# PROCEEDINGS
of the
# INTERNATIONAL CONFERENCE
on
# CHANGING CITIES IV
***Spatial, Design, Landscape & Socio-economic Dimensions***

Department of Planning and Regional Development, University of Thessaly
Laboratory of Urban Morphology and Design

**in collaboration with**
School of Architecture, Technical University of Crete and Regional Authority of Crete.

**Under the aegis of**
THE GREEK MINISTRY OF ENVIRONMENT AND ENERGY

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*University of Thessaly*

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# PREFACE

Dear colleagues,

The 4th International Conference on **"*CHANGING CITIES: Spatial, Design, Landscape & Socio-economic Dimensions"*, Chania, Crete Island, Greece, 24-29 June 2019,** is now a reality and a big academic event. The conference has been organised by The Laboratory of Urban Morphology & Design, Department of Planning & Regional Development, University of Thessaly, Volos, Greece, in collaboration with School of Architecture, Technical University of Crete and Regional Authority of Crete, and under the aegis of The Greek Ministry of Environment and Energy.

The series of ***CHANGING CITIES*** **international conferences [CCC]** has started in 2013 by The Laboratory of Urban Morphology & Design, Department of Planning & Regional Development, University of Thessaly, Volos, Greece, and has so far delivered three conferences:

- ***CHANGING CITIES I: Spatial, Morphological, formal and socioeconomic dimensions,*** 18-21 June 2013, Skiathos Island, Greece.
- ***CHANGING CITIES II: Spatial, Design, Landscape and socioeconomic dimensions,*** 22-26 June 2015, Porto Heli, Peloponnese, Greece.
- ***CHANGING CITIES III: Spatial, Design, Landscape and socioeconomic dimensions, 26***-30 June 2017, Syros Island, Greece.

All three conferences have been welcome by the academic community of planners and architects worldwide attracting over 300 presenters from more than 50 countries.

The CC conferences are always taking place in Greek venues with characteristic urban or/and natural landscape like the Greek islands in the Aegean Sea. The 4th conference has been decided to take place in Chania, Crete Island, since Chania is the most attractive town in Crete Island exhibiting a well-preserved Medieval and Renaissance historical core with a unique Venetian harbour, built between 1320 and 1356.

The series of CC conferences covers a vast spectrum of fields related to the present and future challenges of cities. In the last decades, we have all witnessed a series of dramatic, universal changes and developments affecting cities – their morphology, environment, economies, and societies. Global new conditions such as economic globalisation, European integration and the creation of urban networks and hierarchies; post–industrial economies of culture and new technologies; consciousness of environmental degradation and the necessity of green design, sustainable development, and resilient cities; the development of informational societies, the increasing mobility of individuals, 'space-time' compression, and the emerging smart cities; growing terrorism attacks and new security infrastructures of public spaces; increasing migrations and cultural diversity of individuals, and coexistence in multi – ethnic and multi-cultural urban societies. In this new milieu, cities change themselves to ad hoc adapt into new conditions while simultaneously scholars and practitioners in urban planning and design, and urban policy-makers attempt to change cities so as to better fit into new conditions.

The series of CC conferences aspires to bring together urban planners and designers, spatial planners, architects, landscape designers, urban geographers, urban economists, urban sociologists, and urban policy makers, and investigate all together new challenges concerning cities and their future. The main aim is providing an international forum of transaction of ideas on changing cities.



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The 4th CC conference focuses on two topics:

**1. "SMART CITIES; Smart Environment, Smart Mobility, Smart Economy"**
**2. Planning and Designing new cities in China.**

First, strategic development of smartness in cities is a fast growing field of great academic and policy-making interest, based on the development of new technologies in the services of inhabitants, visitors, tourists, entrepreneurs, et al. Therefore, it is a big challenge for all urban planners, designers, urban economists, and urban policy makers.

Second, China is a huge country with fast growing economy in the industrial sector. This gradually fuels national migration flows of millions of people from agrarian Chinese regions to urban districts, creating a large demand of housing. New large cities are planned, designed and developed in China in the last decade. Since Europe has been shrinking in demographic terms during the last three decades, there is no need for new cities. In this framework, all new schools of thought in urban planning and design are applying new ideas in China – attracting the interest of academia. The Organising Committee is proud to have arranged for the 4th CC conference, important special sessions devoted to Chinese cities:

**(a)** ***"Planning & Designing new cities in China"***, pre-organised by Dr. Huang He, Associate Professor, School of Architecture, Tsinghua University, Beijing, China,

**(b)** ***"Chinese Cities: Urban development, socio-economic transformations, policy challenges and comparisons with the European experience"***, pre-organised by Prof. G. Petrakos, University of Thessaly, and Prof. Geoffrey Qiping Shen, The Hong Kong Polytechnic University.

The conference thematic fields include the following:

- *Urban Design in Planning,*
- *Sustainable Urban Planning & Development,*
- *Urban Landscapes, Landscape Planning & Design,*
- *Urban Cultures & Public Open Spaces,*
- *Historical Centres & Built Heritage Management,*
- *Environmental Urban Planning,*
- *Cities & Health*
- *Resilient cities,*
- *Transportation Planning and Policy in cities,*
- *Urban Planning Laws, Real Estate & Property Rights,*
- *Urban Economies & spatial impacts,*
- *City Branding and Urban Tourism*
- *Shrinking cities,*



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- *Divided cities,*
- Migration, multinational and multicultural societies & Urban Planning.

The 4th CC conference has initially attracted 485 abstracts, and 186 research papers (optional submission to the conference E-Book of Proceedings). In the final conference program, there are 328 oral presentations and 22 poster presentations from all over the world; from Greece and the Balkans, Northwest Europe, USA, Latin America (Brazil, Chile, Colombia, Mexico), Middle East and North Africa, Asia, Far East (China and Japan), and Oceania (Australia, New Zealand, New Guinea). The 4th CC conference is really international since 42% of the presenters are Greek academics and 58% of the contributors are from global academia.

I would like to thank

- the Organising Committee;
- the keynote speakers;
- the scientific Committee of the conference for reviewing work, and especially the colleagues who pre-organised special sessions for the conference;
- the academic supporters of the conference: University of Thessaly; Technical University of Crete, School of Architecture; and The Greek Ministry of Environment and Energy.
- the financial sponsors of the conference: Regional Authority of Crete, Green Fund of The Greek Ministry of Environment and Energy;
- and especially, all of you having contributed to this big academic event.

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# Smart city and alluvial park: the role of the "urban green" in the water management through historical and natural values

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**Abstract**
This paper analyses the possibility of managing the effects on water in urban centres. The water management is an important issue related to the smart cities, because of the climate changes. This problem is felt especially in urban settlements close to river areas, where there are also protected natural elements. Here the effects of climate change are stronger, particularly in the case of rains occurring with less frequency, but with much more intensity. The text identifies the potential of the alluvial park as an element to manage the flooding risk and to make the urban environment a smart city, presenting an application case in the town of Monterotondo Scalo, in the province of Rome in Italy.
*Keywords: Water Management; Alluvial Park; Protected Areas; Historical Urban Centre; Urban Public Smart Space*

## 1. Introduction

The alluvial park is a green area that combines the geo-morphological characteristics of the territory with those of the landscape perception by local people: it is a public space that restores the river landscape in its naturalness, in such a way as to reintegrate it with an urban design and planning approach to front of the climate change effects[1, 2, 3, 4].
The rapid climate change that is sweeping the globe is leading not only to a change in the environment, but also to a change in the way human approach. This approach is crucial especially in those disciplines, such as urban and territorial planning, which have as their object and subject the whole territory and the environment in which man operates. In the field of planning and land management, climate change has highlighted a serious problem concerning water management in the case of increased frequent floods. These phenomena are particularly problematic when they concern rivers near the built areas, especially in a country like Italy. In proposing a solution to this problem, various approaches are identified according to the different roles within those who manage the territory. The first approach is to do nothing and to be carried away by events, quite in line with the logic of the river itself, but it is very questionable. The second is to remedy after the flood event has taken place and this is very widespread and also put into practice in a timely manner by civil protection. The last approach is to propose strategic planning and design solutions to ensure that the river flood phenomenon, which is not avoidable, does not cause damage, but it should become a characteristic element for a culture of environmental phenomena, in those urban areas near rivers.



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The last approach is the one that is supported in this paper. In fact, in current times as landscape and urban planners, the task is to research and investigate solutions that restore resilience in communities, that perhaps in the past was much more current and real than is now widely discussed. It could realistically be defined as a "preventive" approach and, to give evidence of this, solutions that put into practice the afore mentioned logic have been collected and selected: the alluvial parks. These are linked to the integration of planning, landscape and the natural-based solutions (NBS)- river rolling and expansion areas - related to hydraulic engineering and geological logic [5, 6].
Therefore, we examine two different types of solution, descending from different methodological approaches: the integration between landscape planning and the exclusive NBS interventions.
The first solution is represented by alluvial parks, of a purely foreign rather than Italian culture, which are very interesting, above all, because they consider the land project as the characteristic element able to combine the will of nature/public space of the local people with the need for rehabilitation and environmental safety of the river territory. There is not much literature about this topic, since the term alluvial park generally indicates a park area located along the river floodplains, which identifies the characteristic linked to the terrain geomorphology, rather than to a quality design of the park itself.
In this paper, we mean the term "alluvial park" as a park along the rivers that includes, as elements of the project, the recovery of river naturalness and biodiversity among the landscape and the ability to store and act for containing sudden floods phenomena. Since there is no officially recognized terminology, we have relied on a case studies analysis of projects carried out to define and support the validity and existence of this kind of "alluvial park".

### 1.1 The alluvial parks

A case that reflects the very nature of the term "alluvial" is that of the Lower Oder Valley National Park in Germany [7, 8, 9]. This park is alluvial because it is located along the alluvial or irrigated plain of the Oder River which includes both the German and the Polish riverside. The park includes 60 kilometres of floodplains, numerous protected natural areas, meadows and pastures. This case, being far from inhabited centres, is not negatively affected by floods, as it was conceived as an alluvial park and therefore the excess volumes of water flow down the same floodplains, transforming the environment into an excellent wetland area for biodiversity concentration.
We then asked ourselves how this "alluvial" feature could be applicable in an urban or agricultural context, that is in areas compromised by man. The answer was found in the analysis of other case studies in different river areas: in former industrial or waste areas, in peri-urban areas and in urban areas.
In the first group, the cases of the Emscher Park in Germany [10] and the Red Ribbon Park in China [11, 12] are interesting. The interventions on the river have been carried out to recover disused or highly critical environmental areas. The two parks aim to restore a public space to the river and to the community. In these cases, there is no connection with flood management, but with water management and accessibility by the local people for naturalistic and cultural activities.
The Emscher River is a stream that originates from the parts of Dortmund and flows into the mouth of the Rhine. It passes between the most important cities of the Ruhr, the most industrialized area of Germany. It has been nicknamed the “river sewer” due to its smell and pollution - deriving from the



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Rhur historic industrial area. The park had the objective of restoring the naturalness of the compromised area by industrial activities. It consists of 200 hectares of multifunctional park where the old industrial plant houses a variety of different uses, as the buildings have been converted and restructured to accommodate cultural and commercial functions. The park is interesting for its use of water: the old gasholder of 20,000 cubic meters of water was transformed into the largest artificial diving centre in Europe and the river changed from a sewer to a nature trail. The river bed and its tributaries have been re-naturalized, floodplains have been reconstituted, allowing the natural development of the river and a wastewater management system has been set up.

The Red Ribbon Park instead is a park located along the Tanghe River, at the east urban fringe of Qinhuangdao City, Hebei Province, in China. Inside the park, a red ribbon was created, which consists of a long 500 meters seat, similar of the tail of a snake, made of red steel, which follows the river course. The site was initially a slum and dump. The project had the objective of giving back to citizens a site where they can practice activities related to the river: swimming, fishing, jogging. A variety of native vegetation has also been planted to mark the route and to rest. Therefore, the park has become the filter to enjoy the river and the naturalness of the territory, an oasis in which to restore from the stress of the city.

In the second group, the case studies are "alluvial parks" that aim to recover the relationship between the city and the river that touches them. This are the Bishan-Ang Mo Kio Park in Singapore [13] and the Yanweizhou Park in China [14, 15]. In these cases, the river is near or in the core of an urban area and it is close enough to arouse in citizens the desire to use them as refreshment areas. Furthermore, they were created with a view to flood management, caused by the strong monsoons that frequently hit these countries.

The Bishan-Ang Mo Kio Park has been realized to provide a buffer zone between Ang Mo Kio New Town and Bishan New Town. The aim was to give to citizens a leisure area to breath out of the city noise. So, the task was to transform the Kallang River from a linear utilitarian concrete drainage channel into a meandering, natural river through the park.

The integration of the river with the park involved different responsibilities (parks and water). National water agency, PUB, and NParks engaged Ramboll Studio Dreiseitl (design) and CH2M Hill (engineering) to look how the park, river and surrounding residential estates could be integrated as one. Different actions have been applied from the use of soil bioengineering techniques (vegetation, natural materials and civil engineering techniques) to prevent erosion and stabilize the river banks, to phyto-remediation with cleansing water biotopes to eliminate any harmful biological contaminants, to the construction of new playgrounds for children, new bridges, stepping stones, riverside gallery to encourage interaction with water, to other leisure areas for all ages.

The Yanweizhou Park in China was designed by the Chinese studio Turenscape for the redevelopment of the river landscape of Jinhua city. The park of 26 hectares is integrated into a wetland area and represents an ecological solution for flood management. It has native vegetation, curved paths and colourful serpentine bridges that are the public attraction around the opera house of the city and connect the park with the two banks of the river. Because of its exemplary nature, the park received the 2015 Landscape of the Year award within the World Architecture Festival for the section dedicated to landscape architecture.



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The third group is the one of greatest interest for the purpose of sustainable water management in urban areas. They are the floodplain parks of the Enghaveparken in Copenhagen [16] and the Storkeengen in Denmarck [17].
The Enghaveparken project is part of a program to protect public spaces during extraordinary climatic events. This happened because in 2011 there were a series of flood events that caused a lot of damage in Copenhagen and therefore the municipal administration decided to implement containment projects for rainwater. The park has been enriched with architectural systems that guarantee its resilience and greater functional integration in the urban context, to contain floods and rains. The park spaces, which host a wide range of areas dedicated to sports, plays and relaxing activities during the summer, are able to accommodate more than 24,000 cubic meters of rainwater. The whole water collection system is divided into a series of pipes and drains starting from the roofs of the buildings which block the water thanks to a dam and a series of depressions for storage purposes.
Moreover, even plants have been inserted that react well to the abundant amount of water foreseen.
Another project is that of Storkeengen, a natural park, still unrealized. It provides for a union of architecture, urban planning and engineering, to contain rain and storms and to solve the collecting system of city waste water (grey, blue, green water) trying to bring the city of Randers closer to the Gudenå River. Storkeengen will be built between Randers and Vorup, an industrial suburb located in the south of Randers, on the other side of the river, at a higher altitude. The park will be able to contain the rain water and the city waste water.
The second solution for flood management is instead represented by the natural-based solutions (NBS) that are engineering works, very common in Italy. On this type of intervention, the literature is very much attacked and distinguishes the works according to the physical characteristics of the river [18].

### 1.2 Expansion Boxes

One of the hydraulic works used to contain rainwater and river floods are the expansion tanks. They are an indirect structural intervention that are represented by an area delimited by an embankment and can be of three types: in-line, derivation and mixed. In these cases, there is no integration with architecture or landscape design, but they often changed the territory becoming elements with significant naturalistic values.
This is the case of the fluvial park of the Secchia River in Italy. The expansion box is located between the Provinces of Modena and Reggio Emilia, in the territory of the Municipalities of Modena, Campogalliano and Rubiera, and it has the aim of regulating the river flooding, subsequently acquiring naturalistic value. It is a natural reserve of about 260 hectares (within 800 hectares of ecological re-balancing area), with permanent pools of water with islets and peninsulas and typical vegetation of humid plains.
Another example is the expansion tank on the Parma stream in Italy, built in Marano by Pizzarotti between July 2004 and November 2005 which restrains the "Pärma voladóra" race. The basin is capable of holding up 12 million cubic meters of water and it is possible to adjust the output flow thanks to mobile gates. It is a work planned by the Po River Basin Authority that secures the city of Parma with respect to the possibility of flooding and which represents an innovative realization. It has a height of about 24 meters and a development of 110 linear meters, with a total area of overflow



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equal to about 260 meters. It emerges as a hydraulic work exclusively for safety purposes to contain the torrent floods and it still has a high effectiveness [19].
Finally, another example is represented by the expansion boxes of the Renai in the municipality of Signa, Italy. These were implemented with a Memorandum of Understanding for the interventions design to reduce the hydraulic risk. It followed the approval of the Arno River Basin Plan - Hydraulic Risk Excerpt, which took place with a decree of 05.11.99, stipulated between the Tuscany Region and the Arno River Basin Authority [20].
The flood-controlled subsidiary is approximately 1,770,000 m2 and the total storage volume was estimated at around 15,000,000 m3. The "Renai" area is the portion of territory bounded by the Bisenzio River, the Arno River and the bank of the Viaccia. The area corresponds to the inner part of an ancient meander of the Arno River characterized by stable flat lands with silt-sandy coverings. The area was the site of an intense mining activity until its interruption in 1970s, which led to the redevelopment of the Renai area for the recovery of landscape and environmental values and for the insertion and harmonization with the economic and social fabric of the territory. The Signa Municipal Administration has thus initiated the redevelopment process of the Renai area "Project for the recovery of the quarry areas of the Renai Island for the construction of a Natural Park". The result of this environmental recovery plan, where the intervention rules were defined in this sensitive area, allowed the creation of an area not only valid for the hydraulic protection of the place, but above all a naturalistic area for public use and recreational activities [21].

### 1.3 Rolling Tanks

This type of hydraulic works provides for the reduction of the flow through the temporary storage of part of the flood volume which is then released over time.
In the case of the Lura Torrent in Italy, the rolling tanks are included in the Program Agreement of 04/11/2010 between the Lombardy Region and the Ministry of the Environment and the Protection of the Territory and the Sea as urgent interventions for the mitigation of hydrogeological risk. In this case, two controlled rolling areas of river floods (340,000 $m^3$) and those arriving from the Pedemontana motorway drainage system (180,000 $m^3$) have been planned. They have been designed to meet both the purpose of hydraulic protection and the landscape, environmental and fruition of the prestigious Parco del Lura valley and to improve water quality with phyto-purification areas.
The objectives are the unitary management of river, urban surface and road drainage waters, savings in land consumption, in the works construction and management and in the environmental integration [22]. The rolling of the floods of Lura torrent in the municipalities of Bregnano and Lomazzo have been inaugurated on April 6, 2019.
A similar intervention is represented by the A3 rolling basin of the Arno upstream of Gallarate, in the municipal territories of Gallarate and Cassano Magnago, in Italy. For all concrete artefacts, appropriate mitigation and environmental compensation interventions have been planned to include the work in the current landscape context. It is completed with service tracks and internal roads for the area accssibility, a new bridge for crossing the Arno stream by the existing road network and adjustments to a sewer line interfering with the tank.



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## 2. MATERIALS AND METHODS

The text proposal is not a project ready to be applied, but it is an investigation and a design experimentation that tries to give an answer to the requests of how to create a smart city. The fundamental aspect is that of climate change management: we do not want to provide a perfect solution, but a way of codifying the key elements and acting in those situations that present emergencies in the urban context and that require design interventions.

### 2.1 The methodology

To understand and validate the correspondence of an alluvial park project in relation to the river location for which the proposal is made, we tried to highlight the key elements of such a topic.
Starting from the analysis and the study of the examples given as a support to the literature on flood containment interventions, it was possible to extrapolate descriptive macro-categories defining the area on which a project proposal is advanced.
These macro-categories have been identified starting from the elements that link to a greater or lesser extent, all the water management interventions. These identified key elements have allowed us to draw up a descriptive data sheet, whose data can be interpolated to describe the ability to solve the problem in relation to the intervention adopted.
The first identifiable macro-category is that of the Territorial Context as a function of localization, which is divided into various sub-categories which in turn are divided into various sub-groups. The first sub-category is the Localization with Geographical-Political reference, which includes the local area (municipal), the vast area (provincial, regional, inter-provincial, interregional) and the national and transnational framework. The second is the Localization with reference to the prevalence of Land Use of the surrounding territory, which provides for three types of uses, those to prevalence of agricultural areas (Agro and Agro-Forestry areas), those to prevalence of urban areas (Continuous and Discontinuous areas) and finally those to prevalence of artificial areas (Artificial, non-agricultural vegetated areas). The third is the Localization related to the river Features, for which the water bodies' width (in metres), the water hazard and risk (high-medium-low) and the flood frequency (month-years) are defined. The second macro-category describes the design context within which the project proposal is placed or could be placed. The first sub-category to refer concerns Procedures and Funding, broken down into: local, regional, national, European levels and private finance initiatives. The second sub-category instead takes into consideration the Stakeholders and project Implementations that can be public, private and public / private partnerships. The third macro-category is instead represented by the presence of Planning Tools and the provisions they establish for the area covered by the analysis data sheet. All these descriptive elements are then turned into acronyms.
Subsequently, the interpolation of these three categories delineates resources and criticalities linked to the river course, also including the social aspect related to the usability of the project. Then, from the interpolation of the features of the project area with the features of the type of intervention, the various possible effects are enumerated. Two kind of these ones have been highlighted:



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environmental ecological effects and the social effects of impact on the quality of urban spaces. Due to the ecological effects of the alluvial park, there are various possibilities: water collecting system, irrigation system, rainwater collecting system and water treatment system. For social and urban quality effects we find the realization of green public spaces, vegetable gardens, sports activities areas, pedestrian paths, leisure activities areas and educational sites.
From the combination of these effects for each individual area in relation to its territorial localization (urban, agricultural, industrial, protected areas), the solution capacity under the environmental, planning and landscape approach, that is capacity to solve the proposed intervention, can be seen in terms of a degree of evaluation ranging from level 0 = very low, to level 5 = very high. This combination and interpolation have been defined by us the "Data Sheet E + S = U", that is:
**E (***Ecological effects)***+ S (***Social and urban quality***) = U** ***(Usability of landscape project)***

## 2.2 The case-study

In the case of Monterotondo Scalo, located along the Tiber River, in a stretch of about 9 kilometres, the alluvial park is perfectly in line with the characteristics of the place. Between the riverbed and the city centre there is a thin strip devoted to agricultural uses, broken by the presence of a protected natural area, consisting of ex-clay quarries transformed into ponds. The alluvial park has been thought as an opportunity to reconfigure the green space so that it can be accessed and accessible by the local people. In this way, it could also become a natural expansion of the riverbed for its re-naturalized configuration [23, 24, 25].
Monterotondo Scalo is a part of the municipality of Monterotondo City which is in the metropolitan area and in the province of Rome, along the Tiber River, in the Lazio region, Italy. The whole municipality has about 41,000 inhabitants and is divided territorially into various parts: Monterotondo (historical and main nucleus), Monterotondo Scalo (the "peripheral" nucleus), the CAIMO industrial area, Borgonuovo and Piedicosta (newly born centres) and Tormancina (an agricultural estate). In the specific case study, Monterotondo Scalo appears as the "periphery" of Monterotondo and it is characterized by problems in all the urban planning systems.
There is an overlap of vehicular flows given the presence of a single main road (the Salaria road), onto which all local roads flow, in the absence of secondary connecting roads. There is a substantial absence of parking spaces and public green spaces compared to the inhabitants who live there. Finally, there is a total lack of relationship with the Tiber River, although the centre is no more than 500 meters from it, and it is constantly flooded in the event of sudden rainfall rush.
The latter caused flooding of the underpasses in correspondence with public services such as the railway station, as in 2014, causing also the death of a lady who was stuck in the underpass. The problem is obviously under the attention of the authority responsible for the stretch in question of the Tiber River.
The area, as defined by the report of the Basin Plan 1st Functional Excerpt - PS1 "Areas prone to flooding in the stretch of the Tiber between Orte and Castel Giubileo", can be flooded by the Tiber River and with it the Salaria road for a stretch of about 11 km, that is until where, in Passo Corese, it leaves the Tiber valley and heads towards Rieti. On the other hand, the Rome-Florence railway always remains at a safe altitude up to the confluence with the Farfa River" [26]. In this regard, among the interventions to safeguard the inhabited centres in flood risk areas with secular return times, from the Basin Plan 1st Functional Excerpt - PS1, the construction of the left bank of the Tiber River to protect



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the town of Monterotondo is proposed. It is also defined as one of "possible interventions after the realization of the different arrangement of the catchment area that otherwise guarantees the abilities subtracted from the intervention" [26].
In addition to the requirements of the basin authority, various simulation engineering studies have also been carried out for Monterotondo Scalo which show that the area is in any case subject to flooding phenomena, even very serious ones [27] (Fig.1).

**Figure 1**. Simulation of the flood scenario (a) for a flow rate of 1200 mc / s, (b) for a flow rate of 2100 mc / s, (c) for a flow rate of 2400 mc / s, (d) for a flow equal to 2930 mc / s. (Source: Mellace & Piergrossi 2016)

Our proposal is not in opposition with the River Basin Authority directions or the hydraulic solutions, but a different point of view, an overview finalized to integrate different approaches to the territory, in order to find also new funding channel, when the national ones cannot solve the hydraulic interventions proposed. The aim is to valorise the integration of the NBS with planning and landscape design, so that the safety problem of the fluvial inhabited centres become also a quality problem of green urban spaces. The cases studies we have analysed in the introduction are the representation that this is possible.

## 3. RESULTS AND DISCUSSION

Based on the data sheet developed and explained in the methodology, it is possible to identify and summarize all the features of the case study by applying the scheme "E + S = U". This data sheet allows the different landscape, settlement and infrastructural / functional systems to be broken down and reassembled with the demands of hydrogeological safety and the possibilities of planning and landscape design [28, 29, 30].
From the point of view of the territorial context, the area designed for the construction of the alluvial park is located within a municipality (Monterotondo), but its proximity to the Tiber River makes it part of a wider context on an interregional scale (Lazio and Umbria regions). The land use of the surrounding territories is of various nature. Within the proposed perimeter there is a land use mainly destined to agriculture or discontinuous artificial areas. Along the south perimeter there is a prevalence of discontinuous urban areas, which cannot be identified in a homogeneous or unitary system. In fact, the slope that leads to the alluvial park is frayed and does not present any element that unites the buildings, there is the lack of a border or a comparison limit. As regards the relationship between the area and the river, various elements can be highlighted. First of all, the river in question



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is large both in terms of linearity and in terms of range. Furthermore, it is a river with high risk of flood quantity and frequency, therefore the urban centre is classified as high-risk flood area. In this regard, water is to be considered a key element for the success of the land project.
The planning tools available for the description of the identified area are represented by the Landscape Plan, the Provincial Plan, the Local Plan and the Tiber River Basin Plan.
For the Landscape Plan the area has only the constraint of a river basin and is classified as a natural agricultural landscape and natural landscape.
For the Provincial Plan in the provincial ecological network, the areas between the settlement of Monterotondo Scalo and the Tiber River are defined as areas of primary connection (mainly large portions of the natural, semi-natural, semi-natural / agricultural system) and in regional protected natural areas proposals. Furthermore, part of the area falls within the one identified for the formation of the Agricultural Park of the Tiber Valley. Moreover, the possibility of Integrated Intervention Programs for the recovery of the former kilns (Briziarelli Marsciano) is also indicated. Indeed, the Regulatory Appendix II.1 requires to redevelop the "core" area (belonging to the Tiber Valley Floods Unit), in particular, the riparian zone favouring the recovery of herbaceous phytocoenoses, shrubs and trees, the creation of a park and the redevelopment of the Tiber River, avoiding incompatible uses in the riparian belt still present.
For the Local Plan, the unpublished or free areas along the Tiber River fall under the respect band heading of 150 meters from the river banks and for those between the Tiber River and the Salaria road, they are defined as park on the Tiber River, which in reality is not established by any resolution or even actually present to date, if not as a forecast. Moreover, there is also the restriction of purifier near the Natural Monument "Laghetti" (ponds in Semblera).
The design context thus identified can be placed within the framework of European procedures and funds, for what concerns the sustainable development of the territory, or in the context of financing in private public partnership. If it is possible, we could also think about the involvement in the project of bodies that deal with the safeguarding and enhancement of the river context at National territorial level.
In general, from the superposition of these data sheet, it is possible to identify two macro-categories of resources and critical issues, based on the environmental and social aspects. The resources for the environmental aspect are represented by the presence of agricultural areas with irrigation channels, vegetable gardens and the Natural Monument "Laghetti" in Semblera, which constitute a reservoir of biodiversity. From the social point of view, we have instead the presence of urban equipped parks and facilities for recreational and sports activities. The critical points, on the other hand, from an environmental point of view, are the areas of waste or artefacts that disfigure the natural agricultural landscape (junkyards and deposits of building materials), the presence of an abandoned brick kiln, the industrial area and the new fast scrolling road artery. From the social point of view there is instead an inaccessibility to the river by the citizens who fail to see the river positive importance, but only the negative one linked to the flooding. This is also a contradiction if we consider that the area lived due to the presence of the Tiber River (brick kilns), which in the past was the sea of those who could not afford anything else, it was the place of sociality and sharing.



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Finally, the data sheet also allowed for a hypothetical response to the creation of the alluvial park for this area. Crossing the localization data with the typical project interventions of an alluvial park, it turned out that for this case study the balance would be very positive. In that area mainly occupied by buildings, the environmental effects would allow the construction of a system of collection and reuse of black water and rainwater in connection with a more general neighbourhood collection and phyto-depuration system. The social effects would be not only the creation of green areas, but above all the possibility of doing recreational activities related to environmental issues and sustainability for citizens who currently do not have them. For predominantly agricultural areas, the environmental benefit consists on the construction of a water collection and irrigation system of great utility, if considered the increasingly frequent drought. On a social level, citizens would be allowed to cross pedestrian paths to rediscover their territory and food production techniques. In the industrial part, on the other hand, it would be possible to implement an ecological system for the collection and treatment of water deriving from the activities practiced here. On a social level these areas would also be configured as green spaces for the practice of leisure activities in connection with the nearby river, at the service of the anonymous sheds of workplaces. For the central part of the alluvial park instead, which falls within a protected area, it would be possible to create panoramic routes on the ponds and educational sites for the knowledge and teaching of the river landscape features (Fig.2).

## CONCLUSIONS

The described case-study is related to the creation of a shared scenario for the development of the river territory, describing the conditions for further strategic planning. This experience offered a training path that moves from the real knowledge of the environmental, cultural, architectural context in which it operates to the urban and landscape-environmental planning.



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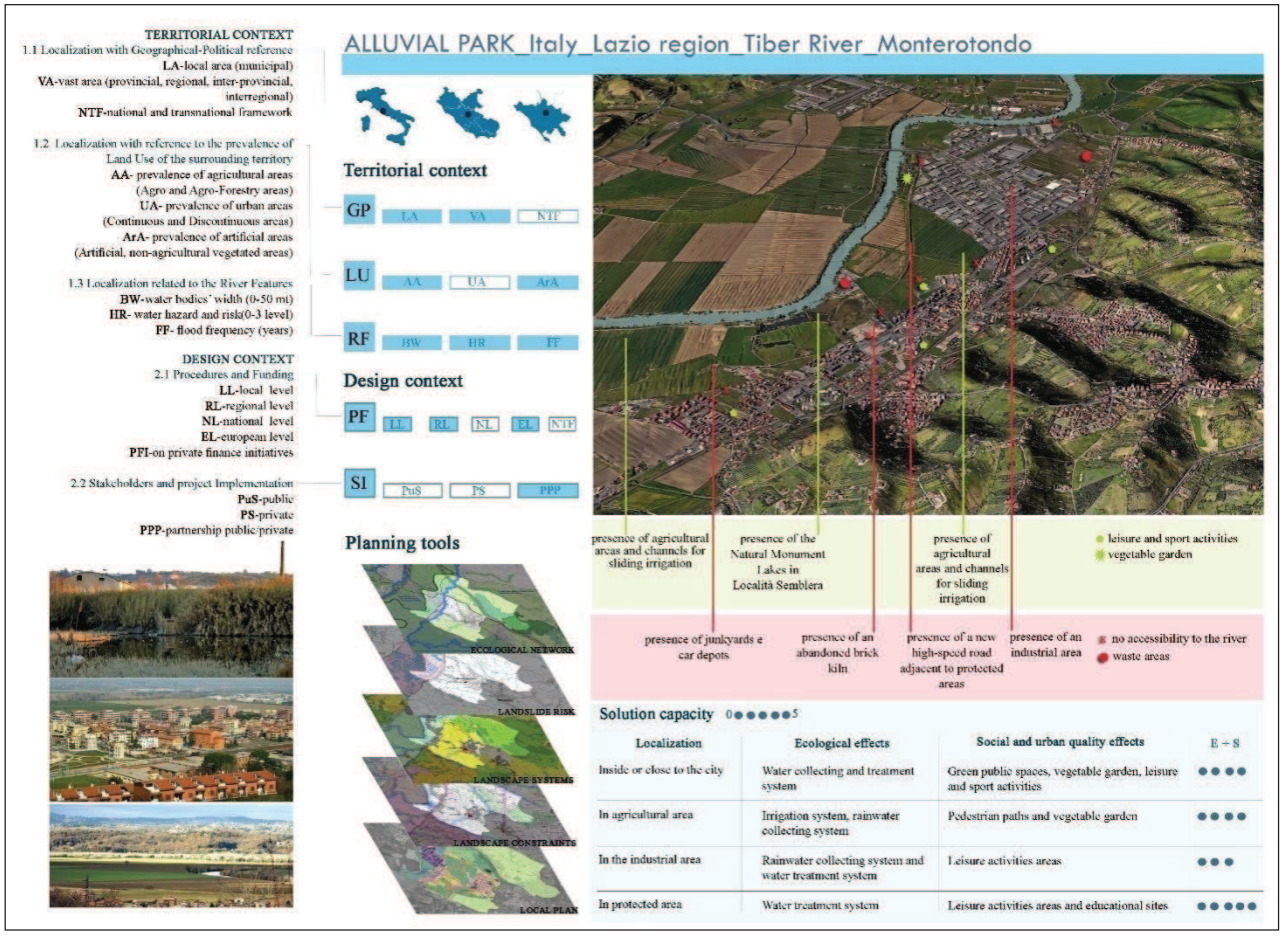


**Figure 2**. Application of the Data Sheet E+S=U to the case study of Monterotondo Scalo (Author's elaboration 2019).

The proposal of the paper is not an already realized project, but it is an investigation and a design experimentation that tries to give an answer to the requests of how to make a smart city. The fundamental aspect is that of the management of climate change inside the city: we do not want to provide a perfect solution, but a way of acting in situations that present emergencies in the urban environment and require project-type measures. It is a way to construct possible scenarios starting just from the description of the project area to direct the project design.

The analysis phase is a fundamental moment of the planning process, lays the basis for correct and coherent actions on the territory and guarantees the creation of the critical and informative apparatus, especially in view of the identification of a unitary and shared development strategy for the river. Elaboration of project ideas and implementation of concrete examples of territorial action methods, will be intended as suggestion for new purposes on the territory, based on environmental and sustainable development. The project thus conceived would therefore allow the realization of an integrated system of actions aimed at a safeguarding and environmental safety for the construction of



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the resilience of the place and the people, for the purpose of a shared accessibility and usability of the landscape project.

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