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.

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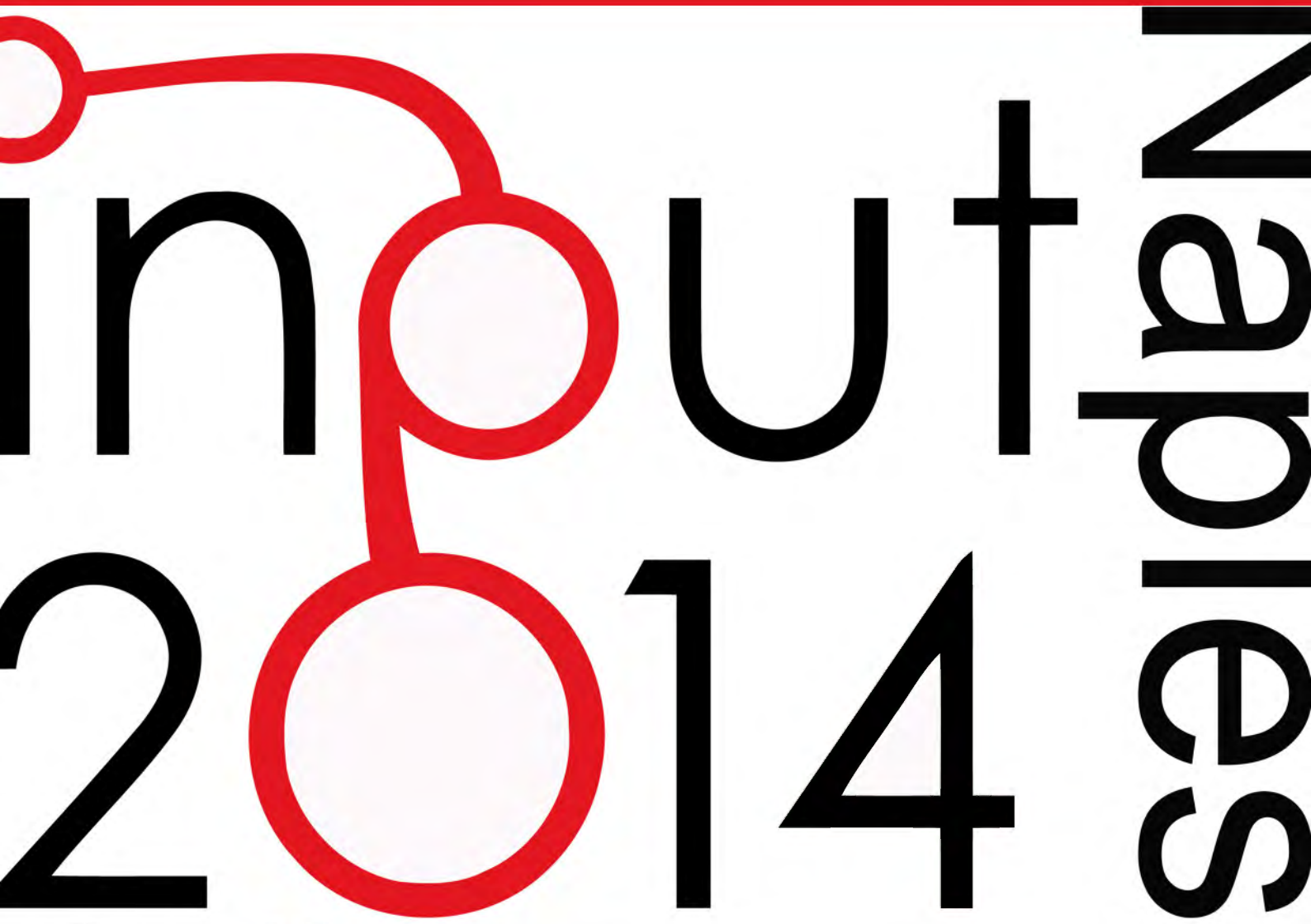

Smart City

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

SMART CITY

PLANNING FOR ENERGY, TRANSPORTATION AND SUSTAINABILITY OF THE URBAN SYSTEM

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Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"
Piazzale Tecchio, 80
80125 Naples
web: www.tema.unina.it
e-mail: redazione.tema@unina.it

TeMA Journal of Land Use, Mobility and Environment

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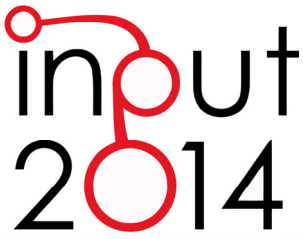
TeMA Journal of Land Use, Mobility and Environment

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.



TeMA Journal of Land Use, Mobility and Environment

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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.

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SPECIAL ISSUE

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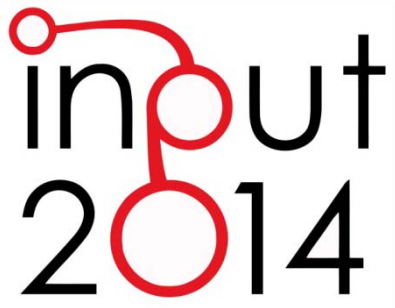

URBAN GAMING SIMULATION FOR ENHANCING DISASTER RESILIENCE

A SOCIAL LEARNING TOOL FOR MODERN DISASTER RISK MANAGEMENT

SARUNWIT PROMSAKA NA SAKONNAKRON[a], PONGPISIT HUYAKORN[b], PAOLA RIZZI[c]

[a b] Department of Architecture, Design and Urban Planning
University of Sassari

e-mail: [a] sarunwit@hotmail.com

[b] p.huyakorn@gmail.com

[c] Department of Architecture, Design and Urban Planning
University of Sassari
e-mail: rizzi@uniss.it

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 chance 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 chances 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 & Gavris, 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 shares 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.

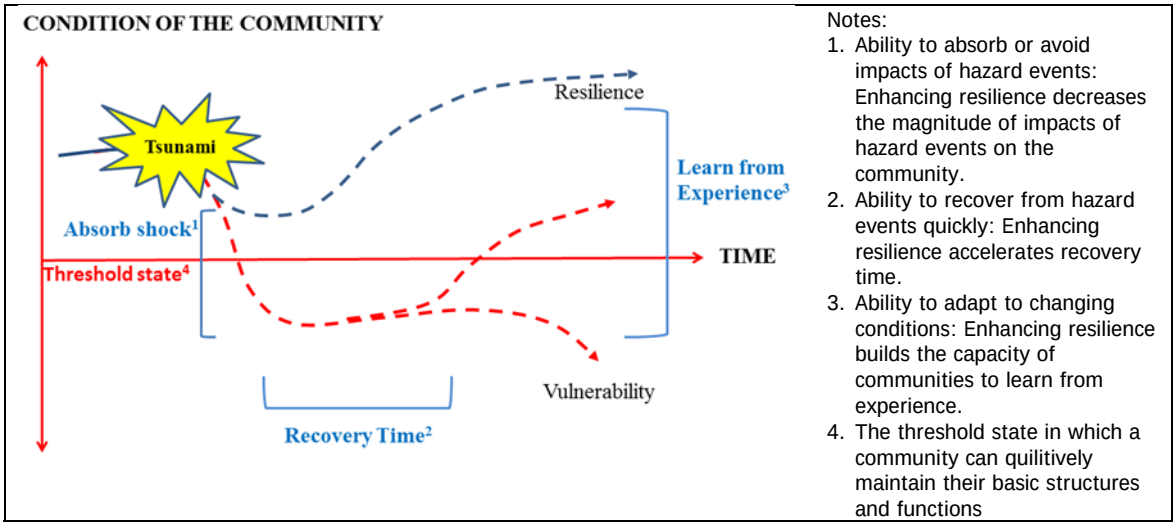

Fig. 1 Role of Resilience in Determining the Urban System's Response to Hazard (adapted from Twigg, 2007 and UNISDR: United Nations Office for Disaster Risk Reduction, 2007)

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).

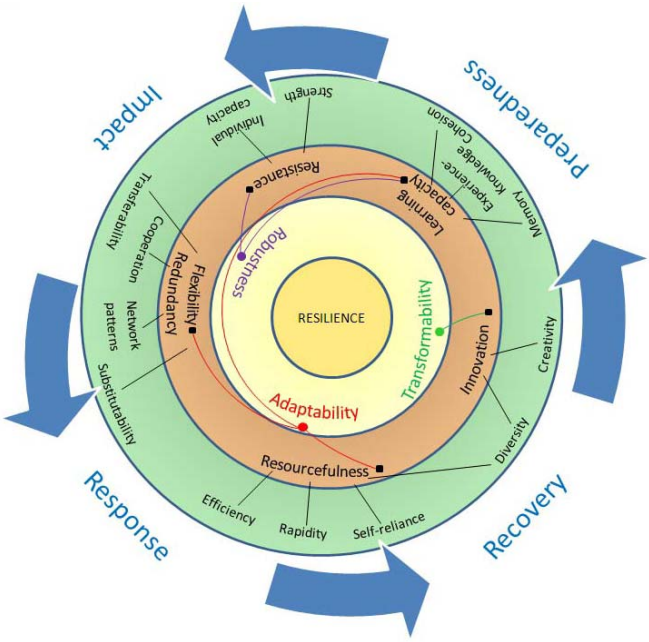

Fig. 2 The key dimensions of resilience in the disaster cycle (Galderisi, Ceudech, Ferrara, & Profice, 2012)

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.

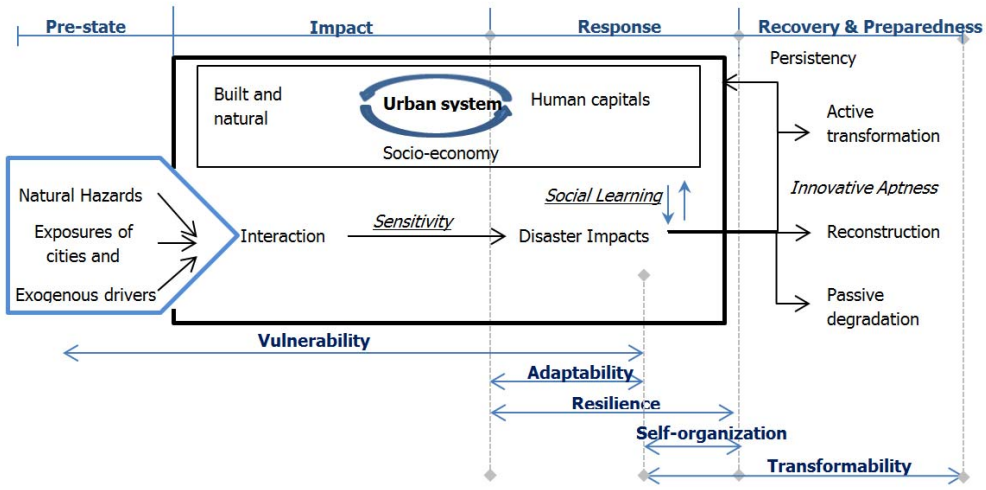

Fig. 3 The conceptual model of urban resilience to disaster (adapted from Twigg, 2007; U.S. Indian Ocean Tsunami Warning System Program, 2007; Chapin, 2009; and Galderisi et al., 2012)

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.

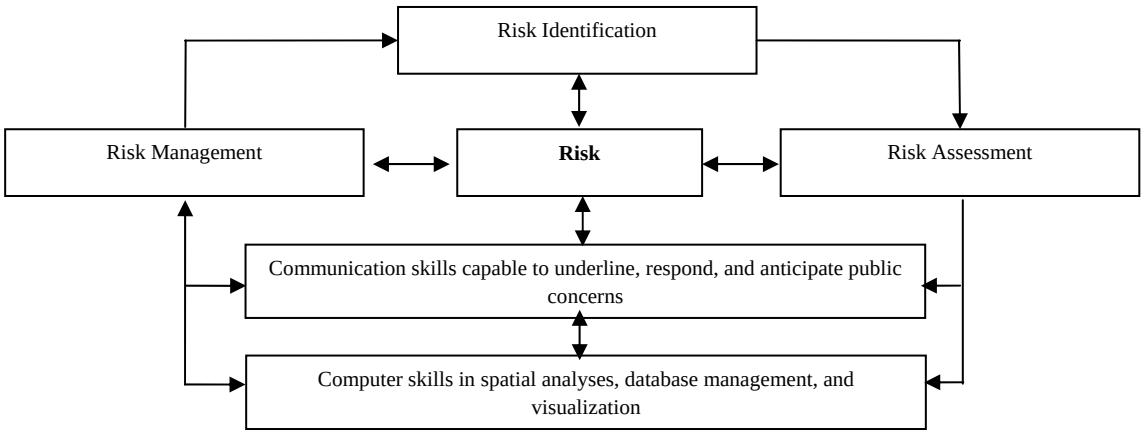

Fig. 4 The integration of risk communication with spatial risk management (adapted from Hatayama, 2007)

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.

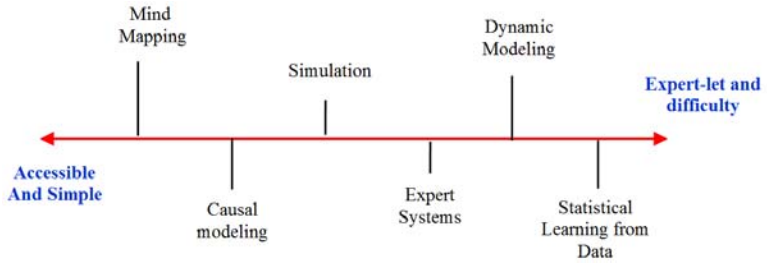

Fig. 5 The sophistication spectrum of risk mapping techniques to visually model and communicate risk (Neil, n.d.)

Among the risk communication techniques in the Figure 7, the simulation is respected as a communication technique, capable to convey a massage that falls in a middle range between the understandable simplicity for the public and the expert-let 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.

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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.

AUTHORS' PROFILE

Sarunwit Promsaka Na Sakonnakron

He earned a bachelor's degree in Urban Planning (Thammasat University, Thailand) and got a Master's degree in policy sciences (Ritsumeikan University, Kyoto, Japan). He is now a PhD candidate of Department of Architecture, Design and Urban Planning (University of Sassari, Italy).

Pongpisit Huyakorn

He received his bachelor's degree in Urban Planning from Thammasat University, Thailand, and got a Master's degree in policy sciences from Ritsumeikan University, Japan. Recently, he has decided to pursue a doctorate in urban planning, and he is now a PhD candidate of Department of Architecture, Design and Urban Planning (University of Sassari, Italy).

Paola Rizzi

She is a Professor of the Department of Architecture, Design and Urban Planning at University of Sassari. She has more than 15 years of experience in gaming simulation and urban planning. She is a founder and director of the international summer school ISAGA (international simulation and gaming association). She was a visiting professor of Virginia Tech, School of Public and International Affairs, Blacksburg, Virginia, USA. During the last decade, she has also taken a role as a visiting professor of Ritsumeikan University, Kochi University, Nagoya University, and etc. She was also part of the steering committee of ISAGA, ACRI, and the board of directors of many institutions and associations, such as CUPUM – Computers in Urban Planning and Urban Management.