



Erasmus+

Edited by

Antonio Acierno

Paolo Camilletti

The case of Phlegraean Fields coastal area on the Mediterranean Sea

CO-LAND. Inclusive Coastal Landscapes

Activating green and blue infrastructure for
sustainable development of the urban-land interface





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The present material is a result of the CO-LAND Intensive Study Programme which took place in the municipality of Pozzuoli (Phlegraean Fields' Region, Italy) on the Mediterranean Sea from 8th to 17th of September 2019.

Credits: texts, plans, maps, photographs and other graphic elements were created by workshop participants unless otherwise indicated in the material.

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CO-LAND OVERVIEW

About the ERASMUS strategic partnership and the relevance of coastal landscapes



The complex coast of Pozzuoli, the main Phlegraean city, along the Via Napoli promenade.

Coastal landscapes across Europe are often characterised by overlapping and competing land uses. These areas are the focus for settlements and infrastructure, especially road and train networks, and many industries and commercial zones that benefit from close access to harbours. Conversely, the tourism industry is also a major driving force with its own development dynamics and typical spatial patterns. All these economic potentials have attracted people to settle on the coast. This process is ongoing, leading to unsustainable development such as urban sprawl and irreversible consumption of soil and other natural resources. However, water-based recreation and exercise activities have various positive effects on human health, physical and mental well-being, which is one of the main



Bacoli's coastline with the Miseno lake, one of the most iconic element of the site.

reasons to pursue the widest possible access to the seaside. The urban-



The tapered coastal strip of Cuma, in the northern part of the Phlegraean Fields.

land interface is also an essential and often vulnerable habitat zone for flora and fauna, which brings additional demands on such areas and also places them at risk from damage and degradation. Being a pole of human settlement since early times, coastal landscapes are also often extremely rich in cultural heritage and form part of our collective memory and identity. The sustainable and integrated planning, design and management of coastal landscapes is crucial for the mental, social, physical and economic well-being of the citizens. The ERASMUS+ strategic partnership 'COLAND - Inclusive

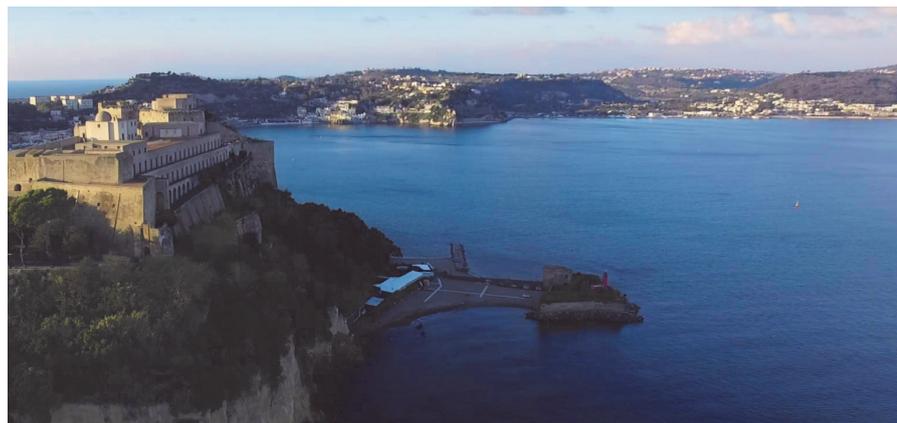
Coastal Landscapes' is developing an innovative study module by combining online and site-based learning activities. Due to the sensitive nature of coastal landscapes and their social, economic and environmental relevance, it is vital that planners and designers learn how to manage these territories in a sustainable way. Course participants develop a profound understanding of the specific character of coastal landscapes. They learn which driving forces are influencing the landscape system and which impact types are most relevant for planning and design responses. Participants further learn about various



Averno lake is an evocative element of the Phlegraean blue infrastructure.

approaches to landscape assessment in order to specify the challenges and potentials of a coastal landscape. They have the opportunity to define and test assessment models and derive relevant knowledge for planning and design, such as the introduction of green-blue infrastructure in coastal landscapes. Different approaches to strategy building, planning and design in the context of coastal landscapes are presented. Hence, the course participants are able to draft a strategy and a master plan for a coastal area taking economic, ecological and social aspects and current policies into account.

The third online course was held in spring 2019 and preceded the 10-day Intensive Study Programme (ISP) in Pozzuoli that is the subject of



The coast of Baia with the homonymous castle, now a museum.

with some 70,000 inhabitants, offers the chance to investigate a multi-layered coastal area where dense urbanisation, rare environmental phenomena (vulcanism), nature values, remarkable cultural and historical heritage and strategic infrastructure coexist. This workshop was the third ISP organised by the project consortium in cooperation with the Municipality of Pozzuoli.

The COLAND project itself began in September 2017 and completed at the end of August 2020. For more information, please visit the project website: <http://www.coland.eu>



The coast of Lake Fusaro with the hunting lodge designed by Luigi Vanvitelli.

this report. The unique landscape of the Phlegraean Fields and Pozzuoli,

CO-LAND Intensive Programme locations



'...the most wonderful regions in the world! Beneath the purest sky, the most treacherous soil; ruins of inconceivable opulence, oppressive and saddening; boiling waters, clefts exhaling sulphur, rocks of slag defying vegetable life, bare, forbidding tracts; and then, at last, on all sides the most luxuriant vegetation, seizing every spot and cranny possible, running over every lifeless object, edging the lakes and brooks, and nourishing a glorious wood of oak on the brink of an ancient crater!'

Johann Wolfgang von Goethe - Italian Journey (1816-1817)

Description of the Phlegraean Fields

Competences and learning outcomes

The Intensive Study Programme (ISP) builds upon subject-specific knowledge presented in the online course that preceded this workshop. The topics introduced to the learners focussed on the following three areas:

- understanding coastal landscapes systems, their driving forces, challenges and processes;
- evaluation and assessment of the economic, ecological and social dimension linked to the UN Sustainable Development Goals and coastal policies; and
- integrated planning and design, by developing a strategy and spatial plans for sustainable development integrated with international and local policies for the coastal area.

The ISP challenged the participants to gain two sets of competences within a list of learning outcomes given below.

Social and personal competences

Participants can:

- identify a change potential based on a critical reflection of structures, conditions and dependencies with respect to their own societal and/

or environmental context;

- actively participate in an interdisciplinary planning and design process;
- actively participate in a multidisciplinary team in a self-organised and process-oriented manner;
- communicate and present in English;
- self-reflect when confronted by other disciplines, cultures, and local contexts;
- describe their value schemes and interpretation patterns; and
- describe their career perspectives and professional goals in the context of integrated planning and design.

Methodical competences

Participants can:

- acquire relevant knowledge and information independently;
- evaluate, analyse and process information for developing integrative planning and design;

- independently design a working process in a target-oriented way;
- transfer planning and design knowledge and methods to a new and unknown context;
- apply project management and team building methods.; and
- communicate results to different types of audiences (i.e., subject-specific and general public) using both analogue and ICT-based means of communication.

Operational structure and process

The process structured around the following major activities:

- identifying local potentials by applying a holistic landscape assessment framework;
- using the green-blue infrastructure approach to improve connectivity and multifunctionality of fragmented and competing spatial layers and structures;
- using people-centred and community-based evaluation, planning and design methods;
- applying scenario techniques for envisioning alternative futures and discussing these ideas with the local community;
- using innovative communication and visualisation tools to support the community in envisioning alternative futures; and
- documenting outcomes as a basis for further local discussions and processes.



Partners and collaborators

Administration

Pozzuoli City Hall

Bacoli City Hall

Economic and Tourism Environment

Associazione Commercianti Centro storico di Pozzuoli

Le Terme Stufe di Nerone

Albergatori dei Campi Flegrei

Cultural environment

Parco Archeologico dei Campi Flegrei

Museo archeologico di Baia

Scavi archeologici del Rione Terra

Anfiteatro Flavio

Villa Ferretti

CNR IRISS - Istituto di Ricerca su Innovazione e Servizi per lo Sviluppo

CNR ISMAR - Istituto di scienze marine

Istituto Tecnico per Geometri "Vilfredo Pareto" Pozzuoli

Civil society

Associazione Percorsi Cumani

Associazione FreeBacoli

Associazione Diamo a Bacoli

Media environment

IlMattino di Napoli

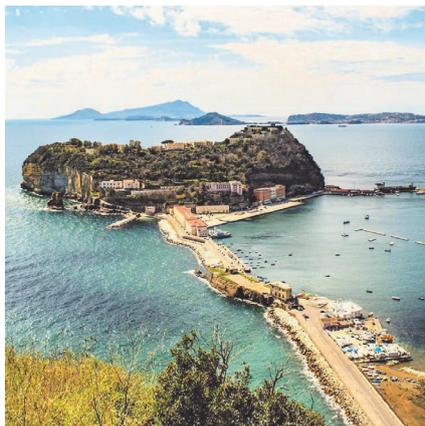


Introduction to the Phlegraean Fields' Case

The landscape of the Phlegraean Fields highlights a deep, ancient, and dynamic interaction between natural and anthropic factors. Volcanism and sea are the main natural elements which shaped this territory. Such fascinating land, colonised by the Greeks, then widely adapted to the agricultural and farming practices, attracted Roman emperors and noblemen who launched its millenary touristic vocation. Moreover, the settlement process was harmonious until very recent times. In the 20th century the anthropic pressure deeply altered the image of the Phlegraean Fields, partly hiding the readability of environmental heritage and affecting the agrarian continuum. Indeed, the current image shows a degraded and fragmented ecosystem. Among the possible actions, the realisation of green-blue infrastructures can be an effective way to enhance ecosystem services and biodiversity, and also to link the cultural and historic heritage. Due to the Greek and Roman settlements, the presence of ancient ruins has characterised the Phlegraean landscape for many centuries. Throughout the history, the interest for this territory increased from the Renaissance on, when architects started to study its archaeological heritage, well preserved and rich of exemplary construction techniques. As said, the morphology of the Phlegraean Fields has been mainly forged by the intense volcanism, whose action can be clearly noticed

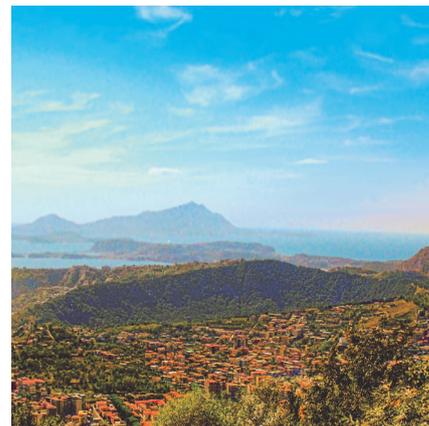
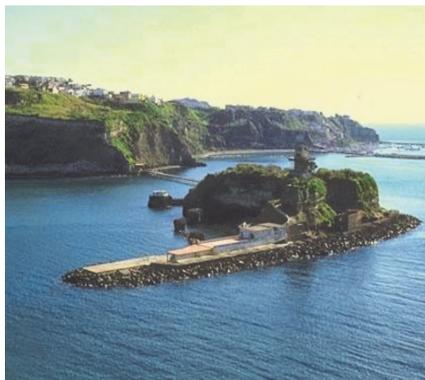


On the left, aerial view of the Phlegraean Fields; on the right, San Martino islet (Monte di Procida).



On the left, the islet of Nisida; on the right, the Astroni crater, near the urban centre of Pozzuoli.

among the lakes, the hills, and the coastal line, not to mention secondary events such as Pozzuoli's Solfatara and the natural springs of Agnano's Baths. It is wise to reflect upon the conservation and the current role of such hallmarks, especially after the urban sprawl occurred in the 20th century, which deteriorated the settlement quality. In the decades 1900s-1950s the decline of crop and farming soil surface was marginal, whilst figures show a 30% loss of woodland surface. Indeed, it was the heavy urbanisation in post Second World War period which threatened the conservation of landscape and cultural heritage. Partly unauthorised and partly planned on mere zoning criteria, it also led to the abandonment of fertile agricultural areas. Despite the land speculation and the industrialisation - the latter located



even in coastal areas - from the 1990s on some natural areas have been put under protection by acknowledging their outstanding environmental characteristics (e.g. Regional Park of Phlegraean Fields). In the recent twenty years, the population trends have been rather stagnant and several urban phenomena have contributed to widen the horizons of local policies. The rediscovery of historic centres, the improvement of green and coastal areas, innovation in mobility and public transport, ideas for reusing abandoned industrial settlements have been only some of the main challenges for local authorities and stakeholders. At the same time, the Phlegraean territory still offers rare volcanic and water features, remarkable agrarian and coastal landscapes. Finally, among urban settlements and countryside, glorious legacies of the past such as Roman cisterns, villas, temples, and oracles emerge in this densely stratified area. Coherently with the shared geomorphologic features, the main Phlegraean archaeological settlements of Cuma, Puteoli-Pozzuoli, and Baia-Bacoli-Miseno cross the administrative borders of the three major municipalities - Pozzuoli, Bacoli, and Monte di Procida. Therefore, it would be wise to delineate a unifying proposal of cultural landscape improvement.

PHLEGRAEAN FIELDS' CASE STUDY

Antonio Acierno

Strategic projects for the Campi Flegrei's green infrastructure

A high concentration of environmental, cultural, landscape, economic and social resources characterises the territory of the Phlegraean Fields. These resources make it exceptionally interesting and, simultaneously, a place of problematic governance of transformations. This is due to the evident conflict between the aspirations and interests of economic drivers and the protection of natural and cultural resources. First, the distinctive character of the Phlegraean Fields, as its name reminds us, is exemplified by its volcanic structure, in which bradyseism and the continuous seismic phenomena associated to it still manifest the power of nature. It is a volcanic land that constitutes a risk for populations, on the one hand, but also is an excellent resource for the richness of its thermal waters and soil fertility, on the other hand. The presence of craters along a snaking coastline makes for an exceptional and unique landscape, as travellers' narratives since the 1700s have demonstrated. The richness of the landscape made

the Phlegraean Fields an important tourist destination since ancient times when the most famous Roman patrician families stayed in luxurious homes during the summer. The presence of Greeks and Romans in the past has left an invaluable asset of archaeological heritage with amazing architecture, infrastructure, signs of agricultural partitions and artistic objects recovered and reused even in contemporary buildings. The Phlegraean Fields constitute an emblematic case of a territorial "palimpsest" where nature, history, architecture and culture overlap, providing us in return a unique coastal landscape. The relationship with the sea is undoubtedly one of the founding features of this landscape. The waves of the sea and the winds have shaped the coastal morphology, variously characterised by the presence of beaches, woods, hills and high cliffs. From the sea, the Greeks founded the first colony of the West Mediterranean Sea, Cumae, from nearby Pithecusa (on the island of Ischia) and later

Puteoli, which became the main port of the Roman empire before the construction of Ostia. As a place of sumptuous patrician residences and military equipment, the latter due to the allocation of the imperial fleet in the safe-basin Lucrino and Averno lakes, the territory of the Phlegraean Fields nowadays is an open-air museum composed of countless archaeological remains, also underwater, many of which can be visited.

While the Phlegraean Fields represent a concentration of natural and historical-cultural resources, they are also a territory burdened by strong settlement, demographic and economic pressures. A population of about 120,000 inhabitants (the Pozzuoli, Bacoli and Monte di Procida Municipalities) lives within a 60 sq km area for a density of 2,000 inhabitants/sq km, one of the highest in Europe. The population growth of the past 60 years nearly doubled when compared with the 80,000 inhabitants of 1960. Along with population growth, economic activities have also developed. Especially the industrial sector, that has settled along the coast in proximity to the ports. All of these past developments have led to soil consumption, dense urbanisation and the waterproofing of natural surfaces. The current road network has never been adequate for the settlements in the territory and is one of the main problems due to the extreme difficulty to access internal areas. Heavy traffic burdens narrow and outdated streets, especially during weekends affecting medium-range tourist mobility. The railway connections with the heart of the metropolitan region, Naples, are more acceptable. Especially with the presence of the Cumana and Circumflegrea lines as well as the regional metro. The railway network that runs mainly along the coast, however, presents a substantial barrier preventing accessibility and limiting connection with the sea. Furthermore, the presence of

Fig. 1 - Phlegraean Fields represent a volcanic area in the western part of Naples.



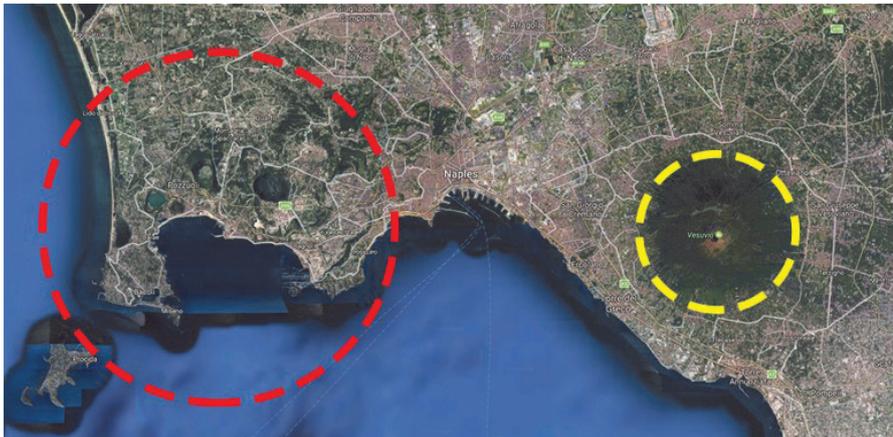


Fig. 2 - The supervolcano in the area of Phlegraean Fields have created a unique landscape.

intense residential and industrial urbanisation close to the coast constitutes a substantial break in landscape continuity, especially the land-sea interface. Despite this difficult access to the sea, the Phlegraean Fields are a popular destination for seaside tourism. Coming from the metropolitan area during the summer and weekends, visitors assault and congest the few available beaches, degrading their environmental and landscape values.

Therefore, the Phlegraean Fields constitute a rich territory in terms of environmental and cultural assets; unfortunately, however, subject to residential and touristic pressures that have severely compromised landscape integrity. The challenges for urban planning and landscape planning in this territory can be summarised as follows:

- mitigation of impacts derived from volcanic, seismic and hydraulic risks;
- urban regeneration and remediation of abandoned industrial sites;
- protection and enhancement of natural and archaeological heritage;
- sustainable management of seaside tourism pressures;
- promotion of sustainable nature-based tourism;
- improvement of territorial internal connectivity and development of slow mobility;

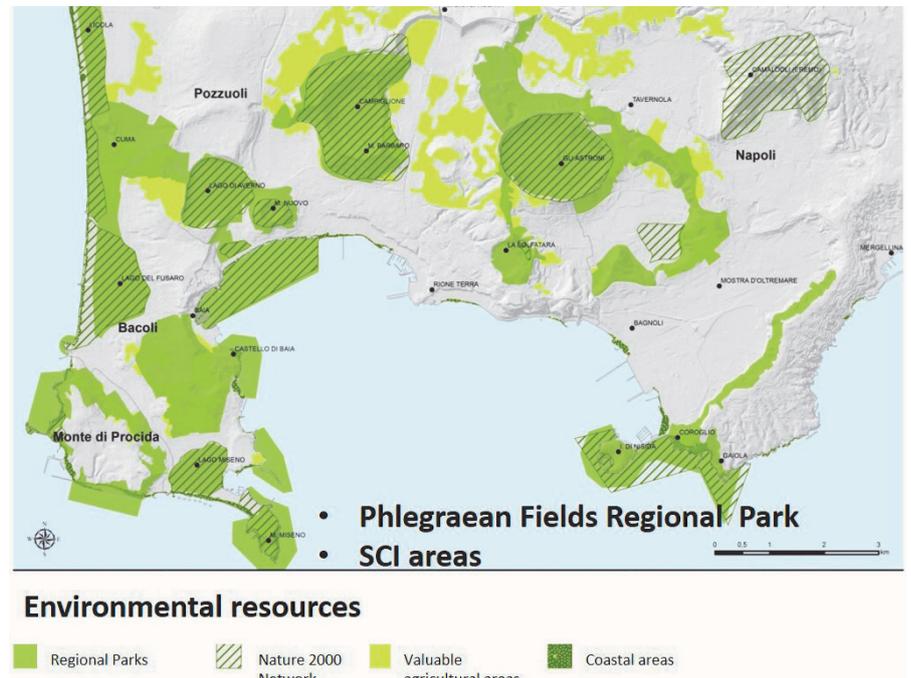
- construction of green and blue infrastructures;
- promotion of organic agriculture and local food products;
- intensification of local communities' participation; and
- empowerment of local identity.

These challenges must be addressed through strategic planning at the metropolitan and municipal level, and subsequently implemented through

the development of local plans, urban projects, landscape redevelopment projects, and sectoral economic programmes. Numerous plans are governing the different scales and components of the Phlegraean Fields territory: the PTR Regional Territorial Plan, the PTC Territorial Coordination Plan of the Metropolitan City of Naples, the PUC (Municipal Urban Plans) of the three municipalities (Pozzuoli, Bacoli, Monte di Procida), the PAI (Hydrogeological Plan) managing landslide and flood risk, the PP (Landscape Plan) of the Phlegraean Fields and the Phlegraean Fields' Regional Park Plan.

Additionally, there are regional programmes such as the "Masterplan of the Domitia-Flegrea Area" and the PIT (Integrated Territorial Project) of Phlegraean Fields which introduce a coherent network of local projects capable of redeveloping and enhancing the territory. Moreover, we should consider all the current implementation plans at the neighbourhood scale, to really understand how the region is planned.

Fig. 3 - Phlegraean Fields' green infrastructure, highlighting the environmental resources.



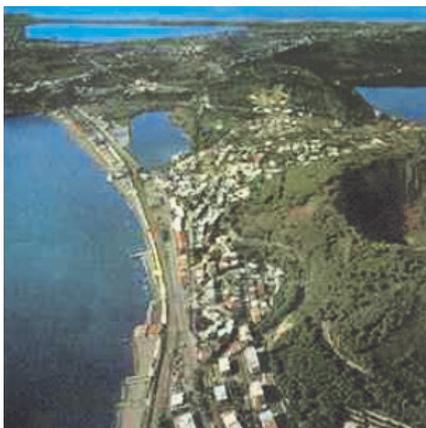
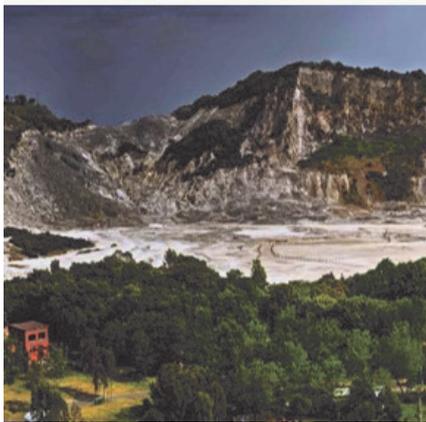


Fig. 4 - Green infrastructure's elements: Miseno beach, Solfatara and Monte Nuovo.

despite the numerous plans and programmes, because sustainable transformations remain limited and affected by slow implementation processes. The PAI is a plan of special interest for the students' workshop because it analyses coastal typologies and risks. The plan highlights the risks associated with coastal erosion produced by currents, winds and the effects of climate change, as well as the particular phenomenon of this volcanic area, bradyseism. Bradyseism consists of the raising and lowering of the soil surface, due to the movement of the underlying magma present in the ancient volcanic caldera. Among the plans' documents, the landslide risk map is of selective interest because it highlights the large areas affected by the hazards, due to the specific geo-morphology composed of edges and steep walls of the craters. The flood risk map is also interesting for understanding the effects of climate change, which result in intense rainfall occurring in limited periods. Alberto Fortelli focussed in detail on the climatic characteristics and effects of flooding in one of the book's essays. Likewise, in the geologist Fabio Matano's essay, the phenomenon of coastal erosion is analysed in depth.

The risks related to the volcanic nature of the territory, its climatic conditions and ongoing planetary climate change are design priorities in the "landscape restoration" required to safeguard environmental resources and regenerate the degraded urban structure.

The restoration and enhancement strategies of the Phlegraean Fields' landscape represent the applied range of projects developed by students during the workshop in Pozzuoli. The strategies at the basis of the design proposals, consider the territorial role of the municipalities of Pozzuoli, Bacoli and Monte di Procida inside the western area of the Neapolitan metropolitan area. The Phlegraean Fields are located on



Fig. 5 - Blue infrastructure's elements: the lakes of Averno, Fusaro and Lucrino.

the western urbanised metropolitan boundary beyond which the vast flat area of the Domitio coast begins towards the north. This border condition shows the role of the

Therefore, the Phlegraean Fields are the focus of urban, regional and landscape planning interests. However, tangible outcomes within the territory are disappointing,

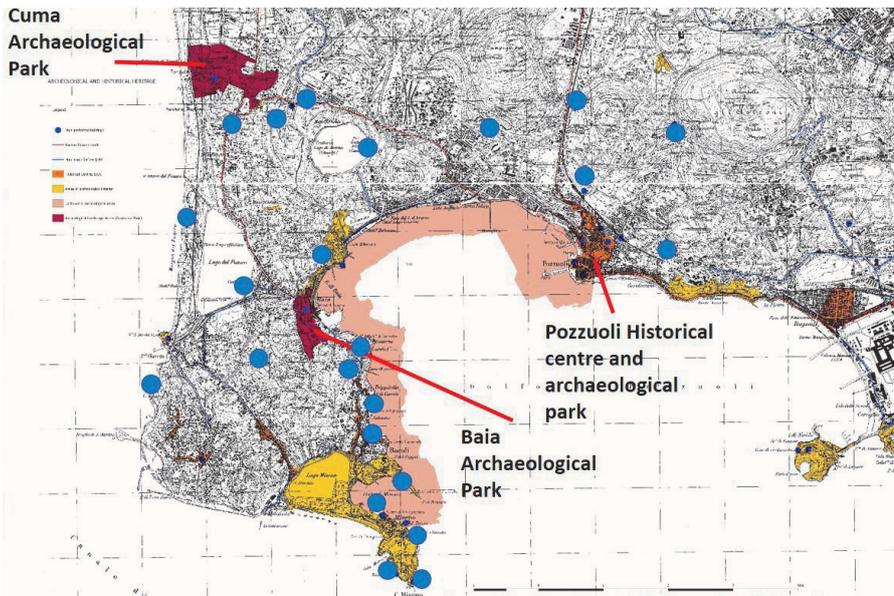


Fig. 6 - Phlegraean Fields' archaeological and historical heritage.

Phlegraean landscape between the dense Neapolitan urbanised area, characterised by volcanic morphologies, and the long Domitio sandy coast.

The challenges posed by the environmental and socio-economic drivers as well as the need to recover degraded and abandoned areas, represent further incentives for the formulation of strategic transformation projects by the students during the workshop.

In detail, the students identified the following four strategic projects for the Phlegraean Fields area.

The first strategic project deals with the enhancement of archaeological resources and historical centres. This strategy must be considered the cornerstone of the sustainable development of the Phlegraean territory. The extraordinary historical and archaeological heritage together with the values of landscape, based on the memory of an ancient past, nowadays becomes an opportunity to develop new commercial and tourist activities and must constitute the main strategic guideline for an intervention plan.

If we consider that cultural heritage

inextricably interconnects with open spaces, the strategy for the enhancement of this specific archaeological-landscape heritage aims to implement good practices avoiding the degradation produced in the past. Above all, in the historical centres, the restoration and redevelopment of the old buildings should respect heights, alignments and traditional materials to improve the quality of urban spaces. To attain these goals, it is fundamental to produce detailed projects, the task given to students during the workshop. Furthermore, another primary goal is the protection of existing private gardens and connection with urban green areas of public use and territorial parks (Astroni Park, Corney Park, Monte Nuovo Park, etc.). This is to define an urban green infrastructure connecting ecological and rural suburban networks. Alessandra Pagliano's article, later in this report, provides an example of the enhancement of archaeological and landscape heritage in a contemporary way, through the use of digital technologies applied to Phlegraean Roman architecture. The second strategic project concerns mobility which constitutes the second fundamental axis for the sustainable development of the Phlegraean Fields' landscape. This approach takes into account the infrastructural initiatives in progress on the railway networks, intermodal car parks and

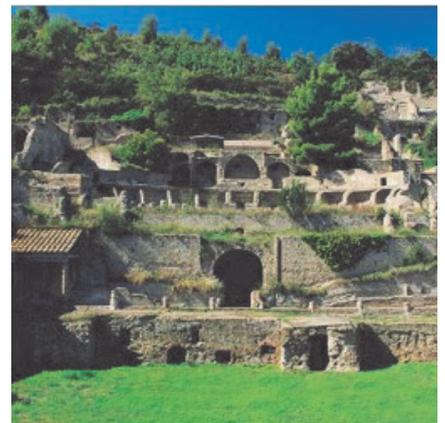
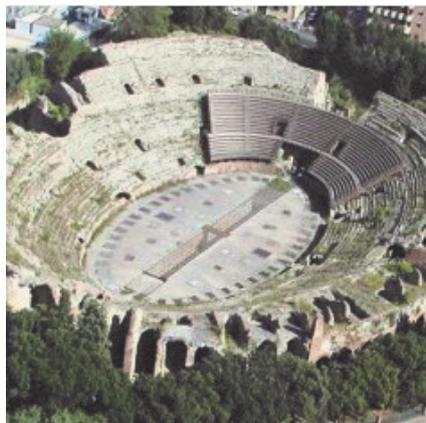
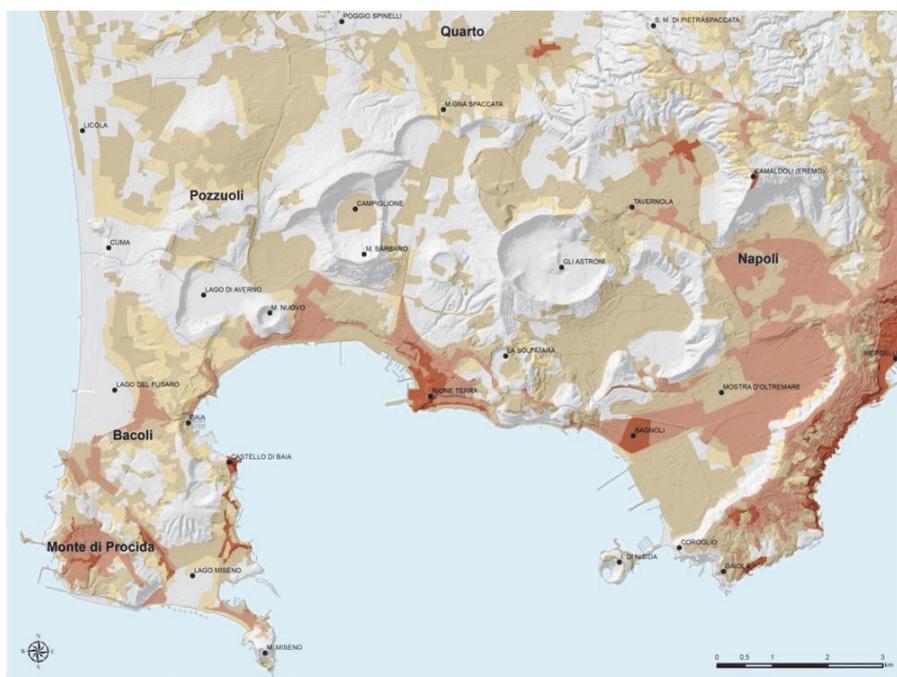


Fig. 7 - Some of the most relevant Phlegraean Fields' heritage elements, located in Baia and Pozzuoli.



Quadro conoscitivo dell'area di studio

Urbanizzazione

- Edificato esistente 1936
- Espansione dal 1937 al 1965
- Espansione dal 1966 al 2009
- Espansione 2007 al 2014

Fig. 8 - Map of the evolution of Phlegraean Fields' urban evolution over the last century.

cycle paths.

The third strategic project aims at identifying the transformable areas in the urbanised territory. As conservation and enhancement are predominant in the first strategic project for historical centres and cultural heritage, transformability constitutes the priority of this strategy, expressed through various means contemplating building recovery, redevelopment of degraded areas and the regeneration of abandoned urban areas. The reduction of soil consumption and the opportunity to regenerate deserted spaces, as well as the urgent need to revitalise neighbourhoods and degraded places, must guide the specific implementation projects.

The conversion of uncultivated, degraded and abandoned areas spread over the territory are envisaged as the priority. These areas must be designed as hot spots of "integrated transformability", that is, areas in which residential, commercial and directional functions guarantee the vitality of the neighbourhood and the social "mixite". These interventions aim to define an appropriate mix of green open spaces, slow pedestrian-bicycle mobility and public facilities. It is essential to design spatial configurations that can ensure the continuity of green infrastructure connecting external rural areas with the internal green spaces existing in the urban centres.

road underpasses, integrated into a strategic vision. This strategy focusses principally on the development of bicycle and pedestrian routes to support tourist mobility within the territory. The Cumana, Circumflegrea railway networks and regional underground are currently under transformation with the provision of tunnels, the abolition of old stations and their replacement locations elsewhere in the territory. Similarly, the transformation of the road network will include tunnels and new connections to facilitate car traffic to the ferry boats that connect to the islands of the Gulf of Pozzuoli and Naples. Additional road network changes include parking spaces to relieve car traffic towards the coast and historical centres. These interventions must be integrated with pedestrian and bicycle networks, electric minibus services and new car parks to create a functional multimodal access network

throughout the territory. It would be desirable to design cycle paths outside urban centres with opportunities to go inside the urban area only for the primary public services and equipment. A scattered system of public car parks should be designed in the peripheral ring outside urban centres as well as near main facilities, integrating the existing



Fig. 9 - Drosscape near the ports in the cities of Pozzuoli (on the left) and Baia (on the right).

The last strategic project, concerning green open spaces, aims to achieve a robust ecological network through building a green infrastructure that manages the current disordered puzzle of green areas, enclosed agricultural lots, discarded spaces and uncultivated soils. This strategy is needed to plan areas used as public parks and amenities as well as cycle paths.

The green infrastructure will connect existing open spaces, new slow mobility bicycle and pedestrian network, a network of accessible public facilities and lastly, the large archaeological parks present in the area.

The green infrastructure strategic project for the Phlegraean Fields then realises the major sustainable development goals, supported by the three preceding proposed strategic projects: the enhancement of the historical and archaeological heritage, the development of a multimodal mobility network and the transformation of degraded urban territory. The improvement of heritage, slow mobility integrated with electric transport and an efficient widespread parking network and finally, prioritising areas of urban regeneration constitute the structure of interventions complement the broader green infrastructure strategic project of the Phlegraean Fields. The contributions of the urban planning town councillors for the municipalities of Pozzuoli, Roberto Gerundo, and Marianna Illiano of Bacoli, detailed later in this report, describe the visions of the local administrations regarding the future of the Phlegraean territory. Students in the workshop actively engaged with the councillors discussing these visions. Also, local stakeholders (associations, citizens, entrepreneurs, institutions, etc.) through specific seminars with students in the workshop discussed and provided useful information about the local community's needs for the Phlegraean

landscape. The participatory activities were developed according to the most recent innovative methodologies, as outlined by Massimo Clemente and Gaia Daldanise in their article also later in this report.

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Pozzuoli, notes about recent urban history and development prospects



Fig. 1 - Rione Terra, Pozzuoli's historical centre, seen from the boathouse.

The contents of Territorial Risk Theory articulate into five programmatic phases to be applied to the geographic contexts periodically involved in natural disasters: forecasting, prevention, emergency, reconstruction and development. The Phlegraean Area is subject to bradyseismic phenomenon, the only subjected territory in the world that is also densely populated. After the historic volcanic eruption of 1538 that suddenly generated a new imposing crater, now a natural oasis, a long period of seismic quiet followed. This new geological conformation significantly influenced the urban development of the territory, in particular during the 1900s. During this long period, urban settlements significantly increased, mainly along the coastline, characterised by the remarkable landscape and environmental qualities. Starting in 1970 and later, in 1983, two subsequent major bradyseismic crises disrupted the pre-existing territorial balance, determining the transformation of sub-coastal areas through the construction of medium

and large urban settlements. The state built these settlements to house populations affected by the bradyseismic phenomena, whose homes, located mainly along the coast, had become unusable and would have had to be restored or demolished. Thus were born the new cities of Toiano and subsequently Monterusciello, which today house a large part of the population previously located along the coast. In this way, the fourth planning phase of territorial risk management, reconstruction, was completed. But it was a partial reconstruction, as the houses from which the populations moved were not restored and remained in abandonment until 1993 when the building redevelopment works began. These houses were located mainly along the coast, which degraded severely during the decade following 1983. In the meantime, some industrial plants located along the coast were decommissioned, such as the Sofer train factory in 2002. After 1994, the famous Olivetti factory was

transformed into a technological and scientific park. With delay, and even with the Sofer factory still abandoned, the reconstruction phase was realised. The fifth programmatic phase in Territorial Risk Theory, development, is still in progress. Development, understood as the evolution of the reconstruction phase, can assume in practice the characteristics of either growth or decline, or it can intermediate between the two. This evolution depends on the quality of the territorial management policies put in place. The management of the popular districts of Toiano and Monterusciello, with publicly owned houses, was essentially of a patronage nature from the time of construction up to the end of the first decade of 2000. This patronage development accentuated the level of urban and environmental degradation in the abandoned parts of the city. The redevelopment of the historic centre based on private financing was partially effective; therefore, this phase brought both forms of growth and decline. On the one hand, redevelopment has determined the elimination of pockets of poverty that generally characterise the historical centres of advanced societies to varying degrees. On the other hand, redevelopment has produced forms of urban congestion due to the considerable concentration of tourist activities, in this case mainly restaurants, to the exclusion of other types of trade. The restoration of the publicly-owned part of the historic centre, Rione Terra, based on state funding has not yet been completed. Also, in this case, there will be conclusive growth, while the length of time elapsed and that will still be necessary continues to determine transitory conditions of decline, which have persisted for 50 years. In fact, Rione Terra was cleared of the resident

population since the first bradyseismic phenomenon, in 1970.

The conversion of the Olivetti factory into a technological and scientific park undoubtedly led to an evident growth condition, quadrupling the number of workers employed within it, compared to the 1950s when it entered activity. But the divestment of large factories, such as the Ilva di Bagnoli, in the neighbouring Municipality of Naples, and the Sofer, cited above, and their lack of urban reconversion, have negatively characterised the development of the entire Phlegraean coastline, causing a condition of dramatic decline.

Even the northern coast, called the Flegreo-Domitio coast, has plummeted since 1982 and over the following thirty years in a condition of decline. This was caused by the construction of a large municipal wastewater treatment plant serving part of the metropolitan area of Naples, built unexpectedly, not far from the very significant and internationally famous Cuma archaeological site.

The Phlegraean territory and Pozzuoli, moreover, were affected until 1994

by abusive building transformations subsequently condoned by state laws. These altered places worsened the urban quality of the territory.

Only the historic centre has partially escaped this phenomenon, maintaining its ancient conformation and architectural quality.

Since the late 1990s, the territory of Pozzuoli has been governed by a Territorial Landscape Plan (1999) and in implementation by a General Regulatory Plan (2002).

Both had the advantage of limiting the consumption of land for new building, anticipating the results of the European urban debate by twenty years.

However, this valid requirement is not currently accompanied by courageous hypotheses of an urban reorganisation of coastal and more generally, city settlements.

The conservation of the pre-existing urban structure and building conformations are considered by the Territorial Landscape Plan as values, while in reality, they have become environmental detractors and limitations to economic growth.

Pending the initiative of the

competent state regional authority to redefine new landscape planning, the Municipality of Pozzuoli since 2012, has put in place a plurality of initiatives aimed at promoting the redevelopment of the territory, based on the strategy of resilient capillary regeneration.

Regeneration: aims at improving the pre-existing building and urban fabric and excludes the consumption of large new periurban and urban interstitial land.

Capillary: interventions on spaces, especially of small dimensions, that have remained abandoned among buildings and allocates them to equipment and services for the benefit of the resident populations.

Resilient: planned interventions carried out by the public or private sector with the goal to implement them economically and sustainably over time and not perpetually weigh on public finances.

The suburban area, on the other hand, is kept for agricultural production, with the task of creating employment and jobs. This action is to help defeat present forms of urban poverty and also to rebuild new agricultural landscapes, in contrast to abandoned fields that are so prevalent today in parts of the territory.

The agricultural landscape constitutes a new green infrastructure that produces income. The experimental permacultural cultivation of 57 hectares of abandoned public property in Monterusciello demonstrates this, as does the planting of typical local products and the regeneration of existing crops in other parts of the territory. Indeed, the Monterusciello Agro City (MAC) project, funded by the European Union, is underway as part of the Urban Innovative Action (UIA) programme.

The coastline, in the intra-urban areas, is the subject of interventions aimed at creating low environmental impact leisure facilities. In contrast, in the extra-urban areas, it orients to bathing

Fig. 2 - Perspective of the urban centre of Pozzuoli from the harbour.



and the use of beaches for long periods of the year, in consideration of the temperate Italian climate. In many of these stretches of coast, a formidable urban redevelopment action will require the demolition and partial reconstruction of the pre-existing buildings that are characterised by poor architectural quality and severe degradation. The historical centre that overlooks the port of Pozzuoli has already been largely pedestrianised. Within the next five years, further filter systems and new forms of mobility will free the centre completely of cars, converting the traditional traffic flows entering the city from highly polluting to environmentally sustainable. Equipped pedestrian-bicycle paths are being built both along the coast and in the new city of Monterusciello. All the interventions underway, of course, do not increase the resident population as the bradyseismic phenomenon is always imminent, even when not expected. But the interventions underway must tend to increase the wealth of the population of the Phlegraean area as a whole. To obtain these results, one cannot count on public funding only. It is also necessary to free all private economic resources immobilised in banking

institutions and channel them into urban regeneration investments. These investments should be aimed at the production of leisure, tourism and hospitality services, culture, food and wine, which can create wealth with low environmental impact and increase employment levels in the area. Pozzuoli is today a city in full transformation towards more advanced environmental, social and economic sustainable conditions. The Phlegraean area as a whole and the entire metropolitan area of Naples will benefit from these transformations. Within which, however, it appears necessary and urgent to significantly improve what is almost entirely absent, that is, the efficiency and effectiveness of territorial governance due to lack of adequate state and regional regulatory frameworks.

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Fig. 3 - The Fusaro beach, along the coastline of Cuma



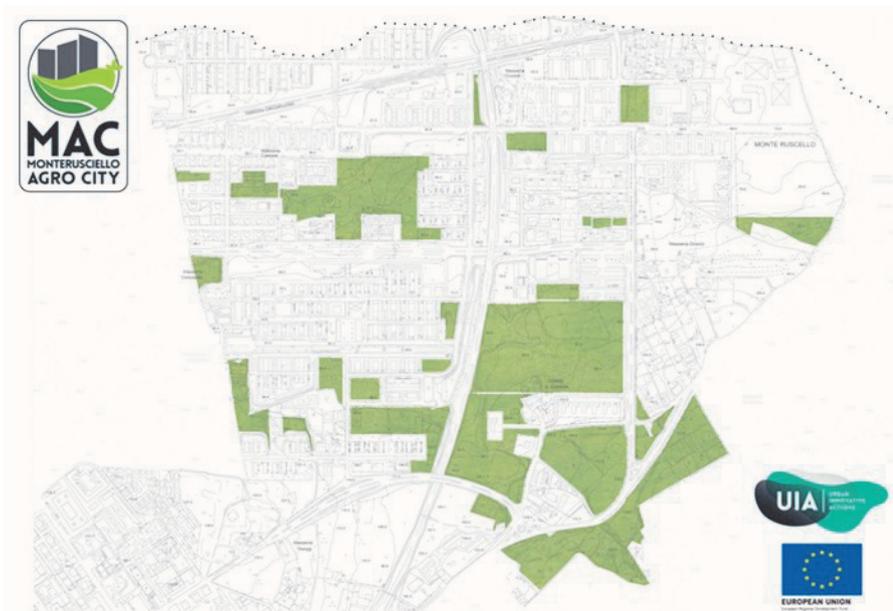


Fig. 4- One of the Monterusciello residential blocks, north of Pozzuoli.

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Fig. 5 - Masterplan of the MAC Monterusciello Agro-City project.



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Greening the Phlegraean Fields: a Mediterranean landscape perspective



Fig. 1 - View of the gulf of Pozzuoli and the promontory of Rione Terra.

Green strategies are the fil rouge to enhance the landscape quality of the Phlegraean territory, particularly of the three main municipalities of Pozzuoli, Bacoli, and Monte di Procida, which share environmental, cultural, landscape and urban features, characterised by a strong Mediterranean coastal identity. In fact, from the early Greek and Roman settlements until now, the peculiar relationships between natural and anthropic factors that shaped such landscape have been the same: a highly volcanic land - literally "burning land" by the historian Giovanni Tarcagnola (1566) - affected by bradyseism and solfataras, whose coasts are eroded by the sea and winds, but also a very fertile area that enabled an outstanding agricultural activity. By considering its strategic sea location, the climate conditions and the remarkable panoramic views, it is understandable why such district and the islands of Procida and Ischia acquired mythical renown among artists, aristocrats and tourists, becoming one of the destinations of

the Grand Tour.

The so called "landscape of holes" (definition by Vito Cardone) clearly denoted its volcanic origins by observing the coastal line shaped by the giant caldera and the dense concentration of landmarks in approximately 110 square kilometres, which include the lakes of Fusaro, Avernus, Lucrinus, Miseno, Grande at Agnano, plus four craters - Astroni, Monte Barbaro, Agnano, Solfataras (still active). The promontories, the buildings and even the drystone walls of the terraced landscape reveal the volcanic nature through the extensive presence of local Neapolitan yellow tuff and pozzolana.

With such a geology, a typical Mediterranean climate, and a maximum height above the sea level of 458 metres, the Phlegraean Fields have enabled the growth of neutro-acidophile species, basically grouped in plant communities of the phytoclimate Lauretum in both its subdivisions, warm and cold, locally influenced by microclimatic natural elements and the anthropic pressure

in urbanised areas. All these features led Sestini to classify the whole district and the Vesuvian area as landscape type "Campania's volcanos", acknowledging their common identity. Almost half of the study area is occupied by natural areas where the Mediterranean scrub and garigue is dominant, plus cultivated fields with vines, fruit trees, and vegetables. One of the most traditional landscape features of the Phlegraean area is the terracing of the fields with dry stone walls, which shaped a considerable extension of the cultivated slopes of the volcanic hills, notably around the lakes. The care for the terraced landscape represents not only an aesthetical issue, but also a preventive action to address the hydrogeological risk and an economic driver for the district, as it links the rural landscape identity to high quality wine production.

It is, however, the urban landscape of the other half of the Phlegraean area, where some 390000 inhabitants live (2011 Census), to offer several chances for planning and design interventions. The process of industrialisation and the various seismic events, both occurred after the Second World War, have challenged this metropolitan area to find immediate responses to the population needs - growth, relocation after seismic events, industrial development - which regrettably led to soil consume and fragmentation of the agrarian landscape, not to mention further troubles deriving from unauthorised building activity and land speculation. Consequently, inland areas denote patchy urbanised areas and small rural settlements, whilst coastal areas are almost completely built with the only exceptions of steep slopes of the promontories, archaeological areas and some public grounds. Further separation in the landscape perception and fruition derives from the contemporary infrastructural developments, due to the two railway lines and the road network.

The landscape and the environmental protection of the Phlegraean Fields has taken place mainly in the recent three decades. Declarations of remarkable landscape interest and further categories of landscape protected areas were included in the Landscape Territorial Plans (PTP, 1999), subsequently integrated in the Regional Territorial Plan of Campania (2008), which classified this district as "high naturalistic-landscape potential area with strong anthropic pressure". There are three SPA (Special Protection Areas) and several SCI (Site of Community Importance) in the whole district with the islands, ruled by the General Forestry Plan (2009-2013) together with woodlands. In 1993 the Regional Parks of Phlegraean was introduced to preserve the outstanding environmental heritage in both selected terrestrial and marine zones, and to provide guidelines for urbanised areas. In line with the mentioned plans, the Hydrogeological Plan and the Declaration of Seismic Red Zone have inhibited new residential developments and allowed only reuse and redevelopment of existing buildings, from the historic centres to the outskirts, including abandoned industrial areas and rural settlements ("masserie" and rural villages). Therefore, the requalification of open spaces and the improvement of public services should inspire the masterplans to reconnect the neighbourhoods and ensure better living conditions. Among the other environmental priorities, there are the implementation of soil permeability and the prevention of soil erosion, as well as effective grey water and heavy rainfall management. Anyhow, none of the mentioned sectoral plans explicitly propose the idea of a green-blue infrastructure.

In the Phlegraean district, the municipality of Pozzuoli stands out for best practices and innovative ideas for urban regeneration integrating green components. The regeneration and reuse of the Rione Terra, evacuated

after the bradyseism, is at the final stage of the project and, once returned to the citizens, will show its multilayered historic cityscape and provide both buildings and open spaces for cultural and touristic events. A wide and ambitious programme of urban regeneration has been launched for the coastal line of Pozzuoli, from Molo Caligoliano to Punta Epitaffio. Such post-industrial site has been abandoned for decades, and its location can play a key role for the whole Phlegraean bay, also in infrastructural terms and implementation of open spaces. The Masterplan was commissioned by Waterfront Flegreo S.p.A. (Protocollo di Intesa, Comune di Pozzuoli - November 22, 2007). The New Waterfront developed by the joined project team Eisenman Architects, P.C. + Interplan Seconda Srl, AZ Studio, completed in 2009, but its application is still under debate.

A second project of resilient regeneration involving circular economy principles and requalification of green areas is Monteruscello Agro-City (MAC), launched in 2017. As a consequence of the 1980s bradyseism, the new development of Monteruscello was

the last major expansion of Pozzuoli. MAC is a project of Urban Innovative Actions funded by the European Union. It aims to promote innovative ideas and actions to stimulate sustainable development of urban areas. In particular, it focuses on urban and peri-urban environment as a tool to prevent anti-social behaviour and to fight poverty. Through a process of economic, entrepreneurial and social development, MAC is developing a new agro-urban landscape based on an interconnection of urban areas and agricultural lands, which favours a creative transformation of the essence of the neighbourhood. It is based on four action-pillars: agricultural activities based on permaculture; the improvement of the urban environment; vocational training; entrepreneurship and employment. Training courses will be provided for young and/or unemployed residents. An initial budget will support agro-cooperation and start-ups. As a general reflection, a holistic and multidisciplinary approach for sustainable cities has been adopted in the scientific and professional realms in Italy. The themes of greening cities and introducing green-blue infrastructures have become a national

Fig. 2 - Coastal landscape from the Aragonese Castle of Baia.



issue, as witnessed by law, directives and regulations enacted in the last decade. In 2010, the Italian Ministry for the Environment adopted the National Strategy for Biodiversity, revised in 2016 with aims and guidelines. In the more recent National Strategy for Urban Green (2018), the role of green infrastructures is highlighted to meet sustainable development standards. In the same years, the National Council of the Economy and Job (CNEL) and the National Institute of Statistics (ISTAT) have chosen the availability of green areas per inhabitant in urban contexts as one of the indicators of equitable and sustainable wellbeing (BES) beyond the conventional GDP indicator. Although the 2016 BES Report highlighted the quantitative increase of green areas availability pro capita together with a better understanding of the environmental priorities and a wider participation, the quality of public grounds and other green features in Italy needs further investments both in terms of design and maintenance. The causes of such weakness can be found in the excessive cuts of municipal budgets, the insufficient awareness of the benefits of urban green,



Fig. 3 - The Solfatara crater: outstanding natural phenomenon in the Phlegraean Fields.

the lack of skilled professionals in landscape construction and care. It must be highlighted that the lack of maintenance of green components reduce the ecosystem services provided by the green infrastructure. Planning, design, and construction are essential in landscaping as well as management and care. For instance, among the landscape tools to improve the quality of the urban environment, planting trees is by far one of the most

effective ways, but it is also a well-known challenge for public authorities, professionals, and citizens. In landscape and garden design, trees have always represented the main structure of the project. As a primary component, they characterise the spatial configuration of public grounds and open spaces. Scientifically, it is well known that planting trees contribute to lower global carbon emissions, filter air polluting particles, prevent soil erosion, mitigate heavy rainfall and summer high temperatures. Nonetheless, being living components, they are subject to biological cycles, thus their appearance and ecological efficiency vary throughout the time. Trees are often cultivated inappropriately, with regards to the choice of species, planting distance, interference of elements or repair works, uncontrolled diseases, and lack of maintenance. These circumstances cause poor growth, often resulting in potential hazards for the community and a significant loss of capacity in providing ecosystem services. Furthermore, the careful choice of trees and site are of primary importance to enhance the aesthetical quality of open spaces. Landscape designers ought to evaluate each site's features





Fig. 5 - The complexity of the inland landscape at Cuma, to be reconnected by the green-blue infrastructure.

and history, avoiding irrational planting, overuse in town centre, and standardised solutions for the streetscape. Focusing on the Phlegraean Fields, Mediterranean trees are part of the iconic images of the landscape. Pines (i.e. *Pinus pinea*), evergreen and deciduous oaks, elms, laurels, have been depicted in landscape paintings for centuries and still represent key elements of the landscape and cityscape identity. Furthermore, allochthonous species i.e. magnolia, acacia, and several palms have progressively become part of the collective landscape image. At the same time, new buildings and infrastructure development are often in conflict with existing mature trees or preclude the replacement or new planting of taller species. Envisioning alternatives in a short-medium term should be one of the municipal priorities, not excluding the introduction of urban forestry to compensate any eventual cut down of tall trees.

The greening process in urban areas could be applied to a variety of open and marginal spaces to be integrated in the design of the green-blue infrastructure. The Phlegraean towns

reflect a conventional typology of green features, from the municipal villa (park) to playgrounds, sport parks, tree avenues, small private gardens and kitchen gardens. Many squares and parks built on the outskirts lack of quality and functionality, hence they need to be redeveloped with emphasis on

green elements and anti-vandalism solutions. Further opportunities may be rain gardens, community gardens, roof gardens, green walls, fitness trails. Some of them, such as community gardens, support the agro-puncture urban regeneration with a didactic role in training specific social targets and a contribution to the food self-production. Logically, the improvement of roads and paths as linear landscape signs would be advisable, particularly for sites of historic or panoramic value. Unfortunately, the densification of the residential buildings along the roads in the 20th century has made almost impossible any enhancement of the road section, which complicates the introduction of bike paths and larger pavements with trees and other pedestrian facilities.

A proposal for a Phlegraean green-blue infrastructure, based on linking environmental and cultural heritage to allow their sustainable development, may focus on: multifunctional quality landscapes; historic centres, monuments, and archaeological sites; roads, bike and pedestrian paths, tree

Fig. 6 - Landscape palimpsests at the Lake Averno: the Temple of Apollo.





Fig. 7 - The entrance to the Cavern of Cumaean Sybil: cultural and environmental heritage.

avenues, info-points and routes; low emission public transport and slow mobility; circular economy with 0-km organic food production and territorial marketing; sport parks and fitness trails; requalification of the coastal areas and access to the beaches. Given all these elements, the CoLand workshop has offered the chance to reflect upon selected areas of the Phlegraean coastal landscapes, as to develop innovative teaching and research proposals. The overall purpose of the research action through innovative mixed teaching on the landscape is to apply it to the construction process of a green infrastructure for coastal landscapes. Documentation for the comprehension of coastal landscape has included geological, territorial,

landscape, naturalistic, environmental, historical, archaeological, architectural, primary production (agricultural and fishing), secondary and tertiary aspects, post-industrial scenarios, infrastructures and green features, access to the sea and to the ports, and the relationship with the islands. The selected landscape units have enabled to analyse numerous sectoral aspects and to propose preliminary design hypotheses inspired by the criteria of sustainability, social inclusion and conservation of cultural heritage in a remarkable landscape. In doing so, open spaces will play the major role to reconnect wide areas of the Phlegraean coastal territory, mainly through sustainable mobility and resilient micro-regeneration.

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Fig. 8 - Public park, architectural heritage and blue infrastructure component: the Casina Vanvitelliana at the Lake Fusaro.

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Fig. 9 - The coastal landscape of the Archaeological Park of Cuma.

Alessandra Pagliano

Accessible archaeology: a digital infoscape for the Phlegraean archaeological parks

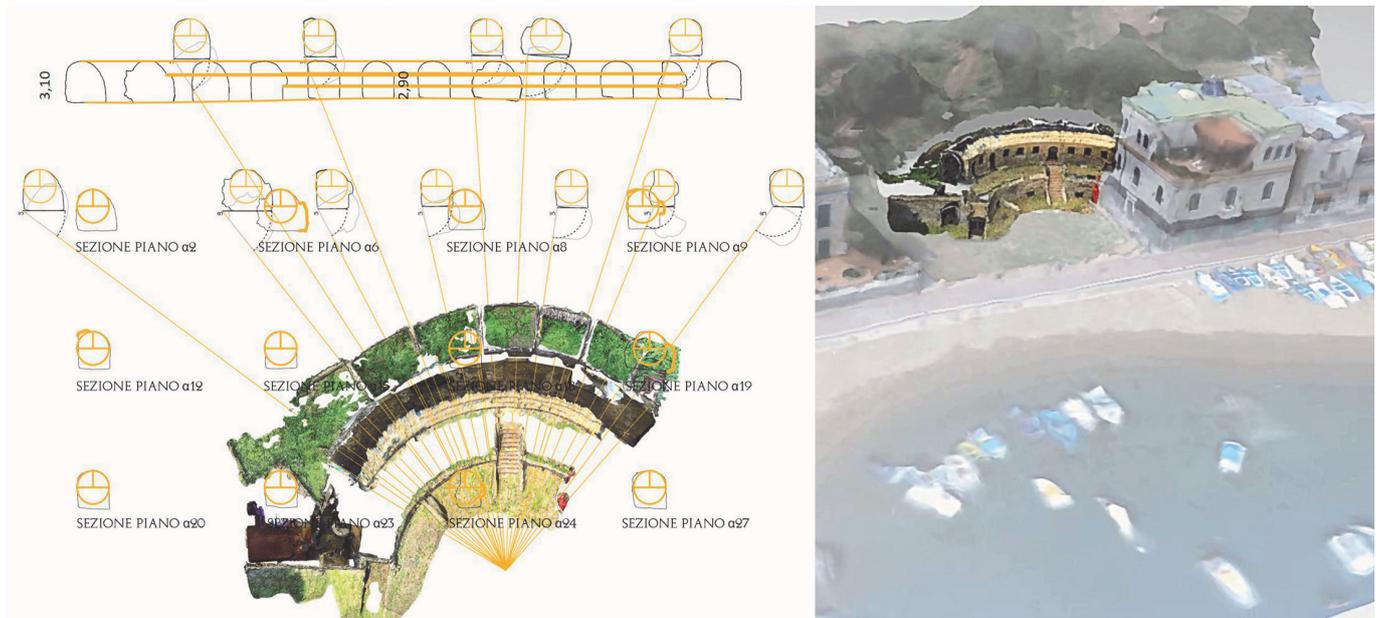


Fig. 1 - The "so called" Agrippina's tomb survey by drone (by C. Borrelli, R. Catuogno, A. Pagliano).

The Phlegraean Fields had undisputed fame among the European Grand Tour travellers for the dense and stratified palimpsest of landscape that has been rewritten over the centuries by complex natural phenomena. These aspects are linked to the intense volcanic activity of the area that has determined its undisputed value regarding the close connection between natural elements and the widespread archaeological remains of ancient Roman buildings. Suggestive paintings and engravings still tell the wonder of those travellers in front of a piece of landscape characterised by the charm of ancient classical ruins immersed in a natural environment, richly characterised by lakes, hills, sea and islands. This link has been abruptly altered since the beginning of the 20th century by the unplanned expansion of the modern city dominated by widespread illegal building.

The Phlegraean Fields are today a singular network of urbanised areas, impressive archaeological ruins and a fascinating landscape, with an inseparable connection

between the archaeological sites and the modern building. Widespread and imposing are the numerous remains of the Greek-Roman age, often still partially buried, which require an integrated cultural approach, with particular attention to the peculiarities of the territory. These are characterised by delicate problems such as hydrogeological balance, the presence of a still-active volcanic system, an important industrial apparatus in crisis, and devastating illegal building that cover, and often incorporate, many ancient monuments thus preventing a diffuse excavation campaign. In fact, it is not possible to valorise the vast Phlegraean archaeological heritage, according to the most modern and shared strategies of conservation and musealisation. This is owing to the impossibility to expropriate private buildings to allow the arrangement of the ruins, or to coherently organise facilities for tourist accessibility. Archaeological remains are frequently hidden and covered to prevent an area from being declared 'inedificabile'. Culture must be, therefore, the strategic factor for

the promotion of an area that can contrast with the inability of citizens to attribute a correct value to their places. On the contrary, these should be assumed by local communities first, and by tourists afterwards, as a symbol of the collective memory of those territories. It is, therefore, necessary to identify the sense of their presence inside the modern city in order to enhance today's inseparable connection through the redefinition of mutual relations.

The project for the enhancement of the Phlegraean archaeological sites must return the archaeological excavations to the life of the contemporary city. It should give the vestiges of ancient dignity and value, through a conscious enjoyment of these goods assisted by innovative techniques and technologies of communication that can allow an active and emotional experience of the archaeological visit. In 2016 the Phlegraean Archaeological Park was founded, a fragmented complex of twenty-five archaeological sites located several kilometres from each other. Among the main problems

of the archaeological park, there is the relative abandonment of large segments of the heritage, the lack of services and access to transport networks. There is also a deficit of awareness of the immense value of the archaeological heritage by the local population that results in a lack of private participation in the cycle of conservation, enhancement, restoration and management of cultural heritage. Sometimes this is even a limitation to the development of buildings in the already densely built area.

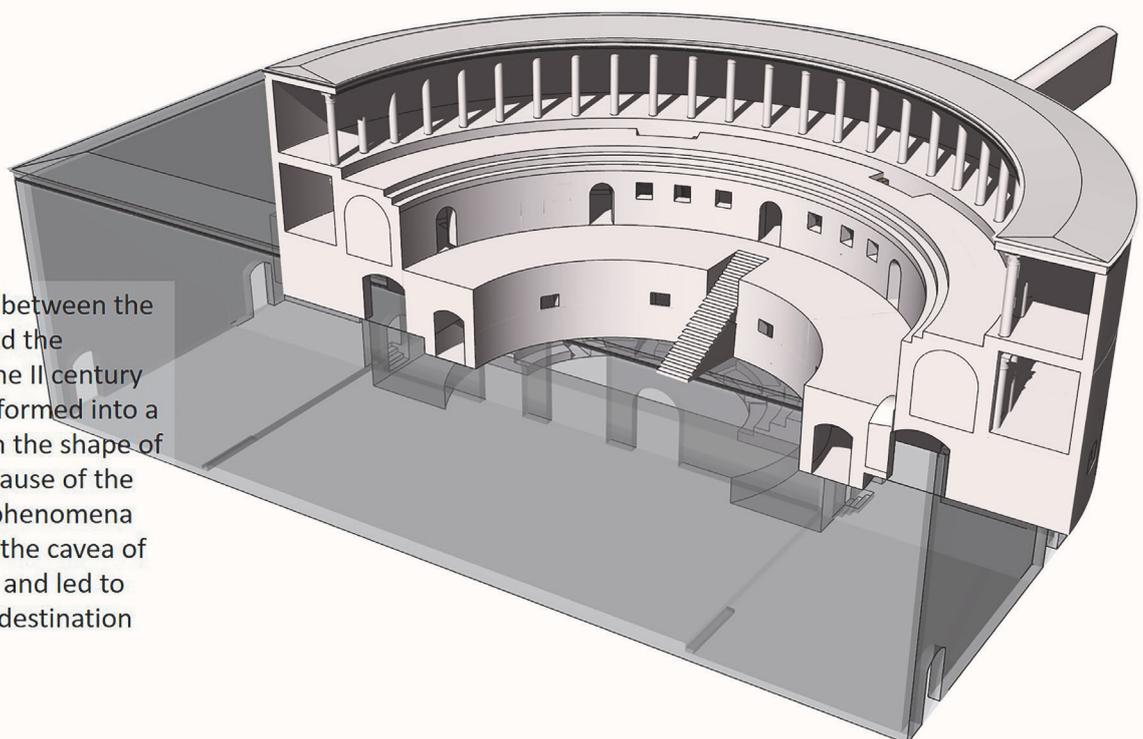
The area's complexity can be overcome by means of technology, with the primary aim of enhancing the archaeological heritage of the Phlegraean Fields Park and overcoming the fragmentation of the places. Moreover, the use of appropriate digital technologies can replace physically visiting places where the archaeological

sites are not yet fully accessible due to structural or security-related problems. These technologies can guarantee new virtual forms of interactive and immersive spatial experience. The understanding of the archaeological ruins is also still difficult for the general public. The loss of the major volumes, coverings and colours decisively compromises the possibility to appreciate the asset. Digital reconstruction of the original condition and relocation of sculptural decoration lost or removed for protection and conservation needs would allow, first of all, local communities to suggestively enrich the emotional impact of a visit to the archaeological sites in their area. It is thus ensuring a deeper and more conscious path of knowledge that can lead the population to look at the archaeological heritage as a starting point to define new relationships between the contemporary city and the ancient urban texture, based

on the recognition of its value. The Information and Communication Technologies (ICT) used in the archaeological sites' design have provided, for each monument analysed, the contemporary use of augmented and virtual reality. Together with the more basic use of Q-Code for reference to multimedia content, and the physical installations of descriptive and graphic panels, technologies combine to ensure a new form of interaction.

It, therefore, becomes fundamental to think of an integrated set-up, partly physical and partly digital, not only focussed as usual on the single object, but also on the relationship with the user and the environment in which they are placed, thanks to the new information flows. The first step has been the digitisation of the archaeological heritage through direct and indirect survey techniques. The geological and

Fig. 2 - Agrippina's tomb: original state hypothesis (by C. Borrelli, R. Catuogno, A. Pagliano)



The structure, between the end of the I and the beginning of the II century A.D. was transformed into a nymphaeum in the shape of an exedra, because of the bradyseismic phenomena that damaged the cavea of the spectators and led to the change of destination of use.

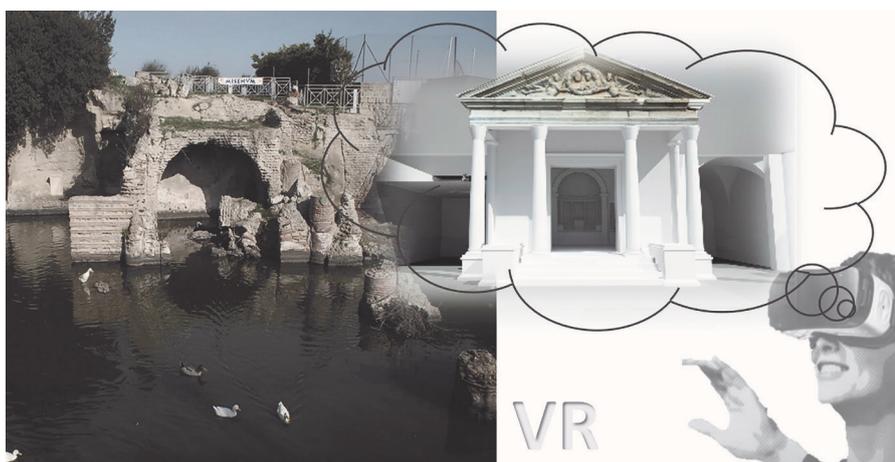


Fig. 3 - Virtual reality experience of Augustales Sacellum (by A. Migliaccio, A Pagliano)

hydrogeological fragility of the Phlegraean area, characterised by the constant presence of the bradyseismic phenomenon, is the major risk factor for the conservation of the archaeological heritage and its transmission to future generations. In such situations of continuous transformation, it was necessary to begin a process of digitisation of the built heritage through a Structure-from-Motion (SfM) photogrammetric survey, which could return reliable 3d-mesh equipped with high-definition textures, a 3d-model not including only measurement and geometry, but also the material evidence of today's state and any traces of past transformations. The presence of 3d-models of the current conditions allows the preservation of the memory of the individual asset, both for the purposes of knowledge and for the needs of restoration and enhancement. In fact, the mesh model allows formulating a faithful reconstructive hypothesis, based on the evidence of the material traces, of the geometric logic of the relationships between surfaces, the topology of spaces and the typology of shapes. The possibility of digitally reconstructing the original architectural configuration, repositioning even the absent sculptural vestiges in their original

locations, becomes the most effective communication tool of the ancient value of the monument, as well as being the indispensable basis for the ICT designed for each site, to which the dissemination project has been entrusted.

Augmented Reality (AR)

Augmented reality allows the visitor to overlap a digital architectural (3D-model) to archaeological remains. This is made possible by the open-source app, Augment, in which virtual data sets is visually superimposed and integrated into the real world, in the physical space framed by the camera of the mobile device. This allows the viewer to 'project', in the same frame, the reconstruction of the monument directly on the archaeological remains. For example, using the partial data, the discovery of a column base can be integrated with the overlapping of its shaft and capital. Thus, spaces of hybrid and multimodal cohabitation are generated. The direct, physical and indispensable experience of the visit to the archaeological site becomes an interactive path of knowledge assisted and implemented by the experience of information. Spaces, with digital objects and real ones, integrate in a mixed reality.

Virtual reality (VR)

Virtual reality isolates the observer from the surrounding environment and totally immerse him or her in a new digital space, that can be enjoyed by means of virtual reality headsets. VR could guarantee a new form of accessibility to inaccessible or lost archaeological sites. The use of virtual reality (VR) is, in fact, associated with the simulation of activities that are impossible to perform in real life. This technology in the field of archaeology allows the experience of inaccessible spaces, both because of questions related to the security of an actual visit to the ruins, or because such sites are now lost or irreversibly transformed. The project of a new infoscape for the Archaeological Park of the Phlegraean Fields provides, for each site, the realisation of a spherical photo or movie (360°), enjoyed utilising a headset, into which the individual user's smartphone can be inserted. This avoids the fast obsolescence of hardware technologies because the visitor is offered a simple container for their smart device. This will then display the photo or the spherical movie by connecting to open platforms such as Youtube or Sketchfab that allow the binocular splitting of the uploaded video, in favour of an immersive experience within the represented digital space. Although the use of VR involves the total isolation of the visitor from the real context (unlike AR, which instead projects its digital content within such spaces), the simulation of a visit inside no longer accessible or impenetrable places allows one the feeling of a physical experience.

Conclusions

The digitisation and enhancement project proposed for the Phlegraean Fields Archaeological Park tends, on the one hand, to respond to the demand for conservation

of the memory of the immense archaeological heritage of the area and, on the other hand, to configure new spatial relationships between physically distant places. Through a paths' thematisation between lost volumes and real remains, between real spaces and digital spaces, a new model of a more widespread and inclusive museum is generated. Digital information is not only related to a single object or place, it is recombined, remixed and recontextualised, creating new physical and semantic geographies..

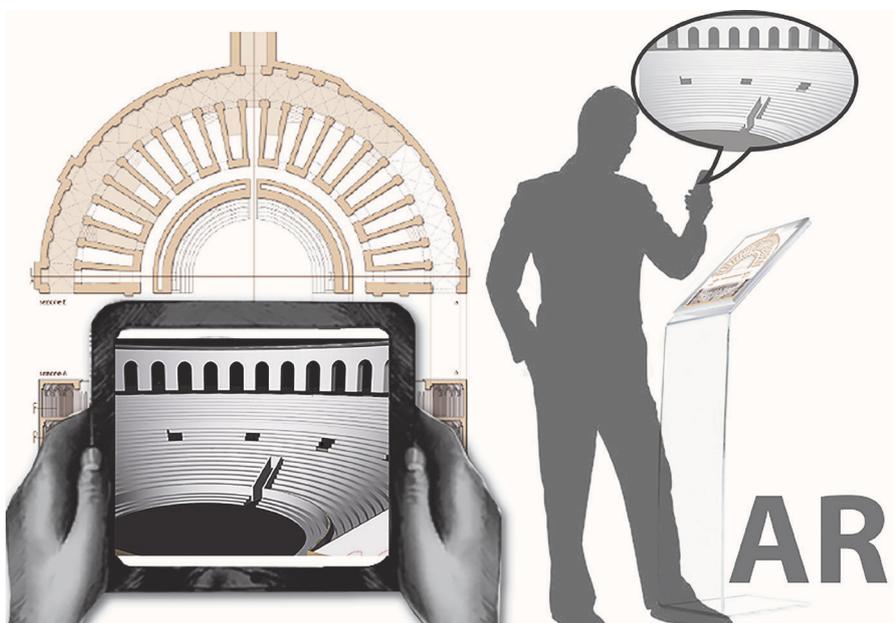
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Fig. 4 - Augmented reality for the Misenum Roman theatre (R. Montella, A. Pagliano, A. Triggianese).



Gianluigi De Martino

The historical matter of the Campi Flegrei: the fragility of tangible and intangible heritage

Between international pronouncements and new landscape definitions, there is an assumption with extensive sharing both among scholars, specialists and in public opinion that both tangible and intangible heritage is always in precarious balance. The Campi Flegrei area has always represented a paradigm of such fragility, with a wealth of extraordinarily important episodes (archaeological, architectural, and environmental). These are representative of various historical periods and ecosystems that potentially make the most interesting scenarios from the ecological and cultural points of view. By contrast, over the centuries, the attention and use of these resources have been uneven, if not counterproductive, dictated by strategic choices that profoundly altered the perception of this area today.

From Bagnoli to Cape Miseno the coastline was only partially exploited for tourism purposes (bathing and yachting), favouring industrial plants with high environmental impact located right along the shore. The



Fig. 1 - Perspective from Pozzuoli towards Monte Nuovo.

thermal resources have seen only a few seasons of successful and systematic exploitation and currently represent a marginal resource. The agricultural and natural lands have

been reduced and given way to the most profitable use of the soils, often resorting in illegal building practices. The numerous archaeological sites of exceptional importance have essentially never been included in an effective promotion network, remaining entrusted to "amateur" management and certainly not up to the resource potential. The widespread historical buildings are less important now when compared to the number of new constructions of low architectural quality. Paying the price for an unstable geological situation, the solution points to the "new" buildings as safer than the older settlements.

Based on planning tools and local regulations, it is possible to imagine new scenarios in which protection returns to the centre of national and international debate, emphasising how cultural operations may have both social and economic impact on an area of such importance.

The myth of foundation is related to the trip of "pious Aeneas", who escapes from burning Troy, bringing

Fig. 2 - One of the streets in the Rione Terra (Pozzuoli), near Palazzo Migliaresi.



his father Anchises on his shoulders and training his young son Ascanio. This image is a powerful metaphor of the man who follows an uncertain destiny in a stranger land with human mercy for his past and heritage, made of knowledge and responsibility, to ensure a future for the next generations.

This history repeats itself even in present days, not with myths, but with hopeful wishes of a new beginning in a land of opportunity.

During his journey, the hero deals with scenarios full of new experiences, either lucky or hazardous. He must face the mystery of the unknown when he enters the dungeon of the Sibilla Cumana and asks a question about the future of his people. The magical character's response was usually written on leaves mixed by the wind, and often the meaning of the answer was ambiguous. One of her famous sentences was "IBIS REDIBIS NON MORIERIS IN BELLO" that could mean "You will go and return and you will not die in war", but also "You will go and not return, you will die in war". Aeneas instead asks for a spoken

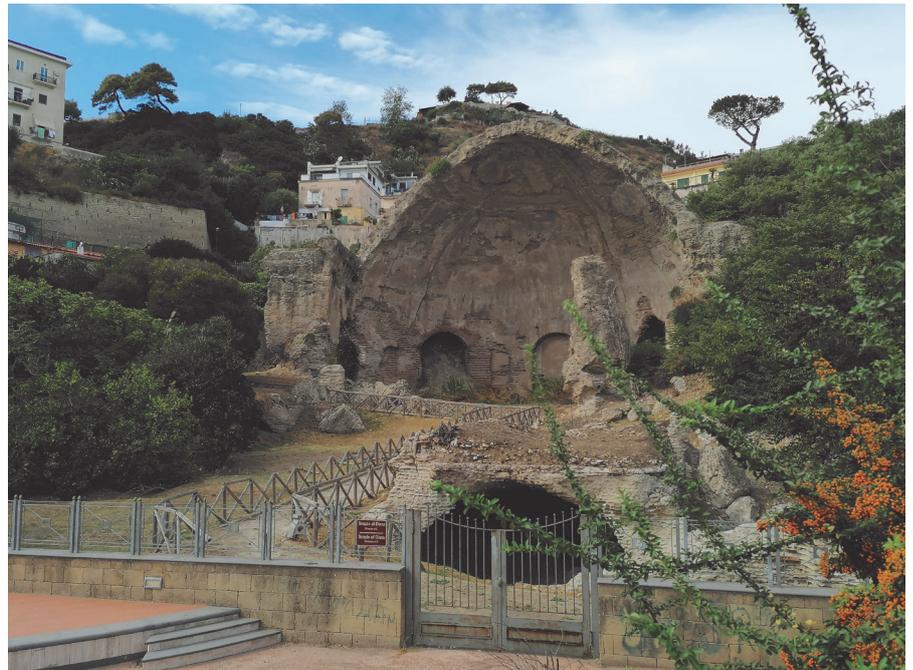


Fig. 3 - The so-called Temple of Diana, actually a thermal structure.

answer without using the leaves, and the sibyl provides instructions to obtain a propitious destiny and continue the journey. Dealing with such historical matter

to elaborate a new proposal for sustainable development in this area is a difficult task. To enhance the touristic perspectives of a land full of meanings means taking into account the multiple layers overlapping a territory neglected by serious interventions to lead a planned design. Environmental aspects, public transport, deregulated buildings, waste management, tourism resources and social development must point in a sustainable direction. Architecture and urbanism are called to provide technical answers to all these points from an economic evaluation perspective. Resilience is not the only resource to exploit in such a fragile balance. Minimal interventions are a strategic approach to provide this area with new holistic visions.

Fig. 4 - Flavian amphitheater's detail in Pozzuoli.



Volcanism and coastal erosion in Campi Flegrei (Italy)

Introduction

Coastal realms are among the most dynamic places on the Earth (Melnick et al., 2019), in terms of social and economic development and natural hazards under the influence of winds, waves, currents, and sea-level changes. A principal concern today and in the foreseeable future is coastal erosion. It is estimated that 70% of the world's sandy shorelines are eroding (Bird, 1985). This worldwide extent of erosion is becoming more critical due to ongoing sea-level rise, although many other local and regional scale processes contribute to the problem. In many low-lying coastal areas, human impacts, such as subsidence induced by groundwater and oil withdrawals or urbanisation of the coastal zone, have also made a substantial contribution to the erosion problem.

Several new techniques are needed to assess the impacts of climate change, the variations of relative sea-level and the erosion of coastal landscapes at a broad range of spatial and temporal scales (Melnick et al., 2019; Matano et al., 2016; Sacchi et al., 2016):

- applications of high-resolution topographic and bathymetric digital terrain models, or time series analysis, to constrain the morphology and metrics of ancient and modern coastal landscapes, including sea-level markers;
- development of subsurface and submarine geophysical imaging;
- studies dealing with Quaternary geochronology to quantify rates associated with the generation and degradation of coastal landscapes; and
- studies using numerical models to constraint coastal processes at different spatial and temporal scales.

The integration of models and metrics opens new scenarios for the quantitative characterisation of coastal landscapes and their changes over

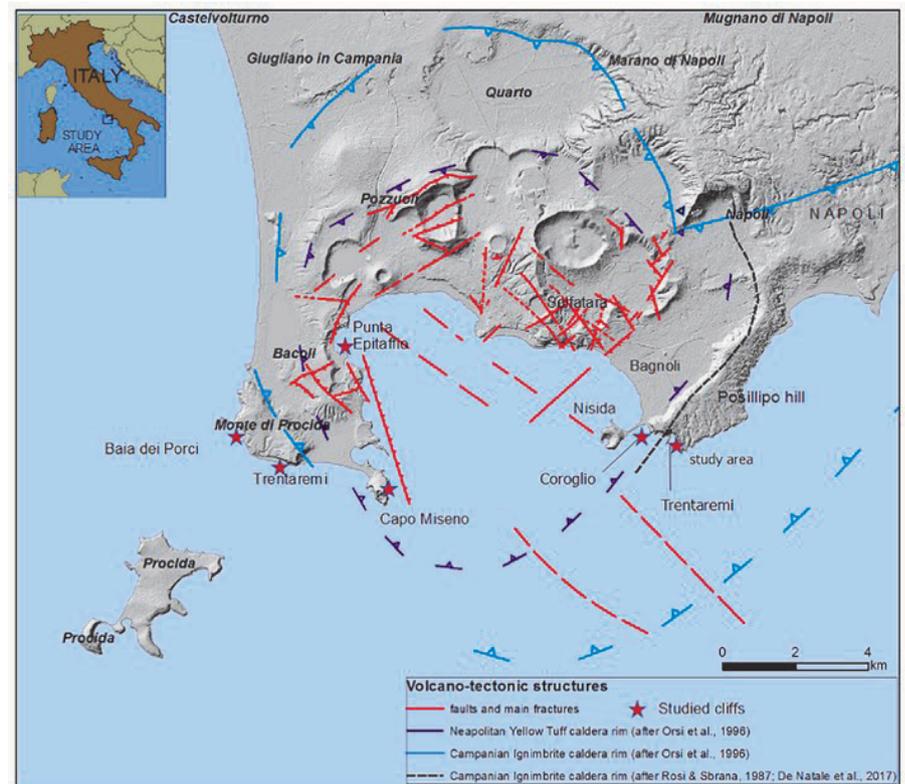


Fig. 1 - Campi Flegrei study area.

time (Melnick et al., 2019), gaining insights on the underlying physical processes responsible for shaping coastal landscapes.

The erosional process results are more intense and rapid within a coastal volcanic landscape where the highest levels of morphodynamic activity couple with the presence of erodible volcanic rock, deposit outcrops and high levels of volcanic-tectonic activity. The present coastal sector of Campi Flegrei area (Naples, Italy) results from the recent geomorphologic evolution of an antecedent volcanic landscape that originated after the major caldera collapse following the explosive eruption of the Neapolitan Yellow Tuff (NYT) and was later re-shaped by several minor volcanic eruptions (Orsi et al., 1996; Di Vito et al.; 1999). The coastal zone of the Campi Flegrei volcanic district is prone to a wide spectrum of natural hazards, including volcanic activity, earthquakes,

tsunamis, flash floods, ground deformation, landslides and coastal erosion. Among geo-hydrological hazards, failures along coastal tuff cliffs are a major threat in the study area producing severe retreat rates (Matano et al., 2015, 2016; Esposito et al., 2017, 2018a; Caputo et al., 2018). In addition, frequent flash flood phenomena occurred in the last decades in the Pozzuoli catchment (Esposito et al. 2015, 2018b; Fortelli et al., 2020).

Campi Flegrei volcanological and geomorphological evolution

The Campi Flegrei volcanic district is an active volcanic area, inhabited by about 500,000 people, located at the periphery of the metropolitan area of Naples, within the coastal sector of the Campania region (Italy). Volcanic activity at the Campi

Flegrei spans throughout the latest Quaternary. It is characterised by two large caldera collapse structures (Fig. 1) produced during the eruptions of Campanian Ignimbrite, dated at ~ 39 ka BP, and Neapolitan Yellow Tuff, dated at ~ 15 ka BP, respectively about 200 km³ and 30-50 km³ of Dense Rock Equivalent ignimbrite (Orsi et al., 1996; Deino et al., 2004). The caldera is represented by a quasi-circular area of ~ 9 km in diameter, that extends in the central sector of the Campi Flegrei district, both on land and in Pozzuoli Bay offshore.

Post-NYT activity (last 15 ky) was characterised by hydromagmatic activity associated with the formation of several small monogenetic volcanoes including tuff rings, tuff

cones, and a few cinder cones and lava domes (Di Vito et al., 1999) with the eruptions of the Capo Miseno (~ 3.9 ka; Sacchi et al., 2014) and Nisida (~ 4.0 ka; Di Renzo et al., 2011) coastal tuff cones among the youngest. The Monte Nuovo eruption in 1538 CE was the last event, which occurred after ~100 years of ground uplift (de Vita et al., 1999).

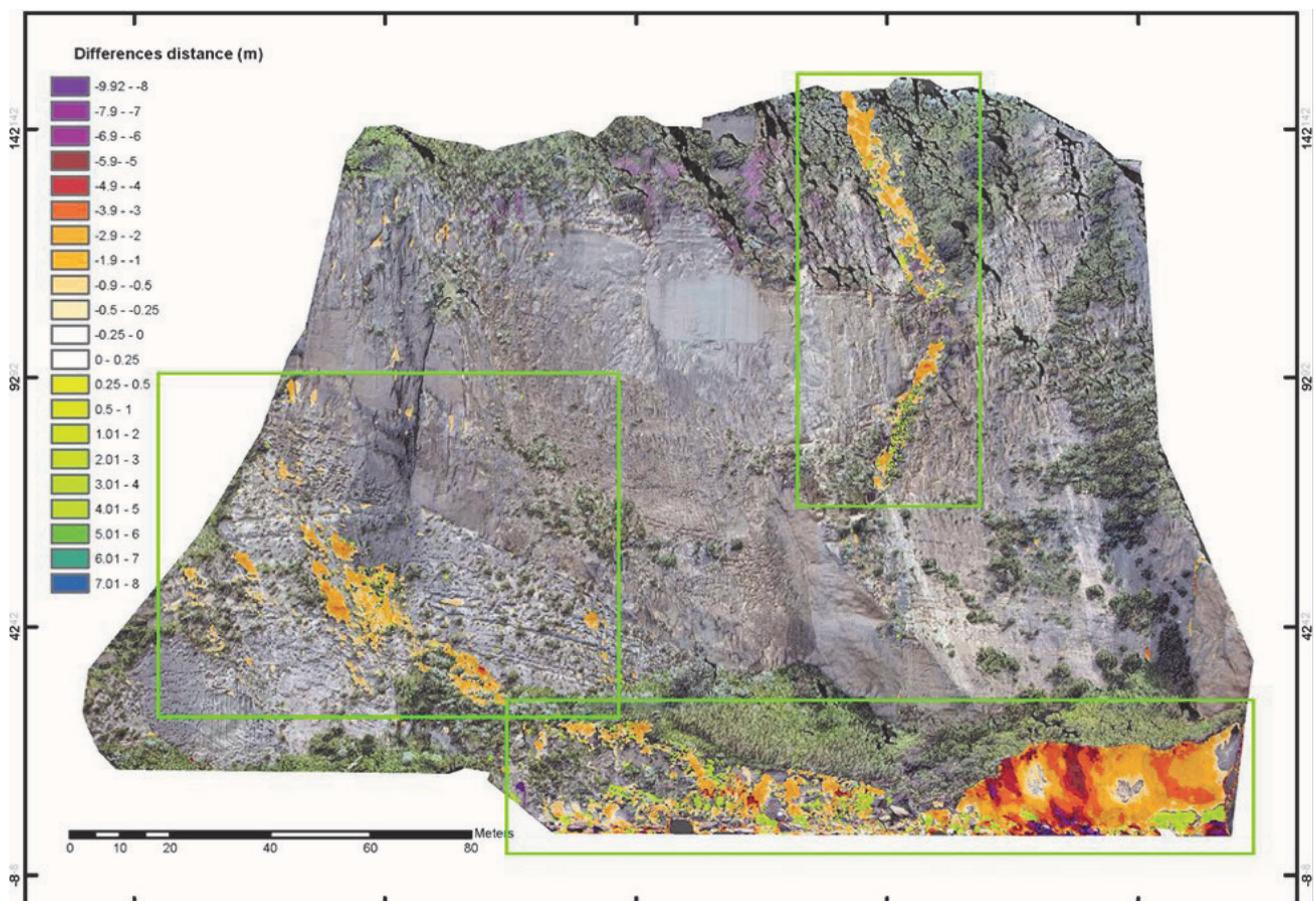
The post-15 ka evolution of the NYT caldera was marked by the development of a resurgent dome in the central part of the caldera collapse (Sacchi et al., 2014), resulting in the emersion of a marine deposit succession in the so-called La Starza terrace, presently exposed up to ~30 m above sea level (Marturano et al. 2018).

Recent caldera unrest is testified by extensive hydrothermal activity accompanied by two major episodes (1970-71 and 1982-84) of shallow seismicity and ground/seafloor deformation originating uplift up to 3.5 m in 15 years, with maximum rates of 100 cm/year in the period 1983-1984. The termination of the 1982-1984 crisis marks the onset of a generalised subsidence trend that lasted until 2004. Since 2006, a new phase is causing an uplift of ~50 cm (Troise et al., 2019).

Cliff evolution analysis

Rocky coastal cliffs represent a very dynamic environment. In fact,

Fig. 2 - Difference between vertical DEMs derived by 2015-2013 surveys in the Coroglio cliff. The sectors characterized by major changes are framed with green boxes.



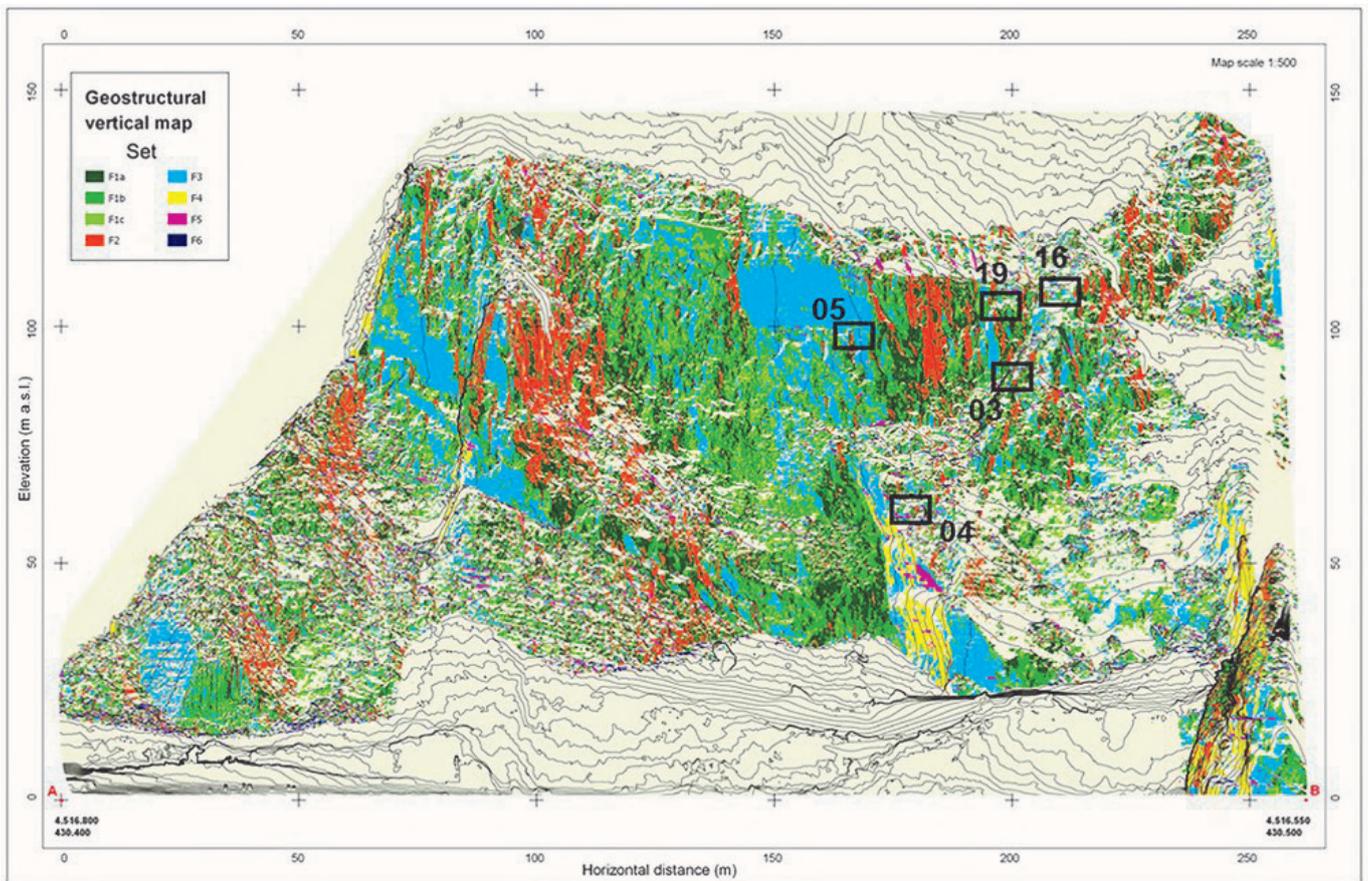


Fig. 3 - Geostructural vertical map of Coroglio cliff (modified by Matano et al., 2016). Black boxes show location of the monitored unstable tuff blocks.

the evolution of rocky coasts often occurs as a progressive retreat of the cliff landward induced by a complex combination of marine (i.e. wave action) and subaerial processes (i.e. weathering, erosion and mass movement) (Sunamura, 2015). Future cliffs recession could be more intense in the next decades under the ongoing accelerating sea-level rise and global warming (Bray and Hooke, 1997). In this context, sea cliff failures represent a serious hazard for populations living in coastal settlements. Severe retreat processes, mainly occurring with landslides and erosion are affecting, for instance, many of the coastal cliffs forming the Italian rocky coastline in various geological contexts (Iadanza et al.,

2009). Severe dismantling processes affect the cliffed coastline of the Campi Flegrei volcanic area. The massive cliff retreat is promoted by weak mechanical properties and low resistance to deterioration of the outcropping sediments (loose to welded ash, pumices, scoria), as well as by the local action of natural factors, such as sea waves, wind, rain, salt spray, wetting and drying cycles, changes in temperature, etc. Rockfalls may cause sudden and localised cliff recessions by displacing hundreds to thousands of cubic metres of rocks. The CNR-ISMAR coastal research group activity aims to achieve a quantitative knowledge about retreat processes that are contributing to the

geomorphic evolution of the Campi Flegrei rocky coast. The research is based on the use of geomatic techniques and focusses on some representative coastal cliffs (Fig. 1), such as Coroglio and Trentaremi cliffs (Naples), Punta Epitaffio and Capo Miseno cliffs (Bacoli) and Baia dei Porci and Torrefumo cliffs (Monte di Procida Municipality). Our methodological approach considers these different steps:

- 1) analysis of historical topographic maps, old aerial photos and orthophotos for defining the long-term coastline variations and erosion rates;
- 2) terrestrial laser scanning and photogrammetric surveys of the

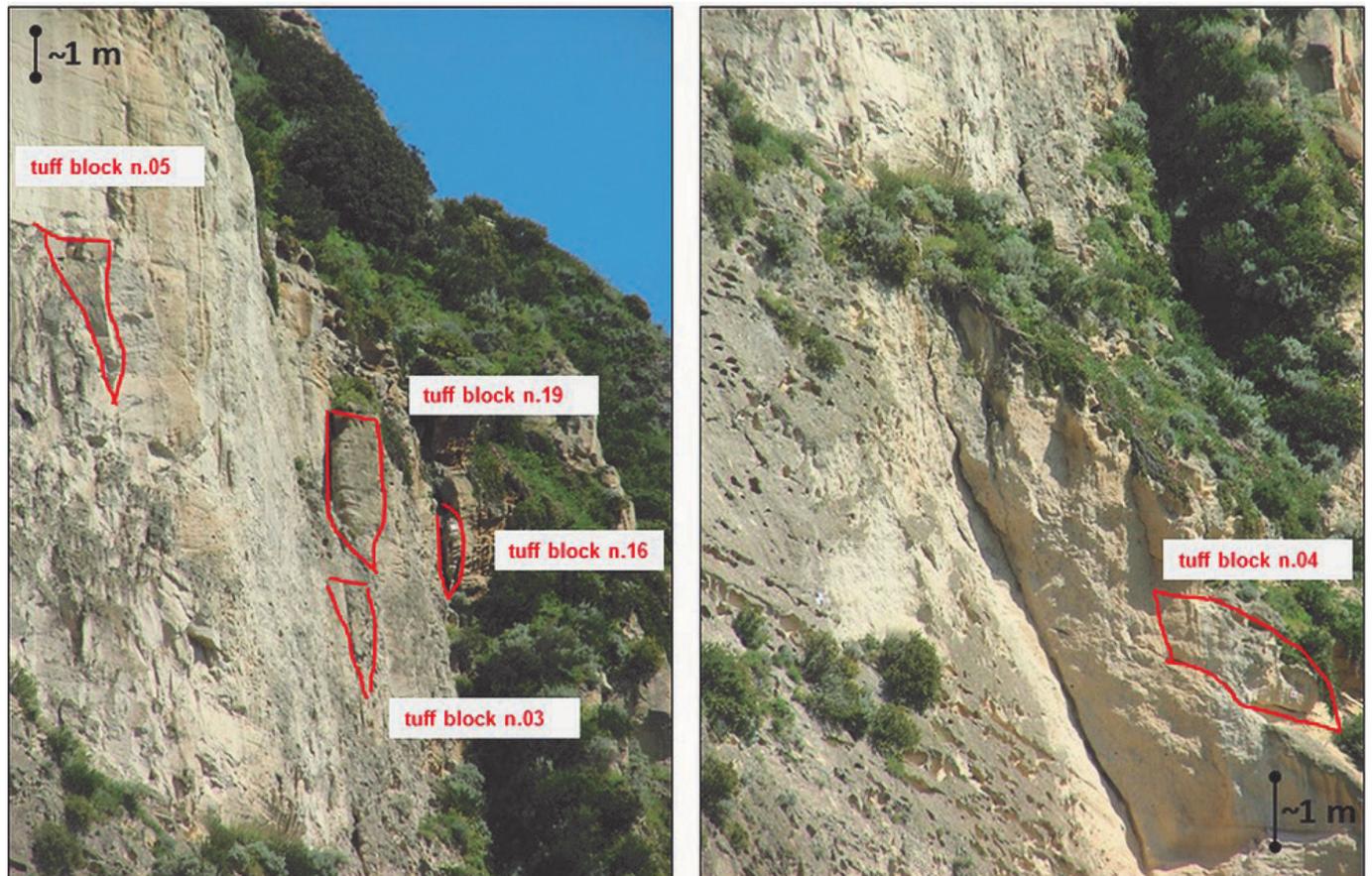
cliffs for detailed 3D topographic modelling;
 3) geostructural and geomorphological surveys for cliff stability analysis; and
 4) development of multiparametric monitoring systems.

The long and mid-term geomorphic evolution of the Torrefumo cliff (1956 to 2008) was investigated by comparing digital elevation models (DEMs) derived from archive aerial images and airborne lidar data (ALS) (Esposito et al., 2018a). This activity allowed quantifying volumetric changes, the maximum retreat of the cliff top, and average retreat rates. In the 1956-1974 time interval, about 943,000 m³ were eroded by retreat processes, whereas from 1974-2008 the amount of eroded cliff resulted

in about 220,000 m³. These volumes allowed us to calculate two different retreat rates of 1.2 m/yr and 0.17 m/yr, respectively (Esposito et al., 2018a). The consistent difference between these two rates was interpreted as the consequence of a seawall construction that occurred in the early '80s to protect the entire cliff toe from sea wave action.
 Short-term geomorphic changes affecting the Coroglio (Caputo et al., 2018) and Torrefumo (Esposito et al., 2017) cliffs were detected by comparing 3D point clouds acquired with the terrestrial laser scanning technique (TLS) in multi-temporal surveys (2013 - 2016). In this way, a cliff failures inventory map was developed and the magnitude-frequency distribution of the rockfall events was calculated. Further

statistical analyses, together with field observations, showed that different geomorphic processes are contributing to the cliff retreat, and vary according to the outcropping deposits. Short-term retreat rates calculated by comparing TLS-derived 3D point clouds for different cliff sectors ranged from 0.001 to 0.025 m/yr during 2013-2016 (Esposito et al., 2018a). These latter are comparable with short-term retreat rates measured along the Coroglio tuff cliff (Fig. 2), ranging from 0.05 to 0.10 m/a, during 2013-2015 (Caputo et al., 2018). At the Baia dei Porci cliff, a large rockslide occurred in October 2013 threatening a series of buildings located close to the cliff edge. The mass movement evolution was monitored until January 2016 (Esposito et al., 2017) with the

Fig. 4 - Unstable tuff blocks of the NYT unit selected for monitoring activity (red lines).



“Structure-from-Motion” (SfM) photogrammetry technique used by performing four surveys (2013 - 2016) with a boat and a remotely piloted aircraft system, as well as a topographic survey of the ground control points used for the exterior orientation of images. Comparison of the 3D point clouds derived from the processing of photogrammetric data allowed accurate identification of the areas where geomorphic changes occurred, as well as quantifying a 45,000 m³ volume of material mobilised during and after the 2013 failure. These deposits eventually formed at the cliff toe have been rapidly eroded by sea wave action and rainfall-induced surface runoff. Geostructural analysis and mapping were performed on Coroglio (Matano et al., 2016) and Punta Epitaffio (Matano et al., 2015) cliffs by combining geometrical modelling of TLS point cloud data and field structural surveys (Fig. 3).

Rockfall Monitoring

The use of systems aimed at monitoring slope stability is becoming a standard practice to assess and prevent geological and geotechnical hazards and plan effective actions for hazard analysis and risk mitigation. These systems have the purpose of detecting and measuring small-scale rock deformations regarded as precursors of slope failures. In our research, we focus on the in-situ measurements of deformations affecting rocky blocks that form part of the Coroglio volcanoclastic coastal cliff (Fig. 1). A database of measurement time series taken over a period of approximately 4 years (Dec 2014–Oct 2018) refers to the deformations of selected tuff blocks in the Coroglio coastal cliff (Matano et al., 2019; Sacchi et al., 2016). The monitoring system is implemented on five unstable tuff blocks (Fig. 4) and formed by nine crackmeters and

two tiltmeters equipped with internal thermometers. The system is coupled with a complete weather station, measuring rain, temperature, wind and atmospheric pressure operating since January 2014 up to December 2018. A measurement frequency of 10 and 30 minutes has been set respectively for meteorological and deformation sensors. The aim of the measurements is to assess the magnitude and temporal pattern of rock block deformations (fracture opening and block movements) before block failure, and their correlation with selected meteorological parameters (temperature, rain, wind, humidity, atmospheric pressure). The results of a multivariate statistical analysis of the measured time series suggest a close correlation between temperature and deformation trends. The recognised cyclic, sinusoidal changes in the width (opening/closing) of fractures and tuff blocks rotations ostensibly link to multiscale (i.e. daily, seasonal and annual) temperature variations (Matano et al., 2019). Some trends of cumulative multitemporal changes have also been recognised. Following the monitoring, the steps will be to define the threshold levels for alert and early warning related to block failures, which can be “dynamic” in order to take into account the different temperature and meteorological regimen during the various “seasons” of the year.

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The Phlegraean area climate and meteorological patterns

The Phlegraean Fields is an active volcanic area located west of Naples, in the Campania region, on the medium Tyrrhenian side of the Italian peninsula. The Italian peninsula stretches from northwest to southeast into the Mediterranean and is directly exposed to warm air

sub-coastal and pure Mediterranean rainfall regimes (typically affecting Calabria and Sicily), the last marked by a well-defined summer minimum and winter maximum. To frame the climatic pattern of the Phlegraean area, it is possible to refer to data detected at the Meteorological Observatory

products and services to forecast high-impact weather conditions, such as those causing flash floods, a few hours in advance so to alert the population early enough of an imminent flash-flood risk. Given the territorial complexity, to fully comprehend alluvial phenomena, it is necessary to analyse both the ground hydrological aspects and the atmospheric dynamics that lead to heavy precipitating events whose territorial distribution is also generally complex. In recent times, there has been increasing attention to small scale floods, often occurring as flash events. Typical examples are the two recent Ligurian flash floods that occurred in October and November 2011 (Rebora et al., 2013), when 13 and six casualties occurred respectively. Still, even more severe flash floods have occurred in previous times. The areas most exposed to the risk of high-intensity rainfalls in Italy correspond to the windward slopes of the Apennines ridge, from Liguria to Calabria. Sicily and Sardinia are also included due to several events that occurred there in recent times. The Apennines have numerous small and fast rivers and a significant number of short and steep river catchments that increase the probability of flash floods, debris or mudflows. The Campania region records a large density of events, so is appropriately included among the most hazardous areas. This is particularly important because of its specific geomorphological factors and high-density population. Recent studies of heavy rainfall events

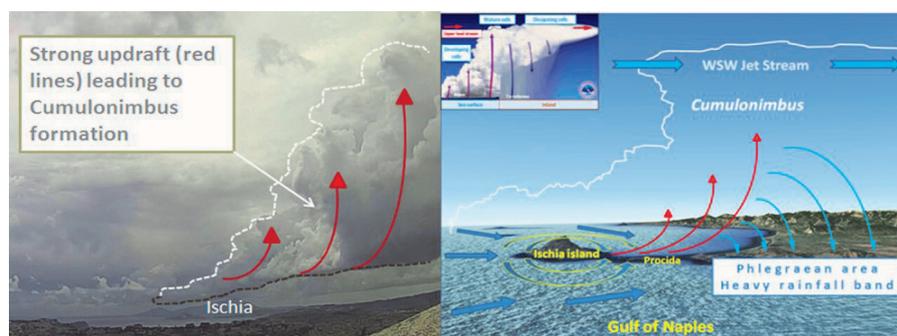
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MTmin (°C)	8.3	8.0	10.0	12.2	16.1	20.1	22.5	22.9	19.7	16.1	12.1	9.2
MTmax (°C)	13.4	13.7	15.9	18.8	23.2	27.0	29.9	30.1	26.6	22.8	17.8	14.5
P (mm)	94.1	76.6	67.3	67.7	46.4	32.0	16.7	27.0	71.0	120.0	126.6	120.2

Tab. 1 - Air temperature and rainfall average mean values measured at "Federico II" University of Naples Meteorological Observatory in the period 1872-2018.

advection coming from Northern Africa, alternating with cold polar air masses entering the warm Mediterranean area through the Rodano, Carcassonne and Trieste valleys. This favourable cyclogenesis determines high expectations of heavy precipitating events (HPEs), also due to the complex Italian morphology and orography. The prediction of these extreme events is problematic using only standard weather forecasting models because of the poor knowledge of the atmospheric mesoscale state, especially regarding the three main components building up thunderstorms, namely: moisture content, convective instability and lifting mechanisms (Kober and Tafferner, 2009). The Phlegraean Fields, thanks to the Tyrrhenian Sea reliever effect that plays a relevant climatologic role, benefits from mild winters and never too hot summers, due to an active sea breeze pattern. The rainfall regime is a sub-coastal type on the Tyrrhenian side, characterised by dry summer seasons with the primary rainfall maximum during Autumn and a secondary maximum during Spring. The secondary winter minimum is not very sharp due to the circumstance that Campania is the southernmost region of this pluviometric area. This results in a transition area between the

of University of Naples "Federico II", located in Largo San Marcellino, in the historical centre of Naples, active since 1872. The historical data starts in 1872 and reaches the present day, being an almost 150 years-long series of continuous meteorological data. Notwithstanding the mildness of the climate, not uncommon is the occurrence of severe weather events that disrupt and damage social and economic activities (see Table 2). The frequency of these extreme rainfall events shows an increasing trend. The most powerful event, with an estimated time of return at over 300 years, occurred this current century on September 15, 2001, with an average rainfall amount of about 150 mm in less than three hours of precipitation. These phenomena lead to the necessity of providing higher and higher precision meteorological

Fig. 1 - Convection triggering leeward Mount Epomeo when SW-flux is active.



occurring in Phlegraean Fields (Fortelli et al., 2019) put in evidence the role of the Mount Epomeo volcanic hill (Ischia Island). Under specific atmospheric conditions, the hill enhances rainfall in the area when the storm comes from the southwest. Mount Epomeo (789 m a.s.l.) has a quasi-pyramidal shape and is located just 15-20 km southwest of the Phlegraean area (see Fig. 1). In recent times, many authors have proposed nowcasting as the correct way to reduce the casualties during flash floods triggered by convective storms. Nowcasting is the forecasting technique based on the observation and kinematic analysis of active meteorological systems, analysed through remote sensing. Its best performance is in the temporal range of 3-6 hours. To this purpose, meteorological radar, satellite imagery and lightning strike detection networks are used by experienced local meteorologists to follow and predict short-time storm evolution, promptly identifying the targeted geographic areas. On September 7, 2017, for example, occurred the



Fig. 2 - Bacoli (on the left and in the middle) and Pozzuoli (on the right) during the flooding occurred in the morning hours of September 7, while still raining.

most recent relevant rainfall event in the Phlegraean area, with over 100 mm precipitation in a wide area stretching from Bacoli to Pozzuoli, Agnano and northeastward up to the hilly part of Naples. The rainfall event triggered a moderate flash flood in the centre of Pozzuoli, causing hardship and damages (See Fig. 2). Pozzuoli is exposed to this kind of alluvial phenomena since its historical centre is located at the outlet of a catchment collecting meteoric waters falling on the external slope of the Gauro, Cigliano and Astroni craters (see Fig. 3).

Conclusions

The study of heavy rainfall events in the Phlegraean Fields, not excluding the utility of nowcasting in framing and estimating the dangerousness of a meteorological situation, stresses the fundamental role played by a real-time rain gauge monitoring network. This network can achieve a higher safety level in areas identified to be involved in flash flood processes, to alert the population about the imminent danger promptly.

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Fig. 3 - Catchment concentrating meteoric flows inside the urban centre of Pozzuoli.



Marianna Illiano

Integrated morphological reading of the Phlegraean coast: archaeology, architecture and geography

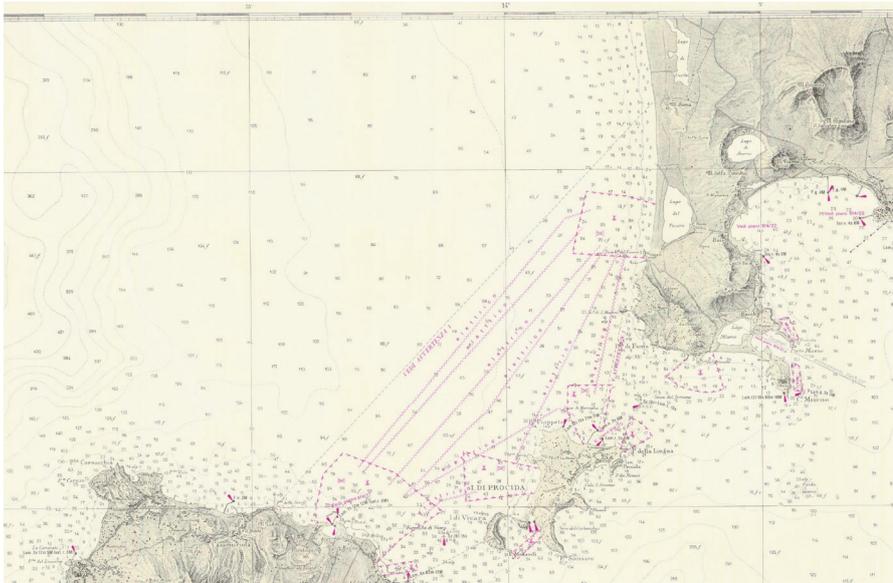


Fig. 1 - Nautical chart of the Phlegraean Fields.

The Research that derives from the analysis of an urban context can become a valuable contribution to often limited and conditioned administrative actions. The daily functioning of the local political and administrative apparatus should be enriched by the research and output of a constant brainstorming of ideas. Currently, Phlegraean cities need to formulate the right questions in terms of architecture, and these must, in turn, come from free research and analysis of the urban context. If the correct questions are not formulated, it will not be possible to arrive at the most suitable answers for a territory that remains in a state of expectation and awaiting new revelations. A reading of the Phlegraean coast, from Cape Posillipo to Mount Cuma, can be guided from the research of the alternating low-high-low sequence, attempting through the variation of the various forms of extension and elevation, to recognise the permanence of multiple elements in a coastal landscape.

The borders, the industrial sites along the coast (from Italsider to Baia), the ports (from Baia to Miseno), the boardwalks and piers, the Chiana,

the beaches, have often forgotten the nature of the "foot" in regards to the spots chosen by history as centres (Cape Posillipo, Rione Terra, the Aragonese Castle of Baia, Cape Miseno to the promontory-light house geographical centre of maritime mythology, Mount Cuma). From the description of such sequences, it is possible to understand the critical points and the general situation of urban decay that has

become apparent at the end of a reciprocal relationship: the Phlegraean duality between acropolis and plains. As A. Corboz states in "Ordine sparso" - "One of the consequences of this situation is that which geographers call central spots is that they are characterised by a double trait: they are no longer locations and they are no longer central. They are no longer locations because their placement in spaces that are often residual and temporary prevent them from claiming the effective and symbolic significance that these locations rightfully deserve by name".

Giving a name to the materials of urban composition is the first step in articulating a geographical story from which it is necessary to begin, in order to launch a process of re-identification of the locations and their unique character.

The emerging character of the geographic story of the Phlegraean city is first and foremost one of inclusivity:

- A seaside city that opens up to landscapes far and near (the horizon from Pozzuoli to the Sorrentine coast, reaching as far as Punta Campanella, and including the three islands of Procida, Ischia and Capri, and also

Fig. x - Panoramic photo of the coast of Campi Flegrei from the sea.



reaching as far as Ventotene and Ponza to the northwest).

- A city that defines itself by the continuous relationship to the shapes of the earth: a promontory, a lagoon, a plain, the internal and external slope of a crater, a ridge, an island. A reciprocity between geography and architecture that permitted, in ancient times, experimentation with varying types of building techniques (i.e., the thermal baths of Baia that took advantage of terraced plains that took advantage of the internal ridge of a crater).
- A city that welcomes all with a landing, a port, a pier, a quay. A city capable of horizontally integrating with the inland territories (the classical port of Miseno, the port of Giulio between Lucrino and Averno).
- A city composed of a great court that faces the sea, repeated like the elements of its composition are repeated: a castle, a tower, a rock, a hill that from far off lines the coast. Or its agropolic elements with the capacity to geographically triangulate creating a system of territorial defence (Rione Terra, the Aragonian Castle, the Avalos Palace of Procida).

The inclusivity of the Flegrean lands is also present in the establishment of its

Fig. 4 - Panoramic view of the Castle of Baia from the sea.

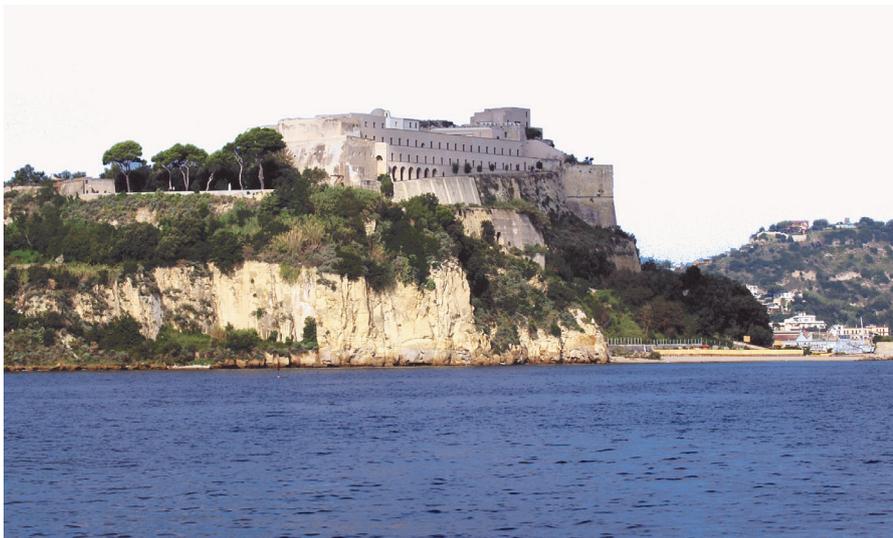


Fig. 3 - Historical map of the Baia area, with Lucrino lake, Averno lake and the coast.

“insides”:

- A city comprised of subterranean elements, cavities, galleries, underpasses and crypts: the Roman Crypts between the high and low parts of Cuma, the grotto of Seiano, the

grottos of Cocceia that link a plain to a low city. Also, the dense pattern, not always noted, that characterised the territory in the early 1900s between military defence systems and industrial sites (the galleries of industrial Baia, and the industrial sites between Baia, Fusaro and Torregaveta).

This proposed reading could define itself as inclusive, in that it presupposes a pre-formulation of geographical and architectural relationships that attempt to read in the same urban context: archaeology, architecture and geography. This is perhaps the only key to read such a complex and rich urban landscape.

Massimo Clemente, Gaia Daldanise

Collaborative processes in coastal landscape planning



Fig. 1 - Panoramic photo of the Phlegraean coast (picture by the authors).

Our participation in the Pozzuoli Intensive Study Programme (ISP) within the Erasmus+ CO-LAND project “Inclusive Coastal Landscapes: activating green-blue infrastructure for the urban-land interface” experiments with an approach already tested within the CNR IRISS research activities: the international collaborative design workshop “Cities from the Seas - city port system and waterfront as commons” (Giovane di Girasole & Procentese, 2019).

The proposed approach promotes the comparison among different disciplines; urban planning, social psychology, evaluation and management, in designing sustainable development proposals and facilitating interaction among the team members. We invited the students to develop their proposals for the coastal landscapes of Pozzuoli, Monte di Procida and Bacoli through a collaborative urban planning methodology (Forester, 1997; Rifkin,

2014) in line with the CO-LAND project objectives.

Pursuing this goal, we highlighted the critical role of the local communities’ psycho-perceptive aspects and the collaborative processes (Ostrom, 2015) for cultural heritage and landscape (Clemente, Castagnaro, Oppido, & Daldanise, 2015; Clemente & Giovane di Girasole, 2016; Clemente, Giovane di Girasole, Cannatella, & Martucci, 2015; Clemente, Oppido, Daldanise, & Sposito, 2015; Giovane di Girasole, Daldanise, & Clemente, 2019).

With this perspective, the student participants developed an innovative analysis of territorial demand by focussing on the qualitative aspects, interpreting end-user needs using an action research approach (Saija, 2017). These methods of the CO-LAND workshop effectively strengthened the interdisciplinary cooperation among team members to develop innovative, creative and sustainable

ideas. Our intervention in supporting the design process included: analysis of existing plans and projects in the study areas, co-planning of the coastal territorial system and co-design of project actions linked to the end-users’ perceptions.

In the first phase, in order to design locally embedded projects, we discussed case study plans and projects that provided tools to strengthen the knowledge base. Some examples are the Domitio-Flegreo Coastal Masterplan for the redevelopment of the coastal area from the Campi Flegrei to Garigliano, and the Flegreo-Pozzuoli Waterfront PUA (urban development plan - adopted but not yet approved) including the ex-former Ansaldo-Sofer and the nearby port area. Furthermore, we focussed on discussing the regulatory and governance aspects regarding co-planning activities: e.g., the Campania region’s draft law which aims to facilitate the integration

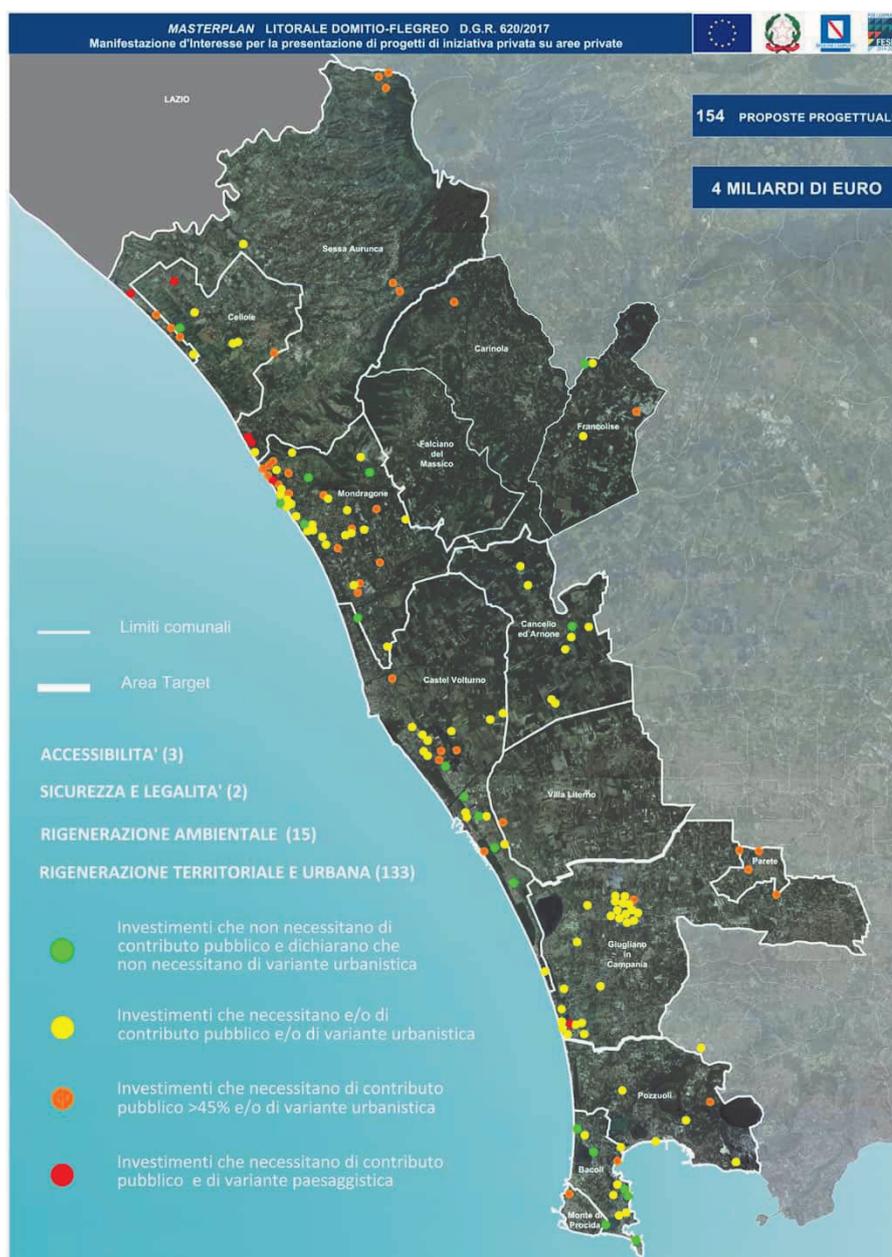


Fig. 2 - Masterplan of the Litorale Domitio

processes between the port and the city. The draft law promotes collaboration among the local authorities: the port system authority, the region, the metropolitan city and the municipalities. This law highlights the need for a multi-transcalar vision as emphasised in the co-planning approach (Piedmont Regional Law n.

3/2013).

In the second phase, starting from maritime identity, we addressed the issue of coastal area regeneration and sustainable development for building new urban visions.

We invited participants to change their perspective for recognising landmarks and tangible or perceptual

relationships by observing the territory and the city from the sea (M. Clemente, 2011). The parallel "belts" lining the coastline can be flexibly crossed, and landscape sections are needed to understand the territory. The working groups imagined a project for reconnecting the coastal system: Pozzuoli, Monte di Procida and Bacoli, by distinguishing the identity elements useful for local socio-economic development. They also identified the "coastal ecosystems" and spaces with a visual relationship to the sea.

Subsequently, in the third phase, we involved students in a co-design process highlighting local needs by defining project actions tailor-made from the residents and their perceptions. The student groups identified end-users in stakeholders categories (entrepreneurs, citizens, tourists, cultural managers, etc.), discussing their attitudes through the business model canvas "Empathy Map" framework (Osterwalder, 2004). The Empathy Map becomes a tool supporting the collaborative decision-making process thanks to an exploration of user profiles. The empathic identification with users' experiences (what they think and feel, what they hear, what they see, what they say and do, advantages and disadvantages) allows project actions to better respond to local needs. Overall, the experience of Pozzuoli's ISP was a success, as demonstrated by the team projects that developed innovative proposals which encouraged the work of each student participant and proactive interaction with the external experts.

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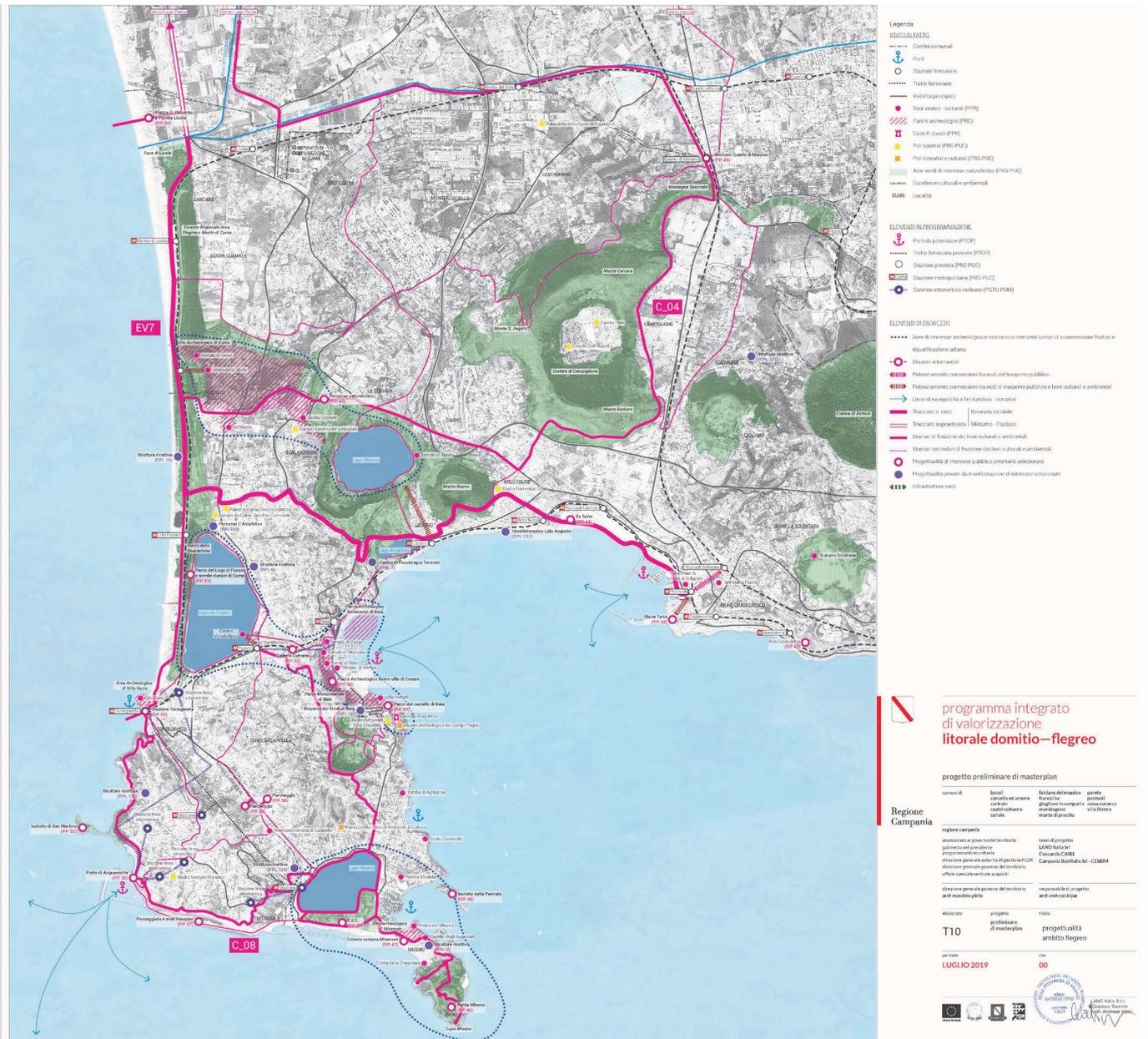
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Fig. 3 - Project Masterplan for the Phlegrean Area describing the integrated enhancement programme.



2nd International Workshop

Maritime Identity and Urban Regeneration for Sustainable Development of Seaside Cities
9th-13th November 2015 - Cruise Terminal Port of Naples, Italy

Linea di costa: Area Metropolitana



Gruppo "Flegrea.net"

Tutors: Carnevale Stefania, De Rosa Patrizio, Giordano Gerardo, Massimino Rossella
Partecipanti: Schiano Di Cola Nicoletta, Vitolo Marcellino

Fig. 4 - Phlegrean coastal line and description of the metropolitan zone elaborated during the workshop 'Maritime Identity and Urban Regeneration for Sustainable Development of Seaside Cities'.

Places, Smart Approaches, Happy People (pp. 719-741).

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INTENSIVE STUDY PROGRAMME

The intensive study programme theme, detailed challenges and problems overview

The COLAND conceptual framework: green and blue infrastructure in coastal landscapes

“Green infrastructure is a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services such as water purification, air quality, space for recreation and climate mitigation and adaptation. This network of green (land) and blue (water) spaces can improve environmental conditions and therefore, citizens’ health and quality of life. It also supports a green economy, creates job opportunities and enhances biodiversity. The Natura 2000 network constitutes the backbone of the EU green infrastructure.” (European Commission, DG Environment).

Ensuring the connectivity, validation, protection and multifunctionality of the Phlegraean green network bears enormous potential for the area. It is also a major strategic goal already adopted by the municipality as part of its development strategy. This concept should combine with the idea of a hiking and cycling network for sustainable transport. The green infrastructure (GI) network could further support the connectivity and accessibility of local heritage areas. Combining ecological, social and economic benefits by an overarching GI strategy can build a powerful framework for joining the forces of different actors and interest groups towards a common goal. Promoting green and blue infrastructure serves as the guiding principle for the working groups. The Pozzuoli Intensive Study Programme will look at this specific coastal landscape from the following six complementary perspectives.

1. Pozzuoli - Solfatara - Astroni

The Pozzuoli-Solfatara-Astroni area is

a very complex and crucial landscape. It consists of an urbanised area, and a more natural zone with extremely rich biodiversity. Landscape values have great potential within the entire region. The coastal promenade, characterised by a very long coastline, is where bars and clubs create a place for spending free time. The territory of Pozzuoli also has a very particular geomorphological composition. The volcanic system of the Solfatara zone, also the name to its largest crater, is one of the most interesting in Europe and is around three kilometres from the urban centre. The Astroni Nature Reserve is also very near to Pozzuoli and composed by a system of 30 craters with various dimensions. It is the habitat of several animal species and hosts diverse plants and trees.

To fully understand this site, it is fundamental to study the coastal area and evaluate the evolution of the landscape. Furthermore, modern urban development should be implemented with proper tourist functions, including new services for the city. Additionally, natural areas should be included in a more comprehensive GI network, connecting the potentials of the Gulf of Pozzuoli with the values of the beautiful inland landscape.

2. Rione Terra - Portus Julius

Pozzuoli is an ancient Roman city, a flourishing settlement that developed for centuries. It has a vast cultural and historical heritage, and its ancient ruins are famous all over the world.

The Rione Terra quarter is the historical centre of Pozzuoli. Founded by the Romans in the 2nd century BC, over the ages Rione Terra has preserved the memory of past historical and natural events that changed the morphology of the Phlegraean Fields. The quarter rises on a hill fronting the sea, and for this reason, it held strong strategic

value and became an important harbour in ancient times. Nowadays, the ancient harbour named Portus Julius, possesses fascinating sunken archaeological remains, elements that are proof of the cultural value of the city. Moreover, the presence of Gauro Mountain is a landmark for this beautiful landscape zone that favours historical and recreational tourism. Thanks to the volcanic composition of the soil, the local terrain is very fertile. The soil has a profound influence on agriculture, even while the bradyseism phenomenon constantly threatens to damage the area.

The evolution of the city has combined Roman settlement with progressive urbanisation, creating a unique urban patchwork within an impressive natural environment. It is essential to reduce the impact on nature and cultural heritage, satisfying the needs of the growing population while implementing connections between green infrastructure and the urban and rural systems.

3. Averno

The site is characterised by an extraordinary and varied landscape, composed of a recreational coastline, a mountain system and volcanic lakes. All of these elements combine with a rich cultural heritage. In the collective imagination, the Averno Lake was considered the door to hell for the ancient Romans, because of its mysterious depth and dark waters. Legends and myths merged in Vergil's Aeneid, where the poet described this unique place. Moreover, this lake was used by the Romans as a military shipyard together with the nearby Lucrino Lake. So, it's not difficult to imagine the richness of on-site historical remains. The local geomorphology is a challenge for urban development due to the small free areas available. The resulting pressures, caused by human needs,



The Phlegæan Fields' study areas: 1. Pozzuoli-Solfatara-Astroni; 2. Rione Terra-Portus Julius; 3. Averno; 4. Baia; 5. Cuma; 6. Fusaro.

damage the natural environment negatively affecting the existing green and blue infrastructure. The tectonic and volcanic activities are also challenging to control, even if they are an essential aspect of the area.

The priority for this zone is to make the Averno Lake surroundings safe, respecting the local ecosystems, safeguarding the historical heritage and enhancing the sustainable development of the human settlements, finally creating a suitably integrated natural and urban system.

4. Baia

Baia belongs to the Municipality of Bacoli, and its importance is strongly

related to the presence of significant archaeological and historical heritage. It is an ancient Greek colony and was a place of extraordinary culture and richness, famous for its thermal waters. The bradyseism phenomenon rapidly sank most of the city in ancient times, sparing just a small part of Baia that rose on a hill. Over the centuries, occasional volcanic activities and constant sea waves shaped its landscape. As a result, the waterfront is composed of a very high ridge covered by local greenery, and by a narrow coastline.

The historical remains mainly derive from very ancient times. The Archaeological Park of Baia was a thermal bath built between the 5th and 3rd century BC. Today, there are some parts of it known as the Temple

of Diana, the Temple of Venus and the Temple of Mars, because in the 19th century they were wrongly believed to be religious buildings.

Another crucial historical element is the Aragonese Castle, an essential landmark on the waterfront. The site is very complex due to its particular coastal formation of the coast and to the lack of connection between the historical elements.

Overall, it is fundamental to create an efficient network in Baia that links all these elements sustainably, relating them to a proper natural system.

5. Cuma

The archaeological site of Cuma belongs to the Bacoli and Pozzuoli

Municipalities. It is one of the most ancient Greek settlements in Italy, and its history mixes with mythology and myths. Cuma was believed to be the house of the Sybil, a famous oracle and priestess of the god Apollo. The area is surrounded by a mystical atmosphere. In fact, the cultural heritage is composed of various temples, such as for Apollo and Jupiter, and Sybil's cave, but there is also a thermal system.

The zone is characterised by lacustrine and swampy environments, due to volcanic eruptions and progressive sea-level variations, while the recent accelerated local urbanisation, together with climate change, has profoundly influenced these natural elements that are now starting to disappear.

The coastal area is a Site of Community Importance (SCI), so it is part of the Natura 2000 network. It has a plain morphology composed of different layers of volcanic sediments such as sands, silts and silty clays. These sediments lay on a substrate of yellow tuff and trachytic lava.

The overall altitude ranges between zero to 15 metres from the sea towards the inland, with a beach-dune system followed by a low inclination zone and slopes made by volcanic reliefs.



The challenge of this area is to combine the substantial archaeological value with a protected natural area, while lowering the pressure of the human settlements and developing sustainable ways to satisfy new urban needs, preserving this unique and mixed landscape.

6. Fusaro

The Fusaro Lake area is located in the Municipality of Bacoli. It was originally the stretch of sea between Torregaveta and Cuma, and the ancient Romans believed it was part of the infernal river Acheron.

The lake is separated from the sea by a narrow strip of land, joined by a system of artificial canals. On a small island in the middle of the lake, there is a beautiful hunting and fishing

house, the 18th-century Vanvitelli's Royal Casina connected to land with a wooden bridge. Moreover, the lake is famous for mussel cultivation since the first Greek colonisation. Today, water pollution negatively influences this traditional activity.

This zone is also surrounded by growing urbanisation that could damage the entire natural system. The presence of two essential railroad lines, the Cumana and the Circumflegrea, is fundamental to access the site but also limits the landscape values.

The Fusaro lake area needs a valid system reorganisation to reconnect the sea and the lake with a proper blue infrastructure, while the green infrastructure should be more widespread in the urban core. Finally, the Royal Casina should fulfil its potential by being included within a comprehensive heritage network.



Process and deliverables by phases

The ISP deliverables were structured in two categories: materials needed for presenting the analysis and proposals in front of a live audience, and materials required to create a written record of the ISP results. The presentations also required two separate deliverables considering the two successive stages of the working process, i.e., the analysis and the proposals. Thus, we arrived at the following three categories.

Phase 1: Analysis

A graphical representation/synthesis of analysis findings on a 15-minute PPT presentation was presented on Thursday, September 12, 4:30 pm. The presentation also had to be uploaded on the ILIAS website.

Phase 2: Visioning

A final presentation of maximum 10 PPT slides was uploaded to the ILIAS website until Sunday, September 15, and presented at 2:30 pm with all the CO-LAND teams and tutors.

Phase 3: Public presentation

The last presentation was shown to the local stakeholders to highlight the main workshop results. The presentation was held on Monday, September 16, 2:00 pm.

Phase 3: Documentation

Additional materials were collected from each working group to record the results of the workshop in a report that we hope will be both inspiring and useful for the local community and anybody interested in the sustainable development of coastal landscapes:

- 3 images synthesising the analysis findings;
- 1 image with the vision and the goals;
- 3 images explaining the strategy (process, partnerships, spatial interventions);
- 2-3 images illustrating the visualisations of the interventions; a text file with captions for each image; and

- a 500 words text file explaining the goals, vision, strategy and measures.

All documents were uploaded at the end of the Intensive Study Programme on the ILIAS website:

<https://ilias.hfwu.de/>

Requirements for achieving full academic recognition

The Erasmus Intensive Study Programme is full time and credits are awarded at each students' educational institute. All participating students who completed the Erasmus ISP received a certificate of participation. At the HfWU the combination of the ISP together with the completed online course "Social Entrepreneurship for Local Change" offered to students seven credits according to the European Credit Transfer and Accumulation System (ECTS). Students are responsible for checking if their respective study programme recognises these credits.

Students and teachers of the working group that participated in the Intensive Study Programme held in Pozzuoli in September 2019.



Organisational team and visiting staff

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Italy**

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Paolo Camilletti

IP organiser, tutor and evaluator

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Heritage Digital Visualization expert/
lecturer

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Cultural Heritage expert/lecturer

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Geology and Coastal erosion expert/
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Luca Scaffidi

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Municipality of Pozzuoli

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Architecture

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Emanuele Giuliano
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Landscape architecture

Schedule of the activities during the Intensive Study Programme in Pozzuoli

	08/09/2019 Sunday	09/09/2019 Monday
Day Topic		<i>The Phlegraean Landscape</i>
09:00 - 10:00		Introduction and welcome, overview of the IP programme, groups division, groups meetings tutors
10:00 - 11:00		Lectures from experts on the Phlegraean area, vulcanism, coastal erosion and Pozzuoli's spatial planning issues and climatic dynamics
11:00 - 12:00		
12:00 - 13:00		Visit to Rione Terra archaeological park and Temple-Duomo
13:00 - 14:00		
14:00 - 15:00		<i>Lunch</i>
15:00 - 16:00		Visit to Flavio Amphitheatre
16:00 - 17:00		
17:00 - 18:00	<i>Arrival, check in</i>	
18:00 - 19:00		Walking tour in the IP project areas and mindmapping
19:00 - 20:00		
20:00 - 21:00	<i>Dinner</i>	<i>Dinner</i>



	10/09/2019	11/09/2019
	Tuesday	Wednesday
Day Topic	<i>Walk and Talk</i>	<i>Understanding</i>
09:00 - 10:00	Welcome seminar at the Baia Archaeological Museum, lectures from teachers on the Phlegaeon Fields' cultural heritage and its valorization through virtual/augmented reality	Meeting with associations and professionals
10:00 - 11:00		
11:00 - 12:00	Guided visit to the museum	Consultation with the teachers
12:00 - 13:00		
13:00 - 14:00	<i>Lunch</i>	<i>Lunch</i>
14:00 - 15:00	Walking tour in the IP project areas	Students working and consultation with the teachers
15:00 - 16:00		
16:00 - 17:00		
17:00 - 18:00		
18:00 - 19:00		
19:00 - 20:00	<i>Dinner</i>	<i>Dinner</i>
20:00 - 21:00		



	12/09/2019	13/09/2019	14/09/2019
	Thursday	Friday	Saturday
Day Topic	Scenario	Visioning	Strategy and Process
09:00 - 10:00	Group work	Group work	Students working in the area
10:00 - 11:00			
11:00 - 12:00			
12:00 - 13:00			
13:00 - 14:00	Lunch	Lunch	Lunch
14:00 - 15:00	Group work	Group work	Consultation with the teachers
15:00 - 16:00			
16:00 - 17:00			
17:00 - 18:00	16:30 Presentation of analysis phase (PowerPoint 15' and written comments by the teachers)	Group work	Students group work
18:00 - 19:00			
19:00 - 20:00			
20:00 - 21:00	Dinner	Dinner	Dinner



	15/09/2019	16/09/2019	17/09/2019
	Sunday	Monday	Tuesday
Day Topic	<i>Visualisation</i>	<i>Presentation</i>	
09:00 - 10:00	Students group work	Students group work	<i>Departure</i>
10:00 - 11:00			
11:00 - 12:00			
12:00 - 13:00			
13:00 - 14:00	<i>Lunch</i>	<i>Lunch</i>	
14:00 - 15:00	14: 30 Final presentation (CoLand team)	14:00 Final presentation (public) - one presentation	
15:00 - 16:00			
16:00 - 17:00			
17:00 - 18:00			
18:00 - 19:00			
19:00 - 20:00		<i>Festive dinner</i>	
20:00 - 21:00	<i>Dinner</i>		





RESULTS

Pozzuoli - Solfatara - Astroni

Focus on Green-Blue Infrastructure



Students

- Emanuele Giuliano [Federico II]
- Loredana Trifan [UAUIM]
- Larisa Gonțilă [UAUIM]
- Hamid Gohari [IMLA]
- Sanja Budinski [IMLA]
- Lia Binte Hatem Chowdhury [EMU]
- Geanina Fanaru [Ovidius]

Tutors

- Christoph Jensen [IMLA]
- Jeroen de Vries [Le:Notre]
- Andrei Schwab [Ovidius]

Analysis phase

Solfatara-Astroni-Pozzuoli is significant as a mixed urbanised area whose potential is highlighted by its biodiversity and various landscape forms. Our study was structured in three steps: analysis, strategy and interventions.

The analysis showed a composition of three different layers of urban fabric: unplanned and unregulated settlement, forest and green lands including fragmented green areas, woodland, crops, vegetation, pastures and urban green spaces; and industrial-commercial areas. The railway and car infrastructure provide access to the area.

From the analysis, we derived the assets and opportunities of the area such as: nature and coast, thermal waters, good soils for farming and archaeological sites. We next contoured our goal: to provide the Solfatara-Astroni-Pozzuoli area with a safe environment and urban living, sustainable economic development and coherent public spaces accessible for all types of users using the green-blue infrastructure.

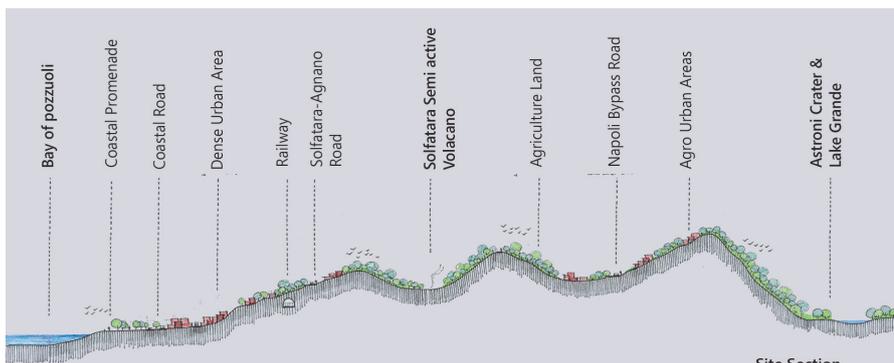


Land-use Analysis map



Mobility Analysis map

Site section from Bay of Pozzuoli to Astroni Crater and Lake Grande.



Vision

The vision for the Pozzuoli area is about connecting the seaside with the upper Solfatara and Astroni Nature Reserve. To realise the vision, we identified historical places and

key points where we propose the main activities. To integrate the social and economic aspects with the environment, we propose a hard intervention, a cable car from the seaside to the belvedere. We also propose a link using existing and proposed streets. The starting point is where we intend to reuse an abandoned building. Additionally, we link the seaside promenade with Solfatara. Along this path, one can perceive the cultural identity and experience the shape of the landscape relief. Also, we connect the urban area with the farming area and Astroni. Following the municipality's decision to build the new railway tunnel, we propose to use the old railway right-of-way as a pedestrian

and bike route. Along the shoreline, we propose a wooden platform to make a stronger connection between the sea and the promenade. This intervention will bring people much closer to the sea and increase the visual and access value of the place. On the promenade is a biking lane with intensified vegetation. Our vision, in summary, proposes to create a stronger connection between the abandoned building on the coast, reused as a cultural pavilion, with the cable car to the Belvedere di Pozzuoli and Solfatara.

Goals and objectives

Our goal is to provide the Solfatara-Astroni-Pozzuoli area with:

- a safe environment and urban living;
- sustainable economic development; and
- coherent public spaces using green-blue infrastructure.

Our spatial-temporal concept is to create corridors connecting Solfatara-Astroni-Pozzuoli in both directions: south-north and west-east.

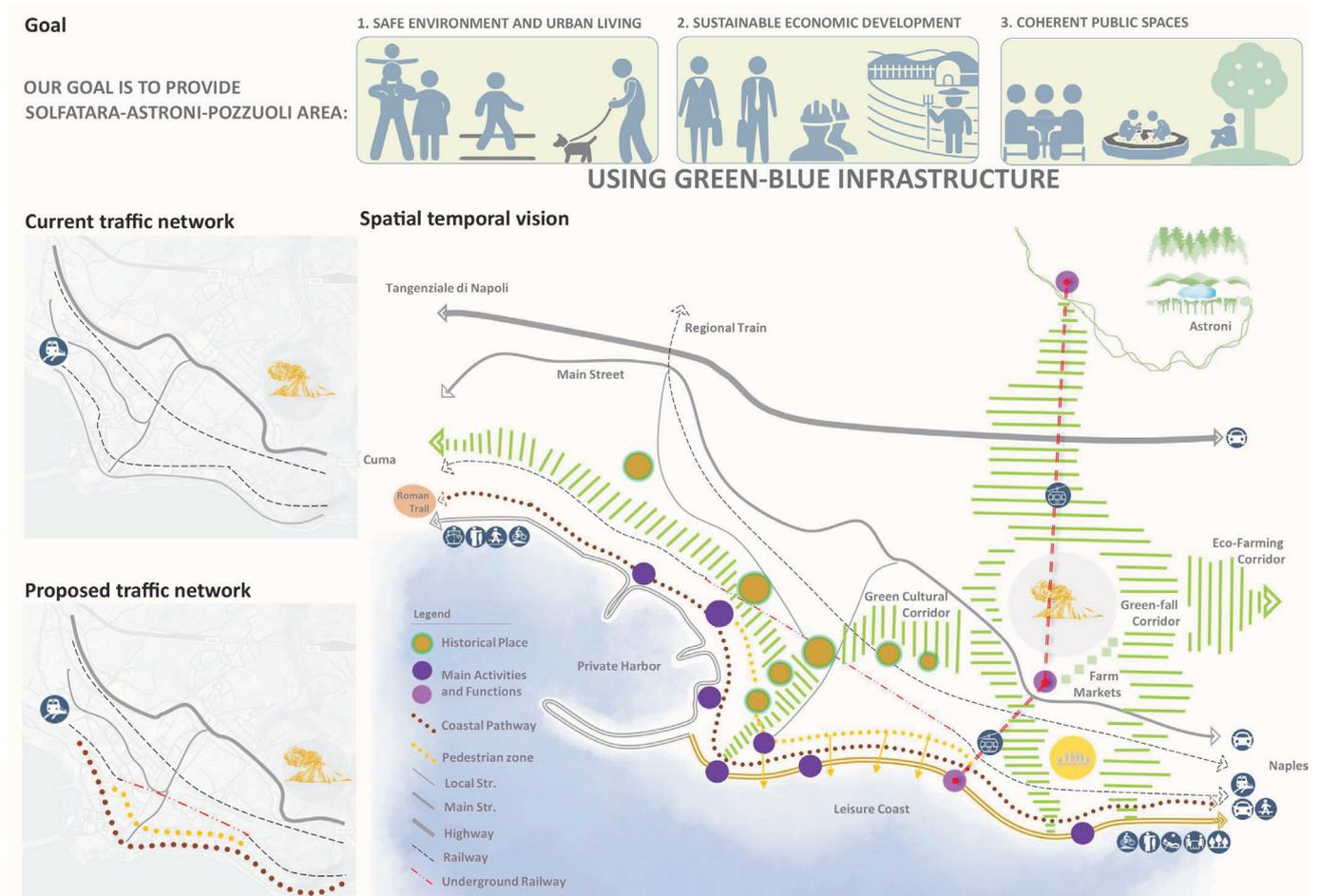
Strategy and measures

Our team have chosen three priority areas to detail and focus on the project. All of them are very important to the city, having different characteristics and types of proposed interventions, from cable cars to

reusing an abandoned building placed in a favourable spot.

The strategy is to implement a step-by-step sequence that will touch on the main problems of the area to ameliorate or resolve some of them. The steps start with taking into consideration local needs and involve young people in activities that can bring space back to life. An important measure for us is also prioritising pedestrians and public transportation. Connecting the critical points identified in our analysis using both green and cultural corridors is a necessity for our strategy to succeed. Actions and measures should grow visibility in the Pozzuoli area for better use of space, a spatial system formed

Goals and vision for the analysed area.



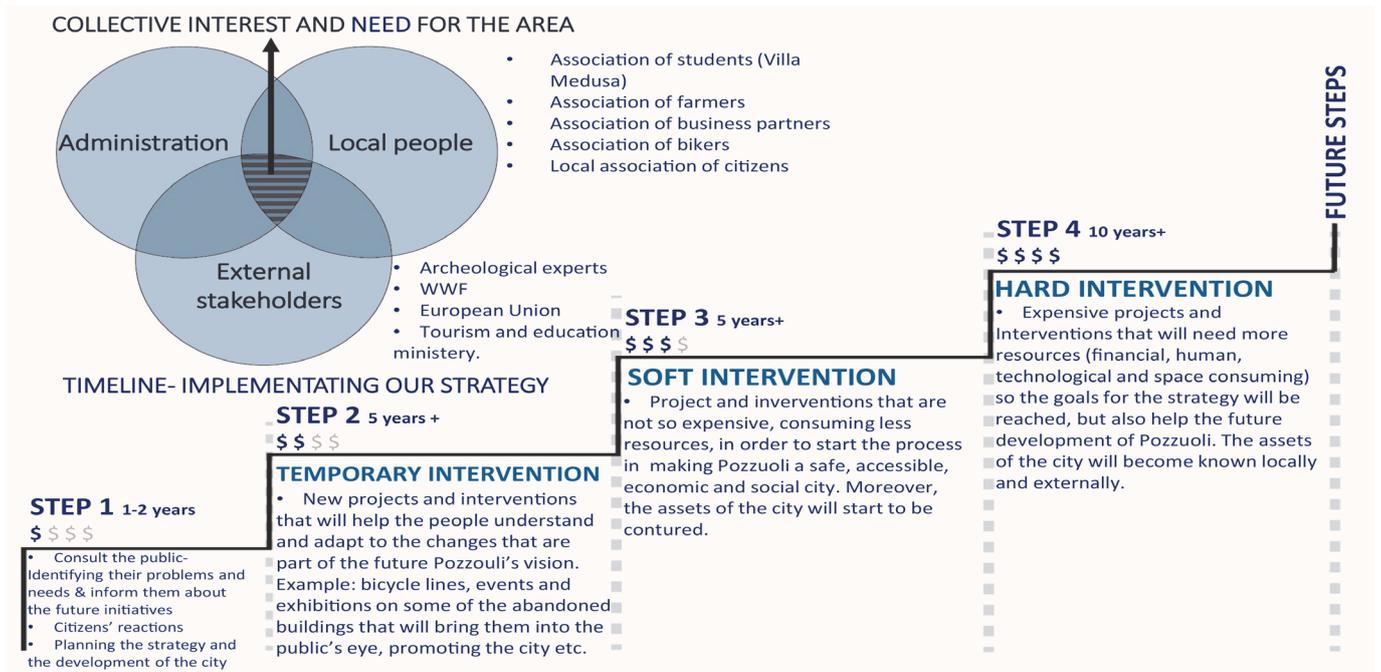


Chart of interested parts and timeline showing the four steps in implementing our strategy.

of urban and green spaces that creates a network connecting people and place. Finally, we create safe access to the local residences, mixing social, economic and environmental assets by reusing as much as possible.

We foresee four steps to implement our strategy: first, consulting with the public; second, quick-win temporary

interventions like painting the bikeway path; third, soft interventions that aren't too expensive but can make money; and finally, hard interventions that are more expensive and take more resources like the cable car.

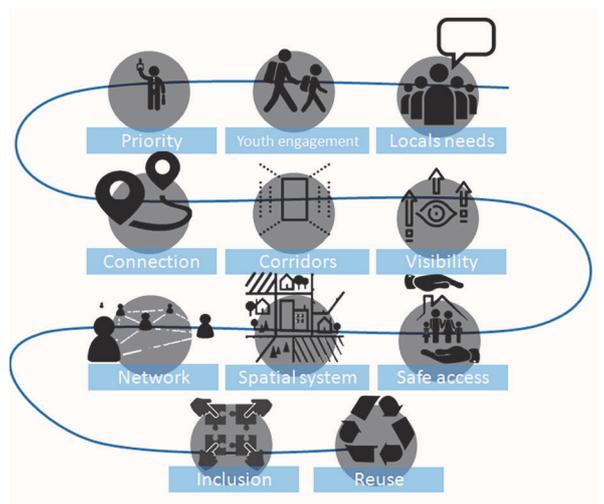
In conclusion, we use the approach that people are at the core of our planning and design. So people, the

residents, should be included in all phases and processes of the proposed strategy.

From our point of view, the Solfatara-Astroni-Pozzuoli area has great potential to turn into high-quality and pedestrian-friendly spaces that link three main parts: the sea, natural resources and cultural heritage.



The three detected priority areas and their relative interventions.



Strategy for Pozzuoli-Solfatara-Astroni area.



Existing belvedere point on the left and proposed intervention on the right (cable car, reuse of the abandoned building nearby belvedere).



This caption shows the proposed platform on the coastal part of Pozzuoli, connecting the sea to city, making the sea accessible.



Existing (left) and transformed (right) train rail: after the interventions there will be commercial area, friendly and attractive for pedestrians.

Rione Terra - Portus Julius

Focus on Archaeological Heritage



Timeline to an identity

The Rione Terra area is a culturally and traditionally rich landscape comprised of different overlapping timelines possessing distinct characteristics and features. Central to the project methodology was to understand the different layers of existing and hidden heritage. The understanding of these layers made us realise the importance of giving an identity to the area. The analysis process started with a visual reconnaissance survey which gave us an idea of the possible existing visual, physical and social-exchange connections.

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Tutors

- Ingrid Schegk [IMLA]
- Ellen Fetzer [IMLA]
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Analysis

The analysis process identified the existing potentials for the site. We highlighted the presence of a highway and a system of main roads, in addition to secondary and local roads that provide access to the area. Some of these connections are ancient Roman roads, and there is also a railway station. There is an inaccessible area along the coastline where there are several abandoned buildings.

Different places along the coast are potentially accessible.

This visual evaluation made us understand the most prevalent positive spaces within the site that we can use to develop a holistic approach to the area. The main component is the Roman road which acts as a vertical and horizontal connection to the different timelines for the city of Pozzuoli. A horizontal transect through the site clearly illustrates the different timelines available. Starting from the old city of Rione Terra and the Roman heritage, the timeline leads to the dilapidated industrial site and then the rapid urbanisation of highways, railways and boxed housing pattern repeated in the city of Pozzuoli.

Main goals and objectives

Our main objectives are to:

- enlighten the natural and rich anthropogenic heritage by bringing back the ancient Roman road along the coastline of Pozzuoli;
- improve the connectivity between Rione Terra and Baia; and
- include social participation of different urban actors to reactivate the industrial area as an inclusive space for multifunctional uses.

Connectivity analysis for the case study.



Concept and vision

The site concept starts with establishing the existing Roman road as the connector for all the layers of diverse cultural heritage. The industrial site is reclaimed for multifunctional land-use incorporating different activities keeping in mind all the possible stakeholders and users for the location. This strategy emphasises the economic feasibility of the site to incorporate stakeholders that help fulfil UN sustainable partnership goals.



Analysis of the tangible and intangible connections in the Rione Terra area.

The reclaimed industrial area realises a macro-scale vision at a micro-scale, connecting with the region of Pozzuoli.

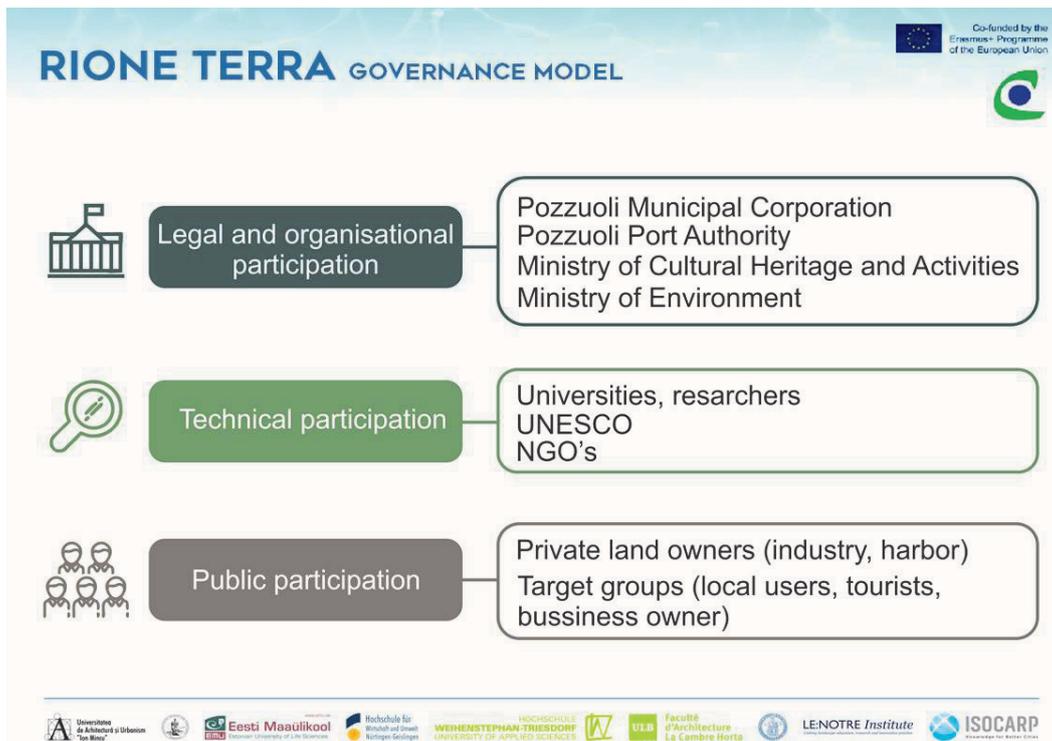
The reclamation concept for the industrial site emphasises the reuse of existing structures as they have a social value for the locals of

Heritage analysis of the case study.

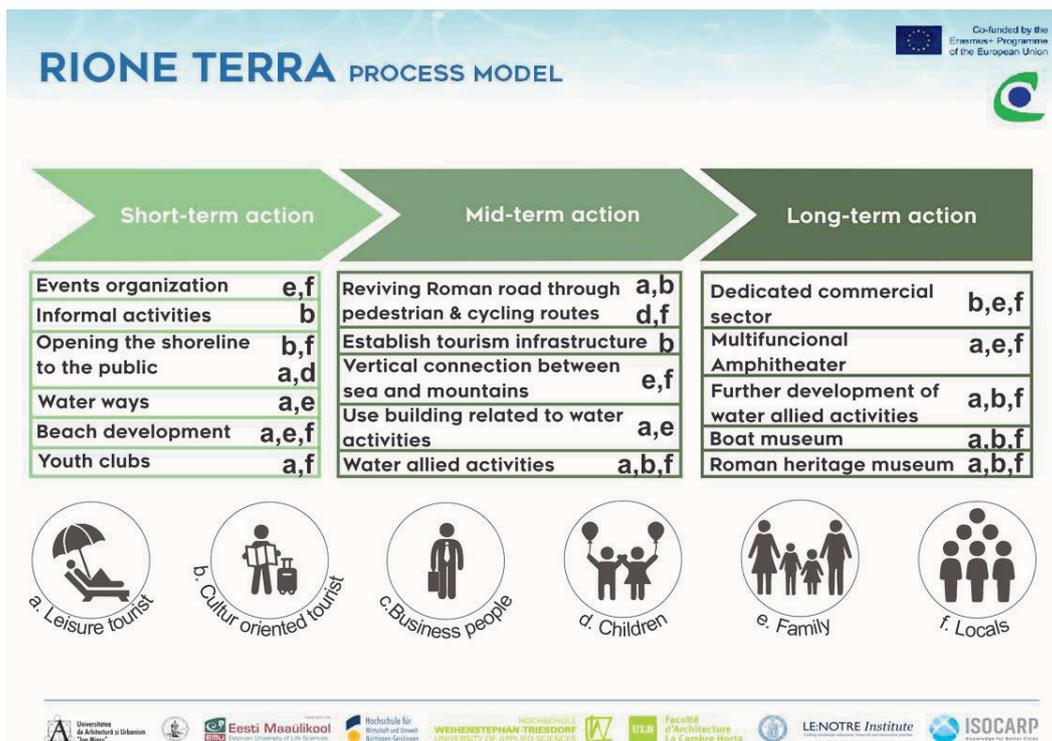


Pozzuoli. Proposed functions for the site keep in mind the overall city of Pozzuoli incorporating ideas such as introducing a food market, water activities related to sports, small scale industries, etc. To support the Timeline concept, it is essential to propose Augmented and Virtual Reality (AR/VR) connections for visual museums in the existing silos as well as a boat museum reviving the maritime heritage of Pozzuoli. Social inclusion plays a vital role in our project as we intend to incorporate all possible user experiences, thus providing variable environments to make a more interesting and multifunctional site.

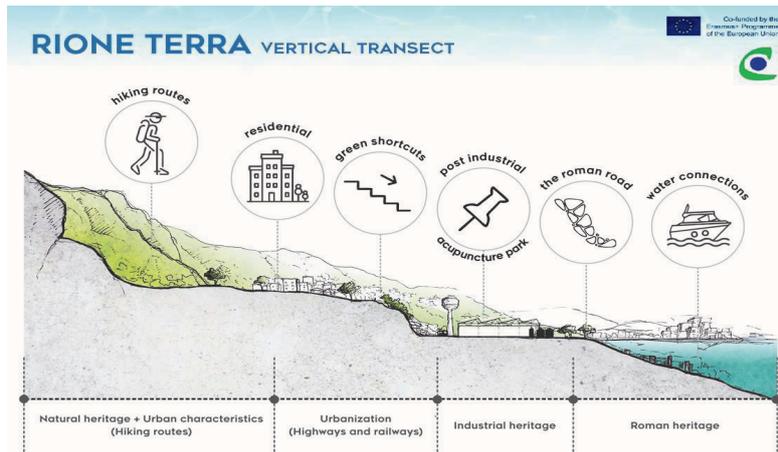
The broad concept of site integration also includes the overall connection with blue and green infrastructure physically and visually surrounding the site. The process model depicts the evolution of the project and the storyline for different users incorporating various functions. The governance model illustrates the relationship between the public and private sectors, and the competent authorities. In concluding the overall concept, it is vital to make a mark about landscape being an overall holistic identity incorporating sustainably and efficiently, the needs of everyone.



Hypothesized governance model for the Rione Terra case study.



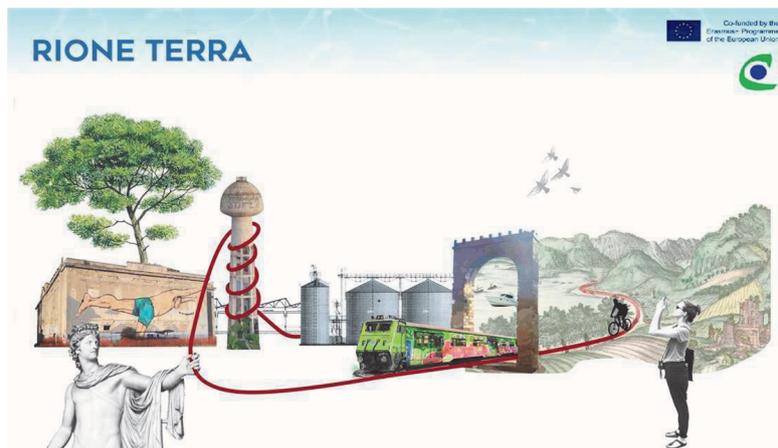
A possible process model for defining the operating priorities over time.



Rione Terra vertical transect highlighting the crucial elements of the site.



Two different project vision for Roman roads in different points of its route though the Rione Terra's territory.



Overall conceptual vision for the analyzed area.

Averno

Focus on Volcanism and Naturalistic Tourism



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- Alexandra Lungu [UAUIM]
- Asif Adnan [IMLA]
- Lubna Mansour [IMLA]
- Bruna Spagnol [IMLA]
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SWOT Analysis

The Strengths, Weaknesses, Opportunities, Threats (SWOT) method was used for the in-depth site-specific analysis. The analysis took into account the problems: fragmented road networks as well as physical and visual space, privatised waterfronts, car dependency, and the potentials: natural and cultural heritage, existing pathways, local agriculture, recreation and services. From this analysis, the following goals and strategies were identified:

Main goals

- Improve connectivity!

It is possible to improve connectivity by integrating and enhancing the existing mobility network and reopening the unused tunnels as

new routes. Together with providing alternative means of transportation, a local and regional connecting hub can be created.

- Improve (local) identity!

It is necessary to form associations and network groups to engage people in the decision-making process and to strengthen local identity through events and activism.

- Develop slow tourism!

We need to develop an appropriate environment and attractions, such as pathways, camping areas, local food restaurants and special events, to captivate tourists.

Vision: Traccia d'acqua

The "Traccia D'acqua" (Tracing the

SWOT Analysis

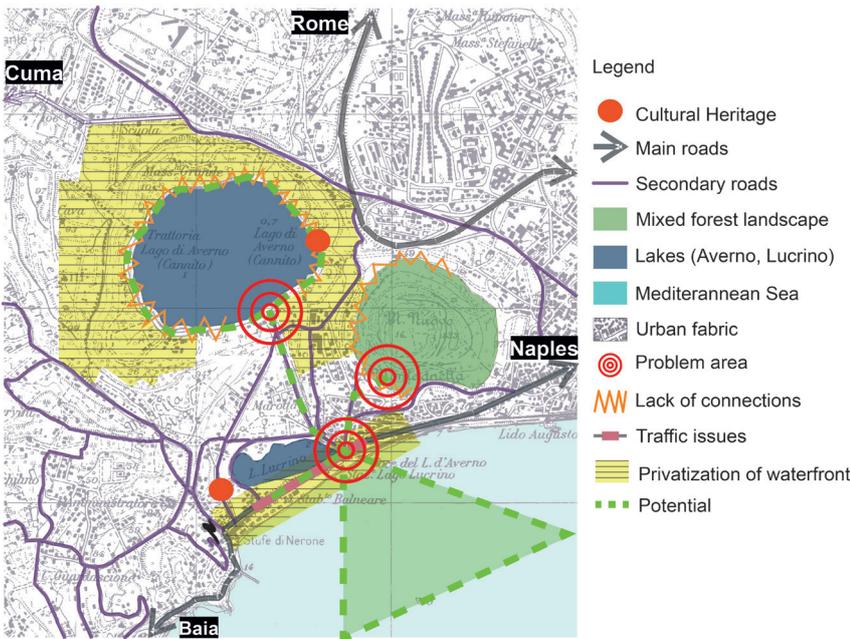
STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> - Heritage (cultural, historical, natural) - Natural diversity, complexity, uniqueness - Variety of ongoing (economic) activities (agriculture, recreation, services) - Existing pathways - Protected areas and low density around them 	<ul style="list-style-type: none"> - Discontinuity of road network - Fragmented (perception) of physical and visual space - Privatization of waterfront - Public services (transport, maintenance of equipment and vegetation, cleaning) - Low maintenance - Car dependency - Local organization system
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> - Slow tourism - Connecting hub - Connecting existing and new slow tourism routes (cycling, train, shuttle, ferry, pedestrian) - Local activism 	<ul style="list-style-type: none"> - Natural hazard - Over development and urban sprawl - Economical instability - Political uncertainty - Lack of funding -

SWOT Conclusion

Focus points:

- Connections
- Nature
- Social economy and culture

SWOT analysis and conclusion, showing focus points and main elements.



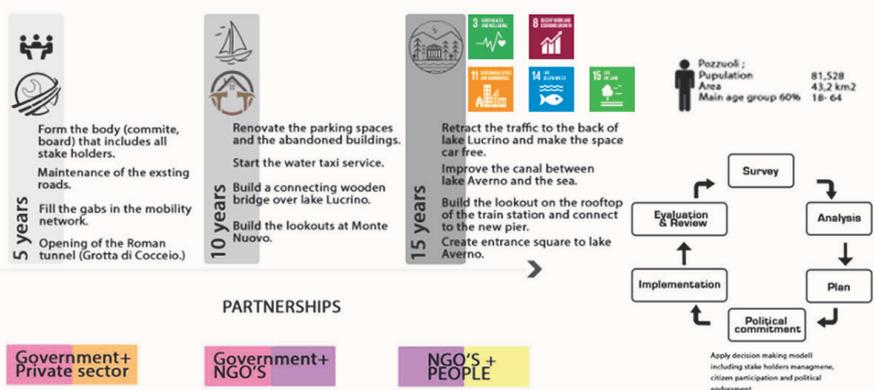
Analysis Diagnosis of the area: Mapped problems and potentials.

Water) vision is to create an area that is well connected and works as a central hub. It is a place that emphasises offering new intermodal transport means to the public: bike rentals, shuttles, water-taxi services, etc). The area should work as a connected-shared space where people are safe and have a sense of belonging. The locals cooperate with the municipality and one another, establishing associations and services.

They take part in different decision-making processes resulting in having a stronger community and increased local economy. There is a balance between public and private areas, making it possible to spend time exploring and getting lost in cultural and natural heritage spaces. Different events and activist actions are held to encourage slow tourism and raise the local cultural and environmental awareness of the area. Farmers should

Strategic process to realize the interventions over time.

Process



support schools and kindergartens, creating possibilities for children to connect with nature and agriculture. This is a place where broad connectivity and distinctive identity are spatially integrated into the unique landscape - making it a place where both the inhabitants and tourists can easily perceive the space and pace of slow tourism.

Measures and priorities

To realise the vision, it is necessary to:

- form an achievable and active governance model;
- prioritise the goals by demonstrating short and long term goals; and
- ensure partnerships between NGO's and the community.

When using the proposed governance model, the project splits into five-year stages, where at the end of each stage a specific set of goals should be achieved.

The following UN Sustainable Development Goals (SDGs) are trackable measures needed to realise the vision:

- Good health and well-being
- Decent work and economic growth
- Sustainable cities and communities
- Life below water
- Life on land

Governance model

To develop a suitable governance model, first, the participants have to be identified. For a public sector to be represented in an administrative body, a question needs to be asked: "What kind of stakeholders are

Goals and measures



improve
CONNECTIVITY

integrating and improving the existing **mobility network** and the unused tunnels to new routes and **alternative** means of transportation, to create a local and regional connecting hub



improve
IDENTITY

forming **associations** and **network** groups, in order to engage **people** into the decision making process and to strengthen **local identity** through **events** and **activism**



develop
SLOW TOURISM

forming **associations** and **network** groups, in order to engage **people** into the decision making process and to strengthen **local identity** through **events** and **activism**



into a committee or board, that has representation from the mentioned stakeholders. The NGOs can monitor public opinion, evaluate it and report it to the committee, which will then decide the necessary measures for the implementation of the project that the committee would adapt. The process model proposes splitting the project into five-year stages, with certain sets of goals achieved at the end of every stage.

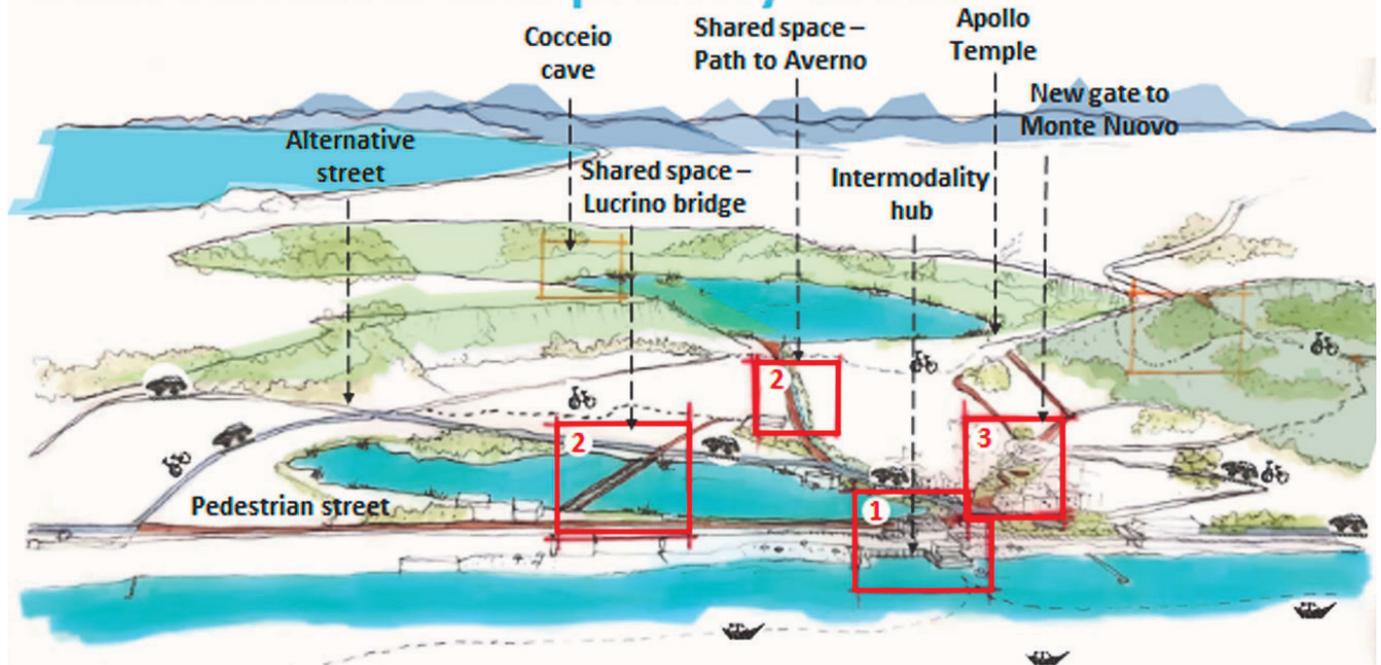
Objectives for the case study and measures to reach them.

necessary to include in the decision-making process?" Also, a variety of other participants are required. We have the private sector business owners, the institutional sector, the NGO sector and the users of the area - residents and commuters.

The second element of the model is to identify the objectives, including the input of all stakeholders and considering the competition between sectors. Afterwards, we identify the instrument, which would be a public-private partnership formed

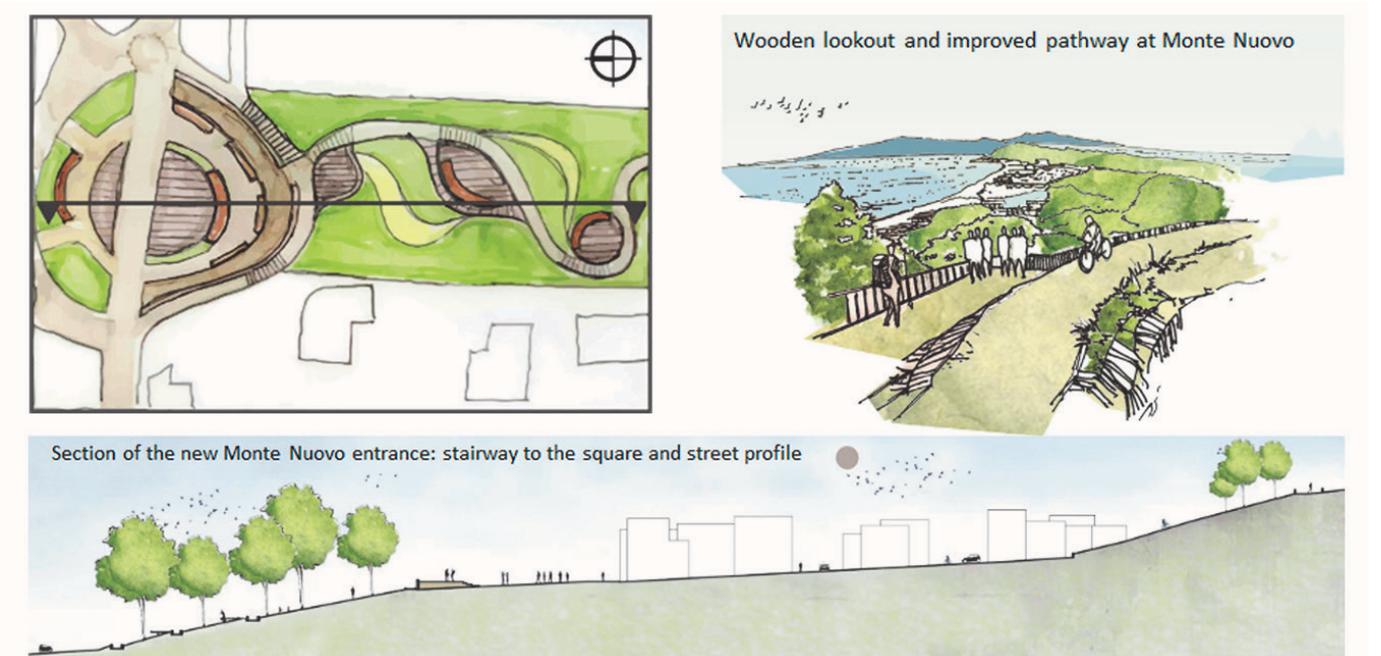
Identification of the main interventions and priority areas.

Interventions and priority areas





On the left, the intervention that defines an intermodality hub with a pedestrian gallery between the hub and the Lake Lucrino. On the right, the creation of shared spaces nearby the Lake Lucrino.



Intervention for creating a new accessibility to the Monte Nuovo, improving pathways and different kinds of connection.

Team 4

Baia

Focus on Post-industrial seascape and drosscape



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- Roxana Triboi [Le:Notre]

Character

Coast of Baia is a dramatic landscape inThroughout history, the coast of Baia has been a dramatic landscape in terms of forces of nature. Sporadic volcanic activities and frequent ocean waves have shaped the coastline today with a unique composition of relatively young and old physical

These walls are a combination of volcanic caldera rims, major and minor faults.

Potentials and challenges

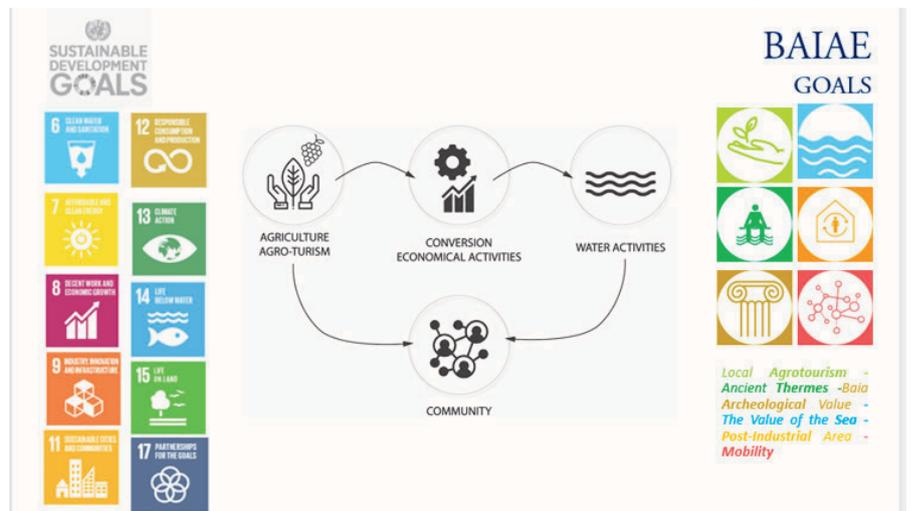
Our team concentrated on discovering the area of Baia, finding its potentials and challenges in order to propose a



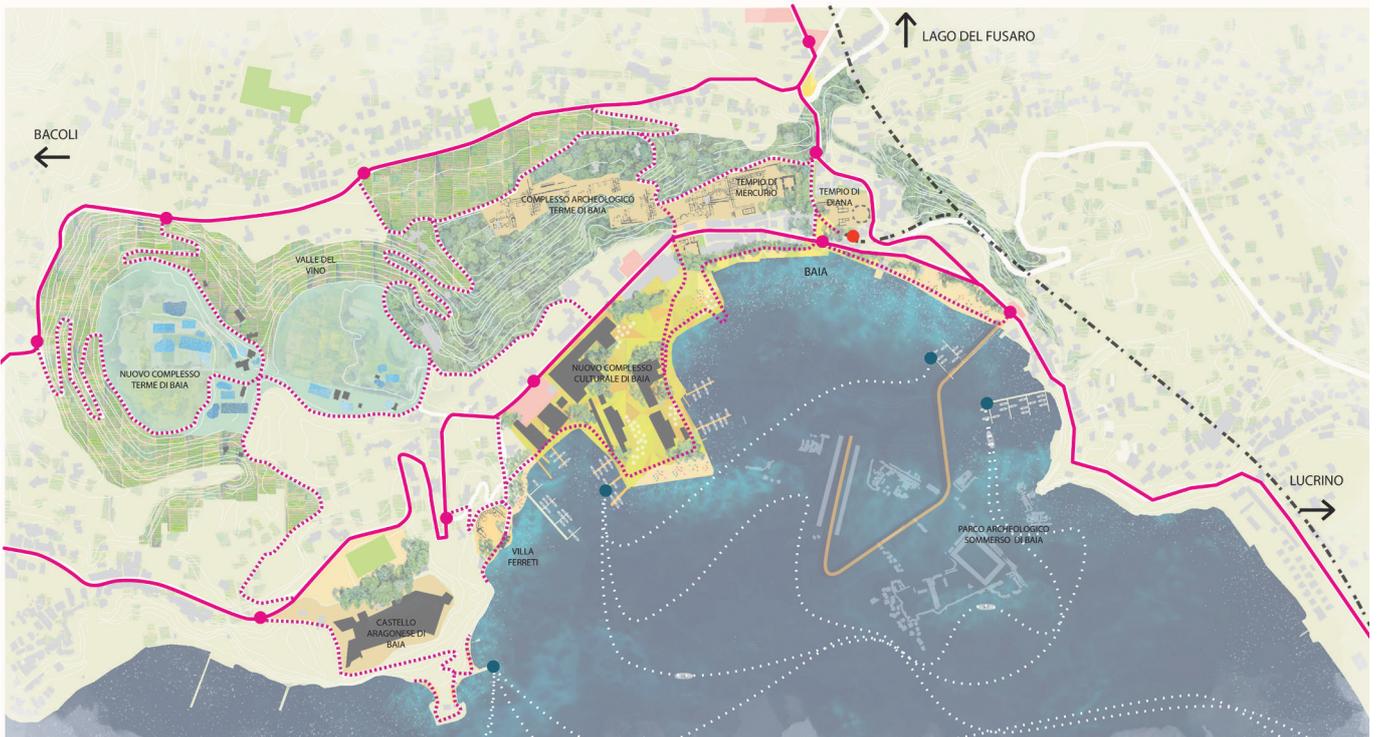
Main challanges of the Baia case study that emerged from the analysis.

matter. Due to the immediate high-ground associated with the coast of Baia defined by layers of land, the 'coastal effect' is limited to a narrow strip of land relative to a typical coastline. Because of the abundant humid wind, greenery has covered the facade of those elevated landforms.

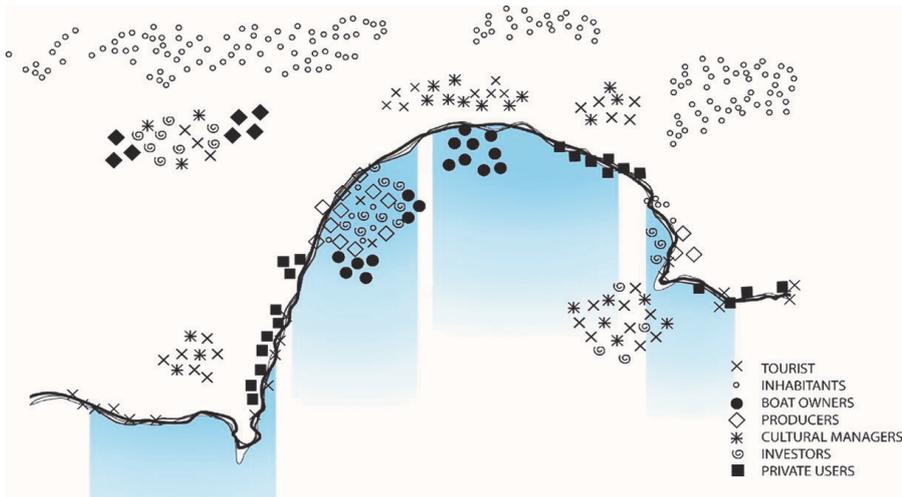
possible strategy and implementation measures. We focussed on the topic of post-industrial areas and drosscapes, among other issues. Following the first few days of exploring Baia, talking with the local residents and stakeholders, we developed the main idea about our study area and



Baia's development goals elaborated for the design phase.



Visual strategies for the area of Baia highlighting the neuralgic points of the site.



Private and public space along the coastline.

started brainstorming the next steps. Through our preliminary observation, we illustrated our first impression as a man above the surface of the land, symbolising private privilege and the objects of exclusive rights that are popping-up all over the area. This image conceptualises the current situation where the area's broad potentials are kept beneath the surface due to the imbalanced usage of the land.

Goals and interventions

The primary interventions of our team took into consideration the UN Sustainable Development Goals. These refer to life underwater, to life

on land and to economic life. Taking these goals into consideration, we propose the conversion of the post-industrial area with new economic activities that could bring new jobs. This action considers the problem with the local teenagers that don't continue school and have no work. Sustainable actions were also an essential part of our interventions.

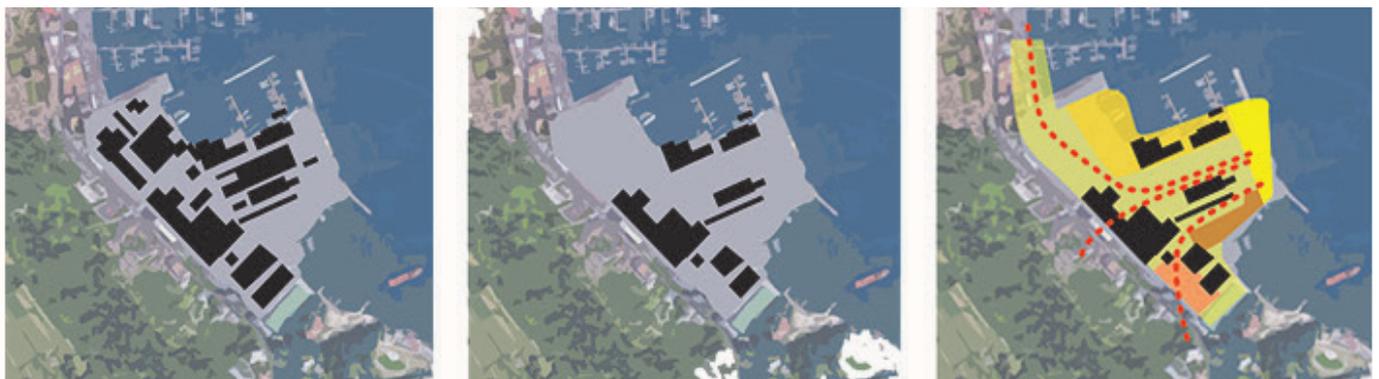
How are we doing this?

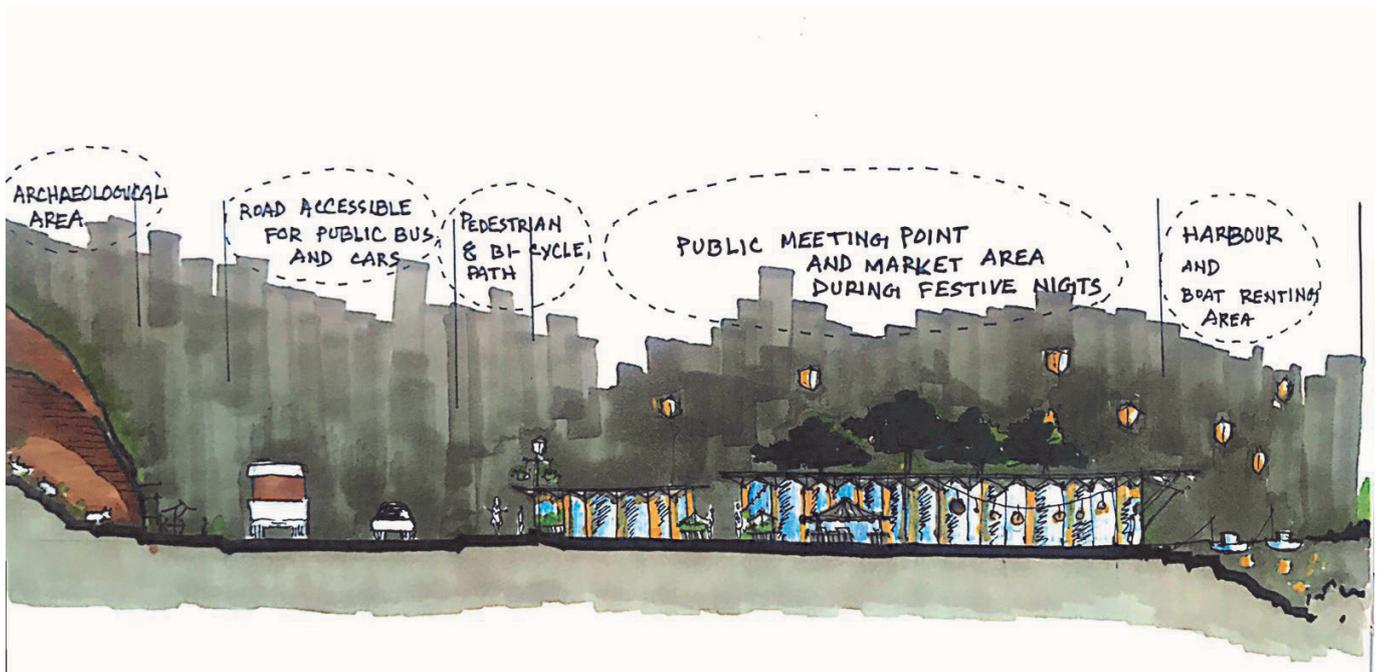
We propose to utilise the main values and most important elements Baia possesses: the agriculture, the production and, finally, the sea. Also, one of the most critical aspects of the system our team proposed is the

community of Baia. The team's primary focus areas within Baia were the post-industrial area on the seashore, the archaeological and historical areas on the land and underwater, and the port of Baia. Also, the system created by these three main elements will be supported and connected by creating new public spaces and markets, as well as offering a mainly public character along the coastline. These actions are supported by the mobility of the area, by local activities and an increased level of citizen awareness.

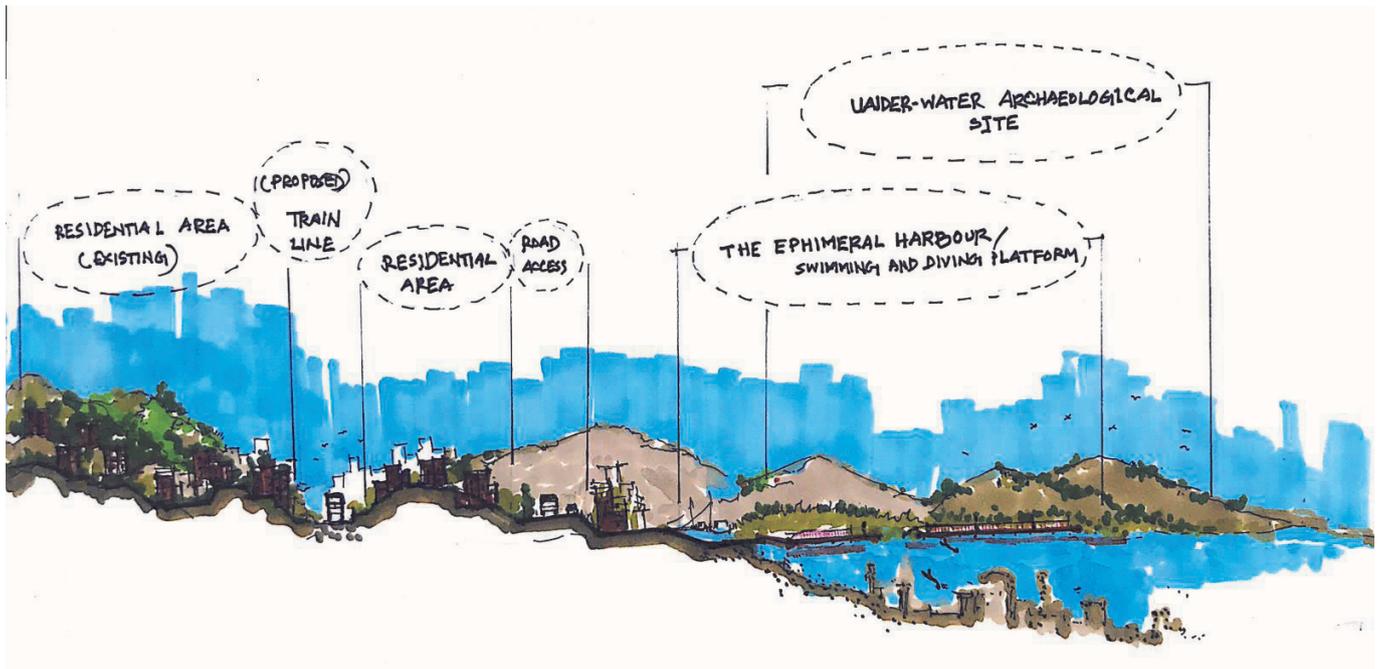
BE PROUD BAIIA!

Design strategy for the harbour area in the Baia coast.





This caption shows the intervention to realize the cultural district transect.



This caption shows the intervention to realize the floating bridge transect.

Cuma

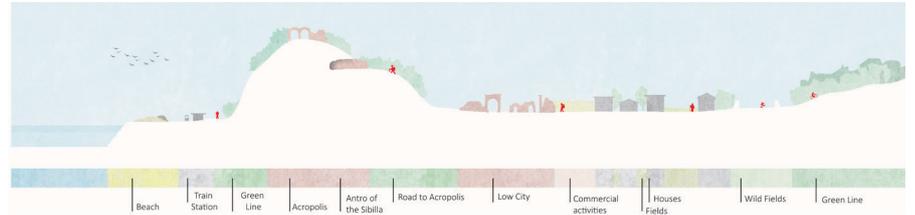
Focus on Rural-fringe landscape



What is Cuma?

This was the mystery that set our study in motion.

many issues, such as poor mobility, lack of transportation options, poor urban planning and natural resources that are out of reach. The coastline and the Costa di Licola Nature Reserve are



Particular topography and heritage of Cuma.

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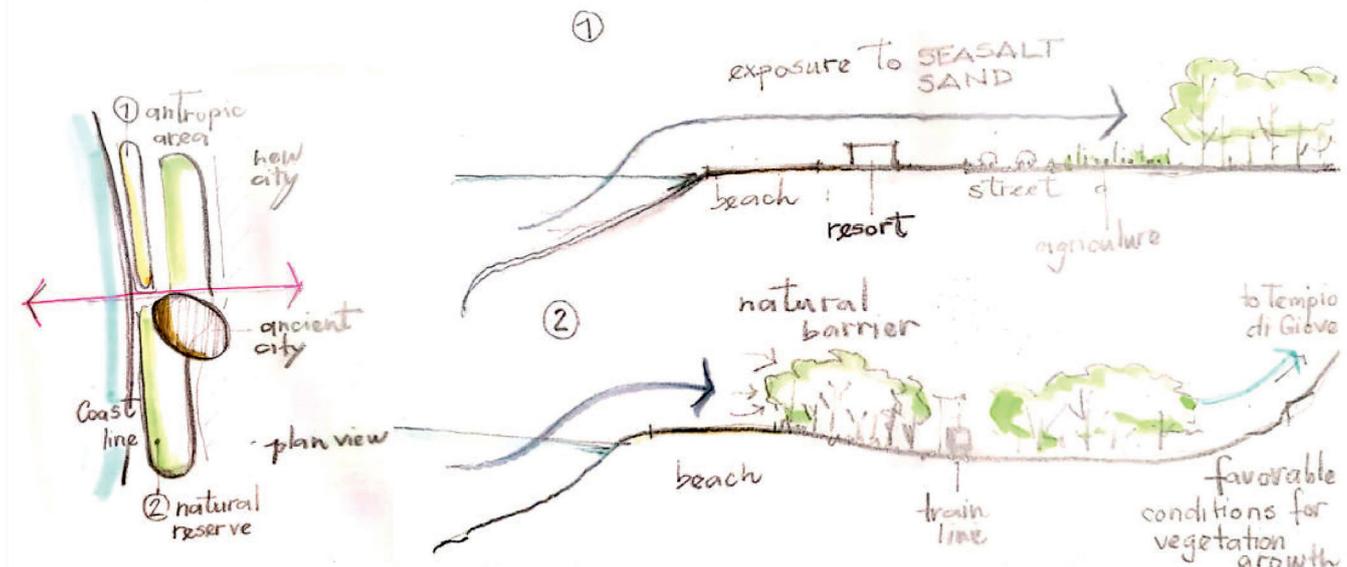
To find our answer, apart from the on-site exploration, we turned our attention to the stakeholders that usually interact with the study area. To our surprise, we found out that Cuma is strongly associated with the ruins of the ancient city of Cumae, which nowadays are part of the Archaeological Park of Cuma. Even more, and what very few people know about is the unique legend of the Sibilla - the most famous oracle of the Roman Empire. Therefore, the cultural heritage of this area is a large part of the landscape with its ancient ruins, canals and streets that all show great potential for being reconnected. At the same time, Cuma is dealing with

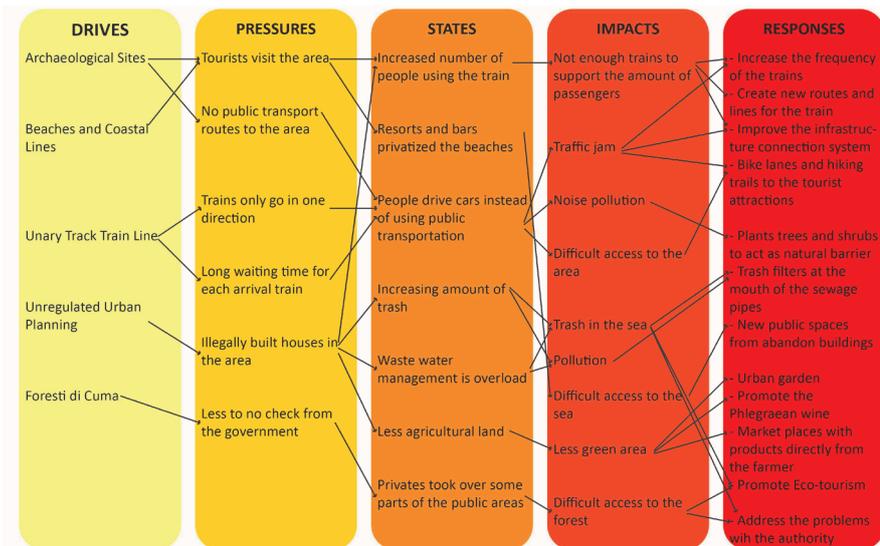
mainly inaccessible.

Therefore, we set up three main goals which try to solve the key issues that people encounter in Cuma:

- Cuma should emphasise the importance of its cultural heritage, using the story of the Sibilla and the ancient Roman canals and streets that connect to the surrounding historic ruins;
- the Costa di Licola Nature Reserve, its beach and the former private beaches should be publically accessible, highlighting the coastal landscape of Cuma; and

Coastal landscape analysis of Cuma.





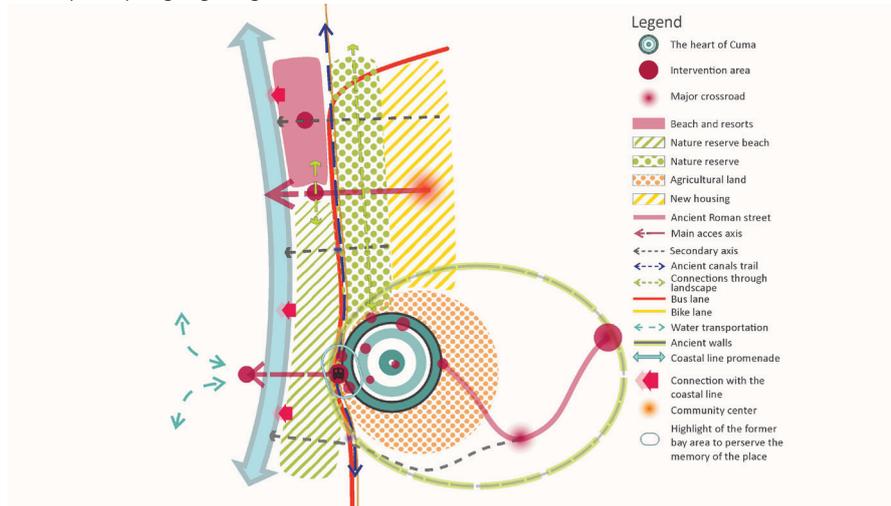
DPSIR analysis studying drives, pressures, states, impacts and responses of the case study.

- Cuma should benefit from enhanced mobility and new, efficient and environment-friendly transport options.

The unique legend of Sibilla was the starting point to accomplish our goals. First, we propose a cluster of activities centred around the modernised and improved train station of Cuma, including the main access point to the Cuma Archaeological Park. In this way, we revive the memory of the place, the old bay of Cuma, and the

new area becomes the centre and beating heart of Cuma. To create an enthralling experience for the tourists and locals, new soft interventions will be implemented along the archaeological park. Sensorial gardens and events will link to other landmarks in the landscape: the hippodrome, the fresh markets, farms and the ancient amphitheatre. To improve mobility, we introduce bike lanes and pedestrian circuits along the former ancient canals. We also propose the revival of a former tourist bus line to

Concept map highlighting the main elements of the area of Cuma



overcome the problem of the one-way-only railway. In our plan, there are proposed routes for both locals and tourists, to suit the individual needs of each group. Moreover, the forest and the coastline will be opened to the public, with soft interventions such as observation towers and wood installations. Fences will be eliminated so that people can easily cross the coastline. For the local residents, we propose the creation of a new civic centre, together with an urban square. Along with history, agro-tourism, an activity that can highlight the unique agricultural potential of the area, will be promoted to create more job opportunities. With these measures, we hope to give Cuma a new and stronger identity.

Regarding stakeholders and partnerships, our first goal is for a collaboration with the UN Sustainable Development Group, the Phlegraean Fields Regional Park Director and the Pozzuoli Municipality to launch many of the proposed projects targeting tourists, local residents and farmers. For our second goal, we propose several projects related to turtles, fireflies and bird watching with the UN and NGOs groups in coordination with the Pozzuoli Municipality, targeting tourists, local residents and the town of Cuma. Lastly, for our third goal, we propose partnerships with the EAV Rail Transport Authority, the Percorsi Cumani Cycling NGO, the Pozzuoli Municipality and merchants. They will advance projects that target tourists, students, parents and workers.

Therefore, in our vision, Cuma is the heart of the surrounding region. It is a well-known tourist destination that highlights the unique legend of the Sibilla, using eco-tourism to integrate the coastal landscape and the area's agricultural potential. The resulting new workspaces and leisure activities will support the economic growth of the region and improved quality of life.

1. Sybilla Ecotourism Destination - due to stakeholders analysis, DPSIR, SWOT: Cuma is emphasizing the importance of its cultural heritage, using the story of the Sybil and the ancient roman canals, streets, which are connected to the surrounding ancient ruins.

2. Sustainable Forest and Coastal Line - due to biodiversity issues and Natura 2000: Natural reserve "Costa di Licola", its beach and the former private beaches, are accessible to the public, highlighting the coastal landscape of Cuma.

3. Connectivity and Mobility - due to stakeholders analysis and transportation needs: Cuma benefits from enhanced mobility and new, efficient and environment-friendly transportation options.

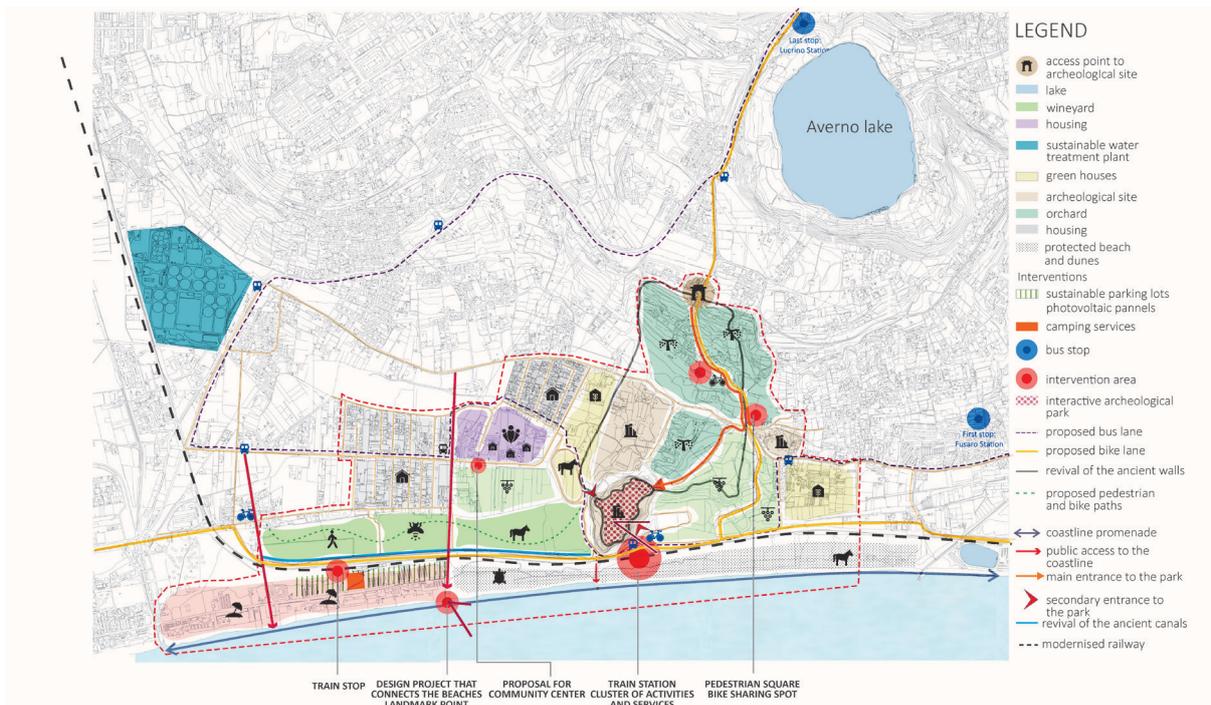




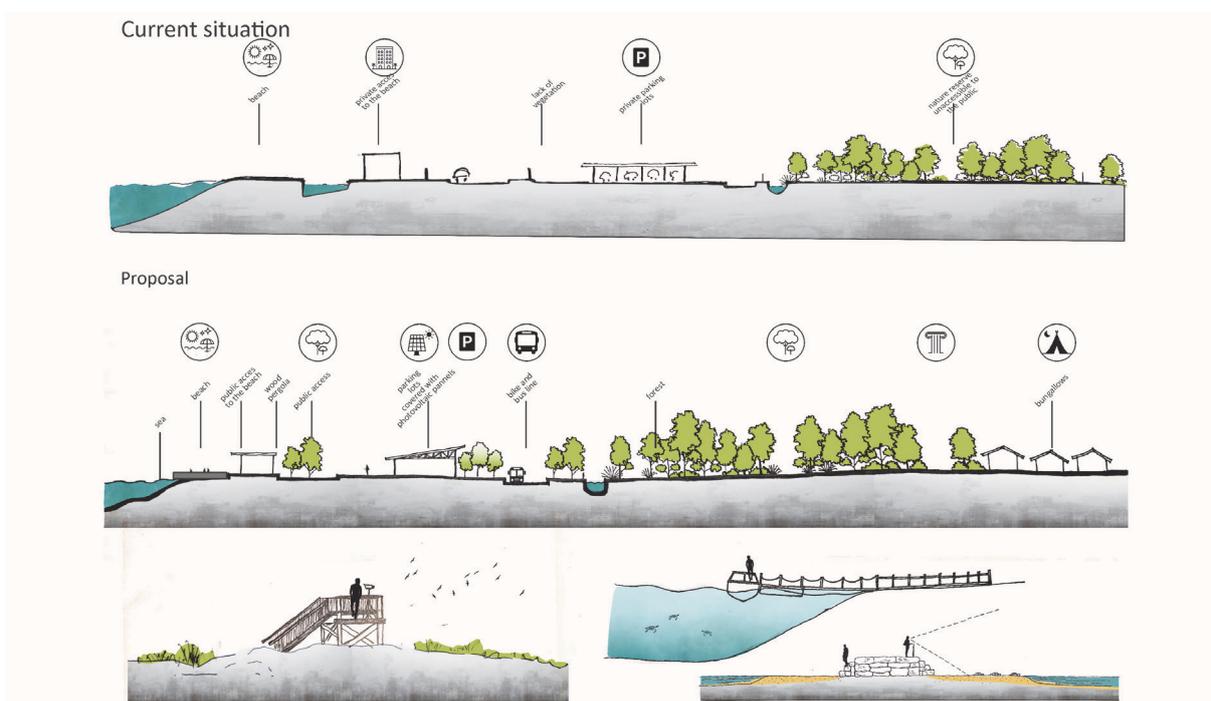

Main objectives and sustainable development goals of the project for Cuma.

Proposed projects	Involver	Target
1 Agritourism 	UN Sustainable Development Farmers  	Tourists, Locals, Farmers   
2 Arcofelice Lighting installation and light traffic 	Municipality 	Tourists, Locals  
3 Archeology tourism interventions 4 Amphitheatre Plays events 	Director of Phlegraean fields Director of Phlegraean fields Municipality	 
5 Horse riding 	Partnership between municipality and Hippodrom owner	Tourists, People interested
6 Second entrance of Sibylla Site	Director of Phlegraean fields Municipality	Tourists
Proposed projects	Involver	Target
7 Turtle observation track (August summer event) Firefly observation trip (summer event) Bird watch tower   	UN Sustainable Development NGOs (WWF Italy) in collaboration with the municipality   	Tourists, Locals, City (Environment biodiversity)  
8 Touristic Busline 	EAV 	Tourists Students Parents Workers
9 Train lines 	Percorsi Cumani 	
10 Beach and forest access 	Municipality 	
11 Boat Kayak dock Bike renting area Kiosks / Restaurants   	Merchants 	Merchants - Client

Design strategy organized according to the implementation priority.



Strategic masterplan for the case study.



Transect describing the current situation of Cuma and design transect and details from the project proposal.

Fusaro

Focus on Historical and naturalistic landscape



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Goals, vision, strategy and measures

The Fusaro Lagoon is the focal point of the area, a unique location with different potentials within and around the lagoon. Our group developed the idea of converting the 'mono-functionality' of the lagoon and its surroundings to 'multi-functionality'.

Today, the area is primarily known for partying and luxury weddings along the beach, and mussel farming inside the lagoon. After communicating with the local residents, we understood that they are really not satisfied with the lagoon, despite the spectacular scenery it offers. They acknowledged that the lagoon is contaminated by sewage discharge and that access and activities are lacking.

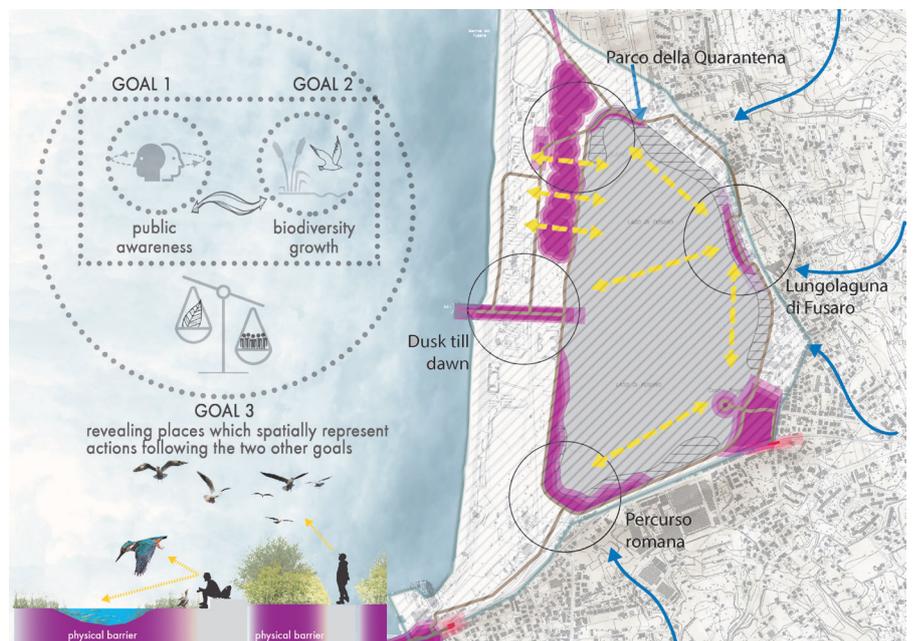
Therefore, we put our focus on improving the quality of life for both the locals and the wildlife using a realistic approach. Our project title "The Lagoon As A Stage", expresses the idea of putting the community's use and enjoyment of the lagoon as our first priority.



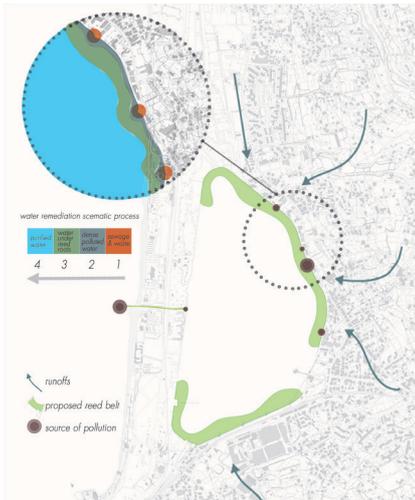
Overall analysis of the case study.

We identified three main goals. First, to raise public awareness of the area's potentials and improve civic engagement by identifying and creating interest points, connecting them with various visual and physical measures.

Second, to revitalise biodiversity within this Natura 2000 site through creating more diverse and reconnected habitats with better water



Goals and vision for the design process of the area of Cuma.



Analysis of the local water management.

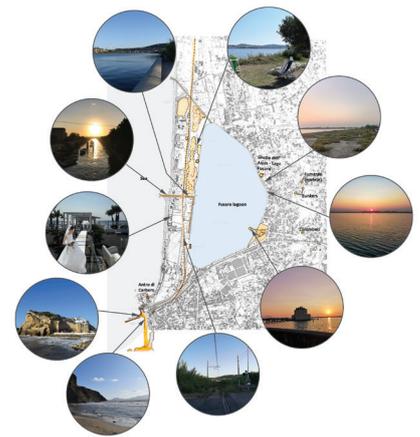
quality management. One example would be planting buffering beds of the existing local plant 'Arundo Donax', for strategic purification by identifying water catchment and sewage discharge areas. For these revitalisation measures to succeed, public awareness, care and engagement will play crucial roles, along with political implementation.

Lastly, our third goal would be to

foresee and propose ways to reduce the conflict of promoted human activities and nature restoration in the same area, in other words, to compromise between our first and second goals. In our proposal, are specific designs for each focus area, created by close considerations of various degrees of human and wildlife interactions.

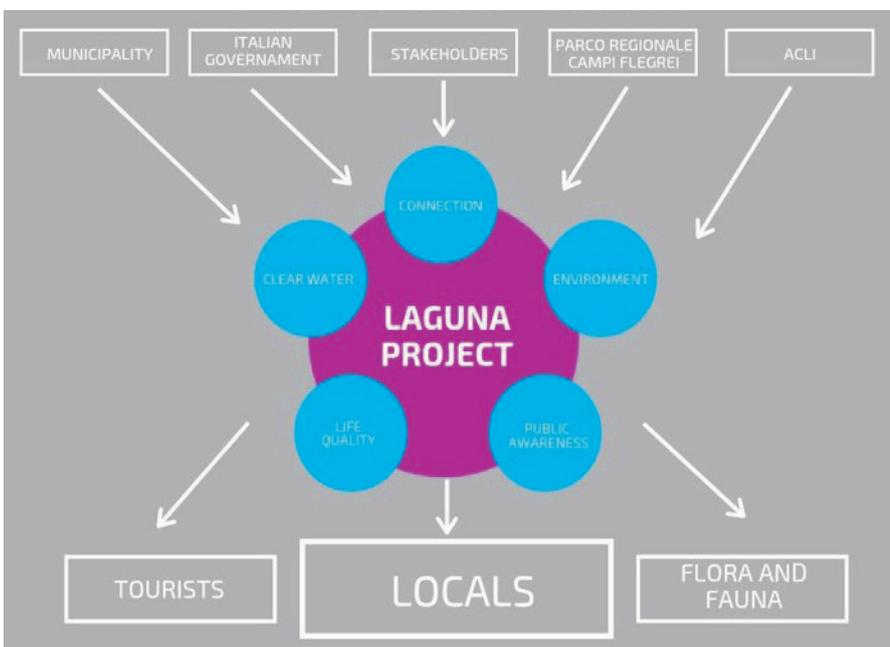
In consideration of the mid-term to long-term vision and the three goals, in both, the strategy would be to promote sustainable development by providing facilities for the locals, which will raise the quality of life, and consequently, the quality of the coastal landscapes. Also, using local resources positively affects economic growth by strengthening partnerships between different stakeholders, industry and production. Awareness of the local needs is also crucial in terms of nature protection as explained through the way we discuss the area to raise awareness of the relationships to consider in a sustainable setting, not to violate nature.

With our best hopes and efforts,



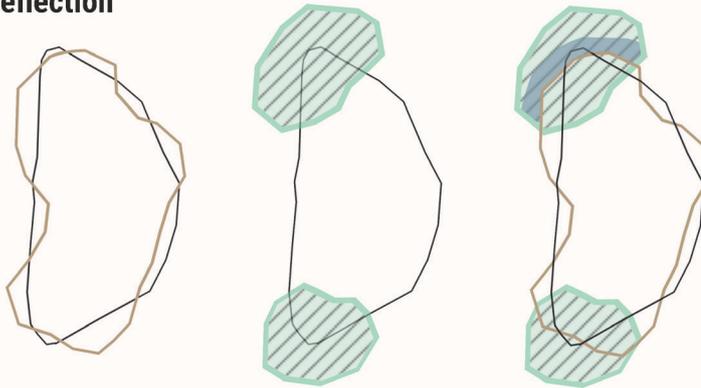
Study of the interest points.

we desire that Fusaro transforms into a neighbourhood that the local residents can enjoy and be proud of in the near future.



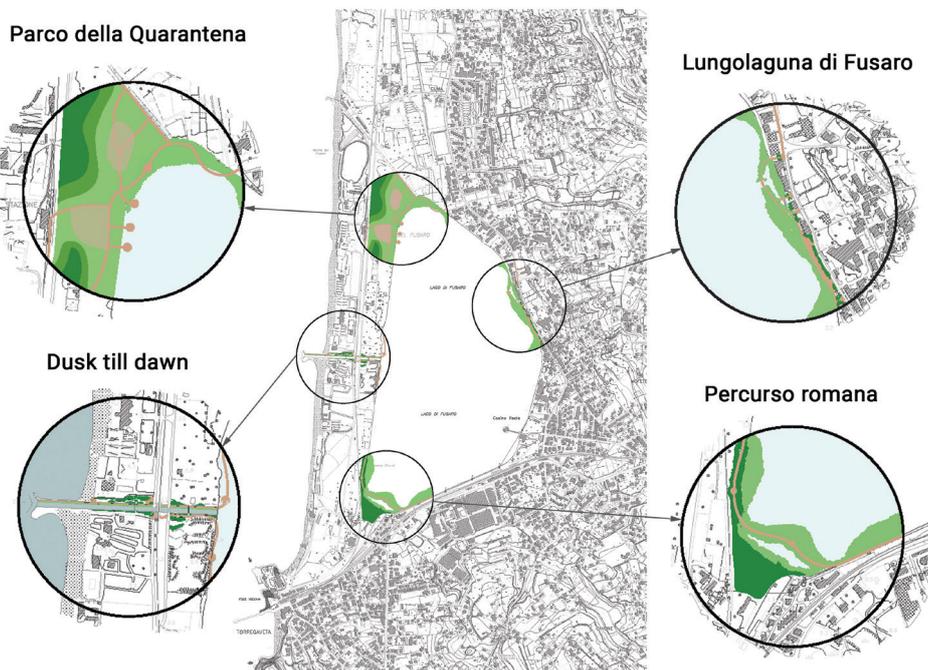
Partnership and governance model for the Laguna Project.

Process Reflection



GOAL	1. public awareness	2. biodiversity enhancement	3. place distribution
ISSUE	<ul style="list-style-type: none"> - visual access - physical access 	<ul style="list-style-type: none"> - water quality - habitat loss 	<ul style="list-style-type: none"> - conflict between nature and human activity
MEASURE	<ul style="list-style-type: none"> - opening views - platforms / paths - magnet places with wow-effect 	<ul style="list-style-type: none"> - Arundo Donax - mussel production 	<ul style="list-style-type: none"> - accessible / inaccessible places - buffer zones

Process reflection highlighting goals, issues and their relative measures to cope with them.



Spatial intervention that have been designed to make the local development possible.



Intervention for the Percorso romano



Intervention for the Lungolaguna di Fusaro



Dusk till dawn



SPIN-OFF PROJECT

Antonietta Miraldi
 Master thesis - Architecture, 2019-2020
 University of Naples 'Federico II'

Potential and criticalities in the Phlegraean Fields

The landscape of the Phlegraean Fields is strongly characterised by both natural vegetation and terraced agricultural areas that have a widespread effect on the whole territory.

The relevant geomorphological and natural features, the presence of numerous volcanic craters, the exceptional historical-cultural and archaeological heritage, the presence of areas with high biodiversity give the Phlegraean territory a strong identity and configure an extremely singular landscape.

Over the decades, the balance of the different territorial and landscape components have been compromised in part by widespread construction that has affected both coastal and inland areas.

These areas, mainly cultivated with orchards and vineyards, have consolidated over time a specific

agricultural landscape with highly balanced environmental conditions.

Over time, the terraces have performed a dual function making the hilly slopes cultivable in an extended way and, at the same time, creating a soil erosion containment system by reducing the gradient of the slopes and slowing down the speed of surface water flows.

In recent decades, widespread urbanisation and abandonment of agricultural areas have in part compromised the conditions of stability and the landscape features of the area.

Currently, the Phlegraean Fields represent one of the most densely populated territories in the province of Naples. However, within the urban fabric, fragmented and widespread intervals of natural and cultivated spaces with high biodiversity characterise the area. The settlements

are divided into numerous core centres that present fairly typical conditions of settlement realities that have consistently changed over the past three decades. These include contradictory morphologies, traffic congestion, reduction of green areas due to overbuilding, functional imbalances with unequal distribution of equipment and services, degradation and widespread settlements in the agricultural area.

The coastal area is highly articulated and diversified from the sandy and regular coastline beaches of Cuma and the Marina del Fusaro to the west, and to the low and mainly anthroposised coastline to the south. This coastal area contrasts a high and jagged coastline of steep walls with the interspersed large inlets of Monte di Procida, Bacoli, Baia and Posillipo.

Compared to the coast, the inland areas have equally complex characteristics of craters and lakes, which together create a unique ecosystem of significant landscape and environmental interest.

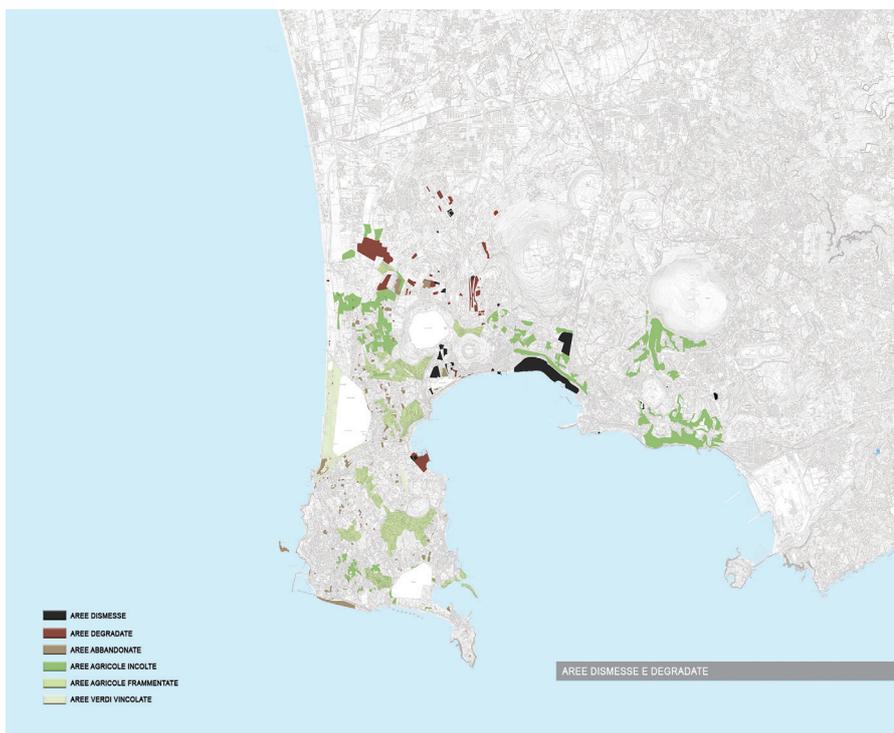
The historical and cultural heritage is of exceptional relevance. The area's territory is indeed rich in important archaeological and historical-architectural testimonies, present in the settlements and widespread in the extra-urban territory where they often establish close relationships with the landscape context (Cuma, Baia, Pozzuoli).

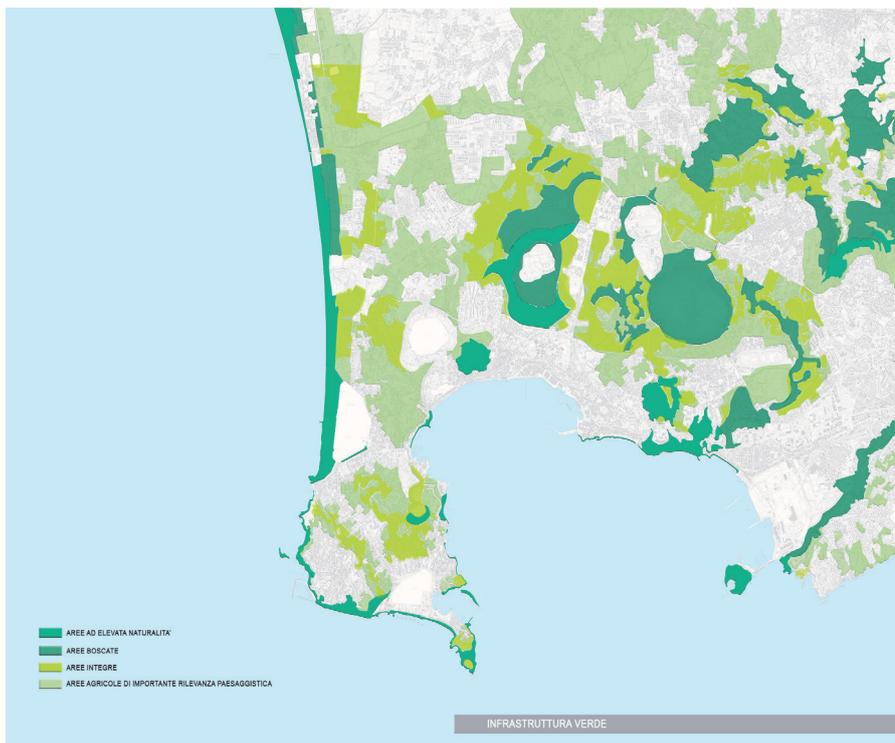
Of paramount importance are also the numerous protected parks where superordinate constraints are often placed to maintain their integrity. Special protection area designations such as SIC and ZPS are not rare.

Environmental and functional criticalities of the Phlegraean fields

The high consumption of land

Map of the abandoned and degraded areas in the Phlegraean Fields.





Phlegraean Fields' most relevant green areas, composing the local green infrastructure.



Interventions on the focus points of the Phlegraean Fields.

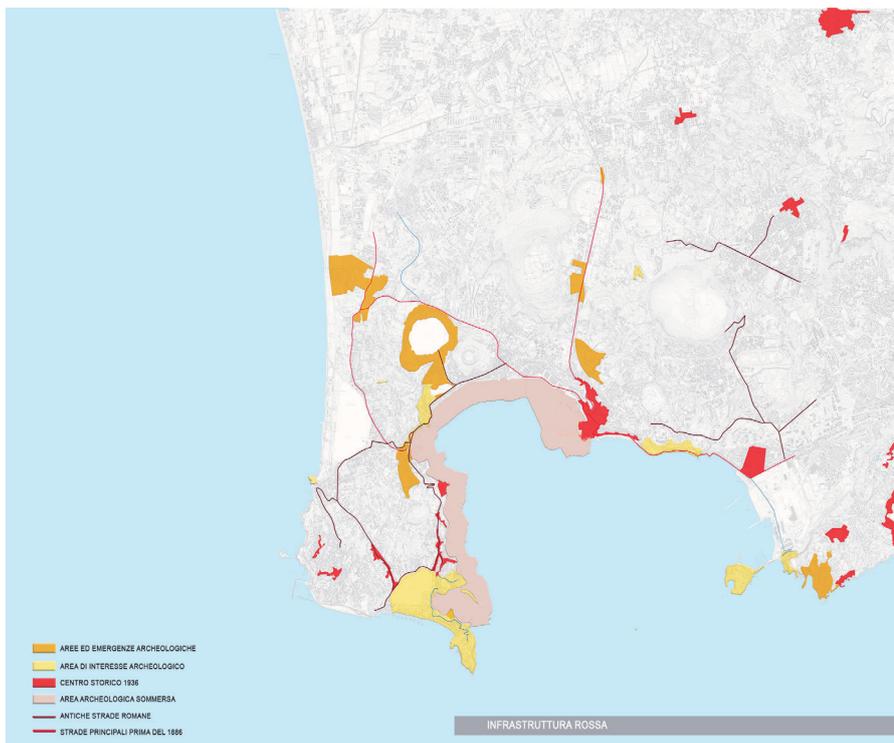
for settlements and infrastructure, and the consequent increases in ecological fragmentation are the primary connected critical elements that characterise the overall situation of the area. The poor quality of the urban environment, disorder, degradation, congestion traffic, noise pollution, the lack of public transport and insufficient network integration, the state of relative abandonment of historical centres and cultural heritage, poor integration between the different resources, the crisis and divestment of many industrial areas and the hydrogeological risk are all contributing factors. Specific problems in the agricultural sector are linked to the abandonment of the cultivated fields and terraces, deforestation, fires, hydrogeological instability and landslide risk. Within the coastal zone, it is possible to highlight risks related to coastal erosion and pollution.

This highly natural and dangerous area, due to seismic and volcanic risk, has numerous craters, mountains and lakes of volcanic origin, unique in their kind, natural structure, historical formation and agricultural use. These are the factors that have determined over time an ecosystem that is still evolving but whose fragility appears even more exposed today after constant changes over the years.

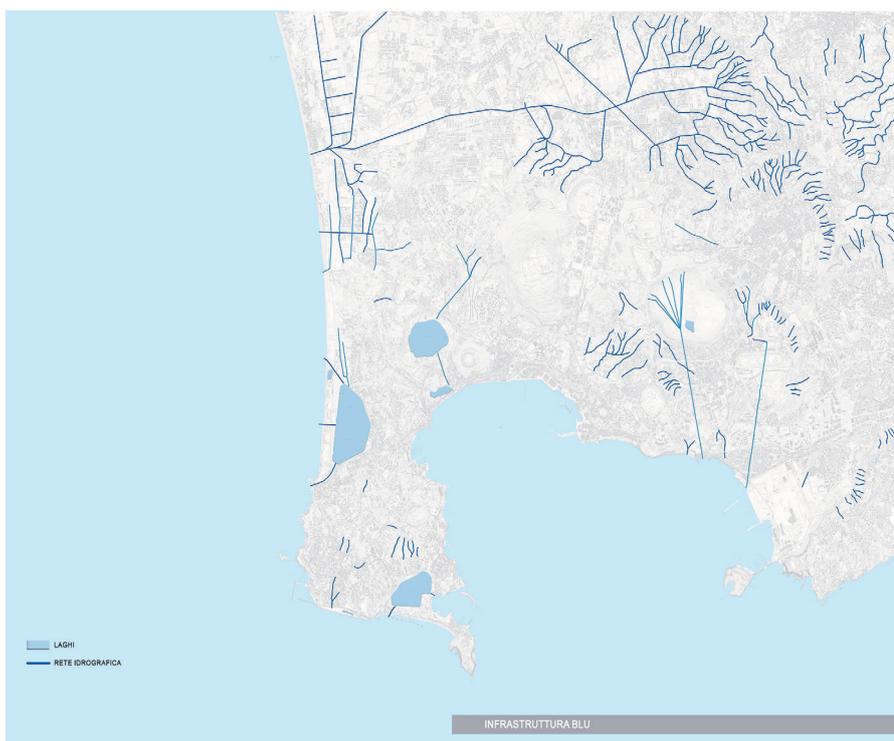
In between the values and vulnerabilities of the area, are highlighted the primary source of problems being: population growth, transport and agriculture, which is also the principal source of work in the area.

The main problems are:

- the limited enhancement of cultural and natural heritage;
- the lack of public infrastructure; and
- the inefficient use and enhancement of the developed soil.



Different kinds of elements composing the local red infrastructure.



The map shows the main elements of the Phlegraean Fields' blue infrastructure.

The main intervention strategies are:

- to create main bicycle and pedestrian network routes that extend to the entire municipal area; and
- to connect neuralgic points;
- to create secondary bicycle and pedestrian network paths that cross the study area; and
- to connect natural areas to settlement areas;
- to create bike-sharing facilities for storage and rental of bicycles;
- to create pedestrian network as a natural path that crosses the coastal area favouring its use;
- to create a new railway station that allows a better connection to urban and tourist settlements; and
- to create new standards that insert missing measures and allow future standards.

The principal objective is the creation of new urban relationships that intersect with existing relationships, improve them and generating new connection systems between parts now degraded.

The decisive urban planning tool is the creation of green infrastructure (GI), which acts as a binder and cradle for the pedestrian and bicycle connections crossing the territory. The GI crosses agricultural areas, sports equipment fields, archaeological and settlement areas as well as historical and natural sites of great value.

The GI results from the coexistence of four defined fundamental networks: the ecological network, the urban accessibility network, the network of historical assets and the network of agricultural fabric. Each of these networks has characteristics and



Project for the green and cultural infrastructure and mobility network for the Phlegraean Fields.

includes actions that the correctly designed GI must guarantee for the correct functioning of the urban fabric. Indeed, the ecological network presupposes the identification and safeguarding of nodal areas through the creation of green corridors, buffer zones or areas of ecological development. The accessibility network and public use raise the problem of guaranteeing the use of these spaces through the creation of attractive site creation and a network of soft roads. In addition, through the network of historical assets and the network of agricultural fabric, the aim is to safeguard and enhance characteristics of the territory such as specialised crops or archaeological areas.

In conclusion, sustainable urban planning, if it complies with the listed criteria, would favour urban rebalancing with significant social and economic benefits. This would make the territories energetically less dependent on non-renewable

and conventional resources, with lower social cost, economic cost and maintenance, and less rural abandonment with the consequent environmental degradation. Loss of soil, landslides, instability and failure to produce renewable energy would slow significantly and biodiversity would undergo a significant increase.

Red Infrastructure

The area identified as "Archaeological Restricted Area" has non-archaeological remains protected inside. The strategy is, therefore, to enhance this wealth by linking it to several archaeological sites in the Phlegraean territory using the main pedestrian and bicycle pathways.

Blue Infrastructure

The study area is located in the centre between marine-lake elements, the Tyrrhenian Sea, Lake Fusaro

and the Averno Lake. There is a close link between blue and green infrastructure. They strengthen and complement each other by creating an entirely new system that regenerates today's abandoned spaces. The goal we set ourselves, therefore, is the protection and enhancement of these areas.

The network of historic assets revolves around two buildings and a historic road. The historic road is used to create a historical-cultural route that connects attraction sites, including the viewpoint. The two buildings, respectively a church and a mausoleum, are along cycle paths inserted in the vineyards to establish particular attraction sites in the area.

In conclusion, this project aims, through the network of the agricultural fabric, to enhance the agricultural uses of the soil and the specialised crops of orchards and vineyards.



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CO-LAND: INCLUSIVE COASTAL LANDSCAPES

Phlegraean Fields Intensive Programme. 8 - 17 September 2019



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