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ADVANCED PLANNING FOR URBAN LANDSCAPE ENHANCEMENT

Abstract
The complexity of urban landscape is clearly shown by the dual dynamic interaction between human activities and natural environment. The latter is the origin of opportunities and hazards. A natural phenomenon does not represent by itself a disaster but can become a disaster when produces negative impacts on vulnerable communities, exposed and not prepared for the event.
In addition, old, blight urban fabric, and urban voids characterize the contemporary urban landscape: even if degraded, underused and compromised in environmental and landscape aspects, they are valid resource for the regeneration of whole parts of cities and for the development of risk reduction strategies.
Authors produce a brief overview of risks mitigation processes state of art, introduce a method based on urban exposure reduction, define advanced planning strategies and evaluate how the same strategies to reduce natural risks influence urban landscape.

Keywords: advanced planning, natural risks reduction, urban regeneration, urban landscape, replacement strategies

Introduction
Cities are complex adaptive systems, spatially extended, called landscapes. Cities, their landscapes and their components, are also the most exposed elements to natural and man-made risks. The actual approach to risks reduction aims to eliminate and limit the related negative effects and to act in advance before the events occurrence. Authors present a brief overview of the landscape, urban landscape and risks mitigation processes state of art. Moreover, with the definition of a case study, they underline the connection among advanced urban planning, urban regeneration planning and urban landscape modifications and enhancement.

Landscape
The complexity of landscape concept, its important public interest role in the cultural, ecological, environmental and social fields, and the interaction between landscape-natural environment and human being is clear in the numerous existing definitions.
The European Landscape Convention [1] defines landscape as an "area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors". Moreover, attention is focused on the territory as a whole whose constituent parts are considered simultaneously in their interrelations, considering the urban, peri-urban, rural and natural areas, inland areas, territorial waters and coastal areas, inland waters, wetlands, rivers and water courses, lakes and ponds, every day and degraded or deteriorated landscapes.
Landscape is a "geographical unit characterized by a specific pattern of ecosystem types, formed by the interaction of geographical, ecological and human-induced forces" [2]. "A landscape is where we all make our homes, do our work, live our lives, dream our dreams" [3].

Urban landscape
The urban landscape (Frederick Olmsted, XIX century) concept is related to the formation and evolution of cities. Urban landscape is a phenomenon that existed due to the quality of the physical factors of the environment. It acquires a mental image due to the historical/cultural context conditions and the population that perceive it: it becomes the stage for public life and the connecting element between people and society.
Depending on the various definitions of "city" and "landscape", the urban landscape meanings are different and sometimes contradictory. Urban landscape design is the art of connecting different components of the physics of the city visually and structurally [4]. The contemporary urban landscape is an image of the city's socio-cultural environment and includes lively and flexible relationships that create a spatial-temporal urban continuity. As outlined by some researchers (among all Sitte; Le Corbusier; Lynch; McHarg; Mumford), urban landscape can be studied using different cultural approaches and different points of view: artistic, functional, perceptual and ecological [5].
The mutual effects of the environment on humans and humans on environment are crucial elements in the development and definition of urban landscape that is a union of natural environment and building environment. The natural aspects are influenced and dynamically modified by human activities (economic decisions, land use, policy, etc.). The natural environment, and therefore urban landscape, is the origin of a series of possible opportunities and a series of possible hazards.

Disaster Risk Reduction: a brief state of art
Over the past 40 years, alongside the evolution of risk concept, there has been a profound change in the risk reduction strategy itself. The increasingly widespread awareness that disasters are not exclusively the result of natural phenomena but also of structural factors (growing poverty, social and economic processes) has led to a change in the risk reduction approach. From an approach based on the hazard factors study, to an approach that recognizes risks as the interaction of Hazard, Vulnerability, Exposure and Adaptation and aims to eliminate (prevent) and limit (prepare and mitigate) the negative impacts of natural hazards on society [6]. In a context of increasing recurrence and impact of catastrophic events, it is fundamental considering the pre-disaster phase and the prevention activity as a long-term solution to reduce natural disasters.
Starting from the end of the twentieth century, UN defines a conceptual approach that aims to minimize the factors causing disasters within society, thus providing to act on risk variables: Disaster Risk Reduction, DRR [7].

Risk Assessment Methodologies
In 2015, the UN adopted the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) [8]. It aims for "the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries" and recognizes the important role of cities and local governments in achieving this goal. To bring the general Sendai framework to a more localized scale (in this case local means national but the methodology can be adopted also for more localized context), the UNISDR [9] created guidelines on National Disaster Risk Assessment (NDRA) to support national implementation of the SFDRR. The guidelines propose a three main stage process:

- Stage I Preparing and scoping. It represents the preparatory phase and creates the knowledge base for the entire process.
- Stage II Conducting risk analysis: definition of methodologies, analysis techniques in relation to hazards and typology of outputs, evaluation techniques and communication format in relation to the final audience.
- Stage III Using NDRA results for disaster risk management and development decisions, inputs for the decision-making phase.

This process is strictly related with the international standards on risk management (ISO 31000:2018) and on risk assessment (31010:2018) that are the most commonly used to explain the risk assessment process flow. It consists of four main phases: Establishing context; Risk identification; Risk analysis; Risk evaluation.

Advanced Urban Planning

Responsible and advanced urban planning represents a great example of a non-structural, long-term, and exposure-vulnerability oriented mitigation measure to reduce disaster risks.
In urban areas, disasters and risk conditions are consequence of a series of factors that contribute to amplifying the effects of negative impacts of natural phenomena. Not-well-studied activities of physical resources planning and management (which do not take into account the real environment characteristics and the risk connected with each soil transformation action) can cause an increase in vulnerability and exposure to hazards, becoming drivers for new risks [10].
If in case of slow natural phenomena (such as drought, climate change, environmental degradation, desertification, etc.) the complex urban system proves to be capable of modifying its main components (physical and functional) adapting the urban structure and the different subjects involved (common people, stakeholders, professionals, decision makers) [11]. The urban system must also have the ability to adapt to very quick modifications of external (global socio-economic environment) and internal (social and organizational scenario) conditions.
Given the definition of sustainable urban development, resilient city and flexible city as certain, different approaches can be followed to achieve an effective advanced urban planning [8]: Localization approach; Technical approach; Approach with economic instruments.
Moreover, the British RIBA and ICE [12] identifies three strategic approaches to hazardous events: retreat, defend and attack. Among all, localization, retreat and attack strategies seem to be the most suitable to become strategic advanced urban planning instruments [13], [14], [15], [16].
In an urban area, human beings (and buildings) are the most exposed elements to risks[1]: the exposure assessment of the different urban functions is crucial and risks mitigation acting on the exposure means remove, reduce and control the quantity and quality of exposed items risks prone areas.
As defined in previous researches by authors, the presented methodology, with three main steps (Tab. 1), allows to evaluate the level of exposure and hazard of a given territory, and to define the optimal intended land use changes to reduce urban exposure and then risk.

Areal and Functional Replacement

The methodology involves the idea of permanent relocation as hazard mitigation measure with natural or technological risks and as management tool to reduce people exposure in floodplains, earthquake, landslide and volcanos prone areas (among all Mileti, Perry, Menoni). It is the most suitable strategy when natural risks are very high, protection measures are not efficient and feasible, and costs are too high.
In urban and regional scale, authors identify two possible strategies:

- Areal Replacement acts directly on the physical relocation of different buildings in areas less dangerous. This advanced strategy is a starting point for the renewal and requalification of suitable dismissed areas in terms of no soil consumption with an implementation of urban social, structural and natural quality.
- Functional Replacement acts on the mix of urban functions by reducing exposure that implies consequently a reduction of natural risk and physical and economic losses. It is an advanced strategy suitable for existing urban areas, partially or totally built. It provides different planning scenarios of compatible land use aiming to a better functional definition and (re-) development of existing urban settlements. It improves also the enhancement of social, cultural and functional mix uses, developing the cultural, economic and natural quality of the areas.

The strategies act on overall urbanized structure and environment instead of focusing on specific interventions on physical elements: acting on micro and medium-scale urban elements (block, neighborhood) the Replacements affect the entire urban and territorial area positively.

Urban Regeneration

Urban regeneration represents a multidisciplinary subject, which takes in consideration many aspects and processes having specific effects from the functional, economic, social and environmental point of view [17]. In Lombardy Region (Italy), the recent law n. 18/2019 [18] increases the importance of interventions aimed at urban and territorial regeneration and concerns regional, metropolitan and urban scale plans. Moreover, it concerns areas and buildings, defining them as priority actions to reduce soil consumption, and to improve the functional, environmental and landscape quality of territories and settlements, as well as the socio-economic conditions of the population.

Dismissed industrial areas

Inside or at the edge of the contemporary cities, there are always many 'urban voids'. Although, in most cases, these areas have high volumetric concentrations, the tangible vacuum is determined by the absence of a precise urban role in the complex urban system and by the urban blight, which compromises the level of environmental quality and living conditions of citizens. These areas derive from a long process of de-industrialization of city centers or from sudden events related to social/economic issues or natural/man-made disasters: degraded, underused but also radically compromised in environmental aspects enough to make unsustainable even policies of simple re-naturalization. Industrial area requalification is an extremely complicated

ISO step	NDRA process		Presented methodology	
Establishing context	Stage 1: Preparing and scoping	Element 1_Establishing a governance mechanism	Urban context analysis: urban fabric analysis, city plan analysis, population analysis	Evaluation of the Exposure Index
		Element 2_Defining the policy scope and technical scope of NDRA		
Risk identification		Element 3_Developing an NDRA data management plan	Typology and level of hazard for urban territory	
		Element 4_Developing NDRA required capacities		
		Element 5_Developing terms of reference for NDRA		
Risk analysis	Stage 2: Conducting risk analysis	Element 6_Utilizing various risk analysis methodologies	Exposure Analysis: Exposure Index for each urban function and Urban Exposure	
		Element 7_Key considerations in conducting risk analysis		
Risk evaluation		Element 8_Preparing the outputs of risk analysis for communication with stakeholders	Most at risk areas	Definition of the most at risk urban areas
	Stage 3: disaster risk management and development decisions	Element 9_Facilitating the process for evaluation and applying results in disaster risk management decisions	Land use changes: areal and functional relocation Optimal scenario definition	Definition of different Intended Land Use scenarios
		Element 10_ Ensuring long-term sustainability of NDRA system		

Tab. 1. Risk assessment methodologies: ISO step, NDRA process and author's method Caption of the table [19]

problem, because it requires a significant mobilization of resources: as already underlined, current polices support to reuse and requalify these areas to create more sustainable, high quality, mixed use, high-density contexts. The most relevant positive effects are: buildings renewal, infrastructural and facilities implementation, natural ecosystems revitalization, social and cultural re-activation, definition of new pattern of social behavior and economic development.

Case Study

Starting from the definition of Areal Replacement strategy, in fig01 it is reported a practical application of the strategy in Pavia municipality, a typical Italian middle size city in the Northern-west part of the peninsula [19].
In area 1 (known as Gasholder from the previous industrial function as gas storage), there are different hazards affecting it: it is a flooding prone area due to the presence of Ticino River and Naviglio channel and a seismic prone area due to seismic amplification related to soil inner characteristics.
In a context like this, it is difficult to define an important and articulated urban renewal with new masterplan and new public functions. Therefore, a relocation of the existing elements and of the volumetric capacity of the area is the optimal solution: the identified second area (SNIA Viscosa, former chemical industry plant) is very well suitable for this purpose.
In relation to Areal Replacement strategy, urban renewal and urban landscape enhancement processes, authors present three examples related to natural hazards affecting or possibly affecting the area.

1. Seismic hazard and landscape. Current geophysical analysis have led to the definition of third-level maps (seismic microzonation) which clearly define the territory of each municipality with a remarkable accuracy. Microzonation maps (preliminary phase of earthquake risk mitigation studies) are the basis for site-specific risk analysis, which is essential for the planning of critical structures like power plants, subways, bridges, elevated highways, and so on. That is the starting point for the definition of the best area to operate Areal Replacement strategy: the building constructions become permanent structural measures, and exposure oriented preventative measures for the mitigation of risks. The creation or renewal of urban fabric portion are actions related to the creation of new urban landscape considering the artistic (cultural), perceived (defying new or maintaining identity) and functional point of view.
2. Biodiversity loss and landscape. Restoring ecosystems reduce vulnerability, increase resilience, and contribute to disaster risk reduction and disaster preparedness. The ecosystem-based approach to DRR with Nature-Based Solutions (NBS) offers multiple benefits. In particular, it improves resilience of ecosystems, and increases the resilience of society to external economic and environmental stresses, but also contributes positively to develop human health and well-being. In public open areas, Areal Replacement's interventions allow carrying out specific interventions for the development of biodiversity oases. These interventions can be ethero-organized urban tactics promoted by the new inhabitants of the settlement. Considering all these aspects, acting on biodiversity loss reduction with advanced planning allows improving the functional, perceptual and sustainable urban landscape enhancement.
3. Drought hazard and landscape. In urban areas, droughts represent situations that require action from water managers to avoid a potential water shortage or to manage the current one. Drought mitigation defines a strong urban landscape enhancement from an ecological and sustainable point of view. It depends on an effective water management system (rainwater collection, storage and treatment). Moreover, to mitigate the heat waves, a sustainable city design guarantees an optimal percentage of surface that is

Fig. 1. Application of Areal Replacement strategy in Pavia, Italy [19]

permeable and biologically active, and protects ecological corridors and secures aeration wedges airing and cooling the city. Sustainable urban planning can involve NBS that provide opportunities for climate change adaptation, increase urban resilience, reduce pollution and enhance small-scale climate mitigation actions [20]. Therefore, the new area must include water collection and water storage basins; natural purification systems and on-site recycling of rainwater and water sewage; an integrated management system and a highly efficient, self-sufficient and support network for neighborhood, entire city and agricultural activities in the surrounding territories.

Discussion and Conclusions

The natural environment is usually neither hazard nor resource until human actions and presence make it one or the other. Thus, direct actions on the urban environment during the Replacement strategies implementation (reforestation, conservation of biodiversity, water and soil, land use and forestry policy and enforcement) can help to mitigate hazards and in the same time improve urban landscape quality. The impact of public policy and investment, good governance at multiple scales, increase awareness and preparedness, mobilization and organization at the different urban and territorial scale.

As seen in the previous definitions, the landscape is a complex phenomenon including subjective, objective, individual and collective issues. By studying the relationship between urban environment and human being, it is possible to conclude that the concept of urban landscape, as a whole, derived from the interaction among the spatial structure, the observation and knowledge, and the perception and intuition of city and environment elements. Considering the risk reduction as the main aim of the urban planning regeneration, in the urban built environment it is necessary reconfiguring the structural, functional and environmental aspects, also varying social, cultural and economic relations. They are consistent, high-impact interventions with long-term consequences and represent an important opportunity for the redevelopment and the improvement of urban life quality (safety, security, health, well-being).

The main difficulties in the regeneration processes are due to: limited financial resources and planning abilities; incapacity in managing the complex and long process of transformation (from the urbanization phase to the construction and management phase); high basic costs (above all decontamination); rigidity of public administration and its slowness in decision-making; not flexibility of regulatory framework.

In the presented case study, the new regional law [18] allows greater freedom to the private stakeholder who can make decisions about the building sector and make choices for all urban planning purposes (keeping the given DRR guidelines) using considerable economic incentives and tax relief (till -50%).

These transformations also affect the urban landscape and allow, if duly developed, improving it enormously: the body of the city is able to identify the main elements and define relationships with natural, cultural and historical context.

In the contemporary city, the problematic dismissed areas can become, and in many cases have already been, a valid resource for the regeneration of whole parts of the city since they are related to the identity, and the memory of the city, and because they belong to the city, and to the citizens.

The use of these areas as zenith point in DDR strategies allows the city to maintain its fundamental characteristics without extreme changes, to maintain its identity, to find stronger motivations (and greater economic possibilities) to begin a profound process of renewal and redevelopment, and finally to ensure that the population involved more fully accepts the expected changes. It is clear how risk reduction/urban regeneration interventions are not concerted only in the areas where they occur but have positive impacts on the entire urban context, on the entire urban landscape and also on a larger portion of the population.

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NOTES

1. Exposure: people, property, systems, or other elements present in hazard zones that are thereby subject to potential losses [6].