

TeMA

Journal of
Land Use, Mobility and Environment

This special issue collects a selection of peer-review papers presented at the 8th International Conference INPUT 2014 titled "Smart City: planning for energy, transportation and sustainability of urban systems", held on 4-6 June in Naples, Italy. The issue includes recent developments on the theme of relationship between innovation and city management and planning.

Tema is the Journal of Land use, Mobility and Environment and offers papers with a unified approach to planning and mobility. TeMA Journal has also received the Sparc Europe Seal of Open Access Journals released by Scholarly Publishing and Academic Resources Coalition (SPARC Europe) and the Directory of Open Access Journals (DOAJ).

INPUT 2014

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Smart City

planning for energy, transportation
and sustainability of the urban system

SMART CITY

PLANNING FOR ENERGY, TRANSPORTATION AND SUSTAINABILITY OF THE URBAN SYSTEM

Special Issue, June 2014

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TeMA. Journal of Land Use, Mobility and Environment offers researches, applications and contributions with a unified approach to planning and mobility and publishes original inter-disciplinary papers on the interaction of transport, land use and environment. Domains include engineering, planning, modeling, behavior, economics, geography, regional science, sociology, architecture and design, network science, and complex systems.

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This special issue of TeMA collects the papers presented at the 8th International Conference INPUT 2014 which will take place in Naples from 4th to 6th June. The Conference focuses on one of the central topics within the urban studies debate and combines, in a new perspective, researches concerning the relationship between innovation and management of city changing.



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EIGHTH INTERNATIONAL CONFERENCE INPUT 2014

SMART CITY. PLANNING FOR ENERGY, TRANSPORTATION AND SUSTAINABILITY OF THE URBAN SYSTEM

This special issue of TeMA collects the papers presented at the Eighth International Conference INPUT, 2014, titled "Smart City. Planning for energy, transportation and sustainability of the urban system" that takes place in Naples from 4 to 6 of June 2014.

INPUT (Innovation in Urban Planning and Territorial) consists of an informal group/network of academic researchers Italians and foreigners working in several areas related to urban and territorial planning. Starting from the first conference, held in Venice in 1999, INPUT has represented an opportunity to reflect on the use of Information and Communication Technologies (ICTs) as key planning support tools. The theme of the eighth conference focuses on one of the most topical debate of urban studies that combines , in a new perspective, researches concerning the relationship between innovation (technological, methodological, of process etc..) and the management of the changes of the city. The Smart City is also currently the most investigated subject by TeMA that with this number is intended to provide a broad overview of the research activities currently in place in Italy and a number of European countries. Naples, with its tradition of studies in this particular research field, represents the best place to review progress on what is being done and try to identify some structural elements of a planning approach.

Furthermore the conference has represented the ideal space of mind comparison and ideas exchanging about a number of topics like: planning support systems, models to geo-design, qualitative cognitive models and formal ontologies, smart mobility and urban transport, Visualization and spatial perception in urban planning innovative processes for urban regeneration, smart city and smart citizen, the Smart Energy Master project, urban entropy and evaluation in urban planning, etc..

The conference INPUT Naples 2014 were sent 84 papers, through a computerized procedure using the website www.input2014.it . The papers were subjected to a series of monitoring and control operations. The first fundamental phase saw the submission of the papers to reviewers. To enable a blind procedure the papers have been checked in advance, in order to eliminate any reference to the authors. The review was carried out on a form set up by the local scientific committee. The review forms received were sent to the authors who have adapted the papers, in a more or less extensive way, on the base of the received comments. At this point (third stage), the new version of the paper was subjected to control for to standardize the content to the layout required for the publication within TeMA. In parallel, the Local Scientific Committee, along with the Editorial Board of the magazine, has provided to the technical operation on the site TeMA (insertion of data for the indexing and insertion of pdf version of the papers). In the light of the time's shortness and of the high number of contributions the Local Scientific Committee decided to publish the papers by applying some simplifies compared with the normal procedures used by TeMA. Specifically:

- Each paper was equipped with cover, TeMA Editorial Advisory Board, INPUT Scientific Committee, introductory page of INPUT 2014 and summary;
- Summary and sorting of the papers are in alphabetical order, based on the surname of the first author;
- Each paper is indexed with own DOI codex which can be found in the electronic version on TeMA website (www.tema.unina.it). The codex is not present on the pdf version of the papers.

SMART CITY PLANNING FOR ENERGY, TRANSPORTATION AND SUSTAINABILITY OF THE URBAN SYSTEM Special Issue, June 2014

Contents

- 1. The Plan in Addressing the Post Shock Conflicts 2009-2014.
A First Balance Sheet of the Reconstruction of L'Aquila** 1-13
Fabio Andreassi, Pierluigi Properzi
- 2. Assessment on the Expansion of Basic Sanitation Infrastructure.
In the Metropolitan Area of Belo Horizonte - 2000/2010** 15-26
Grazielle Anjos Carvalho
- 3. Temporary Dwelling of Social Housing in Turin.
New Responses to Housing Discomfort** 27-37
Giulia Baù, Luisa Ingaramo
- 4. Smart Communities. Social Innovation at the Service of the Smart Cities** 39-51
Massimiliano Bencardino, Ilaria Greco
- 5. Online Citizen Reporting on Urban Maintenance:
A Collection, Evaluation and Decision Support System** 53-63
Ivan Blečić, Dario Canu, Arnaldo Cecchini, Giuseppe Andrea Trunfio
- 6. Walkability Explorer. An Evaluation and Design Support Tool for Walkability** 65-76
Ivan Blečić, Arnaldo Cecchini, Tanja Congiu, Giovanna Fancello, Giuseppe Andrea Trunfio
- 7. Diachronic Analysis of Parking Usage: The Case Study of Brescia** 77-85
Riccardo Bonotti, Silvia Rossetti, Michela Tiboni, Maurizio Tira
- 8. Crowdsourcing. A Citizen Participation Challenge** 87-96
Júnia Borges, Camila Zyngier
- 9. Spatial Perception and Cognition Review.
Considering Geotechnologies as Urban Planning Strategy** 97-108
Júnia Borges, Camila Zyngier, Karen Lourenço, Jonatha Santos

- 10. Dilemmas in the Analysis of Technological Change. A Cognitive Approach to Understand Innovation and Change in the Water Sector** 109-127
Dino Borri, Laura Grassini
- 11. Learning and Sharing Technology in Informal Contexts. A Multiagent-Based Ontological Approach** 129-140
Dino Borri, Domenico Camarda, Laura Grassini, Mauro Patano
- 12. Smartness and Italian Cities. A Cluster Analysis** 141-152
Flavio Boscacci, Ila Maltese, Ilaria Mariotti
- 13. Beyond Defining the Smart City. Meeting Top-Down and Bottom-Up Approaches in the Middle** 153-164
Jonas Breuer, Nils Walravens, Pieter Ballon
- 14. Resilience Through Ecological Network** 165-173
Grazia Brunetta, Angioletta Voghera
- 15. ITS System to Manage Parking Supply: Considerations on Application to the “Ring” in the City of Brescia** 175-186
Susanna Bulferetti, Francesca Ferrari, Stefano Riccardi
- 16. Formal Ontologies and Uncertainty. In Geographical Knowledge** 187-198
Matteo Caglioni, Giovanni Fusco
- 17. Geodesign From Theory to Practice: In the Search for Geodesign Principles in Italian Planning Regulations** 199-210
Michele Campagna, Elisabetta Anna Di Cesare
- 18. Geodesign from Theory to Practice: From Metaplanning to 2nd Generation of Planning Support Systems** 211-221
Michele Campagna
- 19. The Energy Networks Landscape. Impacts on Rural Land in the Molise Region** 223-234
Donatella Cialdea, Alessandra Maccarone
- 20. Marginality Phenomena and New Uses on the Agricultural Land. Diachronic and Spatial Analyses of the Molise Coastal Area** 235-245
Donatella Cialdea, Luigi Mastronardi
- 21. Spatial Analysis of Urban Squares. ‘Siccome Umbellico al corpo dell’uomo’** 247-258
Valerio Cutini

- 22. Co-Creative, Re-Generative Smart Cities.
Smart Cities and Planning in a Living Lab Perspective 2** **259-270**
Luciano De Bonis, Grazia Concilio, Eugenio Leanza, Jesse Marsh, Ferdinando Trapani
- 23. The Model of Voronoi's Polygons and Density:
Diagnosis of Spatial Distribution of Education Services of EJA
in Divinópolis, Minas Gerais, Brazil** **271-283**
Diogo De Castro Guadalupe, Ana Clara Mourão Moura
- 24. Rural Architectural Intensification: A Multidisciplinary Planning Tool** **285-295**
Roberto De Lotto, Tiziano Cattaneo, Cecilia Morelli Di Popolo, Sara Morettini,
Susanna Sturla, Elisabetta Venco
- 25. Landscape Planning and Ecological Networks.
Part A. A Rural System in Nuoro, Sardinia** **297-307**
Andrea De Montis, Maria Antonietta Bardi, Amedeo Ganciu, Antonio Ledda,
Simone Caschili, Maurizio Mulas, Leonarda Dessena, Giuseppe Modica,
Luigi Laudari, Carmelo Riccardo Fichera
- 26. Landscape Planning and Ecological Networks.
Part B. A Rural System in Nuoro, Sardinia** **309-320**
Andrea De Montis, Maria Antonietta Bardi, Amedeo Ganciu, Antonio Ledda,
Simone Caschili, Maurizio Mulas, Leonarda Dessena, Giuseppe Modica,
Luigi Laudari, Carmelo Riccardo Fichera
- 27. Sea Guidelines. A Comparative Analysis: First Outcomes** **321-330**
Andrea De Montis, Antonio Ledda, Simone Caschili, Amedeo Ganciu, Mario Barra,
Gianluca Cocco, Agnese Marcus
- 28. Energy And Environment in Urban Regeneration.
Studies for a Method of Analysis of Urban Periphery** **331-339**
Paolo De Pascali, Valentina Alberti, Daniela De Ioris, Michele Reginaldi
- 29. Achieving Smart Energy Planning Objectives.
The Approach of the Transform Project** **341-351**
Ilaria Delponte
- 30. From a Smart City to a Smart Up-Country.
The New City-Territory of L'Aquila** **353-364**
Donato Di Ludovico, Pierluigi Properzi, Fabio Graziosi
- 31. Geovisualization Tool on Urban Quality.
Interactive Tool for Urban Planning** **365-375**
Enrico Eynard, Marco Santangelo, Matteo Tabasso

- 32. Visual Impact in the Urban Environment.
The Case of Out-of-Scale Buildings** 377-388
Enrico Fabrizio, Gabriele Garnerò
- 33. Smart Dialogue for Smart Citizens:
Assertive Approaches for Strategic Planning** 389-401
Isidoro Fasolino, Maria Veronica Izzo
- 34. Digital Social Networks and Urban Spaces** 403-415
Pablo Vieira Florentino, Maria Célia Furtado Rocha, Gilberto Corso Pereira
- 35. Social Media Geographic Information in Tourism Planning** 417-430
Roberta Floris, Michele Campagna
- 36. Re-Use/Re-Cycle Territories:
A Retroactive Conceptualisation for East Naples** 431-440
Enrico Formato, Michelangelo Russo
- 37. Urban Land Uses and Smart Mobility** 441-452
Mauro Francini, Annunziata Palermo, Maria Francesca Viapiana
- 38. The Design of Signalised Intersections at Area Level.
Models and Methods** 453-464
Mariano Gallo, Giuseppina De Luca, Luca D'acierno
- 39. Piano dei Servizi. Proposal for Contents and Guidelines** 465-476
Roberto Gerundo, Gabriella Graziuso
- 40. Social Housing in Urban Regeneration.
Regeneration Heritage Existing Building: Methods and Strategies** 477-486
Maria Antonia Giannino, Ferdinando Orabona
- 41. Using GIS to Record and Analyse Historical Urban Areas** 487-497
Maria Giannopoulou, Athanasios P. Vavatsikos,
Konstantinos Lykostratis, Anastasia Roukouni
- 42. Network Screening for Smarter Road Sites: A Regional Case** 499-509
Attila Grieco, Chiara Montaldo, Sylvie Ocelli, Silvia Tarditi
- 43. Li-Fi for a Digital Urban Infrastructure:
A Novel Technology for the Smart City** 511-522
Corrado Iannucci, Fabrizio Pini
- 44. Open Spaces and Urban Ecosystem Services.
Cooling Effect towards Urban Planning in South American Cities** 523-534
Luis Inostroza

- 45. From RLP to SLP: Two Different Approaches to Landscape Planning** 535-543
Federica Isola, Cheti Pira
- 46. Revitalization and its Impact on Public. Space Organization A Case Study of Manchester in UK, Lyon in France and Łódź in Poland** 545-556
Jarosław Kazimierzczak
- 47. Geodesign for Urban Ecosystem Services** 557-565
Daniele La Rosa
- 48. An Ontology of Implementation Plans of Historic Centers: A Case Study Concerning Sardinia, Italy** 567-579
Sabrina Lai, Corrado Zoppi
- 49. Open Data for Territorial Specialization Assessment. Territorial Specialization in Attracting Local Development Funds: an Assessment. Procedure Based on Open Data and Open Tools** 581-595
Giuseppe Las Casas, Silvana Lombardo, Beniamino Murgante, Piergiuseppe Pontrandolfi, Francesco Scorza
- 50. Sustainability And Planning. Thinking and Acting According to Thermodynamics Laws** 597-606
Antonio Leone, Federica Gobattoni, Raffaele Pelorosso
- 51. Strategic Planning of Municipal Historic Centers. A Case Study Concerning Sardinia, Italy** 607-619
Federica Leone, Corrado Zoppi
- 52. A GIS Approach to Supporting Nightlife Impact Management: The Case of Milan** 621-632
Giorgio Limonta
- 53. Dealing with Resilience Conceptualisation. Formal Ontologies as a Tool for Implementation of Intelligent Geographic Information Systems** 633-644
Giampiero Lombardini
- 54. Social Media Geographic Information: Recent Findings and Opportunities for Smart Spatial Planning** 645-658
Pierangelo Massa, Michele Campagna
- 55. Zero Emission Mobility Systems in Cities. Inductive Recharge System Planning in Urban Areas** 659-669
Giulio Maternini, Stefano Riccardi, Margherita Cadei

- 56. Urban Labelling: Resilience and Vulnerability as Key Concepts for a Sustainable Planning** 671-682
Giuseppe Mazzeo
- 57. Defining Smart City. A Conceptual Framework Based on Keyword Analysis** 683-694
Farnaz Mosannenzadeh, Daniele Vettorato
- 58. Parametric Modeling of Urban Landscape: Decoding the Brasilia of Lucio Costa from Modernism to Present Days** 695-708
Ana Clara Moura, Suellen Ribeiro, Isadora Correa, Bruno Braga
- 59. Smart Mediterranean Logics. Old-New Dimensions and Transformations of Territories and Cites-Ports in Mediterranean** 709-718
Emanuela Nan
- 60. Mapping Smart Regions. An Exploratory Approach** 719-728
Sylvie Occelli, Alessandro Sciuolo
- 61. Planning Un-Sustainable Development of Mezzogiorno. Methods and Strategies for Planning Human Sustainable Development** 729-736
Ferdinando Orabona, Maria Antonia Giannino
- 62. The Factors Influencing Transport Energy Consumption in Urban Areas: a Review** 737-747
Rocco Papa, Carmela Gargiulo, Gennaro Angiello
- 63. Integrated Urban System and Energy Consumption Model: Residential Buildings** 749-758
Rocco Papa, Carmela Gargiulo, Gerardo Carpentieri
- 64. Integrated Urban System and Energy Consumption Model: Public and Singular Buildings** 759-770
Rocco Papa, Carmela Gargiulo, Mario Cristiano
- 65. Urban Smartness Vs Urban Competitiveness: A Comparison of Italian Cities Rankings** 771-782
Rocco Papa, Carmela Gargiulo, Stefano Franco, Laura Russo
- 66. Urban Systems and Energy Consumptions: A Critical Approach** 783-792
Rocco Papa, Carmela Gargiulo, Floriana Zucaro
- 67. Climate Change and Energy Sustainability. Which Innovations in European Strategies and Plans** 793-804
Rocco Papa, Carmela Gargiulo, Floriana Zucaro

- 68. Bio-Energy Connectivity And Ecosystem Services.
An Assessment by Pandora 3.0 Model for Land Use Decision Making** 805-816
Raffaele Pelorosso, Federica Gobattoni, Francesco Geri,
Roberto Monaco, Antonio Leone
- 69. Entropy and the City. GHG Emissions Inventory:
a Common Baseline for the Design of Urban and Industrial Ecologies** 817-828
Michele Pezzagno, Marco Rosini
- 70. Urban Planning and Climate Change: Adaptation and Mitigation Strategies** 829-840
Fulvia Pinto
- 71. Urban Gaming Simulation for Enhancing Disaster Resilience.
A Social Learning Tool for Modern Disaster Risk Management** 841-851
Sarunwit Promsaka Na Sakonnakron, Pongpisit Huyakorn, Paola Rizzi
- 72. Visualisation as a Model. Overview on Communication Techniques
in Transport and Urban Planning** 853-862
Giovanni Rabino, Elena Masala
- 73. Ontologies and Methods of Qualitative Research in Urban Planning** 863-869
Giovanni Rabino
- 74. City/Sea Searching for a New Connection.
Regeneration Proposal for Naples Waterfront Like an Harbourscape:
Comparing Three Case Studies** 871-882
Michelangelo Russo, Enrico Formato
- 75. Sensitivity Assessment. Localization of Road Transport Infrastructures
in the Province of Lucca** 883-895
Luisa Santini, Serena Pecori
- 76. Creating Smart Urban Landscapes.
A Multimedia Platform for Placemaking** 897-907
Marichela Sepe
- 77. Virtual Power Plant. Environmental Technology Management Tools
of The Settlement Processes** 909-920
Maurizio Sibilla
- 78. Ecosystem Services and Border Regions.
Case Study from Czech – Polish Borderland** 921-932
Marcin Spyra
- 79. The Creative Side of the Reflective Planner. Updating the Schön's Findings** 933-940
Maria Rosaria Stufano Melone, Giovanni Rabino

- 80. Achieving People Friendly Accessibility.
Key Concepts and a Case Study Overview** 941-951
Michela Tiboni, Silvia Rossetti
- 81. Planning Pharmacies: An Operational Method to Find the Best Location** 953-963
Simona Tondelli, Stefano Fatone
- 82. Transportation Infrastructure Impacts Evaluation:
The Case of Egnatia Motorway in Greece** 965-975
Athanasios P. Vavatsikos, Maria Giannopoulou
- 83. Designing Mobility in a City in Transition.
Challenges from the Case of Palermo** 977-988
Ignazio Vinci, Salvatore Di Dio
- 84. Considerations on the Use of Visual Tools in Planning Processes:
A Brazilian Experience** 989-998
Camila Zyngier, Stefano Pensa, Elena Masala

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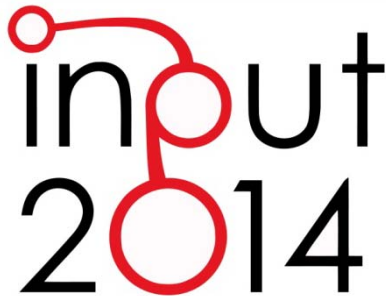
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SPECIAL ISSUE

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URBAN GAMING SIMULATION FOR ENHANCING DISASTER RESILIENCE

A SOCIAL LEARNING TOOL FOR MODERN DISASTER RISK MANAGEMENT

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ABSTRACT

An emergence of the disaster resilience concept broadens the idea of urban risk management and, at the same time, enhances a theoretical aspect in a way in which we can develop our cities without making it more vulnerable to natural disasters. Nevertheless, this theoretical plausibility is hardly translated into a practical implication for urban planning, as the concept of resilience remain limited to some scholars' debate. One of substantial factors that limit the understanding of people about disaster risk an resilience is a lack of risk awareness and risk preparedness, which can be solved by restructuring social learning process that enable a process of mutual learning between experts and the public. This study, therefore, focuses on providing insights into the difficulties of disaster risk communication we face, and how gaming simulation can be taken as a communication technique in enhancing social learning, which is regarded as a fundamental step of disaster risk management prior the mitigation process takes place. The study argues that the gaming simulation can facilitate planners in acquiring risk information from the community, conceiving the multitude of complex urban physical and socio-economic components, and conceptualizing innovative solutions to cope with disaster risks mutually with the public.

KEYWORDS

Gaming Simulation, Risk Communication, Social Learning, Urban Resilience

1 DISASTER RESILIENCE IN THE MODERN URBAN PLANNING

While cities around the world have been developing and transforming their built environment and socio-economic characteristics, the consequences of these urban development efforts bring about changes of built and natural environment. Those development and transformation change the cities from agricultural-based to industrial and commercial-based development in such a way that leads to increased complexities of urban metabolism. Besides, the pressure of capturing globalization stimulates huge investments in the city creating more dense urbanized areas, especially in the disaster-prone zone.

In fact, the vulnerability in terms of environmental changes and natural disasters is not just emerged, but it has been a major threat to the urban fabric of our society since rapid urbanization changed the urban landscapes and socio-economic characteristics (Mitchell, 2010). Dating back to the industrialization era in the the 1970s, the economy of the capitals of major countries in the world had depended on a large-scale production of middle and heavy industries, which was central to the urbanization. Nevertheless, the economy prospered through the industrialization brought about other negative impacts in where factories were located. The industrial development without proper urban management - allowing factories to build in a residential area - led to several urban problems related to the environmental degradation and social inequality, which had considerable side effects on the sanitation service provision with decent housing and the quality of life of the inhabitants. After that, the late 1970s and 1980s many old industrial cities – especially in England – experienced the urban crisis in terms of accelerating declines in their traditional manufacturing industries (Bramwell & Rawding, 1996; Xiao, 2007), corresponding with a stepping increase in the substantial concern on urban revitalization.

As a result, in the 1980s and early 1990s, the process of urban revival responding to economic recession were initiated and considered as “the wave of worldwide economic recovery”, which aimed to restructure cities’ economy towards services and consumption (Xiao, 2007). Recently, thousands of cities have shifted their place marking from the promotion of industrial estates to city-image building and to strategic tourism planning (Lim, 1993). Even through this placement brings about the economic prosperity, the flux of tourists and tourism causes a sharp rise in waste production as well as the demands of urban facility and utility beyond the carrying capacity.

Since the future catastrophe of man-made and natural disaster tends to be more severe than the past, human beings have been forced to seek for a suitable strategy in which it enables us to protect our lives against the perceived risks, and to respond these risks through detecting vulnerable spatial, social and economic attributes that can lead to the catastrophe. Such a kind of that strategy has been developed over time, corresponding to the shift of human understanding of the interactive relations between human society and nature (Table 1).

After the experiences from a variety of destructive disasters in 1980s, we have been aware that natural disasters are not amenable to technological quick fixes alone. The attention of risk management strategies has increasingly been paid to behavior changes and disaster risk awareness that follow upon the environmental sustainability campaign. The increase of risk awareness of world leaders association has shifted the role of human society in dealing with disaster impacts from re-active to inter-active. Besides, it has also stimulated human thinking and cognition about social-natural relations. Correspondingly, the risk response approaches have been innovated. This innovative thinking leads to a series of shifts from adaption, via sustainability, to resilience, which is regarded as a core approach defining the way we enhance our capability and aptness to cope with natural disasters.

THEME	PRE-1980'S	1980'S	1990'S
Urbanization trend	Industrialization	Garden City	Globalization, Commercialization, and Tourismization
The exist of nature and culture	Culture is nature	Nature is culture	Nature and culture have a reciprocal relationship between
Risk response approaches	Adaption	Sustainability	Resilience
Human-environment relationship	Human is re-active to the environment	Human is pro-active to the environment	Human is inter-active with the environment
Human centric perception	Environmental crises hit human	Environmental crises are caused by human	Environmental crises are caused by socio-natural interaction
The perceived risks	Environment is dangerous for human	Human is dangerous for the environment	Neither is dangerous if handled carefully, both if that is not the case
Applied tools and strategies	Apply technofixes	No new technology	Minimalist balanced use of technology

Tab.1. The shift of human cognition toward social-natural relations

2 DISASTER RESILIENCE IN THE MODERN URBAN PLANNING

Even the concept of disaster resilience has been proposed since a couple of decades, there is still no unique understanding of this term. Its definition depends on how scholars apply the resilience concept to achieve their goals and objectives. Nevertheless, the practical use of this concept somehow shows remarkable insight into its theoretical plausibility and the difficulties that we face in defining this term.

Focusing on the theoretical background of the term “resilience”, a concept of resilience is developed from its predecessor term, “vulnerability”. The term vulnerability based on the social sciences was proposed in order to respond to the pure hazard-oriented perception of disaster risk in 1970s (Schneiderbauer & Ehrlich, 2004). After that, this term has increasingly been taken as a starting point for risk reduction programs. For instance, it is heavily promoted in “Hyogo Framework for Action 2005-2015” (UNISDR: United Nations Office for Disaster Risk Reduction, 2007).

Vulnerability is broadly understood as the degree of or potential for loss, or as a predictive variable that can potentially be affected by external threats (Armas & Gavis, 2013; Bohle, 2001; Cutter, et al., 2008). Nevertheless, the conceptual framework of vulnerability proves its weaknesses, as it partially defines a group of people or systems exposed to risk without concerning the flexibility and adaptability of those to react and respond the external stressors. In fact, it is, undeniably, necessary to underline the distinction between exposures to external threats and the adaptive capability coping with the threats. The concept of vulnerability has, therefore, been developed and brought about a concept of resilience, which does not only focus on potential impacts on a defined system, but also the essential of coping capacities of the system under pressures from the external perturbation.

The concept of resilience was originally constructed as a concept referring to a system's capability to absorb shocks and persist in an equilibrium state that focuses on maintaining the basic function of the ecosystem. Resilience is to some extent understood as the opposite of vulnerability as if the flip side of a single coin, while some scholars view the relations between resilience and vulnerability differently. Based on the

interdisciplinary approach, resilience and vulnerability can overlap each other as they share a common ground referring to the susceptibility. Resilience generally refers to the adaptability and capability of the defined system that can resist and recover from changes either in terms of physical, social, or natural environment. However, when urban systems are not resilient, the status of the system does not automatically become vulnerable; its state is in a continuum between resilience and vulnerability in which this sliding state gradually changes into vulnerable. Hence, vulnerability and resilience are not a static state, but they are a dynamic process in which they were misleading in the measurement process that views them as a static state.

3 A SOCIAL LEARNING PROCESS AS A TOOL FOR ENHANCING DISASTER RESILIENCE OF CITIES

Based on the lens of urban planners, urban resilience to disaster mainly comprises of three adaptive capacities: 1) the stability, 2) the reactive responsibility, and 3) the innovative recoverability. The stability refers to a capability to absorb stress or destructive forces through resistance or adaptation, whereas the reactive responsibility determines a capability to manage or maintain some essential functions and structures during disastrous events. On the contrary, the term innovative recoverability is used to express complementarily a capability to recover or 'bounce back' quickly after disasters. To express how those three cover a great proportion of the different elements of resilience, we divide a city state into pre-, during-, and post-disaster time, and the characteristics of urban resilience can be identified by the overall state of city (Figure 1). However, this state based on a resilience approach may not reflect all practical situations as it merely presents the idea of reconstruction process rather than the restoration process that are more related to the theoretical resilience. The other weak points towards concepts of resilience are not represented through absolute terms, but the representation is simply compared with a status quo level of the defined system's functionality.

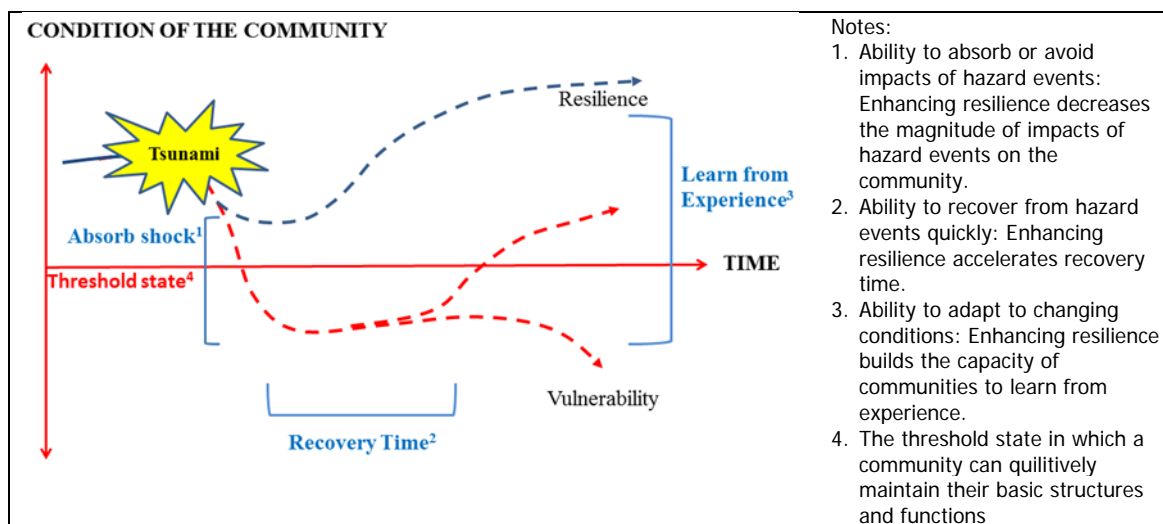


Fig. 1 Role of Resilience in Determining the Urban System's Response to Hazard (adapted from Twigg, 2007 and UNISDR: United Nations Office for Disaster Risk Reduction, 2007)

Thousands of scholars and philosophers have been trying to re-define the concept of resilience and invent a variety of variables to describe an ideal resilient system. This concept is re-defined to amplify the principal capability and adaptability of the system - rather than the qualitative capacity - for processing self-renewal,

self-organization, and the innovative development beyond its principle from the ecological discipline. Nowadays, a resilient system is measured by its unique characteristics instead of its dynamic state during the perturbation. To enhance the understanding of the resilience, Cutter and colleagues (2008) shed the light on resilience indicators that involves different aspects in the indicator development; those include ecological, social, economic, institutional, infrastructural, and competent aspects. Within this indicator development, the resilient system is surrounded by various elements and characteristics referring to, for example, the robustness, adaptability, and transformability of the defined system. Through integrating those constituents into a disaster cycle, a model of key dimensions of resilience was framed by Galderisi, Ceudech, Ferrara, & Profice (2012) (Figure 2).

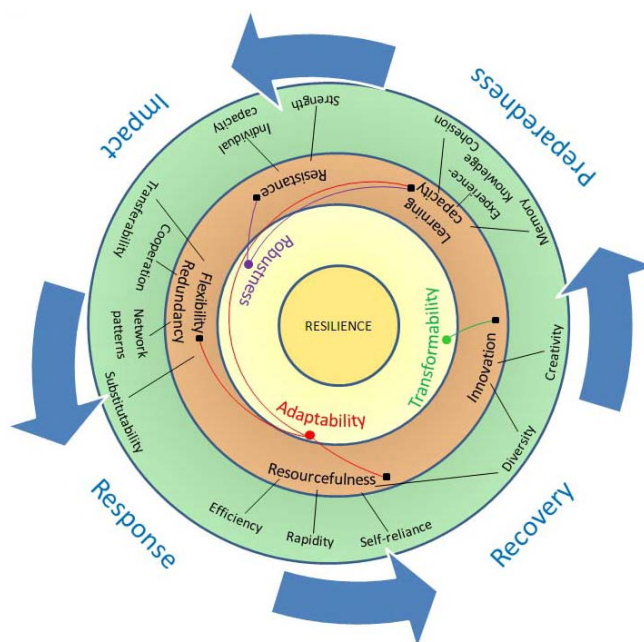


Fig. 2 The key dimensions of resilience in the disaster cycle (Galderisi, Ceudech, Ferrara, & Profice, 2012)

In sum, the resilience of a defined system is not only the sum of each component, but also a dynamic interaction of individual and collective processes at different levels, which contribute to the adaptability and capability to the system to withstand changes. Hence, components of each realm - such as socio-economic characteristics, built- and natural environment - contribute to the capability of the system to turn negative circumstances to opportunities. This dynamic interaction between the system and changes may eliminate or transform some components of the process in order to maintain the system's continuity and growth as an entity.

This study proposes a conceptual model of urban resilience to guard against disaster risk (Figure 3). Resilience in this model is interpreted as both an outcome and a process of disaster preparedness and recovery. This recovery after disaster should be considered as a restoration process rather than a regular reconstruction. Whereas urban resilience to natural disaster means that components of urban system - built and natural environment, human capital, and socio-economic activities - are able to withstand disaster impacts without qualitatively losing its basic functionalities and physical structures that are necessary to maintain livelihood of their users. Urban resilience here is the dynamic process that shifts the urban system from vulnerable, to resilient, and then advances to innovative urban transformations. Nevertheless, this

active movement requires sufficient adaptive capacities and a better social learning process as a set of catalysts to a resilient urban transformation.

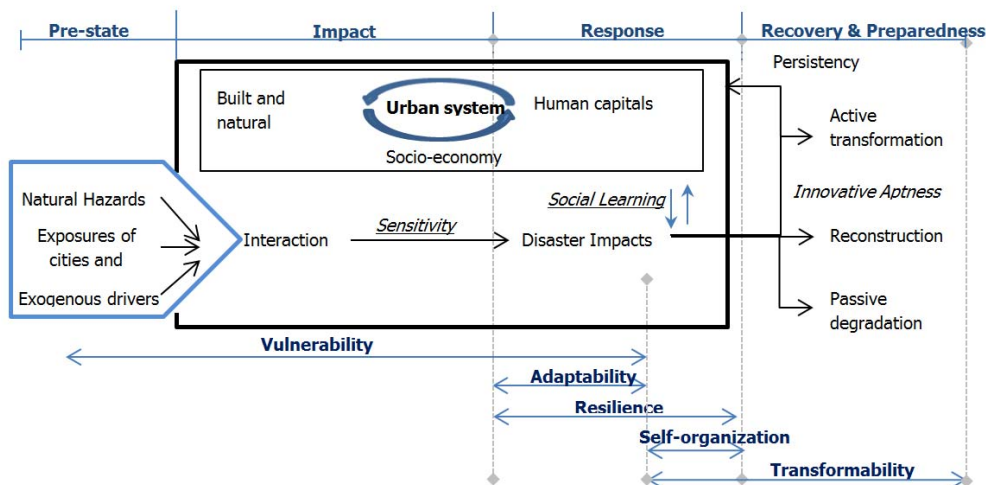


Fig. 3 The conceptual model of urban resilience to disaster (adapted from Twigg, 2007; U.S. Indian Ocean Tsunami Warning System Program, 2007; Chapin, 2009; and Galderisi et al., 2012)

4 IMPROVING A SOCIAL LEARNING PROCESS THROUGH UTILIZING THE URBAN GAMING SIMULATION

Under the aforementioned framework of urban resilience to disaster, risk information sharing and transfer has been recognized as one of the crucial problems of the social learning process. Theoretically, disaster risk management can be integrated into the urban planning field for achieving disaster resilience goals depending on how well the risk assessment is conducted by and conveyed to the public. We need to realize that the risk assessment cannot be a standalone tool of disaster risk management, and it is indispensable to take three board actions of risk analysis, communication, and management into account (Bendimerad, 2008). Based on the top-down approach of disaster risk management, a traditional goal of urban risk management aims at producing a hazard map and risk management policies, and after that bringing them into the locality's consideration. As a result, a delicate concept of risk zoning policy has been increasingly considered as the fundamental discipline for urban and infrastructure planning in Europe and North American continents in the mid-nineteenth century. However, the production of those hazard maps and its relevant policies, in many cases, ignores the essentials of public participation and implicit data arisen form the public, which results in increasing risk and vulnerability of the cities. We have experienced from thousands cases which those actual outcomes of the implementation of risk zoning policy are significantly different from the plans. In some cases, the vulnerability of cities and people living in those cities is continuity increasing instead of decreasing. Those situations can refer to a breakdown of administrative management or a failure of risk communication between experts and the public.

In fact, before a formal risk analysis is initiated, risk information related to both physical attributes and social vulnerability must be obtained from the public, whereas the outcome of risk analysis should also be transferred to the public in the way that can cultivate them the risk awareness. The study proposes, therefore, a new conceptual framework of disaster risk communication, which can contribute to the better result of disaster risk management and enhance the urban resilience. Figure 4 illustrates the role of risk

communication as a means of overcoming the main problems of the contradictory risk perception and awareness between the public and risk managers, while retaining the advantages of sophisticated computer-based risk assessment. In order to enhance the public cooperation, results of dynamic modeling of risk assessment should be conveyed effectively to the public in a proper way that can raise public awareness of environmental hazards. Thereby, the disaster risk managers and planners are expected to develop their risk communication skills as well as to invent an innovative risk communication approach, which enables local community members to get involved collectively in risk communication and management processes.

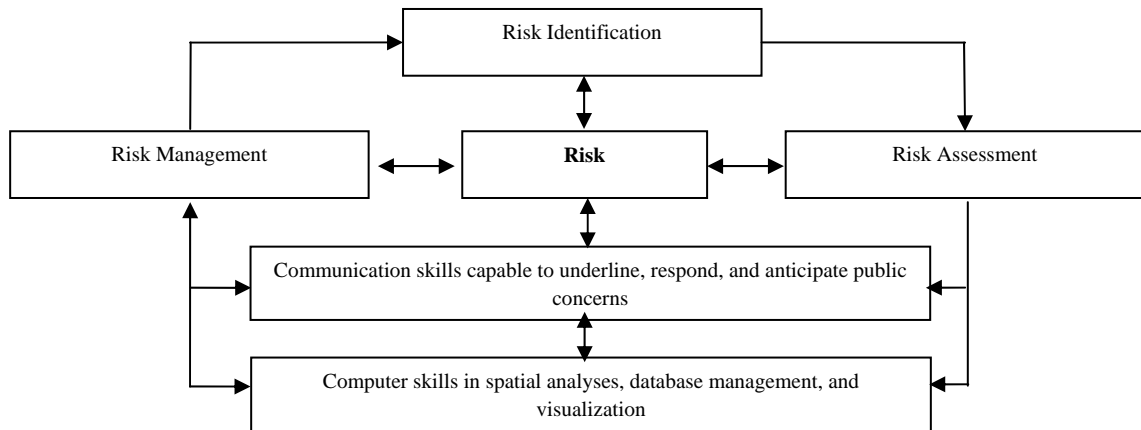


Fig. 4 The integration of risk communication with spatial risk management (adapted from Hatayama, 2007)

Risk communication plays an important role in an interactive exchange of risk information and opinions among risk assessors, risk managers, the public, and other stakeholders (World Health Organization: WHO, 2012). Applicable in the situations where either the qualitative information or precious consideration of hazards is undertaken, risk communication can be used for two different purposes: the data collection and information transfer. It is a useful action to obtain the risk information from different vulnerable groups for the increased effective risk analysis as well as to disseminate risk information among individuals, groups, and institutions in order to educate the public about possible effects of hazards (Ng & Hamby, 1997; Morrow, 2011). Therefore, the formation of risk communication should be taken into consideration as a common action in the disaster risk management. Decision makers have to receive little attention to the paradox in which the intricate risk modeling may provide qualities of risk assessment, but its outcome seems to be incomprehensible to the public (Figure 5). The remarkable issue is how far we can go along with sophisticated risk mapping techniques in visual risk communication, while the risk information and warning can be accessible and simply understandable for them.

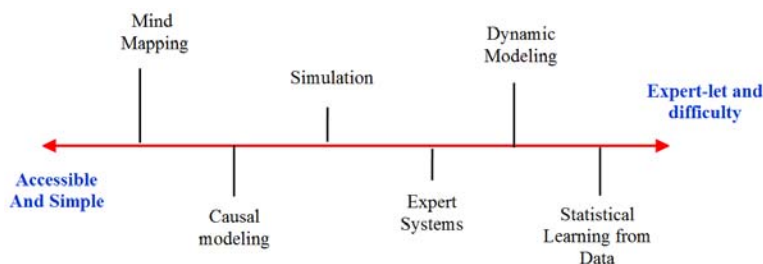


Fig. 5 The sophistication spectrum of risk mapping techniques to visually model and communicate risk (Neil, n.d.)

Among the risk communication techniques in the Figure 7, the simulation is respected as a communication technique, capable to convey a message that falls in a middle range between the understandable simplicity for the public and the expert-level difficulty. Additionally, this simulation technique can be used as a communication tool of urban planning and design in which it can be transferred from a traditional computerized simulation into the gaming simulation. By this way, a sophisticated simulation that provides a complex context of the reality can be represented coherently by a pleasant and playful game, so-called “gaming simulation”, that offers the players to play and make changes to a mock-up of the reality, in order to broaden and deepen understanding the reality that surrounds them. Besides, the gaming simulation offers representatives of stakeholders the opportunity to meet each other, discuss and exchange their different information and opinions on a specific issue, which enable a fruitful communication avoiding a risky judgment on wrong terms.

Additionally, the comparison between two different sciences of urban planning and that of gaming simulation can make better understanding on the differences and the overlapping parts between them. The science of urban design and planning deals with analysis and synthesis on the issues related to infrastructural engineering and social construction of the reality, while the science of urban gaming and simulation mainly emphasizes the importance of building metaphor of the reality under a specific purpose to pursue defined goals (Klabbers, 2006). In a process of producing the urban gaming simulation, the planner can take double vital roles as a designer and a facilitator. Those roles can help the planner in addressing questions that fit into the realm of resolving chronic policy problems related to, for example, a policy implementation issue of the difference between the public risk awareness and desirable behaviors. On the other hand, designing an urban gaming simulation and facilitating the play allow the planner to use this mechanic and its results for collectively representing tangible solutions to real-world controversial risk management, which often faces the conflict over the different interests as well as tricky interpersonal and institutional social issues.

It is clear that the sophisticated urban risk management strategy requires careful implementation and appropriate risk communication model integrating with the simulation technique. Thereby, the efforts of disaster risk communication leads to the emergence of Urban Gaming Simulation (UGS) and Disaster Imagination Game (DIG). To visually illustrate how UGS and DIG can transform today's individualism risk awareness that is limited to group of experts to the collectivism one, VADDI (vallo a dire ai dinosaur) designed by Rizzi and et al. (2010) can be taken as an example.

VADDI, a gaming simulation on urban planning and disaster risk management, shows how UGS and DIG work in exchanging information either between experts and the layman or among experts. This game characterizes as a role-playing game giving players a scenario that they were living in a coastal region where is enriched with environment resources such as mountains, forests, rivers, and the suitable land for pastures and cultivations. Players are given roles of government, planners, developers, and citizens who live in one of three neighboring cities: a metropolis, a seaside town, and a picturesque mountain village. This game simulates the reality where different stakeholders have different concerns on urban development according to an individual's role, which possibly bring about the conflict. Additionally, every player is given personal projects to carry out and to make decision under the consensus of community member whom the play lives and works with. During the play, the climate change scenarios - such as urban heat, overwhelming rainfall, summer fires, landslides, and floods will be given as a mark of the seasonal transition, whereas some areas are subject to prolonged periods of drought. Thereby, the players are put into the situation where environmental problems are no longer under control. During the last phase of the game, players will be motivated to think about their risk and city vulnerability, which let them express their ideas and options related to the future of regional development concerning on environmental risk. Remarkably, this game

simulation can reach its ultimate usefulness when the political advocacy translates the messages from the discussions into risk management projects, strategies and law.

4 DISCUSSION

Decision-makers and planners nowadays know well how to apply their computer skills to obtain and analyze the urban physical attributes contributing to disaster risk and vulnerability, but they are rarely capable of bringing the risk analysis to the public consideration. As a result, this phenomenon manifests the failure of risk communication and a methodology used to identify the problems as well as to reveal a complexity of urban system and its social vulnerability. On the other hand, this reminds human beings that the successful efforts to render the adaptive capability to interact with disaster risk is not only limited to reducing the vulnerability of urban systems, but also alleviating the vulnerability of social structures.

The idea for risk communication, in the face of disaster, can make the urban planner and risk managers deepen their understanding about the reasons behind people's actions that either impede or motivate them to perform desirable protective measures corresponding with a risk zoning policy that is enacted. Similarly, improving urban risk communication through applying the gaming simulation provides the urban planners and practitioners a bridge between their viewpoints on urban risk management with the public risk awareness that actually exists. An integration of the gaming simulation and the urban risk management innovates a traditional simulation to a metaphor of complex urban and social systems, which is so-called "urban gaming simulation". This urban gaming simulation can enable a mutual social learning environment that is regarded as a fundamental principle of enhancing urban resilience against natural disaster.

REFERENCES

- Armas, I., and A. Gavris. (2013). "Social vulnerability assessment using spatial multi-criteria analysis (SEVI model) and the Social Vulnerability Index (SoVI model) - a case study for Bucharest, Romania." Edited by A. Steinführer. *Natural Hazards and Earth System Sciences* 1481–1499. <http://www.nat-hazards-earth-syst-sci.net/13/1481/2013/nhess-13-1481-2013.pdf>.
- Barnett, J. (2001). "Adapting to Climate Change in Pacific Island Countries: The Problem of Uncertainty." *World Development* (Elsevier) 29 (6): 977-993.
- Bendimerad, F. (2008). "State of the Practice in Disaster Risk Management: Urban Risk. Earthquake Megacities Initiative." PreventionWeb. Prevention. Accessed November 10, 2012. <http://www.preventionweb.net/english/hyogo/gar/background-papers/documents/Chap5/thematic-progress-reviews/urban-risk/EMI-Urban-DRM-Practice.doc>.
- Bohle, H-G. (2001). "Vulnerability and criticality: Perspectives from social geography. International Human Dimensions Programme on Global Environmental Change (IHDP)." *Managing the risks of extreme events and disasters to advance climate change adaptation (SREX)*. February. http://ipcc-wg2.gov/njlite_download.php?id=6390.
- Bramwell, B., and L. Rawding. (1996). "Tourism marketing images of industrial cities." *Annals of Tourism Research* (Elsevier) 23 (1): 201-221. <http://www.sciencedirect.com/science/article/pii/0160738395000615>.
- Chapin, Terry. (2009). *Concept and strategies to address sustainability in a changing world*. Alaska: Living on Earth: EPSCoR. www.alaska.edu/epscor/living-on-earth/Terry-Chapin.ppt.
- Cutter, Susan L., Lindsey Barnes, Melissa Berry, Christopher Burton, Elijah Evans, Eric Tate, and Jennifer Webb. (2008). "A place-based model for understanding community resilience to natural disasters." *Global Environmental Change: Local evidence on vulnerabilities and adaptations to global environmental change* (Elsevier) 18 (4): 598–606.
- Galderisi, Adriana, Andrea Ceudech, Floriana F. Ferrara, and Andrea S. Profice. (2012). "Del. 2.2: Integration of different vulnerabilities vs. natural and na-tech hazards. ENSURE : Enhancing resilience of communities and territories facing natural and na-tech hazards." http://www.ensureproject.eu/ENSURE_Del2.1.1.pdf.

- Hatayama, Michinori. (2007). "Integrated Database Management Method for Disaster Risk Governance." International Institute for Applied Systems Analysis (IIASA). September. Accessed November 13, 2012. <http://webarchive.iiasa.ac.at/Research/RAV/conf/IDRiM07/Papers/Hatayama.pdf>.
- Klabbers, Jan H.G. (2006). "A framework for artifact assessment and theory testing." *Simulation & Gaming* (SAGE Publications) 155-172.
- Krimsky, Sheldon. (2007). "Risk communication in the internet age: the rise of disorganized skepticism." *Environmental Hazards* 7: 157–164.
- Lim, Hoe. (1993). "Cultural strategies for revitalizing the city: a review and evaluation." *Regional studies: Journal of the Regional Studies Association* (Routledge) 27 (6): 589-595.
- Mitchell, D. (2010). "educing Vulnerability to Natural Disasters in the Asia Pacific through Improved Land Administration and Management." FIG: Federation Internationale des Geometres. October. Accessed April 14, 2012. http://www.fig.net/pub/monthly_articles/october_2010/october_2010_mitchell.html.
- Morrow, Betty H. (2011). *Risk behavior and risk communication: Synthesis and expert interviews*. Silver Spring: the Food and Drug Administration (FDA).
- Neil, Martin. n.d. "Using Risk Maps to Visually Model and Communicate Risk." *Using Risk Maps to Visually Model and Communicate Risk*. Agena Ltd. & Risk Assessment and Decision Analysis Research Group. London, Queen Mary. Accessed October 25, 2013. http://www.agenarisk.com/resources/Using_Risk_Maps.pdf.
- Ng, K.L., and D.M. Hamby. (1997). "Fundamentals for establishing a risk communication program." *Health Physics* (73): 473-482.
- Pelling, Mark. (2003). *The vulnerability of cities: Natural disasters and social resilience*. London: Earthscan Publications.
- Rizzi, P. and et. al. (2012). *VADDI: Kit didattico di giocosimulazione sui cambiamenti climatici (Didactical kit of gaming simulation on the climate changes)*. Rome: ISPRA.
- Schneiderbauer, Stefan, and Daniele Ehrlich. (2004). *Risk, Hazard and People's Vulnerability to Natural Hazards: a Review of Definitions, Concepts and Data*. Brussels: Office for Official Publication of the European Communities.
- Twigg, John. (2007). *Characteristics of a disaster-resilient community: a guidance note, version 1*. the DFID Disaster Risk Reduction Interagency Coordination Group. <http://practicalaction.org/docs/ia1/community-characteristics-en-lowres.pdf>.
- U.S. Indian Ocean Tsunami Warning System Program. (2007). *How Resilient Is Your Coastal Community?: A Guide for Evaluating Coastal Community Resilience to Tsunamis and Other Hazards*. Bangkok: USAID: the United States Agency for International Development. http://www.preventionweb.net/files/2389_CCRGuidelowresatq.pdf.
- UNISDR: United Nations Office for Disaster Risk Reduction. (2007). *Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disasters*. ISRD: International Strategy for Disaster Reduction. http://www.unisdr.org/files/1037_hyogoframeworkforactionenglish.pdf.
- Van der Leeuw, Sander E., and Chr. Aschan-Leygonie. (2000). *A Long-Term Perspective on Resilience in Socio-Natural Systems*. Santa Fe Institute. <http://samoa.santafe.edu/media/workingpapers/01-08-042.pdf>.
- World Health Organization: WHO. (2012). *Definitions of risk analysis terms related to food safety*. November 13. http://www.who.int/foodsafety/publications/micro/riskanalysis_definitions/en/.
- Xiao, Guirong. (2007). *Urban Tourism: Global-Local Relationships in Dalian, China* (Doctoral dissertation). Waterloo, Ontario, February 19. <https://uwspace.uwaterloo.ca/handle/10012/2728>.

IMAGES SOURCES

Fig. 1: adapted from Twigg, 2007 and UNISDR: United Nations Office for Disaster Risk Reduction, 2007

Fig. 2: Galderisi, Ceudech, Ferrara, & Profice, 2012

Fig. 3: adapted from Twigg, 2007; U.S. Indian Ocean Tsunami Warning System Program, 2007; Chapin, 2009; and Galderisi et al., 2012

Fig. 4: adapted from Hatayama, 2007

Fig. 5: Neil, n.d.

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