

ADRIADAPT REPORT ON THE CATALOGUE OF CLIMATE CHANGE ADAPTATION MEASURES WITH MITIGATION EFFECTS

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PAP/RAC

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Table of Contents

1	Purpose of the document	2
2	Background information	3
3	Catalogue of climate change adaptation measures with mitigation effects....	4
4	Conclusions.....	9

1 Purpose of the document

The main purpose of this document is to present the structure, process of development and contents of the catalogue of adaptation measures with mitigation effects within the Adriadapt knowledge platform.

During the project implementation it was decided to structure the catalogue in the two main categories, exhaustively presented in a deliverable 4.2.1.:

- Adaptation options
- Case studies

In addition to possible measures that can be implemented to improve adaptation to climate change (categorized in three groups: societal, green, and grey options), eleven case studies were chosen, that showcase the most representative adaptation options. Those case studies, already being carried out in a specific location of the Mediterranean basin, are aimed at supporting policy makers, as well as local authorities, in their efforts to cope with the effects of climate change, giving a clear example how those measures are feasible in a real time and with a real budget.

Moreover, considerable attention was dedicated to financing opportunities for adaptation to climate change for Adriatic cities and regions of Croatia and Italy. The relevant recommendations were developed by the Institute for Development and International Relations and were gathered in “A Handbook on the Possibilities of Financing Climate Adaptation Measures for Adriatic Cities and Regions in Croatia and Italy”. The handbook outlines the currently available sources for financing of climate change adaptation projects and opportunities for the development of financial instruments that on the one hand contribute to climate change mitigation, and on the other hand enable the collection of funds for climate change adaptation. In this manner through the application of the polluter-pays principle and with earmarking of the collected funds additional source of financing for adaptation purposes could be mobilized. It is intended for decision-makers at the local and regional level, having in mind the current moment of recovery from the COVID-19 pandemic, and the establishment of a new multi-annual program framework in the EU. It outlines the currently available sources of funding for climate adaptation projects: at the local, regional, national, European and global levels; and the possibilities for private funding. Among others, the handbook gives examples of the Mediterranean Strategy for Sustainable Development (2016-2022) that recognizes that the costs of climate change mitigation and adaptation at national and local levels are generally not covered, and that some cities and regions of both Italy and Croatia use voluntary instruments for linking of measures of climate change mitigation and adaptation.

The Handbook was presented at the Final National Adriadapt Conference “Climate is changing – let us change, too!” in May 2021, as well as at the Final Italy-Croatia Adriadapt Conference in June 2021. During the development of the outputs and outcomes of the WP 4 it was decided that such a publication could be of a best use to the local and regional authorities at this moment. Publication was prepared in Croatian and translated into Italian. It is available at: <https://adriadapt.eu/wp-content/uploads/2021/05/Adriadapt-Prirucnik-za-financiranje.pdf>



Together with all materials developed within the project, the handbook could encourage climate friendly behaviour and facilitate climate change mitigation and adaptation processes.

2 Background information

Adriadapt – a resilience information platform for Adriatic cities and towns, is a collective effort of 6 Italian and 5 Croatian partners aiming to promote local and regional resilience by developing the knowledge base required to identify suitable climate adaptation and planning options, thereby enabling local authorities to respond to policy needs related to climate action in urban and coastal zones of the project area.

The goal of the project was supported by four actions:

- produce high-resolution datasets and projections that provide detailed and reliable information on climate-related impacts in the regions;
- create a climate information system or knowledge platform for the Adriatic region containing best practices, guidance documents, legal frameworks and climate and vulnerability studies;

- test and integrate the knowledge platform in select Italian and Croatian pilot cities and extended urban areas where adaptation and resilience plans will be designed;
- maintain and disseminate the information.

This project has received funding from the European Union’s Interreg V A Italy Croatia Cross-border Cooperation Programme 2014-2020 under subsidy contract No. 10045081, and Adriadapt platform is co-financed by the Government of Republic of Croatia Office for Cooperation with NGOs. The platform consists of 43 adaptation options that are available at the following web address: <https://adriadapt.eu/adaptation-options/> (English version). Many of those adaptation options integrate information on mitigation effects, since climate change adaptation and mitigation come hand in hand in the actual challenges the world faces. Climate change adaptation measures with mitigation effects are presented in an exhaustive list in a following section.

3 Catalogue of climate change adaptation measures with mitigation effects

In the table below are listed all the adaptation measures from Adriadapt platform, that discuss the connections with possible mitigation effects.

Adaptation options	Mitigation effects
Adaptation through integrated land-use planning	Land-use planning can provide benefits for climate change mitigation, since improper land uses can affect important terrestrial ecosystems working as carbon sinks. The role of land use, land-use change and forestry (LULUCF) activities in mitigation has been largely recognised because they have a role in the removal of greenhouse gases (GHGs) from the atmosphere and the accumulation of carbon stocks. Sustainable land-use management, planting and rehabilitation of forests and changes in land use contribute to climate change mitigation.
Adaptation through integrated fire management	Integrated fire management helps preserving forest ecosystems and the related ecosystem services. A synergy with mitigation should be considered because the reduction of uncontrolled wildfires decreases the fire related GHG emissions. In addition, preserving healthy forests from fire as well as planting young rapidly

	growing trees represent important mitigation strategies to maintain carbon storage and enhance sequestration.
Climate smart pest management	Early pest detection is therefore crucial to suppress or mitigate adverse effects after their gradient outbreak. Even if there is a pest monitoring system in forests at the state level (monitoring), it has not been given any special attention at the local level.
Climate change adaptation through afforestation	In the new EU Forest Strategy 2021, special attention has been given to afforestation to mitigate the negative consequences, with a strategic approach in the selection of suitable species, planting design and maintenance of trees. The increase in forest cover has been recognized as a measure to mitigate the negative effects of climate change, and since it can play a key role in the carbon sink, it has been included in the legislation (EU LULUCF 2018/841). Taking part in global actions in which CO ₂ is sequestered through afforestation to mitigate the effects of climate change is highly motivating and educational, and such actions can be taken relatively quickly.
Adaptation through integrated coastal zone management	PAP/RAC provides assistance to the Mediterranean countries in the implementation of coastal plans and programmes. In the latest cycle of those projects particular attention has been paid to climate action. The specific feature of coastal plans is the integrated approach, and that requires a holistic grasp of the actual issues and future challenge and, thus, of the contribution of human activities to the climate change.
Climate-related health action plans	Modifications in urban design to improve well-being also lead to important mitigation benefits, for example providing more vegetated areas for CO ₂ sequestration. Other mitigation benefits could derive from measures addressed to reduce air pollution (including GHGs) undertaken to lessen the increased impacts from pollution under heat conditions.
Protection, restoration and management of coastal wetlands	Wetlands sequester some of the largest stores of carbon on the planet, but when disturbed or warmed, they release the three major heat-trapping greenhouse gases: carbon dioxide, methane, and nitrous oxide. Therefore, protecting wetlands from human disturbance helps to limit the increase in greenhouse gases in the atmosphere and hence, mitigate the climate change.
Use of adapted crops	Synergies with mitigation can also be evidenced, since the cultivation of adapted crops and varieties can improve soil carbon storage by accelerating atmospheric carbon sequestration. A shift from annual to perennial crops and the use of crops

	with deep root systems (such as maize, wheat, barley) can accelerate atmospheric carbon sequestration and storage. Combination with other associated good agricultural practices (precision farming, use of cover crops, minimum tillage, etc.) and market systems (favouring local products commerce) can significantly enhance the mitigation potential of this adaptation option.
Coastal setback	Connecting setback zones with neighbouring areas, such as wetlands, floodplain ecosystems, or natural forests, permits additional recreational areas, restores biodiversity and can serve as a nature-based solution to mitigate climate change effects.
Knowledge sharing and learning platforms	e.g. platform ‘Coastal Resilience’, destined for coastal planners, elected officials, managers and citizens that examines nature’s role in reducing coastal flood risk. Consists of an approach, a web mapping tool, and a network of practitioners in the USA and around the world supporting hazard mitigation and climate adaptation planning.
Disaster Risk Reduction using ecosystem services - Eco-DRR	Disaster risk reduction implies action in all elements of the disaster risk equation: reduction of threats by reducing the vulnerability of people, assets and environment, and their exposure to the identified threats. With this cross-sector measure we avoid disasters or greatly mitigate their effects (investment into prevention is up to 15 times cheaper than the costs of rehabilitation; UNDRR, 2020).
Rehabilitation and restoration of rivers	River and floodplains ecosystems can have an important role in achieving climate change mitigation goals. Measures such as riparian tree planting, re-vegetation and re-naturalisation, as well as broader scale measures in the river catchment area, including sustainable soil management practices and land use changes, have a notable role in carbon sequestration and storage.
Green spaces and corridors in urban areas	Studies on costs and benefits suggest these measures have social, ecological and financial benefits. Benefits include increased urban biodiversity, higher environmental qualities in urban areas (e.g., recreational areas, community gardening), reduced vulnerability to heat waves and to floods, increased carbon storage – climate change mitigation and mitigation of air pollution.
Improved water retention and	Techniques to improve the efficiency of irrigation, optimize water use and in turn reduce water demand include shifting from gravity irrigation to modern pressurized systems (e.g., drip and sprinkler irrigation) and improving conveyance efficiency

irrigation efficiency in agricultural areas	(note: pressurized systems require an energy source to pump the water, therefore the use of non-pressurized systems better mitigate climate change).
Modelling, monitoring and forecasting systems	The Copernicus Climate Change Service (C3S) supports society by providing authoritative information about the past, present and future climate in Europe, supporting adaptation and mitigation policies of the EU.
Water uses to cope with heat waves in cities	Water, when used alongside other UHI mitigation measures, can yield significant temperature reductions; there is even a considerable increase in the mitigation potential when more technologies are combined. Decision on adaptation option for coping with heat in cities should be taken from an integrated perspective. This means that in situations of water scarcity, using water for urban green will contribute more to mitigating climate change than some of the other techniques.
Water sensitive urban and building design	Most efficient results may be obtained when rain water is used for new horizontal and vertical greenery, which will also contribute to improving thermal comfort in buildings, therefore in energy efficiency and in mitigating the climate change. Careful landscape planning may significantly contribute to urban biodiversity, as well as to the market value of the real estate in the relevant zone.
Green roofs	As a result, green roofs contribute to mitigating negative effects in urban areas, particularly the heat island effect, just as urban green spaces and corridors. A modelling study in Madrid found that, during summer, the surface temperature of a green roof with 90 mm of growing media can be 30°C lower than that of a bare roof (Saiz et al., 2006).
Climate proofing of building codes	Climate proofing of building codes is an adaptation option in the hands of local authorities, which involves various aspects of the building sector related to construction, manufacturing, maintenance and provision of services. Beyond improving the adaptation to climate change and contributing to the mitigation, climate proofing of building codes also has the potential of contributing to the improvement of the quality of urban spaces and of the life of their inhabitants.
Measure reducing urban runoff	Benefits include the overall reduction of vulnerability of urban areas to flooding, thus also reducing malfunctions, inefficiencies and interruptions of services in case of extreme climate events. These adaptation measures provide important climate change mitigation co-benefits as all measures including vegetation contribute to

	CO2 absorption. As for the area of sustainable urban drainage and climate change mitigation in the Republic of Croatia, most progress has been made in the City of Pula.
Reduction of soil consumption and surface unsealing in urban areas	Limiting the consumption of soil and the extension of urban sprawl has become a major concern at the global level. It is part of the Sustainable Development Goals, aiming at a land degradation-neutral world by 2030 (SDG 15.3), reducing the environmental impact of urban sprawl (SDG 11) and contributing to the mitigation of climate change (SDG 13).
Adaptation of transport infrastructure and services	Benefits include the overall reduction of vulnerability of transport systems in the cases of extreme climate events. Greater benefits are delivered when transportation plans consider both adaptation to and mitigation of the climate change with actions aimed at increasing the resilience of transport infrastructures and services in initiatives of shifting towards low carbon economy. Structural long-term changes in the organisation of transport and mobility can work in this direction. The identification of adaptation actions with co-benefits in term of mitigation can compensate costs and favour investments.
Diversification of fisheries and aquaculture products and systems	When diversification is complemented by other good practices (e.g. aiming at reducing fuel consumption and the use of fossil energy in general) and measures affecting market systems (e.g. favouring local products), it can contribute to the climate change mitigation goals as well.
Marine Protected Areas and Other Effective Area-based Conservation Measures	The establishment of MPAs, especially if mutually connected through networks and properly managed, is recognised as a tool to support global efforts towards adaptation, with important benefits for mitigation aspects as well. Beyond nature conservation benefits of MPAs and OECMs and their previously described role toward adaptation, these areas offer important opportunities for climate change mitigation. Salt marshes and seagrasses found in the Mediterranean MPAs have high rates of carbon sequestration and act as long-term carbon sinks.
Improving thermal comfort in buildings	From 1 January 2021, all new buildings in the EU should use little or no energy for heating, cooling or hot water. Therefore, the most effective approach to the improvement of thermal conditions in buildings lies in improving energy efficiency and contributing to climate change mitigation. The increase of green spaces in an urban context brings about also several co-benefits in terms of improved health,

	urban biodiversity, social interactions and aesthetic improvements. Moreover, it contributes to mitigating climate change.
Strengthening governance for climate action	Centres for climate action should primarily perform preparation and implementation of strategies, plans and programmes for climate action (adaptation and mitigation). Apart from that, they should deal with other components of governance, such as creation of favourable conditions for adaptation and all other components of governance. For adaptation, as well as for mitigation, great ambition and great knowledge are needed. Therefore, there is a need for competent human resources to whom these tasks will be a priority.
Community-based management and Adaptive co-management as approach for adaptation	The establishment of multi-stakeholder networks, governance structures and mechanisms during an experience of community-based adaptation and adaptive co-management can be regarded as an added value of the process, that can be maintained and work also to address and solve other issues, such as climate change mitigation.
Climate literacy for all	When speaking of literacy building for children the EU project Climate literacy of 2017 has left valuable learning resources on its web pages. There we can find 8 modules for learning about the basics of climate change and causative human activities, as well as areas for the transformation of the society aimed at mitigating climate change.
Protection and restoration of seagrass meadows	Seagrasses play important role in climate change mitigation as they have significant potential for sequestering carbon, both through its own biomass and by filtering out fine organic material from the surrounding water. Globally, seagrass meadows are responsible for more than 10 % of carbon buried in the ocean, even though they occupy just 0.2 % of the world’s seafloor.
Managed retreat	Managed retreat and new intertidal areas store carbon dioxide and methane emissions within the sediment deposits and therefore mitigate climate change impacts, improving sustainability and societal resilience.

4 Conclusions

In order to secure that adaptation measures are contributing to the mitigation goals particular attention was dedicated to these aspects of adaptation options and of case studies. By practicing an integrated approach for several decades, the authors are convinced that an integrated approach is to one to be used when discussing adaptation as well. This doesn't mean that we need to tackle everything – always, but we need to have a full picture whenever we are designing solutions to a systemic challenge such as climate change or environmental degradation are. In addition, it is clear that adaptation without mitigation for coastal areas wouldn't be sufficient. For that reason, we believe that coastal population should become the key ambassador for mitigating climate change.