RECLAIMED LANDSCAPES. THE PONTINE MARSHES AS A DESIGN PROTOTYPE FOR A NEW ALLIANCE

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MODERN WETLANDS RECLAIMED LANDSCAPES AS TERRARIA. AN INTRODUCTION

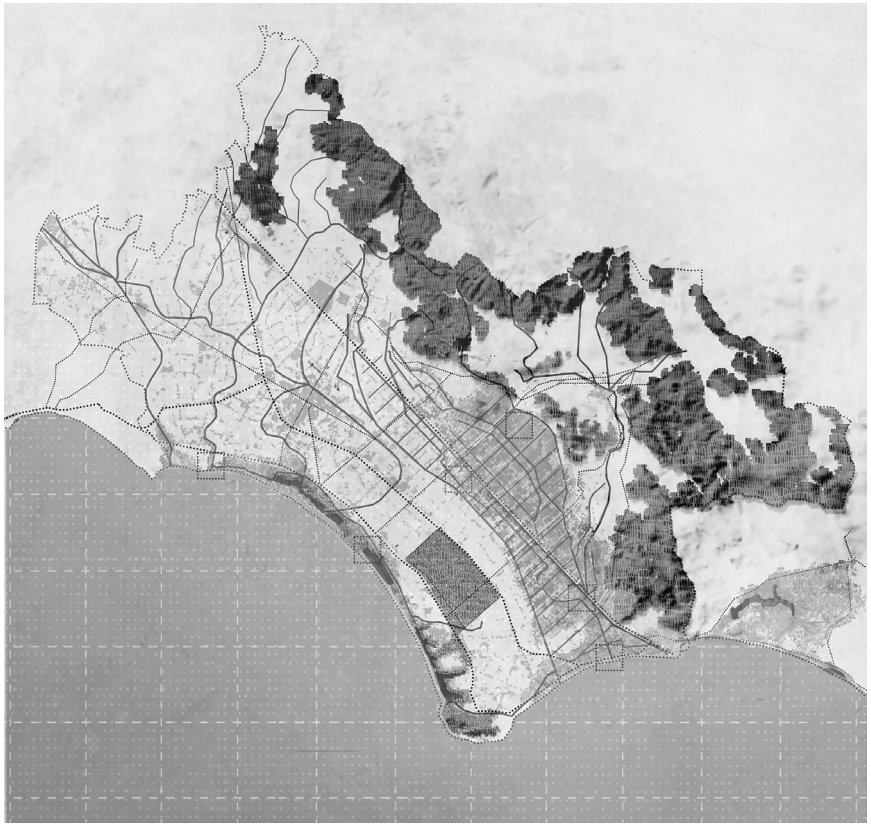
Terraria are artificial enclosed environments and expressions of men's power and supremacy over natural ecologies; they are also creative expressions of a modern divide, between nature and culture, human and no human, etc., which defines controlled ecological dynamics. Through this metaphor we have looked at modern reclamation landscapes built up from the deletion of wetlands and their ecologies. These globally diffused landscapes are today facing changes that let emerge more explicitly their asymmetrical and conflictual inner condition. Present and future changes ask us to reconsider them beyond their segregative nature and experiment design trajectories to support possible metamorphosis, which is political, ecological, cultural and spatial at the same time.

Modern reclamation had redefined and also erased wetlands complex ecosystems, through consistent land and infrastructural works to adapt to human needs and norm their hybrid and amphibious condition. Wetlands' Nature, perceived as uncertain, risky, and unproductive space, had to be normalized, reorganized, 're-generated'; this resulted in territorial re-foundation projects through which new ecologies and morphologies emerged, expressing human control over natural space. Modern reclamation projects aimed at transforming wetlands into self-sufficient territorial machines in which infrastructural networks, tecno-natural spatial devices, crop patterns and settlement logic established their otherness from the pre-existing wilderness. "Artificial enclosed environments" are particularly fragile landscapes, designed to maintain a specific socio-economic, ecological state. Today they are facing the uncertainties of contemporaneity, including the effects of climate change, which will make structural transformations unavoidable, defining new ecologies and new aesthetics by reconsidering the consolidated relationship between land and water, human and non-human, natural and cultural. Inside this framework, the Agro Pontino landscape is conceived both a hologram of wetlands reclaimed landscapes complexity; and a prototype to explore, through design, uncertain territories and design trajectories for envisioning "a new alliance between biology and artificiality".

THE AGRO PONTINO AS LANDSCAPE OF CONTROL

> "Man's conquest of water [...] took on a definitive value [...] the land is shaken as if in the proximity of a war. Man, metre by metre, will put a familiar and human order, establishing his customs of life."; "[...] the blue houses of the

Flooding risks foreseen in 2100 with a sea level rise gradient.
Map elaborated by Alessandro Raffa, 2023.



> settlers advance like an orderly army [...]; the agricultural machines stand in the corrals like herds of a new kind, the pyramids of coal are what remains accumulated here and there of the forest; they are the charnel-houses of it."
> (Alvaro 1934, p. 19-21)

In the story-chronicle *Terra Nuova* on the reclamation of the Agro Pontino, Corrado Alvaro ironically describes the "Battle of the swamps" (1926-1939), by which the Fascist regime transformed Pontine Marshes. The hybrid and amphibious nature of the marshes was perceived as ambiguous and interpreted as "an element of disorder, not only hydrogeological, but also social, sanitary and moral." (Gruppuso 2013, p. 230) The wilderness of the marshes acted, therefore, outside the political ecology of the regime (Armiero et al. 2022), it was narrated as a risky space, amid malaria, unproductivity and semi-nomadism of the local populations. In the Agro Pontino, reclamation involved the dissolution and reconstruction of existing relations between man and the environment through actions of conquest, occupation and re-organization of space. (Cooper 2001) Through extensive hydraulic infrastructure and soil modifications, the regime turned marshes into farmlands, nature into productive land, wilderness into "civilization," giving birth to a "second nature" (Caprotti 2006; 2007). That of the Agro Pontino is an infrastructured (Armiero et al. 2022, p. 17), techno-natural landscape, re-defined and crossed by material and immaterial networks, functional to expel the land-water ambiguity of the marsh (hydraulic reclamation), to eradicate malaria (sanitary reclamation) and to allow the stable presence of peasant communities that would sustain the daily struggle against Nature through fields works (rural reclamation). A "territorial machine" (Purini 2003, p. 93), the expression of a positivist vision of science and geographical knowledge aimed at the control (Caprotti 2006, p. 153) and the reorganization of Nature through the re-definition of its ecologies and the accelerated construction of the new landscape. Risky and uncontrolled wetland spaces had been completely normalized, reorganized through a territorial design made by a Cartesian weave of canals, roads and rows of trees, dotted with hamlets, towns and farmhouses as a means for widespread control. Between 1926 and 1939, the Fascist regime fully drained the Pontine Marshes. 16.165 km of drainage and irrigation canals were adapted or newly built; 18 water drainage systems and 4.500 pits were built; a 1.360 km network of roads and inter-farm tracks; a settlement system of 3.040 scattered farmhouses (Sottoriva 1977, p. 49); fourteen rural hamlets and five towns (Littoria, Sabaudia, Pontinia, Aprilia and Pomezia) were built .

To complete the hydraulic-agricultural systems, the coastal dunes and hillsides were re-modelled and reforested, and a territorial frame of windbreaks was created which, together with the areas dedicated to agriculture, were part of the techno-natural infrastructure of the Agro Pontino reclamation and its landscape. A superimposed design

> "that has taken on the evocative value of the geometric colonizing vocation of the Roman world" and that "relying on a previous system of strongly stratified traces [...] has contradictorily configured itself as the peremptory affirmation of the reasons for the new and as a sophisticated operation of archaeological deciphering of signs and paths." ǂ An ambivalent landscape design, "the production of a new original landscape and the cancellation, except the Selva del Circeo, of the true original landscape." ‖
> (Purini 2003, p. 43)

If, on the one hand, a fragment of the original marshy forest - which became the Circeo National Park in 1934 - is preserved, it is done so without its ecological functionality; an "invented nature" (Armiero et al. 2022, p. 77) that becomes a term of comparison with the reclaimed landscape. But also, a human and no human biology laboratory (Cavallo 2010; Dogliani 1999), where to experiment with power and control relationships between species and define new ecologies coherent with the political ecology of the regime (Armiero et al. 2022) and also a showcase (Pergher 2020, p. 107) for displaying a Fascist and modern reclaimed productive landscape. The marshes' regeneration thus presupposed a total and constant struggle against Nature, in which technology, scientific knowledge, the work of peasants and even the control and management of the animal and plant kingdom were intertwined, generating a landscape that was an expression of the regime's creative power and its political ecology. A fragile, artificial, and conflictual enclosed environment designed to maintain a specific socio-ecological state, whose existence is linked to an engineering system that mechanically removes water from the ground. But its productive landscape, increasingly industrialized, and settlement dynamics evolved beyond its logic and today it is challenged by anthropogenic pressures, with ecological, economic, and social impacts.

THE AGRO PONTINO AS A LABORATORY FOR A NEW ALLIANCE. DESIGN EXPLORATIONS

Modern wetland reclaimed landscapes are critical spaces for "eco-imaginative" (Corner 1997) design exploration, in which identifying research by design possibilities and outlining design methodologies and actions. In the last decades, the Pontine reclaimed landscape has been recognized as a place for research

by design explorations concerning the nexus between ecology, landscape, and architecture, ri-defining the complex entanglements between water and land beyond modern oppositions, envisioning alternative scenarios.

Between 2007 and 2008, Alan Berger, by applying his *Systemic Design* (Berger 2009) approach and mainly focusing on water pollution of Agro Pontino, design a *Wetland Machine*, "for filtering, habitat and biological exchange." (Berger 2008) "[…] a 2 sq. km constructed wetland park […] that would both provide a recreational landscape […] and remove pollutants" (Berger 2008). Berger ecological/landscape design- developed closely with the local planning agency and Pontine Plain consortium, though the project has not been constructed, introduces a new way of thinking through an integrated and holistic process of *Systemic Reclamation* (Berger 2008), to improve water quality and groundwater recharge potential, enhance biodiversity and provide recreational space. (Berger et. al 2010, p. 95) The design of a new topography and amphibious ecologies, and the implementation of Nature-based solutions (NbSs), are not led by the intention to restore the pristine wetland ecosystem locally, but to re-design it according to current patterns of environmental, economic, and social fragility, recognizing the highly infrastructured identity of Pontine Marshes and "set this place on a new path." (Berger in Rosenthal 2008).

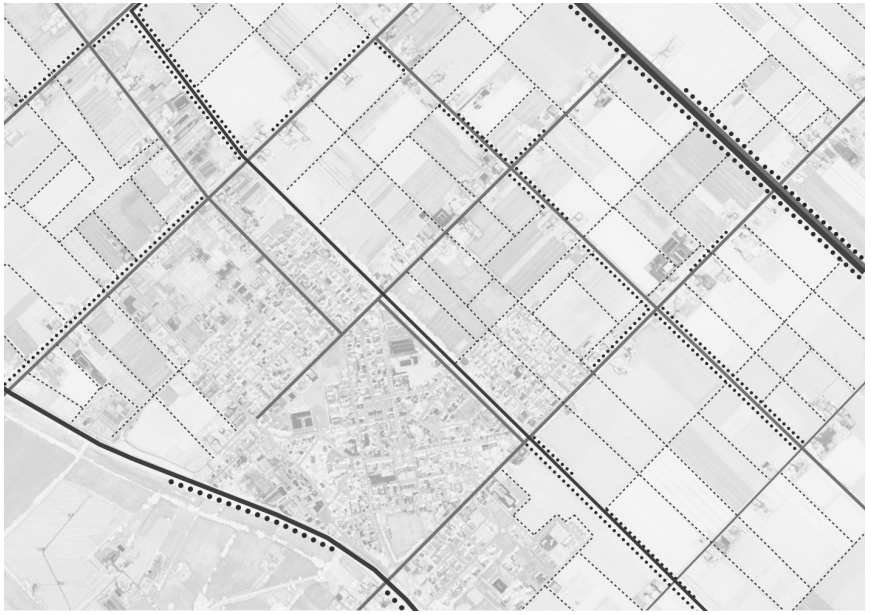
Water quality has been at the core of the project Rewetland (2010-2014), co-founded by the EU LIFE+ Environmental Policy and Governance 2008. The project (Cataldo et al. 2014) aimed to explore the potential of implementing constructed wetlands and phytoremediation solutions for wastewater treatment of Agro Pontino. Through four pilot projects–a protected natural area, an abandoned field, canal buffer strips and a farm – were experimented different NbSs to enhance water quality and management and biodiversity, offering, at the same time, recreational spaces for the community. Whether, from a technical-engineering perspective, the conducted experimentations offer valuable solutions and open toward possible scenarios for improving water resource management, from a design perspective, they highlight a contradictory approach towards re-naturation project.

Water ponds morphologies ape a supposed natural condition, without any engineering-ecological reason related to water management or with respect to foreseen ecological dynamics.

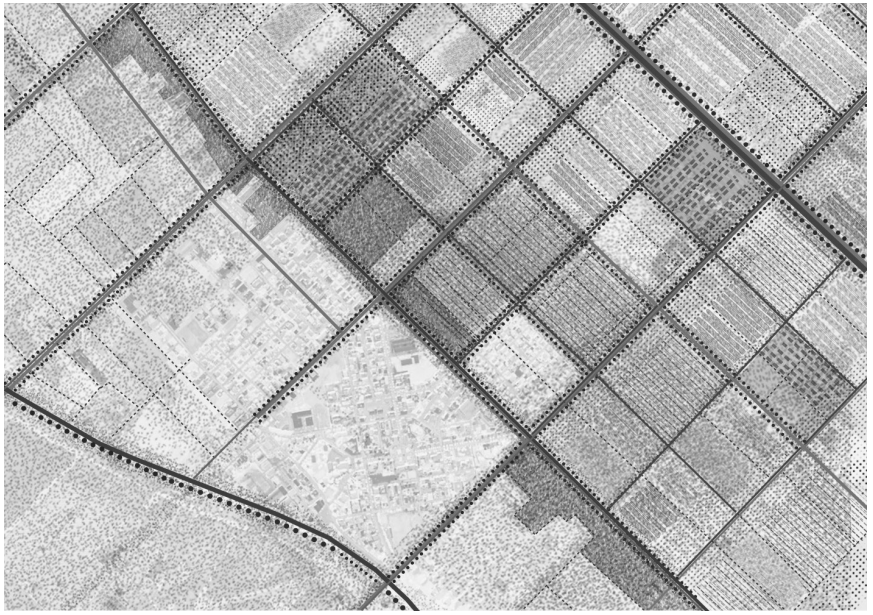
To overcome divisive oppositions and develop a holistic and integrated design methodology, Metta and Onorati (2019) stress the need to

> "[…] recognize the Plain as a platform of change, move-

Flooding risk with different time scenarios in the area of Borgo Pasubio rural village. Post-reclaimed landscape today is affected by sprawl and monoculture and is still based on engineering solutions to ward off water. Map elaborated by Alessandro Raffa, 2023.



Post-reclaimed climate-resilient ecological grid and rural patterns. Its ecological performativity is rethought through the implementation of windbreaks and channels as green-blue corridors; rural pattern is redefined through water farming and bio-retantion areas, also for phytoremediation purposes. Map elaborated by Alessandro Raffa, 2023.



ment, and activities, where a myriad of signs, by human as well non-human beings, are inextricably and vividly entangled." (Metta and Onorati 2019, pp. 5-6)

Inside the research by design process "negotiation", '"co-existence", "indeterminacy", "inclusiveness", "overlap", "simultaneity", "eventuality", "instability", "association and collision" (Metta and Onorati 2019, p. 6) are words of an operational vocabulary that could open to the design of a "[…] a multifunctional landscape platform, able to give back food, beauty, ecology, health and leisure." (Metta and Onorati 2019, p. 8).

The described experimental projects let emerge critical issues and questions. How to transition through design process the Agro Pontino ecosystem, imagined as stable and defined, to contemporary changes and challenges? How to bring together the ecological potential of re-naturation and Agro Pontino's palimpsest condition? How to manage the complex entanglements between ecological, social, economic and cultural patterns through design? With these questions in mind, the Agro Pontino is interpreted as a place of design experimentation, in order to identify issues, an operational methodology and tools to deal with modern reclaimed landscapes in a changing climate.

THE AGRO PONTINO AS A PROTOTYPE FOR A NEW ALLIANCE IN A CHANGING CLIMATE

As mentioned above, Agro Pontino's landscape is challenged by endogenous and exogenous anthropogenic pressure, with ecological, economic and social impacts, which will be even stronger in the future. Concerning climate change impacts, heavy and concentrated rainfall, together with dry periods, are already producing increasingly frequent flooding phenomena. Pontine Plain is among the thirty-three Italian areas more at risk of flooding in the next eighty years. (Antonioli 2016) Climatological projections foresee that sea level rise by 2100, together with local hydro-geological dynamics, will have economic, social, and ecological impacts on coastal and inner plain of the Agro Pontino. Flooding risk asks to reconsider the modern separation between water and land as well its "stability." As much as these are projections, the outlined scenario calls for a general reconfiguration of the techno-natural, settlement and agricultural production system. The intention is to design climate adaption through an integrated, holistic and multidisciplinary approach capable of dialoguing with present complexity and future uncertainties, by investigating the dynamic entanglements that have shaped and continue to shape the Agro Pontino reclaimed landscape.

SEARCHING FOR A DESIGN METHODOLOGY. THE AGRO PONTINO OPERATIONAL ATLAS

Starting from researches and design experiments referable to *Landscape Urbanism* and *Ecological Urbanism* (Waldheim 2016; Mostafavi and Doherty 2016) and multi-scalar climate design experiences (Babtist et al. 2019), the objective is to identify a design-oriented operational methodology ⅄, strategies and actions through which climate adaptation process can accompany towards sustainable development scenarios, testing performative ecologies and envisioning new aesthetics.

With this objective, it has been conceived the Agro Pontino Operational Atlas ⅄Ⅱ⅄: an open mapping process/project that, trying to deal with contemporary complexity and uncertainty, defines a structure of possibilities within which, according to multiple time horizons, local community, groups and stakeholders will take actions according to their evolving needs and urgencies and enhance climate resilience through space.

In a first phase, Agro Pontino blue-green techno-natural infrastructure has been investigated with a multi-scalar, multi-temporal process of de-composition and re-composition in order to describe its ecological figures (natural and re-naturized spaces, dry and wet spaces, rural patterns, green-blue corridors, tree lines, species mobilities, etc.), their fragilities and regenerative potentials. Nature is interpreted as a "field of our imagination" (Corboz 1998, p. 191) and as a space of possibility and particular attention has been paid to Nature's symbiotic dimension, i.e., its ability to adapt to different changes, also climatic, and to be adapted by local community in different time frames and scales. The recognized figures and their diagrams together generate an "operational topography" (Di Franco et al. 2018) understood as a structure of possibilities that will allow for the implementation of design actions at the local scale. By considering present and the foreseen long-term climate impacts, the Atlas tries to cope with uncertainties, envisioning different stages between today and 2100. The operational topography diagrams overwrite a palimpsest (Corboz 1998), in continuous evolution, by reshaping the relationships between the infrastructural modern reclamation grid with new wet spaces and related ecological processes; it introduces new meanings and shows spaces of possibilities for design actions that other authors will define in the future.

Moving from the territorial to the urban scale, the design strategy focuses on certain critical areas with respect to present and potential forms of fragility and vulnerability that the effects of climate change could exacerbate. Concerning the selected

specific areas, their fragilities and vulnerabilities, an abacus of possible adaptation actions was developed and matched to hybrid, symbiotic techno-natural spatial devices[11]. The logic behind the proposed solutions aims to overcome present conceptual and physical divisive boundaries, opening to new forms of co-existence. The selected devices, from weak to structural, will be implemented over time by other authors and will contribute to envisioning locally more performative and complex relationships between land and water, human and non-human, nature and culture.

The modern reclamation network of nodes, rods and fields is redefined through new hybrid relationship between dry and wet soils, enhancing biodiversity and multiplying public space.

In coastal areas: dune restoration and re-naturation, with sub-emerged and emerged vegetation, artificial reefs and sub-emerged structures will built up a multiple line of defense; salt marshes re-creation will allow restoring tidal influence and foster ecological connectivity. Concerning inner rural areas: water farming (raised beds, amphibious and floating farming), bioretention areas (bioswales and rain gardens, detention and retention ponds, permeable pavements), naturation of canal's beds and banks and bypasses. Attention has been paid also to modern reclaimed landscape, existing techno-natural devices, and their adaptation potential enhanced: the continuity of wind break rows will be restored, implemented and scaled to protect from wind gusts and canal's naturation will built up a territorial ecological grid. The envisioned multi-scalar, multi-temporal design solutions will improve climate resilience, enhance biodiversity, ecological and spatial quality, and offering diverse recreational possibilities. Through an integrated, inclusive e multidisciplinary approach to design new forms of co-existence for wetland reclaimed landscapes will emerge, overcoming cultural and physical divides and opening towards multiple entanglements for a new alliance.

The paper is the result of the collaboration between the authors. It had been nurtured by A.R.'s previous research on the contemporary design of wetlands reclamation landscapes and on the ongoing research activity inside "Urban Green Shape" project funded on PON R&I and FSE-REACT EU. Paragraphs' attribution: "Modern wetlands…introduction" is att. to A.R. and I.M.; "The Agro..,control" is att. to A.R.; The "Agro…exploration": from "Modern wetlands…" to "…on a new path"; from "The described…" to "…for the future" to A.R.; from "Water quality…" to "…health and leisure" to I.M.; "The Agro… climate" to I.M.; "Searching for…Atlas" to A.R.

Excerpt from the title of the PRIN «SYLVA. Rethink the sylvan. Towards a new alliance between biology and artificiality, nature and society, wilderness and humanity».

The paragraph is a summary and re-elaboration of the contents from: A. Raffa, *Ecologie della 'lotta alla palude' e paesaggio della bonifica integrale dell'Agro Pontino*, in A. Raffa, *Paesaggio ed ecologie della bonifica integrale in Libia*, Accademia Adrianea Edizioni, Roma 2023, pp. 18-30.

Translated by A. Raffa.

Translated by A. Raffa.

For more on the transformations carried out in the Agro Pontino and the ecologies of its 'second nature' see: Opera Nazionale Combattenti, *L'Agro Pontino*, ONC, Rome 1940.

Translated by A. Raffa.

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The proposed approach refers to the epistemology of complexity (Morin 2001) and transdisciplinary (Nicolescu 2002) and adopt a mixed method for design research (Creswell 2009).

The Agro Pontino Operational Atlas has been developed by A. Raffa in 2021, inside the research project "Flooding heritages in the Agro Pontino" by Accademia Adrianea di Archiettura e Archeologia.

NbS categories identified refer back to: World Bank, A Catalogue of Nature-based Solutions for Urban Resilience, World Bank Group Washington, D.C. 2021.