

WATERFRONT DIALECTICS

ROME AND ITS
REGION FACING
CLIMATE CHANGE
IMPACTS

Edited by:
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MARIE CURIE ACTIONS





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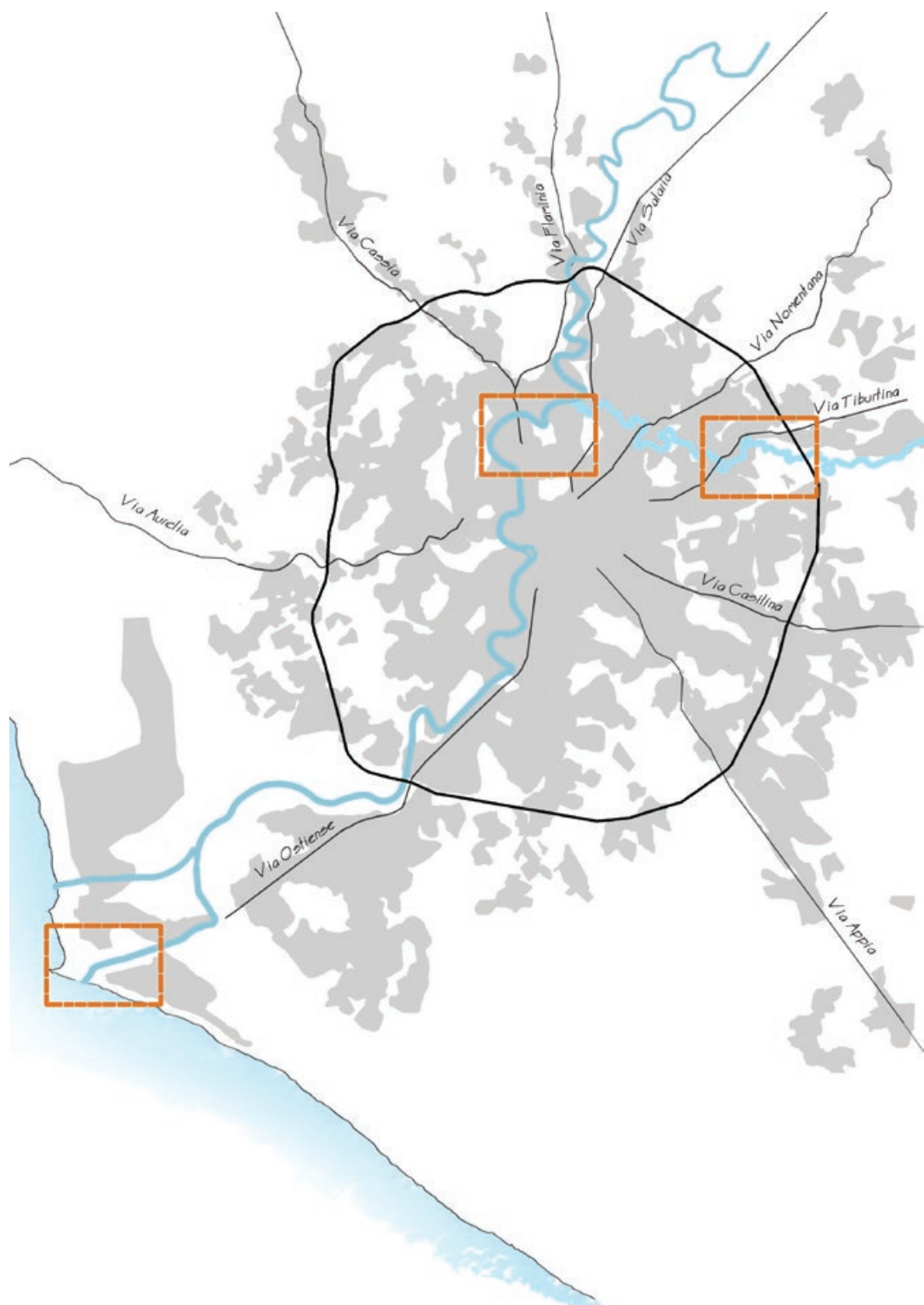
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Introduction

Vulnerability and Opportunity on Waterfront Facing Climate Changing

Waterfront Cities have been struggling with climate change, but are they more vulnerable than other cities?

In recent years the built environment settled along the shore registered major damages from natural disasters and the effects tend to have a growing impact in the next years. At present urban areas near the water are confronted with greater risks, bringing major losses, high maintenance costs and new threats for their communities, thus raising new challenges.

The SOS Climate Waterfront is a H2020 interdisciplinary project, focused on five European cities: Stockholm, Thessaloniki, Gdansk, Lisbon, and Rome facing climate new patterns. Researchers involved in the project aim to identify specific vulnerabilities and envision possible solutions for each city. The research network intends to identify the coming challenges and explore new opportunities for each city enhancing the capacity to develop solutions of resilience by benefiting from the international and interdisciplinary exposure.

The city of Rome is built over a multitude of layers spread out along large periods of time. The eternal city offers a theoretical framework for the present debate that is meaningful to exchange ideas addressing current and future societal, spatial, and environmental challenges. Though poorly equipped to adapt to climate disasters, such as heatwaves, flooding, and rising sea levels, Rome holds an outstanding repository collection of design solutions that have been tested for centuries and that are relevant today.

At present Europe is committed to decarbonize. The United Nations World Population Prospect stipulates that the quality of water services and living conditions in urban areas will decrease due to climatic extreme manifestations. The European Commission claims that the exposure to natural disasters will affect under-equipped cities and their communities thus innovative climate adaptation and mitigation solutions are needed to improve resilience.

Main vulnerabilities emerge with climate extreme manifestations thus strategies of adaptation to new patterns are being implemented. Decarbonization demands decreasing energy consumption, strategies to prevent urban islands' heat effect and the consequent emission of greenhouse gases. It also demands a greener built environment with stronger presence of vegetation and higher permeability of the soil. Impermeable surfaces in urban waterfronts contribute to flooding and pollution of surface waters.

In 2019 the Oslo Triennale discussed the topic “*Enough. The Architecture of Degrowth*” and the Lisbon 2022 Triennale focused on the topic “*Terra*”, both enhancing the importance of reclaiming the balance between humans and the natural environment. The World Congress organised by the International Society of City and Regional Planners in 2020 was dedicated to the “*Post-Oil City: Planning for Urban Green Deals*”. At present degrowth, unbuilding and return to nature are becoming increasingly present in the architectural and urban planning discourse.

Authors such as Pedro Gadanho claim that we will be dealing with the great transition imposed by the urgent need to decarbonize. In his 2022 book *Climax Architecture, how architecture must transform in the age of ecological emergency*, Gadanho argues that emergent new design is inevitable and the process of decarbonizing irreversible. Vishaan Chakrabarti in his 2013 book, *A Country of Cities*, argues that environmental degradation, unsustainable consumption, economic stagnation, rising public health costs and decreased social mobility are threatening the quality of urban life. Density and degrowth are key to enlarging open spaces for the natural environment and enhancement of biodiversity within and around the built environment.

Triennale, Biennale, world congress, authors from various countries share the same concern towards climate emergency. The question is how much change is needed and how long do we have to act. There is an agreement on the main challenges, within a common framework, though solutions are not generic, they are site-specific.

Each neighbourhood requires a delicate approach that holds the knowledge of local historic and geographic circumstances. In Rome, understanding the various scales of urban planning, landscape, architecture, and technology immediately related to water management and the result of previous strategies is required to overcome the gap. The urgent need to collect accurate data on new climatic patterns, learn about the new manifestations, and try to anticipate disasters is present among most of the authors in this book. The main question is how to predict? And to what extent preventive actions, of adaptation and mitigation, are needed?

Throughout the last century, the aim to dominate and control the natural environment has guided most of the decisions on urban waterfronts, both culturally and scientifically. In the 21st century there are new parameters to be considered, as new climate patterns challenge the existing infrastructures. Thus, major costs in infrastructure, still being built at present, represent a huge financial effort for the communities and local governmental agencies.

Outdated and unable to deal with new climatic patterns, they raise the urgent need for a new way of thinking, based on a dialogue with nature. This dialogue is dependent on the capacity to listen, observe and engage with contributions. In the first twenty years of the 21st century there are still major infrastructures being implemented that follow methodologies from the 20th century, driven by the aim to control nature instead of dealing with nature. An approach that does not acknowledge either an interdisciplinary dialogue or the capacity to negotiate and accommodate new patterns.

Some communities settled along the waterfront have been implementing solutions based on interdisciplinary discussions for centuries; there are still some heritage buildings and meaningful public spaces that hold clever solutions and a strong cultural presence along the waterfront. They offer a precious contribution to the present debate. In Rome some territories were redesigned to take benefit from the water, the waterways, maritime activities, and the possibility to moor in the city. When it comes to exploring site specific solutions for the 21st century such knowledge is relevant to improve resilience. Resilient thinking can be described as a way of strengthening the urban fabric, boosting urban life and adjusting to new demands. Urban Resilience is the capacity of the systems within a city to mitigate, adapt and grow while taking advantage of crisis or shocks.

The exchange of good practices among the five European cities, brings an added value to the debate. Each being settled on a particular landscape, has been dealing with hydrologic conditions in a unique way. Each holds an elaborated relation with the water, the landfill built over time, offering a handful of urban environments. Together, the five cover a large spectrum of approaches and paradigms. In Rome, layers of history offer theoretical concepts that lead to specific design solutions. However, when it comes to dealing with climatic extreme swings, they face similar challenges as they are unprepared. Singular historic and geographic conditions make Rome's waterfront unique, a result of a narrative of previous generations. Built upon visions to succeed natural forces, cities have domesticated the wild, managed the environment and implemented a unique cultural landscape.

Rome was initially settled over the river *Tiber*, affluent *Aniene* and a few more water streams that attracted humans to settle in the region. Buildings were implemented along a large network of waterways, layers of interventions have shaped the built environment to the present day. Throughout centuries generations of Romans have benefited from these lines of clean water taking advantage of the communities and the access to the Mediterranean Sea.

In the five cities the transformation of the territory brought more buildings, more impermeable areas and consequently higher floods that occasionally devastated the city. The city of Lisbon for instance, suffered an earthquake of 1755, affecting mainly the waterfront neighbourhoods. The deepness of devastation is well documented, built over landfill and sedimented soiled many constructions collapsed and were flooded by the subsequent high tide that reached the areas located along the river. Later in the late 19th century, the industrial port built on the river along the city, took in consideration the precedent catastrophe. New buildings had to be prepared for high tides and storms, this wisdom was included in their design. At the ground level materials covering the walls were water-resistant and designed to accommodate flooding. The knowledge of the natural disaster of the 18th century influenced the design solutions implemented in the 19th century.

In Stockholm the new neighbourhood of Hammarby Sjostad built in the early 21st century introduced permeable public spaces to drain the floods. At the scale of the built environment, most buildings have 3 to 5 floors. The density treasures energy efficiency and the public spaces keep the human scale. Most of the buildings use wooden structures.

Public spaces with vegetation, design to privilege pedestrians, soft modes of transport and the relationship with nature. The porosity of public spaces, which drain heavy rainfall and prevent flooding. All waste produced by the inhabitants is recycled in the creation of combustion.

Involvement of the community in the discussion of the program as it develops. Public participation in the development of the project and the implementation of a bottom-up strategy to influence policy decisions.

Lessons from each city offer a broad understanding of past, present, and future solutions that are specific to particular geographies and sensitive to local communities, their urban environments and the local building materials. Crossing visions offer enlightened design to overcome existing vulnerabilities.

This book, dedicated to Rome, is divided into three parts plus one. Part One, *Rome Coastal System*, presents historical approaches and dynamics in progress covering histories and current transformations along the seaside. Part Two, *Rome and the Tiber*, deals with historical perspectives, strategies and transformation programs linked to the most central areas of the city.

Part Three, *Rome Aniene River*, aims to contribute to the rediscovery of the largest tributary of the Tiber, the Aniene, too

often hidden by aggressive urbanisation within the metropolitan part.

Part Four is entirely dedicated to the expressive drawings that were elaborated during the Spring Rome workshop 2022. They clearly realise how important the empathic relationship with places is in order to fully understand their structure and potential in view of their transformation sensitive to the current conditions of climate change.

The authors listed in this book are developing their own research and come from different disciplines. They offer a sharp perception of the present debate on Rome's different waterfront, along the coastline, but also along the two major rivers, Tiber and Aniene. Articles address the role of local authorities, public and private investors; they cover a large spectrum of possibilities, the cultural identity based on historic, geographic, and societal issues addressing the city, and individuals.

It takes different approaches, environmental, social, technological, economic, cultural, each in its own way and aims to protect the Eternal city from catastrophic climate disasters. Each group presents solutions and future strategies, and some of the design proposals demand a new culture to manage and heal the territory. Decarbonization demands profound shifts in the way cities have been organised. The mobilisation of local communities towards more sustainable behaviours, the protection of biodiversity, and the integration of blue and green systems in the urban environment come across several authors.

Some design, landscape, architecture, and urban design illustrated in this book, leads to the urgent need for urban porosity and the necessity to bring nature back to the urban environment. Such an approach incorporates new perspectives to spatial planning at the scale of the city of Rome, rivers Tiber and Aniene. Emerging strategies integrate parameters to reduce energy consumption and shrink the carbon footprint. The results of the research carried out within SOS Climate Waterfront are made available on open access sources through the website of the program, shared database, and the publication of this book which will be also available online.

The aim is to share the outcomes, solutions and strategies that, in many cases, need the support and the mobilisation of civil society. It is meaningful for the research project to disseminate the results, and influence contemporary culture so that waterfront communities may evolve towards more sustainable behaviours, build responsive networks, and protect their local biodiversity.

Pedro Ressano Garcia, Primary Coordinator of H2020-MSCA-RISE

Do Three Different Waterfront Make Rome a City of Water?

Rome is a very special city. Anyway, I know that every city is special...

But Rome is truly a special place where everything is superlative and lasting.

Centuries of history have so many layers and everything seems to exist even before it begins.

The traces of the past mix with the becoming, sometimes slow and in any case never hasty.

Aspirations for change appear indeterminate and are crushed by a present in which abandonment and lack of care seem to dominate.

But now, the *Eternal City* is called upon to find new declinations, although the permanence of the uses remains a constant in many spaces. The radial network of consular roads still draws the guidelines for urban development and is confirmed as the main road mobility network.

The Aurelian Walls keep their profile almost unchanged; the layout of the ancient Roman aqueducts still stands out in the Roman countryside and sometimes resurfaces even within the denser urban fabric. Contrary to the past, however, today water no longer plays an important role and often its presence is hidden by senseless landfill works. Water is no longer a resource, as it was in ancient Roman times, but more and more often it is proving to be a problem to be tackled with modest emergency solutions.

The main critical issues can be summarised in four broad categories, of which the first three pertain to environmental phenomena, while the fourth refers to spatial relationships with places.

Coastal erosion. The erosion is mainly concentrated near the mouth of the Tiber River between Ostia and Fiumicino, where the mainly sandy coast is subjected to natural and anthropic pressures. Winds and storms, the presence of currents, sea level rise and soil subsidence, solid supply, and flow rate of watercourses to the sea, are natural components that unfold their effects over the long term. Human interventions are responsible for important changes, a part of which dates to the remodelling of Rome, which became the capital of Italy in 1871. Such as, for example, the construction of the river embankments, the so-called "muraglioni", in the central urban area, about eight kilometres long between Ponte Margherita and Ponte Sublicio, to defend the city from the floods of the Tiber; or the riverbanks of the stretch of the Tiber towards the sea, built in the 1930s to protect the reclaimed land from flooding.

The most consistent and fast transformations, however, took place from the second half of XXth century.

The construction of residential buildings and accommodation facilities along the entire coast, the layout of new infrastructures, the development of tourist ports, have led to heavy “disorganic interferences” which have not respected the delicate balance of marine territories and have accentuated their fragility.

Added to these ones, there are a series of alterations that have modified the course of the Tiber, and therefore, the contribution of sediments, including the repeated withdrawals from the riverbed of huge inert used as construction material, the building of hydroelectric plants and dams upstream for flow regulation.

The floods. The hydrographic structure of Rome is characterised by a dense network of watercourses in which the two major rivers, the Tiber and the Aniene, and 12 short-length tributaries, called “fossi” are distinguished.

Only some of these watercourses are partially visible within environmental corridors, while most of them have undergone profound changes and are incorporated into sewage collectors because of intense and chaotic urban growth. As a result, the landscape suffers for discontinuous alternations of naturalistic stretches and artificial transformations. Green corridors often abandoned are cut by river alterations like fillings and covers, embankment works and captation plants, even illegal ones, which have deteriorated the entire system.

The sealing of the soil, the poor maintenance of the sewage system and the intensification of meteoric events make the city exposed to urban flooding phenomena, especially in the event of particularly intense rainfall, to which are added non-negligible risks deriving from pluvial flooding, or localised flooding caused by the difficult disposal of rainwater.

Water crisis. The effects of climate change, the growing use of water and the increase in water captations, the rise in temperatures combined with prolonged periods of drought, have led in recent years to a critical reduction in the availability of water resources, especially in the summer months.

The flow rates of surface water courses as well as the springs that supply the large aqueducts arriving in Rome, the most populous Italian municipality, are increasingly below the natural levels. Now they are reaching minimum values that do not guarantee the necessary water reserves.

The result is a growing difficulty in the availability of drinking water with important impacts that have repercussions not

only on civic, agricultural, and industrial uses, but also on biodiversity.

Loss of the relationships of perception and collective enjoyment with the sea and rivers. The transformation of the soil from a “natural” to an “artificial” use is a problem of great concern because it affects the fragmentation of the territory, the reduction of biodiversity, the alterations of the hydrogeological cycle and microclimatic modifications.

The coastline, which once represented the opening towards the Mediterranean, is today seriously compromised by kilometres of chaotic urbanisation. The predominantly tourist and residential purpose of the buildings, built above all from the 1960s onwards, completely block direct access to the sea and often also prevent its view.

In an urban context, the Tiber River is enclosed by high “muraglioni” which do not allow direct fruition near the water, but only make possible a broad monumental overview. Furthermore, access to water is practically closed upstream and downstream of the central urban area as the embankments are difficult to access. Industrial buildings and shipbuilding areas, private sports clubs, improper uses such as camps for nomad people and logistics areas, tourist and recreational facilities, alternate with residual open cultivated or uncultivated areas which effectively interrupt the ecological continuity of the river area.

Similarly, the banks of the Aniene are practically “hidden” from view and from pedestrian practicability due to a progressive and illegal privatisation which also negatively affects the quality of the water and the maintenance of the floodplain areas.

In the impossibility of dealing with the vast criticalities due to climate change, which is affecting the entire planet, we have therefore tried to summarize some more immediate problems by identifying three emblematic case studies for the Sustainable Open Solutions Climate Waterfront Workshop in Rome 2022.

The three case studies also correspond to the organization of the volume in three parts and refer to three main problems affecting the coastal area and the two river branches of the Tiber and Aniene.

The first case study is related to the coast, a long strip of sand with dunes, where elements of great environmental quality and large archaeological areas remain. These must live with chaotic urban development, with land consumption often caused by tourism and grey infrastructures, with degradation and lack of care.

Very often the sea is not visible from the hinterland or is difficult to reach. It is hidden by poor quality tourist facilities that have privatized the public use of the coast.

The main goal of the first case study is to re-establish the links between the presences of important archaeological ruins, the surrounding landscape, often disqualified, and the sea.

Green and blue infrastructures could be a good solution to systematize archaeological finds, get closer to the sea and implement landscape and hydrogeological interventions to counteract coastal erosion.

The second case study is in a dense urban space, and it relates to the Tiber River.

The construction of the embankments and the Lungotevere has changed the perception of the river, which has “moved away” from everyday life.

Some urban spaces, even very close to the river, have not been able to assume this presence as a design potential. Often, they even deny its presence...

The main objective of the second case study is to propose an urban project capable of rediscovering and structuring the urban landscape, the role of the river and, at the same time, protecting against floods.

The third case study concerns Aniene River, the hidden tributary of Tiber River. Despite having a very long history in the development of the city and its surroundings (just remember Villa d’Este in Tivoli), its presence goes completely unnoticed.

In the eastern part of the city, Aniene crosses the industrial district and is very compromised from an environmental and landscape point of view.

The main objective of the third case study is to make the Aniene River visible. We need to imagine green paths, open points of view, re-naturalize the smaller hydrographical network, and create a blue network to counteract floods and increasing rains. Climate change strongly interacts with a variety of problems deriving from urbanization, water and air pollution, biodiversity loss and degradation of land and marine ecosystems. Coastal areas as well as river edges are today among the priority places in which to tackle climate change with a design approach to create new landscapes, to reconfigure forms of naturalness, to implement the network of green and blue infrastructures to become more adaptive and resilient. That’s what our planet is calling us to do now!

Claudia Mattogno, Sapienza University of Rome

Part 1.
Rome Coastal System



Rediscovering Layers and Links Between Water Landscapes and Cultural Heritage

The Lazio coast has very peculiar characteristics outlined by ancient evidence of human presence. Finds from the protohistoric era; traces of Roman roads; ancient port structures, transformed later into archaeological and naturalistic areas; defence systems such as watchtowers; salt marshes; wooded areas and scrub Mediterranean maquis; farms and hydraulic reclamation; drainage channels, constitute the historical wealth of the territory. These morphological and environmental characteristics include numerous archaeological and architectural presences in a complex physical context marked by important modern and contemporary anthropic transformations as well as by the effects of recent climate changes.

The different landscapes of the coast, however, still manage to bring out the traces of geography and history, although today they are largely compromised by a consistent, and often uncontrolled, building pressure and tourist use in addition to the construction of important infrastructures, starting from the Fiumicino airport.

These morphological and environmental characteristics include numerous archaeological and architectural relics in a complex physical context, marked by important modern and contemporary anthropic transformations as well as by the effects of recent climatic changes.

Such a varied territory is still able to bring out environmental and cultural potential, but it needs a new strategic vision. The design and awareness-raising practices must be aimed at taking care of the territory so that the equipment and public spaces, the infrastructures and the archaeological-architectural pre-existence are able to dialogue with the environmental peculiarities and generate new forms of collective identity combined with resilient approaches.

However, to challenge climate change it will be necessary to involve local communities and the various stakeholders according to a new synergistic relationship with the administrative powers at all levels: from central government to local administrators. And above all we need an effective and shared strategic vision, immediately followed from concrete actions. Therefore, conscious projects and practices must create a new care of the territory based on sensitive approaches to social needs while preserving the historical, cultural, and environmental legacy.

The first part of the book analyses the Roman coastal system, using the rich and fragile cultural and landscape heritage as a key to understanding it in relation to historical stratifications and in the light of the most recent climate changes. It is proposed

to investigate the development process of the settlements that occurred along the Lazio coast between Civitavecchia in the north and Monte Circeo in the south.

Between the two extremes of this long geographical band, the contributions that follow are concentrated mainly between Ostia Antica and the mouth of the river and are aimed at rediscovering the stratifications and links between the water landscapes of the coast and the cultural heritage, reflecting on the interaction and interdependence of a waterfront territory as a cultural artefact.

The article by Maria Grazia Turco, *The various landscape of the Ostiense coastal and environmental heritage*, introduces this first part and deals with the complex cultural, environmental and landscape heritage of the Ostiense coast, illustrating how the highly valuable morphological conformations that have settled over time are subjected to strong anthropogenic pressures. Its setting is completed by a different approach shared by Sonia Gallico and Barbara Tetti in their article *The coastal territory of Rome. Environment, Architecture and Archaeology* which highlights the continuous transformation of the territory along the Tyrrhenian coast.

Annalisa Metta closes the historical topic with an article with a very suggestive title, *Lake Navona and the eels of the Pantheon. Architecture and landscape for floods*, which highlights the fruitful interweaving between architecture of the past and knowledge of the water dynamics, testifying how in ancient Rome buildings and urban artefacts were conceived to accommodate floods and designed to integrate with the needs of the environment.

Giulia Luciani's contribution *A trip along the coast* invites us to travel along the coast, making us discover suggestive images and problems of great environmental emergency, such as those addressed more specifically in the text by Michele Manigrasso entitled *Land consumption and coastal erosion in Italy. A focus on the Lazio Region*. The anthropic transformations and the strong erosion along the Lazio coast are complementary topics to the article *Land consumption along the coast is increasing the local vulnerability: the case of Rome and other six cities* written by Francesca Assennato of ISPRA. Both recognize the vulnerabilities and alterations created by human interventions on this particular coastal territory where valuable landscapes alternate with areas of chaotic urbanization.

The case study of the Roman Riviera concludes the first part by prefiguring a new vision of the Ostia area aimed at reconnecting the links between environmental and historical

values and at the same time attentive to contemporary uses that can allow for an increase in spatial qualities.

It is essential to “free” the shoreline from any incongruous and invasive activity, reusing the areas left free to reconfigure new forms of naturalness capable of ensuring ecological continuity between the different parts that make up the coast, both longitudinal and transversal depth of the territory itself. The protection of the artefacts and landscapes that make up our cultural heritage proves to be strategic as a starting point for a profound environmental redevelopment that knows how to dialogue with the water spaces and the needs required by the ongoing and now unavoidable climate changes.



Figure 1. The Circeo promontory seen from the coast of Sabaudia.

Figure 2. The dunes of Sabaudia.

One of the most complex discussions concerning climate emergency is the sustainable water management. How to deal with the risks generated by climate change where the presence of cultural and environmental assets is highly stratified over time?

How to manage large densely populated areas rich in environmental and human resources, ensuring their protection and development? It's now time to integrate the connections between the different territorial scales and to ensure the balance between public and private interests in a framework of sustainable strategies.

SOS Climate Waterfront is an interdisciplinary project that aims to explore waterfronts in Europe that are facing climate change. The volume presents the results of the workshop held in Rome in spring 2022.

