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iDEAL - DEcision support for Adaptation pLan

Priority Axis:Safety and resilience
Specific objective:2.1 - Improve the climate change monitoring and planning of adaptation measures tackling specific effects, in the cooperation area

WP3 DEFINITION AND MONITORING OF CLIMATE ADAPTATION PLANS
Activity 3.2 CLIMATE ADAPTATION PLANS

Climate Adaptation Plans
Municipality of MISANO ADRIATICO

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1. INTRODUCTION

The most pressing crisis that the world is currently facing, the climate change, has affected the city of Misano Adriatico too. Since 1966, ten extreme storm events occurred along the Riccione – Misano Adriatico – Cattolica coast (Armaroli, et al., 2011) that have caused river flooding and significant beach erosion. Along with the coastal vulnerability, for the city of Misano is very important also the urban-drainage management and the energy transition process. The latter plays a significant role, particularly in the tourism sector.

In response to these issues, the Municipality of Misano has recently finalised the process of updating its planning tools, both through drafting the new urban plan and designing new rules for the construction, redevelopment, and regeneration of public and private buildings. In March 2016, the Municipality has approved the Sustainable Energy Action Plan (SEAP), and after two years (December 2018) the Sustainable Mobility Urban Plan (PUMS). Both plans are intended to have important effects on energy savings.

The local authority has joined the Italy-Croatia iDEAL project for a collaborative response to the impact that climate change is having, and will continue to have, on Misano and its citizens. The Climate Adaptation Action Plan is part of a series of strategies that the Municipality of Misano is developing to set out actions and policies in line with the targets set by the European Commission.

The document will primarily outline the challenges the city faces as a result of continuous climatic changes. Followed by an extensive process of research, trainings, meetings, workshops and policy analysis with officials, project partners (PP), and working groups, the plan has attained to define a set of integrated actions, which are grounded to the city context and aim to manage the risks as well as the opportunities climate change may also present to the city. Inherent in this goal, most importantly is the drive to help the city makers create a framework that will facilitate them on long-term decisions, strategies and plans on adaptation to climate change.

2. ANALYSIS

2.1. The historical development

Misano's population has grown every year since the post-war period which ranks it among the regional leaders for its growth rate in the Province of Rimini and it is likely to continue to grow. Today, Misano is home to 13.300 residents (596.7 inhabitants/km²), distributed into inhomogeneous densities dispersed in scattered settlements. This spatial configuration has been developed similarly over the decades as it is demonstrated in the historical urban development. The construction periods of urban tissue maps indicate various planning tools that have followed over the years in the Municipality of Misano Adriatico. The mapping of historical urban development shows that Misano has had the largest construction boom in the last two decades.

Table 1. The historical urban development: built-up area over the years (Municipality of Misano Adriatico, 2016)

Year	Built-up area [sq.]	Time interval	The built-up area constructed in the respective year [sq.]
1948	162,238	until 1948	162,238
1985	548,012	1948-1985	337,774
1998	579,839	1985-1998	39,827
2013	834,671	1998-2013	254,852

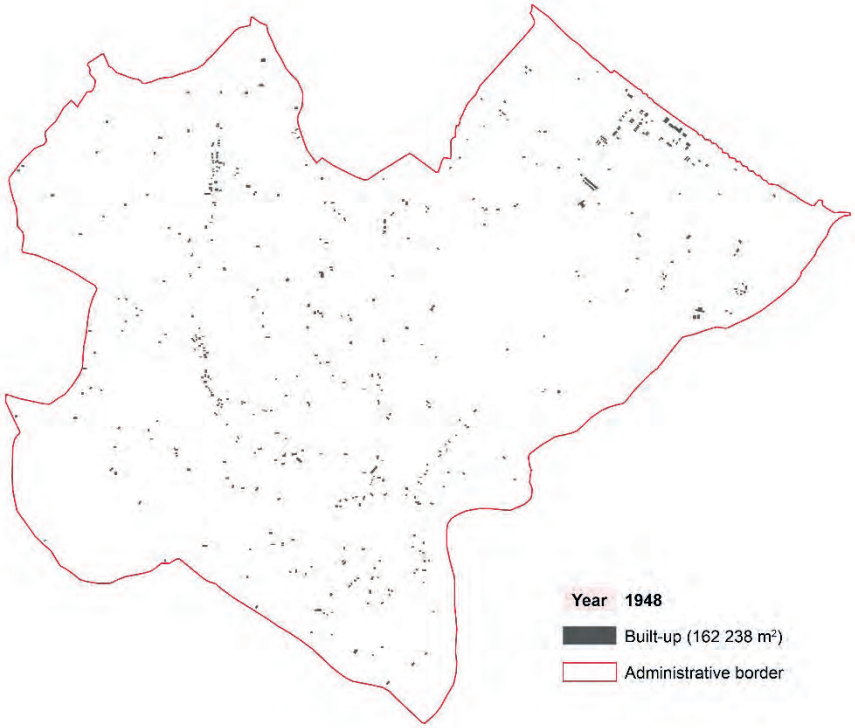


Figure 1. Built-up area until 1948. Re-adapted from Municipality of Misano Adriatico (2016)

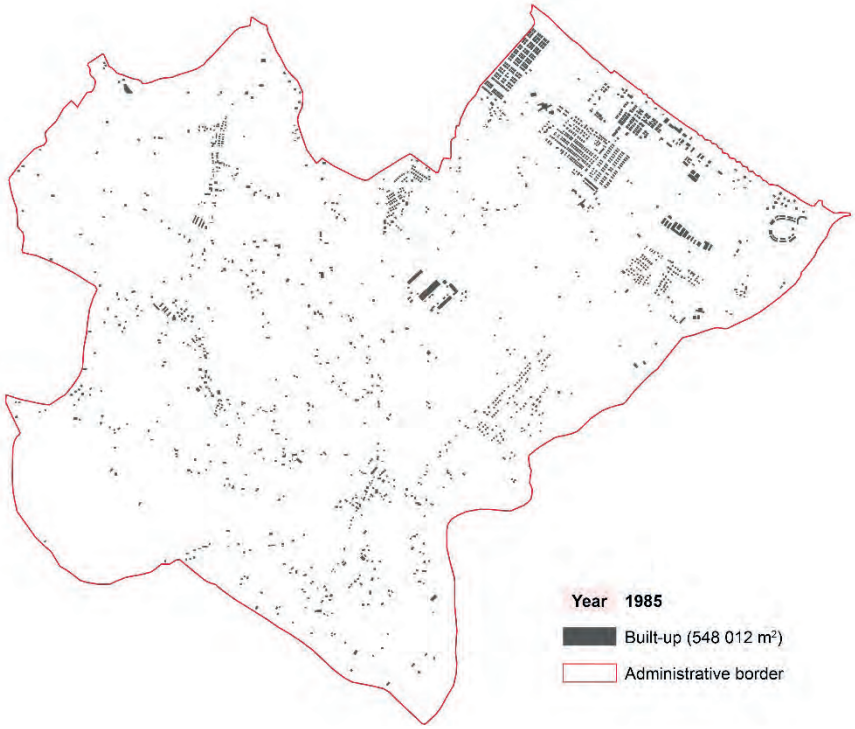


Figure 2. Built-up area until 1985, including the area built until 1948. Re-adapted from Municipality of Misano Adriatico (2016)

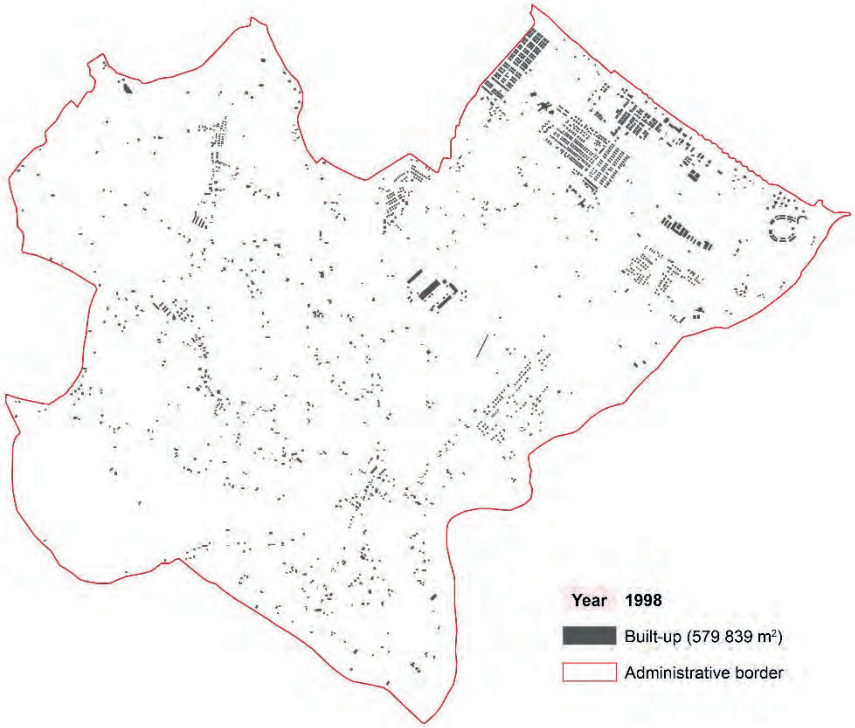


Figure 3. Built-up area until 1998. Re-adapted from Municipality of Misano Adriatico (2016)

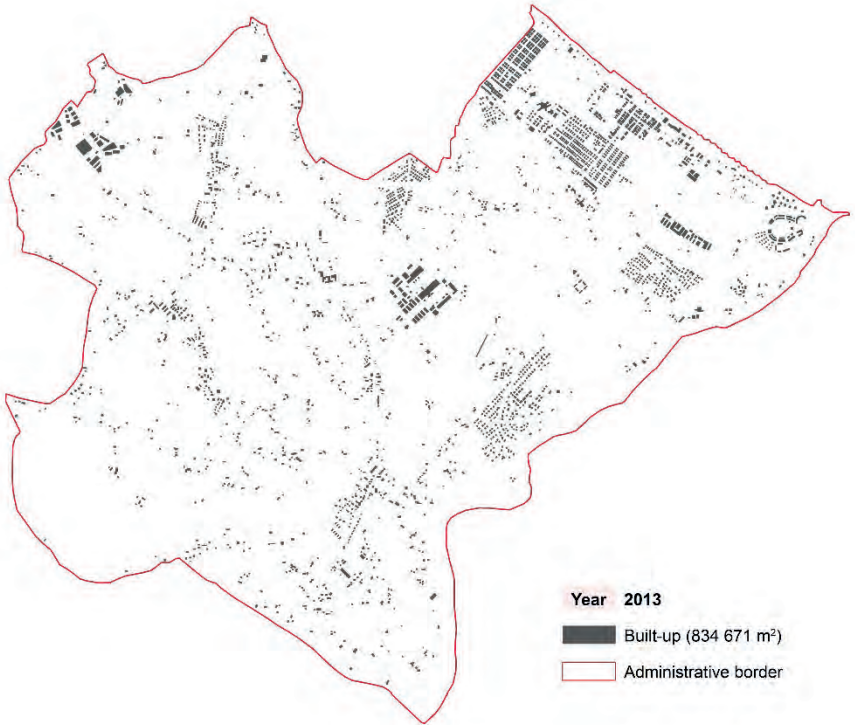


Figure 4. Built-up area until 2013. Re-adapted from Municipality of Misano Adriatico (2016)

2.2. Urban morphology: The recurrent landscapes of Misano Adriatico

The analysis of the built-up area and the natural patterns of Misano Adriatico and its surroundings allows us to put into perspective the livability of the area through both residential, commercial needs and environmental characteristics. The patterns of spread that have been formed allow to analyze the functionality of the interconnecting elements of livable settlements.

The urban fabric of Misano Adriatico comprises quite diffused settlements. They encompass sections of diffused urban patterns along the coastline, where the most tertiary activities are concentrated, 'citadels' or the complex settlement of Misano World Circuit (Autdromo), the planned area or low density 'village' type, some sprawled settlements and mono-residential buildings scattered throughout the municipality.

Figure 6. Planned area

Areas with clear features of being planned, both in geometrical and organic ways. Characterized by low-medium density.

Figure 5. Diffused area along the coastline

In some parts, buildings are agglomerated into compact blocks and in other parts are spread out with no clear orientation usually of relatively higher density that scatter.

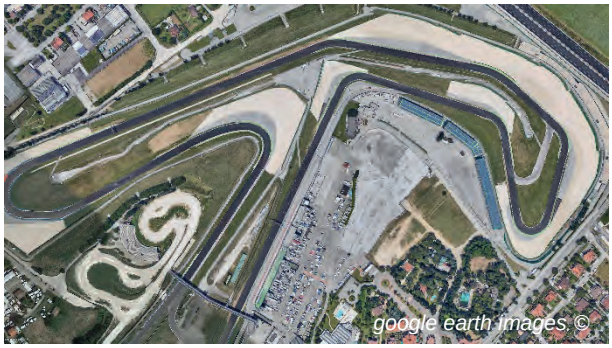
Figure 8. Scatter

Single-family housing dispersed in very low density.

Figure 7. Sprawled settlements

The landscape sprawl is located outside the urban area of Misano, characterized with rigidly separated homes and poor access.

Figure 9. 'Citadels' .



A complex settlement devoted to a specialized function.

The main building typology is the "palazzina", a multi-family building typically 3 to 4 storeys high. Along the coastline, the palazzina is replaced by high-rise hotels of 7 to 8 storeys high.

In the coastal conurbation which consists of a system of discontinued urban settlements from Bellaria to Cattolica, the territory of Misano is the most important in this discontinuity with a peculiar relation between open spaces and built areas. This relation is the most relevant feature that distinguishes Misano and it is the most important territorial resource to be utilized to improve it as a center for urban quality and territory.

Land consumption in Misano Adriatico is constantly growing: it has expanded from 3,686,215 sqm of built-up area in 1976 to 6,646,324 sqm in 2008, increasing by 80%. While, the land used for agricultural purposes, has undergone a decline, from 80% of the total in 1976 to 67% in 2008. Between 2012 and 2017, land consumption has occurred for more than 90% in non-built-up areas or low-density developments. Landslide risk areas are very limited. Only 1.8% of the territory, 0.3% of the population is affected by areas subject to landslides with high and very high danger.

At the level of the urban canopy layer, the physical morphology of Misano Adriatico, which in direct connection with the coastline is not totally built-up but and comprises large open spaces, provides better natural ventilation for summer thermal comfort. Yet, in terms of microclimate, areas, especially those with high ratios of impermeable surfaces (e.g. the area of Autodromo), require thorough considerations in the mitigation of urban heat island effect.

2.3. Economy

The economic structure for a long period of time has seen a continuous development of the tertiary sector (73%). Particularly the tourism sector has become the driving force of the entire economy with very high competitiveness characteristics. 51% of the population are employed in tourism related jobs (the national average is 24%), which is one of the main economic sources that contributes to the destination's economy with 30% of the Gross Domestic Product. Hotels are very numerous (3,915), compared to only 27 apartments, 1 hostel, and 2 campsites. There are mostly 3 star hotels, sized just below the provincial average. During recent years the number of tourists has shown an increasing trend. In absolute values the number of arrivals in 2006

(90,391) has substantially increased in the last ten years, reaching 121,292 arrivals in 2016 (+34%). About 2/3 of tourists visit the area as a family and the main motivation for the holiday are relax and wellness. Despite being the main economic resource, tourism show a Tourist Pressure Index which is among the lowest on the coast.

The craft sector has benefited from the effect of a strong internal dynamic supported by the construction sector, which was powered by the expansion of urbanized areas and the increase in property values. Agriculture has slowly lost its impact in terms of production and employment but has become a protection of the territory that can make a significant contribution to tourism innovation.

2.4. Mobility, Green and Blue infrastructure

The infrastructure of the mobility system represents one of the most critical elements of the territory. Regarding the transport system, Misano Adriatico shows a vast use of the car: 72% of inhabitants use car to move within the city, 12% use bicycle, 10% move by feet, 2% by train and only 4% move by public transport. There are numerous parking lots (2,120), but no Park&Ride areas (Adriatico, 2016b). As far as soft mobility, Misano Adriatico has implemented a public bike sharing system and a network of 22.8 km of cycling lanes, 3 pedestrian areas and 2 Limited Traffic Zones.

The territory of Misano Adriatico preserves important environmental values along the conurbation of the Adriatic Coast, which are part of the green infrastructures network. Some urban parks lack cycling and/or pedestrian infrastructure that allow wider usability. The presence of narrow green lanes along the terminal stretch of the Agina stream may suggest the landscape and ecological improvement of this waterway whose riverbed is currently sealed.

Climate and weather are those typical of the Mediterranean coasts. The warmest month is July (28.6 °C average day temperature) and the coolest one is January (4 °C average day temperature). This month is also the driest in the year, whereas October is the wettest one. As far as biodiversity is concerned, monitoring at the Conca torrent shows a good chemical state and an ecological status from high to good. The ecological conditions of the remaining waterways, Agina and Alberello are not known. From a landscape and ecological point of view, the dam on the Conca stream, the burial of several sections of the Alberello stream and the terminal stretch of the Agina stream represent critical elements for the territory.

Regarding the hydraulic safety, the scarce permeability of soils can determine problems related to the outflow of rainwater onto the final receptors (waterways), especially in case of culverts whose sizing no longer seems to be adequate to the current situation. The territorial surface affected by frequent floods, return time between 20 and 50 years (high probability), is around 10% and characterizes 5% of the population and families and 7% of buildings. 249 buildings are located in areas at risk of marine floods: 73 at frequent risk (no accommodation), 168 infrequent (7 accommodation establishments) and 8 rare. On the sewage system critical conditions are revealed in the summer period during the tourist peaks.

2.5. Energy and water consumption

Regarding energy consumption, the residential sector is prevalent, followed by transport consumption. In the three-year period 2014-16, consumption in the residential sector represented 46%, transport 38% and the industrial sector 16%. The general trend on a provincial scale shows a decline in consumption in the commerce and catering and housing sectors, sectors in which in recent years there has been an increase in the number of companies. The prevailing thermal consumption for the energy of the residential sector is covered for about 80% by natural gas, for about 17% by wood or similar (pellets).

The per capita consumption of drinking water regarding the residents and "equivalent tourists" calculated in Misano Adriatico for the years 2011-13 shows a minimum consumption in the winter season with values <200 l / day / inhab. and maximum values in the summer season equal to or greater than l / day / inhab. The values are higher than those provided for in the regional water territorial plan which envisaged a target of 150 l / day / inhab. Groundwater withdrawals using wells require protection and enhancement because they are mostly located in urban areas, with infrastructures also on a supra-municipal scale (A14 motorway, Santamonica circuit).

2.6. Synthetic profile

In nutshell, it could be said that Misano has the following features and issues:

- a residential centre with low density, safe and welcoming, suitable for families but certainly not very attracted for youth. Ideal for tourism of the third age and for all those who want to live a quiet holiday in contact with an area rich in opportunities;
- it has a competitive touristic-hospitality in relation to the quality-price ratio;
- an economy made up of numerous small tourism, craft and commercial businesses that represent also a heritage to be relaunched after years of crisis;
- a structured urban fabric with efficient services, good infrastructure and parking lots availability;
- it provides a large number of sports, entertainment and leisure facilities;
- green spaces close to the beach and integrated to the urban area;
- open spaces along the seafront, especially the Portoverde area;
- the national and international relevance of Santamonica circuit;
- a waterfront with large opportunities to become a tourist excellence on the Romagna coast;
- a hinterland rich in environmental, historical and archaeological resources, with the ecological corridors of the Conca and the Rio Agina with a high landscape value.

According to the assets and driving forces which have been identified, it may be argued that the implementation of climate change adaptation measures should consider, whenever possible, the opportunity of integration with the existing policies and measures enhancing the sustainability of the following areas: Energy, Mobility and Tourism.

3. PLANNING RECOGNITION

3.1. Legal framework

	Decisionmaker (municipality, regional, state, UE, etc.)	**DD/Month/YYYY** of implementation	**Name**	**Relation with CC**	**Typology** (plan, policy, strategy, action, tool, project, initiative)	**Condition** (compulsory or voluntary)
1	Italy	16/05/2015	CC Adaptation Strategy	National CC adaptation strategy	Strategy (*Directorial Decree*)	Voluntary
2	Italy	07/2017	CC Adaptation Plan	National CC adaptation plan	Plan	Not yet approved
3	Emilia Romagna Region	20/12/2018	CC Adaptation and Mitigation Strategy	Regional adaptation and mitigation strategy	Strategy	Voluntary
4	Emilia Romagna Region	24/05/2019	Forum CC	Operative tools for sharing and communicating the regional adaptation and mitigation strategy	Initiative	Voluntary
5	Emilia Romagna Region	01/03/2017	Regional Energy Plan (PER)	CC mitigation regional plan, set a target scenario 2030 to be followed by all other planning tools at regional and sub-regional level	Plan	Compulsory
6	Emilia Romagna Region	21/12/2017	Urban planning regional law	CC included in the urban quality strategy	Law	Compulsory
7	Emilia Romagna Region	11/04/2017	Integrated Air Quality Plan (PAIR)	2020 targets referred to energy saving and, in general to urban sustainability	Plan	Compulsory
8	Emilia Romagna Region	2015	REnovation of public buildings and urban spaces (REBUS)	Training project which considers CC as one of the main drivers to urban regeneration	Project/Tools	Voluntary

9	Emilia Romagna Region	10/2015	PRIMES- more resilience less risks	Engagement and proactive participation in flood risk prevention	Project/Tools	Voluntary
10	Municipality of Misano Adriatico	28/03/2019	General urban plan (PUG)	CC included in the Urban quality strategy	Plan	Compulsory
11	Municipality of Misano Adriatico	2018-2019	Evaluation of Environmental and Territorial Sustainability (VALSAT)	CC adaptation and mitigation considered as assessment criteria	Tool	Compulsory
12	Municipality of Misano Adriatico	20/12/2018	Sustainable Mobility Urban Plan (PUMS)	CC mitigation actions included	Plan	Voluntary
13	Municipality of Misano Adriatico	16/03/2016	Sustainable Energy action plan (SEAP)	CC mitigation plan establishing specific actions	Plan	Voluntary
14	Municipality of Misano Adriatico	15/11/2018	"Misano insieme rigeneriamo il lungomare"	Greening opportunities for CC adaptation	Initiative. Urban regeneration participatory project	Voluntary

3.2. Planning tools goals

Drawing upon the analysis, the Urban Plan of Misano is called to rethink its city, as a tourist city and its territory, with actions aimed at increasing the quality of the tourist offer:

- urban quality of the tourist city: the urban park;
- renovate the existing hotel fabric;
- promote the diversification of the tourist offer;
- protect the coast line;
- environmental protection and landscape enhancement;
- agriculture as a guard of the quality of the territory;
- enforce the centralities and develop productive activities and services;
- promote the planning a more compact city;
- provide better accessibility within its territory and sustainable mobility.

4. SELECTION OF THE IMPACTS

4.1. Summary of the process that led the selection of the most relevant CC impacts

In order to develop an appropriate analysis for each different location, it was decided, in agreement with all partners to focus on four main climate change impacts (and related hazards) identified as the most relevant for the pilot areas. The detection of the hazards and the potential impacts are based on two phases: a) identification of a broader group of hazards and climate change impacts; b) the selection of a narrower set of hazards and impacts that are considered to be more relevant for the pilot areas based on local expert's knowledge.

Hazards that contribute to climate change impacts that have been considered in this project are: increasing temperature; decreasing temperature; increasing extreme atmospheric events; increasing windstorms; increasing precipitations; decreasing precipitations; and sea level rise. Each of these hazards, individually or considering their mutual role, impact in different ways and with different intensity on certain macro-areas/ sectors. Macro-areas that can be affected by climate change, considered in this project are: agriculture; ecosystem & environment; energy; coastal areas; hydrology & water resources; and socio-economic aspects. For each sector, a set of impacts considered more relevant for the Adriatic Region have been identified (Table 2). The larger list of sectors and impacts listed in the table below was mainly drawn from the United States Environment Protection Agency guidelines (EPA, 2018).

Sector	Impacts
Agriculture	Variation in crop yield
	Variation in livestock production
	Increased irrigation demand
Hydrology and water resources	Increase of drought
	Increase of flooding
	Increased competition for water
	Increase of urban flooding
Coasts	Increased erosion
	Coastal flooding
	Damage to costal human infrastructures
	Damage to costal natural environments
Energy	Impacts on energy infrastructures (energy plants, etc)
	Increased energy demand for cooling
Socio-economic	Increased Urban Heat Island effect
	Impacts on weakest group of people
	Impacts on commercial activities
	Impacts on public services
	Impacts on industrial activities

	Impacts on transportation network
	Impacts on tourism sector
Ecosystems and environment	Loss of species
	Loss of habitat
	Increased forest fires
	Increase of invasive species and parasites
Other	Other

Table 2 First list of climate change impacts from which the PPs are asked to choose (EPA, 2018)

The ultimate impacts selected for each pilot area are summarized in table. For more details, see W4 (4.1.2).

Table 3. Ultimate list of impacts for each pilot area

Pilot area	Impacts
Misano Adriatico	**Increased coastal erosion**
	Increased energy demand for cooling
	Impacts on transportation network
	Impacts on tourism sector
Pesaro	Increased competition for water
	Increased coastal erosion in natural areas
	Increased energy demand for cooling
	Impacts on tourism sector
Parco delle Dune Costiere	Variation in crop yield
	Increase of drought
	Increased coastal erosion
	Loss of habitat
Dubrovnik	Urban heat Island
	Urban flooding
	Sea level rise
Rovinj, Vrsar, Poreč	Urban heat Island
	Urban flooding
	Sea level rise

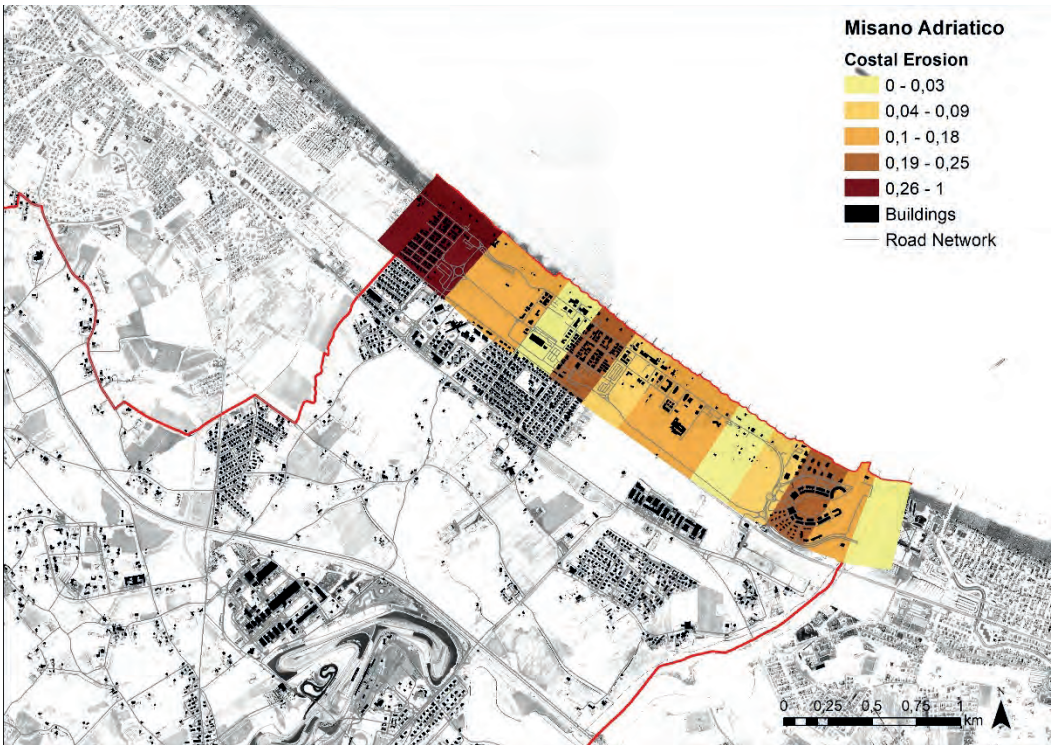


Figure 10. Increased Coastal Erosion (IUAV, 2018)

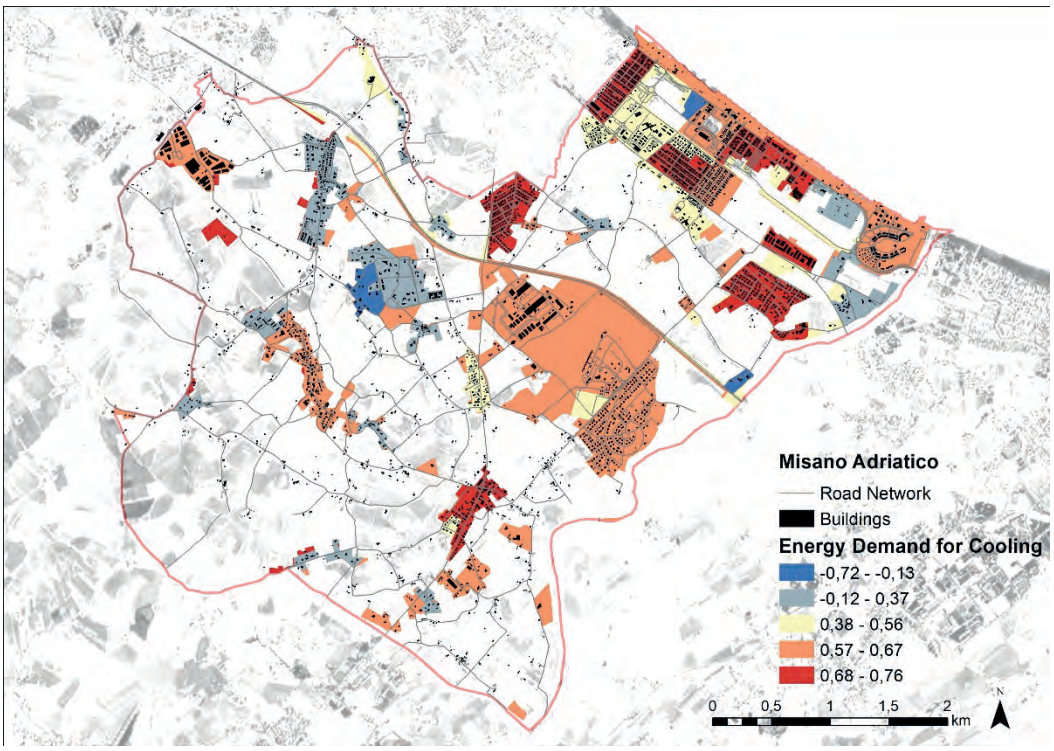


Figure 11. Increased energy demand for cooling (IUAV, 2018)

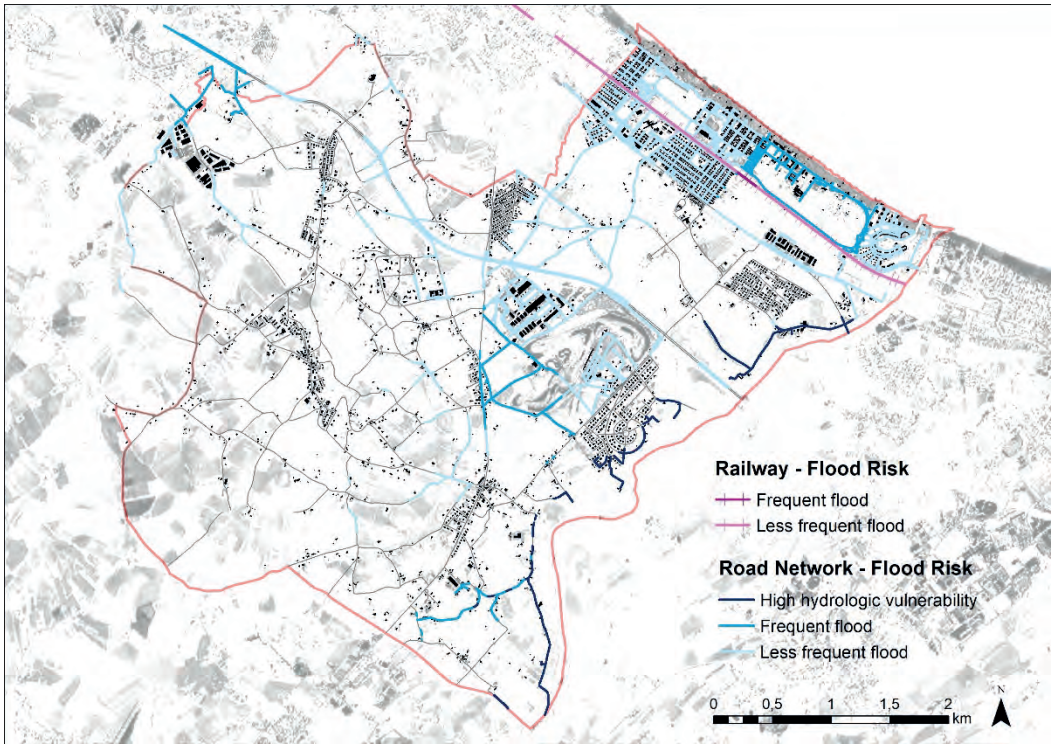


Figure 12. Impacts on transportation network 1 (IUAV, 2018)

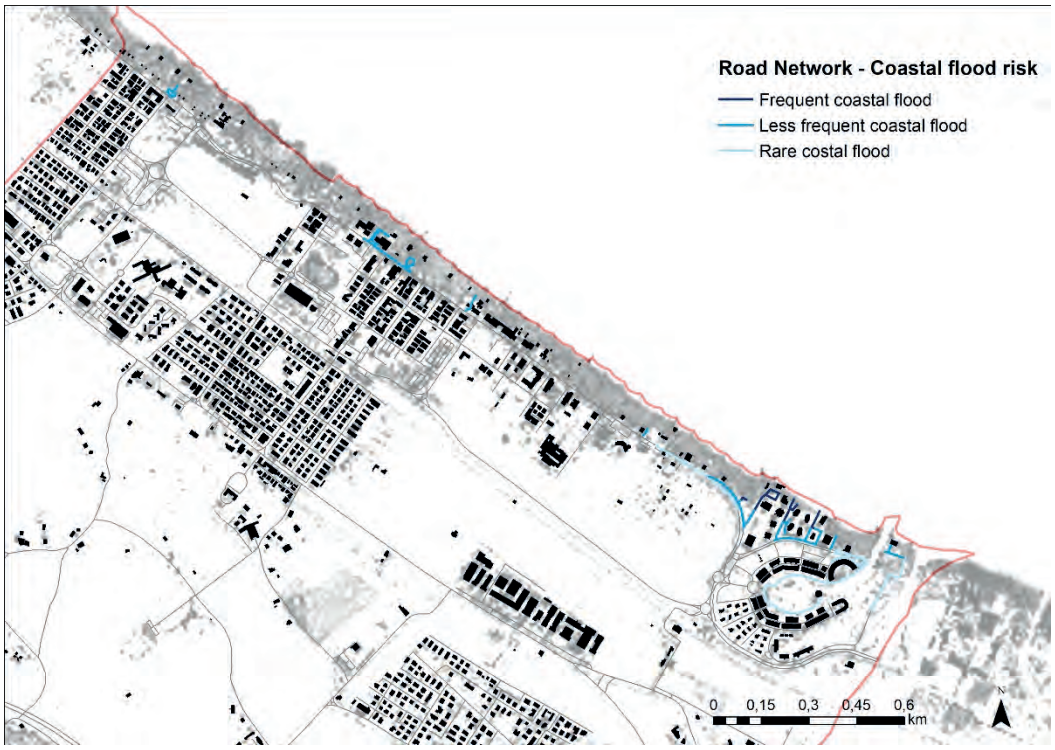


Figure 13. Impacts on transportation network 2 (IUAV, 2018)

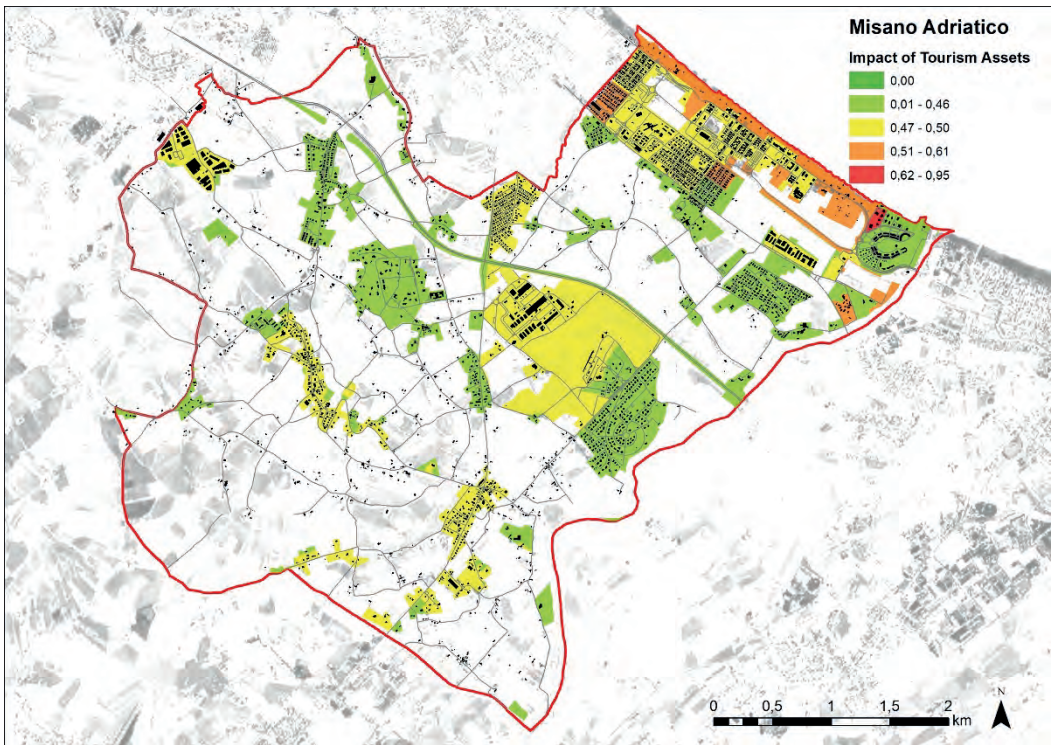


Figure 14. Impacts on tourism sector (IUAV, 2018)

4.2. Summary and description of the decision-makers and stakeholders identified

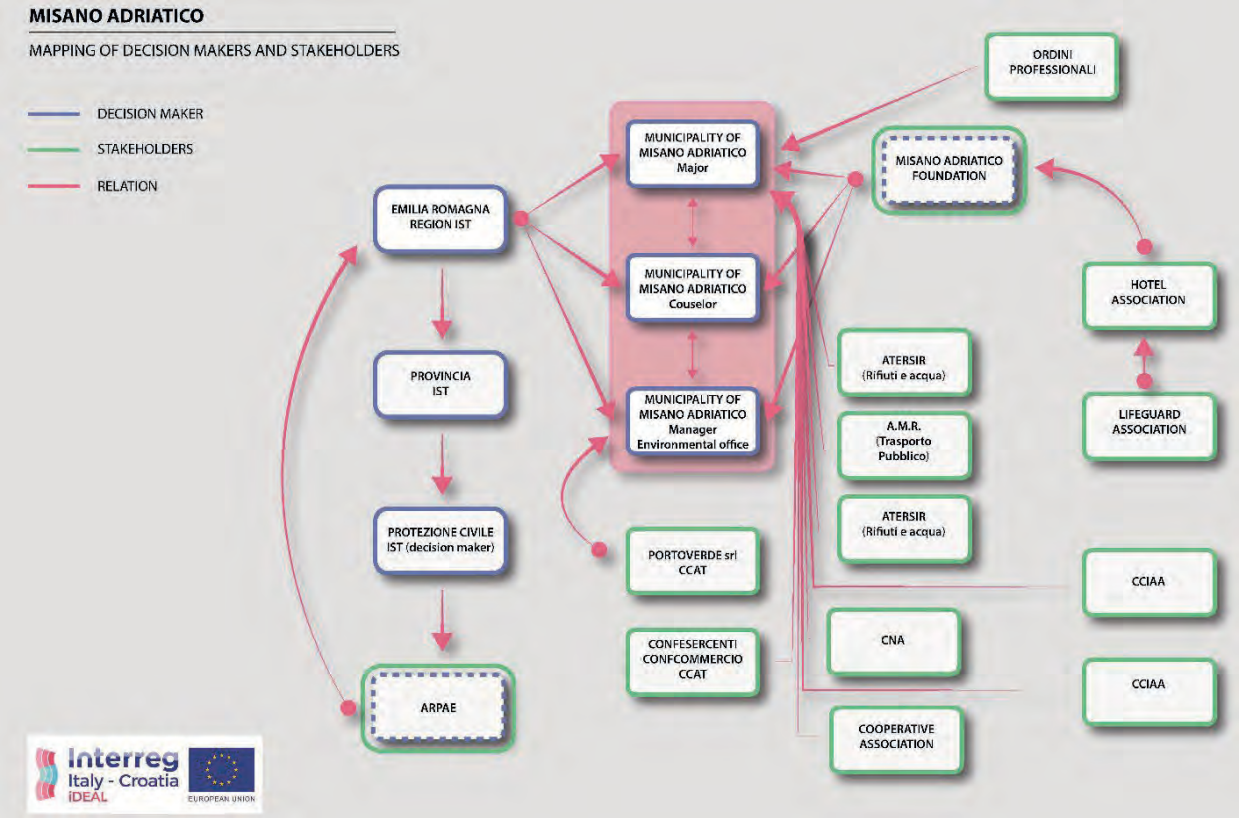


Figure 15. Governance map (iDEAL, 2018)

Table 4. Stakeholders involved on the decision-making process (Municipality di Misano, 2019)

Target group	Nr. reached	List of target groups reached
General public	5000	trade associations architects surveyors engineers environmental associations Citizien
Local, regional and national public authorities and related entities	50	technicians of other Municipalities municipal councilors councilors regional officials officials from environmental organizations
Regional and local development agencies, environmental agencies, regional associations	10	technicians
NGOs	0	//
Universities and research institutes	1	university professors

4.3. Results of the interviews

In order to have a clear vision of what is the governance system for each project area, it has been proposed an interview module that each PP spread through its network.

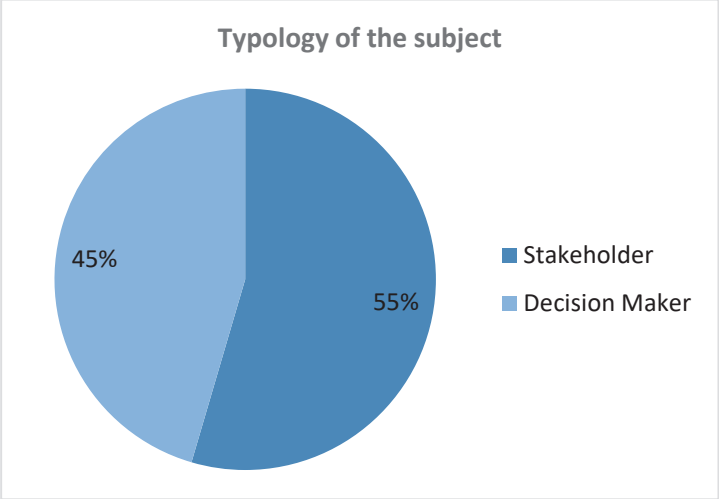
Hazards, macro-areas and specific impacts have been organized in the format of a questionnaire. The questionnaire has been than submitted to local experts for each pilot areas. The local experts have been asked to complete the questionnaire indicating which hazard and (no more than 4) impacts are more relevant for their territories, also linking each selected impact to the most relevant hazards.

In the Fac-Simile reported below there are the main questions posed to the interview. The document has been divided into two parts, the one dedicated to the stakeholders and the other to the decision makers. The differences between the questions posed to the one category and the other are related to the need of identifying the field of interest of each subject and in which way it is linked to the others.

Moreover, the interviewees were asked to describe also their inner resources and the main hazard/impact that they consider to be related to their activity.

The output of the process is the maps reported below, where are proposed the different hierarchy of governance. The governance map is used to describe the hierarchy of the governance system of each territory, and it is used inside this assessment to identify the decisionmakers and the stakeholders who have been asked to answer the questionnaires.

STAKEHOLDERS	
Now considering the hazard and the impact selected before who are the possible *stakeholders*?	
Name/Organization	
Interests	
Relations with others	
Resource description	_
Hazard/impact	
DECISION-MAKERS	
Now considering the hazard and the impact selected before who are the possible decision-makers?	
First Name	
Last Name	
Office/Authority	
Position/role	
Power description	
Resource description	_
Hazard/impact	

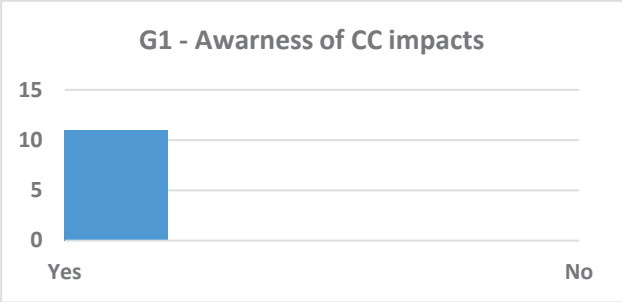


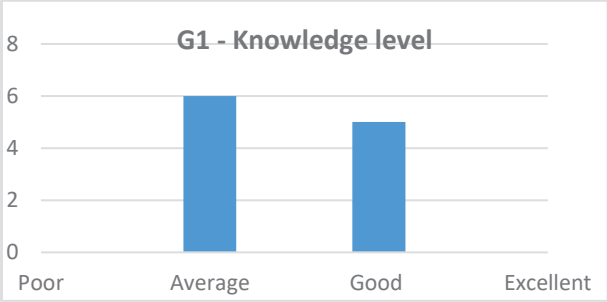
Misano Adriatico's answers come from Stakeholders for the 55% (6 answers) and from Decisionmakers for the 45% (5 answers), showing an equal distribution between decisionmakers and stakeholders.

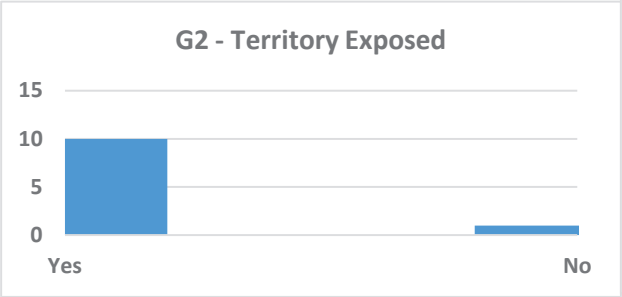
Decisionmakers and stakeholders answered, with minimal differences of percentage and quantity, mostly in the same way, except for the knowledge level (Decisionmakers have more good knowledge than average knowledge while Stakeholders have more average than good one), "Inner resources" and "Collaboration with others" (where we see predominance of "yes" for Stakeholders and a predominance of "no" for Decisionmakers).

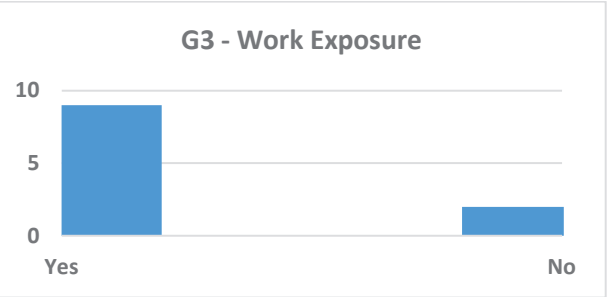
Both Stakeholders and Decisionmakers declare to be aware of climate change impacts and of the exposition of their territory and of their work. At the same time, they believe that their respective works can somehow mitigate/adapt to climate change and express a willingness to cooperate.

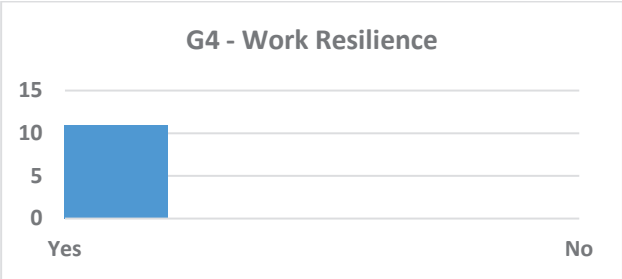
4.3.1. Decisionmakers + Stakeholders

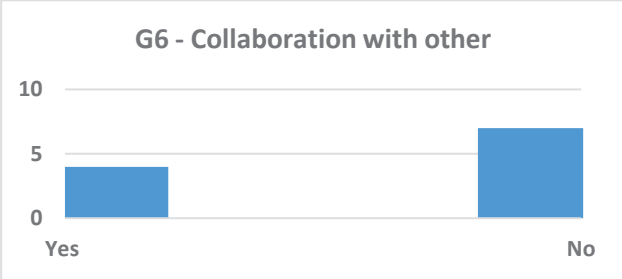


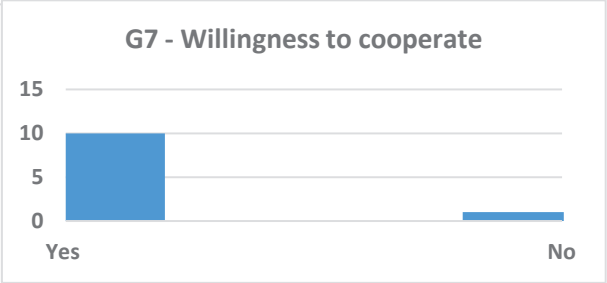




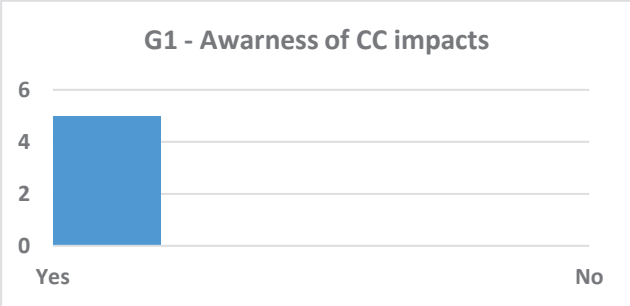


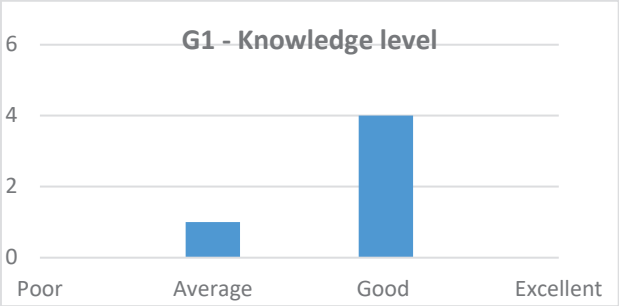


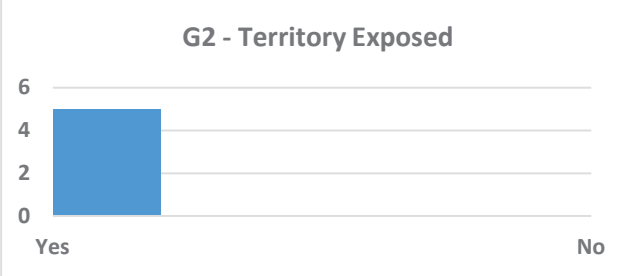


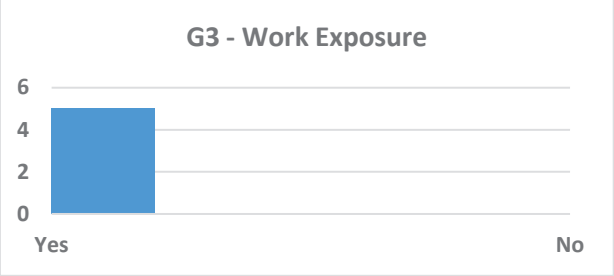


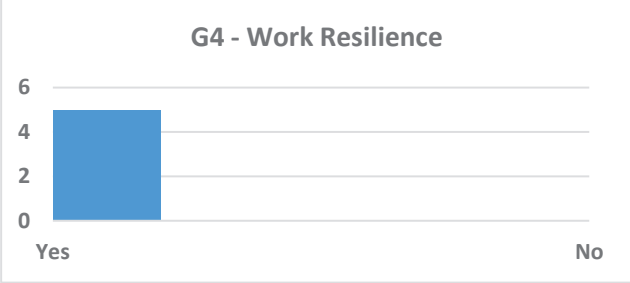
4.3.2. Decisionmakers

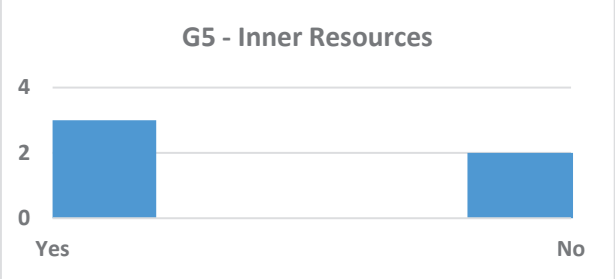


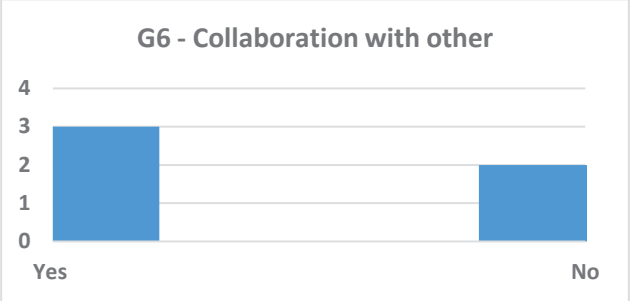




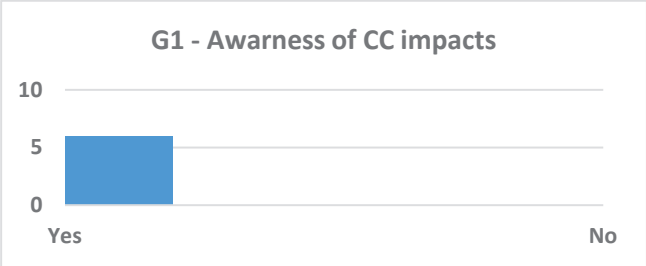


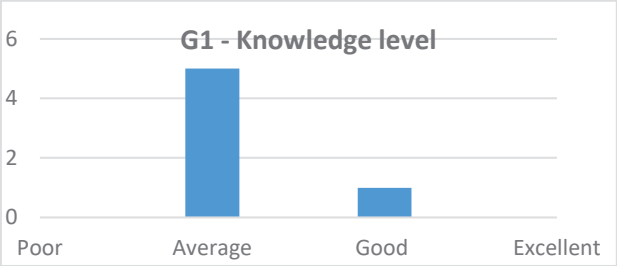


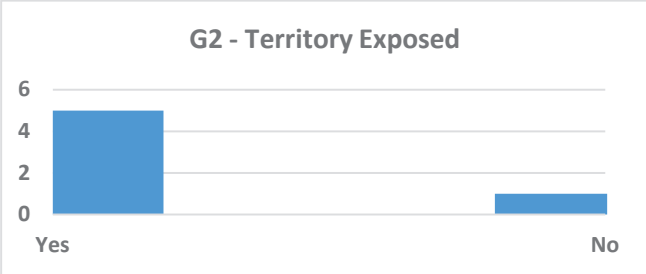


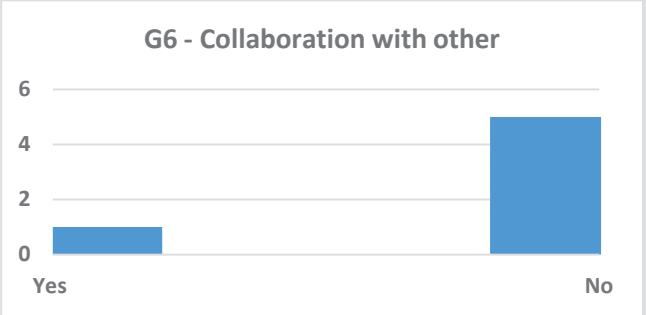


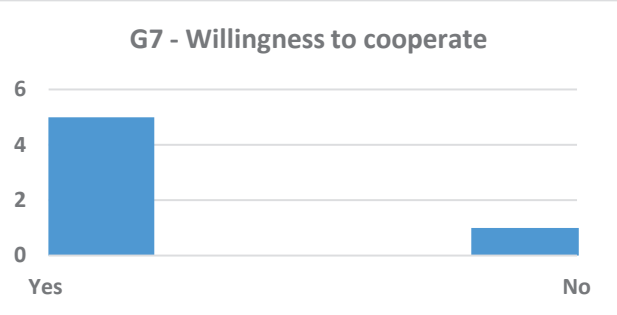
4.3.3. Stakeholders











5. METHODOLOGY

5.1. Methodology and data sheets

Based on the results from the first round of climate change impacts identification, the methodology of data selection and collection activities were initiated. All Project Partners (PPs) were asked to provide data and information that were considered necessary in order to proceed with the development of the risk and vulnerability assessment.

Data and information requested were specific for each area and they were a consequence of the impacts identified. Data requested to each partner, which can be found in ANNEX III, vary from climate data (e.g. historical series of precipitation and temperature), to cartographic data to be used in GIS environment (e.g. shape files of buildings, transport networks, land use, hydrology, etc…). The vulnerability and risk assessment are meant to be based on a GIS environment in which vulnerability and risk are geographically spatialised and visible in a set of maps. However, this is not possible for those impacts that are not possible to link to specific geographic areas.

The bulk of data and information that were initially considered useful for the analysis and that were therefore requested to the PPs were:

- DSM (Digital Surface Model) and/or
- DTM (Digital Terrain Model) (raster)
- Land Cover (.SHP)
- Land Use (.SHP)
- Protected Areas, ZPS, SIC (.SHP)
- Soil Type and geological map (.SHP)
- Administrative unit boundaries (.SHP)
- Population census data (.SHP, DATA)
- Buildings and infrastructures (street and railway, etc.) (.SHP)
- Slow mobility network
- Hydrology map (.SHP)

- Beach Nourishment Plan (.SHP, DATA)
- Cadastral data (commercial tourism activities, residential etc.) (.SHP)
- Cultural and Natural Heritage
- Tourist numbers data
- Tourist infrastructures and buildings (.SHP)
- Water consumption by sector (as detailed as possible)
- Energy Performance Certificate for Building
- Agriculture typology map
- Daily Precipitation and temperature data 1990 – 2017

Slight differences about the data requested can be found between partners, see ANNEX III for more details.

After this phase of data selection and collection, in some cases data required were not available in GIS file format or they were not available at all. The impacts that would be possible to analyse were then reconsidered and discussed with PPs.

5.2. Indicators for action evaluation (DSS)

From the indicators presented in the project TERRE, 25 of them were selected to describe the territories and the necessities of each Project Partner. Maintaining the same "aspects" described in the previous deliverable, here are reported the unit of measurement and the indicators chosen after the meeting that took place in Ostuni /Pesaro). The evaluation of each indicator was made in relationship with the four tailored impacts selected by each PP.

Aspect	Indicator	Unit of measurement
A. Environmental	Soil coastal erosion	m2
	Soil drought	m2
	Impermeability ratio	m2
	Flooding area	m2
	Collected rain water	m3/year
	Reused water	m3/year
	Water consumption	m3/year
	Habitat maintenance	m2
	Uhi reduction	c°
	Energy use reduction	%
B. Social	People who will benefit from the actions n. Of people)	n. Of people
	Most vulnerable people who will benefit from the actions	n. Of people
	New job created by the actions	n. Of job
	Km - upgraded infrastructure	km
	New infrastructure	km
C. Economic	Implementation cost	€
	Management cost	€
	Revenues	€
	Revenues distribution	n. Of actors
	Enterprises supported	n. Of enterprises
	New enterprises	n. Of enterprises
	Traditional crops	ton/year
D. Legal, institutional and perceptional	Legal feasibility	low-medium-high
	Required permits	n. Of permits
	Procedural time	days
	Life time	days
	Peple acceptability	low-medium-high
	Political acceptability	low-medium-high

Thus, through the interviews proposed to the stakeholders and the decisionmakers, a further weighing has been made with the purpose to adjust the DSS. This elaboration allowed the project partner to use their tailored

decision support system to analyse the validity - and the performances - of the adaptation measures that they would use to cope with the climate change effects.

This set of indicators is connected to the set of impacts that each partner has identify. Below are proposed the four group of impacts selected for each of the partner.

6. ACTIONS

6.1. Development of actions packages

The analysis deployed to depict the vulnerabilities and peculiarities of the territory, highlights the land consumption which took place in Misano Adriatico in the last decades as one of the main environmental pressures, leading to an increasing flood frequency and vulnerability to heat waves in most sealed areas. Additional environmental pressures identified are related to the automobile dependency, and a general increase of energy and water consumption. Then a specific set of impacts for Misano Adriatico (increased erosion, increased energy demand for cooling, impact on tourism sector and the impact on transportation network), were identified based on the stakeholders' feedbacks.
Addressing the aforementioned climate impacts, and the effective feasibility in a short-medium term period, the selected actions will respond to the following three main challenges: Energy, Mobility and Tourism.

6.1.1. In pursuit of sustainable actions

Drawn in the existing legal framework, as referring par. 3.1, this section underlines the existing sustainable goals from the main planning tools. The latter paved the way for the definition of the actions package, integrating the research conducted for the plan purposes as well.

<u>Evaluation of Environmental and Territorial Sustainability tool (VALSAT)</u>

- promotion of good practices for the efficiency of hotel cooling system both from a technical and a management perspective;
- a great care must be taken on the theme of greening and shading the cycle lanes and the parking areas set along the coast and near the beaches;
- improvement of the parking areas near the beach;
- specific interventions improving the rain water detention are required for some of the most critical flooding areas surrounding underpasses, which are often subject to flooding events of considerable intensity for a short period of time.

<u>General Urban Plan (PUG)</u>

- improve the greening and use of permeable paving in the new traffic calming zones (zone 30);
- creation of environmental pathways and new parking rules in order to decrease the car speed;
- opportunities for increasing natural and green pathways along the urban streams (Alberello, Agina);
- greening and renewal of the southern part of Lungomare.

<u>Sustainable Mobility Urban Plan (PUMS)</u>

- pedestrianization and traffic calming interventions (including the greening ones) improving the urban quality of traffic calming areas.

6.1.2. Unpacking the actions

According to the three main environmental challenges and the legal framework described, the proposed climate change adaptation actions are listed below:

A.1. Promotion and development of measures in tourist accommodations which are able to decrease the cooling needs improving the indoor microclimate in hotel common spaces (e.g. green wall) and/or to improve the energy performance of the cooling system.
A.2. Promotion and development of greening measures in tourist accommodations which are able to improve the outdoor microclimate, in particular in the garden areas most commonly used by guests.
A.3. Development of greening measures enhancing the permeability of big parking lots (serving commercial structures and the long stay of the hotel guests) and mitigating the heat island effect.
A.4. Promotion and implementation of measures for water saving, collection and reuse of grey waters inside beach resorts and camping sites.
A.5. Development of traffic calming solutions and green urban furniture in low speed and car free zones using, whenever possible, nature-based solutions.
A.6. Testing and development of different solutions aiming to improve the "adaptation capacity" of cycle paths through trees planting, the use of permeable materials and the design of green linear infrastructures separating them from the car traffic.
A.7. Greening measures and tree planting in bordering areas between the seafront and the access areas to the beach.
A.8. Urban forestation: Tree planting in urban areas foreseen as a mitigation measure of the roadway extension.
A.9. Preliminary feasibility assessment of sustainable urban drainage measures along the transport infrastructures (roads, turnabouts, pedestrian subways), improving the water run off management.

Each of the actions is thoroughly elaborated based on several descriptive, expository and technical parameters: the general description, technical information, geographical location, the environmental impact, time frame, funding source, actors to be involved, and the indicators of evaluation. The latter was selected from the table described in par. 5.2.

Environmental aspect
- Impermeability ratio
- Collected rain water
- Water consumption
- UHI reduction

Social aspect
- People who will benefit from the actions
- Upgraded infrastructure

Economic aspect
- Implementation cost

Legal, institutional and perceptual aspect
- Legal feasibility
- Procedural time

ACTION n° 1

TITLE	***Reduction of cooling demand in tourist accommodations***	CENSUS AREAS	***990050000008***
GENERAL DESCRIPTION	*The action seeks to address the emerging demand of cooling in tourist accommodations. The measures developed in this action need to reduce cooling loads, improve the efficiency of air-conditioning system and improve the indoor microclimate in the common spaces of tourist accommodation. In order to do so, the action foresees a pilot intervention in one of the most known hotel in Misano Adriatico that include: the installation of an indoor living wall which contributes to a healthy indoor climate and the renovation of the cooling system which provides thermal comfort but reducing the energy consumption and the climate impact.* *This kind of measure has been indicated also by the Evaluation of Environmental and Territorial Sustainability tool (VALSAT-Valutazione di Sostenibilità Ambientale e Territoriale) as being the opportunity to promote good practices for the efficiency of hotel cooling system both from a technical and a management perspective.* *In addition to the living wall, common areas can be furnished with plants. It is a natural air conditioning provided through plant transpiration when installed in sufficient quantities.*		
TECHNICAL INFORMATION	*Plants cool their environment by evaporating moisture through their leaves. Evaporation rates of plants are linked to light intensities and vary throughout the day. The plants start to evaporate water after the sun has risen and reach maximum evaporation rates around noon. At sun set evaporation rates slow down and come to a stop.* *During the day plants are capable of increasing the indoor humidity 10-15 percent, presuming that 5-10 percent of the total indoor space is allocated to plants. In general, humidity during winter does not fall below 35 percent and during summer never rises above 60 percent. Empirical results show a reduction in temperature of two degrees Celsius during the summer (Danube University in Krems studied the effect of plants on the indoor climate of the Biohof Achleitner building).* *To implement the indoor plantation is required:* - *a meticulous planning,* - *knowledge about the plants used,* - *a suitable building architecture that allows sufficient sun light,* - *and an automatic irrigation.* *An optional cooling tool but very effective is the indoor living wall system. It is composed of vegetation and planter boxes/ foam substrate/ felt layers, each of which contains its own soil or other artificial growing mediums, based on hydroponic culture, using balanced nutrient solutions to provide all or part of the plant's food and water requirements. Under the same principle of evapotranspiration of plants for air-cooling, the living wall performs better than potted plants on humidity control and microclimate regulation. These systems are nearly 20 degrees cooler than their counterparts. They help to reduce the internal temperature on average 4 degrees Celsius over the room temperature and at maximum the temperature decrements 6 degrees Celsius in warmer conditions. While, the average increase in air humidity by an 8 m^2 living wall can exceed*		

15% (the assessment of the cooling potential was carried out by the School of Agricultural Engineering in Seville, inside a small hall).
The modification of the cold generation systems in the hotel industry is able to guarantee savings even up to 30% depending on the efficiency levels of the pre-existing plants. Indeed, the more the conditioning system is outdated, the easier to implement the retrofit interventions will be. The latter allows to obtain low and interesting return times. The range of use is also a relevant parameter; in fact, the longer the plant is used, the more achievable energy saving margins we will get. The most effective technology available up to date is the heat pump with inverter system. The heat pump is able to capture the energy contained in the air and transform it into heat or cooling as needed. The performance levels of a heat pump in summer are quantified using the Energy Efficiency Ratio (EER) parameter. The latest machines available on the market achieve high levels of efficiency with EER values of 4; that is to say, compared to an energy consumption from the network equal to 1, the machine produces 4 heat units.

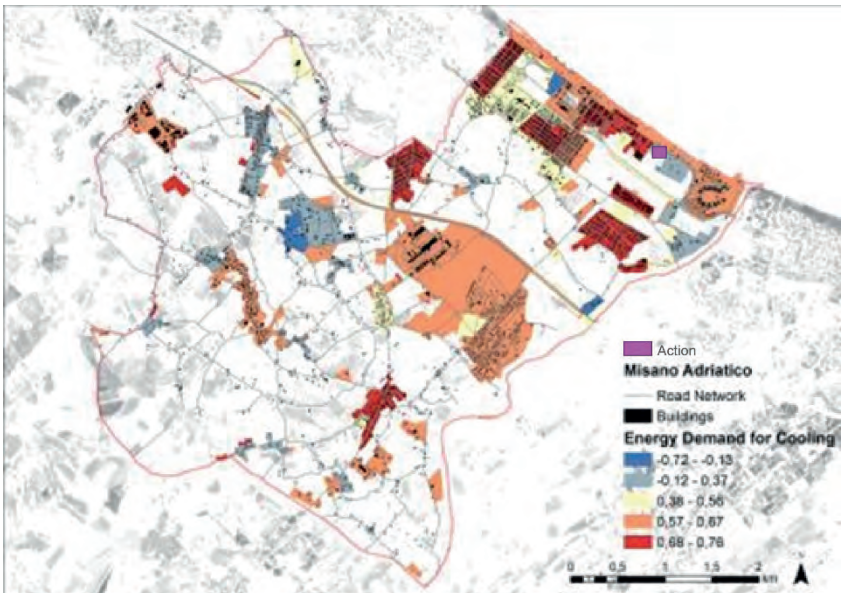
KEYWORDS

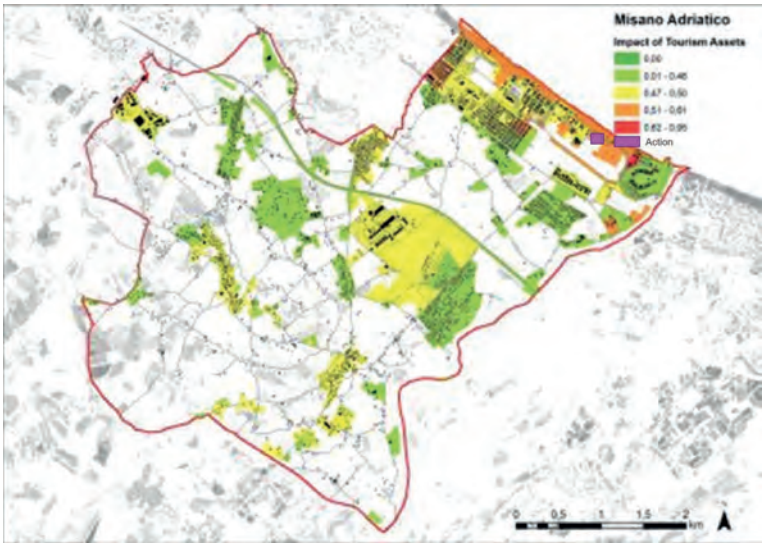
#NaturalAir-Conditioning, #EnergySaving, #TouristComfort

LOCATION

Address: Via Litoranea Sud, n° 50, 47843 Misano Adriatico
Area: 4,000 m^2
Geographic coordinates: 43°58'30.7"N, 12°42'31.5"E (WGS 84/UTM zone 33N)

MERGE WITH VULNERABILITIES





RELATED IMPACT THAT THE ACTION MITIGATES	*Increased energy demand for cooling* *Impact on tourism sector*
PROJECT INITIATOR/PROMOTER	*Hotel Imperial*
STAKEHOLDERS INVOLVED	*Municipality of Misano Adriatico* *Administration of the respective hotel* *Hotels Association "Associazione Albergatori Misano Adriatico"*
BENEFICIARIES/TARGET GROUP	*Tourists (hotel guests), Hotel staff*
TIME OF START/IMPLEMENTATION	*180 days*
INDICATORS OF EVALUATION	*Uhi reduction [°C]* *Energy use reduction [%]* *Legal feasibility [low-medium-high]* *Procedural time [days]* *People who will benefit from the actions [no. of people]* *Implementation cost [€]*
A-ENVIRONMENTAL	1. *Uhi reduction **(indoor temperature reduction):** 2 °C - 4 °C* 2. *Energy use reduction: 5% - 20%*
B-LEGAL, INSTITUTIONAL & PERCEPTIONAL	3. *Legal feasibility: high* 4. *Procedural time: 210 days (from 11/2019 to 05/2020)*
C-SOCIAL	5. *People who will benefit from the actions: 6,100 people/year*
D-ECONOMIC	6. *Implementation cost: 50,000 € (5,136 € annual savings)*

ACTION n° 2

TITLE	***Improve the outdoor microclimate of tourist accommodations***	CENSUS AREAS	***990050000001***
GENERAL DESCRIPTION	*Inherently, vegetated open spaces remain cooler during the day with respect to the ones without vegetation. Various measures which are nature-based, have a significant impact on microclimate regulation because they provide shading, reduce direct solar radiation and increase air humidity. Therefore, the action works on promotion and development of greening measures in tourist accommodations which are able to improve the outdoor microclimate, particularly in the garden areas most commonly used by guests. The accommodation selected as a pilot case is a large structure hosting a summer camp, which have enough space for two different kinds of interventions: a green roof and the greening of the hotel outdoor entryway. For the latter, there is a variety of typologies which are able to reduce the heat island impact, such as, vegetated gazebos, pergola paths, eco urban furniture and more technology-oriented measures like CityTree, folding green wall-shade structures, etc. Furthermore, awareness raising activities will be carried out in order to show to the hotel owners and managers the environmental benefits of these solutions.*		
TECHNICAL INFORMATION	*Green roofs are generally classified in two categories: extensive and intensive. The difference between these two lies in physical characteristics (load, planting medium thickness, planting species) and function (accessibility, usage, maintenance). Extensive roofs are covered with low growing plants such as evergreen sedums. Besides the visual impact of an extensive green roof, they also provide a natural habitat for birds and insects. While, the intensive green roof uses planting mediums that have greater depth than the extensive one. This deeper soil allows intensive roofs to accommodate large plants, dramatic plant groupings and trees. Both benefit the environment. They can decrease the near-surface temperature and the pedestrian-level air temperature, improve the air quality, reduce noise pollution, reduce run-off and have positive impact on the energy balance within a building. Yet, their differences make the environmental impact vary considerably depending on the category. The intensive roof performs more than twice as good as the extensive one on annual removal of air pollutants (PM10, NO_2, O_3). Regarding the reduction of runoff, the discharge coefficient for an extensive roof ranges from 0.48 to 0.67, while for an intensive roof is 0.12. Hence, the latter is capable to retain more the stormwater runoff. They are even more capable at reducing the pedestrian-level temperature by 0.5 ^oC - 1.7 ^oC compared to the extensive roof that reduces by 0.4 ^oC -0.7 ^oC. However, when it comes to design, both categories of green roof require same thorough considerations on the load bearing capacity of a building, building's position and location, waterproofing system and on maintenance management.* *Greening the garden can be conducted using different nature-based solutions (NBS). In addition to planting trees, vegetated gazebos and pergola paths work well in even a small scrap of yard/ garden. Their prime purpose is the shade provision for sitting, which consequently lower the air temperatures. These structures accommodate multi-*		

functional plants, a value-added for hotel guests. Nonetheless, they require thorough design considerations according to sun and wind patterns.

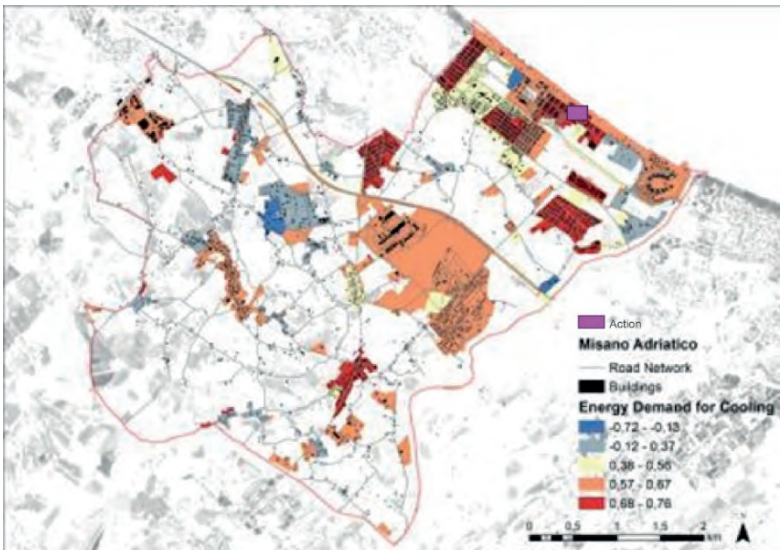
KEYWORDS

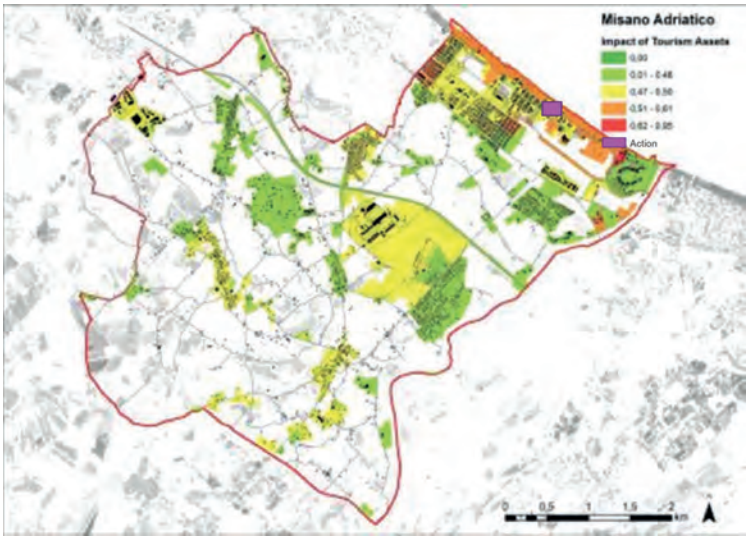
#ClimateMitigation, #Nature-basedSolutions, #TouristComfort

LOCATION

Address: Via Litoranea Sud, n° 25B, 47843 Misano Adriatico
Area: 300 m^2 (120 m^2 - green roof and 180 m^2 - entrance area/garden)
Geographic coordinates: 43°58'41.3"N, 12°42'16.9"E (WGS 84/UTM zone 33N)

MERGE WITH VULNERABILITIES



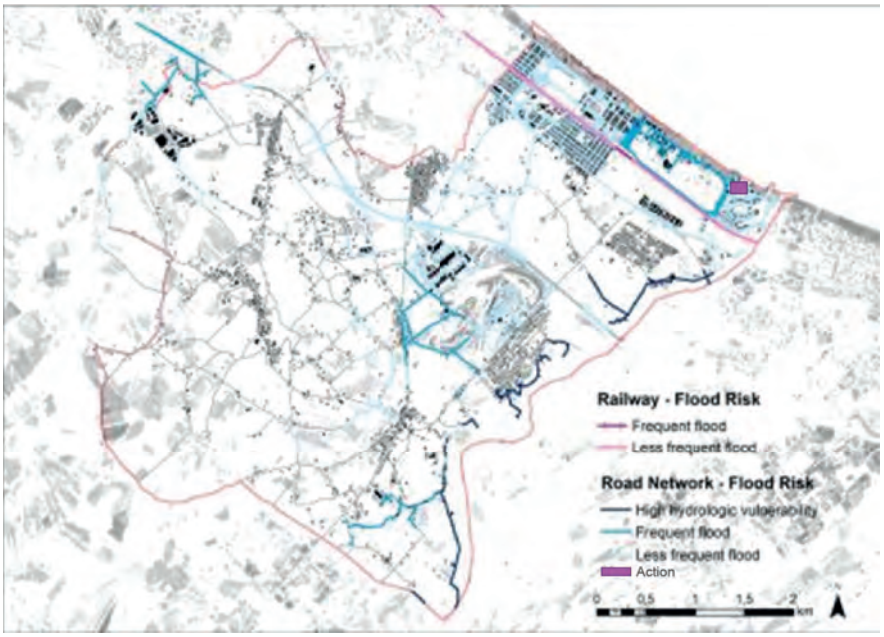


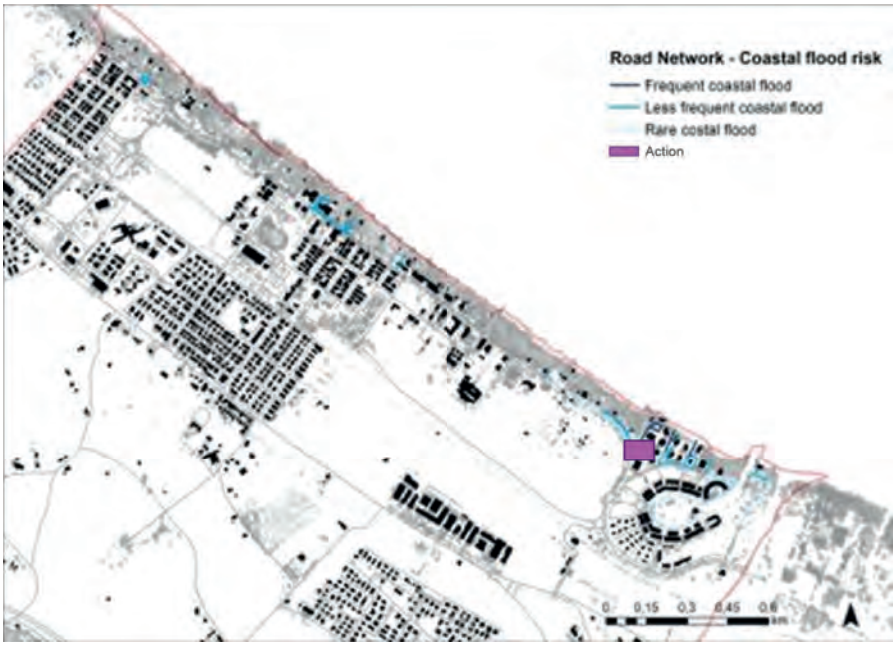
RELATED IMPACT THAT THE ACTION MITIGATES	*Impact on tourism sector* *Increased energy demand for cooling*
PROJECT INITIATOR/PROMOTER	*Municipality of Misano and the Congregation of the Sisters of 'S. Giovanni Battista' (public-private partnership)*
STAKEHOLDERS INVOLVED	*Hotels Association "Associazione Albergatori Misano Adriatico", Municipality of Misano and the Congregation of the Sisters of 'S. Giovanni Battista'*
BENEFICIARIES/TARGET GROUP	*Guests, Residents, Staff of 'Villa Alfonso Maria Fusco'*
TIME OF START/IMPLEMENTATION	*120 days*
INDICATORS OF EVALUATION	*Impermeability ratio [m^2]* *Uhi reduction [C°]* *Legal feasibility [low-medium-high]* *Procedural time [days]* *People who will benefit from the actions [no. of people]* *Implementation cost [€]*
A-ENVIRONMENTAL	1. *Impermeability ratio: 180 m^2 (de-sealed surfaces)* 2. *Uhi reduction: 0.7 C° - 1.2 C°*
B-LEGAL, INSTITUTIONAL & PERCEPTIONAL	3. *Legal feasibility: medium* 4. *Procedural time: 360 days (from 11/2019 to 10/2020)*
C-SOCIAL	5. *People who will benefit from the actions: 3,600*
D-ECONOMIC	6. *Implementation cost: 20,000 €*

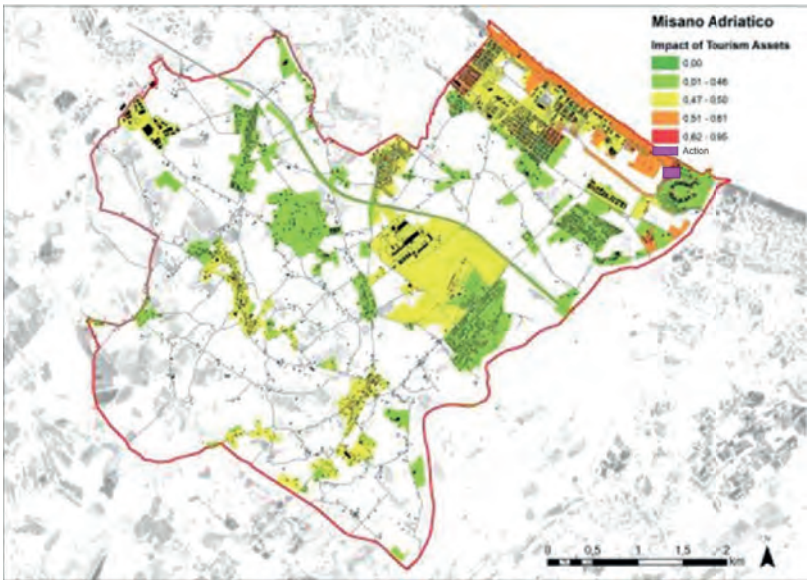
ACTION n° 3

TITLE	***Enhancing the permeability of big parking lots***	CENSUS AREAS	***990050000001***
GENERAL DESCRIPTION	*By reducing the amount of paved surfaces on big parking lots, stormwater runoff is decreased while infiltration and evapotranspiration opportunities are increased. The chosen parking area, part of a large urban revitalization project called 'Lungomare', currently is a conventional parking lot where the largest percentage of area is impervious. It would, therefore, accommodate diverse nature-based solutions such as tree planting and grass permeable pavers. In consequence, its positive impact is multiplied. Especially during the increasingly hot days of summer, the tree planting or pergola paths will prevent the area from heating up and will create an attractive urban feature for locals and tourists to appreciate.*		
TECHNICAL INFORMATION	*Increasing the amount of tree cover and other natural vegetation on the parking site means more shade for the land, which also helps in stabilizing the temperatures. Reducing the heat island effect in parking areas, potentially the natural night time cooling process is supported, the energy demand from neighboring buildings is reduced, and a more comfortable outdoor environment during the hot summer months is provided.* *The parking lot can be also designed to avoid runoff through the creation of a closed loop water collection system, which guides stormwater into open space medians and bioswales, and ultimately into constructed wetlands. Pervious materials that could be used are permeable pavers, grass pavers, or even gravel. Using a combination of native seeding and sod, the parking lot would require less irrigation than in the case of using sod and non-native landscaping. Under natural rainfall events, the species planted in the lot should be able to sustain themselves with little or no irrigation.*		
KEYWORDS	*#ClimateMitigation, #WaterInfiltration, #TouristComfort*		
LOCATION	*Address: XPF7+6J, Misano Adriatico* *Area: 3,400 m^2* *Geographic coordinates: 43°58'23.0"N 12°42'50.7"E* (WGS 84/UTM zone 33N)		
MERGE WITH VULNERABILITIES			

European Regional Development Fund


Railway - Flood Risk
Frequent flood
Less frequent flood
Road Network - Flood Risk
High hydrologic vulnerability
Frequent flood
Less frequent flood
Action
0 0.5 1 1.5 2 km


Road Network - Coastal flood risk
Frequent coastal flood
Less frequent coastal flood
Rare costal flood
Action
0 0.15 0.3 0.45 0.6 km



RELATED IMPACT THAT THE ACTION MITIGATES	*Impact on tourism sector* *Impact on transport network*
PROJECT INITIATOR/PROMOTER	*Municipality of Misano Adriatico: 'Ufficio di Piano'*
STAKEHOLDERS INVOLVED	*Municipality of Misano Adriatico*
BENEFICIARIES/TARGET GROUP	*Turists and residents*
TIME OF START/IMPLEMENTATION	*730 days*
INDICATORS OF EVALUATION	*Impermeability ratio [m^2]* *Uhi reduction [°C]* *Legal feasibility [low-medium-high]* *Procedural time [days]* *People who will benefit from the actions [no. of people]* *Km – upgraded infrastructure [km]* *Implementation cost [€]*
A-ENVIRONMENTAL	1. *Impermeability ratio: 2,150m^2* 2. *Uhi reduction: 6 °C (land surface temperature)*
B-LEGAL, INSTITUTIONAL & PERCEPTIONAL	3. *Legal feasibility: high* 4. *Procedural time: 810 days (from 10/2019 to 12/2021)*
C-SOCIAL	5. *People who will benefit from the actions: 30,000* 6. *Km - upgraded infrastructure: 0.250 km*
D-ECONOMIC	7. *Implementation cost: 173,200 € (172,000 € - de-sealed space and 1,200 € - trees)*

ACTION n° 4:

TITLE	***Water savings in camping sites and beach facilities***	CENSUS AREAS	1. ***990050000008*** 2. ***990050000011***
GENERAL DESCRIPTION	*Water-saving measures will be applied in a large campsite in the southern part of the city and, where possible, in beach facilities located in the same area of the campsite. The most feasible and effective solutions that the management of these facilities can develop are: the installation restrictors or aerators on taps and showers, the replacement of shower heads with more water efficient ones and the installation of partially close angle valves in the water supply to taps. The application of on-off switch devices on wash hand basins or showers is an additional measure which permits the user to stop water flow by pushing a button.* *Another possibility is to install a shower timer to help the user measure the time spent showering. New efficient low flow toilets are available on the market, together with dual flush toilets. If it is not feasible to change all toilets, the water used in flushing can be reduced significantly by manually fixing the floater of the water tank or by placing a brick or a full water bottle in the cistern.* *As regards green areas, a very simple smart watering measure, for instance, could be related to the draft of procedures foreseen watering during morning or evening hours. On the other hand, especially in case of more extensive garden areas, specific technical measures can be implemented. These measures use moisture sensor system or a drip system, which aims at minimizing evaporation and proving the best impact on plant roots.* *A second step, requiring a higher investment, is related to the different tiers of rejected water – flushing from toilets, washing and cleaning that should be reused, according to compatible uses, to flush toilets, to irrigate or fertilize the green areas of the establishment or elsewhere when appropriate.*		
TECHNICAL INFORMATION	*Showers are the main consumers of water in tourist accommodations. As for the hotels, for instance, showers count for an average of around 40%, while wash hand basins count for about 10% (source: Investing in Water - Life+ project). These devices, considered as soft-measures, are applicable to all building typologies since once adapted they will reduce the flow and consequently the water consumption. Flow restrictors can reduce water consumption by 30-40%, tap aerators by 30-50% and water saving showers by 40-50%.* *For example, a standard showerhead uses about 10-12 litres of water per minute, while a water saving showerhead uses 7 litres per minute or even less. Whereas, the water saving devices applied to taps, should guarantee a maximum consumption of 6 litres per minute.* *New efficient low flow toilets available on the market use an average of just 4.5 litres per flush, compared to older models that use roughly two or three times more than that. Dual flush toilets typically use 3-6 litres of water opposed to the old style flush systems which use a massive 9-12 litres per flush.*		

A rainwater harvesting system can provide water to replace up to 50% of the main supply for non-potable water use. The pipework for rainwater should be clearly marked to differentiate it from the main supply.
The treatment of most commonly primary water originating from baths, showers and hand washbasin (which is usually less polluted than water originating from kitchens and washing machines) involve simple diversion and in-line surge tanks with coarse filtration with subsurface garden watering and irrigation purposes only. More sophisticated systems that involve storage, fine filtration, biological treatment and UV disinfection and pumping, offer greater economic value when used for toilet flushing, laundry washing and garden irrigation applications. Using these waters to flush toilets, to irrigate or fertilize the green areas of the establishment or elsewhere appropriate, can reduce water consumption approximately by 20% (source: Investing in Water - Life+ project).

KEYWORDS

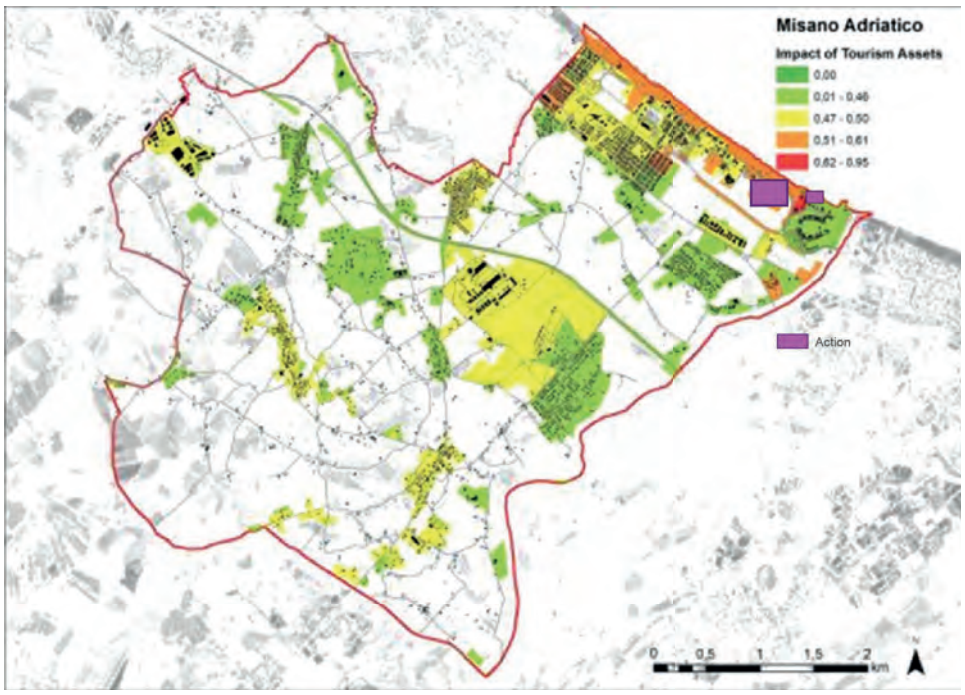
#ClimateMitigation, #WaterConservation, #WaterReuse

LOCATION

1. Camping
Address: Via Litoranea Sud, 60, 47843 Misano Adriatico
Area: 59 214 m²
Geographic coordinates: 43°58'46.5"N 12°41'40.1"E (WGS 84/UTM zone 33N)

2. Beach resort
Address: XPF8+2W, Misano Adriatico
Area: 1100 m²
Geographic coordinates: 43°58'21.3"N 12°43'02.5"E (WGS 84/UTM zone 33N)

MERGE WITH VULNERABILITIES



RELATED IMPACT THAT THE ACTION MITIGATES	*Impact on tourism sector*
PROJECT INITIATOR/PROMOTER	*Municipality of Misano Adriatico and the Management of the beach facilities and camping*
STAKEHOLDERS INVOLVED	*Municipality of Misano Adriatico and the Management of the beach facilities and camping*
BENEFICIARIES/TARGET GROUP	*Management of the beach facilities and camping, residents, guests, Municipality of Misano*
TIME OF START/IMPLEMENTATION	*30 days*
INDICATORS OF EVALUATION	*Water consumption [m^3/year] (in this case is calculated **water savings**)* *Legal feasibility [low-medium-high]* *Procedural time [days]* *People who will benefit from the actions [no. of people]* *Implementation cost [€]*
A-ENVIRONMENTAL	1. *Water consumption **(savings)**: 1,800 m^3/year (camping sites), 300 m^3/year (beach facilities)*
B-LEGAL, INSTITUTIONAL & PERCEPTIONAL	2. *Legal feasibility: high* 3. *Procedural time: 180 days (from 11/2019 to 04/2020)*
C-SOCIAL	4. *People who will benefit from the actions: 90,000 in camping sites, 45,000 in beach facilities*
D-ECONOMIC	5. *Implementation cost: 1,400 € (camping sites), 700 € (beach resorts)*

ACTION n° 5

TITLE	***NBS as traffic calming solutions***	CENSUS AREAS	***990050000005***
GENERAL DESCRIPTION	*In order to decrease the car speed and the traffic problems in streets, many physical obstructions, called traffic calming devices, attempt to lower vehicle speeds, to reduce traffic volumes, to divert cut-through traffic, or some combination therein. There are many different measures, amongst which, those that are nature-based comprise layers of additional functions such as: water infiltration, erosion reduction, pollutant filtration and absorption of traffic-related pollution. Therefore, the action seeks to develop traffic calming solutions and green urban furniture at low speed zones, strongly supporting those which are nature-based. Specifically, the planned intervention will take place along a road section which is located near the school complex area of the town. The action envisions the design of four raingardens (two in the first part of the road section and two in the final part) and of an infiltration strip. The rain gardens narrow the roadway and thus slow down car traffic. Whilst, the infiltration strip connects the rain gardens set on the eastern side of the road, serving as a natural barrier to protect pedestrians from cars, as well as, increases the rainfall detention and infiltration.* *These traffic calming solutions are particularly important around children, who may behave erratically or may not be alert to traffic. So, in parallel to the objective of improving the stormwater management, the action aims also at increasing safety and the perception of safety for pedestrians and cyclists.*		
TECHNICAL INFORMATION	*Traditional traffic calming measures include roundabouts, low walls, speed humps and bumps, chicanes, planters and street trees. Some of them include the feature of nature/vegetation. Apart from improving aesthetics and breaking up sight lines from motorists, street trees provide shadow that strongly impact the temperature reduction specially in street canyons. While, planting boxes deflect vehicular traffic and provide seating and places for informal play.* *Recently, the range of these solutions has expanded and include also drainage solutions such as bioswales and raingardens. When designed for creating meandering roads, they help to slow-down the traffic. Rain gardens are designed to handle at least one-tenth of the rain from a driveway. For 100/150 square meters surface, the rain garden would need to be about 10 square meters. In addition to their stormwater management advantages, this natural control device slows neighborhood traffic by narrowing intersections as well as traffic islands.* *A rain garden should usually consist of the following components:* • *Grass filter strip: to reduce incoming runoff velocities and to filter particulates.* • *Ponding area: for temporary storage of surface water prior to evaporation, infiltration, plant uptake.* • *Organic/mulch area: for filtration, and to create an environment conducive to the growth of microorganisms that degrade hydrocarbons and organic matter.* • *Planting soil: for filtration, and as a planting medium; the clay component will provide good adsorption sites for hydrocarbons, heavy metals, nutrients etc.* • *Woody and herbaceous plants: to provide vegetative uptake of pollutants.*		

- *Sand bed: to provide good drainage and aerobic conditions of the planting soil; the sand bed also provides final, polishing treatment.*

Another green measure planned by this action is the infiltration strip. These are vegetated soil designed to receive runoff as overland sheet flow from upstream development. They lie between a hard-surfaced area and a receiving stream, surface water collection, treatment or disposal system. They treat runoff by vegetative filtering, and promote settlement of particulate pollutants and infiltration.

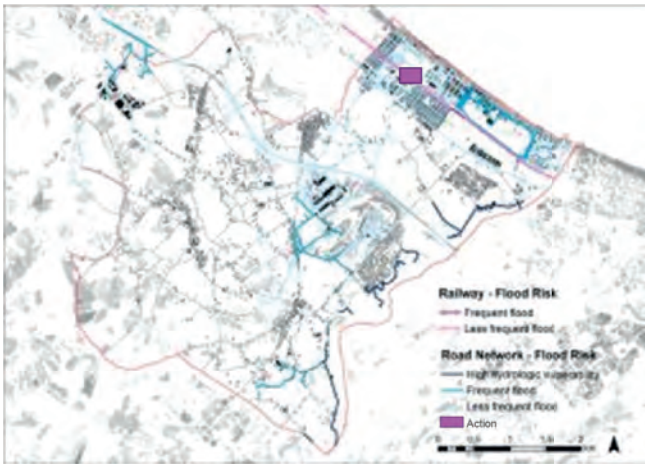
KEYWORDS

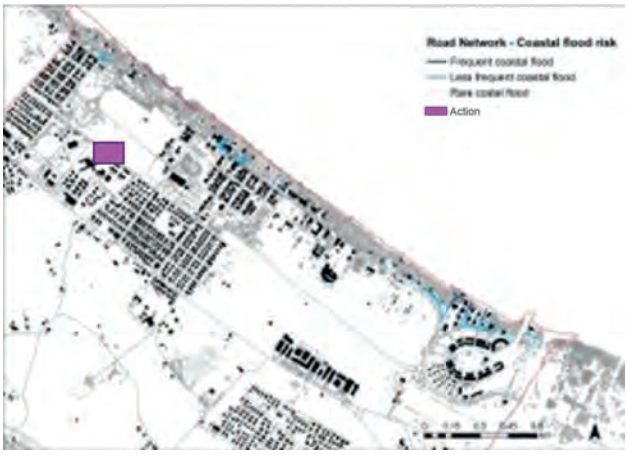
#ClimateMitigation, #WaterInfiltration, #NaturebasedSolutions

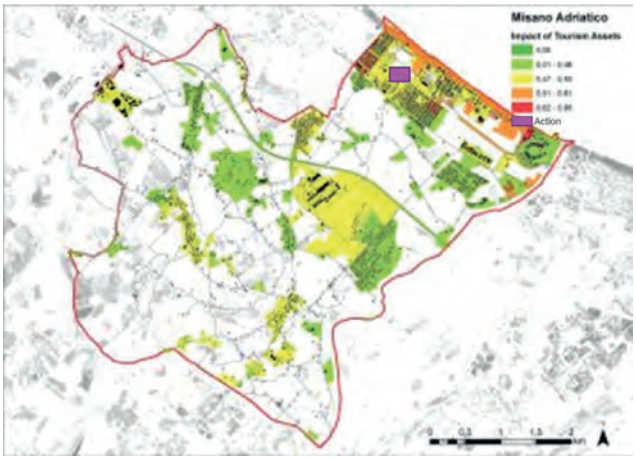
LOCATION

Road 'Giuseppe Verdi' *(the section at the crossroads 'Via Verdi – Via Rossini' and 'Via Verdi – Via Maroncelli')*
Address: XMJR+3H, Misano Adriatico
Area: 165 m^2
Geographic coordinates: 43°58'48.8"N 12°41'29.2"E (WGS 84/UTM zone 33N)

MERGE WITH VULNERABILITIES







RELATED IMPACT THAT THE ACTION MITIGATES	*Impact on transport network*
PROJECT INITIATOR/PROMOTER	*Municipality of Misano "Ufficio di Piano"*
STAKEHOLDERS INVOLVED	*Municipality of Misano*
BENEFICIARIES/TARGET GROUP	*Students and citizens*
TIME OF START/IMPLEMENTATION	*360 days*
INDICATORS OF EVALUATION	*Impermeability ratio [m^2]* *Legal feasibility [low-medium-high]* *Procedural time [days]* *People who will benefit from the actions [no. of people]* *Km – upgraded infrastructure [km]* *Implementation cost [€]*
A-ENVIRONMENTAL	1. *Impermeability ratio: 40 m^2 (raingardens) + 150 m^2 (infiltration strip)*
B-LEGAL, INSTITUTIONAL & PERCEPTIONAL	2. *Legal feasibility: medium/high* 3. *Procedural time: 365 days (from 11/2019 to 10/2020)*
C-SOCIAL	4. *People who will benefit from the actions: 2,800* 5. *Km - upgraded infrastructure: 310 m*
D-ECONOMIC	6. *Implementation cost: 17,000 € (8,000 € - rain gardens and 9,000 € - infiltration strips)*

ACTION n° 6

TITLE	***Cycle paths adapting to climate change/Resilient cycle paths***	CENSUS AREAS	1. ***990050000030*** 2. ***990050000079***
GENERAL DESCRIPTION	*This action aims at improving the capacity of cycling infrastructure to better deal with the climate change effects, by developing and assessing different solutions which are mainly design-oriented. The first pilot case identified, refers to the greening of a wall along an existing bicycle path adjacent to a highly-frequented racetrack. Instead, the second pilot case consists of the separation of the bike lanes from the roadway through different greening measures (planters and vegetated buffers).* *The green wall is expected to decrease the temperatures felt by the cyclists, in particular during the warmest summer months. The other pilot case envisions the use of permeable materials and the design of an infiltration strip, as a separating element from the car traffic, following the planned bike lane along the seafront, part of the project 'Lungomare'.* *The improved cycling infrastructure will motivate citizens and tourists to commute and travel more by bike and the green measures will directly impact the human/cyclist exposure to air pollution, as well as will provide comfort while riding along a shaded area. These kind of interventions are coherent with the indications given by the Evaluation of Environmental and Territorial Sustainability tool (VALSAT-Valutazione di Sostenibilità Ambientale e Territoriale), which emphasizes that a great care must be taken on the theme of greening and shading the cycle lanes.*		
TECHNICAL INFORMATION	*Drawing on the case of Talgarth Road Green Corridor in London, the vegetated areas along the bicycle paths contain long grass called miscanthus. This unique scheme using long grass provides a safe route for cyclists and most importantly protection from traffic-related pollution. The latter is monitored through sensors installed on the site. They track the effects of the grass in stopping vehicle fumes from reaching cyclists and pedestrians.* *In this project, the use of innovative new materials has been foreseen that have also a twofold effect. The 'flexipave' cycle path, a hard wearing recycled rubber, which allows the water to filter through the surface and reach the underlying soils and it keeps the pollutants in place. In this way, a better drainage is ensured. The air quality is also measured by the latest LED Lighting, CCTV cameras and Smart City Sensors, that can control street lighting and count the traffic volumes. The cycle path will be accompanied with the infiltration strips, the advantages of which are explained above.* *Outdoor green walls typologies are the same of those indoor ones (explained in the action 1). Technically they differ in size, weight and species selection. Another difference is their exposure to sunlight. Outdoor green walls receive direct sunlight and do not need an artificial source of illumination as in the case of indoor living walls. They can reduce the ambient air temperature between 0.5 – 4 degrees Celsius when compared to a measurement at a distance of 2 m away (the simulation was conducted in London from Oxford Brookes University). While, generally in other simulations, the green wall (living wall) has been shown to reduce the air temperature for 1.5 degrees Celsius. Additionally,*		

they provide other environmental benefits such as energy efficiency, reduction of air and noise pollution, promotion of biodiversity etc.

KEYWORDS

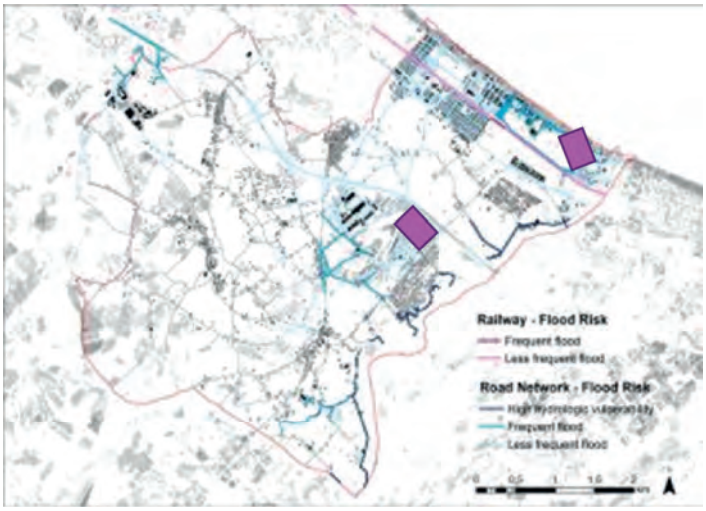
#ClimateMitigation, #WaterInfiltration, #NaturebasedSolutions

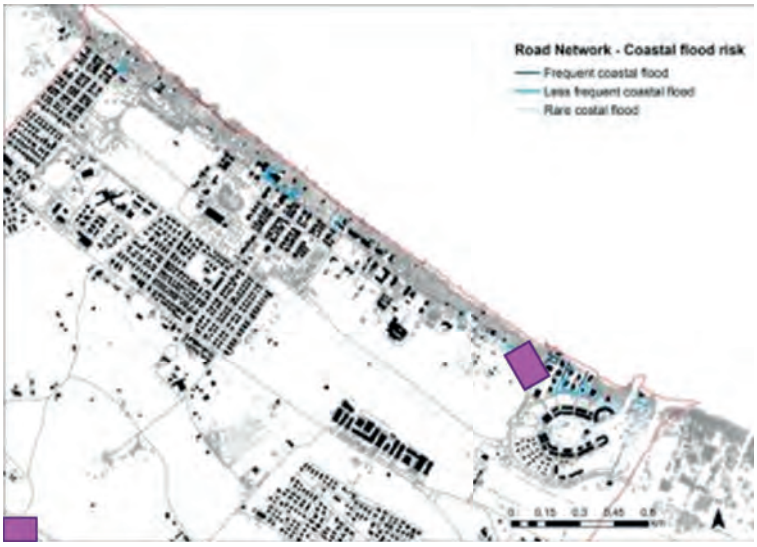
LOCATION

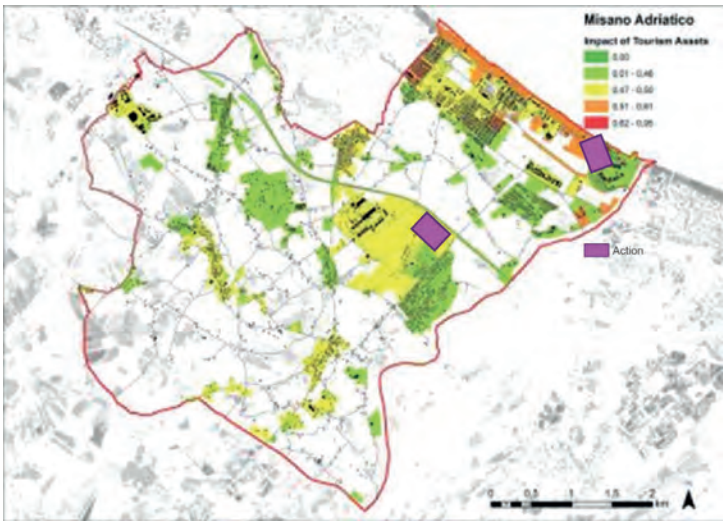
1. Green wall and bushes along the cycle path of 'Via dell'Autodromo'
Address: from XM8M+35 Zona Artigianale to XM6Q+HV Santa Monica-Cella
Area: 1 950 m^2 (length of the wall 650 m, hight 3m) and 650 m^2 bushes
Geographic coordinates: from 43°57'54.6"N 12°40'58.5"E to 43°57'41.1"N 12°41'23.0"E
(WGS 84/UTM zone 33N)

2. Permeable cycle paths and infiltration strips along seafront 'Via Litoranea Sud'
Address: Via Litoranea Sud 43-71, 47843 Misano Adriatico
Area: 2,655 m^2 (2,500 m^2 – cycle paths + 155 m^2 – infiltration strips)
Geographic coordinates: from 43°57'54.6"N 12°40'58.5"E to 43°57'41.1"N 12°41'23.0"E
(WGS 84/UTM zone 33N)

MERGE WITH VULNERABILITIES







RELATED IMPACT THAT THE ACTION MITIGATES	*Impact on transportation network*
PROJECT INITIATOR/PROMOTER	*Municipality of Misano "Ufficio Piano"*
STAKEHOLDERS INVOLVED	*Municipality of Misano, Management "Marco Simoncelli"*

BENEFICIARIES/TARGET GROUP	*Citizens and tourists*
TIME OF START/IMPLEMENTATION	*480 days*
INDICATORS OF EVALUATION	*Uhi reduction [°C]* *Impermeability ratio [m^2]* *Legal feasibility [low-medium-high]* *Procedural time [days]* *People who will benefit from the actions [no. of people]* *Km – upgraded infrastructure [km]* *Implementation cost [€]*
A-ENVIRONMENTAL **B-LEGAL, INSTITUTIONAL & PERCEPTIONAL** **C-SOCIAL** **D-ECONOMIC**	1. *Uhi reduction: 0.7 – 1 Degree Celsius* 2. *Impermeability ratio: 3,305 m^2* 3. *Legal feasibility: medium* 4. *Procedural time: 810 days (from 10/2019 to 12/2021)* 5. *People who will benefit from the actions: 20,000* 6. *Km - upgraded infrastructure: 2.33 km (1.1 km 'Autodromo' + 1.23 km 'lungomare')* 7. *Implementation cost: 330,000€ (30,000 € 'Autodromo' + 300,000€ 'lungomare')*

ACTION n° 7

TITLE	***Greening the seafront***	CENSUS AREAS	1. ***990050000008*** 2. ***990050000079***
GENERAL DESCRIPTION	*The action aims at improving the urban regeneration of 'Lungomare', by developing greening measures which will integrate the existing natural amenities of the area. This will bring an added value to the stormwater management as well.* *The re-naturalization of the area between the waterfront and the existing promenade include pocket parks in one of the main entrances to the seashore, rain gardens in the road along the seafront, and green areas along the same road. Rain gardens can be planted using small trees or, alternatively, tree box filters (in-ground containers typically containing street trees) can be used.* *This network of green spaces will create a livable urban centrality, as well as will serve as a sponge garden, contributing both to the improvement of biodiversity and the reclamation of natural water systems. This system of multifunctional open spaces and parks will increase the walking accessibility into the beach area, encouraging residents and tourists to get outdoors and engage in physical activity.*		
TECHNICAL INFORMATION	*Besides greenery, pocket parks provide a shaded place to sit outdoors, equipped with trees easy adaptable to the local conditions and improve the soil permeability. The planting of other green areas along the seafront road, together with rain gardens and tree box filters, can give a further contribution to capture and filter the rainfall water.* *Rain gardens (see action 5) are bioretention basins designed to handle at least one-tenth of the rain from a driveway: for example, for the drainage of a 100/150 square meters surface, the rain garden would need to be about 10 square meters. By modifying existing landscape to collect rainfall water through rain gardens, it is possible to better manage a 1 in 5 year rainfall event. Rain gardens are also equipped with overflow pipes into the sewer network, to avoid overflow into the road during a more severe events.* *Tree box filters adapt bioretention principles used in rain gardens to enhance pollutant removal and to decrease peak discharge (by detaining stormwater volume and by increasing discharge duration). Their primary advantages are standardized designs and ease of construction and simple, cost-effective maintenance. The system consists of a container filled with a soil mixture, a mulch layer, under-drain system and a shrub or tree. Stormwater runoff drains directly from impervious surfaces through a filter media. Treated water flows out of the system through an under drain connected to a storm drainpipe or into the surrounding soil. Tree box filters can also be used to control runoff volumes by adding storage volume beneath the filter box with an outlet control device.* *Individual tree box filters hold a relatively small volume of stormwater (400 - 1200 liters), but concerted use throughout a stormwater drainage area will significantly decrease the total volume of discharged stormwater.*		
KEYWORDS	*#ClimateMitigation, #WaterInfiltration, #NaturebasedSolutions*		
LOCATION	***1. Green spaces (3 pcs) adjacent to via Massimo d'Azeglio and via Litoranea Sud*** *Address: XPG5+88 Misano Adriatico, Province of Rimini* *Area: 390 m^2* *Geographic coordinates: 43°58'32.9"N 12°42'29.9"E* (WGS 84/UTM zone 33N)		

2. Rain gardens and green spaces along via Litoranea Sud

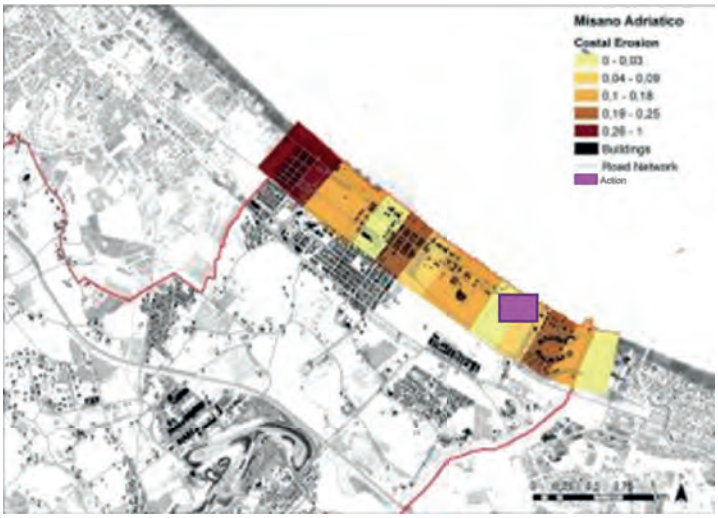
Address: from XPG5+99 Misano Adriatico, Province of Rimini to XPF6+RP Misano Adriatico, Province of Rimini

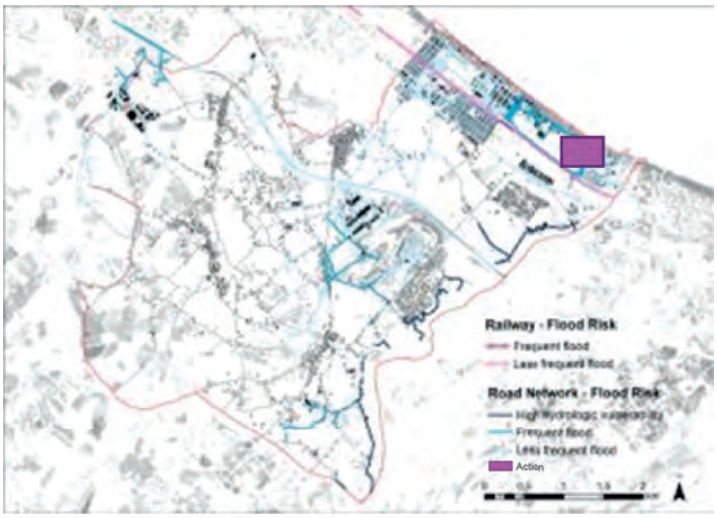
Area: 1,650 m^2(1,500 m^2 green spaces + 150 m^2 rain gardens)

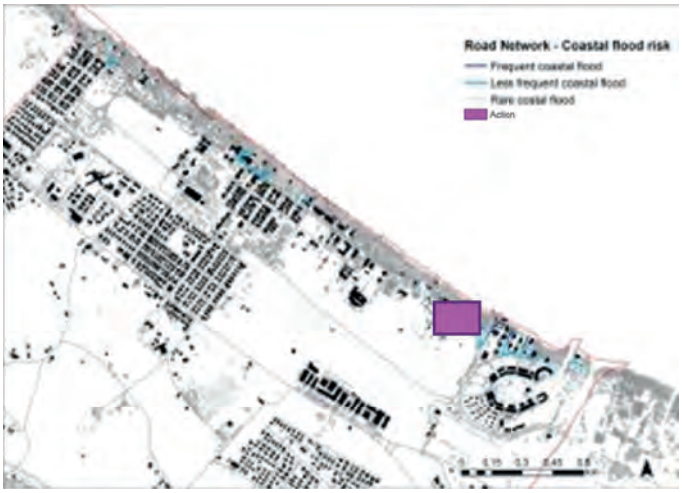
Geographic coordinates: from 43°58'33.3"N 12°42'30.4"E to 43°58'15.0"N 12°42'43.8"E

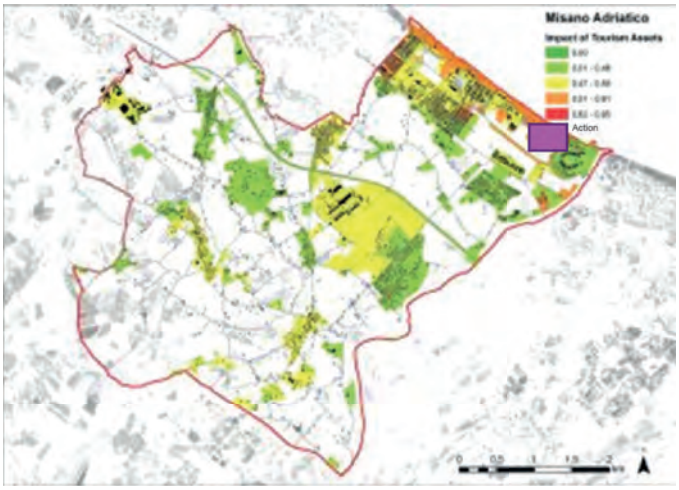
(WGS 84/UTM zone 33N)

MERGE WITH VULNERABILITIES









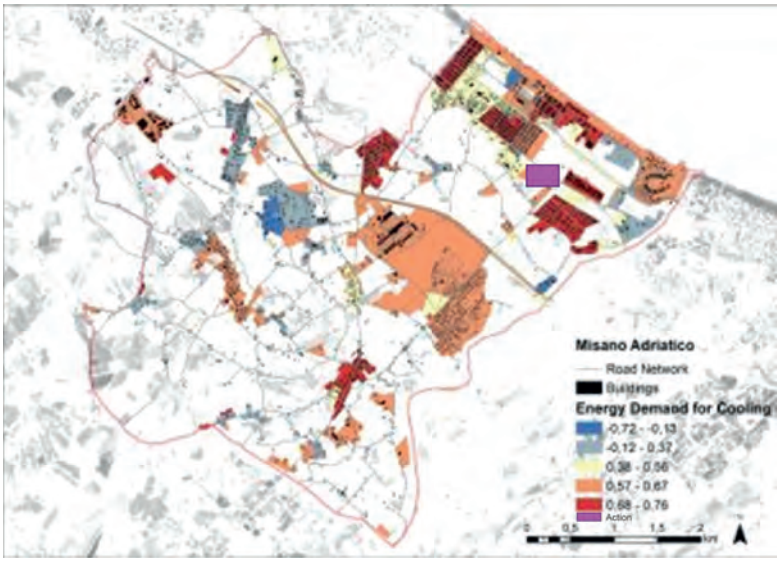
RELATED IMPACT THAT THE ACTION MITIGATES	*Increased erosion* *Impact on tourism sector* *Impact on transport network*
PROJECT INITIATOR/PROMOTER	*Municipality of Misano Adriatico "Ufficio di Piano"*
STAKEHOLDERS INVOLVED	*Municipality of Misano Adriatico*
BENEFICIARIES/TARGET GROUP	*Citizens and tourists*

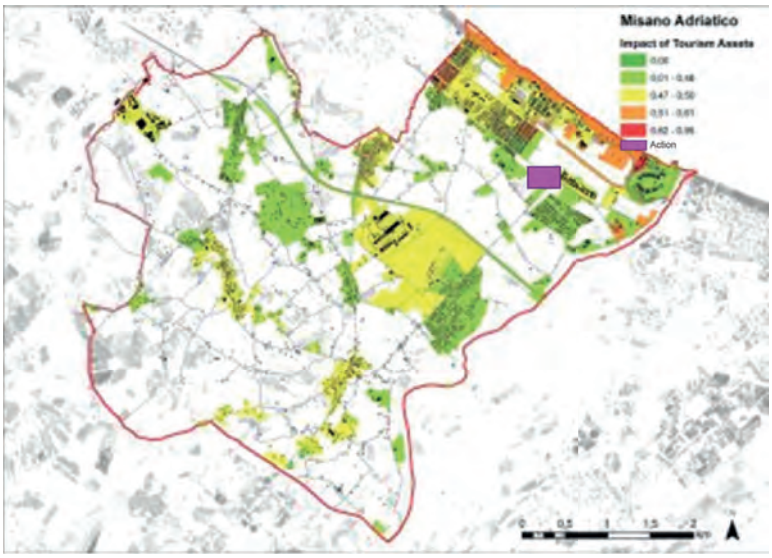
TIME OF START/IMPLEMENTATION	*730 days*
INDICATORS OF EVALUATION	*Uhi reduction [°C]* *Impermeability ratio [m²]* *Legal feasibility [low-medium-high]* *Procedural time [days]* *People who will benefit from the actions [no. of people]* *Km – upgraded infrastructure [km]* *Implementation cost [€]*
A-ENVIRONMENTAL	1. *Uhi reduction: 2 °C* 2. *Impermeability ratio: 1640 m² (1,485 m² green spaces and 155 m² rain gardens)*
B-LEGAL, INSTITUTIONAL & PERCEPTIONAL	3. *Legal feasibility: high* 4. *Procedural time: 810 days (from 10/2019 to 12/2021)*
C-**SOCIAL**	5. *People who will benefit from the actions: 20,000* 6. *Km - upgraded infrastructure: 0.73 km (0.49km green spaces and 0.24 rain gardens)*
D-ECONOMIC	7. *Implementation cost: 60,000€ (6,000€ green spaces adjacent to via 'Massimo d'Azeglio' + 24,000€ green spaces along Lungomare + 30,000€ raingardens)*

ACTION n°8

TITLE	***Urban forestation***	CENSUS AREAS	***990050000021***
GENERAL DESCRIPTION	*The action of urban forestation is underpinned by the emerging urgency of mitigating the urban heat island. Especially in urban areas along the roadway extensions, the tree planting measure have a greater impact on the reduction of temperatures, air quality improvement, carbon sequestration, provision of habitat for pollinators, stormwater run-off reduction and significant energy conservation during summer and winter season. Accordingly, the action envisaged will continue to develop an area already planned for forestation, which is centrally located between the north and south part of Misano Adriatico, planting additional 120 trees.*		
TECHNICAL INFORMATION	*When designing an "Urban forestation area", tree choice affects the accrual of benefits. Trees with large canopies provide the greatest amount of energy conservation, storm water runoff reduction and carbon sequestration. A diversity of trees that flower from spring through fall will provide the greatest benefit to pollinators and other urban fauna. The choice to use both native and non-native trees is suitable as long as they are adapted to urban site conditions.* *Urban forestation encompasses tree planting ranging from individual trees, tree-lined streets, pocket parks, tree wells to a widescreen of evergreen trees. The latter require a larger amount of light and available space.* *Urban street trees are generally placed each 4.5m – 6m and dense placemat is highly desired since it keeps sidewalks dry, despite a steady light all-day rain. Studies have shown that the shade provided by urban street trees can add from 40-60% more life to costly asphalt, while can reduce energy bills for a household set along the street from 15-35%.*		
KEYWORDS	*#ClimateMitigation, #Nature-basedSolutions, #EnergySaving*		
LOCATION	***'Greppa' Park*** *Address: XMCX+R9 Misano Adriatico, Province of Rimini* *Area: 36,000 m^2* *Geographic coordinates: from 43°58'19.6"N 12°41'54.5"E* (WGS 84/UTM zone 33N)		

MERGE WITH VULNERABILITIES





RELATED IMPACT THAT THE ACTION MITIGATES

Increased energy demand for cooling

Impact on tourism sector

PROJECT INITIATOR/PROMOTER

Municipality of Misano "Ufficio di Piano"

STAKEHOLDERS INVOLVED

Municipality of Misano

BENEFICIARIES/TARGET GROUP	*Citizens and tourists*
TIME OF START/IMPLEMENTATION	*300 days*
INDICATORS OF EVALUATION	*Uhi reduction [°C]* *Legal feasibility [low-medium-high]* *Procedural time [days]* *People who will benefit from the actions [no. of people]* *Km – upgraded infrastructure [km]* *Implementation cost [€]*
A-ENVIRONMENTAL	1. *Uhi reduction: 2 °C - 4 °C (surrounding air temperature)*
B-LEGAL, INSTITUTIONAL & PERCEPTIONAL	2. *Legal feasibility: high* 3. *Procedural time: 300 days (from 03/2020 to 12/2020)*
C-SOCIAL	4. *People who will benefit from the actions: 3,700* 5. *Km - upgraded infrastructure: 0.55 km*
D-ECONOMIC	6. *Implementation cost: 8,400€ (120 alberi per 70 euro)*

ACTION n° 9

TITLE	***SUDS along transport infrastructures***	CENSUS AREAS	***990050000060***
GENERAL DESCRIPTION	*SUDS or Sustainable Urban Drainage Systems, are stormwater management installations based on natural hydrological processes which often utilize vegetated land surfaces. Their components help attenuate flood impacts by temporarily storing water, often filtering the pollutants at source and encouraging infiltration of stormwater into the ground. In order to start enhancing these sustainable urban drainage measures along the transport infrastructures (roads, turnabouts, pedestrian subways), a preliminary study about the implementation of SUDS measures is related to a critical flood prone area of the city surrounding the underpass of the train station. As stated in the VALSAT, in fact, some of the most critical flooding areas are the ones surrounding underpasses, which are often subject to flooding events of considerable intensity for a short period of time.* *In order to deal with this problem, two different measures have been identified: the de-sealing of the parking lots in the western area along the railway, decreasing the water run-off towards the underpass, and the construction of a detention and infiltration basin in the eastern part that could turn to be particularly useful as a temporary water storage basin.*		
TECHNICAL INFORMATION	*The design of SUDS can often be geared towards reducing the run-off and improving infiltration and rain water storage, thus reducing impacts across the flood pathways.* *Detention and infiltration basins are surface storage basins that provide flow control through attenuation of stormwater runoff and its later storage for infiltration into the subsurface soils. They are normally a vegetated depressions that are mainly dry, except during and immediately after storm events, and require a large accessible area which is relatively flat and highly pervious. They facilitate the recharge of groundwater resources and the replenishment of surface water baseflows, and remove stormwater pollutants via filtration processes occurring within the unsaturated soils beneath the system. Careful implementation is required to ensure that groundwater is not put at risk, that the site is suitable for infiltration, and that the system is not likely to clog due to the blockage of soil pores by sediments and fine silts. In general, infiltration basins should be designed to treat only small storms and, ideally, they should be designed "off-line" using a diversion structure upstream of the system.* *Especially when located along the road network, they have the multifunctional purpose of both reducing the spread of pollutants and reducing the hydraulic pressure on downstream pipe systems and waterways.* *The other planned measure, the pervious pavements, provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored before infiltration to the ground, reused, or discharged to a watercourse or other drainage system. Pavements with aggregate sub-bases can provide good water quality treatment. Pervious pavements can be made of porous material or constructed as a permeable surface – the distinction being:* • *porous pavements infiltrate water across their entire surface material, e.g. reinforced*		

grass or gravel surfaces, porous concrete and porous asphalt;

- *permeable pavements are formed of material that is itself impervious to water. The materials are laid to provide void space through the surface to the sub-base, e.g. concrete block paving specifically designed to allow surface water falling onto the surface to infiltrate through the joints or voids between the blocks into the underlying pavement structure.*

KEYWORDS

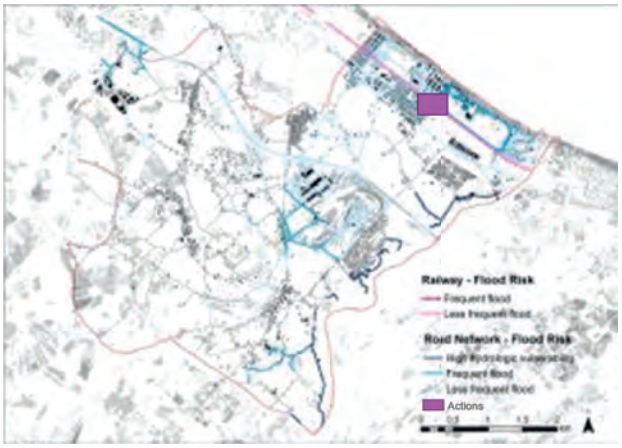
#ClimateMitigation, #WaterInfiltration, #WaterConservation

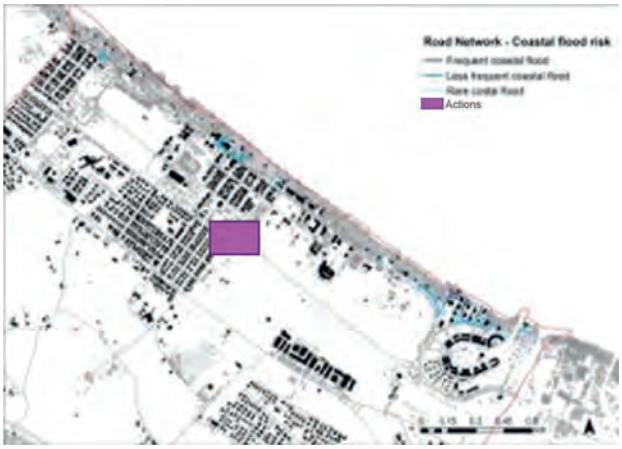
LOCATION

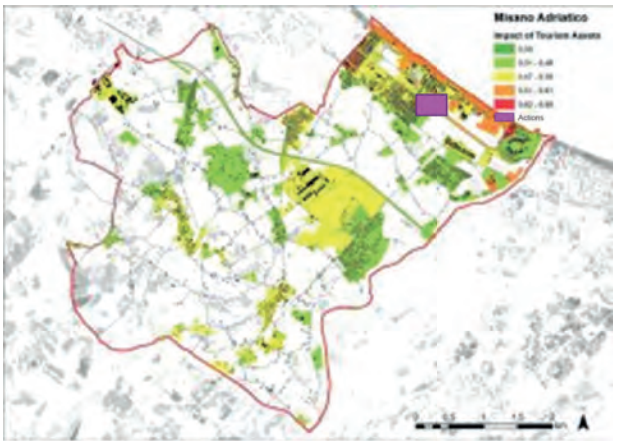
1. Permeable parking lots
Address: XMGX+P7 Misano Adriatico, Provincia di Rimini
Area: 555 m²
Geographic coordinates: 43°58'36.6"N 12°41'53.4"E (WGS 84/UTM zone 33N)

2. Detention basin
Address: XPG2+F4 Misano Adriatico, Provincia di Rimini
Area: 5 000 m²
Geographic coordinates: 43°58'34.4"N 12°42'01.0"E (WGS 84/UTM zone 33N)

MERGE WITH VULNERABILITIES







RELATED IMPACT THAT THE ACTION MITIGATES	*Impact on transport network*
PROJECT INITIATOR/PROMOTER	*Municipality of Misano Adriatico: Settore Tecnico Ambientale e Ufficio di Piano*
STAKEHOLDERS INVOLVED	*Municipality of Misano Adriatico and citizens*
BENEFICIARIES/TARGET GROUP	*Citizens and turists*
TIME OF START/IMPLEMENTATION	*365 days*

INDICATORS OF EVALUATION	*Impermeability ratio [m^2]* *Collected rain water [m^3/year]* *Legal feasibility [low-medium-high]* *Procedural time [days]* *People who will benefit from the actions [no. of people]* *Km – upgraded infrastructure [km]* *Implementation cost [€]*
A-ENVIRONMENTAL	1. *Impermeability ratio: 550 m^2* 2. *Collected rain water: 2,400 m^3/year*
B-LEGAL, INSTITUTIONAL & PERCEPTIONAL	3. *Legal feasibility: high* 4. *Procedural time: 810 days (from 10/2019 to 12/2012)*
C-SOCIAL	5. *People who will benefit from the actions: 3,060* 6. *Km - upgraded infrastructure: 0.87 km*
D-ECONOMIC	7. *Implementation cost: 55,000 € - permeable parking lots and 500,000 € - detention basin*

6.2. DSS: action evaluation

An indispensable factor in the prevention or reduction of the aforementioned impacts of climate change, is the ability of the public sector to be organized in the field of data, information and their integrated elaboration. In this regard, the iDEAL project aims to support local public administrations to make appropriate decisions related to climate adaptation measures and to develop coherent and tailored climate adaptation plans.

This overall objective will be achieved through a shared process of knowledge construction and the implementation of a common Decision Support System. The latter is an interactive system that supports decision-making activities. Through different criteria, datasheets and various parameters, it is able to analyse a set of information that supports the administration in the governance process. The Decision Support System empowers informed and knowledge-based decisions that are based on data storage linked to geographical location, evaluation of different alternatives and scenarios as well as their socio-economic impacts.

6.2.1. DSS: results of actions

In order to quantify the results obtained by the DSS, meaning, a *good* result (value>=0.6), an *acceptable* result (value>=0.3) or an *unacceptable* one (value<0.3), for each indicator two thresholds were chosen. Subsequently, each aspect of indicators (the environmental, social, economic, legal-institutional-perceptual, and the adaptation-mitigation-resilience) has been given a weight. The latter measures the importance of these aspects/set of objectives, and criteria set to achieve the main goal. When defining different weights, a priority was given to the environmental and social aspect, rather than to the economic and legal one. The sum of the weights associated to the five aspects should be 1. More precisely, the weights were allocated as follows:

Environmental aspect is weighted **0.4**
Social aspect is weighted **0.3**
Economic aspect is weighted **0.1**
Legal, institutional and perceptual aspect is weighted **0.1**
Adaptation, mitigation and resilience aspect is weighted **0.1**

Below is explained the appraisal for each of the actions obtained from the DSS.

<u>Action 1: Reduction of cooling demand in tourist accommodations</u>
Location: 990050000008
Result: Acceptable
The result obtained is ‘acceptable’, since the indicators for the main aspects (environmental and social) resulted as acceptable. Although the rest of indicators have resulted either good (legal-institutional-perceptual and adaptation-mitigation-resilience) or unacceptable (economic), due to the distributed weights, the main result emerged was acceptable.

<u>Action 2: Improve the outdoor microclimate of tourist accommodations</u>
Location: 990050000001
Result: Acceptable
Also this action emerged as ‘acceptable’. All four aspects of indicators resulted as acceptable, unlike the adaptation-mitigation-resilience which resulted as ‘good’.

Action 3: Enhancing the permeability of big parking lots
Location: 990050000001
Result: Good
The two main aspects have resulted as 'good' (environmental) and 'acceptable' (social). However, most of the other aspects have resulted as 'good' and since the weight of the environmental aspect is higher, the main result is 'good' as well.

Action 4: Water savings in camping sites and beach facilities
Location: 990050000008
990050000011
Result: Good
Again, the two main aspects have resulted as 'good' (environmental) and 'acceptable' (social) and the much rest is good, consequently the main result is 'good'.

Action 5: NBS as traffic calming solutions
Location: 990050000005
Result: Acceptable
The entire set of objectives resulted as acceptable. Indeed, all the indicators chosen for each objective/aspect emerged as acceptable too.

Action 6: Cycle paths adapting to climate change/ Resilient cycle paths
Location: 990050000030
990050000079
Result: Good
The majority of aspects (legal-institutional-perceptional and adaptation-mitigation-resilience), including the main ones (environmental and social) have resulted as 'good'. Only the economic one is 'acceptable'. Consequently, the action is classified as a 'good' one.

Action 7: Greening the seafront
Location: 990050000008
990050000079
Result: Good
Same situation as for the previous action. Only the economic aspect resulted as acceptable, while the rest are 'good'. So also this action can be classified as 'good'.

Action 8: Urban forestation
Location: 990050000021
Result: Good
The environmental aspect has resulted as 'good', the social aspect as 'acceptable', the economic and legal, institutional and perceptual aspect as 'good', while the adaptation, mitigation and resilience as 'acceptable'. This composition of results generates an overall evaluation which is 'good'.

Action 9: SuDS along transport infrastructures

Location: 990050000060
Result: Acceptable
The main two aspects have resulted 'acceptable', while others are either good or unacceptable. The indicator of the latter, the implementation cost, has exceeded the maximum threshold set in the DSS. Generally, the cost of SuDS is high. This case is no exception, because it comprises quite a large area of intervention. Yet, the action resulted as 'acceptable'.

6.2.2. DSS: the spatial impact of actions

The quantified results obtained from the DSS were mapped for each action in relation to climate change impacts. In order to represent the DSS results with the respective census areas on each impact map, first of all, a re-classification of impact values was needed. These values were grouped into 3 classes representing three levels of impact (low, medium and high impact). For each of intervals/classes the average values were calculated, representing the 'good', 'acceptable' and 'unacceptable' action. These average values were subsequently added as an update of the map matrix. But, prior to this, the initial impact values of census areas were exported in tabular form from GIS software. On the respective census areas, the impact values were modified to the average value based on the DSS results whether the action resulted as good, acceptable or unacceptable. The updated table was imported on GIS to generate the updated map matrix. The latter clearly represents the ability of actions to respond (adapt) to the climate change impacts in Misano Adriatico.

Below are the tables that summarize the values and method described above.

Table 5. Average values taken for each impact (Municipality of Misano, 2019)

IMPACT ON TOURISM SECTOR				
impact	threshold min	threshold max	average value	result
low	0	0.25	**0.125**	good
medium	0.25	0.5	**0.375**	acceptable
high	0.5	1	**0.75**	unacceptable

IMPACT ON TRANSPORTATION NETWORK				
impact	threshold min	threshold max	average value	result
low	0	0.46	**0.23**	good
medium	0.46	0.51	**0.485**	acceptable
high	0.51	0.95	**0.73**	unacceptable

INCEASED ENERGY DEMAND FOR COOLING				
impact	threshold min	threshold max	average value	result
low	-0.72	-0.13	**-0.425**	good
medium	-0.13	0.56	**0.215**	acceptable
high	0.56	0.87	**0.715**	unacceptable

For each action the climate change impacts were selected based on the nature of interventions foreseen to be implemented. The largest impact of the chosen actions was seen to be in relation to the Tourism Sector and to the Transportation Network. In the first one, the map of 'impact on tourism sector', after the reclassification of the impact levels (*see Table 5.)* areas with higher impact are mostly concentrated along the seafront, while those with medium and low impact are dispersed throughout the city.

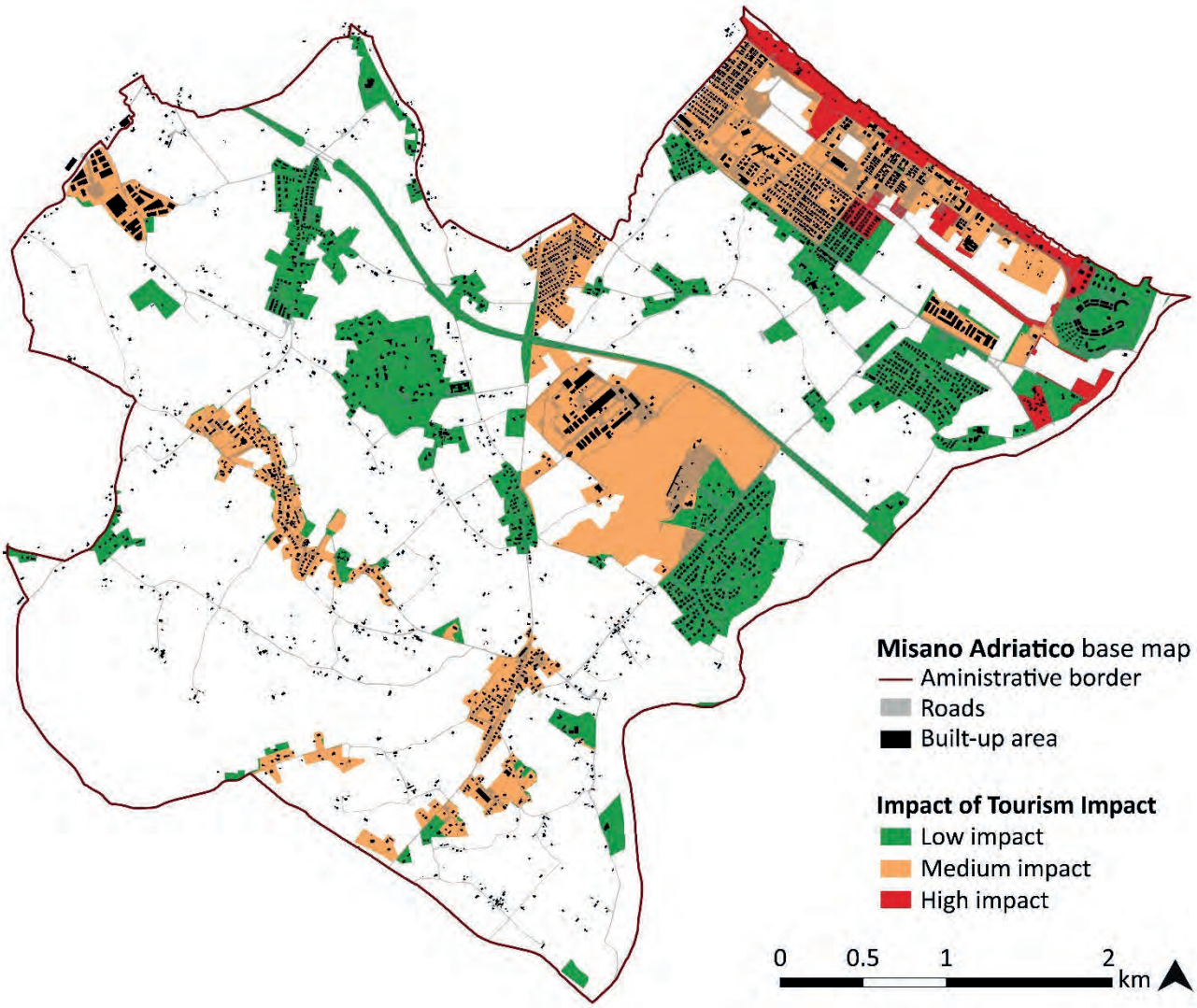


Figure 16. The map of "Impact on Tourism Sector", after the reclassification of impact values (Munic. of Misano, 2019)

Regarding the 'Impact on Tourism Sector', the actions that have the highest positive impact on the current situation, are the action 6 (cycle paths adapting to climate change) and the action 7 (greening the seafront). These two actions would improve the respective areas since the planned interventions are able to lower the high and medium impact. Also the action 4 (water savings in camping sites and beach facilities), which resulted as 'good', is able to lower the medium impact of the camping area. Lastly, the action 2 (Improve the outdoor microclimate of tourist accommodations), which resulted as 'acceptable', maintains the current impact, but undoubtedly contributes towards improving as well.

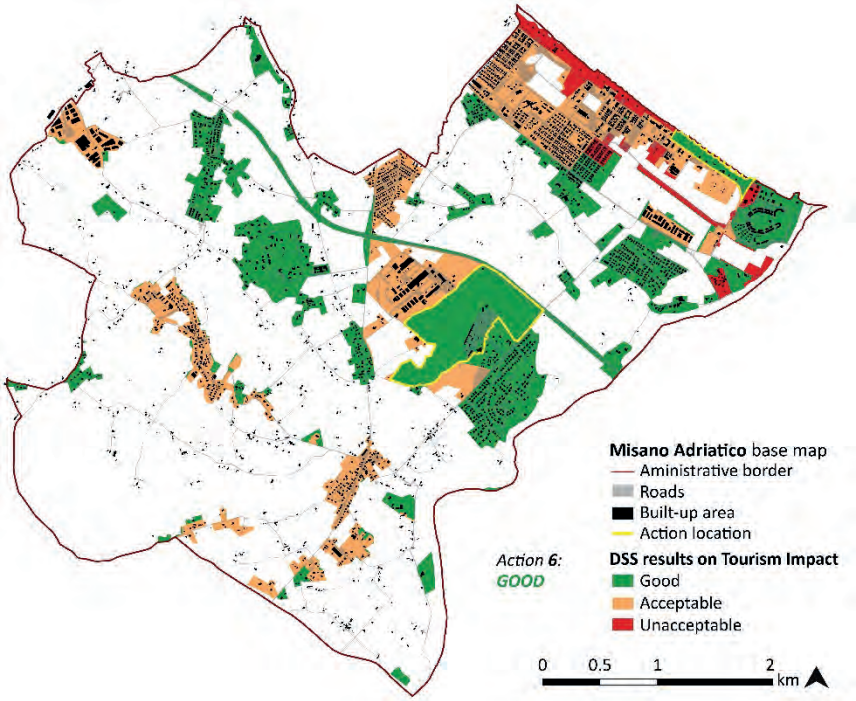


Figure 17. DSS results on Tourism Impact for the Action 6 – 'Good' (Municipality of Misano, 2019)

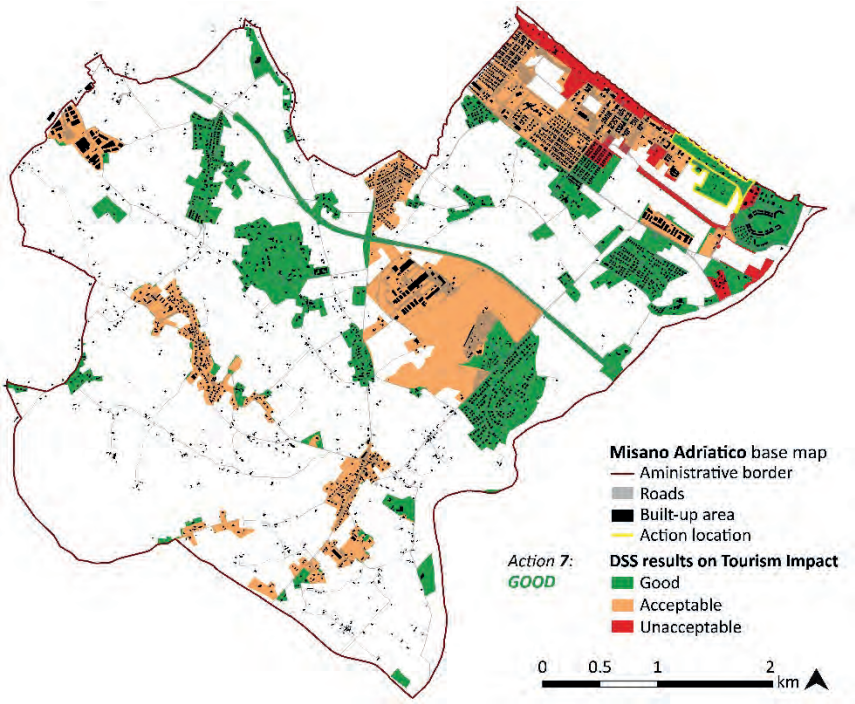


Figure 18. DSS results on Tourism Impact for the Action 7 – 'Good' (Municipality of Misano, 2019)

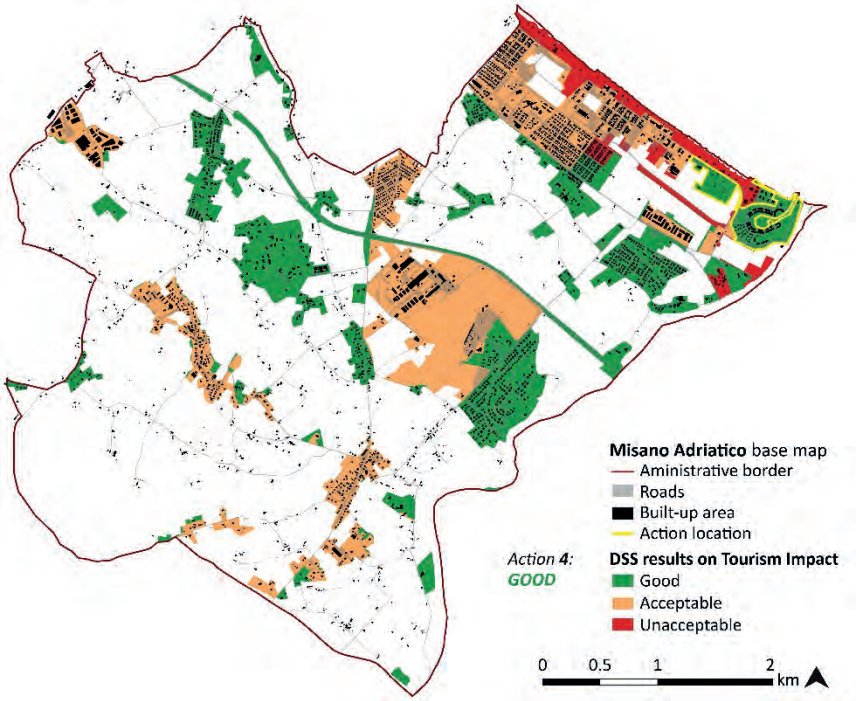


Figure 19. DSS results on Tourism Impact for the Action 4 – 'Good' (Municipality of Misano, 2019)

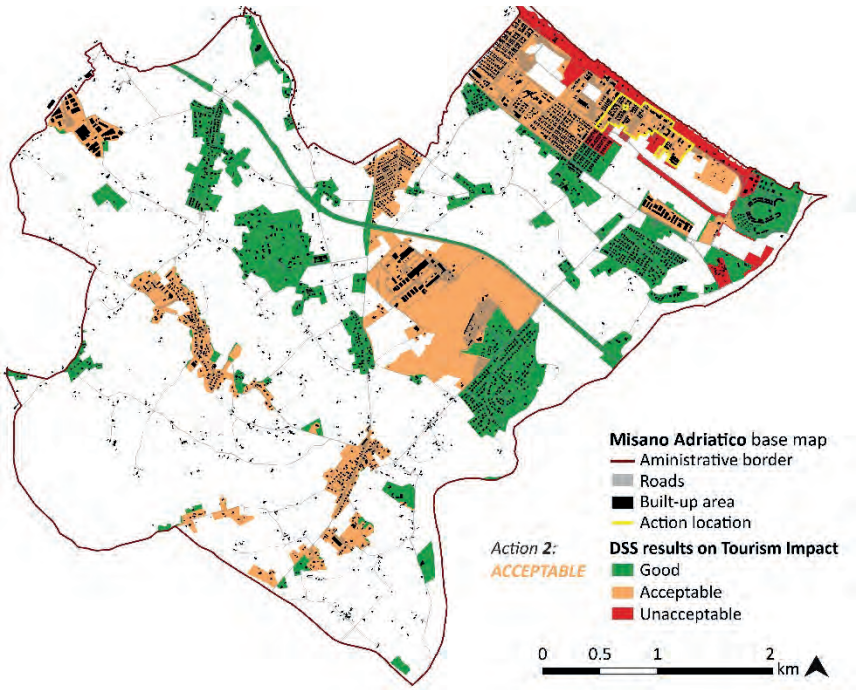


Figure 20. DSS results on Tourism Impact for the Action 2 – 'Acceptable' (Municipality of Misano, 2019)

The map of "Impact on transportation network" confirms the current flooding issues facing the city of Misano (*see fig. 21)*. The areas with the highest impact/risk are located along the sea front while those with medium impact/risk are located along the river Conca, in the south-east part of the city.

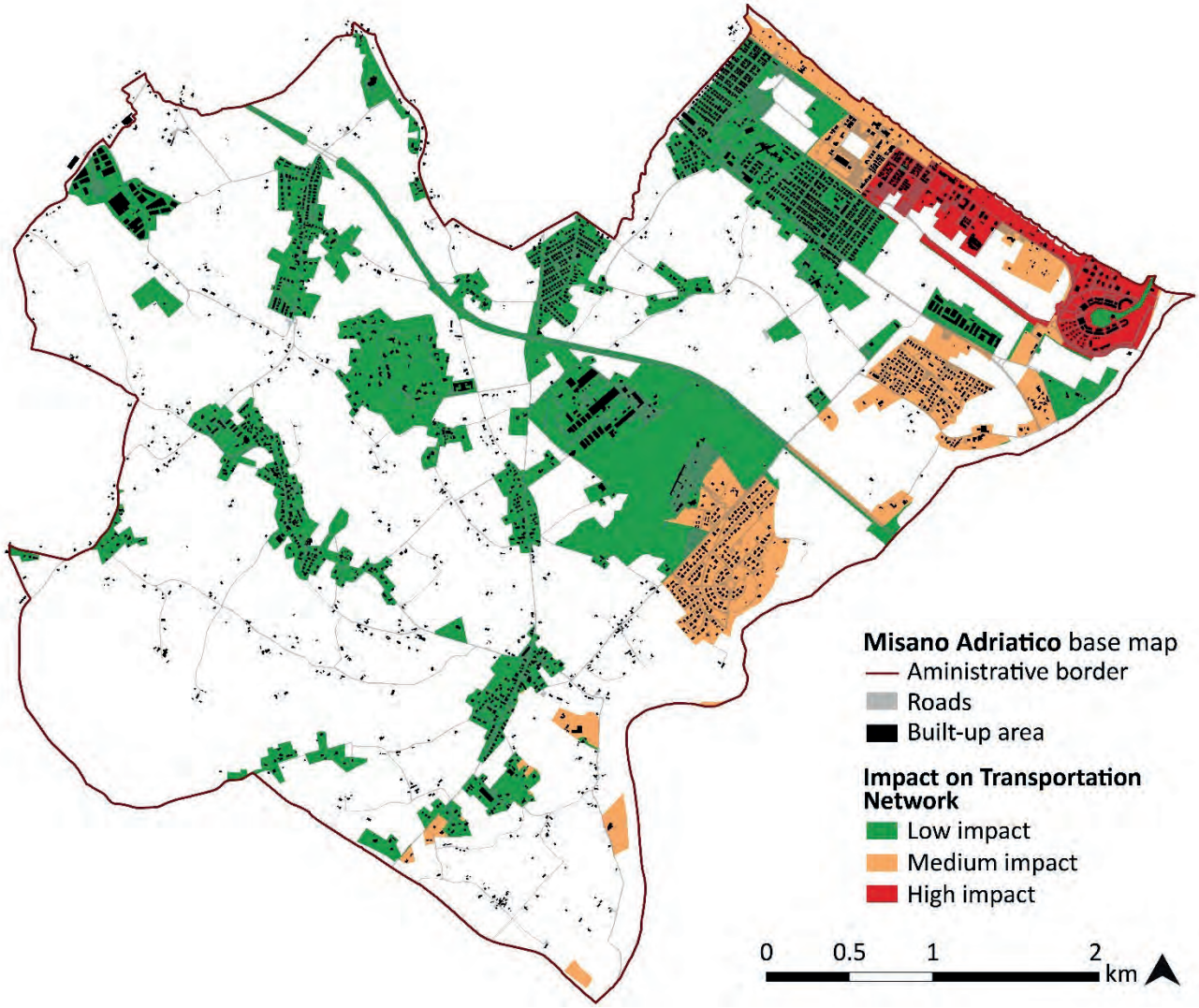


Figure 21. The map of "Impact on Tourism Sector", after the reclassification of impact values (Munic. of Misano, 2019)

The two aforementioned actions (action 6 and 7), have the highest positive impact also on Transportation Network. The action 7 is able to reduce the high and medium impact into the lowest one, and together with other two actions, action 6 and action 3 (enhancing the permeability of big parking lots), to improve the area along the seafront, always lowering the impact from high to low. While as for the 'acceptable' actions, the action 5 (NBS as traffic calming solutions) maintains the current impact because, the area on which the action is located, is a newly revitalised area. Still, the Nature-based solutions would improve the water management in that area.

The action 9 (SUDS along transport infrastructures), though 'acceptable' one, improves the respective census area because it moderates the impact from high to medium.

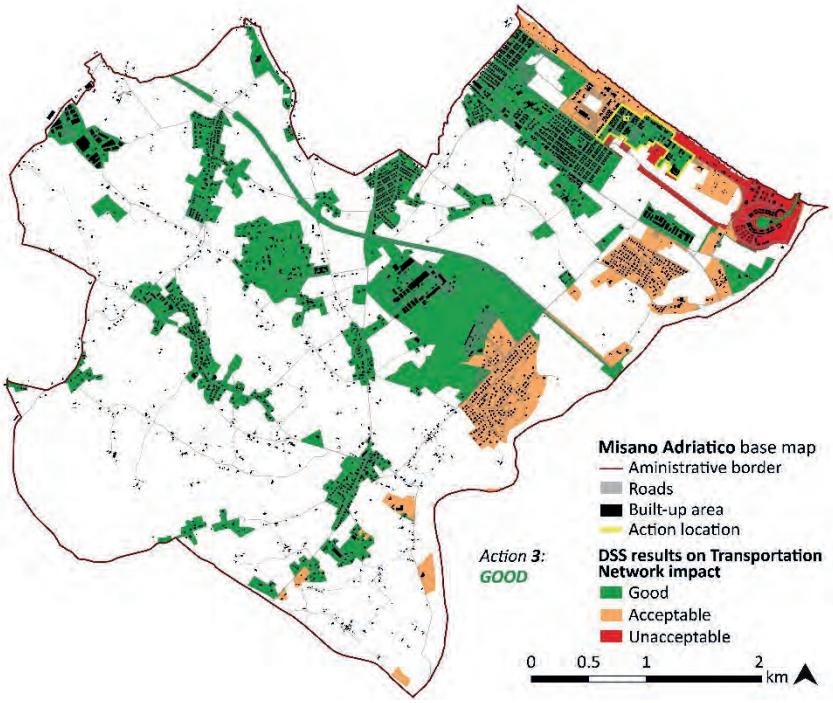


Figure 22. DSS results on Transportation Network Impact for the Action 3 – 'Good' (Municipality of Misano, 2019)

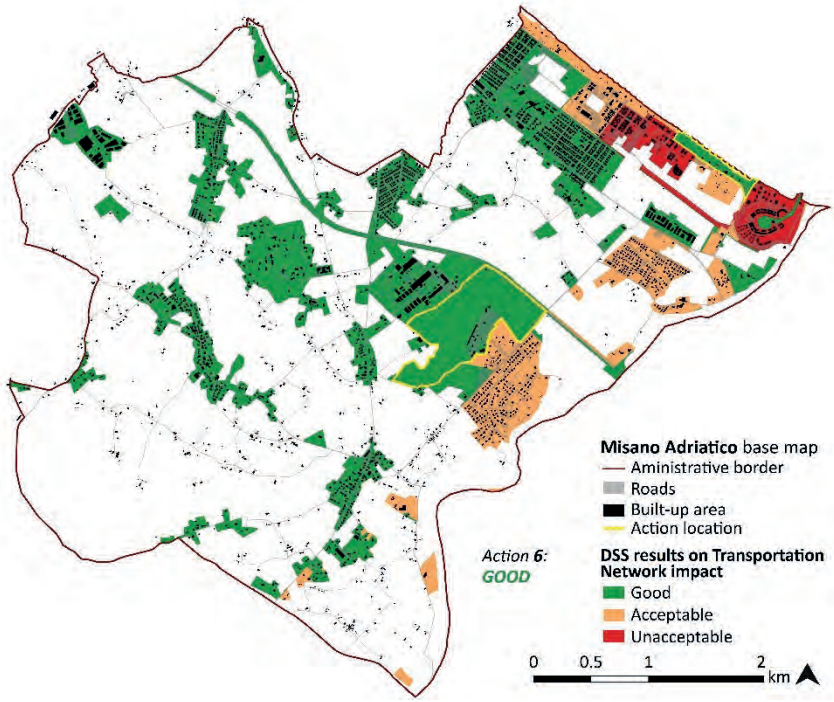


Figure 23. DSS results on Transportation Network Impact for the Action 6 – 'Good' (Municipality of Misano, 2019)

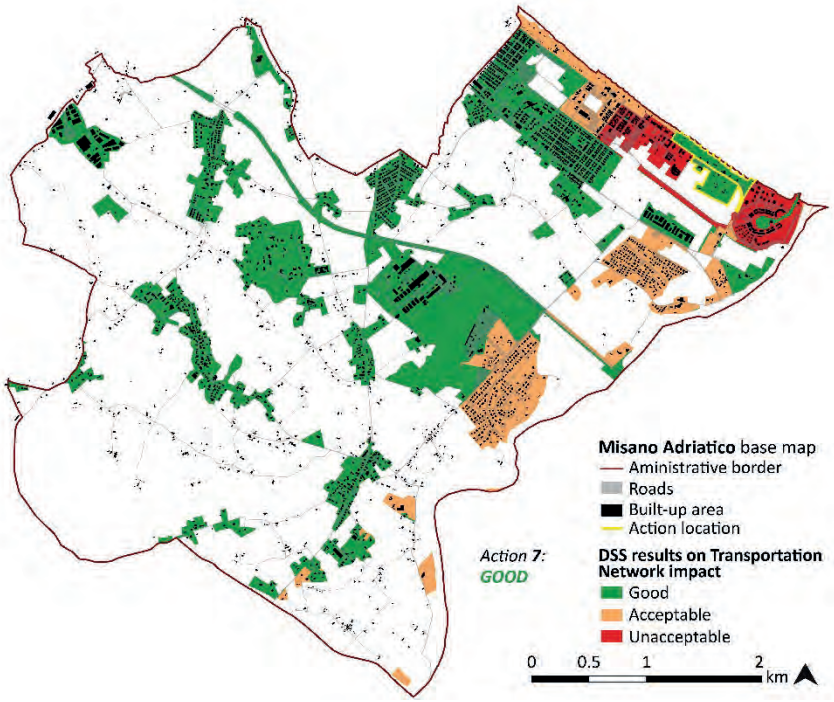


Figure 24. DSS results on Transportation Network Impact for the Action 7 – 'Good' (Municipality of Misano, 2019)

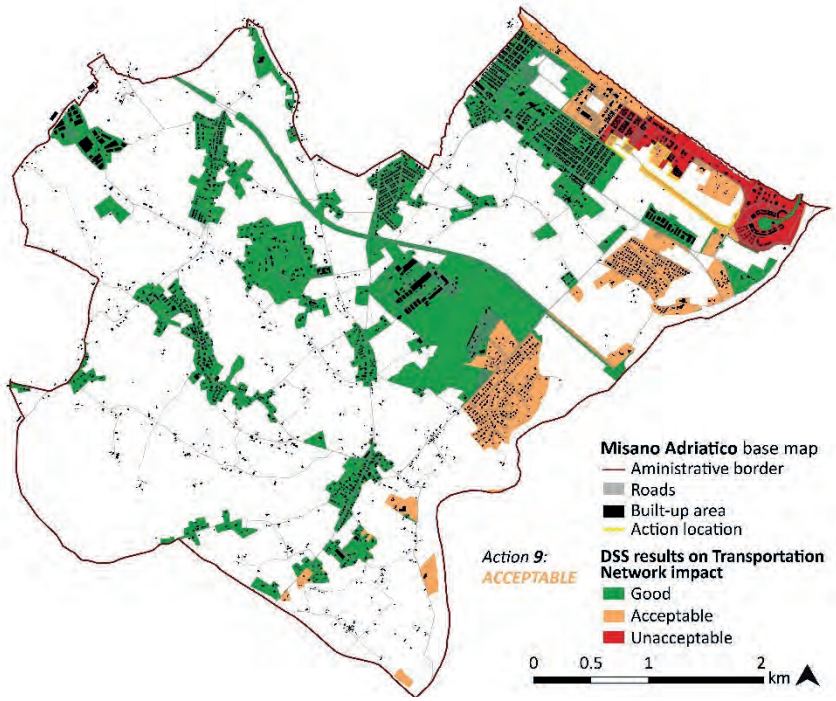


Figure 25. DSS results on Transportation Network Impact for the Action 9 – 'Acceptable' (Munic. of Misano, 2019)

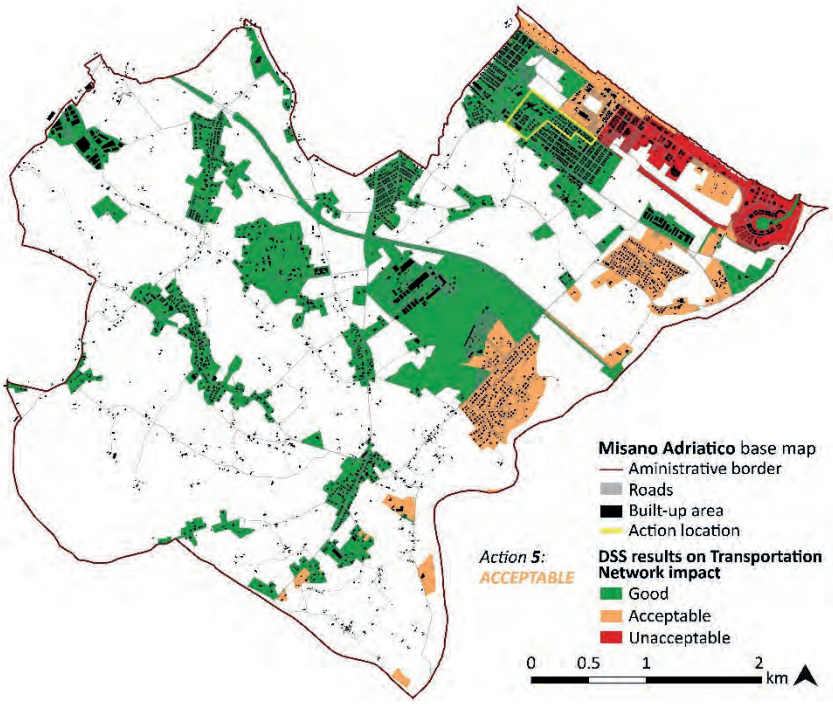


Figure 26. DSS results on Transportation Network Impact for the Action 5 – 'Acceptable' (Municipality of Misano, 2019)

As it has been pointed out several times that the tourism sector is one of the most important factors in the urban and economic development of Misano, the energy transition process is of equal importance. Although the energy transition is a long-term change, any minor action will drive a more significant one. The map of "Increased Energy Demand for Cooling" (*see fig.27)* shows that in most of Misano areas, the energy transition is highly necessary. The action 1 (reduction of cooling demand in tourist accommodations) resulted as "acceptable" because was located in a census area that had already a medium impact, not a high one. Still, it will serve as a good practice to start a more widespread process.

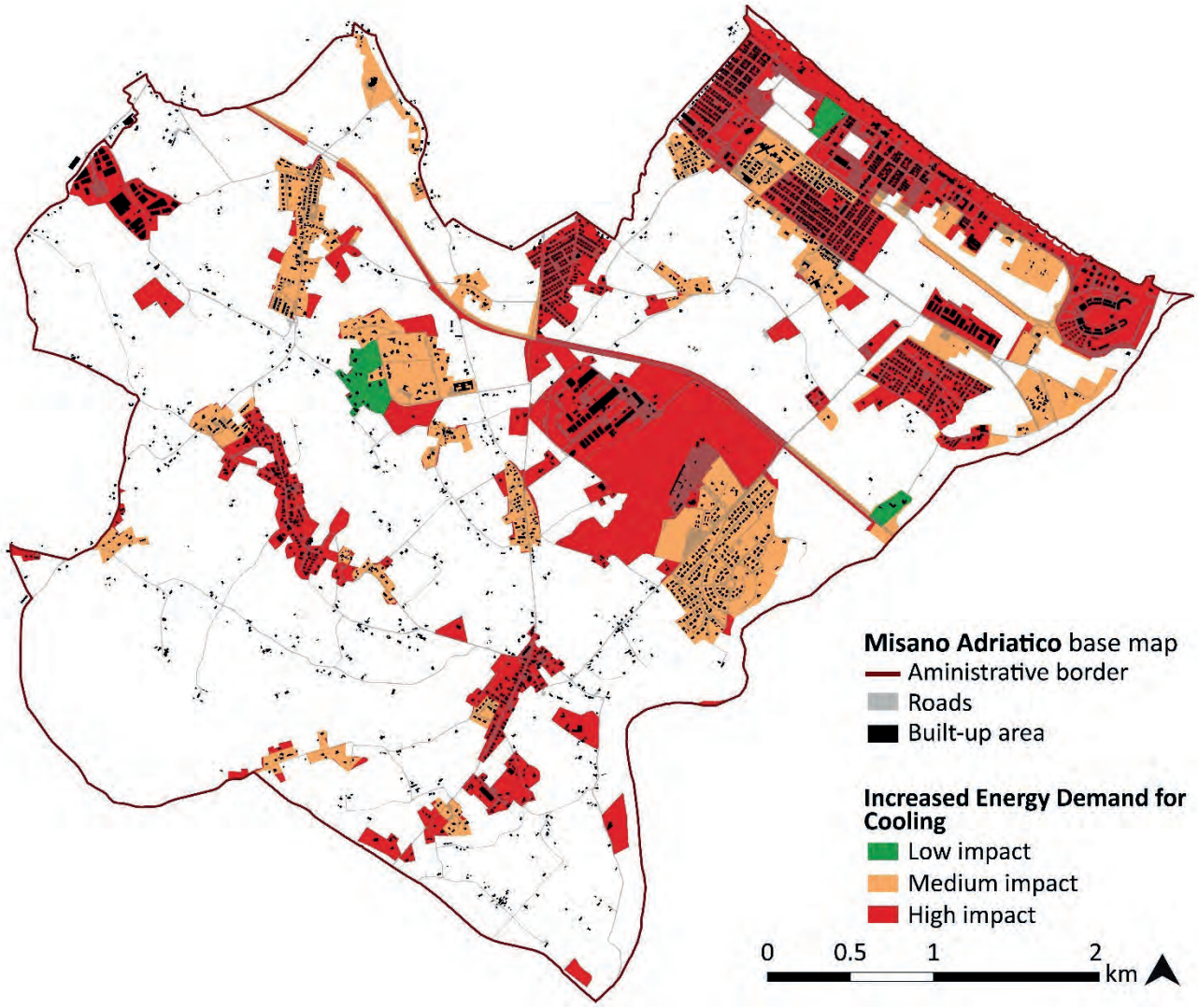


Figure 27. The map of "Impact on Tourism Sector", after the reclassification of impact values (Munic. of Misano, 2019)

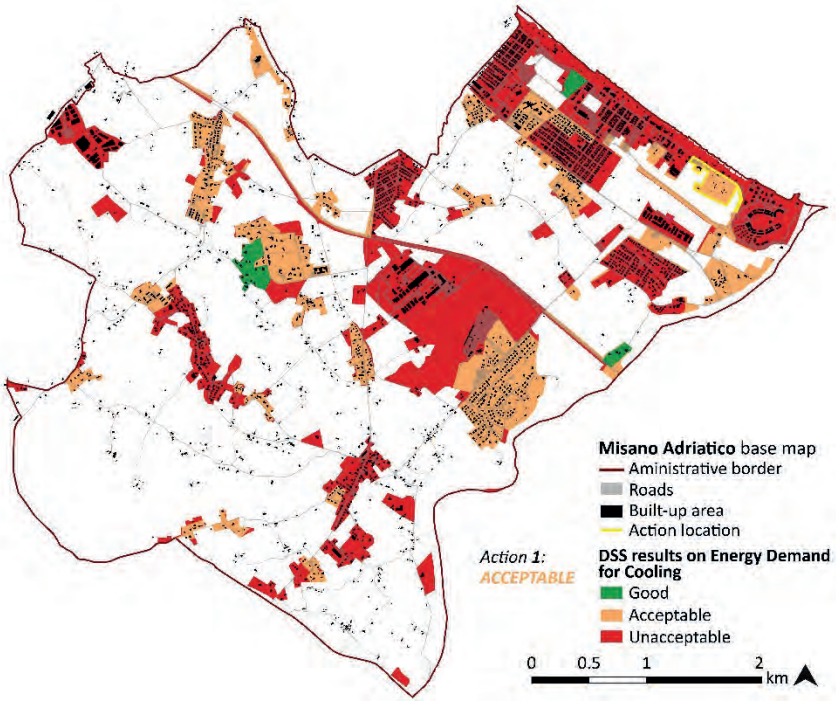


Figure 28. DSS results on Increased Energy Demand for Cooling for the Action 1 – 'Acceptable' (Munic. of Misano, 2019)

6.3. Actions selected for the implementation

The results obtained from the DSS have proven the coherence between the planning tools and the proposed actions. Indeed, the legal-institutional-perceptual aspect in 6 out of 8 actions has emerged as a 'good' action, whereas the other two are 'acceptable'. The same result applies to the adaptation-mitigation-resilience aspect, although in different actions.

The environmental aspect, the one which has been evaluated as the most important one, on all actions, have resulted either good (55% of the actions) or acceptable (45%). While, the social one, on nearly 80% of the actions has resulted 'acceptable' and on the rest as 'good'. Regarding the remaining aspect, the economic one, only two actions, action 1 and action 9, have resulted as 'unacceptable' because of the high cost of needed interventions. The remaining six are 'acceptable'. The action 8 has resulted as the most feasible one. Overall, based on the DSS results, the actions proposed, perform 'good' 22 times, 'acceptable' 21 times and 'unacceptable' 2 times.

In Misano Adriatico, as per above, the actions assessed as 'good' are 5, while the rest are 'acceptable' actions:

1. *Action 3: Enhancing the permeability of big parking lots*
2. *Action 4: Water savings in camping sites and beach facilities*
3. *Action 6: Cycle paths adapting to climate change/ Resilient cycle paths*
4. *Action 7: Greening the seafront, and*
5. *Action 8: Urban forestation*

7. MONITORING SYSTEM

The monitoring systems are useful evaluation tools based on the effects foreseen by a specific project. These systems allow us to consider how the environmental variables vary, based on what has been achieved. Moreover, the monitoring phases allow evaluating, from a quantitative point of view, the effectiveness of the single-action concerning the chosen impacts, whose territory is to be adapted to the negative effects.

In the case of the iDEAL project, it was decided to provide the PPs with a monitoring system specific to their set of identified actions. The monitoring system's principle is based on the same algorithms used in the GIS environment to provide the initial impact analysis and it uses an easy graphic interface - carried out in excel spreadsheets – to show the results according to the five criteria used for the assessment of the overall action:

- Environmental
- Social
- Economic
- Legal, institutional and perceptual
- Adaptation, mitigation and resilience

This system, having been uploaded – at the moment - with the expected results used for the assessment of the iDEAL action, will be updated after the partial or complete implementation of each action, in order to monitor the effective implementation.

BIBLIOGRAPHY

Armaroli, C., Ciavola, P., Perini, L., Calabrese, L., Lorito, S., Valentini, A., & Masina, M. (2011). Critical storm thresholds for significant morphological changes and damage along the Emilia-Romagna coastline, Italy. *Geomorphology*, 34-51.

iDEAL. (2018). *WP4 Deliverable 4.1.1.: A report on questionnaires and intervies* . iDEAL.

IUAV. (2018). *Impacts for Vulnerability Assessment.* iDEAL.

Municipality of Misano. (2019). Own elaboration for the iDEAL project. iDEAL.

Municipality of Misano Adriatico. (2016). *Piano Strutturale Comunale: Relazione Generale del Quadro Conoscitivo.* Misano Adriatico: Municipality of Misano Adriatico.

Municipality of Misano Adriatico. (2019). *Sostenibilita' ambientale e contrasto al cambiamento climatico: il consiglio comunale approva l'adesione al piano di azione per l'energia sostenibile e il clima (PAESC)*. Retrieved 05 13, 2019, from Misano: http://www.misano.org/?IDC=90&ID=27165&page=2