

Waterfront planning: a window of opportunities for post-disaster reconstruction

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Abstract

Waterfronts, where the land meets the ocean, sea, lake, river or canal, are unique, finite resources representing, often, the best opportunity for community enhancement and enrichment. The waterfront development has represented an invaluable occasion for many cities around the world to delineate and enhance their socio-economical role both at national and international level.

On the other hand, waterfronts are highly risk-prone areas. Water-related disasters, like hurricanes, tsunamis, river flooding, sea-storms have affected waterfront areas causing huge economic losses and involving millions of people in the last decades. Unfortunately, these devastating scenarios seem to be realistic warnings for the future, due to the impact of climate change and global warning.

It is therefore necessary and urgent to promote an effective pre-disaster planning for waterfront area and to enhance the awareness about the window of opportunities not to be missed while reconstructing waterfronts after disasters. In this paper the driving principles to develop sustainable waterfront area are presented and the feasibility of their implementation for post-disaster reconstruction is discussed. The chances for reducing the risk affecting waterfront areas, while reconstructing, are briefly examined.

The opportunities got to initiate social-economical development, to enhance the resilience of the community and to reduce the risk, while reconstructing waterfront areas after disasters, will be presented and discussed in relation to two study cases.

Keywords: sustainable development of waterfront; risk; post-disaster reconstruction of waterfronts.

Introduction

Waterfront is, by definition, the land alongside a body of water, or the dockland district of a town or a city. However, the waterfront should not be simply considered as a line,

but should be more correctly envisaged as a network of places, functions, additions and hinges between the coast and the city, between the port and urban activities. The waterfront has to be imagined as a concentration of functions that can be productive, cultural, relational, recreational, residential and public. It is not a closed and protective area, but an osmotic interface, with a permeable perimeter. A waterfront can not be considered as a local hub, but more correctly as a crossroad of infrastructural strips on sea and land that run across, that nourish it: the core of an increasingly planetary network of relational energies. Finally, a waterfront should not to be seen just story and not just future, but is a fertile synthesis of history and perspectives: it is a place in which informed historic knowledge nurtures visions for the future, and which the ambition of strategies produces an effective interpretation of the past (Carta 2006).

Urban waterfronts are, therefore, dense and hybrid places where resources, opportunities, aspirations and ambitions held by the city could become vision, strategy and project, capable of generating a new urban form and producing a new landscape to make cities more vital, communicative and competitive. The planning, development and revitalisation of waterfront areas represent a multidisciplinary and multitask issue, that have to account for the economic, social and cultural development of the community all-together and have to respect, on the other hand, the historical, social and urban conditions of the waterfront.

Consequently, the relationships of the cities with their waterfronts has become, nowadays, a central topic and a paradigmatic element of the more advanced urban planning policy. In order to enhance scientific studies and research about the planning and design stages necessary for an effective development of waterfront area, specific research centres and non-profit organisations have been established all over the world including:

- the Waterfront Center, Washington (<http://www.waterfrontcenter.org/>);
- the Waterfront Vitalization and Environment Research Center, WAVE, Minatoku, Tokyo (www.wave.or.jp);
- the International Association Cities and Ports, Le Havre, France (www.aivp.org);
- the International Centre Cities on Water, Venice, Italy (www.citiesonwater.com).

The main aim of the International Centre Cities on Water is to encourage and improve scientific and cultural exchange between cities on water throughout the world. The Centre intends to establish himself as a reference point for all those who are involved in restoring a positive relationship between water and city, between water and urban context.

The International Centre Cities on Water is concerned with documentation, information, study and research into the problems and experiences of urban settlements which have a close relationship with water including cities on water that have developed along coasts, within gulfs, bays and lagoons, on lakesides or estuaries or on the banks of important rivers. The Centre has recently published, a collection of data about port cities and urban waterfronts regeneration projects and realisations "Port cities and urban waterfront" (Giovinazzi 2007), with the aim to provide an easy-to-use tool and a contribution for community and planners facing the issue of waterfront planning and development.

Thanks to the collaborative work promoted by the aforementioned centres and organisations, a set of trends are developing that are in the process of changing the face of port cities, and of other cities on water, in many countries around the world. These global trends are creating attractive urban waterfront environments for the 21st

century whilst responding both to wider demands for urban renewal and also to changes in the technology of maritime transport (Bruttomesso 1993).

However, in spite of all the opportunities related with the waterfront development, it is no possible to disregard that waterfronts are highly risk-prone areas. Water-related disasters, like hurricanes, tsunamis, river flooding, sea-storms have affected waterfront areas causing huge economic losses and damage to structures and millions of people in the last decades. The need to reconstruct waterfront area has been a complex reality to deal with in the past and it is likely to become more and more an urgent reality for the future. It is, therefore, essential to promote a pre-disaster planning for waterfront area accounting for the fact that, after a natural disaster, there will be many resources in scarce supply, but the scarcest of all it is likely to be strategic planning.

The crucial issue to keep in mind, while reconstructing waterfront areas, is that oceans, seas, island and costal areas form an integrated and essential component of the Earth's ecosystem and are critical for global food security and for sustaining economic prosperity and the well-being of many national economies, particularly in developing countries (2002 World Summit on Sustainable Development Plan of implementation). Waterfront areas should therefore considered part of the cultural and natural heritage of the communities.

Understandably, the post-disaster reconstruction process focus mainly on providing the essential needs for the local communities and on rehabilitating basic infrastructure. Consequently, the attention paid to the damage caused by this disaster to the cultural and natural heritage has been so far very limited (Boccardi and Ostaszewska 2005). However, as Aaronson highlights (2005). "In emergency situations, it is simplistic to think in terms of a rush to save lives followed by a short period of reconstruction. The reality is much more complex, and aiming merely to put things back to the pre-disaster state is to shirk our responsibilities to those affected."

Aware of this urgent need, the University IUAV of Venice, Italy (the only university in Italy teaching Urban and Regional Design and Planning for all disciplines concerned with man's habitat and environment) has recently promoted and funded the research project "Waterfront resilient reconstruction: guidelines for post-disaster waterfront planning" led by Dr. Oriana Giovinazzi. The final objectives of this reserch are to identify the principles that should be followed to ensure a sustainable and conscientious post-disaster reconstruction for waterfront area able, on one hand, to enhance the opportunity for the stricken communities and, on the other hand, to reduce future risk.

This paper presents a first insight into the reserch purposes. The principles that have been established and that are currently applied for waterfront development in "non-post-disaster situation" will be first of all presented, and the feasibility of their implementation for post-disaster reconstruction will be discussed. Secondly, the issue of risk connected with waterfront area will be briefly discussed in order to highlight how, a conscious post-disaster reconstruction process of waterfront areas, could and should include means for reducing the risks.

Finally, in order to increase the awareness about the opportunity of waterfront planning and reconstruction after a disaster, two ad hoc case studies will be presented, including the development of Beirut's new waterfront after 1975-90 Lebanese war and the renewal of Kobe Port after the 1995 Great Earthquake. The opportunities got to initiate social-economical development, to enhance the resilience of the community and to reduce the risk, while reconstructing waterfront areas, will be highlighted while presenting the study cases.

Waterfront planning and sustainable development

Several regions in Europe and all over the world have undergone interesting urban-port conversion processes and urban waterfront transformation projects in recent years.

The sustainable transformation of port cities and urban waterfronts has aimed to recreate a relationship between spaces, uses and visions, between urban image and economic development. The transformation has been achieved developing and implementing specific territorial approaches, tools, and funding strategies and by promoting the dialogue between all the parties involved. In Europe several important cities (e.g. Genoa, Berlin, Glasgow, Valencia, Liverpool just to mention few) have focused on the waterfront development as a strategy to pull ahead their urban and territorial development. All over Europe, the importance of the relationship between city and port is emerging, as well, in small and medium urban realities. These realities, are choosing to delocalise industrial and commercial activities into areas outside the city centre, reclaiming the port and waterfront spaces and structures for the city and for the creation of public spaces, recreational areas, hospitality.

The same trend is observed in America and Asia were large cities (e.g. Baltimore, Boston, Oakland, Toronto, Kobe, Seoul, Singapore, Shanghai), as well as medium-sized cities and small communities are investing in the development and enhancement of their waterfront areas. Waterfront development and enhancement is now a reality in Australia (e.g Melbourne, Sydney) and New Zealand (e.g Wellington) as well.

The urban waterfront development trend has spread beyond the shores of the advanced world to reach the newly-industrializing countries and to touch the poorer developing countries too as they come to reconsider their urban heritage and to find ways to conserve, adapt and re-use long-neglected elements of the waterfront environments of their port cities. East African port cities provide evidence of the increasing diffusion of the waterfront development phenomenon, originally based on European and North American experience, but now increasingly influenced by global trends.

Modern Africa offers a number of examples of active conservation and development in port cities. Best known is Cape Town (South Africa), where the transformation effected in the 1990s is a successful pioneer example. East Africa provides, as well, excellent illustrations of waterfront development processes at work. At Lamu (Hoyle 2001 a) and Mombasa (Hoyle 2001 b) in Kenya, and at Zanzibar (Hoyle 2002 a) and Dar es Salaam (Hoyle 2002 b) in Tanzania, attempts are being made to conserve, rehabilitate and renew parts of the urban heritage, and in these cases the traditional urban waterfront is a critical element in the overall pattern and design of port-city renewal. East African cases show how urban waterfront development can be a significant element in urban conservation and renewal, a spatial domain where, through physical redesign, substantial beneficial change and development can be effected at relatively low cost (Hoyle 2002 c).

The numerous experiences of waterfront development undertaken in the last few years, both in developed and developing countries, have helped in defining guidelines and best practices principles that could be assumed as reference points for planning future waterfront development and waterfront post-disaster reconstruction. Principles for a Sustainable Development of Urban Waterfront Areas and principles for an Integrated Coastal Area Management are presented and discussed in the next paragraphs.

Principles for a Sustainable Development of Urban Waterfront Areas

In the context of the initiatives for the Global Conference on the Urban Future (URBAN 21) held in Berlin in July 2000 and in the course of the EXPO 2000 World Exhibition, 10 Principles for a Sustainable Development of Urban Waterfront Areas were approved. These topics have been previously developed by Wasserstadt GmbH (<http://www.wasserstadt.de/english>) a trustee development agency of the federal state of Berlin in collaboration with the International Centre Cities on Water, Venice, in the course of international seminars attended by local administrators, public and private entrepreneurs, university professors and scholars of the processes to re-qualify urban waterfronts. The value of these 10 principles remains well-founded and their contents may help to understand and evaluate many different projects of waterfront development and revitalisation.

Principle 1 - Secure the quality of water and the environment

The quality of water in the system of streams, rivers, canals, lakes, bays and the sea is a prerequisite for all waterfront developments. The municipalities are responsible for the sustainable recovery of derelict banks and contaminated water.

Principle 2 - Waterfronts are part of the existing urban fabric

New waterfronts should be conceived as an integral part of the existing city and contribute to its vitality. Water is a part of the urban landscape and should be utilized for specific functions such as waterborne transport, entertainment and culture.

Principle 3 - The historic identity gives character

Collective heritage of water and city, of events, landmarks and nature should be utilized to give the waterfront redevelopment character and meaning. The preservation of the industrial past is an integral element of sustainable redevelopment.

Principle 4 - Mixed use is a priority

Waterfronts should celebrate water by offering a diversity of cultural, commercial and housing uses. Those that require access to water should have priority. Housing neighbourhoods should be mixed both functionally and socially.

Principle 5 - Public access is a prerequisite

Waterfronts should be both physically and visually accessible for locals and tourists of all ages and income. Public spaces should be constructed in high quality to allow intensive use.

Principle 6 - Planning in public private partnerships speeds the process

New waterfront developments should be planned in public private partnerships. Public authorities must guarantee the quality of the design, supply infrastructure and generate social equilibrium. Private developers should be involved from the start to insure knowledge of the markets and to speed the development.

Principle 7 - Public participation is an element of sustainability

Cities should benefit from sustainable waterfront development not only in ecological and economical terms but also socially. The community should be informed and involved in discussions continuously from the start.

Principle 8 - Waterfronts are long term projects

Waterfronts need to be redeveloped step by step so the entire city can benefit from their potentials. They are a challenge for more than one generation and need a variety of characters both in architecture, public space and art. Public administration must

give impulses on a political level to ensure that the objectives are realized independently of economic cycles or short-term interests.

Principle 9 - Re-vitalization is an ongoing process

All master planning must be based on the detailed analysis of the principle functions and meanings the waterfront is concerned. Plans should be flexible, adapt to change and incorporate all relevant disciplines. To encourage a system of sustainable growth, the management and operation of waterfronts during the day and at night must have equal priority to building them.

Principle 10 - Waterfronts profit from international networking

The redevelopment of waterfronts is a highly complex task that involves professionals of many disciplines. The exchange of knowledge in an international network between contacts involved in waterfronts on different levels offers both individual support and information about the most important projects completed or underway

Principles for an Integrated Costal Area Management

Integrated Costal Management, ICM analyses and addresses implications of development, conflicting uses, and interrelationships between physical processes and human activities, and it promotes linkages and harmonization among coastal and ocean activities (Cicin-Sain & Knecht 1998). ICM has been proposed and defined as a “process that unites governments and the community, science and management and public interests in preparing and implementing an integrated plan for the protection and development of coastal ecosystems and resources” (GESAMP 1996).

ICM is nowadays an operation reality of how to achieve sustainable development in coastal ecosystems (Olsen 2001) and involves substantive as well as procedural principles. Two broad categories of principles for guiding ICM can be identified: 1) principles based on agreed international norms for environment and development that have emanated from the Earth Summit (Van Dyke 1996) and, 2) key international agreements and principles specifically related to the special character of coasts and oceans.

Principles related to the special character of oceans and coasts have been identified and established in order to capture, on one hand, the essence of the uniqueness of oceans and coasts, and in order to provide, on the other hand, a guidance for ocean and coastal management. The principles have been derived drawing on the work of Van Dyke (1992), Archer and Jarman (1992), Clark (1992), Cicin-Sain and Knecht (1985 and 1998). The resulting eleven principles can be grouped into three main categories:

- *principles related to the public nature of the oceans* - affirming the traditional public character of the ocean: ocean resources should be part of the public domain, not exclusively owned or benefited from by anyone group or person;
- *principles related to the biophysical nature of the coastal zone* - recognising the biophysical nature of the coastal zone and the special circumstances characterising the land-sea interface;
- *principles related to the use of coastal and ocean resources and space* - focusing on the management of conflicts in coastal areas, and on the development of guidelines for use, and public participation.

Towards the definition of the principles for a resilient reconstruction of waterfront areas

To form the basis for the definition of the principles that should be followed to ensure a sustainable and resilient post-disaster reconstruction of waterfront area, the first step taken has been to verify that all the knowledge gained so far from the numerous experiences of waterfront development (and synthesised in the aforementioned principles) do not contradict the guiding principles that are normally followed for achieving a sustainable reconstruction in the disaster affected areas.

To assess that, reference is made in this paper to the ten post-disaster reconstruction principles identified by Sustainable Buildings Canada (Gould et al. 2006) following the Boxing Day Tsunami of 2004:

1. Building back better;
2. Engage and train local communities;
3. Focus on permanent, not temporary solutions;
4. Respect local sustainability practices;
5. Address ecosystem and socio/cultural issues;
6. Use an integrated design process;
7. Aim to restore local economies quickly;
8. Integrate advanced technologies with locally available resources;
9. Keep the implementation plan simple;
10. Communicate best practices and ensure access to information for all stakeholders.

The first one of the post-disaster principles “Building back better” enforces that, as demonstrated by the history, catastrophes can and should be a catalyst for positive changes. This is in agreement with the driving criteria of waterfront development that are the creation and enhancement of new opportunities for the community.

The second-one of the post-disaster principles, highlights the need for the local community to be engaged in the planning as well as in the implementation phase of reconstruction so that all restoration and revitalization activities could be embraced by members of the local population in the long-term. Furthermore, the tenth principle enforces as well that clear and open communications will enable all stakeholders to become engaged with the reconstruction process and that the accessibility of the disaster-affected communities to reconstruction principles and best practices will increase their chances of building sustainable communities. Combining together all the aforementioned concepts, Principle 7 for Sustainable Development of Waterfront states that public participation is an element of sustainability and that the community should be informed and involved continuously from the start of the waterfront development process.

The need to focus on permanent, not temporary solutions, underlined by the third principle for post-disaster reconstruction results from the ascertainment that, unless a plan for transitional and permanent community restoration is developed, it is usually difficult to mobilise resources for sustainable solutions next to the reconstruction phase. This is not in contradiction with the Principle 8 and 9 for Sustainable Development of Waterfronts (respectively “Waterfronts are long term projects” and “Re-vitalization is an ongoing process”) enforcing the need for flexibility and adaptability of reconstruction plans that need to be shaped on the long-term according to the needs and aspirations of the community.

The fifth principle of post-disaster reconstruction affirms that a sustainable reconstruction approach must address, not only the needs of the built environment,

but also ecosystem, socio/cultural and infrastructure requirements. The adoption of such an holistic framework will ensure that the restoration along one dimension will not have a negative impact on other aspects of the long-term health and well-being of the region. The whole structure of principles incorporated into the Integrated Coastal Management include the same holistic framework for the management of coastal areas. Moreover, Principle 1 and 3 (respectively “Secure the quality of water and the environment” and “The historic identity gives character”) for a sustainable development of waterfronts, enforce that the preservation of the ecosystem is a prerequisite for all the waterfront development, and, on the other hand, that the collective heritage of water and city, events and nature should be guaranteed and utilised to give the waterfront development character and meaning.

The sixth principle for post disaster reconstruction affirms that many different kinds of expertise (including engineering, design, construction and finance) are required to develop and implement a sustainable reconstruction plan. Experts and involved stakeholders have to form a collaborative team and work together with the end-user throughout all the reconstruction process to agree on goals, provide input into concept design and development, oversee implementation and evaluate results. This in agreement with Principle 10, stating that the sustainable development of waterfronts is a highly complex task that involves professionals of many disciplines, and with Principle 6, stating that both public authorities and private developers should be involved in the waterfront development.

From this brief assessment of the principles for a Sustainable Development of the Waterfront and for an Integrated Coastal Management in comparison with the ones for a sustainable post-disaster reconstruction, it appears clear that they do not contradict, but conversely enforce the guiding principles for post-disaster reconstruction. Nevertheless, aiming to the definition of a strategic planning for reconstruction of waterfront areas after disaster, it is important to recognise the constraints and limitations caused by a post-disaster condition. For this reason, it is important to work towards the improvement of waterfront strategic planning in order to be able to keep the planning and the strategic design simple, based both on the extensive participation by the local communities and beneficiaries and on the local implementation capacity. The principle to “think local and low cost” can be achieved by: studying the architecture and materials used historically in the region; proposing solutions that integrate advanced technology or micro infrastructure with local materials; training local teams to implement the plan, to take ownership for local reconstruction projects and to maintain systems and equipment in the long-term (Gould et al. 2006).

Waterfronts: vulnerable and risk-prone areas

Waterfronts are highly risk-prone areas. Natural hazards have historically played a major role in directing coastal and waterfront development and nowadays water-related disasters, like tsunami, hurricanes, river flooding, sea-storms, extreme winds are affecting waterfront areas causing huge economic losses and involving millions of people (Fig. 1). Unfortunately, these devastating scenarios seem to be realistic warnings for the future, due to the impact of climate change and global warming.

Coastal and waterfront infrastructure and development have shown, moreover, under the action of non water-related disasters, to be typically more susceptible to damage and destruction than inland facilities (e.g in the case of the earthquakes that have struck coastal areas in Kobe, Japan and Taiwan).

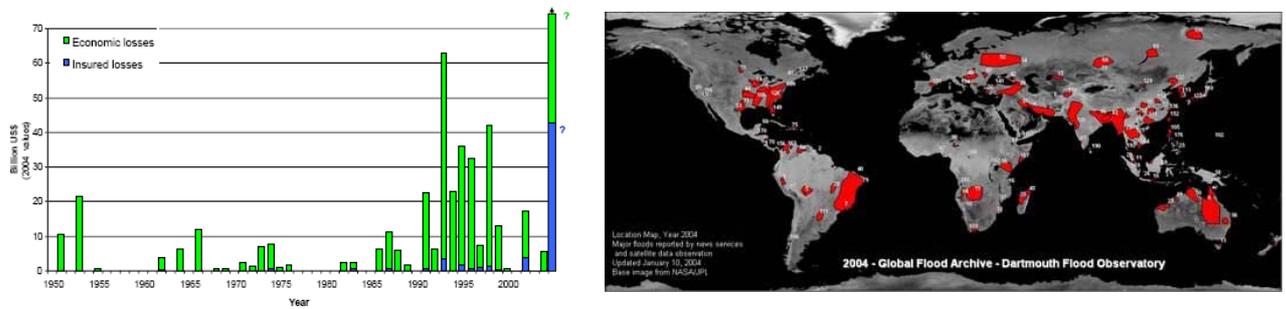


Fig. 1. Flood-related disasters: a) economic and insured losses caused by great flood catastrophes 1950–2005, (source Geo Risks Research, Munich Re, 2006); b) major floods reported in 2004 (source Dartmouth Flood Observatory, 2004).

In order to understand how it is possible to reduce the risk while reconstructing a waterfront area after a disaster, reference can be made to the traditionally accepted definition of risk, i.e. convolution of hazard, vulnerability, exposure:

$$\text{Risk} = \text{Hazard} * \text{Vulnerability} * \text{Exposure}$$

In the context of risks potentially affecting waterfront areas, the three factors can be specified as follow:

- the hazard identifies both natural and man-induced damaging events (e.g. flooding, tsunami, earthquakes, wars)
- the vulnerability includes technical, social, and political dimensions and refers to the degree to which a society is susceptible to the impact of hazards.
- the exposure measures and characterises, qualitatively and quantitatively, the element at risk including people, property, cultural and natural values, business and activities.

A reduction of the overall risk can be achieved by reducing one or more of the three aforementioned factors, namely: hazard, vulnerability and exposure. It is worth highlighting that every risk and situation should be considered and assessed as a specific case.

Making reference to flood risk, for instance, the increased losses due to floods observed in the last two decades (Fig. 1a), have been influenced mainly by two factors:

- an increased hazard, due to human-induced causes (i.e. deforestation, canalisation loss of retention areas change in environmental conditions, climate change, etc).
- an increased exposure, due to people inhabiting low-lying delta areas prone to inundation, changes in land-use, accumulation of values in high risk-prone areas, lack of risk awareness and a wrong risk perception (“feeling of safety behind the dyke”).

The necessary steps to be planned, aiming to limit the flood-risk while developing or reconstructing waterfront areas should aim to:

- reduce the human and business exposure, by relocating business activities out of high risk-prone areas, and decrease the economical exposure by, for instance, preventing high-value areas from flooding;
- reduce the vulnerability of structures and infrastructures;
- reduce the hazards and prepare for flood-events.

Regarding the last point, in the specific case of a periodic risk flooding caused by exceptional high tides, induced by particular meteorological conditions, it is possible to take action with fixed or mobile gates, which can protect the urban areas and preserve

the original ecosystem. These interventions can be designed in such a way to allow the transit of vessel so that they are particularly suitable for the protection of urban harbour areas. Bandarin (1992) examines few examples of these interventions including: the barrage of the Eastern Scheldt estuary in the Netherland, the Thames barriers in London and the mobile barriers for the defence of Venice.

On the other hand, dealing with an unpredictable risk like a tsunami-hazard, reduction of the hazard is unlikely. An early warning system and an effective evacuation plans have to be assumed as the most useful technical means to reduce the risk by reducing the exposure.

Being not always possible to reduce the hazard and for sure impossible to eliminate that, the most challenging aspect of a risk-reduction policy for waterfront areas remains the reduction of the exposure of the coastal communities to be performed by an accurate and effective land-zoning. When dealing with agricultural-based communities, for instance, reconstruction of facilities should take into account the different coastal zones, so that critical services for agriculture (markets, suppliers, storehouse, veterinary services, etc.) as well as farm dwellings should be located further from the shore, in order to improve the resilience of the agro-ecological system in the event of a water-related disaster. It is worth highlighting, however that before planning for any change of land-use, it is necessary to assess whether the reasons for relocation are technically correct. Actually, when moving people away from coastal zones, the tendency to return is almost irresistible. It is likely that there are many social, economic and political reasons why people live in crowded villages near the shore. A strategic land zoning does not simply have to address the changing of the habits of the coastal communities, but must incorporate the aspirations of the communities and address factors that inhibit them from diversification and change of land-use, making it a complex and political process (World Bank OED, 2005).

Resilient reconstruction of waterfronts: two case-studies

Beirut's New waterfront District after the war

During the 1975-90 Lebanese war Beirut's downtown bore the brunt of destruction with the entire infrastructure, two thirds of the buildings left beyond salvage and the waterfront area transformed into a landfill.

Nowadays, the renewal of Beirut is becoming one of the most ambitious city-making ventures of modern time. When the environmental reclamation of the waterfront area will be completed, Beirut will benefit from 73 Ha of new land on the downtown seafront, immediately adjacent to the city's completed restored historic core. No other city on the Mediterranean basin possesses such an asset (Angus 2006).

Throughout the years of war, the downtown foreshore had become a dumping ground for the detritus of war, the rubble of destroyed buildings and the domestic waste of West Beirut, isolated from the municipal sanitation services located in the East of the city. By the end of the war this landfill extended 25Ha into the sea, creating an environmental hazard in the eastern Mediterranean. Turning disaster into opportunity, this landfill has being recycled and incorporated within Beirut's New Waterfront District. The reclamation has had as its primary objectives: the excavation of the landfill to seabed level; the degrading of all vegetable matter to eliminate methane; the extraction of recyclable materials; and the consolidation, on site, of all remaining, after batching, crushing and treatment.

When complete, the New Waterfront District will comprise a city park, quayside and promenades and new waterside development, commanding spectacular views to seaward and to the northeast towards the mountains, snow-capped through winter and spring.

Altogether some of the reclaimed land has been enclosed within a terraced sea-defense system, designed and constructed to withstand centennial storms. The sea-defense system provide harbour enclosures to two new marinas, one of that already operational, containing a public town quay designed to house shops and restaurants, alongside a yacht club and residential apartments.

The renewal of Kobe Port after the Great Earthquake

The international Port of Kobe has sustained the development of the Japanese economy and has been a key factor in the development of Kobe for over 130 years, since its foundation in 1868. The port, which extended 20km from east to west, was seriously damaged by the Great Hanshin-Awaji Earthquake with most of the 116km coastline seriously compromised .

The Hanshin-Awaji Earthquake, which struck the Kobe area on January 17, 1995, killed almost 5,000 persons and injured about 15,000, destroying more than 120,000 home in the City of Kobe. Major damages to quay walls, seawalls, and breakwater were caused by slippage, settling, and tilting. Most of the transit sheds, open storage yards, cargo-handling equipment and private warehouses were also destroyed (Tanaka 2003).

in the aftermath of the earthquake, the Port of Kobe played a multiple role both in the emergency management and response phases, providing a new awareness of the value of the ports could have as a base for transporting emergency goods, and as the base from which restoration and recovery operations could be launched.

Actually, in the aftermath of the Great Hanshin Earthquake, the Kobe port terminals that were undamaged or could be repaired immediately played an indispensable role in evacuating citizens, distributing emergency food and goods and transporting volunteers to the devastated areas. To compensate for paralysed land transportation, emergency repair/reconstruction was promptly began on wharves and other facilities that suffered relatively little damage. These facilities were utilised at fully capacity to receive water, medicine, and other emergency supplies, and to provide sea routes as alternatives to the destroyed land transportation.

Also, as rescue and restoration operations progressed, the green and open spaces in Kobe Port and in the adjacent artificial islands, provided space for temporary housing, space for storing and disposing of debris. In response to the emergency, the Port offered sites for heliports and for the storage of emergency supplies. To help the reconstruction of urban areas that suffered severe damage, the Port offered disposal sites for debris and wreckage from urban areas, and assisted in the transportation of this material (marine routes were used for transporting debris and rubble to avoid road traffic congestion).

In the response and reconstruction phases, both the public and private sectors did their utmost to completely restore Kobe Port, targeting the main goals of making the Port of Kobe “resilient enough to withstand natural disaster”, and to develop the area into an international city of the 21st century.

Soon after the earthquake, the Ministry of Transport, Kobe City and other port-related parties drew up a Port Restoration Plan and began reconstruction work. Kobe Port Restoration Plan has been based on the driving tasks:

- in order to facilitate the early restoration of port functions, repair and reconstruction operations on facilities that could be recovered with minimal repair work were prioritised. Those facilities requiring major repairs were made operational stage by stage.

- the port functions of Kobe Port were planned to be restored to their original state over a period of two years. The transportation system, the harbour Highway, the offshore breakwater and coastal preservation facilities were repaired by the end of 1996. By the end of 1997, the number of foreign trade vessel that visited Kobe Port reached 80% of the pre-earthquake level.
- the Port of Kobe was, not only, restored to its original state, but the expansion of the container terminals and the redevelopment of obsolete conventional terminals were promoted to enable Port Kobe to become the “*Asian Hub Port for the 21st Century*”, a more advanced, international port. To this aim, port facilities straddling a new man-made island, and the redevelopment of existing terminals were both promoted. The city and the port were integrated to redevelop the port area as a multifunctional, complex city.
- Port facilities were reinforced to make them more earthquake resistant. A committee for “Studying and Researching Earthquake Resistant Port Structures” was established for studying the earthquake resistance of individual port facilities, and for enhancing the earthquake resistance of the entire port. The immediate measures taken for strengthening the earthquake resistance of the port included plans to enforce earthquake resistant designs (increased level of seismic intensity accounted for in the design and combination of different earthquake-resistant structural system), constructions of stronger earthquake resistant quays for container and ferry terminals, and construction of disaster prevention center in ports.

Conclusions

A window of opportunities could rise from a sustainable and resilient reconstruction of waterfront areas after disasters. The starting point would be the recognition that waterfront areas are integral part of the cultural and natural heritage of the coastal communities, and that in both their tangible and intangible forms of expression, they may constitute, on one hand, an invaluable resource for reducing the impact of disasters on lives, property, and livelihoods while establishing a culture of prevention and, on the other hand, an opportunity to delineate and enhance the socio-economical role of the community both at national and international level.

Post-disaster reconstruction should target the preservation and the reestablishment of the link between the physical and spiritual heritage that formed the normal context of the life of hit communities before the disaster. Waterfront are an indispensable element to provide affected communities with a much-needed sense of continuity and identity. Enhancing the resilient and sustainable post-disaster reconstruction of waterfront areas will safeguard a precious asset for the sustainable social and economic development of the affected region, both for their capacity to attract investments (such as for tourism purposes) and as a source of renewable and sustainable natural resources.

Unfortunately, the relatively minor attention paid to cultural and natural heritage in the event of disasters, makes post-disaster reconstruction of waterfronts particularly at risk in the period immediately following a catastrophe, when the urgency to address the basic needs of the population, combined with the interests of developers and entrepreneurs, leads, often, to quick insensitive planning and fragmented rehabilitation schemes.

Therefore, it appears urgent and fundamental to define guidelines and best-practices that could and should act as driving principles for a resilient post-disaster reconstruction of waterfront areas. This paper is intended to provide a first insight of

this challenging goal, by the comparison and integration of the principles that have ruled, so far, both the Waterfront Development and the Integrated Coastal Management, with the ones driving the processes of post-disaster reconstruction. Two interesting study-cases of successful post-disaster reconstruction of waterfronts have been furthermore included in the paper, in order to highlight the opportunities they have got to initiate social-economical development, to enhance the resilience of the community and to reduce the risk.

Challenges for the future research will be to investigate:

- reconstruction processes that could help the economy of the communities or, more generally, had a positive effect on the affected areas, while making a wise and good long-term planning of waterfront resources;
- alternative planning strategies that could be adopted and the sustainability and economical feasibility of the resulting projects over the long run;
- the integration of the planning procedures with the results of risk and multi-criteria analysis for the selection of the most effective risk reduction strategies;
- the shared involvement of government, private initiative and various communities to ensure that investments can be rendered compatible and maximised in a integrated implementation of short, medium and long term actions;
- the means of incorporating into reconstruction projects the historic and cultural features of the community together with the natural and man-made surroundings, and the ways of respecting the local implementation capacity.

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