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Architectures, Energy Landscapes and Hydro-social Territories of Reclamation

By Mariacristina D'Oria[*] & Thomas Bisiani[±]

The employment of water resources as a driving force for productive activities has generated a wide taxonomy of methods and strategies for managing and harnessing energy from this natural element. From this perspective, land reclamation areas hold considerable importance, as their very configuration and morphology can be interpreted as a moving witness to human efforts to regulate and shape water, generating a complex system of intertwined and interdependent relations between hydraulic regulations, irrigation artifacts, and energy production networks. By exploring how the current ecological and energy crises are reshaping disciplinary lexicon, the research intercepts three key terms—ritratto, eco-machines, and hydro-social territories—, employing them to reinterpret aquatic landscapes. It examines three international case studies—2050: An Energetic Odyssey, Jade Eco Park, and Environmental Park—to identify design strategies that integrate ecological awareness with hydro-infrastructure at various scales. These inform a speculative project in the Lower Fiulian Plain, Italy, proposing adaptive reuse of hydraulic systems to accommodate rising waters and enable ecological re-colonization. The research explores a potential fourth phase beyond Lewis Mumford's framework: eotechnic, paleotechnic, and neotechnic. By delineating a possible eco-technic era, the work projects new possibilities for the architecture and landscape disciplines to rebalance the technosphere and biosphere for more resilient hydro-social landscapes.

Keywords: *environmental machines, hydro-social territories, renewable energies, bodies of water, ecotechnic era*

Intertwined Bodies: Humans, Water, Ground, and Energy

That between humans and water is an everlasting relation. Water, which constitutes approximately 60% of the human body, plays a crucial role in vital functions such as nutrient transportation, body temperature regulation, metabolic processes, and waste elimination. These very operations can be transposed on the territorial body, within which the aquatic body, through its transience or stagnant presence, influences and modulates the biodiversity of the ground, the humidity of the air, and the atmospheric conditions (Figures 1-2). A fundamental presence that, along the XVI century, was clearly remarked on and implicitly present in the very nomenclature of the Earth, referred to as "terraqueous globe"[1], with a mixed composition of water and land. Conceiving the Earth as a terraqueous globe implied the need for tools able to define,

[*]Research Fellow, University of Trieste, Italy.
[±]Research Fellow, University of Trieste, Italy.
[1]Definition given by the author within his book (Farinelli 2007, p. 120).

with precision, the boundaries and internal logic between ground and water, in order to trace limits and frame possibilities for expansion.

Figure 1. *Diagram of the Human Body in Relation with its Environment, from the Project Phase Shifts Park by Catherine Mosbach, Philippe Rahm, Ricky Liu & Associates Architects+Planners, Taichung, Taiwan, 2011-2014*

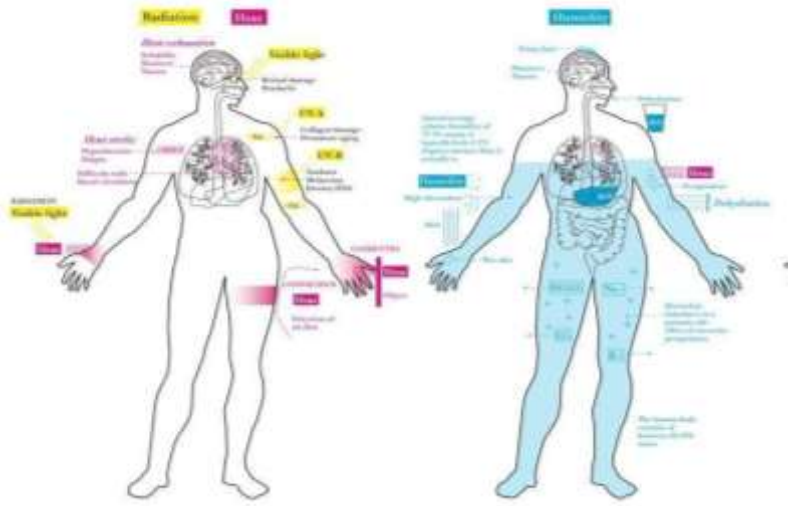
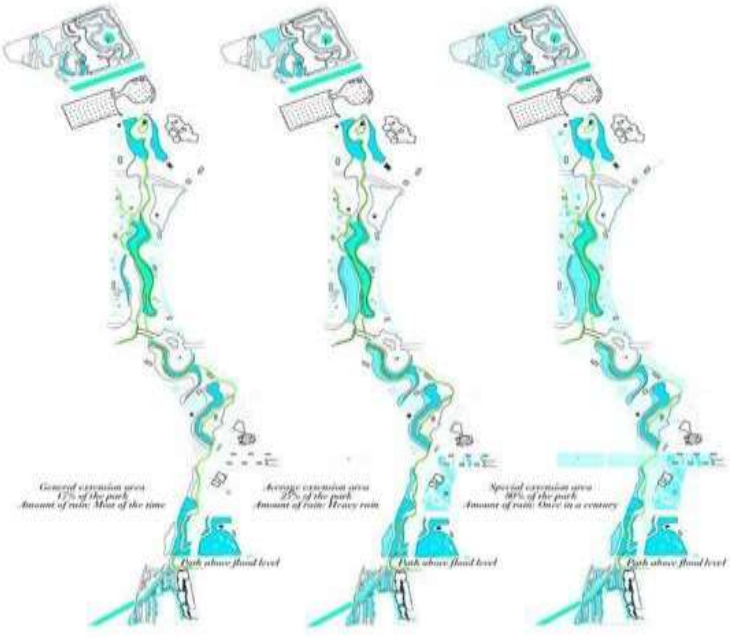


Figure 2. *Litosphere Design, from the Project Phase Shifts Park by Catherine Mosbach, Philippe Rahm, Ricky Liu & Associates Architects+Planners, Taichung, Taiwan, 2011-2014*



Therefore, water and humans are connected by a complex relationship in which water supplies the needs of humans for settlements and living, on the one hand, and is controlled and managed by humans to inhabit territories and produce energy on

the other. Among the operations dealing with the hydric resource stands the reclamation activity, which embodies a consistent concretization of this long-term tension and has been systematically pursued from the Etruscans onward, conquering space for human settlements and agricultural fields. The operations displaced through the reclamation should also be read in strict connection with power agencies. Its system of practices and techniques is not a bottom-up operation but rather a sort of total planning driven by the idea of converting a landscape into an organism designed to function like a machine, reshaped by humans to expand within newly conquered wetlands and channel its flows to produce energy.

The exploitation of these hydric resources' driving force has facilitated the development of a rich taxonomy of dispositifs for producing energy, a sequence of technological artifacts with a long-lasting history. In the seventeenth century, in the Netherlands, wind-powered water mills enabled the transformation of ever larger expanses of sea into dry land, converting what was liquid and mobile into solid and stable ground (Farinelli 2009, p. 67). Mumford recognizes that the roots of such an invention record much deeper origins: "A creative syncretism of inventions, gathered from the technical debris of other civilizations, made possible the new mechanical body. The waterwheel, in the form of the Noria, had been used by the Egyptians to raise water, and perhaps by the Sumerians for other purposes; certainly, in the early part of the Christian era, watermills had become fairly common in Rome." (Mumford 1934, p. 108).

The contemporary looming environmental collapse, climate change, and energy crisis directly affect the hydric resource and all the practices and environments associated with it. Thus, the architectural discipline is asked to confront the urgent call for innovative strategies and logic to operate within the environment, seeking two main objectives: on the one hand, the preservation of the "natural" resources and their management; on the other, the search for new sources of renewable energies and new forms of sustainable living. In this context, the concept of energy landscapes began to emerge, explicitly highlighting the close connection between energetic crises and how the architectural discipline addresses them through designing spatial transformations across all scales. As stated in the editorial's notes of the Ardeth's issue, dedicated to *Energy Landscape* (Fall 2023), "the connection between environmental collapse and architectural discipline operates in two directions: from the climate and energy crisis to space construction and, conversely, from the design of the built environment to its effects on climate, energy resources, and the environment. Architectural design, therefore, presents both a challenge and an opportunity – one that we must find a way to address." (The Editorial Board of Ardeth 2023, p. 6).

The research, adopting this double-directional perspective, intends to explore an energy landscape deeply intertwined and shaped by water: the landscape of reclamation, with the aim of retracing new ways of approaching and rebalancing the weak environmental condition it is currently experiencing.

Thus, the work investigates the latent potentialities of the reclamation landscapes, starting from a first operation of lexicon revision, according to the new terms and values emerging within the contemporary debate, to open a reasoning on the possible new terms and values through three case-study analyses. The framework thus constructed then experiments with the Lower Fiulian Plain, an Italian area of agricultural reclamation,

interpreting it as an operational field of application and a speculative experimentation space to confront the threats materialized by the current ecological, environmental, and energy crisis. The Lower Fiulian Plain offers a peculiar field of investigation that overpasses the technological sphere of mere water management, embracing a stratified system of values and nuances: cultural, geographical, social, and symbolic. In fact, not only has this landscape been a field of experimentation for increasingly advanced technologies, but it has also been, and still is, the domestic space for a group of communities that have stratified within its terraqueous surface, encompassing social practices, personal histories, working efforts, agricultural cultures, public spaces, and collective memories.

The reinterpretation of landscape machines and the shift toward a hydro-social perspective require the formulation of a renewed design lexicon, capable of articulating new relations between the previously discrete technosphere and biosphere, and of expanding the operative scope through which the territory can be read as a complex multiscalar network. If, as underlined by Lewis Mumford, water as a source of energy production encompasses three technological phases – *eotechnic*, *paleotechnic*, and *neotechnic* – the core research question of this work emerges: What shape will land reclamation territories assume in a *post-neotechnic* era? What new forms of coexistence between humans and machines can be envisioned to respond decisively to the current ecological, environmental, and energy crises?

The original contribution of this work lies in the proposal of a design taxonomy and a conceptual framework for the ecotechnic era. Moving beyond a preliminary lexicon revision, the research provides an operational tool for designers by defining the 'environmental machine' as a metabolic system where energy production, ecological coexistence, and inhabitation practices are interactively integrated. By distilling strategies from comparative case studies, this paper establishes a three-fold taxonomy of intervention: water as a strategic environmental-energetic-social infrastructure; the definition of multi-sensory climatic clusters; and micro and diffused systems of amphibious artifacts. This integrated framework serves as a projective methodology to reconfigure reclamation landscapes into resilient hydro-social territories, effectively rebalancing the relations between the technosphere and the biosphere within the architectural discipline.

Amphibious Geographies: Hydro-Social Territories Seeking for Reinterpretation

The reclamation landscape can be introduced by the reasoning of Farinelli. "Who studies the historical cartography of the Po Valley often encounters the term *'ritratto'* (or *retratto*), which in ancient documents refers to a strip of land from which water has receded, either through the gradual addition of soil (reclamation) or through artificial drainage, i.e., simple drying (§ 31), a process that has affected parts of Europe since the early Middle Ages [Ciriacono 1999] and which, in the 19th century, at the time of mechanical water pumps, took on the name 'bonifica' in Italy. It should be noted that even today, a *ritratto* (portrait) is exactly the same thing, a flat surface on which all moisture (that of the painter's colors) has been removed. It should be noted, in passing, that for us, a portrait is still exactly the same thing, a

flat surface on which all moisture (that of the painter's colors or the photographic emulsion) has dried. In other words, the only difference is that while the portraits we are used to are images of living beings, the "portrait" found on the maps of the past is an image of the table itself, of the flat, continuous, homogeneous, and isotropic extension that serves as the archetype of the modern state: precisely the expanse that, in its purest but at the same time most material form, the reclamation, promoted at the beginning by the state itself, generates and exemplarily brings to light as its ideal model." (Farinelli 2009, p. 87).

Figure 3. *Map Representing the Cut of Porto Viro, Po Delta, 1600–1604*

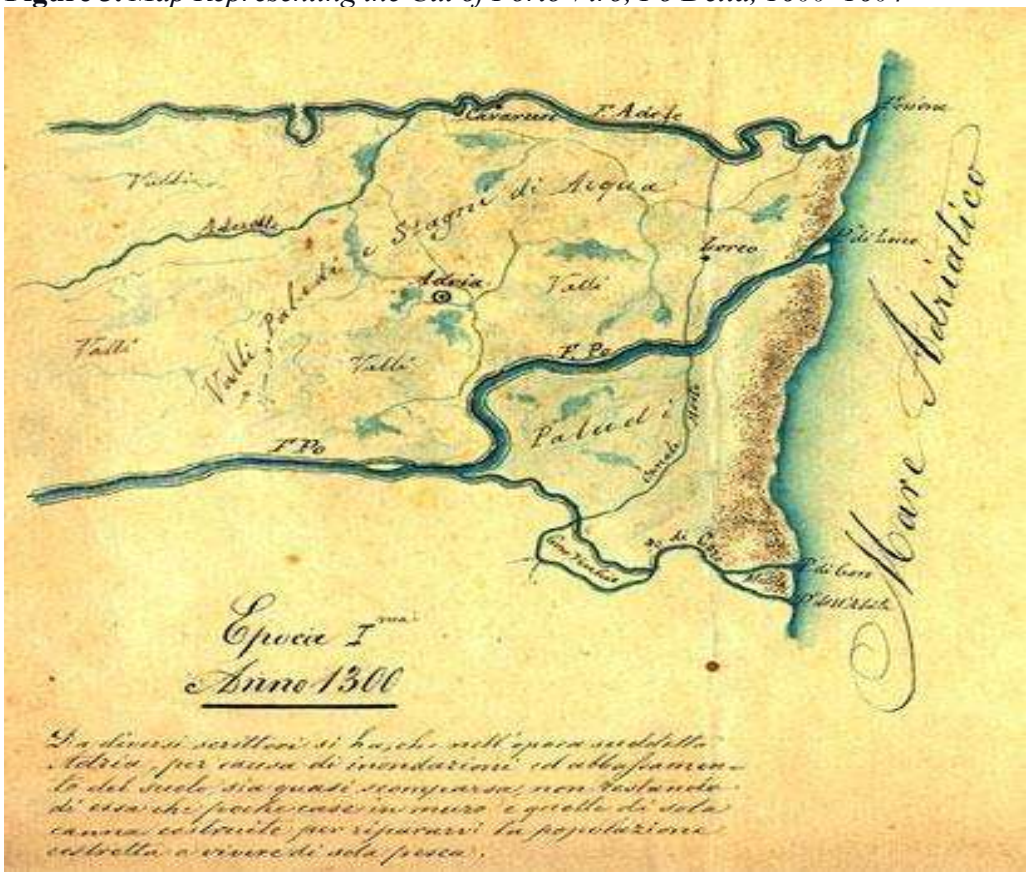
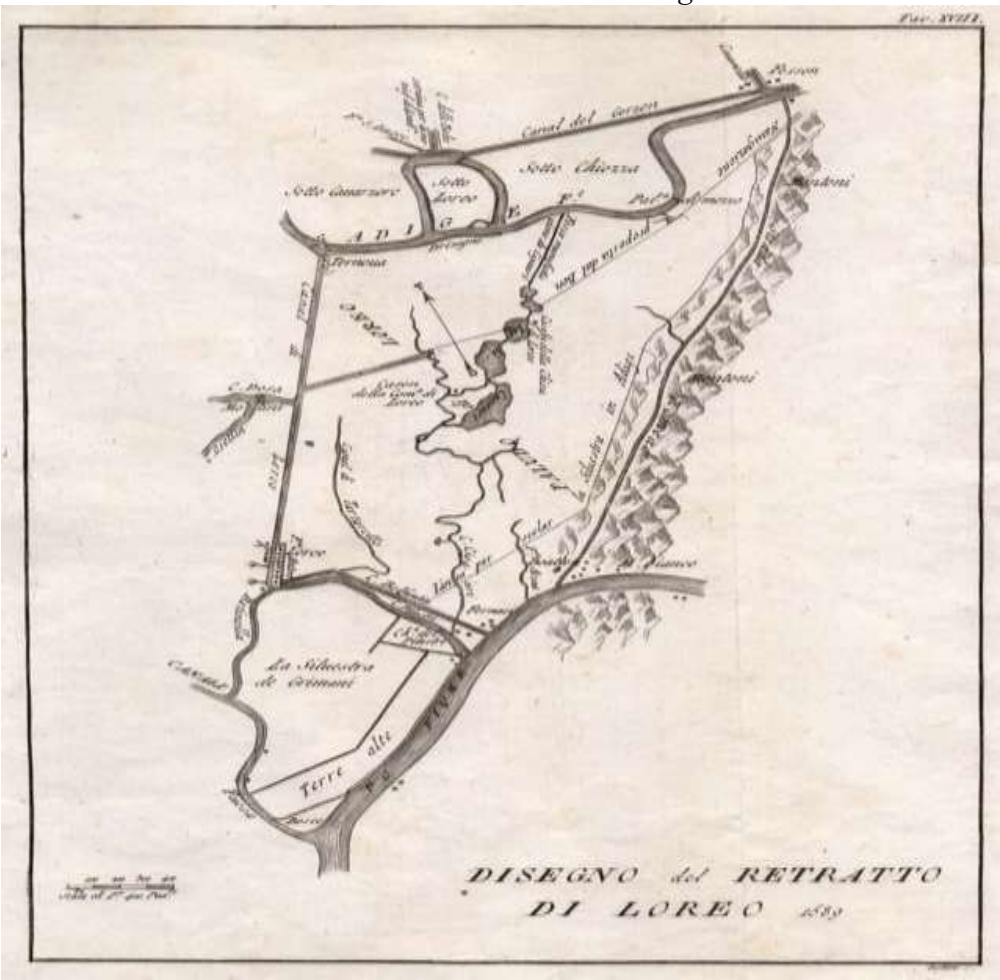


Figure 4. *Bernardino Zendrini, Disegno del Retratto di Loreo, 1589, in the Work "Memorie storiche dello stato antico e moderno delle lagune di Venezia"*



Literally, a strip of land from which water has been forced to recede, a multitude of technologically driven operations has shaped reclamation landscapes focused on drying the water from previous, unhygienic wetlands, domesticating them, and putting them to work within agricultural processes (Figures 3-4). Thus, these areas are no longer natural environments but somewhat artificially shaped territories, constellated by an archipelago of hydraulic infrastructure that stores, distributes, and drives water throughout them. The image one should envision is that of an active management and care operation, which continuously rebalances the water flows according to the production requested and, more recently, also to the necessity of protection from extraordinary meteorological phenomena. This peculiar functioning leads to the interpretation of these landscapes where water has been removed as heterogeneous organisms that integrate nature, human activities, agricultural production, and energy production, organisms highly infrastructured –channels, hydraulic regulations, irrigation artifacts, drainage systems, mechanical water pumps– conceived as "landscape machines". The combination of the words "landscape" and "machine" has been long discussed and interpreted with a negative connotation related to the impoverishing effects of "limitless domination of a globalizing technology, a threat," (Meyer 2008) a negative reading of the landscape that necessitates a shift

in perspective. In fact, among these negative connotations, few authors reasoned on this relation in positive terms: "For Olmsted, parks performed in two ways: they were environmental cleaning machines, open spaces of healthy sunlight, well-drained soils, and shady green groves of trees reducing temperatures, absorbing carbon dioxide and releasing oxygen." (Roncken et al. 2011, p. 71).

In this sense, it can be helpful to underline the significance with which this term should be appropriated and interpreted nowadays, conceiving it as an inspiring concept to construct and shape resilient environments from a new balanced combination between the elements of the machine (*technosphere*) and of the natural ecosystem (*biosphere*), experimenting with systems capable of providing self-sustaining cycles including plants, water treatment, and heat transmission. In this sense, landscape machine "is directly congruent with agricultural developments over the past millennia [...] these are productive landscapes that not only can produce food and accumulate energy but also produce clean dredge, healthy soil, and freshwater at the same time, resulting in unfamiliar types of ecological biotopes that will create the sprouts of new origins of life"[2] (Figure 5).

Figure 5. *C. Vaux and F. L. Olmstead, Map of the Central Park, New York City, January 1st 1870*

The land reclamation areas are, thus, potential landscape machines on which to intervene, finding a new equilibrium of coexistence and interaction between environmental bodies, technology, and human activities. For instance, as shown in their work, Todd and Todd (1994) interpret the project as a tool for shaping "eco-machines", systems designed to treat wastewater or regenerate degraded environments through the combined use of plants, microbes, aquatic animals, and artificial structures. These "living machines" mimic natural ecosystemic processes, providing ecosystem services such as water treatment or biomass production.

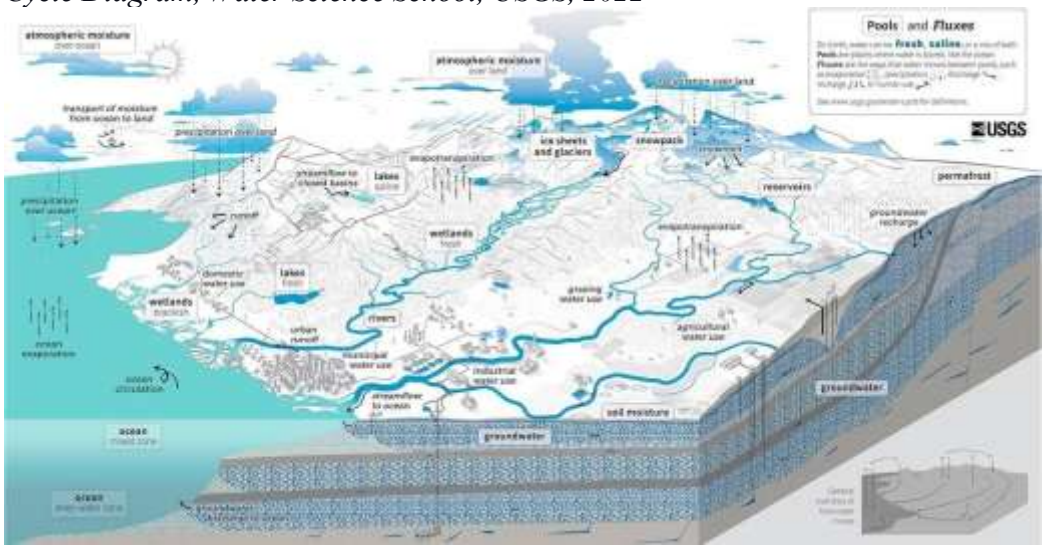
The work of James Corner gives another relevant interpretation of this concept (Corner 1999). With his studio Field Operations, from 1998, he endures the configuration of "Living urban systems", defining ecological infrastructures capable of triggering evolutionary and transformative processes over time and promoting integration between ecology and urban planning.

[2]The term is coined to define: "co-constitution of water and society, rejecting the idea that water flows independently of the social contexts through which it moves". For further information (see Linton and Budds 2014).

Finally, before delving into the recent design experimentations, it is necessary to address one last crucial issue connected with these landscapes, which is directly related to their stratified memory of historical social practices. Reasoning on the longstanding challenge of managing water is not solely a technological issue tied to land use and agricultural production but is also fundamentally connected to how a territory is inhabited and traversed by social practices. The various ways water has been managed, infrastructured, and employed reveal different approaches to imagining and experiencing the territory, giving body to a heterogeneous sequence of social practices and inhabiting strategies. This historical and socio-spatial layering of water practices sets the basis for understanding contemporary approaches to water governance, which increasingly acknowledge the entanglement of ecological, political, and cultural dimensions in shaping hydric territories.

The complexity and urgency of intervening within this field are demonstrated, particularly from the mid-2010s onward, by a growing interest in water management and governance, which has led to the formulation of various concepts, each focusing on diverse dimensions and confronting different nuances of the vast hydric issue. These include, for instance, the *hydrosocial cycle*, *waterscape*, and *hydrosocial territories* (Boelens et al. 2016). In particular, hydrosocial territories foster critical reflection on the complexity involved in operating with and on hydric resources. The term has been defined as: "the contested imaginary and socio-environmental materialization of a spatially bound multi-scalar network in which humans, water flows, ecological relations, hydraulic infrastructure, financial means, legal-administrative arrangements, and cultural institutions and practices are interactively defined, aligned and mobilized through epistemological belief systems, political hierarchies, and naturalizing discourses. Hydrosocial territories (imagined, planned or materialized) have contested functions, values and meanings, as they define processes of inclusion and exclusion, development and marginalization, and the distribution of benefits and burdens that affect different groups of people in distinct ways" (Boelens et al. 2016, p. 2) (Figure 6).

Figure 6. *H. Corson-Dosch, C. Nell, R. Volentine, A.A. Archer, E. Bechtel, J.L. Bruce, N. Felts, T.A. Gross, D. Lopez-Trujillo, C.E. Riggs, E.K. Read. The Water Cycle Diagram, Water Science School, USGS, 2022*



Therefore, if the core research question of this work concerns the formulation of a fourth, contemporary phase of technological development, following the eotechnic, paleotechnic, and neotechnic phases delineated by Lewis Mumford, this phase may be identified as the *ecotechnic* era. This concept remains scarcely adopted within the disciplinary debate. However, an initial conceptualization can be traced in John Michael Greer's 2009 book *The Ecotechnic Future: Envisioning a Post-Peak World* (Greer 2009). Here, the author acknowledges this era as a moment when humans would reach a sustainable climax phase, blending ecological sustainability with advanced technological systems driven by renewable resources. A significant shift in perspective emerges from Greer's text. While Mumford elaborates the succession of technological eras from an anthropogenic perspective—focusing on the relations technology establishes with humans, in terms of social practices and productive systems—Greer introduces a substantial turn. The relationship with technology is no longer analyzed primarily from a human-centered perspective, but rather from what he calls "nature's eyes" (Greer 2009, p. 240), of which humans form only a part. He writes: "To see humanity's trajectory into the future in this way, ultimately, is to consider ourselves through nature's eyes [...], subject to the same natural laws and ecological patterns as every other living thing on Earth. Troubling though this view may be to the hubris cultivated by some recent human cultures, it reaches back to the older and more ecologically relevant ways of understanding humanity and nature common to traditional cultures [...] reach forward to ways of making sense of the world that will blossom in the far future, as the ecotechnic age dawns" (Greer 2009, p. 244).

The *ecotechnic* era envisions the integration of fundamental human and non-human concerns—food, dwelling, work, energy, community, culture, and science—through a decisive shift away from a purely anthropocentric perspective. It calls for a rebalanced relationship between the technosphere and the biosphere, between the technological components of machines and the ecological dynamics of ecosystems,

encouraging the experimentation of systems capable of generating self-sustaining cycles and fostering new forms of multispecies coexistence.

Thus, reclamation landscapes appear to simultaneously embody the meanings and values of hydro-social territories—interfaces among society, technology, and nature—and the potential to act as contemporary landscape machines capable of rebalancing the threatened relationship between nature, humans, production, and sustainable energies.

The reinterpretation of landscape machines and the opening of a new perspective toward the hydro-social territories involve the formulation of a new design field of action capable of intertwining a renewed relation between the previously discrete technosphere and biosphere, adopting multidisciplinary strategies to read the territory as a complex multiscalar network.

Retracing a Taxonomy of Strategies to Configure Renewed Hydro-Social Territories

The research adopts a hybrid methodological approach that integrates theoretical analysis with the research-by-design method, utilizing the critical examination of case studies to inform projective spatial strategies for the reconfiguration of reclamation landscapes into hydro-social territories.

Developing a critical comparative reading of three emblematic design experiments, the contribution seeks to uncover original insights into how water can serve as an active medium to reconfigure relationships among environment, technology, and society.

The selection of case studies carries methodological significance: the three projects were chosen to ensure a heterogeneity of scales—ranging from transnational-transterritorial to urban and local—and to illustrate distinct technological approaches to the hydric resource. Specifically, three core criteria guided the selection: relevance to the energy transition, highlighting projects that envision water as a driver for post-fossil energy landscapes; variety of scale, to test the scalability of hydro-social strategies through different spatial and temporal dimensions; and integration between the biosphere and the technosphere, selecting experiments that move beyond purely engineering-based control toward metabolic and ecological synergy.

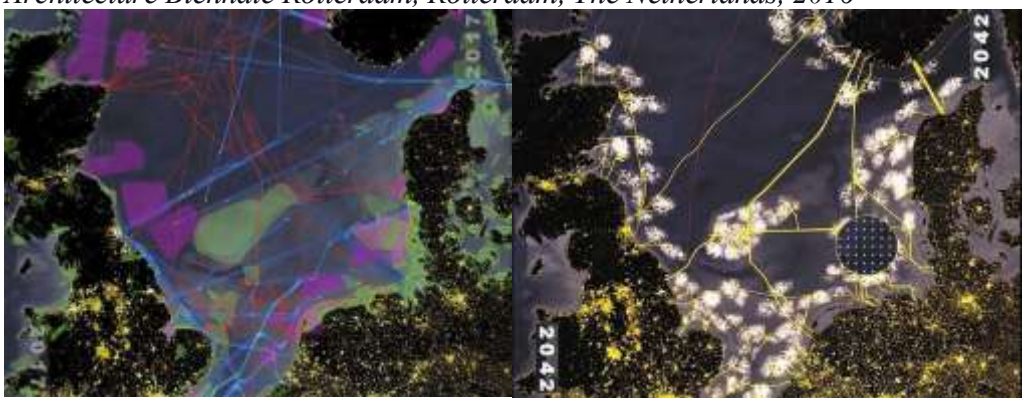
What they share is the ambition to integrate energy production, ecological coexistence, and inhabitation practices within the same design process. Their comparison is therefore used to critically test the concept of the hydro-social territory and to trace an operative design genealogy capable of informing emerging *post-neotechnic* territorial scenarios.

In the context of current transformations in energy landscapes and the emergence of new territorialities linked to ecological transition, *2050 - An Energetic Odyssey* (2015-2016) by H+N+S Landscape Architects, developed with Ecofys and Tungsten Pro, stands as a paradigmatic example of a "narrative infrastructure" capable of articulating projective imagination and political vision. Presented in 2016 within the framework of the International Architecture Biennale Rotterdam (IABR), the project outlines a transnational vision of the North Sea as a collective renewable energy

infrastructure. A twelve-minute animated simulation constructs an immersive vision—across space and time—depicting the progressive reconfiguration of the North Sea (Figure 7) into a post-fossil landscape of large-scale energy reclamation (Figures 8-9). It outlines a system of approximately 25,000 offshore wind turbines (10 MW each), connected through high-voltage networks, artificial conversion islands, and logistical maritime corridors.

Figure 7. *Satellite Photo of the Project Area Taken from Google Maps, 2025*

Figures 8-9. *H+N+S Landscape Architects, Still Images from the Animation "North Sea", IABR 2016 – THE NEXT ECONOMY, 7th Edition of the International Architecture Biennale Rotterdam, Rotterdam, The Netherlands, 2016*



This representation does not merely illustrate a technical transformation; rather, it constructs a territorial and cultural horizon in which energy production is embedded within a new design ecology. The North Sea is no longer portrayed as a neutral surface, but as a contested space — dense with practices, rights, and infrastructures — reconfigured through strategies of coexistence among energy production, marine

ecology, and maritime mobility. In this sense, the project fits within a broader discourse on hydro-social territories, revealing how marine spaces are shaped by socio-technical, political, and ecological mediations, and how they function as productive devices for collective subjectivities.

Water is conceived as a territorial and infrastructural matrix, while landscape design operates not as aesthetic mediation but as an instrumental form of environmental governance that renders competing demands legible and negotiable. Moreover, the project extends the historical logic of Dutch reclamation: whereas in previous centuries land was reclaimed from the sea for agriculture, *2050 - An Energetic Odyssey* envisions a new kind of reclamation, in which the sea becomes a productive surface for sustaining a post-fossil society. This shift entails both a technical and a symbolic redefinition of space, and it repositions landscape architecture as an agent for territorial transformation and collective future-making.

While H+N+S' *Odyssey* operates at a transnational scale, interpreting water as a large-scale energy infrastructure, *Jade Eco Park* (2012-2016) in Taichung experiments with this resource as a catalyst for hydro-climatic transformation. Taiwan's tropical climate, influenced by the Kuroshio—one of the world's most significant sea currents—is warm and humid, with increasingly pronounced extremes. These geo-climatic conditions guided the design of Philippe Rahm Architectes, Mosbach Paysagistes, and Ricky Liu & Associates, who converted a former 67-hectare airport platform into a vast public park (Figure 10).

Figure 10. *Satellite Photo of the Project Area Taken from Google Maps, 2025*

The primary objective was to enhance climatic comfort, enabling residents to inhabit outdoor urban spaces more fully. The project employs water as a vector for ecological performance and public engagement, transforming the former transportation infrastructure into an ecological, convivial, and immersive one. It combines two main elements: the lithosphere—water, topography, and soil—and the atmosphere—heat,

humidity, and pollution—to configure a sensory green lung structured into twelve atmospheric zones that, offering distinct climatic conditions, overlap, separate, densify, or dissipate across the park's surface, producing a range of atmospheres that visitors may select and appropriate—hence the name *Phase Shifts Park* (Figure 11).

Figure 11. *Aerial View of the Project Phase Shifts Park by Catherine Mosbach, Philippe Rahm, Ricky Liu & Associates Architects+Planners, Taichung, Taiwan, 2011-2014*

Figure 12. *The Meteors Dispositifs, from the Project Phase Shifts Park by Catherine Mosbach, Philippe Rahm, Ricky Liu & Associates Architects+Planners, Taichung, Taiwan, 2011-2014*

Thus, the design is modulated to shape a sequence of climatic variations throughout the site, in which heat, humidity, and atmospheric pollution are confronted

with through three categories of dispositifs: cooling devices–such as the "Anticyclone", "Underground Breeze" or "Blue Sky Drizzle"–; drying devices –including dense trees canopies, "Dry Cloud" or "Desert Wind", and depollution devices –such as the "Ozone Eclipse" or the "Ultrasound Repellant Device" (Figure 12).

If in the previous case water served to develop a new energy infrastructure, in this project, it becomes the re-shaper agent of the public urban experience, able to configure climatic topographies and enable ecological and collective responses. Atmospheric flows, microclimates, and meteorological phenomena are conceived as integrated infrastructures shaped through technologies, governance, and narrative design.

The last case study presents a third, further, shift in relating to and managing water as a design element capable of reshaping the spatial and symbolic relationships between energy, architecture, and, in this specific case, the post-industrial city.

Located in the heart of Dora Park in Turin, *Environment Park* (1997-2000) represents a notable Italian case of urban regeneration, hydrotechnology, and environmental education (Figures 13-14). Since 1996, the park has hosted a technological campus that, as of July 2024, incorporates a micro-hydroelectric power plant exploiting a 5.5-meter head on the Meana Canal — a historical derivation of the Dora Riparia river. With an installed capacity of 434 kW, the plant produces approximately 3.8 million kWh annually, covering up to 80% of the park's energy demand and supplying electrolysis systems for hydrogen-powered urban vehicles.

Figure 13. *Satellite Photo of the Project Area Taken from Google Maps, 2025*

Figure 14. *Views of the Environmental Park, Inserted within the Park Dora, Turin, Italy*

The hydro plant's architectural envelope — featuring wooden louvers and a glazed technical room — allows visitors to observe the Kaplan turbine in operation, thereby merging architectural legibility with didactic function. Beyond electricity generation, the Meana Canal is also employed for passive cooling of office buildings in spring and autumn. The facility integrates within a broader eco-technological system that includes photovoltaic panels, biomass plants, green roofs, and closed-loop heat pumps.

This intervention on a former industrial brownfield — once occupied by the Fiat Ferriere steelworks — embodies an expanded notion of reclamation: not merely the recovery of a historical waterway, but its transformation into an energy and knowledge infrastructure for a future-oriented, carbon-neutral urban model. While H+N+S and Rahm operate at regional and climatic scales, Environment Park shows how similar strategies can be scaled down to the urban and metropolitan context. It exemplifies a hydro-social territory in the city: water becomes an active resource for energy production, climate mitigation, public awareness, and technological innovation, all housed within an architecture that is both functional and legible.

Completing this triptych of design approaches, Environment Park reveals how energy, landscape, and memory may be recombined through integrated reclamation strategies. It opens a fertile field for typological and systemic reflection on ecological transition landscapes.

The three case studies offer complementary yet differentiated approaches to the role of water in reshaping territorial infrastructures through landscape, technology, and architecture. Despite operating at distinct scales and within varied contexts, they

can be read together as a comparative matrix outlining a broader typology of hydro-social territories.

Across all three projects, water is conceptualized as an active agent—not merely something to be contained or managed, but to be valorized ecologically, socially, and symbolically. In each case, through a deep interweaving of engineering and landscape, it becomes simultaneously infrastructure, medium, and design material: offshore wind and marine production in *2050 - An Energetic Odyssey* by H+N+S Landscape Architects; evaporative cooling and climatic modulation in *Jade Eco Park* by Philippe Rahm and Catherine Mosbach; and hydroelectric production in the redevelopment of *Environment Park* in Turin. All three embody a renewed balance between the techno- and biospheres: the technical component is not concealed but rendered visible, accessible, and pedagogical.

Beyond these shared premises, however, significant differences emerge. First, the projects diverge in scale and territorial ambition. *2050 – An Energetic Odyssey* operates at a transnational marine scale, articulating a long-term strategic vision for decarbonization across the North Sea basin. *Jade Eco Park* addresses the urban scale, through a systemic approach to climatizing and reprogramming public space within a dense metropolitan environment. *Environment Park*, by contrast, intervenes in a compact post-industrial context, regenerating a brownfield site through high-efficiency energy systems embedded in the existing urban fabric. Second, they deploy distinct design languages. *Energetic Odyssey* adopts a speculative and projective masterplanning mode, constructing a narrative vision that is simultaneously infrastructural and political. *Jade Eco Park* foregrounds sensory and atmospheric experience, making climate perceptible through bodily immersion. *Environment Park*, finally, embraces a technical-functional aesthetic oriented toward replicability and performance.

The modes through which water is rendered visible—or legible—also differ. In *Energetic Odyssey*, water is engaged through distributed offshore infrastructures. In *Jade Eco Park*, it acts as a microclimatic agent shaping localized thermal gradients and ecological niches. In *Environment Park*, it becomes a tangible and readable hydraulic device, embedded within urban memory and materially accessible to citizens.

Functionally and symbolically, the projects further diverge. While *Energetic Odyssey* operates primarily as a governance and visioning tool, projecting a collective energy future, *Jade Eco Park* models a resilient tropical urbanity in which climate adaptation and public space coincide, and *Environment Park* translates sustainability into a form of urban technological literacy, demonstrating how energy production can structure processes of regeneration and education.

Taken together, these cases articulate a threefold paradigm for contemporary hydro-social design: strategic systemic planning (H+N+S), climatic-sensorial architecture (Rahm and Mosbach), and urban technical regeneration (Environment Park). Their comparison reframes reclamation not as mere remediation, but as an integrated design praxis in which water becomes at once infrastructure, landscape, and cultural narrative. In doing so, they offer a methodological and operational framework for exploring the hydro-social territory as a space where landscape architecture mediates between natural resources, climate-responsive technologies, and collective subjectivities—shaping resilient, infrastructural, and experiential landscapes. In particular, these

projects reveal certain strategies which, varying in scale and approach with regard to the use and interpretation of water in architectural and landscape design, can prove useful tools in the construction and enhancement of hydro-social territories, respectively: 1. water as environmental-energetic-social infrastructure; 2. climatic and sensorial dimension; 3. micro and diffused systems of amphibious artifacts.

Exploring the Transformative Potentials of Designing from the Lens of the Hydro-Social Territories: The Application to the Specific Case Study of the Lower Fiulian Plain

This analytical journey across, firstly, the theoretical frame and roots of hydro-social landscapes, and then, through the analysis of heterogeneous cases studies highlights the relevance of reconsidering reclamation landscapes through an alternative interpretative perspective. These territories still embody latent multi-scalar networks in which humans, water flows, ecological relations, hydraulic infrastructure, financial means, legal-administrative arrangements, and cultural institutions and practices are interactively intertwined.

In the current epoch, marked by climate change and its increasing tangible manifestations, it becomes necessary to delineate updated strategies and tools, to re-set, on the one hand, the nowadays-unbalanced equilibrium between resources and their exploitation –identifying new sustainable forms of living– and, on the other, of reframing a new vision of these territories capable of expanding the disciplinary operative ground, overpassing the technosphere, and retracing new sets of action. Reclamation landscapes, given both their anthropic origins and their strict and vital relationship with water bodies, represent a relevant field for testing new tactics and paradigms for post-neotechnic ecologies.

Engaging with water in territories where it is structurally pervasive has historically generated a stratified taxonomy of machines, technologies, and spatial practices, ranging from punctual architectural devices to territorial and transnational infrastructures. A contemporary evolution of this complex taxonomy, mirroring the urgent need to interpret the amphibious grounds, can be identified through the examined case studies, that allowed for the identification of three possible categories of intervention –defined according to scale (spatial and temporal) and field of action–: water as environmental-energetic-social infrastructure; the definition of new climatic and sensorial "clusters", and, finally, the micro and diffused systems of amphibious artifacts that permit the functioning of the whole system.

These categories may operate independently at a one-scalar intervention, yet they can also be interpreted as components of an integrated and processual framework unfolding across space and time.

Analytical Findings: Geo-Hydrological Characterization of the Lower Fiulian Plain

Building upon this analytical structure, this section tests the applicability of these strategies within a specific territorial context: the Lower Fiulian Plain (Figure 15), an agricultural reclamation landscape situated in the Friuli Venezia Giulia region of Italy. This area is bordered on three sides by bodies of water –the Tagliamento (west) and the Isonzo (east) rivers, and the Marano and Grado lagoons (south)– and its surface is crossed by five additional rivers and a vast and capillary hierarchical system of canals, embodying the anthropogenic shaping of water-bound origins.

Figure 15. *Satellite Photo of the Lower Fiulian Plain taken from Google Maps, 2025*

The proposed scenario reinterprets this landscape not merely as a productive agricultural machine, but as a strategic socio-ecological infrastructure –functioning simultaneously as a catalyst for biodiversity, a renewable energy field, and an alternative to urban life.

Water as Environmental-Energetic-Social Infrastructure

As previously observed, reclamation landscapes exhibit particular characteristics that differ from all other rural landscapes: they have been materially produced and shaped by anthropogenic hydraulic manipulation. Land emerged through processes of extraction, drainage, and regulation through various techniques and operations. In this sense, water here does not represent only a vital resource, but the very condition of existence of these landscapes.

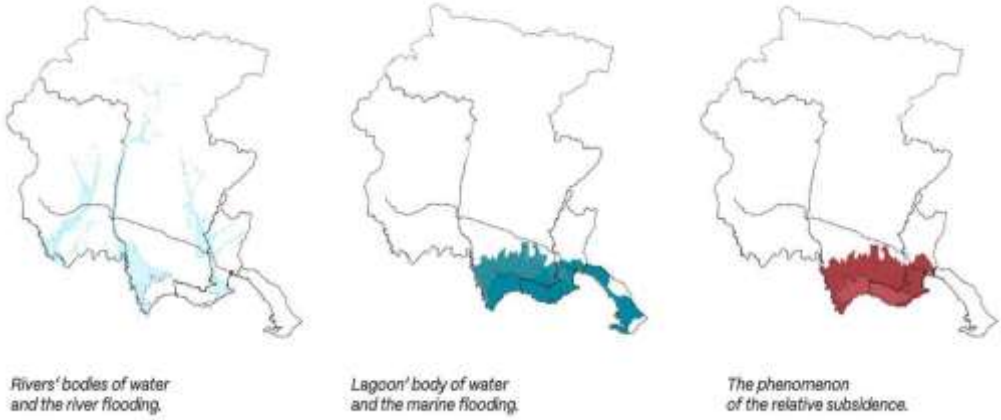
If we recall the first image introduced at the beginning of this contribution –the anatomy of the human body and its constitutive relation to water– reclamation territories may be understood analogously: water acts simultaneously as natural regulating infrastructure and as the generative and repairing matrix from which

recovering operations can begin; constituting both the element historically controlled and the medium through which new ecological equilibria may be reached.

In the contemporary context, where hydric protection, water preservation, and ecological reinforcement demand urgent disciplinary responses, such landscapes provide a relevant ground for experimentation and testing.

The Lower Fiulian Plain, whose water-anatomic-shape dates back to Roman times, provides a concrete context for examining the environmental, energetic, and social dimensions of water management. This framework enables the definition of a scenario to address major threats, including river flooding, marine flooding, and the phenomenon of relative subsidence (Figure 16).

Figure 16. *M. D'Oria, Diagrams of the Main Phenomena Currently Threatening the Lower Fiulian Plain Area, 2025*



At the environmental level, existing water bodies can be interpreted both as precious natural reserves, able to proliferate and nurture biodiversity reservoirs, and as dynamic bodies, whose limits –embankments, riverbanks, dams, banks– can be expanded through the introduction of buffering zones capable of accommodating periodic hydraulic fluctuations while simultaneously supporting processes of ecological re-colonization by new wildlife forms. Seven principal rivers originate from the *linea delle Risorgive* and traverse the plain north-south toward the Grado and Marano lagoons, giving rise to as many linear ecological systems along their course. In addition, the extensive drainage network (Figure 17), spread throughout the plain, constitutes a latent reserve of biodiversity, a potential subsystem that could be strengthened and interconnected through hedges, rows of trees, wooded islands and clearings. Through systematic interventions on both natural and artificial hydraulic margins, the resulting scenario configures a territorial system of buffers and expanded areas able to host water –also by taking advantage of the peculiarly similar altitudes of the Plain and the waters (Figure 18)–, for different time durations, simultaneously mitigating the hydraulic risk and reinforcing the ecosystemic ecological continuity.

Figure 17. *M. D'Oria, Map of Natural Water Systems and the Anthropogenic Hydraulic System, with its Division into Mechanical Basins Served by Water Pumps, 2025*

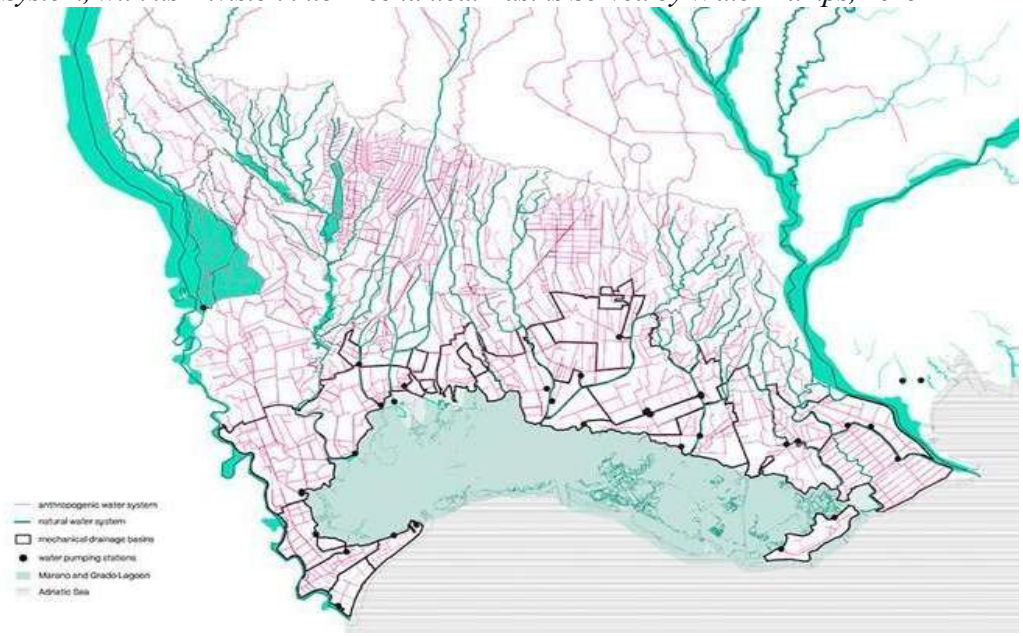
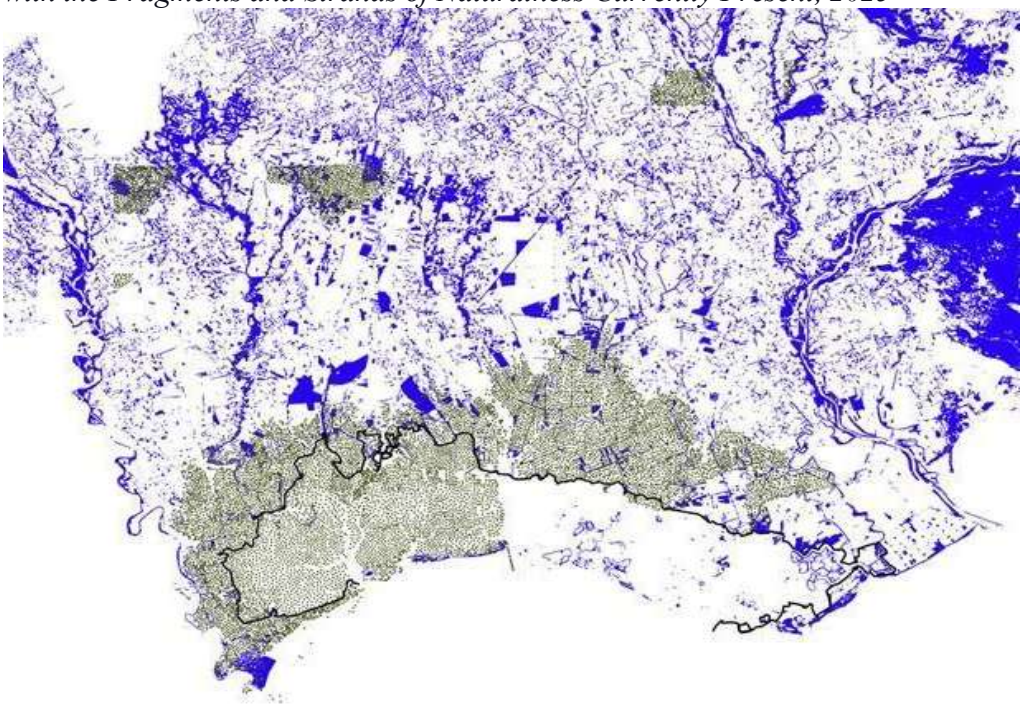


Figure 18. *M. D'Oria, Map of the Altitudes of the Lower Fiulian Plain Intertwined with the Fragments and Strands of Naturalness Currently Present, 2025*



At the energetic level, water is reinterpreted as a proper energetic infrastructure. Its flows, channeled, regulated and accelerated, can once again generate energy, reverberating one of its ancient functions. At a more capillary scale, a vast range of technologically advanced devices could be integrated within the territory to produce

new forms of sustainable energy. Also, for the Lower Fiulian Plain the energetic issue is particularly pressing, especially in the contemporary condition, when climate change is highly alterating these territories, determining a series of shifts in both their production logics and crop typologies, demanding new adaptive strategies. Interpreting this landscape as a whole continuous productive fabric may support the redefinition of its energetic asset. Former drainage and irrigation infrastructures become integrated components of a post-fossil territorial machine – converting the inherited productive infrastructures into new energetic engines (Figures 19-20).

Figure 19. *M. D'Oria, Diagrams on the Interventions on the River Banks, 2025*

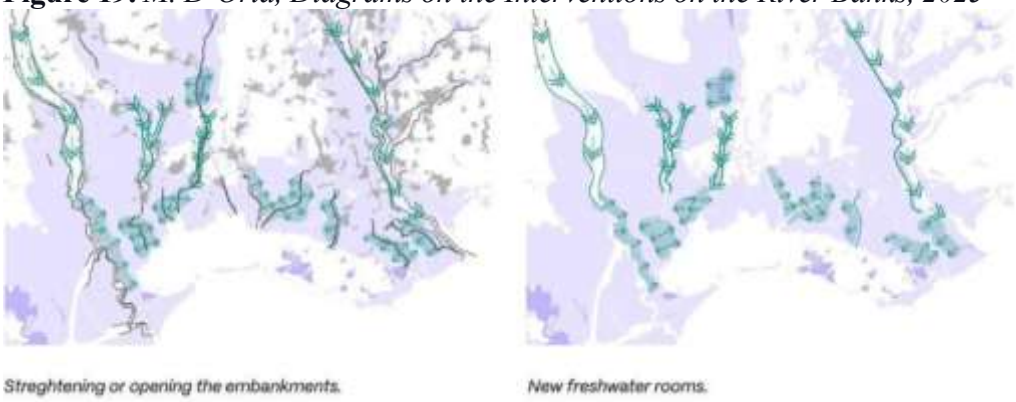
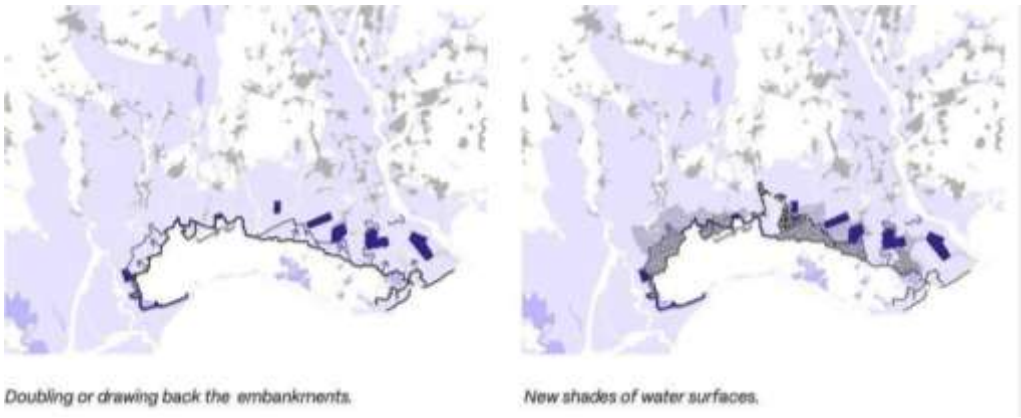


Figure 20. *M. D'Oria, Diagrams of the Interventions on the Lagoon Embankments, 2025*

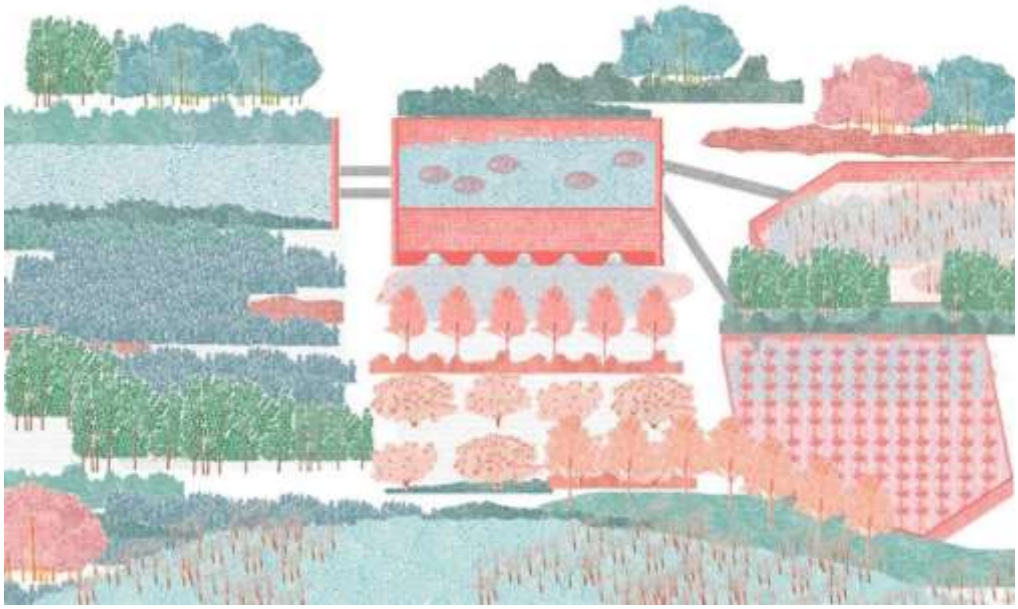


Lastly, recalling and resonating with the concept of the hydro-social territory, water operates also as a social infrastructure, for which the Low Fiulan Plain presents two important elements. Firstly, its very formation is inseparable from centuries of human labor: its ground constitutes a sedimented and stratified archive of social and human practices that have been superimposed upon each other progressively, according to the advancement of reclamation technologies. This grounded social memory recalls not only archetypal water machines, water-connected professions, as well as legends and popular narratives, but constitutes a fundamental vital component that can support renewed forms of crossing, experiencing, and inhabiting the territory.

Moreover, any further phase of hydraulic reorganization would not represent a rupture, but an additional phase in a long-standing process of anthropogenic metamorphosis. Furthermore, a further re-organization of the Plain would not have a huge impact on the existing settlements, due to the very nature of its consistency. The typical settlements and, thus, inhabiting forms rooted within this context, differ radically from the urban ones and also from those of small villages, and are based on the farmhouse. This particular settlement embodies a distinct concept of community, centered around small and isolated centers, and is deeply intertwined with the agricultural fields and their labor. Consequently, architectural interventions remain punctual and localized.

Within this category of intervention, the project identifies approaches operating on vast bodies of water –lagoons, rivers, dikes, deltas–, activating transversal and transcalar tactics aiming at strengthening hydraulic risk prevention while preparing the ground for new integrated ecologies between humans, non-humans, "nature", energy, and settlements. By interpreting water as a strategic environmental, energetic, and social infrastructure, they endure gradual processes of territorial restructuring, rebalancing threatened equilibria, and supporting new models of coexistence (Figure 21).

Figure 21. *M. D'Oria, Going with the Flow: Dealing with Different Water Flows, 2025*



Climatic and Sensorial

The second category concerns the design of micro-climatic and micro-sensorial ambients within this specific context. This approach engages a more invisible and less tangible dimension of water: not only its capacity to regulate climatic comfort, but also its ability to generate experiential and sensorial conditions when carefully orchestrated through design. On the one hand, this category addresses how water's properties –humidity, evaporation, thermal inertia– can be channeled and converted into operative design(ed) elements. On the other, it focuses on the experiential and sensorial dimension this resource can materialize when treated with the proper care

and organized according to the beneficial effects it triggers under certain conditions. In this sense, hydro-social territories concern not only energetic and ecological issues, but also, foremost, much more intangible social practices that can be supported and reinforced thanks to the visible and invisible presence of water. By extending the operative field of design into the atmospheric dimension, differentiated climatic micro-regions are modulated, enhancing the climatic and environmental comfort of humans and non-humans (Figure 22).

Figure 22. *M. D'Oria, Imagining New Possible Sections for the Lower Fiulian Plain, 2025*

This second category operates at an intermediate scale between territorial infrastructure and punctual architectural devices. Strictly connected to the definition of wider macro-territorial systems, constituting its very framework and condition of existence and "specialization" –salty or freshwater, marshland wetlands or permanent grassland, humid or dry climates–, it triggers intermediate-scalar transformations, operating on specific areas and managing water resources to configure heterogeneous ecological corridors and biodiversity-friendly micro-areas.

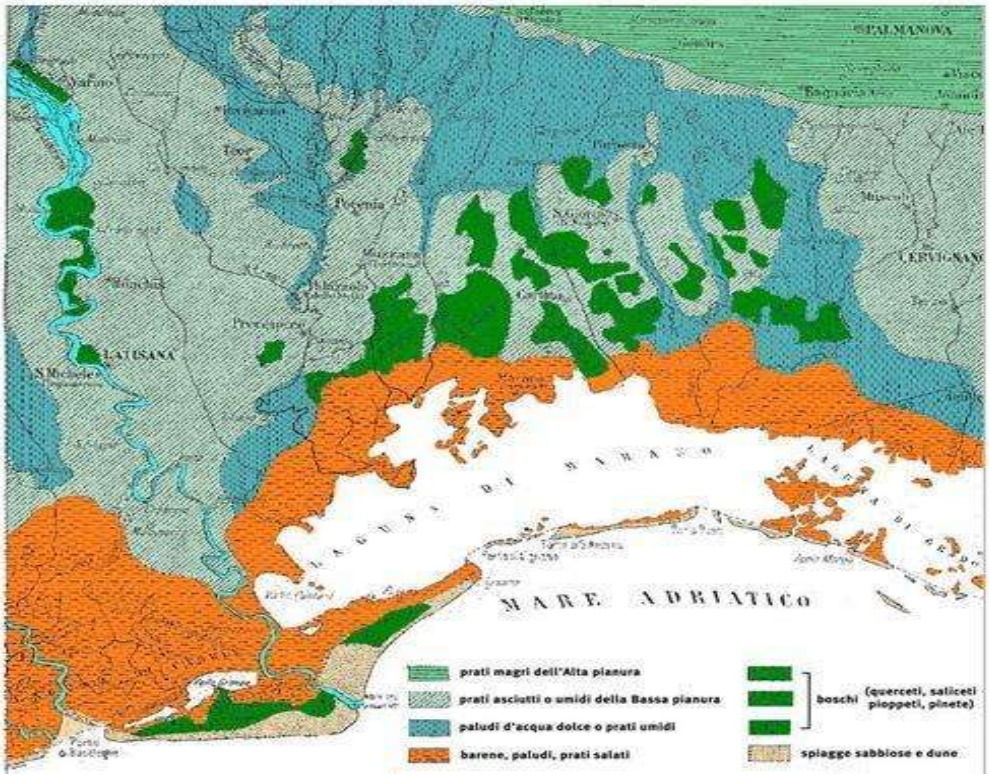
To explore this design approach and test it within the Lower Fiulian Plain, it is necessary to briefly observe the specific interactions between water, vegetation, and anthropogenic pressures that characterize this landscape. The territory consists of a complex heterogeneous mosaic of micro-landscapes, structured around two defining aspects. The first is the close strong dependence on the water presence, both in quantitative terms –soil saturation, groundwater depth, atmospheric humidity– and qualitative terms –particularly the distinction between freshwater and saline systems. The second is the often conflicting tension between "natural" processes, which persists in the form of long strands or residual "wilderness" areas, and the anthropogenic logics of control and exploitation, that have progressively stratified across the landscape. The distribution and variety of vegetation patterns reflect this relationship. In areas where water bodies are present, dense and diffuse vegetation systems emerge, composed of trees, undergrowth, and humid areas. The vegetation modulates itself, harmonizing with the gradation and variation of water's presence, in all its states: liquid, solid, and gaseous, introducing patterns adapted to the different microclimatic conditions. This results in

a layered and articulated landscape composed of lagoons, riparian areas, marshes, forests, and agricultural areas, all of which are now threatened by climate change and require urgent protection and reinforcement strategies.

In this sense, the design of climatic and sensorial clusters is a strategy already embedded in the DNA of the Lower Fiulian Plain. The scenario reinforces the landscape connotations already latent in the area through processes of modulation and gradation. By working through modulation and gradation, the analytical framework demonstrates that this approach introduces within this territory processes of "natural" re-colonization, while simultaneously configuring new spaces for its dispersed community to engage in social practices. By intervening in small-scale areas, the project embodies the very tool through which these microclimatic distributions can be remodeled and re-shaped, generating more hospitable conditions for the inhabitation and coexistence of new forms of living, both for humans and non-humans.

Figure 23. *Silva Lupanica of the Lower Fiulian Plain, 1865*

Figure 24. *D. Feruglio, Territorial Planning Scheme of the Lower Fiulian Plain, 1926*



A crucial element in structuring such a system of gradual climatic zones is the presence of an essential ecological element characterizing this context: the lowland forest known as *silva lupanica*. Historical mappings of this lowland forest, as depicted by the Paiero map (1965), show its once-extensive-configuration (Figure 23). Successive phases of exploitation –firstly under the Republic of Venice to supply the timber for expanding cities and for its Arsenale, and then by the 20th-century land reclamation campaign – gradually replaced the *silva* with crops (Figure 24). Today, this amphibious and archaic forest has been reduced to a scattered archipelago of few isolated strands and fragments, covering approximately 700 hectares. The establishment of differentiated climatic zones supports the reconnection of these fragments, reinforcing ecological continuity and resilience (Figures 25-26).

Figure 25. *M. D'Oria, Diagram of the Progressive Colonization of the Weakened River Banks by the Post-Silva Lupanica, 2025*

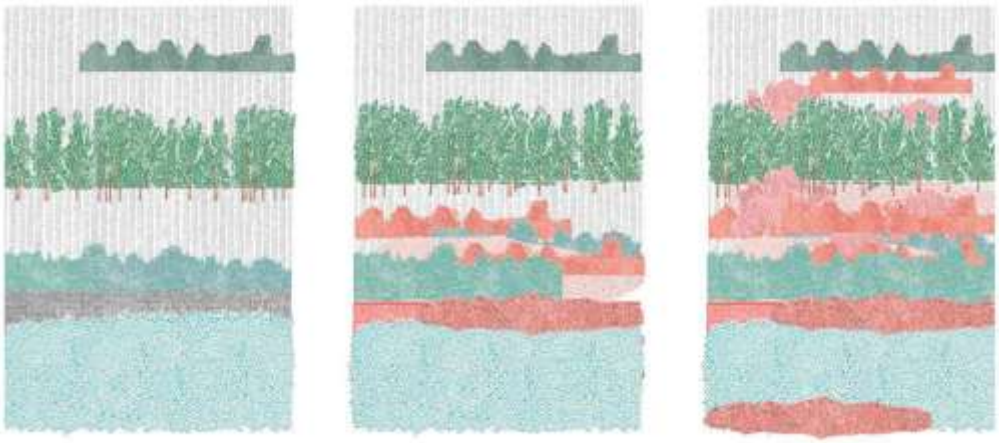


Figure 26. *M. D'Oria, Diagram of the Progressive Recovery of the Agricultural Soil through Specific Arboriculture, 2025*

Micro and Diffused Systems of Amphibious Artefacts

The third category identified through the case studies marks a further scalar shift. It consists of an archipelago of smaller and architectural-scale dispositifs and interventions that endure punctual, yet tactical and crucial, operations at the local scale. Although initially derived from the contextualized urban case of Dora Park, these tools reveal relevant potentials when transposed to rural and environmental contexts. Their main sphere of action involves the issue of regeneration and revaluation of existing heritage, whether natural or anthropogenic. Operating at a reduced scale, these design interventions activate processes of reuse and recovery of existing architectural structures and public spaces, enduring an operation whose results can be understood in two complementary ways. First, they function as minimum intervention units: small and adaptable elements that can be reiterated and declined within much more vast areas, acting as localized activators of regenerative and reparative processes. Second, when deployed as a system, they can construct a diffuse and spread network of socially infrastructure spaces, capable of supporting

pedagogical and educational activities while preserving and reactivating the social memory embedded in historic hydraulic and architectural heritage artifacts.

Within the Lower Fiulian Plain, the introduction of these minimum intervention units, together with the recovery of existing structures, reinforces the visibility and tangibility of water, underlying its vital function for environmental balance, renewable energy production, and social practices and identity.

On the first, environmental, level these objects embody ecological connectors and wildlife strategic passages that permits the functioning of the whole system, as in the case of the accurate maintenance of the riverbanks and the banks of the canals, of the realization of water collection tanks and purification systems or, moreover, of tiny structures built to allow wildlife to cross or to create micro-habitats that encourage them to stop and reproduce. In this sense, the realization of these particular interventions, would guarantee the correct functioning of this hydro-social landscape macro-system, interpreted as a whole, supporting it through a micro and diffused infrastructure of water, energy machines, and multi-species mobility (such as bridges, paths, wildlife confined areas, renewed structures for living). On an energetic level, these objects convert into small and diffuse engines that, exploiting the movements of water and its variations, produce new forms of sustainable energy nurturing locally the settlement as well as the productive system: small machines located into the calm basins or in the same channels, sustainable hydroelectric power plants, water pumping systems, to name a few. Moreover, this diffuse operation would reinforce the specific elements and identitarian structures hosted by this territory, recovering its stratified memory through the restoration of its amphibious archaeology, thus reinforcing its identity. Finally, the realization of a hybrid filigree of minute ancient and new artifacts, by revealing and underscoring the tangible and vital presence of water, would empower social practices of care and re-educative processes that would further solidify the already existing bond between humans and this territory.

Toward an *Ecotechnic* Era

Water has established an enduring relationship between humans, energy, and landscape, a relationship that has formed a heterogeneous system of landscapes in which it has originated different shapes of mutual connections, interdependencies, and interferences. Observed within the contextualized territory of the reclamation landscapes, this relation assumes even broader and more complex shades, due simultaneously to the very *terraqueous* consistency of these territories and their anthropogenic origins –derived from constant processes of modeling to conquer land from water to install settlements and productive fields.

This work positions outside the current mainstream interpretation of these territories as "landscape machines", as an interpretation that separates strictly the technological, cultural, ecological, and social spheres they involve. Employing the concept "hydro-social territory", the research draws a critical reasoning on the complexity of intervening in and interacting with the amphibious territories, which are bound by a "multi-scalar network in which humans, water flows, ecological relations, hydraulic infrastructure, financial means, legal-administrative arrangements, and

cultural institutions and practices are interactively defined, aligned, and mobilized through epistemological belief systems, political hierarchies, and naturalizing discourses" (Boelens et al. 2016, p. 2).

This reinterpretation aims to establish a new territorial and cultural framework in which all the processes at the core of territorial functioning must be integrated as part of a comprehensive system. In this sense, energy production, ecological coexistence, and inhabitation practices are not thematic issues to be solved individually, but interconnected spheres of a unique territory, whose design, also through the adoption of trans-disciplinary assets, has to be ambitiously confronted simultaneously. Therefore, the oddly named "landscape machines" become metabolic systems whose functioning permits the integration of multiple processes: from food production to the accumulation of energy, from the repairing of ecological infrastructures to the favoring of new colonization by forms of wildlife, and finally, from the strengthening of the cultural identity to the formulation of new forms of settlement and coexistence.

These observations require a first significant shift, which can be further developed and explored in the future: the passage from the landscape machine to the environmental machine. Building on this general framework, a deepened focus on the peculiar territories of agricultural reclamation has been developed, firstly investigating three significant case studies and then projecting their deployed strategies within the specific contextualized scenario of the Lower Fiulian Plain, in Italy.

It has been noticed that the reclamation landscapes appear to simultaneously meet the meaning and values of hydro-social territories –interfaces among society, technology, and nature – and the potentialities of being used as experimental grounds to rebalance the threatened relationship between nature, humans, production, and sustainable energies. Therefore, applying, even through a speculative approach, a complex system of multi-scalar strategies, it has been drawn an example of how the reclamation landscapes could be reinterpreted in ecological terms, configuring sustainable and resilient territorial structures, reinterpreting reclamation today as a complex system of practices capable of relaunching climatic, ecological and social interaction emergency cycles.

In this sense, the reclamation landscape constitutes today, in the epoch marked by mainstream debates on urban reforestation, a concrete and still latent potential for defining a new post-fossil environmental machine that converts its old productive infrastructures into new sustainable energy engines and ecological catalysts.

Therefore, if the core research question focused on the possible formulation of a fourth, contemporary phase of technological development –following the eotechnic, paleotechnic, and neotechnic phases delineated by Lewis Mumford– a possible formulation could be the *ecotechnic era*. The formulation of this concept, still scarcely adopted within the disciplinary debate, comes from John Michael Greer who describes this era as the alignment of technological development with ecological limits. A close reading of Greer's argument reveals a significant shift in the epistemological stance from which the relationship between humans and technology is interpreted. Whereas Lewis Mumford elaborates a genealogy of technological eras from an explicitly anthropogenic viewpoint—focusing on how technological systems shape, and are shaped by, social organization, productive practices, and cultural imaginaries—Greer examines technology from a broader

ecological perspective in which humanity is repositioned as one species among others, embedded within natural systems, projecting forward toward a future epistemology in which technological practice is re-situated within planetary processes.

The *ecotechnic era*, where all the main humans and non-humans existential issues would be integrated –food, home, work, energy, community, culture, and science– by operating an exit from a much more human-influenced perspective, stresses the search for a rebalanced combination between the technosphere and the biosphere, between the technological elements of the machines and that, natural, of the ecosystems, inviting to experiment with systems capable of providing self-sustaining cycles for preparing the ground for new multi-species coexistence.

These observations, combining the reinterpretation of the reclamation landscape as a post-fossil environmental machine and the intention of adhering to the incoming new ecotechnic era, need to be posed at the basis for drawing a renewed and updated, constantly mutating, "ritratto" (portrait) of these hydro-social territories.

If the "portrait" found on the maps of the past is an image of the table itself, of the flat, continuous, homogeneous, and isotropic extension that serves as the archetype of the modern state" (Farinelli 2009, p. 87), a flat representation that has been exploited to represent, through an anthropogenic posture, the conquered lands from water, its representation and its very meaning have to be subject to a profound shift too, within the very aim of this representational process. The hydro-social territories refuse any representation as human-controlled and confined surfaces, instead needing to be drawn and interpreted as open and mutable systems that constantly rebalance the weights within the relations between humans, the environment, and energy, seeking the formulation of new ways of living and co-living together.

Impacts and Research Results

The work presented here is part of a research project developed between July 2024 and June 2025 within the Department of Civil-Environmental Engineering and Architecture at the University of Trieste (Italy), entitled *Re-inhabiting the Friulian Deserts*. The work has been presented at numerous national and international conferences. In particular, some important results achieved are highlighted:

- Establishment of a collaborative relationship and dialogue with the Consorzio di Bonifica della Venezia Giulia (Land Reclamation Consortium of Venezia Giulia), within which the research grant has led to an agreement for the creation of an internship programme. This structure is a point of reference for the area under study, both in terms of its administrative and maintenance functions for part of this territory and as an important archive and custodian of its historical memory.
- The survey developed alongside the research also gave rise to critical reflection on the technological device of "filare", understood as an element capable of weaving new ecologies in urban and rural areas. This contribution was presented at the conference 'Arbosfera. Rethinking urban space through the forest' (University of Naples Federico II, January 2025) and later became a

disciplinary contribution to the PRIN (Project of National Interest, PNRR 2022) project "RighTT, The Right Tree in the Right Town. Urban Forestry for People".
- Definition of a further research project "Microstorie del paesaggio della bonifica" ("Microstories of the reclaimed landscape") selected from the University of Trieste (November 2025) to be presented for future fundings by the Regione Autonoma Friuli Venezia Giulia, in particular for the call CAR2go! "proposals to support cultural projects aimed at promoting the intangible cultural heritage of the Friuli Venezia Giulia Region".

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Authorship Attributions

The authors fully agree on the content, but it should be noted that the paper was structured as follows: Conceptualisation - Mariacristina D'Oria, Thomas Bisiani; Investigation - Mariacristina D'Oria; Methodology - Thomas Bisiani; Mariacristina D'Oria; Writing – original draft - Mariacristina D'Oria: Intertwined Bodies: Humans, Water, Ground, and Energy; Amphibious Geographies: Hydro-Social Territories Seeking Reinterpretation; Retracing a Taxonomy of Strategies to Configure Renewed Hydro-Social Territories; Exploring the Transformative Potentials of Designing from the Lens of the Hydro-Social Territories: The Application to the Specific Case Study of the Lower Fiulian Plain; Toward an Ecotechnic Era; Writing – review - Thomas Bisiani; Supervision and validation - Thomas Bisiani.

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