Between Rows and Glades: The Landscape of the Reclamation Between Aquaric Re-Balances and New Forms of Living

Reclamation landscapes result from a strong interaction between humans and nature, expressing simultaneously the need to inhabit previously hostile wetlands and the operation of reshaping the landscape. The continuous mutations linked to human settlement and climate change have, however, modified the appearance of "nature." Although it may appear random and irregular, the reclamation textures follow precise and strategic patterns designed by the water network. They are the result of numerous attempts to make the countryside efficient, productive, and controllable. By examining the case study of the Friulian lowlands, this contribution aims to highlight the importance of reinterpreting reclamation landscapes not only as a productive field but also as an essential ecological infrastructure. In particular, by reasoning on the relationship between rows and clearings, elements characterizing this type of landscape, it is possible to identify a fertile ground on which to define new ecosystemic coexistences, a vegetal front from which to defend biodiversity. Furthermore, rows and glades embody the relationship between "full" and "empty," which is essential for human settlement. Thus, starting from these elements, it is possible to formulate new modes of inhabiting this territory. By repeating and flanking each other, these elements can reach transcalar dimensions, configuring new ecological corridors and laying the groundwork for rethinking the relationship between settlements and the countryside, which has been put into crisis by new agricultural technologies. Thus, it is possible not only to reevaluate agricultural, architectural, and settlement traditions but also to rethink the management of land and water to preserve resources and cope with extreme phenomena caused by climate change.

Keywords: *rows, clearing, water patterns, ecologic corridors, new ways of living*

The Countryside as a Landscape Machine. Toward New Perspectives

The mainstreaming call for urban reforestation and the urgency of observing/intervening in the unobserved space of the countryside

There are landscapes and territories that, despite occupying a marginal position within the contemporary debate, constitute essential reserves of biodiversity, technological experimentation, and multiple investigations in defining new housing models: the countryside. These territories must not remain unnoticed but, as Koolhaas urges, must be urgently reintroduced into the debate as they are strategic for the activation of strategies aimed at ecological transition. The rural landscape, in fact, very often represents the starting points of environmental corridors that reach up to urban centers, constituting proper territories in transition that can be infrastructured to absorb the irremediable consequences of phenomena linked to the climate emergency and, at the same time, embody real fields of experimentation in which to reformulate new models

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of agricultural production and new forms of living.

Within the vast countryside territories, agricultural reclamation landscapes constitute a privileged field of observation and planning, as they present extremely peculiar environmental, economic, social, and cultural conditions. Their ecosystemic balance, modulated and constructed according to the management and control of water resources – driven by economic, productive, and settlement needs – has shifted gradually from a natural to a progressively controlled and mechanized environment. The mechanization of agriculture has, in fact, turned the countryside into a "machine," and the attempts to make it more efficient, productive, and controllable come into conflict with its original spontaneity and rich biodiversity. Water, once perceived as a hostile or uncontrollable element, is regulated through a complex network of technical systems — including overflow channels, pumping stations, and compensation basins — that determine its timing, flow paths, and usage methods. Reclaimed landscapes form a dynamic setting, constantly evolving in response to technological, climatic, and socio-economic changes: territories in continuous transformation, where historical layers and contemporary innovations coexist, interact, and, at times, come into conflict.

The current climate scenario threatens these environments and necessitates a critical reevaluation of these complex landscape machines and their traditional operating logic. Water crises, rising sea levels, the increasing frequency of extreme weather events, and the ongoing sealing of soil surfaces pose new challenges for managing these areas. The very infrastructure of these landscapes, designed during periods of relatively stable climatic conditions, now proves inadequate in the face of present-day complexity and uncertainty. In response, multidisciplinary approaches are emerging, integrating hydraulic engineering, ecology, spatial planning, and landscape design with the aim of preserving and enhancing the unique characteristics of this particular agrarian landscape.

The research sets as a key normative framework the European strategies enshrined by the *Nature Restoration Regulation*[1] approved by the European Union in 2023. This regulation obliges the Member States to restore at least 20% of degraded ecosystems by 2030, extending the measures to agricultural, forestry, and marine areas. Beginning with the investigation of a specific case study in the reclamation areas of the southern Friuli Venezia Giulia region, the intent is to reflect on possible operations for landscape preservation and enhancement.

The aim is to highlight, through an exploration of the anatomy of this landscape, the transformative potential it holds — not only in terms of sustainability, ecological transition, and mitigation of the environmental risks to which it is increasingly exposed due to climate change but also as a fertile ground for experimenting with new agricultural models and new forms of dwelling. In

[1]*The Nature Restoration Regulation* is the Regulation (EU) 2024/1991 of the European Parliament and of the Council, which entered into force on 18 August 2024 with the aim of "to restore a broad range of degraded ecosystems, habitats and species across the EU's land and seas. The Regulation creates a common legal framework for their large-scale restoration, building upon and complementing existing EU legislation." (quote taken by The Nature Restoration Regulation, Luxembourg: Publications Office of the European Union, 2025, p.6.

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fact, the reclaimed landscape should not be conceived merely as a productive machine but reinterpreted as a complex environment capable of simultaneously serving as both a means and a place for achieving ecological sustainability and hydraulic safety objectives, thereby enhancing the future quality of life within the territory.

The research develops an operational reflection that assesses the consequences of changes in this amphibious landscape from two perspectives. On one hand, the architectural perspective of settlement and habitation; on the other, the territorial perspective of the landscape, focusing in particular on the transformations of its two most significant elements: the tree row and the clearing.

The common foundation of this reflection is the relationship with water and its management through infrastructure and the logic of land reclamation.

The Research Unit: The Case Study and the Method

The research presented is part of a series of individual works carried out within the research group "Inhabiting the New Friulian Deserts," based in the Department of Engineering and Architecture (DIA) at the University of Trieste (Italy).

This research unit investigates the territory of the "Bassa Pianura Friulana" to enhance its landscape and promote the reuse and accessibility of rural settlements ("*colonie rurali*") and hydraulic heritage. This area forms a distinctive geomorphological, settlement-territorial, and landscape-environmental system (Venudo, 2020): a reclaimed plain that stretches from the Isonzo to the Tagliamento rivers.

While this topic was the focus of extensive research — especially by the Venetian school of IUAV (F. Tentori, G. Polesello, among others) between the mid-1950s and the late 1970s — it has since been largely neglected. Compared to those early explorations, the anthropic dynamics and the morphological configuration of the area have changed profoundly due to the rise of environmental and landscape phenomena such as the desertification of the countryside (Venudo, Altobelli, Martorana, 2020). Water scarcity, the consequent need for more rationalized distribution, and the spread of intensive agriculture have all become constraints on agricultural systems — and thus on the landscape, which has always been shaped by the logic and machinery of cultivation. The result is a progressive simplification of both production and landscape, changes that inevitably have repercussions on settlement patterns. This system of simplifications is precisely what this research unit seeks to analyze, defining new visions and approaches and proposing new design strategies. The term "deserts" refers both to the gradual loss of ecological and vegetative diversity in the territory and to the ongoing process of depopulation in rural areas.

What, then, might be the new ways to "re-inhabit," use, and enhance the reclaimed territories under a new spatial paradigm, starting precisely from water management?

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Could this be approached by observing the rhythm of "full" and "empty" in the agricultural landscape — that is, the relationship between tree rows and clearings?

Back to the Countryside? From The Modification of the Agrarian Design of the Agricultural Reclamation to New Forms of Multi-Species Co-Habitation

Architecture and planning today are obsessed with the redesign and planning of urban space, underestimating the potential of the remaining 98% of the world's territory: the countryside, an area with a very high technological, logistical, and environmental density, constantly reshaped by industrial, agricultural practices, automation, digitization, and new geopolitical conflicts.

This imbalance concerning solely the urban dimension of the problem is denounced by Rem Koolhaas in *Countryside, The Future* (2020), who states: "Half of mankind lives in the city, but the other half doesn't. Rem Koolhaas presents his manifesto on the countryside, revealing how little attention has been paid to the countryside in the past decades and how this unknown territory is rapidly transforming."[2]

Koolhaas proposes reformulating the role of the countryside as an operational terrain for addressing the significant ecological, social, and productive crises of contemporaneity, thereby opening up a space for design that is still largely unexplored. This vision is linked to other perspectives which, albeit from different angles, converge on the need to expand the design and environmental gaze beyond the urban perimeter. In her *Toward an Urban Ecology* (2016), for instance, Kate Orff interprets active, relational, and infrastructural practical ecology by introducing the concept of bioregion as an operational concept for contemporary ecological design. As her own projects demonstrate, the design process must be aimed at defining living infrastructure that dynamically connects nature and architecture. Thus, the project should not be limited to urban boundaries but must expand beyond, seeking to operate on a larger scale capable of relating to ecological corridors, watersheds, and productive landscapes in transition. This design philosophy is evident in numerous projects developed by the US firm SCAPE, of which Orff is a founding partner, including *Resilient New Jersey* and *Resilient Jacksonville*. The latter, defined as "a 50-year roadmap to prepare Jacksonville for climate change, population growth, and urban development",[3] embodies a reaction to the significant threats posed by climate change – rising temperatures and increased flooding – which are addressed through 45 adaptive actions that gradually redesign the city to make room for water, providing buffer spaces capable of absorbing variations in the water body, which at the same time becomes a real

[2]Quote taken from the *Countryside* page, dedicated to the project, on the OMA studio website (https://www.oma.com/lectures/countryside)

[3]Quote taken from the page dedicated to the project *Resilient Jacksonville* on SCAPE's website: https://www.scapestudio.com/projects/resilient-jacksonville/

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binding agent for a metamorphic landscape whose consistency varies as it moves from the more urbanized coast to the inland countryside.

Another interesting design consideration is outlined by Richard Weller in his *Atlas for the End of the World* (2017), in which he states: "This Atlas audits the status of land use and urbanization in the most critically endangered bioregions on Earth. It does so, firstly, by measuring the quantity of protected area across the world's 36 biodiversity hotspots in comparison to the United Nations' 2020 targets and secondly, by identifying where future urban growth in these territories is on a collision course with endangered species. By bringing urbanization and conservation together in the same study, the essays, maps, data, and artwork in this Atlas lay essential groundwork for the future planning and design of hotspot cities and regions as interdependent ecological and economic systems."[4] Weller conceives ecological restoration as a design responsibility, not a spontaneous or residual process, interpreting the countryside as a decisive operational terrain for testing alternative models of coexistence between nature and culture. In another, more anthropological direction, Tim Ingold, in *The Perception of the Environment* (2000), reformulates the concept of landscape as the result of lived relationships and practices of co-habitation between humans and non-humans. His phenomenological approach breaks down the distinction between nature and culture, inviting us to think of restoration as a process of reconnection between living beings, in which the landscape becomes a relational fabric to be inhabited and cultivated over time. In this sense, thinking about the countryside becomes a way of rethinking this environment not only as a productive resource but also, above all, as a continuum of relationships between people, agricultural production, animals, and the landscape that composes and inhabits it.

If the countryside, as seen previously, constitutes a potential field of investigation for the contemporary era, within it, there are specific territories that present physical, social, and cultural peculiarities that are grafted onto a precise redesign not only of the soil but also and fundamentally of the body of water: the territories of land reclamation. The millennial relationship between humans and water is embodied in the practice of land reclamation, which has enabled the development of large unproductive areas, encouraged settlements, safeguarded their integrity, and preserved the local environment. To inhabit the marshy lands and settle in the newly reclaimed territories, humans needed to "make space for themselves."[5] This necessitated rethinking a new settlement system to occupy the new territories, giving rise to the reclaimed colonies, in contrast to the traditional "village" model. While villages arose "spontaneously," developing along the roads or adapting to natural limits, colonial settlements followed precise rules, adapting to the design of the land created by man. Thus, while villages had to integrate the "emptiness" in the design (with the creation of

[4]Quote taken from the official page of the project *Atlas for the End of the World*: https://atlas-for-the-end-of-the-world.com/

[5]Heidegger, a German philosopher, identifies the creation of a clearing through the act of “making space,” to regenerate, find refuge, or inhabit the territory.

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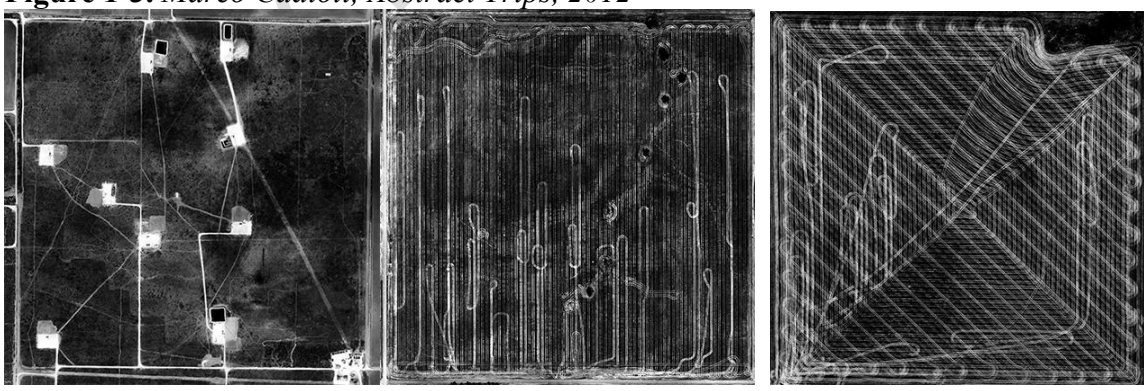
courtyards for domestic and work activities and squares, the beating heart of city life), settlers had to integrate the full (the home) in the emptiness of the countryside. What these manifestations of emptiness, which we can define as a "clearing," have in common is the characteristic of being spaces circumscribed by a border, which separates them from the context but, at the same time, connects them with what surrounds them.

While courtyards and squares continue to be vital centers of socialization and cultural activity, the settlement model created to inhabit the reclaimed countryside is no longer efficient. The colonies have been depopulated and abandoned buildings stand out in the landscape.

The term 'reclamation' derives from the Latin 'bonificare,' composed of *bonus* (good) and *facere* (to do), and refers to operations aimed at improving the quality of land by draining marshy areas to improve their health conditions, previously compromised by the presence of stagnant water. Thus, since ancient times, humans have colonized marshy areas by working on the body of water through increasingly complex and compelling technologies, thereby stratifying the landscape with a veritable taxonomy of forms and water structures that are functional to the regulation and control of water. Viewed from a bird's eye perspective, the landscapes of land reclamation allow us to read the patterns of aquatic infrastructure and understand the logic behind its design, revealing the different, layered phases of its successive transformations. These are territories composed of more or less continuous lines, embodied by canals and rows, and fields of various textures and sizes, crossed by the trajectories traced by agricultural and irrigation machinery. Thus, in this formal reading, it is possible to trace a profound correspondence between form and function, observing in a highly evocative way the movements and trajectories with which human beings have colonized and domesticated the territory.

Figure 1-3. *Marco Cadioli, Abstract Trips, 2012*



The first experiences of land reclamation in Italy date back to when the Italic peoples abandoned their nomadic lifestyle and began to settle in the territory, domesticating it and devising ways to exploit the land and bind themselves to it through cultivation. Deep but still irregular and scattered furrows characterize these early anthropic landscapes, in which the still primordial dimension of the

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field was dictated by the strength of the animals and the distance they could cover with the plow. A redesign of the soil and a more extensive reorganization of the territory was carried out by the Etruscans, whose land reclamation works are recorded in the Lower Veneto, Emilia, Maremma, Umbria, and Campania. In this civilization, agricultural conquest and the relationship with water resources took on extremely symbolic meanings, demonstrating how attitudes toward water management reveal anthropological, cultural, and social issues. For example, the figures of the *aquilages*, priests skilled in dowsing, and the haruspices, priests responsible for demarcating and parceling out land, are loaded with crucial symbolic and mystical significance. The Romans were the ones who gave impetus to a systematic redesign of the countryside, entrusting the task of land reclamation to military personnel and civilian veterans and carefully planning the colonization of marshy lands with a twofold objective. On the one hand, there was the health and hygiene objective of limiting the spread of malaria; on the other, there was the agricultural objective of systematically cultivating the land. The design of the reclaimed countryside was thus marked by a regular and rational grid based on the *Centuria* system: square areas of 50 hectares, divided into 100 *heredia*, square fields each measuring two *jugera* (1 juger = 2,550 square meters). Thus, from the furrow of the plow to a more organized and systematic dimension but still lacking an overall design, we have now arrived, in Roman times, at the first radical transformation of the countryside. Now, looking at it from above, one can appreciate orderly groups of fields of uniform size and harmonious dimensions, perfectly integrated with the road network.

Figure 4-5. *Marco Cadioli, Abstract Trips, 2012*

This operation to redesign and reorganize the countryside was abandoned during the barbarian invasions. At the same time, in the Middle Ages, what had not been destroyed was left to complete neglect until the Renaissance, which marked a revival of land reclamation. However, a strong recovery in this activity did not begin until the 1920s and 1930s, when marshy lands were reclaimed and made productive. Land reclamation works started thanks to the agricultural policy promoted by the Italian fascist regime led by Benito Mussolini, enshrined in the Consolidated Law on *Integral Land Reclamation RD No. 215/1993 - New rules for integral land reclamation*. Through this document, land reclamation acquired global legal significance, qualifying it as a function, and introduced the

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term 'integral,' identifying and recognizing that broad field of operation in the convergence between public interest and private expectations, both in terms of programmatic choices and, more specifically, executive ones.

Furthermore, land reclamation has also been given authoritative recognition by the Constitutional Court, which defined it as: "a complex process of shaping and transforming the territory to make it suitable for residential purposes and usable for a wide range of productive uses: it is therefore rightly considered an ordinary tool for land management and [...] a service that benefits the entire community, an activity that is by its nature perennial and constantly evolving...".[6]

A brief examination of land reclamation history reveals how the rationale for land use has evolved from focusing solely on domestic space to encompassing productive space as well. Today, the operations associated with land reclamation involve a more complex water management system that includes, in addition to optimizing irrigation processes and land consolidation, hydraulic defense and regulation, environmental protection, safeguarding inhabited areas, and managing tourist and industrial settlements.

In the contemporary era, in which climate change and soil sealing are significantly exacerbating specific natural vulnerabilities that already characterize the territory – such as hydraulic instability, river flooding, marine flooding, and relative subsidence – land reclamation can address some of these critical issues, intervening on two fronts. Firstly, the sustainable preservation and management of this resource through the employment of innovative irrigation and water distribution methods. Moreover, regarding flood risk reduction, creating a robust defense mechanism involves defining floodable areas.

The numerous attempts to compensate for extreme weather phenomena and facilitate the management of the countryside with increasingly larger and cumbersome machinery have resulted in a landscape that is increasingly uniform, marked by the regularity of the water network's channels.

The rows that once delimited the fields and provided shade for the farm workers are now cut down to allow the maneuvering of technological agricultural machinery, facilitating cultivation but compromising the biodiversity of flora and fauna.

The row, from the Latin *filum* (thread), metaphorically suggests an act of weaving and is generally used to describe a linear sequence of plants, trees, or shrubs, spaced evenly apart. Observing the reclaimed landscape from above, the discontinuous grids formed by the rows can clearly be identified. These deliberately planted rows form continuous double lines that act as windbreak strips, protecting the canals from soil erosion. Further than the technological function of protection, the rows endure also an element fundamental for the social practices that take place within the reclamation landscapes. In fact, has always accompanied life in the fields: marking time, providing wood and fodder for livestock pulling the plough, offering shelter to farmers during the hottest hours of the day, and silently, reassuringly accompanying the labor of the land.

In contrast to the rows, within the countryside alternates the clearings — “radure” — a term derived from *rado*, from the Latin *rarus* (sparse), which

[6]Corte Costituzionale, n. 66 SENTENZA 5 - 24 febbraio 1992.

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typically refers to a patch of open land within a wooded area where trees grow more sparsely. In the context of reclaimed land, however, the term is not used in its literal sense but rather as a conceptual reference to the idea of void. “Emptiness” has always been a necessary condition for humans to inhabit the land — to interact with the surrounding environment and to locate themselves concerning the natural and built world.[7]

Thus, the agricultural landscape reclamation can be read through the analysis of the alternation between full and empty spaces, between clearings and rows. These two figures, shaped according to the body of water and its evolution, embody two effective strategies for intervening within these complex territories. In fact, according to the urgent re-modulation of water infrastructures, numerous possibilities can be created for new amphibious landscapes that can absorb threats while simultaneously strengthening their own functioning and identity.

Re-Inhabiting the Friulian Deserts

The case selected for a critical discussion on the potential for environmental enhancement and restoration of the agricultural reclamation landscape is the Lower Friuli Plain in the Friuli Venezia Giulia region of Italy. This area is bordered on three sides by bodies of water: the Tagliamento River to the west, the Isonzo River to the east, and the Marano and Grado lagoons to the south. Both its environmental and anthropogenic connotations render it fertile ground for developing strategies that involve enhancing natural restoration strategies and recovering amphibious archaeology and architectural heritage. This case study survey aims to highlight the potential of reinterpreting this territory not only as a productive machine but, above all, as an ecological infrastructure, serving as a strategic catalyst for biodiversity and creating a viable alternative to urban life.

Water infrastructure. Re-drawing and controlling the territory through the design of water paths

As in many Italian contexts, the first attempts at land reclamation in the "*Bassa Friulana*" area date back to Roman times, when hydraulic works were carried out to drain the water and allow access to the port of Aquileia, a Roman colony founded in 181 BC. However, the Roman hydraulic structures were abandoned and deteriorated in the late Middle Ages due to enemy invasions of the territory. Land reclamation resumed at the end of the 1500s thanks to Antonio Savorgnan, a Friulian aristocrat, who promoted the construction of multiple canals for water drainage in the Torviscosa areas to use the land for rice cultivation. Other short-range interventions were carried out by the Venetians,

[7]The clearing has been associated with the origins of habitation since the 1st century BC, as told in the myth of Vitruvius Pollio. It is said that in a clearing in the forest, previously isolated and wild people gathered around the embers of a fire and from this social gathering emerged political institutions, human language and the construction of permanent shelters.

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who were mainly interested in supplying Venice. In 1700, under the Austro-Hungarian Empire, new attempts were made to reclaim the areas of Aquileia and the surrounding land, but these were interrupted due to the high costs of the operations. In 1876, a consortium was formed between the Province of Udine and 24 municipalities to ensure water for domestic, civic, and irrigation use in central Friuli. However, high costs and inexperience led to the project's failure. With the advent of World War I, the few existing irrigation structures were destroyed, and the canals were converted into trenches. The landscape we see today is the result of land reclamation projects promoted by the Italian fascist regime and subsequent transformations, which took almost fifty years.

Currently, the Friuli reclamation system is managed by the Consorzio di Bonifica (Reclamation Consortium) and is based on a dense network of canals that collect spring and rainwater, conveying it to pumping stations, which in turn discharge it into the sea or other waterways. The proper functioning and efficiency of the system depend on two variables: the amount of water entering the network and the rate at which it enters.

The capacity of water flowing into the drainage channels depends on the size of the drained area, the amount of rainfall, the presence of pumping stations, and the infiltration capacity of the soil (sandy soils absorb more water than clayey and impermeable soils). The system is designed to handle an inflow of several tens of cubic meters of water per second at peak times.

The speed at which water flows into the network depends on various factors: the slope of the channels (which, being mainly flat, favor a slower flow), the absorption capacity of the soil, and the abundance of precipitation. Given the same slope, cultivated soil offers greater resistance to the advance of water, vegetated soil offers high but lower resistance, while impermeable soil offers little resistance to water, which ends up in the network more quickly. The flow of water into the network also depends on the cleanliness of the channels, maintenance, and the capacity of the pumping systems. Under optimal conditions, the water could be drained in a few hours, but during extreme events, it could take days.

Although such actions support the system and safeguard the territory, they cause significant damage from a biological and environmental perspective, disrupting the ecological network of wildlife.

The ecological infrastructure: an archipelago of disconnected amphibious landscapes between fresh water, salt water and "deserts"

This section examines the interaction between water, vegetation, and anthropogenic pressures in the Bassa Pianura Friulana, with a focus on its emblematic landscapes, characterized by two key aspects. The first concerns the close dependence on the presence of water, both in quantitative terms (humidity, groundwater, precipitation) and qualitative terms (freshwater vs. salty water). The second concerns the often conflicting interaction of two opposing forces: the "natural" one, which persists in the form of long strands or "wilderness" areas – paradoxically confined and limited by human beings' actions – and the

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anthropogenic force, which stratifies within and in tension with it, logics of control and exploitation. The distribution and variety of plant species reflect this relationship with water, which is based on two fundamental principles. The first, quantitative, includes water dynamics – water availability in the soil, groundwater depth, and atmospheric humidity. The second, qualitative, concerns the relationship between fresh and brackish water, which meet and mix at various points in this area. Water, shaping both conditions, provides a diverse range of landscapes—lagoons, riparian areas, marshes, forests, and agricultural areas—which are now threatened by climate change and require urgent protection strategies.

The Marano and Grado lagoon is a unique landscape: a system of wetlands located between the mouths of the Isonzo and Tagliamento rivers, 32 km long and about 5 km wide. This transition area between land and sea, between fresh and brackish water, is characterized by tidal flats, islands, and emerging areas. Tides are the leading shaping agent of this environment. The shallow depth and the inflow of fresh water from numerous rivers (Stella, Turgnano, Cormor, Zellina, Corno, Aussa, and Natissa) cause water level fluctuations of up to 100 cm, creating valuable brackish wetlands. However, this land-water landscape, crucial for its role in connecting different ecological habitats, nowadays is threatened. In fact, the rise of sea level is causing progressive erosion of the coast, shifting the lagoon's shoreline further inland. These changes are simplifying the very lagoon's morphology: the salt marshes are shrinking, the seabed (*velme*) is deepening, the secondary channels are disappearing, and the main channels are silting up. These transformations are provoking a more generalized displacement of the water masses, slowing down flows and, thus, increasing sedimentation. These mutations are being studied by various disciplines (geomorphology, sedimentology, hydrodynamic modeling) to develop management and adaptation policies capable of safeguarding the natural heritage and traditional anthropogenic uses.

The inland landscapes, fed by freshwater, also present significant challenges. In fact, due to their positioning along river morphologies, the riparian and marshland landscapes of the "Bassa Pianura" river system are facing critical hydraulic safety challenges. Bounded between the "line of resurgence" and the upper Adriatic coast, the vegetational formations follow the predominantly linear course of the waterways and are distributed according to the availability of water, giving shape to three main types: in soils with good water availability, shrubby floodplain willow groves; in constantly waterlogged soils, floodplain willow groves of white willow, southern elm-ash groves of river terraces and springs; and, in soils characterized by water stagnation or a constantly moving horizontal aquifer, marsh willow groves of white willow and black alder. The conservation and restoration of these landscapes are essential for two intertwined reasons. Firstly, riparian vegetation serves as a consistent barrier to erosion and runoff from riverbanks, acting as a natural hydraulic protection device. Furthermore, they can be interpreted as ecological corridors at a territorial scale, permitting the movement and life of a large number of multi-species inhabitants.

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For these reasons, restoring its continuity and introducing ecological crossing systems for wildlife is crucial.

Another essential ecological element is the forest, particularly the lowland forest known as *silva lupanica*. These formations feature oak-hornbeam forests, composed of a group of tree species, including white hornbeam, elm, southern ash, poplar, and alder, which are distributed across the territory according to the soil's water availability. Thus, in the vicinity of stagnant or minimally moving water, there are marsh alder groves of black alder and/or marsh ash groves of southern ash and possibly small groups of poplars, primarily black. In contrast, where the water table is low, we find oak-hornbeam forests, which can become depleted in white hornbeam, where the water table is shallower. The historical reconstruction of the original configuration of the lowland forests, as depicted by the Paiero map (1965), shows a significant extension of this landscape, whose surface area is now minimal and fragmented. Its extension peaked during the Middle Ages when the unhealthy and poorly defensible plain was still sparsely inhabited. Then, the Republic of Venice began to exploit the forests for the Arsenale (Susmel 1974, 1994) and to supply the timber needed for the expanding cities. Finally, the 20th-century land reclamation campaign disrupted this landscape, replacing a vast part of its surface with agricultural crops. Today, only a few isolated strands and fragments remain as evidence of this archaic and amphibious landscape described by Virgil and Pliny the Elder. In fact, it consists of 700 hectares dispersed within an archipelago of disconnected areas: the Bosco dei Larghi (municipalities of San Giorgio di Nogaro and Carlino), the Bosco Ronchi di Sass (municipality of Torviscosa), the Baredi woods, Bando and Coda di Manin (Muzzana del Turgnano), the Boscat (municipalities of Castions di Strada, and Terzo di Aquileia), the Bosco Sacile (municipalities of Carlino and San Giorgio di Nogaro) and the Bosco dei Leoni (Aquileia). As with riparian vegetation, the silva lupanica also requires a systematic plan for the ecological reconnection of fragments to increase its environmental value.

Figure 7. *Topographic map of the Lombard-Venetian provinces and of the former duchies, 1865*

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Figure 8. *Picture of the Bosco Sacile, taken from the website of Fondazione Natura*

(https://www.fondazionenatura7.it/news/alla-scoperta-del-meraviglioso-bosco-sacile-di-carlino-ud/)

In contrast to the natural mosaic's variety, the agricultural landscape—shaped by technological progress—has undergone progressive simplification. Originally rich in diversified crops (fodder, cereals, vineyards, and orchards), today it is dominated by corn, barley, wheat, and soybeans, reflecting an intensified production logic. Important strategies could also be applied in this context. One notable example is given by the transitional landscape formed by alder groves, dominated by species of the genus *Alnus.* This landscape has been introduced by humans due to their rapid growth, the value of their timber, and their ability to improve soil quality through nitrogen fixation. Today, these trees are planted both along the edges and within cultivated fields, often expanding in areas where agricultural activity has decreased or been abandoned. The strategy of displacing temporary colonization of former agrarian lands by these anthropogenic forests could serve as a means to create vegetation barriers that buffer the interface between human-modified and natural environments. Indeed, even young and human-planted forests contribute by providing shaded areas and enhancing water cycles, thereby fostering more favorable conditions in terms of humidity and temperature. This, in turn, prepares the ground for the eventual colonization by more "natural" vegetation.

This brief overview of the landscapes of the Bassa Pianura Friulana highlights a vibrant and varied system characterized by two main features: the clearing, in the form of agricultural fields, and the row, located on the edges of fields and along canals. These two elements, interspersed among the fragments of the *silva lupanica* and the bodies of water that cross the territory, represent the starting point for new interventions capable of enhancing and strengthening the existing environmental system.

The settlement system of the Friuli reclamation

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Friuli, due to its strategic geographical position, has long been a crossroads of peoples and cultures, which have shaped different approaches to managing agricultural land and, consequently, various settlement models: Roman colonies, rural villages, the system of isolated Venetian villas, and the model of *case coloniche* — rural houses built in the open countryside to enable agricultural laborers to manage newly cultivable land.

The land reclamation efforts led to the creation of new rural settlements inhabited by the families who had carried out the soil improvement works. While the reclamation projects were financed by the State, their execution was entrusted to the *scariolanti*, laborers who moved soil with wheelbarrows, raised embankments, dug canals, and filled in swamps. Typically, *scariolanti* worked in crews of 20 to 30 men, each group assigned a plot of about 50 hectares. They were paid daily, based on the cubic meters of earth moved. At the end of the project, as compensation for their work, they were granted a plot of land and a dwelling known as a *casa colonica*. This reward enabled many laborers to free themselves from the constraints of *mezzadria*, a form of sharecropping that bound them to landowners. *Mezzadria*, from the Latin meaning "one who divides in half," was an ancient agricultural contract in which the harvest was divided equally between the landowner (who did not work the land) and the sharecropper (who cultivated it but owned no land). The settlers thus cultivated the land for themselves, with the obligation to pay a percentage to the Reclamation Consortium and maintain the efficiency of the hydraulic network.

Although there is no bibliographic evidence to support this theory, it is believed that the *casa colonica* building typology drew upon existing rural architectural traditions in the area.

Specifically, three main rectangular-plan configurations can be identified:

1. A model composed of three elements, two end blocks used as a stable and a hayloft, separated by the central residential volume, usually on two or three floors.
2. A row-house configuration consisting solely of residential units on three levels.
3. A hybrid model including living spaces along with the stable and hayloft.

Across all three typologies, certain elements recur: wooden doors and windows, internal staircases made of concrete, and floors built with hollow clay blocks supported by beams and load-bearing walls. Roof trusses were typically not exposed, as ceilings were often installed with wooden laths and straws. The gabled roofs, with minimal overhang from the external walls, were covered with alternating rows of concave and convex terracotta tiles to facilitate rainwater drainage. Where present, haylofts featured large openings filled in with exposed brick arranged in a cross pattern to allow ventilation.

The steady abandonment of rural landscapes in favor of small and large cities — driven by economic and work-related factors — has led to the depopulation of these structures, whose distinctive features remain clearly visible in the countryside.

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It is, therefore, essential to devise strategies for recovering this rural architectural heritage through projects of restoration and rehabilitation, oriented toward a new settlement model that mediates between countryside and city and meets the needs of 21st-century society.

Toward New Balances: Shiftings and Reorganization of the Bassa Pianura Friulana Through Clearings and Rows

After investigating the distinctive features of the Friulian landscape — a fertile ground for study and exploration — and exploring the elements already present in the area, the intention is to reflect on how to systematize them, moving toward targeted interventions that address specific vulnerabilities affecting the region: both environmental-climatic and settlement-related. From an ecological perspective, considering this is a landscape constantly shaped by the interaction and separation of saltwater and freshwater, the presence of fragile ecosystems with a delicate balance must not be overlooked.

At the same time, from a settlement standpoint, it is essential to rethink a model that responds to the needs of contemporary society — to repopulate the land and recover abandoned buildings.

The exploratory analysis of the characteristic landscapes of the area has revealed a condition of significant fragility, marked on one hand by increasing fragmentation due to human activities, and on the other by the threats posed by climate change, which is steadily eroding its morphologies and habitats. To initiate a process of environmental repair and enhancement — in line with the goals outlined in the European Nature Restoration Regulation — it seems valuable to consider how the two most recurring features in the aerial imagery of this territory, rows and clearing, can be reinterpreted as operational tools. On one hand, rows, due to their potential for temporal and spatial development (through extensions or bifurcations), can support interventions aimed at environmental reconnection and ecological continuity. On the other hand, glades — large open spaces that host agricultural soils, sometimes abandoned, and rural settlements — can be reimagined with a dual purpose: as supports for hydraulic defense, through the creation of flood retention basins and floodable zones, and as starting points for experimenting with new sustainable forms of dwelling.

Starting from a reflection on the alternation of full and empty spaces — connected to water management and agricultural practices — the aim is to outline possible intervention strategies to rethink the landscape of the Bassa Pianura Friulana, strengthening its ecological system while proposing new settlement models adapted to contemporary needs.

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Figure 9. D'Oria, M. (2025), *The Bassa Pianura Friulana landscape: an alternation of clearings and rows of trees*

The body of water: water patterns and floodable clearings

Sustainable water management is the starting point for developing future strategies in a complex territory that has been historically shaped by its water resources. Interventions on this resource and on the infrastructure that regulates its flow can be divided into two levels, corresponding to distinct scales of action.

At a local level, operations can be identified that aim to maintain the hydraulical structures scattered throughout the territory. The goal is to improve their efficiency and make their operation more responsive to environmental and housing needs. However, these specific interventions must be part of a broader strategic vision that can embrace the entire territory in its heterogeneity, recognizing it as a single, multifaceted landscape to be treated systematically. Among the most significant local actions is the creation of storage basins to collect excess water, which is then redistributed to agricultural fields. At the same time, the introduction of high-efficiency irrigation systems—such as sprinkler irrigation or micro-irrigation—significantly reduces water consumption while improving agronomic performance. These interventions require the modernization of existing water infrastructure, accompanied by ongoing maintenance of the supply network, to minimize losses and optimize overall resource management. The adoption of more advanced technologies, in addition to guaranteeing significant water savings, helps reduce energy consumption, pesticide use, and weed proliferation, thereby promoting the conservation of native species.

Again, on a specific scale, it is possible to implement measures aimed at protecting fauna, particularly fish. These include the installation of systems that facilitate the ascent of fauna from the canals, the construction of fish ladders,

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and the alternate mowing of the banks. The latter practice, which implicates cutting the grass on only one side of the canal to allow vegetation to grow freely on the other side for a year, promotes biodiversity and provides shelter for numerous animal species, thereby contributing to their survival and conservation.

Another level of intervention, which is decidedly more complex but necessary for activating an integrated and coordinated operation, is the territorial level, which rethinks the entire system by integrating water infrastructure, the landscape mosaic, and human settlement.

A possible territorial strategy that has an even more significant impact on the landscape involves conceiving the entire area of the Lower Friuli Plain as a green and blue infrastructure: an ecological system capable of simultaneously operating on the flood resilience and natural reparation through capitalizing the benefits of working with urban green-spaces and naturalised water-flows. From this perspective, the clearing is reinterpreted as a buffer water mirror —a hydraulic expansion field capable of absorbing excess water, especially in rural contexts —and becomes a key element in the design of a resilient landscape.

This vision is rooted in an approach that rejects the idea of absolute control over nature, as advocated by Gilles Clément, who invites us to consider the landscape as a 'planetary garden' to be accompanied rather than dominated. In this sense, clearings are configured as spaces of ecological freedom, consistent with the concept of tiers paysage, marginal or unproductive areas that take on new centrality in a post-anthropocentric logic.

An emblematic example of this strategy is the Dutch program *Room for the River*, developed by the Dutch government in 2007 in response to the severe floods of the 1990s. The plan includes over 30 interventions along the country's main rivers (Rhine, Meuse, Waal, and IJssel) through a process called de-poldering, aimed at containing water and transforming river areas into adaptive and multifunctional landscapes. Depoldering, the process of moving a dyke along a river outwards so that the river has room to flood during periods of high water, has successfully allowed for water to quickly discharge from the rivers into the sea and ensured the safety of more than four million people. One of the most significant projects is *Room for the River IJssel Delta*, developed by H+N+S Landscape Architects in the historic center of the city of Kampen, where the IJssel River narrows to form an urban "bottleneck."

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Figure 10-11. *H+N+S Landscape Architects, Diagrams of the project's strategy. On the left is the site before the intervention; on the right is the area after the creation of the new wetlands*

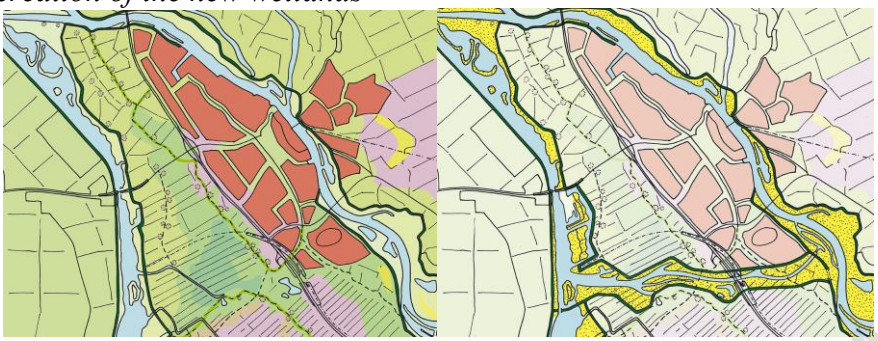

Figure 12. *H+N+S Landscape Architects, Aerial vision of the site after the intervention*

To ensure the safe flow of water in the event of flooding, a new river branch, the Reevediep, has been designed, which crosses the IJsseldelta, flanking the city on both sides. The canal, approximately 6 kilometers long and 500 meters wide on average, gradually widens downstream, serving as a natural flood control basin. This primary hydraulic intervention has also been expressed through architectural and landscaping solutions: a summer dam acts as a threshold for incoming water; the new IJsseldijk features a bridge with sloping pillars that emphasize the direction of the flow. A small migration channel below improves water quality and ecological connectivity.

The design of the floodable landscape is based on the original morphologies: the lower areas are home to new reed beds and wetlands, while the higher areas are used for natural grazing. The design does not impose a static form but leaves

room for the spontaneous evolution of the landscape: a living, responsive, performative device, as James Corner defines it. In this context, the clearing establishes itself as an interface between technology and nature, where hydraulic, ecological, and anthropogenic processes intertwine and co-evolve.

On average, every five years, the water of the IJssel exceeds the threshold of the canal and floods the area. Targeted interventions along the banks of the Drontermeer have included the replacement of the old Zuiderzeedijk and the creation of new reed beds, which serve as strategic habitats for birdlife, including the bittern, an endangered species. At the mouth of the Reevediep, there are also plans to build a new village, designed in line with the logic of adaptive landscape, capable of coexisting with water rather than fearing it.

Another key project within the *Room for the River Program* is the *Noordwaard polder,* developed by West 8 in collaboration with IPV Delft. By lowering its dike, the area is reconfigured to allow controlled inundation, functioning as a dedicated water detention zone. This intervention involved a substantial re-infrastructure of the territory: over four million cubic meters of earth were moved, 50 structures were demolished, and the construction of 30 kilometers of quays and dykes, 45 kilometers of creeks, 29 alluvial fans, 33 bridges, 60 hydraulic structures, and 12 pumping stations was undertaken.Two elements are particularly crucial for both the project: the bridges and the pumping stations. The bridges, favoring the community engagement with this new de-poldered landscape, serve also as dikes, resting areas for birds. In contrast, the 12 pumping stations are the most visually prominent elements in the area. They serve a range of functions, from supporting agriculture to maintaining dike integrity.

Figure 13-14. *West 8, Diagrams of the project's strategy. On the left is the individuation of the new floodable areas; on the right is the area after the creation of the new wetlands and bridges*

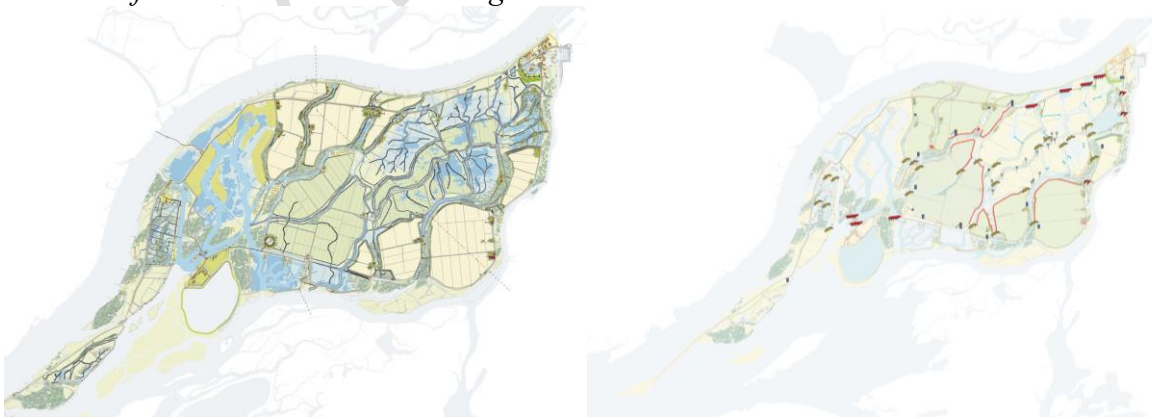

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Figure 15. *West 8, Aerial vision of the site after the intervention*

Ultimately, the Dutch experience provides a fundamental reference point for rethinking the clearings of the Bassa Friulana not as margins or waste but as active elements of a widespread ecological and hydraulic infrastructure capable of responding to climate change and relaunching a new balance between landscape, nature, and society.

The clearing is, thus, reinterpreted not a void but an infrastructural figure that mediates between rural and urban areas, between water management and biodiversity production. Pierre Donadieu, with his concept of hybrid territories, also emphasizes the importance of multifunctional spaces that combine agriculture, ecology, and livability systemically.

Consolidating and repairing existing landscapes by outlining the structure of territorial ecological corridors

The reinterpretation of clearings, as we have seen, embodies an effective strategy to strengthen the territory's hydraulic protection. At the same time, it favors the introduction of environmental variations—such as increased humidity or the presence of stagnant water—creating ideal conditions for protecting biodiversity. The other morphological element that diffuses within the agricultural landscape is the rows. These continuously punctuate and give rhythm to the landscape, structuring its shape and marking the boundaries of fields, as well as accompanying the layout of canals. Their configuration is based on repetition, a principle that is expressed both in space – following the planting patterns – and in time, according to the growth cycles of plant organisms, which require extended periods to take root and develop. In their repetition, the rows thus become devices capable of activating progressive transformations of the

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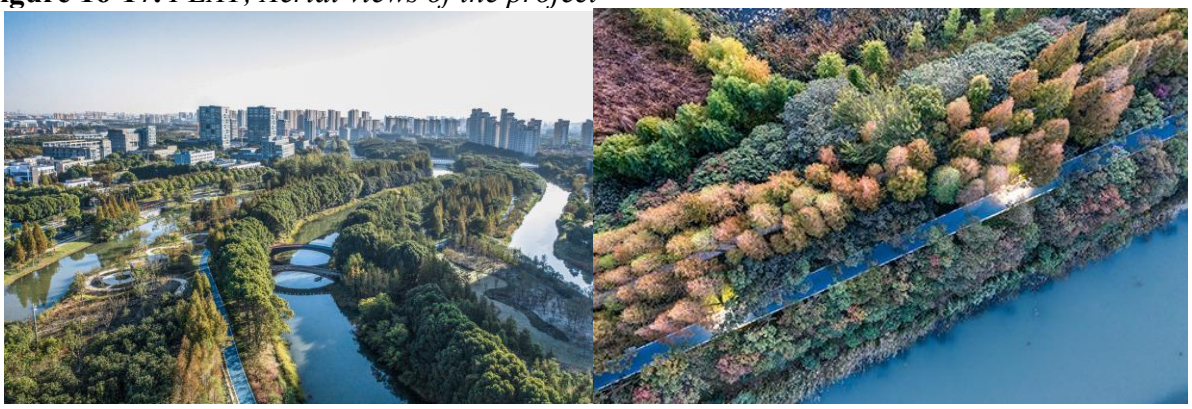
landscape, anticipating future changes, as demonstrated by Michel Desvigne's projects. In these 'intermediate naturalities' – landscapes in the making – the row takes the form of an actual agent of gradual metamorphosis. These elements can be used strategically to build territorial ecological corridors. By intervening in existing discontinuities, strengthening the riparian system, and extending existing rows and hedges, a new green infrastructure can be outlined that acts as a backbone for the spread of natural elements in the agricultural landscape.

An emblematic example of this strategy is the PLAT studio project in Kunshan (China), launched in 2017. The *Miaojing River Central Water Corridor,* originally an aqueduct connecting the Kueilai Lake basin to the historic center, has been transformed into a central axis for the development of Kunshan West's green infrastructure. The river corridor, accompanied by dense tree planting – repetitions of the row element–serves a dual function: protecting the river from surface runoff and defining a large ecological corridor equipped for public use.

Figure 16-17. *PLAT, Aerial views of the project*



A second significant project by PLAT is *Forest Park*, located between Shanghai and Suzhou, within Kunshan —a settlement historically marked by an intense relationship between humans and water, as revealed by a capillary network of urban canals. However, modernization and the construction of heavy infrastructure have compromised this hydraulic structure, which is now at the center of the regeneration project. In fact, the establishment of the new Kunshan West Technology Center has led to an increase in the resident population, making it urgent to renew the integration between green and blue infrastructure, urbanization, and mobility. The design strategy involved the delimitation of a 1,163-hectare area of forest wetland, which was conceived as a green island in the expanding urban context, anticipating and preserving space for nature. This aligns with the precautionary principle in urban ecological planning, which advocates for the conservation of ecological space amid urban growth. The previous western access of the park was redesigned, introducing a gateway to a network of pedestrian and bicycle paths that wind through active and passive recreational spaces. Biodiversity improvement and rainwater runoff management are addressed through a selected variety of plant species. The project, developed in collaboration with hydrologists and local authorities, aims to combine accessibility, ecology, and quality of public space.

The rows represent an element that, due to its ability to extend across large areas of land, can facilitate the definition of a network of ecological corridors capable of connecting the currently interrupted and fragmented natural areas in the area.

Figure 18-19. *PLAT, Views of the project*

Rethinking ways of living and recovering amphibious archaeology

Intervening in reclaimed areas also involves recovering and enhancing water and vegetation networks to improve permeability, water retention, and environmental quality, thereby transforming old hydraulic artifacts into ecological spaces that are integrated into the urban and rural systems. This vision promotes a virtuous coexistence between nature and human settlement, fostering climate resilience through adaptive management that considers the variability and complexity of territorial systems.

The countryside that extends between the abandoned buildings can be understood as a clearing, a "void," where humans once needed to settle to cultivate the agricultural land. Today, human intervention is no longer essential for managing fields, as new technologies do not require the constant presence of agricultural workers. The settlement models that followed the reclamation works have adapted to anthropic design; however, the evolution of technologies has undermined this model, leading to the abandonment of large rural buildings in the open countryside. The large "clearings" where the colonists settled have been depopulated, leaving behind only the "void."

Some of the colonial homes in the area have been converted into B&Bs, restaurants, or new residences, but it is necessary to consider strategic interventions in the territory. Would it be possible to think of new ecovillage models that could be established in their vicinity?

In 1991, Mr. and Mrs. Robert and Diana Gilman published the research paper "Ecovillages and Sustainable Communities,"[8] in which the term "ecovillage" was first used to describe pioneering experiments in sustainable communities. Although it was an ideal ecovillage, it was crucial to establish definitions and baselines for the success of the experiments that would emerge later. The aim is to rethink how the principles associated with the village settlement model—such as cohabitation and self-sufficiency—should be reinterpreted in today's context.

[8]Gilman D. & R., “Ecovillages and Sustainable Communities: A Report for Gaia Trust”, Gaia Trust seminar in Denmark, 1991

A valuable reference is the "Quattro Passi" "co-neighborhood, designed by the architectural firm Tamassociati and located in Villorba, in the province of Treviso (Italy). The complex consists of eight housing units and a collective house (which, in the context of reclamation, could involve the recovery of a rural building). The total built surface is approximately 650 square meters, situated between a residential center and open countryside in an area characterized by lush vegetation and high environmental quality. For this reason, cars are parked on the perimeter of the complex, entirely pedestrian and bicycle-friendly.

The collective house, located near the north entrance, is a multifunctional building designed to meet various collective needs. It features a large multipurpose room connected to a fully equipped kitchen, making it suitable for hosting events such as parties, meetings, study sessions, and social gatherings among residents. The structure also features an outdoor porch for open-air activities, a DIY workshop, a guest room, and a food storage area to support collective purchasing. The surrounding outdoor space features a garden equipped with play areas for children and teenagers, as well as a shared vegetable garden, promoting social interaction and connection with nature.

From a technical standpoint, the collective house hosts a centralized infrastructure that supplies energy to the entire residential complex.

The homes are heated via a biomass thermal power plant, integrated with solar thermal systems for domestic hot water and photovoltaic panels that provide electricity to the buildings. This system is combined with a high-performance building envelope, constructed using precision-engineered clay blocks for load-bearing walls (*Porotherm Bio Plan 30-25/19.9* by Wienerberger) to optimize energy efficiency and minimize the building's environmental impact.

Figure 20. *Tamassociati, Quattro Passi eco-neighborhood*

The Villorba residential complex is also notable for its adoption of the co-housing model, which places a strong emphasis on the social quality of life. At

the heart of this housing approach lies the principle of sharing, where a small group of families chooses to live together based on a shared vision and common rules, designing and building spaces tailored to their specific needs. In addition to private dwellings, which are customized for each family, numerous shared spaces offer a conscious response to the isolation typical of contemporary urban environments. This configuration promotes livability, encourages interpersonal relationships, and represents an innovative and economically sustainable model of living.

Future Perspectives: Re-Starting from Clearings and Rows

The landscape of land reclamation embodies a context rich in meanings, where nature, culture, and human settlement intertwine in a dynamic yet fragile balance. The geomorphological, hydraulic, and ecological complexity of this territory, combined with the historical stratification of agricultural and settlement practices, offers stimulating paths to rethink land and water management strategies and housing models, which are urgently needed to face the current condition marked by environmental crises, climate change, and the abandonment of rural areas. Therefore, the alternation of rows and clearings, archetypal elements of the agricultural landscape, should be adopted not only as an object of interpretation but also as a practical design tool capable of guiding regeneration and adaptation interventions that seek a new balance between ecological sustainability, environmental resilience, and quality of life. Rows, understood as linear green infrastructures, can contribute to the environmental reconnection of the territory, supporting biodiversity and forming ecological corridors. Clearings, on the other hand, offer space for new functions, such as water management basins and multifunctional agricultural fields, as well as places to experiment with innovative and sustainable forms of living.

Experiences such as the 'Quattro Passi' eco-neighborhood demonstrate how it is possible to imagine settlement models based on principles of cohabitation, shared use of resources, and integration between buildings, nature, and communities. The adoption of low-impact environmental technologies, centralization of energy systems, the multifunctionality of shared spaces, and the enhancement of green spaces are elements that could also be effectively applied within reclaimed areas.

Restoring existing buildings, reactivating abandoned rural settlements, and integrating new forms of settlement in harmony with the agricultural and hydraulic landscape morphology is a challenge but also an opportunity to imagine a new rurality. A rurality that is not a nostalgic return to the past but a laboratory for a more equitable and sustainable future integrated with natural cycles. In this sense, land reclamation is not only a legacy to be preserved but also a project platform from which to start building a new balance between man, water, and territory.

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