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Adaptation to Climate Change in Croatia

Country Brief

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CroAdapt

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1. Introduction

Since the 1980ies, there is growing awareness among scientists and decision-makers about climate change. This has led to the implementation of a large number of greenhouse gas (GHG) emission reduction policies on all policy levels, aimed at mitigating the severity of climate change. However, even if GHG emissions stop today, the past emissions will cause climate change to continue for decades. Therefore, adaptation to the changes already caused by the emissions of GHG in addition to the anticipated emissions will be necessary to meet the far-reaching consequences for environment, economy and society anticipated by experts. Climate change mitigation and adaptation actions are two different pillars of climate policy and should be complementary to each other.

Climate change adaptation consists of actions responding to current and future climate change impacts and vulnerabilities within the context of ongoing and expected societal change. Adaptation means not only protecting against negative impacts, reducing potential future damage and associated costs, but also taking advantage of any benefits and new opportunities that may arise due to new climate conditions.

Adaptation is still a rather new policy field on EU, national and regional level. In April 2013, the EU Adaptation Strategy was published and up to now, fifteen EU Member States have already developed national adaptation strategies (NAS). Also more and more regional and local responses are emerging, taking into account that there is no 'one-fits-all' approach to adaptation and concrete action will have to be taken on regional and local level in order to be able to address specific conditions and needs.

There are many issues that in combination drive countries to develop adaptation strategies. Besides the international climate negotiations and already developed EU policies also the experience of extreme weather events and the increasing availability of research on climate change impacts and adaptation are important driving factors for developing adaptation policies.

Croatia has recognized the need to develop a national climate change adaptation strategy and to bring adaptation also to the regional and local level, where concrete measures will need to be implemented. This paper shall support this process by outlining the relevant developments on EU level, giving a brief overview on climate trends and potential climate change impacts for Croatia, describing the current state regarding adaptation in Croatia and explaining the importance to address adaptation as a multi-level issue and integrate it into other policy sectors ("mainstreaming"). Finally, recommendations for further activities are given.

2. EU policy on adaptation to climate change

In 2009, the European Union (EU) published the White Paper Adapting to Climate Change: Towards a European Framework for Action (Commission of the European Communities 2009). Based on a wide-ranging consultation launched in 2007 by the Green Paper Adapting to Climate Change and further research, the White Paper outlined the EU's approach to adaptation and set a framework to reduce the EU's vulnerability to the impacts of climate change. The White Paper acknowledged the varying severity and nature of climate impacts between regions in Europe and therefore left adaptation decisions to the single Member States.

With the White Paper, the EU adopted a phased approach: Phase 1 (2009-2012) focused on building a stronger knowledge base on the impacts of climate change for the EU, taking climate change impacts into consideration in key EU policies, and employing a combination of policy instruments (market-based instruments, guidelines, public-private partnerships) to ensure effective delivery of adaptation. Phase 1 laid the ground for a comprehensive EU adaptation strategy.

In April 2013, at the beginning of the second phase set in the White Paper, the European Commission adopted an EU Adaptation Strategy. The overall aim of the strategy is to contribute to a more climate-resilient Europe. The strategy's key objectives are:

- to encourage all Member States to adopt national adaptation strategies, to provide funding for building up adaptation capacities and taking action, and to support adaptation in cities,
- to climate-proof EU action by further promoting adaptation on EU level, including mainstreaming of climate change (mitigation and adaptation) into key vulnerable EU policy sectors (such as agriculture, fisheries and cohesion policy), promoting the use of insurances against disasters, and ensuring that the EU's infrastructure is made more resilient,
- to address gaps in knowledge about adaptation and further develop the European climate adaptation platform (see also below) in order to make better informed decisions.

The strategy promotes activities of Member States respecting the principle of subsidiarity, i.e. the EU will not take action unless it is more effective than action taken at national, regional or local level. The EU sees a particularly strong role for action on community level when the impacts of climate change transcend the boundaries of individual countries (e.g. river and sea basins) and vary considerably across regions. With its adaptation strategy, the EU complements the activities of the Member States and promotes greater coordination and information-sharing between Member States. In 2017, the Commission will report to the European Parliament and the Council on the state of implementation of the strategy and propose its review if needed. The report will be based on information provided by Member States under the Monitoring Mechanism Regulation38 on national adaptation planning and strategies, the annual implementation reports for programmes funded by the European Structural and Investment funds in the period 2014-2020 and the Intergovernmental Panel on Climate Change's 6th Assessment Report to be issued in 2014.

The EU Adaptation Strategy highlights that adaptation measures need to be taken on all levels, from national to regional and local, and that a coherent approach and improved coordination are needed. It is stressed that active engagement of local and regional authorities will be essential. The European Commission will promote urban adaptation strategies notably by launching a voluntary commitment following the model of the Covenant of Mayors, an initiative of more than 4,000 local authorities voluntarily committed to improving the quality of life by pursuing EU climate and energy objectives.

Besides the strategy itself, the EU Adaptation Strategy Package includes several further documents, among them

- an impact assessment which aims at preparing evidence for political decision-makers on the advantages and disadvantages of possible policy option by assessing their potential economic, social and environmental impacts;
- a Green Paper on the prevention and insurance of disasters which evaluates and reports on the potential for the EU to support increased coverage of appropriate disaster risk insurance and financial risk transfer markets, as well as regional insurance pooling, in terms of knowledge transfer, cooperation, or seed financing,
- Guidelines on developing adaptation strategies which aim at helping to prepare or revise climate change adaptation strategies.

In order to improve knowledge management and share existing information and research among Member States, the EU has established the European climate adaptation platform Climate ADAPT (http://climate-adapt.eea.europa.eu/). The platform, launched in March 2012, serves as a database on climate change impact, vulnerability, and best practice on adaptation. It contains information on adaptation action on all policy levels (from the EU through regional and national to the local level) as well as several useful resources to support adaptation policy and decision making, such as a toolset for adaptation planning.

3. Climate change impacts and vulnerabilities

3.1 Climate trends and risks in Croatia

How exactly the global warming is changing the conditions in Croatia is still unclear, however, since the 19th century, meteorological data has been taken from several stations in Croatia, allowing for a reliable documentation of long-term climatic trends (Simac/ Vitale 2012: 18f.). The key trends of the 20th century can be summarized as follows (Ministry of Environmental Protection, Physical Planning and Construction 2010: 16ff.):

- All across the country, rising average temperatures were indicated, especially pronounced during the last 20 years. The increase of mean annual air temperature in the 20th century varied between 0.02°C per 10 years (Gospić) and 0.07°C per 10 years (Zagreb). The positive temperature trends in the continental parts of Croatia are mainly due to winter trends, while those on the Adriatic coast can mainly be attributed to summer trends.

- There has been a trend of slightly declining rates of annual precipitation during the 20th, continuing at the beginning of the 21st century, and an increase in the number of dry days all over Croatia. Also the frequency of dry spells, i.e. the number of consecutive dry days, has risen.

From all climate change driven hazards, only flooding has been identified by the National Hazard Assessment as major risk in Croatia (Simac/ Vitale 2012: 19). Due to the fact, that Croatia is situated in the Danube basin and is under strong influence of the Sava and Drava rivers, it is a highly flood-prone country and it is estimated that excluding the coastal zones 15% of the Croatian territory is prone to floods (ibid.: 21).

Other climate change driven hazards recognized as risks for Croatia are sea level rise, extreme temperature and precipitation, drought and wind. The Mediterranean, including the Croatian Adriatic coastline, is affected by global sea-level rises. Particularly at risk are low islands and river deltas which are vulnerable to coastal flooding. However, the Croatian coast is a tectonically active area which makes it difficult to accurately predict the impacts of sea level rise as long-term trends in sea level changes may be obscured (ibid.). The increasing temperatures and declining precipitation brings an increased risk of droughts, which is particularly high when there are longer periods of extreme temperatures. From the ten warmest years since the beginning of the 20th century, seven of them were recorded after the year 2000 in Zagreb, in Gospić six of them were recorded in the first years of the 21st century (Ministry of Environmental Protection, Physical Planning and Construction 2010: 17), 2003 being the hottest year in Croatia since 1862 (Simac/ Vitale 2012: 19). As regards winds, the bora and the jugo are the two dominant winds in Croatia, both major factors at the Adriatic coast. While severe bora winds can drastically decrease temperatures, jugo winds can cause serious coastal flooding (ibid.: 20). How exactly the frequency and strength of these winds will change under climate change is at present not known yet.

3.2 Sectoral impacts and vulnerabilities to climate change

Significant parts of the Croatian society and economy are vulnerable to variability in the existing climate and changes in the climate in future (Simac/ Vitale 2012: 21). Almost a quarter of the Croatian economy is based on sectors potentially vulnerable to climate change and extreme weather, which accounts for almost billion Euro a year (ibid.).

The agriculture sector is particularly vulnerable to climate change as it is in general very weather dependent. All direct characteristics of climate – temperature, precipitation, and weather extremes – impact the production. In 2001, 92% of Croatia was classified as rural and 48% of the population lived in rural areas (UNDP 2008: 120). Due to its overall value, its impact on food security and the employment it generates, agriculture is an important sector of the Croatian economy which already in the past years has strongly been impacted by climate variability. Extreme weather events, such as flooding and hail-storms, as well as water shortage resulted in average losses of 176 million Euro per year during 2000-2007 and the scale of damages could get worse in future (ibid.: 129). However,

earlier flowering and the development of other varieties of grapes, olives and fruits due to warmer winter and spring seasons have a somewhat positive impact on agricultural production, enabling a bigger production yield. However, the existing vineyard regions might therefore expand to a wider grape assortment which would result in a loss of regional character of wines and reduce their market competitiveness.

Tourism has for a long time been important in Croatia. The sector generates about 20% of the GDP and almost 30% of total employment (UNDP 2008: 52). Due to hotter day time temperatures along the Adriatic coast – which is the main tourist destination in Croatia, July and August being currently the most active months – many tourists might in future avoid these destinations in summer in favour of cooler locations. Also, a significant share of the touristic infrastructure is at risk of coastal flooding if the sea level rises (Simac/ Vitale 2012: 26).Both could have serious consequences on many local communities given the important role of tourism for the national economy. In addition to the coast, there are other specific natural sites, such as inland national parks. Warmer temperatures can lead to a variety of changes in coastal and inland ecosystems, such as changing the species composition of ecosystems (including increased amounts of mosquitos) and the levels of algae which both could negatively impact tourism as well.

Also health impacts are a major concern related to climate change in Croatia. Already in the past years, events such as heat waves, have had an impact on Croatian citizens and these impact are likely to increase in frequency due to future climate change (UNDP 2008: 90). Particularly vulnerable in extreme weather conditions are elderly and chronically ill people. Besides cardiovascular risks from heat waves, also changed allergic patterns resulting from changing pollen counts, an increase in illnesses carried by mosquitoes, birds and other organisms due to increased non-native species migration and longer warm periods, and increased bacteria growth in food may also emerge.

Coal and oil still splay an important role in Croatia's energy sector and the operation of power plants will be affected by water availability problems and temperature concerns due to the high dependence of those power plants for cooling water. In the past years, Croatia has increased its electricity production from renewable sources. Though being a very positive trend from an ecological point of view, also regarding the power production from renewable sources there are some concerns with regard to climate change, as it may affect in particular the country's hydropower production, in 2010 making up more than 60% of all national electricity production (Simac/ Vitale 2012: 26f.). However, the predicted number of warm days is likely to improve the opportunities for solar energy. As regards energy consumption, the end use in Croatia has increased in the past years (Dreblov et al. 2013: 7). Temperature rise across the country will lead to changes in the level of demand with expected rises of cooling energy and declines in heat energy (UNDP 2009: 52). More frequent extreme events would also threaten all types of energy infrastructure, with an associated increase of maintenance costs (ibid.).

Being among others used for drinking water, agriculture, wetland services, and the production of hydroelectric energy, water is an essential natural resource. As Croatian fresh water resources are abundant, they are not considered a limiting factor for development in Croatia (Ministry of Environmental Protection, Physical Planning and Construction 2010:18). Although there is no shortage of water per se in Croatia, risks do exist, in particular for the agriculture sector (water shortages at critical times of the growing season), the Croatian electricity production (decreased river flows may impact the electricity production from hydropower) and wetland services. However, the present knowledge on climate change impact on fresh water resources in Croatia is not sufficient for precise assessments yet (Pandžić n.d.: 22).

Impact of climate change on biodiversity and ecosystems is already visible in salt intrusion into wetlands and freshwater bodies. The resulting changes of vegetation as well as temperature changes might lead to ecosystem changes and therefore habitat fragmentation for many species, which might require adaptation in the protected areas management.

Climate change will also have an impact on fishing and marine industries. Changes in the distribution of species in the Adriatic Sea will result in both benefits and losses which may not be distributed equally. More research will be necessary to prevent losses and promote the potential benefits from climate change.

There is still significant uncertainty about the level of sea level rise in the Adriatic Sea. However, a lot of important economic activities take place on or near Croatia's coastal zone (e.g. tourism, shipbuilding, maritime transport, and agriculture), so sea level rise has the potential to become one of the most expensive climate change impacts (Pandžić n.d.: 25).

4. Current state of adaptation to climate change in Croatia

According to Article 118 of the Air Protection Act, the Ministry of Environmental and Nature Protection of the Republic of Croatia needs to prepare a comprehensive national action plan on adaptation to climate change. In line with recommendations of the EU strategy on adaptation to climate change and with the support of EU funding instruments, Croatia is currently in the process of preparing this national action plan, i.e. strategy on adaptation to climate change. An amendment of the Air Protection Act which includes the development of both a national adaptation strategy and adaptation plan is currently open for public consultation. It is planned to adopt the amendment until summer 2014.

The future adaptation strategy for Croatia will focus on several sectors identified as most vulnerable to climate change impacts: hydrology and water resources; agriculture; forestry; biodiversity and natural ecosystems; coastal zone management; tourism; and human health. It is also to define the priority measures and activities, as well as ways of integrating adaptation measures into sectoral development plans and strategic documents.

One policy measure has already been introduced by the Ministry of Enviromental and Nature Protection in relation to adaptation. This is the recent setting up of an Intersectoral Committee for the intersectoral coordination of policies and measures on climate adaptation and mitigation at national level. This two-tiered Committee includes institutional representatives of ministries and agencies to discuss policy issues, while experts and practitioners from various sectoral institutions will address technical issues. The members of this committee are nominated for one and a half years to allow a certain degree of coherence.

Although currently there are no sectoral strategies in place that address climate adaptation issues, activities in the field show already a degree of practical adaptation in certain sectors, such as:

- Agriculture: changes in the orientation of wine production as a reaction to earlier flowering and development of grapes, expansion of the wine production assortments in the continent;
- Civil protection: adaptation of fire-fighting activities to the longer fire-fighting season and increasing average summer temperatures, expanding activities from island/coastal to inner continental areas; intensification of heat-wave emergency preparedness among health services;
- Protection of coastal biodiversity and ecosystems: ex-situ and in-situ protection of endangered species to protect the genetic fund; preservation of migratory corridors for species that can adapt to changing habitats; modification of management plans and physical plans of protected areas; adaptation of protection programs at the level of taxa; developing infrastructure for scientific evaluation of the status, projections and monitoring of changes in ecosystems;
- Coastal zone management: In 2012, Croatia ratified the Protocol on integrated coastal zone management in the Mediterranean, committing to the development of a national strategy of integrated coastal zone management with action plans and programs in line with the joint regional framework. The national strategy should include vulnerability and hazard assessments of coastal zones, as well as planning for prevention, mitigation and adaptation measures to address the effects of natural disasters, in particular of climate change.

In the context of building capacities for practical work on climate adaptation, several projects have been implemented so far:

- The UNEP/MAP's Priority Actions Program/ Regional Activity Centre implements the project "Integrating impacts of climate variabil-

ity and change into integrated coastal zone management", aimed at assessing the costs of climate change and variability by using DIVA methodology (Dynamic Integrated Vulnerability Assessment) for the Croatian coastal area, and specifically for Šibenik-Knin County as one of the pilot areas in the Mediterranean Basin, and preparing an integrated coastal zone management plan for the County, all this by using a participatory planning method Climagine.

- A regional ORIENTGATE project (www.orientgateproject.org, July 2012 - June 2015), aimed at implementing coordinated climate adaptation actions across South Eastern Europe, through a partnership in 13 countries, contributing to a better understanding of the impacts of climate variability and climate change on water regimes, forests and agro-ecosystems. The main objective is networking and data exchange of up-to-date climate knowledge for the benefit of policy makers. The project involves two partners from Croatia: the Meteorological and Hydrological Service and the town of Koprivnica.

- The EU Directorate-General (DG) Climate's project "Adaptation strategies for European cities" (http://eucities-adapt.eu/cms/home/about-the-participating-cities/; January 2012 – June 2013) involved one Croatian town – Zadar - among 21 cities selected to receive free training and coaching to develop or improve their local adaptation strategies. Zadar developed a local vision document on adaptation and an action plan in 2013.

- The City of Zagreb has finished first phase of the background study „Climate adaptation plan for the City of Zagreb" in 2013 as well.

- In the frame of the South East European (SEE) Forum for Climate Change Adaptation (www.seeclimateforum.org/CCA-Forum/1/Home.shtml; 2011-2012), the Croatian Red Cross in cooperation with the Ministry of Health and regional public health institutes works continuously on building capacities of health workers for coping with climate change effects, through workshops and public discussions, distribution of educational materials in medical institutions, direct advisory services to elderly people, as well as HydroMet public emergency warnings in cases of weather extremes, heat waves and bio-meteorological forecasts.

5. Approaching climate change adaptation

5.1. Adaptation as multi-level issue

There is widespread recognition that in order to reduce vulnerability to climate change impacts and related threats, and taking advantage of potential opportunities that may arise from climate change, adaptation activities need to take place at various levels of governance. The development of adaptation policy can be approached in a "top-down" manner, responding to concerns about global climate change, international climate negotiations and already developed relevant EU policies, or in a "bottom up" manner reducing vulnerability to observed climate variability (e.g. floods, heat waves) on local or regional level (Swart 2009: 29). While national adaptation strategies are important to set the frame for adaptation, define the overall goals and strategic vision, adaptation on regional and local level are necessary to address appropriately the specific impacts, needs and conditions on regional or local level.

Approaching climate adaptation on different policy levels, it is very important to ensure that the taken measures are coherent across different sectors and levels of governance. Recognizing that different policy levels and stakeholders play a role in climate change adaptation, the topic presents itself increasingly as a challenge not only of international relations, but also of multi-level governance(Swart 2009: 105). Multi-level governance is defined as decision-making through a dynamic inter-relationship within and between different levels of governance, steered not only by the public, but also by private and other interests (Keskitalo 2010: 4; Hooghe/ Marks: 2001). The concept recognises that for effective policy-making also other actors and their interrelations play an important role, besides national governments which have traditionally been regarded as the principle actors in decision-making.

The EU Adaptation Strategy as well as most already existing National Adaptation Strategies (NAS) of EU Member States emphasise the need to take action at the regional or local level with a shared responsibility across administrative scales, reflecting that the effects of climate change will be felt locally and may vary greatly even within national borders (Swart 2009: 21).

The way, in which climate change impacts and adaptation are treated by actors on different levels is to a large extent dependent on different adaptation capacities, including financial resources, access to information, decision-making structures and other institutional features (Keskitalo 2010: 4f.; Smit and Wandel 2006).

5.2. Mainstreaming adaptation

Climate change will have diverse impacts on a variety of sectors. In order to ensure that all relevant policies take due account of climatic changes they are concerned with, it is therefore important to integrate or "mainstream" it into sectorial policies and institutional mechanisms. Mainstreaming climate change adaptation policy means that also actors whose main tasks are not directly concerned with adaptation to climate change incorporate this topic in their work and in this way contribute to attaining the defined goals. Mainstreaming efforts need to be coherent across various levels of governance.

While adaptation to climate change is a rather new policy field in most countries, it must be noted that many existing policies that apply to day-to-day monitoring and management procedures for coping with weather-related events, such as forest fires, floods or heat waves, already contribute to adaptation. Adaptation activities thus cover a wide range of policies that are not necessarily "labelled" as adaptation policies. These potentially already existing policies should be considered and assessed as well in order to get insight into improvements or adjustments that may be necessary.

There are several possibilities to enhance mainstreaming of climate change adaptation. One mechanism which is already in place in Croatia are inter-ministerial working groups on climate change adaptation. Another mechanism is the earmark budgets in each sector for adaptation tasks. In that way, the responsibilities are shared and adaptation is an integrated part in each sector. Last but not least, climate-proofing political decisions (sectorial strategies, investments, plans) across the sectors can help ensuring that climate adaptation issues are considered in all relevant documents.

6. Recommendations for further activities

The overall aim of national adaptation policy should be a more climate-resilient country. This means enhancing the preparedness and capacity to respond to the impacts of climate change at local, regional and national level. Although the choice of instruments plays doubtlessly an important role in reaching this goal, there are other aspects which shall be highlighted here as important determining factors for the success of becoming less vulnerable to climate change:

1. Adaptation to climate change is not necessarily about doing more, but it is also about new ways of thinking and dealing with risks and hazards, uncertainty and complexity. The still significant uncertainty regarding climate variability, long-term climate and socio-economic changes require flexible adaptation policies, which can deal with evolving scientific understanding and lessons learned from already implemented actions. This also means that adaptation policies need to be constantly updated with new information from monitoring, evaluation, and learning.

   - *Using different types of adaptation measures can be helpful to achieve a greater flexibility. For example, implementing a combination of 'grey' (i.e. technological and engineering solutions), 'green' (i.e. eco-system based approaches) and 'soft' (i.e. managerial, legal and policy approaches) adaptation options is often a good way to deal with the interconnections between natural and social systems.*

   - *More knowledge is needed to better understand the regional impacts of climate change in Croatia and to respond to new scientific findings and insights. We recommend regular exchange between scientific research institutes and policy makers in*

meetings, events or working groups to be informed about on-going activities and projects and be able to update adaptation policies once they are developed.

2. As mentioned in the previous chapters, climate change adaptation policies also require the integration of different levels of governance (European, national, regional, and local) and different sectors of economy and society. This complexity presents a challenge, by requiring 'horizontal' and 'vertical' integration of policies. However, if well-coordinated, this mainstreaming and cooperating among different policy levels also offers the potential for synergies and spill-over benefits. In order to develop a coherent approach and improve coordination it may be helpful to create or intensify supporting structures, such as an inter-ministerial working group, an institutionalized exchange among national and regional levels or even a new institution/ department in an existing institution responsible for information and coordination.

- *The inter-sectorial working group should keep up the work and be expanded by missing ministries. This working group, including the participating experts from universities and other institutions, should be used to discuss drafts of the national adaptation strategy and the action plan. Other ministries should be actively prompted to send their opinion on the national adaptation strategy and action plan.*
- *In order to address adaptation in a coherent manner on different policy levels, the responsibilities for different levels of governance should be clearly defined. It is recommended to either set up a coordinating body or assign the responsibility for managing the cooperation across administrative scales to an already existing institution/ department.*

3. Considering that social and economic contexts, as well as local environmental impacts play essential roles for choosing appropriate adaptation measures, it becomes clear that there cannot be a 'one-fits-all' approach to adaptation. While a national adaptation strategy is important to set the frame and objectives of adaptation, regional and local climate change adaptation strategies and plans are important to successfully adapt to the impacts of climate change.

- *Although Croatian regional and local climate change adaptation strategies and/ or plans are still very rare, a few local policy documents regarding adaptation do already exist or are under preparation (e.g. for Zadar and Zagreb) which could serve as an example also for other cities. Additionally, a lot of regional and local adaptation strategies and plans from other EU Member States have been developed and are available online.*
- *We recommend supporting mechanisms to foster the elaboration of regional and/or local climate strategies. This requires not only the strategies itself but preceding capacity building. For this first step we recommend the preparation and dissemination of information material tailored for the needs of the local level. As there is a lot of material available already in English language, a translation and adaptation would probably be enough. Roundtables as proposed below can also serve this purpose. For the actual elaboration, support schemes (e.g. financial support for developing the strategy document) and adaptation guidelines should be provided.*
- *For the selection of concrete measures on local level, multi-criteria analyses or cost-benefit analyses can be applied to assess the possible adaptation options. We recommend implementing a small pilot project to test and demonstrate such methods for a selected case.*

4. The involvement of stakeholders (policy makers, NGOs, business and citizens) from the beginning on is very important to develop adaptation policies that are tailor-made to regional and local conditions and needs. Stakeholder involvement is also essential to build adaptive capacity in the wider society and to create a sense of 'ownership' in adaptation policy, which will be very important for the success of adaptation implementation. With the help of a broad participation of actors it is possible to come to a prioritization of potential adaptation measures.

- *A series of moderated regional roundtables should be held in the frame of the adaptation process. This will create a dialogue between various stakeholders and facilitate the identification of priority sectors.*

5. The way of interaction of state and non-state actors from different levels plays an important role. A consensus-oriented goal formulation among well-informed stakeholders with high level of awareness has proven to be a very good precondition for effective policy-making, i.e. reaching the agreed goal. Providing comprehensive information among stakeholders and citizens and raising their awareness is therefore critical.

- *A communication strategy on climate change adaptation can be very useful to take on a strategic approach regarding communication and awareness raising.*
- *We recommend that the draft of the national adaptation strategy is open for public consultation.*
- *We recommend to set-up an on-line information platform in Croatian language that forms the central information point for events, publications and developments (either as a stand-alone website or integrated into a suitable existing online portal). A part of the information should be directly targeted to citizens and their role in the adaptation process. The on-line platform should also include Croatia-specific case studies.*

6. Climate change impacts should be systematically taken into account in future administrative actions on national, regional, and local level.

- *The revision of national strategies and planning documents should ensure that the revised versions are climate-proof. Especially spatial planning and infrastructure planning (national, regional and local level) should include the anticipated impacts of climate change.*

7. Cost-benefit analyses are an important tool to support the prioritization of adaptation measures. However, it should be considered that at present only limited information on costs and benefits of adaptation action on European, national, and local levels is available at present, and this information has to be considered with care as there is still much work to be done on improving assessment methods.

- *In order to reduce the knowledge gaps, cost-benefit analyses and accompanying research should be focused on priority sectors (to be identified in the adaptation strategy development process) in the beginning.*

8. At EU level, financial instruments for implementing adaptation policy are available and include, for example, cohesion funds, agriculture funds, and infrastructure funds, as well as funds from the LIFE+ and Horizon2020 programme.

- *National co-funding for EU funded projects can be allocated in line with the priority sectors identified in the national adaptation strategy.*
- *Research institutes should be encouraged to make use of EU funding for which Croatia, being a full EU member, is now fully eligible.*

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