Conference Proceedings – Long Paper

MOVING INTO PERI-URBAN MOSAICS. Building resilient relationships along the margins: The Green System Plan of Ravenna for a new liveability

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Abstract: The ongoing process of urbanisation and its expression in intensive land exploitation, fragmentation of natural areas and cycles gave shape to our cities. A renewed centrality of the soil guaranteeing essential functions and services for the local communities' welfare is necessary, particularly in zones of friction and marginality as urban voids and peri-urban fringes. Bearing in mind the definition of a mosaic where the settlement, the agricultural and the environmental systems interact and coexist (Kipar, 1994), a formal and functional reconstruction of peri-urban fringes is crucial (Pinzullo 2009): they could give back a sense and the identity to the undefined spaces produced by a controversial planning tradition, due to their potential of conversion and transformation. The paper deals with clarified reciprocity between the built environment and open territory, outlining project actions measured to the current challenge – such as climate changes –, setting infrastructural intervention and new energy sources. Focusing on the case study of the Green System Plan of Ravenna (Italy), the attention is given to model planning policies towards design actions able to create physical and ecological connections between the city and the territory. Therefore, the peri-urban fringes become places of experimentation, guaranteeing the interaction between different functional layers and improving the urban resilience: the result is the coexistence of the anthropic development with the preservation and implementation of environmental ecosystems, in a systemic and programmatic vision, throughout landscape ecology design approach for a resilient and ecological city. Within this

system, the infrastructures would have a renewed role in building the miscellaneous geographies between urban and rural areas and on landscapes vulnerability: the defined resilient factors and spaces could be innervated along the main corridors, grafting onto the obsolete and dismissed urban spaces, in an osmotic process and a broader vision of urban metabolism recovering the elements of the city.

Keywords: Peri-urban fringes, Complexity, Land mosaics, Infrastructures, Green System Plan

1. The places for building resilience

The resilience of a system describes its ability to persist in chronic stress and perturbations avoiding crisis conditions. This concept finds transversal application for all complex organisms in constant adaptation to changing circumstances: it describes the multiple survival undercurrents of communities and habitats – especially in their most vulnerable components – while continuing to guarantee their role (Holling 1973, Gunderson & Holling 2002, Walker et al., 2004).
Cities accumulate pressures and shocks during the collective transformation of the territory to support the urban economy and welfare. This dynamic process leads to changing necessities according to more unpredictable risks, due to the complexity of metropolitan systems and the uncertainty of the dangers associated. The combination of these factors affects their safety and functionality, for instance in extreme weather events management or energy sources innovation. Therefore, the treatment of resilience challenges for adaptability and prosperity of communities in urban areas involves coping with the organisation and necessary reconfiguration of their critical infrastructures, enhancing their recovery through the development and investing plans.
The global scale of certain phenomena makes urban resilience an international responsibility in mitigation and adaptation strategies: it is required to arrange discussion platforms, shared visions and a further reinterpretation of their policies concerning problems and territorial identity values for effective local action. All the systemic components of the city should be considered in their structural organization to absorbing changes and anomalies while preserving function, government and identity to face chronic environmental pressures and climate risk conditions. Which are the places of such physical and physiological transformations? Could they resolve further urban issues?

In addition to the preservation of the historical and cultural heritage of the cities' foundation where tradition exists, numerous cases of core urban areas include most of the embedded urban fabric, challenging to accommodate great changes. On the other hand, peri-urban areas are fragmented zones of rural and naturalistic relevance often compromised by impactful interventions. Nevertheless, their heterogeneous and disrupted quality allows them to incorporate important transformation processes, necessary for the revising of the third-millennium urban scenario.

The paper deals with a methodology for mediation strategies able to reinterpret the fringes as places of experimentation of urban changes in the urban resilience framework. The article aims to highlight the functional role of these hybrid and complex areas as complementary providers of urban ecosystem services, treating their potential at different levels:

(1) A macro-strategy of multiple coordinated actions to manage the resources availability, the process of integrated management, the project actions and governance for the mid/long term.
(2) An intervention method for implementing the project strategies in place able to transform the existing matrix both in the urban and territorial scale;
(3) A local approach applying regional principles and planning vision, starting from shared supranational guidelines as a common ground of discussion.

The investigation methodology analyses the peri-urban areas as "assets of active resources", from the "limit to diaphragm" concept, in which to identify the matrix of structural transformation for connection between urban and territorial scale. This allows recognizing the gaps in governance tools involving these areas as a fundamental element of planning, and discussing the integration of the appropriate top-down and bottom-up approaches to adapt existing design resources. The re-thinking and re-framing of peri-urban fringes, from the adaptation of the existing conditions and policies, can contribute to the debate on urban growth strategies by combining dynamic environmental processes with the city's structure: for these reasons, the proposed research analyses the *Green System Plan* of Ravenna as a remarkable case study.
The result is the coexistence of the anthropic development beside the conservation and implementation of ecological ecosystems, in a systemic and programmatic vision that combines the design approach of landscape ecology for a resilient city.
By meeting interdisciplinary researches, the article discusses the main objectives of planning principles based on the centrality of the undefined zones of interaction between urban and rural. The restoration of nature and the creation of green infrastructure as a multifunctional system gain space to manage the challenges of resilience, the needs of the local economy and the implementation – or reconnection – of fragmented ecological corridors to return a shape to the margin.

2. Hybrid and dynamic territories for uncertainty management

The spatial configuration of the contemporary city is pervaded by the figure of the fragment and the dispersion: Secchi distances the urban transition of the latest century from a systemic vision due to the lack of encounters between the intensity of urban dynamics, the foresight and the integration of intervention policies. Slightly, it bends to the need for temporary investment interests unrelated to the environmental and cultural features of the territory.
Urban planning disposed to support such movements – considering, for instance, the infrastructural development or the displacement of attractive poles – direct urban development on incomes in the short term. The answer to functional and qualitative requirements is left in the background, from the territorial scale to the neighbourhood unit. The effects of this process occur in poor urban quality locally, especially in peri-urban fringes, and in the climatic, ecologic and ecosystem shortage globally. Is it possible for cities a development model suitable to support similar pressures without creating imbalances in the environment they occupy?

According to UN predictions, 68% of the world population will be urbanized by 2050[1], confirming the prospects of exponential consumption of the territory and its resources in the long term, as foreseen by the "The limits to growth" report (1972).
Given the effects of urban issues, the 2030 Agenda (UN Agenda 2015) delegates the role of building sustainability and resilience to cities at international level for reducing urban vulnerability – and that of their communities – according to the "right to the city". Planning plays a crucial part in fulfilling essential urban necessities together with the protection of landscape and ecosystems (HABITAT III 2016), recognizing and reaffirming the pressure of reducing the risk of disasters[2] in the construction of resilient infrastructures through adaptation, mitigation and prediction.
The structural rethinking of complex systems cannot be separated from an urban planning policy working against the settlement fragmentation and a multiple-level planning coordinated by a consistent wide-area framework for a strategic application at the municipal and inter-municipal level. The evidence of this process lies in the identification of the suitable transformation bands to host interventions to increase biodiversity and naturalness in urban areas. Certain actions should include the increase in soil permeability, the control of hydro-superficial lamination and the enclosure of vegetation with an ecological function, to mitigate the effects of climate change, the "heat island" effect and the pollution levels.

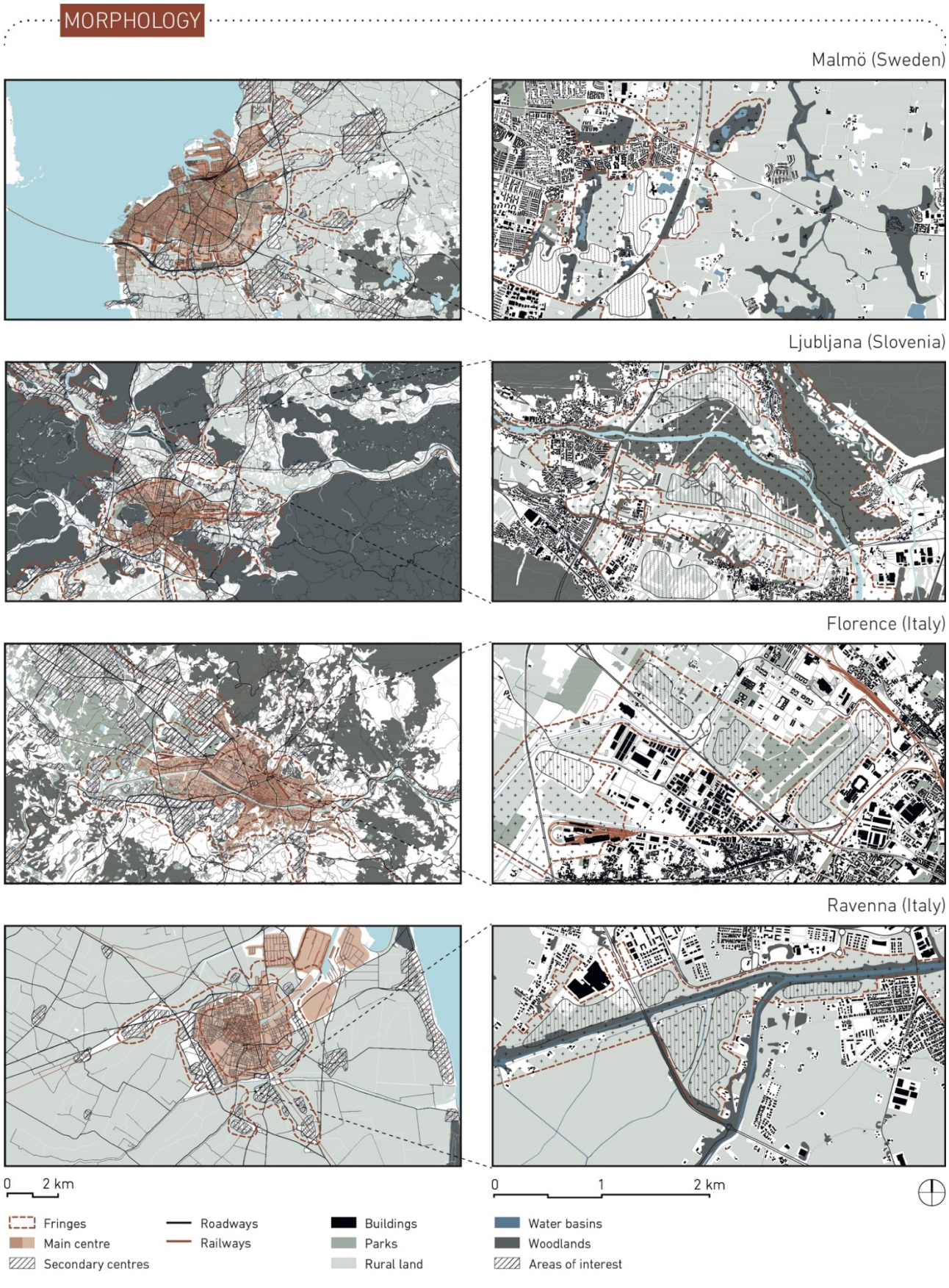
Peri-urban fringes are the shape assumed by the city in its growth along the margins, as urban discontinuity and functional and social incoherence, as a consequence of soil exploitation, natural regions and cycles disintegration. Their morphogenesis is linked to disordered centrifugal expansion pressures and saturation actions of empty spaces, distributed from the inner sites along the main mobility axes, where residues of agricultural and environmental mosaics were incorporated (PAYS.MED.URBAN 2013). The urban scenery does not take shape in these zones, while the rural and natural landscape undergoes a structural degradation due to the fragmentation and insularization of the agro-ecological structure within the infrastructural and built-up meshes (Figure 1). As a simplification, the dispersed city occurs as the result of a degenerative process of the economic, cultural and the social field, fostered by the absence of a universal strategy of regional development. Consequently, the infrastructures are unbalanced in terms of cost-benefit in the low-density cities, while the new urban fabric is characterized by a compact network of incompatibility phenomena between sensitive functions and activities producing environmental pressures. This phenomenology is attributed to the fragmentation of governance authority and to the lack of sharing intents in wide-area contexts (Pinzullo 2009).

Nevertheless, the fragmented city is a cultural projection of a society in a given space, provided with its own material, spiritual and symbolic dimension (Nogué i Font 2005). Where preserved, peri-urban areas present an "heritage of active resources" (Pinzullo 2009), a historical (system of widespread assets, including those incorporated in the rural landscape), environmental (enclosed in the biodiversity of ecological corridors and open spaces) and economic organism in transformation (linked to the rural economy, including forms of lower impact tourism), that the regional government cannot dismiss. They represent complex and dynamic interaction systems of multiple factors, whose

[1] UN 2018 Revision of World Urbanization Prospects, source: https://population.un.org/wup/
[2] *Third UN World Conference on Disaster Risk Reduction* (Framework Sendai).

prosperity requires preservation from the anthropogenic pressures, according to an integrated, interdisciplinary and systemic approach.

Figure 1. (a) The miscellaneous morphology of peri-urban fringes



(b) Content produced by the authors, re-elaborated sources: Google Maps image

Within this vision, a forward-looking management of land use becomes relevant in the reconfiguration of peri-urban fringes as areas of experimentation, through their critical reinterpretation as places of reciprocity between the built environment, infrastructures and open space.

A new semantic is decisive to re-frame a set of areas through the reduction of formal and functional separation, as re-formulating the concept of the landscape (Emanueli and Lobosco 2016) in order to manage its dynamism rather than immobilize it, within multiple levels of intervention:

(1) Rational spatial management through the implementation of compatible forms of anthropization according to the environmental necessities (and vice-versa);
(2) Implementation of ecosystem services ensuring economic development, improving the quality of urban life, applying sustainable policies in the transformation processes and adapting to climate change risks.

3. Transformation matrix: from fragment to a framework

The interpretation of these hybrid and complex areas establishes an opportunity to verify the territorial and local government policies for urban resilience through a methodology able to recognize the transformation matrix in the fringes (D'Onofrio, Sargolini 2012). These assets are able to reconcile the city and the landscape through a network of territorial infrastructures, hosting ecological, productive and cultural functions.

Therefore, the interpretation of peri-urban landscapes requires a critical comparison between: (1) the pre-existing structural and perceptual arrangement in the fringes to identify the valuable components and the main issues; (2) the current planning framework according to their systemic inclusion; (3) a diachronic and synchronic analysis of the territorial transformations according to plan predictions, to define management, requalification and valorisation criteria starting from the critical points.

Consistent with a new landscape culture aimed at the enhancement and legal recognition of "ordinary or everyday landscapes", in the framework of the European Landscape Convention, the reported methodology reaffirms the role of the peri-urban landscape as a structural component of the contemporary and future environment, as integrated in a long-term planning approach based on the semantic perspective of *Landscape Urbanism* (Corner 2005). In order to define its management criteria, new preservation actions are necessary for the framework provided by the ecological network[3]: the overcoming of the nature subsistence policy for "islands" compared to the anthropic contexts conceives a system of diversified and connected landscapes concerning the whole environmental space by the implementation of green infrastructures (Sargolini and D'Onofrio 2013).

[3] The European planning incorporates the *Pan-European Ecological Network* (PEEN) strategy as a pivotal action for the preservation of the biological diversity of landscapes, which provides the *Pan-European Biological and Landscape Diversity Strategy* (PEBLDS) as effective tool of the Biodiversity Convention (Council of Europe UNEP 2007 b) (Socco et. al 2008).

These systems play a fundamental role in strategic planning for the management of urban expansion, solving part of the dichotomy between the city and countryside (Sargolini and D'Onofrio 2013).
The integration of the ecological network with productive farming beside recreational/cultural activities of the environmental heritage creates a multifunctional system with built-up areas and infrastructures. The importance of the system is consistent in its integration with a sustainable and intermodal mobility plan and an environmental compatibility relationship between functions. Its design must contribute creating a distinctive sense of places while defining the shape of the city in joining the development areas between the fringes and the wider surrounding countryside. The perspective is a long-term project for networks of open spaces and green connections through a territory able to develop in the urban-ecological model of the green grid (Socco et al. 2008).

The idea of a connective system between urban and peri-urban open spaces, containing the expansion pressure and accomplishing ecosystem functions, offers an integrated tool for urban development management and protection of natural and productive agricultural factors in marginal landscapes, able to cope with multiple necessities:

1. The landscape is consolidated as a "living environment" holding socio-cultural factors, in which citizens can improve their quality of life according to the spaces supply for leisure while restoring the identity of compromised places;
2. The improvement of natural ecosystems and the maintenance of biodiversity through the establishment of areas of naturalistic interest contribute to the preservation of environmental values, making possible the dynamics of ecological interaction;
3. The increase in agricultural and permeable land and the conservation of "buffer zones" and green infrastructure networks between urban and rural areas lead to an increase in urban sustainability, complying with the requirements of resilience while providing stability of urban margins;
4. Agricultural areas could assume an innovative role, introducing methods for compatible crops according to the environmental needs, as well as taking on a renewed economic value, bringing supply closer to the demand for resources and recovering those parts of a degraded rural landscape.

In such a complex and fragmented scenario, the first step of a quantitative and qualitative methodology consists of recognizing the existing fragmented elements (such as natural patches, rural and historical building) defining their role in the urban system. In the meantime, it is indispensable to identify the territorial matrix (river, ecological corridors, etc) to create a renewed macrostructure. Once these landing points have been defined, it is possible to understand the hierarchies and connections that can be generated, starting from a critical analysis already addressing a specific vision of changing and reshaping the city.

The fragments become framework components for a structure of connections, strategically transformed into levels of essential infrastructures as a qualification for an organic vision of the city, capable of evolving in the space-time relationship as defining a direction of change. Consequently, the peri-urban area acquires a new image following the international focus of adaptation to global challenges, starting from the resolution of local issues through urban and environmental specificities, proposed as catalyst elements involved in the renewal process.

4. The Green System Plan of Ravenna

In the European context the Green System Plan of Ravenna[4] represents an outstanding evidence of feasible re-framing along peripheral areas, according to a stable green infrastructure including dynamic attributes: the strategic network matches the ecological needs, the infrastructure development and the urban services supply, introducing worthwhile considerations on the construction of urban resilience within the peri-urban fringes.

Ravenna is the second largest administrative area in Italy[5], mostly marked by a fragile territory resulting from centuries of land reclamation and water management. Currently, this region is primarily dedicated to agriculture and industrial production, fragmented by densely populated urban areas. Along time, the achieved land recovery has dealt with the loss of its rural heritage against urban sprawl, while suffering from multiple levels of hydrogeological risks related to more common and severe climatic hazards.

The proposal of a *Green Sector Plan* in 1993 arose from the perception of a significant natural asset in the green surfaces' census, realised by the Municipal Administration at the end of the Eighties. This territory was marked by a great anthropic presence and a progressive relocation of citizens towards the periphery unbalanced to the services supply[6]: the creation of a "green permeable frame" could arrange a new boundary for the city containment as spreading itself into the urban fabric. The objective was to guarantee a structured and harmonious urban development in agreement with the need for natural spaces beside the later General Variation of the Regulatory Plan. The strategies for the green infrastructure started from the connection to the main environmental and landscape regional features, as natural and coastal areas, rural landscape, historical landmarks and great infrastructures. An additional green system was introduced to sustain this structure with sizeable municipal parks alongside spread buffer zones, ecological connections or woodlands equipped and highly accessible to neighbourhoods and hamlets.

Despite an uncertain beginning – due to connections proposed on private parcels towards the city outskirts –, the Plan saw a rapid fulfilment in the late Nineties. Since then, it is achieving a dynamic implementation as adapting to urban development.

The systemic green infrastructure shows its consistency in the following sections:

i. The *Green Belt* establishes the peripheral ring preventing urban sprawl, filtering the residential areas from the high-traffic roadways and connecting the inhabited quarters to the rural lands;
ii. The *Ancient City Wall Trail* creates a continuous route along the perimeter of the historic centre, besides a physical and visual relationship between the monumental landmarks and the *Green Belt*;
iii. The *Urban Parks* of 'Teodorico', 'Baronio' and 'Cesarea';

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[4] GSP main Datas: Planning area Ravenna Administration: Franco Stringa, Francesca Proni, Leonardo Rossi, Landscape design: Andreas Kipar (LAND s.r.l.), Antonio Stignani (PAISA' srl.),Teprin associati with Boris Podrecca Surface: 2.471.911 mq, Timescale: 1992-ongoing (source: https://urbanpromo.it/2016/progetti/paesaggi-in-divenire/)

[5] Administrative area: 653,82 km^2; density: 235,14 hab/km^2 (source: ISTAT, https://www.istat.it/it/files//2013/02/Superfici-dei-comuni.pdf, date of access: 10/11/18).

[6] Municipality of Ravenna, *Municipal Structural Plan (PSC), Fact-finding survey*, 20-02-2007 (source: http://rup.comune.ra.it/PSC/Elaborati/Quadro-Conoscitivo, date of access: 4/11/2018)

iv. The *Community Gardens*.

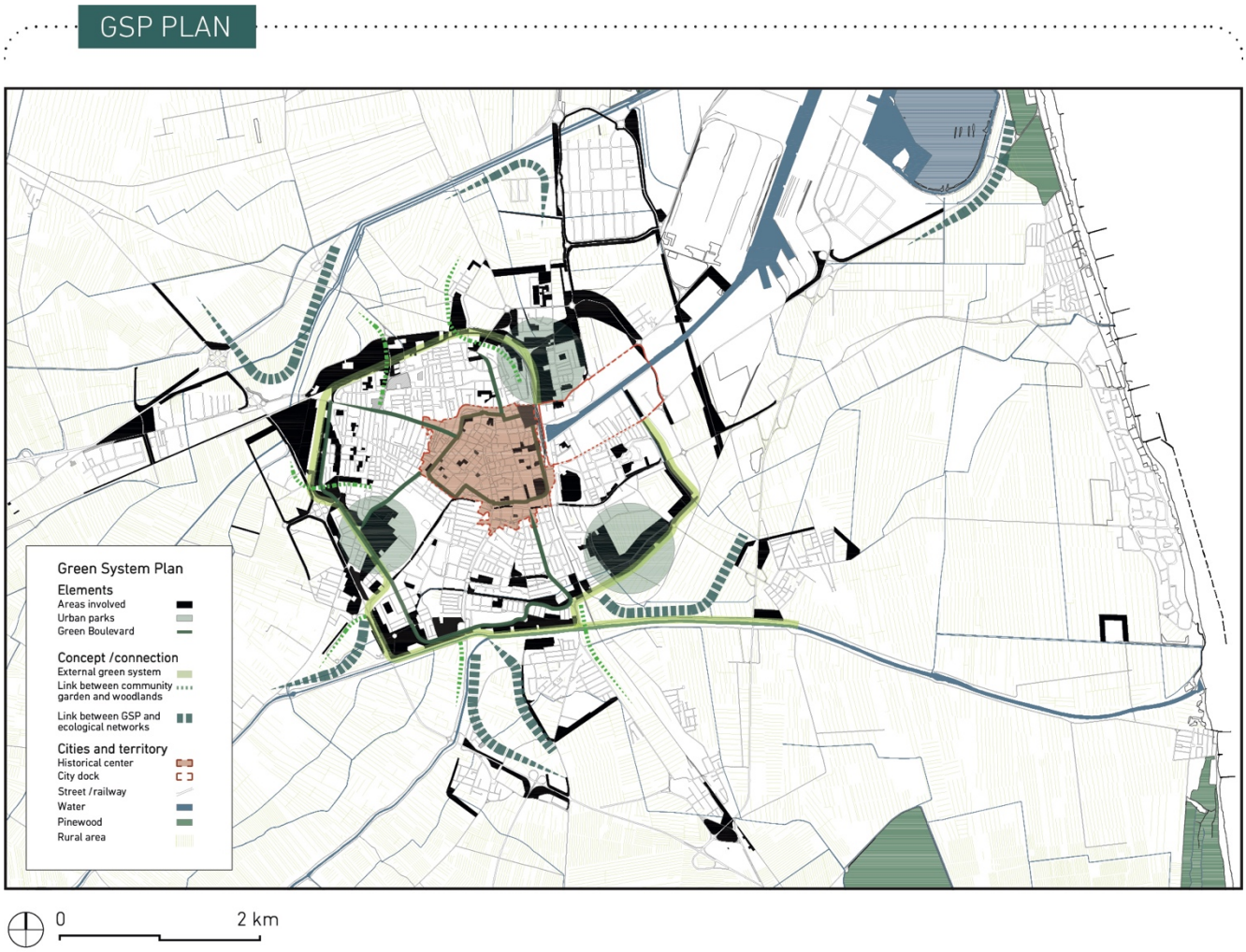
The proposal of a green infrastructure subverted the traditional logic of urban standard, which degrades the open space resource to an urban design leftover or a disjointed integration to built-up morphology, with significant maintenance costs. The green became a tool for urban renewal actions starting from the peri-urban fragments: it offered a different concept of collective space, adapted to the expectations of lifestyle and urban wellness changes while affecting historically settled areas positively.

The drafting of the latest *Municipal Structural Plan*[7] suggested the *Green Belt* implementation according to the recent planning requirements. Currently, the design tools for the construction of the green system (Figure 2-3) have been enriched typologically preserving a complete organic masterplan design, as assumed by the previous Plan:

i. The *Community Gardens* persist as highlights where the urban forest encounters public spaces, joining the *Green Belt* to the city with neighbourhood functions for leisure;
ii. The *Urban Parks* are equally placed along the margins ('Parco Baronio' to the south-west, 'Parco Cesarea' to the south-east with new residential settlements, and 'Parco Teodorico' to the north), balancing and compensating the growth of woodland strips or natural areas on the urban edges with their development along the internal roads and the waterways' banks;
iii. The *Woodland Buffers* provide fast-growing tree species combined with designed land topography – focusing on areas of limited width – to protect the dwellings and open spaces and to provide air regeneration ecologically, significant along congested roadways and manufacturing sites;
iv. The *Ecological Woodland* grows at ground-level along areas with a predominant naturalistic vocation, supported by landscape arrangement (the ‘River Park’, the ‘Lama Canal’, on the edge of the agricultural areas);
v. The maintenance and improvement of *Rural* or *Seminatural Green* cover ecological, landscape and psychological functions, especially where unproductive agriculture can promote natural growth, as self-reproducible environmental units.

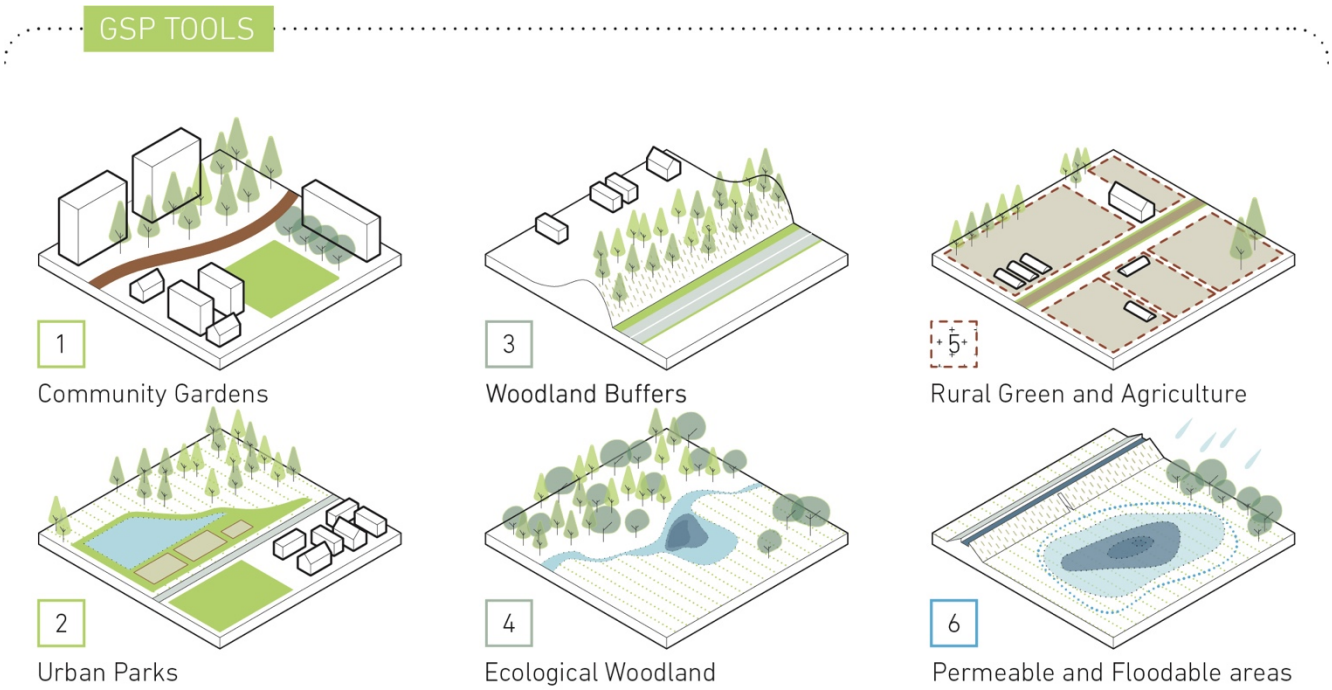
[7] N.25/2007 Deliberation council, compliant with 20/2000 Emilia-Romagna Regional Law standards (source: http://rup.comune.ra.it/PSC/News/APPROVATO-IL-PSC-PIANO-STRUTTURALE-COMUNALE).

Figure 2. (a) The *Green System Plan* fulfilment (Ravenna)



(b) Content produced by the authors, re-elaborated sources: PSC 2.8. b – *Green system – Urban projects*; RUE 6.2/6.3 – *County seat Green system: Typologies*, *Greenbelt implementation*; Urbanpromo, Projects – *Paesaggi in divenire*.

Figure 3. (a) The green typologies implemented in the *Green System Plan* (Ravenna)



(b) Content produced by the authors, re-elaborated sources: PSC 2.8. b – *Green system – Urban projects*; RUE 6.2/6.3 – *County seat Green system: Typologies*, *Greenbelt implementation*; Urbanpromo, Projects – *Paesaggi in divenire*.

In the Nineties, the urban growth cycle of Ravenna had not achieved completeness in the outskirts, leaving interstices and marginal farming areas characterised by low-density housing typologies close to the hamlets of the city. Almost 30 years after its implementation, the effects of the *Green System Plan* are visible as an urban expansion model integrated into a relevant landscape structure: the 60% of 247 hectares of green planned, 141.5 of which owned by the Municipality in 2016, reached fulfilment. Over time, the *Green Belt* is strengthening its nature of multifunctional green infrastructure inside the city, making a transition between the inner compact block and the low density of the green blueprint in a harmonious scheme. Therefore, the urban shape gathers the rural tradition matrix of Ravenna. The canals and banks become elements of urban design regulation. The green margin reaches the main parks through internal corridors integrated with the urban structure. A slow mobility network allows to overcome of land slopes – while emphasising its character of "environmental embankment"–, to cross the woodland areas and to connect them with the equipped and accessible public spaces.

As the ecosystem of multifunctional natural areas, the *Green Belt* offers a significant evapotranspiration area due to the presence of mature woodlands, stable meadows and high-density zones of perennial species: its conservation reduces the atmospheric pollution, contributes to climate adaptation and mitigates the effect of urban "heat island". Likewise, the Green Belt introduces water as "active" environmental resource to accomplish the landscape functions, restoring permeable and floodable areas to collect, recover and reserve rainwater through surface water supplies. These interactions solve any possible overload of the traditional water disposal for severe weather events and guarantee the useful water balance for the enhancement of landscape complexity and biodiversity.

Additionally, the green infrastructure supports the hypothesis of encouraging alternative crops, preserving the landscape heritage and bringing the citizen closer to the valorisation and consumption of local products. This choice contributed to the *Green Belt* design through the agricultural plot, as well as the introduction of leisure or sports activities related to wellness, ecological and cultural tourism. As part of the development process, the areas preserved for integrated agriculture in grassland contribute to solving subsequent issues in the evolution of the green frame, whereas a system of gardens surrounding the main parks provides their management and monitoring.

The study of the *Green System Plan* of Ravenna has clearly illustrated the success of the proposal due to the availability of a significant amount of free areas by the Municipality. Its constitution was based on the transfer of distant planning standards – to maximise the effect of public funding – and the free acquirement of further surfaces by private interventions within the Executive Urban Plans, with multiple effects on urban quality. This system has transformed landowners into "active" figures in the achievement of urban transformation, linked to an implementing mechanism of equalisation. Although initially established as a sector plan, the Green System Plan has been integrated into a comprehensive planning perspective to achieve the local development guidelines. Indeed, the reference to its proposal as a remarkable practice is not only for its consistent vision. The project tools introduced in the Nineties linked the preservation of urban voids to a potential resource for common open spaces, restoring them to the natural area. Furthermore, this approach has foreseen the demand of available flexible zones for climate risk management. Nowadays, the system is able to match the environmental matrices altered by the urban sprawl of the Eighties. The plan instruments demonstrated their mutual relationship of environmental protection, spatial management and construction control in restoring peri-urban fringes as a shaped and functional bond between urban and rural landscape.

5. From edge to diaphragm: Mediation strategies

The research suggests the peri-urban fringes as places of experimentation, assuring the interaction between functional levels to improve urban resilience. The result is the coexistence of the anthropic development alongside the conservation of environmental ecosystems, in a programmatic vision clarified by the landscape ecology approach. Therefore, an enriched preservation of the “active resources” (Pinzello I. 2009) in the cities’ outskirts involves strategically coordinated actions – in project, planning and governance – and determines effectiveness by their timeliness application.
(1) The improvement of peri-urban resilience to promote regional sustainability requires to conceive all the involved components and dynamics of the city as a whole. The decisions taken to connect the value of peri-urban assets to the enhancement of the urban system must result in (2) an integrated management process. The importance of the strategy is consistent in (3) short, medium and long-term planning for the implementation of governance measures and project instruments.

Given the involvement of multiple factors and the role of peri-urban landscapes as complementary suppliers of urban ecosystem services, the cross-sector application of the strategic vision requires:

i. Forward-looking policies coordinated at the institutional level, assuming a territorial vision at the higher governance scale;

ii. An interdisciplinary approach to a complex and dynamic setting, supported by an integrated risk assessment for the several factors of the transformation matrices;
iii. Multiple time dimensions of planning as interventions attained per phases, strategic outcomes and milestones;
iv. An investment-benefit evaluation joined to an economic valorisation of the assets to be improved, through incentive measures for the private stakeholders;
v. Co-design and co-management tools to build social integrations and community bonds with the region, returning a sense of belonging and care for their local heritage;

This process is necessary for the reconstruction of the marginal sites' identity, by connecting and re-framing the fragments for an ecologically balanced urbanity[8].

The mediation strategies (Pellegrini 2014) for the city-countryside relationship in the fringes require flexible design configurations for established goals, given the compound conditions offered by the dimensional and geomorphological features of peripheral regions. Reasonably, the production of transformation scenarios can trigger proper processes for the land, referring to general principles, common objectives and respecting the context distinctiveness. The following multiple forms of appropriate mediation for the fringes can concurrently act on sites according to settled "pilot projects", organising frames of functional diversification within the system:

(1) Restoration of physical permeability between public and private space, community open areas and the surrounding agricultural land;
(2) Mitigation of the perceptual thresholds between scenarios, repairing the visual "porosity" and treating the disturbing urban factors;
(3) Creation of functional relations between farmland and city through open spaces alongside the residential edges of built-up areas;
(4) Composition or strengthening of the urban margins with new residential developments while maintaining a high degree of permeability and quality of open spaces.

6. A renewed role for resilient infrastructures

According to this system, critical infrastructures undertake a renewed role in the construction of peri-urban geographies and landscapes' vulnerability. A paradigm shift is necessary, restoring historically acquired experiences in which the landscape and ecological component assume design relevance. Prior models of green infrastructures and biological networks set the debate on green integration systems in urban development processes – as radial wedges or concentric belts –, grounding the elaboration of wider-scope policies[9].

In the last twenty years, medium-sized European cities have become laboratories of landscape experimentation as a mean of urban renewal, reaching elaborate policies and overcoming the traditional rules of "cascade structures". This flexible attitude marked the transition to an

[8] Strategic proposal suggested from the results and sector-based competences acquired within the participation to the *"2018 DELTA INTERNATIONAL SUMMER SCHOOL"* on the *Effects of Coastal Resilience in Rural Areas* (11-16/06/2018, Ravenna).
[9] To name a few: the *Eindhoven Expansion Plan* by J. M. de Casseres (1930); Copenhagen *'Finger Plan'* by the Regional Planning Office (1947); *General Plan* of the city landscape of Cologne by R. Schwarz (1951).

environmental reinstatement of the local features in evidently unsolved city regions by planning, agreeing to territorial guidelines (Socco et al. 2008).

The achievement of discussed and disseminated targets within a platform of shared experiences (PAYS.MED.URBAN, 2013) can trigger processes of virtuous plan proposals, supported by reward, facilitation or incentive systems of private interests in effecting interventions. Likewise, the development of a collective strategy requires a method of approach, investigation and analysis for flexible tools based on wide-area spatial planning.
The extensiveness of the urban fragmentation phenomenon eliminates the distinction between the unregulated growth and the urban design outcome: it evidences the gap between the technical discipline and the practice – as a distortion of principles – and the defectiveness of governance instruments concerning the processes of urban morphogenesis. For these reasons, the establishment of a regional inter-institutional roundtable should attain regional planning to give programmatic lines for transformation and management of fringes. The fulfilment will be able to produce a *Local Structural Plan* for peri-urban areas management as a territorial landscape tool, integrated by a *Green System Plan* as connective infrastructure. A *Regional Coordination Plan* could integrate multiple peri-urban planning products of municipal jurisdiction for governance of the metropolitan area and the urban-region ring, always in compliance with a common strategy. Moreover, multiple scales and interdisciplinary networking of local and territorial expertise takes advantages of enticement systems, mutually for private assets on public land and landowners' active role in the transformation process (as clarified in the Case study of Ravenna).

Nevertheless, the introduction of a new green network is consistent in the renovation of the existing infrastructural system as a priority. Shared guidelines should provide preventive measures from the identification of critical zones, according to their adaptability to strengthen environmental organisms and compatible human activities. Consequently, administration, displacement or adaptation of existing functions becomes significant. It is crucial to outline the mandatory stages for building resilient relationships between infrastructures, facilities and ecological corridors according to a timeline:

(1) A preventive removal and reconfiguration of the existing elements of disruption;
(2) The identification of areas for conservation purposes and of patrimonial interest in cultural, historical and environmental terms;
(3) The selection of new "buffer zones" and green diaphragms to filter sensitive functions and impactful infrastructures;
(4) The integration of the territorial matrix enhancing the river drainage basins as ecological backbone corridors, followed by the re-shaping and reforestation of existing open spaces for the adaptation to floods/erosion risks;
(5) The implementation of an accessible mobility system supported by public transport, connecting the nodes of the green network;
(6) The identification of suitable places to accommodate new public uses as catalytic elements, allowing adaptation into areas of ecological value;
(7) The integration of low-impact activities within the water basins and forestry matrix for the management of resources' consumption and waste production.

The review of complexities and issues in peri-urban areas demonstrates that a multidisciplinary approach is necessary. Different professionals can transfer their sector know-how providing local solutions for global questions.

A further fundamental factor for a green infrastructure feasibility is its constant relationship with sustainable mobility planning. This condition entails an adaptation of the transportation pattern according to multiple interventions: the drastic reduction of private motorized traffic supporting the quiet lanes implementation; the improvement of an intermodal public transport; the widening of pedestrian and cycle mobility; the increase of vegetation along the main mobility axes to reduce air pollution. The symbiotic relationship between green infrastructure and traditional mobility shapes an ecological mobility network – respecting the continuity of environmental corridors – and with compound urban ecosystem functions (Socco et al., 2008). Besides, the pathways of soft mobility approximate community utilities through the practice of physical exercise in more natural settings.

Indeed, the consequences of such interventions evoke a social influence in the communities' integration over the territory through the local market and the socio-cultural heritage. As places of experimentation, the peri-urban fringes can improve a "low environmental impact" approach, making investments on the native and rural economy while taking advantage of existing values, agricultural activities and low-tourism networks. According to this, another line of the research worth pursuing further is to study the importance of a renewed infrastructural network in addressing the multicultural needs brought by the most recent migratory phenomena and social integration. The concerns related to degradation and abandonment – especially in peri-urban areas – remain unsolved where certain marginal spaces become issues of social acceptance by segregated groups. Without an adequate social policy, a spatial and community integration cannot occur even where local economy requires, making the original project of urban-rural connection impossible to enforce.

Inside this vision and the international agreements, participation is an essential instrument to give the citizens a role, especially in the appropriation processes over scattered abandoned places. The involvement of people gives a new image of the city starting from the uses – both formal or informal – of non-defined public spaces. The promotion of participation through education and training by authorities, territorially competent administrations, institutions and experts builds an awareness structure. The creation of social bonds highlights the importance of partnership between communities and local/regional governments, focusing on the peri-urban areas as zones of friction. The participation of citizens in planning and management stages makes the future users responsible for the places they could use, attended by the administration and professionals responsible for following the process.

7. An osmotic process along landscape corridors

The global challenges for the 21st century are strictly related to the integration of urban sustainability and landscape governance, within a symbiotic system capable of mutual osmotic interactions among all the elements involved between city and countryside. The propagation of resilient factors along the main corridors of urban and ecological structuring allows the re-elaborated organism to embrace a

wider area of influence, affecting compromised or undefined spaces even further from the intervention sites. Nowadays, peri-urban fringes require high-quality renewal interventions starting from the critical conditions left by land exploitation as degraded, obsolete or abandoned components: recovery and maintenance actions should return strategically selected spaces to their re-naturalisation in order to preserve ecological continuity, rural components and soil permeability, within a widespread network guaranteeing improved accessibility.

In response to this matter, the sustainable design provides an alternative way to conceive next-generation infrastructures and the built form. It takes advantage of the principles offered by the Circular Urban Metabolism to achieve a renewed management for peri-urban areas: (1) retrofit of the existing infrastructures by redefining the spatial strategies in the existing urban fabric – including forms of incentive and allowance – capable to metabolise their flows and management for greater climate resilience and liveability; (2) taking the opportunity of new infrastructural interventions to advance research and practice, designing new spatial processes where natural areas and the built form are systematically integrated. The resulting level of social and ecological benefits is advanced and resilient-based according to climate risks and environmental pollution. Therefore, a planning approach based on a multiple time dimension confirms its value in achieving the expected outcomes, supported by milestones, impact and cost-benefit evaluations from the application of pilot projects. Widespread design actions of peri-urban renewal become feasible as implemented, adapted and improved per phases, starting from the achieved results compared to the inter-institutional roundtables for spatial planning.

The adaptation and re-shaping of peri-urban fringes – from fragment to frame – always rely on the ability to convert public policies in real projects, answering to multiple levels of intervention:

(1) Reference to the main aims of regional governance, including the peri-urban fringes as integrated planning areas, rather than a complementary variation to the Regulatory Plan;
(2) Restoration of nature where land exploitation already occurred, through renewal methods and compact settlements planning according to fixed targets and flexible project tools;
(3) New economy investments based on rural and low tourism activities, offering services to citizens and continuous green spaces in the framework of “green infrastructures” as a multiple-function system;
(4) Restoration of continuity along fragmented ecological corridors to repair form and functionality to “buffer zones” between urban areas and countryside.

Nevertheless, the critical management of peri-urban areas needs to establish the approach to its multiple challenges starting from the citizens’ and administrations’ consciousness: the soil is an exhaustible resource, able to give a converted image of fringes while addressing both environmental and social issues. For this reason, a development paradigm based on the relationship between urban and rural demands a systemic complex: it requires to be based on the value of land according to a multifunctional diversification, an integrated approach, social bonds and regional visions to achieve urban networks and solutions from local actions to global influence.

Acknowledgments

The *Green System Plan* of Ravenna and "Baronio Park" intervention: 1st Prize Awarded Projects in the "CITY&LANDSCAPE" competition (Category: Parks, Gardens, Green spaces and Connection in the urbanised city), during an international symposium organized by PAYSAGE TOPSCAPE (*Triennale di Milano,* 09/06/2017).

From the Jury Report: "(It) Guides the transformation of the urban landscape to the construction of numerous parks, integrating in planning and design, several elements of the local landscape, such as water, woods, countryside with an ecological and landscape approach together"

Conflict of Interest

The authors declare no conflict of interest

Journal Articles:

Folke C., S. Carpenter B., Walker M., Scheffer, T. Elmqvist, L. Gunderson, and C. S. Holling, (2004), Regime shifts, resilience, and biodiversity in ecosystem management. *Annual Review of Ecology, Evolution, and Systematics* 35:557-581

Holling C. S. 1973. Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics* 4:1-23

Books and Book Chapters:

AA.VV. Osservatorio del paesaggio dei parchi del Po e della collina torinese. *L'infrastruttura verde del Parco del Po Torinese "Immagina il Po"*, Edited by Socco C. Alinea Editrice Firenze 2008 ISBN 978-88-6055-275-4

Bogaert J. and Biloso A. and Vranken I. and André M. 2005. Peri-urban dynamics: landscape ecology perspectives. In *Territoires périurbains: Développement, enjeux et perspectives dans les pays du sud*, 1st ed. Gembloux: Presses agronomiques de Gembloux, pp.63-73, ISBN 978-2-87016-136-4

Corner J. 2006. Terra Fluxus. In *The Landscape Urbanism Reader*: 1st ed. Edited by Waldheim C.. New York: Princeton Architectural Press, pp. 21-33. ISBN 10: 1-56898-439-1

Emanueli L., and Lobosco G. 2016, HyperNatural landscape. In *Albanian Riviera / An alternative model of Progress and Development for a Next Generation Albania.* 1st ed. Edited by Aliaj B. and Rossi L.. Tirana: in, Botime Pegi, pp.42-45. ISBN 978-9928-147-34-9

Forman R.T.T. 2009. *Land Mosaics. The Ecology of landscapes and regions*, Cambridge: Cambridge University Press, pp. 656, ISBN-13: 978-0521479806

Gunderson, L. H. and Holling, C. S. (2002). *Panarchy: Understanding Transformations in Systems of Humans and Nature*, Washington DC: Island Press. pp.42-45 ISBN 978-1559-638-57-9

Kipar A. 1994. La produzione dei valori ambientali nelle aree peri-urbane: verde agricolo, verde naturalee verde attrezzato. in *Tra città e campagna. Peri-urbanizzazione e politiche territoriali* 1st ed. Edited by Boscacci F. and Camagni R. Milano: Franco Angeli,.pp. 484, ISBN 88-15-04781-6

Nogué i Font J. 2005. Inutel Paisagem. In *Bones pràctiques d'incorporació del paisatge en el planejament urbanístic de Catalunya*, Elements de debat territorial 22, Edited by Mallarach J. M. and Comas E. pp.13-14 ISBN 84-9803-065-X

Secchi B. 2001. *Prima lezione di Urbanistica*, Bari Laterza (Biblioteca Urbanistica). ISBN 9788842060604

United Nations, A/RES/71/256 *New Urban Agenda*, 2017, ISBN 978-92-1-132731-1

Conference Proceedings:

Pellegrini M. 2014. Il peri-urbano come spazio di mediazione: territori del Friuli-Venezia Giulia. In *L'urbanistica italiana nel mondo.* Paper presented at XVII Conferenza Nazionale SIU, Milan, 15-16/05/2014. Milan: Planum the journal of urbanism ISBN 978-8899-237-00-4

Pinzello I., Colonna Romano L., Giampino A., and Todaro, V. 2009. Paesaggi di margine. In *Il progetto dell'urbanistica per il paesaggio*. Paper presented at XII Conferenza Nazionale SIU, Bari, 18-20/02/2009. Bari: Adda, ISBN 978-8880-827-94-8

Sargolini M., and D'Onofrio R. 2013. Planning interpretation for peri-urban landscapes. In *Planum. the journal of urbanism*. Paper presented at Living Landscapes-Landscapes for living, Florence. February-June 2012. Milan: Planum the journal of urbanism; pp.:15-20. ISSN 1723-0993.

Websites:

- ISTAT. 2011. *La superficie dei comuni, delle provincie e delle regioni italiane.* Available online: https://www.istat.it/it/files//2013/02/Superfici-dei-comuni.pdf (Accessed on 10/11/18)
- Comune di Ravenna, Area Pianificazione Territoriale. PRG 2003. Piano Strutturale Comunale. PSC – Quadro conoscitivo, *Relazione del Quadro Conoscitivo*. Available online: http://rup.comune.ra.it/PSC/Elaborati/Quadro-Conoscitivo/Relazione-al-Quadro-Conoscitivo (Accessed on: 10/09/2018)
- Comune di Ravenna, Area Pianificazione Territoriale. PRG 2003. Piano Strutturale Comunale. PSC 2.8. b – Capoluogo, *Sistema del verde – Progetti urbani*. Elaborato descrittivo. Available online: http://rup.comune.ra.it/PSC/Elaborati/ELABORATI-DESCRITTIVI/PSC-2.x-Tavole-descrittive (Accessed on: 10/09/2018)
- Comune di Ravenna, Area Pianificazione Territoriale. PRG 2003. Regolamento Urbanistico Edilizio. RUE 6.2 – *Il sistema del verde del capoluogo: Tipologie*. Elaborato prescrittivo. Available online: http://rup.comune.ra.it/RUE/Elaborati/Gestionali/RUE-6-Il-Piano-dei-Servizi (Accessed on: 10/09/2018)

- Comune di Ravenna, Area Pianificazione Territoriale. PRG 2003. Regolamento Urbanistico Edilizio. RUE 6.3 – *Il sistema del verde del capoluogo: Stato di attuazione della cintura verde*. Elaborato prescrittivo. Available online: http://rup.comune.ra.it/RUE/Elaborati/Gestionali/RUE-6-Il-Piano-dei-Servizi (Accessed on: 10/09/2018)
- DELTA 2000, PSR Emilia-Romagna 2014-2020 – Misura 19 – Supporto allo sviluppo locale LEADER. Available online: http://www.deltaduemila.net (Accessed on: 07/07/2018)
- DISS 2018, *Delta International Summer School – Effetti della Resilienza Costiera nelle Zone Rurali*. Convention project under construction, Measure 19.2.02.10 "Pilot Project to Increase the Culture and Landscape Knowledge" – Sostegno dello Sviluppo Locale LEADER - PIANO DI AZIONE DELLA STRATEGIA DI SVILUPPO LOCALE PER IL DELTA EMILIANO-ROMAGNOLO 2014-2020. Available online: https://drtlne.wixsite.com/ilmiosito (Accessed on: 01/09/2018)
- PAYSMED, Il portale dei paesaggi mediterranei. Available online: http://www.paysmed.net/pays-urban/index.php (Accessed on: 12/10/2018)
- Population Division, Department of Economic and Social Affairs, *2018 Revision of World Urbanization Prospects*. Available online: https://population.un.org/wup/ (Accessed on 5/11/18)
- United Nations, A/RES/70/1 *Transforming our world: The 2030 Agenda for Sustainable Development*. Available online: https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf
- Urbanpromo. *Paesaggi in divenire, Il piano del verde di Ravenna*. Ravenna 2015, Capitale italiana della cultura. Available online: https://urbanpromo.it/2016/progetti/paesaggi-in-divenire/ (Accessed on: 1/09/2018)