2014 - 2020 Interreg V-A
Italy - Croatia CBC Programme
Call for proposal 2017 Standard+

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 3.3 MONITORING SYSTEM

Best Practices Catalogue

FINAL Version-Public
September 2019

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Index

Index 1

1. Introduction 3

2. Analysis of BP 4

3. BP Catalogue 6

3.1 Sector: Agriculture 6

3.1.1. LIFE + Climagri 6

3.2 Sector: Hydrology and water resources 8

3.2.1Torrente Agogna River Contract 8

3.2.2 Communal cisterns 10

3.2.3 Recycled water TDR 11

3.2.4 Irvine Ranch Water District 12

3.2.5 Stormwater Management System 13

3.2.6 Ecosystem-based coastal defence 15

3.2.7 Non-structural measures 17

3.2.8. Rainwater saving and use in households 18

3.3 Sector: Coasts 20

3.3.1. Nigeria Erosion and Watershed Management Project (NEWMAP) 20

3.3.2 Biomares - Restoration and Management of Biodiversity in the Marine Park Site Arrábida-Espichel 22

3.3.3 Project and intervention for the littoral current regularisation in Viserba (Rimini) 24

3.3.4 Recovery and proper use of the natural coastal area (dunes) 26

3.3.5. The Deltaplan 28

3.3.6 The OBREC (Overtopping Breakwater for Energy Conversion) 29

3.4 Sector: Energy 31

3.4.1. Energy renovation of the Karlovac General Hospital, Karlovac 31

3.4.2. Energy renovation of the multi apartment building, Sjenjak 101, Osijek 33

3.4.3. Energy renovation of the Primary school Josip Zorić, Dugo Selo 34

3.4.4. Energy renovation of the Preschool 'Turnić', Rijeka 35
3.4.5. Cool Roofs: Protecting Local Communities and Saving Energy 36
3.4.6. Kingsmill Hospital 38
3.4.7 Kindergarten (nursery) Pjerina Verbanac (KPV) 39
3.4.8. Hotel Parentium 40
3.4.9. Berlin Biotope Area Factor 41
3.4.10. Vrijburcht multipurpose living-and-working complex 43
3.4.11. IMDEA ENERGY building 45
3.5 Sector: Socio-Economic 47
3.5.1. Integrating adaptation in the design of the metro of Copenhagen 47
3.5.2. Talgarth Road Green Corridor 49
3.5.3. Scandic Hotels - towards climate neutrality 50
3.5.4. Heifer Parking Plaza 52
3.6 Sector: Ecosystems and environment 54
3.6.1 Conservation of the last italian peninsular population of Tetrax tetrax 54
4. References 56

1. Introduction

In the project iDEAL the identification of the Best Practice (BP) plays a very important role. The selection of BPs aims at learning from others' experience of demonstrated success. BP catalogue is part of the broader process of benchmarking: comparison method designed to identify, understand and adapt particularly significant practices (recognized as a best practice or practice with a high performance) implemented by others, in order to improve each pilot area's performance or business.

The project iDEAL allows the creation of a BP catalogue, that is a collection of BPs selected by each Partners (PP). This catalogue is regarded as an essential part of the Decision Support System (DSS), and with the whole DSS, it contributes to provide decisionmakers a support to discover new possibilities and in case copy or implement innovative actions.

Having a BP catalogue means to evaluate and share experiences with those who have faced, worked on and solved similar problems in the past. The assumption of this research process is the widespread collection and the continuous exchange of information, between partners, on the knowledge of: "what others did", the method they used, the difficulties they encountered and solutions enabled.

By studying and comparing different realities that have characteristics of excellence, the University IUAV of Venice intends to acquire and capitalize suggestions and examples to be transferred to iDEAL partners and their main stakeholders.

Considering the different contexts in which the PP are, and the limits imposed by the different language used by PP, IUAV has proposed a concise but inclusive BP format. It was developed in order to clarify key issues and main lessons learnt, and also to simplify the BPs' reading and understanding. The format has been based on several questions and to underline the key elements of each BP's success. It considers the ingredients and main aspects developed, as well as conflicts or barriers encountered. Specifically, it focuses on several aspect as: governance and government; relevance in local development aspects, integration and synergies of different environmental-social-economic aspects; effective participation process and synergies with economic actors, or stakeholders.

There will also be a specific chapter that refers to external BPs result of the work of different networks that collected, during the years, good practices around the world: Covenant of Mayors, C40, 100RC, ecc

2. Analysis of BP

IDEAL Partners have selected 32 BPs (see tab. 2.1).

Partner	Number of BP
City of Dubrovnik, Development agency DURA	8
Regional Natural Park "Coastal dunes from Torre Canne to Torre San Leonardo"	4
IRENA – Istrian regional energy agency L.T.D.	12
Municipality of Misano Adriatico	4
Municipality of Pesaro	4

Tab. 2. 1 BPs per Partner

Best Practices do not have all the same target and it is possible to have more than one. The BPs presented by each local Partner (PP) are attributable to the 4 types of impacts. These were previously chosen by each PP, from the complete list proposed.

The BP was then brought back to the 6 impact sectors (see Table 2.2) and systemized according to type, in order to make consultation of this "BP catalogue" easy and result-oriented and to understand the synergies between different aspects that it is possible to be find in the BPs.

BP's distribution is not homogeneous among the 6 sectors and suggests different partner's perception. The main impact areas are Energy (11), Hydrology and water resources (8) and Coasts (6) which are also cross-border. These sectors are considerate from the Italian (3) and Croatian (2) Partner as more important than others like Socio-economic (4), Agriculture (1) and Ecosystem and Environment (1).

Following the complete list of the BP presented (32), sorted by sector of impacts area organized using topics and keywords.

Sector	Impacts[b]
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 coastal human infrastructures
	Damage to coastal 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

Tab. 2. 2 BPs per Partner

3. BP Catalogue

3.1 Sector: Agriculture

3.1.1. LIFE + Climagri

GEOGRAPHICAL LOCATION: Spain, Portugal, Greece, Italy
KEYWORDS: Dry-farming, Adapting crops, extensive crops
RELATED IMPACT: VARIATION IN CROP YELD
PROJECT INITIATOR/PROMOTER: Ministry of Agriculture, Food and Environment – Spain
STAKEHOLDERS INVOLVED:

- Spanish Association Conservation Agriculture Live Soils (coordinator);
- European Federation of Conservation Agriculture (ECAF) (partner);
- Andalusian Institute for Research and Training in Agriculture, Fisheries, Food and Ecological Production (IFAPA) (partner);
- University of Cordoba (partner);
- Agrarian Association of Young Farmers of Seville (ASAJA Sevilla) (partner);

BENEFICIARIES/TARGET GROUP: The European Network of Demonstrative Farms
TIME OF IMPLEMENTATION: n.a.
COSTS: n.a.
GENERAL DESCRIPTION: Demonstrate performances of management systems based on the integration of mitigation and adaptation measures to climate change in irrigated crops of the Mediterranean Basin.
Verify globally the impact of the joint mitigation-adaptation strategies adopted through the creation of a European Network of Demonstration Farms (REFD).
Establish a protocol that, based on the identified mitigation-adaptation strategies, allows technical recommendations for their adoption and monitoring of their implementation, also serving to verify the application of environmental measures and other programs related to climate change.
Disseminate and transfer the acquired experience and management philosophy to other areas with similar circumstances, enhancing the communication channels between research, administration and farmers and technicians.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Implementation, on a pilot scale, of a management system which brings together good agricultural practices that mitigate climate change and that favour the adaptation of the crop to its effects. For this, the use of two demonstration scenarios is contemplated, one to verify the mitigating and adaptive aptitude of the system under current climatic conditions (demonstration farm) and another to verify these aptitudes in future climatic conditions (demonstration trials in greenhouses).
Establishment, on a global scale, of a European Network of Demonstration Farms, in which the Good Agricultural Practices implemented at pilot scale are put into practice.
Development of a GIS showing information about the European Network of Demonstrative Farms, related to agrarian practices implemented, the evolution in mitigation and adaptation to climate change provided by them, applicable European regulations, etc.
Follow-up of each campaign, both on a pilot scale and on a global scale, of the mitigating effects of the Good Agricultural Practices used, as well as the capacity to adapt to climate change in those crops in which these practices have been implemented.Realization of a study of the socioeconomic impact in the area of action as a consequence of the development of the actions of the project. Realization of face-to-face courses, on-line courses and field days for various agents of the agricultural sector.

Implementation of dissemination and communication actions (participation in various forums of technical and scientific scope, publication of publications and development of multimedia material).
Realization of a European workshop showing the results obtained throughout the project and the conclusions reached at the end of it.
WHY IS IT A BEST PRACTICE FOR YOU? This project allows to implement cultivation practices in line with the local vocation, through the training of operators, the use of local varieties at risk of extinction and the creation of a transnational network of companies
IDENTIFY POSITIVE ASPECTS: Creation of a network of farms using dry-farming methods
Creation of actions for the recovery of ancient varieties in dry-farming
Implementation of measures to improve the training of entrepreneurs involved in the process
IDENTIFY NEGATIVE ASPECTS: Project linked to European funds
Different vocations of the territory in the various European partner areas
Lack of operators and farmers who want to experiment with new farming practices
INNOVATIVE ASPECTS: Use of advanced technologies (decision support systems, precision agriculture, fleet management).
Implementation of optimal and deficit irrigation strategies.
Joint consideration of agronomic, technical and economic practices optimized for the improvement of irrigation water management. Implantation of multifunctional margins and retention structures.
INFORMATION SOURCES:
www.climagri.eu

3.2 Sector: Hydrology and water resources

3.2.1 Torrente Agogna River Contract

GEOGRAPHICAL LOCATION: Piemonte, Italy
KEYWORDS: River, participation, governance
RELATED IMPACT: Increase of drought
PROJECT INITIATOR/PROMOTER: Department of territorial and urban planning of Novara
STAKEHOLDERS INVOLVED: Piemonte Region, ATO n°1, Municipalities of the basin area, Irrigation Association Est Sesia, Agricultural Associations (CIA, Unione Agricoltori)
BENEFICIARIES/TARGET GROUP: Municipalities, farmers, citizens
TIME OF IMPLEMENTATION: Plan development: 3 years, Contract signing: 6 years
COSTS: n.a.
GENERAL DESCRIPTION: The "Torrente Agogna River Contract" is a negotiated planning tool for an integrated management of the river basin, aimed at protecting and enhancing it.
The "Contract" is set up as a voluntary agreement between all the public and private parties concerned, aimed at defining the objectives and strategies of intervention to be activated as well as establishing the mutual commitments and roles for its implementation.
The objective is that to improve the overall ecological status of the river basin is integrated with the additional objectives of reducing hydrogeological risk, enhancing the value of water resources, and using the watercourse.
The Action Plan is made up of various action lines to achieve the specific objectives on various scales:
- Actions at river basin scale: actions to be implemented on a large area in order to improve the arrangement and organization of the territory.
- Actions at scale of the hydrographic tract: interventions that, even if they can be carried out at the scale of the stretch, must be consistent with the planning and the actions implemented at the basin scale.
- Actions on a specific scale: pilot actions of particular environmental value, to be implemented in the short or medium term.
- Actions for the continuous monitoring of the state of implementation of the commitments made by the subscribers
The structure for the implementation of the Contract consists of:
- Assembly of the Basin, a body participated by all the subjects that have direct or indirect interests related to the river basin, and which has the task of addressing, validating and approving the work of the Control Room and the Technical Table as well as the disclosure of the choices adopted ;
- The Control Room, a body composed of the public institutions involved, which has the task of supervising the decision-making process and of validating the works of the Technical Table;
- The Technical Table, technical body for the implementation of the Plan.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: 1. Activation: definition of the working methodology and structuring of the organs and instruments for participation through the approval of the "Decalogo per l'Agogna" and the signing of the "Memorandum of Understanding" between the bodies involved; 2. Analysis and characterization: construction of a cognitive framework integrated with the contributions and data deriving from the participation and drafting of the "Environmental Dossier"; 3. Definition of objectives: shared processing, based on the knowledge framework, the vision, specific objectives and strategies to be followed to achieve them; 4. Definition of the interventions: elaboration of the "Action Plan" which establishes actions, priorities, roles and methods of implementation a scheme to monitor their implementation 5. Evaluation: through a Strategic Environmental Assessment, the actions of the Plan have been evaluated and redefined; 6. Subscription: definition and signing of the negotiated planning agreement "Fiume Contract" which specifies the commitments and roles for the implementation of the Plan of the components of the "Basin Assembly";
WHY IS IT A BEST PRACTICE FOR YOU? The "River Contract" can be a new governance tool that can also be applied to the water catchment areas of episodic waterways (the so-called "lame") of the monumental olive grove that flows into the Coastal Dunes Park and feed the retrodunal lakes system, thus also influencing the quality of their habitats. The variety of problems related to the management, protection and enhancement of the "blades" and their basins (water quality, salt salinization and desertification, mitigation of alluvial events, ecological connections, landscape qualification),

requires the realization of a planning process strategic to be implemented through a co-planning path such as that of the experiences of the "River Contracts" in which the methodology and the path itself are shared in itinere with all the actors. In fact, the plurality of actors involved in the management of surface water and groundwater resources or directly or indirectly influencing their quality of activities, requires the definition of a scenario of sustainable development of the watersheds developed in a participatory way, so that it is widely shared and so that all the actors take precise commitments for their protection and enhancement.
IDENTIFY POSITIVE ASPECTS: Involvement of stakeholders in all phases of the process, from the construction of the knowledge framework to the sharing of the strategic scenario and the definition of the action program. Integrated vision of the redevelopment of the river basin in all its aspects of protection and enhancement; Definition of a monitoring plan for the continuous improvement of the Shared Action Plan.
IDENTIFY NEGATIVE ASPECTS: High time for concluding the process by signing the contract; Lack of a Territorial Information System to support decisions and monitoring; Insufficient involvement of all categories of actors and lack of responsibility of private operators in the direct implementation of interventions.
INNOVATIVE ASPECTS: Application of the principle of horizontal subsidiarity through the involvement and definition of specific commitments for the redevelopment of the river basin by all the actors involved, both public and private;
- Integrated approach in the redevelopment of a water catchment area aimed not only at improving the use of water resources, but also at recovering and improving ecosystems, mitigating the effects of floods and droughts, landscape redevelopment and the development of a fruition sustainable.
- Integration and coordination between the various programming and planning actions and the various interventions and activities undertaken by the various public and private bodies interested in the various basin scales, in terms of section and detail.
- Permanent monitoring of the actions undertaken and of the commitments undertaken and redefinition of the same based on the results achieved.
INFORMATION SOURCES: http://www.provincia.novara.it/ContrattoFiumeAgogna/

3.2.2 Communal cisterns

GEOGRAPHICAL LOCATION: Barbici, Istria, Croatia - Veli Golji, Istria, Croatia
KEYWORDS: Potable water, water tank, water collection
RELATED IMPACT: Increased competition for water
PROJECT INITIATOR/PROMOTER: Outdated, not in function
STAKEHOLDERS INVOLVED: Local residents
BENEFICIARIES/TARGET GROUP: Local residents
TIME OF IMPLEMENTATION: 19th to mid-20th century
COSTS: n.a.
GENERAL DESCRIPTION: Due to the scarce water sources and the location of springs at relatively long distances, the so called “communal cisterns” were developed in rural centers.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Communal cisterns were made in the lower parts of a village. All the houses which were on a higher ground were connected with underground pipes to the communal cistern. Rainwater was collected with the roof gutters, which were then connected to the underground pipes. There was a dedicated person who distributed the water to local residents evenly and fair.
WHY IS IT A BEST PRACTICE FOR YOU? The communal cisterns were abandoned after WWII and the villagers connected to the water supply network. The situation and approach towards nature started to change at the end of 20th century. Nowadays, with the changing climate, more draught and higher water demand, it is crucial to be responsible towards the water reserves and sources. This was used as potable water but new use can be made of it at the present. Although considered obsolete, this technique can be reconsidered nowadays and act as at least the source of technical water (for garden irrigation, flush water etc.). Furthermore, it allows to use the water which is usually “lost” and doing so can decrease the stress on the public water supply network, reduce costs of transportation and save potable water.
IDENTIFY POSITIVE ASPECTS: The average water consumption per household in Croatia was 46m3 in 2013. The precipitation in Rovinj was around 1000mm per square meter, or 1m3/m2 in 2013. Therefore, one household would need around 46m2 of roof to collect the water, which is roughly the same as an average family house’s roof area. In order to reduce the costs of building a personal cistern, in the new housing developments and for existing houses, the communal cisterns could be made. One cistern can be made to connect 15-20 houses, and nearby cisterns can be mutually connected. This would allow for:
Water micromanagement (the system can be automatized), higher independence of public water supply network, reduce the costs of increasing the capacity of public networks, reduce the vulnerability of public networks, reduce the costs for sewages as the rainwater would not be included, increasing the user’s responsibility towards the water as everyone directly contributes.
IDENTIFY NEGATIVE ASPECTS: Maintenance costs of communal cistern, eventual pump and purifier systems costs, more planning needed, overfilling at high rain.
INNOVATIVE ASPECTS: Nearby communal cisterns can be connected and automatized so that the reserves can be adjusted to the connected consumers’ needs. Moreover, this would ensure redundancy and flexibility of the system.
INFORMATION SOURCES: http://klima.hr/razno.php?id=priopcenja&param= oborina2013
https://www.enu.hr/gradani/info-edu/usteda-vode/

3.2.3 Recycled water TDR

GEOGRAPHICAL LOCATION: Kanfanar, Istria, Croatia
KEYWORDS: Recycled water, accumulation lake, irrigation
RELATED IMPACT: Increased competition for water
PROJECT INITIATOR/PROMOTER: Tvornica Duhana Rovinj (Tabaco Factory Rovinj)
STAKEHOLDERS INVOLVED: Tvornica Duhana Rovinj
BENEFICIARIES/TARGET GROUP: Tvornica Duhana Rovinj
TIME OF IMPLEMENTATION: 2009
COSTS: n.a.
GENERAL DESCRIPTION: The waste water is collected and treated with the membrane bioreactor technology (MBR). The water is then collected in an artificial lake of 25.000m3 capacity. The water is used for irrigation of the parks around the factory.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Recycling waste water, Accumulation of water in the artificial lake
WHY IS IT A BEST PRACTICE FOR YOU? The waste water would need to be transferred until a public water treatment facility by pipes and additional stress on the public water supply network would be made due to irrigation needs. This system overcomes those difficulties and can even be used for irrigation of nearby agricultural land.
IDENTIFY POSITIVE ASPECTS: Public water supply network is not additionally stressed by the factory's demand for irrigation, waste water is treated and collected in an artificial lake which ensures better water management (there is sufficient water in times of drought), waste sludge is used as fertilizer, the water might be used for irrigation of agricultural land, especially in the times when there is insufficient precipitation. Rainwater is catch so it does not present a "threat" to communal infrastructure and prevents flooding.
IDENTIFY NEGATIVE ASPECTS: Lack of quality control, accidental discharges of untreated waters, land area used for artificial lake.
INNOVATIVE ASPECTS: Membrane bioreactor technology (MBR), waste sludge treatment to become usable as a fertilizer.
INFORMATION SOURCES: www.adris.hr/file/9/
http://www.poduzetnistvo.org/news/tdr-ce-mulj-iz-procistaca-koristiti-za-prihranu-u-parku
http://www.tehnika.hr/index.php/portfolio-items/tvornica-duhana-rovinj/

3.2.4 Irvine Ranch Water District

GEOGRAPHICAL LOCATION: Irvine, California, USA
KEYWORDS: Recycled water, irrigation, toilet-flushing water
RELATED IMPACT: Increased competition for water
PROJECT INITIATOR/PROMOTER: Irvine Ranch Water District (IRWD)
STAKEHOLDERS INVOLVED: IRWD, local community
BENEFICIARIES/TARGET GROUP: IRWD, private companies, local community
TIME OF IMPLEMENTATION: Since 1963
COSTS: n.a.
GENERAL DESCRIPTION: IRWD provides high-quality drinking water, reliable wastewater collection and treatment, ground-breaking recycled water programs, and environmentally sound urban runoff treatment to more than 380,000 residents [1]. They decided to integrate water recycling into the design of local community. Currently, there is more than 525 miles of recycled water pipes. The water is used throughout the IRWD service area for landscape and agricultural irrigation. Recycled water is the end product of sewage treatment that mirrors and accelerates the natural water cycle [2].
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: As stated in [2]: IRWD produces and distributes tertiary treated recycled water, also known as Title 22 water. Title 22 water is used throughout the IRWD service area for landscape and agricultural irrigation. It also is used for toilet-flushing, cooling towers in commercial buildings, dust control on construction sites and industrial processes such as concrete production and composting. Each day we deliver about 25 million gallons of recycled water to more than 5,500 metered customer connections. Every gallon of recycled water used for these purposes saves a gallon of drinking water.
WHY IS IT A BEST PRACTICE FOR YOU? Because of savings of potable (drinking) water, the recycled water piping network, usage of recycled water for toilet flushing (which can be used in Istria) and all other mentioned use of recycled water. Istria is a highly touristic region and at the peak of the season can have 1.5 tourists per one local resident, or in other words, there is 150% more people which puts a lot of stress on the water supply network. Moreover, hotels and other facilities use significant amount of water for landscape irrigation. By using the recycled water for irrigation and toilet flushing significant savings of potable water can be achieved and the sudden increase in population would be less problematic for local infrastructure.
IDENTIFY POSITIVE ASPECTS: Recycled water for irrigation and toilet flushing, more conveniently designed water infrastructure (due to lower consumption of potable water), sustainable tourism, optimization, saving water resources, more responsible approach.
IDENTIFY NEGATIVE ASPECTS: High cost of installation of separate piping network for recycled water and treatment, potential problems with incorporating new pipelines in existing infrastructure,
INNOVATIVE ASPECTS: Synergy between the hotels and resorts and local community, synergy between waste water treatment operator and water supply operator.
Saving the drinking water resources for future generations, better and more responsible management etc.
INFORMATION SOURCES: https://www.irwd.com/about-us
https://www.irwd.com/services/recycled-water
https://www3.epa.gov/region9/water/recycling/

3.2.5 Stormwater Management System

GEOGRAPHICAL LOCATION: N/A, this is in general (reference can be made to [1] or [2] for some cost estimations and implemented solutions)
KEYWORDS: Stormwater management, green roofs, retention ponds, swales
RELATED IMPACT: Increased competition for water, coastal flooding; damage to coastal human infrastructure
PROJECT INITIATOR/PROMOTER: Cities and municipalities
STAKEHOLDERS INVOLVED: Local communities
BENEFICIARIES/TARGET GROUP: Local communities
TIME OF IMPLEMENTATION: n.a.
COSTS: n.a.
GENERAL DESCRIPTION: Stormwater Management System is a system designed to retain the stormwater in order to decrease the risk of flooding by lowering the water runoff flow. This is a set of measures which retain the water for longer time, thus preventing a rapid runoff into the sewage system which can become overburdened. This can result in the overflow and flooding of surrounding areas. By retaining the water the peak runoff flow is reduced and delayed,

- Recommended systems used are [5]:
- Storage vaults, or tanks
- Gravel beds
- Perforated pipes
- Stormwater chambers
- Blue roofs
- Green roofs

These measures need to be taken into account in urban planning and in building design.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Green roofs detain rooftop stormwater runoff and reduce the rate of runoff entering the city sewer system during rainfall events [5]. The vegetation evapotranspires water into the atmosphere, the rest goes into the sewages. However, storage tanks can be put into the basement or ground floor to collect the water which can then be used for:
*Irrigation and watering
*Non-potable uses, including toilet flushing and clotheswashing
*Potable uses, such as drinking, cooking, and bathing
Retention ponds accumulate water from the channels and pipes, one it is full, water starts to overflow through swales up to lower level ponds or in the channel. This ponds can often be a rich source of biodiversity and micro habitat.
The design philosophy of having some minimum green areas on parking places is visually pleasing but also useful for flooding prevention.
WHY IS IT A BEST PRACTICE FOR YOU? This system demands more green areas (green roofs, ponds, swales, pocket wetlands) and encourages trees planting. Not only does this makes the space visually more pleasant, but also prevents flooding (main scope), serves as habitats for organisms that would otherwise be absent in the urban areas (vegetation, frogs, birds, insects etc.), helps during hot weather (microclimate regulation, shade), contributes to carbon dioxide extraction etc.
IDENTIFY POSITIVE ASPECTS: Flood prevention, visual aspect, shade, potential of storing the rainwater for irrigation, toilet flushing etc. thus reducing drinkable water consumption. More park areas for people.
IDENTIFY NEGATIVE ASPECTS: Increased efforts during planning stage, asks for good elaboration of plans by the local authorities, increased maintenance costs of these areas (although this can be compensated by lower demands on sewage infrastructure size, could increase population size of some undesired insects like mosquitoes etc.
INNOVATIVE ASPECTS: Refined set of measures and systems used requiring monitoring and maintenance. Rainwater management, flood prevention, parks, CO_2 reduction, more natural feel, introducing vegetation into urban areas etc. Even roads can be build to flood during storms and act as temporary collectors [3].

INFORMATION SOURCES: [1]
http://www.peterborough.ca/Assets/City+Assets/Engineering/Documents/Stormwater+Master+Plan/Reports/Stormwater+Quality+Management+Master+Plan+Final+Draft+(Report+Only).pdf
[2] http://www.switchurbanwater.eu/outputs/ pdfs/CEMS_PAP_Urban_ stormwater_management_demo_projects_Emscher.pdf
[3] http://gotoby.com/news/article/2309/Palm-Coast-Streets-Designed-to-Flood-as-Part-of-Storm-Water-Management-System
[4] https://www.pwdplanreview.org/manual/chapter-3/3.5-integrated-stormwater-management-examples
[5] http://www.nyc.gov/html/dep/pdf/ green_infrastructure/stormwater_guidelines _2012_final.pdf
[6] Shafique, M., Kim, R. and Kyung-Ho, K. (2018) 'Green Roof for Stormwater Management in a Highly Urbanized Area: The Case of Seoul, Korea', Sustainability, 10, 584; doi:10.3390/su10030584
[7] http://stormtrap.com/

OTHER: Other innovative solutions are available on the market, like StormTrap (http://stormtrap.com/) . The core concept here is do build an underground storage tanks, usually below the building, which takes vast amount of water during heavy rains. It also removes floatables, trash and debris, see Figure 15.
The Stormwater Management would be particularly of interest for the Croatian coastal cities which are prone to flooding during high rain. Rainy weather comes with the decrease of atmospheric pressure which causes sea level rise (this can be easily around 20-30cm compared to when it is good weather plus the rise from the surge, which can be even more). This can be significant for old sewages and where the buildings are located near the sea level. Moreover, the sewages get easily blocked by the debris which is transported with the flow. The waves will than have a bigger impact and some parts can become flooded. Lowering the peak runoff flow and distributing it more evenly throughout the time would put less demand on the sewage network.

3.2.6 Ecosystem-based coastal defence

GEOGRAPHICAL LOCATION: All over the Earth
KEYWORDS: Ecosystem, coastal defence, sustainability
RELATED IMPACT: Increased competition for water; coastal flooding; damage to coastal human infrastructure
PROJECT INITIATOR/PROMOTER: n.a.
STAKEHOLDERS INVOLVED: Government agencies for water management and coastal defence, government, general public, local community
BENEFICIARIES/TARGET GROUP: Local, regional and wider community, government
TIME OF IMPLEMENTATION: Ongoing, Example: Belgian Scheldt estuary – 2006 – 2030
COSTS: Example: Belgian Scheldt estuary: up to 4.000ha of historically reclaimed wetlands are being converted back into floodplains. Of 4.000ha, 2.500ha should become tidal marshes. The estimated costs are around 600 million EUR.
GENERAL DESCRIPTION: Rather than a single investment, the ecosystem-based coastal defence is a design philosophy. The idea is to change the traditional coastal defence approach and to use natural protections instead, or at least to complement the former.
Flood protection by ecosystem creation and restoration can provide a more sustainable, cost-effective and ecologically sound alternative to conventional coastal engineering [1].
It is expected that the coastal flooding will become more frequent in the coming decades as a result of the climate change and sea level rise. Some estimations say around 40 million people and $3.000 billion worth of assets are currently located in the flood-prone coastal cities, and it is expected to increase to 150 million people and $35.000 billion by 2070 [1].
Ecosystem-based coastal defence (EBCD) is applied to the locations that have sufficient space between urban area and the coastline. In this areas a new ecosystem is created by changing the topography, growing tidal marshes, mangrowes, creation of dunes, coral reefs and shellfish reef, that have the natural capacity to reduce storm waves and surges, see Figure 26. Moreover, they can keep up with sea level rise by natural accretion of mineral and biogenic sediments.
The ecosystems used for coastal defence provide several added benefits like water quality improvement, fisheries production and recreation, and in the long term they can be more cost-effective than conventional solutions.
It was, and still is, a common practice to reclaim the wetlands. This unfortunately leads to the loss of storage area for flood waters so that storm surges rise higher and propagate faster and further inland through the remaining channels of delta or estuary. The EBCD approach is to give back some of the reclaimed land and make the storage areas again. This approach would ensure there is sand build up at shores, that there is better sedimentation and an ecosystem which is full of life and potential and acts as a sink for carbon dioxide. Moreover, the area gets a natural and visually pleasant look which can attract more people.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: The new ecosystem is created by changing the topography, growing tidal marshes, mangrowes, creation of dunes, coral reefs and shellfish reef, that have the natural capacity to reduce storm waves and surges.
The ecosystems used for coastal defence provide several added benefits like water quality improvement, fisheries production and recreation, and in the long term they can be more cost-effective than conventional solutions.
Some studies for Florida have shown that hurricane surge level can be reduced by 40 to 50cm per kilometer of mangrove forest width [1].
WHY IS IT A BEST PRACTICE FOR YOU? The EBCD is a natural approach where the nature is not being endlessly fought against, but people instead need to create certain starting conditions and “leave” the nature to take care of itself. EBCD has many positive sides and added values. In addition to protecting the coast from storm waves and surges (floods), it improves water quality, production of fisheries, carbon sequestration, biodiversity enhancement, nature conservation and the creation of recreational space. Wetlands and reefs promote fisheries production by providing an indispensable habitat for juvenile fish, shellfish and crustaceans.
IDENTIFY POSITIVE ASPECTS: Coastal protection, nature conservation, carbon sequestration (adaptable, resilient, cost reduction).

IDENTIFY NEGATIVE ASPECTS: Requires more space than traditional defence; the nature of the created ecosystem and its effectiveness for flood defence is still partially uncertain due to the lack of long-term studies.
INNOVATIVE ASPECTS: Use the naturally available mitigations for coastal flooding. Instead of fighting the nature EBCD supports it and uses it to the advantage of human coastal communities. The EBCD is not only used as protection, like usually in the conventional coastal engineering, but it has many other added values like water quality improvement, production of fisheries, carbon sequestration, biodiversity enhancement, nature conservation and the creation of recreational space.
INFORMATION SOURCES: Temmerman, S., Meire, P., Bouma, T. J., Herman, P. M. J., Ysebaert, T. and De Vriend, H. J. (2013) 'Ecosystem based coastal defence in the face of global change', Nature, Vol. 504
[2] Ysebaert, T. (2014) Eco-system based coastal defence:
opportunities & steps to take [PPT], Workshop "Ecological Engineering for Coastal Protection and Food Production in Bangladesh"

3.2.7 Non-structural measures

GEOGRAPHICAL LOCATION: n.a.
KEYWORDS: Climate adaptation plans and strategies, cost-benefit analysis, spatial planning
RELATED IMPACT: Increased competition for water; coastal flooding; damage to coastal human infrastructure
PROJECT INITIATOR/PROMOTER: Government, regional and local communities
STAKEHOLDERS INVOLVED: National, regional and local authorities, general public
BENEFICIARIES/TARGET GROUP: General public
TIME OF IMPLEMENTATION: n.a.
COSTS: n.a.
GENERAL DESCRIPTION: Herby, we would like to stress out the importance and positive effects of planning and preparing for the future. Climate adaptation strategies and plans are needed on all levels of authorities. Firstly, a country needs to have good network of monitoring systems for onshore and offshore monitoring. Based on this database the past trends can be studied and future scenarios can be analyzed and elaborated. Future scenarios on water level change and other climatic changes needs to be dealt with locally as well, as not everywhere will the effects of global climate change be the same. The results obtained from the studies have to be considered and their risks evaluated. Possible solutions to the changes need to be identified and a cost-benefit analysis performed so to chose the optimal solutions which should be implemented. Clear instructions of what neads to be done have to be given, together with the implementation time and budget allocation.
Financing options need to be known. The conclusion of climate adaptation and other plans need to be in synergy and implemented in the spatial planning. Clearly, all the stakeholders need to be considered, the nature and human society. A vision and a goal needs to be set by every community .
Such documents, if properly supported, can reduce costs in the future as they take into account a wider area in the long time run.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Climate adaptation strategies and action plans, spatial planning, other strategies and action plans in synergy with the clime adaptation.
WHY IS IT A BEST PRACTICE FOR YOU? Long term planning and vision, cost reduction, sustainability, taking care of future generations
IDENTIFY POSITIVE ASPECTS: Clear vision and goals, cost reduction, preparedness
IDENTIFY NEGATIVE ASPECTS: Misinterpretation, lack of motivation and funds to accomplish the goals in the long run, political changes
INNOVATIVE ASPECTS: Long term planning and vision, cost reduction, sustainability, taking care of future generations
INFORMATION SOURCES: Ministry of Environment and Energy (2017) Climate Change Adaptation Strategy in the Republic of Croatia for the period to 2040 with a view to 2070
Ministry of Environmental Protection and Energy (2017) action plan for implmenting the strategy on adaptation to climate change in the republic of croatia for the period from 2019 to 2023

3.2.8. Rainwater saving and use in households

GEOGRAPHICAL LOCATION: Bremen , Germany
KEYWORDS: Water consumption reduction, reuse rainwater in household
RELATED IMPACT: impacts on water competition
PROJECT INITIATOR/PROMOTER: City of Bremen, Federal State of Bremen, Bremen environmental consulting
STAKEHOLDERS INVOLVED: -
BENEFICIARIES/TARGET GROUP: citizens
TIME OF IMPLEMENTATION: From 2016
COSTS: No specific cost – it's a regulation measures + incentives
GENERAL DESCRIPTION: For the area of Bremen climate projections are predicting higher temperatures and a change in precipitation, and during the winter period more frequent extreme rainfalls are expected. In addition flood risk from sea and land side (including river and pluvial flooding) are expected to increase. These changes will have an impact on the sewer system.
The overall objective of actions taken by the city of Bremen is to establish a natural water balance and to reduce the rainwater discharge into the sewerage system, supporting its use. At the same time drinking water consumption for certain uses in households should be decreased
Currently in Germany the fee for rainwater is separated from wastewater, based on the extension of impervious property surface (m2), which directs water into the public sewage system. Collecting and reusing rainwater on private property is then likely to reduce sewage costs due to lower loads to be treated by the treatment plant.
Bremen has decided to take new approaches in rainwater management, in order to reduce pressures on the sewer systems, drinking water consumption, preserve the natural water cycles.
By a specific regulation, a refund is given if properties are less sealed and a contribution is provided to reuse rainwater.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: The solution provided to improve rainwater use in Bremen household is a combination of technical and economic approaches and applies to all private property owners.Firstly the practice take effort of a national German law that split the fee for rainwater from wastewater, based on the extension of impervious property surface (m2). the Federal State of Bremen introduced two instruments:
Refund of rainwater fee: the property owner gets the rainwater fee (0.63 €/m2/year) refunded if rainwater use is applied or the ground is kept permeable, as the fee is calculated on the sealed area. For properties larger than 1,000 m2 the fee has to be split between rain and wastewater. Smaller properties can voluntary decide if such a split is feasible and convenient. In practice the larger the property is and the more water can be kept on the ground the more cost savings in comparison to sealed properties can be achieved.
Subsidies for the installation of the rainwater use system, a maximum of 12.000 Euros or a maximum of 1/3 of the total investment costs.
The solution is based on a cistern, that collect rainwater from roofs. The cistern, mostly located in the underground, may be constructed of various materials including reinforced concrete, precast concrete, fiberglass, or steel. The cistern supplies water to the household through a standard pressurized plumbing system. The rainwater can be used either for toilet flushing, but also for watering the garden. The installation of such systems in existing buildings requires adaptation of the piping system and some earthworks and is therefore sometime quite costly.
WHY IS IT A BEST PRACTICE FOR YOU? In Pesaro the drinking water supply depends on the water network infrastructure at province level, which is anomaly compared to the other regional and national realities, as it is strongly dependent on surface waters (about 80%), mainly from the Metauro river catchment (outside municipal territory). This makes water supply highly conditioned by seasonal rainfall patterns, in particular in the mountainous area, which show a decrease of precipitation in the last 50 years. At local level, it emerged that nine times in the last 11 summer seasons, Pesaro issued order to limits drinking water use, confirming a trend of water scarcity and drought.
A solution as described in the practice could improve the reduction of water consumption.
IDENTIFY POSITIVE ASPECTS:

- Reuse of rainwater
- reduction of soil sealing
- water availability during drought periods.

IDENTIFY NEGATIVE ASPECTS:

- Necessity of a national law condition
- high cost to apply in existent buildings

INNOVATIVE ASPECTS: The most innovative aspect regards the mechanism of refunding rainwater fee , based on the concept of soil sealing, and the According to information from the Bremer Umweltberatung (environmental consulting for Bremen), several citizens would like to have more eco-friendly houses, but without a proper funding they are rarely taking any actions concerning rainwater management.

INFORMATION SOURCES: https://www.hansewasser.de/wir-fuer-bremen/leistungen-fuer-die-bremer-buerger/entwaesserungsgebuehren.html
https://www.bauumwelt.bremen.de/umwelt/abwasser/regenwasser-25593
https://climate-adapt.eea.europa.eu/metadata/case-studies/rainwater-saving-and-use-in-households-bremen/#contact

3.3 Sector: Coasts

3.3.1. Nigeria Erosion and Watershed Management Project (NEWMAP)

GEOGRAPHICAL LOCATION: Nigeria
KEYWORDS: Gully erosion, watershed, land degradation
RELATED IMPACT: Increased erosion
PROJECT INITIATOR/PROMOTER: Federal Republic of Nigeria / Federal Project Implementing Unit, Federal Ministry of Environment.
STAKEHOLDERS INVOLVED: NEWMAP is currently working in seven states (referred to as tier 1 states), and additional 12 states (referred to as tier 2 states) joined the project at a later implementation stage. NEWMAP involves many Federal and State Ministries, Departments and Agencies (MDAs), local governments, communities, and civil society. Effective implementation requires inter-ministerial and inter-state coordination, collaboration, and information sharing. Each component, sub-component and activity will be implemented through relevant Federal and State MDAs.
BENEFICIARIES/TARGET GROUP: People receiving project-supported advisory support services and households benefitting from livelihoods enhancement activities (more than 2 million project beneficiaries).
TIME OF IMPLEMENTATION: NEWMAP project became effective on September 16, 2013 and is still ongoing.
COSTS: US$ 508 million
GENERAL DESCRIPTION: In response to the challenges of gully erosion and the emerging land degradation and environmental insecurity, a request for assistance was made in 2010 by the President to the World Bank Nigeria office, to support the country in addressing severe erosion and its impacts in south-eastern Nigeria. The Federal Ministry of Environment in concert with the World Bank and its partner agencies have designed the Nigeria Erosion and Watershed Management Project (NEWMAP) to address on a multidimensional scale the menace of gully erosion in the south east as well as land degradation in the North. The project (NEWMAP) is in line with the growth and resilience goals of Nigeria's Vision 20:2020.
The Nigeria Erosion and Watershed Management Project (NEWMAP) development objective, aims to reduce vulnerability to soil erosion in targeted sub-catchments, address climate change and air quality, maintain water quality and effective drainage system, create jobs, and implement strategies for resolving Nigeria's long-standing infrastructure problems. This innovative, multi-sectoral project will finance State-led interventions to prevent and reverse land degradation, initially focusing on gully erosion sites that threaten infrastructure and livelihoods in seven States: Abia, Anambra, Cross River, Ebonyi, Edo, Enugu and Imo. The Project has further scaled out to twelve states in Nigeria including: Delta, Oyo, Sokoto, Gombe, Plateau, Kogi, Kano, Akwa Ibom, Borno, Nasarrawa, Katsina and Niger states.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: The project comprises of four main components:
1. Erosion and watershed management infrastructure investment. This component supports on-the-ground interventions to restore major, high-risk gully systems and reduce vulnerability to further land degradation. The primary focus has been on addressing gully erosion and watershed management in Southeastern Nigeria while Northern states are developing their site intervention approaches and designs. Erosion and watershed management infrastructure will also include slope stabilization, planting of grasses and trees, construction of drainages, rehabilitation/reconnection of roads that were cut off by erosion or earthworks.
2. Erosion and watershed management institutions and information services. The objective is to strengthen the enabling environment and investment planning and readiness for effective implementation of erosion and watershed management. The component supports all three levels of government (federal, state and local) and the private sector, but with a special focus on states. The federal level serves primarily as facilitator, regulator, monitor, bench-marker, information broker, and aggregator. Activities under this component will also include installation of meteorological and Hydro-Met station, the development of participatory sub-watershed management plans, the development of several city storm water master plans which are informed by climate projections of increased rainfall intensity and risk assessment, the development of EIA guidelines for targeted investment types that affect erosion (road cross drainage, urban water supply and drainage), the establishment of three National Centers of Excellence in erosion control, and, to support improved erosion risk mapping in all 19 participating states.
3. Climate change response. The objective of this component is to strengthen Nigeria's capacity to promote low-carbon, climate resilient development. Outcomes focus on providing tools and approaches for governments to become better

equipped to respond to climate change; and on supporting demonstration projects to test the viability and scaling-up potential of low carbon development options. In 2016, the parent project Mid-Term Review recommended certain balance reallocation for the implementation of approved designs for gully interventions in both existing tier 1 and tier 2 states, and for interventions to manage soil degradation in the dry and semi-arid landscapes of the tier 2 states; investment to strengthen the Environmental Impact Assessment (EIA) review functions of the federal government; and activities to include institutional capacity building to support the government of Nigeria to implement its framework for climate action—the Nationally Determined Contribution (NDC)—to mobilize financial resources for climate action priorities, including the issuance of green bonds. The activities under the component 3 will also include the production of seven technical reports/guidelines that promote low carbon development or that enhance climate resilience; and the implementation of ten climate adaptation/low carbon demonstration projects (e.g., fuel-efficient bakery ovens, clean and efficient cook stoves and solar mini grid projects in remote areas).
4. Project management. The component supports: (a) project management and coordination at federal and state levels, including procurement and financial management; (b) social and environmental safeguards management and oversight; (c) strategic project communication and documentation; (d) project Monitoring & Evaluation; and (e) impact evaluation.
WHY IS IT A BEST PRACTICE FOR YOU? The NEWMAP project can serve as the best practice example firstly due to the government's identification and devotion to substantial Nigerian challenge - gully erosion and the emerging land degradation and environmental insecurity. Furthermore, the project included strategic combination of civil engineering, vegetative land management and other catchment and other protection measures, as well as community-led adaptive livelihood measures. Strong communication and consultation approach with communities allowed meaningful involvement of various stakeholders, beneficiary verification, and use of local civil society organizations.
The intention is to assure sustainability and reinforcement of the investments across sectors and other states facing the same challenge. At the same, flexible approach allows movement of implementation from site to site depending on the current working conditions at some sites, as well as reengaging as things stabilize.
In order to assure project success, continuous technical assistance for capacity building and support has been provided to federal and state project management units, as well as to other project stakeholders at federal, state, and local levels. Finally, the project was assessed to have 100% climate co-benefits. Project components included adaptation measures against climate risks such as droughts, flooding, erosion, land degradation, carbon emissions, afforestation.
IDENTIFY POSITIVE ASPECTS: Strategic combination of civil engineering, vegetative land management and other catchment protection measures, and community-led adaptive livelihood initiatives;
Territorial comprehensiveness (twelve states altogether), Sustainability of investments across sectors and States.
IDENTIFY NEGATIVE ASPECTS: Comprehensive approach and project complexity results in high risk of corruption and fraud;Long-term duration of the project creates a risk for overlapping mandates or gaps in mandates of many ministries, department and agencies involved in the project (this can be tackled by providing strong and continuous technical support for capacity building).
INNOVATIVE ASPECTS: NEWMAP is making significant progress in tackling land degradation and major gully erosion in Nigeria and has succeeded where earlier initiatives had failed, by adopting innovative, integrated approaches based on community participation. For the first time in Nigeria, NEWMAP introduced a holistic watershed management approach linking poverty alleviation with maintaining sustainable ecosystems and better disaster risk management. Blending physical and vegetative technologies has saved money, significantly reduced soil erosion, improved surface water availability over a longer period, and allowed for better percolation of rainwater into the soil. Above all, the integrated approach has improved, and even saved in some cases, the lives of people at risk living near existing gullies. The project's participatory approach and alternative livelihood activities have helped communities and policymakers see the value of an integrated approach.
INFORMATION SOURCES: http://newmap.gov.ng/
http://projects.worldbank.org/P164082/?lang=en&tab=overview

3.3.2 Biomares - Restoration and Management of Biodiversity in the Marine Park Site Arrábida-Espichel

GEOGRAPHICAL LOCATION: Lisboa e vale do Tejo(Portugal)
KEYWORDS: Marine reserve, protected area, restoration measure
RELATED IMPACT: Increased erosion
PROJECT INITIATOR/PROMOTER: Centro de Ciências do Mar
STAKEHOLDERS INVOLVED: Instituto Nacional de Investigação Agrária e das Pescas (INIAP), Portugal Instituto da Conservação da Natureza (ICN), Portugal Instituto Superior de Psicologia Aplicada (ISPA), Portugal Consejo Superior de Investigaciones Científicas (CSIC)
BENEFICIARIES/TARGET GROUP: Portugal
TIME OF IMPLEMENTATION: 01/01/2007 - 30/06/2011
COSTS: 2,364,438.00 €
GENERAL DESCRIPTION: The Natura 2000 site Arrábida-Espichel is located just south of Lisbon, on the west coast of Portugal. The site was classified as an SCI due to the high marine biodiversity of the area, including more than 1 100 marine species of fauna and flora. Seagrass meadows in the site guaranteed shelter and food to the juveniles of many species of marine fauna, giving it a nursery role similar to many estuaries.
However, in recent years, these non-estuarine Zostera marina meadows and their associated biodiversity had been almost totally destroyed. The main threats have been illegal fishing practices - such as dredging for bivalves - and the anchoring and mooring of recreational boats. Seagrass formations in what was the last truly marine example of this habitat on Atlantic Iberian Coastlines fell from 30 ha in 1983 to 0.006 ha in 2006.
A management plan was approved in 2005, which regulates all activities for the area, including fishing and recreational boat numbers.
The Biomares project proposed an active management strategy for reefs and the restoration of sand banks permanently covered with sea water - Habitats 1170 and 1110 respectively under the EU Habitats Directive - at the Marine Park Site Arrábida-Espichel. It aimed to reverse the existing tendency for overexploitation and damage to habitats.
The project specifically sought to restore the lost seagrass meadow at Portinho da Arrábida. This challenging objective was to be achieved through the planting of seagrasses in the target area. Seagrass would be harvested from donor populations. However, it would also be important not to overly stress the donor sites through excessive harvesting. Therefore, the project also aimed to cultivate seagrass by sowing seeds on the target site and propagating seagrass shoots in laboratory, which could also be planted. These different approaches would help achieve the additional goal of establishing genetic diversity in the restored habitat.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: The project successfully conducted the preparatory actions for habitat restoration of Zostera marine meadows. It gathered marine data and raised awareness of local stakeholders that will be extremely important for the future management of the SCI.
The project assessed the available area and genetic diversity of donor populations. An extended search resulted in a full assessment of cover distribution and conservation status of the seagrass habitat along the Portuguese coast. It identified the four most appropriate areas for harvesting donor plants and three areas for collecting seagrass seed covering different species.
The team conducted four annual surveys of key marine data using techniques including seabed acoustics, sediment analysis, net fishing for marine life samples and seabed videoing. These generated a marine ecosystem characterization and cartography covering the project area to a depth of 100 m. They also developed quantitative spatial models to estimate the time required for total recovery of a continuous seagrass meadow based on examination of patch dynamics for different planting densities of specific species.
A key focus of the project was engaging with fishing and leisure-boat activities. Specific studies characterized the fishing fleet, trends in fishing activity and the opinions and expectations of fishermen. Several tons of underwater cables were removed from old moorings in the project area and substituted by around 100 environmentally friendly mooring buoys.
The team conducted seagrass germination experiments with varying temperature, salinity, sediment and light to find the optimum conditions. However, not enough seeds grew to the seedling state to allow their use as a donor population. Nor was the direct sowing of seeds on the seabed successful, with no germination observed.

WHY IS IT A BEST PRACTICE FOR YOU? It is a best practice because is the most effective solution from an engineering and geoenvironmental point of view to prevent and contain the erosion of the beaches through the preservation of the Posidonia Oceanic, present in the sea, and in the maintain on the beach the banquettes of biomass in order to guarantee a sedimentary balance. Moreover, Posidonia Oceanic has a fundamental role in the balances and exchanges of organic material between the terrestrial and coastal system, among which it establishes a close trophic connection.

IDENTIFY POSITIVE ASPECTS:

- Increase of the Posidonia Oceanic
- Decrease of the costal erosion
- Using environmentally friendly floating buoys

IDENTIFY NEGATIVE ASPECTS:

- Project linked to European funds
- Control and defense from the fishing and pleasure boats
- Survival of Posidonia was very low with major threats seeming to be storms and predation from fish.

INNOVATIVE ASPECTS: Installation of environmentally friendly buoys and removal of oceanic Posidonia from donor sites with subsequent replanting in sites a risk.

INFORMATION SOURCES:
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3164

3.3.3 Project and intervention for the littoral current regularisation in Viserba (Rimini)

GEOGRAPHICAL LOCATION: Viserba (Rimini) - Italy
KEYWORDS: Erosion, coast, beach
RELATED IMPACT: Increased erosion, impact on tourism sector
PROJECT INITIATOR/PROMOTER: Rimini municipality
STAKEHOLDERS INVOLVED: Technical experts, decision makers, environmental associations.
BENEFICIARIES/TARGET GROUP: Citizens, tourists
TIME OF IMPLEMENTATION: February 2011
COSTS: n.a.
GENERAL DESCRIPTION: After the construction of the marina of Viserba, the south area of the marina had a strong erosion allowing the presence of muds in the bathing area within the breakwaters which were built to protect the whole coast of North Rimini. Due to the obstruction of the marina and to the silting-up of the seabed close to the breakwaters, the bottom current couldn't flow naturally and was forced to partially reverse its direction creating an erosion on the south side of the marina and a sedimentation of sand even further southwards. The current, by reversing its direction and eroding the beach, led also to the creation of submarine canyons on the seabed close to the shoreline. In addition to that, the mud and the suspended fine materials coming from costal storms during the summer season settled inside these hollows making the seabed muddy and thus creating bathing problems. Starting from these premises, the intervention project envisaged the lowering of the breakwater in the south side of the marina at the medium sea level. The function of this lowering was to make the waves break just behind the breakwater creating an hollow of about -2.00 meters along the opening. This hollow would become the new site of the bottom current that would continue its path without being forced to reverse its direction.
In February 2011, the City Hall of Rimini decided to approve the project concerning the opening of the breakwater. As soon as the project was carried out, there was an immediate increase of the beach width and after the big coastal storm of March 2011 the beach size increased by about 12 meters decreasing the erosion stride and levelling the shore. During the summer season of 2011 the shore continued to increase in width by 10 meters more. In the following years the width of the new beach was maintained, and no more erosion phenomena took place.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Studies carried out with a systematic comparison of the local bathymetry, revealing a coastal bottom current that goes from South-East towards North-West and specifying the differential erosion/deposition between two areas of detailed topo-bathymetric high-ground (seasonal) and the changes in the morphology of the submerged beach, with the dynamics of the currents that cause them.
Lowering of the breakwater in the south side of the marina at the medium sea level, making the waves break just behind the breakwater thus creating a hollow allowing the current to continue its path without being forced to reverse its direction.
WHY IS IT A BEST PRACTICE FOR YOU? The erosion of the beach is tackled by changing the natural balance of the bottom current without doing any nourishment (the measure commonly used in similar cases along the coast) and relying on a simple intervention allowing to open the breakwater at the medium sea level. It seems to have more positive long-term effects than the traditional approaches, even if they would have to be confirmed through an effective experimentation.
IDENTIFY POSITIVE ASPECTS: As soon as the project was carried out, there was an immediate increase of the beach and in the following years the width of the new beach was maintained, and no more erosion phenomena took place. The result has been achieved by changing the natural balance of the bottom current without doing any nourishment. A seabed of about -2.00 meters close to the breakwater has been created, with the possibility of swimming while before bathing was limited as the seabed was about 40-50 cm.
As the bottom current does not reverse its direction, there are no submarine canyons on the seabed that is now sandy and hard thus improving bathing conditions.
Waves, by carrying sandy material to the ground, have increased both the width and the thickness of the beach.
Thanks to the regularized bottom current the water is cleaner.
IDENTIFY NEGATIVE ASPECTS: The natural balance of the bottom currents could be more difficult to be evaluated than expected, so the dynamics of the currents would need to be carefully verified during a first testing phase.

INNOVATIVE ASPECTS: Detailed analysis of the coastal circulation of bottom currents is essential for the adoption of solutions that provide solid answers to erosion problems.
INFORMATION SOURCES: Dynamics of coastal currents and resilient beaches (pdf)

3.3.4 Recovery and proper use of the natural coastal area (dunes)

GEOGRAPHICAL LOCATION: Marine Protected Area " Riserva Naturale dello Stato di Torre Guaceto " falling within the municipalities of Brindisi and Carovigno, Apulia Region, Italy
KEYWORDS: coastline defense, management Natura 2000 sites, Nature based solution
RELATED IMPACT: Increased erosion
PROJECT INITIATOR/PROMOTER: Regional Park "Dune Costiere", Municipal of Ostuni, Marine Protected Area (Riserva Naturale) Torre Guaceto, University of Salento (Laboratorio di Ecologia del Paesaggio - Dipartimento di Scienze e Tecnologie Biologiche ed Ambientali (Di.S.Te.B.A.))
STAKEHOLDERS INVOLVED: Agenzia Regionale Irrigua e Forestale
BENEFICIARIES/TARGET GROUP: residents , bathing operators - tourist villages, tourist
TIME OF IMPLEMENTATION: 01-11-2011 / 28-02-2014 (timing project NAT-PRO) – details for actions below
COSTS: € 40,000 Sources of financing: European funds; Regional funding POR FESR Puglia 2007/2013
timing: 2013-2015
GENERAL DESCRIPTION: The project NAT – PRO "Strategic plans for restoration, protection & eco-tourism[1] promotion in Natura 2000 sites which devastated by natural disasters" (European Territorial Cooperation Programme Greece Italy 207-2013) lead out a broad list of results; the best practice observed is related to specific activities for the recovery and proper use of the natural area "Litorale Brindisino" (SIC – IT9140002), inside Regional Park "Dune Costiere". The main naturalistic recovery interventions implemented within the Nat Pro project were: closing the gaps along the dunes; planting species of the Mediterranean vegetation that characterize the retro-dunes environment; new parking area outside natural areas. retrofit of the area adjacent the main traffic way (SS 379 Bari -Lecce), where in the past there were phenomena of waste's abandonment and unauthorized parking: reshaping of the road margins ,construction of embankments and their re-naturalization planting numerous Mediterranean essences. It has been also created a bike parking with racks, benches and educational panels connected to cycle routes and itineraries realized through the pilot action on ecotourism. All these interventions have been realized thanks to a special agreement between the Municipality of Ostuni and the Regional Irrigation and Forestry Agency (ARIF) stipulated within the Nat Pro project.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: the specific actions are described in the Strategic Plan for the restoration and protection of the Regional Park Dune Costiere for the promotion of Ecotourism; hereafter two specific interesting case:

- Action 3.3 : Restoration of coast in fron wet area

activities: recovery of the dunes, closing of the gaps, restoration of connection between the sea and the wet area, construction of wooden walkways to access the beach.
timing: 2012-2014
Costs: € 150,000 Puglia Region - Environmental Protection Plan
RESPONSIBLE SUBJECT: Coastal Dune Park - private operators

- Action 3.10: SAVE THE DUNES:

First phase: identify possible areas for the location of exchange parking lots.
Second phase: recovery of the dune and retro-dune placed near "lido Stefan", also through the construction of walkways and guided access, in order to reduce the tourist pressure on the coastal natural habitats
RESPONSIBLE SUBJECT: Coastal Dune Park
list of all actions of the Strategic Plan for the restoration and protection of the Regional Park Dune Costiere: http://natproject.eu/wp-content/uploads/2014/06/5.3.5_P6_Strategic_plan.pdf
WHY IS IT A BEST PRACTICE FOR YOU? The attention to the natural dune environment, and its role to protect the coastline, is under development in Marche Region by two recent instruments: the new Integrated Coastal Zone

[1] About the concept of Ecotourism, with NAT-PRO has been realized a technical study to improve sustainable mobility in the area.
http://www.parcodunecostiere.org/newsite/dl/02_12%20Studio%20Mobilit%C3%A0%20sostenibile%20costa.pdf .

Management Plan (http://www.regione.marche.it/Regione-Utile/Paesaggio-Territorio-Urbanistica-Genio-Civile/Difesa-della-costa#Piano-GIZC-2018) and the reception of the Ecological Network (DGR 1288/2018 Approvazione degli indirizzi per il recepimento della Rete Ecologica delle Marche – REM).
The coastline of Pesaro is characterized by an half of rock cliff high-coast, and a half of sand beaches low-coast. Part of sand beaches are "free" (not managed by bathing operators) with presence of typical Mediterranean dune vegetation. Recently has been instituted a floristic area to preserve one of these areas, accompanied with a first protection intervention, the realization of walkways.
It's needed to deepen how to increase the defense of all the natural area, in particular the dunes, along Pesaro's coast, and its defense role to sea erosion.
The practice analyzed offers a good integrated approach that could be useful also for Pesaro.
IDENTIFY POSITIVE ASPECTS: Capacity to involve local stakeholders, like residents and local commercial activities (bathing operators and tourist villages. integration of nature conservation with tourism development, Presence of a body of management, the Park
IDENTIFY NEGATIVE ASPECTS: Conflict with local activities, loss of natural environment
INNOVATIVE ASPECTS: The main innovative aspect is the governance of the process, among public bodies and management bodies, but also the capacity to involve the commercial activities in the realization of the restoration's works. The experience show as natural based solution system works can guarantee the conservation of protected area, and the presence of tourism as well. The study on sustainable mobility offers interesting environmental technical solution to access to the coastline, based on three pillars:

- environmental sustainability to sea access
- the compatibility and environmental sustainability of parking areas along the coast
- interventions on the slow mobility network

INFORMATION SOURCES: www.natproject.eu
http://www.parcodunecostiere.org/newsite/ita/content.php?cod=64&codSez=10&type=formSection

3.3.5. The Deltaplan

GEOGRAPHICAL LOCATION: The Netherlands
KEYWORDS: Dikes, dams, flood control
RELATED IMPACT: Coastal flooding; damage to coastal human infrastructure
PROJECT INITIATOR/PROMOTER: Government of The Netherlands
STAKEHOLDERS INVOLVED: Near coast residents, the entire country
BENEFICIARIES/TARGET GROUP: citizens
TIME OF IMPLEMENTATION: Started in 1953
COSTS: N/A (Only The Eastern Schelde storm surge barrier cost around 2.5 billion EUR)
GENERAL DESCRIPTION: In order to prevent and control the flooding, the Dutch made a The Deltaplan in 1953, of building a system of dikes and dams in order to:
1.Drain the areas that flood regularly during high water levelsand protect them from the water,
2.Protect the land from getting brackish
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Dikes, dams, storm surge barriers, water pumping, channels etc.
WHY IS IT A BEST PRACTICE FOR YOU? Parts of Istria (especially Raša, some parts of Poreč and river estuaries areas etc.) are prone to flooding. The most successful way of defense there is is to hold the water off by barriers, dams and dikes. However, their construction cost is significant and there must be a justification of such an investment. Furthermore, the level of defense will depend on the importance of what is being defended.
IDENTIFY POSITIVE ASPECTS: Protection of human lives and property, avoiding damages to the infrastructure, protection of agricultural fields, prevent negative effects on business and psychological ease. An area can be deliberately left to flood and then the water used for irrigation of agricultural land.
IDENTIFY NEGATIVE ASPECTS: Cost of construction, potential clashing with existing infrastructure, visual pollution, change of topography and potential impact on wild life.
INNOVATIVE ASPECTS: Safety of people and infrastructure, potential of enclosing a flooding area which can later be used for irrigation purposes, if appropriate dams can have a road built on them, increased safety of local agricultural fields.
INFORMATION SOURCES: http://www.deltawerken.com/Deltaworks/23.html
https://interestingengineering.com/netherlands-billion-dollar-sea-wall
https://www.designingbuildings.co.uk/wiki/Flood_defences
OTHER: Note that only the projects which could be used in the Istria region are mentioned. This does not mean they need to be at the same scale as the examples. Here the project MOSES in Venice could be mentioned as well. However, some parts of Istria could make use of dam and dikes but on a much smaller scale.

3.3.6 The OBREC (Overtopping Breakwater for Energy Conversion)

GEOGRAPHICAL LOCATION: Napoli, Italy
KEYWORDS: Breakwater, wave energy conversion, infrastructure defence
RELATED IMPACT: Coastal flooding; damage to coastal human infrastructure
PROJECT INITIATOR/PROMOTER: Università degli Studi della Campania "Luigi Vanvitelli
STAKEHOLDERS INVOLVED: Breakwater operator, University, general public
BENEFICIARIES/TARGET GROUP: University, general public
TIME OF IMPLEMENTATION: 2015
COSTS: N/A
GENERAL DESCRIPTION: The Overtopping Breakwater for Energy Conversion, or OBREC, is a non-conventional breakwater which exploits the wave overtopping in order to generate electricity. Wave power extracting breakwater prototypes were installed in the past. However, OBREC is apparently the first Wave Energy Converter (WEC) which uses the water overtopping to power the turbine for electricity production. Only a prototype exists in the harbour of Naples, the San Vincenzo breakwater. It is situated at the middle of the breakwater at 25m water depth and is 6m wide. The total power of the turbines is 2.5kW.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: The OBREC's main purpose is to break the waves and protect the harbour and its infrastructure from the waves. However, the design implements an innovative way of taking advantage of a breakwater to produce electrical energy. Adriatic Sea (especially North Adriatic) has a rather low wave energy potential (estimated at less than 1kW/m in North Adriatic) but the OBREC system could well be implemented at several sites, especially in the South Adriatic, since the wave energy potential near the harbour of Naples is only 2.5kW/m.
WHY IS IT A BEST PRACTICE FOR YOU? The structure which is anyway needed, i.e. the breakwater, is equipped with the system which converts wave energy in the electricity. This adds up additional value to the construction and saves the space, as otherwise the WEC technology would need a separate structure to accommodate it. WEC uses a renewable source of energy and helps to reduce the carbon footprint, while the breakwater has a clear purpose of keeping the harbor waters calm. Furthermore, due to the absence of any significant wave in the protected area there is lower risk of flooding due to wave overtopping. Moreover, some harbors and breakwaters design could allow for installing a kind of gates at the entrance and thus protect the harbor from storm surges and high water levels which could flood the area.
IDENTIFY POSITIVE ASPECTS: Breakwater – costal infrastructure and vessel protection, energy production from renewables, i.e. wave energy conversion, and space saving.
IDENTIFY NEGATIVE ASPECTS: Damage to WEC technology due to extreme weather conditions; geographically limited as not every site has the required potential for the technology to be implemented; although the technology is still in development the costs and the profitability is unknown (moreover, the geometry and the performances of the OBREC are strongly site specific which means cost reduction due to serial production is impossible).
INNOVATIVE ASPECTS: Breakwater – costal infrastructure and vessel protection, energy production from renewables, i.e. wave energy conversion, and space saving. Furthermore, this technology means lower CO2 footprint and the electricity can be used for nearby structures, for lightening, air conditioning or can be connected to the existing electrical distribution network.
INFORMATION SOURCES:

- Vicinanza, D., Contestabile, P. and Di Lauro, E. (2017) 'Overtopping Breakwater for Wave Energy Conversion: Status and Perspective', Proceedings of the 12th European Wave and Tidal Energy Conference 27th Aug-1st Sept, Cork, Ireland
- Iuppa, C., Contestabile, P., Cavallaro, L., Foti, E. and Vicinanza, D. (2016) 'Hydraulic Performance of an Innovative Breakwater for Overtopping Wave Energy Conversion', Sustainability, 8, 1226; doi:10.3390/su8121226
- http://www.enea.it/it/seguici/events/energia-dal-mare/Arena1.pdf
- Vicinanza, D., Contestabile, P. and Di Lauro, E. (2017) 'Prototype Overtopping Breakwater for Wave Energy Conversion at Port of Naples', Proceedings of the Twenty-sixth (2016) International Ocean and Polar Engineering Conference, Rhodes, Greece, June 26-July 1

OTHER: Caisson breakwater and a full-scale device called REWEC3 were built in 2012 at the harbor of Citavecchia in Italy. It has a total of 136 chambers and air turbines of 20kW. The average annual electrical power delivered is estimated at more than 2.800MWh.

3.4 Sector: Energy

3.4.1. Energy renovation of the Karlovac General Hospital, Karlovac

GEOGRAPHICAL LOCATION: Karlovac, Karlovac County, Croatia
KEYWORDS: energy, renovation, ESCO
RELATED IMPACT: Increased energy demand for cooling and heating
PROJECT INITIATOR/PROMOTER: Karlovac General Hospital
STAKEHOLDERS INVOLVED Karlovac General Hospital; Agency for Transactions and Mediation in Immovable Properties (APN); The Environmental Protection and Energy Efficiency Fund (EPEEF); Esco Energy d.o.o.
BENEFICIARIES/TARGET GROUP: Karlovac General Hospital
TIME OF IMPLEMENTATION: December 2015. – September 2016.
COSTS: Total project value: 62,2 mil.kn; Subsidy 40% of funds from EPEEF: 24,2 mil.kn
GENERAL DESCRIPTION: Deep energy renovation, a total of 36.000 m2 net usable area, financed with EPC - Energy Performance Contracting. Renovated:

- 15.700 m2 thermal insulation of facade
- 8.300 m2 thermal insulation of flat roof
- 5.000 m2 of doors and windows replaced
- 6 thermal substations reconstructed
- 25% of energy produced from renewable sources (heat pumps, 22 solar collectors)
- new cooling system installed
- 1.200 thermostatic valves installed
- 12.500 lighting fixtures replaced
- The hospital is now more comfortable and energy efficient.

LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Energy renovation measures:

- renovation of the building envelope
- reconstruction of thermal substations
- reconstruction of thermal power systems
- installation of solar collector system and heat pump
- compensation of reactive energy
- reconstruction of the interior lighting system
- Building Management System (BMS)

WHY IS IT A BEST PRACTICE FOR YOU?

- energy savings: 54%
- reduction of CO2 emissions: 55%
- share of renewable energy sources: 25%

IDENTIFY POSITIVE ASPECTS:

- energy savings
- CO2 reduction
- development of ESCO market in Croatia

IDENTIFY NEGATIVE ASPECTS:

- complex project preparation and implementation
- no funds available for energy renovation
- no administrative capacity in public sector

INNOVATIVE ASPECTS:

- development of ESCO market in Croatia
- deep energy renovation of public sector buildings without additional expenditures of national budget
- joint investment of private capital (60% by energy service company – ESCO) and national grants (40%)
- max. 14 years contracting period of energy service between ESCO and the public body
- savings achieved through energy renovation are used for paying the service charge to ESCO

INFORMATION SOURCES: http://apn.hr/obnova/opca-bolnica-karlovac
https://www.youtube.com/watch?v=370ZUXcqMsk

3.4.2. Energy renovation of the multi apartment building, Sjenjak 101, Osijek

GEOGRAPHICAL LOCATION: City of Osijek, Osijek-Baranja County, Croatia
KEYWORDS: energy, renovation, ERDF
RELATED IMPACT: Increased energy demand for cooling and heating
PROJECT INITIATOR/PROMOTER: Co-owners of multi apartment building
STAKEHOLDERS INVOLVED Co-owners of multi apartment building; Ministry of Construction and Physical Planning (Intermediate Body 1 - IB1); The Environmental Protection and Energy Efficiency Fund (Intermediate Body 2 - IB2)
BENEFICIARIES/TARGET GROUP: Co-owners of multi apartment building
TIME OF IMPLEMENTATION: July 2017. – January 2018.
COSTS: Total project value: 5.812.751,69 kn ERDF grant: 3.398.223,96 kn
GENERAL DESCRIPTION: Deep energy renovation of a building built in 1979. with 133 apartments, gross floor area (GFA) of 11.636,46 m2, 60% grant co-financing.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Energy renovation measures - renovation of the building envelope: thermal insulation of facade, thermal insulation of flat roof, replacement of doors and windows.
WHY IS IT A BEST PRACTICE FOR YOU?

- energy savings: 78%
- improvement of energy class from D before renovation to B after renovation

IDENTIFY POSITIVE ASPECTS:

- energy savings
- CO2 emission reduction
- increased living standard, health and well beeing

IDENTIFY NEGATIVE ASPECTS:

- applicants lack of previous EU experience
- poor project preparation & irregularities
- public procurement problems

INNOVATIVE ASPECTS:

- first multi apartment building renovated with EU funds
- • deep energy renovation of privately-owned residential Building without additional expenditures of national budget
- joint investment of private capital and ERDF grants

INFORMATION SOURCES:
https://hr-hr.facebook.com/sjenjak.stojedan/
http://zgradekojestede.fzoeu.hr/projekti/sjenjak-101-osijek/6.html
https://vijesti.rtl.hr/video/vijesti/219551/prva-zgrada-u-hrvatskoj-koja-ide-u-energetsku-obnovu-vise-od-pola-troska-od-55-mil-kuna-sufinancira-se-iz-europskog-budzeta/

3.4.3. Energy renovation of the Primary school Josip Zorić, Dugo Selo

GEOGRAPHICAL LOCATION: Dugo Selo, Zagreb County, Croatia
KEYWORDS: energy, renovation, ERDF
RELATED IMPACT: Increased energy demand for cooling and heating
PROJECT INITIATOR/PROMOTER: Zagreb County
STAKEHOLDERS INVOLVED Zagreb County; Ministry of Construction and Physical Planning (IB1); The Environmental Protection and Energy Efficiency Fund (IB2)
BENEFICIARIES/TARGET GROUP: Zagreb County / Primary school Josip Zorić Dugo Selo
TIME OF IMPLEMENTATION: June 2016. – December 2016.
COSTS: Total project value: 3.005.160,19 kn, Grant (ERDF + EPEEF): 1.878.649,63 kn
GENERAL DESCRIPTION: Deep energy renovation of a primary school building built in 1962., gross floor area (GFA) of 3.595,44 m2, 70% grant co-financing (ERDF 30% + EPEEF 40%). After energy renovation there are lower energy costs and maintenance costs, which improved working conditions and increased the quality of services provided.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Energy renovation measures - renovation of the building envelope: thermal insulation of facade, thermal insulation of ground floor, replacement of doors and windows.
WHY IS IT A BEST PRACTICE FOR YOU?

- energy savings: 70%
- improvement of energy class from D before renovation to B after renovation

IDENTIFY POSITIVE ASPECTS:

- energy savings
- CO2 reduction
- improved working conditions

IDENTIFY NEGATIVE ASPECTS:

- applicants lack of previous EU experience
- poor project preparation & irregularities
- public procurement problems

INNOVATIVE ASPECTS: Pilot project which served as an example for future project proposals.
INFORMATION SOURCES: http://os-jzorica-dugo-selo.skole.hr/?news_id=1302
http://www.mgipu.hr/default.aspx?id=30982

3.4.4. Energy renovation of the Preschool ‘Turnić’, Rijeka

GEOGRAPHICAL LOCATION: Rijeka, Primorsko-Goranska County, Croatia
KEYWORDS: energy, renovation, ERDF
RELATED IMPACT: Increased energy demand for cooling and heating
PROJECT INITIATOR/PROMOTER: City of Rijeka
STAKEHOLDERS INVOLVED: City of Rijeka; Ministry of Construction and Physical Planning (IB1); The Environmental Protection and Energy Efficiency Fund (IB2)
BENEFICIARIES/TARGET GROUP: City of Rijeka / Preschool ‘Turnić’, Rijeka
TIME OF IMPLEMENTATION: January 2016. – May 2017.
COSTS: Total project value: 1.407.170,11 kn, Grant (ERDF + EPEEF): 880.978,08 kn
GENERAL DESCRIPTION: Deep energy renovation of a preschool building built in 1972., a total of 821,60 m2 net usable area, 70% grant co-financing (ERDF 30% + EPEEF 40%). After energy renovation there are lower energy costs and maintenance costs, which improved working conditions and increased the quality of services provided.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Energy renovation measures - renovation of the building envelope: thermal insulation of facade, replacement of doors and windows.
WHY IS IT A BEST PRACTICE FOR YOU?

- energy savings: 73%
- improvement of energy class from C before renovation to A+ after renovation

IDENTIFY POSITIVE ASPECTS:

- energy savings
- CO2 reduction
- favorable microclimate for work

IDENTIFY NEGATIVE ASPECTS:

- applicants lack of previous EU experience
- poor project preparation & irregularities
- public procurement problems

INNOVATIVE ASPECTS: Pilot project which served as an example for future project proposals.
INFORMATION SOURCES: https://www.rijeka.hr/obnovu-uredenje-zgrada-vrtica-skola-ulozeno-gotovo-135-milijuna-kuna/

3.4.5. Cool Roofs: Protecting Local Communities and Saving Energy

GEOGRAPHICAL LOCATION: India
KEYWORDS: cool roofs, heat waves, energy, sunlight reflection
RELATED IMPACT: Increased energy demand for cooling
PROJECT INITIATOR/PROMOTER: Indian Government
STAKEHOLDERS INVOLVED: Indian Government, Indian Meteorological Department, National Disaster Management Authority, citizens.
BENEFICIARIES/TARGET GROUP: Primarily people living in buildings/houses with roof surface constructed from galvanized metal, asbestos or concrete. These hot surfaces can produce heat island effect and worsen air pollution, therefore affect the whole population.
TIME OF IMPLEMENTATION: In 2017 and 2018 the cities of Ahmedabad and Hyderabad initiated pilot cool roof programs.
COSTS: n.a.
GENERAL DESCRIPTION: Due to climate change, heat waves in India are becoming more frequent and intense, with deadly consequences for India's most vulnerable communities. Less than 10% of India's house holds have air conditioning. However, due to a rising standard for tens of millions of Indians, an immense increase in cooling and air conditioning demand is expected, which will probably strain the country's electric grid, increase air pollution, require fuel import, and magnify the impacts of global warming. Low-rise buildings like these can absorb up to one-fifth of a building's heat through the roof.
More than 65 million of people in India live in informal urban housing, known as slums or bastis. Low-rise buildings like these can absorb up to one-fifth of a building's heat through the roof. Roofs, therefore, offer an avenue to significantly impact internal temperatures and provide indoor thermal comfort, in both air-conditioned and non-air-conditioned buildings. In 2017 and 2018, the cities of Ahmedabad and Hyderabad initiated pilot cool roof programs. These initial programs include citizen awareness campaigns, pilot initiatives targeting 3,000 roofs, cooperation with businesses, and applying cool roof techniques to government buildings and schools.
A cool roof is one that stays cooler than regular roofs by reflecting the sunlight incident on it and emitting thermal radiation. Cool roofs have the ability to reflect sunlight and reject heat because the roofs are prepared, covered or coated with materials that have special characteristics. Buildings and built up areas in cities are often constructed of concrete, brick or cinder blocks that absorb solar radiation, transferring this incident heat to the internal spaces of the building. This causes the interiors of a building to get heated up, and stay hot, often hotter than the external ambient temperature, and well beyond comfortable conditions. Collectively, many hot surfaces together can result in increased temperatures across an entire urban area, adding to the heat island effect in cities.
Cool roofs function in the following way: every time solar radiation falls on a roof, the roof reflects a part of the incident solar radiation back into the atmosphere; it conducts a part of the heath through itself into the ground and to other buildings; it convects a part of the heat to the ambient air (external and internal); and it emits a part of the absorbed heat to internal surfaces and back to the sky. There are four broad cool roofs techniques: cool roofs coated in a specific material or paint with high reflectivity; membrane cool roofs containing pre-fabricated materials such as membranes or sheeting; tiled cool roofs with high albedo, china mosaic tiles or shingles; special cool roof materials such as ModRoof; and green roofs.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: In 2017 and 2018, the cities of Ahmedabad and Hyderabad initiated pilot cool roof programs. These initial programs include citizen awareness campaigns, pilot initiatives targeting 3,000 roofs, cooperation with businesses, and applying cool roof techniques to government buildings and schools. Three models were implemented allowing the cool roofs program to grow from a single neighbourhood to a city-wide effort:
1. Pilot model, i.e. designing and implementing pilot programs to showcase benefits of cool roofs;
2. Municipal, voluntary & CSR (corporate social responsibility) model, i.e. implementing cool roofs in municipal and government buildings;
3. Building codes model, i.e. enforcing cool roof provisions through building codes and partnering with real estate developers and residents for wider adoption.

WHY IS IT A BEST PRACTICE FOR YOU? Firstly, considering the rising number of India's population and living conditions of the population's majority, government's efforts to improve these communities and life for their residents are of high value and importance. Furthermore, considering the expected increase in energy demand (due to a rising income levels and climate change), cool roofs represent an effective way of tackling heating and cooling challenges at a larger scope. There are six key benefits of cool roofs:

- Cool roofs save energy and costs by reducing cooling load requirements in a building;
- Cool roofs keep homes and buildings from gaining heat and thereby improve occupant comfort;
- Cool roofs can help reduce the urban heat island effect, improve air quality and combat climate change;
- Cool roofs enhance durability and appearance of roofs;
- Cool roof increase energy access by reducing peak load on the grid;
- Cool roofs help build community resilience to extreme heat.

IDENTIFY POSITIVE ASPECTS:

- Immediate effectiveness even with minor investments;
- Easily applicable to a large population portion
- Variety of cool roof materials available.

IDENTIFY NEGATIVE ASPECTS: There are certain studies claiming that the cheapest cool roof material - white color - cools houses, but also reduces cloudiness and allows more sunlight to reach the ground.

INNOVATIVE ASPECTS: Cool roofs in general represent an innovative concept of responding to heat waves, in particular among people without access to reliable electricity or those who cannot afford the power it takes to run an air conditioner. Experts are continuously developing innovative roofing materials which in different ways and amounts reflect sunlight from their surface and emit thermal radiation.

INFORMATION SOURCES: https://www.nrdc.org/experts/anjali-jaiswal/keeping-it-cool-models-city-cool-roof-programs https://www.nrdc.org/sites/default/files/ib_-_cool_roofs_-_hyd_workshop.pdf

3.4.6. Kingsmill Hospital

GEOGRAPHICAL LOCATION: Mansfield, Nottinghamshire, UK
KEYWORDS: Water source heat pump, cooling, renewable energy
RELATED IMPACT: Increased energy demand for cooling
PROJECT INITIATOR/PROMOTER: Sherwood Forest Hospital Trust, National Health Service (NHS)
STAKEHOLDERS INVOLVED: Sherwood Forest Hospital Trust, Kingsmill Hospital, NHS, patients
BENEFICIARIES/TARGET GROUP: Kingsmill Hospital staff and patients
TIME OF IMPLEMENTATION: Completed 2009.
COSTS: n.a.
GENERAL DESCRIPTION: All of the cooling and approximately one third of the heating for King's Mill Hospital is provided by 42 water source heat pump units. This is a close loop system with 140 stainless steel heat exchangers under the surface of a 65.000m2 nearby water reservoir (lake). This system capacity is 5.400kW of cooling and 5.000kW of heating. The estimated savings in energy are 25.000GJ and 2.078t CO2 per year. The cost savings are estimated at £126.500 per year.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: One of the largest closed lake loop system used in the World. The system provides the entire cooling needs for the hospital by taking the advantage of the nearby lake's lower temperature during the periods when cooling is required. A full environmental impact assessment was carried out. The Coefficient of Performance (CoP) is around 6.0 for cooling and 3.8 for heating.
WHY IS IT A BEST PRACTICE FOR YOU? The savings in energy, CO2 reduction, cost and the renewable nature of the energy source for cooling and heating is plausible. This can be an effective system to be used on sites near larger lakes or accumulation reservoirs or sea (coastal area).
IDENTIFY POSITIVE ASPECTS: Energy savings, CO2 reduction and cost saving
IDENTIFY NEGATIVE ASPECTS: Energy loss, unpredictable costs, resistance by the local community
INNOVATIVE ASPECTS: ---
INFORMATION SOURCES: http://www.awebgeo.com/wp-content/uploads/Kings_Mill_Hospital-GI_Case_Study.pdf

3.4.7 Kindergarten (nursery) Pjerina Verbanac (KPV)

GEOGRAPHICAL LOCATION: Labin, Istria, Croatia
KEYWORDS: Heat pump, renewable energy, energy pile
RELATED IMPACT: Increased energy demand for cooling
PROJECT INITIATOR/PROMOTER: IRENA – Istrian Regional Energy
STAKEHOLDERS INVOLVED: Town of Labin, KPV, local community
BENEFICIARIES/TARGET GROUP: KPV, local community
TIME OF IMPLEMENTATION: Completed 2014
COSTS: 81.000 EUR (of which 74.000 EUR for heating and cooling system)
GENERAL DESCRIPTION: The KPV's building extension and energy renewal project was complemented with the new heating and cooling system which was funded by the EU project Legend.
The system itself consists of a floor heating system, wall heating / cooling, ceiling heating / cooling (fan coils) and a ventilation system incorporating a heat recuperator.
Low-temperature surface heating elements were selected to ensure the maximum efficiency of the system and the 22 kW geothermal heat pump. Three 100m deep energy piles provide thermal energy to the heat pump. The system is sufficient to heat/cool around 350m2 of useful surface. The capacity of one energy pile is 5.4kW which enables the total of 16.2kW to be passed on to the heat pump.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Energy piles for heating/cooling, renewable energy source, reduced consumption and cost savings, CO2 reduction. The system is automatized and the room temperatures are being kept at constant value. Moreover, system variables (temperature, electricity consumption etc.) is monitored and available online in the real time.
WHY IS IT A BEST PRACTICE FOR YOU? Because of renewable energy sources it uses (geothermal energy), energy and cost savings, CO2 reduction and automatization. It is a positive example for local community and encourages investment in renewables. Furthermore, anyone can see the system variables, how much are the current and cumulative costs and savings. In addition, the same system provides both cooling and heating without additional costs.
IDENTIFY POSITIVE ASPECTS: Energy savings, CO2 reduction, promotional aspect and awareness rising
IDENTIFY NEGATIVE ASPECTS: Technical problems, relatively high investment costs, limited applicability at certain areas
INNOVATIVE ASPECTS: Renewable energy use, cooling and heating provided by the same system and same principle, CO2 reduction, automatization.
INFORMATION SOURCES: http://www.irena-istra.hr/index.php?id=4109

3.4.8. Hotel Parentium

GEOGRAPHICAL LOCATION: Poreč, Istria, Croatia
KEYWORDS: Cooling, heating, seawater
RELATED IMPACT: Increased energy demand for cooling
PROJECT INITIATOR/PROMOTER: PLAVA LAGUNA d.d.
STAKEHOLDERS INVOLVED: PLAVA LAGUNA d.d., water management authorities
BENEFICIARIES/TARGET GROUP: PLAVA LAGUNA d.d.
TIME OF IMPLEMENTATION: 2014
COSTS: n.a.
GENERAL DESCRIPTION: Hotel Parentium was build in 1967, the first major adaptation was in 1987 and the next one in 2014. It has a net area of 20.582m2 and 538 beds. The building needs 2.900kW for heating and 1.350kW. The heat pumps have a 1380kW cooling capacity and 1590kW heating capacity.
Instead of energy piles, there are two exploitation wells and four discharge wells. This is an open system so that the sea water is pumped from the exploitation wells through heat exchanger and back to the discharge wells. The depth of each well is -40m. Yearly cost savings are around 20.000 EUR.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Heat pump, sea water use for heating/cooling, renewable energy.
WHY IS IT A BEST PRACTICE FOR YOU? Because of renewable energy sources it uses, energy and cost savings, CO2 reduction and automatization. It is a positive example and encourages investment in renewables by private sector. The same system provides both cooling and heating without additional costs. Using seawater for heating/cooling is natural in coastal areas and using such a system in hotels enables a more sustainable tourism and has less impact on the environment, which is a constant place of living for the local community.
IDENTIFY POSITIVE ASPECTS: Energy savings, CO2 reduction, promotional aspect and awareness rising
IDENTIFY NEGATIVE ASPECTS: Technical problems, possible opposition from local community, applicable only near the coast
INNOVATIVE ASPECTS: Renewable energy use, cooling and heating provided by the same system and same principle, CO2 reduction, automatization.
INFORMATION SOURCES: Karacic, I. (2014) Examples of Geothermal Energy Use in Hotels, Guest Houses and Businesses

3.4.9. Berlin Biotope Area Factor

GEOGRAPHICAL LOCATION: Berlin (GER)
KEYWORDS: Design, greening, urban
RELATED IMPACT: Increased energy demand for cooling
PROJECT INITIATOR/PROMOTER: Municipality of Berlin
STAKEHOLDERS INVOLVED: n.a.
BENEFICIARIES/TARGET GROUP: Building contractors, developers, planners, architects, designers
TIME OF IMPLEMENTATION: 1994-onward
COSTS: The costs of the measures selected on the basis of the Biotope Area Factor (BAF) are diluted within construction costs. They may be calculated or not by each building owner who does not always inform administrative authorities. If building owners are confronted with inappropriate high expenses, they normally ask for an alleviation of the BAF which will be normally agreed to.
GENERAL DESCRIPTION: In Berlin inner city, plans for the development of new buildings fall under a regulation requiring a proportion of the area to be left as green space: the Biotope Area Factor (BAF) or BFF (Biotop Flächenfaktor). All potential green areas, such as courtyards, roofs and walls are included in the BAF. The regulation is a part of a larger set of documents relating to landscape planning and design and species protection.
It responds to the need to encourage more green space in densely built-up urban areas. Climate change is expected to increase and intensify heat waves and water-related extremes that are of particular relevance for cities. Thus, the BAF is an important mechanism to reduce local vulnerability as its measures help to lower the temperatures and improve the runoff management.
The BAF started to be implemented in 1994 and is still on-going. A considerable number of new built areas in the inner centre have implemented this regulation, translating it into green areas.
The Biotope Area Factor establishes that the development of new buildings requires a proportion of the area to be left as a green space. The BAF provides developers, architects and designers with clear but flexible guidelines on the portion of a plot of land that must be planted or provide other green space functions contributing to the following environmental quality goals:safeguarding and improving the microclimate and atmospheric hygiene, reducing the urban heat island effect and therefore reducing vulnerability to heat waves; safeguarding and developing soil function and water balance, reducing vulnerability to water-related extremes; creating and enhancing the quality of the plant and animal habitat as well as improving the ecosystem's functionality; improving the residential environment.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Specific solutions implemented in the BAF included: (i) greening of functional spaces (e.g. bike or bin sheds); (ii) planting trees and shrubs or, in smaller areas, climbing plants to create green walls; (iii) introducing green roofs; (iv) paving only on main routes and using permeable surfaces elsewhere. These measures reduce radiation fluxes, provide shade, provide cooling effect inside buildings and outside, improve air and water quality, and improve storm-water run-off.
The BAF formula calculates the proportion of an area that needs to be green space: BAF =Ecologically Effective Surface Areas/Total Land Area.
BAF targets depend on the specific uses of an area. Residential and public areas need to achieve a BAF target of 0.6 while commercial, business and administrative areas are requested to achieve a lower target of 0.30.
WHY IS IT A BEST PRACTICE FOR YOU? The BAF concept is consistent with the strategic targets of the new urban planning tools of Misano Adriatico that are currently under revision: the soil sealing reduction, the environmental quality improvement, the general increase of energy efficiency and, more in general, a commitment to tackle the negative effects of climate change.
This give the possibility, in some situations, to apply a specific planning tool/rule which take into account the BAF scheme.
IDENTIFY POSITIVE ASPECTS: The strength of the BAF concept is that it allows flexibility of the site design: the developer may decide what green space measures are applied, and where, as long as the required green space ratio is achieved, combining different areas with different types of surfaces for achieving the required standard.
The BAF is an important mechanism to reduce local vulnerability as its measures enhancing the proportion of green spaces help to lower the temperatures and improve the runoff management.

At the same time the application of the BAF can improve other environmental and qualitative features of an area creating and enhancing the quality of the plant and animal habitat as well as improving the ecosystem's functionality and improving the residential environment.
IDENTIFY NEGATIVE ASPECTS: In some cases, a strict application of the BAF, could entail higher expenses for the building owners. For some specific intervention (e.g. parking in a rural area) the application of the BAF could be unnecessary.
INNOVATIVE ASPECTS: BAF targets depend on the specific uses of an area and different types of green spaces are weighted differently according to their ecological value, based on evapotranspiration capacity, permeability, possibility to store rain water, relationship to soil functioning and provision of habitat for plants and animals. For example, the weighting of surfaces with vegetation unconnected to soil below is 0.5; that of surfaces with vegetation connected to soil below is 1.0 and that of green roofs is 0.7.
INFORMATION SOURCES: https://www.berlin.de/senuvk/umwelt/landschaftsplanung/bff/index_en.shtml

3.4.10. Vrijburcht multipurpose living-and-working complex

GEOGRAPHICAL LOCATION: Amsterdam, Netherlands
KEYWORDS: Extreme Temperatures, Water Scarcity, social awareness
RELATED IMPACT: Increased energy demand for cooling & impacts on water competition
PROJECT INITIATOR/PROMOTER: Vrijburcht Foundation, a collective private commissioning initiative.
STAKEHOLDERS INVOLVED: Bank (for a personal loan at favorable interest rate) housing corporation (that provided financial warranty and know-how.)
BENEFICIARIES/TARGET GROUP: owners of the apartments
TIME OF IMPLEMENTATION: Planning phase started in 2000, construction phase started in 2005. Vrijburcht, including the courtyard garden, was completed in 2007.
COSTS: garden: € 55.000, Rainwater storage facility € 17.500, greenhouse € 30.000, costs for maintenance of the garden amount to € 3.000 / year, including the contribution of a gardener next to the voluntary work of the residents
The total costs of the building complex were € 16 million.
GENERAL DESCRIPTION: Vrijburcht is a multipurpose living-and-working complex in Amsterdam. It offers many shared social amenities for both the residents and the people from the neighbourhood. The heart of the complex is the courtyard garden with trees, a vegetable garden, lawns, flowers, benches and a greenhouse. The garden provides various solutions to the expected impact of climate change; it offers residents a cool environment during warmer summers; rain water is stored in underground tanks for irrigation in dry periods; the unsealed area permits maximum rainwater permeability. The complex was realized and financed through of a 'collective private commissioning'. Future residents jointly develop the project, which gives them maximum influence on the design but also includes carrying the risks related to the pre-financing and construction phase. The climate-proof courtyard garden was an integral part of the design of the complex and its features based on the wishes of the future residents.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: The development of the project was done through private collective commissioning. Private persons jointly acquired a piece of land and united themselves in a Foundation that acts as a commissioner for the whole project. Once the project was realized, all owners of the apartments and other spaces in the building have been united in the Homeowner Association, which is a legal entity that takes care of the maintenance of the building and other shared interests, among which the garden. The association has an executive committee, a general assembly, a chair and a financial committee (This is a common structure in all cases in the Netherlands when more owners are involved within a building)
The construction of Vrijburcht comprised 52 dwellings with an average size of 100 m2. The courtyard garden provides solutions to prevent or reduce flooding from extreme rainfall, drought during dry periods and heat stress during hot summer days:

- Rain water from the roof tops is collected in two tanks that are buried in the garden and can in total contain 6000 l of water. this water is used for irrigation of the garden and the plants on the surrounding terraces/balconies and covers the total irrigation needs in most of the years.
- The car parking garage is constructed under the building and the garden is paved minimally to create maximum permeability for rain water in the garden.
- Relief is created so that water flows from higher parts to a marsh-like environment. This prevents flooding of the garden and enhances vegetation diversity by creating dryer and wetter environments across the courtyard garden.
- Drainpipes are detached from the facades at ground-floor level and together form a pergola construction for creeping plants. This minimizes the impact of eventual leakages on the facade. Creeping plants are also used at the exterior of the building were they cover wind screens to form green facades.
- The many trees in the garden provide shade and thus contribute to an agreeable microclimate on hot summer days.

WHY IS IT A BEST PRACTICE FOR YOU? Due to the water supply condition in Pesaro (see BP n.2) , and the increasing of hot nights and warm days in summer in the last 30 years observed in Pesaro with related risk of heat waves , the solution described seem adapt to develop resilient communities able to copt with the impacts of climate change expected in Pesaro, especially for the urban area. The solution is especially interesting.

IDENTIFY POSITIVE ASPECTS: Social awareness integrated solution for several impact (drought, warm, rainwater permeability)
IDENTIFY NEGATIVE ASPECTS: the risks related to the pre-financing and construction phase, by private
INNOVATIVE ASPECTS: the most innovative aspect is that the initiative is leaded by a private group of citizens.
The design of the courtyard garden was made in close cooperation with the (future) residents. Via presentations, excursions, an opinion poll and several workshops a common idea about program, atmosphere and design style was formed: a lush green, natural and informal meeting space for all residents, young and old
The solution of greening contribute, at the same time, to reduce the risk of pluvial flooding, store rainwater for irrigation and decrease heat stress by providing a good micro-climate to the users of the building.
The application seems a perfect example of adaptive solution based on low-tech solutions in urban context.
INFORMATION SOURCES: http://www.vlugp.nl/projecten/binnentuin-vrijburcht/
https://climate-adapt.eea.europa.eu/metadata/case-studies/vrijburcht-a-privately-funded-climate2013proof-collective-garden-in-amsterdam

3.4.11. IMDEA ENERGY building

GEOGRAPHICAL LOCATION: municipality of Móstoles, Spain
KEYWORDS: extreme heat, water scarcity, energy saving
RELATED IMPACT: Increased energy demand for cooling & impacts on water competition
PROJECT INITIATOR/PROMOTER: Madrid Institute for Advanced Studies (IMDEA)
STAKEHOLDERS INVOLVED: Stakeholder participation was not directly relevant for the design and construction of the new building, even if different consultants have been involved: an architect company to supervise the project, several installations consultants, and a specific society for the LEED certification process.
Municipality of Móstoles supported the project by ceding the land for free.
BENEFICIARIES/TARGET GROUP: Madrid Institute for Advanced Studies (IMDEA)
TIME OF IMPLEMENTATION: 2010 – 2012 (Construction of the building)
COSTS: about 9.2 million of euros.
GENERAL DESCRIPTION: The new building of the energy department of the Madrid Institute for Advanced Studies (IMDEA) incorporates different climate change adaptation solutions for extreme heat in summer and water scarcity.
The building has been designed according to the criteria of bioclimatic architecture, in order to achieve low indoor temperatures during hot periods and minimize energy use for cooling and lighting. Climate adaptation measures have also been developed with respect to water management. Water-saving systems are implemented and all the water from the roof is collected to irrigate green areas or for other non-specified purposes. Not only extreme droughts, but also extreme rainfalls are taken into account; the parking has a permeable surface, which drains water quickly after the event. Climate mitigation measures focus mainly on energy efficiency, renewable energy sources and reduced energy consumption.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: The building has been designed according to the criteria of bioclimatic architecture, in order to achieve low indoor temperatures during hot periods and minimize energy use for cooling and lighting. Special care has been taken in the orientation of the building: different facade systems have been designed and compared in order to develop the optimal facade according to function and orientation. The building was designed in modules, so it could be expanded or divided without affecting its functionality or image.
Building facades are back-ventilated with 80 mm isolation. It is enveloped by large transparent surfaces, especially in the indoor walls, which improve the appearance and energy quality of the building as more radiation reaches its interior. Horizontal blades are used on the outside of the building, thereby offering effective solar shading without impairing the view. These sunshades protect the users against an excessive level of heat due to solar radiation. Together with a proper orientation of the building, the sunshades enable optimal use of the incoming light in times of low solar altitude (early morning, late evening and winter days). Roof areas exposed to direct sun have been covered with special white material reflecting radiations, which reduces the amount of energy needed for cooling and the contribution to the urban heat island effect.
Water-saving systems are implemented; for example sinks, toilets and urinals are very low water consuming and the saving is over 40% compared to a conventional building. Additionally, all the water from the roof is collected and used to irrigate green areas or for other non-specified purposes.
The parking has a permeable surface, which drains water quickly after the extreme rainfalls events.
Attention is also paid to the biodiversity and nature value of the area. The green area surrounding the building is covered with local trees and plants and counts for more than 40% of the total area.
The building has energy efficient facilities and a monitoring and control system to ensure optimal use of those facilities. Three years after its completion, the building has become more energy efficient every year, due to this monitoring system. A closed system of water cooling also supports the energy and water efficiency of the building.
An aquifer thermal energy storage installation, cogeneration and solar panels are installed as renewable energy sources. Climate change mitigating measures are also implemented via behavioural measures; electric cars and carpooling are encouraged by the reservation of special places on the IMDEA parking area.
WHY IS IT A BEST PRACTICE FOR YOU? The Energy Performance of Buildings Directive requires all new buildings to be nearly zero-energy by the end of 2020. All new public buildings must be nearly zero-energy by 2018.

Also, in Pesaro the municipality is working to find solution to realize buildings with elevate standard like NZEBs, especially for public building as schools that is the main category of public property.
The practice seems to be a perfect example of ideal building for commercial – tertiary – sector, included companies' headquarter, or research – school complexes.
Starting designs with the clear objective to integrate mitigation and adaptation solution can optimize the investments
IDENTIFY POSITIVE ASPECTS: High technical skill integrated climate mitigation and adaptation solutions
IDENTIFY NEGATIVE ASPECTS: The project seem to be applicable only in new buildings necessity of private companies with high investment capacity
INNOVATIVE ASPECTS: Most of the solutions implemented in the construction of the IMDEA building are climate change adaptation and mitigation measures at the same time. The design of the building started from a bioclimatic approach. The IMDEA ENERGY building was designed and developed according to the Green Building specifications, established by the US Green Building Council) targeting the highest LEED Certification. It obtained the Gold Certification (LEED NC2.2 Gold). At the website https://www.usgbc.org/projects/edificio-fundacion-imdea-energia is it possible to see the LEED Scorecard. The technical solution are well integrated (eg solar panels have been installed in the roof directly instead of adding them at a later stage). The building is meant to save money during the period of use, estimated in more than 50 years
INFORMATION SOURCES: https://climate-adapt.eea.europa.eu/metadata/case-studies/white-roof-innovative-solar-shadings-and-bioclimatic-design-in-madrid
http://www.construction21.org/case-studies/es/madrid-institute-for-advanced-studies-imdea.html

3.5 Sector: Socio-Economic

3.5.1. Integrating adaptation in the design of the metro of Copenhagen

GEOGRAPHICAL LOCATION: Copenhagen, Denmark
KEYWORDS: Copenhagen, design standard, metro, storm urge, urban transport
RELATED IMPACT: Impact on transportation network
PROJECT INITIATOR/PROMOTER: The City of Copenhagen, the City of Frederiksberg
STAKEHOLDERS INVOLVED: The City of Copenhagen, the City of Frederiksberg, the National Parliament, the Ministry of Transport, Metroselskabet (the Copenhagen metro company).
BENEFICIARIES/TARGET GROUP: Metro service users.
TIME OF IMPLEMENTATION: Preliminary construction works started in 2010. The project should be open to service in 2019.
COSTS: Approximately EUR 3 billion (as estimated in 2010)
GENERAL DESCRIPTION: The project is aimed at protecting the metro system against changes in climate, particularly from heavy rainfall, storm surges and storms, that could impact the infrastructure (mainly by flooding), affecting the metro operation and passenger safety. Heavy rainfalls, storms and storm surge affect locally and are hard to predict as they can vary greatly within a short distance.
The highest water level has been identified separately for each station in order to estimate the exact level for each entrance, stairs, tunnel ventilation, ramp, technique room, shaft, elevator, and control and maintenance centre. Apart from the track, the areas and installations mentioned are the most vulnerable that may affect the operation and safety, which should be ensured.
This project also incorporated two adaptation options:
Water sensitive urban design (WSDU), an emerging urban development paradigm aimed at minimising hydrological impacts of urban development on environment;
Adaptation of urban planning: water and energy, a set of soft adaptation measures which can be considered for climate proofing of urban planning and design.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Adaptation measures of Copenhagen metro infrastructure included the following actions: an increase of the elevation level of metro stations critical elements (entrance, stairs, tunnel ventilation, ramps, technique rooms, shaft, elevator, control and maintenance centre) from approximately 2.25 m on the existing metro to approximately 2.50 m on the City ring, which is currently under construction and is expected to be opened in July 2019. Moreover, IPCC climate projections were considered as a basis for sea level rise; the area around the entrances to the underground stations is designed to ensure the runoff of rainwater away from the openings. Furthermore, at some underground stations, a step has been incorporated, which requires a step up before you go down to the station; all underground stations have pumping capacity to a so-called 1000 year event of rain. In the event that the tunnel is flooded, the water will automatically be pumped away;
floodgates are established in 3 underground stations to secure the metro from flooding from other parts of the public transport train system; in the above-ground metro system, drains are installed along the track leading the water out into the local sewer system; the underground stations are protected against backflow from the city's sewerage system;
installations of waterproof outer doors to the technique rooms at several stations as well as electrical and mechanical installations have been made them waterproof; technique rooms are installed with a 0.3 m raised doorstep; waterproof walls up to level 2.3 m and against waves up to level 2.55 m along the exposed above-ground metro sections.
WHY IS IT A BEST PRACTICE FOR YOU? Copenhagen local government, in cooperation with its metro company recognized flooding as accelerating threat to the existing metro transportation network, with direct effect on the citizens' safety. Since the establishment in 2002 the Copenhagen metro has become a huge success, and the characteristic driverless white trains are now an important vehicle for the expanding number of commuting Copenhageners. To ensure stable and reliable operations in the years to come, Metroselskabet engaged in external expert reevaluation of the initiatives planned to adapt the metro to the future climate.

Measures taken to alleviate climate change effect on life quality and safety were cautiously planned in accordance to the existing climate adaptation strategies and initiatives. Preparatory works have been performed timely and thoroughly, including geotechnical drilling in order to calculate how much earth pressure tunnels, stations and shafts could withstand; trial pumpings in order to test where the water-bearing layers are located and how deep into the subsoil the effect of the construction work can be traced; particularly vulnerable structures are measured and photographically registered in order to precisely determine whether construction work will affect the structures around it; the excavation of so-called injection wells in order to ensure that the drilling of the tunnels minimally affects the surrounding terrain; and finally, archeological excavation works were performed in search of prehistoric findings and cultural artefacts.
Furthermore, the project envisages 17 new metro stations which are spacious, open, subterranean, with easy access from street level and to the platform, as well as provided with a special quality of light what makes them one of the Copenhagen Metro's hallmarks.
IDENTIFY POSITIVE ASPECTS: Integrated approach, including flooding issues within the whole metro design concept since the feasibility stage; Building upon the experience gained during the design and operation of the previous metro lines (M1 and M2), respectively opened in 2002 and 2007; Consistency with city-wide adaptation plan to climate changes.
IDENTIFY NEGATIVE ASPECTS: Significant delays in project implementation due to a series of complaints from residents about construction noise which have led to various work stoppages and legal battles.
INNOVATIVE ASPECTS: The next generation of Metro stations is being created to complement Cityringen, the Copenhagen Metro's new circle line. Cityringen's stations will follow the now-familiar Copenhagen model welcomed by Metro users: spacious, open, subterranean stations with easy access from street level and to the platform. This design gives natural daylight inside the stations.
The design of the Metro fittings in the station area will be taken in new directions. It is imperative that the diversity of the urban spaces into which Cityringen's stations will be integrated is respected and taken into account. Local variations will affect the design of elements, such as stairways and skylights. In addition to providing the subterranean cityscape of the Metro with daylight, at some locations, skylights will be designed to function as integrated and attractive features of the cityscape above ground.
The project also incorporates the so-called "cool construction" concept, as a way of turning construction site hoardings into temporary urban labs for the benefit of neighbours and passers-by. Cool Construction is financed by the sale of advertising space on dedicated parts of the hoardings.
INFORMATION SOURCES: https://climate-adapt.eea.europa.eu/metadata/case-studies/integrating-adaptation-in-the-design-of-the-metro-of-copenhagen/#stake_holder_anchor
https://ramboll.com/media/rgr/helping-the-copenhagen-metro-adapt-to-climate-change
https://intl.m.dk/#!/about+the+metro/metro+expansion

3.5.2. Talgarth Road Green Corridor

GEOGRAPHICAL LOCATION: Borough of Hammersmith and Fulham, London (UK)
KEYWORDS: cycling; greening; runoff
RELATED IMPACT: Impact on transportation network
PROJECT INITIATOR/PROMOTER: A multi-partnership project between Hammersmith London, Hammersmith & Fulham Council, Transport for London and the Greater London Authority,
STAKEHOLDERS INVOLVED: Transport authority, local council, municipality, citizens
BENEFICIARIES/TARGET GROUP: Citizens, public authorities, developers
TIME OF IMPLEMENTATION: The corridor was officially completed in May 2016 after three months of construction work.
COSTS: The scheme was part-funded by H&F Council, with contributions from the London Mayor's Air Quality Fund, Transport for London and Hammersmith London BID.
GENERAL DESCRIPTION: The Talgarth Road Green Corridor represents a unique scheme using tall grass called miscanthus to protect cyclists and pedestrians from traffic pollution has launched in the London borough of Hammersmith and Fulham.The Talgarth Road Green Corridor is a new safer cycling scheme, running in the north part of the Hammersmith Flyover which contributed to improve an underused and quite grey part of the town centre, serving as an attractive and biodiverse route that helps to boost air quality, reduces surface water run-off and acts as pleasant green space in Hammersmith for visitors and wildlife to enjoy.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Planting of areas of tall grass called miscanthus
Air pollution monitors installed on the site will track the effects of the grass in stopping vehicle fumes from reaching cyclists and pedestrians.
The use of innovative new materials has been foreseen, such as the 'flexipave' cycle path; a hard wearing recycled rubber which is water permeable to also help drainage.
Latest LED Lighting, CCTV cameras and Smart City Sensors to measure air quality, control street lighting and count traffic volumes will also soon be installed.
WHY IS IT A BEST PRACTICE FOR YOU? The innovative scheme proposed represents a new approach in designing cycling routes which is able to decrease the environmental impact and, at the same time, to increase the safety of cyclists. It could be replicated, in particular, along streets with enough space available and high traffic volumes, keeping in mind the coherence with mandatory criteria provided by the national law.
IDENTIFY POSITIVE ASPECTS: Areas of tall grass called miscanthus, within two years, is expected to grow to a height of around two meters, creating a natural barrier between people and the road.
Surface water from this stretch of road drains into the roadside planting, reducing the strain on the sewer system and helping prevent floods. The use of innovative new permeable materials will also help the rain water drainage.
IDENTIFY NEGATIVE ASPECTS: The application of this scheme needs a cooperative governance model.
Planting tall grass requires spaces that could not be available in highly urbanized and built areas.
The designing of cycle paths has to be coherent with mandatory criteria provided by the national law and in some cases this new scheme could not be fully applied.
INNOVATIVE ASPECTS: The Talgarth Road Green Corridor represents a unique scheme using tall grass called miscanthus to protect cyclists and pedestrians from traffic pollution
The scheme was part-funded by H&F Council, with contributions from the London Mayor's Air Quality Fund, Transport for London and Hammersmith London BID.
INFORMATION SOURCES: http://hammersmithlondonbid.co.uk/talgarthroad-2/

3.5.3. Scandic Hotels - towards climate neutrality

GEOGRAPHICAL LOCATION: Amsterdam, Netherlands
KEYWORDS: water, energy, waste, carbon emissions
RELATED IMPACT: Impact on tourism sector
PROJECT INITIATOR/PROMOTER: Scandic Hotels
STAKEHOLDERS INVOLVED: Scandic is part of the Consultation Committee on the environment project ICARUS, operated by Business Travel Association. ICARUS is the largest international sustainability initiative for the business travel industry; Visita; Klimaloftet is Norway's climate campaign from the government and the Ministry of Environment. The aim is to create an understanding and commitment to climate issues and to contribute to reducing emissions. Scandic is one of the Ministry of Environment's corporate partners and is to participate in the design of a powerful concept for Klimaloftet; Nordic Swan Ecolabel.
BENEFICIARIES/TARGET GROUP: Business travelers, including authorities, groups, sports associations and individual leisure travelers, loyal customers – Scandic Friends, Nordic tourist, with a continuously increasing share of international travelers mainly from Germany and Russia followed by the US and the UK.
TIME OF IMPLEMENTATION: 1983.
COSTS: n.a.
GENERAL DESCRIPTION: Scandic is the largest Nordic hotel operator with a network of about 280 hotels with 55,000 rooms in six countries and annual sales of SEK 14.6 billion. Globally leading hotel chain in efforts to become carbon neutral, to recycle and to deliver sustainable development benefits. Climate Change Impact: Emissions from accommodation and in particular hotels are second only to transports in Swedish tourism. Strong action is needed to reduce emissions from the accommodation sector. Scandic Hotels are one of the earliest hotel chains to focus on environmental sustainability. The hotel chain announced its ambitions to become more resource efficient as early as in 1994. By 2008, 106 of 130 Scandic hotels are certified with the Nordic Swan, a Scandinavian ecolabel, and one with the EU Flower. The chain has recently announced plans to become carbon neutral by 2025, further reducing energy use and expanding its use of renewable energy.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE:

- Introduced its environmental rooms in 1995, with some 17,000 hotel rooms now being 97% recyclable;
- Has stopped using disposable packaging, for instance for soap and shampoo, saving 400 million items of disposable packaging in 11 years;
- Reduced energy consumption by 24% and water consumption by 13% in 1996-2006;
- Offers an organic breakfast in its Swedish hotels, with 20% of food offered being certified by the Swedish quality label for ecological foods, KRAV; an important part of breakfast items in Norway, Denmark and Finland are eco labelled with countries' respective type 1 organic label (the biggest difference between breakfasts is that in Sweden there are guidelines for an eco labelled breakfast, while in the other countries only single items can be labelled.);
- Offers only organic and fair trade coffee in its Swedish, Danish and Finnish hotels, while in Norway all coffee is organic (UTZ certified in Denmark and Finland);
- Separates up to 26 fractions of waste in Sweden, reducing unsorted waste in all its hotels by 67% in the period 1996-2006;
- Buys environmentally certified products to the largest extend possible;
- Has educated 11,000 members of its staff in pro-environmental management.

WHY IS IT A BEST PRACTICE FOR YOU? Scandic introduced its pro-environmental strategy more than a decade ago, in 1994, and has since then made considerable progress in achieving its goal of becoming the most resource-efficient hotel chain in the world. Measures taken range from broad ones such as the implementation of an environmental management system at the individual hotel level that includes management, technology and behavioral changes, to detailed steps such as changing of purchasing routines focusing on certified organic, renewable, environmentally friendly or fair trade products.
IDENTIFY POSITIVE ASPECTS:

- sustainability as a company's culture

- climate adjustments on multiple areas (e.g. ecolabelled TVs, reduction of waste from restaurants, refurbishments and changes that have resulted in more energy-efficient hotels, better lighting and ventilation controls, controls on water flow, etc.);
- extensive training of team members;

IDENTIFY NEGATIVE ASPECTS: n.a.

INNOVATIVE ASPECTS: Scandic company, together with all its hotels, is organized in such a way that every manager and rand-and-file employee is empowered to be innovative in sustainable practices. Sustainability is part of the company's culture, and it actually pays off. Innovation happens as a continuum within day-to-day working practices, from reducing energy and water consumption or waste, to designing new products and services that have less environmental impact. The company views sustainability as a never-ending path that requires continuous improvements and new goals. The company stands out with going beyond just minimum compliance standards, hence, it sets standards by which they and their competitors will be judged. They are willing to become carbon neutral by purchasing and producing 100% of electricity from producers who only use renewable fuels. Furthermore, they strive to divert all waste from going to landfill, and increase their devotion to community volunteer work.

Their holistic approach to sustainability rests on the following theoretical triple bottom line:

1. How can we minimize environmental impacts in our organization? (environmental dimension)
2. How can we maximize our economic profit? (economic dimension)
3. How can we maximize the social well-being of all stakeholders? (social dimension).

This in fact indicates how Scandic represents a truly sustainable organization which goes beyond what is expected from regulations or other stakeholders. Scandic managers and employees work on a continuous innovation, they work on making every process of their operation more efficient. Here are some examples:

- choosing raw materials and recyclable packaging (products that do not fulfill this criterion should not be used);
- development of products and services in a way to use nature's resources as sparingly as possible;
- Scandic led many co-innovative actions with suppliers, such as working with the laundry supplier to remove chlorine bleach from its laundry processes; working with the dishwashing liquid supplier to reduce detergent dosage in washing machines for breakfast dishes -the amount of detergent needed for breakfast dishes is not as high as for lunch or dinner; working on the eco-room design (they created the 97% recyclable room); working with suppliers to reduce the size of bar soap; working with suppliers to reduce waste from shampoo bottles by developing a more natural soap and shampoo in a PET dispenser, etc.

INFORMATION SOURCES: https://www.scandichotels.com/partners/sustainable-partnerships
http://www.ih-ra.org/public/images/document/scandic-sustainability-case.study_.pdf

3.5.4. Heifer Parking Plaza

GEOGRAPHICAL LOCATION: Castle Rock (US)
KEYWORDS: Extreme Temperatures, Water Scarcity, social awareness
RELATED IMPACT: Impact on tourism sector ; impact on transport network
PROJECT INITIATOR/PROMOTER: Heifer International
STAKEHOLDERS INVOLVED: n.a.
BENEFICIARIES/TARGET GROUP: Organization and companies having big parking lots, designers, customers
TIME OF IMPLEMENTATION: 2016.
COSTS: TOTAL INITIAL COST $2,480,000, Paving materials $ 670,000, Landscape design $ 120,000, Landscaping (including trees) $ 42,000, Irrigation $ 140,000), Stormwater management (swales, wetlands) $ 1,200,000.
ANNUAL MAINTENANCE COST $47,850, Landscaping $ 26,000, Wetlands $ 19,000
GENERAL DESCRIPTION: Heifer International, a non-profit sustainable community development organization located in Little Rock, Arkansas (US), was awarded an Environmental Protection Agency's Innovations grant in June of 2003 to design an environmentally-friendly parking plaza - about 11,700 m2 with 199 space lots - to complement the organization's new headquarters, which is a green building located on a former brownfields site.
A first of its kind in Arkansas, this project is intended to serve as a model for other organizations and companies considering utilizing green parking lot techniques.
Heifer's parking plaza encompasses numerous green parking lot techniques that minimize impervious surface, reduce runoff, decrease the heat island effect, reduce virgin water use, and incorporate recycled materials.
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: Impervious surface at the Heifer lot is minimized by integrating a gravel pave system and bioswales into the lot design, reducing impervious cover by 30%.
The City of Little Rock's parking ordinances for a lot of Heifer's size requires that the interior landscape area should comprise at least eight-percent of the total vehicular use area, or about 940 m2. Heifer exceeds this minimum standard with 1.620 m2 of conventionally landscaped islands and bioswales.
Both the retention basin and the wetlands provide irrigation water for landscaping, and the wetlands also help to provide habitat for local species.
The aisles and driveways of the Heifer parking lot are paved with concrete rather than asphalt. Because it is a light colored and highly reflective surface, concrete helps minimize the heath island effect compared to asphalt paving. For instance, at some sites the use of concrete for paving has been shown to result in a 6 C° reduction in surface temperatures compared to asphalt.
City of Little Rock parking ordinances require that one tree be planted for every 12 parking spaces. Typically a minimum of 17 trees would be required for a 199-space lot such as Heifer's. Heifer exceeded this standard, planting 80 trees (1 each 2,5 cars).
WHY IS IT A BEST PRACTICE FOR YOU? The new city planning take into consideration the possibility of moving outside the city center the parking lots mainly used by the hotels' guest for a long parking period and to maintain a part of the parking lots dedicated to the short parking periods related to commercial activities which are near the beaches. In this cases, the greening solutions foreseen are very important to mitigate the environmental impact and the increased soil sealing.
IDENTIFY POSITIVE ASPECTS: Increasing the amount of tree cover and other natural vegetation on the site, Heifer has created more shade for the land, which also helps to stabilize temperatures. Reducing the HIE potential helps support the natural nighttime cooling process, reduces the energy demand from neighboring buildings, and provides for a more comfortable outdoor environment at the site during the region's hot summer months.
The parking lot is 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.
Under natural rainfall events, the species planted in the lot should be able to sustain themselves with little or no irrigation. In fact, when the site's vegetation matures, in a normal rainfall year, the landscape will only have to be irrigated once a week. Because Heifer used a combination of native seeding and sod, the lot required less irrigation than would be needed for a lot using all sod and non-native landscaping.
IDENTIFY NEGATIVE ASPECTS: Both initial and maintenance costs are quite higher than a standard parking lot

INNOVATIVE ASPECTS: The Heifer parking lot is 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. In a typical, non-drought year, Heifer's closed loop stormwater system will provide 100% of the water necessary to irrigate the lot.
INFORMATION SOURCES: www.solaripedia.com/files/1036.pdf

3.6 Sector: Ecosystems and environment

3.6.1 Conservation of the last italian peninsular population of Tetrax tetrax

GEOGRAPHICAL LOCATION: Foggia
KEYWORDS: Pseudosteppa habitat
RELATED IMPACT: Loss of habitat
PROJECT INITIATOR/PROMOTER: Amministrazione Provinciale di Foggia
STAKEHOLDERS INVOLVED: BioPhilia s.a.s., Italy Centro Studi Naturalistici Onlus, Italy Federazione Provinciale Coldiretti, Italy Diomede S.r.l., Italy Oasi Lago Salso SpA, Italy Ente Parco Archeologico Storico Naturale delle Chiese Rupestri del Materano, Italy
BENEFICIARIES/TARGET GROUP: Puglia e Basilicata
TIME OF IMPLEMENTATION: 01/09/2013 - 30/09/2020
COSTS: 1,865,964.00 €
GENERAL DESCRIPTION: The little bustard (Tetrax tetrax), is a flagship species associated with semi-natural steppe habitats and traditional, low-input agricultural systems.
With its overall distribution in rapid decline, the species is considered as globally threatened by BirdLife International (2004) and is also listed in the EU Birds
Directive. The project is developed on large aera part of the historical presence of the species and invests two regions, Puglia and the Basilicata and four provinces: Foggia, Barletta Andria Trani, Bari and Matera. Moreover in this vast territory, characterized by presence of steppe (habitat 6220) environments there are Mediterranean ones interspersed with areas cultivated mainly a cereals such as wheat, there are two national parks, Gargano and Alta Murgia, and a regional park, that of the Rock Churches of the Matera.
The area subject of the intervention is also included in four of ZPS (Protection Zones Special within the Network Natura 2000), two of which particularly large: "Murgia Alta "e" Valloni and Steppe PedeGargano ".
LIST OF THE ACTIVITIES DEVELOPED IN THIS BEST PRACTICE: The project's overall objective is the preservation of a vital population of little bustards. Specific objectives are: Sowing of plant species suitable for the restoration of pasture biocoenosis (habitat 6220) in an area suitable for the Tetrax Tetrax. The intervention has a pilot character and provides for the restoration of pastures.
Creation of a breeding center for the Tetrax Tetrax;
Prevent the dramatic decline of the little bustard population at the site;
Reduce the presence of predators (rats, stray dogs and cats) in the targetareas;
Reduce the impact on the birds from human activities, notably from the loss of low-input extensive farming
Increase knowledge of the species at a regional level.
The project expects to achieve the following: An increase of the little bustard population in the area by up to 100 individuals and the restoration of some 280 ha of the priority habitat 'Pseudosteppe with grasses and annuals of the Thero-Brachypodietea'.
WHY IS IT A BEST PRACTICE FOR YOU? This project allows to preserve and develop the habitat of pseudosteppa that is important for the biodiversity of the Parc and for the pastures, and in the same time allows to protect this historical species of Tetrax Tetrax.
IDENTIFY POSITIVE ASPECTS:

- Increase of the area of the Pseudosteppa Habitat
- Develop the pastures and the production of biological products
- Increase the number of the species of Tetrax Tetrax

IDENTIFY NEGATIVE ASPECTS:

- Project linked to European funds
- Control and defense from the predators and the hunters
- Difficulty to find funds to allow at farmer to develop new area for pasture

INNOVATIVE ASPECTS: The innovation lies in realizing a project that at the same time allows the defense of an endangered species, a habitat at risk and an activity like that of grazing land that is decreasing with the reconversion of

the fields towards an intensive agriculture and less respectful of the environment, and of the water and biodiversity potential of the area of interest.
INFORMATION SOURCES: http://lifetetrax.it/
OTHER: The project may envisage a future european cooperation as this species and this habitat are in a risk throughout the Mediterranean area.

4. References

To integrate the BPs we link here some catalogues produce by different European or international networks. This will be a helpful container to tap into to find different and original actions to improve urban resilience and urban adaptation to climate change, to find different and already experimented solutions.

COVENANT OF MAYORS
This catalogue contains good practices divided by type, country, sector of competence, implemented by cities part of the Covenant around Europe.
https://www.covenantofmayors.eu/plans-and-actions/good-practices.html

100 RESILIENT CITIES
This website contains actions implemented or planned by the cities part of 100 Resilience Cities. Those are catalogued by city and themes.
https://www.100resilientcities.org/cities/

INTERREG
Good Practices implemented thanks to the European Regional Development Found are catalogued by Country and Theme.
https://www.interregeurope.eu/policylearning/good-practices/

URBACT
Urbact – Driving Change for better cities lists good practices by Theme, Topic, City Size, Country
https://urbact.eu/good-practices/home