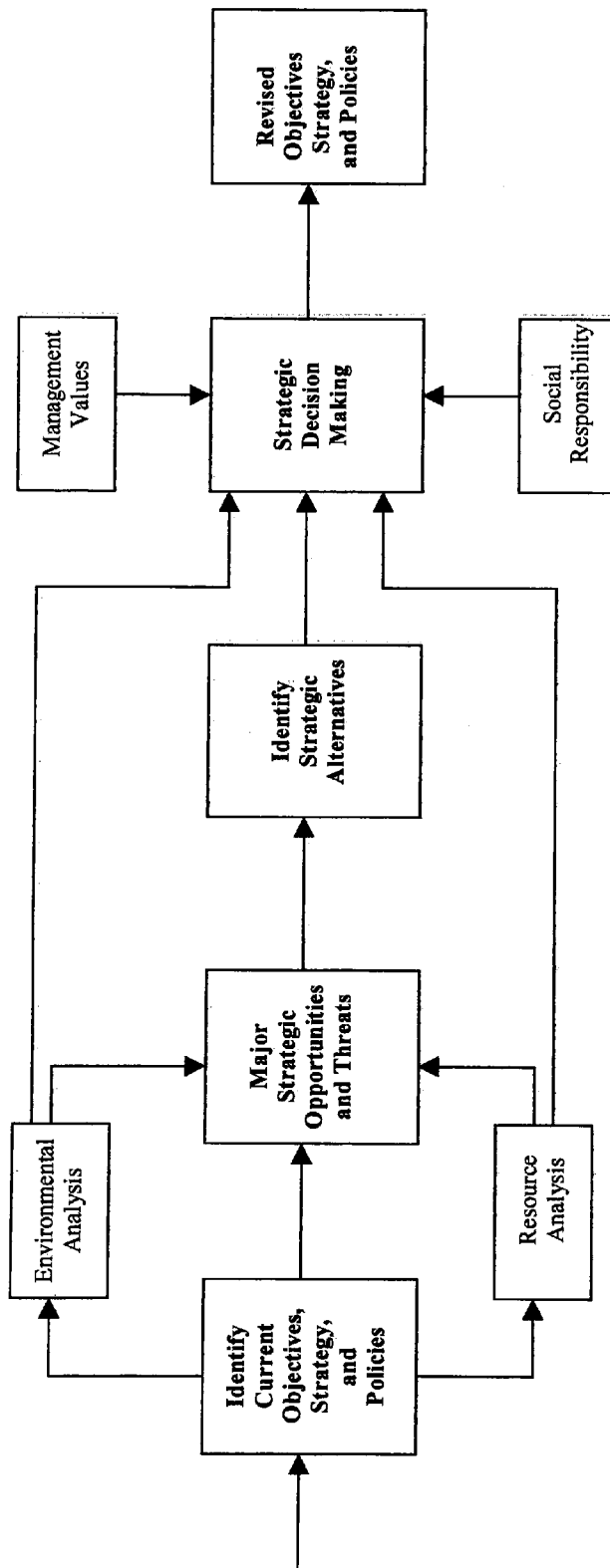
Figure 3.1   Andrews Model of the Strategy Formulation Process, 1965 in Hofer and Schendel, 1978
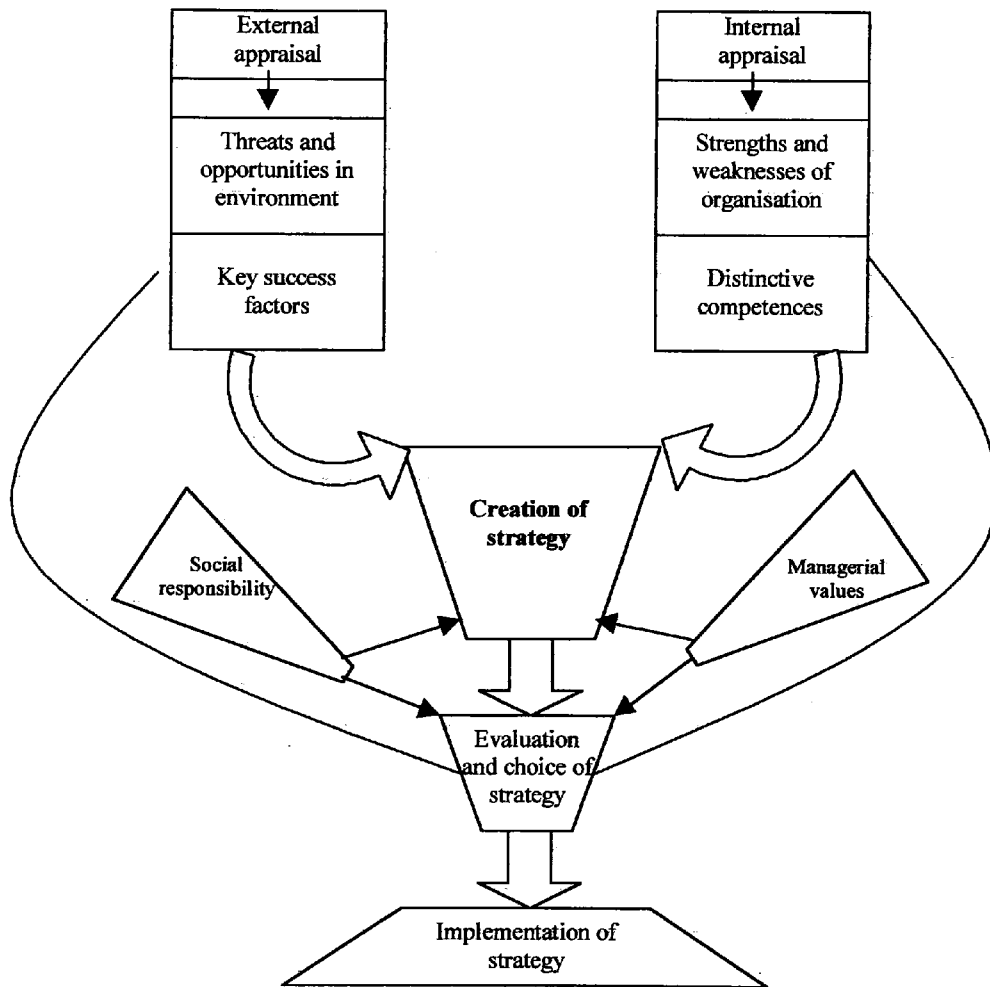
Figure 3.2   The Basic Design School Model, Mintzberg, 1994.

3.5.2   Linear Strategy Model

This kind of model focuses on strategic planning, strategy formulation and strategy implementation processes, which are the linear results of strategic decision-making (Chaffee, 1985). This model includes strategic planning, strategy formulation, and strategy implementation stages and allows the top management and decision-makers to identify their goals, generate alternative methods of changing them and to decide which ones to implement after assessment. This model is concerned about top management and decision-makers and ignores the involvement and participation of all other types of management and major groups.

Carew-Reid et al., (1994) discussed and provided the single-track strategy process shown in Figure 3.3 as an example of a linear model. The elements of this type of model are continuous and there are several factors that may hinder the model. The first factor is that the model encourages an excessive emphasis on the preparation of strategy and on large investment in information assembly, policy formulation and action planning. The second factor is that the model encourages a view of strategies as linear models and it does not include commitment to regular review and revision of the policy framework. It is reviewed as a one-off event. The third factor is that the strategy model does not include the effective elements of the process such as communication and capacity building. Finally, the single-track strategy does not reflect what is needed throughout the strategy process elements. It consists of integrated plans that will set and achieve goals and generate alternative methods to achieve them (ibid).

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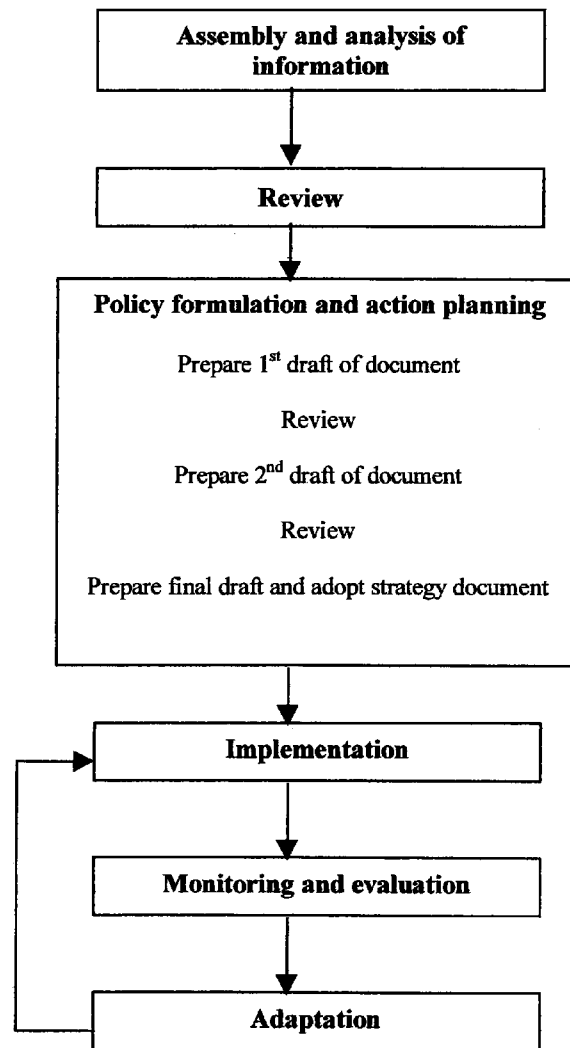
Figure 3.3   Single-track Strategy Process, Carew-Reid et al., 1994

3.5.3   Adaptive Strategy Model

This model incorporates the idea of strategic change. Figure 3.4 shows that the changes in the environment are gradually adapted with time, so maintaining a continuing dynamic equilibrium with the environment changes (Stacey, 1996). For example, the formulation of environmental policies, plans and programmes requires continuing changes based on the environment condition changes. Therefore, it is important to make incremental changes to the strategy in order to match strategy objectives to the external environment (Hofer and Schendel, 1978).

Chaffee (1985) explained that the adaptive strategy model differs from the linear model as follows: (1) the adaptive model focuses more on monitoring the environment, and making required changes are a continuous function; (2) it is less concerned about top management and decision-makers' levels, it emphasises that the lower level of management are also important in managing the strategy and influence change; (3) it deals more with the means of achieving objectives and goals rather than the goals themselves; and finally (4) the organisation is expected continually to assess external and internal conditions.

Carew-Reid et al. (1994) argued that the strategy should not be a one-time event and should not be linear but a cyclical process of planning. In this approach, many of the elements are undertaken concurrently and are repeated. Figure 3.5 shows that the strategy process should focus on the problem and issues that need to be taken into account in the strategy and budgets. It should also include feedback between one cycle and another and it is used to show how the strategy influences, and is affected by events. This feedback will occur through effective monitoring and evaluation and it needs to reflect how the strategy is influenced by, events.

Summit of the Americas on Sustainable Development (1996) suggests elements for designing a strategy, which are:

- Improvement of legislation;
- Public participation;
- Access to information;
- Co-operation;

- Financing; and

- Suitable institutional framework.

Also Lampietti and Subramanian (1995) argued that any environmental strategy should include the following key elements: identifying problems; setting priorities; identifying causes of environmental problems; choosing policies and instruments; and legal and institutional reform. Piasecki (1995) considered that to develop a reliable environmental strategy, expert opinion, historical perspective, political opinion and institutions should be used.
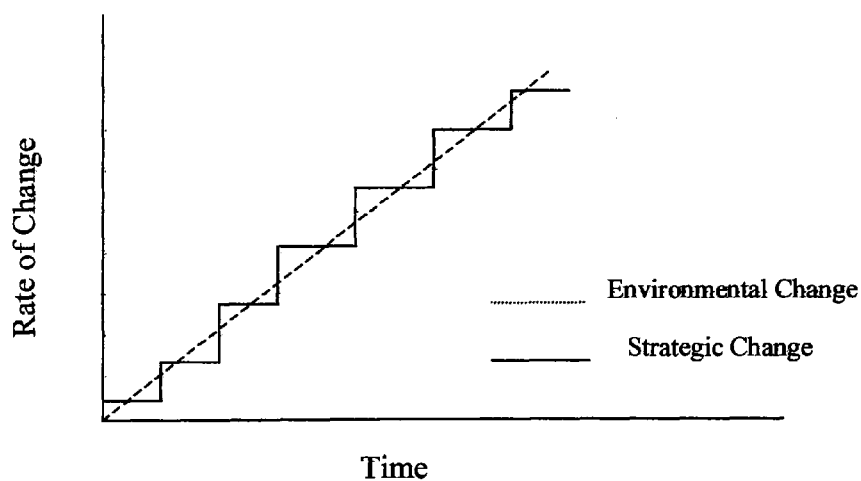
Figure 3.4   Incremental Change
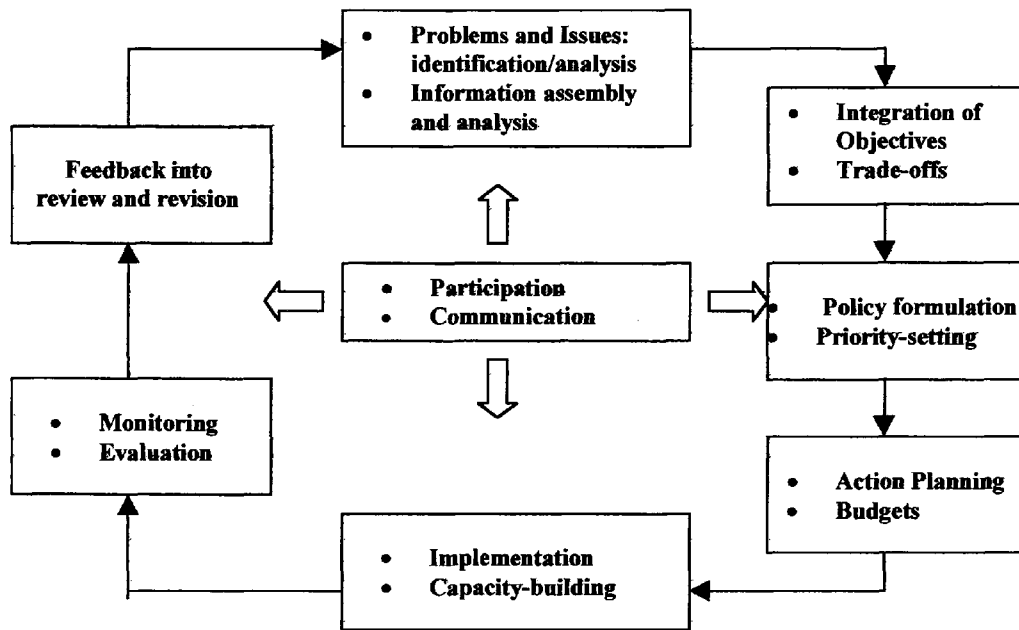
Figure 3.5   The Strategy Cycle, Carew-Reid et al., 1994

3.5.4 Other Models

There are many different strategy models. For example, Hunger and Wheelen's (1995) is called "Basic Model of Strategic Management". Figure 3.6 shows that this model process involves four basic elements: (1) environmental scanning, (2) strategy formulation, (3) strategy implementation, and (4) strategy evaluation and control. Figure 3.7 illustrates the key features of the framework of Wheelen and Hunger. It shows how these elements are interacting together, the continuity of the process and provides a structure of format for directing the examination of strategies, under the heading of environmental scanning, strategy formulation, strategy implementation and evaluation and control (Smith, 1998). Scanning the external and internal environment to search for any significant opportunities or threats and strengths or weaknesses, called strategic factors, are summarised with the acronym S.W.O.T. analysis (Peattie, 1995), i.e. Strengths, Weaknesses, Opportunities, and Threats (Zack, 1999). This technique was developed to help planners and managers keep a strategy appropriately matched to its environment. After identifying strategic factors,

the strategy formulation process must start. The first step in this process is a statement of missions, objectives, strategies and policies. Strategy implementation will be achieved through programmes, budgets, and procedures. The final process is performance evaluation and feedback to control the organisation activities by the management (Hunger and Wheelen, 1998). This feedback will help to compare what is planning with what is planned to make modification and correction in the strategy process, if needed.

Andrews (1980) proposed another model of the strategy process, which provides two stages: formulation and implementation as shown in Figure 3.8. At the formulation stage, there are two main aspects: (1) identifying opportunities and estimating the risk; and (2) determining material, technical, financial and managerial resources. Mintzberg and Quinn (1998) explain that this model provides a number of requirements to achieve results and successful implementation such as the organisation structure and the top management skill and support.
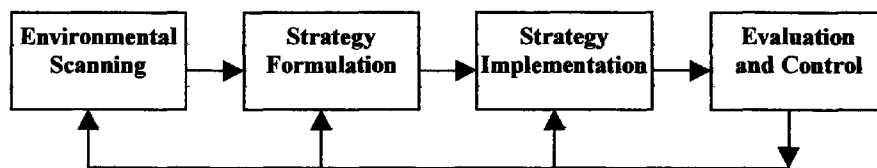
Figure 3.6   Basic Elements of the Strategy, Hunger and Wheelen, 1995
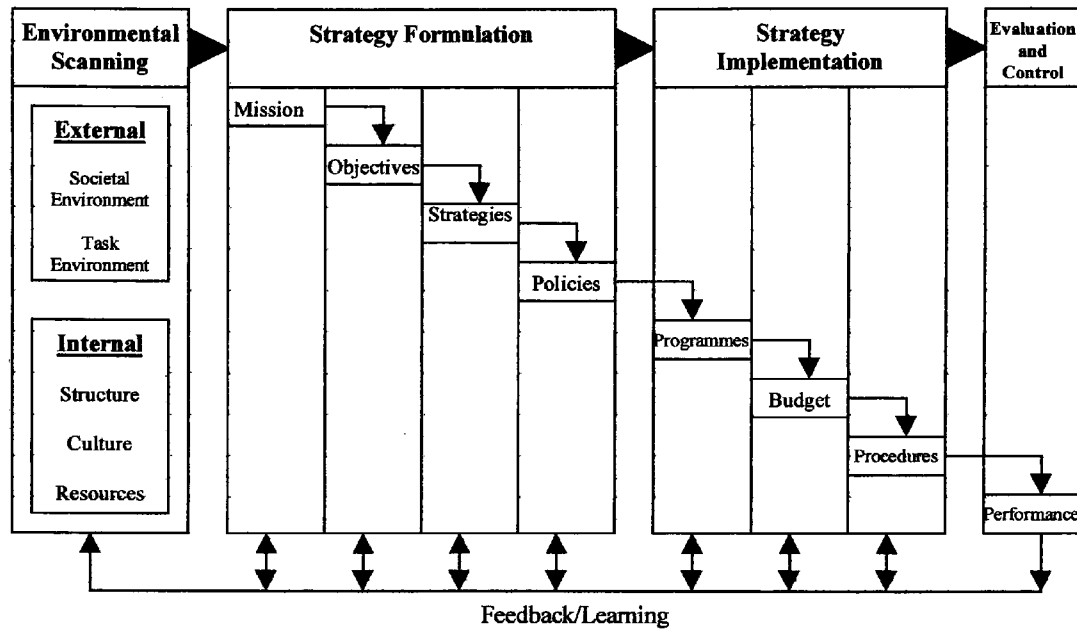
Figure 3.7   Strategic Management Model, Hunger and Wheelen, 1998
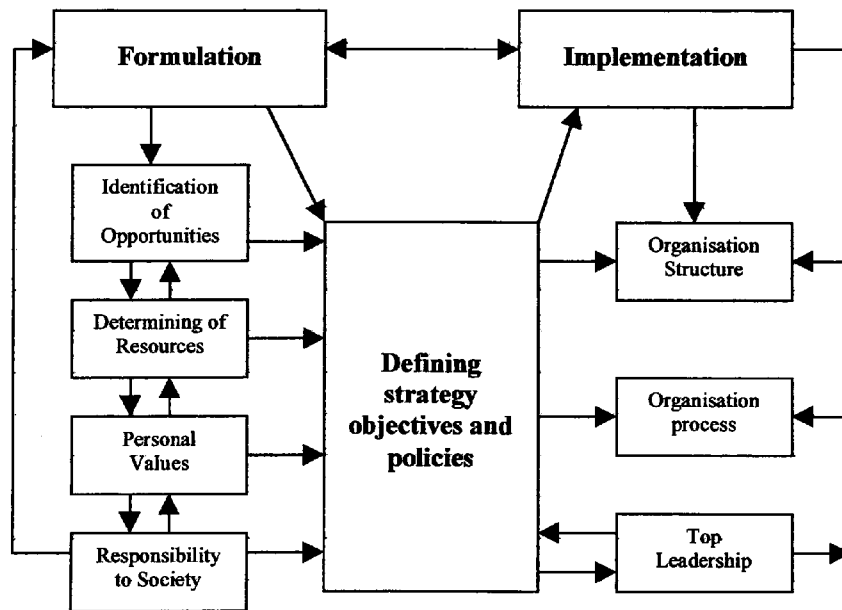
Figure 3.8   The Strategy Process, Andrews (1980) in Mintzberg and Quinn, 1998

3.5.5   Review and Evaluation of Strategy Models

Based on the previous description and examination of different strategy model, the following are the main conclusions of this review. The Simple Model calls for participation and the importance to look at the economic part of the strategy but at the same time it ignores the monitoring and evaluation process. The model also does not consider policies, plans and programmes, which are essential parts of the strategy process. The Basic Design Model suggests that the success of the strategy depend on the institution capability and structure, and the participation of other social responsibility.

The Linear strategy model gives the top-management responsibility to identify objectives and goals and it ignores the involvement and participation of lower management and other groups. The review of the strategy process is a one-off event. Although the linear approach is simple and straight forward, it fails to take account of the conditions in which the strategy will be formulated and implemented. It also fails to consider possible changes in the environment, such as new regulations and legislation and political conflicts. This single-track model ignores an excessive emphasis on the preparation of a strategy document and considerable investment in assembling information, policy formulation, policy formulation and planning quite out of proportion to what can be implemented (see Table 3.3). The linear strategy does not include a commitment to regular review and revision of the policy framework for the strategy as an essential component of the development cycle. It ignores certain major elements of the strategy process, such as risk assessment. Without this, the strategy will be very hypothetical and will fail to reflect the real situation in the society and there is therefore a risk of unexpected difficulty will faced in its implementation. The strategy should also consider the culture and values of the authority involved in the strategy implementation such as decision-making process and the role of private sector and major groups participation.

The adaptive model focuses on the monitoring and making any required changes to the strategy, if needed. It also focuses on the participation of other management levels and other groups in the formulation of objectives and goals and policies. It suggests that strategy should be continuously assessed and evaluated to achieve the

success of the strategy. In this model, the components of the model are undertaken concurrently and repeated. Unlike the linear approach, this approach deals more with the means of achieving goals rather than the goals themselves. It is also less centralised at top management and decision-making levels.

The Basic Model involves preparation, formulation of objectives and policies, implementation and evaluation and control. Implementation would be achieved through providing budget and clear programmes. In order to control strategy activities, performance assessment and feedback is also important. In the context of environmental strategy, this means that capabilities and resources should be explored in order to avoid any delay or disruption during the strategy implementation. This includes determining financial resources and studying political and social conditions in order to minimise the risk of facing major future problems.

Andrews' (1980) model provides two stages. Formulation stage, which should be supported with adequate financial and administrative resources and the implementation stage, which requires organisation structure and top-management support and skills to achieve a successful strategy. Although there are no definite indicators available, personal judgement is used in making such an evaluation. However, in an environmental strategy model, this should not be the case, for various sustainable indicators can be used to measure progress in its implementation.

Table 3.1 shows that all of the reviewed models take the preparation stage as the first step in the model. This stage covers the collection of environment and data analysis. It also includes the identification and determination of alternative strategies and choosing the best after evaluation. Scanning environmental condition is also important to keep strategy appropriately matched to its environment. The second component is the formulation of objectives and goals. It also includes policy formulation and action planning. The third stage is the implementation of these policies and plans to achieve strategy objectives and goals. This process could be achieved through providing financial resources, capable institutions and structure, and top-management support. Monitoring and evaluation is the fourth stage of strategy model which helps to monitor the progress made and evaluate the preference of strategy process. The last stage is the feedback used to make modification and

correction in the strategy process and it also reflects how strategy is influenced by events.

Table 3.1   Summary of Different Strategy Models

	Simple Model	Basic Design Model	Linear Model (Single-Track)	Adaptive Model (Cycle Strategy)	Basic Model	Andrews (1980)
Preparation	√	√	√	√	√	√
Formulation	√	√	√	√	√	√
Implementation	-	√	√	√	√	√
Monitoring	-	-	√	√	-	-
Evaluation and control	-	-	-	√	√	-
Feedback	-	-	-	√	√	-

A strategy, enables countries to act on the basis of understanding of how environmental, economic and social are related to each other, to achieve sustainable development (see Chapter Two). Strategies also provide a review of the analyses of key environment and development issues. They can also help to overcome problems that may hinder achieving strategy objectives. An effective strategy cannot be attained unless it contains appropriate designed to accomplish it is objectives.

Based on this information, the strategy should contain the following components and stages: preparation, formulation, implementation, monitoring and evaluation, and review and feedback. According to the review and evaluation of the different strategy models, this components includes a number of elements such as the collection and analysis of information and data; participation of other groups; institutional capability and structure, top-management support; and financial and administrative support are essential.

Having briefly analysed a number of strategies making models, it is now important to consider how these models can be integrated in the designing of an environmental strategy model (Chapter Seven).

Based on the information presented, the adaptive approach (see Section 3.5.3) appears to include all the main component of strategy, such as preparation, formulation, implementation and monitoring and evaluation. The feedback is another component that strategy have to consider to show how the strategy influences and affected by events and to make modification and correction in the strategy process (see Sections 3.5.3). Integrating strategy models into the concept of sustainable development requires adaptation so that the strategy includes a review of the state of the environment report. Based on the information presented in Chapter Two and the review of different strategy making models, it was found that this model needs some modification to be more effective towards achieving sustainable development. The development of report is essential component before the feedback process takes place (see Section 3.6.6). The reporting used to provide a valuable source of information that produced after monitoring and evaluation. Auditing is also one of the new component which should be consider during each stages of the strategy process (see Section 3.6.7), to assess and evaluate the impact of each stage and component of the strategy. In addition to these new components, the elements concluded form the above review and the review of Agenda 21 document and LA21 programme should be consider when designing the proposed environmental strategy model in Chapter Six. Chapter Six describes the approach proposed by the author for developing environmental strategy model.

3.6   STRATEGY COMPONENTS

Based on Agenda 21, Caring for the Earth, and the various types of strategy models, which are presented in previous sections, the components of a successful strategy may be identified as the following elements. These components will help to build up and design the proposed strategy model in Chapter Six.

3.6.1   Strategy Preparation

The strategy must begin with an assessment of the current situation of the environment, called the 'State of the Environment Report', (SoE) which involves a careful analysis of internal strengths, and weaknesses and external opportunities and threats. This environmental review will help to identify the environmental problem

priorities and define the main causes of environmental problems. According to Carew-Reid et al., (1994) the strategy requires a number of conditions before it can be developed. Mintzberg and Quinn (1996) argued that in order to achieve an effective strategy it should contain three elements (1) achievable objective, (2) significant policies guiding action, and (3) the major action sequences. These conditions include defining and setting strategy goals and objectives; needs and purposes; high level support; commitment of other sectors; and establishing the appropriate committees. Luffman (1996) explained that any strategy has to be developed through an organisation.

Generally, targets are used to improve the condition of both people and ecosystems (Carew-Reid et al.,1994). The main purposes of objectives are to focus the management on specific outcomes, and to provide a means of assessing whether the outcomes have been achieved or not (Lynch, 1997). According to Hofer and Schendel, (1978) the objectives have four components and all the following components should be specified as useful for management purposes. The components are (1) the goal, (2) an index for measuring progress toward the goal, (3) a target to be achieved, and (4) a time frame within which the target is to be achieved. Luffman (1996) argued that the objectives should be measurable, achievable, realistic, explicit, communicable to others, and time bounded. Before the objective-setting process is complete, there are four steps necessary to follow. These steps are (1) check whether objectives can be achieved or not; (2) establish action priorities; (3) break down each objective into sub-objectives; and (4) set an organisation goal structure to determine the targets that the strategy is intended to reach (Hofer and Schendel, 1978).

According to UNEP and EEU (1996), the preparation and implementation of strategies requires cross-sectoral integration of economic, social and environmental factors; public and decision-makers participation and consultation; and institutional capabilities to prepare and implement.

Objectives usually are more specific than goals, and are used to let people know what they are trying to do or what is expected of them to achieve effective implementation of strategy (Baste and Eldredge, 1980). The strategy objectives and goals differ from

one strategy to another and vary depending on the environmental priorities and concerns and should be clearly defined having few enough to be achieved and easily understood by all sectors and authorities, with appropriate time-scales for implementation (Carew-Reid et al.,1994). Thompson (1997) explained that when developing objectives there needs to taken into consideration size or type of organisation, and the nature and variety of the areas of concern and interest.

3.6.2 Strategy Formulation

This stage of the strategy should be managed and not left to chance. Information derived from the above section is used to construct strategies. Effective strategy formulation is based on identifying, understanding and using the capabilities and strengths of current institutions (Pitts and Lei, 1996).

The formulation of alternative strategies is important at this stage so as to achieve the strategy goals and objectives. As shown in the review of different strategy models these alternatives should be identified and determined and then the best chosen after evaluation. The draft strategy must be made available to all major groups in the community, such as women's groups, non-governmental organisations, research institutions, and private sectors and they should be asked to contribute by providing their views and comments.

Hunger and Wheelen (1998: 10) defined strategy formulation as:

> *the development of long-range plans for the effective management*
> *of environment opportunities and threats, in light of corporate*
> *strengths and weaknesses.*

Strategy formulation includes setting policies, plans and programmes. A policy is a guideline for decision-making that links strategy formulation and implementation (ibid). The content of any policy will vary from one strategy to another and it will be influenced by the activities of the organisation. It needs to be detailed enough and related to the areas where the organisation wishes to improve its environmental performance (Welford and Gouldson, 1993). Coopers and Lybrand (1991) explained

that strategy policy, plans and programmes should be clearly timetabled with the date of completion of each plan.

3.6.3   Strategy Implementation

Once strategy policies, plans and programmes are formulated and developed they need to be implemented. Strategy implementation is usually considered after the strategy has been formulated (Hunger and Wheelen, 1998). Joels (1994) argued that the capability of the institutional framework is a major factor contributing to the effectiveness of a strategy. It is one of the main factors identified as an impediment to effective implementation (Milton-Smith et al., 1999). Institutions vary in nature according to the contingent circumstances of history, culture and structure (Joels, 1994). Strategy implementation is therefore concerned with efforts to build a more effective organisational or institutional framework.

Understanding strategy implementation is crucial, because the success of any organisation depends upon how well people work together to translate strategies into action. Pitt and Lei (1996) and Al Ghamdi (1998) take the view the strategy can be successfully implemented through assessing the capabilities of the organisational framework, identifying the required information, determining the best organisational structure and promoting the other sectors' commitment. The commitment of major groups is important, because people have continuing contact with the environment and development activities and they can provide useful ideas and comments for the strategy. Their direct contact with the environment gives them an edge in sensing whether the strategy is moving in the right direction (Pitt and Lei, 1996). This involvement and commitment should be developed and maintained through the implementation process (Alexander, 1989).

The implementation process can begin from the earliest stage of a strategy. Early implementation might be targeted to specific problems, which are disclosed during the definition of issues. The most difficult time for most strategies is when plans have to be turned into action. Many strategies have not made this transition. Carew-Reid et al. (1994: 128) suggested that, in order to maximise the chances of full and systematic implementation, strategy teams should emphasise the following (1)

continuing high-level political backing; (2) integration with recognised plans and procedures; (3) consistent and long-term sources of funds; (4) the capacity for action; (5) co-ordinating mechanisms; and (6) continuity.

A successful strategy process must address the practical requirements of implementation. According to ICLEI and IDRC (1996), the successful implementation of strategy requires two primary activities. First, the institutional structure must have specific responsibilities and capabilities for implementation. Second, local government must integrate the targets of the other sectors' involvement.

The major factors which could affect the implementation process are: tractability of the problem; lack of clarity of goals and objectives; lack of commitment of those responsible for implementation; inadequate access to information; inappropriate assumption; the dynamic of enforcement; and different styles due to cultural variations (Mitchell, 1997). Alexander (1989) suggested various implementation problems that may hinder implementation efforts:

- insufficient financial resources;
- unclear definitions of sector roles and responsibilities;
- ineffective organisational structure;
- inadequate co-operation; and
- insufficient incentives.

Lynch (1997) identified the following basic elements for achieving an effective implementation process: (1) identification of objectives; (2) formulation of plans; (3) resources of budget; and (4) monitoring and control. Communication is also needed throughout the implementation process to monitor what is happening, analyse how to deal with problems, and deciding what modification might be needed to promote successful strategy implementation (Alexander, 1989). It is essential for three reasons: (1) to ensure that everyone has understood; (2) to resolve any confusion; and (3) to ensure that the organisation is properly co-ordinated (Lynch, 1997).

Lynch (1997) argued that the following questions needed to be addressed to achieve effective implementation: (1) what activities need to be undertaken to achieve

implementation?; (2) what is the timescale needed to achieve effective implementation?; and (3) how will progress and performance be monitored and evaluated? But Peattie (1995) argued that effective implementation could be difficult to diagnose.

Many strategy researchers and writers (for example, Hunger and Wheelen, 1998, and Hofer and Schendel, 1978) have fully supported implementation as a separate stage after strategy formulation. This is also revealed in the previous example of models. Also, Peattie (1995) explained that the consideration of implementation after formulation, rather than before strategy formulation. But Lynch (1997) argued that it is important to view implementation as a series of small steps over time with feedback and it needs to be considered as an interrelated activity, not just as a single event.

It is important to define who will implement the strategy, who is responsible to review the progress of strategy implementation, and who will carry out the strategy plans (Lynch, 1997 and Hunger and Wheelen, 1998). Luffman (1996) believes that the successful implementation of any strategy will be dependent on the quality of the leadership. Bartelmus (1994) and IUCN (1994) provided a number of important instruments for implementing environmental objectives toward achieving sustainable development. These include:

- legislation, regulation and enforcement;
- science technology;
- institution building;
- data development and awareness building; and
- financing and budgeting.

3.6.3.1 Implementation Instruments

Bartelmus (1994), Carew-Reid et al. (1994) and ICLEI and IDRC (1996) suggested that environmental regulation and legislation, institutional framework and economic instruments are important for an effective implementation of the strategy.

Legislation and regulation instruments provide the immediate means for translating strategy policies, plans and programmes and standards and also help to review the existing policies. Environmental legislation is used to reduce environmental degradation or resources depletion (Carew-Reid et al., 1994). Legislation provides the immediate means of translating the environmental strategy policies, plans and programmes and also environmental standards. It also provides visibility to monitor the implementation of environmental polices, plans and programmes (Bartelmus, 1994).

Formulating new **institutional structures** in a new framework that facilitates co-operation and participation is required. It is important and essential that all sectors involved in the implementation process have clear roles and responsibilities (Carew-Reid et al., 1994). The Agenda 21, Chapter 23 calls on all local government to develop partnerships with major groups in the community.

An organisational structure is appropriate for efficient performance and its required tasks must be made effective by information systems and relationships permitting co-ordination of different activities (Mintzberg and Quinn, 1998).

Luffman (1996) identifies a number of principles that need to be met in order to ensure that the strategy objectives and goals are achieved. These principles are:

- organise an appropriate institutional structure;
- provide staff to fulfil the structure; and
- ensure that the structure is operating efficiently, which will require communication, co-ordination and negotiation skills.

Economic instruments are normally used to strengthen environmental protection. Fiorino (1995) explained that decision-makers become more interested in applying economic incentives as alternatives, because of the weakness of regulation to effect the behaviour of polluters. The use of economic instruments is also recommended in UNCED's Rio Declaration on Environment and Development. Principle 16 states:

> *"National authorities should endeavour to promote internalisation*
> *of environmental costs and the use of economic instruments, taking*

into account the approach that the polluter should, in principle,

bear the cost of pollution, with due regard to the public interest and

without distorting international trade and investment".

Richardson (1998) considers that the main advantages of economic instruments are that they: provide environmental protection at minimum cost; generate incentives for ongoing environmental improvement; and provide a source of governmental revenue. The main aims of economic incentives are to protect resources from pollution; to encourage the early adoption of pollution control equipment; and to raise revenue to compensate victims of pollution.

The main categories of economic incentives are (1) effluent charges designed to encourage polluters to achieve provisional effluent standards as soon as possible (Baumol and Oates, 1992); and (2) charges and taxes designed to enable a polluter to choose how to adjust to the environmental quality standard and enable industry to meet this standard in a cost-effective way; it also gives them an incentive to do better than the standard (Carew-Reid et al., 1994); and (3) emission charges designed to reduce the quantity of emission or to improve the quality of pollution, by making polluters pay at least part of the cost of the harm they do to the environment. It gives producers an incentive to develop and adopt newer and better pollution control technologies to bring down the charges they must pay (Hanley et al, 1997).

All the above environmental charges are used and designed to encourage producers to hold to environmental standards and regulations and to encourage producer behaviour toward more environmentally friendly inputs, processes and products (Haughton and Hunter, 1994).

3.6.3.2 Strategy Implementation Tools

Strategy tools are used to ensure effective implementation and monitoring of the progress towards achieving strategy objectives and goals. These tools help authorities and communities to organise themselves for the implementation of strategy. The use of these tools by local authorities in their day-to-day decision-making is the key to achieving increased environmental performance (PDoEP, 1997). Environmental tools include the following: Environmental Impact Assessment (EIA), Strategic

Environmental Assessment (SEA), Environmental Management Systems (EMS), and Sustainable Development Indicators (SDI).

1. Environmental Impact Assessment (EIA)

The term EIA originated in the USA and comes from s.102 (2)(c) of the National Environmental Policy Act 1969 (NEPA) (O'Riordan and Hey, 1976). It is usually a formal document and it may have one of a variety of names, but it is widely known as EIA, sometimes-called 'Environmental Assessment' or 'Environmental Appraisal'.

Welford (1994: 10) defined EIA as " *the strategy point for new development"*. It is a procedure for encouraging decision-makers to take account of the possible effects of development investment on the environment (DeWeerdt, et al., 1996).

Roberts (1995: 120) also defined EIA as:

> *a procedure for predicting, analysing and evaluating the impacts of*
> *a proposed action on the environment and ensuring that information*
> *regarding these impacts are taken into account in decision-making.*

Clark et al. (1980) and UNDP (1992) explained that the main objective of EIA is to provide decision-makers with an account and consideration of the implication of alternative courses of action before a decision is made. Roberts (1995) and UNDP (1992) argued that EIA is not always conducted to assess the environment impact of development projects. The process of EIA involves the collection of information on the environmental effects of a development (Cullingworth and Nadin, 1997).

EIA is used to assess the overall impact on the environment of development projects and to introduce effectively a systematic consideration of environmental issues into all important decision-making steps on development activities to achieve sustainable development (UNEP and EEU, 1996 and Moon, 1997). Elliott et al. (1996) and UNEP and EEU (1996) explained that the main role of EIA is to ensure that the environment is one of the factors considered in decision-making stages. McLaren (1996) argued that one of the main purposes of EIA is to predict the possible effects

of the development on the environment. UNDP (1992) provided more principles for developing an EIA, which are:

- focus on the main issues;
- involve the appropriate groups;
- provide information in a form useful to decision-makers; and
- present clear options for sound environmental management.

2. Strategic Environmental Assessment (SEA)

The consideration of the environmental impacts of policies, plans and programmes is known as strategic environmental assessment. SEA has been described as the application of environmental impact at the level of policies, plans and programmes. More specifically, Therivel et al. (1992) defined SEA as:

> *the formalised, systematic and comprehensive process of evaluating*
> *the environmental effects of a policy, plan or programme and its*
> *alternatives, including the preparation of a written report on the*
> *findings of that evaluation, and using the findings in publicly*
> *accountable decision-making.*

This tool requires government bodies to assess the impact of polices, plans and programmes, which influence the framework for future development and before development takes place (Sadgrove, 1997). SEA must be used as part of the policy process, for identifying and assessing environmental issues in the necessary circumstance of the formulation and implementation of policies, plans and programmes. There is no clear definition or guidance of SEA or on how it should be conducted (UNEP and EEU, 1996). It is a flexible tool, which can be applied to examine policy areas, such as energy policy, food security and air pollution, and is also used at different levels of decision-making (Hamblin, 1999). Therivel and Partidario (1996) showed that the SEA could play a significant role in enhancing the integration of environmental concerns in environmental policies and plan formulation.

SEA can increase the weight given to the environment in decision-making, increase consultation and participation on environment matters and establish principles for the development of projects (Wood, 1995) and help to integrate environmental consideration into policies (Sadgrove, 1997).

Wood and Djeddour (1992) argued that SEA has various benefits such as, encouraging the consideration of environmental objectives during activities; facilitating consultation and participation between government and other sectors; encouraging consideration of alternatives; and allowing analysis of the impacts of policies which were not implemented through projects.

3. Environmental Management Systems (EMS)

EMS is one of the strategy tools used to implement environmental strategy objectives and to facilitate the implementation of a strategy. It has been designed for use by both private sector and government. These systems establish the organisational structure, responsibilities and procedures that will consistently be used by the government to achieve environmental improvement through effective management (Quazi, 1999). It provides an organisation with a framework for improving environmental management practices and reducing its impact on the environment (WWF, 1993).

The EMS, such as British Standards Institute (BS7750), Eco-Management and Audit Scheme (EMAS) and also the International Standards Organisation (ISO14000), are different types of tool used to establish environmental management system. The ISO14000 is equivalent to EMAS and BS7750 but more user-friendly and easy to understand (Barrow, 1999). It is expected to have a significant impact on environmental performance (Hams, 1994). ISO 14000 was first discussed in 1991, and a comprehensive set of EMS standards was published in September 1996 (Switzer et al., 1999). These include ISO 14001 on EMS specification (is taking over from BS7750), ISO 14002 on EMS for small and medium sized companies, ISO 14004 on general EMS guidance, and ISO 14010-14014, which give guidance on environmental auditing and review (Roberts and Robinson, 1998). This series emerged from the UNCED held in Rio de Janeiro in 1992 and it consists of a set of standards and guidelines of EMS, environmental auditing, Life Cycle Analysis

(LCA), and environmental aspects in product analysis (Mohammed, 2000). This series aims to provide guidance for a comprehensive environmental management system and helps to integrate environmental consideration into the management structure (Quazi, 1999).

The world's first EMS was offered by BS7750 in 1992. It is derived from an earlier Management Quality System BS5750. It was revised in 1993 and 1994 to make it more compatible with the more recent EMAS. According to Barrow (1999) BS7750 is a means by which an organisation can establish an EMS. EMAS was launched in 1993 but it came into force in the UK in April 1995. It seeks to encourage organisations to improve their performance and approaches to environmental management. It is much broader in scope and stronger than BS7750 on environmental protection (Barrow, 1999).

4. Sustainable Development Indicators (SDI)

Chapter 40 of Agenda 21 calls on all countries to develop indicators of sustainable development and use them to develop environmental policy (UN, 1997). In particular paragraph (40.6) states:

> *countries at the national level and international government and non-governmental organisations at the international levels should develop the concept of indicators of sustainable development in order to identify such indicators.*

SDI is a tool used for assessing environmental performance and allows critical review of progress (Price and Robert, 1997). DoE (1996) used indicators as quantified information, which help to explain how things are changing over time. Pinfield (1996) believes that the SDI is not only a tool for policy-makers, but can be used to encourage community interest and involvement in sustainable development. McLaren (1996) explained that the SDI should be used to evaluate overall progress. According to Price and Robert (1997) the following factors should be taken into account when developing a set of indicators for local sustainability, SDI should be:

- representative
- scientifically appropriate and valid;
- simple and easy to interpret;
- sensitive to the changes in the environment;
- based on the available data;
- capable of being updated at regular intervals;
- able to show trends over time;
- able to give early warnings; and
- able to have guidelines against which to compare it.

3.6.4 Monitoring

Strategies need to be more than formulated and implemented; they need also to be monitored and controlled (Peattie, 1995). Monitoring is an integral part of the strategy and it can improve the strategy process. It can be used as an early warning system, to identify harmful trends before it is too late to take action (Glasson et al., 1994 and Bisset and Tomlinson, 1988), and to ensure that the work is done to the specified standard (Tuxworth, 1996). The strategy process must include this stage to monitor potential environmental changes and alert managers to developments that require modification or adjustment of goals, objectives and implementation practices (Pitt and Lei, 1996). The monitoring process is usually used to establish and find out what is happening and is concerned with the identification, measurement and recording of the impact of development (Selman, 1992).

Glasson et al., (1994) explained that the reasons for conducting monitoring are to: (1) assess the condition of the environment; (2) establish an environmental baseline; (3) determine the effectiveness of environmental regulation and standards; (4) educate and make the public aware of environment conditions; and (5) provide information for decision-making.

The strategy should include a monitoring programme, which has clear objectives, sufficient funds, clear responsibilities and regular reporting. It should also include strong co-operation between all participants in the strategy process. For example,

data and information collection could involve local authorities and community groups (Glasson et.al. 1994).

Without monitoring, it would be difficult to know whether environmental strategy policies, plans and programmes are moving towards the achievement of strategy goals and objectives. These finding should be discussed with the major groups in the community to identify the action needed to be taken (Coopers and Lybrand, 1991).

The establishment of procedures for documenting the implementation of the strategy can be used to make the reporting required under an internal management system more consistent and reliable. It should also be considered for the saving and benefits that it will provide as the plan is implemented, evaluated and revised in the years ahead (ICLEI and IDRC, 1996).

3.6.5 Evaluation

Evaluation is the process used to check performance results, after monitoring, so that the actual performance can be compared with the desired performance. The resulting information is used to take corrective action and to resolve problems. Backhard and Harris (1977: 86) defined evaluation as:

> *"a set of planned information gathering, and analysis activities undertaken to provide those responsible for the management of the change with a satisfactory assessment of the effects and/or progress of the change efforts"*

To achieve effective evaluation and control, the responsible authority must obtain clear information. By using this information, the authorities compare what is actually happening with what was originally planned in the formulation stage (Hunger and Wheelen, 1998). Luffman (1996) argued that it is difficult to determine strengths or weaknesses of strategy policies, plans and programmes unless they have been evaluated.

The strategy evaluation is used to focus on how the strategy is carried out, and what is actually happening in relation to what was supposed to happen. It should be

undertaken early, in order to create a baseline, and regularly, thereafter, as an integral part of the strategy (Carew-Reid et al., 1994).

The purposes of evaluation are to review the total system performance and monitor the effects of specific interventions (Backhard and Harris, 1977). It is also used to inform the public about progress in meeting specific targets and objectives. An effective evaluation and feedback procedure provides regular information to authorities and major groups about changes as they happen in the local environment and the progress towards goals and objectives to achieve sustainable development. It can be a very suitable tool to assess strategy performance (ICLEI and IDRC, 1996).

Evaluation helps to audit the strategy process and to make sure that the system of strategy formulation has produced policies, plans and programmes that will meet the needs of the organisation and its citizens (Dittrich, 1988). The strategy needs evaluation to inform top-management of how the process or system is performing and to determine whether or not objectives have been met (Baste and Eldredge, 1980). Hunger and Wheelen (1998) suggested a five-step feedback model for the evaluation and control process, which is shown in Figure 3.9.
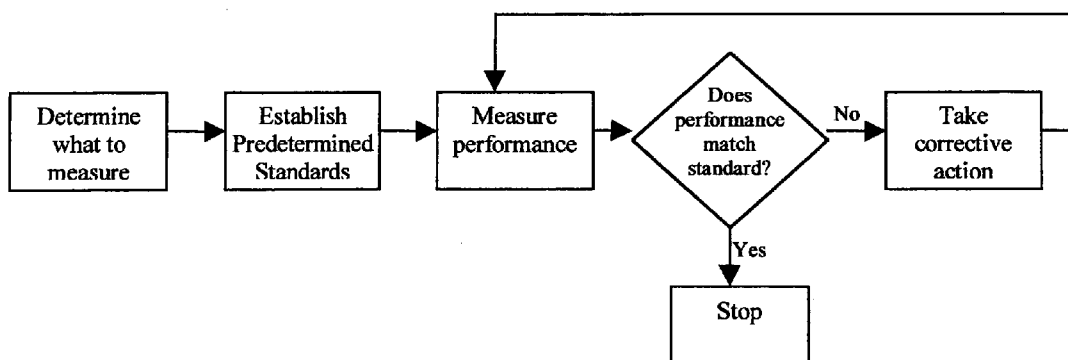
Figure 3.9   Evaluation and Control Process (Hunger and Wheelen, 1998)

3.6.6 Reporting and Feedback

Environmental review is used to assess the present environmental performance. It differs from environmental audit because it is a one-off exercise, whereas the audit cycle is periodic (Welford and Gouldson, 1993). Review should include the result of assessment and evaluation (Welford, 1998). According to Hutchinson and Hutchinson (1997), environmental review can provide a number of indicators to show improvement over time. It considers assessment of the current environmental performance. The major outcomes of the review process will be the development of an action plan (Welford, 1994).

The reporting system must address the performance of local government and the other sectors in achieving the strategy goals and objectives. There are two kinds of report. The first report is the performance report, which focuses on the actions taken to achieve the strategy goals and objectives. The second report is the progress report, which focuses on the authorities' and community progress towards becoming sustainable (ICLEI and IDRC, 1996).

3.6.7 Environmental Auditing

Environmental audit has become a major tool for environmental management (Sinclair-Desgagne and Gabel, 1997). It is used to compare and assess the actual outcomes with the predicted outcomes. Audit means mainly making an inventory of activities that are already going on (DeWeerdt, et al., 1996) and is described as an independent examination tool. Miller and Bailley (1989: 101) defined audit as:

> *"a methodical review and objective examination of an item, including the verification of specific information as determined by the auditor or as established by general practice"*

The aim of audit is to detect any problems with the strategy process at any early stage, in order to help to reduce and prevent risk of future problems (see Chapter Three). Welford and Gouldson (1993) and Welford (1994) explained that the key objectives of the environmental audit are:

- to advise authorities on environmental improvements it can make;

- to assess the impact on the local environment; and

- to identify and assess the authorities' risk resulting from environmental failure.

The result of an audit can be used for modifying and updating the strategy policies, plans and programmes. It is used to measure and evaluate the impact of each and every process of the strategy, to measure the strategy performance, to know where strategy stands. It also gives an indication of the effectiveness of the system and how it can be improved (Welford, 1998). Welford and Gouldson (1993) defined the overall aim of environmental auditing as providing ongoing status checks. The result of an audit should also allow the authorities to develop and modify the strategy for making required improvements that will minimise negative impacts to the environment (Kuher, 1996). Dunn (1991) suggested that auditing be intended to enable all major groups to access more heavily to the required the information. Environmental auditing is introduced as a management tool to help in strategy implementation (Shillito, 1994). Selman (1992) argued that this step must follow the monitoring process and it should be used to compare the actual outcomes with predicted outcomes.

Welford (1998) and Renger (1992) argued that the main objectives of environmental audit are to:

- identify problems;

- formulate environmental policy;

- measure environmental impact;

- measure performance;

- confirm environmental management system effectiveness;

- provide a database for corrective action and future plans; and

- develop the strategy and communication.

Selman (1992) believes that the audit process must follow the monitoring process, but it is argued that audit is a kind of evaluation which is used to assess, evaluate and review each stage and step of the strategy component. The evaluation is the process

done after monitoring to review the total system performance; this review helps to make sure that the strategy process meets the proposed objectives and targets.

There are two types of audit. The first is **Internal Auditing (IA)**, which is used to review how their existing procedures and practices might support or hinder the implementation. This review will provide a framework for introducing the strategy to all sectors in the community (ICLEI and IDRC, 1996). This type of audit has two main components: (1) a review of the activities of the authority, called a Policy Impact Assessment (PIA), (2) a review of procedures and structures, by which environmental policies are managed by an authority (Jacobs, 1992). IA can be undertaken by external consultants, or can be organised as a participatory process involving a local authority. This process will guarantee that the strategy is fully understood and discussed. ICLEI and IDRC (1996) provided two key elements of an effective auditing procedure, which are **audit criteria** and the **audit protocol**. The audit criteria are the measures against which performance will be measured. The criteria are defined by the person requesting the audit and should be communicated to the party being audited prior to beginning the audit. The criteria are defined to test the consistency of current government practices, procedures and policies with the goals, targets and action plans of the strategy. The audit protocol consists of a set of procedures that will be used by the auditor to determine performance relative to the criteria. By applying a clear audit protocol, a similar audit by different auditors should produce similar results.

The second type is the **External Audit (EA)** which is called the State of the Environment Report (SoE). SoE is used to provide information regarding the present condition of the environment, which can lead to better environmental policies and it provides basic data for the formulation of local authority policies.

Dunn (1995) has indicated that the environmental audit can be conducted to achieve and assess the following purposes: (1) regulatory complaints; (2) environmental risk; (3) improve manager performance; (4) identify cost saving potentials; and (5) improve major groups image. Renger (1992) argued that before starting any kind of environmental auditing process, in order to achieve an effective auditing, it is

necessary to determine and understand the scope and objectives of audit requiring strong co-operation between all sectors.

Selman (1992) described that the audit process must follow the monitoring process, but it is argued that the audit is a kind of evaluation which is used to assess, evaluate and review each stage and step of the strategy component. It is different from evaluation, because it is used to detect any problem at early stage for the process which is already going on. The evaluation is the process done after monitoring to review the total system performance; this review helps to make sure that the strategy process meets the proposed objectives and targets (see section 3.7.5).

3.7   NATIONAL SUSTAINABLE DEVELOPMENT STRATEGIES (NSDS)

NSDS and Plan (NSDP) are focal points for integrating the environment and development into decision-making and for defining and implementing sustainable development priorities. One of the problems is that both developed and developing countries have different experiences of environmental policy plans. These experiences were compared at a workshop in Ottawa (Canada) during 13-15 October 1993, organised as part of the follow-up activities of UNCED. Some of the main conclusions of this workshop are important for the NSDP. The following ideas emerged (Hens, 1996):

- National strategies for sustainable development will be different for each country since each country's social, political and cultural structures and aspirations are different and each country has different environmental and economic conditions; therefore, there can be no universal model;

- NSDP should be seen as an interactive process rather than a finite one; it should be designed to evolve constantly in response to changing circumstances and needs; and

- In order for NSDP to be effective, the planning process must be carried out with full local participation including the involvement of all sectors and organisations at all levels.

NSDS can be divided into two broad categories: those which address a particular sector or theme (such as plans for forestry, agriculture, tourism, biodiversity, global change, or combating desertification); and those which attempt a more comprehensive, multi-sectoral approach (conservation strategies, environmental action plans, green plans, or plans for sustainable development) (Hens, 1996 and Carew-Reid et al., 1994).

3.7.1   Comprehensive Strategies

National Conservation Strategies (NCSs). These were proposed and promoted by the WCS (IUCN et al., 1980), and are intended to provide a comprehensive, cross-sectoral analysis of conservation and resource management issues. They are used to identify the most urgent environmental problems and needs, stimulate national debate and raise public consciousness and build institutional capacity to handle complex environmental issues (World Bank and ESD, 1995).

National Environmental Action Plans (NEAPs). These are led and supported by the World Bank. NEAPs describe major environmental concerns, identify the causes of environmental problems and formulate policies and actions to deal with them (IBRD, 1993). The plans are intended to provide a framework for integrating environmental consideration into economic and social development programmes (IIED, 1993).

National Sustainable Development Strategies (NSDS). These were called for by Agenda 21. NSDS is a generic name for a participatory and cyclical process to achieve economic, ecological, and social objectives in a balanced and integrated manner. NSDSs may take many forms and build on the approaches briefly described above (World Bank and ESD, 1995).

3.7.2   Sectoral and Thematic Strategies

Tropical Forestry Action Plans (TFAPs). These are sponsored by FAO and promoted under the Tropical Forestry Action Program. They are undertaken by the country concerned, starting with a multi-sectoral review of forest-related issues and formulation of strategic plans that define national targets and actions regarding

afforestration and forest management, forest conservation and restoration and integration with other sectors (IIED, 1993 and Carew-Reid et al., 1994).

National Plans to Combat Desertification. These are sponsored by the Permanent Committee for Drought Control in the Sahel of Africa. These documents analyse the socio-economic and ecological situation, review current activities, and discuss policies and actions to combat drought for a number of Sahelian countries (World Bank and ESD, 1995). These plans are now being developed in response to the Global Climate Change and Biodiversity Conventions adopted by UNCED (Carew-Reid et al., 1994).

3.8   CONCLUSION

Designing an environmental strategy requires studying and reviewing different strategy models in order to understand the different views, strengths and weaknesses. In this chapter, the different strategy models were examined and discussed. This discussion and the examination of each model suggested that the strategy model should contain the following elements: collection of information and analysis, participation, institutional capability and structure, top-management support, and financial and administrative support. Also it is noted that some of the earlier models do not contain monitoring as a component, e.g. Andrews (1980), Mintzberg (1994), and Hunger and Wheleen (1998). This chapter also concludes that in order to achieve strategy objective and goals and to be successfully achieved, the strategy must involve a continuous and cyclic process and also take into consideration the importance of the participation of major groups such as NGOs, research institutions, and the private sector (see Sections 3.5.5, 3.6.2 and 3.6.3). The main components of the strategy are: preparation, formulation, implementation, monitoring and evaluation and feedback.

There are many types of environmental strategies, which could be built into national or local levels. The strategy requires the production of the state of the environment report (SoE) to review the condition of the environment by identifying the main environmental problems, their cause and defining environmental problem priorities. The main purpose of any strategy is to set environmental priorities for actions.

Depending on these priorities, the strategy objectives differ from one strategy to another, as will be considered in the next chapter.

The use of environmental tools are encouraged and used in different models and also encouraged by Agenda 21 (see section IV in Appendix B). These tools are used to implement strategy policies, plans and programmes. Beside environmental tools, there are legislative and regulatory, institutional framework and economic instruments. All these tools and instrument are used to achieve effective implementation of the strategy polices, plans and programmes. This stage is important and it should be considered as an interrelated activity not just a single event.

Monitoring is an integral part of the strategy process. It is used to improve the implementation of policies, plans and programmes and without monitoring, it would be difficult to know whiter the strategy is moving towards achieving its objectives. To know how the strategy was carried out and what actually is happening, it is important to evaluate the progress achieved in relation to what is supposed to happen. Reporting is critical to address the progress achieved. The environmental audit is also a vital step in the strategy process, which is used to review and check the activities that are already going on and the results are used to modify and update the strategy with information needed.

There are a number of factors, which may help the success of the strategy process. These factors are the participation and involvement of major groups in all the stages of the process; continuity of funding support; encourage awareness at all levels; top management support; co-ordination between authorities; international co-operation; technical support; capable institutions; able leadership; and immediate implementation. There are also a number of factors that may hinder the strategy, such as lack of support, lack of awareness, lack of participation, and inadequate access to information. These elements should be overcome when designing the environmental strategy model in order to achieve an appropriate and effective environmental strategy for the Emirate of Abu Dhabi.

CHAPTER FOUR

A REVIEW OF ENVIRONMENTAL STRATEGY EXPERIENCES IN SELECTED COUNTRIES

CHAPTER FOUR

A REVIEW OF ENVIRONMENTAL STRATEGY EXPERIENCES IN SELECTED COUNTRIES

4.1 INTRODUCTION

Many countries have prepared, or are currently formulating and adopting, national and local environmental strategies, such as the National Environmental Policy Plan for Netherlands; the National Conservation Strategy for Pakistan; the National Conservation Strategy for Zambia; and the National Environmental Action Plan for Yemen; The Environmental Profile of Egypt; Towards Sustainable Development in Germany; the United Kingdom Sustainable Development Strategy; the National Environmental Strategy for Jordan; and the National Environmental Strategy for Oman. All these different strategies have been reviewed by the researcher.

Some of these strategies have been linked closely to the principles and themes of Agenda 21 and most of them have taken UNCED as the framework for their strategy. In attempting to achieve sustainable development, it is necessary to explore how other countries have prepared, formulated, implemented and monitored their strategies.

For this research, the UK, Jordan and Oman strategies have been taken as examples of countries with different political, social, economic, demographic priorities and also at various stages of development. Due to the time and context of this research, it is neither necessary nor feasible to investigate every country. The selection of these countries is based on the following reasons. This review is better than the review of one country's experience: many researchers have examined the experience of one country only, such as Al-Attar (1997), Barrett (1997), and Silengo (1996) (see Chapter One).

The UK was chosen firstly because this research has been undertaken there and therefore data and information is easier to collect. Also, the UK was one of the first countries to industrialise, and it has a long experience of the problems that economic development can bring to the environment in terms of resource depletion, pollution, congestion and degradation of the urban and rural environment. To try to tackle these problems, the UK was the first to develop policies for restoring air, water quality and better land-use planning (HMG, 1994). The UK is one of the developed countries and it will be a useful example from which to learn some lessons, which should be taken into consideration in the proposed model. There is a similarity in the type of government levels, where the UAE has federal and local government levels like the UK, which has central and local government levels.

The other two examples are of developing countries similar to the United Arab Emirates (UAE); have a similar culture but different political, economic, social, and natural resource priorities. They are also at different stages of development. These two were chosen in order to understand the strengths and weakness of each strategy process to overcome any constraints. Both are amongst the first countries in the Middle East and Gulf region to develop and formulate an environmental strategy.

This examination will deal with the following strategy components (as identified in the previous chapter): preparation; formulation; implementation; and monitoring and evaluation. This will provide useful feedback about the importance of these components in the making of the strategy. It also improves the understanding of the problems faced at each stage of the strategy development. This information will minimise the risk of failure and reduce the mistakes and weaknesses in achieving the proper design of an environmental strategy for the Emirate of Abu Dhabi. Examination of such experience will enable the author to identify some of the key issues that need to be addressed when considering or developing the environmental strategy model for the Emirate of Abu Dhabi, which is the main objective of this research.

This chapter will discuss the role of the major groups and government authorities in the formulation and implementation of the strategy. This will introduce the role of international organisations in the strategy process.

Designing and formulating an environmental strategy and action plan in any country depends on its particular environmental circumstances and concerns. These circumstances and concerns differ from one country to another according to variations in the goals and objectives of the strategy and means successful implementation will not necessary follow. Most strategies, especially those of developing countries such as Jordan and Oman, suffer from a lack of public participation in decision-making, which makes the strategy objective more difficult to achieve.

Goals and objectives of the strategies differ from one country to another, depending on current environmental issues, the priority of environmental problems and concerns, priority actions, types of decision-making, institutional frameworks, geographic, economic, and social features which influence the strategy process. The UK sustainable development strategy is more developed and is expected to be different in scale, content and structure compared with other strategies. Table 4.1 compares of some geographic, economic, population, environmental issues and natural resources, to indicate the differences in order to improve an understanding of how these differences influence the environmental strategy process.

Studying the experience of three countries such as the UK, Oman and Jordan will provide an insight into different types of constraints in each country, which hinder the achievement of environmental strategy objectives and also to different factors that may help the strategy succeed. This kind of review suggests the need for a comprehensive approach to the environmental strategy model to overcome some or all of these constraints. Section 4.5 will provide a comparison and critical comments on the three selected strategies.

This chapter contains five sections. The First Section will cover the experience of UK in developing and formulating the UKSDS. Section Two and Three presents the Jordan and Oman environmental strategies. Section Four presents the comparisons between the three experiences. The lesson learned and features for success will be presented in Section Five.

Table 4.1   A Comparison of UAE, UK, Jordan and Oman (Geographic,
population, government and economic features).

	UAE	UK	JORDAN	OMAN
Location	Middle East	Western Europe	Middle East	Middle East
Natural resources	Petroleum, natural resources	Coal, petroleum, natural gas, tin, limestone, iron ore, salt, clay, chalk, gypsum, lead, silica	Phosphate, potash, shale oil	Petroleum, copper, asbestos, some marble, limestone, chromium, gypsum, natural gas
Land use (%)				
Arable land	0	25	4	2
Permanent crops	0	0	1	0
Permanent pastures	2	46	9	5
Forest and woodland	0	10	1	0
Other	98	19	85	93
Irrigated land (sq.km)	50	1080	630	580
Current environmental issues	Lack of natural fresh water resources being overcome by desalination plants, desertification, marine pollution	Sulphur dioxide emissions from power plants contribute to air pollution, river pollution, marine pollution, soil erosion and loss organic matter, increase in extraction of building materials etc.	Limited natural freshwater resources, deforestation, overgrazing, soil erosion, desertification	Rising soil salinity, marine pollution, very limited natural freshwater resources
Population (1999)	2,344,402	59,113,439	4,561,147	2,446,645
Population growth (%)	1.78	0.24	3.05	3.45
Government type	Federation with specific powers delegated to the federal government and other powers reserved to member emirates	Constitutional monarchy with parliamentary government, no written constitution, parliament is sovereign	Constitutional monarchy	Monarchy
GDP/capita ($)	17,400	21,200	3,500	7,900

Source: International and Pan-American Conventions, 2000

4.2   THE UNITED KINGDOM SUSTAINABLE DEVELOPMENT STRATEGY (UKSDS)

The United Kingdom Sustainable Development Strategy (UKSDS) was published in 1994 and represented the first national programme for sustainable development in the UK. The White Paper: *This Common Inheritance*, was the first comprehensive environmental policy for the UK; and the UK Sustainable Development Strategy, which guides the UK until 2012. The UKSDS was evolved from the following developments:

1. The UK was one of the first countries to respond to the Brundtland Report, and the concept of sustainable development in July 1988.

2. Its first response came in the form of "A Perspective by the United Kingdom on the Report of the World Commission on Environment and Development", and in 1989, the Government produced a progress report on implementing sustainable development. This report, *Sustaining Our Common Future*, produced by the Department of the Environment (DoE), was a first attempt to set out policy aims and measures for the UK, specifically directed towards achieving sustainable development. The ideas in this report were taken up in 1990 in the UK's first comprehensive strategy; the White Paper entitled *This Common Inheritance*.

This Common Inheritance (HMG, 1990) was produced in response to the rapid greening of UK politics in the late 1980s. It set out the UK's environmental strategy until the year 2000 (O'Riordan and Voisey, 1997). It contained over 350 detailed commitments to action on the environment (HMG, 1994). It also committed the government to a wide range of measures to protect and enhance the environment in every area of concern (Hams, 1994).

Since 1990, five reviews of the White Paper process have been produced. It was developed by the Department of Environment (DoE) in very close co-operation with two Inter-Ministerial Committees and both of them were headed by the Prime

Minister (including Trade and Industry, Energy, Transport and Agriculture) (Janicke and Jorgens, 1998). The White Paper introduced four main institutional innovations: Ministerial Committees, Green Ministers, Annual Department Reporting, and Guideline Documents.

Voisey and O'Riordan (1998) noted that the White Paper failed to address issues such as green taxation, the links between the environment, economic and social policies, and real institutional reform. Also, it did not represent a strategic assessment of the needs of future generations.

3. The Earth Summit and Agenda 21. The UK strategy responded to Agenda 21, by presenting a Report on the Strategy to the Commission of Sustainable Development (CSD). It also prepared a Climate Change Programme, Biodiversity Action Plan and a Forestry Programme.

The UKSDS was published in January 1994 (*Sustainable Development-The UK Strategy*). It was formed to meet the Government's commitment, made at Rio in 1992, to produce a national sustainable development strategy, in the period until the year 2012, as is called for by Agenda 21. It represented the first national programme for sustainable development in the UK and was submitted to CSD in 1994. It provides the framework for current legislation and polices (Hill, 1998). The strategy looks at the UK economy and environment as a whole. It also looks wider than the UK's national boundaries and begins to consider the effect the UK has on other countries and on the global environment, and the effect others have on the UK. This document looks at the subject from three perspectives: the state of the environment; economic development; and types of policy response. It is a governmental document, although it has been prepared in consultation with many individuals and organisations outside central government. The strategy also focused on new initiatives on demand management regarding water, energy, transport and minerals.

To take the strategy forward, the Government created new institutional machinery and new government bodies, including the Panel on Sustainable Development, the UK Round Table on Sustainable Development, and the Citizens Initiative or Going

for Green (Janicke and Jorgens, 1998 and Spedding, 1996). The UK Panel on Sustainable Development published two reports in 1995 and 1996. It is a small group of individuals, with wide knowledge and practical experience, who will advise the Government on strategic issues. The main tasks of this group is to provide warning and encouragement to the government about the direction of its sustainable development strategy (Spedding, 1996). It meets about four times a year and has access to all Ministers. Its terms of reference are: to keep in view general sustainability issues at home and abroad; to identify major problems and opportunities; to monitor progress; and, to consider priorities. Both reports have addressed a number of subjects, the initial being: environmental pricing and economic instruments; environmental education and training; the depletion of fish stocks; ozone depletion; technology transfer; reform of the Common Agriculture Policy; climate change; and transport (Voisy and O'Riordan, 1998 and HMG, 1994).

The Round Table meet four times a year and had its preparatory meeting on 23 January 1995. Its role is described as that of 'driving forward environmentally sustainable development'. Its main function is to oversee the initiatives taken by all sectors of the community (Spedding, 1996). The Round Table has the following aims:

- to develop new focus of consensus on difficult issues of sustainable development and where this is not possible;

- to inform and involve others, building wider support for an emerging consensus;

- to help identify the agenda and priorities for sustainable development;

- to provide advice and recommendations on action to achieve sustainable development; and

- to help evaluate progress towards objectives (DoE, 1995). It was also established to build a consensus about action necessary to achieve sustainable development (DPCSD, 1996).

In January 1996, it produced reports on the domestic energy market, freight transport, and environmental management and audit. Its membership includes

representatives of local and central government, non-governmental organisations, academia, the Church, trade unions, business, the medical and farming professions, and consumers. The Secretary of State for the Environment is the Government's representative and is co-chairman.

The main purpose of the Round Table is to encourage discussion on major issues of sustainable development between people from different positions and who have different responsibilities (HMG, 1994). Voisey and O'Riordan (1998) mentioned in their *'Sustainable Development in Western Europe'* that the Round Table is more transparent than the Panel, and is easier to monitor because it has more concrete objectives.

The third important implementation body is the Citizens Initiative, which has since been renamed 'Going for Green' (GFG). It was launched in 1995, with all sector support. Its aims are to identify and explain what individuals can do about sustainable development and to increase the interest of members of societies on the issue of sustainable development.

Designing and formulating the UK strategy involved the following steps:

4.2.1   Strategy Preparation

The collecting of information and data analysis is necessary to assess the current situation of the environment and to encourage awareness of different sectors in the community. Information was obtained from Government reports, research findings that used to prepare the state of the environment report.

The determination and preparation of this strategy was based on wide consultation including written submissions, seminars, and round table discussions. The Government invited over 100 bodies from local government, businesses, voluntary sectors, industry, researchers, and individual citizens to participate at seminars to discuss the different issues. Thus, all Government Departments, non-government organisations, businesses and individuals have been involved in the preparation stage. The Department of the Environment (DoE) prepared a draft framework for the

strategy and discussed it with a number of the above sectors. The participants were asked to look at the principles of sustainable development and the implications of the Earth Summit. This was prepared and published by the Green College Centre for Environmental Policy and Understanding.

The government also prepared a consultation paper giving more details about the strategy and setting out the main topics to be covered. Considering the national scale at which the strategy will be applied and the number of departments, organisations and other concerned sectors (see Table 4.1), it is more practical to consider two levels of sustainable development strategy. At the national level, the strategy is expected to be broad and present a general guide for sustainable development strategy at lower level. This is because it is difficult for a national strategy to be very specific on environmental, economic and social issues in every community in the UK. Local sustainable development strategies are expected to focus more on priority issues under the control of the local council. Local authorities are also expected, according to the strategy, to formulate a local sustainable development strategy (LA21) by which major issues of concern in each district are determined and tackled because they have more experience of dealing with the problems in their areas (see Section 4.1).

4.2.2 Strategy Formulation

The structure of the strategy is based on the current trends and emerging problems and examines the process of new arrangements for carrying sustainable development forward in different sectors of society. Also, based on the information and data, which was obtained and discussed in the consultation meetings and response and comments of the different bodies, the DoE published the UKSDS in 1994.

The UKSDS contains four sections. Section one considers the principles of sustainable development in the international and national context. It also provides background on the preparation of the strategy. Section two reviews the state of the environment and identifies key trends and likely pressure points over the next 20 years. It also reviews specific sectors of concern such as population, air, fresh water,

sea, soil, land uses, minerals, and wildlife and habitats. Section three discusses economic development and sustainability. It reviews the major sectors of the economy and identifies where the objectives of sustainability may require new policy developments in the years ahead, and also where the challenge of securing environmental improvements may provide market opportunities and growth points for particular sectors of the economy. These sectors are agriculture, forestry, mineral extraction, and energy. Section four discusses how action by central and local government, by business and industry, by voluntary bodies, and by individual people can best help. It addresses the question of putting sustainability into practice through central and local government, business and industry. It also looks at policy responses, and concludes with announcing proposals for new arrangements on 'working together' (HMG, 1994).

Based on the information presented, the UK government appears to have included principles on how to achieve sustainability but did not consider the resources or favourable and non-favourable conditions that might effect the strategy implementation. The implementation process is more applicable at the local level, where local authorities are more capable of determining their capabilities.

4.2.3   Strategy Implementation

For successful implementation, there needs to be effective action and co-operation between the concerned bodies, individuals and non-governmental organisations. The UKSDS encouraged all local authorities to implement a sustainable development strategy and to determine their priorities for implementation. It also encourages them to integrate environmental considerations properly into development plans. The document explained the role of each participant, such as the central and local government, NGOs, research institutions, individuals and public sectors. Local authorities developed their own policies and programme responses for many of the issues raised in Agenda 21 and launched their own LA21 initiative and promoted round table discussions of local problems and opportunities. Responsibility for co-ordination of the Local Agenda 21 initiative lies with the Local Government

Management Board (LGMB), under guidance from a steering group consisting of various stakeholders and interest groups. Local Agenda 21 involves all sectors of the community and it aims to develop local policies for sustainable development and building partnerships between local government and other sectors to implement them (DPCSD, 1996). The LGMB helps authorities in the UK to make the best use of Agenda 21 and it also forms LA21 programmes for UK (LGMB, 1992).

This discussion involved people from differing sectors of society having a wide range of knowledge and backgrounds and was chaired by the Secretary of State for the Environment. The meetings were held twice yearly.

Implementation can be aided by using the media to increase the interest of individuals in the issue of sustainable development, particularly, in the things people can do to change their lifestyles. The aim of this kind of participation is to increase peoples' awareness of the part that their personal choice can play in delivering sustainable development.

Figure 4.1 shows the mechanisms on preparation, formulation and implementation of the UKSDS and how it is related to other national and international organisations. It shows that local government is the key government authority, which should implement and practice the strategy activities. Sustainability is mainly rooted at the local level where local authorities are the ones who should act. They are responsible for the implementation of plans, consumption of resources and providing services (Bains, 1995). Local authorities, therefore, are considered to be the key government organisation who should practice more sustainable activities. This requires central government to recognise the critical role of local authorities in sustainable development. It requires the application of three key principles: flexibility, power and integrated environmental management system (LAA, 1994).

Local Government in UK has adopted the following tools to improve the implementation of strategy: state of the environment reporting, sustainable development indicators, resources accounting, strategic environmental assessment, environmental management system, investment appraisal, and environmental

information, education and training (Hams, 1994).

4.2.4   Monitoring and Evaluation

The main purpose of this stage is to review and update, in order to improve the strategy process and find alternative solutions for the problems. The UK government has carried out a review of the strategy and the DoE has published a guide to policy and the environment, which was designed to increase awareness within government. The DoE has committed itself to set up a working group to produce a preliminary set of national environmental indicators to monitor the effectiveness and progress of implementation strategy policies towards achieving sustainable development (Pinfield, 1996).

The government has published two reports reviewing progress and setting new targets to achieve sustainable development and to improve people's lifestyles. In 1995 the UK government produced a follow up report counting a number of actions taken by the government since the sustainable development strategy document was published. The major output of information regarding progress on sustainable development is mainly presented by the government.

Also ' Green Ministers' have been established inside all government departments, and all departments are required to dedicate a chapter of their yearly reports about environmental matters within their areas of concern (Janicke and Jorgens, 1998). It co-ordinates with government departments to make sure that environmental consideration is integrated into the strategy and policies of their own departments (DPCSD, 1996). There is a yearly report on the strategy implementation progress. In May 1999, the UK government published a "Better Quality Of Life in the UK" which is used to measure the progress for sustainable development (DETR, 2000).

To ensure that sustainable development strategy is being implemented according to the objectives of the strategy it is necessary to try to measure what progress is being made. The UK sustainability indicator project was commissioned by the Local Government Board to develop a framework for measuring sustainability at a local

level using specific indicators.
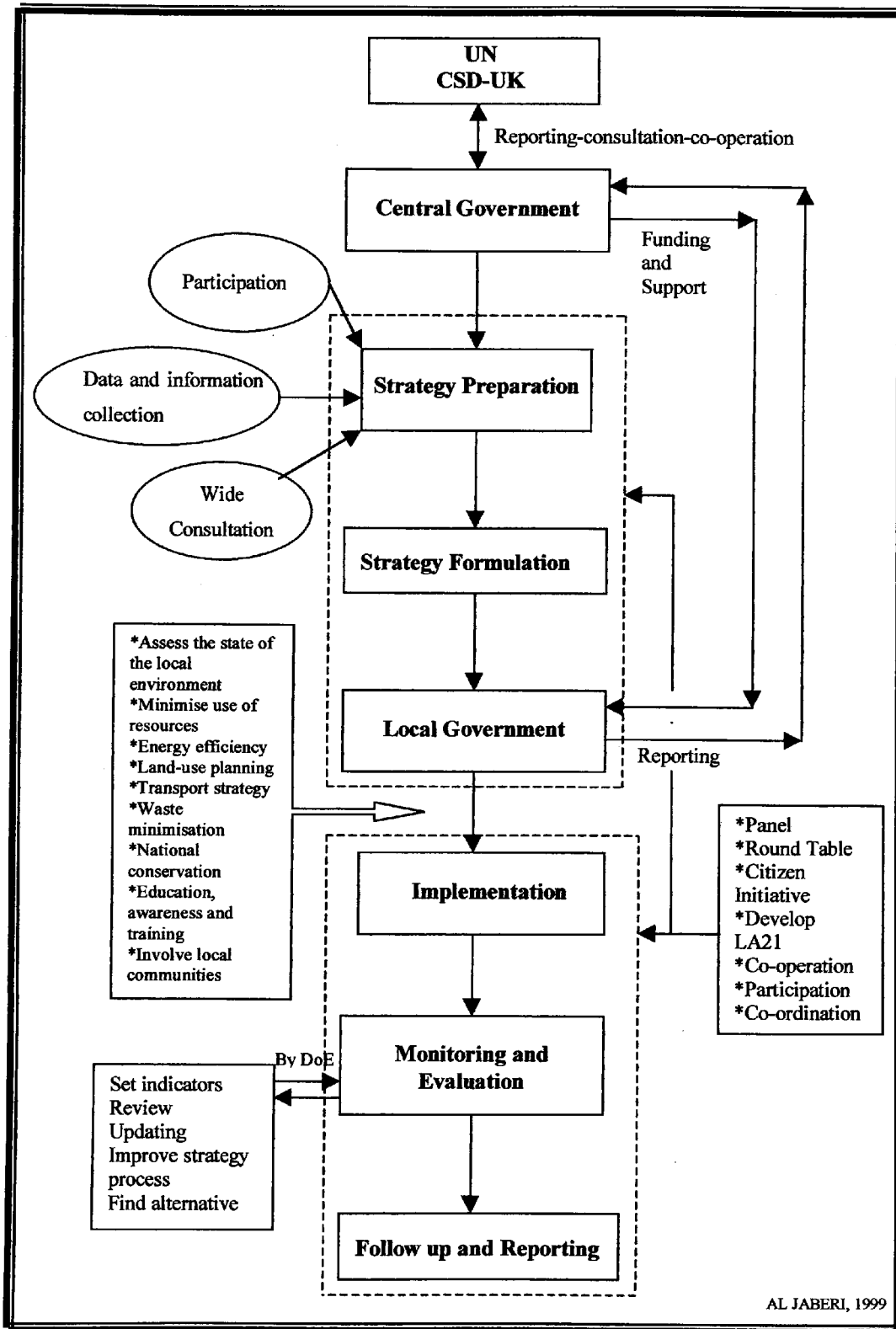
Figure 4.1   UK Sustainable Development Strategy Mechanisms

4.3   THE NATIONAL ENVIRONMENTAL STRATEGY FOR JORDAN (NESJ)

The practical objective of the NESJ is to ensure that future generations are not overburdened with the environmental debt of the present generation's actions.

4.3.1   Strategy Preparation

In 1985 the Prime Minister convened a committee, including members of various ministries and official agencies, to prepare an environmental protection strategy for Jordan. In 1988, the Council of Ministers formed a steering committee to initiate the strategy process. This committee was charged with drawing up environmental policies, facilitating and reviewing the progress of work, and consulting with the various sectors involved in environmental affairs. In addition, in the same year, an agreement for producing the strategy was signed between the government and the IUCN to provide technical assistance in order to prepare a strategy within the framework of the WCS. The United States Agency for International Development (USAID) agreed to fund this project (MMR, 1991). This document was complied by a team of 180 Jordanian specialists.

4.3.2   Strategy Formulation

The strategy, which the Government of Jordan officially approved in 1991, generated substantial information on Jordan's natural and socio-economic environment. It contains over 400 specific recommendations and suggested actions in the field of environmental protection and conservation. The process of drawing the strategy involved sustained and focused co-operation among scores of people, from the public and private sectors, universities, NGOs, research institutions and international organisations, all of whom worked closely together to achieve the aims and objectives of the strategy.

The NESJ consists of twelve sections (MMR, 1991). It is starts with an executive brief. This brief introduction illustrates that all sectors consider the issues of water and maintaining agricultural productivity the priority of action. Chapter One provides

a brief overview of Jordan's geography and landscapes. Chapters Two to Eleven cover the following: agriculture and lands, surface and groundwater, wildlife and habitat, coastal and marine, energy and mineral resources, population, housing and settlements, environmental health, atmosphere and air quality, antiquities and cultural resources and legal initiatives for the strategy. The last chapter, Chapter Twelve reviews existing legislative recommendations developed by the sectoral working groups (MMR, 1991). Each chapter in NESJ presents a detailed description of environmental conditions, identifies outstanding issues and suggests policies and action for the future.

4.3.3 Strategy Implementation

The NESJ puts combined efforts and actions into practice for different authorities and groups such as government authorities, NGOs, private sectors, communities and individuals. The strategy is considered as the main source of environmental information because it is based on the state of the environment report, which includes the current situation of environment. Planners used this information to develop environmental action plans. To achieve that, environmental legislation was formulated in 1995 and contains the basic principles for the legal framework of environmental management, but it does not contain any specific standards or regulation for implementation. The NESJ includes recommendations for strengthening environmental protection in four strategic areas (McEachern, 1991):

1. establishing a legislation framework for environmental management;

2. creating new and upgrading existing protection areas;

3. instilling environmental awareness among the public; and

4. strengthening environmental institutions.

In 1996, the Ministry of Planning prepared the National Environment Action Plan (NEAP) in co-operation with The World Bank, which provided the technical assistance and was funded by Japanese International Co-operation Establishment.

Before the final form of NEAP was prepared and published the government organised workshops to discuss it with all government and non-government organisations and based on their outcome and comments the final form of the document was prepared. NEAP includes four main parts. Part One identifies the main human and financial resources, followed by defining the main causes of environmental problems such as population growth, poverty and rapid economic growth. The second part of the document illustrates the main environmental subjects facing the country such as water resources, soil resources and urbanisation. The third part is concerned will legislation and the institutional situation. The final part, Part Four, provides the possible achievable solution for environmental problems (MP, 1996).
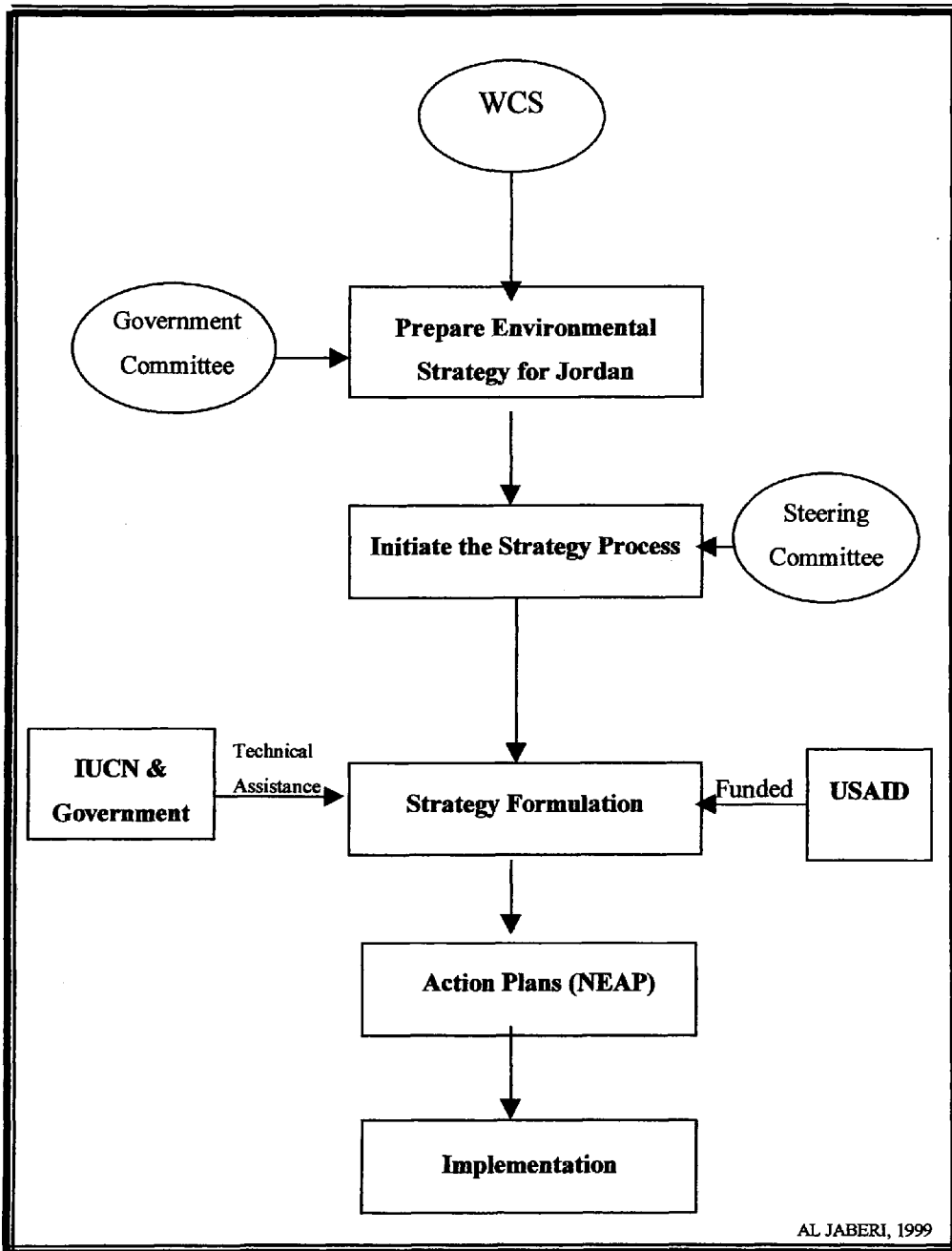
Figure 4.2   National Environmental Strategy for Jordan.

4.4   THE NATIONAL ENVIRONMENTAL STRATEGY FOR OMAN (NESO)

The National Environmental Strategy for Oman (Final Draft) focuses on the following main subjects (1) nature conservation; (2) environment protection; and (3) the relationship between environment, economic and social aspects. It considers and depends on the analysis of the natural resources and consumption monitoring (MME, 1993).

The strategy highlights the importance of co-operation and co-ordination between all sectors, because it covers all aspects related to human life (economic, social, and services). This fact appears in each stage of the strategy.

4.4.1   Strategy Preparation

The first step involved the collection of data and information required for strategy preparation. The government invited all sectors to participate in this stage; the main purpose of this participation was to increase awareness and realisation, especially at the official level. The sources and references used at this stage were taken from government documents, regional and international studies and documents, from overseas visits and meetings, questionnaire results, field interviews, and from meeting and conference discussions and recommendations.

4.4.2   Strategy Formulation

The strategy contains three volumes. Volume One entitled 'Fundamental Document', consists of an analytical review of the following: (1) the natural, human, economic and resources; (2) the development aspect; and (3) the state of the environment. It also covers the elements and instruments that are used to maintain, manage and save the resources. Volume One also contains the theoretical framework, general ethics and the strategy aims and concepts.

Volume Two covers the elaborate review and assessment of natural resources. It monitors the growth rates and development in different sectors, and the quantitative

and qualitative levels of resources. It contains a detailed calculation of resources.

Volume Three illustrates the environmental action plans and programmes to implement the national environmental strategy through sectoral projects and programmes.

4.4.3   Strategy Implementation

The implementation of the strategy depends on the following components:

- demonstration of institutional requirements and co-ordination: by reconstructing the current environmental institutions, identifying responsibility for each department and agency, identifying institutional requirements and co-ordination instruments, employment and environmental training;

- environmental legislation: by evaluating the current environmental regulations;

- technical and financial support: by increasing the regional and international technical co-operation, by providing new fund sources for strategy implementation programmes and projects and providing technical and co-operation requirements to implement the strategy;

- setting the number of national and sectoral policies such as population policies, economic, natural resources, water, industrial, tourism, energy use, health, and regional and international co-ordination policies; and

- action plans priorities: this is about 65 projects and programmes, which are distributed in ten main sectors: agriculture, fish, water resources, industrial and minerals, environment protection, water and electricity, urban planning, academic research, human health and environmental security.

In order to achieve successful implementation of action plans, the following requirements should be set out:

1. Accept the sectoral integration principle and encourage higher government level co-ordination;

2. Effective participation of all sectors;

3. Government should give the strategy priority in implementing its programmes and projects; and

4. Encourage external endorsement.

4.4.4   Monitoring and Evaluation

The Oman strategy sets out a number of environmental indicators, which help in monitoring, evaluating and following up the progress of the strategy implementation. These indicators are:

1. Approval of the strategy document.

2. Establishment of a higher environmental committee, which will be responsible for co-ordination and follow up procedures at political levels.

3. Approval of legislation framework.

4. Application of the proposed environmental strategy policies and programmes.

5. Continuation of the government endorsement, to enable government authorities and agencies to their responsibilities in an appropriate way.

6. Establishment of arrangement procedures in administration departments and institutions, and the identification of their responsibilities and duties.
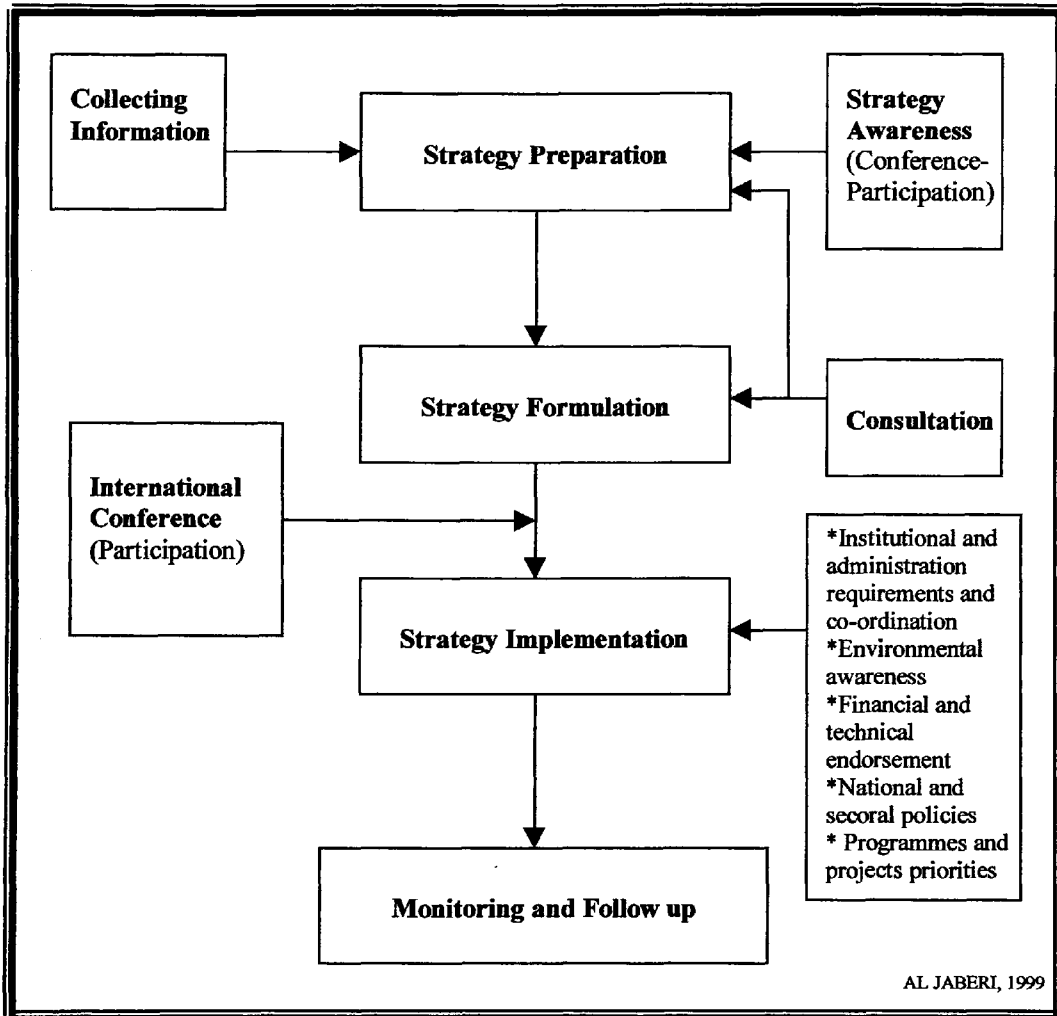
Figure 4.3   National Environmental Strategy for Oman.

4.5   COMPARISON BETWEEN THE THREE EXPERIENCES

The experiences in developing and formulating environmental strategies in the UK, Jordan and Oman have been discussed in the previous sections. According to the literature review on environmental strategies and types of models (Chapter Three), these examples will be examined and evaluated in this section based on the strategy components: preparation, formulation, implementation and monitoring and evaluation. Table 4.2 presents the summary of the comparisons between the three experiences. The indicators used in this table are based on the information presented in Chapter Three and Agenda 21 (Appendix B). The following are the main findings from this comparison.

Preparation

All three examples prepared a State of the Environment Report (SoE) which contains the current environmental information and data as a base to formulate a successful and achievable strategy. The UK approach was more consultative, however, involving local and central government and the other major groups such as individuals, business, industry, researcher and NGOs. It illustrates the benefits of activities that maintain public and political support throughout the strategy process. The government prepared a consultation paper giving more details of the strategy and setting out the main topics to discuss in the seminar in order to achieve effective participation. Also, the draft of the document was discussed with a number of the major groups such as NGOs, industry, business, researchers, and local government.

In the Jordan strategy, the government involved members of various government authorities and official agencies to prepare an environmental strategy. But in the Oman strategy, the government invited all sectors to participate in this stage. The main reasons for participation, especially at this stage of strategy, is to increase awareness at all levels and to integrate decision-makers to take into account the environmental considerations in all development projects. The three examples used different techniques, such as media, seminars, and meetings to achieve effective participation of these groups and sectors. In the UK this consultation involved a

large number of people. For example, approximately 100 organisations took part in a series of meetings during the strategy formulation phase.

Table 4.2   Comparison between the three examples of Environmental Strategy.

Strategy Processes	Indicators	UKS	NESJ	NESO
1. Strategy Preparation	Strategy Awareness	✓	✓	✓
	Participation	✓	✓	✓
	Collection Data and Information	✓	✓	✓
	Co-operation	✓	✓	✓
	International and Regional Co-ordination	✓	✓	✓
	Conferences/seminars/ workshops	✓	✓	✓
	State of the environment report	✓	✓	✓
	Identify environmental problems	✓	✓	✓
	Defining environmental priorities	✓	✓	✓
	Consultation	✓	✗	✓
	Resource Accounting	✓	✓	✓
2. Strategy Formulation	Government committee	✓	✓	✓
	Funding	✓	✓	✓
	Technical assistance	✗	✓	✓
3. Implementation	Legislation instrument	✓	✓	✓
	Institutional framework	✓	✓	✓
	Economic instruments	✓	✗	✗
	Environmental tools	✓	✗	✗
4. Monitoring and Evaluation	Set monitoring indicators	✓	✗	✓
	Reviewing	✓	✗	✗
	Updating	✓	✗	✗
	Improving strategy process	✓	✗	✗
	Solution alternatives	✓	✗	✓
	Follow up	✓	✗	✗
	Reporting	✓	✗	✗
5. Strategy Tools	Sustainable development indicators (SDI)	✓	✗	✗
	Environmental Impact Assessment (EIA)	✓	✗	✓
	Environmental Strategy Management (ESM)	✓	✗	✗
	Land Use Planning (LUP)	✓	✗	✗
	Strategic Environmental Assessment (SEA)	✓	✗	✗
	Environment Information, education and training	✓	✓	✓
Framework Guide	Agenda 21	✓	✓	✓
	IUCN	✓	✗	✓
	WCS	✓	✓	✗

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Formulation

All three countries established a governmental body with independent financial and administrative resources to prepare the strategy documents and discuss with different sectors. In the UK the Department of Environment (DoE) took responsibility and in both Jordan and Oman a steering committee was set up. These bodies were charged also to review the progress of the strategy and work as a consulting body to advise various sectors involved in environmental affairs. The structure of the strategy was based on the current trends in the environment. It was also based on the information obtained in the consultation meeting (UK) or seminar discussions (Jordan and Oman). Oman and Jordan's experience provides examples of the importance of co-operation with international organisations, as is recommended by Agenda 21 (see Chapter Two). This kind of co-operation is important because of the shortage of trained staff and qualified experts.

In Jordan, the preparation of the strategy document took many years without commensurate results, with only two environmental strategy documents prepared from 1985 to 1992. This seemed to be partly the result of a preoccupation with producing documentation rather than implementation of the strategy.

Implementation

The UK strategy explained the role of each participant, such as central and local governments, NGOs, research institutions, individuals and public sectors. It encourages them to determine their priorities for implementation and to develop their own local strategies and policies. It also showed that the implementation of the strategy is more applicable at a local level, where local government is more capable of determining and monitoring the implementation process.

The previous review shows that, for effective implementation of strategy policies, plans and programmes, the Government such as UK and Oman (see sections 4.2 and 4.4) adopted and used the following tools and instruments to improve the implementation. The SoE report, Sustainable Development Indicators (SDI),

resource accounting, Environmental Impact Assessment (EIA), Environmental Management System (EMS), and environmental information. The Oman strategy indicated the importance of defining institutional requirements (financial and administrative), providing a clear and strong co-ordination system between concerned authorities, reviewing the current environmental regulation, and finally providing additional sources of funds.

Jordan did not describe how the strategy policies, plans and programmes were to be implemented and monitored; and the responsibilities of authorities were also not clear. It failed to implement the strategy polices, plans and programmes because it depended on external funds which were limited to covering all stages. According to Carew-Reid et al. (1994), most of the donors are not maintaining a long-term support for all the strategy components. When a donor removes his support, key components of a strategy may be at risk, especially when the implementation step begins. Jordan and Oman are examples of environmental strategies that were not successfully implemented for various reasons. These include lack of economic and human resources and the lack of government support.

Monitoring and Evaluation

The UK strategy is the most advanced of the strategies in terms of monitoring and evaluation. It provided a list of environmental indicators to monitor the effectiveness of strategy policies, plans and programmes and it also helps to produce progress and performance reports. The UK government established a unit in each Department to make sure that environmental considerations are integrated in their actions. In addition, the UK carried out a review of the strategy and published a guide to increase awareness within government. Oman also provided a set of indicators to monitor and evaluate the progress made in implementing the strategy policies, plans and programmes. It also indicated the importance of continuous funding by the government to enable each authority to achieve and implement their plans and programmes and to achieve their roles. The Jordan strategy did not demonstrate the need for monitoring and evaluation because the implementation of the strategy policies, plans and programmes was not achieved and also because of the lack of

financial and administrative support.

Review

The UK government publishes two kinds of reports. The first is the progress report to review progress and to set new targets to achieve sustainable development and to improve people's awareness. The second type of report is the follow up report to review the actions taken by the government since the document was first published. Each authority is required to dedicate a chapter of their yearly reports on environmental matters within their areas of concern.

The UK strategy creates a new institutional machinery and new bodies to take forward the strategy, including the Panel on Sustainable Development (to advise and encourage government about the direction of strategy), the Round Table on Sustainable Development (to identify priorities, and evaluate progress towards objectives) and the Citizen Initiative (to increase the interest of individuals and awareness).

The UK strategy highlights the most important issue, which is the integration of environmental considerations into economic and social policies and development strategy. The strategy encourages all local authorities to formulate their own local strategies (LA21) to focus more on priority issues under their control, since they have more experience of problems in their areas (see section 4.2.1).

4.6 LESSONS AND FEATURES FOR SUCCESS

The three examples of experiences have been reviewed and evaluated in the previous section. This examination and evaluation revealed that there are similarities and differences in some strategy components. The major difference is in the implementation, monitoring and evaluation processes and the level of the major groups' participation. This is based on the government culture, the awareness of policy makers, the main purpose of formulating strategy, the level of major groups participation, financial sources, institutional capacity, government support, types of

environmental problems and the availability of information and data. The investigation of these features has been discussed in Section 4.5.

The three experiences are good examples of government support, where all were successfully approved by government. In the UK for example, there was consistent support from the Prime Minister. The Jordan and Oman strategies were supported by the government only in the early stages of preparation and formulation. This was due to the lack of political and public awareness and also the lack of financial and administrative support to the importance of implementation and monitoring of the strategy. This level of support gives the strategy an endorsement for the implementation of its proposed policies, plans and programmes. The high level of support should be based on an understanding of the strategy process by integrating environmental considerations into the decision-making process and in any development projects. The UK strategy is good example to follow in integrating environmental considerations into economic and social policies and development strategy. According to Carew-Reid et al. (1994) support must be based on an understanding of the strategy process and its cost.

Participation in the decision-making process and in all strategy processes and stages is encouraged by identifying the role of each sector, where participation is important to the success of the strategy (Welford, 1998). In the UK, participation has occurred to varying degrees in information generation, preparation, formulation, and implementation and monitoring and evaluation. This increases environmental awareness at all levels and encourages the exchange of information.

The comparison shows that the establishment of an independent body is critical to prepare and review the progress of the strategy and also to work as a consulting body to advise various sectors involved in environmental strategy activities. It also provides overall direction for the strategy (Carew-Reid et al., 1994). All strategies reviewed in this chapter established their own independent body in the preparation stage.

Significant co-ordination amongst environmental institutions is vital to integrate development and effective environmental strategy, including the formulation of a strong institutional framework and the establishment of an inter-governmental co-ordination unit or machinery to make sure that environmental considerations are integrated activities and plans. The comparison between the three countries' experiences showed how the Jordan and Oman strategies co-operate with international organisation to provide technical assistance, particularly in the preparation and formulation stages.

The cultural context of government regarding the environment is also critical to the success of an environmental strategy. For instance, in both Jordan and Oman, the environmental strategies partly failed because the decision-makers failed to involve the participation of major groups in all the strategy processes. The shortage of staff in the field of the environment was also identified as a factor hindering the success of the strategy process. This occurred in both the Oman and Jordan strategies. It can also be argued that the use of technical assistance by international organisations is a possible indicator of the shortage of locally qualified and expert staff.

Strategy polices, plans and programmes should be flexible (see Chapter Three) and they needs to be focussed on a wider environmental strategy rather than just trying to control small scale development in isolation. Implementation is the process used to translate strategy policies, plans and programmes into action (Chapter Three). To achieve successful implementation, the investigation showed that it is important to identify and explain the role of participants in the strategy process and encourage them to determine their priorities for implementation. Also, the use of environmental tools such as EIA, SEA, EMS and SDI is critical in achieving effective implementation and increasing environmental performance (PDoEP, 1997). In order to achieve successful implementation, the investigation revealed the importance of defining institutional responsibilities and requirements; providing adequate financial resources; and providing strong co-ordination between all participants.

The failure of an environmental strategy to achieve its objectives is noted in both Jordan and Oman. For example, Jordan failed to implement strategy policies, plans and programmes on an effective scale, because of lack of government support and awareness and also over dependence on external funding. To maximise the chances of achieving full implementation, the strategy should emphasise the continuous high level support, long-term source of funding, and co-ordinating mechanisms (Carew-Reid et al., 1994). Bartelmus (1994) believes that formulating environmental regulation provides the immediate means of translating into actions the strategy policies, plans and programmes and the ability to monitor the implementation of these activities.

The comparisons also revealed that monitoring and evaluation are important to review the progress and performance achieved. They are used to improve the strategy process (Glasson et al., 1994). Strategies such as the UK's and Oman's provided a set of environmental indicators used to help in monitoring. Without this, it is difficult to know whether the strategy processes are moving towards the achievement of strategy objectives (Coopers and Lybrand, 1991). The UK strategy shows the importance of producing progress and performance reports to review and evaluate the strategy progress and to improve decision-making and public awareness. The follow up report is vital to review the action taken by the government since the strategy was formulated. This review is needed to provide a number of indicators to show improvement over time (Hutchinson and Hutchinson, 1997). The provision of financial resources is also essential to achieve effective monitoring and evaluation of strategy progress and to guarantee the continuity of producing different reports.

According to Janicke and Jorgens (1998) the strategy should take the following elements into consideration, to achieve an effective strategy process: sustainability should be the backbone of the strategy; clear targets and timetables; appropriate policy and incentives; streamlined institutional framework; and close monitoring of performance capacity.

Based on the existing review of these experiences, some essential elements and characteristics of the environmental strategy process can now be identified:

- strong government leadership;

- participation between government and other sectors in the community;

- structured public participation and consultation;

- inter-governmental co-operation and co-ordination;

- collection of systematic baseline information;

- integration of environmental considerations into economic and social policies and development strategy;

- sustainability is the backbone of the strategy;

- clear targets and timetables;

- appropriate policy and incentives;

- streamlined institutional framework;

- availability of various resources;

- close monitoring of performance capacity; and

- suitable to local conditions; and dynamic updating.

Also from the review it is clear that the development of an environmental strategy process could be hindered by a number of factors. Oman is strategy, for example, faced the problems of a shortage of up-to-date information and data regarding the current environmental situation. The variation of information and statistical data between relevant departments is one of the factors that may hinder the development of any environmental strategy.

Experience also shows that not all strategies have been successful for various reasons such as, the lack of decision-makers' understanding; lack of adequate financial resources; lack of sufficient skills and manpower; and lack of government support. In general, all obstacles and constraints must be overcome in order to achieve an

effective strategy process.

To conclude, the three selected experiences are facing the main burden of implementing and monitoring sustainable development in their country. They are also responsible for improving and integrating the various planning and monitoring tools in the strategy process. The role of the government is to support and generate general guidance. In the Emirate of Abu Dhabi, a strategy will need to be specific in determining the issues that require to be tackled, the means of implementing its objectives and monitoring progress. ˙The government is also responsible for determining the roles of sectors. Therefore the scope of the proposed strategy is broader in the sustainability issues covered and more specific in its objectives than the UKSDS.

In summary, according to the review of the three selected experiences presented and evaluated in the previous sections, the following lessons are concluded which will be taken into consideration when designing and developing an environmental strategy model for the Emirate of Abu Dhabi in Chapter Six. This model could be used as a framework and adopted elsewhere but the detailed methods will be vary from one country to another. In this particular case, it is applicable to the Emirate of Abu Dhabi.

• The strategy cannot be effectively implemented unless priority action is defined.

• The participation of major groups is critical for a successful strategy.

• Attention should be given to reviewing and updating the information base.

• The strategy cannot be developed and formulated by government alone.

• The environmental strategy has a better chance of being successfully implemented when there has been a wide range of participation from the major groups.

• The function of relevant authorities must be clearly defined.

- Strong and clear co-ordination and co-operation systems between all sectors must be provided.

- Action plans must specify priorities, responsibilities and budgeting requirements.

- The development of an environmental strategy should be integrated with economic planning.

- The implementation of strategy policies, plans and programmes should being during the strategy formulation stage.

- Adequate financial resources and funds must be available for all strategy processes activities, either from government or from external sources.

- There is a need for an effective communication system to transfer information between all sectors.

4.7 CONCLUSION

The review of different countries' experiences in developing and formulating an environmental strategy has been provided in this chapter to find out how environmental strategies has been carried out and developed elsewhere. Based on the reasons described in section one, the UK, Jordan and Oman strategies were selected as examples of other countries' experiences in developing and formulating an environmental strategy for sustainable development.

The comparison between the three selected experiences have been examined and evaluated. The main purpose of this comparison was to improve an understanding of the problems faced at each stage of the strategy so as to minimise the risk of failure and reduce the mistakes and weaknesses in achieving the proper design of an environmental strategy model of the Emirate of Abu Dhabi. The comparison provided an insight into different types of constraints in each country, which hindered the achievement of some strategy stages. The lessons learned from the comparisons of the three selected experiences suggested the need to overcome some

or all of these constraints.

It can be concluded that as anticipated, circumstances differ from one country to another but nevertheless the development of environmental strategy components are the same. These components are preparation, formulation, implementation, monitoring and evaluation and review. This review can make any environmental strategy model difficult to adopt universally (see Section 4.1).

This chapter has indicated that participation of major groups, co-ordination amongst government authorities, consultation, the SoE report, co-operation with international organisations, institutional structure and capacity, financial resources, environmental indicators and environmental tools are critical and key elements in achieving an effective and successful strategy process.

CHAPTER FIVE

IDENTIFYING ENVIRONMENTAL PROBLEMS AND PRIORITIES: STATE OF THE ENVIRONMENT REPORT FOR THE EMIRATE OF ABU DHABI

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IDENTIFYING ENVIRONMENTAL PROBLEMS AND PRIORITIES: STATE OF THE ENVIRONMENT REPORT FOR THE EMIRATE OF ABU DHABI

5.1   INTRODUCTION

The reviews of Agenda 21 (Chapters Two and Three) and the experiences of other countries   (examined in the previous chapter) has indicated the importance of building a strategy upon strong and clear environmental information, which can be achieved through establishing the State of the Environment Report (SoE). This will act as a cornerstone for developing and formulating any environmental strategy, as shown in the previous chapter.

This research applies to Abu Dhabi Emirate and the following information and data are needed to describe the current situation of the Emirate's environment. It will also provide a background to the Emirate (see section 5.2). This is a necessary step to provide the reader with the context of the study. The provision of the following information is required to prepare a Local Agenda 21 for the Emirate of Abu Dhabi. Chapter 28 of Agenda 21 contains a direct call to all local governments to create and prepare their LA21.

As described in Chapter Two, sustainable development tries to balance the overlapping considerations of resource and economic development and environmental protection. Agenda 21 establishes the importance of taking environmental priorities into consideration, so that the programmes of Agenda 21 can be applied in the appropriate way. This chapter contains nine sections, and the divisions are based on the Agenda 21 document and its contents. Section Two of this chapter provides a background to the Emirate of Abu Dhabi. It describes the Emirate's location, climate, landforms and soils, and government structure. Section Three provides information about the social dimensions in the Emirate, which includes social security, health, education and human settlement. Section Four focuses in the Emirate's natural resources including air, land resources and

management, desertification, agriculture, biodiversity, marine and coastal areas, water resources, wastewater, and solid and hazardous wastes. Section Five describes economic aspects of the Emirate. Section Six focuses on the current environmental institutional framework and the problems facing these institutions. Section Seven provides information about the major groups in the Emirate, which have environmental concerns, such as the Women's Society and Environment Friends Society (EFS). Section Eight illustrates the major international conventions and protocols signed and ratified by the government. Finally, section Nine, focuses on the main environmental problems and their causes in the Emirate of Abu Dhabi. Overall, this chapter provides an analytical review of the state of the environment in the Emirate.

The information and data obtained in this chapter are based on the survey, which was conducted in December 1998 (see Chapter Seven). The statistical data presented in this chapter were based on the Statistical Book for 1998, which was published by the Department of Planning (DP). It is considered the most recent publication available and contains statistical data for the years 1993-1997. In 1999 exactly at the field study period, the author tried to obtain the latest publication of the Statistical Book, but this was not possible because it had not been approved officially for distribution. Another statistical book was found in the Crown Prince Court-Research and Studies Department (RSD) published in 1999 and it was collected personally. All the data it covered is for the year 1997.

The information obtained and presented in this chapter was collected from two main sources: government departments and the university library. It covers government reports, research and studies conducted by environmental departments and agencies, and textbooks dealing with the Emirate of Abu Dhabi. The information, which was collected from the government authorities in this chapter, is not up-to-date information, because of confidentiality of the available new information, the lack of research and studies, which can help in updating the data and information, and also due to the shortage of qualified staff.

5.2   THE BACKGROUND TO ABU DHABI EMIRATE

Abu Dhabi Emirate has grown substantially over the last 20 years. It is the national capital and the largest Emirate of the seven Emirates within the United Arab Emirates (UAE) (see Figure 5.1). It has a coastline of over 400 kilometres, stretching from Dubai to the Saudi Arabia border. It has an area of 67,340 square kilometres, representing about 87% of the total UAE area, excluding the islands, and has the major share of the population and the greatest part of the oil reserves (Osborne, 1996, Hellery and Buckton, 1998, Darke, 1998 and Heard-Bey, 1996). This Emirate is made up of coastal *sabka* (salt flats) and inland rolling desert dunes.

Abu Dhabi Emirate lies on the Arabian Gulf between latitudes (22.5° and 25°) North and longitudes (51° and 56°) East. Bottomley (1995) mentioned that the climate of Abu Dhabi may be classified as 'desert', but the Emirate experiences a wide variation in weather during the course of the year. The maximum temperature during summer (May-October) exceeds 40 degrees centigrade in Abu Dhabi City, and the highest temperatures occur in the south-western part of the Emirate in summer, rising up to 50 degrees centigrade (DP, 1997). Winter is an unsettled period, when active weather systems can produce rain and strong winds. These systems decrease in the spring and temperatures increase rapidly. The autumn is the most pleasant season, with light winds and decreasing temperatures. Humidity in January sometimes reaches 100% at the coastal areas and decreases in the internal parts of the desert (DP, 1997).

Rainfall usually occurs in winter and is scarce or absent in summer. The total rainfall in Abu Dhabi City is 128.2 m.m per annum. The maximum rainfall occurs in December, but totals vary greatly from year to year. Rainfall is the highest in the north-eastern parts of the Emirate and lowest in the south-western corner (Bottomley, 1995). Summer rainfall can occur over the mountains near Al Ain, while the total rainfall in Al Ain City is 119.8 m.m per annum.

Figure 5.1   The United Arab Emirates

Low temperatures and long hours of sunshine lead to extremely high evaporation rates. Winds in the Emirate remain light for most of the year, but stronger winds can occur with the passage of a weather system or during a "shamal". Mist and fog can occur throughout the year, but are more likely in the winter months and at the end of the summer months and occasionally thick dust haze is blown across from Saudi Arabia (Bottomley, 1995).

The Emirate has a long and romantic history, in which the desert has played an important role. The harsh climate and limited means of sustenance meant that the people of Abu Dhabi depended solely on three basic life-supporting elements: camels, dates and water. The unfavourable environment forced people to sustain themselves by herding camels in the barren land, growing dates in the inland oases, and fishing and pearling along the coast (PWD, 1997). After the exploitation of oil, life changed considerably and the inhabitants were offered all the benefits of progress, from schools and hospitals to roads and airports.

Abu Dhabi Emirate is divided into the following regions (see Figure 5.2):

- the group of islands which includes Abu Dhabi City;

- the second region, known as the Western Region, which includes Al Dhafra and Bainuna, and the main Emirate's onshore oil fields, such as the industrial complex of Al Ruwais and Jabel Dhana on the coast. This region also contains the greater part of the Liwa Oasis, which is in reality a group of a dozen small oases; and

- the Eastern Region, compromising almost all of Al Ain, the capital of the region.
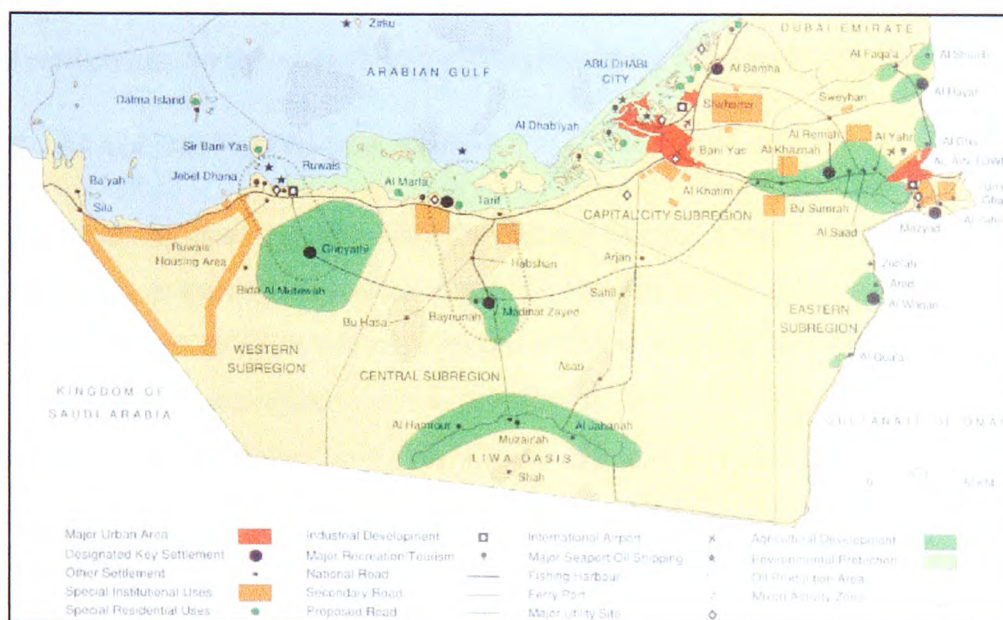
Figure 5.2   Emirate of Abu Dhabi

5.2.1   Abu Dhabi District

This district includes the city of Abu Dhabi, the capital of the UAE. The founding of the City of Abu Dhabi in 1761 followed the discovery of a spring of fresh water by a group of Bedouin hunters. The hunting party had come across the tracks of a gazelle, and following the tracks to one of the numerous islands near the southern shore of the Arabian Gulf, they sighted the gazelle by the spring. This discovery marked the

beginning of the first settlement on the island that came to be called Abu Dhabi, meaning appropriately, 'father of the gazelle' (DSSCB, 1997).

In 1960, when oil was first exported, the present capital was no more than a fishing village with houses made of mud-brick and *barasti* (palm fronds). Now it is a totally modern city (Higgins, 1995).

5.2.2 Western Region

This region is characterised by its undulating surface, overlain with several types of dunes. It was developed as a regional centre to provide services and amenities, not only for the local population, but also for the population of the smaller settlements in the region. Government policy aims to develop desert areas and to establish new rural settlements for the nomads in various areas of the Emirate (TPD, 1990).

5.2.3 Al Ain District (Eastern Region)

Al Ain is at the heart of Abu Dhabi's Eastern Region, which covers much of its inland area. It is the second largest city in the Emirate and is situated 160 kilometres east of the capital. Because of the existence of fertile soil, it is the main destination of the visitor and the expatriate and it is considered as one of the most popular centres of tourism in the Emirate and Gulf region. Al Ain is well-watered, verdant and located between mountains and desert. It is a centre for agriculture tourism. Over the last few decades, it has changed from a small outpost of traditional desert culture into one of the most attractive population centres in the UAE (Hellery and Buckton, 1998).

Al Ain is unique among the UAE's major population centres. The others, all capitals of the Emirates, which bear their name, lie on the coast. All have traditionally looked to the sea for the bulk of their livelihood, even if in some cases, they lie at the end of a cross-desert trade route or have some agriculture in their immediate hinterland. Their changing fortunes over the centuries have been largely dependent on their relations with the outside world. Al Ain, however, is land-locked (Hellery and Buckton, 1998).

5.2.4   Government Structure

The United Arab Emirates (see Figure 5.1) is a federation of seven Emirates, comprising Abu Dhabi, Dubai, Sharjah, Ajman, Umm Al Qaiwan, Ras Al Khimah, and Fujairah. The Federal Government is substantially dependent on funding from Abu Dhabi. The Federal Government runs a deficit and its budgets have only been approved retrospectively in recent years. The ability to invest in capital projects and key investment decisions for Abu Dhabi are therefore increasingly taken at Emirate level (TPD, 1990). The federal system of government includes a Supreme Council, a Council of Ministers, a Parliamentary Body, the Federal National Council an Independent Judiciary, and the Federation Supreme Council.

The Supreme Council of the Federation (SCF) is the country's top policy-making body and the highest federal authority in an executive and legislative capacity. It is made up of the rulers of each of the seven Emirates within the Federation. It is the sole responsible body for setting general national policies and legislation in all matters. It has the power to appoint the Prime Minister and Supreme Court judges (Al Abed and Vine, 2000 and BMIL, 1998).

The United Arab Emirates parliament is known as the Federation National Council (FNC) and is a consultative body with no executive powers. Its plays the key role in ensuring that the people's voice is heard and fully considered by Government. It is the principal legislative authority. It has 40 members drawn from the Emirate on the basis of their population. Also, it is empowered to summon and to question any federal ministries regarding their performance. The main duty of FNC is to discuss the annual budget and to review laws proposed by the Council of Ministers (ibid).

The Council of Ministers (Cabinet) is headed by the Prime Minister and handles day-to-day affairs of state. It has executive authority for the Federation, initiates and implements federal legislation, and is collectively responsible to the Supreme Council of the Federation. The ministries are appointed to the seven Emirates in order of economic and political importance (BMIL, 1998). The federal judiciary includes the Federal Supreme Court (FSC) and Courts of First Instance. The FSC consists of five judges appointed by the Supreme Council of Rulers. The judges decide on the constitutionally of federal laws and arbitrate between Emirates'

disputes and also between the federal government and the Emirates (Al Abed and Vine, 2000, and BMIL, 1998).

Each individual Emirate also has its own local government. These differ in size and complexity from one emirate to another, depending on variation of population and the degree of development (Vine and Casey, 1992).

Sheikh Zayed has ruled the Emirate of Abu Dhabi since 1966, and has also been the UAE's President since 1971. Shaikh Kalifa is the Crown Prince of Abu Dhabi Emirate and Deputy Supreme Commander of the UAE Armed Forces. The Emirate of Abu Dhabi has two local policy-making and legislative authorities in the Emirate, which are: (1) the Executive Council and (2), the Supreme Petroleum Council. The Crown Prince of Abu Dhabi chairs both. The Supreme Petroleum Council is responsible for the administration and supervision of all petroleum affairs. The Executive Council is responsible for the administration, supervision and monitoring of all works in the Emirate except petroleum affairs (Al Shahin, 1997 and Al Abed and Vine, 2000). The National Consultative Council (NCC) undertakes a role similar to the FNC, its members drawn from among the Emirate's main tribes and families (BMIL, 1998).

An official Ruler's Representative heads Al Ain District and Western District. The *diwan,* or court, acts as the central point of reference for various Abu Dhabi Government Departments. There are also a Ruler's Representatives on the important oil terminal island of DAS (Al Abed and Vine, 2000). Municipalities administrate each of the above districts. Each of them has a nominated Municipality Council. All administration in the Emirate is implemented by a number of local departments covering water and electricity, public work, finance, customs, purchasing, aviation, agriculture and public heath and services.

5.3   THE SOCIAL DIMENSION

This section provides a review of the social features of the Emirate. This includes poverty, population growth, health, education and human settlement.

5.3.1 Population Growth

The harsh environment and marginal economic conditions kept the population of the region low until the exploitation of the oil. The population of Abu Dhabi Emirate has experienced very rapid growth in the last two decades, the result of a combination of high natural increase in population and rapid inward migration. The total population in 1980 was 451,848 (TPD, 1990) and increased to 764,491 in 1990, with an average annual growth rate of 5.4 percent. The breakdown of population by area from 1990 to 1997 is given in Table 5.1.

Table 5.1 Population Estimate 1990-1997

Year	Population		
	Urban	Rural	Total
1990	562369	202122	764491
1991	586983	210967	797950
1992	611763	219875	831638
1993	635398	228368	863766
1994	660238	237309	897547
1995	682914	245446	928360
1996*	629655	296308	925963
1997*	651966	306808	958774

Source: DP, 1997 and RSD, 1999.
* Projection by DP.

The total population in Abu Dhabi Emirate in 1997 was estimated at 958,774, with an estimated annual growth rate of 0.86 %, according the Department of Planning. This will rise to a population of over 1, 200, 000 by the year 2010 (Al Abed and Vine, 2000). The rapid increase of the non- citizen population (Arab, Asian and others) has produced a very unequal demographic profile with a high number of males of working age. The male-females percentage was 69 percentage of males and 31 percentage of females due to the large numbers of males expatriate workers (BMIL, 1998). Some 634,708 of the total population are estimated to be living in Abu Dhabi region and 324,066 in the Al Ain region, representing 30 percent of the total population of the Emirate. The total number of population living in urban areas was 651,966 and in rural areas 306,808 in 1997 (DP, 1997). It is estimated that almost three-quarters of the population are non-citizens. Registered live births in 1997 were 20,171 of which, 52% were males and 48% female. In addition, registered

deaths in the same year reached 2095 persons; 73% males and 27% females. Infant and child mortality rates have fallen rapidly since 1975, as a result of improved health and rising living standards. This has a direct affect on both citizen population growth and age profile, with more than 62% now below the age of 20 years.

The rapid development of the Emirate attracted substantial inward migration of expatriate workers. The total size of the labour force in 1997 was 543,625, being 57% of the population. The total number of local government employees until the end of the year 1997 was 76,144 and of these 6891 were nationals (DP, 1997).

5.3.2 Social Security

Generally, there is very little sign of poverty in the Emirate; there is wealth, which also causes harmful effects on the environment. The Social Security Law which came into effect in 1977, listed the following categories of people as being entitled to financial assistance from the government, if required. These include health deficiency; widowhood; senility; low income; married students; old maids; divorcees; abandonment; orphan-hood; the families of those serving prison sentences; non-national wives (Al Abed and Vine, 2000). The total number of such cases supported in 1997 was 7,916. The total cost of social aid was US$ 3.7 M (DP, 1997).

5.3.3 Health

Progress has been swift and dramatic, with the country well on the way to meeting its stated goal of reaching the World Health Organisation objective of 'Health for All by the Year 2000' (Al Abed and Vine, 2000), which is one of the Agenda 21 targets (see Appendix C). The provision of health services in the Emirate, both public and private, has increased substantially and significant efforts have been made to provide a wide coverage throughout urban and rural areas for all residents in the country towards achieving above target. In fact, the UN Human Development Report in 1999 ranked the UAE forty-third out of 174 industrial and developing countries, up five places from the previous year (Al Abed and Vine, 2000).

The number of hospitals reached 13 in 1997, with over 2504 beds and 50 clinics and child-care units. In addition to the public sector, there is a smaller private sector, which is carefully supervised by the Ministry of Health. Hospitals and clinics can be found in the small towns and villages, while mobile teams visit the smaller desert communities to ensure that health services are taken to all human settlement.

Considerable efforts have also been made in the preventive medicine field, through simple health and hygiene education, and through vaccination and other programmes to eliminate the diseases that formerly crippled or killed large numbers of the country's population (Al Abed and Vine, 2000). Over 95 percent of newborn children are vaccinated against the most serious diseases such as diphtheria, whooping cough, tetanus and polio, measles and German measles (DP, 1997). This helped to reduce infant mortality rates to 9 per thousand in 1998 (Al Abed and Vine, 2000) comparable to developed nations, while average life expectance has risen to 76 years (BMIL, 1998).

Different types of health services are proposed to promote health service in the Emirate due to the population growth. Thus, for example, Zayed Herbal Centre includes sections for treatment by herbal drug production and research and the Psychiatric Hospital. Other examples include, Corniche Paediatric Hospital, Highway Accident Treatment Unit (PWD, 1997).

The Ministry of Health and the UNDP in association with the regional office of the World Health Organization (WHO) started in 1997, preparing a draft health strategy for the 21st century. This draft strategy considered various political, economic, social and cultural aspects of the community.

5.3.4 Education

The education system in the UAE consists of public and private sector schools, military schools, higher education and vocational training establishments. The present school structure has four levels: kindergarten, primary, intermediate and secondary. During 1996/1997, there were 190,746 pupils enrolled in 259 private and government schools (DP, 1997). The UAE University is spread over 17 different locations within Al Ain Town. It was established in 1977 with 509 students. By

1996/1997 enrolments had increased to 14,104. There are four centres of higher technology two in Abu Dhabi and others in Al Ain. The number of students in 1996/1997 was 2390 (DP, 1997). Within the Abu Dhabi Emirate, there are three educational districts responsible for implementing the government's educational programme: Abu Dhabi, Al Ain and the Western District.

The government education system now reaches into every small village and the remote areas. The government has issued instructions to embark on a systematic programme of building schools all over the Emirate and other parts of the country, in close co-operation with the Ministry of Education so they can be accessible to all citizens, whether they are living in rural or urban areas (PWD, 1997).

5.3.5   Human Settlements

Many rural dwellers have left behind their traditional way of life in favour of that of the cities. To control this trend, the government has initiated programmes for rural development. Typically, these have focused on job creation linked to a massive expansion of agriculture, fisheries and other employment in the Liwa Oases, and towns. There have also been noticeable achievements in education, health care, in housing and in infrastructure and utilities in these areas. The towns of Madinat Zayed and Gheyathi have expanded to become the administration centres of their sub-regions, providing also for the social, education and cultural needs of the rural communities (TPD, 1990).

There are six housing types in the Emirate: apartments, villas, Arab houses, low-cost/popular houses, annexes, and various forms of temporary housing. The government has adopted policies to ensure that all citizens are housed adequately, safely and hygienically. These houses are distributed free to eligible citizens who have a relatively low level of income. This programme has been a vital part of rural development to discourage migration to the urban areas. The total number of distributed low cost houses to citizens in 1997, the latest year for which statistics are available, was 21,344 units, and it has increased since 1993 by 22.72% (DP, 1997).

5.4   NATURAL RESOURCES

This section deals with natural resources and issues. It deals with the issues concerning the state of the atmosphere and issues affecting the planning and management of land resources. It addresses oil and mineral resources, desertification, agriculture, biodiversity, marine and coastal areas, water resources, wastewater, solid waste management, and hazardous waste.

5.4.1   Air

Air quality in Abu Dhabi is generally good, except in areas in the vicinity of industrial complexes and around oil refineries, power generating plants and desalination plants, which operate around the clock (ADM and UNDP, 1995).

There are several activities which result in emissions to air; these are related to stationary industrial sources (oil production, oil refineries, power generation, natural liquefied gas production, fertiliser production and others) and mobile sources (dominated by petrol-engine motors). Emissions from industrial sources are one of the most significant sources of air pollution in Abu Dhabi Emirate. Contributions from mobile sources are significant at major roads and intersections, but not away from the cities (LLS, 1990). Following world-wide trends, air quality in cities might become seriously affected by mobile sources in the future (ADM and UNDP, 1995). Motor vehicles are the most important source of air pollution in cities and towns. According to the automobile emission survey which has been conducted by Environment Protection Section (EPS) of Abu Dhabi Municipality (ADM) in collaboration with the Federal Environmental Agency (FEA) for Abu Dhabi City in 1997. The main finding of this survey is that the automobile emissions are the main sources of the pollution in the city of Abu Dhabi and it may be a serious environmental problem in the future if its not taken into consideration by policy makers and planners. The study reveals that the number of cars is likely to be above 200,000 by the end of year 2000. The study recommended that to control and reduce the emission of automobiles, it is important to use techniques such as catalytic converters and encourage the use of unleaded gasoline (FEA and EPS, 1997).

Based on these findings, the government started in 1997 to provide wide streets, improve traffic flow, and also introduce the use of unleaded gasoline. These measures are aimed at reducing the impact of vehicle-generated pollution. In March 1999, a new law was passed aimed at reducing air pollution and also there is a regulation under discussion for controlling the use of leaded fuel (Al Abed and Vine, 2000). The ambient air quality of Abu Dhabi has been monitored by a number of automated and computerised online monitoring stations. These stations are fixed at strategic sites to represent the impact of traffic movement and industrial installations. At present, there are three such stations located in Abu Dhabi City and its environs. The stations monitor ambient air levels on a continuing basis. The parameters monitored are sulphur dioxide, nitrogen oxides, carbon monoxide, ozone, methane, non-methane hydrocarbon and inhalable particulate (PM10) in the air, together with continuing recording of meteorological parameters (wind speed, wind direction, temperature, humidity and solar radiation). All stations are connected via data loggers to a central computer at Abu Dhabi Municipality for data recording. In addition, two mobile laboratories have been equipped with monitors to measure the air pollution in particular areas. Another network comprises of five stations to measure the radiation levels in ambient air on a continuous basis. These stations are also connected to a central computer at Abu Dhabi Municipality.

Also, the Abu Dhabi National Oil Company (ADNOC) is planning to provide a number of air quality monitoring stations at onshore and offshore oil and gas fields by the year 2005. It is also monitoring all petroleum-based industries in adopting and using the environmental standards and guidelines.

5.4.2   Land Resources and Management

The landforms of Abu Dhabi can be divided into the following: (1) sand dunes which predominate in the area and start between 10 to 15 kilometres from the coast, increasing in height towards the south, and rising to 150 meters (Glennie, 1995); (2) coastal sabkhas which consist of salt mud flats and extend the full length of the coast and which are saturated with salt and cannot support any vegetation; (3) gravel plains which are found mainly towards the extreme west of the Emirate and also to the east of Abu Dhabi; (4) sand plains which occur in extensive areas, mainly towards the

north-western limit of Abu Dhabi Emirate and immediately south of the coastal sabkha; and (5) rocky hills which are found in the vicinity of Al Ain; there are also a few small rock outcrops on the islands and towards the west of the Emirate (TPD, 1990 and Glennie, 1995).

The soils of the Emirate are typical of the arid zone. The soils differ from each other in their relative degree of maturity, the degree of stoniness, soil depth and in the degree of salinity and alkalinity. Most of the soils are likely to be calcareous (containing calcium carbonate). Most of the Emirate area is covered by soils which are unsuitable for agriculture (TPD, 1990).

Land use planning is the responsibility of the Town Planning Department (TPD). Table 5.2 shows the pattern of land use within the Abu Dhabi Emirate. The pattern of land use is characterised by large areas of *sabkhas* and deserts which are inhospitable to man and which limit development to defined and traditionally known areas. In the inhabited area, the pattern of agriculture and forestry is fragmented and not always well-related to settlements. The major productive oil fields are mostly situated away from settlements, but have their own self-contained residential work camps. Urban land use accounts for only 0.49% of the total area (ibid).

Table 5.2   Land Use Distribution in Abu Dhabi Emirate (km2)

Land Use	Western District	Eastern District	Total	%
Urban	191	140	331	0.49
Airport	14	10	24	0.04
Regional Roads	36	8	44	0.07
Special Uses	495	0	495	0.74
Oil Fields	2040	0	2040	3.04
Agriculture	115	128	243	0.36
Forestry	374	233	607	0.91
Sabkha	4750	500	5250	7.84
Desert	47285	10681	57966	86.51
Total	55300	11700	67000	100

Source: TPD, 1990

Abu Dhabi Municipality (ADM) and Town Planning Department (TPD) control the development of land under the land use-planning system. It issues approval for developing land for both residential and industrial uses. Also, Government departments and agencies must obtain an approval from the TPD for any land

requirement proposal. These requirements are reviewed in terms of land area and siting and land plots.

The Abu Dhabi Regional Development Plan (RDP), prepared and published by the TPD, has allocated land for different development activities, such as housing, industry, oil and gas processing, recreation and general services, agriculture, public utilities, communication, ports and airports and road networks. It provides a structure based on a statistical and analytical framework for the development of the Emirate in the period up to 2010 and beyond. It focuses on promoting the continued socio-economic development of the Emirate and achieving significant improvement in the quality of life. It seeks to develop human resources through training programmes and the improved provision of social and cultural facilities. The main component of the RDP is the Regional Land Use Plan (RLUP). The plan emphasises the need to increase the involvement of the private sector in the development process, particularly in the housing, commercial, education and tourism sectors.

The Government of Abu Dhabi has invested heavily in the provision of transport, especially in the road network system that aims to provide linkages between all major settlements. The Public Works Department is currently undertake a number of projects costing approximately US$ 2,482 million in various parts of Abu Dhabi Emirate (Al Abed and Vine, 2000).

5.4.3 Oil and Mineral Resources

The Emirate of Abu Dhabi has vast resources of oil. It is the biggest oil producer in the UAE. Oil, and associated gas from crude production, are explored and produced onshore and offshore controlling more than 85% of the UAE's total oil outputs capacity and over 90% of its crude reserve (Al Abed and Vine, 2000). The main onshore oil fields are located at Bab, Bu Hasa, Asab, and Shah (see Figure 5.2). Hydrocarbon processing includes two refineries located at Umm Alnar and Ruwaise. The network for oil pipelines focuses on Jebel Dhana, which is the terminal for the export of crude oil onshore. Offshore oil production areas are mainly concentrated at Umm Al Dalkh, Zakum, and Umm Shaif islands and the extension from Bandaq fields (see Figure 5.2). Crude oil flows to Das Island. Offshore gas production is

mainly operated in Das Island, which receives associated gas from the offshore oil fields (TPD, 1990).

The latest available statistics for 1996 from DP indicated that the proven crude oil reserves in 1996 are 92.2 billion barrels; proven natural gas reserves are 183 trillion cubic feet; the number of oil wells is 1174; crude oil production is 673,074 thousand barrels, crude oil exports 1,617 thousand barrels; natural gas production is 876,871 million cubic feet; the production of refined products is 10,865.3 thousand metric ton, the production liquefied natural gas products is 9 million metric ton, and the export of liquefied natural gas products is 11,684 thousand metric ton (DP, 1997).

The mineral resources in the Emirate are divided into three categories: rocks, sands and soils; metals; and other minerals of interest. Rocks and gravel used for construction are concentrated mainly in the Eastern Region close to Al Ain and Jabel Hafit. Limestone, sand, marl and gypsum are obtained from around Jebal Hafit and used to manufacture cement at the Al Ain cement plant. The limestone is also used as a building material for hardcore and constructing harbour jetties. Some of the limestone is extracted and polished to make decorative building stones. Sand and coarse aggregates are obtained from areas close to the Omani border and are used in manufacturing cement blocks (TPD, 1990).

5.4.4 Desertification

There are three main causes of desertification in the Emirate. The first is the drop in ground water levels. Most of the abstracted ground water is used on farms. Increasing demands for water for irrigation leads to the desertification of these farms. The second cause is the increasing salinity of ground water. The rate of abstraction is more than ten times the recharge; an increase in the salinity is a result of seawater ingress and the flow of added salts from the irrigation water and agriculture chemicals to the ground water. The third is the encroachment of sand on agricultural land. Sand covers about 78% of the total area of the Emirate.

The government of Abu Dhabi has set out a programme to combat desertification. Many steps have already been taken. The first involves the laying down of legal procedures for agricultural development; the second consists of establishing

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experimental farms; and the third step is to fix sand dunes through cultivation, using irrigation methods that require much smaller quantities of water (see next section). The government also enacts a number of regulations, which prevent the uprooting of trees (Alitihad, 1998).

5.4.5 Agriculture

Agriculture in the Emirate has advanced considerably in the last years. The government has encouraged this development through policy objectives aimed at national food security and the greening of the desert. The measures adopted to carry out the above policies include the establishment of citizens' farms; general support to farmers; the development of state farms; and the establishment of forestry plantations (Al Abed and Vine, 2000).

The aims of the green revolution are to push back the movement of the desert, to make more land available for use by its inhabitation, and to reduce dependence on external sources of food supply.

The Departments of Agriculture in the government are cultivating thousands of hectares for farming. The total number of farms in the Emirate in 1997 was 13353 (DP, 1997). Recent agricultural policy has been aimed at enabling more citizens to apply for, and operate, small farm units. These play an important part in sustaining their cultural heritage, contributing at the same time to the internal economy of the Emirate by producing vegetables and fruit for sale. The government provides seed and planting material, labour for a period of two years, irrigation water from wells (unmetered), equipment, maintenance of farm equipment including wells and pump equipment, and crop protection. All these inputs from government are provided free of charge with financial assistance to purchase equipment, fertiliser and seeds (Al Abed and Vine, 2000). In addition, fertilisers are provided at 50% of the cost price. Two years ago, the municipality of Abu Dhabi has completed supplying 714 farms with a projection of 1000 farms before the close of the year. The estimated total number of trees in Abu Dhabi in 1998 was 23,500 million (Alitihad, 1998a).

The forestry plantation programme is undertaken as part of the government policy of desert greening. Concerned authorities, like municipalities, have played a role in

spreading afforestration and establishing farms to increase agriculture production towards meeting local market requirements. The main purpose of forestry is for landscaping and amenity, desert greening, shelterbelts to protect roads and agricultural areas from wind and sand, and to some extent for dune stabilisation. The forest planting covers 153,070 hectares, stretching out from the city into the depths of the desert (DP, 1997). In the meantime, the plantation provides a welcome microhabitat for fauna and flora (Hellery and Buckton, 1998).

Planting has also been carried out, on a smaller scale, in Abu Dhabi City and Al Ain town where parks and gardens have been planted to provide places where the population can relax away from their homes. Abu Dhabi district has over 39 parks, which cover 3,700 hectares (Al Abed and Vine, 2000). There include four special ones for mothers and young children. Al Ain district has 28 parks and gardens, and 5 parks can be found in the western region. Even small settlements have gardens, well planted, well watered and well cared for. Around 18 million palm trees have been planted in Abu Dhabi on over 93,000 hectares of land. A total of 60,000 palm trees were planted in 1997 at roads inside and outside the Emirate.

Most of the agriculture areas in the Emirate are irrigated by using treated water from sewage treatment plants, except the areas which are being irrigated by sprinklers which are being supplied with desalination water to safeguard the public from any possible pathogens which may be present in the recycled wastewater (Al Abed and Vine, 2000). Also the government enforce strict laws governing the use of chemicals in agriculture to protect human health.

5.4.6   Biodiversity

There are more than 300 species of flora in the Emirate, more than half of which are transient, appearing mostly in spring and some in winter. The vegetation of the Emirate is diffuse, and much of it can survive for long periods without water. Dune plains have sparse vegetation on the shifting sands, but more varied cover in the saline depressions. The climate is arid and soil is poor in nutrients. When rain comes there is limited water available for plant growth. These factors make for harsh growing conditions. There are three types of vegetation able to cope with desert condition: ephemeral, succulent perennials, and woody perennials (Western, 1989).

Coastal areas, where the substrata is either mud or sand, occasionally with a thin covering of topsoil, provide habitats for a number of species, including beach grass, salt-marsh plants, and a variety of rushes and sedges (Vine and Casey, 1992).

ADM and Environment Research Wildlife and Development Agency (ERWDA) in 1998 started to develop parts of a mangrove swamp into a wetland conservation area. The Government has also identified sensitive natural coastal zones. ERWDA has conducted studies on fisheries and pollution of the marine environment and projects have been conducted to conserve marine wildlife, such as sea turtles and dugong.

There are about 36 species of terrestrial reptile, which inhabit the Emirate. Many of these reptile species are well adapted to living in soft sand, which is the most widespread and characteristic habitat in the Emirate (Western, 1989).

The Private Department of the President's Office has established and manages a wildlife sanctuary "Sir Bani Yas". This park is the first project in the region orientated to preserving the natural heritage and the unique agricultural base of the Emirate. Many species from Arabia and Africa have been introduced successfully to the park. Breeding programmes have been undertaken with good results, especially in the case of endangered and rare species. These activities have been undertaken directly by its Environment and Wildlife Management Department (EWM) (Al Abed and Vine, 2000).

5.4.7 Marine and Coastal Areas

The Arabian Gulf has been the mainstay of life for the Emirate. Before the discovery and exploitation of oil, the Gulf was used by the local people as their sole route for trade, and their main source for food and recreation (Khordagui, 1991). Following the discovery of oil, the Gulf played a much more important role in the Emirate's development. The Gulf provides water for power generation, and water desalination for industrial, domestic and agricultural uses. In recent years large numbers of beach clubs, marinas, hotels, and summer resorts have been developed along the shoreline.

The Emirate of Abu Dhabi encompasses the majority of the coastline of the UAE and includes many offshore and near-shore islands. This entire coastline is characterised

by sabkha (salt lands), with its seaward boundary, formed of large intertidal areas of calcareous sand. In the zone to the southwest and northeast of Abu Dhabi Island, the coast is characterised by a series of low islands and peninsulas interspersed with shallow tidal creeks or khors. Offshore, the islands are of older geological origin, surrounded by carbonate plains and coral reefs. The shallow waters of the Abu Dhabi coastal seas are highly productive, playing an important role in the functioning of the ecosystem of the Gulf, but they are also sensitive to the effects of pollution and other human interference (ADM and UNDP, 1995).

Great attention is paid by the ERWDA and FECC to prevent marine pollution by controlling land based sources of pollution. In 1998, ERWDA established a marine monitoring programme to check the status of the marine life. It is also, conducting a national project for wildlife protection, which aims to determine marine ecology in the UAE coastal water and to conserve and protect some the marine species from extinction such as sea turtles and dugong by using satellite.

In general, the sea is the major source of drinking water for the population of the Emirate. Seawater quality in Abu Dhabi coastal waters is extremely good. A number of regulations have been issued to protect the marine environment, such as a federal law for the conservation of water resources and fish operation arrangement.

Fish resources are relatively abundant along the Emirate coastline. They can be grouped in two main categories: resident fish and migratory fish. Most commercially exploitable fish are found in water between 25m and 50m depth. Fishing is carried out from five main fishing ports located in Abu Dhabi. The use of explosives, poisons, trawling, nylon non-filament nets, spear guns, modern factory freezer ships and all forms of shrimping are prohibited (TPD, 1990).

5.4.8 Water Resources

Abu Dhabi Emirate has an integrated water supply system. Water resources in the Emirate are finite and very precious. They originate from three sources, groundwater from aquifers, desalinated water from the Arabian Gulf and treated sewage. Al Ain consumes more water than it produces from groundwater and is, therefore, served by a pipeline from Abu Dhabi's desalination plants. The treated sewage is used for

irrigation and watering roadside planting and public gardens, but the supply is not enough to cover all requirements and is supplemented from other sources.

In the Western Region, coastal towns are supplied from desalination plants. Inland settlements are supplied from coastal desalination plants, from wellfields, and by tankers, where no piped service has been provided.

Groundwater originates from rainfall and is limited. The only source to recharge groundwater is the surface water. Surface water flows do not occur, except during periods of flood and are quickly evaporated and absorbed into the groundwater system. The extraction rates are substantially higher than the rate of replenishment. The total annual production rate of groundwater in 1997 was 2800 million gallons (DP, 1997).

The population depends heavily on the output of desalination plants in the area. The annual production rate of desalinated water in 1997 was 56,322 million gallons and the annual consumption was 68,842 million gallons (DP, 1997). The cost of water desalination is very high. Thus, the lack of fresh water may be considered as the most serious environmental problem in the area. Due to that the government introduced a universal meter reading and billing system trying to control and manages the consumption on this rare resource.

A federal law was issued in 1999 to protect and develop the use of water resources. The federal and local governments recently discussed a number of solutions to conserve and increase the precious water supply. These include: conducting a survey of ground water resources to define quantity, encouraging farmers to use new irrigation methods, evaluating environmental impacts, and expanding the use of treated sewage water (Alitihad, 1998b).

5.4.9 Wastewater

Full conventional piped sewerage and sewage treatment facilities exist in Abu Dhabi Emirate, covering all cities and towns. Outside Abu Dhabi, ADNOC controls these areas and communities. There are no central sewage treatment works provided in the small settlements. Septic tanks are used in all other rural communities, which are

discharged at a selected area in the desert. The government also provides the large rural areas with centralised sewage treatment facilities. There were two main sewage treatment plants in Abu Dhabi Emirate. They were established to treat the wastewater from Abu Dhabi City and Al Ain City and environs and there is a small sewage treatment plant in the western area (rural area).

The provision of full biological treatment, followed by chlorinating and rapid gravity sand filters, ensures that the plant produces a high standard effluent (according to the World Health Organisation). One hundred percent of the effluent is reused by municipalities for the parks, public gardens and roadsides irrigation. Ninety nine percent of the sludge goes to a composting plant after drying and is mixed with the incoming waste stream, with one percent left for soil conditioning around plants. Methane (CH4) from digesters is flared daily. The government has begun to privatise sewage treatment plants in urban and rural areas. It has also developed surface water drains with the road system, which drain into the sea.

5.4.10 Solid Waste Management

Municipalities and the ADNOC operate a waste collection service, covering the whole of the Emirate. Collection of municipal solid waste is currently carried out on a seven-day a week basis. Per capita household waste has reached an average annual 730 kilos in Abu Dhabi (Al Abed and Vine, 2000). All separation of waste is done at the Compost Plants. There are no curbside recycling services offered to the citizens of Abu Dhabi.

Because no proper transfer station exists, the cost of transporting all municipal waste to dump sites is unnecessarily high. The municipalities provided the existing waste containers for household and agriculture waste. There are many small private companies involved in the collection and segregation of waste paper, car batteries, glass, plastic, aluminium cans, metals, and wood. Some of this waste, such as aluminium, paper, steel, and car batteries is being recycled in the Emirate itself, or in the other Emirates. These activities have reduced the amount of waste that needs to be put in landfill. Oily waste and lubricants from automobiles are collected also by private companies and transferred to other Emirates for reusing.

There is an attempt to encourage the private sector to invest in the collection, transportation and treatment of solid waste, and in the recycling business. At the same time, there are plans made to encourage the public to sort its garbage at home, schools and places of work.

The compost plants works to accomplish two major goals: firstly, to utilise solid waste in a healthy manner that would benefit the environment and public hygiene; and secondly, to gain economic profit from solid waste, rather than merely paying for incineration or disposal. The compost plant accepts a wide range of materials for composting including organic waste, slaughter refuse, sewage sludge, agricultural waste and green waste.

There are three landfills in the Emirate, located in Abu Dhabi, Al Ain and Western Region. All landfills have the same problems, including high transportation costs. There is no tipping fee required by the municipalities. The disposal sites are not designed to be landfills, as they do not contain gas collection nor a leachate collection control system, nor liners to prevent ground water pollution, nor a daily cover system, other than sand from the surrounding area. Ground water contamination is an unavoidable problem, because the ground water level at this site is extremely shallow (0-2 meters). The landfill is not fenced in, because of that wild animals could potentially stumble upon these areas. There is no weigh station to monitor the amount of waste being disposed. All solid waste is disposed of freely at this site. Tyres are currently being disposed of in large amounts. Frequently, fires occur at the landfill sites, the causes being unknown. There are no records being kept of what is being dumped in the landfill. This could be a serious problem for the future, because the government has plans to increase the number of non-oil industries and also the growth of urbanisation towards this area. The absence of this record will let companies and other industries to increase their waste without any care about the environment. Establishing a record system of what is dumped in the site and also the adoption of charges for waste disposal in the landfill will encourage companies to minimise their waste (Sadgrove, 1997).

5.4.11 Hazardous Waste

Hazardous waste treatment facilities exist for the separate collection or disposal of hazardous wastes. Municipalities do not allow disposal of hazardous waste at the landfill sites. However, unauthorised dumping does take place. All hazardous waste can be disposed of in a temporary hazardous waste landfill, located in the Western Region.

Medical wastes are currently incinerated at all hospitals in the Emirate, each having their own incinerators. It is strictly prohibited for biomedical waste to be dumped in municipal waste bins. Not all biomedical waste is incinerated. Some of the waste is transported and disposed in the landfill sites. Toxic waste from the hospitals is currently incinerated. The disposal methods for medical waste from private hospitals, and clinics are not known.

No system has been implemented to prevent potentially harmful materials from being incinerated. Both infectious and non-infectious wastes are incinerated. Regulations and codes of practice have been produced by the UNDP project on the handling and disposal of medical waste in the form of a local law.

5.5   ECONOMIC ASPECTS

Abu Dhabi is one of the commercial centres in the Gulf region, its main port being Mina Zayed. It has one of the highest per capita incomes in the world. The Emirate stands as an attractive and flourishing market for foreign goods and services and provides incentives for both local and foreign investors. It organises a wide range of local and international fairs and exhibitions round the year. (ADCCI, 1996).

The basic support to the economy of the Emirate is the oil and gas industry sector. Also, manufacturing industry, including petroleum manufacturing, has been given great support by relevant authorities in order to diversify the sources of income and to reduce economic dependence on oil. A major feature of government policy is to encourage the private sector's contribution into the industrial growth planning (BMIL, 1998).

The Emirate was almost totally dependent on oil revenues, but due to the instability of oil prices, the government realised the need to diversify the economy, not only to reduce dependence on a single source of income but also to create an infrastructure of opportunities for future generations. Based on that, the government invested in the agriculture sector to enable it to meet a large part of local demand for foodstuffs (Al Abed and Vine, 2000).

Abu Dhabi has established a modern and sophisticated infrastructure to act as a solid base for a stable and sound economy, by providing civil airports in Abu Dhabi and Al Ain; road network within and between the Emirates; public utilities; telecommunications; and marine port and facilities (ADCCI, 1996).

The Emirate of Abu Dhabi is a very wealthy Emirate, principally due to its major oil resources. The oil sector is by far the largest contributor to the Gross Domestic Product (GDP) of Abu Dhabi. The contribution of different sectors to GDP is shown in Table 5.3. The percentage distribution of Abu Dhabi GDP from oil production has decreased from 44.4% in 1994 to 43% in 1997 (DP, 1997), reflecting population growth and lower oil prices.

Table 5.3   Abu Dhabi Emirate GDP in (Million US$).

Sector	1995	%	1997	%
Agriculture and Fishers	694.6	2.9	973.23	3.48
Mining and Quarrying	11135.9	45.8	12844.86	45.9
Manufacturing Industries	2411.4	9.93	3003.1	10.73
Electricity Gas and Water	450.8	1.85	528.63	1.89
Construction	2302.8	9.5	2552.3	9.12
Wholesale and Retail Trade and Restaurants and Hotels	1886.3	7.76	2082.85	7.44
Bank services	395.5	1.64	444	1.59
Transport and Communication	1128.2	4.6	1128.26	4.031
Housing	144	0.6	162.3	.59
Financial and Insurance	1075.2	4.4	1241.86	4.44
Government Services	2346.2	9.6	2644.6	9.45
Other Services	326.8	1.345	378.86	1.35
Total	24297.7	100	27984.85	100

Source: DP, 1997

Because trade is an integral part of the country's economy, seaports are critical for the flow and growth of the economy of Abu Dhabi and the UAE as a whole (PWD, 1997).

Economic policy depends mainly on the following: (1) achievement of balanced economic, social and cultural development; (2) provision of support for the national economy and boosting its resources to realise self-reliance by utilising the accomplishments made in the Emirate and diversifying activities; (3) fulfillment of the Emirate national requirements in the field of social services; (4) ensuring community welfare and social justice as one of the main goals of development, by continuously increasing living standards in consumption and social services; and (5) development of national manpower (ADDCI, 1996). Economic growth has been affected by two main factors: (1) the fluctuation of oil prices leading to a recession in some economic sectors, especially trade, construction and government expenditure; and (2) the progress and accomplishments made in various economic and social sectors.

The government has opened up a new opportunity for investment from private business. BMIL (1998) explained that private business involvement could create real jobs for the next generation and should take the pressure off government. The government aim of privatisation not only attracts the private sectors but, it also makes sure that projects will be carried out at the actual cost and in the shortest time (EIUL, 1997). Plans for privatising the utility sectors in Abu Dhabi have continued to develop. The governments newly established Privatisation Committee is handling the programme for the Electricity and Water Sector. Although the government has the resources to meet future demands for the water and electricity itself, the authorities have decided to give foreign and private business an opportunity to invest in what is a major business (ibid).

If the experience proves a success in meeting its targets, it may be tempted to open up other areas of the economy to local, private investment, particularly those downstream from the petrochemical industry, while privatisation will free government revenues for spending in other sectors (ibid and BMIL, 1998).

The policy of intensive investment in different sectors of the economy has played a major role in boosting the economy. Abu Dhabi provides, regionally, distinct incentives to help foster joint ventures and enhance both local and foreign investments. They include, among other: (1) no income tax on all types of profits, whether of individuals or companies; (2) no restrictions on any repatriation of capital or profits; (3) exemption of all foodstuffs, capital and intermediate goods, together with all the exports, and re-exports, from customs duties; (4) maximum customs duties, which have recently been imposed on some goods, of 4%, still the lowest in the region; (5) freedom of movement for all, whether within, between or outside the Emirates; (6) freedom of economic activity guaranteed by the prevailing economic laws, which also provide the necessary incentives for all types of business and investment; (7) nominal land rents for all types of business establishments; and (8) minimal water and electricity charges for both personal, commercial and industrial uses, amongst the lowest in the world (ADCCI, 1996).

These incentives and the encouragement of investment could effect the environment and causes some of the environmental problems such as air pollution, waste disposal, and increases the consumption rate of resources. Therefore, it is important to integrate environmental considerations into development planning and any decision-making. The government should also encourage sound environmental management to improve the economy along with its environmental performance by using new technologies, which offers many opportunities for business growth without environmental damage.

A number of strategies have been adopted to achieve the above aims: reform the commercial laws to ensure effective protection for investors; the development of free zones; continuation of the privatisation process; and implementing an effective offset programmes (EIUL, 1997). The government has made it a condition that foreign firms awarded military contracts should invest a portion of value of the deal in joint venture projects with a local partner. Under this condition, foreign defence firms are entitled to hold up to a 49% stake in the joint ventures with the rest being held by local private investors (Al Abed and Vine, 2000 and BMIL, 1998).

In 1997, the total non-oil export was 180,275.5 tons at a value of US$ 165,346. The biggest non-oil exporting country is Oman, which exports 14.2% of the total import value, followed by Qatar, which exports 11.4%. Total re-export was 148,589.8 tons in 1997 at the value of US$ 491,643. Saudi Arabia is the biggest importing country which imports 16% of the total import value, followed by Vietnam 12.3% (DP, 1997).

5.5.1 Changing Consumption Patterns

The urbanisation of Abu Dhabi Emirate has improved the Emirate's standard of living. As a result of urbanisation, the import of technology has brought a rapid change in lifestyle. Consumer goods are now easily available. But this has also led to an increase in waste, especially plastics, metals, glass, and paper.

5.5.2 Industry

The oil and natural gas sector in the Emirate of Abu Dhabi represents the basic support to the economy of the Emirate. Power and seawater desalination plants come next in importance to the oil sector. BMIL (1998) explained that the government re-examined industrial policy to build on the progress already made in terms of reducing the dependency on oil revenues. The industrial activities in the Emirate are located in five areas. The largest of these is the Ruwais industrial complex, which contains an oil refinery, a fertiliser plant, a liquid natural gas plant, a sulphur terminal, a tank farm and various small industries. The other main site is located in Umm Al Nar Island, which contains an oil refinery, a power station and a desalination plant, a chemical processing plant, and a tank farm. The other industrial areas are Sadiyat Island, Al Ain, Mussaffah, and Mafraq industrial areas. The most important products of these are: flour, animal food, vegetables canning and freezing, cement, cement blocks, paper and plastic bags, fertilisers, and steel fabrication, aluminium extrusion, paint and emulsions, steel fabrication, aluminium extrusion, paint and emulsions and industrial gases.

All industrial areas are subject to very limited environmental controls, due to the lack of environmental legislation and regulations in the Emirate. Some private companies are adopting environmental management systems and environmental policies of

continual improvement and are taking responsibility for providing employee-training programmes on environmental issues and have formed environmental protection sections or departments to look after and assess the environmental impacts of their operations.

UN experts from UNDP and United Nations Industrial Development Organization (UNIDO), who have worked with the Abu Dhabi Government, are of the opinion that the environment in the Emirate is relatively unpolluted and it is not suffering from severe urban problems. This is due to the relatively small non-petroleum based industrial sector and the very good separation between the city, industrial areas, and sewage treatment, composting plants and landfills (ADM and UNDP, 1995).

The government is setting up new institutions such as an Industrial Loan Bank, established in 1997 to provide soft loans for all new industrial projects and to encourage investment and diversification (BMIL, 1998). The General Industry Corporation (GIC), which is a government agency, is planning to establish three new industrial areas in Abu Dhabi, Al Ain and Ruwais. It also inaugurated the "Sheikh Kalifa Award for Excellence" in June 1998. This is aimed at encouraging industrial growth and achieving higher standards in management. The Federal Environmental Agency is conducting a new system for industrial development projects, which will involve the application of an environmental impact assessment system for new major industrial installations. Also, the ADNOC has demonstrated a commitment to minimise the impact of industry on the environment by adopting environmental, protocols and guidelines.

The Ministry of Health and the UNDP, in association with the regional office of the World Health Organisation (WHO) started a project in 1998 to prepare a national strategy for occupational health. This aims to develop occupational health services and to reduce risk and disease of workers in the work places.

Industrial development in the Emirate is facing a very important transitional stage, due to the high volume of investment especially in heavy industry projects. This development also receives support from the Country Innovative Military Offset Programme (CIMOP), under which companies selling equipment to the UAE are required to invest a substantial percentage of the contract value in local industry. The

programme adopted to establish joint venture projects that yield profits equivalent to 60 per cent of the value of the contract and the projects must be profitable and sustainable (BMIL, 1998). Thirty projects have been launched, including a technologically advanced hospital; the Gulf Diagnostic Centre, an innovative solar power company, GPSC; a high-tech imaging and geo-information facility, the Gulf Centre for Remote Sensing (GCRS); the Oasis International Leasing Company; and Tabreed (a cooling System Manufacture) (EIUL, 1997).

The encouragement of industrial development and the establishment of new industrial areas in the Emirate may have an effect on the local environment if it is not controlled by sufficient environmental regulation and standards. The industrial production can effect on the today's generation in the same way it can store up most of the problems for the future (Satterthwaitc, 1999). For example, industrial emissions lead to concentrations in the upper atmosphere that contribute to climate change. Industrial waste results in contaminated land, which will cost more for cleaning up. Inadequate effluent control can also generate a build-up of toxic materials in sea and ground water.

5.5.3 Transport

The transportation sector plays an important role in achieving social and economic development of the Emirate, and represents the essential base of the infrastructure of the economy. The government has invested heavily in the provision of the transport system in order to meet the current demands. It has rapidly developed a highly efficient transportation infrastructure, with a total of 9,060 kilometres of roads. Modern highways connect all settlement areas in the Emirate and connect the Emirate with the other Emirates and with other states in the region. The Emirate is served by road, air and sea transport. Automobiles are the most common forms of transportation used. In 1997, the total number of motor vehicles licensed in Abu Dhabi Emirate was 159,460 (DP, 1997), which equal a ratio of one car for every 6 persons living in the Emirate. Traffic has many negative effects on the environment ranging from air pollution, noise pollution and also damages habitats and biodiversity (World Bank, 1997). The government has started to reduce the effect of

transportation through adopting different action, which have been described in section 5.4.1.

5.5.4   Tourism

Warm seas, sandy beaches, shopping centres, the quality of hotels and centres, virtually crime-free surroundings and the hospitality of the local people have made the Emirate become a tourist destination. The average annual growth in tourism in the Emirate is about 15-20 per cent in 1997 (DP, 1997). Tourism has an effect on the environment including an increase in the demands for transport and natural resources such as water.

The following section provides and presents the main environmental authority institutions in the Emirate of Abu Dhabi and also describes their responsibility and roles in the field of the environment.

5.6   INSTITUTIONAL STRUCTURE

To ensure effective implementation of environmental policies, plans and programmes, there is a need for the establishment and integration of an effective institutional framework. This section focuses on the requirement to build a strong social partnership, by involving all major groups in the decision-making process and development plans. This section illustrates the need for collecting information and data to improve the state of the environment report (see Chapter Three).

5.6.1   Integrated Decision-Making

As a result of the United Nations Conference on Environment and Development (UNCED) held in 1992, and due to the growing concerns among decision-makers about environment management within the Emirate, the Emirate of Abu Dhabi started to show interest in environmental concerns by establishing several institutions. The existing environmental institutional structure reflects the degree of attention the government has given to environmental issues. All the following government bodies have contributed to the ongoing environmental decision-making in different ways.

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5.6.1.1 Municipality/Food and Environment Control Centre (FECC)

The FECC, within Abu Dhabi Municipality (ADM), was established under Law, Number 3 for 1993 and is considered as a local authority in the field of environment protection. Also Al Ain Municipality (ALM) established its FECC in 1997. Both FECCs have been set up to control the activities that affect the environment. This law defined the FECC's responsibilities, which are mainly in food monitoring and protecting the environment. Each of FECCs has established an Environment Protection Section (EPS). The EPS in Abu Dhabi Municipality has built up an integrated environmental management system to carry out its function. This project is entitled 'Development of Environmental Management System for Abu Dhabi Municipality'. It was initiated and funded by Abu Dhabi Municipality and implemented by a British Consultant (ENTEC), under technical supervision of the United Nations Development Programme (UNDP). Two phases of this project were executed: the preparatory phase in 1994/1995 and the second phase in 1997/1998. This project provides some elements of the environmental management system, which are organisational structure, draft regulation and code of practice, and technical training of staff. EPS conducted a number of surveys addressing important environmental issues. The Public Health Section in ADM is responsible for some environmental activities, i.e. solid waste collection, transportation and disposal.

5.6.1.2 Abu Dhabi National Oil Company (ADNOC)

ADNOC is the National Oil Company of Abu Dhabi, established in 1971 to develop and market the hydrocarbon reserves of Abu Dhabi. ADNOC claims to strive to provide quality products and services to meet local market needs. Also, it exports oil, gas and petrochemicals to its worldwide customers. ADNOC takes pride in its employees and maintains a strong commitment to protection of the environment. In the field of the environment, ADNOC conducts the following activities: environmental research and studies on environmental impact assessment for all projects; air pollution monitoring; occupational health and safety; waste management facilities; flare minimising; and cleaner seas campaign. ADNOC has a crisis management system. This is undertaken by distributing oil spill control centres in four locations around Abu Dhabi.

In 1997, ADNOC published new guidelines for environmental, health and safety, which cover wastewater discharges, air emissions and hazardous waste management to reduce waste and emissions, reduce hazards and improve safety of workers in order to prevent major incidents which may damage people and the environment (BMIL, 1998). Environmentally sound technologies have also been integrated in different phases of exploration and production activities (e.g. flare minimising and sulphur reuse). It has also participated with local government bodies to develop codes of practice.

5.6.1.3 Environment Research and Wildlife Development Agency (ERWDA)

The ERWDA was established under Law No. 4 for 1996, and amended by Law No. 1 for 1997. The Agency's tasks include the establishment of projects to redress or eradicate the negative effects of industrial, agricultural, recreational and economic activities on the environment and wildlife of Abu Dhabi Emirate. The overall aim of ERWDA is to enhance the sustainable development of Abu Dhabi Emirate's environment and wildlife. ERWDA has six research centres: the Marine Environmental Research Centre; the Terrestrial Environmental Research Centre; the Wildlife Veterinary Research Centre; and the National Avian Research Centre; the Environment Services Unit; and the Falcon Facility, which is based in the UK. The legislation gives ERWDA the responsibility to supervise all programmes of environmental protection in the Abu Dhabi Emirate. It is a central environmental authority at the Emirate level. It acts as the co-ordinator and the link for all policies and environmental protection programmes executed by local authorities such as Abu Dhabi Municipality, ADNOC and Al Ain Municipality.

5.6.1.4 Federal Environmental Agency (FEA)

On the 4th of February 1993, in accordance with the Federal Law No 7 of 1993, the FEA was established as an independent governmental authority specialising in environmental affairs. It is affiliated to the Council of Ministers. The FEA has a limited number of technical staff. It is responsible for the protection and conservation of the environment in UAE. It also encourages the individual Emirates to develop local enforcement and monitoring capabilities to deal with local problems.

FEA is still in the process of developing its structure, and organisation; building its technical and management capacities; and designing its programme of work. A draft Federal Environmental Act has been scrutinised and referred to the authorities concerned for ratification.

Federal Environmental Law was produced in 1999 by FEA. It is covers many aspects of environmental protection in the UAE. It provides a legislative framework that would boost several functions performed by each Emirate. A special committee in FEA is developing the processes for applying environmental impact assessments in development processes. There is also a national emergency plan project to protect the marine environment.

The FEA established a steering committee to prepare the National Environmental Strategy for the UAE, which aims to execute the Agenda 21 programme. This project is being prepared in collaboration with the Economic and Social Commission for Western Asia (ESCWA) and is still in process. According to EL Khalifa (1999) the project will take three years to produce the first draft document and it will cover strategy preparation and formulation. Due to time and funding, the implementation and monitoring process are not covered in the project. The concern of government is only to formulate the document, not to implement its policies, plans and programmes. Because the implementation process will be the concern for individual Emirates depending on their priorities and capability. Each Emirate will be encouraged to formulate and develop local environmental strategy or plans to focus more on priority issues under their control. This step is important as mentioned in Chapter Four, the strategies of Jordan and Oman have such problems, which has hindered their success. The relationship between this effort and the model to be developed for this research will be discussed in Chapter Six.

5.6.2   Institutional Constraints

According to the World Bank and ESD (1995) there are number of problems that may affect any environmental institutions. These problems are:

- Unclear definition of responsibilities;
- Overlapping responsibilities among authorities;

- Lack of qualified staff;
- Inadequate communication; and
- Weakness of the judiciary.

Despite the presence of local environmental authorities and agencies, environmental problems have increased over the years, due to:

1. The absence of effective co-ordination and co-operation between the different authorities; this is the most common problem facing environmental authorities, such as FESSs, ERWDA, ADNOC, industry and the public.

2. The lack of enforcement powers and resources, especially among other government bodies and major industries.

3. The absence of effective legislation regarding environment protection and resources.

4. The process of environmental decision-making is struggling and needs time to reach the final form.

5. Due to increasing attention being given to environmental problems and issues themselves, the participation of the major groups in environmental activities, or in the decision-making process, is limited.

6. The weakness of environmental awareness programmes.

7. Unclear definition of institutional responsibilities

8. Overlapping responsibilities among agencies in the different levels of government authorities.

9. Authorities do not have clear programmes to support research institutions; they also do not have a clear vision of what is needed.

10. All present environmental programmes, plans and projects face serious implementation problems, including a lack of qualified staff and overlapping of responsibilities.

11. Institutions have few human and financial resources to carry out environmental activities.

In 1997, the ERWDA was established as a new body to propose environmental legislation in light of the Federal Environmental Law. The Agency took over all the responsibilities of environment protection.

5.7   MAJOR GROUPS

The Women's Society and Environment Friends Society are the main major groups, which are active in the environmental field in the Emirate. The other major groups such as research institutions and private sector do not have a clear role in environmental activities and their contribution is unclear. Chapter Eight offers a number of proposed elements to achieve the effective contribution of these groups, based on the responses to the questionnaire and interview survey.

5.7.1   Womens' Society

His Highness, President of UAE and the ruler of Abu Dhabi Emirate has extended his support and care for women to upgrade their status. His concept of their role is comprehensive, seeing women as mother, wife, student, doctor and worker in many other fields (Al Abed and Vine, 2000). He also supports the view that women should enjoy equal opportunities to participate in the existing task of national development.

Women in the Emirate now enjoy all social rights and work in many economic, health, social, information and education fields. Women in the Emirate have made serious efforts to serve the cause of women and to enable them to play a greater role in all aspects of society, including Government and commerce. These have made an important contribution to boosting women's activities through the holding of conferences, seminars, and training courses (Al Abed and Vine, 2000).

The Government is now preparing a National Strategy for Women for 2020, in co-operation with the United Nations Development Programme (UNDP). As part of this policy to involve women more actively in the political process, a selected number of women will attend meetings of the Federal National Council (Alitihad, 1998c and d).

5.7.2   Environment Friends Society (EFS)

EFS is a non-governmental society established in 1996. It is operates under the Ministry of Work and Social Affairs and also funded by the government. This situation let this society acts as a tool of government to implement some of the awareness programmes. It involves all society sectors such as students, employees and experts, women and business. EFS conduct a number of programmes annually, each of which targets particular segments of society. The Society focuses mainly on providing training courses for students, especially in the summer.

5.8   INTERNATIONAL LAW

There have been several international conventions within recent years and the signing of these convention shows the commitment of the government towards the environment at all levels. The UAE government has signed and/or ratified many international and regional conventions and protocols that are relevant to the protection of the environment. These conventions and protocols and the date of ratification are (ESCWA, 1997 and FEA and ESCWA, 1998):

Framework Convention on Climate Change (Brazil, 1992)-ratified in 1995

Convention on Biological Diversity (Brazil, 1992)- ratified in 1992

Basil Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal, (Basil, 1989)- ratified in 1990

Protocol on Substances that Deplete the Ozone Layer (Montreal, 1987)- ratified in 1990

Convention for the Protection of the Ozone Layer (Vienna, 1985)- ratified in 1990

The United Nations Convention on the Law of the Sea (Montego Bay, 1982)- ratified in 1983

Agreement for Combating Desert Locust (FAO, Rome, 1965)- ratified in 1974

Convention for the Prevention of Pollution of the Sea by Oil (1985)-1983 convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington, 1973)- ratified in 1974

Kuwait Regional Convention for the Co-operation on the Protection of Marine Environment from Pollution, 1979- ratified in 1979

Protocol Concerning Regional Co-operation in Combating Pollution by Oil and other Harmful Substances in Case of Emergency, 1979- ratified in 1979

Protocol for the Protection of the Marine Environment against Pollution from Land Based Sources, 1989- ratified in 1990.

Protocol Concerning Marine Pollution Resulting from Exploration and Exploitation of the Continental Shelf, 1989- ratified in 1990.

In addition to these, the United Arab Emirates contributes to many regional and international organisations, which are concerned with environment and conservation, such as the World Health Organization (WHO), United Nations Development Programme (UNDP), United Nations Food and Agriculture Organization (FAO), United Nations Educational, Scientific and Cultural Organization (UNESCO) and others.

Based on the information which has been presented in the previous section of this chapter the following section will provide the main environmental problems and priorities in the Emirate of Abu Dhabi.

5.9   ENVIRONMENTAL PROBLEMS AND SETTING PRIORITIES

This section will discuss the environmental problems and concerns in Abu Dhabi Emirate as part of the strategy model process. Also, it will assess how they can be prioritised.

5.9.1   Environmental Problems and Concerns

The World Bank and ESD (1995) identified that deciding of what are the environmental problems and concerns is mainly based on environmental conditions

and impacts. Finding the causes of environmental problems is essential for finding the right solutions and to formulate appropriate environmental strategy and planning. This requires understanding of the link between the causes and effects of environmental problems. The World Bank and ESD (1995) argue that the causes of environmental problems can come from direct pressure on the environment or by enabling factors.

The direct pressure factors include rapid population growth, rapid economic development and changed life style. These cause pressures on the environment and resources through air, noise, water, marine and coastal pollution, and increase the number of vehicles, security problems, natural resources depletion, and accelerate a consumer society (causing increases in waste generation, water and electricity consumption).

There are different types of enabling factors, which cause pressure on the environment and resulting environmental problems. These arise when environment dimensions are not integrated into the feasibility studies of development projects; or when economic mechanisms fail. They also arise because of weak human, institutional and legislation capacity building; and lack of environmental awareness.

ESCWA (1997) argued that the unsustainable use of natural resources was caused by:

- Massive extraction and inefficient use of water for irrigation;

- Lack of incentives for conservation and allocation to higher value uses;

- Lack of cost recovery by water and sanitation services

- High energy consumption in relation to economic outputs by low energy price; and

- High polluting public enterprises still responsible for the bulk of industrial air and water pollution.

Today, the Emirate is facing many environmental challenges, such as, more freshwater will be consumed than can be renewed, relying on expensive desalination of seawater and causing depletion of non-renewable aquifers. Based on the above

information, the main environmental problems and concerns can be categorised into the following major topics according to their origin and cause.

5.9.1.1 Water Problems

The Emirate is facing a water problem, in terms of water resource depletion, water supply and water pollution. Population growth and rapid economic development in the Emirate increase the demand on the limited water resources. The Emirate depends mainly on ground water for agricultural uses and desalinated water for other uses. Increasing population numbers and rising living standards result in over extraction of groundwater. This is in addition to a wide development in agriculture and industrial projects, which increase demand for water. Demand in both groundwater and desalinated water is high and generally outbalances overall available supplies.

Water for agricultural development is free from fees and domestic water is subsidised highly by government, where the consumer pays about a tenth of the actual running cost. The low prices encourage people to use excessive amounts, thus depleting ground water reserves. This is manifested by the lowering of the water tables and increased salinity.

Although, there are limited water resources in the Emirate and excess water consumption demand has been steadily growing because of rising population, agriculture and industrial growth and development, there are no policies to protect and preserve water resources through using new technology and techniques and by modifying consumer behaviour.

5.9.1.2 Industrial Problems

Industrial pollution differs from one case to another depending on the type of industry, volume, production rate, type of fuel, and type of raw materials. Industrial pollution is generated mainly by heavy industry, such as the oil and chemical industries. It has caused groundwater and surface water pollution, air and marine environment pollution and results in solid and hazardous wastes.

Industrial activities have also caused thermal and chemical water pollution in different areas of the Emirate especially the coastal areas. Thermal discharge, mainly from power and desalination plants, has caused an increase in water temperature in some areas and this can result in the depletion of oxygen. The presence of oil in water reduces the heat transfer coefficient in the evaporation units, lowering their efficiency, while the presence of ammonia increases the corrosion rate of surfaces within the stations. It also decreases the biological quality, which requires the addition of more chlorine as a disinfectant agent that adds to the costs of production.

The major concern about the sewage treatment plants is that the quantities and nature of the industrial wastewater disposed into the sewer network are unknown. The composition of sludge is not purely organic but contains hazardous compounds. Oil sludge, which contains heavy metals such as aluminium (Al), lead (Pb) and magnesium (Mg), is discharged from oil activities and is mainly disposed in oil lagoons at sites in the desert.

Disposing of hazardous waste, which contain toxic and heavy metals, has always been a problem. Storage is a usual practice for toxic waste, while landfill is used for other wastes.

Other industries produce less hazardous waste but nevertheless produce large amounts. It includes, for example, paper, plastics, glass, metals, textile and construction wastes.

5.9.1.3 Agricultural Problems

Rapid agricultural development in recent years has added new components to the environmental load. Plastic is one of these components; it is used widely and in different forms. It is used to cover greenhouses and it is used to cover land (heat sterilising), or in plant nurseries. All these kinds of plastics are disposed of by burning or are simply thrown out, which can affect wildlife health.

Fertilisers are another type of agriculture pollution. As mentioned in section 5.4.5, most agriculture lands in the Emirate are sand areas, having low organic material and debility to save water. Due to these reasons the farmers add a high quantity of

fertiliser to the land, usually exceeding the limit, to increase production rates thus making it saline and unproductive. The third type of agricultural pollution is the misuse of insecticides.

5.9.1.4 Marine and Coastal Problems

Oil transportation is the main source of marine pollution and is produced from vessels cleaning, ship operation, ballast water, disposal of oil, chemical and hazardous material wastes, accident, ships' wastes (wastewater and solid wastes) and ship painting.

Other problems include the unregulated fishing and overfishing of species, due to weak legislation and limited institutional responsibility, although the government has specified seasons and locations for commercial fishing, which has improved their production rate.

The marine environment and the quality of marine water in the Emirate is subjected to considerable stresses through deliberate or accidental oil spills, ballast water discharge, dredging and infilling for coastal development, and uncontrolled industrial wastewater discharges. Oil is regarded as the most serious pollutant of concern in the Emirate (Oostdam, 1980). According to Abu-Hilal and Khordagui (1994), the beaches of the Emirate were found heavily polluted with industrial plastic.

Apart from development of the urban areas of Abu Dhabi, the principal influences on the coastal zone are oil and gas exploitation, oil spills (accidents in exploration and transportation), commercial fisheries, dredging, the building of artificial islands and inter-island causeways, desalination for water supply (highly saline hot water), and, increasingly tourism (garbage from human activities). Coastal activities are now regulated in order to minimise the adverse effect of dredging and land reclamation on the marine environment, but there is no clear regulation issued to minimise the adverse effects of dredging on the marine environment.

5.9.1.5 Urbanisation Problems

The expansion of the urban environment into agricultural areas is affecting the environment, for example, due to some agricultural areas being converted to industrial sites resulting in new buildings and roads.

Another aspect of uncontrolled urban growth is the expansion in coastal areas, which destroys natural protected areas, and causes loss of biological diversity and ecosystems such as mangroves, coral reefs and marine grass. Also exploitation of oil and gas, commercial fisheries, dredging, the building of artificial islands, power and desalination plants, and increasingly tourism are other affects of urban growth.

5.9.1.6 Environmental Awareness

Awareness is important to help reduce environmental problems, especially with regard to water consumption, solid waste and others. Awareness programmes are mainly used to introduce changes in the behaviour of the society and adopt more responsible attitudes.

Government authorities try to improve environmental awareness and raise public understanding of environmental issues, but there are major weaknesses in environmental awareness programmes due to absence of co-ordination and co-operation between government authorities themselves and between them and major groups.

The main causes of environmental awareness problems are: (1) lack of environmental awareness at all levels; (2) work pressure, and modern lifestyle complexity; (3) rapid urbanisation growth; (4) unlimited wealthy feeling; (5) consumption behaviour; (6) feeling and consideration that the government must sponsor everything, even maintaining and saving resources; (7) the permissiveness and leniency in regulation and penalties application; (8) all environmental awareness programmes are limited; and (9) most successful programmes are carried out by independent authorities and companies.

The major causes of environmental problems are: population growth, migration and density; rapid economic growth; wealth; land use policies; pricing policies; lack of

environment protection law and enforcement; lack of awareness; lack of monitoring and control; lack of treatment facilities; lack of energy alternatives.

The international environmental issues such as ozone layer depletion, global warming, toxic and hazardous waste may have an effect on the local environment and may cause some of the environmental problems such as marine pollution and industrial pollution. This is because the Emirate is located on the Gulf and all other countries located at this area also have oil and gas industries. The degree and type of this effect will be tested by conducting questionnaire and interview survey (Chapters Seven and Eight).

5.9.2 Environmental Priority Problems

Identifying and setting the priority of environmental problems is an essential step for effective environmental strategy and planning. Setting priorities is a fundamental component of an environmental strategy model (see next chapter), because it encourages the efficient uses of resources.

The World Bank and ESD (1995) show that in order to decide what are the priorities, it is necessary to use transparent selection criteria, to give weight to expert opinion, and to listen to the concerns of the public. These criteria include the impact of environmental problems on human health, economic productivity, ecological impacts, loss of amenity.

The impact of environmental problems on human health can be determined by knowing the number of people affected by direct or indirect environmental pollution. These problems can lead to illness or early death and so their impact could be measured through the size of affected population and mortality rates.

Pollution has a negative impact on health and thus on the productivity of human resources. Environmental degradation effects can also reduce the productivity of natural resources, especially ecological cycles and systems. Depletion indicators of natural resources include the loss in the number of plant or animal species, and of hectares of agriculture land.

The effect of environmental degradation on ecological cycles and the maintenance of ecosystems can be significant. Overexploitation of resources can disrupt key environmental services. There is an aesthetic value of a clean environment, which has positive effects on human health, economic productivity, and ecological systems. A good understanding and evaluation of the risk and uncertainty produced by environmental effects is an instrument to identify the important environmental issues.

Based on that, the environmental problem priorities for the Emirate could not be identified because it is difficult to identify the impact of environmental problems (see Section 5.9.1), on human health, economic productivity and ecological impacts. Therefore, to determine these kind of impact it needs the collection of up-to-date information regarding the present environmental situation. As discussed in Section 5.1, the information presented in this chapter is not updated information and data. Due to that, the identification of environmental priorities in this research will be based on the experts and people opinions. Where expert and specialist opinions can influence the priority setting and political process by providing a rough ranking of environmental problems and causes in order of importance, and they will need to consider explicit technical criteria in their ranking decisions. Also, it will be necessary to listen to individuals especially those affected, because they know the effect of environment problems on their welfare. A consultation and participation process in this stage will be adopted by involving them in a questionnaire survey (see Chapters Seven and Eight). The results from their opinion and involvement will affect the setting of environmental priority problems (World Bank and ESD, 1995).

5.10   CONCLUSION

The State of the Environment Report (see Chapter Three) should contain the review of the current situation of the Emirates' environment. Based on that, this chapter provides a SoE report for the Emirate of Abu Dhabi in order to achieve one of the research objectives (see Chapter One). To achieve this requirement, it is necessary to collect accurate information and data, identify the environmental problems and concerns and to define environmental problem priorities. This report should be work as a base for developing an environmental strategy for the Emirate of Abu Dhabi.

The background of the Emirate of Abu Dhabi in section 5.2 showed that population and the economy grew rapidly after oil exploration. These growths have caused pressure on the local environment and present environmental problems such as urbanisation, industrial pollution, marine pollution, water pollution, and an increase in the consumption of resources. As previously described in Chapter Five, the Emirate of Abu Dhabi is the largest Emirate in the UAE representing about 87% of the total area of UAE. Each Emirate has its own local government which differ in size and complexity from one Emirate to another depending on variety of population and degree of development. All these factors are making the environmental problem priorities differ from one Emirate to another. This statement will be tested in Chapter Eight by asking respondents to the questionnaire survey to rate their opinion and agreement level if the environmental problem priorities differ from one Emirate to another.

The existing environmental institutions reflect the degree of attention given to environmental issues. The most important institutions that have a direct concern with environment are ERWDA, ADNOC, and Municipalities. These institutions are facing different problems and constraints (see section 5.6.2) which may hinder the implementation of environmental plans and activities and also affect the enforcement of regulation. Due to these problems the current environmental institutions need to be rearranged into a new structure and framework for organising their roles and responsibilities.

According to the literature review in Chapter Three and the review of other countries' experience, the importance of providing comprehensive information and data regarding the current environmental situation is vital to prepare SoE report. The review of other countries' experiences in Chapter Four showed that all strategy examples were began with the provision of information and preparing the SoE report as a starting point in developing and formulating their environmental strategies by identifying environmental problems and defining priorities. Clear problem identification, identifying causes and concerns, and setting environmental problem priorities are considered as a critical major step in designing an environmental strategy model for the Emirate of Abu Dhabi. However, the required information sources are interconnected and dependent on each other. For example, to identify

environmental priority problems, it is necessary to define the environmental problems and concerns. Also, to define environmental problems and concerns, it is necessary to have accurate and up-to-date environmental information and data. Properly identifying the causes of environmental problems helps in formulating appropriate policies and setting achievable objectives towards achieving sustainable development and successful strategy process.

DESIGNING AN ENVIRONMENTAL STRATEGY MODEL FOR THE EMIRATE OF ABU DHABI

CHAPTER SIX

DESIGNING AN ENVIRONMENTAL STRATEGY MODEL FOR THE EMIRATE OF ABU DHABI

6.1 INTRODUCTION

In this Chapter, the environmental strategy model for the Emirate of Abu Dhabi is designed. This model is built up based on the concept of sustainable development, Agenda 21 and environmental strategy and models which have been discussed and examined in Chapters Two and Three. The literature review of different strategy models (Chapter Three) is one of the main sources of information regarding formulating and developing environmental strategies by providing and examining different types of strategy models. Strengths and weaknesses of the other countries' experience and the lessons learned from these experiences can help to achieve an effective and successful strategy for the Emirate of Abu Dhabi (Chapter Four). All this information will be taken into consideration in this chapter. The model will attempt to overcome the factors that hindered the development of the three selected experiences (Chapter Four).

In the concluding paragraph of Chapter Four, it was emphasised that the practice of developing an environmental strategy in any country depends on the particular circumstances within which it is undertaken. These circumstances differ from one country to another, according to variations in the scope and objectives, demography, sources of income, patterns of decision-making, and environmental problems and priorities. Therefore, there can be no universal model. But there are also similarities. For example, the UK government structure has two levels, central government and local government. Central government cannot be too specific on the environmental, economic and social aspects for each local area. This is similar to the UAE, where the government structure has two levels, federal (national) level and local government level (see Chapter Five). Therefore, it is, more practical to consider two levels of environmental strategy in UAE, that is the federal and local levels. At the federal level, the strategy should be broad and provide general guidance. At the local level, each Emirate should formulate a local environmental strategy and they should

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confirm with the national strategy at federal level. These strategies are expected to be more specific and to focus on priority issues under the local government control.

The federal environmental strategy cannot be very specific on environment issues for each Emirate, because there are differences between Emirates in population size, total area of land, degree of development, sources of income, and sources of financial support. Based on the above-mentioned factors, the environmental problem priorities will differ from one Emirate to another. For example, the size of population in Abu Dhabi Emirate is more than 35% of the total number of UAE population of 2,938,000 in 1999, and the main source of GDP is oil revenue, whereas in Dubai Emirate the main source of GDP comes from trade and tourism. This statement will be tested in Chapter Eight by a questionnaire and interview survey to rate the opinion and agreement level of respondents regarding this matter.

At present, the Federal Environmental Agency (FEA) is preparing a National Environmental Strategy for the UAE in co-operation with the UN (ESCWA). The Chief Technical Advisor of the National Environmental Strategy for the UAE (El Khalifa, 1999) stated that it would take four years to prepare and formulate the national strategy. The implementation, monitoring and evaluation processes are not covered at this stage of the project. The advisor mentioned that the important recommendation of this project is how to encourage each Emirate to formulate a local environmental strategy (Chapter Five).

Based on the previous discussions the proposed environmental strategy model for the Emirate of Abu Dhabi is designed. The following model will be used as a conceptual framework for the strategy process and it will operate for the Emirate of Abu Dhabi. Thus, a model is a key element in determining the scope of the research (see Chapter Seven). This model has to be produced in order to achieve the research aim and objective (see Chapter One). In order to achieve the successful development of the strategy, the concept of sustainable development (see Chapter Two) must be integrated into the desired strategy model. In this chapter the author will propose an environmental strategy model specially designed for sustainable development. Therefore, achieving sustainable development requires formulating an adequate strategy model that considers other strategy experiences and weakness. But at the

same time, the integration of exiting environmental condition is important in the strategy process.

As a starting point for discussion, Figure 6.1 sets out in diagrammatic form a summary of the proposed environmental strategy contents which describe the approach proposed by the author for environmental strategy. It contains four stages and each stage will have a number of components. These components include: (1) collecting environmental information; (2) identifying environmental problems and setting priorities; (3) preparing the strategy; (4) formulation; (5) implementation; (6) monitoring and evaluating; (7) reporting and feedback; and (8) auditing. Each of the strategy components is produced and facilitated by the participation and involvement of major groups. From the previous chapters, some essential elements can be identified and it is very important that these be taken into consideration in each part of the strategy process. These elements are: the provision of a strong and clear institutional and legislative framework; financial and administrative support; high level support; clear goals and objectives; inter-governmental co-ordination; participation and involvement of public and other sectors and groups; and setting priorities concerning the most important environmental problems. Figure 6.1 illustrates these elements and their applicability to the Emirate of Abu Dhabi.

As discussed in Chapter Three, the strategy depends on its components to guarantee a successful strategy process, and the ability to implement and monitor strategy. To formulate strategy, it is important to collect the accurate data and information to define the major environmental problems and concerns and also to identify the priorities. In Chapter Five, the collection of up-to-date information proved to be difficult, and the absence of adequate data may hinder the success of the strategy process and the implementation of strategy policies, plans and programmes. This was one of the main reasons why Oman failed to implement its policies, plans and programmes (see Chapter Four). To avoid this kind of failure, the strategy should be based on the information presented in the latest state of the environment report. The formulation of an institutional framework and redistribution of responsibilities, duties and mandates is also essential to achieve a successful strategy process.

The use of environmental tools, such as sustainable development indicators (SDI), environmental impact assessment (EIA), strategic environmental assessment (SEA), land use planning (LUP), and environmental management system (EMS) will be adopted in the strategy process. This chapter also will discuss the role of different authorities and the participation of major groups in each step of the strategy process. Moreover, it will discuss other components of the strategy, such as auditing, reporting, feedback and assessment.

In order to achieve an effective environmental strategy model, the structure of this model includes participation, awareness, co-ordination and co-operation and consultation as a key elements which will be used in each step of the strategy such as in preparing the state of the environment report; setting the environmental problem priorities; strategy preparation; formulation; and implementation.
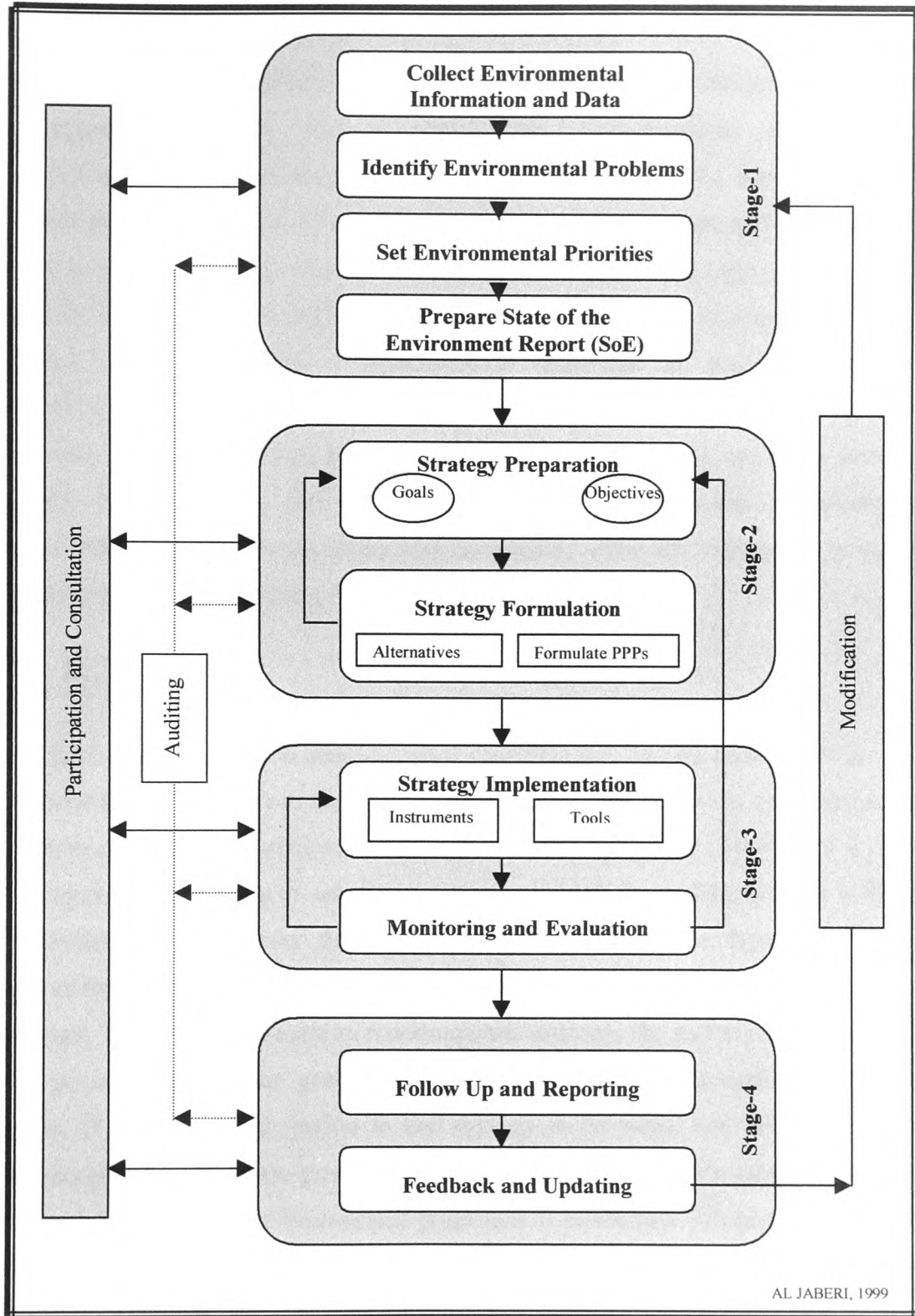
Figure 6.1   The Proposed Environmental Strategy Model for Abu Dhabi Emirate

6.2   KEY ELEMENTS OF THE STRATEGY

According to the review of other countries' experience and the overview of Agenda 21 (Appendix B), the use of participation, co-ordination, co-operation, communication and consultation should be key elements of the strategy. These elements are critical issues in achieving sustainable development and essential to develop successful strategy process. The participation of different major groups at all levels which may differ according to their role and the type of involvement. The co-operation with international organisations is important to provide technical assistance, exchange information and transfer technology. Providing clear and strong co-ordination system will also help to achieve strategy objectives and goals and to organise the contribution and participation of all participants into the strategy process. The following are the descriptive information about the importance of each element in the proposed strategy process.

6.2.1   Participation

Total involvement cannot be achieved all at once (Gunderson and Janson, 1994). As concluded from Chapter Four and described in Chapter Three, there is no formal way to achieve major group participation in the government operations. Teamwork is one of the most effective ways to achieve participation (ibid). According to LAA (1992) local authorities, like many other sectors, still have much to learn about the environment; because of that, the involvement of major groups is particularly important. To prepare a successful environmental strategy, the government authority needs to encourage major groups participation in the decision-making process. Agenda 21 calls for participation in the strategy to be wide, and should include government authorities, non-governmental organisations, women's groups, and the private sector, as far as environmental protection is concerned (Chapter Two). The review of other countries' experiences in Chapter Four has shown that the major groups' participation could be achieved by using different techniques during the strategy process. For example, in the UK strategy, there is widespread participation and consultation in each of the strategy processes, whereas in Jordan and Oman the participation of other groups takes place through conferences and workshops and establishing a strategy steering committee. The UK strategy had involved major

groups in different stages of the strategy, such as information generation, preparation, formulation, implementation and monitoring and evaluation. It also encouraged the exchange of information by increasing communication between all participants.

The objective of participation is to give these groups in the community an opportunity to contribute to the solution of their own local environmental problems. In order to achieve this, the following information must be made available to the public: environmental baseline database results of EIA studies, the state of the environment report, and strategy progress reports. Gunderson and Janson (1994) explained that all participants should be given equal opportunity to join in the strategy process to enhance participation. Such groups can support authorities and allow them to participate in following up the implementation of environmental strategy policies, plans and programmes. The participation can be effective if the involvement of major groups is made at each stage of the strategy and requires the major groups to have easy access to the environmental information (Morgan, 1995). The role of each major group is listed and provided in section III of Agenda 21 (see Appendix B).

Public participation in environmental decision-making is one of the principles of the Rio Declaration Principle 10 (see Appendix A). In the Emirate, public participation and its role in the environmental field, especially within government authorities, is limited, due to the increasing attention given to international environmental issues rather than local ones. The participation and involvement of the public is essential to promote and support the authority actions. Participation is important to the success of the strategy (Welford, 1998). Joels (1994) provided in his research six objectives in securing public participation, which are:

- to educate the public;
- to identify problems and needs;
- to seek approaches to problem solving;
- to seek feedback to the proposed solution;
- to evaluate alternatives; and
- to resolve conflicts.

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The participation of government employees in the strategy process is also important to get a better and more detailed overview of the environment and to provide a means for reducing conflict (Halme, 1997). Quazi (1999) argued that the lack of employee participation and involvement could have an effect on the process of implementation.

The private sector can play an essential role, if it is provided with a clear role in the strategy process. They should be encouraged to fund research institutions, environmental awareness programmes, and the strategy programmes and projects and to support environmental seminars and workshops. They should also be encouraged to use clean production technologies to achieve sustainable development and strategy targets. At present, this sector controls the non-oil-manufacturing sector and the Emirate's new policy is to find other sources of income beside oil and gas (see Chapter Five), to reduce the reliance on oil revenue.

As concluded from Chapter Five, research institutions are not playing an active role, due to the lack of resources and qualified persons. At present these institutions contribute little to this field. Another reason could be the lack of co-operation and co-ordination between government authorities and other research institutions. Research institutions can contribute to the strategy process by becoming involved in the information and data collection and analysis; preparing the state of the environment report; and identifying the environmental problems and priorities. Their role is to provide advice and consultation to the government authorities on the environment at each step of the strategy process. They can also contribute to awareness programmes and can educate and encourage people to change their attitudes and behaviour by organising or participating in education programmes and seminars. Research findings can increase the capacity of authorities to manage their activities (Kitchen, 1997). The importance of the private sector and research institutions' contribution in the strategy process will be also tested in Chapter Eight by the questionnaire and interview survey.

There is an urgent need to carry out an environmental inventory and conduct research and surveys for assessing the environmental impact of development projects. The information that has been presented in Chapter Five was not up-to-date and does not include recent studies and research results, because of the shortage of qualified staff,

and the lack of co-operation and co-ordination between authorities and research institutions. Based on that, there is also a need to change government attitudes towards research institutions. This requires sufficient funding and support for research institutions.

The involvement of NGOs and other groups such as women's group, are other forms of public participation. Based on the information presented in Chapter Five, these groups have a very limited role in matters related to the environment, and their organisations are dominated by individuals who are government employees (not completely independent organisations). These groups can contribute and function within the proposed model through increased public awareness and proposing solutions to environmental issues. These groups can support government authority plans and enable the public to participate in following up the implementation of the strategy plans, policies and programmes. It also can support other groups and public initiatives to protect, conserve and enhance their local environment (LAA, 1992).

Gibbs et al. (1996) showed that the implementation of environmental plans and programmes requires the active participation of local authorities and major groups. Agenda 21 recognised that the major groups' participation is vital because the outcome would need to be widely supported to achieve sustainable development (Pinfield, 1996). Bell et al. (1994) and Smith (1993) provide a number of approaches and techniques that can be used to achieve major groups participation such as questionnaire surveys, exhibitions and public meetings (see Chapter Three). The importance of each technique will be examined in Chapter Eight.

In summary, participation is a critical issue in achieving sustainable development. It requires participation of the different sectors and groups as well as top decision-makers and lower administrators. Participation may differ according to the tasks in the strategy. As discussed in Chapters Three and Four, it can be performed in the strategy awareness and information gathering and analysis stage, to develop a broad knowledge of opinions. Participation can also be performed in the policy formulation and planning process in which more practical objectives are agreed, so as to give greater credibility to the strategy.

The following figure (Figure 6.2) shows the participation of the various sectors at different stages of the strategy process.
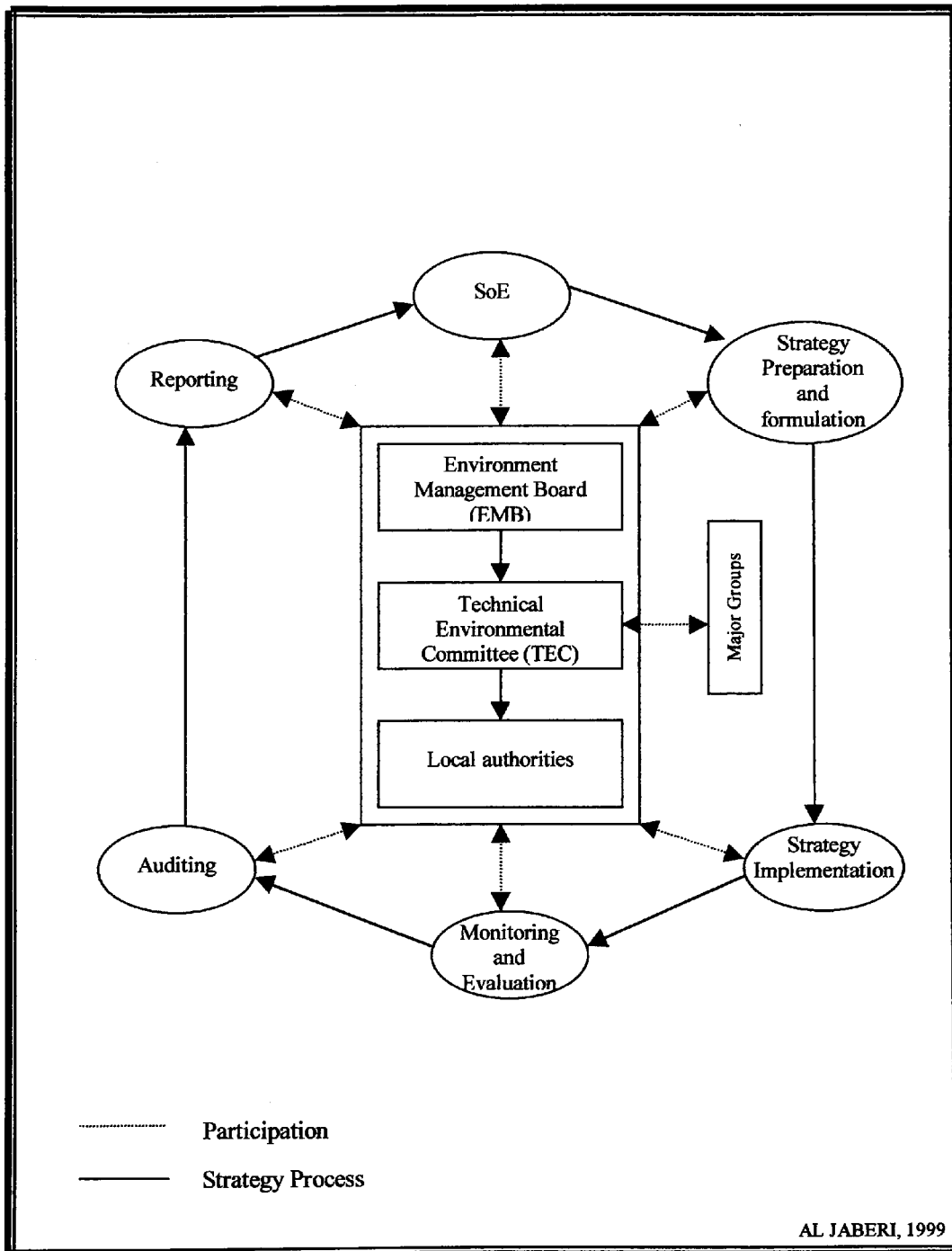
Figure 6.2   Participation of the various Sectors at Different Stages of the Strategy Process

6.2.2 Co-operation

The principles of co-operation requires a clear framework among government authorities and between government and international organisations in order to share the information and expertise to achieve the maximum results in developing and formulating strategy. International co-operation is important in the strategy process to provide technical support. This co-operation is necessary where there is a shortage of qualified staff and expertise in this field. The review of the Jordan and Oman strategies showed how these countries co-operated with the international organisations to provide technical assistance, because of this shortage of qualified staff (see Chapter Four).

International organisations such as UNDP, UNEP, IUCN and the World Bank can play a key role in the different processes through exchanging knowledge, technology and skills and also through providing technical assistance, as described in Section I of Agenda 21 (see Appendix B).

6.2.3 Co-ordination

Co-ordination between the different participants is also one of the elements used in a successful strategy process. It is stressed in Agenda 21 that this means different sectors or groups working together, increasing the partnerships between the major groups and local authorities. This can be achieved in many ways e.g., through providing basic information and data from all sectors and keeping them available for the people. Co-ordination is used to build up strong links between all concerned participants in the strategy process to organise the contribution and participation of all sectors. Chapter Four showed the impotence of establishing an inter-governmental co-ordination unit or machinery to make sure that environmental considerations are integrated in their activities and plans. Communication is necessary to share information (see the next section) and to achieve clear and strong co-ordination between all sectors (Margerum and Born, 1995).

The proposed Technical Environmental Committee (TEC) (see section 6.4) should decide which authority takes responsibility for co-ordination and make sure that it

has links between all federal and local government authorities, the private sector, NGOs, women's groups, etc.

6.2.4 Consultation and Communication

According to Baldwin (1985), effective communication in the strategy process is the key to achieving successful strategy formulation and implementation. The strategy must be prepared and designed in consultation with major groups such as businesses and industries, researchers and specialists, NGOs, and women's groups. They should be asked to comment on the goals and objectives of the strategy. They have a valuable contribution to make at the different stages of the strategy by obtaining information and providing their comments and views on the draft version of the strategy. The involvement of major groups could be achieved by using various types of mechanisms. The Round Table is one possibility, where government representatives, business, NGOs, academic researchers and other groups of the community are invited to share points of view regarding environmental issues (see Chapter Four). Other mechanisms, such as a network system, can be used to create communication channels with different sectors. The strategy makers must take their comments and views into consideration to achieve a successful strategy. Effective participation and involvement of major groups in the decision-making processes could achieve these kinds of consultation. The opinion and views of the above groups will be taken into consideration when testing the proposed model, by involving all environmental authorities and major groups in the questionnaire survey. Communication is an important element for moving towards the strategy and in improving the linkage between major groups and government through information exchange. It also helps people to see the need for the change (Kotter et al., 1989).

Figure 6.1 shows the proposed environmental strategy model for the Emirate. Therefore, the next sections will concentrate on the main components of the proposed strategy model. Under each topic a brief assessment is given.

6.3   STAGE ONE: DEFINITION OF ENVIRONMENTAL PROBLEMS

This is the first stage in developing and designing the proposed strategy model. It contains four components, as shown in Figure 6.1. It is considered to be the baseline

of the strategy model. It provides the following steps: collecting environmental information and data, identifying environmental problems and causes, setting environmental priorities, and the preparation of the State of the Environment Report (SoE) for the Emirate of Abu Dhabi.

6.3.1 Collection of Information

Without providing information regarding the current environmental situation, the environmental strategy cannot be designed. The collection and analysis of environmental information is vital in promoting environmental policies and public participation and this information should be continuously updated and improved (Price and Robert, 1997). This is because strategy components such as preparation, formulation, implementation, monitoring and evaluation are also based on this information and data. Environmental information for the Emirate of Abu Dhabi have been collected and presented in Chapter Five. The review of other countries' experiences in Chapter Four has shown how the Oman strategy failed in implementing its strategy because of the shortage and variation of information between involved departments. As discussed in Chapter Three and Four, the first step in the preparation of a strategy is to acquire sufficient and accurate information regarding the major issues and problems that need to be tackled by the society.

6.3.2 Identifying Environmental Problems and Setting Priorities

Based on the information and data collected in the previous section (6.3.1), environmental problems will be identified by government authorities, in co-operation with major groups, by organising seminars or conducting surveys and inviting the major groups to participate. Their opinion and views should be considered in order to identify the main environmental problems and priorities. These problems have been discussed and described in Chapter Five. The main causes of environmental problems are rapid population growth, rapid economic development, increasing consumption, lack of environmental law and enforcement, lack of monitoring and control, and the lack of awareness and lack of treatment facilities.

International environmental issues such as ozone layer depletion, global warming, marine pollution and industrial pollution also need to be addressed. These may have

an effect on the local environment (Chapter Five). UNDP (1992) argued that the solution of global environmental issues could only be achieved through international co-operation according to the sustainable development approach. Defining environmental problems and knowing the causes will allow priorities to be set. These priorities will be set based on a number of criteria, such as human health, economic productivity, ecological impact, loss of amenity, and risk and uncertainty (see Chapter Five). In Chapter Eight, the definition of environmental problems and causes and also the identification of environmental priorities will be provided, based on the opinion of the respondents to the questionnaire and interview survey, by trying to involve the most concerned authority and major groups in the Emirate.

6.3.3   The State of the Environment Report

Mitchell (1997) suggested that the State of the Environment Report (SoE) should be adopted for one or more of the following reasons:

- to provide early warning signals about changing environmental conditions;
- to encourage public participation and consultation;
- to identify where there is insufficient knowledge; and
- to stimulate the public about the implications of decisions.

A SoE must provide up-to-date information on environmental conditions. This information is used to increase public knowledge and understanding and to inform them what the government is doing about matters related to the environment.

The SoE differs from one country to another since there are differences on environmental problems, causes and priorities. According to Mitchell (1997), there are four types of SoE reports; (1) comprehensive (i.e. national, state, city); (2) sectoral (i.e. forests, agriculture, water); (3) issue-based (i.e. global change, and wastes); and (4) indicator-based (i.e. air and water quality).

The use of a Comprehensive State of the Environment Report is appropriate for this model, because it is designed for the Emirate of Abu Dhabi. The main aims of the SoE are to provide basic information on the present environmental situation and to present an overview of environmental condition (Hams, 1994). The main purpose of

the SoE report, as described by Barton and Bruder (1995), is to obtain a comprehensive review of what exactly the environment is, how it has changed and how to manage change in a positive way. This kind of report is needed to make good decisions about the environment to achieve sustainable development (DoE, 1996). The proposed Technical Environmental Committee (TEC) needs to publish and produce an annual SoE report because it should be up dated with new environmental information and data, where the environmental conditions change. It should be made available to the public and decision makers, and all sectors should be encouraged to participate in the collection of information, data analysis, information exchange, and the assessment of the current situation by identifying their role in each strategy process (see Chapter Five).

6.4   STAGE TWO: STRATEGY INITIATION

This stage of the strategy is built on the available information and data, which were collected and reviewed by all concerned authorities and departments to prepare the State of the Environment Report. Once environmental problems have been identified and prioritised, it is necessary to set out realistic and achievable objectives. The next stage involves preparation and formulation, in which the proposed **Environmental Management Board** (EMB) will set achievable goals and objectives in co-operation with the proposed TEC and all concerned departments and major groups as shown in Figure 6.2.

A clear institutional framework will be formulated, with specified mandates and responsibilities and identification of the roles of each participant in each strategy process. At the formulation stage, environmental strategy policies, plans, and programmes will be formulated for each environmental issue and the strategy alternatives will be set (see Figure 6.1).

Reconstructing the existing environmental institutions in the Emirate is essential if a successful strategy process is to be achieved. As discussed in the previous chapter, the existing environmental institutional framework in the Emirate has some disadvantages and faces several problems, which hinder the implementation of any environmental policy. Therefore, the rearrangement and reconstruction of the current

framework is necessary. This new structure needs government support through the provision for each authority of an adequate financial and administrative support to build up its capacity. As described in Chapter Two, the term "capacity building" is used throughout Agenda 21 to mean developing the structure, resources, and skills needed to make necessary changes. This includes training, information collection, and the establishment of an appropriate institutional structure and regulations. The lessons learned from the review of other countries' experiences in Chapter Four indicated that this support should be continuous and cover all the strategy stages and components and it should stand on an understanding of the strategy process and its cost.

6.4.1 Strategy Preparation

Based on the review of different strategy models in Chapter Three, the strategy must begin with a careful analysis of internal strengths and weakness and external opportunities and threats.

As described in section 6.2.1, participation is essential to help in defining goals and objectives and to provide consultation and advice in setting these requirements. The proposed EMB can organise public meetings or seminars to discuss different environmental issues and introduce the strategy process.

Clear institutional structures can play a critical role in achieving the success or failure of the strategy process (Noble, 1999). The establishment of clear responsibilities and duties allow authorities to obtain a better understanding of their roles in implementing and monitoring the strategy's policies, plans and programmes and to solve any conflict between existing responsibilities (Quazi, 1999). Thus, there may be a need to restructure, rearrange and redistribute authority responsibilities. The proposed new institutional framework takes into consideration the existing political and administrative system. As described in Chapter Three, the size or type of institutions and the nature and variety of their areas of concerns and interest should be also taken into consideration to achieve successful strategy development and formulation.

Although Abu Dhabi Emirate law gives the main responsibility to enhance the sustainable development of the Emirate to Environment Research and Wildlife Development Agency (ERWDA), nevertheless they still struggle to achieve this because of overlapping responsibilities between other authorities (Chapter Five). These problems hinder the implementation of any environmental activities. In order to achieve sustainable development in the Emirate of Abu Dhabi, an environmental Management Board (EMB) with an independent budget should be established. The function of the EMB is to provide overall direction for the strategy, taking its mandates from the Emirate's highest authority (Executive Council).

This Board would replace the ERWDA Governance Board and be chaired by the same chairman (the Emirates' Crown Prince). It is necessary for the EMB to have clear authority of the strategy. Giving this function, the EMB should consist of high-level representatives of the main authorities involved in the field of the environment. Members would be the chairmen of all relevant departments such as Abu Dhabi Municipality, Al Ain Municipality, ADNOC, and ERWDA. It needs to take this shape of structure to be more powerful and supportive. The EMB should provide financial and administrative support to all authorities involved in order to ensure that all the facilities they need are provided. The EMB should be able to influence all government sectors to integrate environmental consideration into development projects throughout the Emirate.

The EMB can play a role in following up the implementation of the strategy and would be responsible for protecting and maintaining a clean and healthy environment for the public. In addition to its role as the body responsible for overseeing all environmental activities, the EMB should function as the last resort in resolving any conflict in decision-making between environmental authorities. The investigation of other countries' experiences provided a number of independent body roles and responsibilities towards achieving sustainable development. Based on this investigation and on the UNEP report (Eltaib, 1988), the main roles of EMB are:

- to formulate environmental legislation and regulation, codes of practice and local orders;
- to formulate the Emirate environmental strategy;

- to propose environmental policies, plans and programmes for all sectors which are required for implementation;

- to set environmental standards;

- to plan and monitor the implementation of strategy policies, plans and programmes;

- to report to the Executive Council;

- to determine the budgetary plan;

- to monitor environmental trends and identify issues;

- to encourage the participation approach by other sectors;

- to review reports submitted through the technical committee;

- to formulate the institutional framework with clear responsibilities and duties; and

- to promote environmental education, training, and public awareness.

Another important body in the proposed environmental institution framework would be the **Technical Environmental Committee** (TEC). A TEC is required to be established within ERWDA and be chaired by ERWDA, because as mentioned earlier, ERWDA has the main responsibility for enhancing sustainable development in the Emirate and supervising the all-environmental programmes and activities (see Chapter Five, section 5.6.1.3). It proposed to take this form to confirm the role of ERWDA and to save time in submitting reports to EMB. As described in Chapters Three and Four, when the strategy is formulated, it needs to be implemented immediately. The responsibility of TEC should be to maintain co-ordination and co-operation of all concerned government authorities and major groups. It will also be responsible for analysing all kind of reports, such as monitoring and evaluation reports, progress reports, EIA reports for the major developments, and auditing reports to modify and adjust the strategy process, if needed. It will be also responsible for improving environmental awareness through developing a Local Environmental Awareness Plan. It will be a neutral body to advise the EMB of any dispute between environmental authorities and also work as an advisory body for other authorities. It can be a tool for involving major groups in the decision-making process. These would be achieved if every government authority and representatives from the major groups were members of this committee, in order to achieve fast responses to its recommendations. It needs to establish a local environmental

database covering basic information to assess local environment conditions and to prepare the SoE Report. The existing database of the ADM, ADNOC, ERWDA, etc. can be the starting point for this database.

The TEC will work as a communication point between EMB and other environmental departments. The main roles of the TEC are following up the implementation of environmental policies, plans and programmes and deliberating on any problem facing the implementation process. In addition to the above responsibilities, the TEC should be responsible for:

- reviewing the environmental situation in all departments and sectors;
- developing information systems;
- producing standard performance indicators for monitoring purposes,;
- monitoring implementation of strategy plans and programmes;
- ensuring continuous communication with other sectors;
- reporting to EMB;
- ensuring full participation of all sectors;
- keeping authorities and participants informed;
- reviewing the strategy progress and performance reports;
- following-up departments' activities;
- organising seminars, workshops and conferences; and
- providing all other sectors with information related to the environment.

All other authorities including Municipalities, Abu Dhabi National Oil Company (ADNOC) and ERWDA have a number of roles to play such as: (1) environmental protection, monitoring, and inspection, (2) enforcing environmental regulation and code of practise, (3) conducting environmental studies and research, and (4) encouraging environmental awareness and education. Each institution involved in the strategy should have clear roles, functions, responsibilities and duties and resources with clear mandates (Ornat, 1997). For example, ADNOC have responsibility for all oil and gas industry activities such as inspection, monitoring, enforcing regulation, conducting studies and research and encouraging environmental awareness, education and training. ERWDA, for example, is responsible for nature conservation and resources, environmental research, and wildlife development. The Abu Dhabi

and Al Ain Municipalities are responsible for waste management, environmental monitoring (air pollution and quality, coastal area monitoring etc.), industrial permits, EIA studies, environment and food inspection, agriculture, waste water treatment, and land use planning.

These authorities should be provided with enough resources and powers to enable them to carry out their responsibilities. This rearrangement may include the involvement of the major groups, such as the private sectors in some environmental activities, such as waste disposal and management systems. It is also important to make sure that all authorities are equipped with sufficient human and material resources to conduct their job in a proper way. Figure 6.3 shows the proposed institutional framework in the Emirate.

The EMB and TEC are proposed based on the discussion made with some decision-makers and environmental professionals in government during the collection of information and data stage (see Chapter Seven, Section 7.5.2).
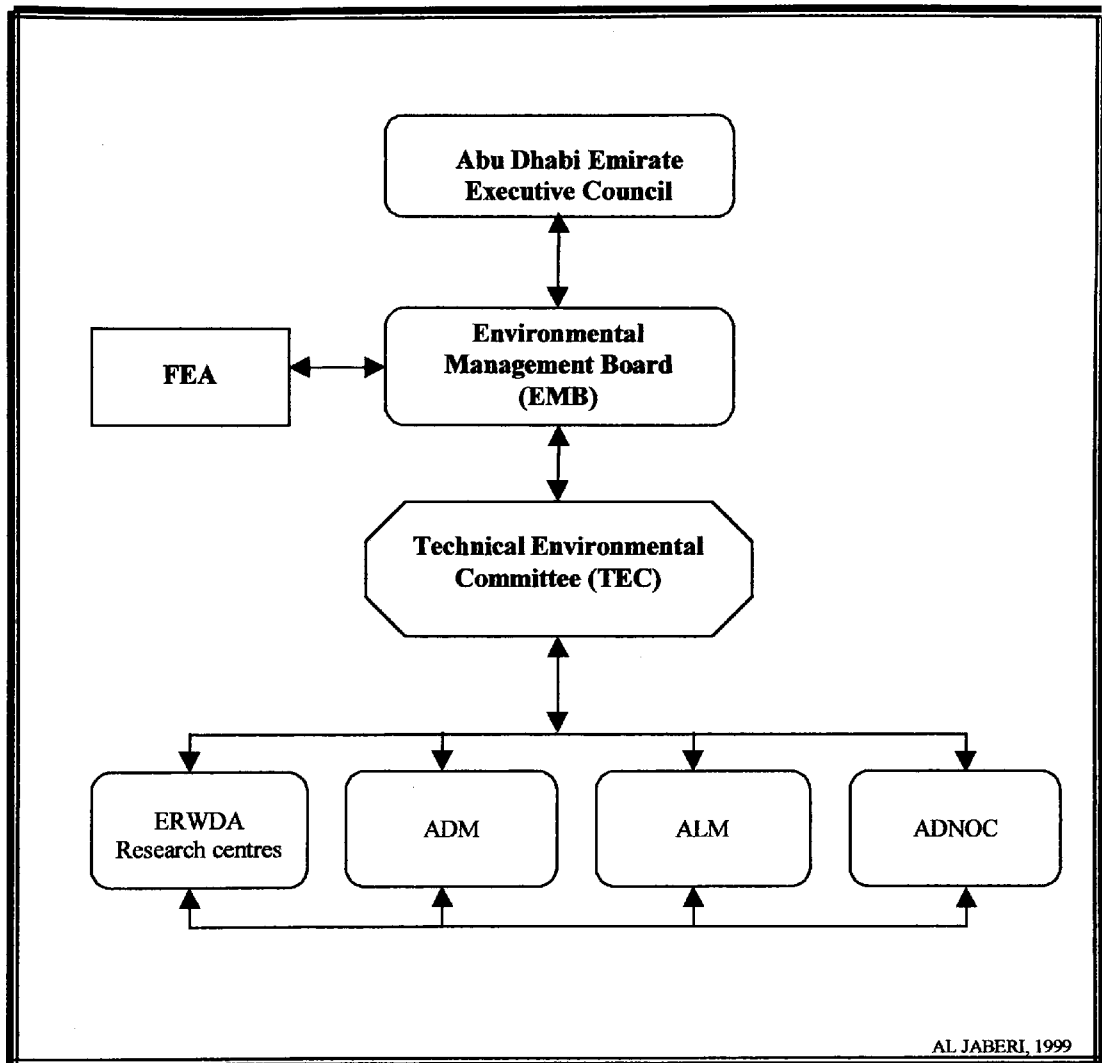
Figure 6.3   The Proposed Structure of Environmental Institutional Framework for
Abu Dhabi Emirate.

The review of other countries' experiences, has shown the importance of organising
environmental conferences, workshops or seminars in the preparation stage to
promote and explain the purpose of the strategy and to involve all concerned
authorities and major groups. This involvement makes them aware of the strategy
goals and objectives, strategy components and lets them know what they are trying to
do or what is expected of them to achieve a successful strategy process. The seminars
should be held and organised by the EMB, in co-operation with international

organisations and research institutions for their technical assistance (see Chapter Two).

6.4.2   Strategy Formulation

Information provided in the preparation stage and the comments and views of discussions made by the participants in seminars should be taken into account to formulate effective strategy policies, plans and programmes. The review of other countries' experiences showed that the formulating of strategy policies, plans and programmes should be flexible and should focus on a wide environmental strategy, rather than trying to control small-scale development in isolation. The EMB would be responsible for formulating and publishing the environmental strategy, based on the response and feedback from the participants in relation to strategic goals and objectives and content. In the UK, Jordan and Oman strategies, the published environmental strategies were based on the information and feedback, which was obtained from consultation meetings, seminars and workshops (Chapter Four).

After undertaking an initial environmental review and preparing the SoE report, authorities are required to formulate short, medium and long-term environmental policies, plans and programmes (Street and Barker, 1995). These should be clearly defined, implementable, practical, and related to the areas of responsibility of each authority and major groups to improve performance (Welford, 1994), (see Chapter Three). All environmental plans and programmes must contain a time limit to allow government authorities and the major groups to examine and monitor the implementation of such plans and programmes. Also UNDP (1992) considered that environmental policies are difficult to implement and frequently fail if designed in isolation of strategy goals and objectives.

The fundamental goal of the proposed strategy is to satisfy the basic needs of the present and future generations based on the concept of sustainable development (Chapter Two). This goal is an important factor in achieving sustainable development and the integration of sustainable resource use appropriately and safely. Goal setting is an important aspect of an effective implementation process (Noble, 1999). The goals and objectives of the strategy need to be realistic, achievable, workable and clearly specified. It should be also as specific as possible to become

useful for all participants (Chapter Three). Starkey (1998) comments that the objectives and goals of any strategy should be related to government policy commitment and that this commitment must comply with relevant environmental legislation. Flexibility is especially important where local conditions are changing.

The main objective of the strategy is to use the Emirate's natural resources in a sustainable manner and this can be achieved only by strong and clear co-operation between the authorities concerned. Defining objectives is important for each environmental issue so that the monitoring and evaluation of the strategy will be efficient (see Chapter Three). Based on the analysis of environmental problems, which were discussed in Chapter Five, the main objectives of the environmental strategy are: to enable authorities to manage environmental resources in a sustainable manner; to provide authorities with a legal framework within which to operate; and to improve the existing environment situation and involve the private sector in different activities, such as waste disposal and management.

The setting of objectives usually generates alternative strategies, which need to be evaluated and selected in order to choose the best (Chapter Three). The selection and application of policies and plans is a critical step in this part of the strategy. Environmental policy sets the guidelines by which the authorities and sectors can set their goals and objectives (see Chapter Three). Brophy (1998) explained that the environmental policy must:

- be communicated, implemented and maintained at all levels;
- be publicly available;
- include a commitment to continual improvement; and
- state clearly how each objectives will be achieved.

6.5   STAGE THREE: STRATEGY IMPLEMENTATION

This stage includes two components as shown in Figure 6.1, strategy implementation, and strategy monitoring and evaluation. It describes the importance of using implementation instruments and environmental tools to achieve the effective implementation of the strategy and illustrates the purpose of monitoring and evaluation.

6.5.1   Strategy Implementation

The degree of success of any strategy is dependent on its components, the efforts put into its implementation and the capability of organisation to manage its planning implementation and monitoring (see Chapter Three). Once the strategy has been formulated, then the various instruments need to be put in place for successful implementation. As concluded from Chapters Three and Four, this stage of the strategy is the most difficult. It will be easier to achieve strategy objectives and goals, if the management style is co-operative and systematic (Halme, 1997). Shah (1996) explained that the purpose of implementation is to test the ability of strategy for formulating its policy, plan and programme, in order to achieve a full implementation of the strategy.

Based on the review of different strategy models and the components of these models in Chapter Three and having regard to the section IV of Agenda 21 (Appendix B), there are a number of instruments which must be taken into account for effective implementation of any environmental plans and programmes. These elements are: participation; financial support, funding programmes and projects; legislative support; and strong co-operation and co-ordination between the different participants; establishment of an institutional framework; integration of environmental considerations in decision-making; linkages between local and federal efforts; and the enhancement of public awareness and education.

The EMB should provide financial and administration support for all authorities in order to implement the strategy, and to make sure that all the requirements which they need are provided, for example, financial and legislative support. The review of other countries' experiences showed how the Jordan and Oman strategies failed in implementing their policies, plans and programmes because of the lack of financial and high level support and also lack of awareness. As mentioned in the previous sections, to achieve full and effective participation, this will require roles to be set for each of the participants including Municipalities, ERWDA, ADNOC, and FEA, NGOs, business, industrial, and women's groups. The activities also need to be distributed between them according to their responsibilities with adequate funds. For example, the review of environmental impact assessment for the non-oil industrial

projects should be checked and approved by Municipalities (the oil industry is under ADNOC responsibility). To achieve successful implementation of the strategy, the TEC must work in co-operation with major groups to encourage each sector to initiate and establish an environmental unit to review the progress of strategy.

6.5.1.1 Strategy Implementation Instruments

There is no single mode for implementing environmental polices, plans and programmes (Phillipson, 1998). The implementation includes the following instruments, which may be used to achieve effective implementation of strategy policies, plans and programmes.

Environmental Regulation

This instrument can be used through reviewing and updating existing laws and regulations, specifying standards, establishing enforcement resources, creating timetables to meet these standards, and applying an environmental impact assessment to avoid irrevocable environmental changes (see Chapter Three). The EMB can play an important role in the formulation of environmental laws and legislation (see section 6.4.1). Hill (1998) argued that the main objectives of setting and formulation of legislation frameworks are to preserve, protect and improve the quality of the environment; and to contribute towards protecting human health and also to provide an effective means of preventing hazards.

In order to achieve successful implementation of the strategy, regulations should be formulated before the implementation and at the same time the capability of the institutions to implement the regulations should be taken into account (UNDP, 1992). The review of the other countries experiences showed that the Jordan and Oman strategies are examples of unsuccessful strategies because environmental regulations were not formulated and reviewed during the development of the strategy.

Economic Instruments

Economic instruments are usually used to change the behaviour of polluters and users of resources and also to change consumer behaviour. These instruments can be

used in particular with the private sector. Pollution charges, pricing and financial penalties are the economic tools used to limit the use of resources, to force pollutants to reduce their damage to the environment and to help to lower the costs of pollution prevention (see Chapter Three). These tools may be used to prevent damage to and to protect the environment. Economic instruments can be used by applying the principle of "the polluter pays", which means that the polluter should pay the cost of prevention, disposal or elimination measures (Hill, 1998), and should pay the full cost of any damages caused by their activities (Hams, 1994 and Mazher, 1997). This will improve the ability of government authorities and major groups to implement the strategy policies, plans and programmes. Further advantages of using economic instruments have been discussed in Chapter Three.

Economic instruments are also used to encourage the adoption of practices, which reduce environmental damage. Thus, the private sector may provide investment in environmental protection. This kind of investment can be used in pollution control and waste management. Investment in environmental infrastructure and technology, such as water and electricity supply, oil spill control, coastal management, and establishment of protected areas can be provided by the private sector. As described in Chapter Five the government of Abu Dhabi Emirate has begun to privatise some infrastructure, such as water and electricity, wastewater treatments plants and waste management.

Awareness and Education

The absence of clear environmental awareness plans by the Emirate's environmental authorities and major groups such as NGOs and women's society has been discussed in Chapter Five. Current environmental programmes and activities are carried out by each organisation independently, without co-ordination and co-operation between the concerned organisations (see Chapter Five).

As described in Chapter Three, and evidenced from other countries' experiences in Chapter Four, the government should increase environmental awareness at all levels to change attitudes and behaviour towards achieving successful implementation of strategy policies, plans and programmes. Increasing environmental awareness could be achieved through this model by providing public awareness campaigns,

environmental education, and communication systems to exchange information between all participants. Price and Probert (1997) considered that to achieve sustainable development, it is necessary to increase environmental awareness at all levels. Awareness should also be encouraged to let decision-makers know about the progress of the strategy and the effectiveness of implementing strategy polices, plans and programmes. (Thompson, 1997).

Environmental training and education should equip government staff at all levels and other major groups such as, teachers, students, journalists, and the media with the basic information and tools required for the implementation of environmental policies, plans and programmes (Emerson et al., 1997). Workshops, seminars, conferences and training programmes should be organised by the government in co-operation with international and regional organisations. In order to create behaviour change, environmental education should be given, not only to those who are directly responsible for the environment, but also to the whole community (Halme, 1997). The main purposes of the training and education programmes is to raise the level of awareness at all levels, to promote an understanding of the role of environmental authorities and environmental issues, to change authority culture at all levels, and to encourage lifestyle changes (Netherwood, 1998, Sleszynski, 1996 and Alabaster and Hawthorne, 1999). Each authority must identify environmental training needs for their staff. The proposed EMB needs to draw up a local plan of environmental awareness activities of several programmes, each programme dealing with specific issues and supported by government and adequate financial resources.

Institutional Framework

Another important instrument for the effective implementation of strategy is the formulation of an appropriate institutional framework. This issue was described in the preparation stage (see section 6.4.1). The World Bank and ESD (1995) provides three main elements in order to enhance institutional performance, which are: (1) assigning clear responsibility, (2) establishing consistent and transparent legislation, and (3) ensuring effective implementation capacity (trained staff, strong institutional performance, private sector involvement, and effectiveness of judiciary). Huntcheroft (1996) argues that Agenda 21 states one of the major challenges facing

achieving sustainability is the need for institutional change, this change can be difficult for well-established institutions. The presence of appropriate environmental institutions can ensure success in any strategy programmes and can enforce environmental regulation (UNDP, 1992). Netherwood (1998) believes that to ensure that environmental strategy policies, plans and programmes are implemented, clear authority responsibilities and duties need to be defined for all authorities involved within the activities.

A major problem facing implementation is the lack of well-defined institutions with clear mandates, the fragmented and overlapping responsibilities of various agencies, and lack of co-ordination among government departments (see Chapter Five). The current situation needs rearrangement and restructuring to avoid overlap of authority and conflict of interest and responsibility to distribute implementation responsibilities between several authorities rather than concentrating it within one body (see section 6.4.1). This will reduce the risk of overlapping responsibility and duplication. EMB must give these authorities the flexibility to develop their internal structure. Netherwood (1998) explained that this is because the importance of the environment to those authorities varies and the priorities will also differ.

6.5.1.2 Strategy Implementation Tools

The types and the purpose of environmental tools have been discussed in Chapter Three. These tools include Environmental Impact Assessments (EIA), Environmental Management Systems (EMS), Sustainable Development Indicators (SDI), and Strategic Environmental Assessments (SEA). These can help to implement the strategy and to achieve sustainable development in an appropriate way.

The government should be committed to adopting these tools, within a specific time limit, because they will be needed to monitor and manage environmental problems; to emphasise the impotence of environmental protection; and to minimise human health hazards and protect the present and future generations. The review of other countries' experiences has shown that the UK and Oman strategies used these kind of environmental tools to help to implement strategy policies, plans and programmes (see Chapter Four). The UK strategy has been implemented using SDI, EIA, and

EMS because they provide information on the present situation and future trends in environmental resource use to achieve sustainable development.

EIA could be used to ensure that the strategy is implemented in an effective way (see Chapter Three) and to assess the implementation process of the strategy. It is a tool for both planning and decision-making. It is also used to identify, predict and evaluate the potential environmental effects of development activities (UNDP, 1992). The proposed EMB should plan to produce new legislation to adopt and apply EIA in all development and planning activities and new development projects should be required to submit environment impact statements to the relevant authority. It should be part of the licensing procedure and checked and approved by the relevant department according to the type of project, with the right to re-examine any statements it considers a high risk.

SEA is one of the environmental tools used for assessing the impact of policies, plans and programmes at a strategic and decision-making level. For example, Abu Dhabi and Al Ain Municipalities and the Town Planning Department are the authorities responsible for preparing Comprehensive Plans in the Emirate. They are responsible for adopting land use planning policies and programmes (see Chapter Five). These departments need to take the environment into consideration in the assessment of future Comprehensive Plans. The municipalities should co-ordinate, co-operate with and involve other authorities to assess the Comprehensive Plans and to make sure that land uses are allocated in an environmentally sound manner, (eg. allocation of housing and road network, and also the allocation of oil refineries and pipelines).

The development of Sustainable Development Indicators (SDI) are used to measure and monitor the progress of implementing environmental polices, plans and programmes towards sustainability (see Chapter Three). These indicators are supposed to provide information about a particular matter (Jung, 1997) and help in checking and testing the progress achieved (UN, 1997). DoE (1996) provided four main reasons of why the indicators are needed.

- to inform people about the state of the environment;
- to provide early warning of environmental problems;
- to measure the extent to which policies achieved strategy objectives; and

- to clarify the confusion.

The adoption of EMS is another tool for achieving effective implementation of strategy policies, plans and programmes (see Chapter Three). International standards such as ISO 14001, covering environmental management systems are used to provide a framework for organisations and departments to manage their environmental performance (Halme, 1997). This tool makes use of the information and analysis provided by an EIA and adds elements to protect and conserve the environment (UNDP, 1992). EMB should encourage all concerned authorities and major groups to adopt these tools in an appropriate way to achieve effective implementation and successful strategy process.

6.5.2 Strategy Monitoring and Evaluation

Once the strategy policies, plans and programmes are formulated and identified, they need to be monitored and evaluated. As described in Chapter Three, monitoring is a critical stage in the strategy process, because it assesses and evaluates the progress of strategy implementation and authorities' performance. The monitoring and evaluation will be undertaken at the strategy implementation level. It is used to ensure that the policies, plans and programmes and other actions are proceeding according to plans and strategy goals (see Chapter Three). It provides the basis for corrective action, to improve the strategy alternatives and strategy design. Through monitoring, the authority can determine whether or not a strategy implementation continues to be relevant. The review of other countries' experiences has shown how the UK and Oman strategies set environmental indicators to monitor the progress of implementation and the effectiveness of strategy policies, plans and programmes. The monitoring and evaluation process must provide information that can serve as a basis for making decisions to institute corrective action and/or early signs of success.

Evaluation is an exercise that attempts to assess the performance and success of ongoing strategy implementation. Beckhard and Harris (1997) explained that the main purpose of evaluation is to identify the types of problems encouraged in the early stage, to evaluate the change happened in the implementation process, and to provide guidance to eliminate such problems. The TEC would be responsible for

monitoring and evaluating the progress achieved in implementing the strategy policies, plans and programmes by each participant in the strategy process. The information derived from this measurement can provide decision-makers with a useful guides in order to achieve strategy objectives and goals (Young, 1998).

The result of the monitoring and evaluation process will be analysed and published by the TEC and submitted in the form of a report to the EMB. The feedback and comments for EMB will be used to make modification and adjustments to the strategy process, if needed. If the evaluation indicates that the programmes are not effective, the additional modification and follow up is appropriate for the strategy process (Nelson and Leslie-Bole, 1994).

6.6   STAGE FOUR: STRATEGY MODIFICATION

This stage includes two components, strategy reporting and feedback. It describes the types of reports, and how it should be produced. The feedback is usually used to modify and adjust the strategy process and components (see Figure 6.1).

6.6.1   Strategy Reporting

The report is a valuable source of information that is produced after monitoring and evaluation. It covers all monitoring activities (i.e. field visits, meetings and reviews) and includes an assessment of the relevance and performance of the strategy implementation. It is used to identify early signs of potential problems or successes. Also, it must contain practical recommendations on how to resolve any problems or optimise initial gains. In the UK strategy, the follow-up report has been used to measure actions taken by the government since the strategy document was published (see Chapter Four).

According to the information provided and presented in Chapter Three regarding reporting and also the review of other countries' experiences in Chapter Four, there are two types of reports which could be published at this stage of strategy. Each of the authorities and major groups needs to publish a progress report, assessing the achievement of adopting and implementing the strategy policies, plans and programmes. The second type is the performance report, which focuses on the action

being taken to achieve the proposed strategy goals and objectives. Both reports must be submitted to the TEC, explaining their progress and achievement in the implementation of the strategy polices and plans. The UK strategy experience shows the importance of producing both reports to review and evaluate the strategy progress and to improve decision-making and public awareness (see Chapter Four). The TEC should review and assess both these reports and produce its own report discussing the overall progress achieved in implementing the strategy activities. This should be submitted to EMB, to ensure that the findings are accurate. This discussion will generate suggestions for the follow up actions that are required to improve and modify the strategy (Coopers and Lybrand, 1991). According to UNDP (1992), this report should include the following:

- identify the main environmental opportunities;

- suggest alternatives to the plans, programmes and projects (alternatives should be proposed to modify the project if has not achieved the stated strategy targets and objectives); and

- identify areas of uncertainty regarding modification to the environment.

These reports provide reference information when evaluating the implementation of the strategy process. They should be presented in non-technical language and distributed to other sectors for consultation. This helps to achieve the full participation of major groups and clear understanding of strategy goals and objectives. (Roberts, 1995). It should include the identification of gaps and problems with environmental policies and plans, areas that could not be implemented and sets of new indicators (Netherwood, 1998). Also Starkey (1998) believes that these reports should review the process to ensure the progress, effectiveness and suitability of environmental policies, plans and programmes.

6.6.2 Feedback

After analysing the results of the monitoring process, the feedback from the discussion of TEC and EMB is used to make modifications and adjustments to the strategy, when required. The feedback process also provides important information about the progress and performance at the different stages of the strategy. Changes must be made to the process when necessary.

Feedback refers to information generated through monitoring and evaluation and transmitted to parties for whom it will be relevant and useful. It includes findings, conclusions, recommendations, and lessons drawn from the strategy process experience.

6.6.3 Strategy Auditing

Auditing is used to compare actual outcomes with expected outcomes, and it can be used to assess the quality of predictions and the effectiveness of the strategy process to improve the environmental performance of authorities (Netherwood, 1998). It is also used to assess whether or not the strategy is being managed and implemented according to plan. It needs to be seen as a continuing programme (Welford, 1994). The environmental audit is an attempt to provide information on the environmental performance of the strategy. It can be undertaken as a part of regular review of strategy stages and components to detect any problem with any strategy stages at an early stage in order to reduce and prevent risk of future problems (see Chapter Three).

It provides government and other sectors with recommendations on how they can improve this environmental implementation performance and reduce their impact on the environment. It can be conducted internally by the staff of the government and independently by the TEC (see Chapter Three). According to LAA (1992), the Internal Audit (IA) helps an authority to examine and evaluate its own impacts on the environment and raise awareness of its staff. It can be conducted by employees of local authorities into any environmental aspect of its affairs (Millichamp, 1996).

6.7 CONCLUSION

In this chapter the environmental strategy model for the Emirate of Abu Dhabi has been designed. This model is based mainly on current information about the Emirate's environment, which is needed to define environmental problems and concerns and also to identify environmental priorities for the Emirate. All the above information should be presented as the State of the Environment Report. This report as presented in this chapter, should contain up-to-date information regarding the current situation of the environment condition.

The participation of major groups, co-ordination between authorities, co-operation with the international organisations, communication and consultation with other groups are the strategy key elements used to achieve a successful strategy process. Participation is critical to give major groups the opportunity of participating in solving their own problems and supporting the government actions. The designed model shows that each of the major groups could contribute and participate in each part of the strategy processes. For example, the private sector can fund the research institutions; encourage environmental awareness programmes, and promote the use of clean production technology. Also, research institutions can contribute to the strategy process by being involved in the information and data collection and analysis, providing advice and consultation to authorities regarding environmental issues, encouraging training and education, and conducting research which can increase the capability of authorities to manage the environment. Co-operation with international organisations is also important to provide technical assistance for a successful strategy. Establishing an inter-governmental unit is essential to ensure that the environmental considerations are integrated in development projects and to achieve better co-ordination between the authorities. To achieve better exchange of information, communication could be encouraged between authorities and major groups by establishing a "round table".

Before preparing the strategy and setting objectives and goals, it is necessary to restructure the current environmental institutional framework into a new structure with clear and specific mandates and responsibilities for each authorities which allow them to obtain a better understanding of their roles in the strategy process. In the proposed model, the establishment of EMB and TEC are necessary to organise and define each authority's responsibility. Seminars should be organised by EMB and TEC in the preparation stage to promote and explain the purpose of the strategy by involving all concerned authorities and major groups to let them know what they are trying to do and their role in each strategy process. The comments and views should be taken into account to formulate policies, plans and programmes, which should be clearly defined, implementable, practical, and related to the areas of responsibility of each authority and groups and also it should contain time limits to allow examination and monitoring of the implementation of such plans.

Implementation is the most difficult part of the strategy. There are a number of instruments and environmental tools, which could be used to achieve effective implementation of the strategy process. Implementation instruments, such as formulating and reviewing environmental regulation, economic instruments, and institutional framework are used to reduce environmental damage, changing behaviour, and improve the quality of environment. An environmental tool such as EIA, SEA, EMS and SDI should be used in the designed model where appropriate to achieve effective implementation of the strategy policies, plans and programmes. For example, EIA is used to identify and predict the potential of environmental effects of development activities. SEA is also used to assess the impact of policies, plans and programmes at decision-making level.

Monitoring and evaluation should be undertaken at the strategy implementation level to ensure that the strategy policies, plans and programmes are proceeding according to what is actually planned and also to assess the performance and success of the ongoing strategy implementation process. Setting environmental indicators will also help to monitor the progress made in implementing strategy plans and programmes. The result of this process should be analysed by TEC and presented to EMB. There are different kinds of reports, which should be produced by each participant in the strategy process. These are the progress report and performance report, which should be reviewed and assessed by the TEC to produce the overall progress report and should be discussed with EMB to ensure that the findings are accurate. The environmental strategy process is a cyclic and dynamic process. Therefore, the comments and feedback should be used to make modification and adjustment to the strategy process, if needed.

Auditing is also one of the strategy components, which is used to evaluate and assess the effectiveness of the strategy process during each stage of the strategy to improve the environmental performance of authorities and to detect and reduce any problem with any strategy stages.

There is a clear possibility that this model, whilst having been designed for the Emirate of Abu Dhabi, may also be applicable for other Emirates and even beyond.

The wider applicability of the model is addressed in the questionnaire and will be discussed in the later stage of this research.

CHAPTER SEVEN

RESEARCH METHODS AND METHODOLOGY

CHAPTER SEVEN

RESEARCH METHODS AND METHODOLOGY

7.1 INTRODUCTION

This chapter explains and describes the main research methods and methodology. It provides an overview of various research techniques, which could be used to gather information and data. This chapter also investigates the requirements of a pilot study. It also focuses on the main statistical methods and tests used in this research. As illustrated in Figure 7.1, the chapter consists of six main stages, which are the research problem, research hypothesis, research design, research process, data collection, and method of analysis. A discussion of each stage will be provided.
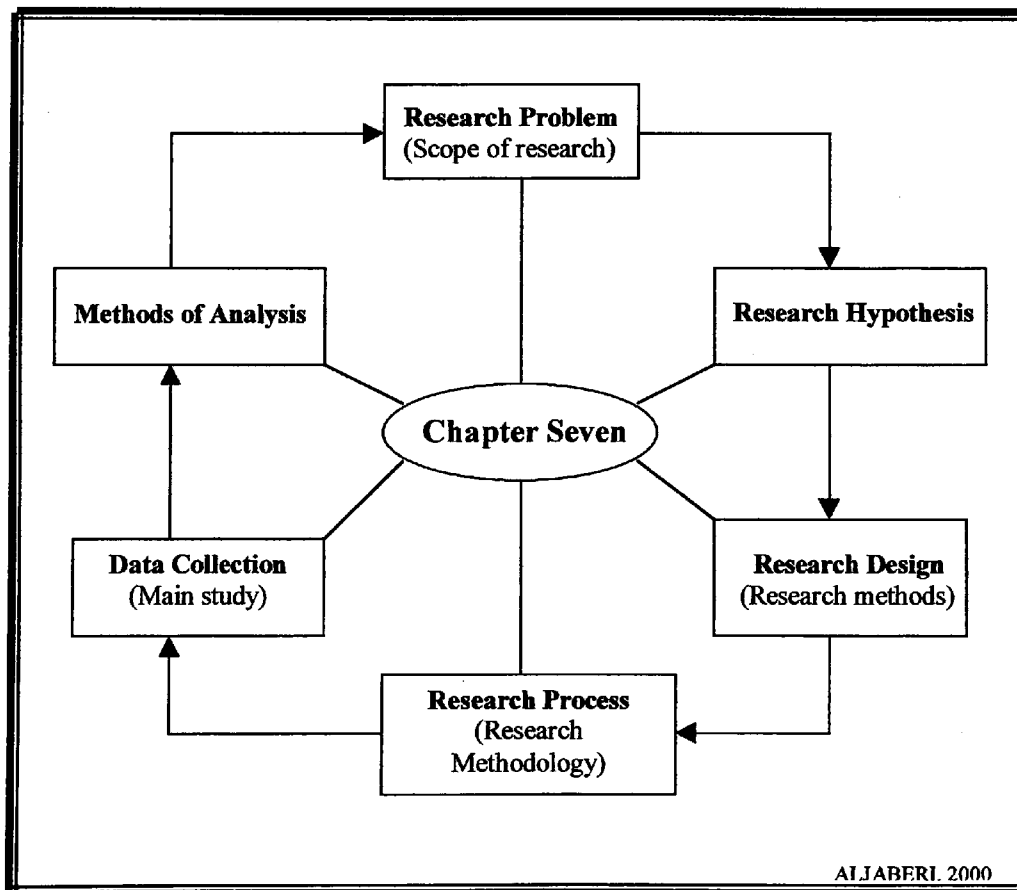
Figure 7.1   Stages of Chapter Seven

7.2   THE SCOPE OF THE RESEARCH

The research aim is to design a conceptual framework for developing a local environmental strategy model for Abu Dhabi Emirate.

To achieve the above aim, the following research objectives must be achieved:

- Analyse the concept of sustainable development and review of Agenda 21 and Local Agenda 21.

- Discuss the definition of strategy and evaluate the different strategy models.

- Develop the environmental strategy for the Emirate of Abu Dhabi.

- Identify environmental problems and causes in the Emirate of Abu Dhabi.

- Define environmental problem priorities in the Emirate of Abu Dhabi.

- Provide a State of the Environment Report for the Emirate of Abu Dhabi.

- Propose a suitable environmental institution framework in the Emirate of Abu Dhabi.

- Test the applicability of the proposed model by conducting questionnaire and interview surveys.

- Formulate the Emirate environmental action plans as recommendations.

In line with the aim and objectives, this study concentrates on philosophies and principles of concepts and the related political, institutional framework, including scientific methods and techniques. Four major concepts were analysed, sustainable development, Agenda 21, LA 21 and environmental strategy and models.

7.3   RESEARCH HYPOTHESIS

The research hypothesis determines the contents of the questionnaire (Festinger and Ketz,1966). According to Frankfort-Nachmias and Nachmias (1996) hypotheses share three common characteristics, which are: (a) they must be clear, (b) they should be specific, and (c) they should be testable with available methods. The major

problem faced in this study is the understanding of the background to sustainable development, Agenda 21, and environmental strategy in all sectors in the Emirate.

To the best of the researcher's knowledge, and after undertaking a computer and personal search, no single study had even attempted to formulate an environmental strategy in the United Arab Emirates and in particular the Emirate of Abu Dhabi; neither was there any study about the state of the environment in the Emirate and defining environmental problem priorities there. Moreover, little was found in the literature investigating the subject of research under consideration. This shortage or absence of previous work provides a strong justification for the present research. In the field of the environment, it is believed that this study is a pioneering work (see Chapter One). Much preliminary work had to be undertaken in order to test the proposed model. These efforts mainly involved interviewing those involved with the environment.

Formulating the hypotheses is one of the major steps in the research process. The main target of this research is the formulation of an environmental strategy for Abu Dhabi Emirate. The research will test the following main hypothesis:

> *The designed environmental strategy model is appropriate for sustainable development and for application and implementation in the particular circumstances of Abu Dhabi Emirate.*

Testing the hypothesis requires empirical experiment, and this hypothesis can be achieved by carrying out questionnaire surveys and interviews. To test and to achieve the above hypothesis it is important that to verify and to check the availability of the following items, which are mentioned in the proposed, model found in Chapter Six. These items are:

- environmental problem causes and priorities,
- institutional framework and co-operation, co-ordination systems,
- environmental regulation and standards,
- participation of major groups in the strategy process,
- independent budget and financial sources for environmental programmes, projects and plans,

- private sector encouragement to support environmental strategy projects and programmes,

- the availability of an information baseline and information exchange system,

- use of environmental tools, such as environment impact assessments and environmental management systems,

- independent administration board or council,

- environmental monitoring and control instruments, and

- environmental awareness programmes

Based on the literature review (see Chapter Two and Three), experience elsewhere (see Chapter Four), and the proposed model (see Chapter Six) of this research, the above main hypothesis can be divided into the following sub-hypotheses, which were developed to test and investigate the main research hypothesis, which are:

H₁: *Environmental problem priorities differ from one Emirate to another*

Question (4) in the questionnaire was designed to provide a number of variables in order to test this hypothesis. These variables are:

- Size of population,

- source of income,

- source of finance and support,

- degree of development,

- variance of law and regulation,

- source of pollution,

- capacity of management, and

- enforcement of regulation.

H₂: *The current environmental institutional structure needs rearranging into a new framework.*

Question (7-1 to 7-9) and (9-10) dealt with this hypothesis by providing a number of variables to test the hypothesis. These variables are:

- absence of a co-operation and co-ordination system,

- weakness in applying and enforcing law,

- absence of effective regulation,

- weakness of environmental awareness programmes,

- shortage in specialised human resources,

- unclear responsibilities and duties,

- overlapping responsibilities,

- inexperienced departments, and

- no separate budget for environmental projects.

H₃: *The participation of major groups is important to achieve effective and a successful strategy process.*

Questions (8-7), (9-1), (11), and (12-1) were used to test this hypothesis. Question (11c) provides a list of techniques that may useful to achieve effective participation (see Appendix D).

H₄: *Environmental awareness should bee encouraged and increased to achieve strategy objectives and goals towards achieving sustainable development.*

Questions (8-9) and (9-8) were provided to deal and test this hypothesis.

H₅: *The use of environmental tools such as EIA, SEA, EMS and SDI is essential to achieve effective implementation of strategy policies, plans and programmes.*

Question (9-9) was used in the questionnaire to deal with and test this hypothesis.

H₆: *providing a separate and adequate budget and financial resources is important for achieving a successful strategy process.*

Questions (8-13) and (10-5) were stated in the questionnaire to deal and test this hypothesis.

H₇: *The provision and exchange of information is important to establish a strong strategy baseline information to prepare SoE report.*

Questions (8-8), (8-11), (9-11), and (10-1) were provided to test this hypothesis.

H8:   *Establishing a co-operation and co-ordination system is important to achieve a better relationship between all sectors.*

Questions (8-5), (9-5), and (9-7) were used to deal and test this hypothesis.

H9:   *Providing a clear environmental strategy monitoring and evaluation system is important to achieve effective progress in implementing the strategy policies, plans and programmes.*

Question (10-1) to (10-6) was used to test this hypothesis.

H10:   *The research institutions and private sector have an important role and contribution in all the strategy processes towards achieving strategy objectives and goals.*

Question (13) and (14) were provided to deal and test this hypothesis.

7.4   RESEARCH METHODS

Once the research objectives are identified and clearly specified the research effort is transferred to data collection and generation (Chin-Shan, 1997). Sapsford and Jupp (1996) considered that there is no single best way of collecting data; the method chosen for collecting research data should depend on the nature of the research. Fastinger and Ketz (1966) argue that the questionnaire and interview serves two major purposes. These are: (a) to translate the research objectives into specific questions, and (b) to assist the interviewer in motivating the respondent to collect the required information. Research methods were based on both the qualitative and quantitative methods.

7.4.1   Interview Technique

Interviews are one of the most frequently used data collecting techniques. Much has been written on the type of interviews. For example, Oppenheim (1992) distinguishes two types of interviews, (a) exploratory interviews, and (b) standarised interviews. The purpose of the exploratory interview is to collect ideas and to understand how people feel and think about the research subject. In the standarised interview, the same question should be asked of every respondent, using the same wording. Also

the method of asking question should be standardised (Sapsford and Jupp, 1996). Naoum (1998) describes a three-way classification of interview techniques, which are structured interview, semi-structured interview and unstructured interview.

Some interviewers use open-ended questions in which the respondent's reply is written by the interviewer and classified later into one of a set of codes. This kind of question allows the researcher to search the full range of responses obtained before setting categories (Sapsford and Jupp, 1996). Table 7.1 shows the advantages and disadvantages of interview technique.

Table 7.1   Advantages and Disadvantages of Interview Techniques (Oppenheim, 1992) and Frankfort-Nachmias and Nachmias (1996).

Advantages	Disadvantages
-High response rates	-Expensive
-Help with reading difficulties	-High cost of data collection
-Prevent any misunderstandings	-High cost of processing
-Offer standarised explanation to certain problems	-Lack of anonymity
-More easily reach less well educated respondents	
-Flexibility in the questionnaire process	
-Control of interview situation	

In short, there are many types of interviews, and the selection of interview type is based on research purpose and questions or hypothesis. It is important to decide which type of interview technique to be adopted.

Punch (1998) and Festinger and Ketz (1966) have provided general guidelines to be taken into consideration when constructing interviews, which are:

- Who will be interviewed and why?
- How many will be interviewed?
- When and for how long will each respondent be interviewed?
- Where will the respondent be interviewed?
- What is the main purpose of the interview?
- Why was the respondent selected?
- Who sponsored the research? and
- anonymity and confidentiality of the interview.

Moser and Kalton (1978) identified three concepts, which are necessary for a successful interview. The first is the accessibility of the required information to the respondents. The second is the understanding by the respondents of what is required from them, and the third is the need to encourage respondents to answer the question accurately.

7.4.2 Questionnaire Technique

The questionnaire is the one of the most widely used techniques for collecting data. There are a number of different ways in which a questionnaire can be administrated. It requires self-explanatory instructions and it is different from the interview in the way of administration. Oppenheim (1992) described three types of questionnaire techniques, (1) mail (postal)-questionnaire, (2) self-administrated questionnaire, and (3) group-administrated questionnaire. The first type is a prepared list of questions, which is posted to the respondents to answer and return. The questions in this type should be easy to understand because there is no interviewer to explain what may be meant to the respondents. In the second type of questionnaire the respondents are contacted personally by the researcher to complete the questionnaire. This type of data collection technique provides a necessary explanation to respondents. The third type of questionnaire technique is the group-administrated questionnaire. It is the same as the self-administrated questionnaire but is given to a group of respondents at the same time, in one place to fill in. This is to ensure that all respondents answer the questions in the same order and at the same time (ibid). The questionnaire technique has several advantages and disadvantages as a data collection technique. These are summarised in Table 7.2.

Table 7.2   Advantages and Disadvantages of the Postal Questionnaires (Oppenheim, (1992) and Frankfort-Nachmias and Nachmias (1996).

Advantages	Disadvantages
-Low cost of data collection	-Low response rates
-Low cost of processing	-No opportunity to offer explanation or help
-Ability to reach respondents everywhere	
-Respondents have time to think about their answer	-No check on incomplete responses
-Provide wide access	-No control over the order in which questions are answered
-Provide a high degree of anonymity.	

The questionnaire questions may be open, (i.e. answered in the respondent's words), or they may be closed (i.e. the categories or multiple choices are provided and specified by the researcher) (Gunawardene, 1980). The open-ended questions or free-response questions are easy to ask, difficult to answer, need explanation, and are more difficult to analyse (Oppenheim, 1992). Gunawardene (1980) argued that open questions are easier to process, but the possibility of misinterpretation by the respondents is high. Closed-ended questions are used to offer a choice of alternative replies such as Yes and No. It takes many forms such as ranking. This form of question are easy to complete and quicker to analysis, thus saving vital time for both researcher and the respondents (Oppenheim, 1992). Table 7.3 shows the advantages and disadvantages of both types of questions open and closed-ended.

Table 7.3   The Advantages and Disadvantages of Open and Closed-ended Questions by Oppenheim (1992: 115) and Naoum (1998).

Types	Open Questions	Closed Questions
Advantages	-Freedom of the answer -Opportunity to probe -Useful for testing hypotheses -Easy to ask -Useful when sensitive information is required	-Time-consuming -In interviews: costly of interviewer time -Coding: very costly and slow to process -Demand more efforts from respondents
Disadvantages	-Require little time -No extended writing -Low cost -Easy to process -Make group comparisons easy -Useful for testing specific hypotheses -Less interviewer training	-Loss of spontaneous responses -Bias in answer categories -Sometimes too crude -May irritate respondents

De Vaus (1986) suggests six areas which need to be considered when preparing questions for a questionnaire, which are:

- Answering procedures,
- Instructions,
- Contingency questions,
- Use of space,
- Order of questions, and

• Setting up for coding

All the above areas were taken into consideration when constructing the questionnaire for this research.

7.5   RESEARCH METHODOLOGY

In order to satisfy the aims outlined at the beginning of this chapter, it is considered necessary to adopt both a qualitative and quantitative approach to the research. This decision was taken because there was a need to collect information regarding the level of awareness, and the importance of strategy elements and components. Also, there was a need to know how many organisations would need to be involved in the survey.

As mentioned earlier, this study is the first of its kind formulating an environmental strategy model for the Emirate of Abu Dhabi. Respondents were asked to rate the level of importance regarding environmental issues and strategy development. The survey method was chosen to obtain data and information and to achieve the research aims and objectives.

7.5.1   Research Process

The research process contains six steps and are described as follows:

Step 1 : The research framework.

Step 2 : The state of the Emirate environment.

Step 3 : The proposed environmental strategy model for the Emirate.

Step 4 : Test model.

Step 5 : The conclusions

Step 6 : The environment action plans and programmes as recommendations.

In *step one*, the identification of the aims and objectives of the research were used to determine the scope and the methodology of the research. The literature review was used to establish and provide current knowledge on the main concepts, i.e.

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sustainable development, Agenda 21, LA21 and environmental strategies and models; this was covered in Chapters Two and Three. The main sources of information and data used in this research are classified as follows:

1. Published government reports and studies,

2. Published research, books, essays and studies related to the study subject of the research, and

3. Publication and studies of international framework related to this research.

The main target of *step two* is to identify the state of the Emirate environment. Based on this information the environmental problems, causes and priorities were identified in Chapter Five. This step was achieved by collecting data and information for different government departments and non-governmental sectors, which have environment activities. This survey was called "data and information availability".

The main task of *step three* was to design and examine the Emirate environmental strategy model. Based on the review of other countries' experiences with different political, social and cultural contexts and at different stages of development, as appropriate (see Chapter Four). The UK, Jordan and Oman experiences were used as examples of different developed and developing countries, which are attempting to achieve sustainable development by formulating a national environmental strategy. This evaluation and assessment involved pointing out their strengths and weaknesses and drawing conclusions about appropriate lessons for the strategy process. It also provided an understanding of the actual problems that have arisen in a country with a long established history of planning and environmental management, so that those lessons could be learned in the Emirate. The proposed model is an approach to achieve sustainable development in the Emirate of Abu Dhabi, which has very different geographical and cultural characteristics to other countries (see Chapter Four).

The model was designed in Chapter Six. It consists of four main stages, which are the definition of environmental problems and priorities, strategy initiation, strategy implementation and monitoring, and strategy modification (see Chapter Six).

The model was tested in *step four* through conducting a questionnaire survey and a series of interviews with selected professional persons and decision-makers in the government authorities and major groups such as NGOs, private sector, research institution, and women's groups. The questionnaire and interview techniques were used to test the research hypothesis and to investigate the concern of people towards the environmental situation in the Emirate, in order to provide qualitative and quantitative data. The data and feedback from questionnaire and interviews were analysed to provide an indication of any weakness in the proposed model.

Step five focuses on the final conclusions, which will be drawn as to whether the model is sufficient and applicable to be acted upon and to be implemented as an environmental strategy for the Abu Dhabi Emirate. These conclusions and recommendations will be explained and enumerated based on the survey analysis and measurements (see Chapter Nine).

In *step six,* the environmental action plan and programmes will be formulated in Chapter Nine in this research as recommendations, based on the strategy model after testing. The list of subjects for further research and development are also identified (see Chapter Nine).

However, since this study is the first of its kind dealing with designing an environmental strategy for the Emirate of Abu Dhabi, respondents were asked to rate the level of their participation in the strategy process. Also, they were asked to rate their level of importance with each stage and component of the designed strategy model. Finally, they were asked to rate research institution and private sector roles, which could be provided to achieve successful strategy and implementation.

Step four was carried out in three stages. The first was data and information collection. The second stage was the questionnaire, interview design and the piloting the data collection methods. The third stage was the main study, to test the designed model and research hypothesis.

7.5.2 Stage One: Data and Information Availability

A well-designed questionnaire will save the researcher time both in data collection and in data analysis. To be effective, the questionnaire was systematic and provided a full coverage of environmental strategy issues. This stage was mainly conducted to gather and collect information regarding the Emirate environment. The main objective of this stage, which was carried out during December 1998 and January 1999, is to provide the background of the research. As explained in the previous section 7.5.1, there was no previous research work on formulating and designing an environmental strategy in the Emirate of Abu Dhabi. Government documents, which were collected, take the form of annual reports, annual statistical books, and proposals for development projects, technical papers, conferences and workshops, speeches and notes. These data and information were used to prepare in Chapter Five "State of the Emirate's Environment". This information is an important part in designing an environmental strategy and also from this information the environmental priority problems and concerns are identified (Chapter Five).

7.5.3 Stage Two: Questionnaire Design

The questionnaire is one of the most widely used survey methods (Blaxter et al., 1996). In this study, a questionnaire has been used in conjunction with the interviews, to cover more respondents. In view of the lack of sufficient literature review on the environmental strategy at the Emirate, the decision was made to collect the needed data through the use of a self-administrated questionnaire. This type of method was considered to be the most useful technique for data collection, because at present, the government mail service is not reliable and the possibility of loss is high, resulting in a low response rate. A mail questionnaire is expensive especially in follow-up and reminding (phone calls and letters). Also some of the respondents may be careless, if the questionnaire is not distributed to them personally. Based on the above reasons, the researcher preferred to rely on the self-administrated technique. To be effective, however, the questionnaire has to be systematic and provide a full coverage of the research issues and take into consideration all the guidelines and issues that are stated in section (7.4.2).

A well-designed questionnaire will save the researcher time both in data collection and in data analysis (Welford and Gouldson, 1993). In this stage, a number of issues need to be taken into consideration, such as type of questions, ordering, wording, and style of each question in order to achieve a high response rate. Also, it is necessary to consider the respondent's cultural background when designing the questionnaire. Therefore, the questionnaire was framed in such a way to reflect this concern. Festinger and Ketz (1966), Welford and Gouldson (1993) and Greenfield (1996) considered the following important principles should apply to the design of a questionnaire. It should be:

- limited to a single idea;
- phrased so that they contain no suggestion;
- easy to understand;
- so arranged, that they make sense to the respondents; and
- use simple grammar.

The choice of language was taken also into account when designing the questionnaire and to ensure the validity of the questionnaire. The questionnaire was translated from English to the main language of the sample, in this case Arabic (see Appendix D), in order to offer the maximum opportunity to understand and complete the questions. To test whether the translation gave a correct interpretation of English, an expert from FEA, Dr. Ali (environmental researcher), checked the translation.

After deciding what to ask, the wording is, therefore, critical. Moser and Kalton (1978), Cohen and Manion (1980) and Blaxter et al. (1996) described a number of useful guidelines regarding question wording, which are to avoid:

- Asking too many open-ended questions.
- Questions which may be insulting.
- Leading questions.
- Questions which are antonym or imprecise.
- Questions which are negative terms.
- Very complex questions.

In this respect, there are two types of question available in the questionnaire: open ended and closed questions. Open questions were used because it allows respondents to provide their opinions, views and their comments and suggestions in free response, whilst closed questions restrict the respondents to answer from a short response. In the closed-ended questions, respondents were asked to circle their chosen answers a choice of alternative replies such as of Yes, No, don't know. The different types of choices were provided to the respondents to rate and rank their opinion regarding different matters. At the end of any questions, an open-ended question was included to give an opportunity to the respondents to highlight "any other" issue(s) that may have been omitted in the questionnaire. In general, the questions were designed in a manner to help respondents' step-by-step, with the minimum of time and effort to complete.

Moser and Kalton (1971) considered that the questionnaire layout or framework should be such that editing and coding of data proceed smoothly. By taking this into consideration, the code numbers typed clearly on the left side of the questionnaire, so that feeding in computer was done smoothly (see Appendix D).

As the qualitative measurements in the analysis of the effectiveness of the strategy model under study are ordinal, the most appropriate scale to use is the Likert scale, by presenting a list of a number of statements and asking respondents to rate them in terms of agreement or disagreement. According to Moser and Kalton (1970), Likert scales have higher reliability. Black (1999) advises that the use of "disagree" as a response is sufficient to be positive and that there is no need to adopt "strongly disagree" as well. In order to achieve maximum reliability and validity, some questions did not include a "neutral" view. This approach is widely used in the professional literature (Black, 1999). The Likert scale is not restricted to five points. Many studies use a three or four point scale (for example, Al-Kuwari, 1992 and Barrett, 1997) depending on how detailed the required data are. The use of four scales, however, is the most widely adopted in research work to avoid neutral responses and ensure positive ones.

Therefore, in the research questionnaire, a four point scale, 1 to 4, was adopted (Appendix D). However, in one question only (Q 9), where it was felt that it was

acceptable for a "strongly disagree" response to be made, a 5 point scale, 1 to 5, was used.

7.5.3.1 Questionnaire Structure

The questionnaire was structured in a manner that gave every possible encouragement to respondents to co-operate in the study. An important part of the questionnaire survey is the covering letter. It explains and introduces the respondents to the questionnaire purposes. The questionnaire confirms that the responses will be treated confidentially, ensures that no information will be published without their permission, and that the information will be used by the researcher and for research purposes only. According to Frankfort-Nachmias and Nachmias (1996), there are two common methods the researcher uses to protect participants; anonymity and confidentiality. Anonymity is provided by separating the identity of individuals from the information they give. Oppenheim (1992: 105) suggested the following statement to provide confidentiality to the participants:

THE CONTENTS OF THIS FORM ARE ABSOLUTELY CONFIDENTIAL. INFORMATION IDENTIFYING THE RESPONDENT WILL NOT BE DISCLOSED UNDER ANY CIRCUMSTANCES.

It can be seen from Appendix D that the questionnaire covered five parts. In order to increase the response rate, the questionnaire was set out on A4 paper, double-side booklet form with a different coloured paper used for the cover to identify the main purpose of the questionnaire and included the title of the research in large print. The questionnaire was set out as clearly as possible with bold types for the headings. The last paper of the questionnaire booklet contained a personal note to respondents, which explained the confidentiality of information obtained and thanked them for their time and effort.

The following describes each part. Table 7.4 illustrates the topics, number of questions and information collected.

Part I: General information, including the type of sectors, to make sure that the questionnaire survey covered all target sectors. The personal questions such as name, age, occupation, etc. were not included in the questionnaire, because: (1) there is no

need for it; (2) it is not important in this kind of questionnaire; (3) to ensure a free and honest answer; and (4) to minimise the number of questions. This may increase the response rate. In this part of the questionnaire, respondents were asked to give general information about their type of sector and education level.

Part II: Strategy preparation and formulation step. In this part, the questionnaire asked respondents to give their ideas and opinions about their local environmental problems, the causes of these problems and to rate the most serious environmental problems in order of priority. This part of the questionnaire provides a list of problems that may face environmental departments, which may hinder the strategy process. Finally, a number of items were provided to rate the importance of each element and to achieve a successful strategy.

Part III: This part of the questionnaire was used to rate the importance of the strategy process elements, implementation tools and instruments which may help to achieve effective implementation of the strategy.

Part IV: The importance of the monitoring and evaluation process was examined by rating a list of items, which may be used to achieve effective monitoring and evaluation of the strategy process.

Part V: The final part of the questionnaire was used to rate the importance of the major group's participation in the strategy. A number of techniques were provided to rate the importance in achieving this kind of participation. The main strategy elements were provided also in the questionnaire and the respondents were asked to rate the importance of each item. Finally, this part provided a list of items, which was used to rate the roles of research institutions, and private sectors.

The main purposes of the questionnaire survey, in order to test the proposed model and the research hypothesis, are the following:

- to measure the degree of major groups' participation in environmental aspects and in the decision-making process;

- to determine the degree of environmental awareness and knowledge at all level of sectors;

- to identify the problems facing environmental departments, which may hinder a successful strategy implementation; and

- to define the role of private sector, research institutions, NGOs, and women's group to support the strategy plans, programmes and projects; and

- to identify the level of co-operation, co-ordination, communication and the exchange of information between government departments and the other major groups.

Table 7.4   Topics, Number of Questions, and Information Collected

Topics	Number of questions	Information collected
Type of sector	1	Local/federal government/non-government
Education level	2	Last year of school completed
Environmental problem priorities	1	To rank the list of problems in order of importance and priority
The differences in environmental priorities	1	Yes, no, and don't know
Causes of difference in environmental priorities	8	Strongly agree, agree, neutral, and disagree
Causes of environmental problems	14	Strongly agree, agree, neutral, and disagree
The effect of global environmental issues	2	Yes, no, and don't know Strong effect, moderate, minor, and no effect
Environmental institution structure need rearrangement	1	Yes, no, and don't know
Problems facing environmental institutions	9	Strongly agree, agree, neutral, and disagree
Strategy process elements	14	Very important, important, less important, and not important
Strategy implementation elements	14	Strongly agree, agree, neutral, disagree, and strongly disagree
Monitoring and evaluation elements	6	Very important, important, less important, and not important
Participation of major groups	1	Yes, no, and don't know
Participation techniques	9	Very important, important, less important, and not important
Elements to achieve successful strategy	8	Very important, important, less important, and not important
Research institution contribution	2	Yes, no, and don't know Very important, important, less important, and not important
Private sector contribution	2	Yes, no, and don't know Very important, important, less important, and not important

7.5.3.2 Questionnaire Validity and Reliability

Validity and reliability are required for both the design and the measurement of research (Kidder et al., 1981). It is important to note that Tull and Albaum (1973) point out that showing care at each stage of the survey will help to improve both validity and reliability. The use of validity and reliability is needed to assess how each question does its job and to check whether methods, approaches and techniques are actually related to the research objectives and aim (Blaxter et al., 1996). Zeller and Carmines (1978: 7) define validity as:

> *"The degree to which a variable corresponds to the concept that it is designed to measure ".*

Frankfort-Nachmias and Nachmias (1996), Punch (1998), Oppenheim (1992) and Moser and Kalter (1970) identify four types of validity: (a) content validity, (b) concurrent validity, (c) predictive validity, and (d) construct validity.

Kidder et al. (1981) commented that the content validity is usually evaluated and assessed by a group of judges or experts. Content validity measures the techniques used in the questionnaire to gather the required information. Based on the experts' opinion of content validity, the researcher is able to assess the extent to which the questionnaire measures what it sets out to measure. The higher the percentage of experts who respond by saying that it measures what it claims to measure, the higher the validity of the questionnaire.

Kidder et al. (1981: 133) also define concurrent validity, predictive validity and construct validity as follows:

Concurrent validity is the *"ability of a test to distinguish between individuals who are known or differ"*.

Predictive validity is the *"ability of a test to identify future differences"*.

Construct validity is *"an evaluation of the extent to which an instrument measures the theoretical construct the investigator wishes to measure"*.

Punch (1998) and Frankfort-Nachmias and Nachmias (1996) argue that there is no one best procedure to establish or evaluate validity, because it is dependent on the situation of research and because all methods have limitations. The content validity can be determined and measured by expert judgement or by experts in the field of the study.

Therefore, the questionnaire was given to four experts in the UAE environment to provide the researcher with their advice on questionnaire content validity, by giving them the research aims and objectives. Based on their feedback and comments a number of modification and changes were made to the content and framework of the questionnaire. A final conclusion on this work, the judges agreed that the instrument used in this questionnaire had significant content validity. Table 7.5 shows the names and position of the judges or experts.

Table 7.5   List of Judges and Experts of Research and Questionnaire Validity.

Names	Position
(1) Prof. El Mamoun Doud	Chief Technical Advisor, UN (ESCWA).
(2) Dr. Eisa Abdellatif	Technical advisor, Zayed International Prize for the Environment.
(3) Dr. Ali Awad	Environmental Researcher, FEA.
(4) Dr. Lutfi Dasoki	Environmental Researcher, FEA.

Reliability comes after validity. It basically means consistency (Punch, 1998) and according to Frankfort-Nachmias and Nachmias (1996: 171) reliability is:

> *"the ratio of the true score variance to the total variance in the scores as measured".*

Kidder et al. (1981) suggests that reliability is assessed in several ways and the most important one is by using test-retest correlation. Thus, by using an instrument twice on the same persons or groups to see how stable the responses are, the correlation can be measured by comparing between two scores. This correlation is a measure of

reliability. Moser and Kalton (1970) point out the test retest method hardly serves as an exact test of reliability.

For these reasons, the questionnaire was piloted before conducting the survey (see next section 7.5.3.3). The reply from the pilot or pre-test study was distributed to the same group or persons at two different times, and the correlation between the two sets of scores was computed. The obtained coefficient is the reliability estimate. In general, Litwin (1995) considered good correlation coefficient value when they equal or exceed 0.70. Reliability of Lakert scale tends to be good, because of the greater range of answers provided to respondents and the reliability coefficient of 0.85 is often achieved (Oppenheim, 1992).

7.5.3.3 The Pilot Study (Pretest)

Sapsford and Jupp (1996: 103) defined a pilot study as:

"a small-scale trial before the main investigation, intended to assess the adequacy of research design and of the instruments to be used for data collection".

Festinger and Ketz (1966) considered that a pretest or pilot study is aimed to test the questionnaire from the research review and to check whether the responses fulfill the research objectives. This process was used to assess the study questionnaire and calls for revision of the questions before designing the final form of questionnaire and conducting the main survey. It was used also to obtain the views of some professionals in the area of the study to test the questions for relevance and sensitivity (Oppenheim, 1992). Naoum (1998) argues that the pilot study involves testing the wording of the questions, identifies ambiguous questions, testing the technique that it is used, and measuring the questionnaire effectiveness. The questionnaire must be piloted in order to remove ambiguities in questions, and to make questions fit for all respondents (Gunawardene, 1980). Oppenheim (1992) added that the pilot study could help not only with the wording of questions, but also with the covering letter, the ordering of questions and the reduction of non-response rates. He also mentioned that this work is expensive and time-consuming, but actually saves time and money in the end. Bell (1996) identifies the following questions, which should be asked:

- How long did it take you to complete?
- Were the instructions clear? Were any of the questions unclear or ambiguous? If so, will you say which and why?
- Did you object to answering any of the questions?
- In your opinion, has any major topic been omitted?
- Was the layout of the questionnaire clear/ attractive?
- Any comments?

According to Oppenheim (1992) and Sapsford and Jupp (1996), the respondents in this work should be as similar as possible to those in the main enquiry, that is, they should be a judgement sample. In this respect, a total of five persons were contacted to provide the researcher with their comments and views. These persons were chosen from different backgrounds in the environmental field and from different positions in the various sectors of the Emirate. They were either qualified, or had a degree, in the environmental field. There were four from the government sector (two from local and other two from the federal government) and one from the private sector. This study was undertaken between 1 and 20 September 1999, so a three weeks period was given for responses. But this period was extended to the end of the September 1999, because some respondents were not active and it was found that they needed continuous reminding. The result and findings of this study revealed certain issues in the questionnaire, which could effect the validity of the data collected.

In general, they provided valuable information and they also provided advice on the following: (1) questionnaire design, (2) order of questions, (3) wording, (4) the questionnaire cover paper, which should include the main purpose of the study and some definitions. All these comments and suggestions were carefully examined and some were discussed personally with respondents and were taken into account when redrafting the final form of the questionnaire.

The final version of the questionnaire was given to the same respondents to test-retest the reliability (correlation coefficient). The correlation coefficient of the two questionnaire scores was 0.73, which means that the reliability is good. After this work, the questionnaire was amended and standarised for fieldwork application.

7.5.4   Stage Three: The Main Study

7.5.4.1 Main Questionnaire

The field study was carried out during November and December 1999 and ended with a sample size of 66 case studies, representing a 72.5% response rate from the total number of distributed questionnaires, which is considered very good. Thus, the sample size was sufficient to carry out analysis, as the minimum sample size according to Dixon et al. (1987) and Roscoe (1975) is 30, for student research. A copy of the four-page questionnaire is included in Appendix D. The researcher divided environmental sectors into three types: federal government, local government and major groups based on the government structure in the Emirate. The major groups were based on Agenda 21 categorisations and the situation in the Emirate. Table 7.6 shows the three types of sectors.

Table 7.6   List of Environment Sectors in the Emirate of Abu Dhabi

Type of sector	Name
Local Government	-Abu Dhabi Municipality
	-Abu Dhabi Oil Company
	-Environment Research and Wildlife Development Agency
	-Al Ain Municipality
	-Environment Section in Private Department
	-Planning Department
	-General Industry Corporation
Federal Government	-Federal Environmental Agency
	-UAE University
Major Groups	-Research Institutions
	-Women's Society
	-Industry
	-Private Sector
	-Friends Environment Society

The main objective of the survey was to gather information to test the proposed strategy model for Abu Dhabi Emirate, which is described, and discussed in Chapter Six. The questionnaire was sent to the entire department as listed above and sectors

with environment related activities, by using a covering letter from the author's government department that explained who was doing the study, and what was the purpose of the research. The final paragraph explained the degree of confidentiality of respondents that the information will be used by the researcher and for research purposes (see Appendix E). The reasons for issuing a covering letter and the taking this form were to ensure the return of the questionnaire and to increase the response rate.

Generally, the survey indicates the level of participation of government departments and major groups in strategy preparation, implementation and monitoring and evaluation stages, and the level of taking environmental consideration in decision-making. Also, it indicates the degree of awareness towards environmental management.

7.5.4.2 Main Interviews

The personal interview is one of the major techniques for collecting information as well as opinion (Naoum, 1998). It was a useful technique for collecting data and views of political and decision-maker persons. It was undertaken by note-taking to avoid any misunderstanding, and to make the interviewer think that what they were saying was significant. A tape-recorder was not used in this case, to avoid the interviewees becoming anxious and because respondents usually do not like being recorded. The interviewees were a group of Emirate decision-makers, who have professional experience and who deal with political and institutional aspects of environmental management. The main problem faced in this work was the lack of co-operation from some of the selected interviewees. Ten persons were selected for interviews, but only six were finally interviewed. The six interviewees were:

- Abu Dhabi Municipality Undersecretaries (2)
- Director of Food and Environment Control Centre in Al Ain Municipality
- General Director of Federal Environmental Agency
- The General Secretariat of ERWDA
- Director of Environment, Health and Safety in ADNOC

In this research, it was decided to adopt the structured technique. By using open-ended questions and a copy of the questions used in the interview survey is shown in Appendix F, the respondents reply was written down by the interviewer and then classified into a set of codes. These interviews were conducted at the same time as the questionnaire survey, between October and November 1999. Interviewees were given a copy of four pages, two weeks before the interview. This contained the interview questions. The interviews were arranged personally and by sending an official letter with Abu Dhabi Municipality assistance (Appendix G). This letter described the purpose of interview, the date and the place of interview, and the degree of confidentiality.

The first ten minutes of the interview were used to explain the nature, purpose and the importance of this research. From personal experience in the Emirate environment field, the lack of knowledge of environmental strategy was already known before the beginning of this research and the lack of participation and co-operation.

The interviews were used to gather opinions on the concepts and on the proposed model. Generally, the interviews focused on the issues, which were covered in the questionnaire. Although a small number was covered, the overall response was good. The feedback from the interview and questionnaire survey helped to strengthen and improve the proposed strategy model in constructing the conclusion.

7.6   Method of Analysis and Test

The data collected was analysed by using SPSS (Statistical Package for Social Science) techniques, which provide analysis and graphical representation of the data in an easy format. There are a number of important considerations, which may affect the choice of analysis methods, and tests, which are:

1. Type of data: most of the questions used in this survey were ordinal scale.

2. Sample characteristic: it considers the number of groups, number of variable, and independence of samples.

3. Research approach and the type of the research hypothesis: the research approach of this study was explained in sections 7.2, 7.3 and 7.4.

Kruskal-Wallis Test was used to test the research hypothesis. The test is an alternative nonparametric procedure to the F test for testing the equality of means in the one-factor analysis of variance when the experimenter wishes to avoid the assumption that the samples were selected from normal distribution. It is appropriate whenever we have a number of an ordinal-scale level measurement and in assessing the difference between the mean ranks of three or more independent samples (Hubert and Blalock, 1990). Where little difference is found between the mean ranks of each sample, then one would not expect the statistic to be significant. The Kruskal-Wallis test is also called Kruskal-Wallis H test (Walpole, 1982). Its power efficiency for large samples is approximately 95 per cent (Hubert and Blalock, 1990).

The **Spearman Test** (Rho), also known as Rank Order Correlation, is used to identify the strength of the relationship between ordinal variables concerned when the parametric assumption of the experimental data were not met (Daniel, 1991). The formula of both tests are provided in Appendix H.

7.7   CONCLUSION

This chapter discussed and explained the methods used to carry out the research. Each method was selected based on the research needs and fieldwork circumstances. These methods were used to obtain data and information to test the research hypotheses and to achieve the research aims and objectives. The two survey methods are different in several ways. These differences are shown in Table 7.7. Finally, the limitations of the research methodology have been described.

Table 7.7   The Differences of the Two Surveys

	Questionnaire	Interview
Purpose	Gathering information regarding the proposed model	Gathering information regarding the proposed model
Respondents	All who work in the environment field	Decision-makers who work in the environment field
Surveyor	Self-administrated questionnaire	Structure interview-(interview face-to-face questions)
Responses	Closed-questions: ranking and rating are made on different scale	Open-questions
Timing	Takes 20 minutes	Takes 30 minutes
Resources	Need translation to Arabic Printing and distribution	Need translation to Arabic
Privacy	All responses are anonymous	All interviewees comments are confidential

CHAPTER EIGHT

RESEARCH ANALYSIS AND DISCUSSIONS

CHAPTER EIGHT

RESEARCH ANALYSIS AND DISCUSSIONS

8.1   INTRODUCTION

The results of the fieldwork are presented in this chapter. As shown in Table 8.1 the questionnaire was distributed to 91 recipients and 66 responses were received, with 56.1% representing Local Government (LG), 16.6% representing Federal Government (FG), and 27.3% representing Major Groups (MG). Respondents replied by answering a series of questions relating to key environmental and strategy process issues in the Emirate of Abu Dhabi, using a variety of grading methods (see Appendix D). Table 8.1 shows types of sectors and the number of questionnaires distributed and collected in the research fieldwork. The classification of the major group's category was based on the Agenda 21 categorisation in section III (see Chapter Two). The major groups include women, children and youth, indigenous people, non-government organisations, trade unions and workers, business and industry, scientific and technology, and farmers. The purpose of this is to ensure that all major groups are actively involved in all programme areas of Agenda 21. The types and numbers of major groups differ from one country to another, depending on their social, political, and economic circumstances.

Accordingly, the research attempted to involve all the major groups in the Emirate of Abu Dhabi, in the context of the limitations of the research (see Chapter One). The survey covered the major groups in the Emirate including women's society, NGO (Environment Friends Society), business and industry, and research institutions. This chapter also reports the results of the statistical analysis, which was carried out by using SPSS for Windows version 8.0.

Table 8.1 Types of Sectors and Number of Questionnaire Distributed and Collected

Sector	Questionnaire Distributed	Questionnaire Collected	Response Rate %
Local Government			
- ADM	17	13	
- ADNOC	10	8	
- ERWDA	8	7	
- ALM	4	-	
- GIC	6	5	
- PD	5	4	
	50	37	40.6
Federal Government			
- FEA	10	7	
- University	6	4	
	16	11	12.1
Major Groups			
- Women society	7	5	
- Friends Environment Society	8	4	
	5	5	
- Business and industry	5	4	
- Research institution			
	25	18	19.8
Total	91	66	72.5

8.2   STATISTICAL ANALYSIS

Before discussing the analysis of the data, the methods used will be explained. The first statistical method is descriptive analysis, which is used to provide an overview of data, such as frequency distribution, measurement of central tendency, and measurement of dispersion. The second type is inferential statistics, which helps to draw the correlation, relationship and association between variables, such as chi-square test, t-test, and correlation. The following are the results of the statistical analysis.

8.3   DESCRIPTIVE DATA ANALYSIS

The first step of any statistical analysis is to display and summarise the data values (Norusis, 1998). This main objective of this section is to explore and discuss the respondents' opinions and their judgements on environmental problem priorities,

causes of environmental problems, problems facing institutions, strategy process elements, implementation elements, monitoring and evaluation elements, participation techniques, and the role of research institutions and private sectors.

8.3.1   Education Level and the Field of Specialisation

Figure 8.1 reflects the difference in education levels at all sectors. Respondents were asked about their education level. As shown in Figure 8.1, there is only one respondent whose level of education is secondary school (1.5%). 30.3%, 9.1% and 12.1% of respondents, respectively at local government, federal government and major groups, have obtained a postgraduate degree, and 25.8%, 6.1%, and 15.2% of respondents, respectively at local government, federal government and major groups, have obtained a first degree.

Respondents were asked also to describe their field of specialisation. The results are illustrated in Figure 8.2. This shows 66.6% of respondents were in fields of study not related to the environment. This finding revealed that although, 51.5% of respondents to the questionnaire survey have got postgraduate degrees, there is a shortage of qualified staff. This supports what was stated in Chapter Six regarding this matter.
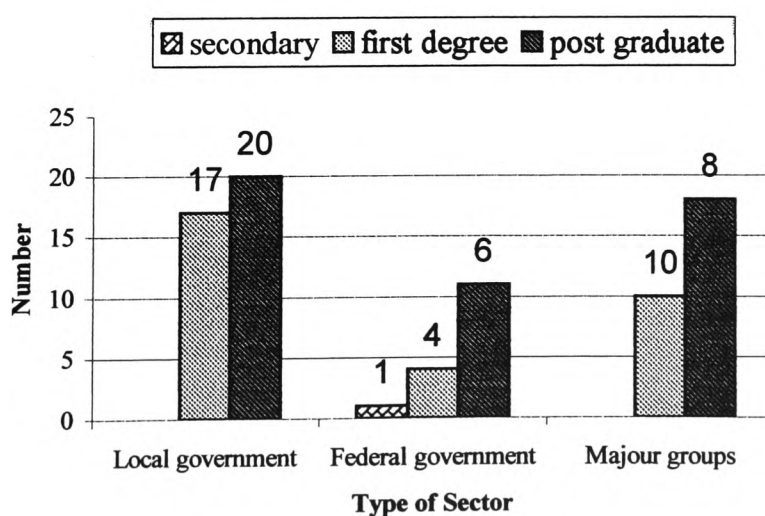
Figure 8.1   Education Level at each Sector
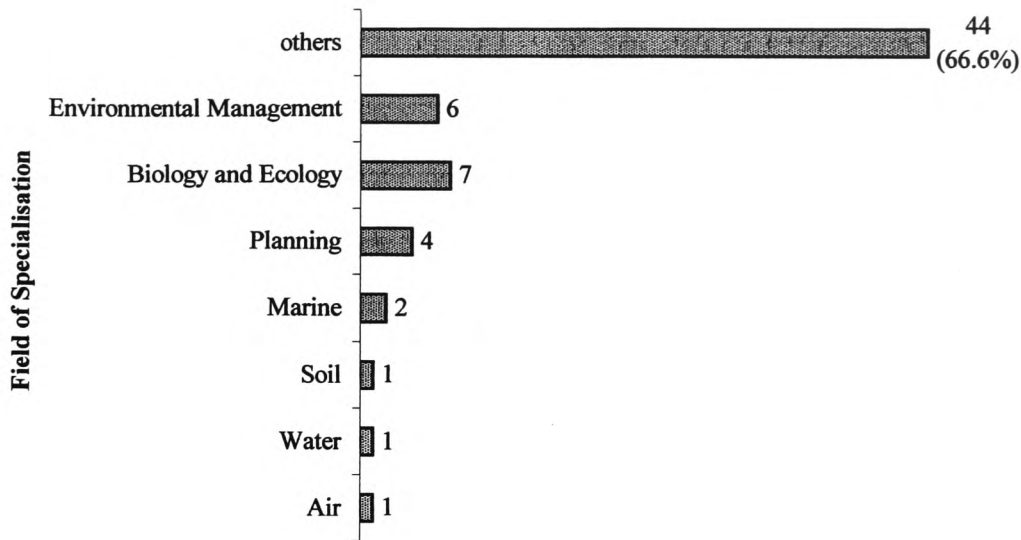
Figure 8.2   Field Study at each Sector

8.3.2 Environmental Problem Priorities

As part of the survey, the respondents were requested in Question Three in the questionnaire to rank environment problems in terms of importance and priority. The responses have been presented in Figure 8.3, which shows the environmental problem priorities at each sector from their point of view. This variance in ranking the environmental problem priorities is due to the lack of co-ordination between LG and FG and also between them and the major groups. It is also due to the absence of the effective participation of the major groups into the decision-making process and development projects. Where there is concern about the environment, the emphasis tends to be placed on *global* issues. Hence, there is often a low level of awareness of *local* environmental problems (see Chapter Five). The overall rank to the environmental problem priorities in the Emirate of Abu Dhabi is illustrated in Table 8.2. The main environmental problem priorities in the Emirate of Abu Dhabi are water pollution, marine and coastal pollution, waste management, air pollution, industrial pollution, urbanisation and desertification.
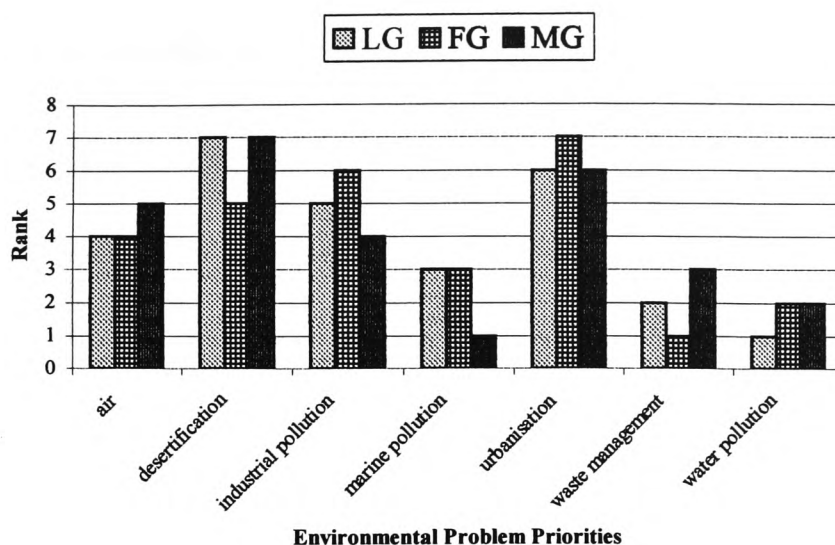
Figure 8.3   Environmental Problem Priorities.

In addition to these priorities, interviewees added two environmental problems, which should be taken into consideration when defining the main environmental problem priorities in the Emirate. These two problems are the disposal of industrial wastes and the use of pesticides. The respondents' specialisation field does not effect the ranking of these priorities, because 66.6% of them are not specialised in environment.

Table 8.2   The Environmental Problem Priorities for the Emirate of Abu Dhabi

Environment Problem Priorities	*Rank*
Water pollution	1
Marine and coastal pollution	2
Waste management	3
Air pollution	4
Industrial pollution	5
Urbanisation	6
Desertification	7

Table 8.2 reveals that the environmental problem priorities differ from what has been presented and provided in Chapter Five, because the setting of these priorities was based on the theoretical approach which was provided by the World Band and ESD (1995). These findings show that the participation of major groups and government staff is important in defining environmental problems, causes and priorities.

8.3.3   Differences in Environmental Priorities

This is one of the important questions used in the questionnaire to check whether the previous environmental priorities differ from one Emirate to another. This question is also used to indicate the factors that cause these differences. Respondents were asked to rate their level of agreement with the number of elements that may cause the differences. The level of respondents' agreement was measured using a four point Likert scale. Figure 8.4 reveals that 47%, 15.2% and 25.8% of respondents, respectively, at local government, federal government and major groups agree that the environmental priorities differ from one Emirate to another.
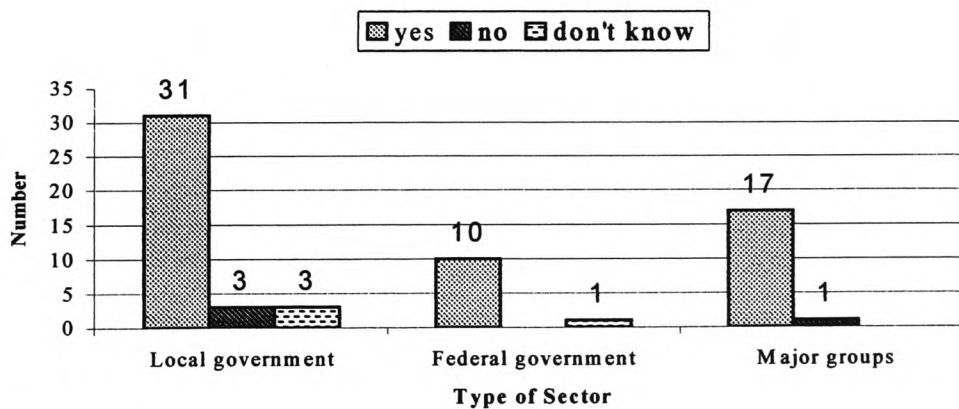
Figure 8.4   The Environmental Problems Priorities Differ from one Emirate to another.

These differences have been attributable to the factors illustrated in Figure 8.5. Most of the respondents to the questionnaire survey "strongly agree" and "agree" that those factors including size of population, source of income, source of finance, degree of development, variance of law, source of pollution, capacity of management, and enforcement of regulation are causing the difference of environmental problem priorities between the Emirates (see section 8.4, sub-hypothesis 1). In addition to the above factors, the interviewees agree with this and

added that the geographic location and area of each Emirate also causes differences in the environmental priorities from one Emirate to another.

This supports what was mentioned in Chapter Five regarding that each Emirate has its own local government and they differ in size and complexity depending on variety of population and degree of development. Other factors such as source of finance, enforcement of regulation and the variance of law are also causing the differences of environmental problems priorities between the Emirates.

Factors Causing the Difference of Environmental Priorities
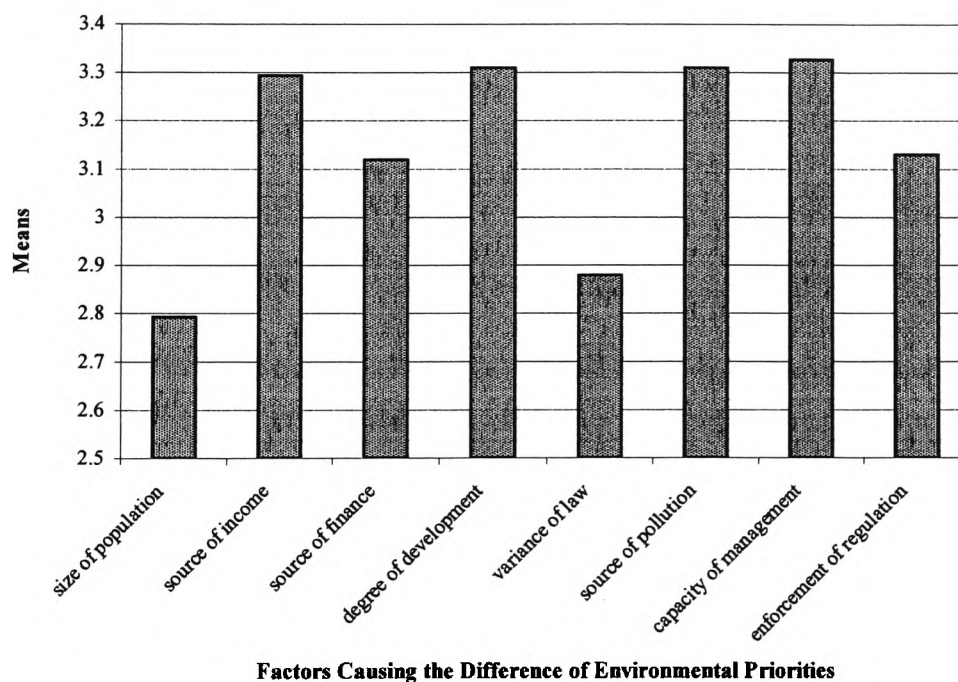
Figure 8.5   The Main Factors that Cause Environmental Differences from One Emirate to another.

Figure 8.6 shows that the respondents' agreement levels differ from one sector to another. It reveals that the respondents to the questionnaire survey "strongly agree" and "agree" to these factors. For example, the respondents to the questionnaire survey at local government level, rate the degree of development factor as the top factor that causes the differences of environmental problem priorities among the Emirates, followed by source of finance, enforcement of regulation, variance of law, management capacity, source of income, sources of pollution and the size of population. But the respondents to the questionnaire survey at the federal level, rate the source of income as the major factor causing the difference of environmental problem priorities between the Emirates. Finally, the respondents at the major groups' rate the management capacity as the main factor that causes the differences of environmental problem priorities between the Emirates. The main factors causes of these difference are the lack of co-ordination between sectors and the weakness of environmental awareness level, and also the lack of the availability of up-to-date information (see Chapter Five).
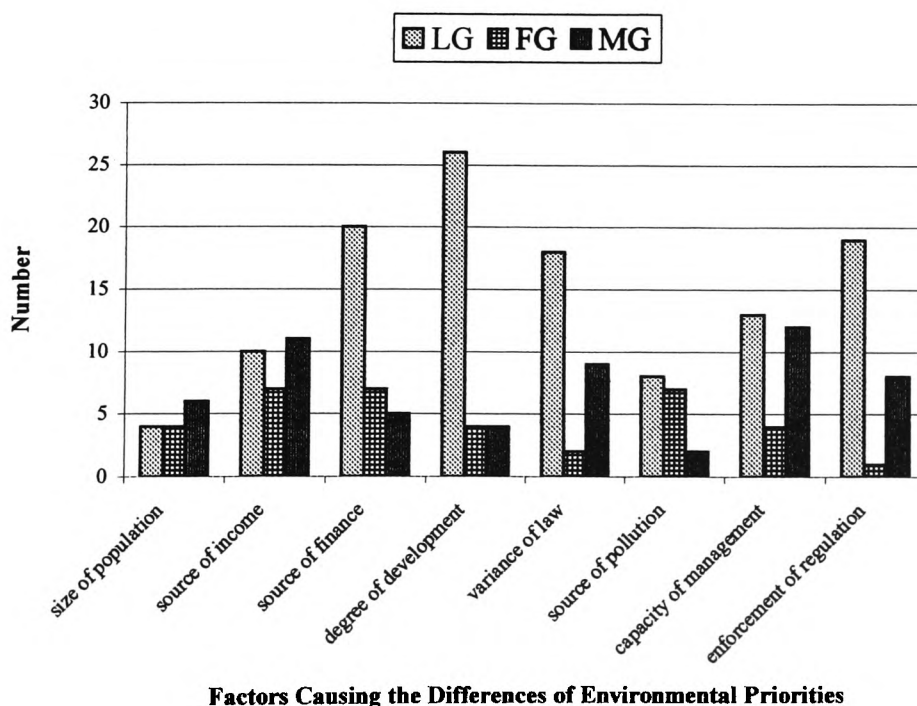
Figure 8.6   The Main Factors Causing Environmental Priority Differences from One Emirate to another by Sectors.

8.3.4   The Main Causes of Environmental Problems

The respondents were asked to rate their level of agreement with the listed main causes of environmental problems. The analysis reveals that most respondents to the questionnaire survey "strongly agree" and "agree" to these causes. Figure 8.7 shows that the lack of monitoring and control, lack of enforcement, lack of awareness, rapid economic growth and ground water depletion are the main causes of environmental problems in the Emirate of Abu Dhabi. Other elements such as the effect from other Emirates or countries, the lack of financial incentives, migration, and pricing policy are also causing these problems.

The Main Causes of Environmental Problems
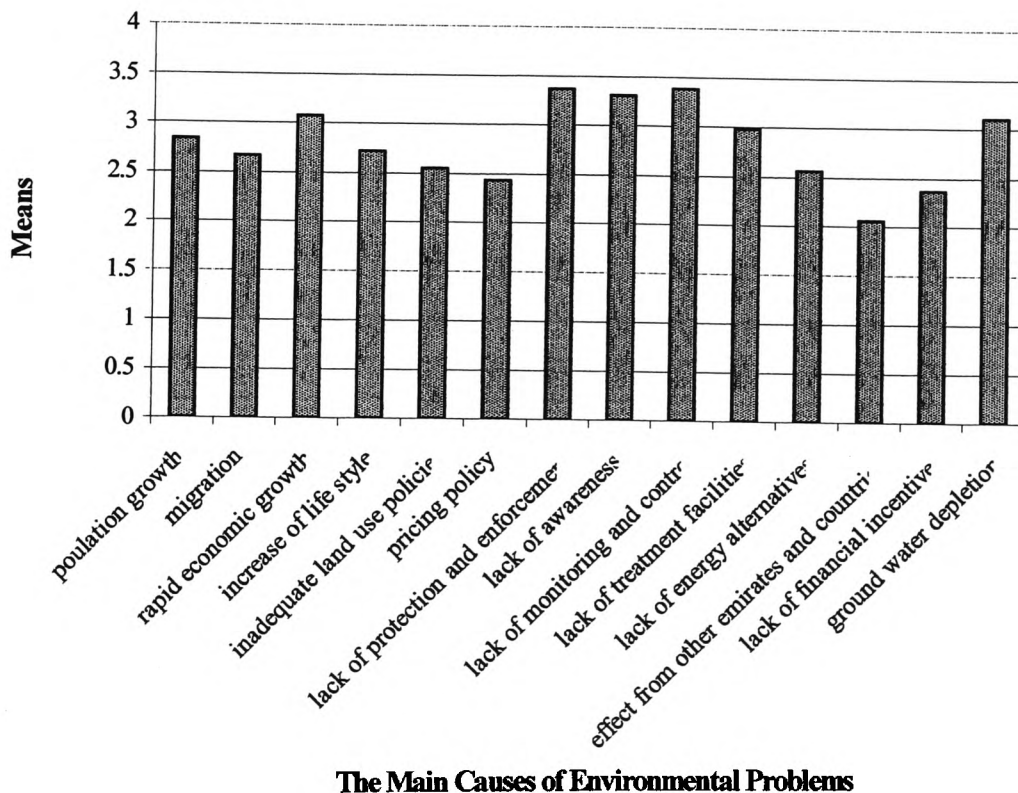
Figure 8.7   The Main Causes of Environmental Problems

However, the ranking of the agreement level to these causes differ from one sector to another as seen Figure 8.8.   For example, at LG the lack of regulation and enforcement, lack of monitoring and control, lack of awareness, lack of treatment facilities and ground water depletion are the main causes of environmental problems in the Emirate. Where the FG respondents ranked the ground water depletion, lack of

treatment facilities, lack of monitoring and control and lack of awareness as the main causes of environmental problems in the Emirate of Abu Dhabi. At the MG respondents ranked the lack of awareness, lack of regulation and enforcement, ground water depletion and rapid economic growth as the main causes of environmental problems. These differences are probably due to lack of co-operation and co-ordination between sectors, and the weakness of awareness programmes at all levels.

Interviewees also agree with the above environmental causes, and additionally that the lack of taking environmental consequences of development projects into account in the decision-making process is also causing some of the environmental problems in the Emirate.

The Main Cuases of Environmental Problems
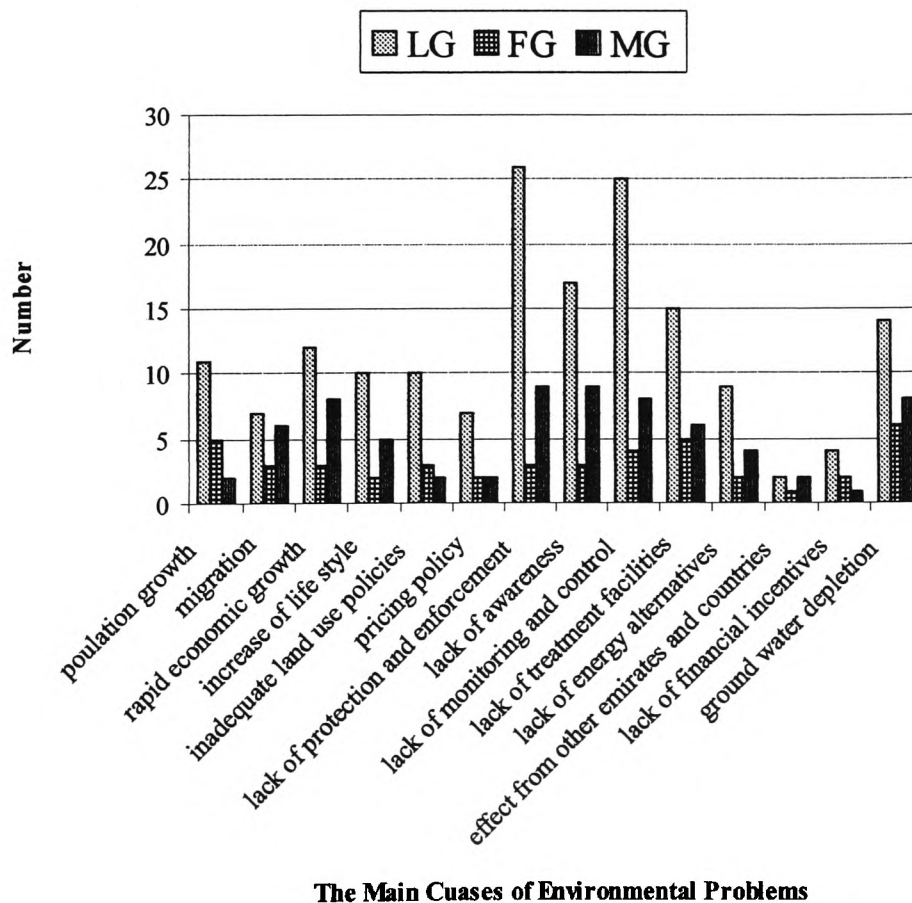
Figure 8.8   The Main Causes of Environmental Problems by Sectors

8.3.5   The Effect of Global Environmental Issues

Figure 8.9 shows that global environmental issues have contributed to some of the environmental problems to the Emirate environment. The respondents were asked to rate the level of the global environmental issues effect on the local environmental problems. It shows, in Figure 8.9, that (60) 91% of respondents among them 47%, 16.7% and 27.3% from local government, federal government and major groups respectively, agree with the above statement.

The Effect of Global Environmental Issues on the Local Environment
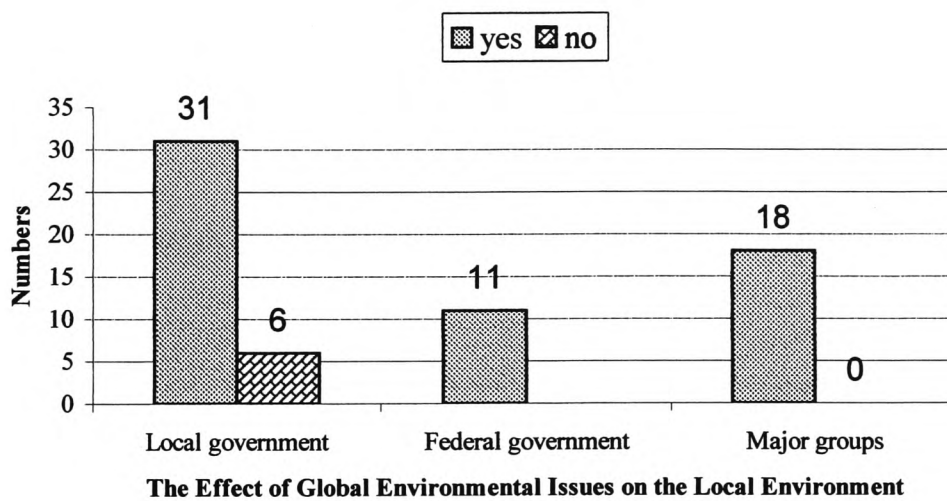
Figure 8.9   The Agreement Level for the Effect of Global Environmental Issues on the Local Environment.

Figure 8.10 shows that the respondents to the questionnaire survey generally think that marine pollution, industrial pollution, and toxic and hazardous waste have a strong effect on the local environment and may cause some of the environmental problems in the Emirate. Other issues such as ozone layer depletion, global warming, deforestration and desertification have a moderate effect on the Emirate environment. As mentioned in Chapter Five, the Emirate of Abu Dhabi is located in the Arabian Gulf, sharing the marine environment with a number of countries that also have oil and gas industries which intensively rely on marine resources. To summarise, the global environmental issues such as marine pollution, industrial pollution and dealing with toxic and hazardous wastes may effect the local environment and cause some of the present environmental problems at the Emirate.

The Effect of Global Environmental Issues
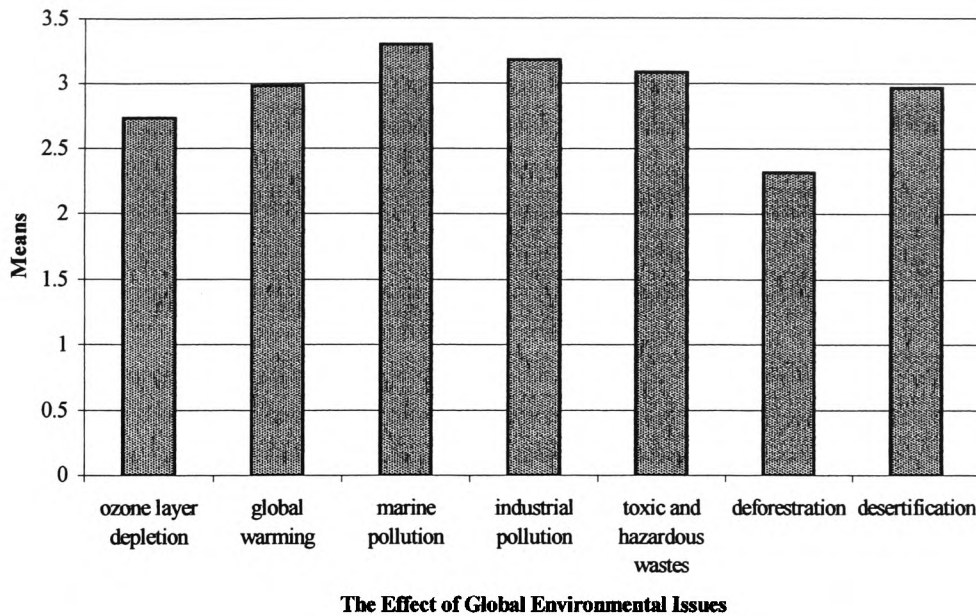
Figure 8.10   The Effect of Global Environmental Issues on the Emirate's Environment.

8.3.6   Environmental Institutions

The respondents were asked to rate the importance of reorganising the present institutions into a new institutional framework. This question was used to determine the opinion of the respondents to the questionnaire survey, whether the present institutional framework has the required capability to pursue and achieve strategy objectives and goals.

As shown in Figure 8.11, (57) 86.4% of respondents think that the existing environmental institutions need to be reorganised into a new institutional framework as shown in Chapter Six. This is an urgent need because improper environment institutions may hinder strategy preparation, formulation and the implementation of strategy policies, plans and programmes. Also it may hinder the monitoring and evaluation of the strategy process (see Chapter Three).

The need to rearrange the current institutional framework
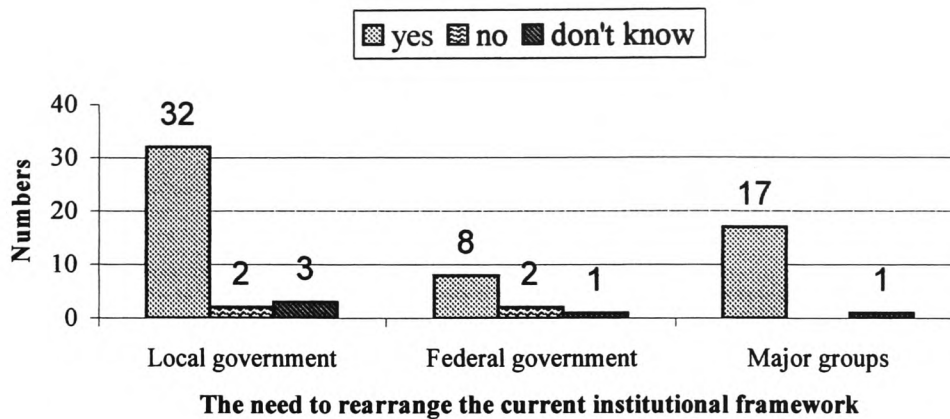
Figure 8.11   The   Need   for   Restructuring   of   the   Existing   Environmental Institutional Framework.

The respondents were asked to indicate the problems that may face the existing environmental authorities by providing a list of nine problems given by the researcher (see section 8.4, sub-hypothesis 2). The selection of the listed problems was based on the literature review and also from the researcher's experience in local government (see Chapter Five). In addition, the respondents were asked to add any other problems not included in the provided list that may face the authorities.

Figure 8.12 shows that most of the respondents to the questionnaire survey strongly agree and agree to these problems. It shows that the absence of co-operation; weakness in applying and enforcing law; absence of effective regulation; weakness of environmental awareness; shortage of specialised staff; unclear responsibilities; overlapping responsibilities, inexperienced departments; and no separate budget are the most important problems facing the present environmental institutions in the Emirate of Abu Dhabi. However, the ranking of agreement level to these problems differ form one sector to another. For example, the major groups think that the absence of co-operation and lack of environmental awareness and the absence of effective law are the main problems facing environmental institutions because they suffer from these problems (see Figure 8.12).
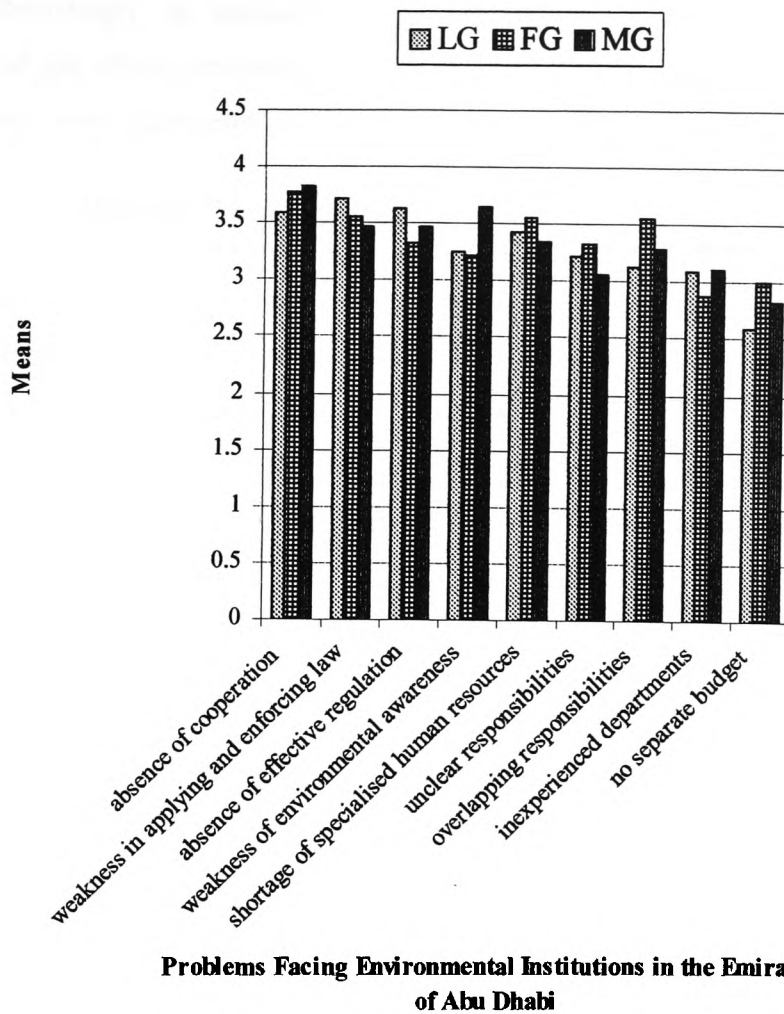
Figure 8.12   Problems Facing Environmental Institutions by Sectors

Also, all the interviewees strongly agree with the above mentioned problems which may face the present environmental institutions and agree also with the need to reconstruct the existing environmental institutions into a new framework. They think also it is an urgent step which should be developed before starting formulating strategy, because it may hinder all the strategy process and components. This rearrangement needs to clearly define the function and responsibility of relevant authorities, to minimise the conflict between authorities, and to ensure effective co-ordination among authorities and other major groups in the community. This result supports what has been described in Chapter Six.

Accordingly, an independent body with proper authority should be established to lead the efforts towards achieving sustainable development. More details about this body were mentioned in Chapter Six.

8.3.7 Strategy Process Elements

The respondents were asked to rate their agreement level with the strategy process elements that may be used to achieve a successful strategy process. These elements were presented based on the information provided and explained in the previous chapters. Figure 8.13 shows most respondents to the questionnaire survey think that the use of these elements are "very important" and "important" to achieve a successful strategy process. These elements are:

- formulate legislation and regulation;
- set environmental standards and specification;
- adopt environmental policies, plans and programmes;
- initiate a clear inter-governmental co-ordination system;
- having enough staff;
- promote environmental awareness;
- review strategy progress and performance;
- provide and exchange information;
- encourage public and private sector participation;
- develop an environmental information system;
- organise seminars;
- financial resources;
- institution rearrangement; and
- promote regional and international co-operation.
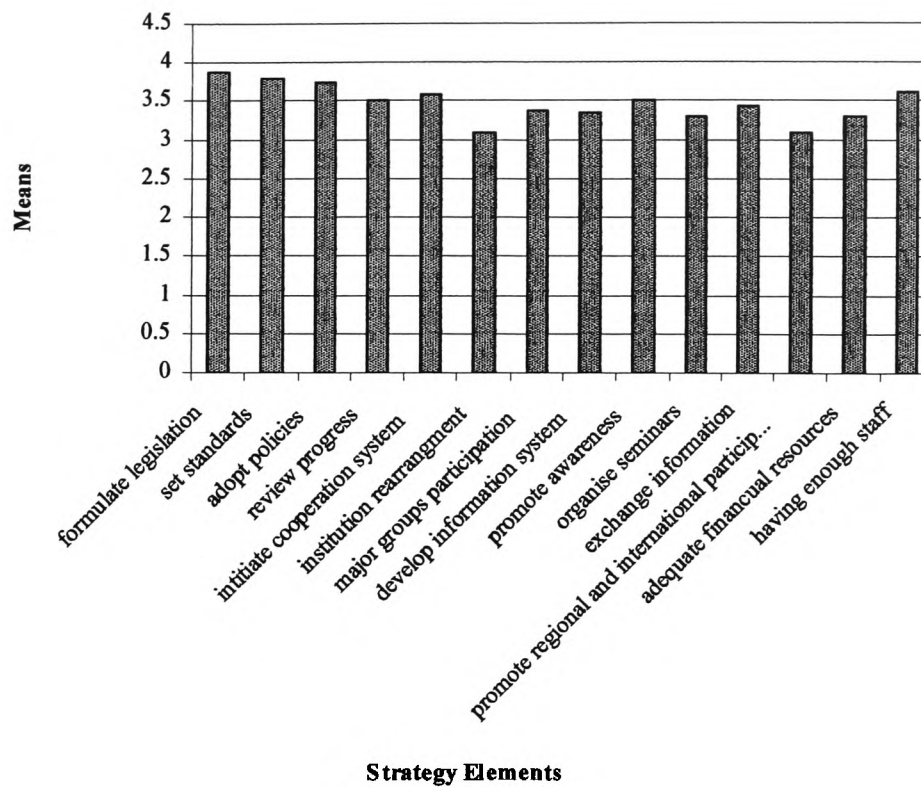
Figure 8.13   The Strategy Process Elements

8.3.8   Strategy Implementation Instruments

Respondents were asked in the questionnaire survey to rate their agreement level with the provided list of implementation instruments, which may be used to achieve effective implementation of strategy policies, plans and programmes. These instruments are stated in the proposed strategy model in Chapter Six. As shown in Figure 8.14, most respondents to the questionnaire survey agree that the use of these instruments is important to achieve effective implementation of strategy policies, plans and programmes, in order for the strategy to succeed.

These instruments are listed on the level of importance to the respondents involved in the questionnaire survey, which are: legislation support, strong co-operation and co-ordination system, integrating environmental consideration in the decision-making process, participation of all sectors, applying penalties and charges system for industries and private sectors, providing financial support, funding the strategy programmes and projects, link between local and federal efforts, use of environmental tools, and encouraging environmental investment.

Strategy Implementation Elements
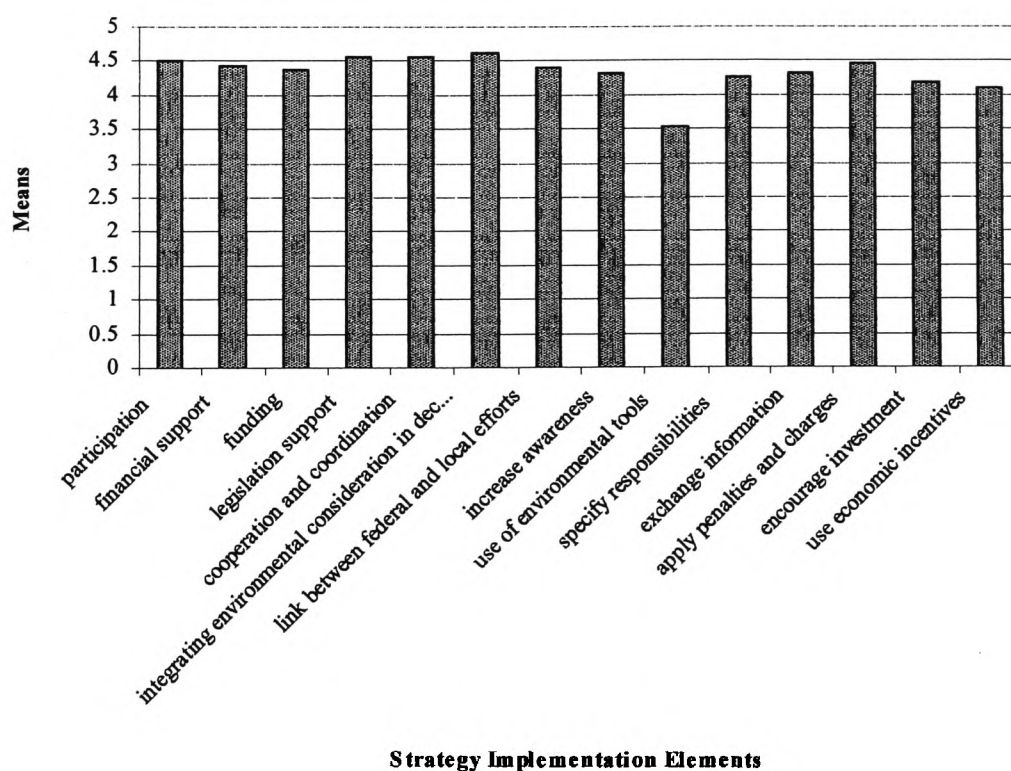
Figure 8.14   The Strategy Implementation Elements

8.3.9   Monitoring and Evaluation Elements

In this part, the respondents were asked to rate the importance level of monitoring and evaluation elements, which are used to achieve effective monitoring and evaluation of the strategy process. Most of the respondents to the questionnaire survey think that the use of monitoring and evaluation elements are "very important" and "important" to achieve effective monitoring and evaluation of strategy progress and performance (see section 8.4, sub-hypothesis 9).

8.3.10 Participation Techniques

Figure 8.15 shows that almost all respondents to the questionnaire survey agree that the major group's participation in all strategy stages is essential to achieve a successful strategy process. However, some interviewees think that there must be a limit to their participation. For example, they can participate in the collection of data and information, strategy preparation, strategy formulation, and also in the implementation process, but they could not be involved in monitoring and evaluation because it is one of the government authorities' responsibilities. This kind of participation should be encouraged by the government through defining the role of each participant in the strategy process. The best way to achieve participation of these groups is to organise workshops and seminars, and take their comments and suggestion into consideration when formulating the final strategy document. The interviewees think that the main role of these sectors is to provide environmental awareness programmes for the community and to help in implementing some of the strategy plans and programmes that relate to the community.
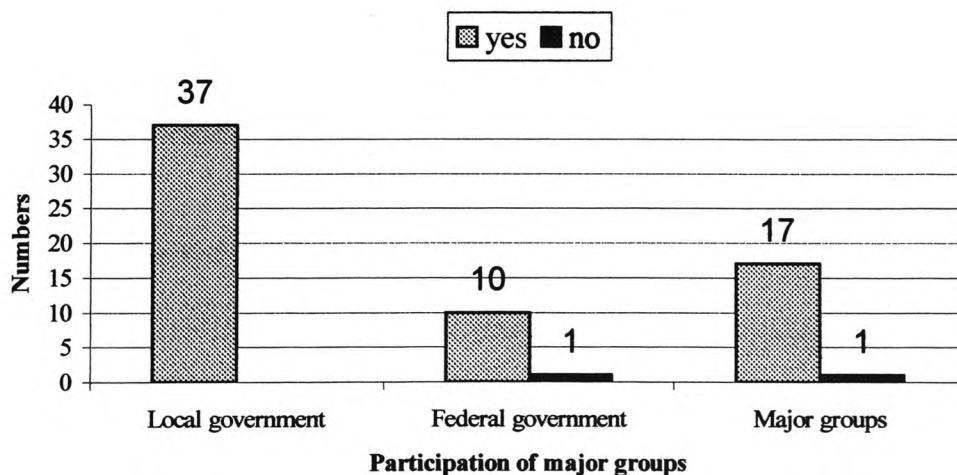
Figure 8.15   The Agreement Levels of Major Group's Participation.

The respondents were asked to rate the importance of the major group's participation in several parts in the questionnaire. Almost all respondents strongly agree with the importance of the major groups participation and involvement in the strategy process to achieve strategy goals and objectives.

Question 11a in the questionnaire, asked respondents to provide their opinion regarding such techniques. The purpose of this question was to establish the most popular technique to achieve effective participation of major groups in the strategy process. Table 8.3 shows the responses to this question. It shows that almost all respondents agree to the importance of using the media as participation techniques to achieve effective participation of major groups. The review of other countries' experiences in Chapter Four showed that UK strategy used the media as a technique to achieve major groups participation in strategy process and to increase the awareness level. Also, Oman and Jordan strategies used seminars and workshops to achieve other groups' participation and involvement.

Table 8.3   The Participation Techniques to Achieve Major Groups Participation and Involvement.

Rank	Participation Techniques	Mean	S.D.
1	Media	3.7656	.5840
2	Newsletters	3.2031	.6468
3	Electronic media	3.1429	.7374
4	Seminars and workshops	3.1094	.6695
5	Public libraries	2.9687	.7340
6	Survey programmes	2.9063	.8110
7	Public meeting	2.8906	.7153
8	Public society	2.8594	.7318
9	Consultation paper	2.7969	.7167

8.3.11 The Role of Major Groups

Respondents were asked in the survey by way of yes/no/don't know questions whether research institutions and the private sector have a contribution towards the strategy process. The choice of research institutions and private sectors in the questionnaire as an example of the major groups in the community, because it is believed that these two sectors do not have an essential contribution in the environmental field (see Chapter Five). It is also because the other groups in the

Emirate such as women's groups and NGOs have already a little contribution in some of the environmental activities and programmes such as encouraging public awareness. As described in Chapters Three and Six, the research institutions and private sector may have an essential role to contribute in a different way to the strategy process. For example, research institutions could provide technical assistance, consultation and advice and also conduct research studies. The private sectors also have an important role in supporting environmental activities.

Questions 13 and 13a sought the respondents' opinion regarding the role of research institutions in the strategy process. 97% of respondents' to the questionnaire and most of interviewees think that the contribution of research institutions is very important and there were only two respondents whose answer was "don't know" (see section 4.8 hypothesis 10).

8.4   TESTING THE HYPOTHESIS

Before testing the research hypotheses, it is important to decide which test to use (see Chapter Seven for more details). Based on this, the following analyses were undertaken to test the main research hypothesis and sub-hypotheses. The Kruskal-Wallis test was used for calculating difference in population mean. It is used to test the hypothesis that independent groups are the same against the alternative hypothesis that one or more of groups differ from the others. When the value of the Kruskal-Wallis is significant, it indicates that one of the groups is different from at least one of the others. In this section the following sub-hypotheses is tested.

Sub-Hypothesis 1

Environmental problem priorities differ from one Emirate to another

The main objective of this hypothesis is to determine the effect of the following factors in causing the difference of environmental problem priorities between the Emirates. In order to test this hypothesis, the respondents were provided with a list of environmental factors that may cause the differences of environmental problem priorities form one Emirate to another and asked to rate their agreement level with each factor. The result of their opinion has been presented in section 8.3.3.

The result is also presented in more detail in Table 8.4. It indicates that there has been no significant difference of opinion between the selected groups (LG, FG and MG). This is reflected by the chi-square, which is greater than 0.05 (5 percent level).

The mean for each group can be easily seen from Table 8.4, where it is found that the mean is around 3 for all groups which means that all respondents agree that all factors provided in the questionnaire are causing the differences of environmental problems priorities between the Emirates. As described in Section 8.3.3, the interviewees agree that environmental priorities differ from one Emirate to another. The overall result indicated that the majority of respondents rank the management capacity factor as the main factor that is causing these differences with an overall mean of 3.327, ranking the first. The second highest mean is for the enforcement of regulation, with 3.317. Source of pollution comes third followed by degree of development; source of income; sources of finance and support; variance of law and regulation; and size of population. There was, however, a significant difference in opinion between the three groups towards the regulation enforcement factor (.005). A possible explanation for this may be due to the fact that FG has reported lower mean than LG and MG. This is due to FG being represented by the FEA, which formulated the national environmental regulation and enforcement of this law is the local government responsibility. Because of that and because of the lack of co-ordination and co-operation between these sectors the federal government does not know the level of enforcement in each Emirate.

Therefore, the chi-square test for differences in means clearly shows no significant differences in opinion and in agreement levels of all groups (LG, FG and MG). Based on this result it is concluded that the environmental problem priorities differ from one Emirate to another and these differences are affected by a number of factors which are provided in Table 8.4. Therefore, the sub-hypothesis is accepted.

Table 8.4   Factors affecting Differences in Environmental Problem Priorities

	N	Mean	Rank	Sub-group	mean	by sector	SD	Chi-square	P. value
				LG	FG	MG			
Size of population	58	2.793	8	2.612	3.300	2.823	.969	3.649	.161
Source of income	58	3.293	5	3.225	3.400	3.352	.675	.512	.774
Source of finance and support	58	3.120	6	3.129	3.300	3.000	.727	.853	.653
Degree of development	58	3.310	4	3.387	3.100	3.294	.799	1.110	.574
Variance of law and regulation	58	2.879	7	3.096	2.500	2.705	.974	4.155	.125
Source of pollution	58	3.310	3	3.193	3.700	3.294	.706	3.952	.139
Management capacity	58	3.327	1	3.387	3.000	3.411	.866	1.463	.481
Regulation enforcement	58	3.317	2	3.483	2.300	3.000	1.01	10.70	.005

LG: Local Government   FG: Federal Government   MG: Major Groups

Sub-Hypothesis 2

The current environmental institutional structure needs rearranging into a new framework.

The main objective of this sub-hypothesis is to determine the problem facing environmental authorities and to test if there is a need to rearrange and reconstruct these institutions into a new framework. In order to achieve this objective, the respondents were provided with a list of the main problems that may face environmental authorities in the Emirate of Abu Dhabi and asked to rate their agreement level with each of the listed problems. The results were presented in Table 8.5.

The overall result indicated that the majority of the respondents' rate the absence of a co-operation and co-ordination system as the main problem facing environmental

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authorities in the Emirate that might hinder the formulation, implementation and monitoring of the strategy policies, plans and programmes. The overall mean of this problem is 3.689, ranking it first. The second highest mean is for the weakness in applying and enforcing law, with means 3.620. Absence of effective regulation is the third main problem facing authorities followed by shortage in specialised human resources; weakness of environmental awareness programmes; overlapping of responsibilities; unclear responsibilities; and inexperienced departments. "no separate budget" problem come last with little support from respondents with mean 2.724, which is the lowest mean. This is due to most environmental authorities having separate budgets and financial support.

Therefore, most of respondents to the questionnaire and interview survey agree with the suggestion that the present environmental institutions face the above problems and there is a need to rearrange and reconstruct into a new framework. Also the chi-square test for differences in means clearly shows no significant differences in opinion and in agreement level of all groups (LG, FG and MG) towards that the present environmental institutions facing different problems that may hinder the formulation and implementation of any strategy policies, plans and programmes. From the above result and findings it is found that there is a need to rearrange the present environmental institutional structure with a new framework. Therefore, the above sub-hypothesis is accepted.

Table 8.5   Problem Facing Environmental Institutions

	N	Mean	Rank	Sub-group	mean	by sector	SD	Chi-square	P. value
				LG	FG	MG			
Absence of co-ordination and co-operation system	58	3.689	1	3.593	3.777	3.823	.627	1.927	.382
Weakness in applying and enforcing law	58	3.620	2	3.718	3.555	3.470	.524	3.495	.174
Absence of effective regulation	58	3.534	3	3.625	3.333	3.470	.681	2.026	.363
Weakness of environmental awareness programmes	58	3.362	5	3.250	3.222	3.647	.693	4.487	.106
Shortage in specialised human resources	58	3.431	4	3.437	3.555	3.352	.797	.525	.769
Unclear responsibilities and duties	58	3.189	7	3.218	3.333	3.058	.804	1.319	.517
Overlapping responsibilities	58	3.241	6	3.125	3.555	3.294	.844	1.225	.542
Inexperienced departments	58	3.069	8	3.093	2.888	3.117	.834	.254	.881
No separate budget	58	2.724	9	2.593	3.000	2.823	.932	1.630	.443

LG: Local Government   FG: Federal Government   MG: Major Groups

Sub-Hypothesis 3

The participation of major groups is important to achieve a successful environmental strategy process.

The main objective of this sub-hypothesis is to test the agreement and opinion levels of various groups in the Emirate towards the importance of major groups' participation in all of the strategy process to achieve a successful strategy process. In order to achieve this objective, the respondents to the questionnaire survey were asked to rate their agreement level and the importance of this element.

Table 8.6 summarises the statistical results by groups, where the majority of respondents agrees and strongly agrees with the importance of major groups' participation in the strategy process. As described in Section 8.3.11, the interviewees agree with importance of the participation of major groups. The above result highlighted that there is no significant difference in opinion and agreement level between the three groups. According to the mean in these items, the chi-square statistics were not significant at the 5 percent level for the type of groups. It is, therefore, concluded that there are no significant differences of opinion among the various groups, which agreed that the major groups' participation is essential and important to achieve a successful strategy process. Therefore, the sub-hypothesis is accepted.

Table 8.6   Participation of Major Groups

	N	Mean	Sub-group	mean	by sector	SD	Chi-square	P. value
			LG	FG	MG			
Encourage major groups participation in all strategy process	66	3.393	3.378	4.454	3.388	.653	.023	.989
Participation of all major groups in implementation process	66	4.500	4.459	4.727	4.444	.662	1.371	.504
Participation of all major groups in monitoring and evaluation process	66	3.772	3.729	3.727	3.888	.457	1.559	.459

LG: Local Government   FG: Federal Government   MG: Major Groups

Sub-Hypothesis 4

> *Environmental awareness should be encouraged and increased to achieve strategy objectives and goals towards achieving sustainable development.*

In order to test this sub-hypothesis, the respondents were asked to rate their agreement level to the importance of encouraging and increasing environmental awareness to achieve a successful strategy process. A summary of respondents' opinion is presented in Table 8.7. It can be seen from this table that a high proportion of respondents agree with increasing environmental awareness at all levels and promoting education and training programmes, with a mean of almost 4.

The chi-square statistical results were insignificant for all items at the 5 percent level. Thus, there is no statistically significant difference in the opinion or agreement level of the three groups (LG, FG and MG) towards increasing and promoting environmental awareness, training and education programmes. Based on this result it is found that there is a need to encourage and increase environmental awareness programmes at all levels to achieve strategy objectives and goals. Therefore, the sub-hypothesis is accepted.

Table 8.7   Promote and Increase Environmental Awareness

	N	Mean	Sub-group	mean	by sector	SD	Chi-square	P. value
			LG	FG	MG			
Promote environmental awareness, education and training programmes	66	3.500	3.378	3.636	3.666	.588	4.127	.127
Increase environmental awareness at all levels	66	4.333	4.270	4.363	4.444	.640	.914	.633

LG: Local Government   FG: Federal Government   MG: Major Groups

Sub-Hypothesis 5

The use of environmental tools such as EIA, SEA, EMS and SDI is essential to achieve effective implementation of strategy policies, plans and programmes.

The main objective of this sub-hypothesis is to determine the importance of using environmental tools in environmental strategy to achieve effective implementation of strategy policies, plans and programmes. In order to achieve this objective, the respondents were asked to rate the importance level of using these tools.

In Table 8.8 the overall result indicates general agreement in opinion among the use of environmental tools such as EIA, SIA, EMS and SDI, where the chi-square value is insignificant at the 5 percent level. Based on the mean of this item, the respondents agree that the use of environmental tools is important and essential to achieve effective implementation of environmental strategy policies, plans and programmes. This table also shows no significant difference between the three groups suggesting an agreement of opinion towards the using of environmental tools. It is found that the using of environmental tools is important and essential to achieve effective implementation of strategy policies, plans and programmes. Therefore, the sub-hypothesis is accepted.

Table 8.8   Use of Environmental Tools

	N	Mean	Sub-group	mean	by sector	SD	Chi-square	P. value
			LG	FG	MG			
Use of environmental tools	66	4.530	4.567	4.545	4.444	.637	.361	.835

LG: Local Government   FG: Federal Government   MG: Major Groups

Sub-Hypothesis 6

Providing a separate and adequate budget and financial resources is important for achieving a successful strategy process.

In order to test this sub-hypothesis, the respondents were asked to rate their agreement level with the importance of providing adequate budget and separate financial resources to achieve successful implementation of the strategy process.

Table 8.9 reveals no significant difference between the three groups in their opinion and the importance of providing adequate and separate budgets for environmental plans and programmes. It showed that respondents agree with the importance of providing an adequate budget and financial support for each authority and organisation. Based on this result it is found that the need to provide an adequate budget and separate financial resources is important to achieve a successful strategy process. Therefore, the sub- hypothesis is accepted.

Table 8.9   Provide Adequate Budget and Financial Resources

	N	Mean	Sub-group	mean	by sector	SD	Chi-square	P. value
			LG	FG	MG			
Provide an adequate budget	66	3.393	3.351	3.545	3.388	.604	.720	.698
Provide adequate financial resources and incentives	66	3.303	3.297	3.545	3.166	.678	1.742	.418

LG: Local Government   FG: Federal Government   MG: Major Groups

Sub-Hypothesis 7

The provision and exchange of information is important to establish
a strong baseline information to prepare SoE report.

The main objective of this sub-hypothesis is to determine the importance of providing and exchanging environmental information to establish a strong information baseline and environmental database. In order to achieve this objective, the respondents were asked to rate their agreement level and the importance of providing environmental information and the exchange of this information among authorities and between them and major groups.

In Table 8.10 the overall result indicates general agreement in opinion among the importance of providing an information system and the proper exchange of this information between authority departments and major groups, where the chi-square value is insignificant at the 5 percent level. Based on the mean of this item, the respondents agree or strongly agree that the provision and exchange of information is important to establish a strong baseline information to prepare SoE report. This table also shows no significant difference between the three groups suggesting an agreement of opinion towards providing and exchanging information.

It is found that the provision and exchange of information is important to establish a strong baseline information to prepare SoE report. Therefore, the sub-hypothesis is accepted. The exchange of information within government authorities and between them and major groups needs a clear co-operation and co-ordination system to achieve an effective and strong environmental information baseline. The following sub-hypothesis will test the important of establishing this system.

Table 8.10   Provide and the Exchanging of Environmental Information

	N	Scale No.	Mean	Sub-group	mean	by sector	SD	Chi-square	P. value
				LG	FG	MG			
Develop environmental information system	66	4	3.530	3.540	3.363	3.611	.560	1.705	.426
Provide and exchange information between all authorities and major groups	66	4	3.439	3.324	3.727	3.500	.635	4.048	.132
Encourage exchange of information	66	5	4.333	4.297	4.454	4.333	.664	.556	.757
Provide baseline information and data	66	5	3.572	3.756	3.545	3.777	.481	2.444	.295

LG: Local Government   FG: Federal Government   MG: Major Groups

Sub-Hypothesis 8

Establishing a co-operation and co-ordination system is important to achieve better relationship between all sectors.

The main objective of this sub-hypothesis is to determine the importance of establishing a co-operation and co-ordination system to achieve a better relationship between all sectors. In order to achieve this objective, the respondents were asked to rate their agreement level to the importance of this subject.

In Table 8.11 the overall result indicates general agreement in opinion among the importance of establishing a co-operation and co-ordination system between all sectors, where the chi-square value is insignificant at the 5 percent level. Based on the mean of this item, the respondents agree or strongly agree that the establishment of a co-operation and co-ordination system is important and essential to achieve a better relationship between all sectors. This table also shows no significant difference between the three groups suggesting an agreement of opinion towards providing and exchanging of information. It is found that the establishment of a co-operation and co-operation system is important to achieve a better relationship between all sectors. Therefore, the sub-hypothesis is accepted. It is recognised that however, this sub-hypothesis is self-proving and it represents a critical argument.

Table 8.11 Environmental Co-operation and Co-ordination System

	N	Scale No.	Mean	Sub-group	mean	by sector	SD	Chi-square	P. value
				LG	FG	MG			
Initiate clear inter-governmental co-operation and co-ordination system	66	4	3.590	3.621	3.636	3.500	.554	1.240	.538
Provide strong co-operation and co-ordination system	66	5	4.560	4.540	4.545	4.454	.530	.172	.918
Link between local and federal efforts	66	5	4.393	4.297	4.611	4.555	.762	1.418	.492

LG: Local Government   FG: Federal Government   MG: Major Groups

Sub-Hypothesis 9

Providing a clear environmental strategy monitoring and evaluation system is important to achieve effective progress in implementing the strategy policies, plans and programmes.

In order to test this sub-hypothesis, the respondents were asked to rate their agreement level with a list of monitoring and evaluation elements that are used to achieve effective monitoring and evaluation of the implementation of strategy polices, plans and programmes. It should be first noted that the respondents viewed all the provided elements as important to achieve a successful and effective monitoring and evaluation process.

In Table 8.12 the overall result indicates general agreement in opinion of the importance of providing baseline information and data followed by setting strategy objectives and goals; establishing environmental indicators; producing regular reports; providing an adequate budget; and updating the strategy. These elements are important to achieve essential and effective monitoring and evaluation for the implementation process of strategy policies, plans and programmes.

There were differences in opinion between the three groups in relation to the producing a regular report. The research found value of .063 which, although above the accepted 5 percent level, was still quite close to being significant. A possible explanation for this may be due to the fact that MG has reported a lower mean than LG and FG. This due to weakness of awareness level at this group regarding the importance of producing regular reports. This result shows that the participation of major groups in the current environmental activities is very limited (see Chapter Five) and it is not provided with accurate and up-to-date information.

From Table 8.12 it is clear that the chi-square statistic were not significant at the 5 percent level, which indicates no significant difference in opinion among respondents for the various groups (LG, FG and MG). Based on this result, the use of these elements is important to achieve effective monitoring and evaluation of strategy polices, plans and programmes. Therefore, the above hypothesis is accepted.

Table 8.12   Monitoring and Evaluation Elements

	N	Mean	Rank	Sub-group	mean	by sector	SD	Chi-square	P. value
				LG	FG	MG			
Provide baseline information and data	66	3.727	1	3.756	3.545	3.777	.481	2.444	.295
Set strategy objectives and goals	66	3.697	2	3.675	3.818	3.667	.495	.791	.673
Establish monitoring indicators	66	3.439	3	3.459	3.363	3.444	.558	.381	827
Produce regular report	66	3.075	6	3.162	3.272	2.777	.686	5.540	.063
Provide an adequate budget	66	3.393	4	3.351	3.545	3.388	.604	.720	.698
Updating the strategy	66	3.378	5	3.405	3.454	3.277	.674	.476	.788

LG: Local Government   FG: Federal Government   MG: Major Groups

Sub-Hypothesis 10

The research institutions and private sector have an important role and contribution in all the strategy processes towards achieving strategy objectives and goals.

The main objective of this sub-hypothesis is to determine the contribution level of the research and private sectors in the strategy process. In order to achieve this objective, the respondents were asked to rate their agreement level with the importance of research institutions and the private sector's contribution into the strategy process. They were also asked to give their views and agreement level about the contribution of these sectors in the different activities, which are provided in Table 8.13 and Table 8.14. These items were provided to help in identifying for them a clear role and responsibility towards achieving strategy objectives and goals.

The results by type of groups are summarised in Table 8.13. By examining this table and by looking at the ranking of the mean, the highest means are in the collection of information and identifying environmental problems and causes items, which are almost equal 3.651. Table 8.13 shows no significant difference between groups in their opinion and agreement level towards the provided items, as the significant levels are all greater than 0.05 (5 percent level).

The overall means indicate that the respondents agree or strongly agree with the provided items. As shown in Table 8.13, the contribution of research institutions in awareness programmes came last with the lowest mean 3.242. This is because respondents may think that the public sector represented by NGOs in collaboration with the government authorities should take this part.

The results of various groups towards the contribution of the private sector are summarised in Table 8.14. By examining this table and by looking at the ranking of the mean, the highest means is in the investment in environmental technology item, which are almost equal 3.651, followed by encourage cleaner production; staff training and awareness; support research institutions; and provide financial support and funds. Table 8.14 shows no significant difference between groups in their opinion and agreement level towards the provided items, as the significant levels are all greater than 0.05 (5 percent level). The lowest significant levels are found in providing financial support and funds where the significance .054 but not significant at the widely accepted 5 percent level. A possible explanation for this may be due to the fact that LG has reported lower mean than FG and MG. This because the local authorities have strong financial support from the government to formulate and implement any environmental projects and programmes (see Chapter Five) and the contribution of the private sector in providing financial support and funding environmental projects and programme is not appropriate at this level.

The overall means indicate that the respondents agree or strongly agree with the provided items. As shown in Table 8.14, the contribution of the private sector in supporting seminars and workshops came last with lowest mean 3.187. This because respondents may think that this should be the government authority responsibility.

Based on this result, it is revealed that the research institutions and private sector have an important contribution in different strategy stages towards achieving strategy objectives and goals. Therefore, the above sub-hypothesis will be accepted.

Table 8.13   Contribution of Research Institutions

	N	Mean	Rank	Sub-group	mean	by sector	SD	Chi-square	P. value
				LG	FG	MG			
Collection information	66	3.651	1	3.648	3.727	3.611	.480	.403	.818
Data analysis	66	3.621	2	3.567	3.909	3.556	.519	4.228	.121
Preparing state of the environment report	66	3.454	3	3.378	3.727	3.444	.683	2.076	.354
Identifying environmental problems and causes	66	3.651	1	3.621	3.454	3.833	.568	3.065	.216
Defining environmental priorities	66	3.409	4	3.297	3.363	3.666	.722	2.622	.270
Awareness programmes	66	3.242	8	3.189	3.272	3.333	.765	.764	.682
Education and training programmes	66	3.333	7	3.297	3.636	3.222	.791	1.798	.407
Provide consultation and advice	66	3.393	5	3.432	3.272	3.358	.578	.210	.900
Monitoring environment	66	3.348	6	3.351	3.181	3.444	.850	.707	.702

LG: Local Government   FG: Federal Government   MG: Major Groups

Table 8.14   Contribution of Private Sector

	N	Mean	Rank	Sub-group	mean	by sector	SD	Chi-square	P. value
				LG	FG	MG			
Provide financial support and fund	64	3.406	5	3.250	3.454	3.705	.683	5.827	.o54
Investment in environmental technology	64	3.546	1	3.472	3.545	3.705	.561	1.771	.413
Support environmental awareness, training and education programmes	64	3.281	7	3.194	3.272	3.470	.548	2.902	.234
Support seminars and workshops	64	3.187	8	3.138	3.272	3.235	.709	.669	.716
Support research institutions	64	3.421	4	3.333	3.545	3.529	.751	1.526	.466
Participation in formulating environmental policies, plans and programmes	64	3.296	6	3.388	3.272	3.117	.659	1.749	.417
Encourage cleaner production	64	3.500	2	3.524	3.636	3.352	.642	1.308	.520
Staff training and awareness	64	3.453	3	3.444	3.636	3.352	.640	1.002	.606

LG: Local Government   FG: Federal Government   MG: Major Groups

Table 8.15 provides the summary and the result of the research sub-hypothesis test. It shows that the main research hypothesis is accepted based on previous analysis of respondents to the questionnaire and interview survey.

Table 8.15   Results of the Main Hypothesis Test

Hypotheses	*Proved (yes/No)*	Reference	Results
H1	yes	Table 8.4	Environmental problem priorities differ from one Emirate to another
H2	yes	Table 8.5	Environmental institutional structure needs rearranging into a new framework
H3	yes	Table 8.6	Participation of major groups in strategy process is important
H4	yes	Table 8.7	Encourage and increase environmental awareness at all levels
H5	yes	Table 8.8	The use of environmental tools is essential
H6	yes	Table 8.9	Provide an adequate budget and separate financial resources for strategy plans and programmes
H7	yes	Table 8.10	Provide and exchange information
H8	yes	Table 8.11	Establishing an environmental co-operation and co-ordination system
H9	yes	Table 8.12	Provide a clear environmental monitoring and evaluation system
H10	yes	Table 8.13 and Table 8.14	The contribution of research institution and private sector is essential in the strategy process
MAIN	yes		The proposed strategy model is applicable for the Emirate of Abu Dhabi and is appropriate to achieve sustainable development.

8.5   CORRELATION TEST

This section measures and examines the relationships between the strategy process elements, strategy implementation instruments, and the strategy monitoring and evaluation elements. It also measures the relationship between the environmental problem priorities and the causes of these problems. Finally it determines the relationship between environmental problems priorities and the global environmental issues. Cross tabulation and correlation coefficient analyses were used. The Spearman (rho) correlation test is used to measure the value of significant correlation between different environmental issues. Fink (1995) explained that the Spearman Correlation was used to describe the relationship between two ordinal variables. It ranges from +1 to −1. +1 coefficient indicates a strong positive relationship between the two variables. Similarly a −1 correlation is an indication of strong negative relationship between variables. A correlation close to (0) indicates a much weaker relationship between variables, that means there is no systematic variation at all between the variables (Drew, 1976). The measurements and analysis for these relationships will be used to support the findings of the analysis presented in Section 8.4, and to show how these elements and factors depend on each other. For example formulating legislation require setting standards, capable institutions, and clear co-ordination system. These findings will be drawn out in Chapter Nine.

8.5.1   Correlation Coefficient between the Strategy Process Elements (Q8)

Table 8.16 shows whether the main environmental strategy elements are interrelated to each other. The following positive relationships are indicated:

1.   Setting environmental standards is related with the formulation of environmental legislation and regulation. This relationship suggests that without setting standards the regulation could not be formulated and enforced because regulation provides the immediate means of translating the environmental standards (see Chapter Three).

2.   Adopting environmental policies, plans and programmes related with reviewing strategy progress and issuing the performance report. This relationship reveals that the review of strategy progress toward adopting

strategy policies, plans and programmes is important to produce the performance report. This review provides strategy with the up-to-date information, which is needed to formulate and update strategy plans and programmes.

3.   Initiating a clear co-ordination system between government institutions is related with formulating legislation and regulation and also with the review of the strategy progress. This finding suggests that providing co-ordination between institutions will help in formulation legislation and to the success of the review of strategy process.

4.   Rearrangement of environmental institution structure is related with initiating a clear co-ordination system between institutions. This relationship reveals that in order to achieve an effective and strong institutional structure, the provision of a clear co-ordination system between concerned institutions is essential to achieve a successful strategy process.

5.   Encouraging major groups participation is interrelated with the review of the strategy progress. This relationship supports the idea that the participation of major groups in the review of the strategy progress process is essential to increase their awareness and to gain from there comments and opinion in solving their own local environmental problems (see Chapter Six).

6.   Developing information system correlates with setting environmental standards, initiating clear co-ordination system between institutions, rearrangement of environmental institutions and encouraging participation. This finding suggest that an information system could not be established and developed without providing a clear co-ordination system between institutions through a proper framework and also without involving major groups in this process. Also, developing and providing environmental information will help in setting standards based on the current environmental condition.

7.   Promoting and encouraging environmental awareness at all levels is related with encouraging major groups' participation and with developing an

information system. This finding suggests that encouraging major groups participation in the strategy and providing them with information, will encourage and increase environmental awareness at all levels.

8.   Organising seminars, workshops and conferences is one of the techniques used to increase the level of awareness and to achieve effective participation of major groups (see Chapter Six). Table 8.16 shows that the organising of seminars, workshops and conferences is related with encouraging major groups participation and promoting awareness.

9.   Exchanging information is related with encouraging participation, promoting and increasing awareness, organising seminars and workshops and developing an information system. This finding suggests that the exchanging of information could be achieved by initiating a clear co-ordination system between all the participants in the strategy process and also, by encouraging the major groups' participation through organising workshops and seminars (see previous relationship).

10.   Promoting regional and international co-operation is related with all strategy process elements, except the formulation of regulation, setting standards and initiating clear co-ordination system. These relationships reveals the importance of international and regional co-operation in providing environmental awareness programmes and training through organising seminars and workshops and also in providing and exchanging information, for example through providing technical assistance.

11.   Providing adequate financial resources for the strategy process is related with all other elements of strategy process, except formulating regulation, setting standards and adopting policies, plans and programmes. This finding supports the idea that the financial resource is the key element that will let all strategy stages and components be achieved and implemented.

12.   Having enough staff is related with setting standards, encouraging participation, providing and exchanging information and with providing adequate financial resources. This may suggest that adequate financial

resources be given to recruit enough staff to facilitate the participation in the strategy process. Having enough and qualified staff is important to exchange information and setting standards. Providing departments with adequate financial recourses is also essential to increase staff qualification, experience and awareness. Their participation in the strategy process is also essential to get a better understanding of the environment and to provide a means for reducing conflicts (see Chapter Six).

Table 8.16   The Correlation Coefficient between the Strategy Process Elements

	Mean	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3.87	1.0													
2	3.89	.35**	1.0												
3	3.75			1.0											
4	3.53			.37**	1.0										
5	3.60	.24*			.29*	1.0									
6	3.10					.25*	1.0								
7	3.22				.35**			1.0							
8	3.56		.32**			.36**	.30**	.48**	1.0						
9	3.56							.46**	.39**	1.0					
10	3.00							.38**		.35**	1.0				
11	3.43							.48**	.41**	.47**	.35**	1.0			
12	3.10			.29*	.36**		.35**	.41**	.28*	.41**	.54**	.62**	1.0		
13	3.27				.41**	.46**	.36**	.39**	.26*	.35**	.26*	.38**	.41**	1.0	
14	3.60		.43**					.25*	.25*			.32**		.42**	1.0

 *   Correlation is significant at the 0.01 level (2-tailed)
 **   Correlation is significant at the 0.05 level (2-tailed)

8.5.2   Correlation Coefficient between Implementation Elements (Q9)

Table 8.17 shows whether the main implementation elements are related to each other to achieve effective implementation of strategy policies, plans and programmes. The following positive correlation was found between the implementation elements:

1.   Providing financial support with participation of all sectors. This finding suggests that the participation of major groups such as private sectors could

provide some financial support and funding of some of the strategy programmes and activities (see Chapter Six).

2.   Funding strategy programmes and projects is related with financial support. This relationship suggests that without providing adequate financial resources for the strategy process, the strategy objectives and goals could not be achieved.

3.   Legislative support with funding strategy programmes and financial support. This relationship supports the idea that applying of charges and pricing or the polluter pays principle will provide another source of finance to fund strategy programmes. The legislation should clearly define the financial resources to fund strategy programmes and plans.

4.   Providing strong co-ordination and co-operation system is related with financial support of strategy programmes and projects and also, with legislation support. This relationship suggests that to achieve effective implementation of strategy, it is important to provide a strong co-operation and co-ordination system with clear adequate financial and regulation support.

5.   Linking between local and federal efforts is related with financial support of the strategy process, legislation support and integrating environmental consideration in the decision-making process. This finding suggests that taking environmental consequences of development into the decision-making process should be a policy at both local and federal levels, which means sustainable development should be a national policy.

6.   Increasing awareness at all levels is related with funding strategy, providing strong co-operation and co-ordination system, integrating environmental consideration in decision-making process and linking between federal and local efforts. This finding supports the idea that increasing awareness level will increase the integration of environmental consideration into the decision-making process. It also increases the link between local and federal efforts to

avoid repetition and conflict by providing a strong co-operation and co-ordination system.

7. The use of environmental tools is related with legislation support, providing co-ordination and co-operation system, integrating environmental consideration into decision-making process, linking between local and federal efforts and increasing awareness level. This relationship suggests that the use of these environmental tools is the key to achieving increased environmental performance (see Chapter Three), and to achieve effective implementation of strategy programmes and plans.

8. Encouraging the exchange of information is related with all other implementation elements in Table 8.17. This relationship reveals that providing and exchanging information is the vital step in the strategy process and to achieve a successful strategy process.

9. Specifying responsibility and the role of each participant in the strategy process are related with all other implementation elements. This relationship suggests that this specification could ensure success of any strategy programmes and could enforce regulation (Chapter Six).

10. Applying penalties and charges system are related with providing strong co-operation and co-ordination system, integrating environmental consideration into the decision-making process, linking between local and federal efforts, increasing awareness, using of environmental tools and exchanging information. This relationship helps to achieve sustainable development and applying the polluter pays principle. Another relationship was found between encouraging environmental investment with all other implementation elements except participation and financial support.

11. Using of economic incentives with all other implementation elements except participation, increasing awareness, and using of environmental tools. This finding supports the idea that has been mentioned in Chapter Six that the strategy is a dynamic and comprehensive process. Using of this instrument may increase the implementation of strategy policies, plans and programmes.

Table 8.17　　　The Correlation Coefficient between Implementation Elements.

	Mean	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	4.242	1.00													
2	4.424	.26*	1.00												
3	4.287		.44**	1.00											
4	4.575		.48**	.47**	1.00										
5	4.318		.42**	.28*	.31**	1.00									
6	4.606						1.00								
7	4.333	.29*	.34**	.33**	.47**		.33**	1.00							
8	4.227		.32**			.37**	.41**	.38**	1.00						
9	4.636				.25*	.45**	.27*	.33**	.32**	1.00					
10	4.348	.49**	.38**	.47**	.49**	.27*	.39**	.34**	.33**	.28*	1.00				
11	4.318	.44**	.41**	.4**	.37**	.39**	.41**	.36**	.25*	.25*	.61**	1.00			
12	4.469					.38**	.35**	.32**	.34**	.33**		.31**	1.00		
13	4.197		.29*	.37**	.41**	.36**	.30**	.43**	.40**	.36**	.32**		.58**	1.0	
14	4.015		.38**	.44**	.31**	.287	.35**	.27*			.38**	.4**	.4**	.5*	1.0

*　　　Correlation is significant at the 0.01 level (2-tailed)

**　　Correlation is significant at the 0.05 level (2-tailed)

8.5.3　Correlation Coefficient between Monitoring and Evaluation Elements (Q10)

Table 8.18 shows the interrelationship between monitoring and evaluation elements. A correlation was found between establishing monitoring indicators with setting strategy objectives and goals. This correlation shows that the establishment of indicators is associated positively with setting strategy objectives and goals. This finding suggests that setting environmental indicators should be based on the strategy objectives and goals to monitor the strategy progress.

A positive relationship was found between providing an adequate budget with setting indicators. This fact supports the idea that to achieve strategy objectives and goals, there is a need to provide adequate and separate financial resources. This source of finance will help in setting indicators and also for the monitoring process. A positive correlation was also found between updating the strategy with establishing indicators, producing regular reports and providing an adequate budget for monitoring. This relationship reveals the importance of providing an adequate budget

for monitoring process because without that the monitoring process could not be achieved and the progress report could not be produced.

Table 8.18   The Correlation Coefficient between Monitoring and Evaluation Elements.

	Mean	S.D.	1	2	3	4	5	6
1	3.800	.442	1.00					
2	3.606	.522		1.00				
3	3.500	.533		.34**	1.00			
4	3.197	.706				1.00		
5	3.393	.604			.36**		1.00	
6	3.378	.601			.33**	.32**	.51**	1.00

*   Correlation is significant at the 0.01 level (2-tailed)
**   Correlation is significant at the 0.05 level (2-tailed)

8.5.4   Correlation   Coefficient   between   the   Main   Problems   Facing Environmental Institutions (Q7)

Table 8.19 shows the relationships between the main problems facing environmental institution in the Emirate of Abu Dhabi. The following correlations were found.

Positive correlation exists between the absence of co-ordination and co-operation system with the weakness of applying and enforcing law. This finding suggests that the absence of co-operation and co-ordination system between the environment institution in the Emirate may hinder applying and enforcing the environmental law.

A positive significant relationship was found between the weakness of applying and enforcing the law with the absence of effective law. This relationship reveals that without effective and clear environmental law, applying and enforcing the law could not be achieved.

Another significant relationship exists between the unclear responsibilities and the absence of effective regulation and also with the shortage of specialised staff. The correlation was found also between the inexperienced institutions with all other problems except the absence of co-operation and co-ordination system and the

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weakness of awareness. The environmental legislation system should empower the law-enforcement departments, and define their responsibilities. To implement environmental regulation, the provision of qualified staff is essential and also providing proper co-operation and co-ordination is necessary.

Table 8.19   The Correlation Coefficient Between the Main Problems Facing Environmental Institutions.

	Mean	S.D.	1	2	3	4	5	6	7	8	9
1	3.689	.627	1.00								
2	3.620	.524	.340 **	1.00							
3	3.534	.681		.591**	1.00						
4	3.362	.693				1.00					
5	3.431	.797					1.00				
6	3.189	.804			.310*		.301*	1.00			
7	3.241	.844	.269*				.420**	.585**	1.00		
8	3.069	.834		.262*	.331*		.539**	.467**	.449**	1.00	
9	2.724	.932									1.00

*   Correlation is significant at the 0.01 level (2-tailed)

**   Correlation is significant at the 0.05 level (2-tailed)

8.5.5   Correlation between Environmental Problem Priorities and the Main Causes of Environmental Problems (Q3 with Q5)

Table 8.20 shows the relationship between environmental problem priorities and the main causes of these problems. The following correlations were found.

Positive correlation was found between marine pollution and the population growth. This relationship reveals that the population growth causes marine pollution. Increase in population also means increase in land use for construction, industries and transportation.

Negative association was found between waste management with the lack of awareness, lack of monitoring and control and lack of treatment facilities. This finding shows that the waste problem could be managed be increasing awareness regarding the effect of waste on environment and also by increasing the monitoring and control of waste disposal activities. It is also could be managed by providing treatment facilities.

Positive correlation was also found between industrial pollution and inadequacy of land use policies. This indicates that providing and developing clear land use polices that will decrease the industrial pollution.

The industrial pollution is related negatively to the lack of treatment facilities. This relationship indicates that the lack of treatment facilities will increase industrial pollution and providing treatment facilities will decrease industrial pollution.

Negative correlation was also found between desertification with the ground water depletion. This relationship was not significant, because increase in ground water depletion will increase desertification as an environmental problem.

The last positive relationship was found between desertification and the effects from other Emirates and countries. This correlation suggests that the increase of other Emirates and countries environmental effect will increase the desertification problem.

Table 8.20   The Correlation Coefficient between Environmental Problem Priorities and the Main Causes of Environmental Problems.

	Marine	Water	Waste	Air	Industrial	Urbanisation	Desertification
1	.327**						
2							
3							
4							
5					.268*		
6							
7							
8			-.272**				
9			-.308**				
10			-.291*		-.303**		
11							
12							.262*
13							
14							-.327**

*   Correlation is significant at the 0.01 level (2-tailed)
**   Correlation is significant at the 0.05 level (2-tailed)

8.6   CONCLUSION

The main objective of this chapter was to investigate respondents' opinion and views of different aspects of an environmental strategy model among the Emirate of Abu Dhabi. The data was undertaken by conducting questionnaire surveys and interviews to achieve the research objectives. The results and discussion were based on a statistical analysis of a survey sample representing local government, federal government, and major groups in the Emirate of Abu Dhabi.

The result indicated that there were shortages of qualified staff in the field of environment, where 51.5% of respondents were qualified, but 66.6% of them were not qualified related to environment. The results of this analysis indicated that the main environmental problem priorities include marine and coastal pollution; water pollution, waste management; air pollution; industrial pollution; urbanisation; and desertification. Most respondents to the questionnaire and interview survey agreed that these priorities differ form one Emirate to another. It was found that differences were caused by a number of factors such as enforcement of regulation; capacity management; degree of development; variance of laws; source of pollution; source of income; source of finance; and size of population. These factors were listed in order of importance to the respondents. In addition, the results indicated that the main causes of environmental problems are lack of environmental law and enforcement; lack of monitoring and control; lack of awareness; ground water depletion; lack of treatment facilities; rapid economic growth; population growth; lack of energy alternatives; changing lifestyle; and the lack of land use policies.

Moreover, most of the respondents in this survey agreed that the global environmental issues such as marine pollution, industrial pollution, and hazardous wastes have effect on the local environment and may cause some of the environmental problems.

Most respondents also agreed that the present environmental institution authorities were facing a number of problems that may increase environmental problems over the years. These problems are the absence of a co-operation and co-ordination system; weakness in applying and enforcing law; absence of effective regulation; shortage in specialised human resources; weakness of environmental awareness

programmes; overlapping of responsibility; inexperienced departments; and unclear responsibilities and duties. Most respondents agreed upon the need to rearrange and reconstruct these institutions into a new framework, where this rearrangement will allow authorities to obtain a better understanding of their roles and responsibilities and to avoid any future conflict and also to ensure effective co-ordination among authorities and major groups.

Furthermore, most respondents to the questionnaire and interview survey agreed that the following environmental strategy elements are important to be used to achieve strategy objectives and goals. These elements include formulating legislation and regulation; setting environmental standards; reviewing strategy progress and performance; initiating a clear co-operation and co-ordination system; encouraging participation at all levels; developing and exchanging environmental information; promoting environmental awareness; organising seminars and workshops; promoting regional and international co-operation; providing adequate budget; and employ sufficient staff.

This result also indicated that most respondents in questionnaire survey and all the interviewees agreed that the following implementation elements should be taking into considerations to achieve successful and effective implementation of strategy policies, plans and programmes. These elements include participation of all sectors; financial support; provide a strong co-operation and co-ordination system; integrate environmental consideration into decision-making process; provide a link between local and federal efforts; increase awareness at all levels; use of environmental tools; specify responsibilities and the role of each sector; encourage the exchange of information; apply penalties and a charges system for industry and private sectors; encourage environmental investment; and use of economic incentives.

Furthermore, the results revealed that the respondents in this survey agreed upon the importance of using the following elements to achieve an effective monitoring and evaluation process towards achieving strategy objectives. These elements include providing information; setting environmental indicators; producing regular reports; providing an adequate budget for monitoring process; and updating of strategy information.

The finding also revealed that the majority of respondents agreed that the participation of major groups and government staff; the contribution of research institutions, private sectors and the public; increasing of environmental awareness; providing and exchanging information; establishing a co-operation and co-ordination system are essential and important to achieve a successful strategy process. Almost all respondents agreed that the use of the media is the most important technique used to achieve effective participation of major groups.

It is obvious from the results that the use of environmental tools as EIA, SEA, EMS and SDI is significant to monitor and assess environmental problems and emphasis protection of the environment and to measure the progress to implement the strategy policies, plans and programmes toward achieving sustainable development. This study also concluded that almost all government authorities have adequate budget and financial resources, which will help the success of the implementation of the strategy policies, plans and programmes.

In order to achieve a successful strategy, the result of analysis of the respondents to the questionnaire and interview survey revealed that the provision and exchanging of information is essential to establish a strong baseline information system to prepare the state of the environment report for the Emirate of Abu Dhabi. To exchange this information and to achieve better relationship between all the participants in the strategy process, the result showed that it is important to establish a co-ordination and co-operation system between them.

Finally, the results also indicated that the major groups such as research institutions and the private sector might have a vital contribution and role in the strategy process in order to achieve a successful strategy.

CHAPTER NINE

RESEARCH CONCLUSIONS AND RECOMMENDATIONS

CHAPTER NINE

RESEARCH CONCLUSIONS AND RECOMMENDATIONS

9.1   INTRODUCTION

Chapter One of this research described the main purpose of developing and designing an environmental strategy for the Emirate of the Abu Dhabi. It also provided the research aim and objectives. The aim of this research has been to design a conceptual framework for developing a local environmental strategy for the Emirate of Abu Dhabi. This chapter also explained the importance of this research and the research structure. The concepts of sustainable development, Agenda 21, and Local Agenda 21 have been discussed and examined in Chapter Two. The conceptual background to the strategy has been discussed in Chapter Three. This chapter also provided and examined the different types of strategy models.

Chapter Four reviewed and analysed the experiences of other countries related to developing and formulating an environmental strategy. This review was used to improve the understanding of the problems faced at each stage of the strategy so as to minimise the risk of failure and reduce the mistakes and weakness in achieving the proper design of an environmental strategy for the Emirate of Abu Dhabi. Chapter Five investigated and identified the Emirate's state of the environment and defined the main environmental problem priorities and causes. From this research and analysis, the environmental strategy model for the Emirate of Abu Dhabi was designed and presented in Chapter Six.

The main research hypothesis is that the designed environmental strategy model is appropriate for sustainable development and for application and implementation in the particular circumstance of Abu Dhabi Emirate. Questionnaire and interview surveys tested the research model. The methods for conducting these techniques were discussed and explained in Chapter Seven. The analysis of the collected data was presented in Chapter Eight.

This final chapter sets out the conclusions obtained from the research and the recommendations for research improvement, implementation and strategy model

modification. This includes guidelines for all sectors to achieve a successful strategy and sustainable development. Also, this chapter presents and discusses recommendations for future research in this field.

The research process, which has been provided and discussed in Chapter Seven, could be summarised in three stages. These stages are outlined in Figure 9.1 to achieve the objectives of this research (see Chapter One). The first stage contains the collection of information regarding the main research concepts (Chapters Two and Three), the review of other country experiences (Chapter Four), and the review of the current environmental situation in the Emirate of Abu Dhabi (Chapter Five). The second stage contains the designing of an environmental strategy model for the Emirate of Abu Dhabi (Chapter Six). The third stage contains the testing of the proposed model by testing the main research hypothesis (Chapter Seven and Eight) and it also contains the recommendation for model improvement and modification (Chapter Nine).

In order to achieve the research objectives, there are a number of problems and limitations in this study which should be taken into consideration such as the deficiency of relevant literature; the result of analysis reflect only the opinions and views of the respondents to the questionnaire and interview survey; and some of government authorities and major groups were not covered due to a specific period of time for completion of the field work. Also, sub-hypothesis 8 was recognised to be a self-proving assumption. These limitations have been summarised in detail in Chapter One.
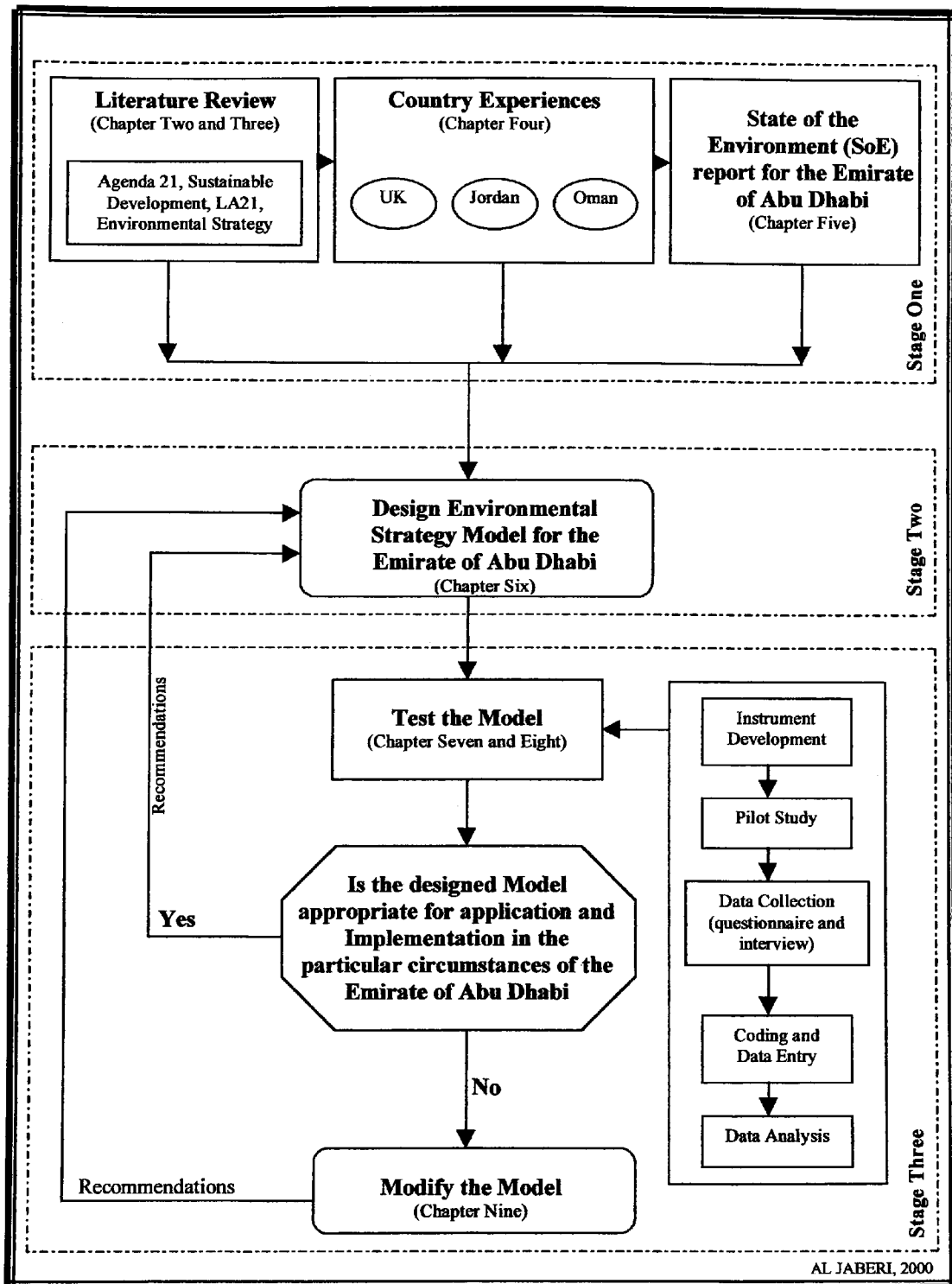
Figure 9.1   The Research Stages and Sequences

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9.2   CONCLUSIONS

The main aim of this research is to design an environmental strategy model for the Emirate and to test whether it is appropriate for sustainable development and for application and implementation. The research concludes that the designed model is indeed applicable for use and implementation for the Emirate of Abu Dhabi.

This thesis explored the concepts of sustainable development, Agenda 21, Local Agenda 21 and environmental strategies and discussed how to put these concepts into practice by formulating an environmental strategy model for the Emirate of Abu Dhabi. In order to achieve sustainable development, decision-makers in government authorities need to integrate consideration of the environment into any decision-making processes and development projects.

Designing and developing an environmental strategy model requires studying and reviewing different strategy models. These models were provided and discussed in this research in order to understand the strengths and weaknesses of each model, where most strategy models are based on two main approaches, the adaptive and linear models. Each model contains important elements and components, such as setting objectives, formulation, implementation and monitoring. These models did not include some essential elements such as environmental awareness, and auditing. This discussion suggested that the strategy model should contain the following elements and components: setting objectives, preparation, formulation, implementation and monitoring and evaluation, review, reporting and feedback and auditing.

Achieving sustainable development also requires explaining and illustrating other countries' experience in developing environmental strategies and to explore how these countries have prepared, formulated and implemented their strategies. This review improved the understanding of strengths, weaknesses and problems faced at each stage. It also minimised the risk of failure of the proposed model and reduced the risk of mistakes in achieving a proper design of an environmental strategy for the Emirate of Abu Dhabi.

Based on this discussion, the environmental strategy model was proposed and developed to attempt to overcome and avoid some of the following problems. These problems are the main factors that may lead to a strategy failing to achieve its objectives and targets. These include:

- insufficient budget or financial support;
- shortage in specialised manpower;
- unclear institutional framework; and
- poor communication, co-operation and co-ordination systems.

In developing and designing an environmental strategy model for the Emirate of Abu Dhabi, the first stage was the development of State of the Environment Report (SoE) for the Emirate, by collecting information and data on the environment, defining environmental problems and causes and identifying priorities, which was used to develop the Emirate's State of the Environment Report (Chapter Five). This study concluded that environmental problem priorities differ from one Emirate to another, based on the following factors, which caused these differences. These are: the enforcement of regulations; capacity management; degree of development; variance of laws and regulation; source of pollution; sources of income; sources of finance; size of population; and attention given to reviewing and updating the information.

The study also concluded that the institutional structure plays a critical role in achieving a successful strategy and there is an urgent need to reconstruct and rearrange these institutions within a new framework. The reconstruction allows authorities to obtain a better understanding of their responsibilities and roles to prepare, formulate, implement and monitor strategy and to avoid any future conflict among them.

The study has shown that setting realistic and workable objectives is important and flexibility should be taken into account where local conditions are changing. Also, the formulation of environmental strategy policies, plans and programmes must be clearly defined, be implementable and related to the area of responsibility for all authorities and groups.

To achieve the strategy objectives, in order to achieve sustainable development, it is important to make sure that the implementation process is done effectively. The study has shown that the success of a strategy is only achieved when it has been implemented. This can be achieved through establishing policies, plans and programmes. Furthermore, the study has shown that to achieve successful and full implementation of strategy policies, plans and programmes, the following instruments should be taken into consideration when implementing the strategy policies, plans and programmes. The first instrument is the need to formulate regulations and legislation, specifying standards, establishing enforcement resources and creating timetables to meet these standards. Applying charges and adopting pricing policies will provide another source of finance to fund strategy programmes and plans; they will help in changing consumer behaviour and attitudes; and will reduce damage to the environment. Without providing and formulating effective and clear environmental regulations, applying and enforcing this law could not be achieved. Another important instrument is the need to rearrange and reconstruct the present institutional structure within a new framework.

Increasing environmental awareness at all levels is one of the implementation instruments, which should be used to increase decision-making to integrate environmental consideration into the decision-making processes and development projects and encourage the participation of government staff and major groups in these decision-making processes. It also increases the link between local and federal efforts and helps to avoid any repetition of environmental programmes and projects. The study revealed that participation could be achieved through public awareness campaigns and environmental education.

Furthermore, the study revealed that the use of environmental tools such as EIA, EMS, SEA, and SDI are critical tools to monitor the progress achieved in implementing the strategy policies, plans and programmes and also to assess the formulation of policies, plans and programmes. These should also be used to measure progress to implement the strategy policies, plans and programmes towards achieving sustainable development.

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The study also indicated that, providing a clear monitoring and evaluation system by setting environmental indicators, producing progress reports, providing adequate budget and updating strategy information, are important to achieve strategy objectives and goals, and that the establishment of environmental indicators is associated positively with producing regular reports of strategy progress and performance. Publishing regular reports is also important to provide early sign of any problems during the strategy process and to provide solutions to reduce and resolve these problems. Action must be taken to modify and justify when necessary. The study has shown that without environmental enforcement and awareness, the monitoring of the strategy progress could not be achieved. Reviewing the strategy progress towards adopting strategy policies, plans and programmes is important in order to issue progress and performance reports.

The main conclusion of this research is that to achieve an effective and successful environmental strategy towards achieving sustainable development, it is fundamental to take into consideration the importance of using the following key elements.

Participation and Contribution

Participation of major groups is essential to achieve successful strategy preparation, formulation and implementation by giving people an opportunity to participate in all these stages and also in solving their own local problems. The research has shown that the participation of major groups should be limited to some environmental strategy activities such as encouraging public awareness, collection of data and information. Their role should be clearly defined by the government. The study also indicated that the use of the media is one of the major participation techniques to achieve effective participation of major groups in the decision-making process and in different strategy processes and stages. This kind of participation requires that the participants have easy access to environmental information and covers all sectors such as government authorities and major groups in the community.

The contribution of research institutions and the private sector is also one of the important elements used to achieve an effective strategy process. The contribution of research institutions could be achieved through collecting information and data; data

analysis; preparing SoE report; defining environmental problems; causes and priorities; education and training; and providing scientific consultation and advice. The contribution of the private sector could be achieved through supporting environmental awareness, training and education programmes, supporting seminars and workshops, providing investment in environmental technology, encouraging the use of cleaner technology, and funding strategy programmes and projects.

This study has revealed that the NGOs have an important role in promoting their views and ideas regarding the environment and also in helping to change their consumption patterns and increasing productivity and efficiency at work. These organisations support plans and allow the public to participate in following up the implementation of environmental policies, plans and programmes. It also supports them to protect and enhance their local environment.

Information

Providing and exchanging information is essential to establish a strong strategy baseline information and database and also to establish the SoE report for the Emirate. The establishment of this system depends on co-ordination between all sectors through establishing a proper framework and this could be achieved by encouraging the major groups' participation in all the strategy processes and making this information available for all.

Co-operation and Co-ordination

In order to achieve a successful strategy process, it is essential to establish a clear and strong co-operation and co-ordination system between concerned authorities and major groups. Adopting this system will help to organise the contribution and participation of each participant in the strategy process. It is also important to promote regional and international co-operation to increase awareness, provide technical assistance and support, and also to improve the exchange of information, which can be achieved through providing environmental awareness programmes and organising conferences. The absence of a co-ordination and co-operation system among institutional authorities may hinder the application and enforcement of environmental regulations.

Financial Resources

Providing an adequate budget and financial support is one of the major findings of this research. The study has revealed that most of the existing environmental authorities have adequate budgets.

The study revealed that the provision of continuous and adequate financial resources for all strategy processes is vital to achieve a successful strategy.

Finally, the findings and conclusions of this research have shown that, in order to achieve a successful environmental strategy for the Emirate of Abu Dhabi, it will be necessary to formulate and prepare environmental strategy plans, policies and programmes and also to ensure that they are effectively implemented and monitored. The following section focuses on recommendations to suggest possible ways in which to achieve a successful and effective environmental strategy for the Emirate of Abu Dhabi towards sustainable development.

9.3 RECOMMENDATIONS

The following recommendations have been drawn up in the light of the information provided, discussed, assessed and analysed in this research in order to achieve sustainable development in the Emirate of Abu Dhabi. To achieve a successful and effective environmental strategy process for the Emirate of Abu Dhabi the following actions are recommended.

1. Environmental awareness should be encouraged within all organisations through all levels by developing awareness programmes and organising seminars and conferences based upon environmental information to promote concerns and interest in finding solutions and to improve environmental policies, plans and programmes. Decision-makers should be aware of the present serious problems facing the Emirate's environment and should take environmental considerations into account in any decision process, whether related to the environment, the economy or society. The local environmental awareness plan should be developed by the government to avoid any duplication and repetition of activities within the local government authorities.

2.   There should be a clear, concrete and integrated approach to environmental education through all aspects of the education system and the public should be educated about the value of natural resources and motivated to reduce their consumption and disposal.

3.   Environmental training should be given to staff in authorities and in major groups to raise the level of awareness and improve their skills to take appropriate action, if required, and also to promote the understanding of strategy objectives and targets.

4.   Active and wide participation of major groups and government employees in environmental planning, programmes and activities should be encouraged and strengthened through all levels of the decision-making processes so as to be more effective and representative. They should also be given opportunities to be involved in solving their own local environmental problems, to provide suggestions and views which could support their initiatives and concerns to protect and enhance their environment and to ensure successful implementation of environmental plans and programmes. This participation can be achieved through using a number of techniques such as use of the media, public meetings, seminaries, surveys and exhibitions.

5.   The co-operation and co-ordination within government authorities and between government and the major groups should be encouraged and promoted in a clear and properly defined system, to promote sustainable lifestyles for present and future generations by ensuring that major groups are involved in building and establishing the required environmental infrastructure. Also, international and regional co-operation should be strengthened and continued in order to provide technical assistance, training and advice. Providing a clear co-ordination system will build up the strong links between all concerned authorities and organise the contribution and participation of major groups in environmental activities.

6.   Environmental information should be available for all and be easily accessible to encourage public interest and raise awareness which will enable people to

make informed decisions on matters affecting their own quality of life and that of future generations. Exchanging information regarding environmental quality, conditions and situations should be developed among government authorities to establish a strong baseline information and database so that environmental considerations become a part of every decision that is made. The local environmental inventory should be established by the local authorities, which should cover all information regarding the environment. The existing database of government authorities should be the starting point for this inventory.

7. Access to modern communication technology for all sectors should be encouraged and provided in order to improve the link between major groups and government authorities and also between local and federal efforts. It also helps to share information and to achieve clear and strong co-ordination between all organisations.

8. In order to achieve successful formulation, implementation and monitoring of environmental policies, plans and programmes, an Environmental Management Board (EMB) with an independent budget should be established. Taking its mandates from the Emirate's highest authority, the Executive Council under the Ruler of the Emirate. It should be able to formulate environmental strategy and action plans and to follow up the implementation process and also ensure that all authorities and groups obey environmental regulations. It should be the last step in resolving any decision-making conflicts between government authorities.

9. The government should take the lead to promote and expand the understanding of the principle of sustainable development by decision-makers, government officials, media personnel, leaders of commerce and industry and major groups. This means sustainable development should be incorporated into government policy by taking the environmental consequences of development into every decision-making process. The government through EMB should support all environmental authorities to integrate environmental issues in their plans and programmes. The roles and responsibilities of authorities should be

redefined by the EMB to allow each authority to obtain a better understanding of implementation and maintaining of environmental policies, plans and programmes and also to avoid any conflicts.

10. A Technical Environmental Committee (TEC) should be established as a part of the ERWDA. Its responsibility should be to maintain co-ordination and co-operation between all concerned government authorities and major groups. Reporting should be directly to the Board. It should work as an advisory body for the government authorities in solving any problems facing implementation of environmental policies, plans and programmes.

11. The TEC should publish a State of the Environment Report in co-ordination with all related authorities and major groups to increase the knowledge and understanding on which decisions about the environment are made. This report should encourage major groups, participation and involvement and provide early warning signals about changes in environmental conditions and contain comprehensive data and up-to-date information about the environment.

12. An immediate review of the existing environmental regulations and codes of practice should be developed by the government to reduce resource depletion and for environmental protection. The government, also, should develop and formulate appropriate regulations, which should match economic reality and institutions' capabilities, which should be suited to the needs of the government for effective implementation towards protecting human health. More attention should be given to the financial incentive aspects of charges to limit the use of resources and to improve the quality of the environment in order to reflect the environmental protection objectives.

13. Environmental standards should be developed, reviewed and revised periodically based on new research findings and local conditions to ensure that the concentrations of pollutants does not exceed the safety limits.

14. The government should provide financial and administrative support to all environmental authorities in order to ensure that all the facilities that they

require are provided so as to achieve effective implementation and monitoring of environmental policies, plans and programmes.

15. The use of environmental tools such as EIA, SEA, SDI and EMS should be encouraged and promoted to ensure an effective implementation of environmental policies, plans and programmes towards achieving sustainable development. The EMB should establish an effective EIA and SEA system in co-ordination with the TEC, which covers all concerned departments and groups to assess the environmental impact of development projects and the impact of environmental policies, plans and programmes before development takes place. The TEC should work to establish a set of sustainable development indicators to assess environmental performance and review the overall progress achieved for implementing environmental polices, plans and programmes and to help in determining the weaknesses and strengths of such plans and programmes. These findings will inform top management and decision-makers whether or not the environmental policies, plans and programmes meet their objectives and targets.

16. Emirate Municipalities and Town Planning Departments should review their Master Plans and land-use policies by taking the importance of environmental consideration and protection into account. They should also co-ordinate with other environmental authorities which are directly concerned with the environment, such as ADNCO, GIC, and ERWDA to ensure that all future activities are environmentally sustainable.

17. The experience of other countries in developing environmental strategy and action plans should be studied to achieve effective formulation, implementation and monitoring.

18. The private sector's contribution in environmental activities should be encouraged through the government supporting and funding some environmental activities, such as awareness programmes, seminars and workshops, the use of clean technology and research activities. They should be

also encouraged to invest in the environmental industry, such as recycling and reuse technology.

19. The contribution of research institutions should be encouraged and promoted by government to conduct research on priority problems and to provide a greater understanding of the ways in which environmental quality affects human health.

20. The public should be encouraged by the government to contribute to the environmental strategy through promoting the NGO's participation and involvement in the decision-making process and in environmental plans and activities, in order to increase public awareness and allow them to protect and enhance the environment.

9.4   RECOMMENDATIONS FOR FUTURE RESEARCH

This study presented and provided the theoretical model of an environmental strategy for the Emirate of Abu Dhabi by using different stages of preparation, formulation, implementation and monitoring. One of the main objectives of this study was to develop an environmental strategy model for the Emirate of Abu Dhabi. The other countries' experiences in developing and formulating an environmental strategy were reviewed and evaluated, in order to gain insight into how the strategy operates in practice. Also different types of strategy models were discussed and examined in an attempt to increase understanding of the appropriate model for the strategy.

The study highlighted a number of important issues such as the participation of major groups and government staff in the decision-making process and in the strategy process, co-ordination between government authorities and major groups, co-operation with international and regional organisations, communication and consultation. It also highlighted the importance of using environmental tools, for example, EIA, SEA, EMS and SDI to achieve effective implementation and monitoring of environmental policies, plans and programmes. The findings of this study suggests that there is a need to rearrange and reconstruct environmental institutions within a new framework, in order to achieve better and successful implementation of the strategy process. In addition, it is hoped that this study will

provide basic information for future research in the area of environmental strategy and management.

A number of different methodological approaches could be applied to this area of research to gain a greater understanding of developing and formulating environmental strategy and action plans. The research also provided several implications for future research in this field. In particular:

1. In order to improve the understanding of environmental conditions, the environmental researcher needs to look at other environmental studies and experiences in developing the SoE, LA21, and environmental tools. These provide a more complete look at the issue of sustainable development (see Chapter Four, Section 4.1).

2. The development and formulation of any environmental plans requires the active participation of major groups (Gibbs et al., 1996, see Chapter Four, section 4.6 and Chapter Six, Section 6.2.1, 2,3 and 4 and Section 6.3.1). Researchers in the environmental field should give careful attention and consideration when designing and developing their model or framework to the importance of the key elements such as major groups participation, co-ordination and co-operation, and using of environmental tools that will reduce the likelihood of failure.

3. Developing State of the Environment Report and LA21 require collection of up-to-date information. This information is a cornerstone of developing any environmental model and a vital in promoting participation which should be continuously updated and improved (Price and Robert, 1997, see Chapter Six, Section. 6.3.1).

4. A well-designed questionnaire will save the researcher time both in data collection and analysis (Welford and Gouldson, 1993). It is essential to take into consideration the situation and culture of the field study area and the factors that may affect the response rate (see Chapter Seven, Section 7.5.3).

5. Further research could expand into other Emirates within the UAE and a comparison could then be carried out to determine the differences and similarities

of each effort, which helps in developing national environmental policies and plans (see Chapter Five, Section 5.2.4 and Chapter Six, Section 6.1).

6. In order to achieve successful implementation, it is important to change decision-makers culture to promote understanding of the role of each authorities and different environmental issues (Netherwood, 1998; Sleszynski, 1996; and Alabaster and Hawthorne, 1999) (Chapter Six, Section 6.5.1). It is therefore suggested that a study of the effect of the decision-making process on the implementation of environmental policies, plans and programmes needs to be undertaken (see Chapter Three).

7. Further research should be geared towards establishing a clearer pattern of relationships between government authorities and major groups toward achieving better implementation of strategy policies, plans and programmes (see Chapter Three and Six).

8. Comparative analysis provides insight into future research to investigate the development of LA21, SoE report, and formulating of environmental polices, plans and programmes comparatively with other countries (see Chapter Two, Section 2.4, Chapter Five, Section 5.1 and Chapter Three).

9. This research covers only the main government authorities and other sectors, which are directly related to the environmental activities in the Emirate of Abu Dhabi. Future research might complete the picture by studying the opinion and attitude of other departments and organisations toward achieving a successful strategy process (see Chapter 1, Section 1.4 and this Chapter, Section 9.5).

10. To find out how much knowledge people already have about the issue in question, future research should take into account the use of a checklist method for interviews instead of the open-ended questions (Oppenheim, 1992). It is more useful in collecting the required data, because of the low level of awareness about environmental issues (see Chapter Seven, Section 7.5.4.2).

In short, developing and designing an environmental strategy model is an important model or framework for the Emirate of Abu Dhabi. It was found to be very important

and useful for achieving sustainable development, but more emphasis should be given to its components and stages to be meaningful and successful. This research shows that the proposed environmental strategy model is applicable to use and be implemented for the Emirate of Abu Dhabi and appropriate to achieve sustainable development.

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APPENDIX A

RIO DECLARATION ON ENVIRONMENT AND DEVELOPMENT

Rio Declaration on Environment and Development

- Principle 1:   Protect the environment and natural resources of people.

- Principle 2:   Develop national laws to provide compensation for damage and ensure that activities under their control do not cause damage to areas beyond their borders.

- Principle 3:   the right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

- Principle 4:   Integrate environmental protection in development process in order to achieve sustainable development.

- Principle 5:   co-operate in the essential task of eradicating poverty, in order to decrease the disparities in standards of living and better meet the needs of the majority of the people of the world.

- Principle 6:   international actions in the field of environment and development should address the interests and needs of all countries.

- Principle 7:   Co-operate to conserve, protect and restore the health and integrity of the Earth's ecosystem. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressure their society place on the global environment and of the technologies and financial resources they command.

- Principle 8:   Reduce and eliminate unsustainable patterns of production and consumption while promoting appropriate demographic policies.

- Principle 9:   Co-operate to improve scientific understanding through exchanges of scientific and technological knowledge.

- Principle 10:   Encourage public awareness and participation by making environmental information widely available.

- Principle 11: Enact effective environmental laws and develop national law regarding liability for the victims of pollution and other environmental damage, in those areas where they have authority.

- Principle 12: Co-operate to promote an open international economic system that will lead to economic growth and sustainable development in all countries.

- Principle 13: develop national law regarding liability and compensation for the victims of pollution and other environmental damage.

- Principle 14: co-operate to discourage or prevent the relocation and transfer to other states of any activities and substances that cause sever environmental degradation or are found to be harmful to human health.

- Principle 15: Apply the precautionary approach, according to their capabilities, to protect the environment.

- Principle 16: promote the use of economic instruments.

- Principle 17: Environmental impact assessment of proposed activities that are likely to have a significant adverse effect on the environment.

- Principles 18 and 19: Notify other states immediately of any natural disasters or activities that may have harmful transboundary impacts.

- Principle 20: Encourage the full participation of women, which is essential to achieve sustainable development.

- Principle 21: Ensure a better future for youth.

- Principle 22: Recognise and support the identity, culture and interest of indigenous people.

- Principle 23: Apply the precautionary approach to protect the environment. Where there are threats of serious or irreversible damage, scientific uncertainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

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- Principle 24: warfare is inherently destructive of sustainable development, therefore respect international law providing protection for the environment in times of armed conflict.

- Principle 25: peace, development and environmental protection and interdependent and indivisible.

- Principle 26: Resolve all their environmental disputes peacefully.

- Principle 27: Co-operate in a spirit of partnership in the fulfilment of the principles embodied.

AN OVERVIEW OF AGENDA 21

Chapter One of Agenda 21 is the preamble containing seven paragraphs and gives an introduction and description of the Agenda 21 contents and the structure of the document. Agenda 21 is a dynamic programme as it is mentioned in the permeable. The preamble concludes, "*Agenda 21 is a dynamic programme. It will be carried out by the various actors according to the different situations, capacities and priorities of countries and regions...This process marks the beginning of a new global partnership for sustainable development*".

Section I: Social and Economic Dimensions

This discusses the way that environmental problems and solutions are interrelated with poverty, health, trade, consumption patterns and population. It also stresses how environment and development issues must be integrated into decision-making processes. It contains seven chapters, which are:

Chapter 2: *International Cooperation to Accelerate Sustainable Development.* This calls on nations to establish a new global partnership. It deals with the international economy to provide a supportive international climate for achieving environment and development goals by: promoting sustainable development through trade liberalisation; making trade and environment supportive; providing adequate financial resources to developing countries; dealing with international debt; and encouraging macroeconomic policies conducive to environment and development

Chapter 3: *Combating Poverty.* Poverty is a complex multi-dimensional problem with origins in both national and international domains. The programme area of this chapter is for the poor to achieve sustainable development.

Chapter 4: *Changing Consumption Patterns.* This chapter focuses on sustainable patterns of production and consumption and encourages nations to develop national policies and strategies to encourage changes in unsustainable consumption patterns.

Chapter 5: *Demographic dynamics and sustainability.* This addresses the link between demographic trends and factors and sustainable development; and

formulating integrated national policies for environment and development, by taking into account demographic trends and factors.

Chapter 6: *Protecting and Promoting Human Health.* This chapter focuses on the need to meet primary health care by developing a national health action plan to protect vulnerable groups such as infants and children, youth and women; and to reduce health risks from environmental pollution and hazards.

Chapter 7: *Promoting Sustainable Human Settlement Development.* The programmes proposed in this chapter focus on the provision of adequate shelter, managing human settlements, land-use planning and management, integrated provision of infrastructure, sustainable energy and transport systems, problems of disaster-prone areas, construction industry activities and developing the capacity-building and human resources.

Chapter 8: *Integrating Environment and Development in Decision – Making.* This chapter focuses on the importance of integrating environment and development at the policy, planning and management levels and providing an effective legal and regulatory framework and effective use of economic instruments and markets and other incentives to achieve sustainable development.

Section II: Conservation and Management of Resources for Development

This section deals with the conservation and management of resources for development and the results of different types of human activity, such as waste management.

Chapter 9: *Protecting the Atmosphere.* This chapter deals with the three major international issues of climate change, ozone layer depletion and air pollution. The programmes proposed focus on improving the scientific basis for decision-making, promoting sustainable development, energy and transportation development, industry development, land-use and resources development, preventing stratratospheric ozone depletion and transboundary atmospheric pollution.

Chapter 10: *Integrated Approach to the Planning and Management of Land Resources*. This is concerned with providing an effective framework that will co-ordinate decision-making.

Chapter 11: *Combating Deforestation*. The programme proposed in the chapter focuses on four areas. The first deals with sustaining the multiple roles and functions of all types of forests, forest lands and woodlands; and the second with enhancing the protection, sustainable management and conservation of all forests, and the greening of degraded areas, through forest rehabilitation, afforestation, reforestation and other rehabilitative means. The third programme area deals with promoting efficient utilisation and assessment to recover the full valuation of the goods and services provided by forests, forest land and woodland. The fourth area covers the establishment and/or strengthening capacities for planning, assessment and systematic observations of forests and related programmes, projects and activities, including commercial trade and processes.

Chapter 12: *Combating Desertification and Drought*. This chapter addresses land resource issues in deserts, as well as arid, semi-arid and dry sub-humid areas.

Chapter 13: *Sustainable Mountain Development*. This chapter calls for immediate action to develop mountain areas and understanding of mountain ecosystems.

Chapter 14: *Promoting Sustainable Agriculture and Rural Development*. The chapter gives priority to maintaining and improving the capacity of higher potential agricultural lands to support an expanding population.

Chapter 15: *Conservation of Biological Diversity*. The objectives and activities in this chapter are intended to improve the conservation of biological diversity and sustainable use of biological resources and support the Convention on Biological Diversity.

Chapter 16: *Environmentally Sound Management of Biotechnology*. The aim of the chapter is, following on internationally agreed principles, to ensure the environmentally sound management of biotechnology. This chapter suggests promoting the development of sustainable applications of biotechnology.

Chapter 17: *Protection of the Ocean, All Kinds of Seas, Including Enclosed and Semi-Enclosed Seas, and Coastal Areas and the Protection, Rational Use and Development of Their Living Resources.* This chapter covers the following programme areas: integrated management and sustainable development of coastal areas, including exclusive economic zones; marine environmental protection; sustainable use and conservation of marine living resources of the high seas; sustainable use and conservation of marine living resources under national jurisdiction; the marine environment and global change; international and regional co-operation and co-ordination; and sustainable development of small islands.

Chapter 18: *Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources.* This chapter gives priority to flood prevention and control measures.

Chapter 19: *Environmentally Sound Management of Toxic Chemicals, Including Prevention of Illegal International Traffic in Toxic and Dangerous Products.* This chapter addresses the major problems posed by the lack of sufficient scientific information for the assessment of risks and the lack of resources for assessment of chemicals for which data is already available. It deals with international assessment of chemical risks, labelling and classification of chemicals, exchange of information, management, prevention of illegal international traffic and with risk-reduction programmes.

Chapter 20: *Environmentally Sound Management of Hazardous Wastes, Including Prevention of Illegal International Traffic in Hazardous Wastes.* The chapter addresses the need to control the generation, storage, movement, recycling and reuse and disposal of hazardous wastes. It covers the importance of minimising waste, and to preserving illegal international traffic of waste.

Chapter 21: *Environmentally Sound Management of Solid Wastes and Sewage-Related Issues.* This focuses on minimising waste, maximising reuse and recycling of environmentally sound waste, promoting disposal and treatment of environmentally sound waste and extending waste service coverage.

Chapter 22: *Safe and Environmentally Sound Management of Radioactive Wastes.* The main aim of this chapter is to ensure that radioactive wastes are safely managed, transported, stored and disposed of, with a view to protecting human health and the environment.

Section III: Strengthening the Role of Major Groups.

This section deals with strengthening the role of nine stakeholders groups, which are playing a major part in implementing Agenda 21 to achieve sustainable development. These groups are women, children and youth, indigenous people, NGOs, local authorities, workers and trade unions, business and industry, scientific and technological groups and farmers. This section also covers the issue of how people are to be mobilised and empowered for their roles in sustainable development. It contains 10 chapters, which are:

Chapter 23: *Preamble.* In four paragraphs, it addresses the needs of individuals, groups and organisations to participate in decision-making and to have access to environmental information.

Chapter 24: *Global Action for Women towards Sustainable and Equitable Development.* Its aim is to ensure the full, equal and beneficial integration of women in all development activities. This is dependent on the active involvement of women in economic and political decision-making, which will be critical to the successful implementation of Agenda 21.

Chapter 25: *Children and Youth in Sustainable Development,* focuses on the involvement of youth in environment development, decision-making and implementation which is also seen as critical to the success of Agenda 21.

Chapter 26: *Recognizing and Strengthening the Role of Indigenous People and Their Communities.* The chapter calls on countries to promote and strengthen the role of indigenous people and their communities.

Chapter 27: *Strengthening the Role of Non-Governmental Organizations: Partners for Sustainable Development.* This chapter focuses on the full contribution of non-

governmental organisations to carry out and review the implementation of Agenda 21.

Chapter 28: *Local Authorities: Initiative in Support of Agenda 21.* This chapter focuses on the role of local authorities in sustainable development. It calls for each local authority to prepare and adopt a local Agenda 21.

Chapter 29: *Strengthening the Role of Workers and Their Trade Unions.* This aims to provide a basis for strengthening workers participation in the implementation of sustainable development.

Chapter 30: *Strengthening the Role of Business and Industry.* This recognizes that to achieve more sustainable production patterns there must be full participation of business and industry in the implementation and evaluation of activities related to Agenda 21. This must be done through efficient production processes, preventative strategies, and clear production technologies and procedures throughout the product life cycle.

Chapter 31: *Scientific and Technological Community.* This focuses on how to enable the scientific and technological community to make an effective contribution to the decision-making process concerning the environment.

Chapter 32: *Strengthening the Role of Farmers.* The chapters focus on the role of farmers and rural communities in the economic and cultural life.

Section IV: Means of Implementation

This section contains eight chapters, which are:

Chapter 33: *Financial Resources and Mechanisms.* This deals with the financing of the implementation of Agenda 21 and reflects a global consensus integrating environmental considerations into an accelerated development process.

Chapter 34: *Transfer of Environmentally Sound Technology, Cooperation and Capacity –Building.* It calls for countries to transfer environmentally sound technologies and promote technology co-operation. The activities in this chapter aim at improving conditions to access and transfer technology.

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Chapter 35: *Science for Sustainable Development.* This chapter focuses on the role and the use of the sciences in supporting the prudent management of the environment and development. Scientific knowledge should support the goals of sustainable development.

Chapter 36: *Promoting Education, Public Awareness and Training.* This chapter sets out broad proposals. It encourages government and international organisation to provide education towards sustainable development, increasing public awareness and promoting training.

Chapter 37: *National Mechanisms and International Cooperation for Capacity-Building in Developing Countries.* The main objectives of this chapter are to develop and improve national, regional and related sub-regional capacities and capabilities for sustainable development.

Chapter 38: *International Institutional Arrangements.* The overall objective of this chapter is to integrate environmental and development issues at national, sub-regional, regional and international levels.

Chapter 39: *International Legal Instruments and Mechanisms.* This sets out to evaluate and promote the efficiency of international law on environment and development. Also it calls on countries to consider procedures and mechanisms to promote and review their effective implementation.

Chapter 40: *Information for Decision-Making.* This focuses on the need for information. It has two programme areas which are needed to be implemented to ensure that decisions are based increasingly on sound information.

APPENDIX C

AGENDA 21: TARGETS BY THE YEAR 2000 AND BEYOND

AGENDA 21: TARGETS BY THE YEAR 2000 AND BEYOND

Section/Chapter	Section	Responsibility/year	Target
Section I: Social and Economic Chapter 6:	6.4	2000	• to achieve health for all
	6.12	government, UN organisations and non-government organisation/2000	• to eliminate guinea disease • eradicate polio • to effectively control onchcerciasis • reduce the number of death from childhood die in developing countries by 50 to 70 % • Reduce the incidence of childhood diarrhoea in developing countries by 25 to 50 %. • To initiate comprehensive programmes to reduce mortality from acute respiratory infections in children under five years by at least one third. • To provide 95% of the world's child population with access to appropriate care for acute respiratory infections within the community. • To institute anti-malaria programmes in all countries • To implement control programmes to reduce the prevalence of schistosomiasis and other trematode infections by 40% and 25%.
	6.34	2000	• To achieve a 10 to 40 % improvement in health indicators
Chapter 7: Human Settlement	7.7	Countries/2000	• Should undertake with the active participation of the business sector as appropriate, projects in selected cities for collection, analysis of urban data, including environmental impact analysis at the local, state, and national and international levels.
	7.38	Developing countries/2000	• To build the necessary technical, financial and human resource capacity aimed at ensuring better integration of infrastructure and environmental planning.
	7.39	Countries/2025	• To ensure the provision of adequate environmental infrastructure facilities in all settlements.

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Section II: Conservation and Management of Resources for Development			
Chapter 10: Land resources	10.5	Government, regional and international organisations/2000	• Improve and strengthen planning, management and evaluation systems for land and land resources by not later than 2000.
Chapter 11 Deforestration	11.2	Government with support of regional and international organisations.	• Strengthen the capacities and capabilities of national institutions to enable them to acquire the necessary knowledge for the protection and conservation of forests by the year 2000.
Chapter 13 Mountain	13.15a	Government with support of the international and regional organisations/2000	• Develop appropriate land-use planning and management for both arable and non-arable land to prevent soil erosion, increase biomass production and maintain the ecological balance.
Chapter 14 Agriculture	14.45a	Government with support of the international and regional organisations/ 2000	• Review and initiate national land-resource surveys
	14.57c		• adopt policies and strengthen or establish programmes for farm and integrated the conservation and sustainable use of plant genetic resources for food and agriculture into strategies and programmes for sustainable agriculture
	14.75b		• Improve and implement plan protection and animal health services, including mechanisms to control the distribution and use of pesticides.
	14.85a		• Develop and maintain in all countries the integrated plant nutrition approach, and optimise availability of fertiliser and other plant nutrient sources.
	14.85b		• Establish and maintain institutional and human infrastructure to enhance effective decision-making on soil productivity.
	14.85c	2005	• To maintain and enhance the ability of developing countries
	14.94a	2000	• initiate and encourage a process of environmentally sound energy transition in rural communities

Chapter 18 Freshwater	18.11ai	States through bilateral and multilateral co-operation including the UN	• Designed and initiated costed and targeted national action programmes, and to put in place appropriate institutional structures and legal instrument.
	18.11a.11	2000	• Establish efficient water-use programmes to attain sustainable resource utilisation patterns
	18.21b	2025	• Achieve subsectoral targets of all freshwater programme areas.
	18.26a	2000	• studied in detail the feasibility of installing water resources assessment services
	18.58a	2000	• all urban residents have access to at least 40 litters per capita per day of safe water.
	18.58b	2000	• Established and applied quantitative and qualitative discharge standards for municipal and industrial effluents.
	18.58c	2000	• Ensured that 75% of solid waste generated in urban areas are collected and recycled or disposed of an environmentally safe way.
Chapter 19 Toxic chemicals	19.13a	Government through the co-operation of international organisations and industry/2000	• Strengthen international risk assessment.
	19.27	2000	• A globally harmonised hazard classification and compatible labelling system, including material safety data sheets and easily understandable symbols.
	19.38b	2000	• Full participation in and implementation of the PIC (Prior Informed Consent) procedure.
	19.58	2000	• National systems for environmentally sound management of chemicals, including legislation and provisions for implementation and enforcement.
Chapter 21 Solid wastes management	21.9a	Government encouraged and participated by NGOs and consumer with the co-operation of the UN.groups./2000	• Ensure sufficient national capacity to access, process and monitor waste trend information and implement waste minimisation programmes.

	21.9b	2000	• should stabilise and reduce production of wastes
	21.9c	2000	• To reduce the production of agrochemical wastes, containers and packing materials.
	21.18a	2000	• promote sufficient financial and technological capacities at the regional, national and local levels to implement waste reuse and recycling policies and actions
	21.18b	2010	• Have a national programme to the extent possible; targets for efficient waste reuse and recycling.
	21.29a	2000	• Establish waste treatment and disposal quality criteria, objectives and standards based on the nature and assimilative capacity of the receiving environment.
	21.29b	2000	• Establish sufficient capacity to undertake waste-related pollution impact monitoring and conduct regular surveillance.
	21.29d	2025	• Dispose of all sewage, wastewater and solid wastes in conformity with national or international environmentally quality guidance.
	21.30c	developing counties/ 2005	• Ensure that at least 50% of all sewage waters and solid wastes are treated or disposed of in conformity with national international guidelines.
	21.39b	2025	• provide all urban populations with adequate waste services
	21.41a	2000	• dispose of all sewage, waste waters and solid wastes in conformity with national or intentional environmental quality guidelines
	21.39a	2000	• have the necessary technical, financial and human resources capacity to provide waste collection services commensurate with needs
	21.39c	2000	• ensure that full urban waste service coverage in maintained and sanitation coverage achieved in all rural areas
Section III: the role of major groups			
Chapter 24 Women	24.2c	Government/2000	• Develop and issue strategies of changes necessary to eliminate constitutional, legal, administrative, cultural, behavioral, social and economic obstacles to women's full participation in sustainable development and in public life.

	24.5	As above	• States parties to the Convention on the elimination of all forms of discrimination against women should review and suggest amendments to it.
Chapter 25 Children and youth	25.5	Government	• Each country should ensure that more than 50 per cent of its youth, gender balance are enrolled in or have access to appropriate secondary education or equivalent educational.
Chapter 29 Workers	29.3	Government, business and industry	• Promote ratification of relevant conventions. • Establish bipartite and tripartite mechanisms on safety, health and sustainable development • Increase the number of environmental collective agreements aimed at achieving sustainable development • Reduce occupational accidents, injuries and diseases according to recognized statistical reporting procedures • Increase the provision of workers education, training.
Section IV: means of implementation			
Chapter 35 Science	35.21b		• Substantial increases by the year 2000 in the number of scientists particularly women scientists.

APPENDIX D

QUESTIONNAIRE ENGLISH AND ARABIC VERSIONS

Abu Dhabi Municipality
Emirate of Abu Dhabi
UAE

School of Technology
University of Glamorgan
United Kingdom

FORMULATING ENVIRONMENTAL STRATEGY QUESTIONNAIRE

The main aims of this questionnaire are:
(1) to identify the main environmental problems and concerns in the Emirate of Abu Dhabi;
(2) to define the main causes of the above problems;
(3) to identify the problems facing government departments; and
(4) to know the awareness degree of non-governmental organisations and their role in decision-making process to formulate, implement and monitor the environmental strategy.

Environmental Strategy: is a set of broad environmental priorities and principles, which act as a framework of action and activities, together with a description of the resources, needed to implement it.

1. Type of Sector: ☐ Local Government

                         ☐ Federal Government

                         ☐ Non-government Organisation, please specify _____

2. Education Level: 1. Less than Secondary   2. Secondary

                         3. First Degree   4. Post graduate

2a. If your answer 3 or 4, please specify the field_____

Part I. Strategy Preparation and Formulation

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3. In your opinion, what are the most serious environmental problems facing the Emirate?
(please number them 1, 2, 3, 4, 5, 6, 7 in order of importance).

☐ Water pollution and over-consumption of resources   ☐

☐ Industrial pollution   ☐

☐ Marine and coastal pollution   ☐

☐ Waste management   ☐

☐ Urbanisation   ☐

☐ Air pollution   ☐

☐ Desertification   ☐

If you have others, please specify and number them in order of importance.

_____

_____

_____

_____

4.   Do you think that environmental priorities differ from Emirate to Emirate?

☐ Yes   ☐ No   ☐ Don't Know

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4a. If Yes, does this result from the following criteria? (please circle the appropriate number)

		Strongly Agree	Agree	Neutral	Disagree	Used by Researcher
1.	Size of population	4	3	2	1	1. ☐
2.	Source of income	4	3	2	1	2. ☐
3.	Source of finance and support	4	3	2	1	3. ☐
4.	Degree of development	4	3	2	1	4. ☐
5.	Variance of laws and regulations	4	3	2	1	5. ☐
6.	Sources of pollution	4	3	2	1	6. ☐
7.	Capacity of management	4	3	2	1	7. ☐
8.	Enforcement of regulation	4	3	2	1	8. ☐

If you have others, please specify

_____

_____

_____

_____

_____

_____

4b. If the answer to question (4) is "No", please explain your reasoning

_____

_____

_____

_____

_____

_____

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5. **Do you think that the main causes of environmental problems in the Emirate arise from:**
(please circle the appropriate number in each line)

		Strongly Agree	Agree	Neutral	Disagree	
1.	Population growth	4	3	2	1	1. ☐
2.	Migration	4	3	2	1	2. ☐
3.	Rapid economic growth	4	3	2	1	3. ☐
4.	Increase of life standard	4	3	2	1	4. ☐
5.	inadequate of land use policies	4	3	2	1	5. ☐
6.	Pricing policies (water and electricity)	4	3	2	1	6. ☐
7.	Lack of environmental protection law and enforcement	4	3	2	1	7. ☐
8.	Lack of awareness	4	3	2	1	8. ☐
9.	Lack of monitoring and control	4	3	2	1	9. ☐
10.	Lack of treatment facilities	4	3	2	1	10. ☐
11.	Lack of energy alternatives	4	3	2	1	11. ☐
12.	Effect from other Emirates or countries	4	3	2	1	13. ☐
13.	Lack of financial incentives	4	3	2	1	15. ☐
14.	Ground water depletion	4	3	2	1	16. ☐

Used by Researcher

If you have others, please specify

_____

_____

_____

_____

6. **Do the following global environmental issues affect local environment and cause the present problems?**

☐ Yes   ☐ No   ☐ Don't Know   6. ☐

6a. If Yes, please rate the degree of affects of the following environmental issues by circling the appropriate number.

		Strong effect	Moderate	Minor	No effect		Used by Researcher
1.	Ozone layer Depletion	4	3	2	1		1. ☐
2.	Global warming	4	3	2	1		2. ☐
3.	Marine Pollution	4	3	2	1		3. ☐
4.	Industrial Pollution	4	3	2	1		4. ☐
5.	Toxic and Hazardous Waste	4	3	2	1		5. ☐
6.	Deforestation	4	3	2	1		6. ☐
7.	Desrtification	4	3	2	1		7. ☐

If you have others, please specify

_____

_____

_____

_____

7. Do you think the environmental department needs rearrangement into new organisational framework?

☐ Yes   ☐ No   ☐ Don't Know   7. ☐

7a. If Yes, do you believe that departments are facing the following problems?
(please circle the appropriate number)

		Strongly Agree	Agree	Neutral	Disagree		Used by Researcher
1.	Absence of coordination and co-operation system	4	3	2	1		1. ☐
2.	Weakness in applying and enforcing law	4	3	2	1		2. ☐
3.	Absence of effective regulation	4	3	2	1		3. ☐
4.	Weakness of environmental awareness programmes	4	3	2	1		4. ☐
5.	Shortage in specialised human resources	4	3	2	1		5. ☐
6.	Unclear responsibilities and duties	4	3	2	1		6. ☐
7.	Overlapping responsibilities	4	3	2	1		7. ☐
8.	Departments inexperienced	4	3	2	1		8. ☐
9.	No separate budget for environmental projects	4	3	2	1		9. ☐

If you have others, please specify

_____

7b. If the answer to question (7) is "No", please explain your reasoning

_____

_____

_____

_____

_____

8. How do you rate the impotance of the following items to a successful strategy process?
(please circle the appropriate number):

		Very important	Important	Less important	Not important	Used by Researcher
1	Formulate environmental legislation and regulations	4	3	2	1	1. ☐
2.	Set environmental standards and specification	4	3	2	1	2. ☐
3.	Adopt environmental policies, plans and programmes	4	3	2	1	3. ☐
4.	Review the strategy progress and performance reports	4	3	2	1	4. ☐
5.	Initiate clear inter-governmental co-ordination system	4	3	2	1	5. ☐
6.	Rearrangement and capacity building of environmental institutions	4	3	2	1	6. ☐
7.	Encourage public and private sectors participation in all aspects of environment	4	3	2	1	7. ☐
8.	Develop environmental information system	4	3	2	1	8. ☐
9.	Promote environmental awareness, education and training	4	3	2	1	9. ☐
10.	Organise seminars, workshops and conferences	4	3	2	1	10. ☐
11.	Provide and exchange information with all non-governmental organisations and groups	4	3	2	1	11. ☐
12.	Promote regional and international participation in environmental activities	4	3	2	1	12. ☐
13.	Adequate financial resources and incentives	4	3	2	1	13. ☐
14.	Having enough staff	4	3	2	1	14. ☐

If you have others that are important, please explain your reasoning

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_____

9. Do the following elements contribute to achieving the effective implementation of strategy plans and programmes? Please rate your agreement to the following elements by circling the appropriate number.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
1.	Participation of all sectors	5	4	3	2	1	1. ☐
2.	Financial support	5	4	3	2	1	2. ☐
3.	Funding strategy programmes and projects	5	4	3	2	1	3. ☐
4.	Legislation support	5	4	3	2	1	4. ☐
5.	Strong co-operation and co-ordination system	5	4	3	2	1	5. ☐
6.	Integrating environmental consideration in decision-making	5	4	3	2	1	6. ☐
7.	Link between local and federal efforts	5	4	3	2	1	7. ☐
8.	Increase government staff and public awareness and training at all levels	5	4	3	2	1	8. ☐
9.	Use of environmental tools such as environmental impact assessment	5	4	3	2	1	9. ☐
10.	Specify responsibility and the role of each sector	5	4	3	2	1	10. ☐
11.	Encourage the exchange of information	5	4	3	2	1	11. ☐
12.	Apply penalties and charges system for industry and private sector	5	4	3	2	1	12. ☐
13.	Encourage environmental investment	5	4	3	2	1	13. ☐
14.	Use economic incentives	5	4	3	2	1	14. ☐

If you have others, please specify

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10. How do you rate the importance of the following items to achieve effective monitoring and Evaluation? (please circle the appropriate number)

		Very important	Important	Less important	Not important	
1.	Provide baseline information and data	4	3	2	1	1. ☐
2.	Set strategy objectives and goals	4	3	2	1	2. ☐
3.	Establish monitoring indicators	4	3	2	1	3. ☐
4.	Produce regular reports	4	3	2	1	4. ☐
5.	Provide an adequate budget for monitoring	4	3	2	1	5. ☐
6.	Updating the strategy	4	3	2	1	6. ☐

If you have others, please specify

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Part IV: Strategy Elements

11. In your opinion the participation of public and private sectors are important for the strategy process?

☐ Yes   ☐ No   ☐ Don't Know   11. ☐

11a. If Yes, do you think that it is important to use one or more of the techniques in Question (11C) to achieve effective participation of public and other sectors ?

☐ Yes   ☐ No   ☐ Don't Know   11a. ☐

11b. If your answer to question (11) "No", please explain your reasoning

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11c.   If your answer to question (11a) is "Yes", how would you rate the importance of the following techniques in achieving effective participation? (please circle the appropriate number)

	Very important	Important	Less important	Not important	
1. Regular newsletter	4	3	2	1	1. ☐
2. Regular public meeting	4	3	2	1	3. ☐
3. Electronic media such as E-mail and Website	4	3	2	1	4. ☐
4. Information available for review at local library	4	3	2	1	5. ☐
5. Regular stories in local newspapers or radio and TV.	4	3	2	1	6. ☐
6. Information provided through membership in interest groups	4	3	2	1	7. ☐
7. Social surveys	4	3	2	1	8. ☐
8. Seminars and workshops	4	3	2	1	9. ☐
9. Consultation papers	4	3	2	1	10. ☐

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If you have others, please specify

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11d.   If your answer to question (11a) is "No", please explain your reasoning

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12. How important are the following elements in any strategy process?
   (please circle the appropriate number)

		Very important	Important	Less important	Not important	
1.	Participation of all sectors	4	3	2	1	1. ☐
2.	Co-operation with national, regional and international organisations	4	3	2	1	2. ☐
3.	Co-ordination between all sectors	4	3	2	1	3. ☐
4.	Consultation and communication	4	3	2	1	4. ☐
5.	Environmental awareness	4	3	2	1	5. ☐
6.	Environmental education and training	4	3	2	1	6. ☐
7.	Information exchange	4	3	2	1	7. ☐
8.	Financial requirements	4	3	2	1	8. ☐

If you have others, please specify

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_____

13. Do you think the research institutions can contribute to the strategy process?

  ☐ Yes   ☐ No   ☐ Don't Know   13. ☐

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13a. If Yes, how would you rate the contribution of research institutions in the strategy process interms of the following items? (please circle the appropriate number)

		Strongly Agree	Agree	Disagree	Disagree	
1.	Collecting information	4	3	2	1	1. ☐
2.	Data analysis	4	3	2	1	2. ☐
3.	Preparing the state of the environment report	4	3	2	1	3. ☐
4.	Identifying environmental problems and causes	4	3	2	1	4. ☐
5.	Setting environmental priorities	4	3	2	1	5. ☐
6.	Awareness programmes	4	3	2	1	6. ☐
7.	Education and training programmes	4	3	2	1	7. ☐
8.	Providing advice and consultancy	4	3	2	1	8. ☐
9.	Continuous monitoring of environmental quality	4	3	2	1	9. ☐

If you have others, please specify

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13b. If your answer to question (13) "No", please explain your reasoning

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14. Do you believe that the private sector has an important role in environmental strategy?

☐ Yes   ☐ No   ☐ Don't Know

14. ☐

14a. If Yes, do you think that the following roles are useful to achieve the private sector participation? (please circle the appropriate number)

		Strongly Agree	Agree	Neutral	Disagree	
1.	Funding strategy programmes and projects	4	3	2	1	1. ☐
2.	Investment in environmental technology	4	3	2	1	2. ☐
3.	Supporting environmental awareness and training programmmes	4	3	2	1	3. ☐
4.	Supporting environmental seminars and workshops	4	3	2	1	4. ☐
5.	Supporting environmental research institution	4	3	2	1	5. ☐
6.	Participating in the environmental plans and programmes with an effective role	4	3	2	1	6. ☐
7.	Encourage clear production	4	3	2	1	7. ☐
8.	Educating their own human resources	4	3	2	1	8. ☐

If you have others, please specify

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_____

_____

14b. If your answer to question (14) "No", please explain your reasoning

_____

_____

If you have any questions or concerns, please feel free to contact me on:

Tel: 050-6115911

Fax: 02-767683

P.O.Box 3665

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دائرة بلدية أبوظبي

إمـــارة أبـــوظبـي

دولة الإمـــارات العربية المتحدة

كلية التكنولوجيا

جـامـعة جـلامـورجن

المملكـة المتـحــدة

استبيان حول تصميم وتشكيل استراتيجية بيئية لإمارة أبوظبي

بهدف الاستبيان إلى معرفة أهم المشاكل والقضايا البيئية في أمارة أبوظبي ومسبباتها والمشاكل التي تعاني منها الدائر الحكومية المعنية بأمور البيئة. وكذلك معرفة درجة الوعي لدى الجهات الغير حكومية وحدود مشاركتهم في صناعة القرار وفي إعداد وتنفيذ ومراقبة السياسات والخطط والبرامج والمشاريع البيئية المختلفة.

الرجاء استعراض التعريف التالي للاستراتيجية البيئية قبل الإجابة على الاستبيان.

الاستراتيجية البيئية هي عبارة عن خطط للأولويات والمبادئ البيئة التي تعمل كهيكل أو إطار للنشاطات والأعمال البيئية المختلفة وذلك بتوضيع أهم المصادر والاحتياجات لتنفيذها بشكل فعال.

١. نوع القطاع: ☐ حكومي محلي

☐ حكومي اتحادي

☐ غير حكومي، ارجوا تحديد ذلك _____

٢. المستوى التعليمي: ١. أقل من ثانوي ٢. ثانوي

٣. جامعي ٤. فوق جامعي

٢أ. إذا كانت إجابتك ٣ أو ٤ أرجو تحديد التخصص _____

٣. في اعتقادك، ما هي أهم المشاكل البيئية التي تواجه الإمارة؟ (ارجوا ترقيم المشاكل التالية من ١ إلى ٧

حسب الأهمية)

☐ تلوث مصادر المياه وزيادة الاستهلاك

☐ التلوث الصناعي

☐ تلوث البحر والشواطئ

☐ إدارة النفايات

☐ التحضر

☐ تلوث الهواء

☐ التصحر

أخرى، أرجو ذكرها مع ترقيمها حسب الأولوية

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٤. هل تعتقد بأن الأولويات البيئية المذكورة مسبقا تختلف من إمارة إلى أخرى؟

☐ نعم ☐ لا ☐ لا أعرف

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٤-أ   إذا كانت الإجابة بنعم، هل هذا الاختلاف ناتج عن العناصر التالية (أرجو رسم دائرة حول الرقم المناسب)

	أوافق بشدة	أوافق	معتدل	لا أوافق
١. حجم السكان	١	٢	٣	٤
٢. مصادر الدخل	١	٢	٣	٤
٣. مصادر الدعم المالي	١	٢	٣	٤
٤. درجة التطور	١	٢	٣	٤
٥. اختلاف السياسات المحلية	١	٢	٣	٤
٦. مصادر التلوث	١	٢	٣	٤
٧. كفاءة الإدارات وقدرتها	١	٢	٣	٤
٨. تطبيق القوانين	١	٢	٣	٤

أخرى، أرجو ذكرها

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٤-ب   إذا كانت إجابتك على السؤال رقم (٤) بلا، أرجو توضيح الأسباب

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٥. هل تعتقد أن المسببات الرئيسية للمشاكل البيئية في الإمارة تصدر عن العناصر التالية (أرجو رسم دائرة حول الرقم المناسب)

	لا أوافق	معتدل	أوافق	أوافق بشدة
١. النمو السكاني	٤	٣	٢	١
٢. الهجرة	٤	٣	٢	١
٣. النمو الاقتصادي السريع	٤	٣	٢	١
٤. ارتفاع مستوى المعيشة	٤	٣	٢	١
٥. سياسات استخدام الأراضي غير ملائمة	٤	٣	٢	١
٦. سياسة التسعير (الماء والكهرباء)	٤	٣	٢	١
٧. ضعف القوانين البيئية وضعف تنفيذها	٤	٣	٢	١
٨. ضعف برامج التوعية	٤	٣	٢	١
٩. ضعف الرقابة والتحكم	٤	٣	٢	١
١٠. ضعف وسائل المعالجة	٤	٣	٢	١
١١. عدم وجود بدائل للطاقة	٤	٣	٢	١
١٢. تأثير من إمارات أخرى أو دول مجاورة	٤	٣	٢	١
١٣. ضعف الحوافز المالية	٤	٣	٢	١
١٤. استيراد المواد الحيوانية	٤	٣	٢	١

أخرى، ارجوا ذكرها

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٦. هل تعتقد أن القضايا العالمية المذكورة في السؤال التالي تساهم في حدوث المشاكل البيئية في الإمارة؟

☐ نعم   ☐ لا   ☐ لا اعرف

٦-أ إذا كانت الإجابة بنعم، أرجو تحديد درجة تأثير هذه القضايا عن طريق رسم دائرة حول الرقم المناسب

لا يوجد تأثير	تأثير طفيف	تأثير محدود	تأثير شديد	
٤	٣	٢	١	١. تآكل طبقة الأوزون
٤	٣	٢	١	٢. تغير المناخ العالمي
٤	٣	٢	١	٣. التلوث البحري
٤	٣	٢	١	٤. التلوث الصناعي
٤	٣	٢	١	٥. النفايات الخطرة والسامة
٤	٣	٢	١	٦. إزالة الغابات
٤	٣	٢	١	٧. التصحر

أخرى، ارجوا ذكرها

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٧. هل تعتقد بأن الإدارات البيئية تحتاج إلى إعادة ترتيب في هيكل تنظيمي جديد؟

☐ نعم   ☐ لا   ☐ لا أعرف

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٧-أ   إذا كانت الإجابة بنعم، هل تعتقد أن هذه الإدارات تواجه المشاكل التالية (أرجو رسم دائرة حول الرقم المناسب)

لا أوافق	معتدل	أوافق	أوافق بشدة	
٤	٣	٢	١	١. غياب التنسيق والتعاون
٤	٣	٢	١	٢. ضعف تطبيق القوانين البيئية وغيرها
٤	٣	٢	١	٣. غياب القوانين الفعالة
٤	٣	٢	١	٤. تعثر برامج التوعية
٤	٣	٢	١	٥. قصور في وفرة القوى العاملة المتخصصة
٤	٣	٢	١	٦. عدم وضوح المسئوليات والمهام
٤	٣	٢	١	٧. التداخل في الصلاحيات
٤	٣	٢	١	٨. حداثة الإدارات
٤	٣	٢	١	٩. عدم وجود ميزانيات مستقلة للمشاريع البيئية

أخرى، أرجو ذكرها

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٧-ب   إذا كانت إجابتك على السؤال رقم (٧) بلا، أرجو ذكر الأسباب

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٨. حدد درجة أهمية البنود التالية في إنجاح الاستراتيجية وذلك برسم دائرة حول الرقم المناسب؟

غير مهم	أقل أهمية	مهم	مهم جدا	
٤	٣	٢	١	١. تشكيل قوانين حماية البيئة
٤	٣	٢	١	٢. وضع مقاييس ومواصفات بيئية
٤	٣	٢	١	٣. تطبيق السياسات والبرامج والخطط البيئية
٤	٣	٢	١	٤. مراجعة تقدم سير العمل في الاستراتيجية ورفع التقارير بشكل دوري
٤	٣	٢	١	٥. تشكيل نظام تنسيقي واضح بين الدوائر المعنية بالبيئة
٤	٣	٢	١	٦. تشكيل هيكل إداري جديد للبيئة
٤	٣	٢	١	٧. تشجيع مشاركة القطاعات الأخرى في جميع مراحل الاستراتيجية
٤	٣	٢	١	٨. تشجيع برامج التوعية والتدريب والتعليم
٤	٣	٢	١	٩. تطوير نظام المعلومات البيئية
٤	٣	٢	١	١٠. تنظيم المؤتمرات وورش العمل
٤	٣	٢	١	١١. توفير المعلومات وسهولة تبادلها
٤	٣	٢	١	١٢. تشجيع المشاركة في النشاطات البيئية على المستوى الإقليمي والعالمي
٤	٣	٢	١	١٣. توفير مصادر مالية والحوافز
٤	٣	٢	١	١٤. توفير كوادر بشرية مؤهلة

أخرى، أرجو ذكرها مع توضيح الأسباب

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٩. هل العناصر التالية تساهم في تنفيذ فعال لخطط وبرامج الاستراتيجية؟ اجو تحديد درجة الموافقة برسم دائرة على الرقم المناسب

	أوافق بشدة	أوافق	معتدل	لا أوافق	لا أوافق بشدة
١. مشاركة جميع القطاعات الأخرى	١	٢	٣	٤	٥
٢. الدعم المالي	١	٢	٣	٤	٥
٣. دعم مشاريع وبرامج الاستراتيجية	١	٢	٣	٤	٥
٤. الدعم التشريعي والقانوني	١	٢	٣	٤	٥
٥. وجود نظام تنسيق وتعاون قوي وواضح	١	٢	٣	٤	٥
٦. إدخال الاعتبارات البيئية في صناعة القرار	١	٢	٣	٤	٥
٧. الربط بين الجهود المحلية والاتحادية	١	٢	٣	٤	٥
٨. زيادة الوعي على جميع المستويات	١	٢	٣	٤	٥
٩. استخدام الأدوات البيئية مثل تقييم الأثر البيئي	١	٢	٣	٤	٥
١٠. تحديد المسئوليات ودور كل قطاع	١	٢	٣	٤	٥
١١. تشجيع تبادل المعلومات	١	٢	٣	٤	٥
١٢. تطبيق نظام الرسوم والمخالفات خاصة على قطاعي الصناعة والخاص	١	٢	٣	٤	٥
١٣. تشجيع الاستثمار البيئي	١	٢	٣	٤	٥
١٤. استخدام الحوافز المالية	١	٢	٣	٤	٥

أخرى، أرجو ذكرها

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١٠. كيف تحدد أهمية العناصر التالية لتحقيق تنفيذ وتقييم فعال للاستراتيجية (أرجو رسم دائرة حول الرقم المناسب)

	غير مهم	أقل أهمية	مهم	مهم جدا
١. توفير قاعدة للمعلومات والبيانات البيئية	٤	٣	٢	١
٢. وضع الأهداف والموضوعات	٤	٣	٢	١
٣. وضع مؤشرات لعملية الرقابة	٤	٣	٢	١
٤. إصدار تقارير بشكل دوري	٤	٣	٢	١
٥. توفير ميزانية مستقلة لعملية الرقابة والتقييم	٤	٣	٢	١
٦. تحديث الاستراتيجية بالمعومات	٤	٣	٢	١

أخرى، أرجو ذكرها

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١١. برأيك، هل مشاركة الجمهور والقطاع الخاص مهمة في جميع مراحل الاستراتيجية؟

☐ نعم   ☐ لا   ☐ لا أعرف

١١-أ إذا كانت الإجابة بنعم هل تعتقد أن استخدام أحد أو بعض التقنيات في السؤال (١١-ج) تحقق هذه المشاركة؟

☐ نعم   ☐ لا   ☐ لا أعرف

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١١-ب   إذا كانت إجابتك على السؤال رقم (١١) بلا، أرجو تحديد الأسباب

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١١-ج   إذا كانت إجابتك على السؤال رقم (١١-أ) بنعم، أرجو تحديد درجة أهمية التقنيات التالية لتحقيق مشاركة فعالة.

	غير مهم	أقل أهمية	مهم	مهم جدا
١. نشرات دورية	٤	٣	٢	١
٢. اجتماعات للجمهور بشكل منتظم	٤	٣	٢	١
٣. الوسائل الإلكترونية (الإنترنت والبريد الإلكتروني)	٤	٣	٢	١
٤. توفير المعلومات في المكتبات العامة	٤	٣	٢	١
٥. استخدام أجهزة الإعلام	٤	٣	٢	١
٦. توفير المعلومات عبر عضوية في الجمعيات العامة (النفع العام)	٤	٣	٢	١
٧. البرامج الإحصائية	٤	٣	٢	١
٨. المحاضرات وورش العمل	٤	٣	٢	١
٩. الأوراق أو التقارير الاستشارية	٤	٣	٢	١

أخرى، أرجو ذكرها

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١١-د   إذا كانت إجابتك على السؤال رقم (١١-أ) بلا، أرجو تحديد الأسباب

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١٢. ما مدى أهمية استخدام العناصر التالية لانجاح الاستراتيجية؟

غير مهم	أقل أهمية	مهم	مهم جدا	
٤	٣	٢	١	١. مشاركة جميع القطاعات الأخرى
٤	٣	٢	١	٢. التعاون على جميع المستويات المحلي والوطني والإقليمي والعالمي
٤	٣	٢	١	٣. التنسيق بين جميع الدوائر والقطاعات الأخرى
٤	٣	٢	١	٤. الاستشارة والاتصال
٤	٣	٢	١	٥. التوعية البيئية
٤	٣	٢	١	٦. التعليم والتدريب البيئي
٤	٣	٢	١	٧. المتطلبات المالية
٤	٣	٢	١	٨. تبادل المعلومات

أخرى، أرجو ذكرها

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١٣. هل تعتقد أن معاهد البحث يمكن أن تساهم في عملية الاستراتيجية؟

☐ لا أعرف   ☐ لا   ☐ نعم

364

١٣-أ   إذا كانت الإجابة بنعم، حدد مدى موافقتك مع البنود التالية عن طريق رسم دائرة حول الرقم المناسب.

غير مهم	أقل أهمية	مهم	مهم جدا	
٤	٣	٢	١	١. جمع المعلومات البيئية
٤	٣	٢	١	٢. تحليل البيانات
٤	٣	٢	١	٣. إعداد تقرير حالة البيئة
٤	٣	٢	١	٤. معرفة المشاكل البيئية ومسبباتها
٤	٣	٢	١	٥. وضع وتحديد الأولويات البيئية
٤	٣	٢	١	٦. برامج التوعية
٤	٣	٢	١	٧. برامج التدريب والتعليم
٤	٣	٢	١	٨. توفير النصح والاستشارة
٤	٣	٢	١	٩. الرقابة المستمرة للبيئة

أخرى، أرجو ذكرها

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١٣-ب   إذا كانت إجابتك على السؤال رقم (١٣) بلا، أرجو تحديد الأسباب

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١٤.   هل تعتقد أن القطاع الخاص له دور هام في إنجاح الاستراتيجية؟

☐ نعم   ☐ لا   ☐ لا أعرف

١٤-أ   إذا كانت الإجابة بنعم، أرجو تحديد درجة أهمية العناصر التالية في مشاركة القطاع الخاص عن طريق رسم دائرة حول الإجابة المناسبة.

	مهم جدا	مهم	أقل أهمية	غير مهم
١. توفير الدعم المالي لبرامج ومشاريع الاستراتيجية	١	٢	٣	٤
٢. الاستثمار في مجال التكنولوجيا البيئية	١	٢	٣	٤
٣. دعم برامج التوعية والتدريب والتعليم	١	٢	٣	٤
٤. دعم المحاضرات وورش العمل	١	٢	٣	٤
٥. دعم معاهد البحث والدراسات	١	٢	٣	٤
٦. المشاركة في الخطط والبرامج بصورة فعالة	١	٢	٣	٤
٧. تشجيع الإنتاج النظيف	١	٢	٣	٤
٨. المساهمة في توعية مصادرها البشرية	١	٢	٣	٤

أخرى، أرجو ذكرها

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١٤-ب   إذا كانت إجابتك على السؤال رقم (١٤) بلا، أرجو تحديد الأسباب

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شكرا على حسن تعاونكم،،،،،،،

إذا كان لديك أي استفسار أرجو الاتصال بي على الأرقام التالية :

متحرك : ٠٥٠٦١١٥٩١١   فاكس : ٠٢٧٦٧٦٨٣   ص.ب : ٣٦٦٥

APPENDIX E

QUESTIONNAIRE COVERING LETTER

Food & Environment Control Centre
ABU DHABI MUNICIPALITY
P. O. Box 263
Abu Dhabi - U. A. E.
Telephone : 725007
Telefax   : 785961

مركـــز رقابـــة الأغذيـــة والبيئـــة
بلديـــة أبوظبـــي
ص.ب : ٢٦٣ ـ أبوظبــي
دولة الامارات العربية المتحدة
تلفون : ٧٢٥٠٠٧
فاكس : ٧٨٥٩٦١

Date: / /1999

Dear Sir,

Subject: DESIGNING AN ENVIRONMENTAL STRATEGY MODEL FOR THE EMIRATE OF ABU DHABI

Mr. Al Jaberi is conducting research at the University of Glamorgan on the above subject. We welcome your help with the enclosed questionnaire.

All information provided are absolutely confidential and will not be disclosed under any circumstances. Would you please complete the questionnaire by the end of this month.

We look forward to receiving the complete questionnaire.

Yours sincerely,

Director of FECC

APPENDIX F

INTERVIEW QUESTIONS

INTERVIEW QUESTIONS

Date:

Duration Time:

Name of Person:

Occupation:

Education Level:

1. What are the main causes of environmental problems? Are the global environmental issues affecting and causing some of environmental problems?

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2. What are the main environmental problems facing the Emirate? Can you order them on priority?

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3. Do you think environmental problem priorities differ from one Emirate to another? If so, what is the main factors that causing these differences?

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4. Do you think the existing environmental departments and agencies facing problems which may hinder the implementation of any environmental plans and programmes? If so, could you please list them?

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5. Do you think it is necessary to reorganise and restructure the existing environmental institutional framework into a new framework such as to establish an Environmental Management Board to administrate environmental matters and activities in the Emirate?

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6. Is their need to formulate Technical Environmental Committee to provide assistance and co-ordination among authorities and major groups in the community?

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7. Do you think that the use of environmental tools and instruments such as (EIA, EMS, SEA...etc.) are necessary and needed to achieve effective implementation of strategy policies, plans and programmes and also to achieve sustainable development?

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8. Do you think it is applicable to formulate a local environmental strategy for Abu Dhabi Emirate?

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9. Do you think it is useful to apply environmental charges and penalties for polluters and users especially for industry and private sectors? If so, how it can be achieved?

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10. Are the non-governmental sectors such as NGOs involved and participated in decision-making process?

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11. When do you think it is useful to use environmental auditing? Which department should be responsible for it?

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12. What are the roles of the following sectors: private sector / research institution / NGO / and women? How they can contribute to the environmental activities?

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APPENDIX G

INTERVIEW LETTER

Food & Environment Control Centre
ABU DHABI MUNICIPALITY
P. O. Box 263
Abu Dhabi - U. A. E.
Telephone : 725007
Telefax   : 785961

مركــــز رقابــــة الأغذيـــة والبيئـــة
بلديــــة ابوظبــــــي
ص.ب : ٢٦٣ ـ أبوظبـي
دولة الامارات العربية المتحدة
تلفون : ٧٢٥٠٠٧
فاكس : ٧٨٥٩٦١

Date: /   /1999

Dear Sir,

Subject: DESIGNING AN ENVIRONMENTAL STRATEGY MODEL FOR THE EMIRATE OF ABU DHABI

Mr. Al Jaberi is conducting research at the University of Glamorgan on the above subject. He is planning to conduct interview with you on ....1999 regarding the above subject.

Would you please confirm if its applicable for you or not, if not please let me know the appropriate time for you.

We look forward to receiving your approval.

Yours sincerely,

Director of FECC

APPENDIX H

KRUSKAL-WALLIS AND SPEARMAN FORMULA

Kruskal Wallis Test Formula:

$$H = \frac{12}{n(n+1)} \sum_{J=1}^{k} \frac{R_j^2}{n_j} - 3(n+1)$$

Where:

k= the number of groups

nj= the number of observations in the jth group

n= the number of observations in all groups combined

Rj= the sum of the ranks in the jth group

df = the value of freedom is one less than the number of categorise in the table.

Spearman Test Formula:

$$r_s = 1 - \frac{6\Sigma d^2}{n(n-1)(n+1)}$$

Where:

rs= Spearman's Correlation Coefficient

d= the difference in rank between the items in a pair

n= the number of items