

Dynamic heritage. Designing landscape and ecosystem scenarios for the Po Delta area in Italy

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THE MATTER OF FUTURE HERITAGE

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The Matter of Future Heritage

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Dynamic heritage. Designing landscape and ecosystem scenarios for the Po Delta area in Italy

Retreat; Evolving Landscapes; Scenario-based Approach; Hyper-natural Landscapes

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The role of climate change in re-defining and improving the notion of heritage is a critical issue in many fields of study. During the last few years, an intense debate around the necessity of dislodging heritage from the conventional concept of its being somehow pre-figured or ready-made has been fed by a vast multidisciplinary literature that has highlighted the impacts of environmental transformations on both its tangible and intangible qualities.

In such perspective, landscape architecture can contribute to articulate this dynamic nature of the cultural heritage concept into planning and development frameworks, by operating on the spatial implications associated with the construction of exploratory scenarios and adaptive strategies to climate change. With this aim, the present contribution focuses on the on-going transformations of deltaic systems, seen as an exemplar case-study of how the current conservation-driven management policies need to be deeply reformed to face the challenges of resilience. The article explores the potentials of alternative solutions to the orthodox implementation of landscape and ecological restoration criteria, proposing a selective retreat of human activities from the Po river Delta area in the northern Italy.

A possible way of addressing the issue is to theoretically frame the actual trend of the Delta transformation within the definition of *novel ecosystems*. Following this concept, a more pragmatic and prospective mindset can affect the way into which the ideas of landscape and heritage conservation should inform the development of appropriate management goals and approaches. In order to understand whether these new systems are - or will be - persistent, sustainable, and what values they may have for the cultural identity of a territory, long-term strategic visions are needed and useful for addressing right away policymakers' decisions for the future.

The research work, considering the region's increasing hydro-morphological degradation and other variables, depicts different scenarios of infrastructural and environmental evolution. In summary, the intent is to define procedures and ways according to which abandoning to the marine transgression selected areas of the Po Delta by re-organizing the whole landscape, infrastructural and environmental system at the light of a new dynamic ecosystem functioning. In this perspective, the proposal of a *Selective Retreat* investigates limits and potentials related to the possible transition of the Po Delta from an intensively-managed (and collapsing) systems to a novel and emerging heritage.

Introduction

The role of climate change in re-defining and improving the notion of heritage is a critical issue in many fields of study. An intense debate around the necessity of dislodging heritage from the conventional concept of its being somehow pre-figured or ready-made has been fed by a vast multidisciplinary literature¹ that has highlighted the impacts of environmental transformations on both its tangible and intangible qualities. A different perspective on the dynamic components contributing to define cultural identities has grown. Especially within the field of human studies, a new attention has been paid to the processual interaction

1 Cristina Sabbioni, Peter Brimblecombe and May Cassar (ed.). *The atlas of climate change impact on European cultural heritage: scientific analysis and management strategies*. London and New York: Anthem Press, 2010.

of the past and the future as an agent of cultural change² and finally of heritage production, evolution, or continuity.

As noticed by David Harvey and Jim Perry³, the heritage-climate change nexus needs to be tackled according to an operational attitude which should “reject the traditional view of heritage conservation carrying a treasured past into a well-understood and unsafe future”⁴. A new view of heritage, serving society in times of rapid climate change, should embrace loss, alternative forms of knowledge and uncertain futures in order “to make decisions about values and the ways heritage assets are passed through time”⁵.

In such perspective, landscape architecture can contribute to articulate this dynamic nature of the cultural heritage concept into planning and development frameworks, by operating on the spatial implications associated with the construction of exploratory scenarios and adaptive strategies to climate change. With this aim, the present contribution focuses on the on-going transformations of deltaic systems, seen as an exemplar case-study of how the current conservation-driven management policies need to be deeply reformed to face the challenges of resilience.

The research work, considering the region’s increasing hydro-morphological degradation and other variables, depicts different scenarios of infrastructural and environmental evolution by following the *Scenarios’ Evaluation by Design methodology*.⁶ The final goal is to provide policymakers and management authorities with alternative standpoints from which to start rethinking the future of the Po Delta area as a dynamic

2 Mike Hulme, “The conquering of climate: discourses of fear and their dissolution,” *Geographical Journal* 174, no.1 (2008): 5-16.

3 David Harvey and Jim Perry (ed.) *The future of heritage as climates change: loss, adaptation and creativity*. London: Routledge, 2015.

4 *Ibid.*, 3.

5 *Ibid.*, 3.

6 Roberto Di Giulio, Luca Emanuelli, and Gianni Lobosco, “Scenario’s evaluation by design. A “scenarios approach” to resilience,” *TECHNE-Journal of Technology for Architecture and Environment*, no.15 (2018): 92-100.

heritage. In this framework a Selective Retreat Strategy can be considered as an exploratory scenario⁷ aimed at grounding the debate around the Delta on a more prospective outlook.

The Po Delta toward a novel ecosystem

Life on deltas has always been largely subject to uncertainty, and large flooding events were ordinary phenomena to deal with.⁸ Mostly during the last century, such processes have been widely altered by human interventions aimed at exploiting natural resources of rivers and framing their normal dynamics. As a consequence, deltas have undergone an increasing degradation due to several factors like the sharp reduction in the sediment input, large fresh water consumption, man accelerated subsidence, water salinization and eutrophication. Combined with global climate change effects, such as the eustatic sea level rise, all these forces have made the environmental management of delta areas more and more difficult, expensive, and pervasive to the point that, without strong anthropic actions, many of them would be rapidly submerged by fast marine transgression.⁹

The Po River Delta is a distinct example of how such complex issues have intertwined over time shaping the landscape and transforming ecosystems [Fig. 1]¹⁰. Its present morphology is an over-engineered system in which any kind of interaction is hardened, strictly mediated and controlled [Fig. 2]. In spite of that, the sea is constantly retaking its space on the top plain, re-flooding

7 Luca Emanuelli and Gianni Lobosco, "Scenarios' Evaluation," in *Riviera Re-attiva*, ed. Luca Emanuelli (Macerata: Quodlibet, 2018), 107-113.

8 James P.M. Syvitski, "Deltas at risk," *Sustainability Science* 3, no.1 (2008): 23-32.

9 Irina Overeem and Robert G. Brakenridg (ed.). *Dynamics and vulnerability of delta systems*. GKSS Research Centre, LOICZ Internat. Project Office, Inst. for Coastal Research, 2009.

10 This illustration, as well as the figures 4, 5 and 8, has been realized by Lucia Ferrarini within her Master thesis at the University of Ferrara, co-supervised by the author: Lucia Ferrarini, "PAESAGGI ANFIBI. Una strategia di ritiro selettivo per l'area del Delta del Po." Master Thesis diss., University of Ferrara, 2015.

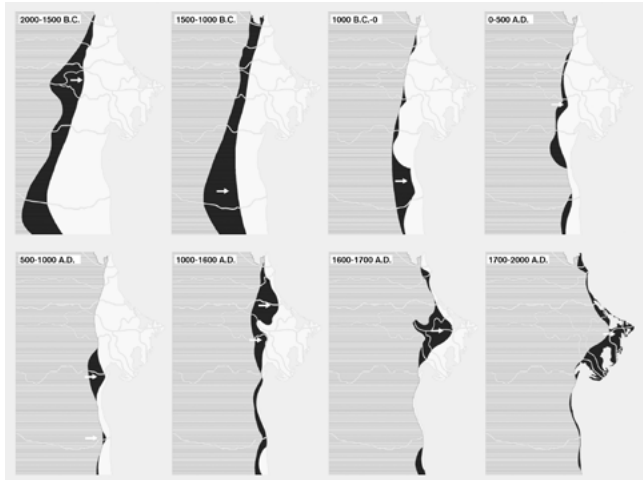


Fig. 1

Age of deposition of the different sediment belts now forming the Po Delta coastal plain between the Venice Lagoon and Ravenna.

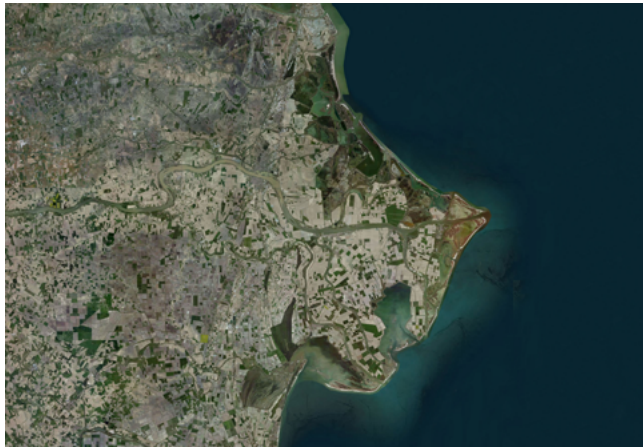


Fig. 2

Satellite imagery of the present day Po Delta configuration.

broader and broader areas, and affecting human activities, settlements and their safety [Fig. 3]. More than four-fifths of the Delta is already well under the average sea level, even below -4 and -5 meters [Fig. 4], and the predictions about the global eustatic sea level rise (1 or 1,5 m by 2100¹¹) foretell even a more dramatic scenario.

11 According to the Intergovernmental Panel on Climate Change (IPCC).

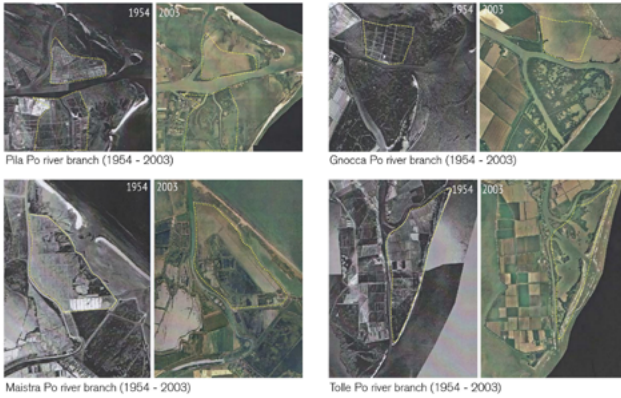


Fig. 3

Examples of the widespread erosive retreat affecting the delta coastline.

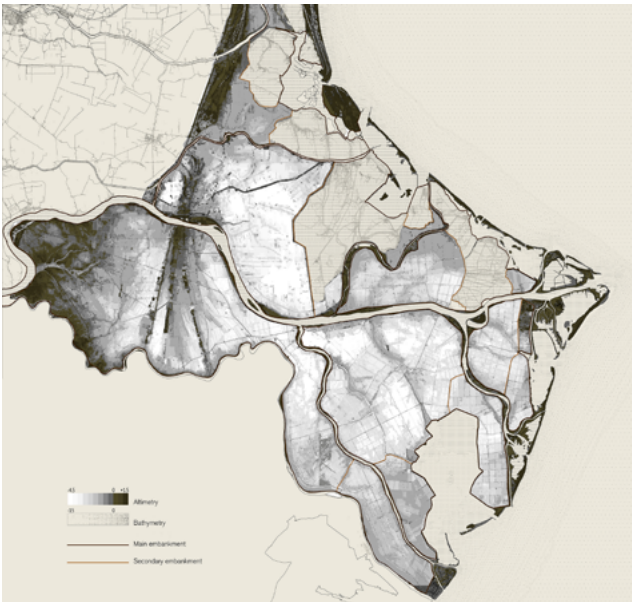


Fig. 4

The Po Delta plain elevation model; note that the vast majority of the area is presently well below sea-level and is artificially kept dry by large land reclamation works.

As many events have already proved, the futile attempt to crystallize and fully control such a changeable system is a losing approach. Innovative strategies grounded on the intrinsic dynamism of the Po Delta system are therefore strongly needed. It is clear that the present rigid environmental framework

will soon become untenable¹², and a retreat of human activity from the artificially reclaimed areas well below sea level will become unavoidable.

On this assumptions, a possible way of addressing the issue is to theoretically frame the actual trend of the Delta transformation within the definition of *novel ecosystems* proposed by Hobbs and colleagues¹³ to describe those new ecological assemblages that form self-organizing systems with no historical precedent, arising “from biotic response to human-induced abiotic conditions and/or novel biotic elements (e.g. land degradation, enrichment of soil fertility, introduction of invasive species). This includes the cessation of management of systems that have been managed or created by humans (e.g. agroforestry systems, pastoral land).”¹⁴

Following this concept, a more pragmatic and prospective mindset can affect the way into which the ideas of landscape and heritage conservation should inform the development of appropriate management goals and approaches¹⁵. In order to understand whether these new systems are - or will be - persistent, sustainable, and what values they may have for the cultural identity of a territory, long-term strategic visions are needed and useful for addressing right away policymakers’ decisions for the future.

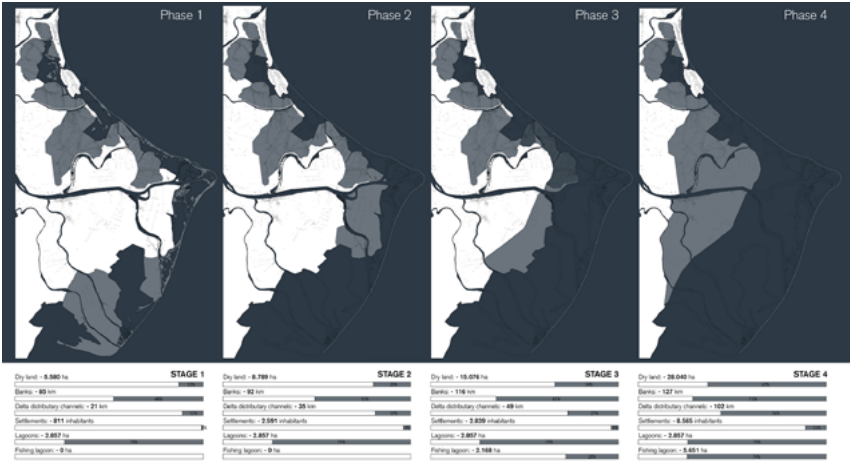
In this belief, the proposal of a *Selective Retreat* aims at investigating limits and potentials related to the possible transition of the Po Delta from an intensively-managed (and collapsing) systems to a novel and emerging ecosystem.

12 Stefan Greiving, Juan Du and Wiriya Puntub, “Managed Retreat—A Strategy for the Mitigation of Disaster Risks with International and Comparative Perspectives,” *Journal of Extreme Events* 5.02, no.03 (2018): 1850011-35.

13 Richard J. Hobbs et al. “Novel ecosystems: theoretical and management aspects of the new ecological world order,” *Global ecology and biogeography* 15, no.1 (2006): 1-7.

14 *Ibid.*, 2.

15 Eric Macdonald and Elizabeth G. King, “Novel ecosystems: A bridging concept for the consilience of cultural landscape conservation and ecological restoration,” *Landscape and urban planning* 177 (2018): 148-159.



Designing the Retreat Scenarios

In summary, the intent of the proposal is to define procedures and ways according to which abandoning to the marine transgression selected areas of the Po Delta by re-organizing the whole landscape, infrastructural and environmental system at the light of a new dynamic ecosystem functioning.

Still work-in-progress, the study started by analyzing potential risk scenarios forecasted for the next decades; extreme events such as sea storm surges, very high tides, and river floods were taken into account to highlight the large vulnerabilities and weakness spots of the region. The Po Delta plain was then subdivided into areas showing different levels of vulnerability, according to their propensity to be flooded: an increasing *porosity degree* value has been assigned to each area in order to indexing the whole territory in terms of *prospective retreat probability*.

On the base of these analytical inputs, four successive retreat boundaries (i.e., desertion lines) have been planned [Fig. 5] leading, step by step, to increasingly safer configurations of the Delta system, and to reach a progressive economic balance in its hydro-morphologic management.

Fig. 5

Planned stages of the anthropic retreat from the Po Delta plain

At every stage of the retreat process, some sites are planned to be preserved from flooding, to form an artificial archipelago in front of the Delta where several services and infrastructural facilities will be developed. Existing embankments or harbor works could be saved becoming marinas or off-shore cruise docks, with the aim of boosting the maritime accessibility to the area. Small isolated villages, such as Santa Giulia, San Rocco, Gorino, and other sites below sea-level, could be networked and converted into diving parks. This whole archipelago system [Fig. 6]¹⁶, besides its value as a focal element within the landscape, would probably act as a catalyst for the development of tourism and as a trace of the past.

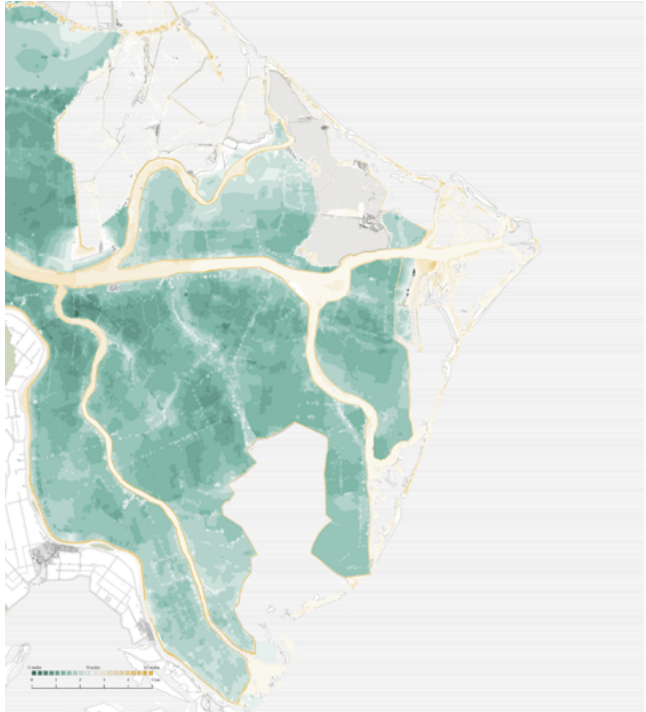


Fig. 6

A possible configuration of the Delta morphology at the very beginning of the selective retreat process.

¹⁶ This illustration, as well as the figures 7 and 9, has been realized by Giuseppe Dotto within his Master thesis at the University of Ferrara, co-supervised by the author: Giuseppe Dotto, "NEUTRAL BUFFER MODEL. Un nuovo paesaggio progettato tramite modello parametrico per le aree tampone della sacca degli Scardovari nella biosfera del delta del Po" Master Thesis diss., University of Ferrara, 2017.

More in general, each subsequent scenario relies on the rethinking of two main operative layers: the mobility infrastructure network and the wetlands system. The infrastructural system needs to be reset before the starting of the regulated flooding process. Both existing and new infrastructures have to be connected to manage the population and the economic activity resettlement.

The project sets up a new mobility network through two types of roads corresponding to an increasing resiliency level. The first one consists in seasonal connections, conceived to be flooded under extreme overflow conditions, being just over the average sea level. They will shape the wetland landscape when the most advanced protections are dismantled. The second level is designed to be a long-lasting infrastructural element: this road system is patterned after existing main roads and embankments, set up to a safety elevation, and will ensure durable connections between dry lands. Road infrastructure will become the supporting framework to the retreat process, catalyzing new functions and re-shaping the Po Delta's identity [Fig. 7]. Unlike today, the future Po Delta landscape will lay on a *branched* fruition system, rather than on the monotonous zoning of single-purpose areas.

Fig. 7

An example of Grasshopper-based processing for developing landform strategies aiming to the re-configuration of the infrastructural networks.

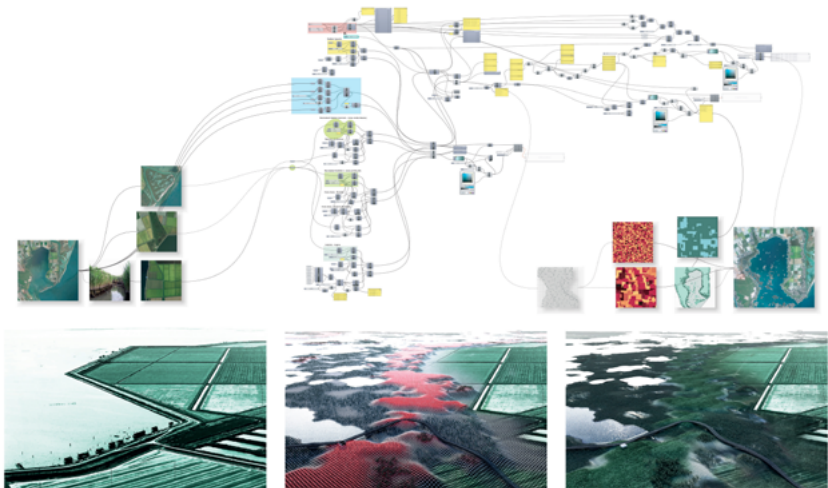




Fig. 8

Some interventions concerning floods protection by wetlands and vegetation planting to improve the area resilience.

In order to control environmental and coastal dynamics, the project strategy relies on a new wetlands system which will evolve from the deliberate flooding of lower areas [Fig. 8]. Such operation will allow to contrast erosion phenomena both at a local – by dissipating the marine wave energy –, and territorial scale – by providing a great amount of additional material to the sediment transport along the littoral limiting the erosion of southern beaches. Wetlands also behave as expansion basins for river floods and their importance is associated with biodiversity conservation and improvement. All these qualities should be measured in the long term and according to an overall management of the different Delta's habitats.

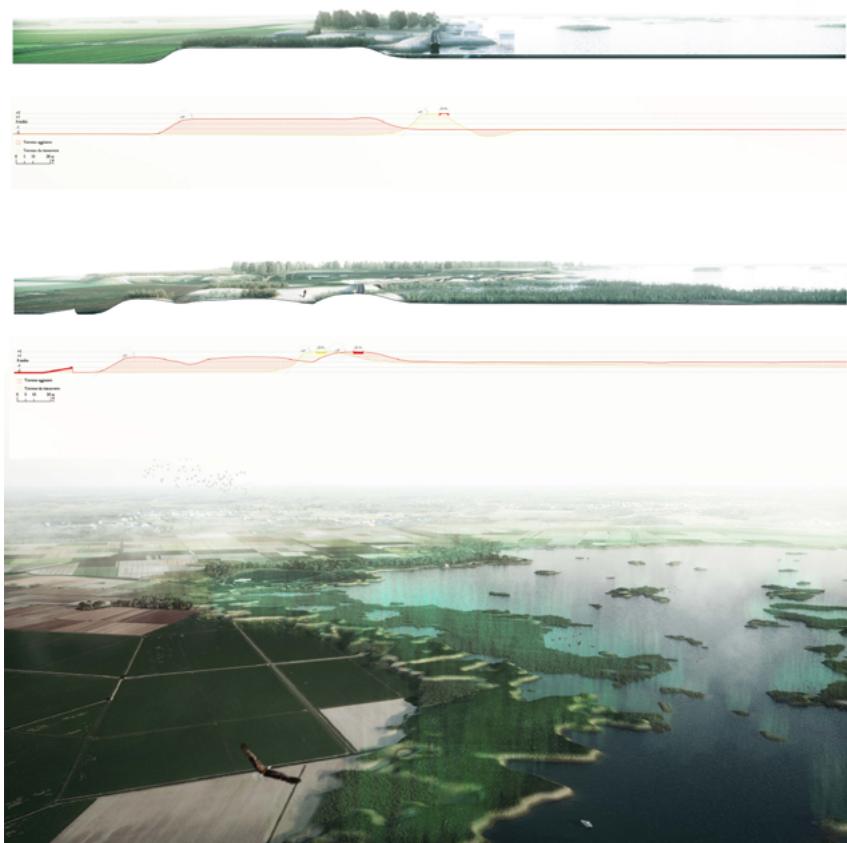
Along the coastline, after removing a few portions of embankments, the sea will quickly retake large areas. In inner lands, artificial basins will keep fresh waters in order to prevent the salt water wedge intrusion from reaching the inner delta plain and to improve the productivity of the remaining fields.

It is almost impossible to exactly predict the final configuration of the coastline and the way the sandbars will migrate over the years. The persistence of a lagoon belt and inter-distributary bays between the coastal sand spits and the new delta borders is certainly the most likely scenario. Within the lagoon belt *buffer zone*, many activities will be rearranged and enhanced such as the mussel culture, taking advantage from the increase of the shallow seabed areas [Fig. 9].

All these interventions consider the limit between land and water as a deep and dynamic space with soft transition borders,

Fig. 9

An example of a potential buffer zone implementation among the Sacca degli Scardovari located in the southern area of the Delta.



and as consistent resiliency sectors devoted to mitigate extreme sea and river events. In such perspective, these areas are meant to work as biodiversity reserves which could host the local fauna's relocation during the retreat process. Unlike the current setting of the deltaic zones, featured by a sharp distinction between different environments, the proposed scenario should improve the inter-connections of different habitats fostering fauna's adaptability to future climate change and extreme events.

Conclusion

The present article depicts a radical solution to the question of how to articulate the dynamic nature of the cultural heritage concept in relationship with effective adaption strategies to climate changes. The proposal aims at planning a new ecological assemblage featured by a different balance between biotic and abiotic conditions raising from the cessation of unsustainable management systems and the creation of a new landscape.

In such perspective, the concept of *novel ecosystems* informing the research on the *Selective Retreat Strategy* has been proposed to define a new conceptual framework for landscape planning policies which are now still mostly tied to the assumption that an ideal Delta environment exists and must be kept *frozen* at any costs.

During the last few years, planning procedures have mainly focused on environmental remediation, ecological restoration, and the so-called *re-naturalization* processes. According to this approach, the landscape should be brought back somehow to a previous *natural* state, whose characteristics however actually belong to a very specific evolutionary phase. Fast evolving contexts such as deltas have often been considered and managed as if their dynamic attitudes were something to be fixed or eliminated rather than being included into planning policies. Even the European and National regulatory framework itself, following the same logic, identifies protected areas and high environmental interest zones as permanent in time and space. This

is in sharp contrast with the high natural mobility of the deltaic systems and the landscape in general.

The recent declaration by the UNESCO of the Po Delta as one of the 651 *Biosphere Reserves* of the world ratifies the importance of this region and presents a new challenge. Since the proclamation purpose is to “recognize and promote a balanced relationship between human communities and ecosystems”¹⁷, we should better consider, in projection, if and how long this nexus would last without being updated by new visions and adaptive solutions to climate change. In these terms, as landscape architects, we are called upon today to take seriously the demand for creativity in order to envisage the physical scenarios in which the production of new meanings and the dynamic constitution of heritage can actually happen.

17 Francesco Di Castri, Malcolm Hadley, and Jeanne Damlamian, “MAB: the man and the biosphere program as an evolving system,” *Ambio* 10, no.2/3 (1981): 52-57.

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