Cascades of Catastrophe

Caring Pathways to Transformability

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Transitional Territories

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Transitional Territories
Altered Nature | Poetics of Change

Master Thesis - P5 Report
June, 2025

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Abstract

Keywords:
Interconnected climate risk; Disaster-resilient futures; Process-based risk; Systems of Care; Convergence; Transformative capacity building; Mediterranean peri-urban zones

In the face of increasing uncertainties and heightened frequency and intensity of natural disasters, questions arise on how societies can enhance their ability to adapt and transform both behaviourally and structurally to increase disaster resilience. Current risk management approaches fail to address the evolving nature of risk and tend to overlook how processes of urbanisation and landscape transformation actively contribute to its accumulation.

The rapid urbanisation patterns in the Mediterranean coastal zones and the dispersed territories with conflicting land-uses that they formed are examples of how mismanagement of land alter environmental conditions and structure peri-urban systems that contribute to the evolution of risk. Their organisation predominantly through conflicting land-uses poses a challenge on convergence of actors and taking transformative actions that could reorganise territories to align better with natural processes and mitigate disaster risk.

This research aims to introduce process-based risk in spatial planning and design and to investigate how they can influence local practices and acts of care in peri-urban coastal Mediterranean zones to build transformative capacity, promote convergence and reorganise territories for disaster-resilient futures. It proposes a framework to develop new values in local decision-making and governance recommendations to enable local communities to become the agents of change by fostering attentive land management and coordinating across catchments.

The thesis conducts a literature review, defining the role of evolutionary resilience in the process of risk mitigation, and a history informed analysis in the case study of Marathon to identify how risk evolves in the territory. A reinterpretation of the territory through risk-based values is suggested and provides strategic directions for employing attentive land management and design principles. Through projective design explorations the thesis reimagines actor interrelations in peri-urban territories to establish alignment between natural and societal systems and sets conditions for the region to address in its development strategies in order to build transformative capacity and mitigate risk.

The thesis provides an alternative narrative in the role of local communities and the support provided by the region in risk mitigation strategies. Focusing on land management and actor interrelations, while adopting a long-term perspective, it raises questions on how multi-level governance and interdisciplinary planning, research and design can contribute to shaping disaster-resilience.

fig.1: Visiting the Olympic rowing centre, Marathon, Greece, 2004
(Captured by Gordon Sutherland)

Motivation

I still remember how the sun set over the Aegean, in July 2018

A burnt orange sea

A group of sun burnt girls

We were away but we listened closely

I revisit every year

And how can I not?

I hear the irony in the rotor noise

I sweep away the ashes from my doorstep

or I smell them every other night

No one expects it, then everyone does

And when it carries through it revisits somehow soon

And if it carries through, you carry it with you

This is a story for those caught by surprise

It was written long ago

It is rewritten every day

Acknowledgements

No research is the product of a single researcher, student, person, or perspective. Especially when it takes a place-based approach. This thesis was shaped by many conversations, lectures, activities, and site visits throughout the two years of the master's programme, and I would like to thank all those who contributed to this work.

First and foremost, I want to express my gratitude to my two mentors, Diego Sepulveda-Carmona and Alex Wandl, who not only pushed me to explore throughout this process but truly joined me on the journey, engaged and intrigued by its complexity. This thesis would not have been the same without their guidance, critique, and support .
Thank you for listening and putting trust in my findings, even when they were still developing.

I am most thankful to my friends and family, who somehow always find ways to support me in all my ideas and pursuits, no matter how ambitious. I appreciate every small act of help, even when I do not ask for it, as well as the curiosity and respect you continue to show in what I do .
Thank you for being there every step of the way.

I would particularly like to thank Gina Barkoura for sharing her insights, knowledge, and experiences of Marathon and the underlying processes that continuously shape Greek peri-urban environments. My appreciation also goes to Thomas and Athina Kafaraki, who welcomed me into their home and helped me see Marathon and its life through a local lens.

Without all your contributions, my understanding of the territory and its complexities would not have reached the depth and context it did.

To all who gave me time, encouragement, and trust when I needed it most:
this thesis is as much yours as it is mine.

Contents

Climate, Risk and Topos

1.1 Problem Field

Weather extremes and natural hazards are posing threats to ecosystems and humankind as their intensity and frequency increase worldwide. Aside from natural causes, these phenomena are induced by human activities that have gradually altered the environment in a manner that interferes with natural processes and sets the ideal conditions for disastrous events to occur. Taking this into consideration, the key challenge posed by climate change lies in our hindered ability to adapt and transform as a society, both structurally and behaviourally. While resources are strained and assets like human health, cultural heritage and biodiversity are threatened, the interdependencies among all living beings and their habitats are becoming more prominent. Yet, the lack of convergence towards balanced natural and societal processes prevents risk-based planning and equivalent transformative actions from taking place on local scales, growing our distance from safer and more just futures.

1.2 Problematisation

According to the United Nations Office for Disaster Risk Reduction, disaster risk is determined by the interplay of hazard, exposure, vulnerability and capacity that form probabilities in loss or damage of life and other assets, associated with a place in a specific period of time. (UNDRR, 2009) From a risk management perspective the components of risk can have a tangible or intangible form that occurs naturally or is human made. (Serra-Llobet et al., 2023) In most cases, hazard describes the natural and physical processes or phenomena that threaten life, health, quality and stability of social and natural structures. Exposure is considered the sum of all tangible assets that are in locations relative to hazards, while vulnerability describes the characteristics and processes that influence susceptibility to them. Additionally, capacity refers to strength and ability to withstand or counteract hazards and their causes. (Serra-Llobet et al., 2023; UNDRR, 2023) All these components relate closely to one another across time and space, making disaster risk an understandably complex notion to measure and manage.

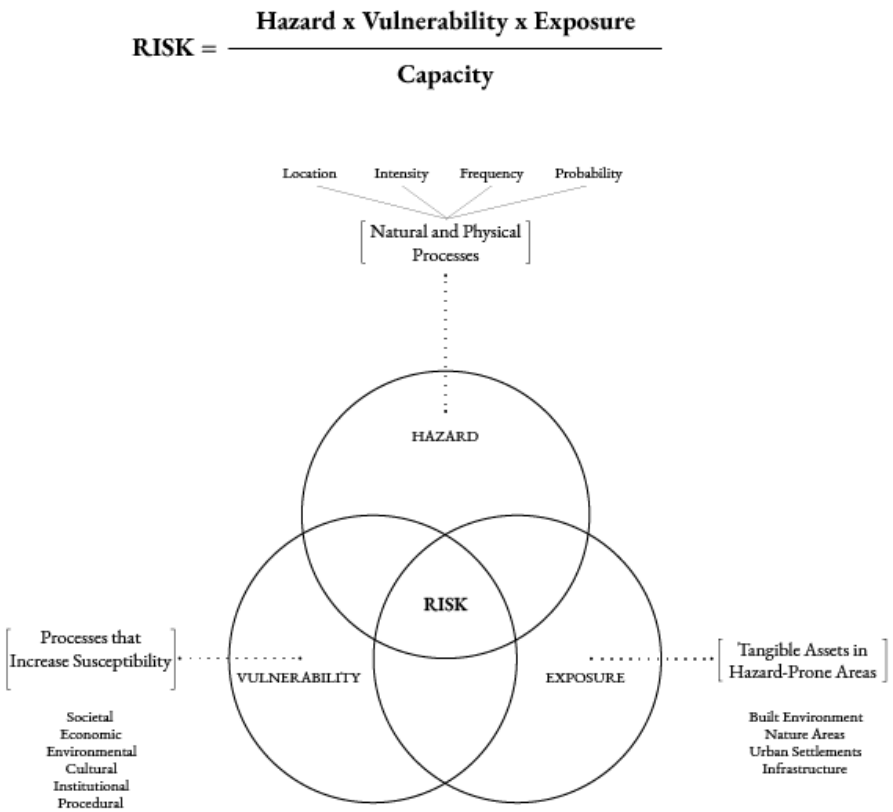


fig.2: Diagrammatic representation of risk composition

Traditional risk management approaches fail to capture the dynamic character of hazard, diverting the focus of risk reduction plans to preparatory and responsive tactics that neglect triggering factors of these natural processes. (Mimikou et al., 2013; Serra-Llobet et al., 2023) As regions experience an increase in frequency of uncommon to the area natural hazards, regardless of management efforts, the interrelated character of natural hazards is gaining importance in risk management. (Tsoutsos, 2023; UNDRR, 2020) Natural hazards are processes within socioecological systems that alter environmental conditions, interfering with triggering factors of other types of hazards. Therefore, a cycle of disastrous events that interact with assets of urbanised environments and human activities is created, causing a series of cascading effects that compound damage, intensify vulnerability and increase disaster risk. (Gill & Malamud, 2016; Tsoutsos, 2023) Taking this into consideration, risk is determined by multi-hazard interactions and demands an integrated management that incorporates diverse practices and actions from multiple sectors and knowledge backgrounds.

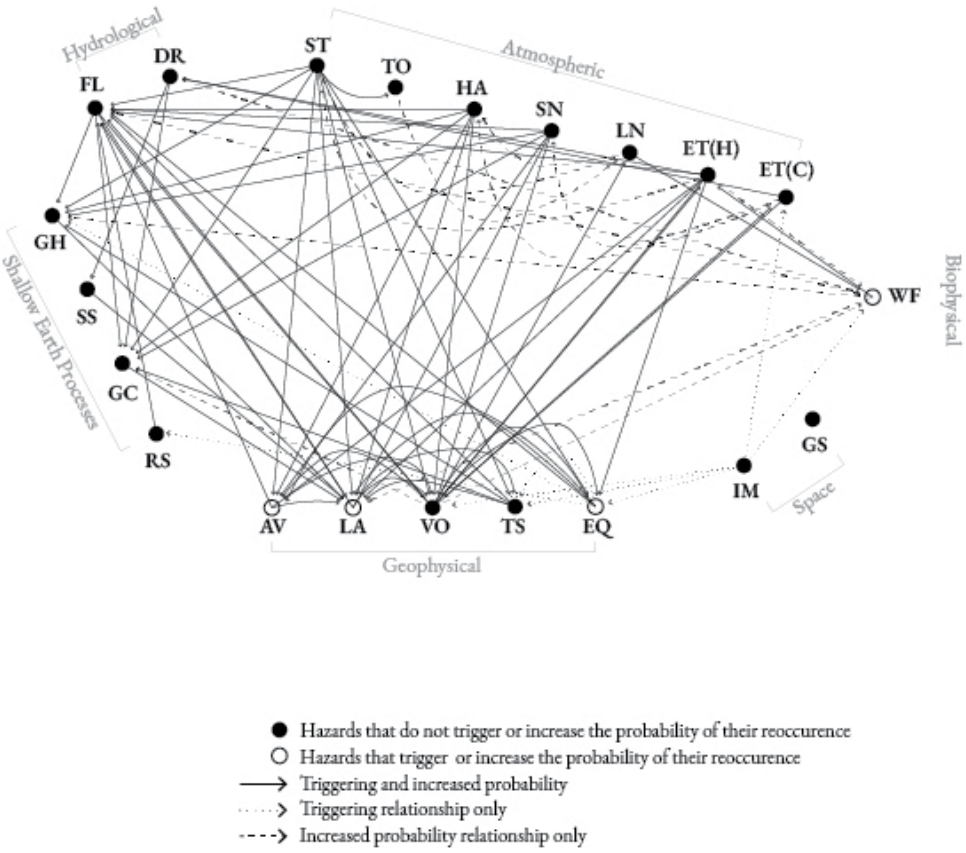


fig.3: Visualisation of hazard interrelations (Adapted from Gill & Malamud, 2016)

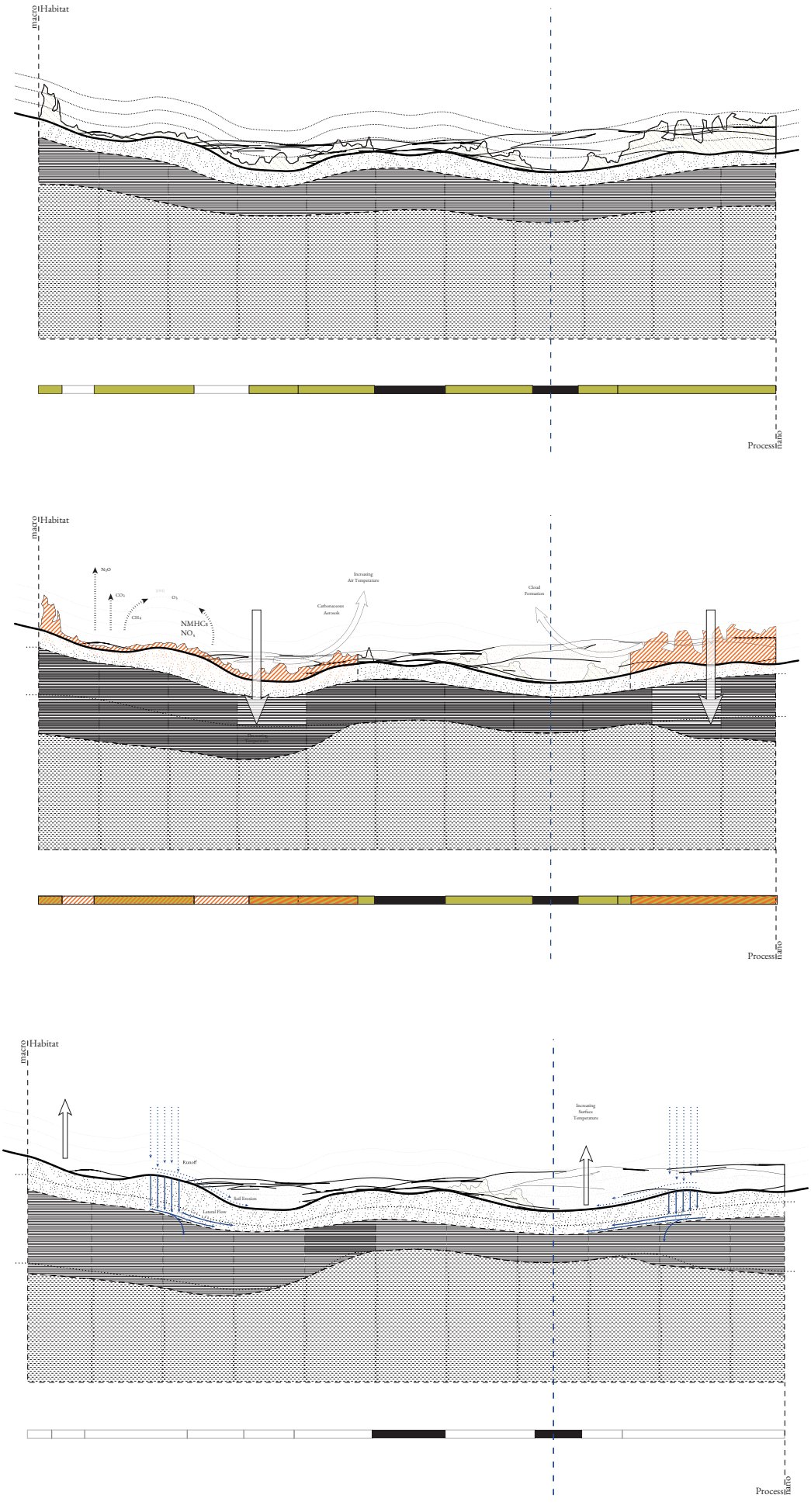


fig.4: Alterations: From fires to floods

The additional parameters of disaster risk, vulnerability, exposure and capacities, also contribute to its dynamic character. All of them derive from societal, economic, and cultural processes that gradually build-up depending on values, priorities, goals and structure of an equivalent region. (Serra-Llobet et al., 2023; UNDRR, 2023) The interplay between these parameters is much harder to distinguish as they create their own cycle of exchanges through the course of time. Additionally, these fluctuating measures of risk are in constant interaction with landscapes and natural processes that can possibly lead to hazards. While it is evident that all risk components are dynamic and result from socioenvironmental processes, risk is still managed with a static approach that refers to a short timespan compared to the one in which it accumulates.

The existing climate of uncertainty and instability is raising calls for immediate action. Additionally, disaster risk management is mainly focusing on the ability of systems to bounce-back to a stable state after exposure to natural hazards. Therefore preparatory and responsive actions often become the primary focus of disaster risk reduction strategies.(Davoudi et al., 2013; UNDRR, 2020) However, this static approach that views capacity in disaster risk as a stagnant ability to maintain existence and regain function without significant changes hinders capacity building.(Manyena et al., 2019) On the contrary, human practices and activities constantly alter socioenvironmental conditions with a future oriented perspective that often overlooks disaster risk, leading to capacity reduction and risk enhancement. Gaining a long-term perspective in risk management and introducing a systemic approach with small and gradual interventions appears crucial for enhancing capacities in living with uncertainty.

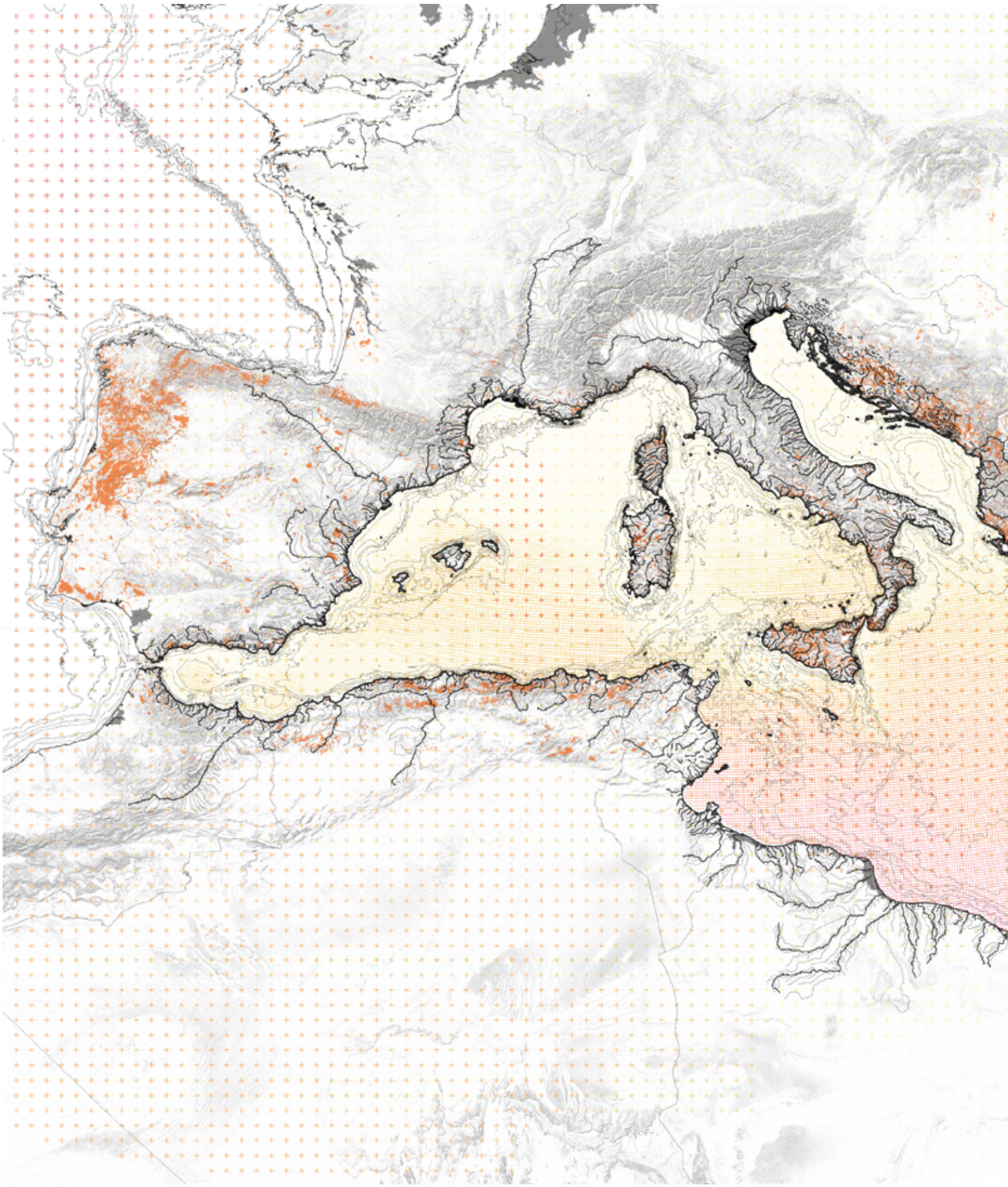
Any systemic approach necessitates an alignment in goals and values across scales. While climate urgencies drive collective plans on larger scales, the equivalent transformations that take place through local actions present resistance. Conflicting interests and lack of awareness within communities hinder processes of coordination towards a shared aim and realisation of small and incremental changes. Therefore, building local capacities that facilitate convergence is a prerequisite to planning adaptation for disaster-resilient futures.

1.3 Problem Scope

The Mediterranean region is an almost-closed basin in one climatic zone with unique geographical characteristics that create climate variability across scales.(Lionello et al., 2006) The region is structured through a complex socioecological system and is globally recognised as a climate change hotspot, facing an overall increase in air and surface temperatures that overcomes the global average, along with decrease in precipitation rates, rise in rainfall extremes in its northern areas, as well as sea level rise. This has resulted in a concerning number of climate extremes and natural hazards in the region, raising urgent calls for climate adaptation and new paradigms in disaster-risk management. (Cross-Chapter Paper 4, n.d.; MedECC, 2020)

This multiplicity of climate hazards the region is experiencing in addition to its highly vulnerable communities and ecosystems classifies it as a critical area for interconnected climate risk. (IPCC, 2022) The rising temperatures, longer drought seasons and chronic exposure to wildfires alter environmental conditions that increase the possibility of flooding through various cascading effects.(Tsoutsos, Tsoutsos, 2023; UNEP/MAP, 2017) However, fires and floods remain hazards that are handled separately although they are tightly connected as subsequent natural processes. (Mimikou et al., 2013)

Environmental alterations and land degradation that result in amplified disastrous events in the Mediterranean basin are prominent in peri-urban environments. The rapid population growth of the region, approximately the last 65 years, resulted in a shift of urban development patterns from compact cities to an expansion that formed dispersed territories with low density. (Imbrenda et al., 2021) This pattern, driven by the presence of infrastructure, resulted in territories that can not be classified neither as urban nor rural, while they predominantly function through conflicting land-uses that increase the interface of these two typologies. (Imbrenda et al., 2021; Wandl et al., 2014) In combination with continuous urbanisation, peri-urban development has resulted in human interventions that amplify the occurrence and extent of forest fires and floods. (Mimikou et al., 2013) This impacts local well-being and functionality, as well as dense metropolitan cores that depend on resources deriving from the peripheries. Acknowledging these unique characteristics of peri-urban settlements in the Mediterranean and understanding how they relate to natural hazards and are heavily impacted by them signifies the importance of risk-based planning in peri-urban zones to reflect their mixed features.



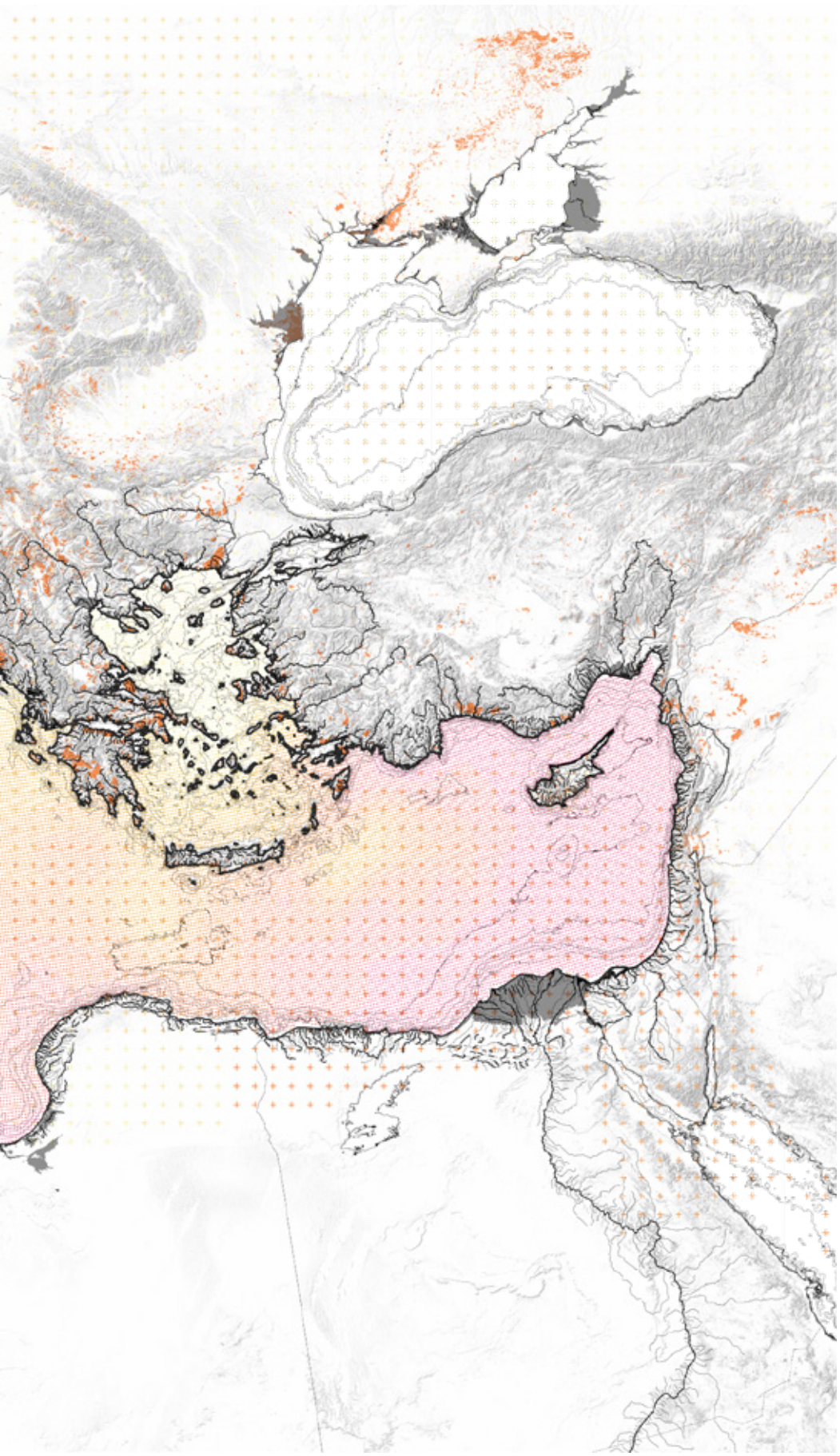


fig.5: Mediterranean basin, hydrogeomorphology and interconnected disaster-risk.

Backbone

2.1 Glossary

Key concepts and theories that address issues stated in the problematisation and problem statement are briefly explained in this section. These concepts and theories shape the approach of the research and introduce new perspectives progressively.

Hazard Interactions & Cascading Effects

Hazards are natural processes or physical phenomena that cause environmental alterations which can either trigger other types of natural hazards or increase their probability of occurrence. Hazards can therefore be classified as primary and secondary, depending on whether they initiate an interaction or are a subsequent event of one, respectively. (Gill & Malamud, 2012) These interaction relationships give a better understanding regarding cycles between hazards and their cascading effects that gradually compound damage and increase vulnerability in society and infrastructure.(Tsoutsos, 2023) Acknowledging and understanding links between different hazards can therefore instigate a shift towards multihazard assessments and interdisciplinarity in risk management. (Gill & Malamud, 2012; Tsoutsos, 2023)

Process-Based Risk

Process-based risk is an approach in disaster risk studies that recognises the dynamic character of disaster risk and how its parameters are influenced by natural, societal, cultural and economic processes. Risk as a process incorporates hazard interactions and focuses on the evolution of vulnerability and exposure to identify critical points, their characteristics and the processes across time that build-up risk. This approach contradicts the existing conceptualisation of risk as a static form that drives preparatory and responsive actions as an answer. Approaching risk as a process introduces a long-term perspective in decision making that addresses root causes and builds up resistance and resilience to reduce risk. (Serra-Llobet et al., 2023)

Evolutionary Resilience

Evolutionary resilience is a framework that describes the process of change, adaptation or transformation in complex socioecological systems that have been disturbed, want to regain stability and to also move towards a desirable future. For these to happen, social learning plays a critical role in preparing the system to gain persistence and adaptability regarding shocks and transformability into a desirable trajectory. Therefore, the concept of resilience does not only describe the capacity to bounce-back as it is often perceived, but includes the short-term, mid-term and long-term perspective for a socioecological system to perform conveniently when disturbed. Small and incremental changes across different scales, affect resilience, either harming or enhancing it, which happens inherently through human actions. (Davoudi et al., 2013)

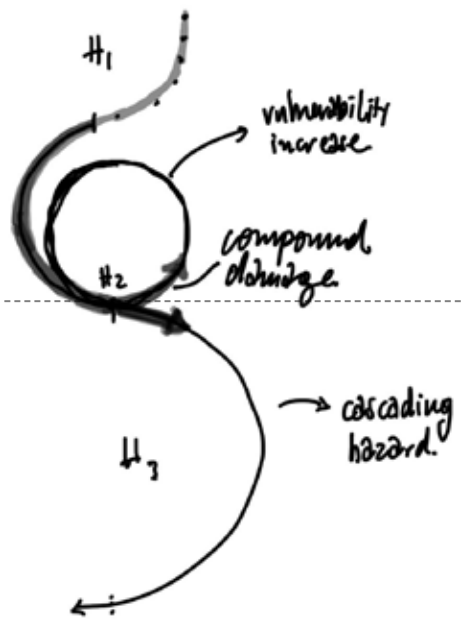


fig.6: Representation of hazard interactions and cascading effects

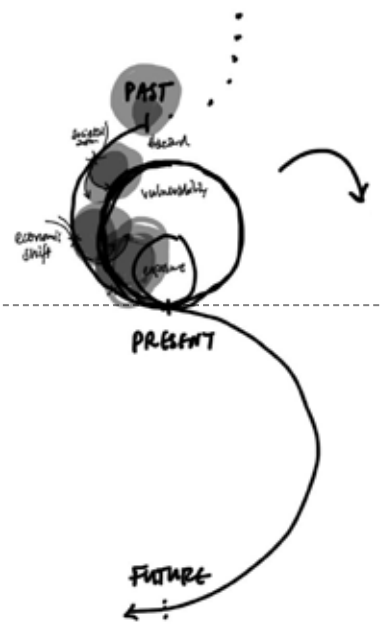


fig.7: Representation of process-based risk

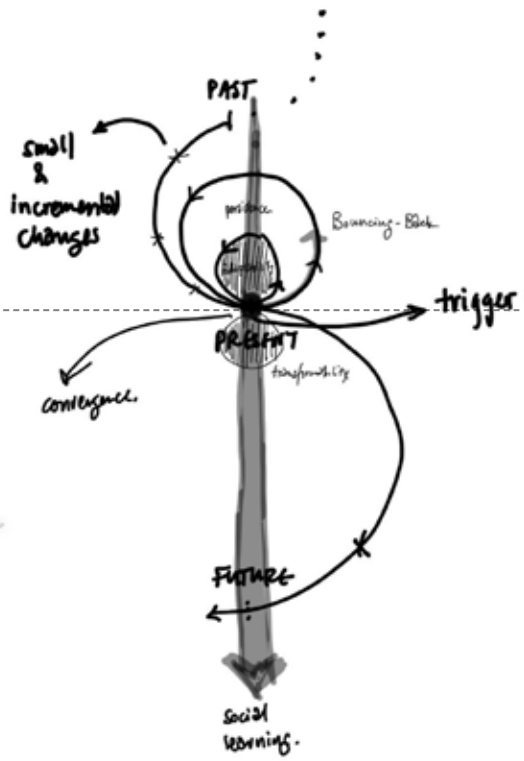


fig.8: Representation of evolutionary resilience in disaster-risk

Peri-Urbanisation

Peri-Urban zones are urbanised environments in the peripheries of cities that occur from metropolisation processes and the expansion of urban cores. Such environments are often structured as Territories in Between, a typology that combines both rural and urban characteristics, and includes mixed functions that are interrelated and highly dependent on infrastructure and links. (Wandl et al., 2014) Due to these characteristics they are often seen as spaces of opportunity and therefore deal with continuous and unorganised urbanisation. Peri-Urban zones are, thus, of supra-local interest while they hold their own endogenous local value.

Systems of Care

Care theories derive from feminist and eco-feminist studies and take practice-oriented and ethical perspectives on interdependencies and relationality in socioecological systems. Systems of care describe ecosocial relations and address all species, human and non-human, as active participants in the system's function. In these systems, interdependencies and interrelations are considered an ontological condition of all beings. Therefore, care is inherently existent when two or more entities coexist, due to their desire for well-being. However, this does not entail that care is naturally positive. On the contrary, it can often take an oppressive form. How care is practiced is demonstrated within formed relations, making attentiveness in our participation and its results necessary for meaningful care practice.(Krzywoszynska, 2023; Puig de la Bellacasa, 2012)

Caring for

"Caring for" is a moral, ethical and most times intangible aspect in systems of care. It derives from building relations and engaging, as well as concentrating on acknowledging the interdependencies that occur.

Taking care of

"Taking care of" is the active form of care in socioecological systems. It relates to the effects care produces as a result of how it is practiced by the entities of the equivalent system.

2.2 Theoretical Framework

The research uses the conceptualisation of risk as a process as a key concept that incorporates the importance of hazard interrelations and their cascading effects in a process that builds-up disaster risk by influencing both the parameters of hazard and vulnerability. This relates to the highly interconnected climate risk that the Mediterranean region is experiencing. The same theory addresses how human interventions are a root cause of risk amplification and signifies the ability of different practices and actions to alter this process and increase or reduce risk. Evolutionary resilience ties into this as a process of change with a long-term perspective that suggests social learning as a way of building capacity and living with uncertainty by bouncing both backward and forward from disturbances. The conflicting functions of peri-urban zones and their unorganised and continuous urbanisation reflect the causes for risk amplification that these theories address and the need to build transformability through collective alignment.

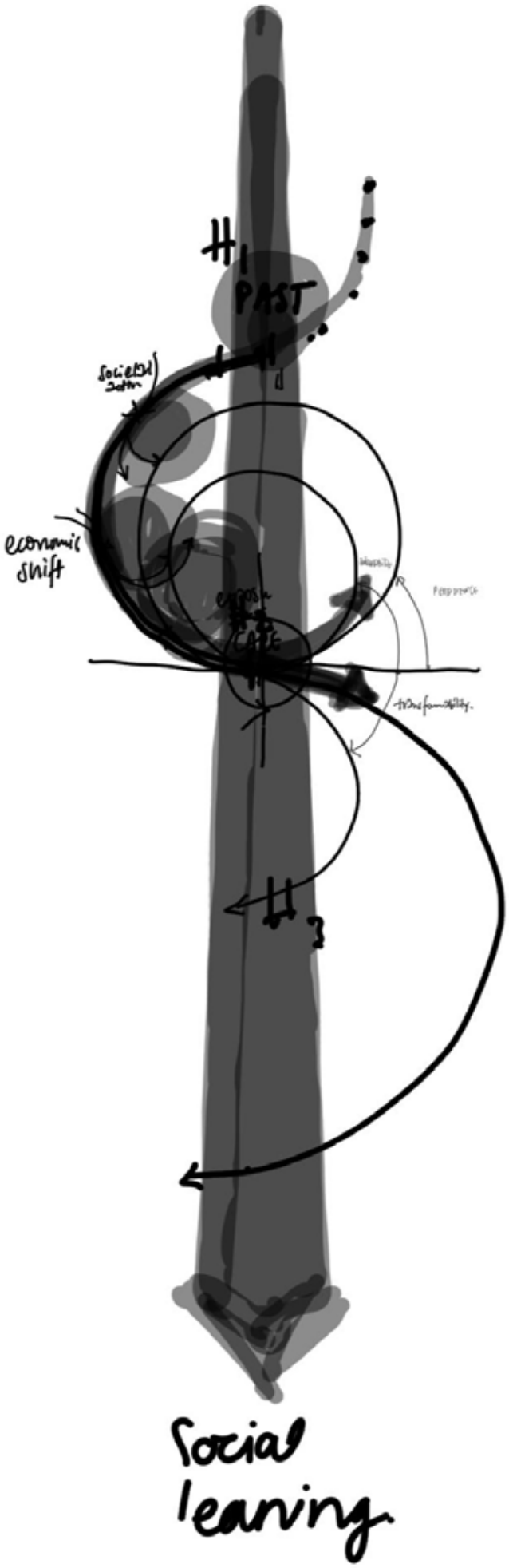


fig.9: Theoretical Framework

2.3 Problem Statement

The Mediterranean basin is recognised as a climate change hotspot, facing increase in air and surface temperatures, decrease in precipitation rates, longer drought and fire seasons and rise in rainfall extremes. (IPCC, 2022; MedECC, 2020; UNEP/MAP, 2017) The region is characterised by its geomorphology that juxtaposes high mountain peaks and low-lying coastal zones, creating climate variability and suitable conditions for highly interconnected climate risk. (IPCC, 2022; Lionello et al., 2006) As population grew rapidly in thwe 20th and 21st century, Mediterranean cities began expanding and stroked the development of dispersed and low-density territories in the peripheral areas that also serve for the increasing demand of resources. As a result, these peri-urban territories, that are in continuous urbanisation, function with conflicting land-uses that interfere with natural processes and degrade land quality. An amplification in intensity and extent of interrelated natural hazards, like fires and floods, has become prominent in peri-urban zones, straining resources even further and posing threats to human well-being, culture and biodiversity.(Imbrenda et al., 2021; Mimikou et al., 2013)

The existing climate of uncertainty and instability has risen urgent calls for climate action, local transformations and risk management that interconnects hazards and integrates diverse practices, to shift away from inadequate static risk approaches that focus on preparatory and responsive actions.(Serra-Llobet et al., 2023; UNDRR, 2020b) Peri-urban zones of the Mediterranean, that are under high pressure from interconnected disasters, face difficulty in building capacities and reducing disaster risk due to their multiple and highly related functions. Segregation, disparities and conflicts created by these conditions hinder such environments from building transformative capacity and acting towards disaster-resilient futures. Therefore, convergence between local actors towards a common goal that rebalances socioenvironmental processes is a key aspect for risk-based planning and risk reduction strategies to build more robust, but flexible peri-urban environments.

2.4 Research Questions and Sub-Questions

How can actor-relational theories enter spatial planning and design to cultivate practices and acts of care that reorganise peri-urban Mediterranean zones towards disaster-resilient futures?

Sub-Questions

In the context of peri-urban zones of the Mediterranean basin,

Hazard

(1) How have biophysical capacities been altered through the years?

(2) How can biophysical capacities direct a process of creative destruction and reorganisation?

Exposure

(3) How does peri-urbanisation influence exposure evolution?

(4) What is the role of local land management in the alignment of socioenvironmental processes?

Vulnerability

(5) What are the driving forces that influence risk as a process and how have they organised the territory?

(6) What elements in territorial processes create misalignments between social and natural systems?

Capacity

(7) How can projective design of encounters and attentive care direct regional development?

(8) How can a region enable local transformations through practices and acts of attentive care in the peripheries?

Transferability

(9) How can the emerging strategies and principles be transferred in other territories that face similar climatic conditions and geomorphological structure?

Methodology

3.1 Methodological Framework

The research develops in three stages by employing a case study. It begins with an investigation on the processes that formulate risk in the territory of the case study. A history informed analysis, using literature review, statistical analysis and multi-temporal comparisons of maps and orthophotography as methods, correlates landscape transformations, land management decisions and historical events. This reveals the evolution of risk in the territory and identifies the amplification of exposure, the driving forces of peri-urbanisation and landscape alterations as well as the biophysical capacities of the land. These findings are combined with spatial data analysis and findings from fieldwork to determine the socioenvironmental systems under which the territory operates and evolves. Misalignments of these systems are determined by a deeper investigation on the elements of territorial organisation, as well as spatially overlaying them and comparing them to recurrence of hazards and modelling for potential events. A demonstration of the socioenvironmental values that partake in the cascade between fires and floods are mapped and combined with findings in literature review they provide strategic directions for the reorganisation of the territory toward the systems' alignment. This is followed by a stage of projections and propositions. Using the method of maximisation projective design is employed at a local scale as a research tool. This way stakeholders and their potential roles are identified and related to the findings from the current elements of territorial organisation. The strategic directions and the design suggest regional strategies to build transformative capacity and enable local transformations.

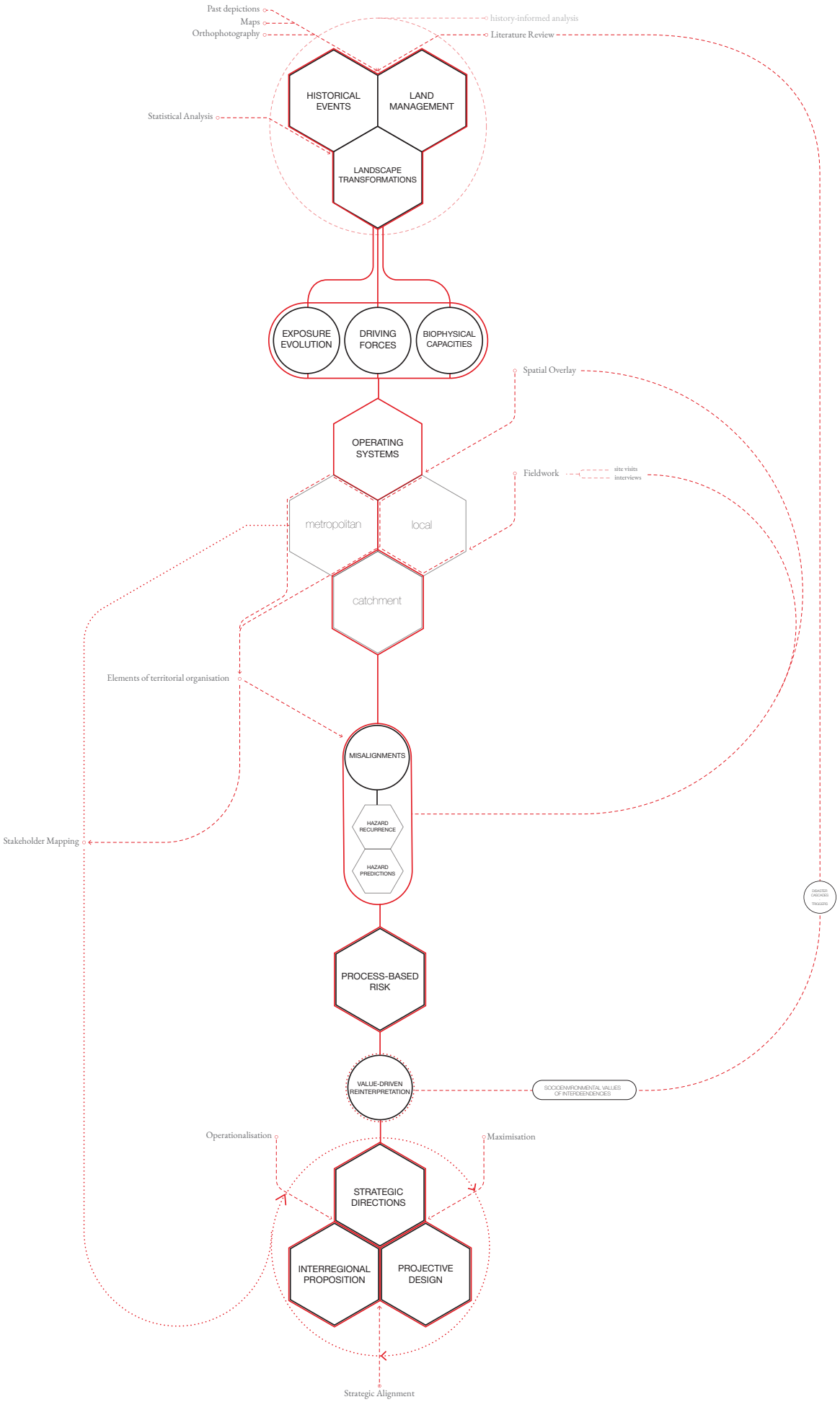


fig.10: Methodological Framework

3.2 The case of Marathon, Greece

The thesis argues that what hinders the ability of peri-urban territories, and their communities, to build disaster-resilience capacities and reduce risk is the inability of local actors and administrative bodies to converge and collectively align with natural processes. Two of the key reasons behind this are the lack of acknowledgment from local communities on the role that land management and self-organisation have in disaster risk formation, as well as the conflicting land-uses of dispersed peri-urban territories. The thesis aims to challenge them by utilising a case-study and bringing a local perspective and inter-scalar relations at a focal point in risk-based planning. The case needed to exhibit the following specific characteristics that bridge risk as a process and peri-urbanisation:

(1) a territory with **chronic exposure to wildfires and high risk of flooding**,

(2) a geomorphology that juxtaposes **mountain peaks and a low-lying coastal zone**, making it prone to highly interconnected risk,

(3)a territory under **continuous and unorganised peri-urbanisation** that poses landscape alterations that disregard natural processes.

fig.11: The plain of Marathon, 1830 (Carl Frommel)

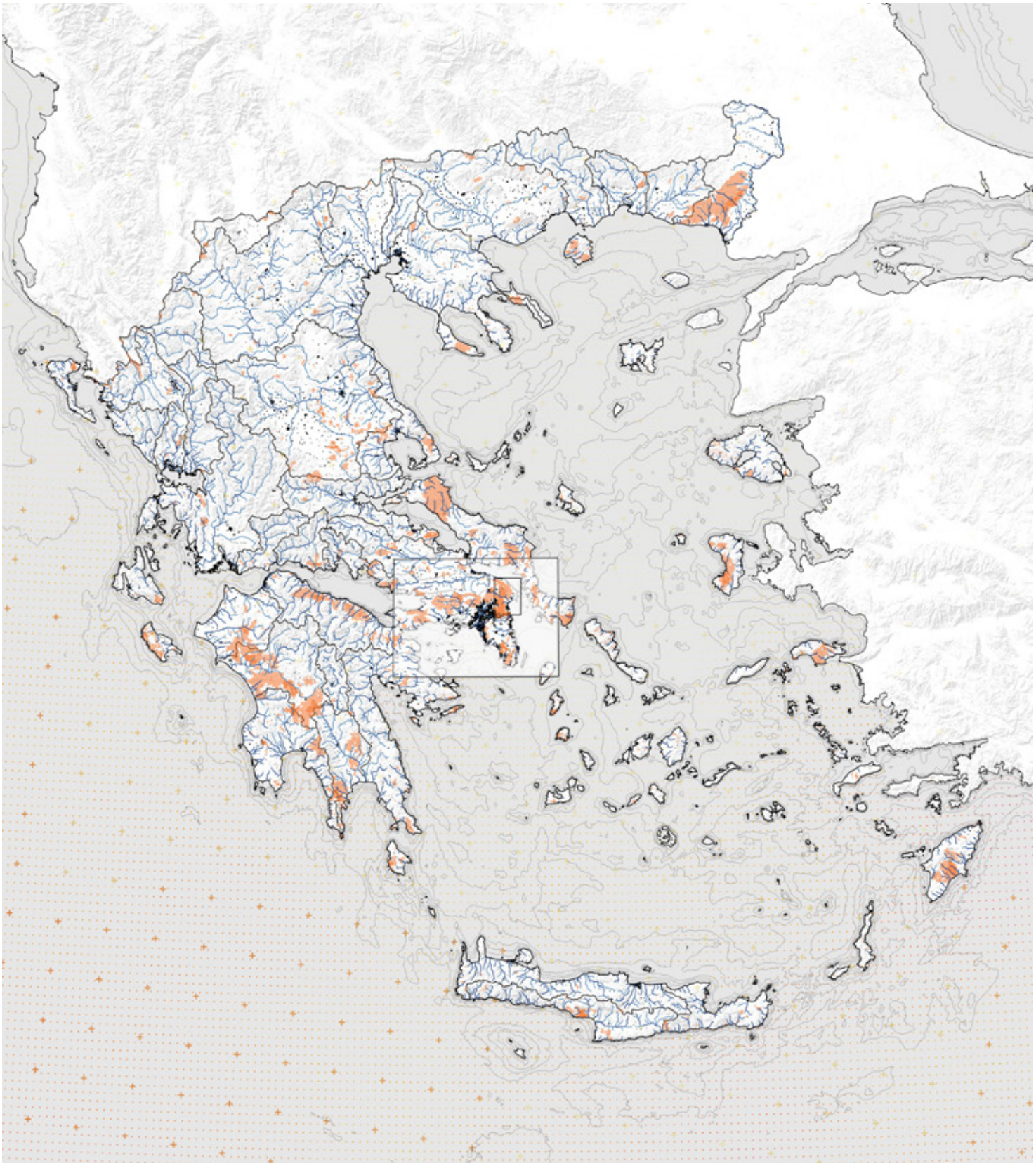


fig.12: Case-study location - Marathon, Greece

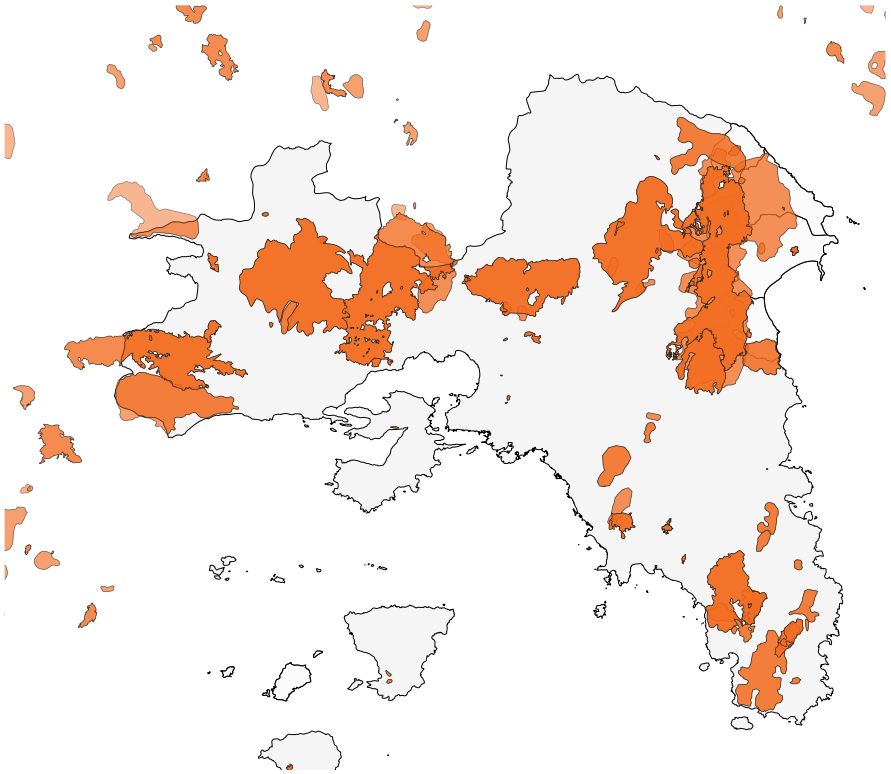


fig.13: Fire exposure in Attica after 2000

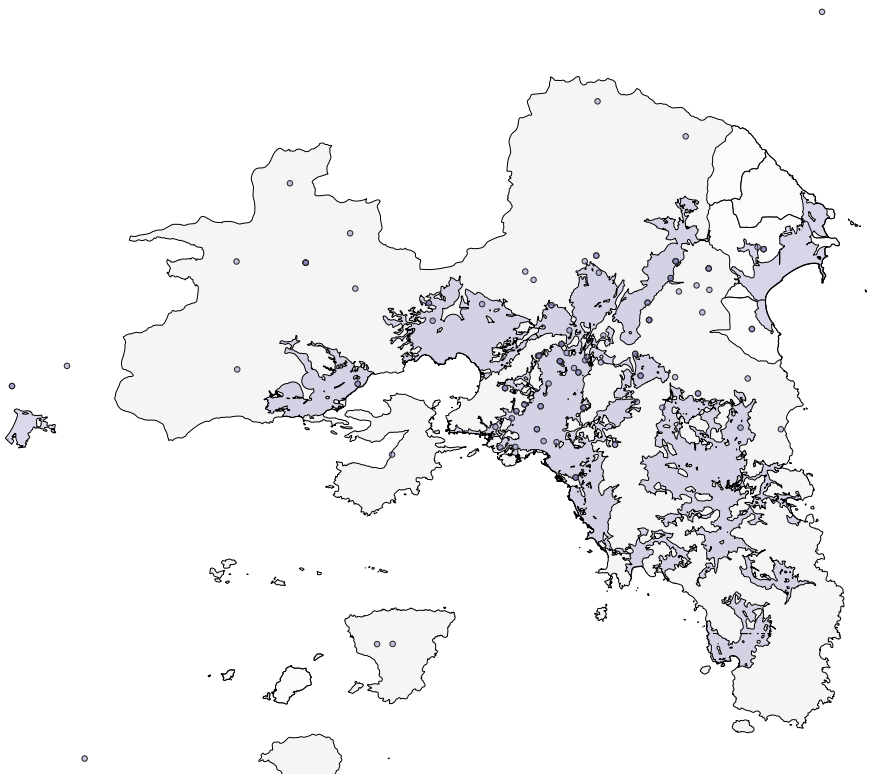


fig.14: Historical flood events in Attica and potentially high flood risk zones

Marathon, located in the eastern region of the metropolitan area of Athens, Greece, embodies all of the above characteristics and therefore was chosen as a case study. The territory is historically defined by its hydrogeomorphology. Lying in the eastern foothills of mount Penteli and mount Parnitha, it is characterised by steep slopes that surround a coastal plain opening up to the Aegean Sea. Two marshes define its extents, Schinias ("the Great Marsh") on the north side and Vreksiza on the south. Both marshes serve as outlets for rivers and streams originating from the mountains.

Based on data retrieved from EFFIS , the European Forest Fire Information System, the territory has been exposed to notable fires at least 5 times in the 21st century, with two significant wildfires in 2009 and 2024 that affected 20521ha and 10971ha respectively. (Copernicus Emergency Management Service (CEMS), 2024) This has greatly impacted soil quality and the ability of the terrain to retain rainstorm water. Since 2018 part of the territory is designated as a potentially high flood risk zone by the Hellenic Ministry of Environment and Energy (ΥΠΕΝ). This declaration was informed by recorded flood events, geomorphological features and vulnerability of specific land-uses to flooding.(Hellenic Ministry of Energy, 2018)

However, the area is no stranger to stream overflows and sediment deposition from the mountainous parts of the territory onto the agricultural plain.(Steinhauer, 2009) It has been stated multiple times that Marathon's plain experienced flood events during ancient times, whereas the first detailed report came in 1841. The settlement of Marathon and the coastal front showcase a high number of flood events during winter and spring, while the flood recurrence rates show an increase in areas with degenerated morphological characteristics of the streams, high density of impermeable surfaces and relativity to steep slopes. Studies attribute these phenomena to human interventions in riparian zones and agricultural practices that hinder the ability of natural drainage, alterations of the hydrological network and the trend of unregulated urbanisation.(Diakakis, 2010; Tsergas, 2021)

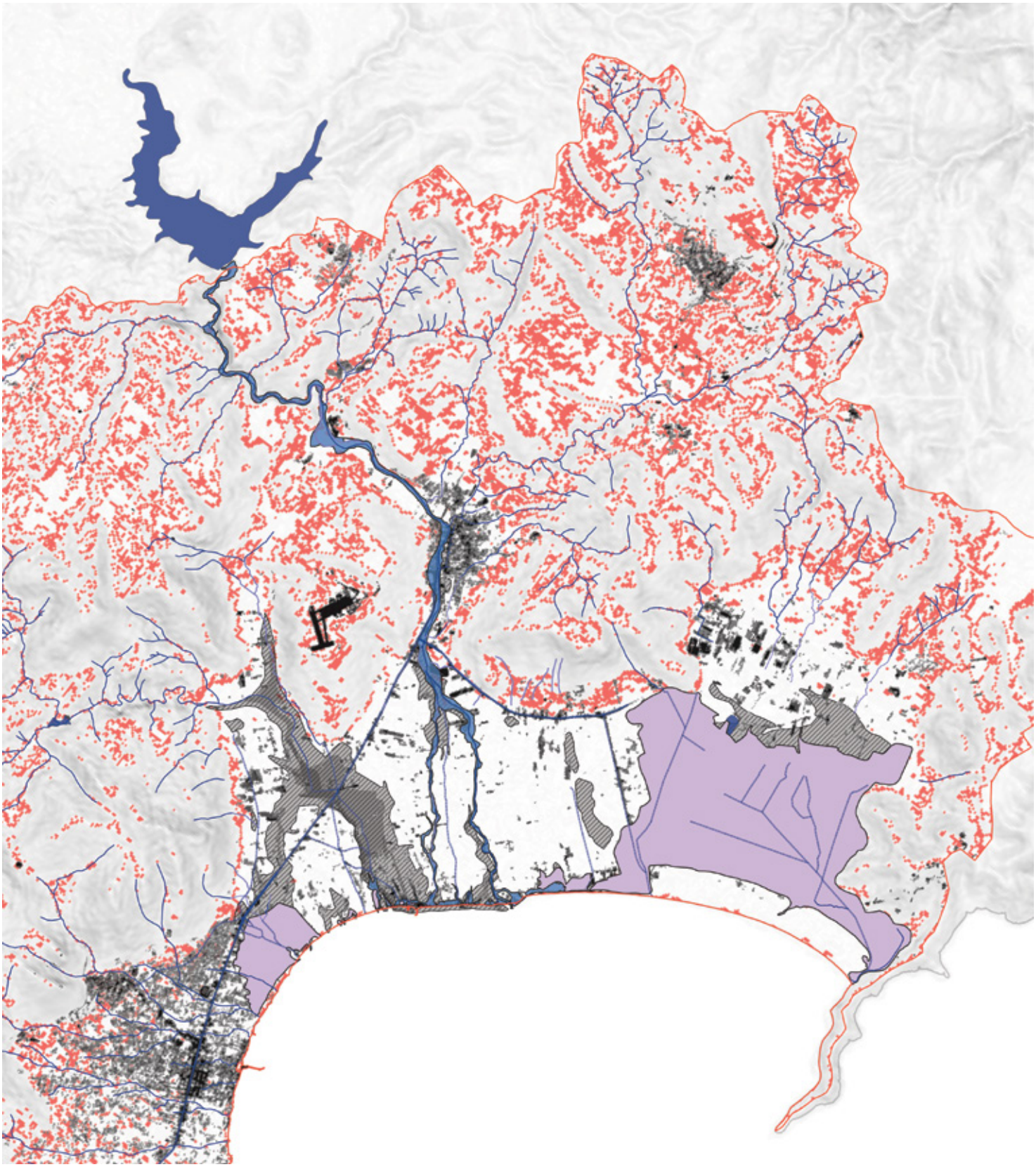


fig.15: Flood recurrence amongst grey infrastructure, altered landscape and steep slopes

- Waterways
- Impervious Surface Density
- Flood Recurrence
- Past wetlands
- Steep slopes

In this context, Marathon is a representative example of peri-urban mediterranean coastal zones and their structural challenges that influence the amplification of disaster risk. By situating the research in a territory with dynamic and highly interrelated systems the study draws attention to risk as a process of socioenvironmental alterations and the role that spatial planning, design and governance have in this interplay.

Incidents, processes and the territory

Gaining an understanding of how and why risk evolves is crucial in building risk reduction strategies with a long-term perspective. Risk as a dynamic measure is shaped across time through the interplay of natural and socioeconomic processes on a territory. By corelating historical events and land-use decisions with the evolution of exposure and the biophysical capacities of a territory we gain a better understanding of how peri-urbanisation can lead to the accumulation of trigger factors for natural hazards and their cascading effects. (Serra-Llobet et al., 2023)

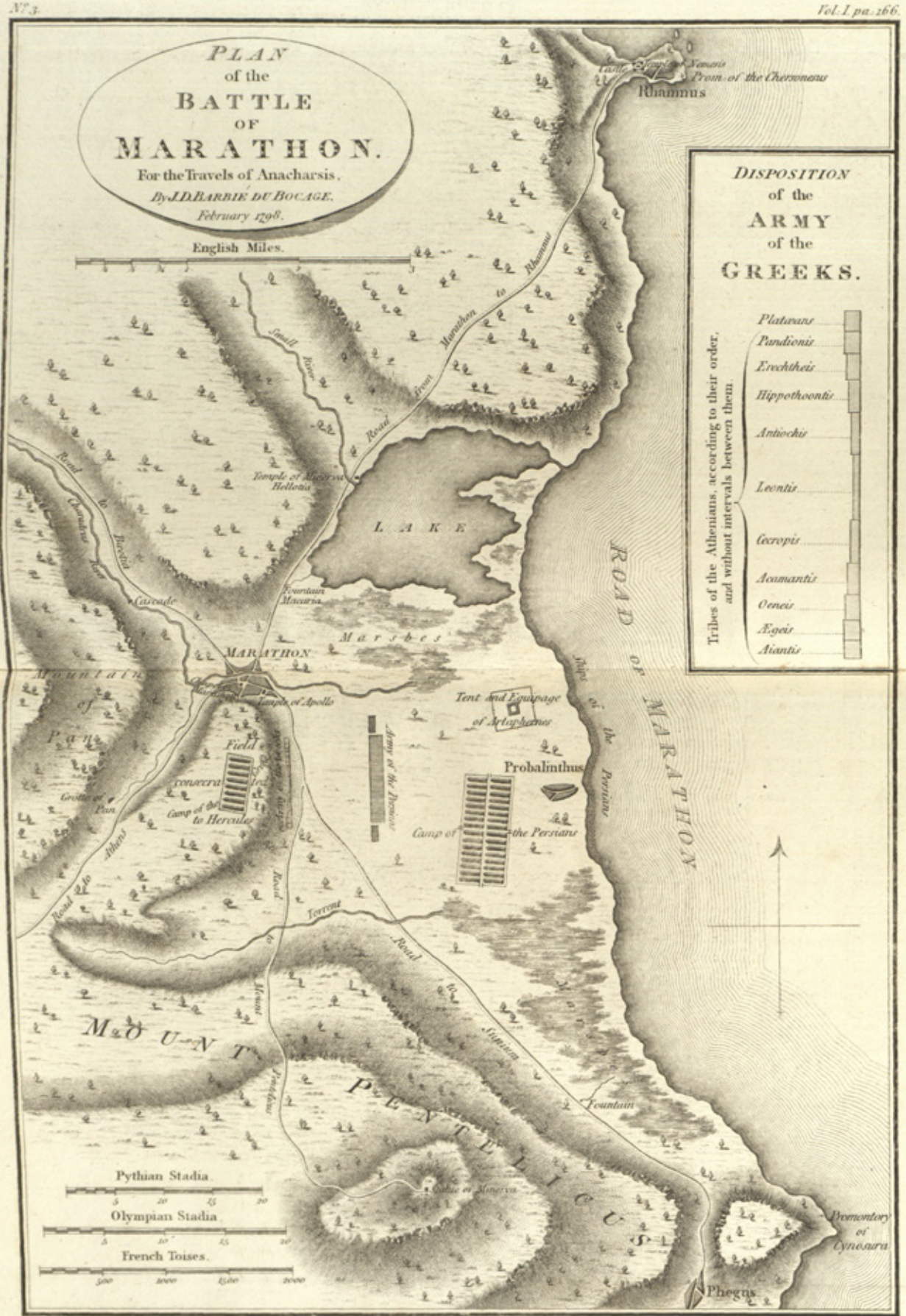
A history informed analysis through the lens of land management and modification reveals where natural and social systems are misaligned in Marathon. Relating past depictions of the landscape with historical events and changes in land practices shapes a timeline of disaster risk evolution in the territory.

fig.16: Plan of the battle of Marathon.(Villanova Digital Library - Travels of Anacharsis the Younger in Greece: Maps, Plans, Views, and Coins, Illustrative of the Geography and Antiquities of Ancient Greece. :: Digital Library@Villanova University, n.d.)

4.1 Urbanisation and Landscape Transformations

The history of Marathon dates back to the neolithic ages, when first settlers left traces of their civilisation in the area, although, the landscape was there long before that. Marathon, however, is historically known for the battle of the Athenians against the Persian fleet in 490BC that took place in the territory. (Steinhauer, 2009; Ισσάρη, 2016) Depictions of Marathon and its landscape come from spatial interpretations of Herodotus' description of the battle, portraying a swampy terrain that restricted the Persian's maneuvers. (Herodotus, The Histories, Book 6, n.d.) Drawings and maps of the 17th and 18th centuries combine the ancient narratives of the battle with on-site experiences of western travellers in the area. This provides an understanding of the biophysical capacities, the water system, agricultural land and settlements of the area before the 19th century. (Steinhauer, 2009) Karten von Attika, an archaeological mapping of Attica that was produced between 1862 and 1897 by E.Curtious and J.A Kaupert, gives insights regarding how land and water management took place in the area of Marathon.(Dipylon Society for the Study of Ancient Topography, 2023; Livieratos et al., n.d.) Depicting waterways, streets and trails, vineyards, canals and cisterns, the map suggests an early alteration of the landscape that came with traditional practices of agriculture in the area. Relating this map and earlier drawings with today's parcellation of the territory leads to a hypothesis of how the land and water were organised and cooperating originally.

fig.17: The plains of Marathon. (John Varley, 1778–1842, British)



London, Published as the Act directs July 1st 1803 by J. Mawman, Poultry.

fig.18: Curtius, E., & Kaupert, J. A. (1878). Karten von Attika, Marathon [Map]. Wikimedia Commons.


DRAKONERA
Karten von Attika Bl. XVIII.
aufgenommen und gezeichnet 1885 von Eschenburg, herausgegeben vom Kaiserlich deutschen archäologischen Institute.
Kato Suli
Sumpf
von
Marathon
Canal
Drakonera
Cap Marathon
BUSEN
VON
MARATHON
Redaction u. Terrainzeichnung v. J. A. Kaupert.
1 : 25000 d. w. Länge.
BERLIN DIETRICH REIMER.

fig.19: Midday rest in handcarts during the Dam's construction, 1927 (EYDAP,2011)

fig.20: Processing of marble for the Dam's facade, 1927 (EYDAP,2011)

fig.21: Construction of Marathon Dam.(EYDAP,2011)

During the 19th century there were two milestones that triggered change in land-use and therefore altered parts of the natural system. Between 1922 and 1924 the arrival of refugees from Minor Asia and Ionian towns led to a rapid population increase mainly in Nea Makri, a settlement adjacent to the Marathon plain. A few years later, in 1926 began the construction of the Marathon Dam to provide drinking water for Athens, whose population at the time was also rising.(Δάφνη, 2016; ΕΥΔΑΠ, 2011; Ισσάρη, 2016) These two historical events set out two parallel trajectories concerning agricultural land-use and settlement formation in the territory.

Following the population increase of 1922, came the legislative Decree of 17.7/16.8.1923, titled "On City, Town, and Settlement Plans of the State and Their Construction.". This law set out the way for the modern urbanisation of Greece as it recognised significant cities and settlements of the time and declared city plans and exemptions for urban development. (School of Architecture NTUA, 2023) The old settlement of Marathon was the only one of the settlements in the territory with a city plan. However, this was soon outgrown due to exemptions that provided building permits in the perimetric zone of the existing city. The rest of the territory grew in dispersion, also based on exemptions to the law and arbitrary development. By overlapping aerial photographs of the territory, we see that along a population rise came the development of mobility infrastructure. This unregulated and rapid urbanisation of the territory led to development on critical elements of natural processes, the built up of impervious surfaces and the lack of public and civic spaces. The multi-temporal analysis regarding the establishment of settlements and the development of infrastructure in Marathon highlights how heavily altered the coast is to date and the mismanagement of land with previously existing marshes, estuaries and discharge points.

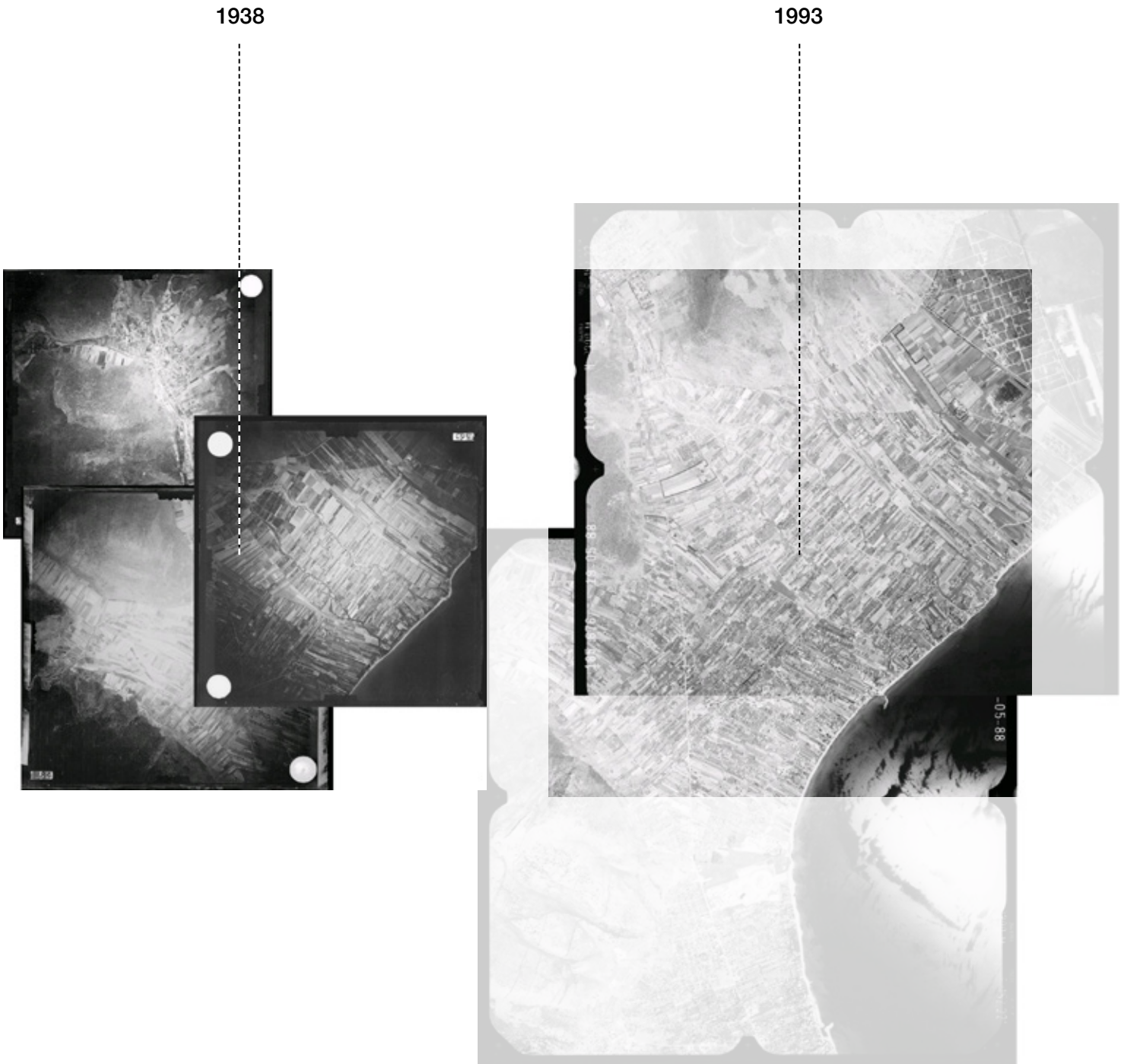
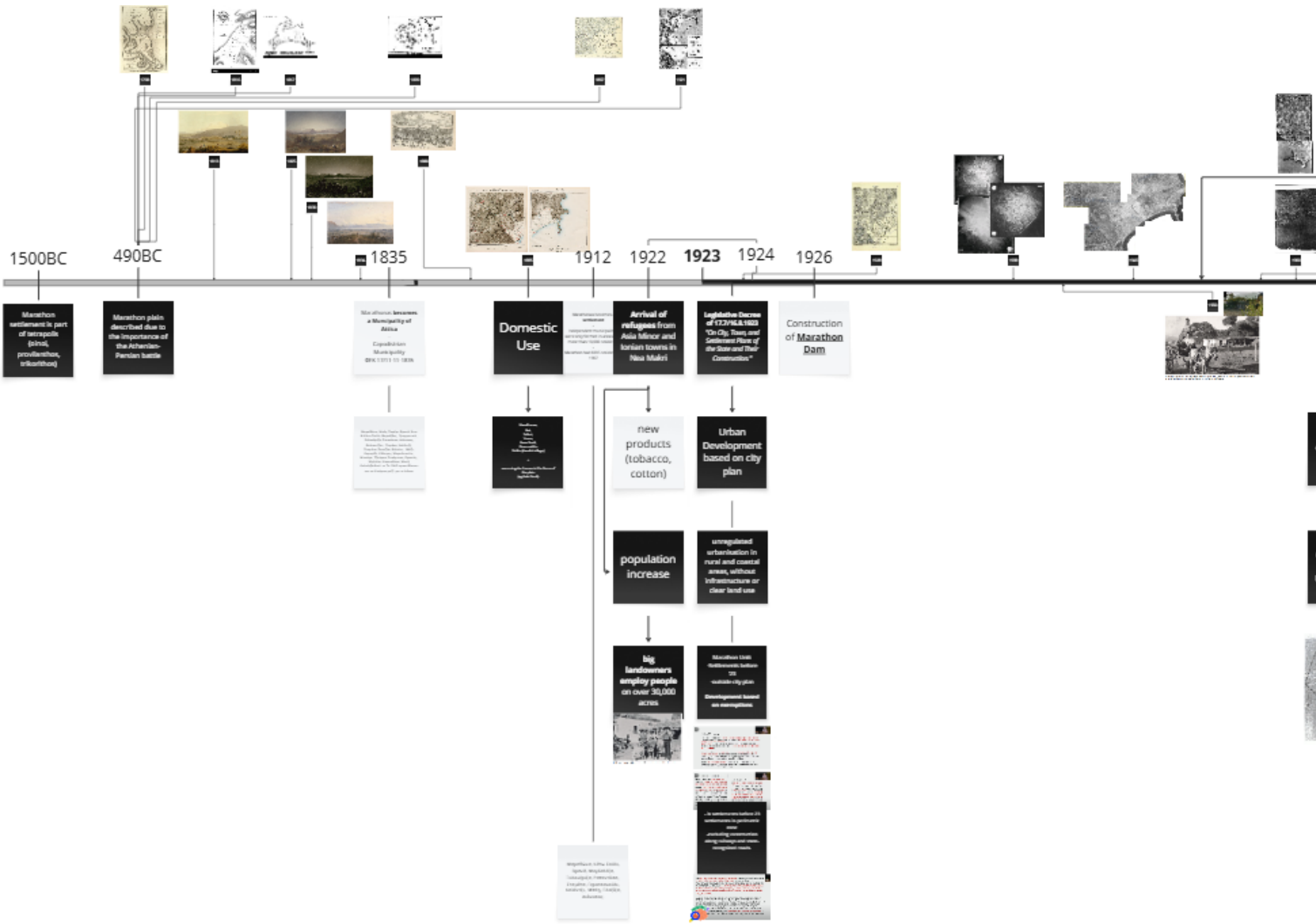


fig.22: Comparison of orhtophotography between 1938 and 1993 in Marathon. (GYS)


1500BC
490BC
1835
1912
1922
1923
1924
1926
Marathon settlement is part of Istropolis (Oinoi, provilanthos, trikorithos)
Marathon plain described due to the importance of the Athenian-Persian battle
Domestic Use
Arrival of refugees from Asia Minor and Ionian towns in Nea Makri
Legislative Decree of 17.7/15.8.1923 "On City, Town and Settlement Plans of the State and Their Construction"
Construction of Marathon Dam
new products (tobacco, cotton)
Urban Development based on city plan
population increase
unregulated urbanisation in rural and coastal areas, without infrastructure or clear land use
big landowners employ people on over 30,000 acres

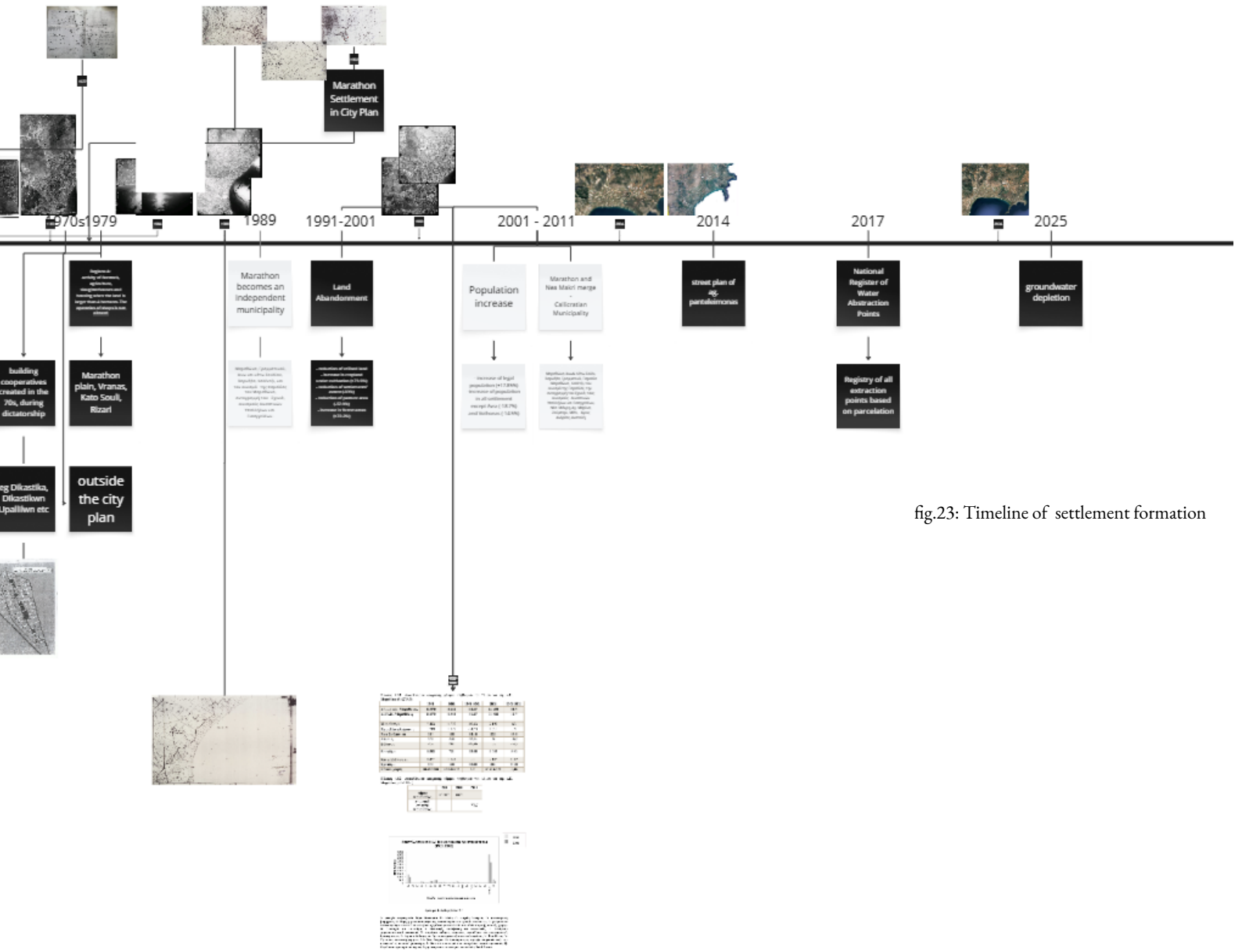
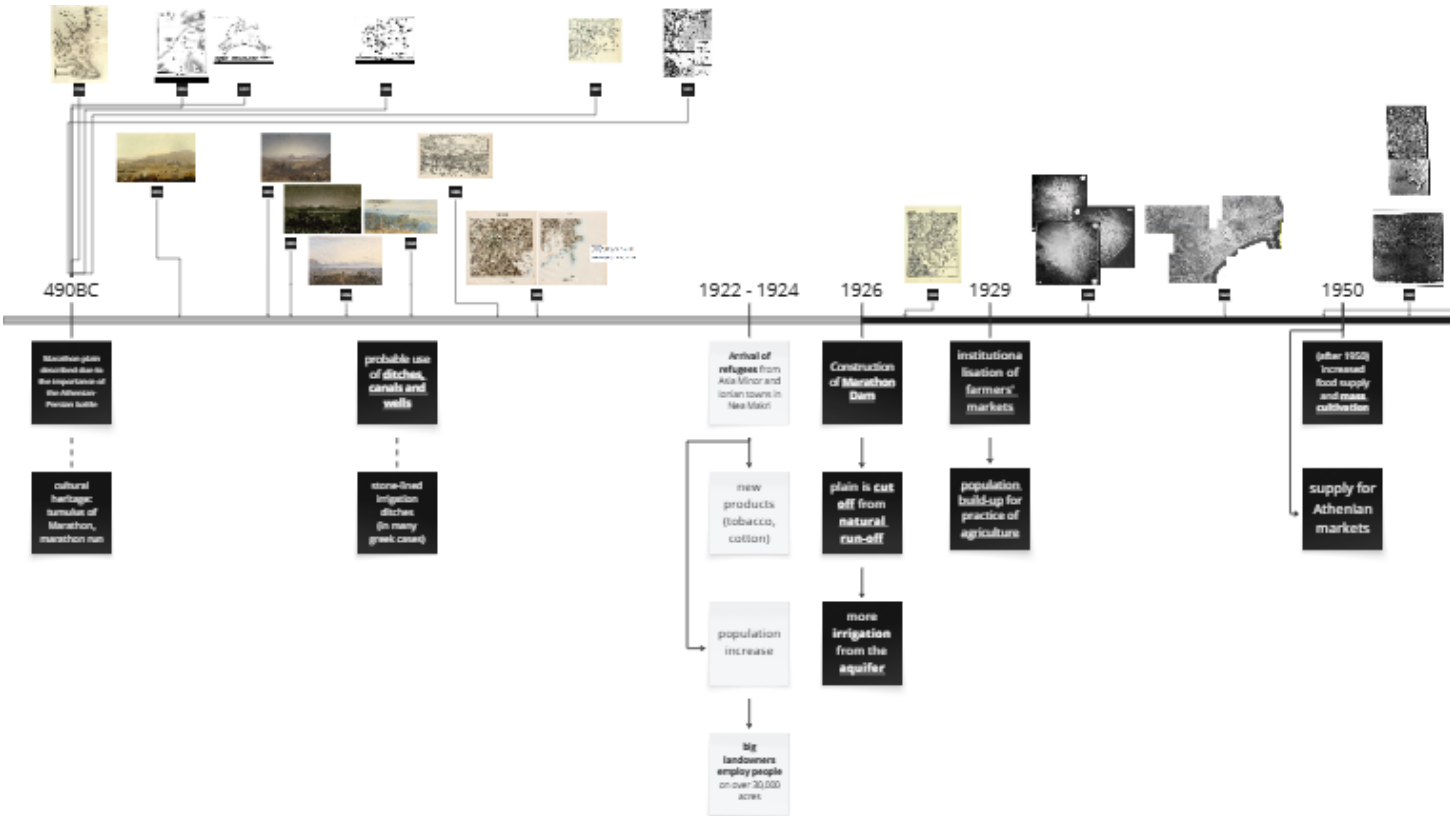


fig.23: Timeline of settlement formation



Although agricultural land in the 19th century was traded for the previously described residential development, agricultural practice remained prominent in the territory. The institutionalisation of farmer's markets in Greece in 1929 led to a population build-up in Marathon that related to the practice of agriculture. However, a noticeable switch in methods of agricultural practice came after the construction of the dam. With the plain being cut-off from natural run-off after 1926 the land began getting irrigated mainly with water abstracted from the aquifer.(Δάφνη, 2016) Additionally, after 1950, mass cultivation, industrialisation of agriculture and a built up of greenhouses took place to supply the Athenian market and its demands. The multi-temporal analysis of aerial photography and chartography showcase an evident transition of the landscape to a much drier state, the "disappearance" of water bodies and therefore the interruption of streams' continuity. Between 1991 and 2001 followed land abandonment that led to the intensification of agriculture, industrialisation and mechanisation.(Δάφνη, 2016) The reduction of utilised land gave space for shrub and forest encroachment on unmonitored and unmaintained land. Additionally, in this period tree crops were transformed to arable land possibly affecting the subsoil's ability to retain and infiltrate water. An increase in the extents of farmland but not the diversity in produce may have negatively affected the local biodiversity and the soil's ability to regenerate. In the following years the land remained productive and industrial agriculture occupied more space , but the practice is challenged with water shortages due to aquifer over-abstraction. (Δάφνη, 2016; Χειλάς, 2017) Evidently the intensified and mechanised practice of agriculture, coupled with over-extraction of nature's resources, have disrupted natural processes of the territory. This signifies the role of agricultural land-use in the evolution of risk in the territory.

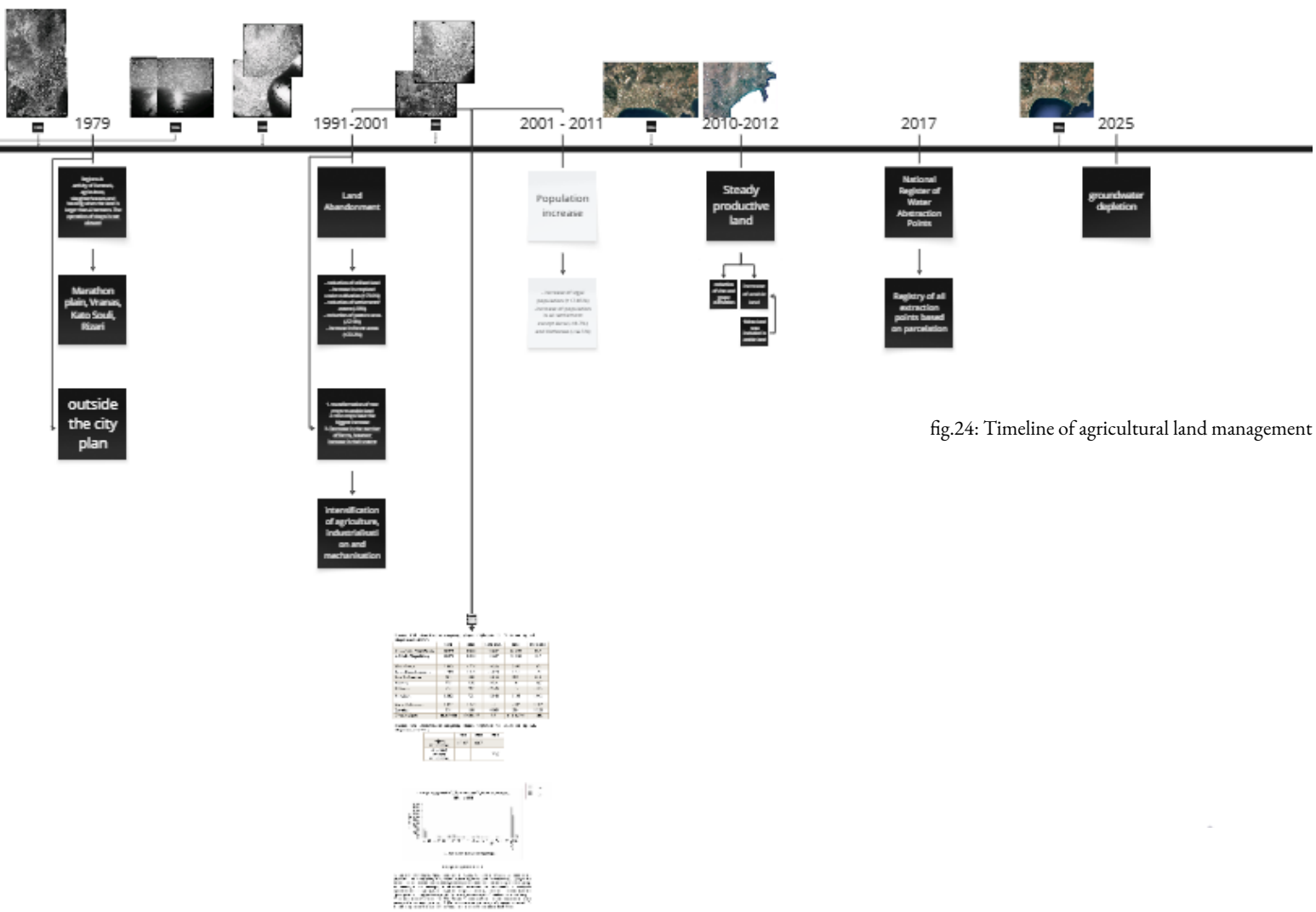


fig.24: Timeline of agricultural land management

fig.25: Schinias amd the industrialisation of agriculture

The multi-temporal analysis that was carried out indicated large-scale development driven by the Metropolitan Area of Attica. During the conducted fieldwork observations and interviews revealed that these transformations seem to have neglected the local values of the natural system, creating neighbourhoods on marshland and the infrastructure for the military and sport facilities in natural reserves and water discharge points. Locals referred to the rushed works and the bad quality of infrastructure that was developed in the 21st century, particularly in the preparations for the 2004 Olympics, connecting these to the incompetence of the area's drainage systems and increased disaster risk. Additionally, the fieldwork indicated the counteracting role of administrative bodies and regulations, such as the Archaeological Service and the Natura2000 network, in moderating certain interventions.

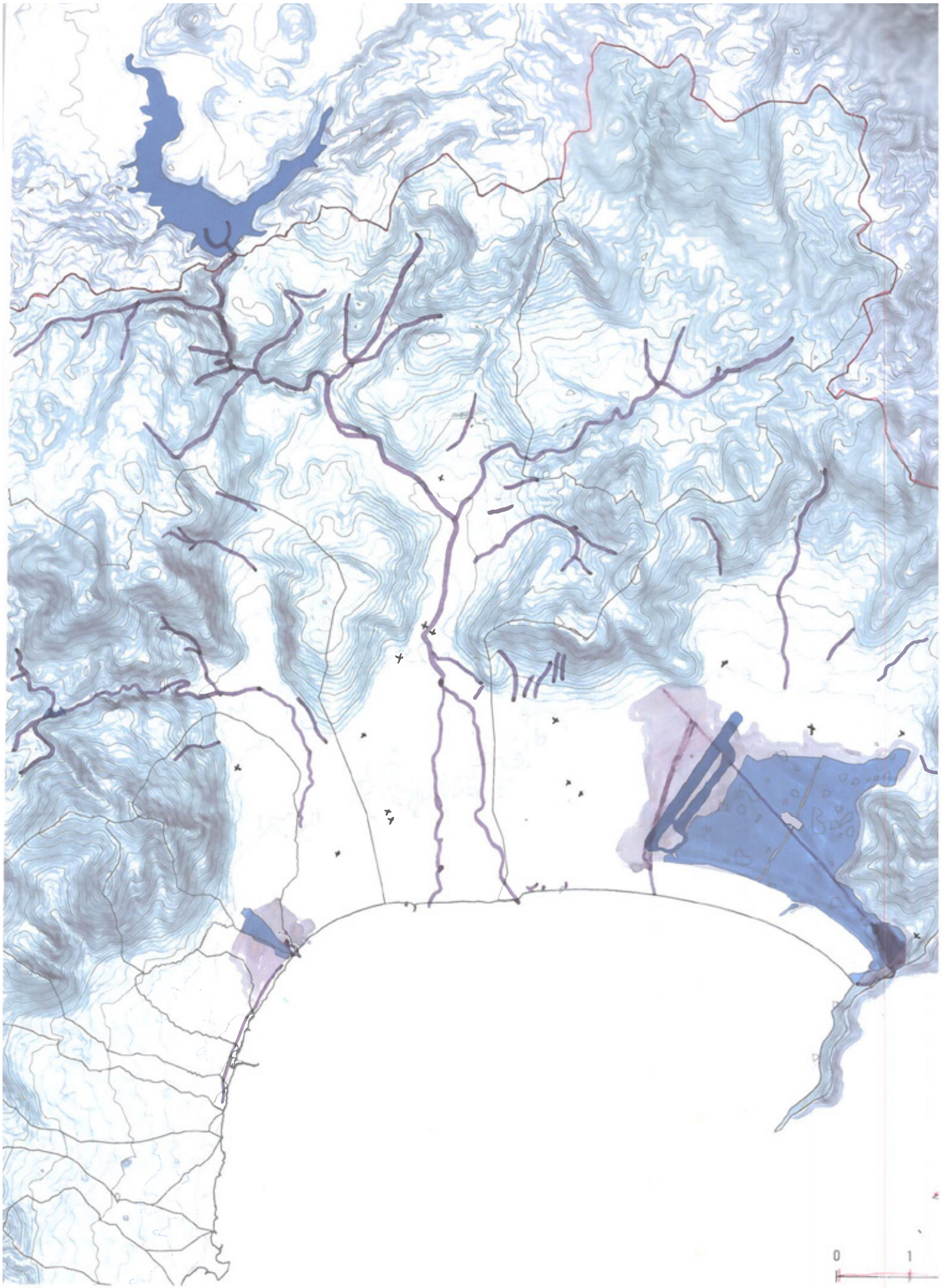
The territory's peri-urbanisation patterns, driving forces and landscape transformations demonstrates how natural processes have been reshaped through societal interventions and how vulnerability and exposure have evolved.(Boukouras, 2024; Serra-Llobet et al., 2023) The landscape of the territory, and its values as a natural system, has significant cultural importance locally and regionally. (Steinhauer, 2009) The societal processes and self-organised land management have led to an erasure of the territory's natural capacities and a disconnect between them and the people. (Diakakis, 2010; Hadjibiros, 2010) Additionally, the mechanisation and industrialisation of agriculture replaced traditional techniques of land and water management and set conditions that amplify both exposure and vulnerability in Marathon.(Tsergas, 2021; Δάφνη, 2016; Χειλάς, 2017) Recorded disaster events indicate that the landscape still holds its memory with hazards recurring in highly altered water bodies. (Diakakis, 2010)

4.2 Operating Systems

Risk in Marathon has evolved through land alterations planned, designed and implemented across different scales and uncoordinated stakeholders. The findings from the multi-temporal analysis of the territory led the research t oward an investigation of how multiple socioenvironmental systems operate in the territory, and in which scale they do so. Their intersections and misalignments provide an overview of Marathon's disaster risk as a process and the different socioenvironmental elements that form it.

Three systems were identified in Marathon as key structures that shape driving forces in the accumulation of risk across the cascade from fires to floods. These are the natural system that sets the biophysical parameters in the performance of natural processes, the metropolitan system that outlines development from a supra-local perspective as provision for the metropolitan area and the system of local and self-organised management with an individualistic perspective and conflicting land-uses that trigger natural disasters through hands-on practice. These systems operate simultaneously and shape this cultural and highly dynamic territory.

fig.26: Natural System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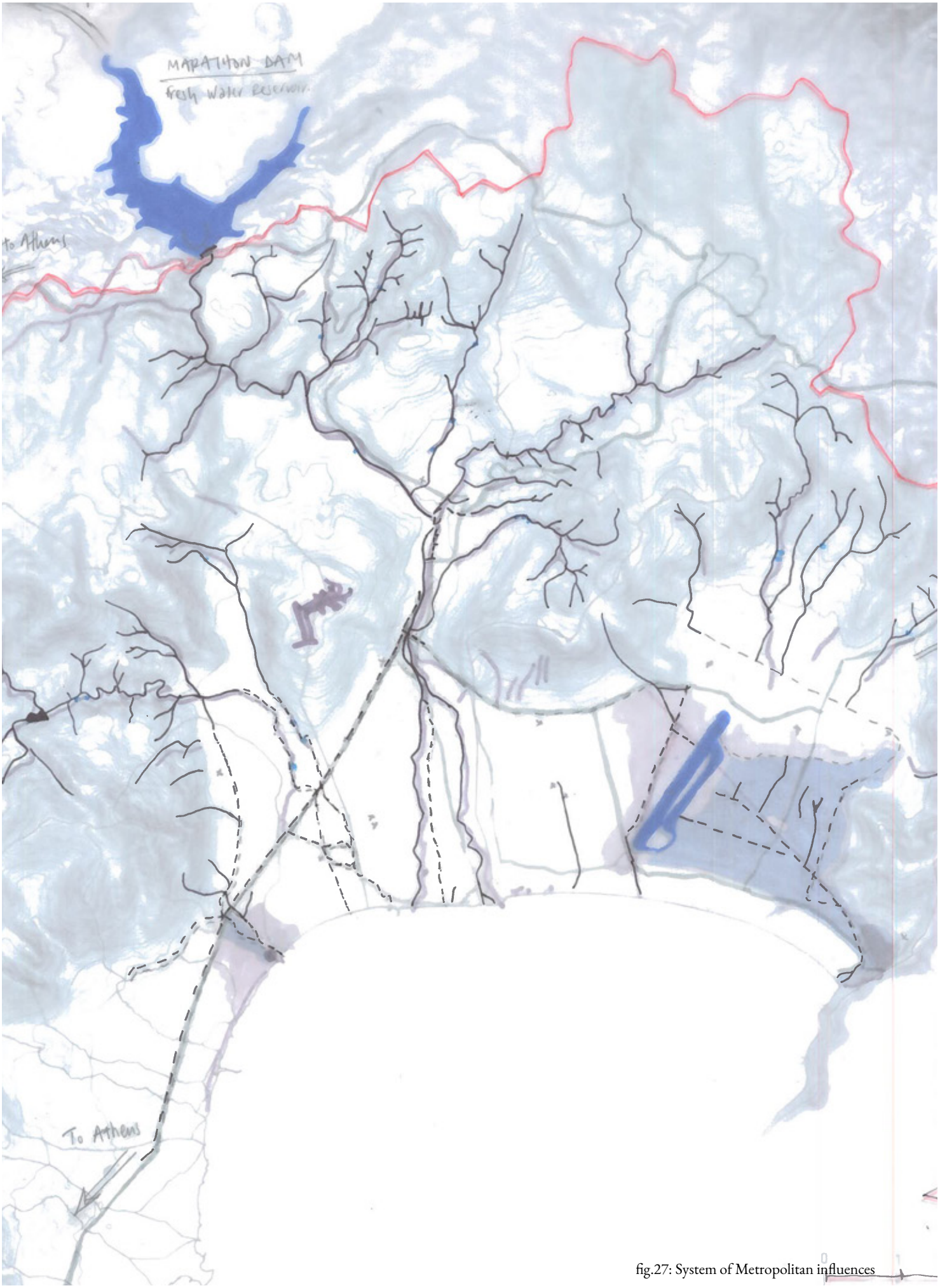


fig.27: System of Metropolitan influences

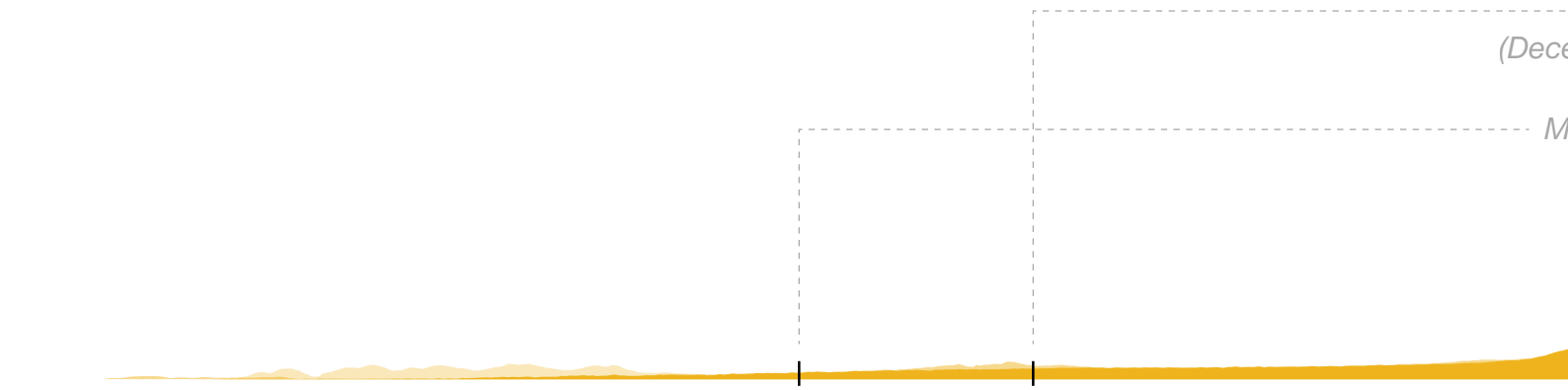
fig.28: Local land management

4.3 Misalignments

Risk in Marathon has evolved through land alterations planned, designed and implemented across different scales and uncoordinated stakeholders. The findings from the multi-temporal analysis of the territory led the research toward an investigation of how multiple socioenvironmental systems operate in the territory and in which scale they do so. Their meeting points and misalignments provide an overview of Marathon's disaster risk as a process and the different socioenvironmental elements that shape it.

These systems are comprised of elements that organise the territory and have power and influence over each other that propel processes amplifying, stabilising or reducing risk parameters. In the graduation studio Transitional Territories, we investigated the territorial organisation of our case-studies through Material Ecologies, a catalogue of a series of key processes that play significant role in the territory.

The understanding of territorial organisation as an active force of production shaped through natural and collective goods, institutional and regulatory infrastructure, as well as cultures of production and reproduction relates closely the dynamic notion of risk as a process. A territory and its equivalent risks are not fixed states but processes of socioenvironmental systems. (Serra-Llobet et al., 2023; Swyngedouw, 1992) For the purpose of this study three processes in the territory were investigated to analyse the territorial elements of the operating system and the gaps and misalignments between actors and practices.



(a) groundwater and governance

Acknowledging the spatiotemporal interrelation between the construction of the Marathon Dam, mass agricultural produce and the intensive abstraction of groundwater in the Marathon plain, the first investigation examined the current operationalisation of water intake points. This depicted the influence of water abstraction on the water table and the intensification of drought, while highlighting how large-scale administrative bodies regulate the distribution and operation of intake points based on small scale parcels. ('Διαχείριση Υδατικών Πόρων', n.d.; 'Οδηγός Έκδοσης Πιστοποιητικού Εγγραφής στο Εθνικό Μητρώο Σημείων Υδροληψίας (Ε.Μ.Σ.Υ.)', n.d.) This significant gap between scales in decision-making and local practices results in extractive land management that exceeds the capacities of the natural system.

Involved Stakeholders:

-Ministry of Environment and Energy

-Decentralised Administration of Attica

-Landowners

-Farmer Operators

-Aquifer

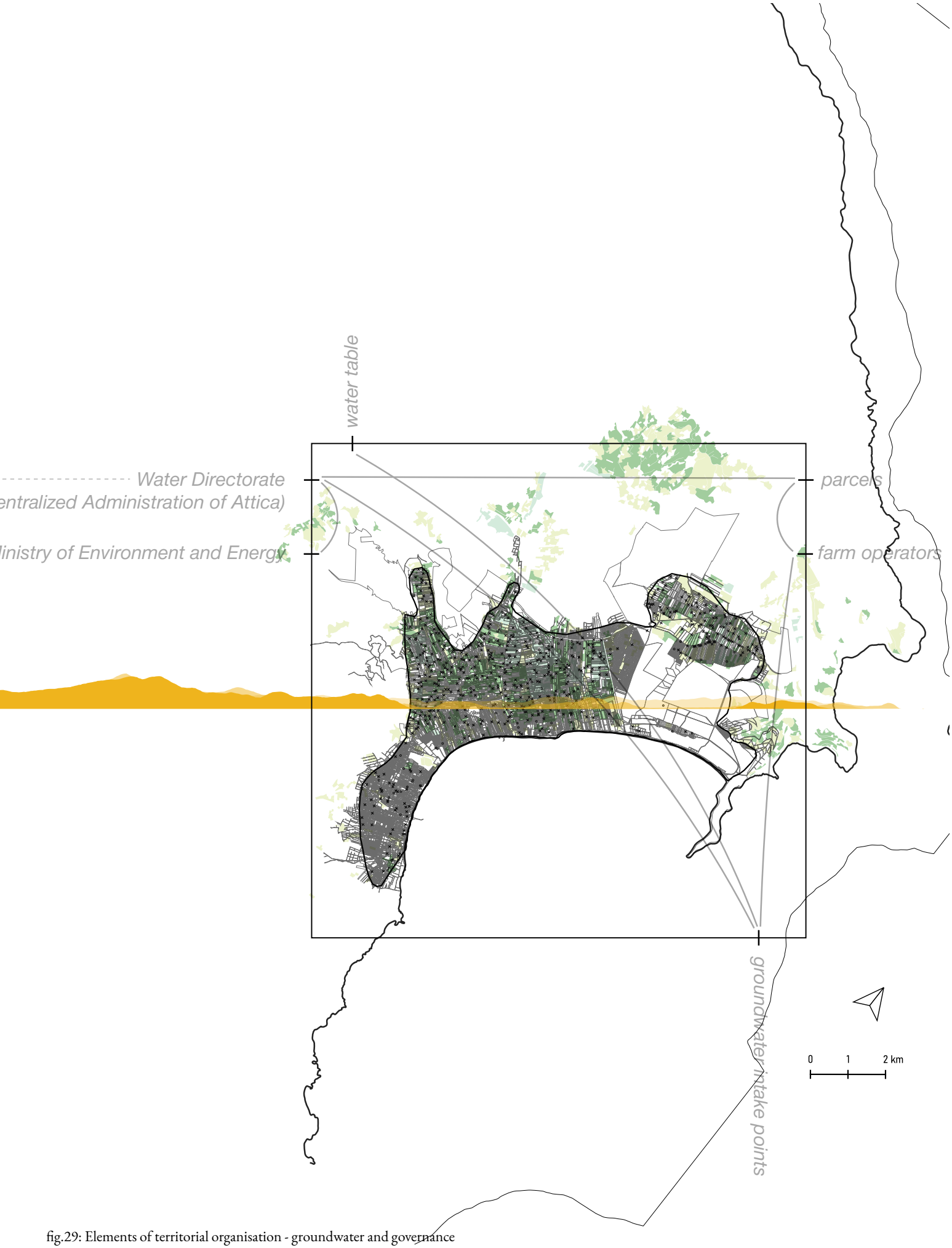


fig.29: Elements of territorial organisation - groundwater and governance

(b) settlement formation

The history informed analysis indicated a trade-off between agricultural land and residential building constructions in Marathon during the 20th and 21st century. Additionally, it relates to land degradation and underperformance of natural bodies in the territory.(Gambella, 2021; Imbrenda et al., 2021) The second investigation explored how settlements and impervious surfaces are formed in zones of the territory that are not included in city plans. This exploration revealed how central decision-making, and policies define the criteria for how soil can be altered based on land-use, while the implementation of this lies on the municipality. This indicates how local perception on the role of land slowly shape the territory and interfere with soil and its capacities to process natural phenomena. (Vassi et al., 2022)

Involved Stakeholders:

- Government
- Municipality of Marathon
- Residents
- Businesses
- Soil

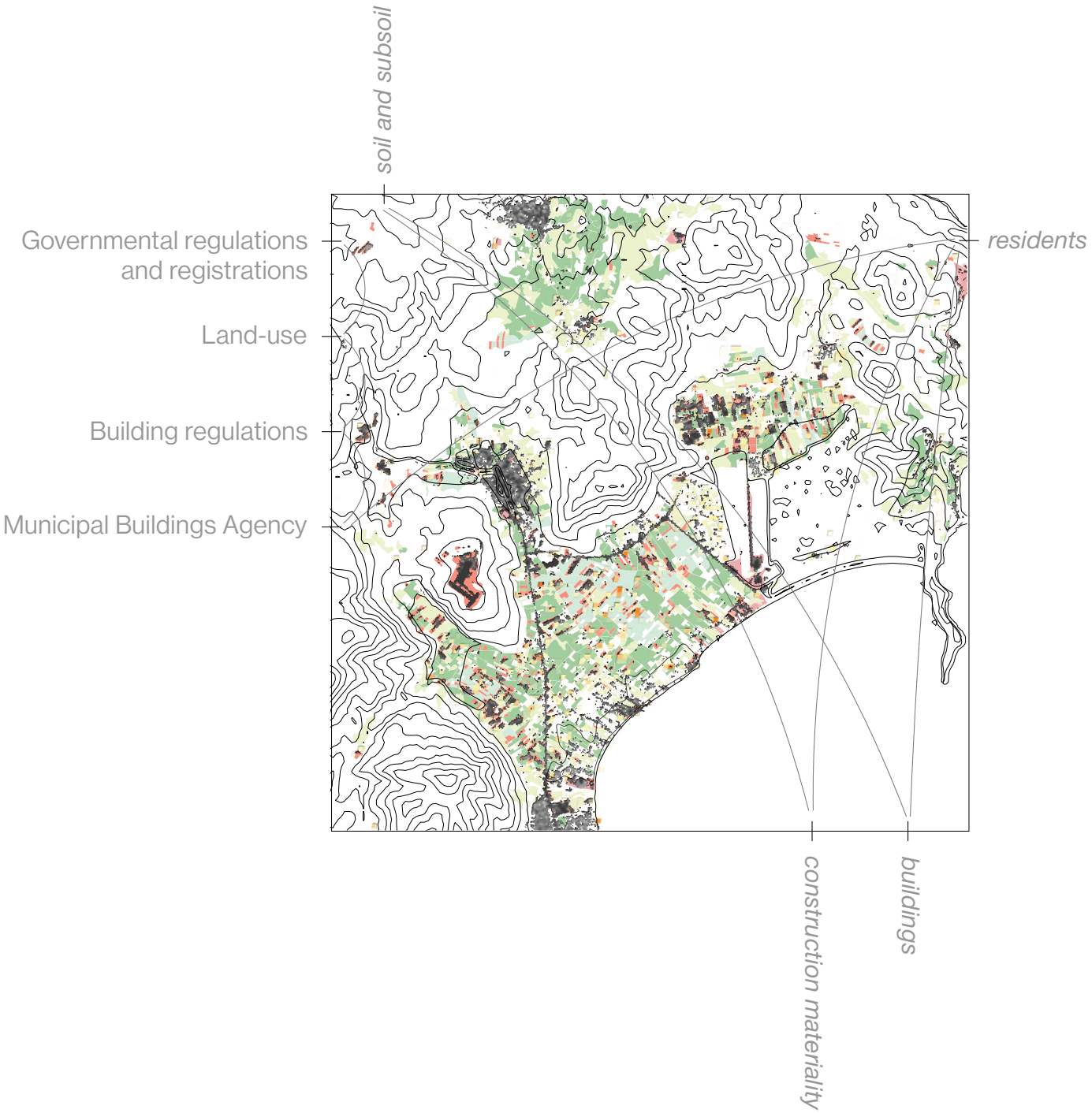


fig.30: Elements of territorial organisation - settlement formation

(b) infrastructure development and public works

Mobility infrastructure development, alterations of hydrological pathways and water management are interrelated processes that took place in Marathon and influenced its evolution of risk. (Diakakis, 2010, 2012) The third investigation regarding elements of territorial organisation assesses the development of mobility infrastructure and stormwater drainage systems in Marathon. In territories without city plans, like Marathon, infrastructure development is guided by central administrative bodies that set regulatory frameworks for the Metropolitan area. These plans are then carried out by the municipality in collaboration with engineering firms. This process develops infrastructure at a rapid pace and often with negligence over the local hydrogeomorphology and natural needs.

Involved Stakeholders:

- **Ministry of Energy**
- **Ministry of Infrastructure and Transport**
- **Decentralised Administration of Attica**
- **Municipality of Marathon**
- **Engineering Firms**
- **Soil**

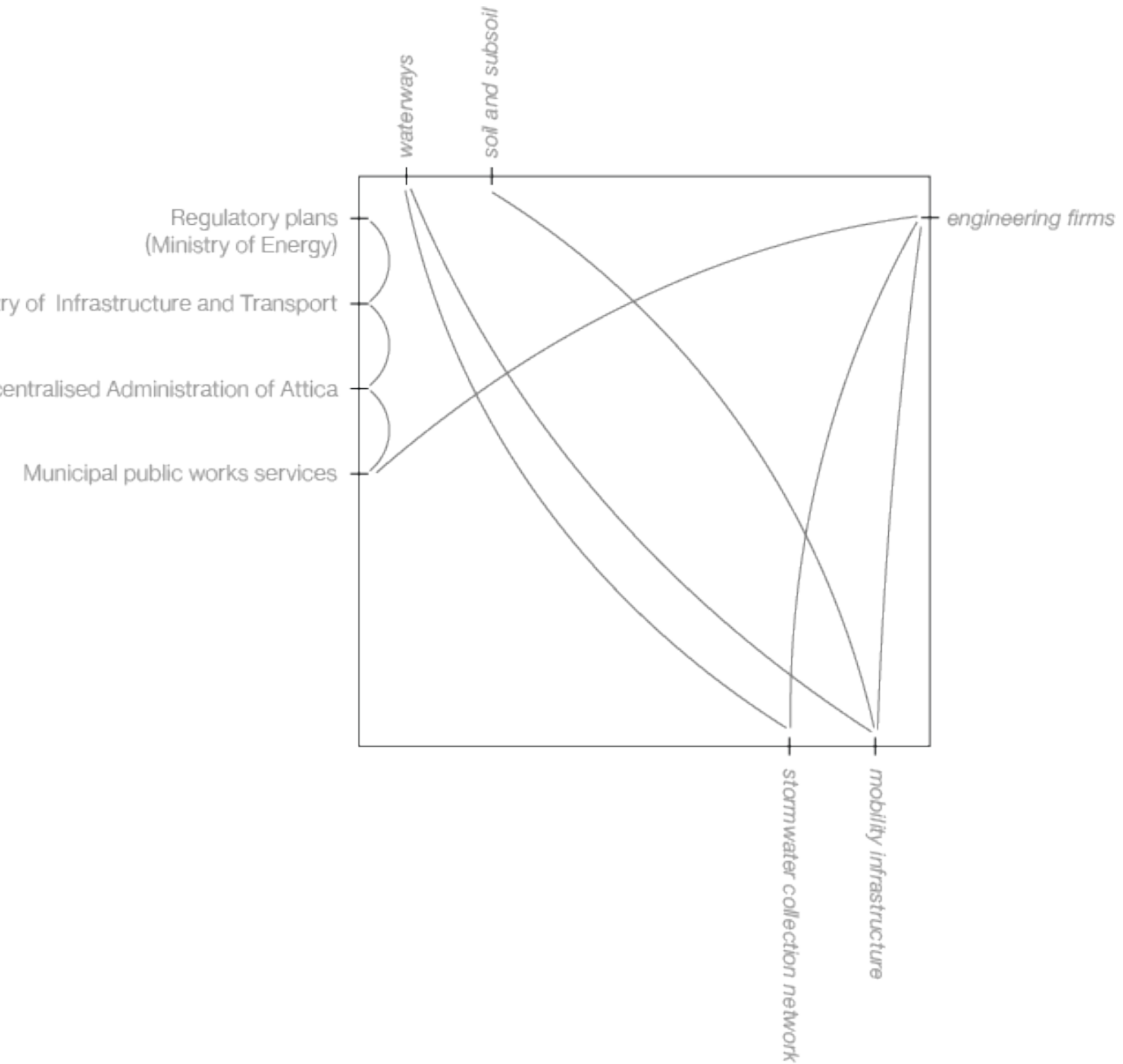


fig.31: Elements of territorial organisation - infrastructure development and public works

When overlapping the different investigations, the segregation of the local administrative agencies becomes prominent. However, the public and private structures that are established under their jurisdiction are highly interrelated with natural goods and therefore with hydrological processes. Additionally, a disconnect between cultures of production and reproduction with natural goods indicates the lack of acknowledgment of the interrelation between human labor and care with nature.

fig.32: Elements of territorial organisation - links and gaps between elements

4.3 Risk through Misalignments

Misalignments between the grey infrastructure for water management designed by metropolitan drivers and the natural system that has faced erasure over the years leads to the accumulation of risk and higher pressure in the areas between the two systems.

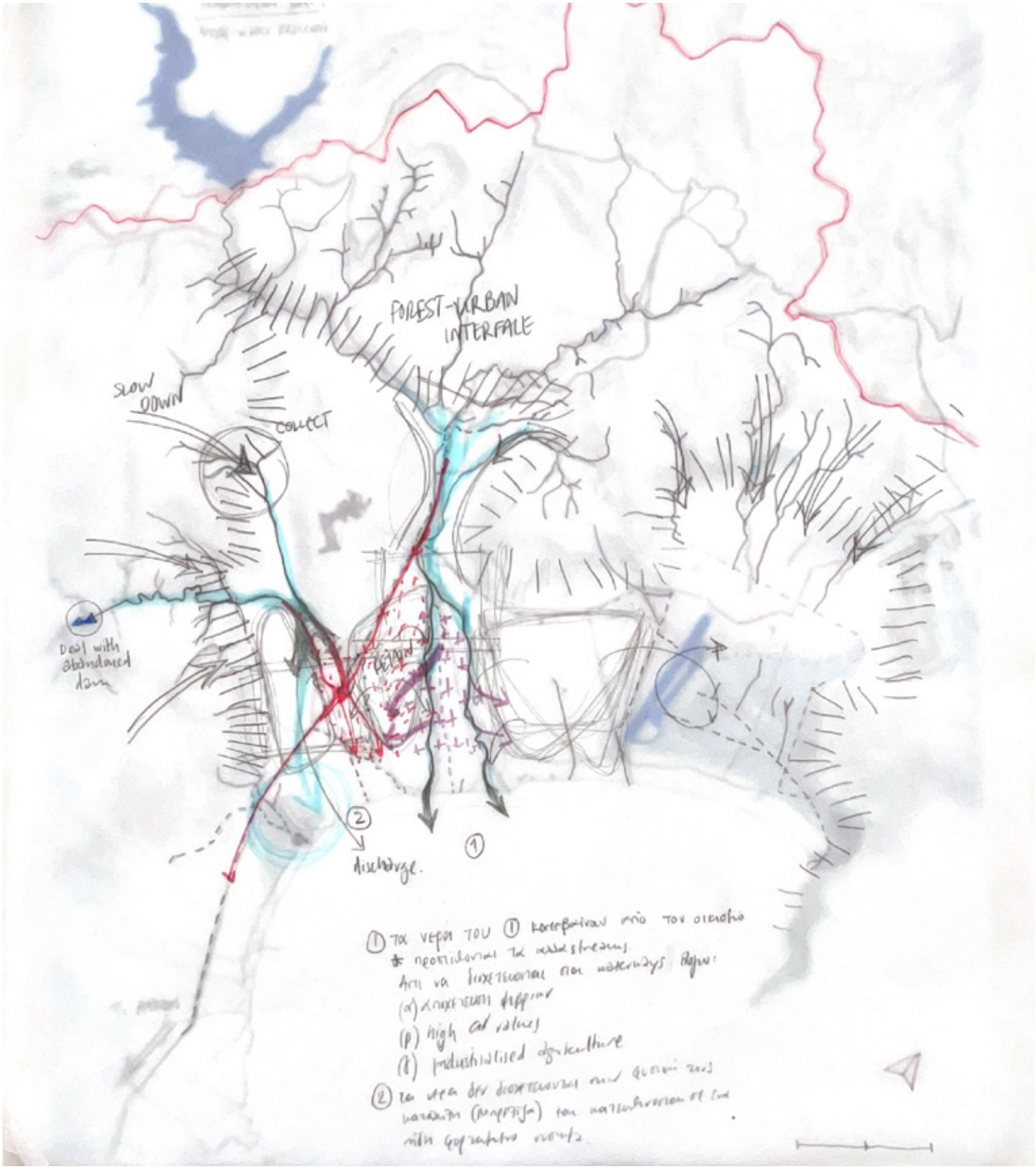


fig.33: Risk through misalignments - sketch

Creative destruction, care and transformability

5.1 Research aim

This research aims to (1) introduce process-based risk in spatial planning and design, as well as to (2) investigate (a) how spatial planning can influence practices and acts of care to build transformative capacity, promote convergence and reorganise territories for disaster-resilient futures. Additionally, it aims to (b) explore design pathways that emerge from engagement driven transformations on a local scale.

These aims contribute to (1) incentivising and practicing integrated risk management with a long-term perspective and (2) developing risk reduction strategies, to create transformations that foster caring interactions between all beings, while protecting and supporting local communities in peri-urban zones of the Mediterranean.

5.2 Conceptual framework

The research develops under three pillars that build transformative capacity through an actor-relational approach.

“Caring for” includes the acknowledgement of interdependencies and the formation of encounters. “Convergence” addresses the alignment of actors across scales and represents a stage of creative destruction and reorganisation. “Taking care of” describes the acts and practices of care that guide land management to interrelate hazards, process vulnerabilities, and stabilise exposure.

In this cycle, adaptive learning, multi-level governance, and attentive participation play key roles in the sequence between the three pillars.

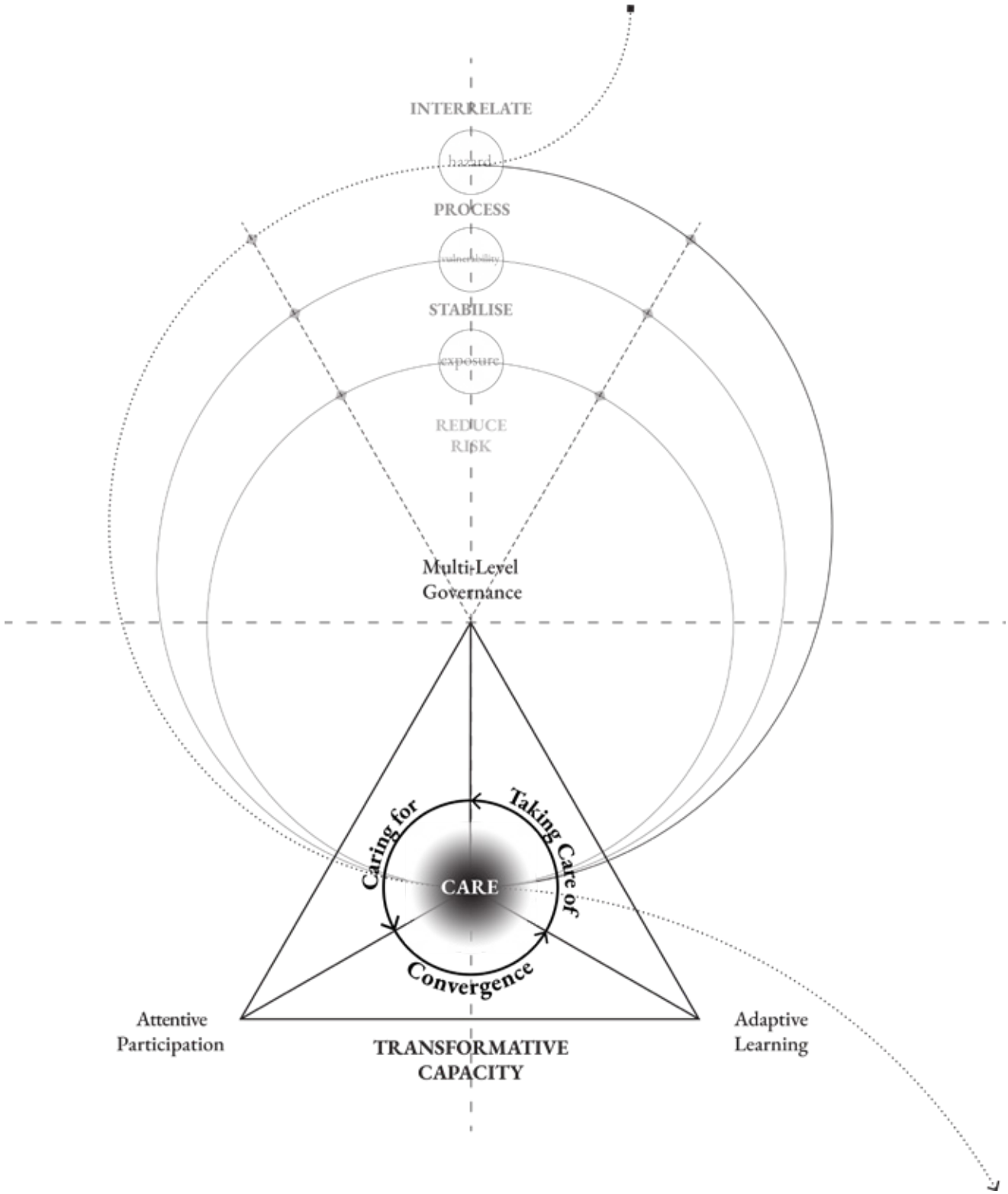


fig.34: Conceptual framework

Caring for

6.1 Values in process

A systematic investigation of natural and socially constructed parameters in the territory is conducted to identify the spatial elements that form risk and their role within hazard interrelations. The research acknowledges these parameters as risk-based values that organise the natural processes in the territory. Their spatial relation indicates qualities and opportunities for better alignment between social and environmental systems.

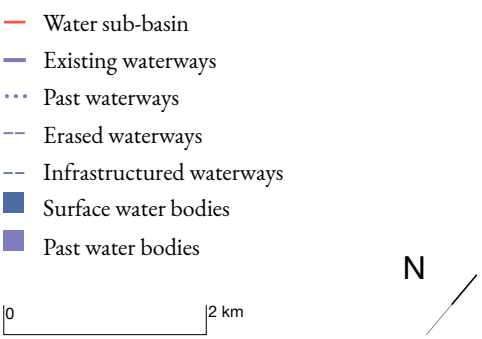
These values organised in a sequence from surface to subsurface, reflecting the cascading processes between fires and floods, along with their underlying triggers, extreme heat and drought.

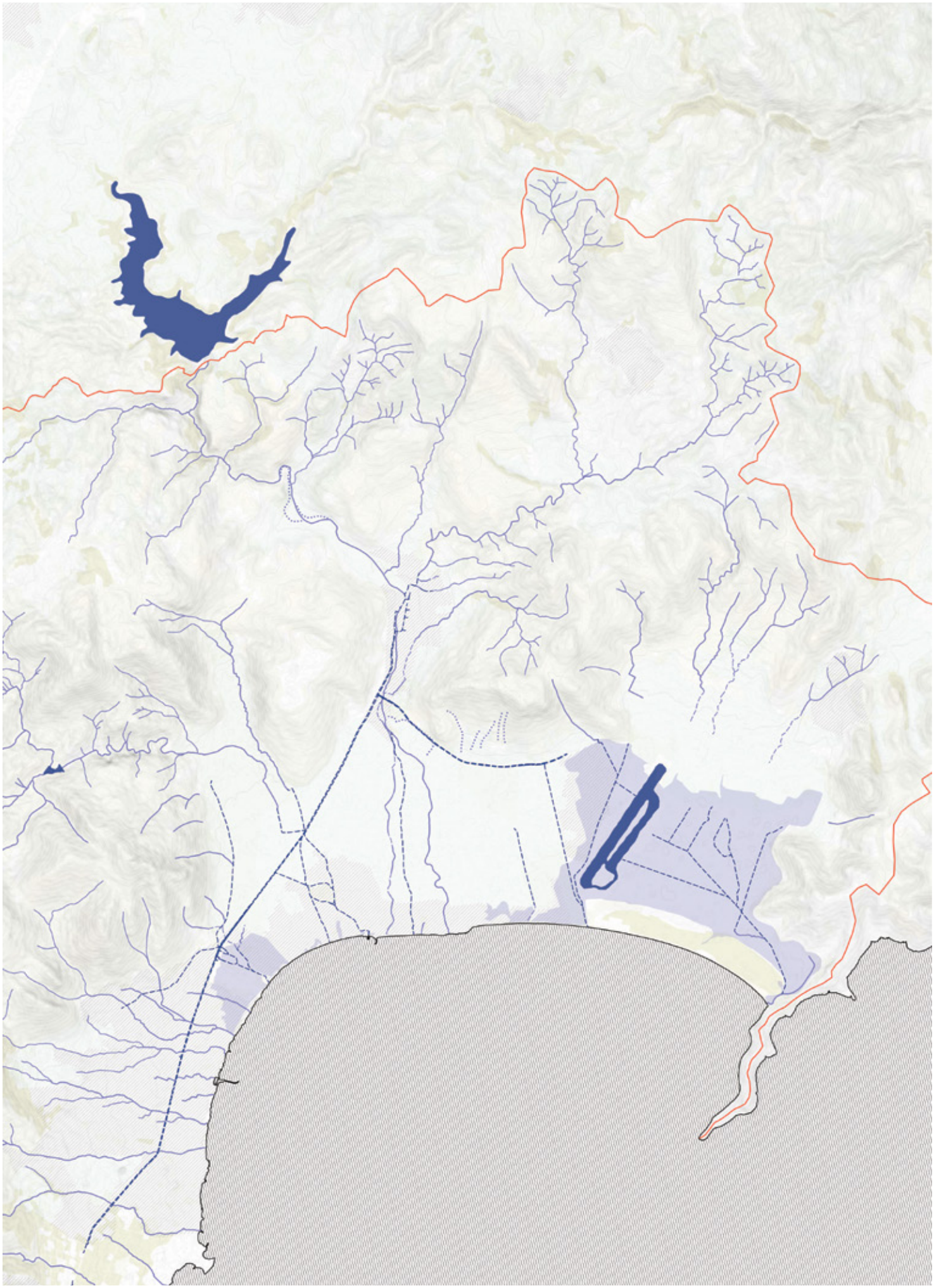
Hydrology

The hydrological network of the territory comprises, not solely the existing surface water bodies, but also the constructed water infrastructure, as well as the erased waterways and marshlands. The correlation of these elements highlights the memory of the land and the tendencies of its water, and assign characteristics to it that are being neglected in processes of local transformation. The value of the hydrological network in risk accumulation is significant as it shapes both the absorption capacity of the land and the speed and direction of water and sediment flow following extreme events of precipitation in fire exposed landscapes.

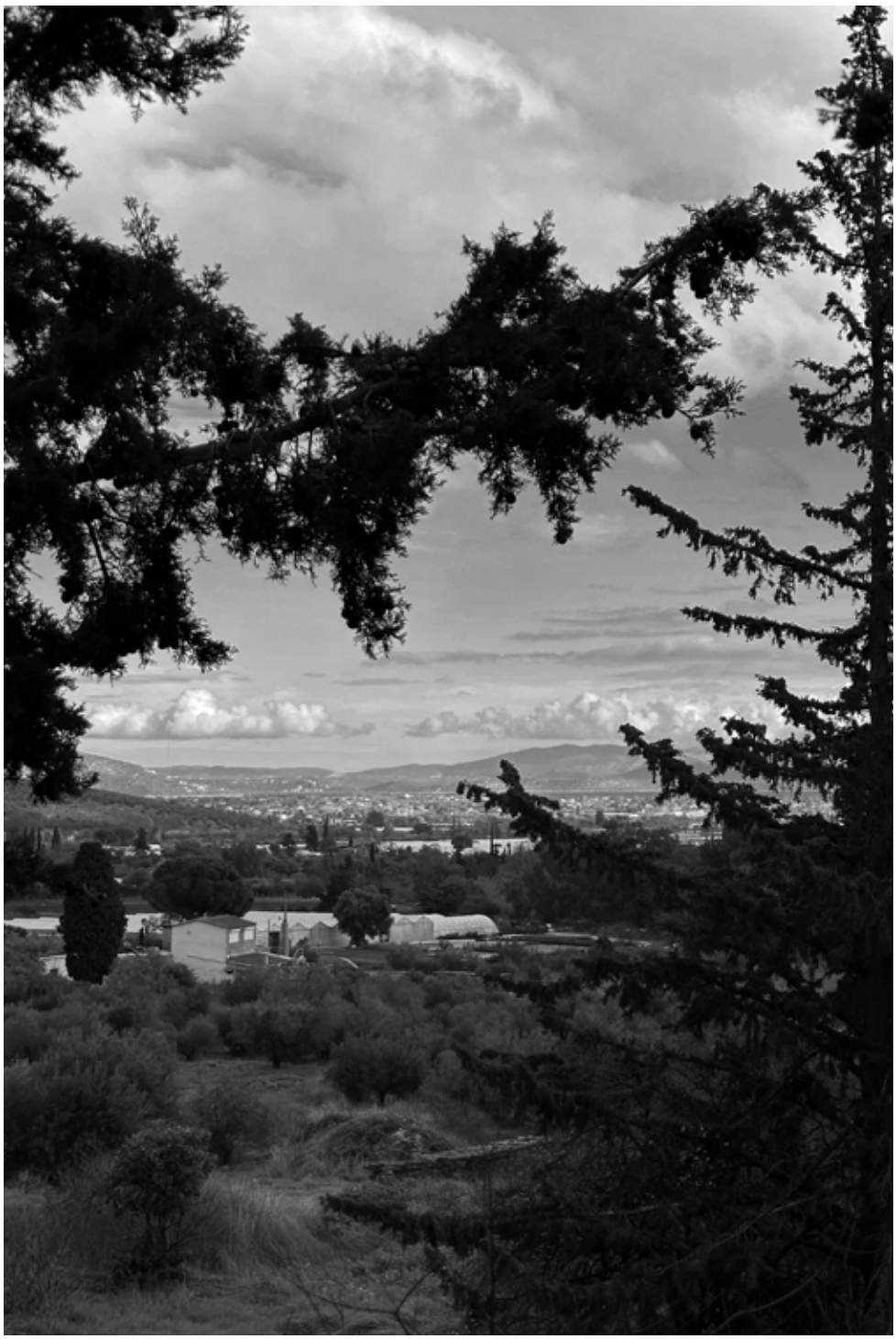
fig.35: "The big Marsh", Schinias, Greece (left)

fig.36: Hydrology: natural and "man-made" (right)





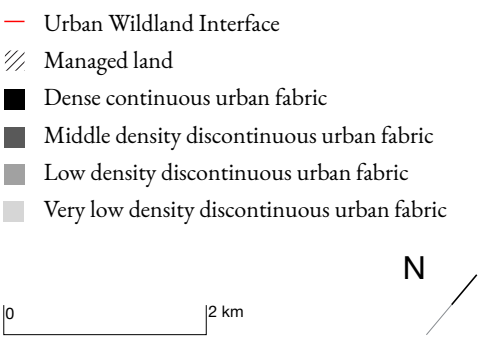
Land Management

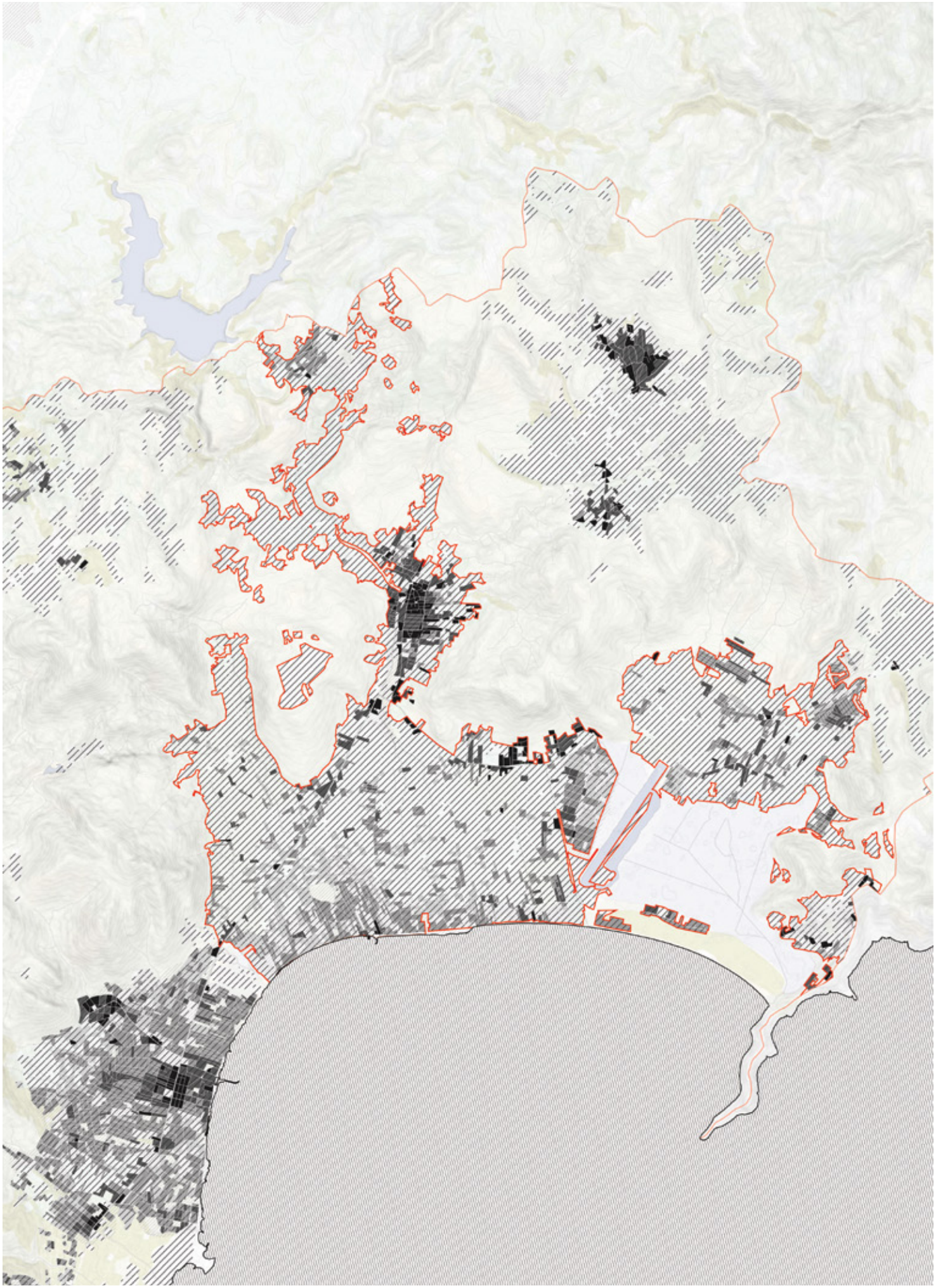


Land management is a critical value that organises natural processes in a territory as it directly alters environmental conditions. In the cascade between fires and floods land management reflects the indirect interaction of humans with wildland. The urban–wildland interface plays a decisive role in interconnected disaster risk, as it marks zones particularly vulnerable to fire outbreaks. Land management stands out as the most directly controllable parameter in fire hazards, offering a strategic point of intervention for preventing wildfire exposure.

fig.37: Urban-wildland interface, Marathon, Greece

fig.38: Local land management and the urban-wildland interface





Certain elements in the territory act as links or barriers within the landscape and the practices, and influence the behaviour of hazards and their probability in triggering cascading effects. These elements also influence how land-management is organised spatially and its opportunities to align better with natural processes. Parcelation, mobility infrastructure and impervious surfaces are examined as risk-based values because they guide flows and structure access. Understanding their role is essential for identifying how territorial organisation and materiality contribute to the organisation of natural processes in a territory.

Links - Barriers

Parcels define the limits of agency over land management and segment the landscape. As administrative and legal units, they often determine where and how development and land modification can occur. This morphology introduces barriers that interfere with ecological continuity and disrupt the natural organisation of processes such as water flow. However, parcelation can also reveal new spatial logics within the territory and, rather than simply segregating practices or natural processes, it can help align them more effectively.

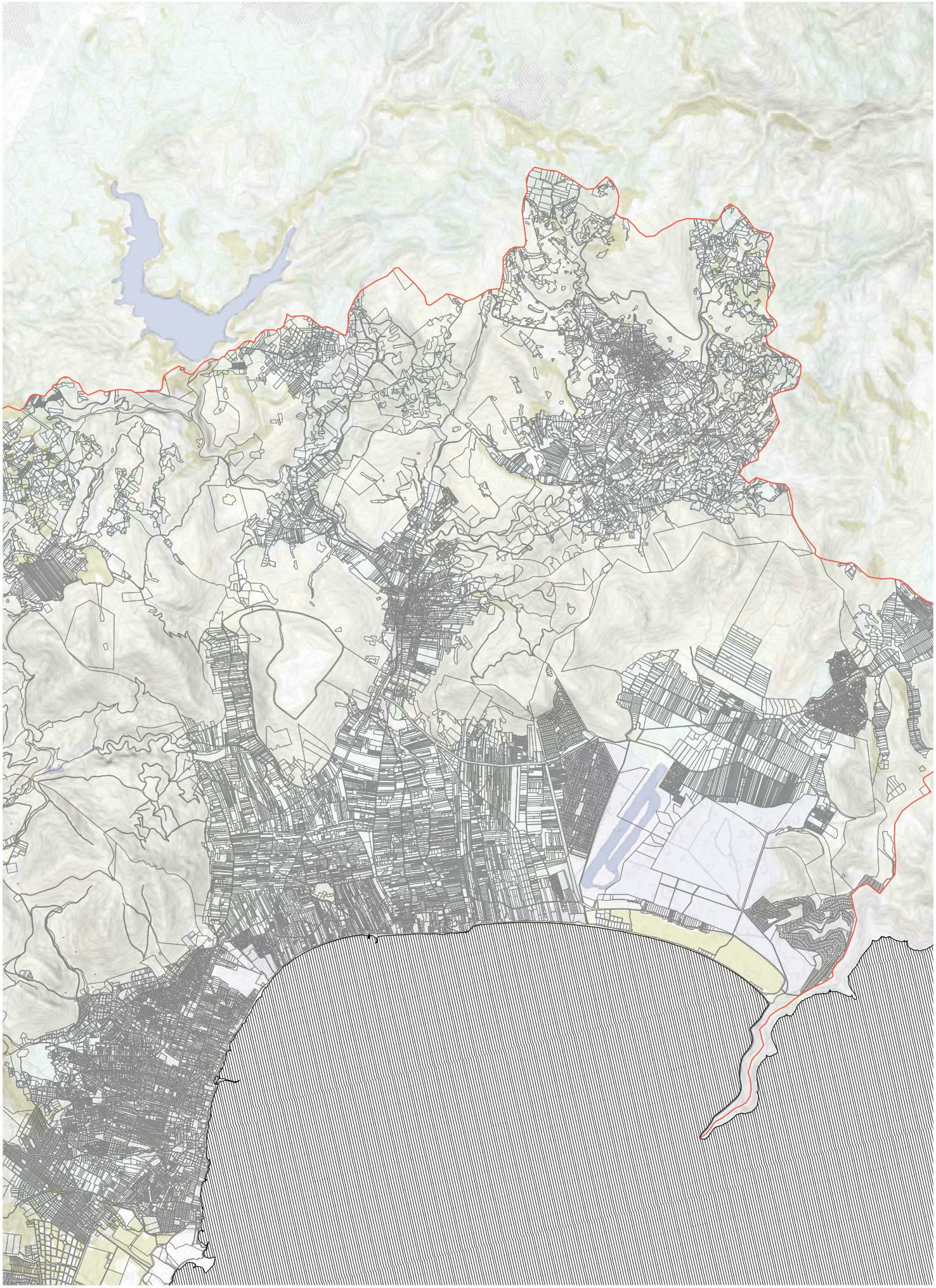
fig.41: Parcelation: defining land management and guiding water

fig.40: Links-Barriers, Parcelation

— Water sub-basin
— Parcels

N

0 2 km



Links - Barriers

Mobility infrastructure functions as a critical instrument of land management, guiding the spatial development of the territory and linking it to the metropolitan core. However, this infrastructure often acts as a barrier, disrupting natural water flow by channelling greywater and drainage along constructed paths that segregate water from its natural bodies. Yet, mobility infrastructure offers opportunities for encounters between people, practices and non-human entities, enabling a cultural understanding of the territory and its processes.

fig.43: Mobility infrastructure and constructed water paths

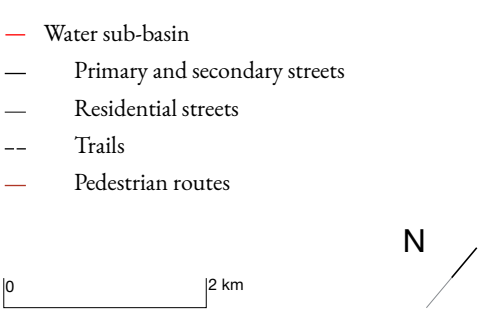
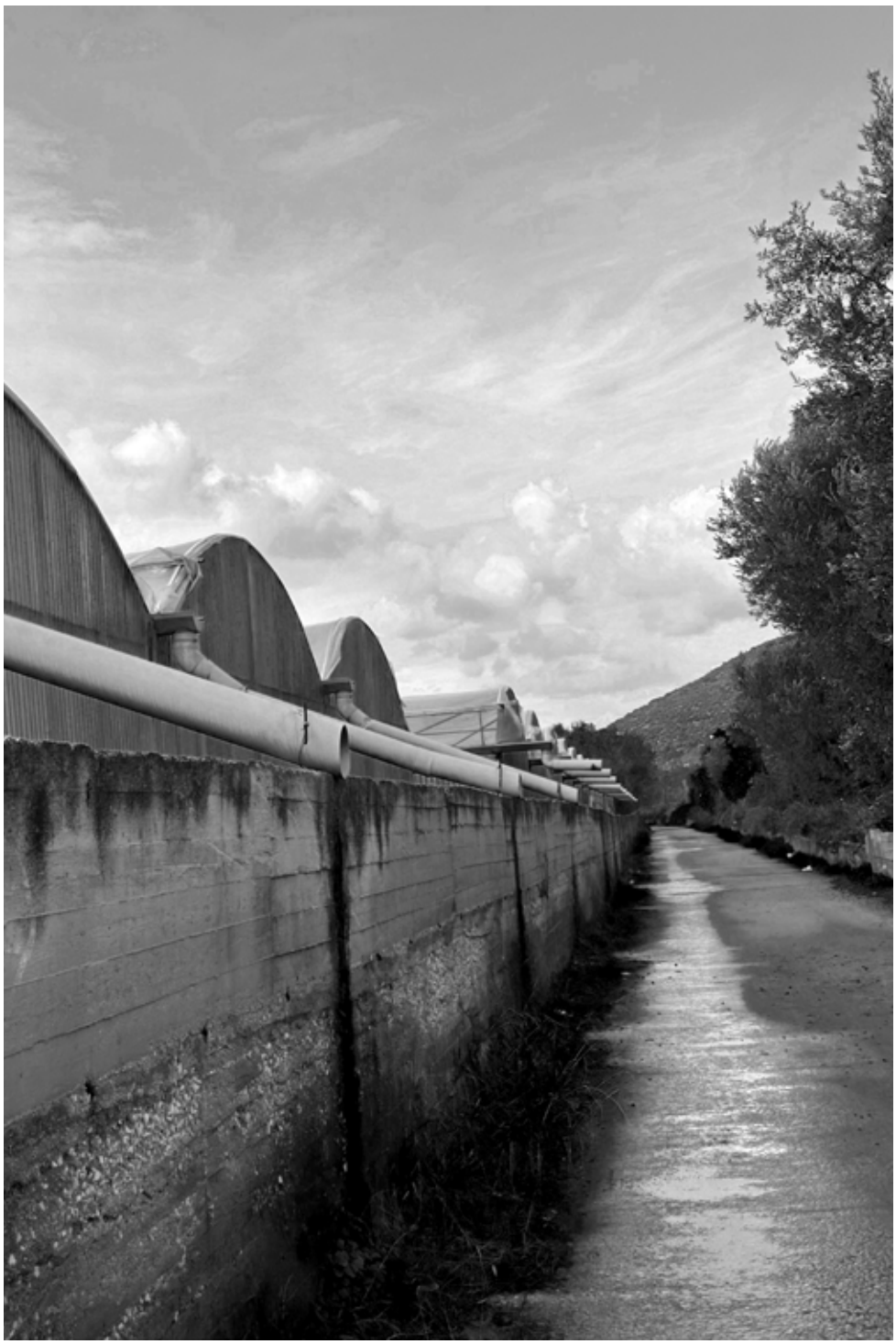


fig.42: Links-Barries, mobility infrastructure

Links - Barriers



Impervious surfaces disrupt the hydrological cycle by preventing rainstorm water from infiltrating in the ground, increasing surface run-off and intensifying the risk of flooding and erosion. By segregating surface water from subsurface bodies that naturally absorb and filter it, impervious surfaces interrupt processes crucial to extreme precipitation events. Additionally, this disruption reduces groundwater recharge, exacerbating drought conditions by limiting the availability of stored water. Understanding their distribution and impact is essential to addressing how the built environment influences water movement and contributes to cascading hazards.

fig.44: Industrial agriculture water discharge, Marathon, Greece

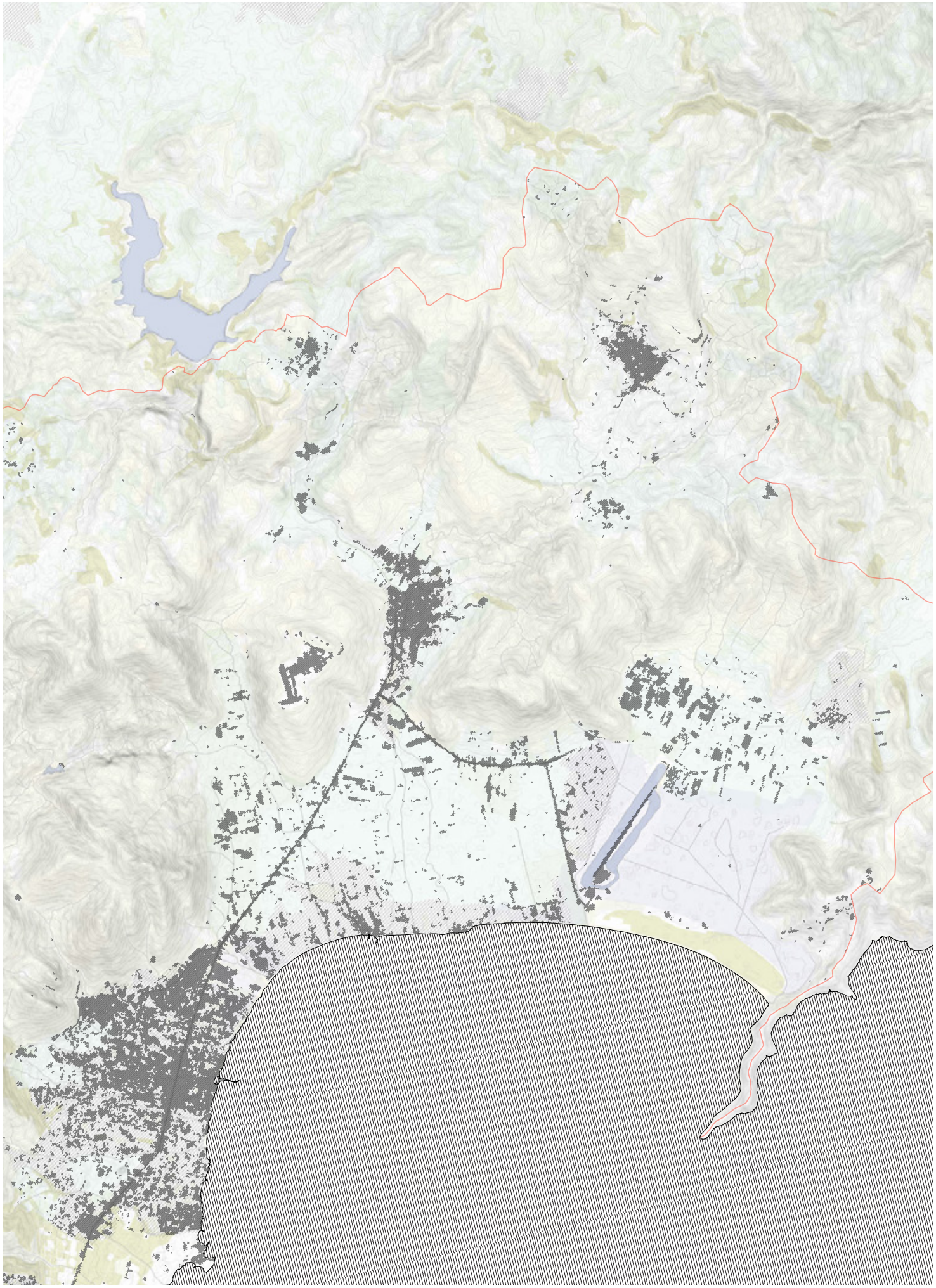
fig.45: Links-Barriers, impervious surfaces

— Water sub-basin

■ Dense continuous urban fabric

N

0 2 km

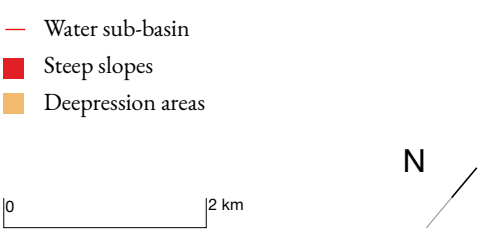


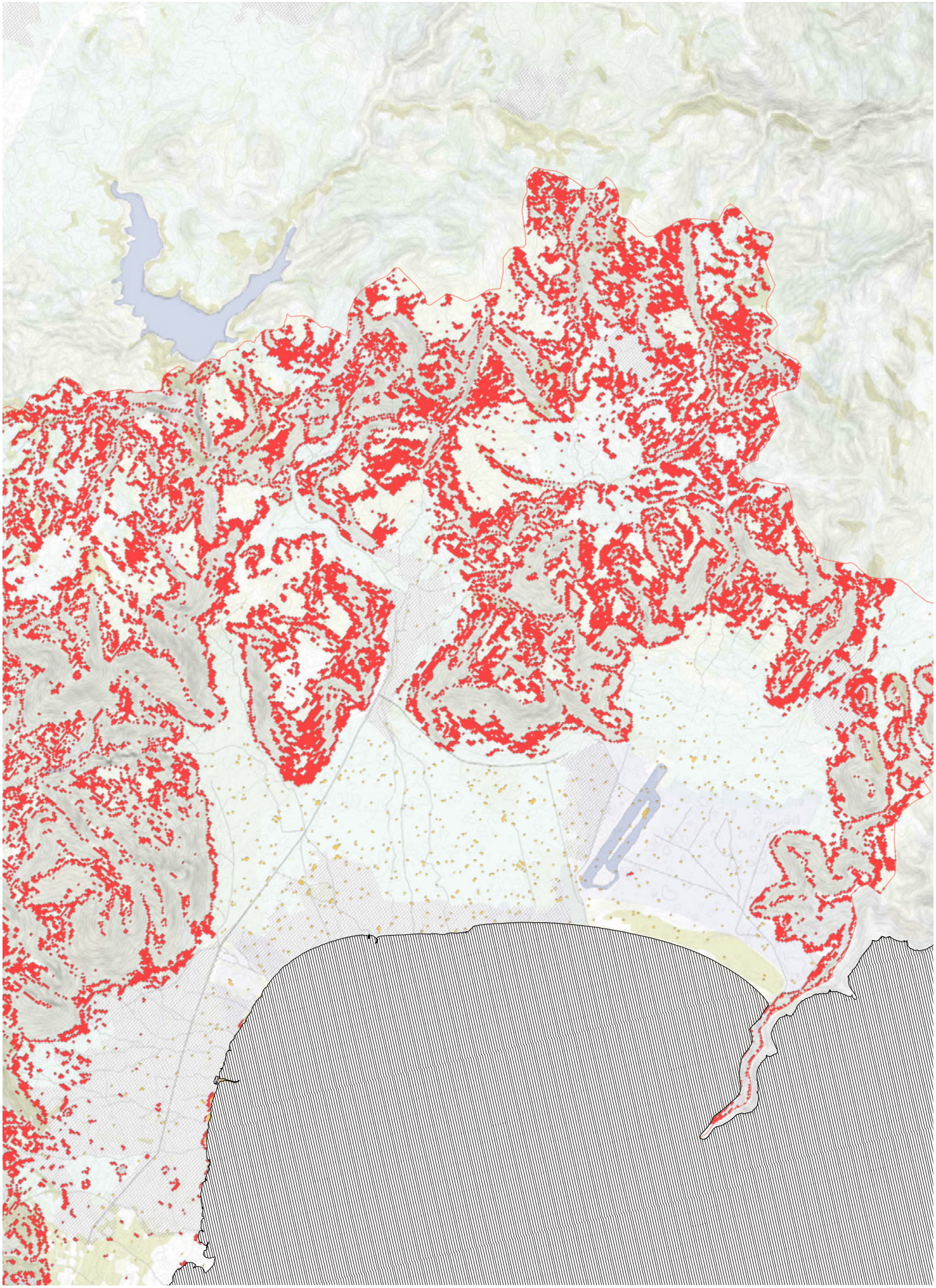
Geomorphology

Slope as a risk-based value reveals both vulnerabilities and opportunities for sustainable management. Steep slopes that have been exposed to fires are highly susceptible to debris flows and floods, as fire can cause soil to become water-repellent, greatly increasing runoff. Areas with steep slopes indicate where urgent soil regenerative and stabilising actions need to take place. In contrast, lower-lying depression areas naturally retain water, offering strategic sites for rainwater harvesting. Utilising these zones can help reduce groundwater extraction, supporting a more balanced hydrological cycle and promoting sustainable water use throughout the territory.

fig.46: Post-fire slope stabilisation with logs, Marathon, Greece

fig.47: Geomorphology, slopes



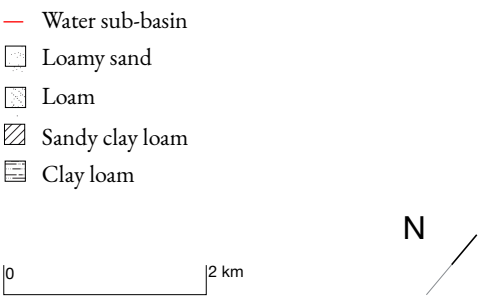


Geomorphology

Soil directly influences water infiltration capacity, vegetation type and land productivity. Different soil types support distinct plant communities, which in turn affect the stability and health of the landscape. Soils with high infiltration rates help regulate the hydrological cycle by allowing water to penetrate and recharge groundwater, while compacted or degraded soils increase surface runoff and flood risk. Additionally, soil characteristics determine the land's ability to retain nutrients and support agricultural production, influencing both ecosystem health and human livelihoods. Understanding soil distribution is essential for identifying areas prone to water stress and for guiding land management practices that align the hydrological cycle with societal processes.

fig.48: Coastal waterlogging

fig.49: Geomorphology, soil

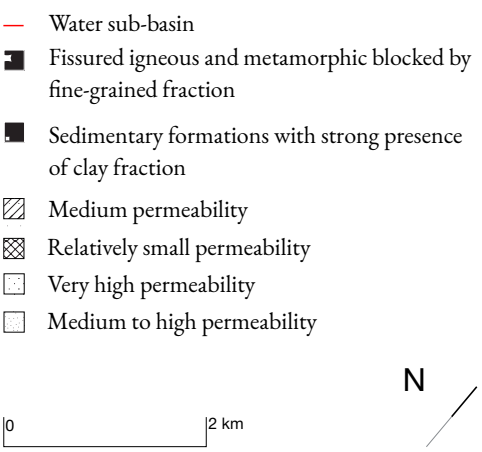


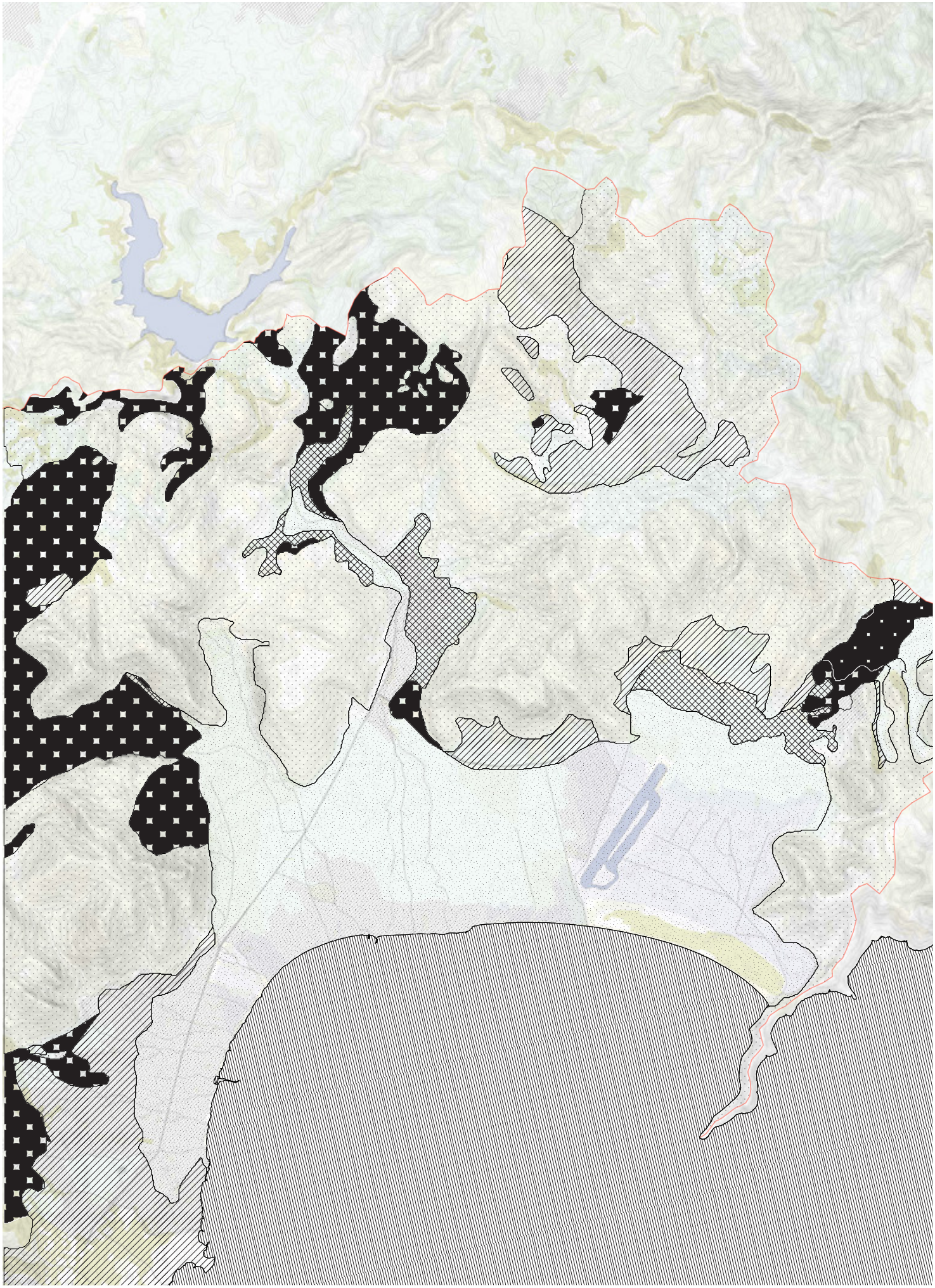
Geomorphology

Subsoil texture and composition directly influence how water infiltrates and moves through the ground. Different types of subsoil indicate where deep-rooted vegetation can thrive, supporting groundwater recharge by reaching deeper water reserves. This helps the territory become more resilient to drought by maintaining moisture levels, while also reducing flood risk by lowering surface runoff. Understanding subsoil characteristics is essential for guiding decisions on planting, land use, and water management. It reveals opportunities to better align natural processes with land management.

fig.51: River naked to the eye, Marathon, Greece

fig.50: Geomorphology, hydrolithology - subsoil permeability

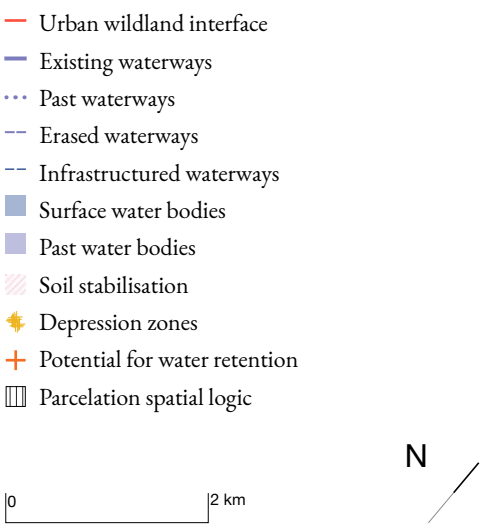


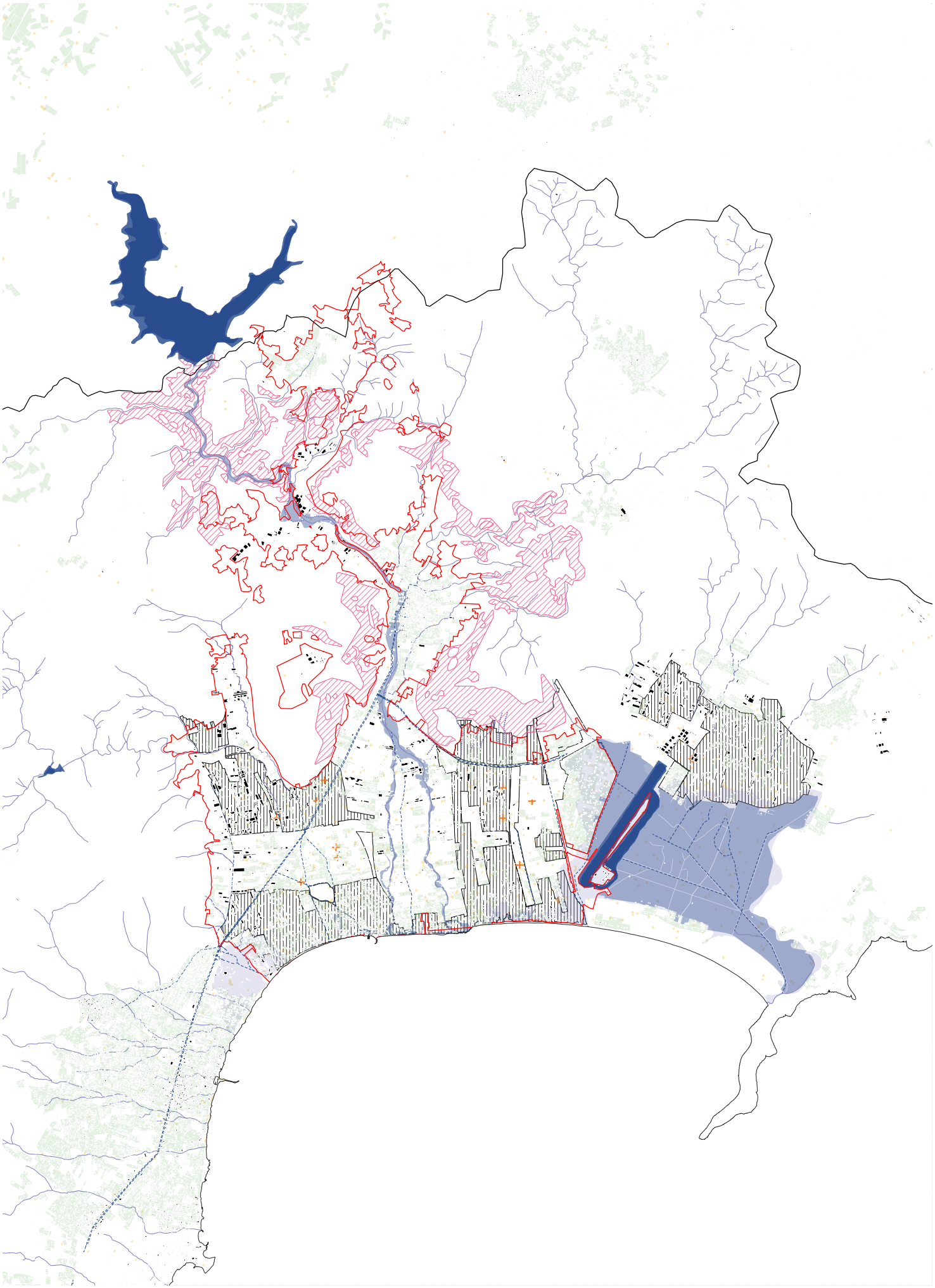


6.2 Value-Driven Territorial Reinterpretation

The spatial correlation of risk-based values, along with their interactions with the hydrological cycle and seasonal climatic conditions, provides strategic direction for development pathways across different parts of the catchment. These directions inform how caring interrelations can be formed in the local socioenvironmental context to reduce disturbances in natural processes and stabilise exposure. The reinterpretation of the territory sets contextualised goals and priorities for specific areas and therefore guides decision-making for local transformations.

fig.52: Risk-based value-driven reinterpretation





Taking Care of

7.1 Projections

A series of projective drawings, using the method of maximisation, demonstrates how aligning local land management with situated risk-based values transforms the community into the agent of change toward disaster-resilience. The scale at which natural processes operate in a catchment contradict the scale of local land management. Therefore, attentive practices and acts of care need to coordinate and synergise for the local land management to operate in sync with the system of the whole catchment.

These projections are developed sectional drawings across the catchment to explore the local synergies that can restore an equilibrium with the catchment. Actors, their roles and their interrelations are identified to address how can such an imaginary trajectory be enabled.

Two sections within the catchment are studied in greater depth, as they demonstrate a complexity that highlights actor interrelations. Sections (b) and (d) project key points where synergetic land uses and attentive practices begin to take form. These moments of overlap and coordination serve as critical sites for observing how mutual responsibility and care can be spatially organised.

section (a)

Dealing with stabilisation of slopes and landscape regeneration.

section (b)

Water sensitive and fire-smart settlements.

section (c)

Creating synergies across the territory and re-using water.

section (d)

Synergetic landscapes with aligned land-uses.

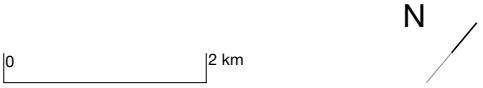
section (e)

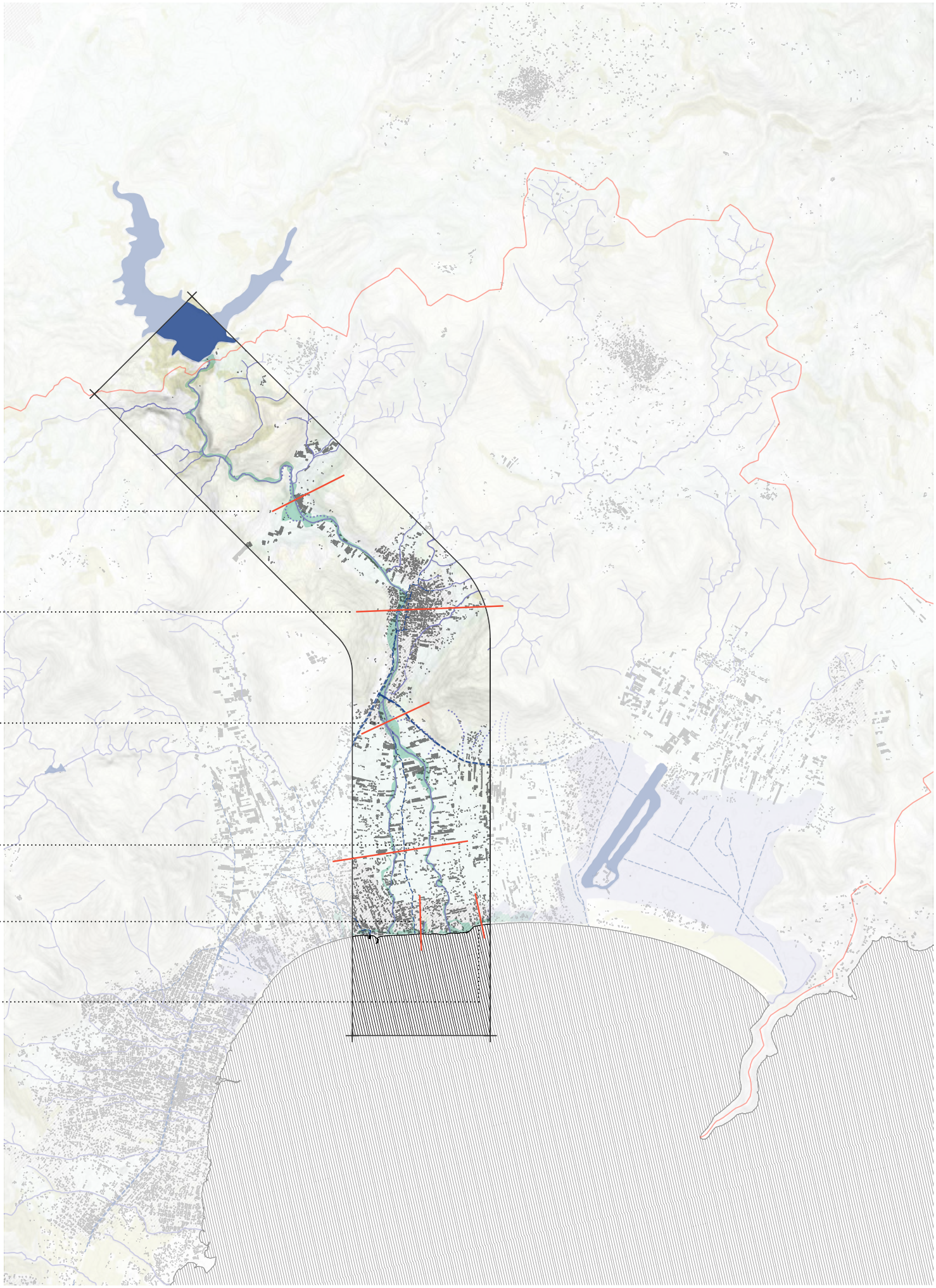
Dealing with water discharge and sea level rise: residential coastal front.

section (f)

Dealing with water discharge and sea level rise: commercial coastal front

fig.56: Focal area for projective investigation





Urban-Wildland Interface and Water Harvesting

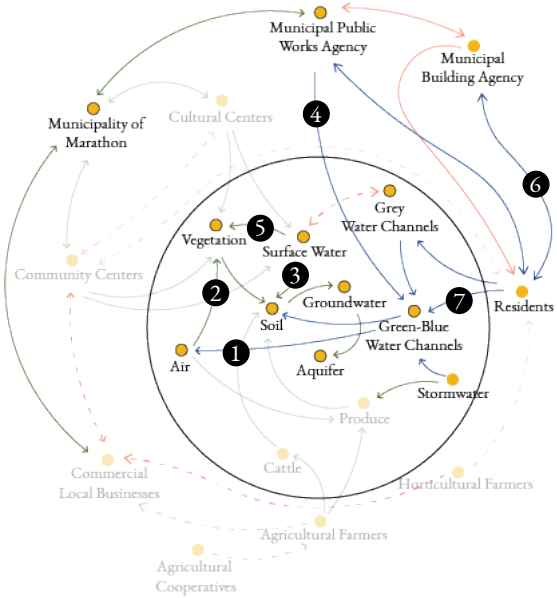


fig.57: Projected Actor Interelations

- Urban water infrastructure systems
- Encounters
- Communications and regulation
- Synergies

This projection explores how the employment of fire-smart design principles at the plot level can reduce exposure to fires. These principles are integrated with water harvesting techniques, with rainstorm water becoming either a community resource or a private unit for reuse. The projection describes the role of local residents as actors who monitor and regulate the trigger factors of disasters at the scale of their individual property and in relation to public infrastructure.

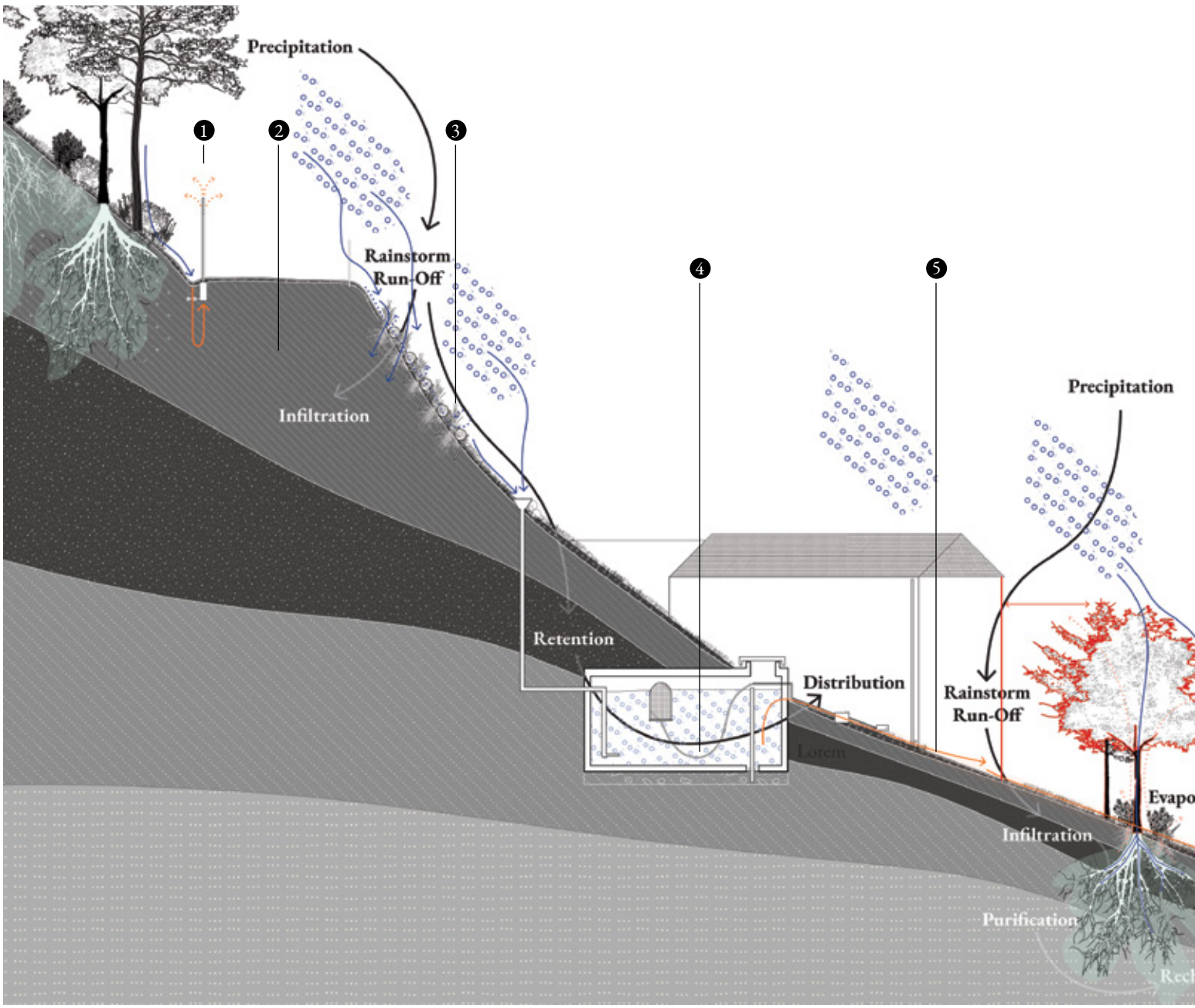


fig.58: Civic infrastructure, civic action: the garden as a line of defense

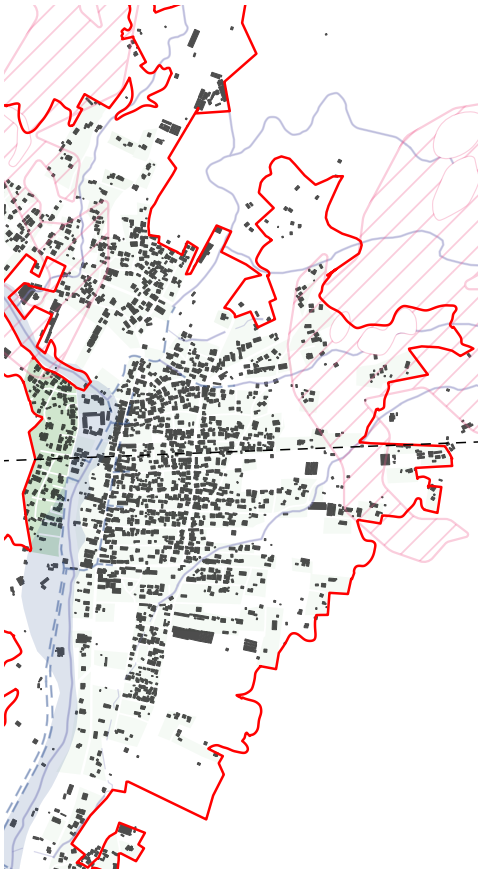
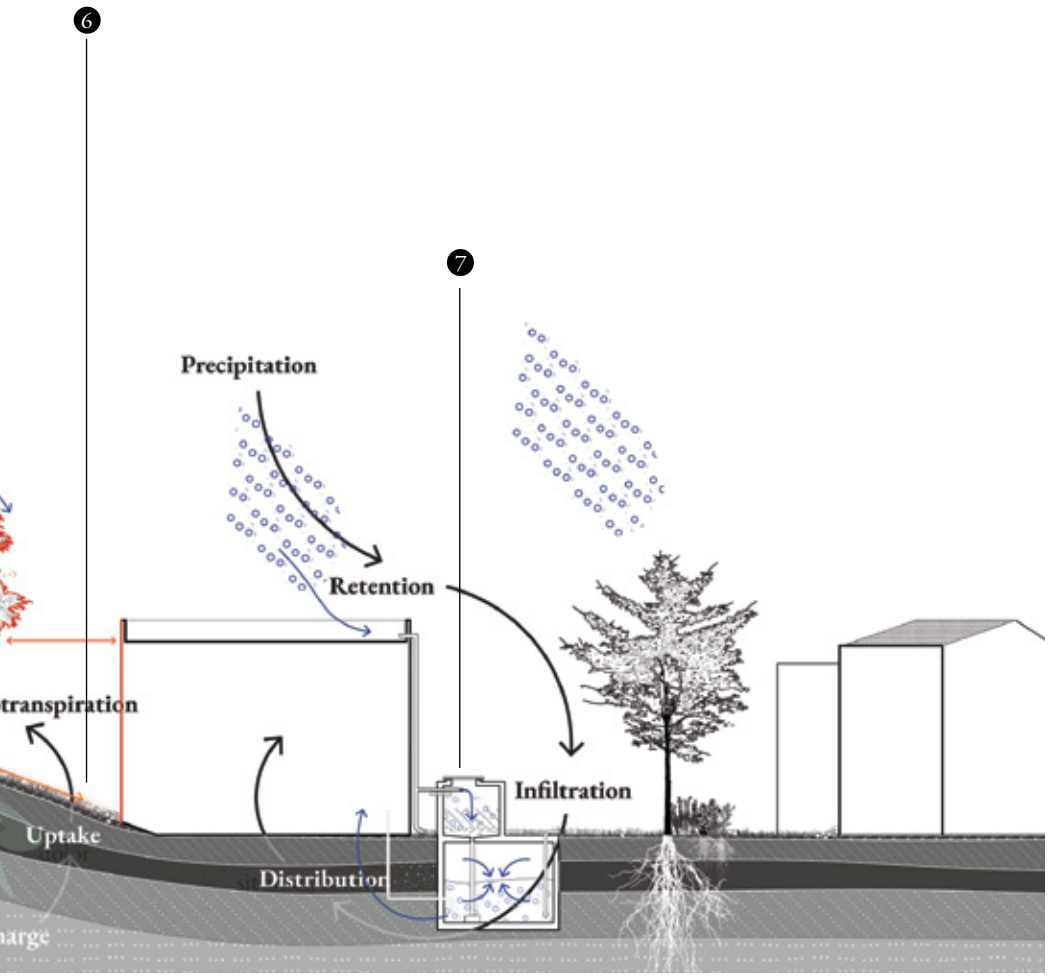


fig.59: Corresponding risk-based values

1. Mist deployment
2. Firebreak
3. Vetiver system
4. Cistern
5. Emergency wet downs
6. Fire-smart landscaping
7. Rainstorm water re-use



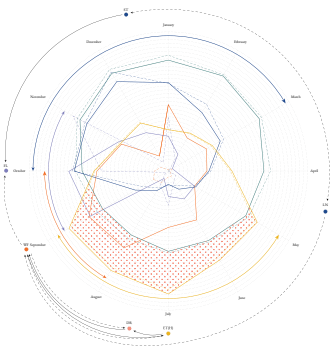


fig.60: Projected interface between wildland and settlements

Mist
Water flow (EH)
Water flow (DR)
Fire-smart principles
Rainstorm water flow

Organic matter
Sandy clay loam
Clay loam
Sandy loam
Marble - limestone

Rainstorm water
Water level
Infiltration
Recharge
Wetting down
Fire

Stream Regeneration and Urban Water Infrastructure

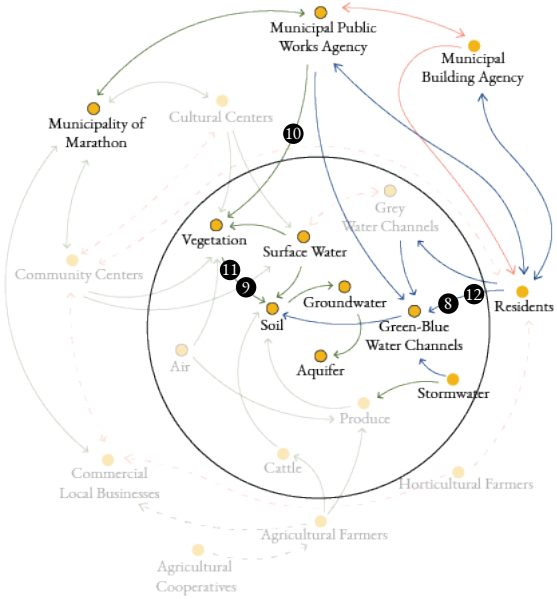
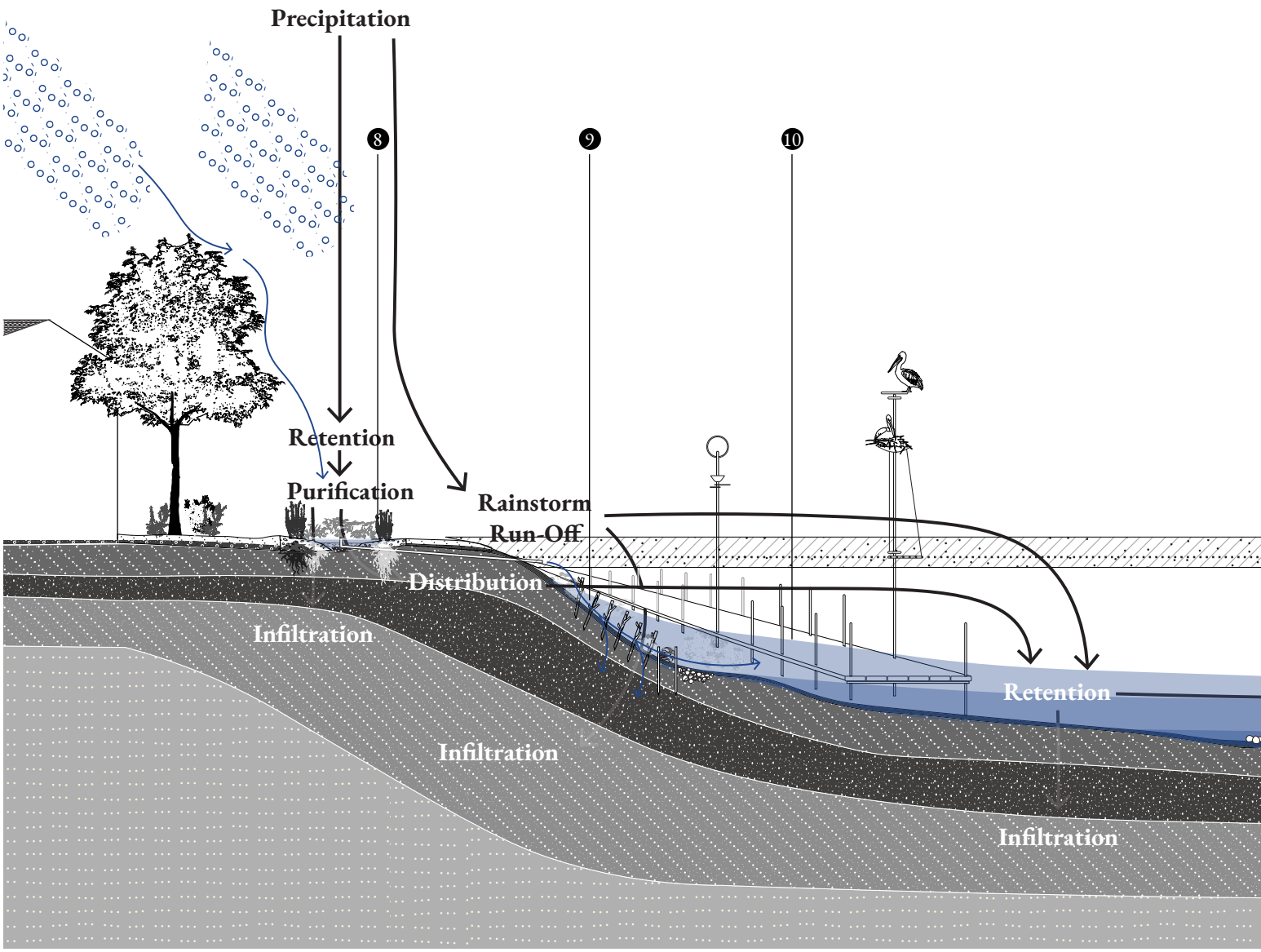


fig.62: Projected Actor Interelations

- Urban water infrastructure systems
- Encounters
- Communications and regulation
- Synergies

This projection explores the synergies between the greywater of the settlement and efforts to regenerate the stream. The banks are reinforced with live staking to support biodiversity and enhance the natural habitat, forming a small-scale ecosystem. Considering seasonality and the stream's dry condition during warmer months, multifunctional spaces are projected that act both as areas of encounter between humans and nature, and as evacuation routes during fire emergencies. In this scenario, the stream becomes accessible to the community, while residents take an active role in its care by reusing household greywater as a resource for regeneration. This is enabled through the connection of individual properties to the neighbourhood's urban water infrastructure.



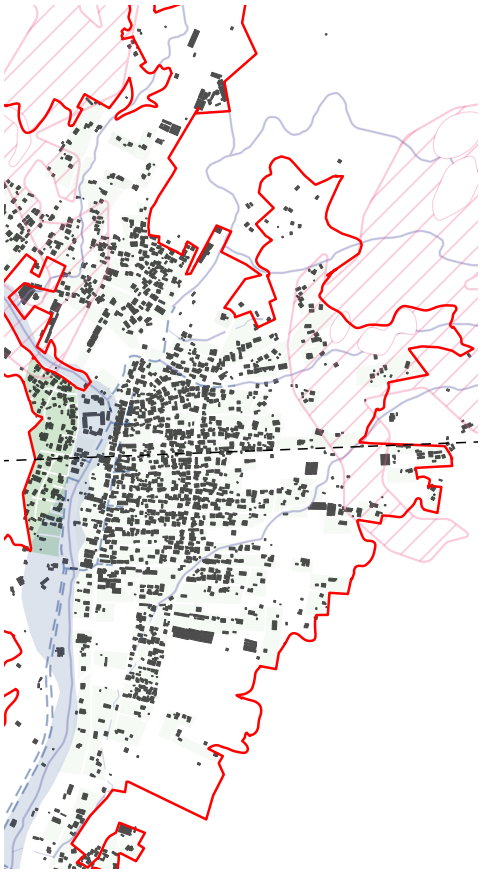
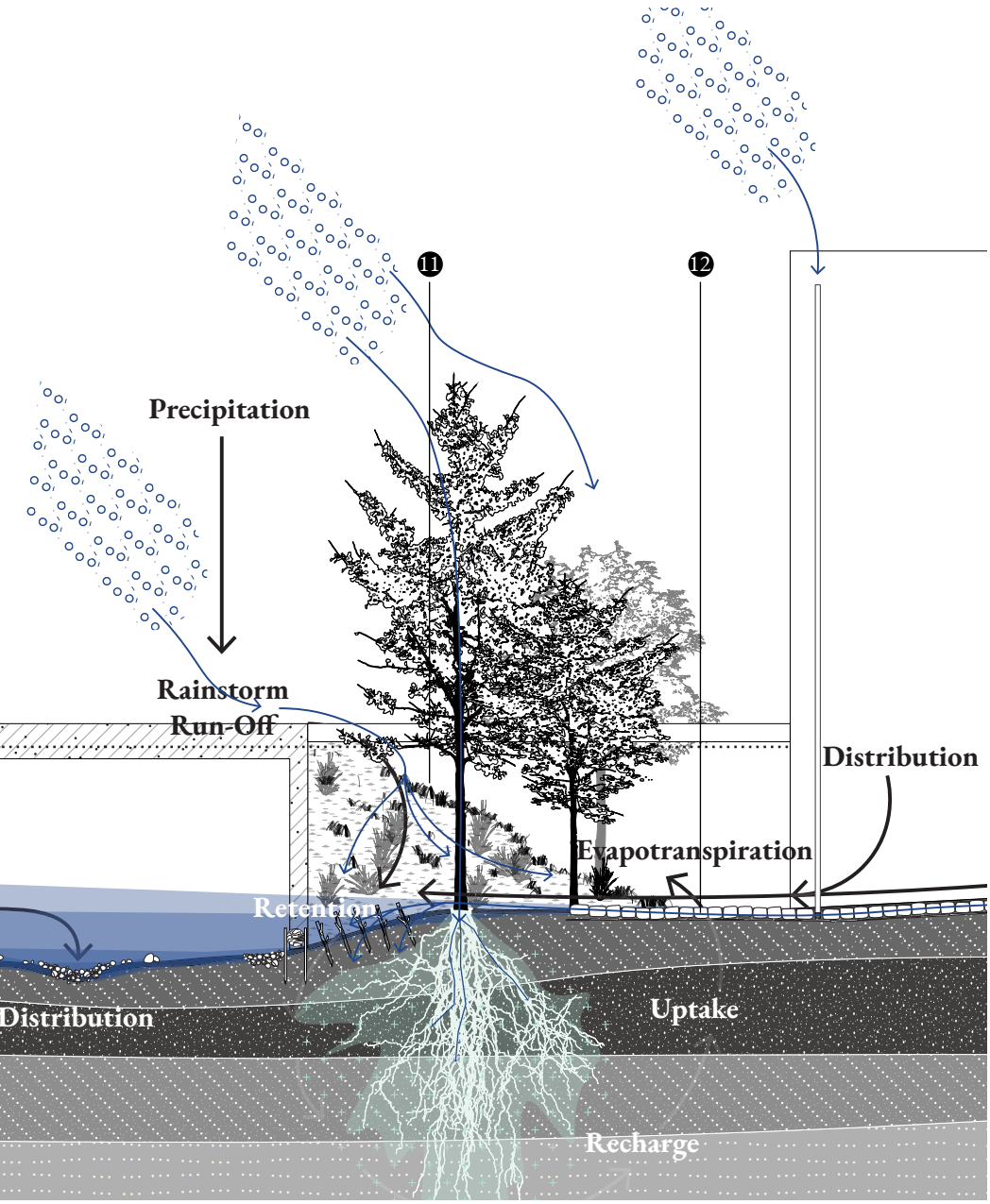


fig.63: Corresponding risk-based values



8 Raingarden
9 Live staking
10 Multifunctional evacuation routes
11 Vegetated buffers
12 Stone-lined canals

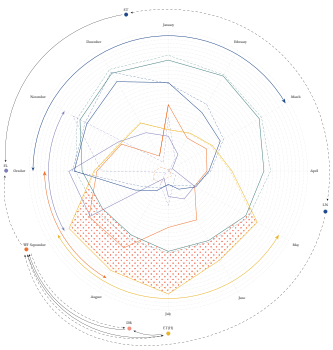


fig.64: Stream regeneration, integration of green-blue and grey infrastructure, multifunctionality.

Mist
Water flow (EH)
Water flow (DR)
Fire-smart principles
Rainstorm water flow

Organic matter
Sandy clay loam
Clay loam
Sandy loam
Marble - limestone

Rainstorm water
Water level
Infiltration
Recharge
Wetting down
Fire

Urban Green and Water Sensitivity

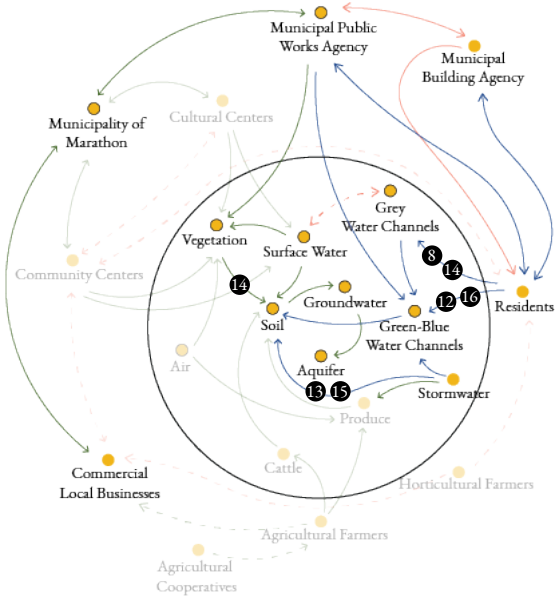
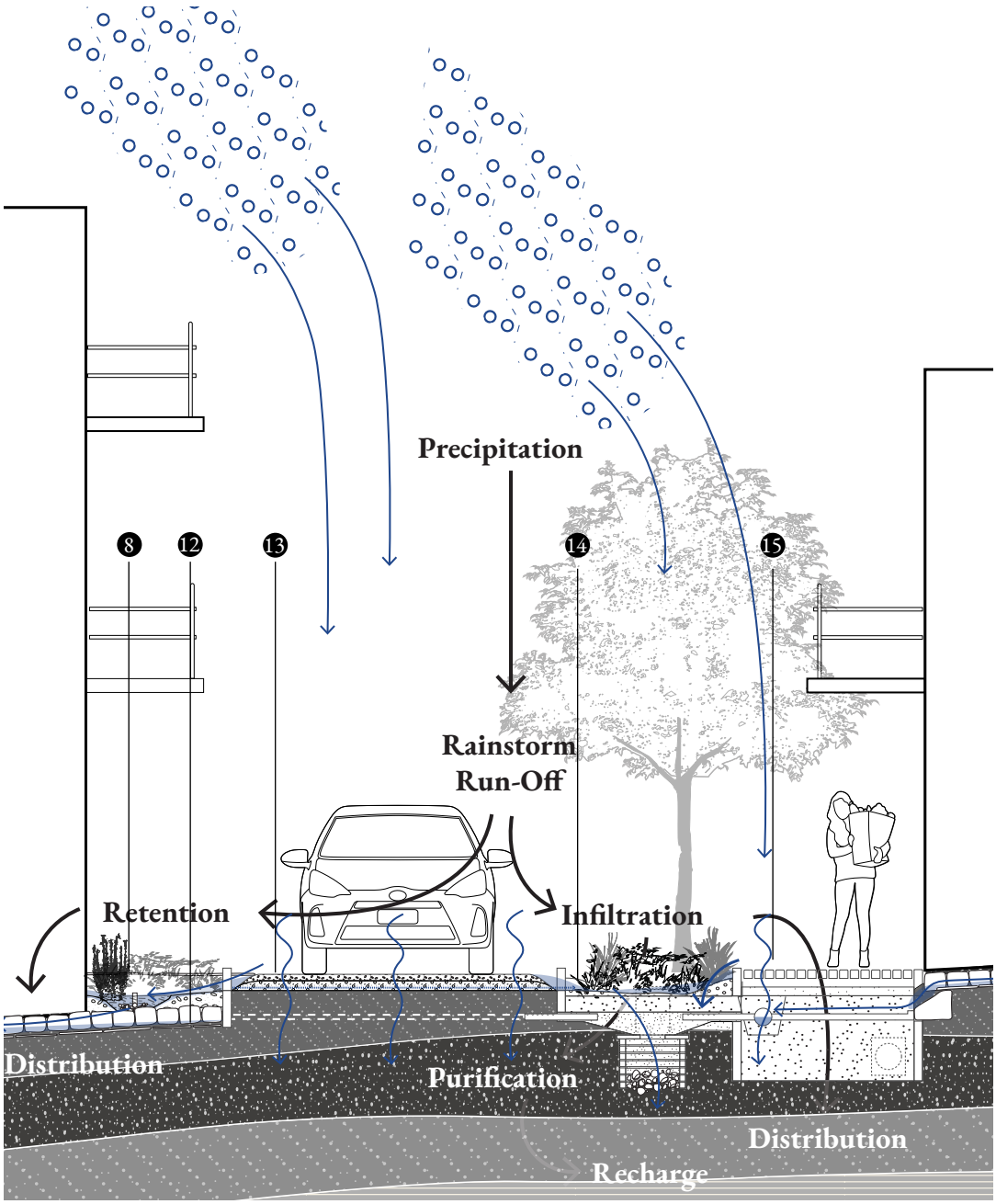


fig.65: Projected Actor Interelations

- Urban water infrastructure systems
- Encounters
- Communications and regulation
- Synergies

This projection highlights how public infrastructure can enhance water sensitivity and contribute to the formation of a hybrid green–blue–grey water network across the catchment. It also explores the potential of private properties to collectively manage water and integrate into a wider system. Two parallel flows are proposed: one directs treated greywater toward the regeneration of the stream, while the other connects to a water treatment plant for reuse further downstream. Together, these interlinked systems demonstrate how local and collective efforts can align to support a broader water strategy at the scale of the catchment.



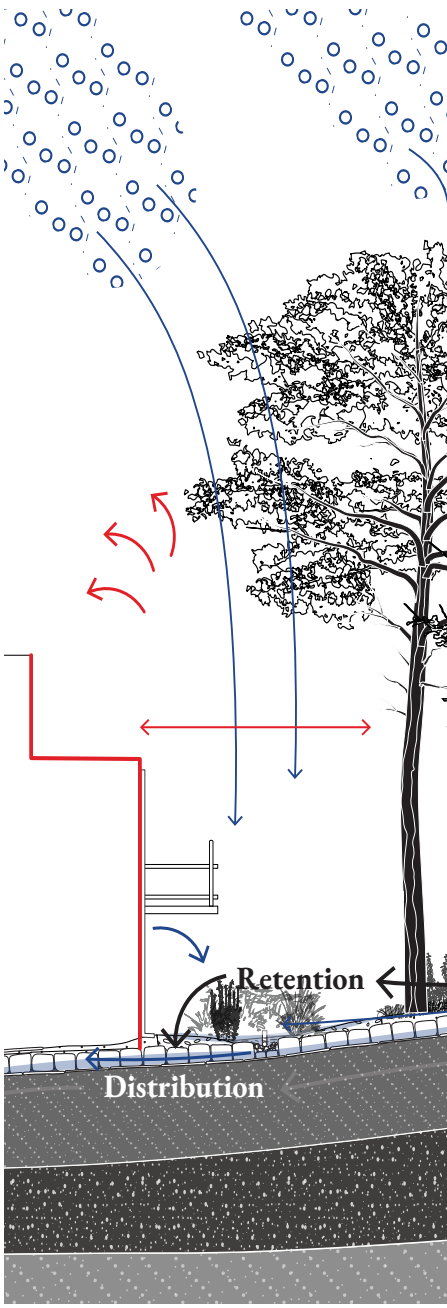
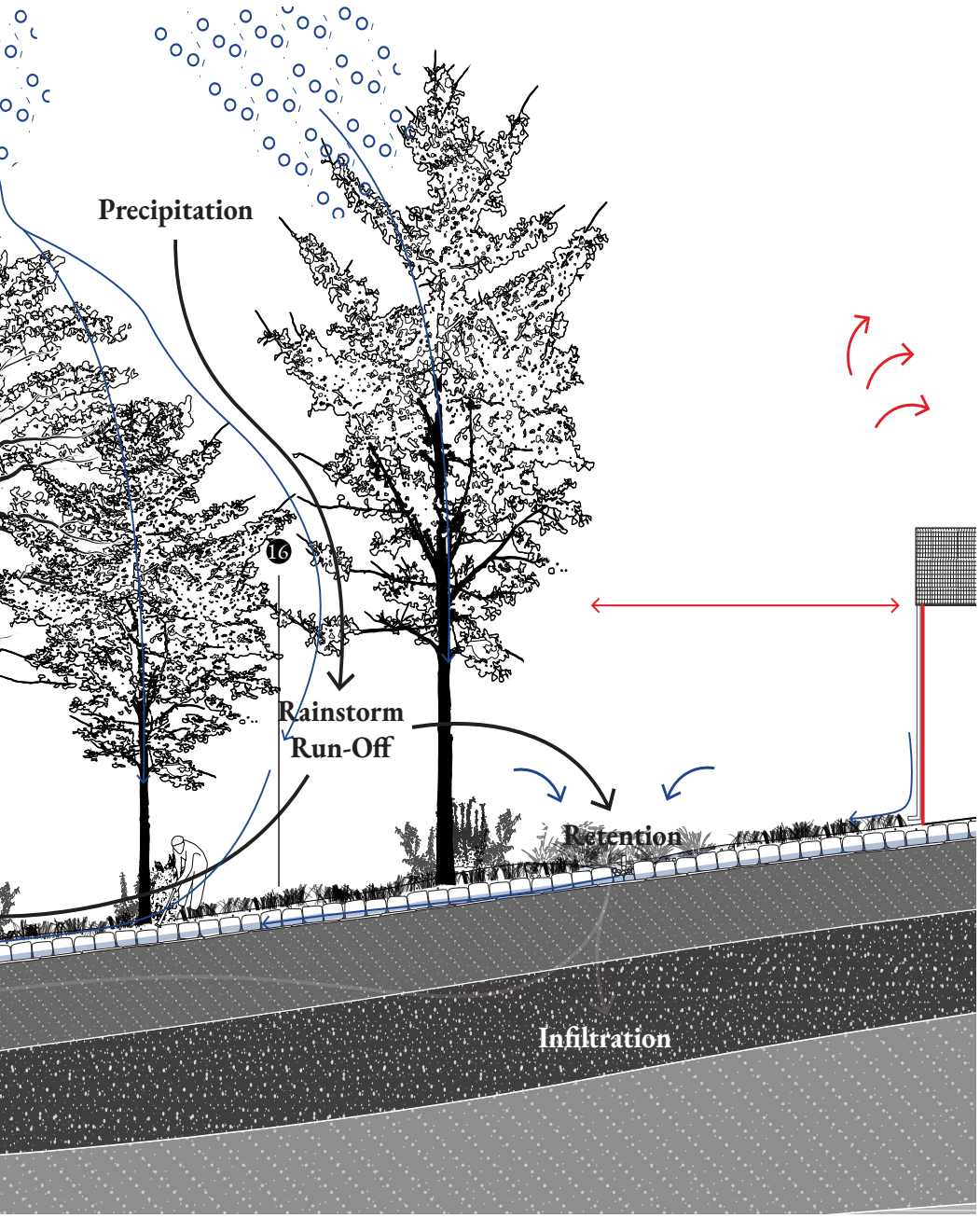


fig.66: Corresponding risk-based values



8 Raingarden
12 Stone-lined canals
13 Porous asphalt pavement
14 Bioswales
15 Permeable pavement
16 Raingardens cluster

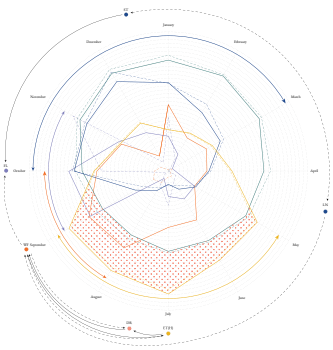


fig.67: Green-blue and grey water infrastructure, a synergy between private and public land.

Mist
Water flow (EH)
Water flow (DR)
Fire-smart principles
Rainstorm water flow

Organic matter
Sandy clay loam
Clay loam
Sandy loam
Marble - limestone

Rainstorm water
Water level
Infiltration
Recharge
Wetting down
Fire

Urban-Wildland Interface, Agriculture and Encounters

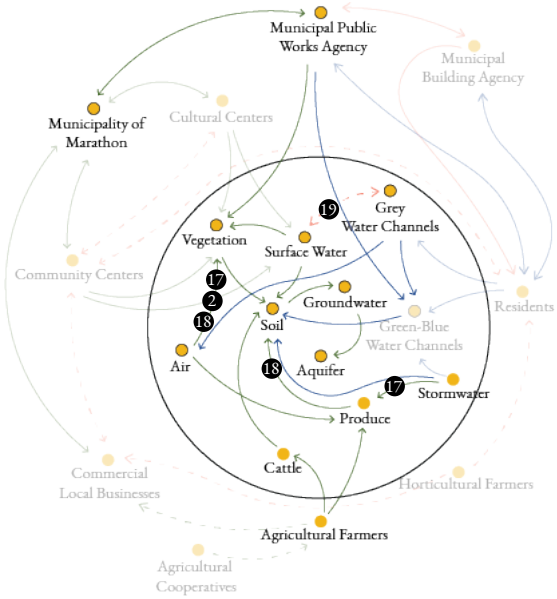


fig.68: Projected Actor Interelations

- Urban water infrastructure systems
- Encounters
- Communications and regulation
- Synergies

This projection explores the role of agriculture in reinforcing the urban–wildland interface, while sustaining moisture in the landscape. Agroforestry is introduced as a productive strategy that also functions as a buffer, creating distance and slowing the spread of fire. Firebreaks are further strengthened through the use of linear grazing, which reduces flammable vegetation. Within this transitional zone, rainwater harvesting structures and multifunctional spaces are integrated to address water scarcity and reduce ignition potential. The projection highlights agricultural practices that contribute to a system of care, one that supports both the land's productivity and its resilience.

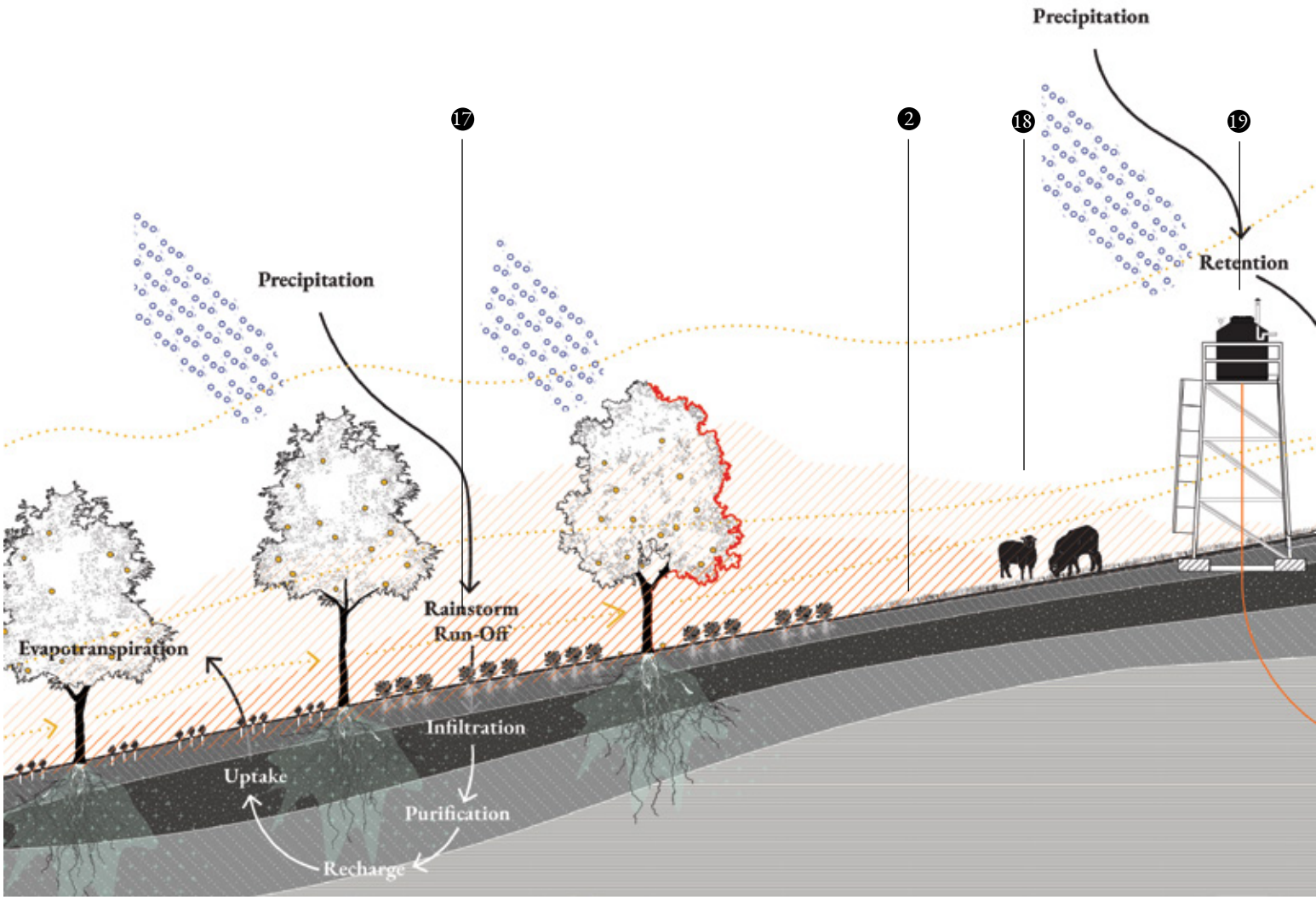
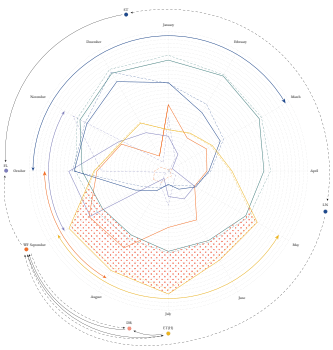


fig.69: Corresponding risk-based value

17 Agroforestry
2 Firebreak
18 Linear grazing
19 Water tank
1 Mist deployment
20 Nature tracks



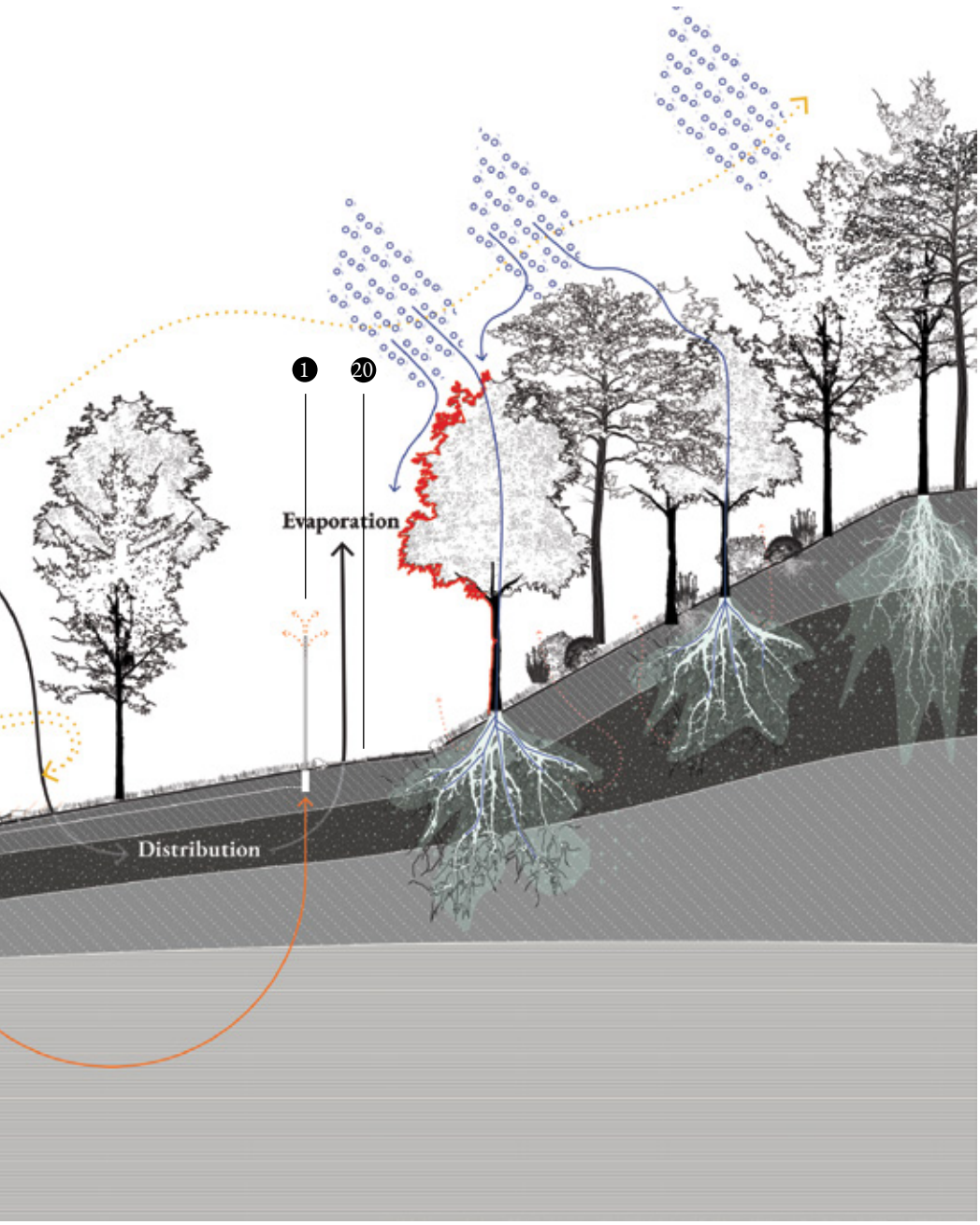


fig.70: Projected interface between wildland and productive land

Mist
Water flow (EH)
Water flow (DR)
Fire-smart principles
Rainstorm water flow

Organic matter
Sandy clay loam
Clay loam
Sandy loam
Marble - limestone

Rainstorm water
Water level
Infiltration
Recharge
Wetting down
Fire

Synergetic Land-Uses

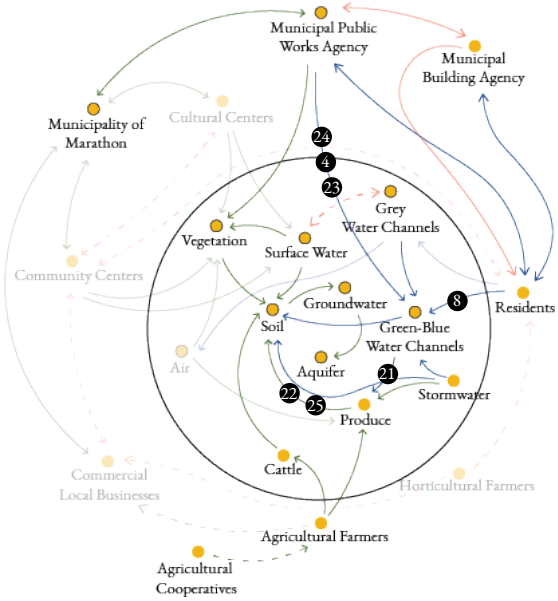
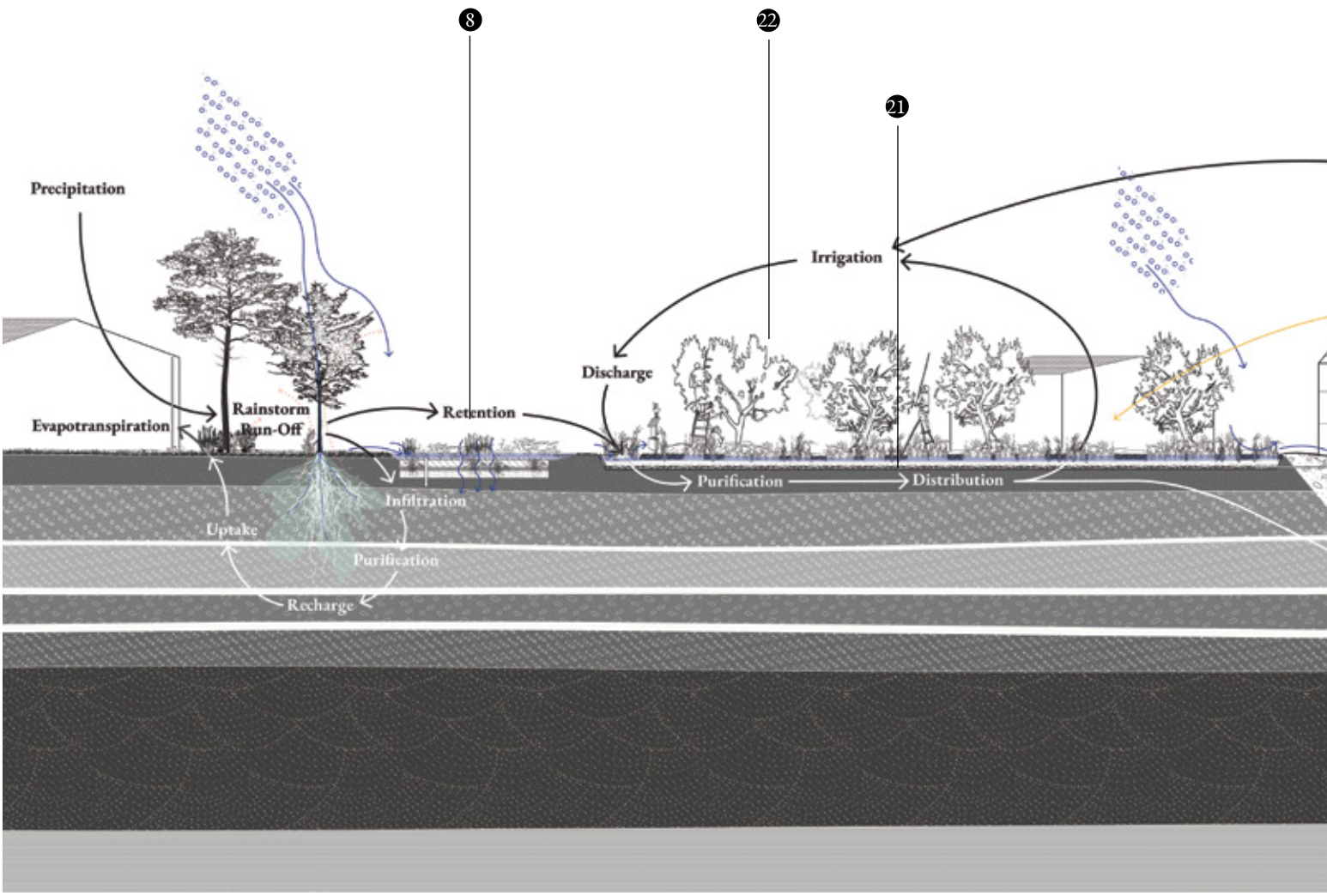


fig.71: Projected Actor Interelations

- Urban water infrastructure systems
- Encounters
- Communications and regulation
- Synergies

This projection investigates how residential units within the agricultural plain can support sustainable agricultural practices by creating closed greywater loops through green–blue infrastructure. Household greywater is reused to irrigate agricultural land, connecting each property to a collective irrigation network. domestic routines become part of a broader system of care, where water is treated as a resource that nourishes both the land and its productive capacity. The projection highlights how synergies between the community and their daily practices can form interrelations that align better the natural and the societal processes.



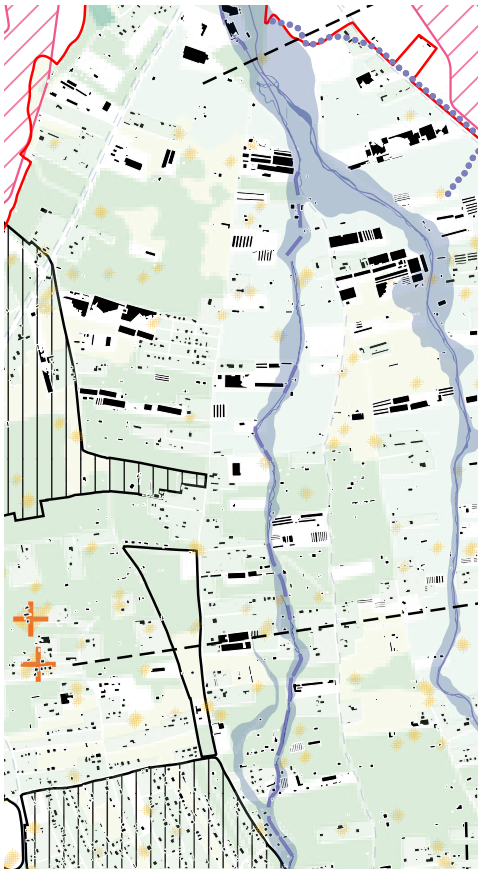
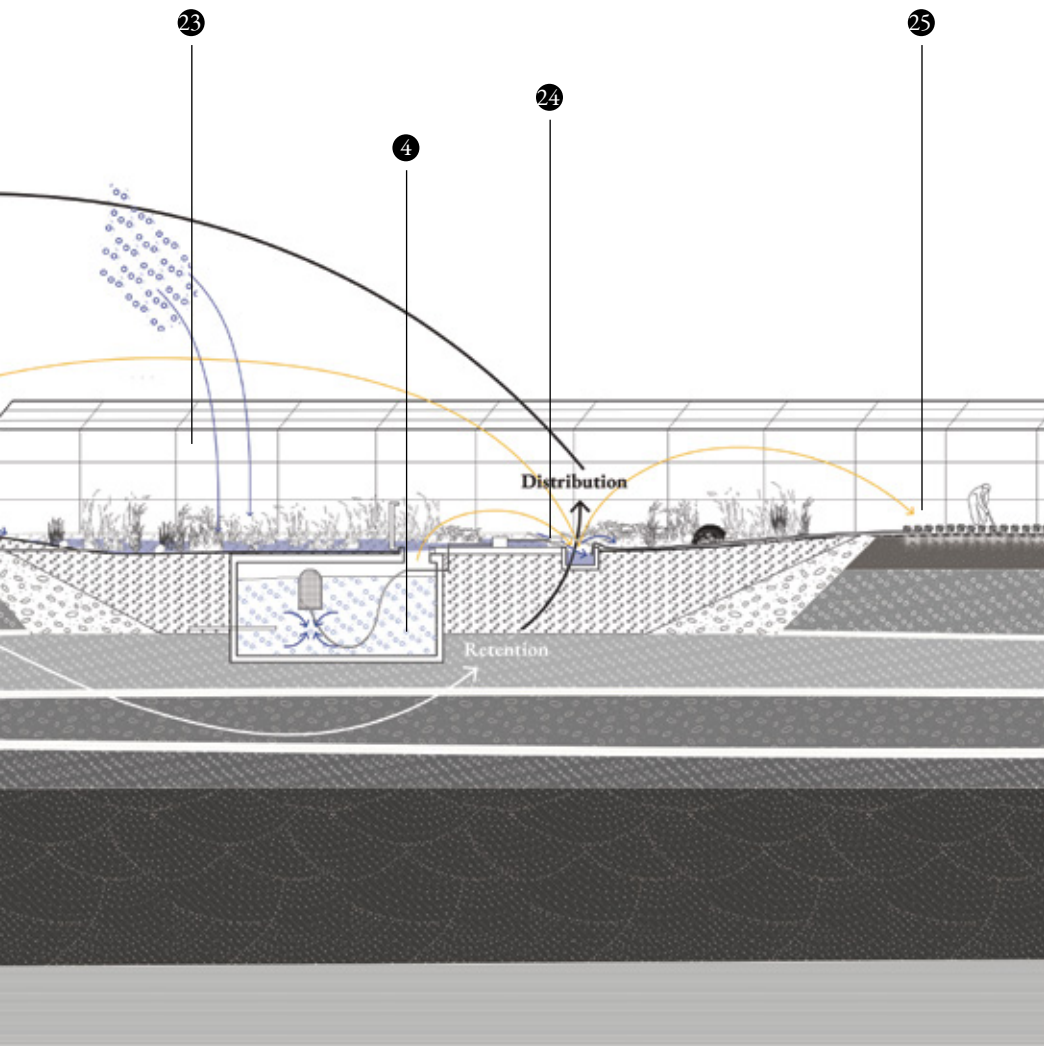


fig.72: Corresponding risk-based value



8 Raingarden
21 Reedbed
22 Deep-rooted produce
23 Constructed wetland
4 Cistern
24 Collective irrigation system
25 Open rotating crops

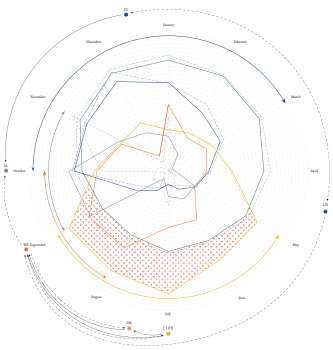


fig.73: Water infrastructure as a synergy between residential and agricultural land use.

Organic matter
Brown clay
Pebbles-sand
Peat
Gravel
Rounded gravel
Rounded gravel
Dark sandy silt
Marble - limestone
Mist
Water flow (EH)
Rainstorm water flow
Rainstorm water
Water level
Infiltration
Recharge

7.2 Cross-Catchment Synergies

Individual actions fall into place within a larger system, one that has the capacity to operate at the scale of the catchment and respond to its natural processes. Societal routines and everyday practices inherently represent only a portion of this broader system. Therefore, these local acts of care must be organised across the catchment and interlinked with other spatial and functional operations. A local system of care is formed by the way these practices work together across the territory.

From Marathon's Dam to the coast, land management, whether public or private, needs to respond to specific risk-based values. Each part of the catchment carries a responsibility towards the rest of the territory, while all areas share a common responsibility toward supporting the natural system.

In the upstream zones, sediment flow must be monitored, and space must be ensured for water retention. Soil regeneration and stabilisation become part of agricultural practice and are coordinated with municipal or regional efforts on wildland management. The integration of floodplain functioning with agriculture influences the pace and behaviour of running water as it moves downstream towards the settlements.

Settlements need to develop their interface with the wildland and better align their functions with the biophysical characteristics of the land, reducing vulnerability to fire spread. Compactness is key for managing the urban-wildland interface and for sharing infrastructure that supports water sensitivity. Harvesting rainstorm water and directing run-off through green-blue or grey networks allows the hydrological process to continue downstream, supporting the coastal plain where water is needed even more.

Given that water is a scarce resource, efforts to reuse and circulate it across the catchment become essential. The piedmont areas, where water naturally gathers, must capture rainstorm water, surface run-off, and greywater, treat it, and redistribute it across the plain. This can be done by employing the spatial logic of parcelation and regenerating or resurfacing erased waterways.

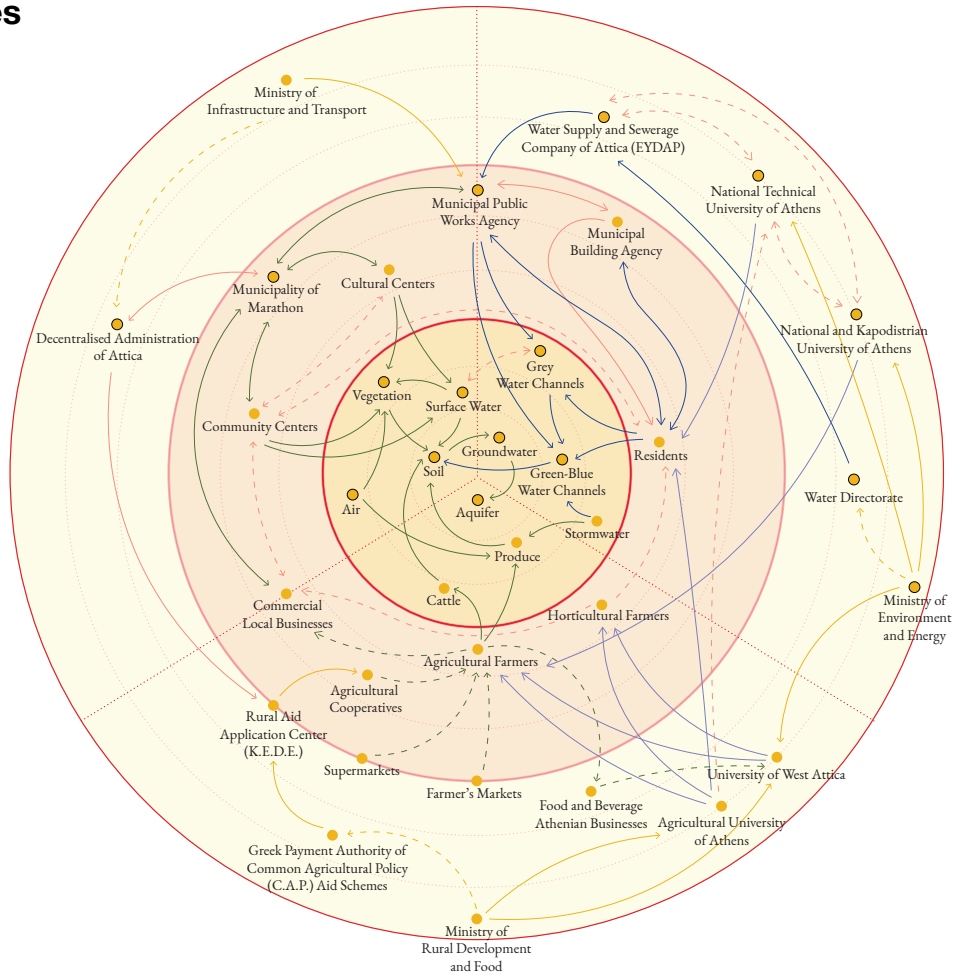


fig.74: Projective stakeholder mapping

A less arid environment strengthens the land's ability to retain and infiltrate water and contributes to aquifer recharge.

In the plain, where water flows are slower and resources are limited, agricultural and residential land uses must take shared responsibility for monitoring soil conditions and managing water collectively. Establishing water loops between these land uses suggests that water distribution is shaped by the practices of the local community, while public infrastructure must be designed to support and enhance these networks.

In the coastal areas, residents and businesses that manage the land, have a role in ensuring that water is not only discharged into the sea but also that estuary conditions are maintained and enhanced. This means creating an urban fabric that supports the filtration of saline water and preserves the balance between fresh and saltwater across the coastal plain. Multifunctional and seasonally responsive design is key to fulfilling this role. Evidently, the roles and responsibilities of the local community across the catchment can only be realised through interconnected systems and shared infrastructure. This underlines the critical role of municipalities and local agencies in developing public infrastructure that reflects and supports these networks of care. To do so, municipalities must be equipped with the knowledge, resources, and direction to coordinate locally specific systems. It is the responsibility of the region to support this effort, by aiding municipal governance and responding to the situated needs of local authorities, their communities and the territory's natural properties.

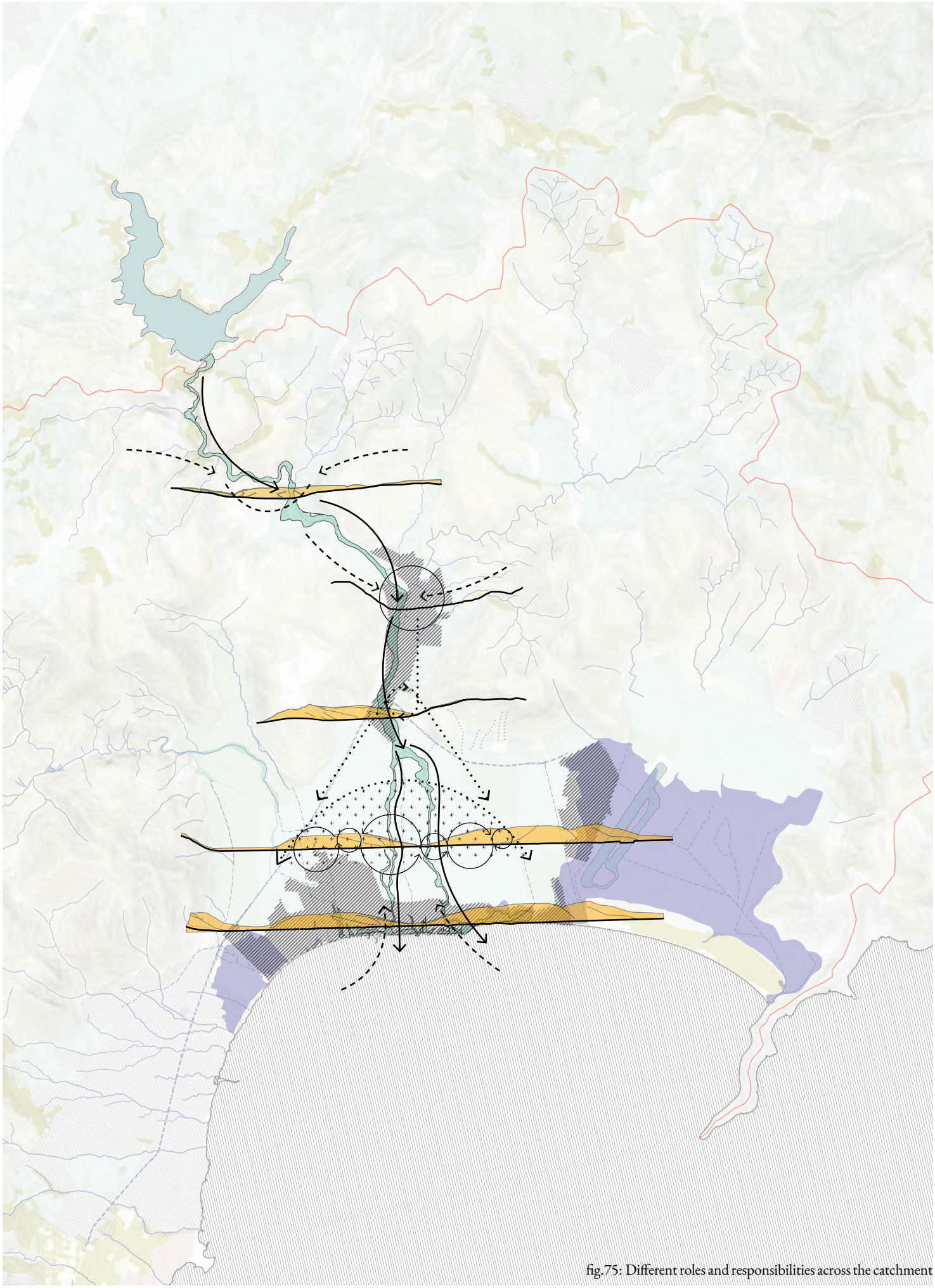


fig.75: Different roles and responsibilities across the catchment

Convergence

8.1 Interregional Proposition

For the local community to become the agent of change that aligns meaningfully natural and societal processes in the territory, the region take sup an enabling role by providing incentives and support for transitions toward sustainable land management. Building transformative capacity in peri-urban Mediterranean zones requires from the region to develop and strategise in response to the situated knowledge of the peripheries and the limits of its socioenvironmental capacities. Convergence between local actors, metropolitan development and natural systems is essential for attentive and place-based action. It is a matter of acknowledgement of interrelations, collaboration and interdisciplinarity.

This interregional proposition explores how regional strategies can activate and support attentive land management across catchments, allowing local systems of care to emerge from the bottom up. It also identifies relevant EU policies, strategies, and initiatives that relate to societal processes that participate in the built-up of disaster risk in the peripheries, and which may be challenged by this proposed framework.

Territories of common stories

To enable local systems of care to form in the peripheries, it is crucial to acknowledge the context they are addressing. Identifying equivalent territories within the region that face fire-prone landscapes, high flood risk, and dispersed urbanisation helps reveal communities with shared experiences. These communities can become part of knowledge exchange networks and develop synergies toward alternative, context-sensitive development pathways. This research challenges the EU Civil Protection Mechanism to reconsider the meaning and scope of preparatory actions in disaster risk management, placing greater emphasis on how land is managed to enable long-term resilience. It addresses the EU Civil Protection Knowledge Network and the Disaster Risk Management Knowledge Centre by proposing that regional planning integrate the co-evolution of knowledge and community-led risk management. This includes acknowledging the evolution of risk and the need for technical resources that identify risk-based values across territories. By doing so policies and initiatives that respond to the realities of peri-urban systems and support attentive, place-based transitions can be formed.

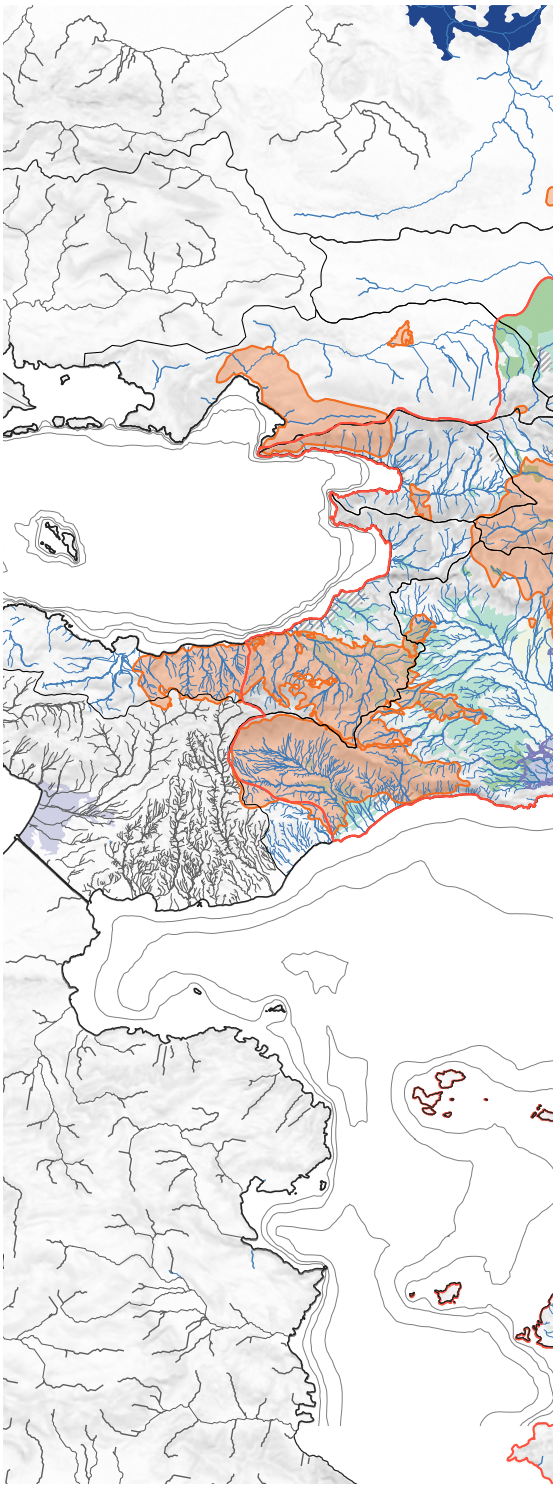
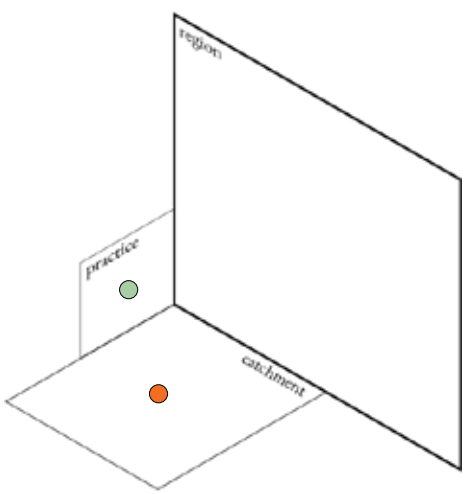


fig.76: Knowledge sharing territories



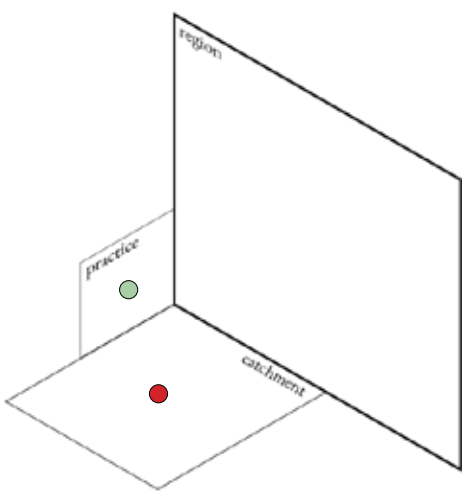
Disaster
Risk
Management
Knowledge
Centre

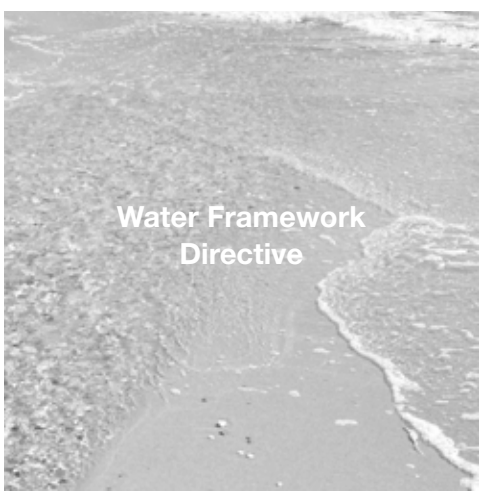
Catchment-based synergies

Local systems of care require synergies between communities within the same catchment or sub-basin. This necessitates a shift in regional planning strategies, away from economic-based relations between areas and towards catchment-based synergies that align community practices with the hydrological cycle across territories.

This proposition challenges the Water Framework Directive to expand its scope beyond pollution control and water quality, urging the incorporation of land mismanagement and fragmented water regulation into its framework. It advocates for a decentralised approach to water governance, in line with the aims of the European Union of Water Management Associations. It also suggests a transition to circular water management systems shaped by the actors and ecologies of the peripheries, which is in alignment with Interreg Europe's objectives under the framework for sustainable water management in the circular economy.

fig.77: Networks of catchment-based synergies in the Metropolitan area of Attica





EUWMA

European Union of Water Management Associations

Sustainable agriculture networks

This proposition explores how transitions toward more sustainable agricultural practices can be operationalised across the peripheries, cultivating attentive relationships with productive land that respond both to the natural capacities and the broader needs of a catchment. Such a transition can be enabled through on-site, interdisciplinary research that relates to the daily realities of local communities and provides diverse tools, techniques, and infrastructures that they can employ. Decentralising agricultural support through the establishment of rural aid centres at the municipal level ensures that these transitions are shaped in response to local conditions and in alignment with natural systems. At the same time, agricultural practices are tied to the demands of the market, highlighting the need for the region to strengthen alternative food networks and reconfigure market dynamics in line with the actual capacities and rhythms of agricultural land in the peripheries

This approach to risk management through agricultural transitions calls on the European Initiative for Sustainable Development in Agriculture to prioritise locally embedded practices that build resilience through care for land and community. It invites the Common Agricultural Policy (CAP) to move beyond "one size fits all" incentives and support decentralised systems that respond to the natural and social specificities of the peripheries. Finally, it challenges the European Green Deal to recognise the role of peripheral agricultural landscapes not only in food security and biodiversity, but also in sustaining water cycles and mitigating disaster risk, pushing for a more integrated and territorial approach to ecological transition.

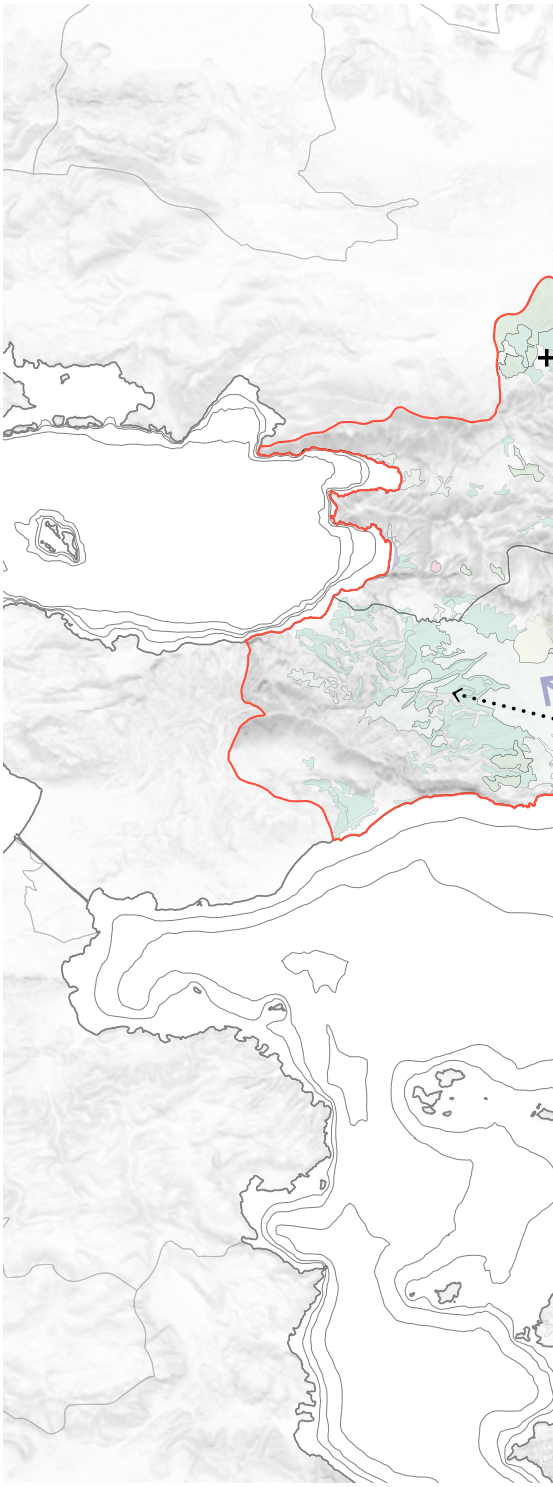
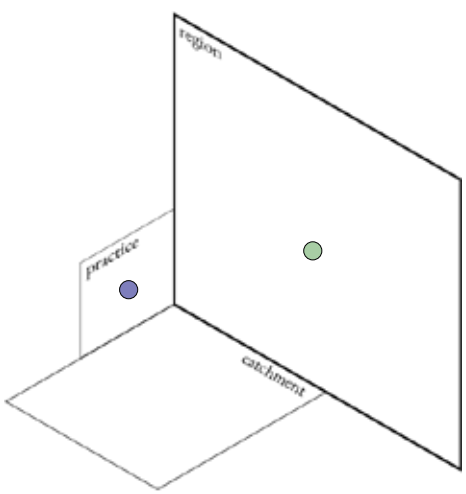


fig.78: Strategic operationalisation of attentive agricultural practices from regional scale synergies



COMMON AGRICULTURAL POLICY FOR 2023-2027

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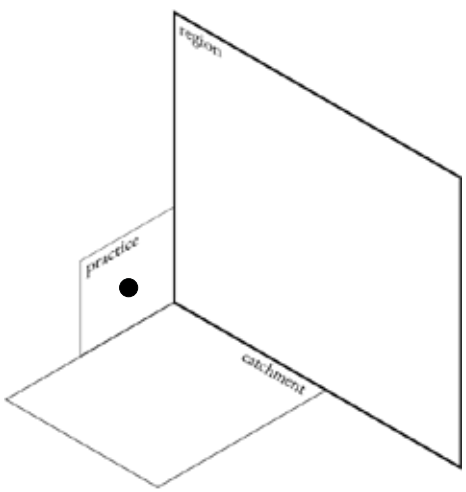
AGRICULTURE & INNOVATION

Creating encounters

This proposition invites us to rethink of mobility infrastructure across the peripheries not as a means for expanding development, but as a way to create space for nature and foster more attentive interactions between human and non-human entities. By transitioning to slow mobility systems that connect peripheral settlements with natural habitats, cultural nodes, and public transport links to the metropolitan core, mobility becomes part of a potentially balanced socioecological system. Reducing hard infrastructure that interferes with natural processes while maintaining accessibility supports a shift in how people relate to their surroundings and cultivates awareness, interest, and ultimately, care for the dynamics of the land. In doing so, this challenges the current orientation of the EU Urban Mobility Framework and Sustainable Urban Mobility Plans (SUMPs), calling not for more infrastructure, but for a transformation of existing networks into sustainable, nature-aligned alternatives that respond to the specificities of the peripheries.

fig.79: Establishing encounters anwith naturethrough slow mobility




What is the European Green Deal?
The European Green Deal is about improving the well-being of people. Making Europe climate-neutral and protecting our natural habitat will be good for people, planet and economy. No one will be left behind.
The EU will:
"The European Green Deal is our new growth strategy. It will help us cut emissions while creating jobs."
"We propose a green and inclusive transition to help improve people's well-being and secure a healthy planet for generations to come."

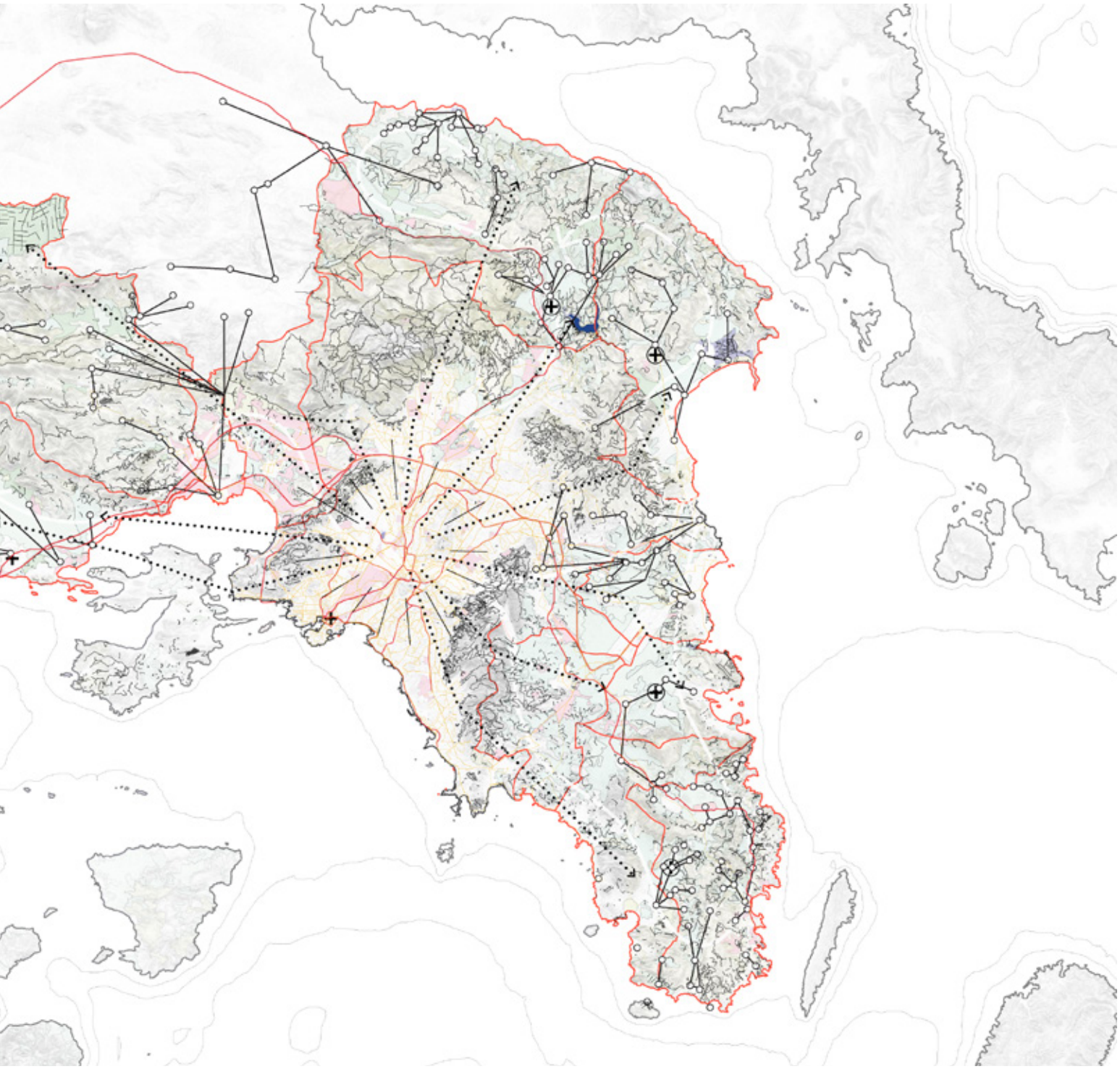

Efficient & Green MOBILITY
14 December 2021
THE NEW EUROPEAN
Urban Mobility Framework
Cities are the powerhouse of the modern economy and home to millions of people. Their inhabitants are increasingly facing challenges such as congestion, poor air quality and excessive noise.
We want people and goods to move more sustainably in our cities, to make life easier for the rural and suburban commuters travelling to school or work, and to support cities in their role as essential transport hubs within the single market.
WITH OUR FRAMEWORK WE PROVIDE GUIDANCE FOR LOCAL ACTION AND OFFER CITIES A TOOLBOX FOR SUSTAINABLE MOBILITY:


Sustainable
Urban Mobility Plans
(SUMPs)

Cultivating attentive practices: integrating regional efforts

This regional proposition argues that reducing risk in peri-urban territories requires a shift in how planning and governance engage with the socioenvironmental context of the peripheries. Rather than imposing top-down strategies informed by the context of urban core systems, the region must respond to the limits and capacities of peripheral landscapes, recognising their elements, processes and communities. Coordinated transitions in water governance, agriculture, and mobility can establish the foundations for local systems of care to emerge and therefore shape attentive interrelations between communities and natural processes through land management. The proposition challenges the region to listen more attentively to the voices and ecosystems of the peripheries, and to embed their situated realities into strategic planning. It reframes risk management not as a standalone domain of civil protection or environmental policy, but as a cross-cutting concern within metropolitan development. Risk is understood as accumulating through the misalignment of various systems, and its reduction depends on integrated, place-based transitions that cultivate care, responsibility, and resilience from the ground up.

fig.80: Building transformative capacity in peripheral territories through integrated and place-based transitions that cultivate attentive practices



8.2 Staging the Framework

The proposed framework was developed through an initial analysis of risk as a process, identifying risk-based values in the area of Marathon, and projecting these into a territorial condition where processes align with both these values and the hydrological cycle through local practices of care. This allowed for a better understanding of how actors interrelate across scales and how the region can build transformative capacity in the peripheries to reduce disaster risk. However, the implementation of such a framework could not unfold in the same sequence. Instead, it would follow the structure of "caring for," "converging," and "taking care of", supported by feedback loops between communities, land, and the region.

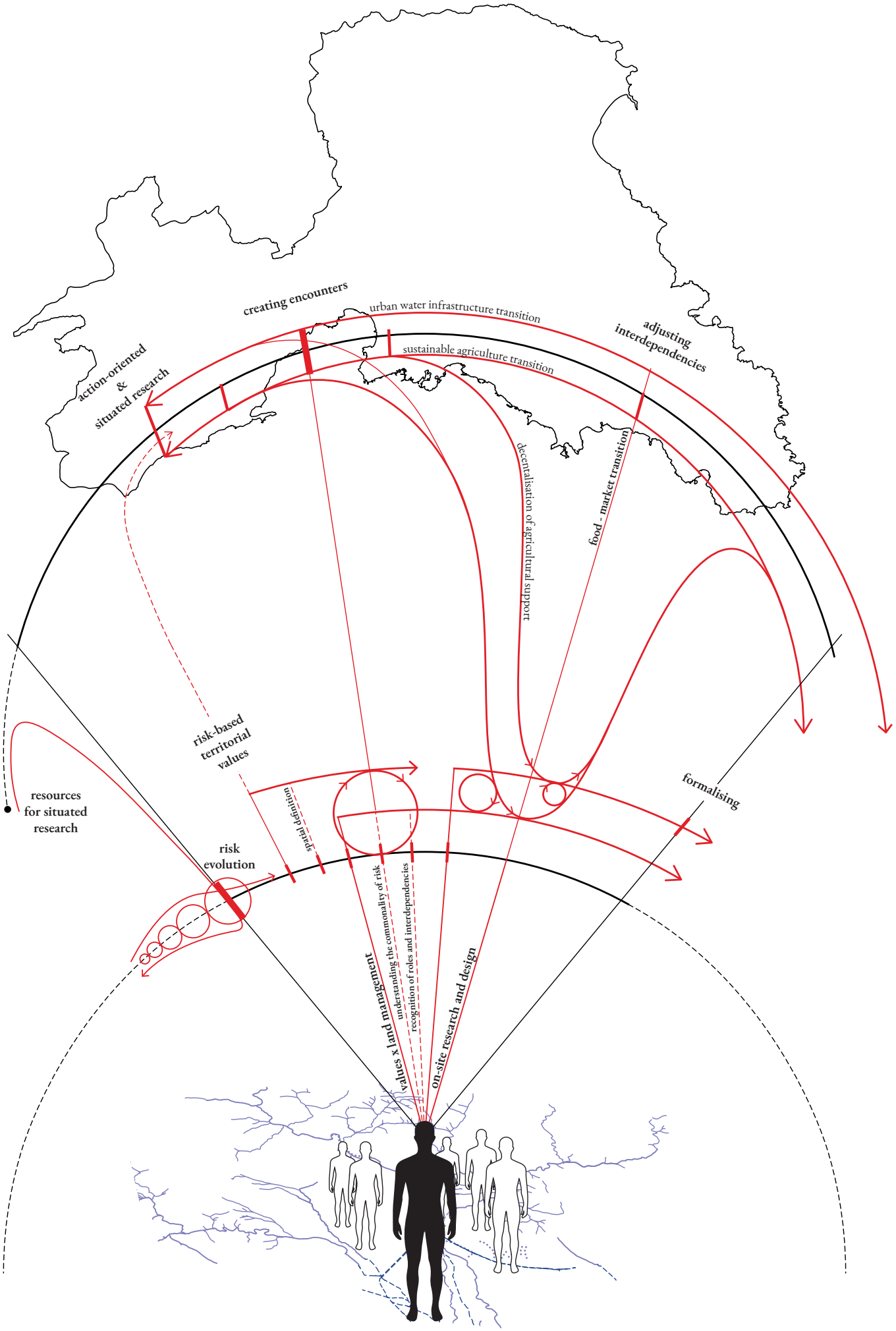
To bring this framework of new values into local decision-making and peri-urban development to life, he region would first need to provide resources for situated research that investigates the evolving nature of risk and identifies risk-based values in peripheral territories. This activates two synchronous and interacting processes. On the local scale, these values and their spatial extents begin to guide more caring and sustainable approaches to land management. This includes building an understanding among local communities of the commonality of risk, recognising individual and collective responsibilities, and identifying synergies between land uses and different areas of the catchment.

On the regional scale, action-oriented and situated research can be initiated once peripheral municipalities define and acknowledge the risk-based values and the communities they relate to. To cultivate awareness of shared vulnerability and foster collective responsibility, strategies that create meaningful encounters between people and land must be prioritised. This includes advancing slow mobility networks and implementing public works that support green-blue infrastructure and nature-based solutions. At the same time, academic institutions and research centres must contribute by generating knowledge and methodologies for on-site research into sustainable agricultural practices and urban water infrastructure transitions.

At this stage, local and regional processes begin to inform one another, forming co-creative testing environments that demonstrate how local systems of care can operate in real conditions and what their broader benefits are. The decentralisation of agricultural support enables peri-urban territories to adopt agricultural practices that respond to the land's specific capacities and limits. Meanwhile, strategies for developing alternative food networks help support this transition by reshaping metropolitan demand on types of produce, allowing more suitable agricultural practice to take space.

Altogether, these strategies adjust the interdependencies between the natural systems of the region and the social processes of the peripheries. The framework suggests development cycles that allow for adaptive learning on both regional and local scale to shape a continuum of stabilising exposure and vulnerability in peri-urban zones.

fig.81: The stages of applying the framework


creating encounters
urban water infrastructure transition
adjusting interdependencies
sustainable agriculture transition
action-oriented & situated research
decentralisation of agricultural support
food - market transition
risk-based territorial values
resources for situated research
spatial definition
risk evolution
formalising
values x land management
understanding the commonality of risk
recognition of roles and interdependencies
on-site research and design

Conclusions

The thesis addresses the incapacity of peri-urban Mediterranean coastal territories to transform their sociotechnical elements that interfere with natural processes and trigger cascades of disaster. It focuses on the need for convergence between stakeholders that can enable these transformative actions, align socioenvironmental processes and build disaster-resilience. Land management, practices and act of care are seen as key aspects of risk reduction as a process.

The study showcases how biophysical capacities of a territory are revealed through investigations of the evolution of land, its use and the ways it is practiced, and identifies key interferences with natural processes spatially. Additionally, the use of land management to identify the process of risk locally reveals the involved stakeholders and their interrelations across scales and systems. These findings provide risk-based planning with insights for their strategic involvement in the process of risk reduction.

The case of Marathon revealed how uncoordinated metropolitan growth and local land management lead to peri-urbanisation that neglects the territory's natural structure, especially when experiencing transitions to mechanisation, industrialisation and construction. Disaster events and their spatial recurrence reveal that erasure of natural bodies and their degradation is perceptible from the hydrological systems, however local communities and administrative bodies do not acknowledge them in their processes.

Land management in peri-urban territories responds to regulations without situated context, enforced from central administrative bodies. As a result, natural capacities are misused and land is maladapted in peripheral territories. Additionally, the segregation of roles and responsibilities between municipal agencies impacts the misalignment and disconnection of structures and practices in the territory. However, these partitioned agencies allow synchronous transformations that interfere with natural processes and enhance disaster risk. All the above misalignments reflect the territory's disaster-resilience and should be reinterpreted in risk-based planning.

The acknowledgement of how people interrelate with land and the evaluation of how attentively they do so can shape a better understanding of the socioenvironmental values in risk as a process. This can guide planning in suggesting an alignment between practices, acts and processes for local communities to aspire towards. Representing the territory through the interrelations of its socioenvironmental processes provides strategic directions for what caring practice means in different parts of a territory and the role of these parts in the process of risk reduction. The involvement of water management and circularity in projective design is required to facilitate the alignment of conflicting land-uses that peri-urban environments face. The projection of the socioenvironmental values of risk as a process through design suggests responsibilities of local actors in this process and gives insights for a more inclusive and informed decision-making on a regional scale.

The thesis suggests a new governance model in which climate action is taken locally and through land management, while regional planning sets the parameters that allow for the biophysical systems and the societal processes to align and enable a process of risk reduction.

Reflections

What is the relation between your graduation project topic, your master track, and your master programme?

The thesis explores how peri-urbanisation is involved in the evolution of risk to understand social and technical drivers and identify potential areas for transformation and the necessary strategies to converge actors and align processes. The use of a history-informed analysis to understand an urbanised territory, re-interpret its values and structures and project through that its possibilities with a long-term perspective is highly reflected in the department of Urbanism. The methodologies used in research from the department and taught during theoretical courses, as well as research and design studios in the master's track integrate historical analysis with contemporary urban challenges. (Rocco et al., 2022)

The actor-relational approach that was taken in the thesis and the focus on the process of development of infrastructure and the build-up of settlements against a territory's biophysical system integrates geosciences, social sciences and governance with technology and engineering. Additionally, the use of the method of maximisation for projective design that informs planning and policymaking combined large-scale planning, design and climate-adaptive engineering. Many of these themes are addressed across the different master tracks, creating a body of academic work from the programme that highlights its interdisciplinary approach for innovative recommendations on sustainable urban-rural development. Therefore, the graduation topic aligns with the interdisciplinary philosophy of the MSc Architecture, Urbanism and Building Sciences, as well as the multi-scalar approach on how urbanised systems develop. (MSc Architecture, Urbanism and Building Sciences, n.d.; Rocco et al., 2022; Xiong & Zhang, 2020)

How did your research influence your design/recommendations and how did the design/recommendations influence your research?

In this thesis research and design were used as reinforcing processes. The research revealed that the proposal needed to be multi-scalar in order to respond to the influence of metropolisation processes and to address the local and self-organised land management. Additionally, the research indicated the need for design to showcase how land management and practices connect with water, soil and multiple species to communicate the actor interdependencies. This suggested the scale of the design projections had to be small and to portray socioenvironmental processes through sections. The research also led to the reinterpretation of the territory through its socioenvironmental components that gave strategic directions for the design. By looking at risk as a process and the interrelations of natural hazards, many of the findings expressed the biophysical capacities and requirements for their stabilisation. This led to a design proposal that involves mainly nature-based solutions with multifunctionality based on climate cycles. Exploring the territory's hydrogeomorphology along with the history-informed analysis led to findings that guided the spatial distributions of the strategies and the design. However, the way methods and findings were combined during research were results of intuition and knowledge obtained during fieldwork or an understanding of the cultural context due to lived experiences. This suggests that the research was a selective and designed process in this thesis however explorative it was. (Manolakelli, 2023; Zboinska, 2021) On the contrary, the design elements, the proposed practices and the demand son green-blue or grey infrastructure led the research in the regional scale, as well as investigations regarding key stakeholders.

Overall, the research revealed existing possibilities and requirements for building disaster-resilience though urbanisation which directed the design. Design projected alternative territorial organisation and functionality that set inquires for further research.(De Jong & Van Der Voordt, 2002; Salingaros, 2000) As a whole the graduation embraced the reciprocal process in research and design, and used design as a research tool rather than a solution.

How do you assess the value of your way of working (your approach, your used methods, used methodology)?

The thesis addresses disaster-risk as a process and therefore focuses on societal and natural dynamic measures. Combined with systems thinking, this approach produced research, findings and proposals that address challenges of the real-world, acknowledging their complexity and dynamic notion.(UNDRR, 2020a) Approaching disaster-risk as a social construction led my focus primarily on researching and projecting on the variable of exposure. Guided by the biophysical capacities of a territory to align the societal processes reflects a naturalist stance that aims for an equilibrium instead of imposing technical solutions.(McHarg, 1995) This led to a contextually grounded proposal with analytical depth and ethical relevance. The method of maximisation in projective drawings proved to communicate possibilities for local transformations not as rigid solutions that demand from local actors to operationalise them individually. On the contrary, using the method as a tool to develop further the research was far more valuable. It allowed for the thesis to introduce planning strategies that build transformative capacities and address a gap in the field of risk-based planning. This communication of alternative futures opens a discourse and space for researches to challenge the thesis' body of work. Ultimately the developed methodology throughout the graduation project suggests an alternative combination of instruments for planning and design to develop more resilient pathways. This body of work is not a definite solution but a framework that addresses the societal role in living with uncertainty.

How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?

Entering the field of risk management through the lens of urbanism this thesis contributes to the academic discourse on risk-based planning and suggests a methodological and systemic approach to dealing with disaster-risk as a dynamic measure. The methods used in the research offer alternative options in developing risk reduction strategies in territories that lack records of disaster exposure, spatial data and access to smart tools that otherwise facilitate research, planning and climate-adaptive design. The thesis' focus on long term perspectives and dealing with root causes of disaster risk tie it to the theory of evolutionary resilience. The research introduces design and maximisation as a method to envision convergence of actors and employs backcasting to construct pathways that can build transformative capacity and propel a process of risk reduction. This is an emerging approach in planning practices that expands on knowledge and techniques to operationalise resilience.

The thesis provides new means for societies to creatively destruct and reorganise their territories by rethinking their institutions, infrastructure and practices to address climate challenges they are facing. Its outputs and the methodology it presents provide a body of knowledge and tools that can be utilised by municipalities facing similar challenges as the ones the research addressed. Additionally, the study provides a reflective analysis of actor interrelations that can be employed for policy recommendations or can inform participatory planning.

Bringing local land management as a central point in disaster risk reduction highlights the agency of local communities. This could be misinterpreted as placing all the responsibility in. Bringing local land management as a central point in disaster risk reduction highlights the agency of local communities. This could be misinterpreted as placing all the responsibility in local actors. It is crucial to point out that disaster risk is a shared responsibility, carried across different scales and related to power dynamics. Inequalities within communities shape vulnerability, especially in the ability to carry out transformations regarding practices that support them economically. The methodology that the research followed did not incorporate such inequalities as it focused mainly on land-use and practices. This suggests the need for further research to ensure just processes in risk reduction.

How do you assess the value of transferability of your project results?

The thesis presents a methodology to reinterpreting the territory through the lens of hazard interrelations and exposure evolution that helps to strategically direct adaptation and development in peri-urban coastal zones of the Mediterranean. This methodology can be utilised in risk-based planning for territories that face similar patterns of uncontrolled peri-urbanisation and small-scale land management which is often self-organised by private landowners. Territories that have been exposed to the same natural hazards and share similarities in their hydrogeomorphology can also employ the presented approach. However, it is necessary to situate locally the values of their territory that shape socioenvironmental interrelations in the process of risk. Although the thesis addresses peri-urban coastal zones of the Mediterranean the methodology and strategies were developed through a case-study of a dispersed territory. Therefore, the research might not be as transferrable to densely urbanised coastal zones. Although some of the design principles and strategies might be applicable the interrelated systems in dense and compact environments might demand an alternative approach.

How does approaching disaster-risk as a process, rather than a technical problem, reshape the role of spatial planning?

Approaching disaster-risk as a process transforms the role of spatial planning from delivering rigid solutions that respond to risk, to facilitating the alignment of societal actions with natural systems to stabilise parameters of risk. This approach reveals that risk is shaped through land practices, misaligned administrative bodies and uncoordinated transformations that interfere with natural processes. Planning, in this sense, becomes an agency of alignment between systems, scales and stakeholders.

The reinterpretation of territories through the lens of dynamic measures of risk, showcased a role of spatial planning in communicating spatial responsibilities and enabling their operationalisation through situated knowledge about the territory and its biophysical capacities. The value of this approach lies in its ability to inform planning that supports systemic alignment, care and transformation across scales.

Why did the thesis employ the theoretical body "Systems of Care"?

The thesis aimed to explore a methodology that would facilitate spatial planning and design to build transformative capacity, promote convergence and reorganise peri-urban territories for disaster-resilient futures. Territorial organisation and the structure of their systems are based on functionality and its gradual change. Therefore, land management is key in the evolution of risk. A deliberate choice was made in the research to use land management instead of function, as it highlights better the interrelations shaped between land and society. This portrayed clearly the aspect of human interferences in natural processes that shape disaster-risk.

Systems of Care take practice-oriented and ethical perspectives on interdependencies and relationality within socioecological systems, such as the ones the thesis addresses regarding risk as a process. They represent all species as active participants in socioenvironmental processes and therefore have the potential assist planning in acknowledging how territories are shaped through dynamic interactions between humans and non-humans, but also to inform on action-oriented strategies grounded in those interdependencies.

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