LIFE SEC ADAPT PROJECT

Upgrading Sustainable Energy Communities in Mayor Adapt initiative by planning Climate Change Adaptation strategies

ACTION C.3: Adoption of Local Climate Adaptation Strategy and Plans through SEAP Integration

DEFINITION OF A COMMON METHODOLOGY FOR DRAFTING OF THE CLIMATE CHANGE ADAPTATION STRATEGY AT MUNICIPAL LEVEL

-Final draft-

Region of Istria in collaboration with Apsara Intl.

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1. INTRODUCTION

There is an indisputable scientific and political consensus, confirmed by the adoption of a series of international agreements, that climate change is a threat and will remain a growing challenge for all humankind towards the end of the 21st century. Many emerging climate change risks are concentrated in urban areas. Urban areas hold more than half the world's population (this number is predicted to grow to more than 70% by the end of the 21st century) and most of its built assets and economic activities. Consequently, cities also house a large proportion of the population and economic activities most at risk from climate change, in particular those in coastal areas and near the coastline.

Climate change impacts on cities are increasing. Key issues include rising temperatures, heat stress, water security and pollution, sea-level rise and storm surges, extreme weather events, heavy rainfall and strong winds, inland flooding, food security, ocean acidification, etc. Climate change may worsen access to basic urban services and the quality of life in cities. Most affected are likely to be the urban poor in developing countries where the population is growing rapidly. Three fifths of the world's urban population are located in centres with fewer than 1 million inhabitants and it is here that much of the growth in urban population is occurring.

Adaptation to climate change is considered, along with mitigation (i.e. reduction of net greenhouse gas emissions), the second important pillar of the implementation of climate policy, which is in the function of preserving the values of society, the environment and the economy and ensuring the sustainable development. Therefore, adaptation is a necessary complement to mitigation in addressing climate change. Adaptation involves making adjustments in our decisions, activities and thinking because of observed or expected changes in climate, with the goals of moderating harm and taking advantage of new opportunities.

One of the IPCC reports defines adaptation as "…adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change" (Smit and Pilifosova, 2001). Adaptation to climate change may be any activity that reduces the negative impacts of climate change but also when it takes advantage of new opportunities that may be presented by climate change.

Adaptation includes activities that are taken before impacts are observed (anticipatory) and after impacts have been felt (reactive). Both anticipatory and reactive adaptation can be planned, i.e. it is the result of a deliberate policy decisions. Reactive adaptation can also occur spontaneously, when people take measures to reduce negative impacts of climate change without them being part of a deliberate policy. In most circumstances, anticipatory planned adaptation will incur lower long-term costs and be more effective than reactive adaptation. Successful adaptation does not mean that negative impacts will not occur, only that they will be less severe than would be experienced had no adaptation occurred.

Cities are playing a vital role in the global response to climate change by curbing their greenhouse gas emissions and adapting to the effects of a changing climate. Local governments are central to these efforts. They lead climate action by framing strategies and programmes, integrating such actions into ongoing urban development, and forging the partnerships necessary for effective climate responses.

In addition, what are the cities doing about it? Urban governments are at the heart of successful urban adaptation because so much of this depends on local assessments and integration of adaptation into local investments, policies and regulatory frameworks. Well-governed cities with universal provision of infrastructure and services provide a strong base for building climate resilience if processes of planning, design and allocation of human, capital, and material resources are responsive to emerging climate risks. Urban adaptation provides opportunities for a shift towards resilience and sustainable development via multi-level urban risk management, alignment of policies and incentives, strengthened local government and community adaptation capacity, synergies with the private sector, and appropriate financing and institutional development. Although many rapidly growing cities provide good opportunities for such developments, there is limited evidence of this being realised in practice.

According to one report (Carmin, J. et al, 2012), 19% of the cities responding to a poll, conducted by ICLEI and MIT, have completed an assessment and a similar number are in the process of conducting one. An additional 31% of the cities plan on conducting an assessment at some point in the future. This leaves 30% of the cities that have not assessed risk or vulnerability to climate change and do not plan on doing so. Furthermore, approximately 37% of cities are in the preparatory stages of adaptation planning. This encompasses gathering information, exploring options for adaptation, and holding informal discussions. Another 11% of the cities are in the initial stages of planning, such as forming committees, researching climate science, and holding preliminary meetings. Another 9% are working on risk and vulnerability assessments. Finally, about 21% of the cities report that they are working on plan development, 4% have had their plan accepted, and 18% are working on implementation. Meanwhile in Europe, results from a survey conducted among the European cities within the EU Project – Adaptation Strategies for European Cities – show that among the surveyed cities:

- around 24% have already adopted an adaptation strategy, even though half of those are still in the very early stages;
- 14% have an adaptation strategy because they are legally obliged to have one;
- 34% have publicly committed to develop an adaptation strategy voluntarily;
- 8% have not started thinking of or working on adaptation. (ISPRA, 2014):

Although the above information dates back to 2012 and earlier, it is safe to conclude that still many cities have not embarked on the track towards effective adaptation to climate change.

The need for adaptation of urban areas to changing climatic conditions is widely recognized. The IPCC Fifth Assessment Report (published in 2014), as on previous occasions, analyses the state of adaptation efforts and, among other, contains the chapter on urban areas. It emphasizes three facts: the very large differences between cities around the world in adaptive capacity and the factors that influence this; the limits that even high levels of adaptation face without mitigation; and the need for transformative adaptation that also addresses issues of development and mitigation. (Revi, A. et al., 2014). It is obvious that adaptation initiatives are lagging behind the actual needs and that efforts towards better urban adaptation have to be stepped up.

Action C.3 of the LIFE SEC ADAPT Project has as its final objective the adoption of local climate adaptation strategy and plan in participating cities. The action envisages implementation of five sub-actions and the first sub-action is aimed at definition of a common methodology for the drafting of

these strategies and plans (in further text: Common Methodology). The terms of Reference state that the Region of Istria (one of the partners in the project) "…defines the common methodology and tools of the climate adaptation strategy adoption that is composed of 4 phases: 1) definition of a political vision; 2) identification of potential adaptation options; 3) prioritization and selection of best options; 4) drafting and adopting the municipal climate adaptation strategy and plan. This could be considered as the basic structure of the Common Methodology, but the one that will be presented in this document will follow the standard methodological tasks needed to develop an urban adaptation strategy. The Common Methodology will be used and tested by the participating cities while they will be preparing their adaptation strategies and plans.

2. NEED FOR THE COMMON METHODOLOGY

Why do we need a Common Methodology? A simple and most straightforward answer would be that the aim is to increase the capacity for climate change adaptation planning in cities participating in the SEC ADAPT Project. Methodology[1] is, in generic terms, generally defined as a systematic way of doing something. It should tell us what steps to take, in what order, and how to perform those steps. While there is a large variety of the guidelines and methodologies tailored just for the purpose of urban adaptation planning, the SEC ADAPT Project partners have, in spite of that, felt that there is a need to develop a common methodology that would guide the municipal authorities in developing an adaptation strategy and related action plan. This document would, thus, try to precisely determine steps and activities that will lead to the preparation and adoption of an urban climate change adaptation strategy and an action plan.

Even an offhand review of urban climate change adaptation strategies and action plans reveals a wide range of formats, levels of details, scopes, time horizons, planning parameters, etc. contained in them. This is not to say that a strictly defined and very detailed format for such documents has to be developed, because the methodological approach has to be adaptive, taking in consideration the developmental and environmental context of a municipality preparing strategy and plan, as well as resources that are available for such endeavor. However, there must be an agreed minimum number of steps that have to be followed when these documents are being prepared, and each strategy and action plan has to contain a minimum number of elements following a basic framework format. Therefore, this should be a niche that the Action C.3 of the SEC ADAPT Project is trying to fill with the development of the Common Methodology.

There are many documents, guidelines, scientific articles, web sites, toolkits, handbooks, etc. that deal with the issue of urban climate change as well as adaptation to it. It can be, therefore, concluded that, from the technical perspective, the field is fairly well covered. In addition, EU is particularly active in financing a number of projects related to various aspects of urban adaptation. Among the wealth of available resources, it is worth mentioning two EU projects' deliverables that cover this aspect fairly well and which consequently, are covering quite well some of the requirements of this project:

[1] Similar notions are "guidelines" and/or "framework", but they are less strict than a "methodology" because they only recommended certain practice that allows for some discretion or leeway in its interpretation, implementation, or use.

- The ACT's *Planning for Adaptation to Climate Change: Guidelines for Municipalities* (in further text: the ACT Guidelines) prepared by ISPRA (ISPRA, 2014), and
- Climate-ADAPT's web platform "The Urban Adaptation Support Tool" (in further text: UAST).

The "Planning for Adaptation to Climate Change: Guidelines for Municipalities" gives the user a comprehensive insight into the complexity of adaptation planning and it refers to a large number of sources and references. It also presents a large number of cases where strategy and plan were prepared. However, the document often refers to "strategy or plan" without specifying that the strategy precedes the action plan, and that the latter has to evolve from the former. There is no clear definition of the preparation of the strategy as a step in the planning process. There is only clear reference to the plan and detailed guidelines for its preparation are given. Since there is no clear distinction between the adaptation strategy and adaptation action plan, it looks like one does not have to follow the other. While many aspects of the document could be taken as a valuable resource, the clear definition of the adaptation strategy and action plan needs to be outlined and the preparatory steps to prepare them as part of the same process need to be outlined. This is one of the niches that the Common Methodology intends to fill.

The Urban Adaptation Support Tool, which is part of the European Climate Adaptation Platform, follows the same procedural logic as the ACT guidelines, but is a bit simpler and its emphasis is on identifying and assessing adaptation options. It is a massive platform that is simple to use but, on the other hand, somehow difficult to grasp in its fullness. It gives a basic description of every step of the process and directs the user towards, virtually, hundreds of documents and web sites dealing with specific topics. The documents and web sites are grouped in several sections: guidance and tools, publications and reports, city specific information and research projects and information tools. It doesn't guide the user to specific resource but leaves it to the user's intuition and pursuance of her/his specific interests to choose what suits them best. In that respect, while it is a very useful compendium of the resources, one should ask how useful it really is to the user in the end because a considerable time is needed to absorb all the information that is offered before the user reaches the right information that may be needed. The wealth of resources presented in the Urban Adaptation Support Tool, however, will be a valuable compendium to this document. In addition, one observation is worth mentioning. In every step and sub-step of the Tool's process, there is reference to the above mentioned ACT guidelines. This creates the strong linkage between the two and stresses the importance of the ACT guidelines as one of the most important resources to be used while developing urban climate change adaptation strategy and plan.

It has to be kept in mind that cities are not individual units alone but are always elements of a larger spatial structure, or a system of cities. Climate change also does not recognise boundaries when its impacts are being felt. This relates to a number of resulting impacts such as floods, extreme weather events, draughts, etc. Therefore, a strategic approach to wider urban areas or system of cities, covering several cities, needs to be taken. This entails understanding of urban interlinkages, and of the impacts one city's actions may have on another. Therefore, ecosystem approach to urban climate change adaptation planning is essential. This is particularly important when assessing the risk and vulnerability associated with the climate change. While each city is developing its own risk assessment and later the adaptation strategy and plan, some risks could be dealt with only in a wider context where causalities have to be established. For example, in coastal cities the erosion can be a problem. However, if we want to identify causes of coastal erosion affecting cities, analysis of the process leading to that erosion has to be carried out over a wider area than are the boundaries of the

affected city. Very often it is the agricultural practice inland and upstream, or forestry practice and other events, that may cause coastal erosion downstream, meaning that the causes may lie at some distance from the area where concrete effects are being felt.

While this document will try to respond to the stated project's needs by developing the requested methodology, it will also try to provide basis for answering, *inter alia*, some other questions that have not been found in the available documentation on the subject, or adequate attention has not been given to, such as:

- What are the instruments for mainstreaming local adaptation strategies and plans into development and other sectoral strategies and plans, in particular urban and regional spatial strategies?
- What is the position of local disaster management strategies and plans in wider adaptation strategies and plans?
- What is the role of specific approaches, such as Integrated Coastal Zone Management, in urban adaptation to climate change?
- What are the risks specific to coastal areas (coastal erosion, urban coastal flooding, forest fires, etc.)?

3. URBAN CLIMATE ADAPTATION APPROACHES

To date, climate change mitigation has been the main focus of attention, given the importance of getting governments to accept the scientific evidence for human-induced climate change. This situation came to the extreme when it has been even argued that mitigation should be understood as a form of adaptation. Namely, the mitigation that does not directly support adaptation in the short run may serve the purposes of adaptation in the long run. The reason is straightforward: the most desirable form of adaptation is adaptation that is made unnecessary (Davoudi et al, 2009). However, increasing concern with the complementary issue of adaptation has led to an increased focus on this aspect of climate change. Approaches have ranged from disaster risk reduction that broadened in scope to include climate change, to the emergence of new specific climate change adaptation approaches. The diversity of approaches to climate change adaptation is complex, interrelated, and often overlapping and, therefore, difficult to disentangle one from the other. Some of these different adaptation approaches in terms of the historical period when developed, the key objectives, and current emphases, as well as other characteristics are summarised in Table 1. This overview serves the purpose of acquainting the reader with the fact that adaptation can take different directions very often depending on the circumstances of the context where adaptation planning is taking place. Also, this overview has no intention of encouraging the reader to select one of the approaches, in particular if it won't serve her/his immediate purpose.

The ACT Guidelines give a good summary of why we need to adapt: climate is already changing; climate change impacts are already occurring even more quickly than predicted; near-term significant reduction of GHGs is unlikely; climate change impacts will occur long after the GHGs are stabilized; without action, the impacts of climate change will increase rapidly and some changes will be irreversible; delaying action will only exacerbates the economic, environmental and social costs; early action will allow to take full advantage of the opportunities arising from climate change. The

important statement, repeated by many, is that while mitigation is the global concern, the adaptation is definitely the local one, because it is at that level that climate change impacts are mostly felt.

UN Habitat, the principal UN agency dealing with urban matters, has proposed a set of principles that should guide urban climate change adaptation planning. These principles, outlined below, do not indicate a process in itself, but should be considered by municipal authorities throughout the entire adaptation planning process. Therefore, the city climate action planning should be (UN Habitat, 2015):

- **Ambitious:** Setting goals and implementing actions that evolve iteratively towards an ambitious vision.
- **Inclusive:** Involving multiple city government departments, stakeholders and communities (with particular attention to marginalized groups), in all phases of planning and implementation;
- **Fair:** Seeking solutions that equitably address the risks of climate change and share the costs and benefits of action across the city;
- **Comprehensive and integrated:** Coherently undertaking adaptation and mitigation actions across a range of sectors within the city, as well as supporting broader regional initiatives and the realization of priorities of higher levels of government when possible and appropriate;
- **Relevant:** Delivering local benefits and supporting local development priorities;
- **Actionable:** Proposing cost-effective actions that can realistically be implemented by the actors involved, given local mandates, finances, and capacities;
- **Evidence-based:** Reflecting scientific knowledge and local understanding, and using assessments of vulnerability and emissions and other empirical inputs to inform decision-making; and
- **Transparent and verifiable:** Following an open decision-making process, and setting goals that can be measured, reported, independently verified, and evaluated.

Name of approach	Period of Development	Key objectives and current emphasis	Examples of institution using the approach	Origin	Focus on assets
Disaster Risk Reduction (DRR)/Disaster Risk Management (DRM)	1980s	Reduction of underlying factors of risk, intensity &/or frequency of disaster occurrence in the pre-disaster & post-disaster context (i.e. development, relief and response) including climate-related and non-climate-related disasters. Current emphasis is on the integration of DRR into sustainable development through a management perspective	Tearfund, Environment, Climate Change & Bio-energy Division of FAO, GTZ; IDS, Sida, Dfid, etc.	DRM (emergency/relief organisations, social scientists)	In the context of strengthening capacities & resilience of h/holds, communities & institutions assets are a major theme.
Climate Risk Management (CRM)	1990s/00s	Reduction of vulnerability to climate risk by maximising positive & minimizing negative outcomes caused by climate change with the final aim to promote sustainable development.	IDS, Energy for Sustainable Development Africa, UN Secretariat of ISDR, ADPC	Climate change adaptation community/DRM	Due to its orientation towards community adaptation and institutional capacity building, assets are addressed.
Climate Change Adaptation	1990s/00s	Reduction of vulnerability to climate risk developed as a reaction to the 1990s greenhouse gas debate that promoted the mitigation agenda. Emphasis of adaptation is here on dealing with physical impacts of climate change.	South South North, Acclimatise; TCPA, IIED, ADPC and ACTS.	DRM/climate change adaptation.	Assets addressed through the interest in local knowledge & competence.
Climate Change Vulnerability Resilience	2000s	Increasing the ability of communities to withstand and recover from climate change related external shocks & stresses with an emphasis on economic well-being, stability of a community, social & political factors, institutional capacity, global interconnectivity, & natural resource dependence.	IDS, Tyndall Research Centre, Acclimatise, IIED, Practical Action, ITDG	DRM/climate change adaptation	Assets addressed implicitly as approach attaches significance to governance quality at municipal & local levels.
Community-Based Adaptation	2007 (adapted from poverty-focused CBA of 1990s)	Support of knowledge & coping strategies of individuals & communities to reduce vulnerabilities to climate risk, based on individual & community knowledge of climate variability.	IDS, Eldis, ACTS, ADPC, IISD, IIED, & Practical Action' ITGD	DRM/climate change adaptation (influenced by development experts such as Robert Chambers)	Assets form a central theme due to its bottom-up approach emphasising people's capabilities and abilities.
Asset-Based Vulnerability & Adaptation	2008 (building on asset vulnerability of 1990s)	Analysis of asset vulnerability and asset adaptation relating to the erosion and/or protection of human, social, physical and financial assets at individual, household and community level for resilience, pre-disaster damage limitation, immediate post-disaster response, and rebuilding	Global Urban Research Centre (GURC); IIED.	Asset vulnerability and asset accumulation framework ; climate change adaptation	Assets main basis of focus at different levels including role of external institutions such as municipalities, NGOs and private sector

Table 1: Urban climate change adaptation approaches (Moser, 2011)

4. DEVELOPMENT OF THE CLIMATE CHANGE ADAPTATION STRATEGY AND ACTION PLAN: THE PROCESS

The Terms of Reference for this project's task require that the "…common methodology and tools of the climate adaptation strategy adoption that is composed of 4 phases: 1) definition of a political vision; 2) identification of potential adaptation options; 3) prioritization and selection of best options; 4) drafting and adopting the municipal climate adaptation strategy and plan" be defined. Interpretation of the above requirements leads to the conclusion that the Common Methodology needs to be focused on the process that will result in the adoption of the climate change adaptation strategy (in further text: the Strategy) and adaptation action plan (in further text: the Plan) in participating municipalities in later stages of the project.

The two previously mentioned sources have also proposed the process to prepare the Strategy and the Plan. The ACT guidelines describe in considerable detail all the steps of the process leading to the development, adoption and implementation of the climate change action plan, starting from the actions to be taken at the start of the process; building the baseline knowledge; assessing vulnerability and risk; developing plan; and implementing it, monitoring and evaluating its performance; and, finally, mainstreaming adaptation into wider development planning.

The UAST web platform follows the similar route proposing the following steps: Getting started; Preparing the ground for adaptation; Assessing risks and vulnerabilities to climate action; Identifying adaptation options; Assessing and selecting adaptation options; Implementation; and Monitoring and Evaluation.

A score of other methodological documents also propose procedural steps to prepare urban adaptation strategy and plan. It is worth mentioning the UN HABITAT's proposal (see below figure). It somehow differs from the two examples mentioned above, but what counts is the logic of the process, which has plenty of similarities with the above two (UN HABITAT, 2015).

The UAST states that "…adaptation should involve all levels of decision-making, as well as most sectors and even the surrounding areas. Adaptation needs to be structured as a cross-sectoral, multi-level and inter-regional activity bringing together actors with different knowledge, interests and values." Therefore, adaptation to climate change is widely recognized as a multi-level governance challenge. This statement leads towards the issue of governance in general, and specifically governance of adaptation to climate change in urban context. Why is governance so important principle in climate change adaptation? Governance can be defined as "…the formal and informal arrangements, institutions, and mores that structure: how resources or an environment are utilized, how problems and opportunities are evaluated and analyzed, what behavior is deemed acceptable or forbidden, and what rules and sanctions are applied to affect the pattern of use" (Mahon et al, 2009). The governance of climate change is a question of how to manage different motives, expectations and moral norms. Governance is also a process in dealing with challenges such as integration of adaptation policies and strategies horizontally, across policy sectors, and vertically, across jurisdictional and planning levels, and in particular integration and involvement of non-state stakeholders in adaptation policy-making and development of adaptation strategy. The latter are extremely important if we want the adaptation strategies and action plans to succeed in a long term.

Very often, the national level is the starting point of the climate change adaptation but other jurisdictional levels quickly come into the picture. The EU climate change adaptation strategy defines climate change adaptation as an issue of national importance, which almost by default results in national adaptation strategy. However, at the same time, the nature of the climate change adaptation problem is generally framed at the regional or at the local level, because it is there where most of the concrete action is taking place. Governance is the critical tool that allows the transposition of the climate change adaptation issue from global and national to regional and municipal/local levels.

Prior to the actual start of the adaptation planning process (to be explained in detail in the rest of the document), there is a need to undertake the "start-up" activities. The purpose of these activities is to create an enabling institutional and organizational framework for the adaptation process to succeed. Several guidelines mention what are these necessary activities. Thus, for example, the document "Methods and Tools for Adaptation to Climate Change: A Handbook for Provinces, Regions and Cities" (Prutsch *et al*., 2014) mentions four essential activities:

- Securing political commitment and resources;
- Preparing and communicating information;
- Internal collaboration with colleagues; and
- Initiating cooperation with stakeholders.

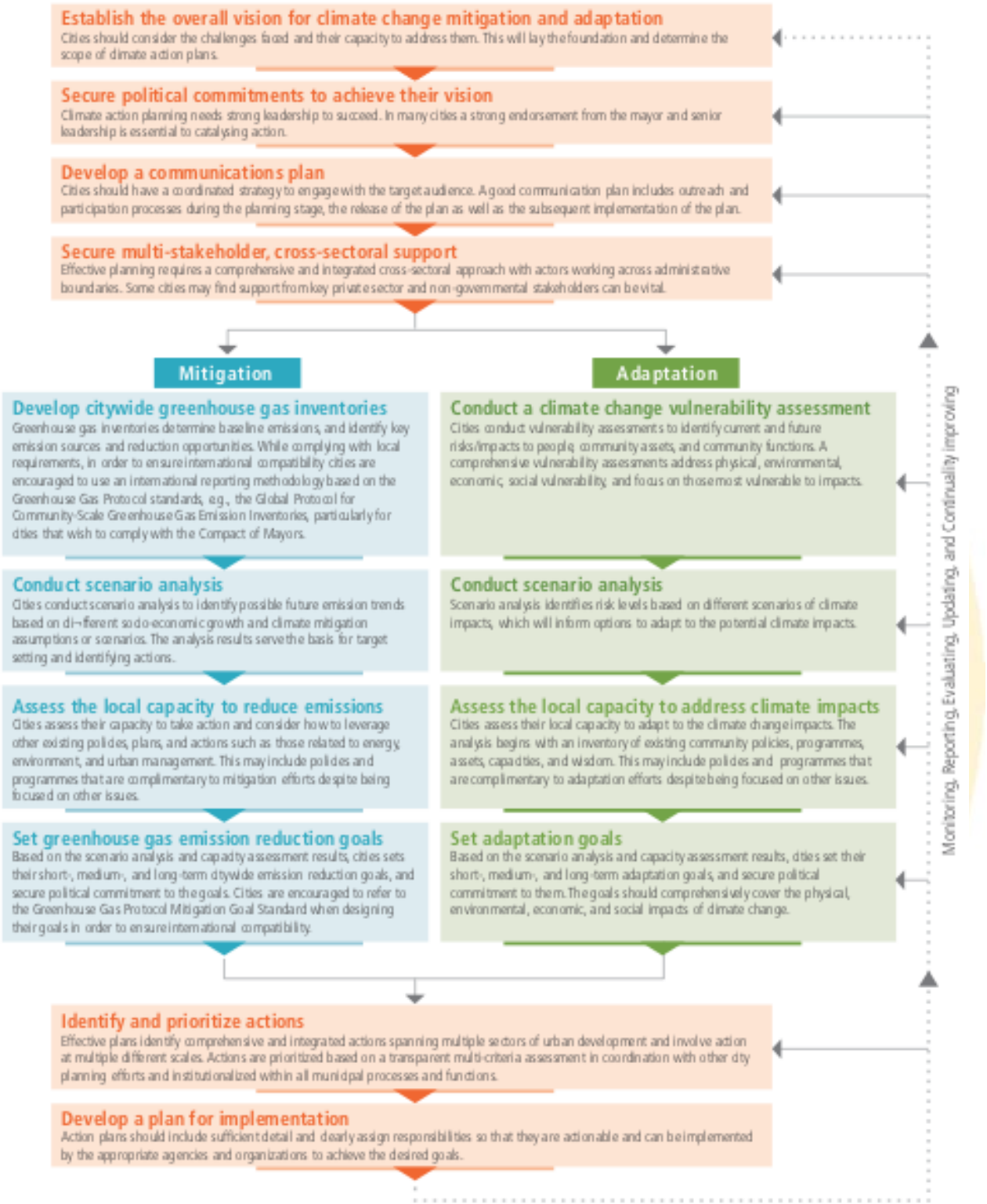

Figure 1: An example of the urban climate change adaptation planning process (UN HABITAT, 2015; the document could be found on the following web page: http://e-lib.iclei.org/wp-content/uploads/2016/02/Guiding-Principles-for-City-Climate-Action-Planning.pdf)

The ACT Guidelines (2013) are more specific, and mention the following activities:

- Secure the organizational and technical management;
- Ensure political interest and commitment;
- Establish a vision and guiding principles;
- Take the first decisions;
- Secure financial resources;
- Focus on policy aim and generic adaptation objectives; and
- Identify potential barriers to adaptation at local level.

It should be mentioned here that ACT Guidelines place development of the vision even before the actual adaptation planning process starts. This, however, should be considered as a bit premature because definition of the future that is meant to be achieved by implementing the adaptation measures has to emerge from a certain scientific basis. It is true, however, that at this stage some preliminary elements of the vision can be established but they have to be confirmed with the results of the subsequent steps in the process.

The "Preparing the ground for adaptation" stage of the Climate ADAPT's Urban Adaptation Support Tool (UAST) envisages seven preparatory activities, namely:

- Ensure high level of political support;
- Set the adaptation process within the municipality;
- Identify human, technical and financial resources needed for the adaptation planning and management;
- Identify available financial resources for the adaptation;
- Identify the scope of initial information needed to collect;
- Identify main internal and external stakeholders and modalities of their involvement; and
- Define the communication process.

There are many similarities among the approaches presented. There is no need to follow strictly either of the above-mentioned processes, but each municipality can carry out those "start-up" activities that will best suit its specific context.

It also has to be noted, in the context of preparatory or "starting up" activities, that it is important to undertake a review of the available knowledge and establish a baseline situation, which would help setting up priorities for the adaptation planning. Above all, effective adaptation planning should be evidence-based, grounded in a scientific understanding of climate change whenever possible, and informed by local knowledge (UN HABITAT, 2015). The ACT Guidelines are very specific on that and their advice can be followed in this respect. Another example that could be followed is the Croatian Adaptation to Climate Change Strategy, where a sectoral analysis of all relevant research activities that have preceded the development of a strategy has been carried out. The analysis included the legal basis for adaptation in each sector, scientific research, concrete sectoral activities hitherto carried out, etc. For each sector the knowledge gaps have been identified and proposal for future research given. It would be useful if similar activity could be undertaken in each municipality prior to embarking to the development of the strategy.

Having the above in mind, the process that is advised to be followed in the urban climate change adaptation, and after the preparatory ("getting started") activities are being carried out, should encompass the following substantive steps:

1. **Vulnerability and risk assessment:** critical precondition that informs the decision makers and other stakeholders of the severity of the climate change issue and the risks that they may face in the future.
2. **Definition of the Vision Statement on adaptation:** the moment when decision is taken what is it that the stakeholders would like to do and how they intend to cope with the challenge of climate change in their area. This decision also entails definition of the goals and objectives.
3. **Identification of the adaptation options:** it includes identification and selection of options. Based on the vulnerability and risk assessment, and a desired future that the city wants to achieve, the stakeholders explore options within a framework of adaptation scenario and embark on prioritisation and selection of the option that will best fit their vision as well as available resources to undertake action.
4. **Drafting and adoption of the Strategy:** the most critical activity because it entails definition of steps that need to be taken toward achieving resilient cities that will be able to cope with the climate change challenges. Development of the strategy is a consensus building process that has to correspond to the main principles of governance. The strategy results in recommendations and measures to be taken.
5. **Drafting and adoption of the Plan:** follows the Strategy and covers shorter periods with detailed actions that are embedded in the recommendations and measures proposed by the strategy.

The figure 2 below depicts the Strategy planning process.

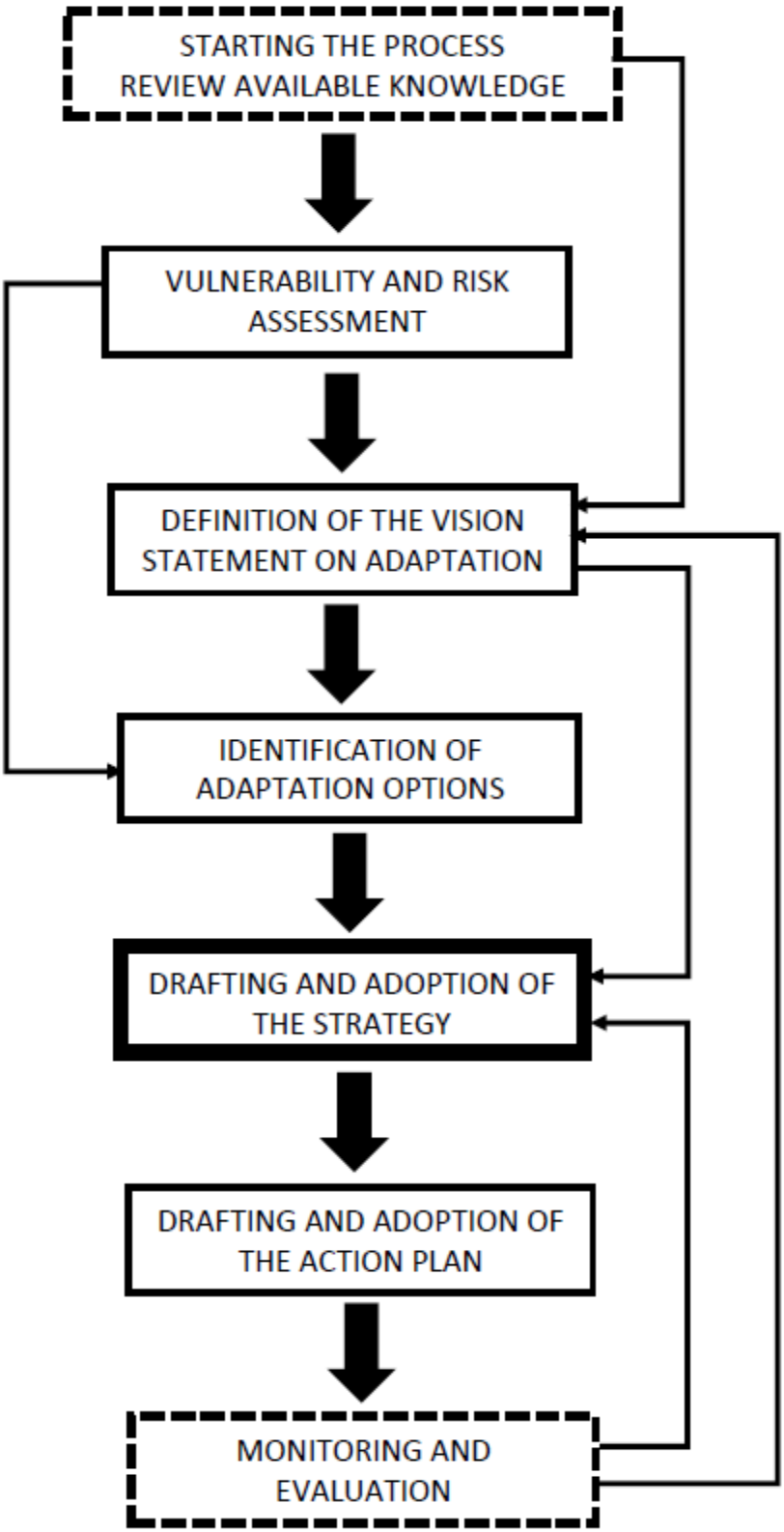

Figure 2: The climate change adaptation planning process

4.1. Risk and Vulnerability Assessment

Risk and Vulnerability Analysis (RVA) is a crucial first step in the process. It has been the subject of one of the earlier SEC ADAPT Project activities (C2) and specific guidelines have been prepared for that purpose (Methodology for Vulnerability and Risk Analysis in Regions Marche and Istria). It is assumed that the document has been used during the preparation of RVA in each participating municipality. However, it would be useful to have agreement on basic definitions that are the foundation of the RVA. Sometimes, there is a confusion in understanding their proper meaning among those that are using them. The basic definitions are the following:

Hazard: The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources (UN Environment, 2017).

Risk: The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. Risk results from the interaction of vulnerability, exposure, and hazard (UN Environment, 2017).

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. (UN Environment, 2017).

Adaptive Capacity: The ability of a system to adapt to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. (Wilson and Piper, 2010).

The SEC ADAPT Methodology for Vulnerability and Risk Analysis rightly states that “the concepts of hazard, vulnerability and disaster risk are dynamically related i.e. hazards and vulnerability have to be both present in the same location to create risk.” The Covenant of Mayors defines the RVA as an analysis that determines the nature and extent of risk, by analysing potential hazards and assessing vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend. It allows the identification of areas of critical concern and therefore provides information for decision-making. The assessment could address risks related to floods, extreme temperatures and heat waves, droughts and water scarcity, storms and other extreme weather events, increased forest fires, sea level rise and coastal erosion (if applicable). The RVA serves, along with the Baseline Emission Inventory (which is part of mitigation plans), as the point of departure for the development of the Strategy and Plan and is a cornerstone towards defining the adaptive capacity of a certain system, in this case a municipality. The figure below explains the relationship between hazards, vulnerability and adaptive capacity.

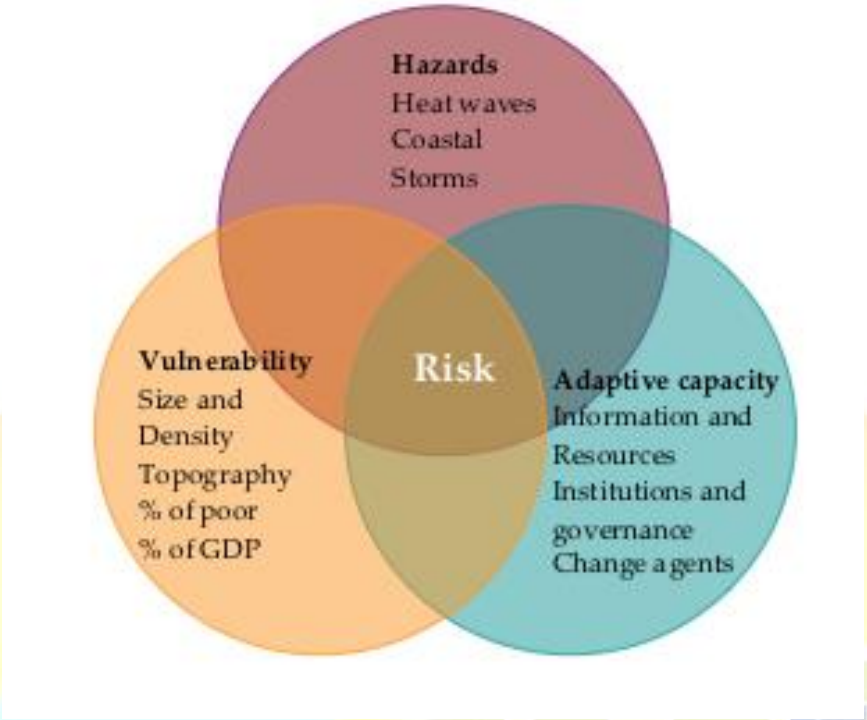

Figure 3: Relationship between hazards, vulnerability and adaptive capacity (Mehrotra, S. et al., 2009)

The risks, which compose of hazard, vulnerability and exposure, need to be assessed in all dimensions: environmental (biodiversity losses of marine and coastal ecosystems), social (health, mortality) and economic (potential losses in all sectors). Direct and indirect effects of climate forcing on natural hazards must be explored and disentangled. Special attention should be given to the vulnerability component of risk where the level of uncertainties is much higher.

Climate ADAPT's UAST states that assessing risks and vulnerabilities to climate change aims "…to develop a comprehensive picture of current and future climate change risks in an urban area as further stress factors to be expected."

The combination of vulnerability and risk assessment is fundamental for the prioritisation of impacts which is the main objective of the assessment activity (ISPRA, 2014). Following on the above, conducting a vulnerability assessment helps to identify weak spots for further investigation and to figure out which impacts can be adapted to with available capacity and which require actions outside available capacity.

Normally, the RVA should be undertaken following the modeling study that will determine the future climate scenaria. Unfortunately, these studies are not usually being undertaken at the municipal level, because very high resolution is needed and most municipalities, particularly smaller ones as is the case for many in the SEC ADAPT Project, are not either technically capable or do not have financial resources to do so, or both. In this case, it is advisable to consult models whose resolution is coarser, such as the models that are usually being run for the national climate change adaptation strategies. They may point to some regional variations, which could be useful for municipal level RVA. One such example is the model that was developed for the Croatian Climate Change Adaptation Strategy

in 2016. The model followed the IPCC RCP4.5 Scenario. Its resolution is 50 square km, which is large for municipal level but could still provide some useful information for RVA. The figure below shows example of the total annual rainfall for the reference period 1971-2000, and then for the periods 2011-2040 and 2041-2070. Finally, the document "Climate Assessment on Local and Regional Levels: Methodological Document", produced within the SEC ADAPT Project, gives some guidance that could be followed for climate modeling at municipal level.

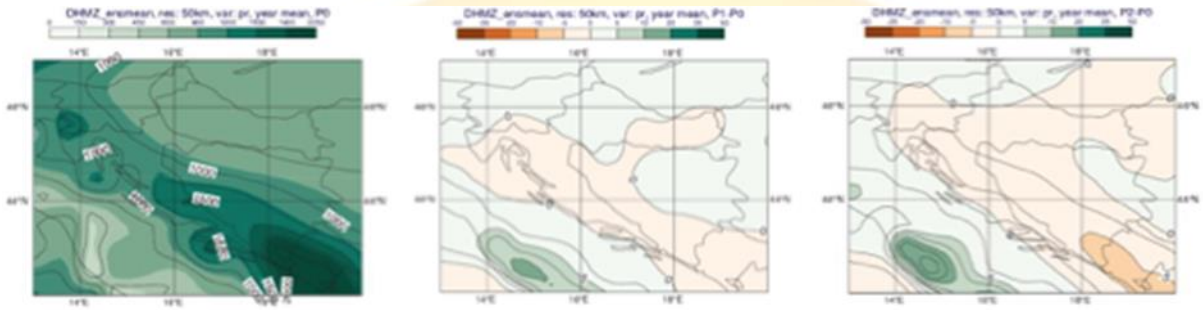

Figure 4: Modeling annual rainfall in the Croatian Strategy for Adaptation to Climate Change

RVA should concentrate on "sectors" that are important in certain municipality. However, there are sectors that are common to all, such as water resources availability, health, energy, etc, while some may be specific, such as economic sectors (tourism, for example, may not be important in every municipality, while it may be the backbone of the economy in the other). Furthermore, some sectors may be crosscutting like, for example, spatial planning, Integrated Coastal Zone Management, or management of risk. RVA Report, for each sector, should identify four different types of vulnerability, namely:

- impacts we are not vulnerable to now;
- impacts we are vulnerable to now (high or low vulnerability);
- impacts we are likely to be vulnerable to in the future (high or low vulnerability);
- impacts we are not likely to be vulnerable to in the future.

The RVA Report may also identify some possible responses to the impacts and challenges that cause high vulnerability. The early indication of possible adaptation responses/adaptation options may be taken over to the step where Strategy and Plan will be defined.

The Vulnerability and Risk Analysis was proposed in the respective SEC ADAPT Guidelines, and that methodology has been used in the preparation of several RVA studies within the project. The steps of the RVA process are presented in the Figure 4 below.

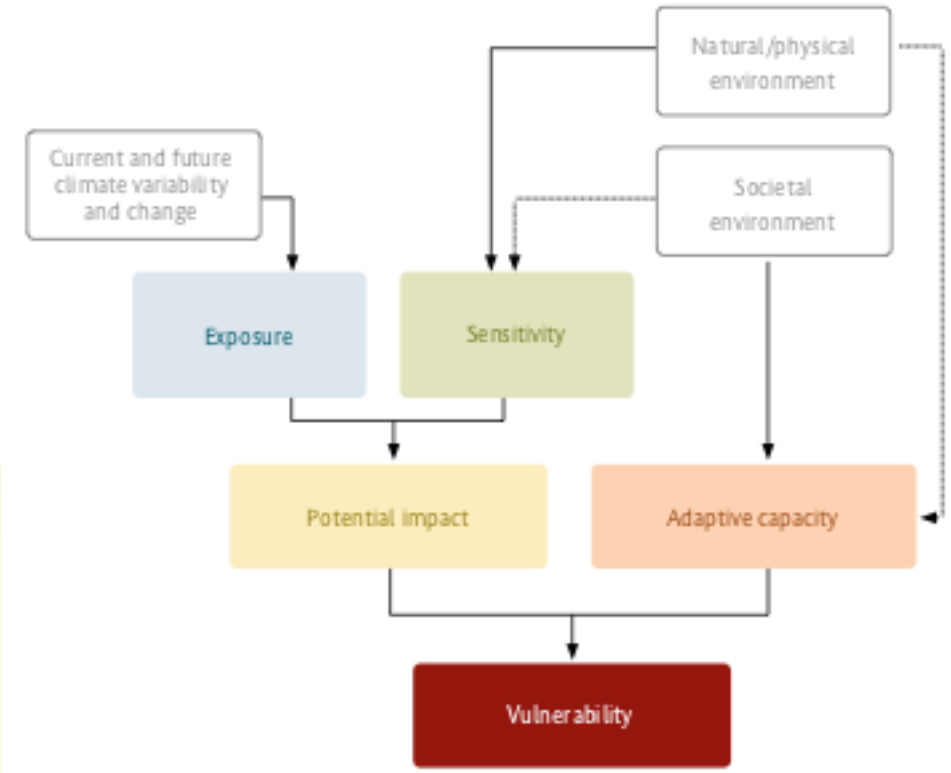

Figure 4: The Risk and Vulnerability Assessment process (GIZ, 2014)

4.2. Definition of a Vision Statement on Adaptation to Climate Change

RVA is the major input into definition of a vision for the future adaptation to climate change and preparation of the respective statement. RVA Report is the first document that provides argument that climate is changing and proves that there will be impacts that the municipality has to respond to, and to do that early enough. A Vision Statement, in a way, presents the "picture" of the municipality in the future, which will be impacted by significant climate change. But, it may also be more than that if it will be treated as an inspiration or the framework for all the subsequent strategic planning.

Vision Statement, per se, is not a strategy or an action plan because it should not outline a detailed "road map" towards the desired future but is a constituent element of the Strategy. The Vision Statement is not tied to the details. The Vision Statement is about "soaring"; the "poring" over ways and means to accomplish the vision comes after. A Vision describes in general terms the desired state that a municipality seeks to achieve and with which the majority of the inhabitants of the municipality can identify with. Thus, the development of a Vision needs to be established through a participatory process.

Public participation is commonly advocated in policy responses to climate change. It should be an inclusive, ambitious and transparent process (UN HABITAT, 2015). However, involving a wide range of stakeholders in decision-making may present a serious challenge for the definition of the Vision Statement, because some of them may be embedded in relations of power and, therefore,

represent opposing interests. These challenges may be magnified because of the long-term and uncertain nature of the climate problem. Sometimes, a more narrowly approach to participation may be instrumental and more likely to succeed, as long as the scope and limitations of public involvement are made explicit from the outset.

Example of the vision development process through public participation

Through a practical application in the municipality of Rivière-au-Tonnerre on the Northern coast of the Gulf of Saint Lawrence, an approach was used in small "kitchen meetings" for the elaboration of an adaptation action plan that was approved by the municipal council in September 2013 and revised in November 2014. The impacts of climate hazards were discussed as obstacles to the desired future conditions expressed by participants. This approach allowed the planning of a number of adaptation options, to define roles and responsibilities of different actors involved and to articulate different plans that are either in existence or being developed, linking them with adaptation. Based on observations and on other studies in the fields of social movements, psychology and risk perception, it was suggested that the use of a vision in discussion meetings with local actors could increase their motivation by placing the avoidance of undesired situations in the context of reaching their aspirations, in other words by embedding a prevention problem in promotion logic. The expression of a vision of a desired future could allow them to express their values and could facilitate the "framing" of a plan in a way that is coherent with them. The visions could then also be used to frame awareness-raising activities along the values they express.

The analysis of examples of current visions shows that there is no uniformity in the format of a vision that cities and municipalities are adopting. Sometimes it is a very short statement and sometimes, at the other side of the spectrum, it is almost depicting a plan. The latter is typical in the situations when a certain municipality feels that vision needs to describe everything, and then it contains things which should, normally, be contained in the document of the Strategy itself. **Vision is not a substitute for the Strategy but is only one element of the Strategy.** Therefore, Vision Statement needs to be short in length but with a strong message, which is easily recognizable and memorable. That message should be supported by the majority of inhabitants and sectoral interests in the municipality.

What is the time-horizon of the vision? Vision is synonymous with a long-term view, but a precise time horizon doesn't necessarily have to be established. Unlike a climate change adaptation strategy and a plan, Vision Statement does not have a precise timeframe because it does not directly lead to concrete measures and activities.

A few examples of the vision statements are given below. They differ in style, but all of them are relatively brief and are focused on the most important aspects of climate change adaptation in their respective contexts.

South Australia's Climate Change Vision

A vision for South Australia is for a prosperous South Australia that is healthy, equitable and sustainable. The Premier's Climate Change Council believes that a successful response to the challenges we face from climate change will improve our wellbeing and our economic resilience.

His vision foresees a low carbon South Australia that is adapting to climate change and embracing the opportunities it presents. It proposes that all South Australians share responsibility for transitioning our state and our economy. Importantly, it maps out a role for the South Australian Government in facilitating this transition. The vision sets out a number of recommendations and priority actions that will become the subject of an SA Government response as legislated under the Climate Change and Greenhouse Emissions Reduction Act 2007.

In this vision:
Our leadership in reducing emissions and adapting to climate change is maintained and developed further.
Our people use their skills, knowledge and connections to keep making SA great and we do it equitably, supporting our most vulnerable.
Our energy generation, distribution and demand is clean, efficient, reliable and competitive. It no longer causes a climate change impact.
Our natural resources, especially water resources, are protected, enhanced and resilient to changes.
Our reliance on our environmental assets for our wellbeing and ongoing prosperity is widely acknowledged and valued.
Our cities and towns are well designed and deliver an enviable lifestyle. They connect us as communities to our leisure and work activities. They deliver the infrastructure for efficient, comfortable buildings and competitive businesses. They help us adapt to climate challenges and reduce our emissions footprint.
Our economic transition is led by our businesses. They seize the opportunities to solve the everyday challenges of making SA a better place, and many thrive by selling those solutions across the world.
South Australia has benefited from its climate change leadership to date. Between 2004 and 2011, South Australia performed better than the national average in stabilising and reducing emissions. Our Adaptation Framework is internationally recognised and has received national awards.
The Council has first-hand experience in the power of leadership and political will to get things done. Climate change is no exception. It is a critical issue for this state and needs SA Government to be persistent in leading the transformation throughout our economy and preparing for the impacts of climate change.
Our climate change leadership is an opportunity to position our economy. South Australia needs to demonstrate leadership with community and industry actions to become as efficient and competitive as possible, and with government structuring our society for a low carbon economy.
A steady policy direction and delivering on commitments will create certainty and confidence in South Australia's low carbon vision.

The DANVA (Danish Water and Wastewater Association) vision for proactive climate change adaptation

- In year 2100 the climate changes have induced a society that is sustainable,
- The proactive utilities contribute to a diverse landscape, where water is ”grown”, and the city is green and appealing to the citizens.
- The utilities supply clean drinking water for the citizens. Clean groundwater is a sustained resource, because specific areas have been allocated to groundwater formation.
- Agricultural waste is utilized without risk of polluting the aquatic environment.
- In the cities and industrial areas, we transport wastewater in a safe manner and discharge only to the environment when properly treated. The varying amounts of rain are utilized in different ways in the local environment.
- Already in the year of 2025 we treat water – including increased amounts of rainwater– as a valuable resource in all parts of the water cycle. The utilities contribute continuously to reduce the global emission of greenhouse gases, through an intensified energy saving effort and in 2025 the water sector has become CO2 neutral.

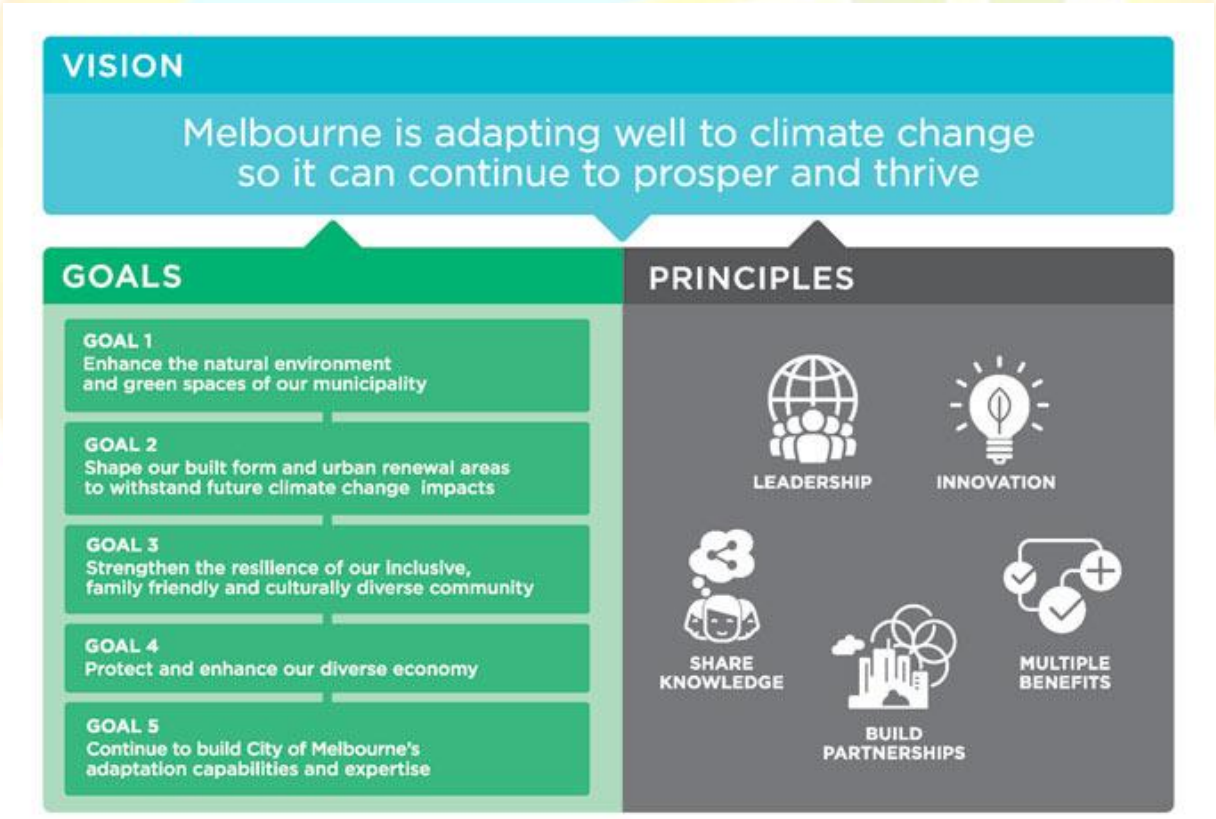

Figure 5: An example of adaptation vision of the city of Melbourne, Australia

At this stage of the planning process, it is useful to think of the adaptation goals and objectives that will be formulated during the Strategy development stage. Goals and objectives should be linked to the vision. In case of the very short statement, such as South Australia and City of Melbourne, the linkage is obvious because every objective is clearly linked to the main statement in the vision. In the

case of DANVA vision, which lists several aspects of the adaptation, the objectives will have to be linked to specific elements of the vision. It is important to say that the vision, through associated goals and objectives, defines which indicators have to be selected to monitor the implementation of the Strategy. Definition of indicators should follow the SMART approach, which essentially means that indicators have to be:

- **Specific (S):** Indicators must use clear language, describing a specific future condition (for example, DANVA states that "The utilities supply clean drinking water for the citizens");
- **Measurable (M):** Indicators must have measurable aspects making it possible to assess whether they were achieved or not (in the case of DANVA vision above as well as its subsequent strategy, this means that the quality of water will have to respond to well defined quality standards);
- **Achievable (A):** Indicators must be within the capacity of the municipality to achieve (the Strategy has to be realistic enough to envisage the implementation of all activities; this is the role of action plans that are prepared for shorter time periods and where each plan is realistically assessing what is achievable and what is not);
- **Relevant (R):** Indicators must make a contribution to selected priorities of the national adaptation framework (this is achievable if the municipal Strategy follows the course envisaged by the national strategy);
- **Time-bound (T):** Indicators are never open-ended, there should be an expected date of accomplishment (the Strategy's indicators are less precise but should still be within the bounds of the possible; the Plan's indicators are more precise and should be connected with the baseline state and will aim to reach precisely defined targets; the targets should be realistic and possible since the Plan's time horizon is usually about 5 years).

The adopted Vision should be embedded within the strategic development framework at the municipal, regional and national levels. Thus, for example, the urban climate change policy needs the following types of governance co-operation between municipalities and other levels of territorial administration:

- Regionally coordinated actions: Co-operation between the regional and the city levels leads to climate policies that mutually strengthen one another. Co-operation makes it possible to up- and downscale climate change related issues in order to select a proper set of multilevel actions. Thus, for example, a successful energy initiative of a city may become a regional standard. In turn, a climate-aware regional disaster management plan can, on the one hand, harmonise the flood protection plans of the individual cities (pointing out where buildings should not be located even if they would be otherwise highly energy-efficient), and, on the other hand, it may serve as the basis for elaborating the site-specific details of the cities' flood protection plans (such as, for example, exploiting and depositing materials required for flood protection operations).
- National and European level mainstreaming: The co-operation between the national level policy forming bodies and the cities supports the mainstreaming of the cities' progressive climate change initiatives into the national climate policy, and even into other relevant policies, such as transport, health, education, water management. It also means that regional and national climate protection and adaptation actions should not merely be organised around large projects or flagship initiatives (such as, for example, a power plant conversion programme, a river

regulation project, etc.), as these do not offer a chance for bottom-up city initiatives or to the emergence of solutions tailored to the local conditions. (Corfee-Morlot *et al*, 2009)

4.3. Identification of adaptation options

Following the Risk and Vulnerability Assessment, which has the aim of identifying major climate change challenges in important sectors in a certain municipality in the future, and the Vision Statement, which provides a longer-term view on what would be the desired future and which is suported by a wide group of stakeholders and adopted by political decision-makers, a set of adaptation options that will address climate change challenges needs to be identified. It has to be mentioned that these adaptation options, even if they are being part of the Strategy, do not necessarily have to be the options that will be immediately proposed to be included in the first Plan. The purpose of this early identification is to inform decision makers on the wide array of available adaptation options which: (1) have proven to be the best response to their actual needs; (2) have already been tested somewhere else; (3) have proven their worth in similar contexts; and (4) may be feasible enough to be implemented with the resources available in a certain municipality and at a certain point in time.

There are several principles that should be followed when defining climate change adaptation measures/options. These principles are:

- *Science-based adaptation approach:* By applying this principle, it is possible to reduce the uncertainties and insecurities regarding the possible effects of climate change.
- *Complementarity of adaptation and mitigation of climate change impacts:* Adapting and mitigating the effects of climate change are two complementary concepts of policy related to climate change. Efficient and timely mitigation measures positively affect adaptation or reduce socio-economic cost of adaptation. However, it is necessary to clearly separate the adaptation measures from mitigation measures to reduce the duplication of effort.
- *The precautionary principle:* The uncertainty about the future effects of climate change is not a reason for inactivity. Although there is a need to insist on the scientific foundation of the measures, even in the case of lack of scientific basis for implementation, it is necessary to carry out adaptation measures, since inaction can significantly increase the cost.
- *The adaptability principle:* The long-term perspective of the Strategy requires that the principle of adaptability be applied in order to be able to act in timely fashion in the adaptation process.
- *Principle of sustainability:* No proposed measure should jeopardize the interests of future generations, nor negatively affect the development of other sectors. From the perspective of nature and the environment the measures must have a positive effect on nature and the environment, while from the economic perspective the measure must undergo cost-effectiveness analysis and then be ranked.
- *Involvement of stakeholders in the consultation and decision-making process:* Active involvement of stakeholders is a basic prerequisite for successful implementation of climate change adaptation.
- *Integration of adaptation into sectoral policies:* The issue of adaptation to climate change and appropriate measures should be integrated into sectoral policies. The Strategy provides a framework and proposes measures, but their implementation largely depends on the degree of integration of climate change adaptation policies into other sectoral policies, strategies and plans. (Croatian Strategy for Adaptation to Climate Change, 2017)

Adaptation options can be "soft" or "non-structural" actions ranging from building adaptive capacity (e.g. building knowledge base, creating supportive institutional framework, sharing information, etc.) to establishing management systems and supportive mechanisms (e.g. better land management planning, insurance mechanisms). They can also be more concrete or "structural" measures, and they are often referred to as 'grey' (e.g. infrastructure development) or 'green' (ecosystem or nature-based) measures (Kabisch *et* al, 2017).

For each sector, identified in RVA, in which adaptation deficits or needs for action have been identified, a comprehensive portfolio of potential (sectoral and cross-sectoral) adaptation options should be taken into consideration. As a rule, in this first round of the options' identification, priority should be given to measures that result in benefits independent of climate change (*win-win*), or that entail no disadvantages should the actual climate change not match projections (*no-regret*). In order to further reduce uncertainty, adaptation measures should focus on responses to existing impacts (Prutsch et al, 2014).

There is a very wide range of possible measures and options that could be proposed at this stage of the process and it is impossible to list all of them. These measures are usually grouped by sectors. Depending on the source, the number of sectors varies. Thus, for example, Prutsch *et al* (2014) divide measures/options in 12 sectoral groups/fields of action: agriculture, forestry, water, nature conservation/biodiversity, tourism, health, construction and housing, energy, transportation infrastructure, spatial planning/cities, disaster management, economy/insurance. One of the most relevant sectors for the municipal adaptation planning is certainly one related to spatial planning and cities. Some of the possible adaptation options relevant to this sector are presented in table 2 below. The table gives an indication of the relevance of the measure. However, the final relevance and/or importance of the measure should be determined for each specific municipality taking in consideration its spatial, natural and developmental characteristics.

Table 2: An example of potential adaptation options - spatial planning and cities (adapted from Prutsch *et al*, 2014)

Sub-Sector Group	Measure/option	Relevance
Strategic	Mainstreaming of climate change adaptation as a fundamental spatial planning principle in regional and national level spatial planning law	Highly relevant
	Awareness-raising measures and targeted communication on the subject of adaptation to climate change at all planning levels, especially for municipalities	Relevant
Data base	Improvement of data sources and bases for knowledge on potential land use and the spatial planning-relevant consequences of climate change and vulnerability	Relevant

	Preparation of spatial planning-relevant information and data on climate change, climate impacts, and adaptation options for spatial planning actors	Relevant
	Establishment of a spatial monitoring system with climate change-relevant indicators	Relevant
	Consideration of climate-relevant issues in specialized training and further education	Relevant
Planning instruments	Review of spatial planning systems (spatial planning law, instruments, procedures) of the national and regional levels with regard to their suitability to contribute to adaptation to climate change	Highly relevant
	Systematic integration of climate change and adaptation as a processing item in plan creation and approval procedures	Highly relevant
	Elaboration and provision of working, planning, and implementation aids for decision-makers, regulatory authorities, communities, etc. (e.g., informational materials, guidelines, handbooks, checklists, standards) that provide guidance and assistance on how to handle and present the issue of climate change adaptation in spatial planning	Relevant
Zoning and hazard area management	Clear and legally binding anchoring of hazard zone maps in spatial planning and the associated construction law, aimed at increased coupling between zoning and the contents of hazard zone maps	Highly relevant
	Provision of comprehensive and up-to-date planning principles (hazard zone maps, flood attack lines) by flood control management	Relevant
	Mandatory statements on the handling of threatened zoning and development stock in spatial planning instruments and establishment of guidelines for the management of threatened zoning and building stock	Relevant
	Increased use of regulatory approaches such as building bans and development areas in order to ensure the safeguarding of threatened objects and properties	Relevant
	More consistent controls and enforcement of building safety regulations	Relevant

	Zoning for and new development of green and open spaces from the perspective of adaptation of urban structures to climate change (distribution, networking, cooling, air filtering)	Highly relevant
	Increased consideration of habitat corridors, biotope networking, refuges, etc. and of nature protection instruments in instruments for regional and local spatial planning	
Inter municipal cooperation	Promotion of inter-municipal cooperation models as a contribution to sustainable spatial development (e.g., for the protection of large-scale open spaces or various functions, for local cooperation in the development of commercial and industrial areas or touristic infrastructure, and for multi-city and multi-regional water supply networks)	Relevant
	Increased cooperation and improved coordination between upstream and downstream communities to jointly safeguard large-scale flood retention areas and areas at risk of natural hazards	Relevant
	Adaptation of the legal framework within spatial planning for the promotion of inter-municipal cooperation	Relevant
	Increased use of regional planning for the identification and designation of precautionary and reserve areas	Relevant

In another source (UAST) measures/options are divided in 13 sectors: agriculture, biodiversity, buildings, coastal areas, disaster risk reduction, energy, financial, forestry, health, marine and fisheries, transport, urban, water management. There is a wide catalogue of measures/options proposed for each sector. The section on urban measures, for example, lists 15 different groups of urban – related measures. Each group is, then, briefly analysed through following parameters: category, stakeholder participation, success and limiting factors, costs and benefits, legal aspects, implementation time, and life-time of the measure/option. Also, wherever possible, the sources for specific group of measures (usually a web site) is provided for further consideration by the users.

A good overview/presentation of the potential adaptation responses/options across sectors is given in Table 3. The table is instructive for two reasons. First, it gives a good overview of potential adaptation options that could then be selected in a concrete case of urban climate change adaptation. And second, this table is very instructive because it gives an overview of climate changes, drivers, consequences of inaction, sectors involved, sample adaptive responses and relative investments/costs needed. **The municipalities are advised to develop similar tables during this step of the adaptation planning process**. This can be considered as an analytical tool that will help municipalities to make a pre-selection of adaptation options/measures.

Table 3: Example of an overview of potential adaptation options (Hoornweg et al, 2011; the document could be found on the following web page: http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1318995974398/GuideClimChangeAdaptCities.pdf)

Projected Change in Climate Phenomena (Likelihood)	Drivers of Urban Exposure and Vulnerability	Consequences for Cities, if Unaddressed	Sectors Involved	Sample Adaptive Responses (not an exhaustive list)	Relative Investment Level / Cost
Warmer with fewer cold days and nights, more hot days and nights (virtually certain) Hot spells/heat waves—increased frequency (very likely)	Urban heat island effect. Lack of electricity and cooling systems, especially in many informal settlements.	Exacerbated air pollution Heat-induced illness and death	Transportation, housing, private sector building industry, public health	Green infrastructure, including improved vegetation and green building investments for natural cooling.	Medium to high with significant economic and sustainable development cobenefits
				Retrofit of existing bus fleet with white roofs to reduce solar heat gain and ventilation to ensure adequate air circulation. Undertaking public relations campaigns to encourage passengers to carry water with them to avoid heat stroke.	Low to medium
	Lack of diversified energy supply and substandard energy infrastructure.	Energy shocks and disruptions because of increased demand	Energy	Investment in clean energy and energy efficiency.	Low to high, depending on the specific energy investment; significant cobenefits for economic prosperity and "green growth."
Heavy precipitation events—increased frequency (very likely) Intensity of tropical cyclone activity increases (likely) Rising sea level (virtually certain) *(continued next page)*	Rapid urban growth leading to informal settlements on marginal land with no roads or drainage systems, or drains that are clogged with debris and silt.	Exacerbated flooding and landslides	Land use, housing, solid waste, public health, emergency management	Development and enforcement of a sound land use plan that a) is based on understanding of climate change vulnerabilities, b) effectively encourages dense, mixed-use development in resilient areas, and c) engages ecological planning approaches outside of city limits (for example, village-level watershed management on the outskirts of a city, protection of mangroves and wetlands on nearby coastline).	High, involving significant political and staff investment
		Contaminated waters and spread of disease in stagnant waters		Improved solid waste handling practices (for example, proximity to drinking water supply, corrosive-resistant containers) to prevent leakage and contamination.	Medium to high.
				Short-term clearance/disposal of solid waste from drains to prevent clogging.	Low
				Public health engagement and risk prevention around likely flood-related diseases.	Low
	Nonexistent or substandard transportation infrastructure.	Blockage of emergency routes because of road flooding, resulting in delayed emergency evacuations Losses in commercial activity	Transportation, emergency management, private sector	Investment in roads and other transportation choices for informal settlements.	Medium to high
				Green infrastructure.	Medium to high with significant economic and sustainable development cobenefits
				Relocation of storage yards for buses and train cars out of flood-prone areas to reduce the risk of damage or loss of this equipment.	High

Projected Change in Climate Phenomena (Likelihood)	Drivers of Urban Exposure and Vulnerability	Consequences for Cities, if Unaddressed	Sectors Involved	Sample Adaptive Responses (not an exhaustive list)	Relative Investment Level / Cost
Heavy precipitation events—increased frequency (very likely) Intensity of tropical cyclone activity increases (likely) Rising sea level (virtually certain)	Storm water infrastructure unable to deal with current or future runoff, compounded by deforestation / degradation of natural storm water filtering functions.	Increased runoff in absence of vegetated land Increased flooding	Sanitation, solid waste Natural resources management	Short-term clearance/disposal of solid waste from drains to prevent clogging.	Low
				Investment in "green infrastructure" and ecosystem planning to improve natural storm water function. (for example, contour planting, terracing and afforestation for erosion control)	Low (localized planting) to high (large-scale infrastructure or afforestation) with significant economic and environmental cobenefits.
	Already high population densities and concentrated commercial activities (for example, ports and industry) located in coastal cities or in river deltas	Loss of property and infrastructure, potentially before the end of their useful life	Private sector	Relocation of facilities out of flood-prone areas.	High
				Sea walls or other structural investments to protect against coastal flooding.	High
	Lower structural quality of homes, especially in informal settlements.	Loss of property and life	Housing, emergency management	Retrofit of old buildings and improved design of new buildings (if residents remain in vulnerable location)	Medium to high
				Stricter risk disclosure requirements for housing developers.	Political and staff investment for sound enforcement
				Public awareness / emergency preparedness initiatives to educate residents on flooding risks.	Low
	Location of aquifers, wastewater treatment plants and other infrastructure in coastal areas or on river deltas	Saltwater infiltration of infrastructure (for example, potable water supplies and wastewater treatment)	Water supply Wastewater treatment	Modification of pipes	Medium
Areas affected by drought increase (likely)	Existing water scarcity and competing pressures for water use (for example, potable water, irrigation, wastewater, hydropower) Food shortages or higher food prices because of impacts in other parts of the region or world.	Exacerbated water scarcity and competition	Water supply (with implications for energy sector in areas of hydropower generation)	Utility piped water supply (assuming water supply is resilient).	Medium to high
				Reclaimed wastewater (resilient if properly managed)	High
				Long-term demand management and water use efficiency programs.	Low to medium
			Food and agriculture	Raising public awareness and developing municipal competency about food supply.	Low; with staff investment
				Promotion of urban agriculture.	Staff investment and potential high costs, if involving land purchase
				Development of city-level food storage infrastructure.	High

Croatian Strategy on Adaptation to Climate Change revolves around the following 10 sectors: hydrology/water/marine resources, agriculture, forestry, fisheries, biodiversity, energy, tourism, health, spatial planning/management of coastal areas, risk management. It should be kept in mind that this strategy is a national strategy and that it should be considered as instructive only. However, it is an indication of a possible approach to identification of adaptation options at the regional/municipal level. The table 4 below shows how the responses (adaptation options/measures) have been formulated for the tourism sector in the Strategy.

Table 4: Potential adaptation options for the tourism sector (Croatian Strategy on Adaptation to Climate Change, 2017)

Impacts and challenges that cause high vulnerability	**Possible responses to reduce high vulnerability**
• The tourist offer is not tailored to projected climate change (high temperatures, increased solar irradiance, frequency of extreme weather events, etc.) • Changing attractiveness of the coastal areas and inland areas of the Republic of Croatia • Damage to and/or reduced functionality of various infrastructure systems (water supply, drainage, beach infrastructure, horticulture etc.) • Deterioration of the status of ecosystems important for tourism and biodiversity due to the indirect and direct effects of climate change	• Adaptation of the tourism sector to changed operating conditions due to climate change impacts • Harmonization of tourism activities with projected climate change • Strengthening the competence related to adaptation to climate change of all people directly related to the tourism sector • Inclusion of climate change adaptation measures in all segments of sustainable Croatian tourism • Inclusion of climate change adaptation measures in all segments of sustainable Croatian tourism • Revitalization of tourist offer in the entire territory of the Republic of Croatia and exploitation of up-to-now insufficient or unused potentials

It is important to mention that selection of sectors depends on the actual municipal context and ranking based on their importance. The reader is advised to consult the following sources of potential measures, but these lists should not be considered as definitive and/or exhaustive whatsoever:

Prutsch, A., Felderer, A., Balas, M., König, M., Clar, C., Steurer, R. 2014. *Methods and Tools for Adaptation to Climate Change. A Handbook for Provinces, Regions and Cities*. Environment Agency Austria, Wien.
Climate ADAPT's Urban Adaptation Support Tool (UAST)
(http://climate-adapt.eea.europa.eu/knowledge/tools/urban-ast/step-3-1
Deutscher Stadtetag. 2012. *Position Paper on Adaptation to Climate Change: Recommended Measures to be Taken by and for Cities*. Deutscher Stadtetag: Koeln.
Schauser, I. et al. 2010. *Urban Regions: Vulnerabilities, Vulnerability Assessments by Indicators and Adaptation Options for Climate Change Impacts:Scoping Study*. ETC/ACC Technical Paper 2010/12.

The first set of the measures/options proposed is only indicative and should be considered as an early response to identified challenges. However, the final list of the adaptation options should be the result of a closer scrutiny of potential options (see section 4.4.4. below). The ACT guidelines give a possible method of creating the adaptation options portfolio by categorising the initial list of adaptation options (Figure 6). In addition, the adaptation options could be categorized as "no-regret", "low-regret", "win-win" and "flexible" type of measure (see Table 5 below)

Figure 6: Categorising potential adaptation options (ISPRA, 2014; the document could be found on the following web page: http://www.actlife.eu/medias/306-guidelinesversionefinale20.pdf)

Table 5: An example of grouping of municipal adaptation options (ISPRA, 2014; the document could be found on the following web page: http://www.actlife.eu/medias/306-guidelinesversionefinale20.pdf)

ADAPTATION OPTIONS				
BUILDING ADAPTIVE CAPACITY				
Adaptation options	**No-regret**	**Low regret**	**Win-win**	**Flexible**
Research				
Conducting risk-based assessments to evaluate current and future climate and non-climate risks and opportunities	x			
Undertaking technical/quantitative impact and adaptation assessment		x		
Data collecting and monitoring				
Phenological observations		x		
Monitoring the impacts of observed climate, including extreme events		x		
Changing or developing regulations, standards, codes, plans, policy or programmes				
National, regional and local policies and plans that recognise climate risks and opportunities and adaptation				
Resource allocation that recognise the need for investment in understanding and addressing climate risks and opportunities, as well as adaptation	x			

4.4. Drafting and adoption of the Strategy

This is the most critical step in the adaptation planning process. The Strategy is the main pillar of all efforts that will be undertaken towards realising the Vision. The previous steps (Definition of the vision, Risk and Vulnerability Analysis, and the preliminary Identification of adaptation options) could be considered as preparatory activities leading to the development of the Strategy. The Vision Statement, thus, is an expression of the will of municipal stakeholders to undertake a decisive action. The Risk and Vulnerability Assessment is an effort to put the accumulated knowledge into a cohesive overview of the threats as well as challenges that expected climate change might bring to the municipality. Finally, the preliminary identification of the adaptation options, is the first attempt to directly respond to the climate change challenges . What is, then, the strategy?

The Oxford Dictionary defines the strategy, in the broadest sense, as "…a plan of action designed to achieve a long-term or overall aim". The ACT Guidelines define the strategy "…as the foundation stone, an early-stage level of policy making, to be prepared before the implementation of adaptation measures." Following the above generic definitions of the "strategy", it is possible to conclude that the strategy is a broad plan of action that is implemented through policies and measures. A climate

change adaptation strategy for a country, region or a city, thus, refers to a general plan of action for addressing the impacts of climate change, including climate variability and extremes. It includes a mix of policies and measures, selected to meet the overarching objective of reducing the country's (region's or city's) vulnerability. It is important to mention that an adaptation strategy may turn into **a binding legal instrument if adopted as a law**. However, even if it is not a legally binding instrument, an adaptation strategy should be considered as an instrument that requires a high level of commitment to implement it by all those that have participated in its development and adoption.

In drafting the Strategy, the municipalities should do the following:

- Define the timeframe for the Strategy;
- Define goals and objectives of the Strategy;
- Describe the socio-economic and environmental context of the municipality where adaptation planning is taking place, including climate projections, vulnerabilities and risks;
- Prioritize adaptation options; and
- Define implementation arrangements.

4.4.1. Timeframe of the Strategy

The adaptation to climate change is a long-term effort. Many projections of climate change take the year 2100 as the target year. While this timeframe seems adequate from the perspective of analyzing long-term trends in climate change, it is too long a period if we want to plan measures and actions to improve the adaptive capacity based on the identified risks and vulnerabilities. Therefore, a shorter time-frame needs to be defined. For example, the Croatian Strategy for Adaptation to Climate Change has set two time periods: 2010-2040 for which more precise climate projections are being made and relative measures proposed, and 2041-2070 as the period for which long term climate change projections are being made and only the framework measures were proposed. This project proposes the year 2050 as the target year for defining the strategic vision as well as for planning the respective measures. It is important to note, however, that the Strategy should be implemented through shorter-term Plans (usually 5-year plans), which should contain very precise measures. Preparation of every subsequent Plan follows a review of achievements of the previous Plan, as well as a review of the implementation of the Strategy as a whole, after which the corrective measures could be taken (if necessary).

4.4.2. Goals and objectives

Goals and objectives are directly linked to the Vision Statements. "Goal" is more general and more long-term and it defines, in general terms, an outcome (not a precise output!) that is desired to be achieved. The goals should be limited in number and should deal only with the major elements of the Vision. One example of broad goals in adaptation is given in the box below.

GENERAL GOALS OF THE CROATIAN CLIMATE CHANGE ADAPTATION STRATEGY

The main, long-term goal of the Adaptation Strategy is to reduce the vulnerability of social and natural systems to the adverse impacts of climate change, *i.e.* to strengthen their resilience and the ability to recover from these impacts. Finally, taking into account the possible positive effects of climate change, the implementation of the Adaptation Strategy should make the systems more robust, *i.e.* more resistant than they are today, which will contribute to the achievement of the long-term sustainable development of the Republic of Croatia.

The next goal of the Adaptation Strategy is to bring together all relevant institutional, political, economic and social stakeholders to create strong enough support for the implementation of joint actions on the implementation of adaptation measures, which necessitates a proactive approach. This means that actions or measures need to be started immediately because any delay will reduce their effectiveness and make them more expensive.

The Adaptation Strategy aims at integrating the adaptation process, including the implementation of measures, into existing and new policies, programs, plans and other activities implemented at all levels of governance. In that sense, it should help adaptation principles and appropriate measures to become one of the decisive criteria for making strategic and developmental decisions in the future. This will help mitigate the negative impacts of climate change, eliminate potential conflicts between sectors in the process of adaptation, and reduce their vulnerability.

Despite significant advances in scientific knowledge on climate change and their effects, there are still many unknowns related to climate change impacts and the degree of vulnerability that they cause for particular sectors. The adaptation strategy aims to stimulate or enhance scientific research to better understand the complexity of climate change impacts and reduce the degree of uncertainty related to the effects of climate change.

Finally, the Adaptation Strategy aims to raise awareness of the importance of climate change and the inevitable launch of the adaptation process in all social segments, which are also the main beneficiaries of the positive effects of the climate change adaptation process.

The “objective” refers to more specific outputs or results which a certain municipality wants to achieve. Each objective should be measurable and should follow the SMART approach (described earlier). Objectives are broadly emanating from the Vision, but they should be more sectorally oriented, i.e. tied the sectors identified in the Strategy. An objective also needs to be linked to the targets that should be achieved. In this respect, it is important to establish the baseline situation so that the achievement of objective towards target could be easily measured. The baseline situation is the current situation in a specific sector, and a starting point in the process towards reaching a desired state in the future (targets).

4.4.3. Description of the context

This should largely be based on the outcome of the RVA as well as climate projections if they will be made at the municipal level. If a projection for the specific municipality level does not exist (which is usually the case), then the climate change projection for the higher spatial level (regional, national) should be used. The Strategy should present a simplified description of such projection. The results of the risk and vulnerability assessment per sector should be presented in a highly condensed form, specifying the following:

- major risks, vulnerabilities and impacts;
- situation that might evolve if no Strategy is being implemented;
- possible responses to reduce highly vulnerability.

4.4.4. Prioritization of adaptation options/measures

4.4.4.1. Description of adaptation options/measures

Once potential adaptation options/measures have been identified (in the previous steps of the adaptation planning process – see section 4.3.), it is necessary to assess and prioritize those options based on a detailed description of options/measures and use of selection criteria. The suggested options/measures must be assessed to determine their suitability for the regional and/or municipal context; their effectiveness in reducing vulnerability or enhancing resilience; their wider impact on sustainability of the municipality; and timing of their implementation through Plans. As UAST states, the objective of this step "…is to avoid decisions that lead to mal-adaptation. The selection of preferred adaptation options should be done in close interaction with all actors involved and stakeholders impacted in the adaptation process." As the Strategy is now shaping in form, it is more appropriate to use the term adaptation measures instead of the adaptation options.

Possible adaptation measures have to be described before the prioritization is being performed. There are several approaches in doing so. The description may be rather basic, such as in the case of national adaptation strategies (see Table 6 below depicting the spatial planning measures in Croatian Strategy for the Adaptation to Climate Change).

Table 6: Description of adaptation options (Croatian Strategy for Adaptation to Climate Change, 2017)

Measure's ID	Measure's name	Key stakeholders
PP-01	Strengthening of the knowledge base, as well as the monitoring and evaluation system	Ministry responsible for environmental protection, ministry responsible for spatial planning, HV, HAOP, JLP(R)S
PP-02	Strengthening the human and institutional capacities of professional stakeholders in the spatial planning system	Ministry responsible for spatial planning, ministry responsible for environmental protection, expert authors, carriers and coordinators of spatial plans, HKA (Croatian Chamber of Architects), ministry responsible for environmental protection, authorities for preparation of strategic studies, ministry responsible for education and science, HZPR, county institutes of spatial planning, JLP(R)S

PP-03	Integration of adaptation measures into the spatial planning system	Ministry responsible for spatial planning, HZPR, county institutes of spatial planning, JLP(R)S
PP-04	Raising awareness of the public and decision-makers at all levels	Ministry responsible for environmental protection, ministry responsible for spatial organization, JLP(R)S, citizens

However, while the above approach may be appropriate for the national strategies, where the level of detail is, by default, smaller it is advisable, and if resources available allow, to describe urban adaptation measures in a more detailed manner. The ACT Guidelines propose a simple table where all the basic information for each measure could be found (see Table 7 below). The items in the table refer to an individual adaptation measure (or option) and, if possible, each measure should be described following the guidance below, starting with the name of the mesure (the first row) and ending with the potential barriers to the implementation of the measure (the last row).

Table 7: Generic description of an adaptation measure (ISPRA, 2014)

INFORMATION	DESCRIPTION
Name of the action and description	Description of the contents and objectives of the adaptation action, how the action should be implemented
Social, economic and environmental context	Characteristics of the context in which the option may be implemented
Lead department	Potential role and responsibility of the lead department
Other relevant departments	Potential role and responsibility of any other departments that should be involved with planning and/or implementation
Financial resources	Description of the financial resources required for the implementation
Pre-cursors to action	What steps need to be taken to enable the implementation of an action (e.g. research studies, establishing partnerships, etc)
Timeline	Start and end dates; short, medium or long-term timelines; immediate or ongoing actions, etc;
Framework	Legal, institutional, policy framework
Expected results	Description of the results that are expected following the implementation of the action
Potential barriers	What are the potential barriers to the implementation of the action and the mechanisms to overcome these
Other information	

The reader is also advised to see the Table 3 in section 4.3. above, which gives an example of detailed description of adaptation options at municipal level.

Another example is the template that could be found in Prutsch *et al.* (2013), and it is presented in Table 8 below. Both examples are indicative only and it is up to the municipality to decide whether to use advice given in these examples fully or partially. All the presented templates are self-explanatory and filling out of the tables for each measures is relatively simple. Concrete selection of items to be described for each measure depends on the resources that every municipality has at its disposal. However, using a combination of generic templates, presented in Tables 7 (above) and 8 (below), is strongly recommended.

The measures presented in the Strategy are those that will be implemented throughout the entire strategic adaptation period.

Table 8: Template for the description of adaptation measures (Prutsch *et* al, 2013)

TITLE OF THE MEASURE	
Adaptation objective	*What will be achieved with this measure?*
Description of the measure	*What is this measure about?*
Primary responsibility for implementation	*Which department/organization/actors are responsible for this measure?*
Significance of the measure	*What climate change-related impacts are addressed by the measure?*
Link to existing instruments	*Are there any existing instruments (laws, strategies, networks) that support the measure's objectives?* *What instruments (laws, regulations, strategies, funding programmes) are well suited to integrating the measure's objectives?* *What instruments conflict with the measure's objectives?*
Status of implementation	*What steps have been/are being carried out in the implementation of the measure?*
Necessary further steps	*What additional steps are necessary in the short, medium, and long term for implementation?*
Required resources	*What financial resources will be required for the planning and implementation of the measure (to the extent an estimation is possible)?*
Potential obstacles	*What obstacles could impede the success of adaptation?* *How can these barriers be removed?*
Effects on other sectors	*Which areas/sectors interact with the measure or will be affected by it?* *Are positive or negative impacts on other sectors expected? If yes, how can these be utilized or prevented?*
Schedule for planning and implementation	*How much time should be allowed for the planning and implementation of the measure?* *How much lead time will there be until the measure is fully effective?*
Additional affected actors/sectors within the organization	*Which areas within the organization/additional stakeholders can support the measure's implementation or will be affected by the measure?*

It is also important to mention at this point that each measure needs to be divided into certain number of actions/activities. The Strategy has to identify the activities that are part of each measure, because together with the measures it is the activities that are implemented via the Plans (next step in the adaptation planning process). One example of the measures being broken down into activities is shown below (measures and activities for the Spatial Planning and Coastal Zone Management sector of the Croatian Climate Change Adaptation Strategy).

Table 9: Example of an adaptation measure from the spatial planning and coastal zone management sector, and its respective activities (Croatian Strategy for Adaptation to Climate Change, 2017)

Measure designation	**Measure title**	**Activity designation and title**
PP-01	Strengthening of the knowledge base, as well as the monitoring and evaluation system	**PP-01-01.** Implementation of targeted research on the impact of sea level rise on the most vulnerable parts of the coast as a basis for the preparation of priority intervention plans **PP-01-02.** Implementation of an integrated multi-disciplinary assessment of the vulnerability of coastal areas to extreme sea levels, including social and economic aspects as well as cost estimates and the benefits of adaptation options **PP-01-03.** Implementation of targeted research on climate change impacts related to spatial planning decisions in the function of tourism development **PP-01-04.** Implementation of an assessment of vulnerability to the occurrence of thermal islands and extreme precipitation in settlements, with emphasis on connection with spatial planning solutions **PP-01-05.** Ensuring availability of research results through current information systems of spatial planning, protection of the environment and waters or Open Data Portal I.e. Geoportal of National Spatial Data Infrastructure
MEASURE DESCRIPTION		EXPECTED RESULTS
The task of this measure is to intensify monitoring, research and assessment of climate change pressures, their impact on the coast, the built environment and infrastructure. The research will include integral analysis of vulnerability and possible adaptation measures, especially those that have to be planned by spatial plans. Priority areas of research are related to the impact of extreme sea levels, the impact of thermal waves, i.e. thermal islands in settlements and the impact of extreme precipitation in settlements. The general theme of these research and monitoring programmes is to identify and eliminate barriers within the spatial planning and environment system, which hamper planning and implementing adaptation measures that are part of the spatial plans.		The first result of this measure is to provide an incentive environment for conducting targeted monitoring and research activities with the purpose of strengthening the knowledge base. Implementing activities from this measure will enable a better understanding of climate processes and scenarios as well as their impacts that will be the basis for making decisions related to adaptation measures, especially those that are part of spatial planning and those involving significant investment activities. As a result of this measure, it will be easier to remove barriers within the spatial planning system and in the environment, which hamper planning and implementing adaptation measures. Finally, this measure will contribute to strengthening of the adaptive capacity of society to climate change through well-thought-out and practicable adaptation measures in spatial plans, especially those related to the planning of built environment of settlements and tourist areas as resilient to climate as possible, as well as planning of spatial development of the narrow coastal area.

Another example, more appropriate for the municipal level, is from the City of Ancona (see Table 10 below).

Table 10: Elements for the description of adaptation option/measure in the City of Ancona (ISPRA, 2014)

A FORMAT FOR THE DESCRIPTION OF ADAPTATION OPTIONS IN ANCONA (M. Cardinaletti, Project Manager for Sustainable Development, Consultant for the Municipality of Ancona).	
In the Local Adaptation Plan of Ancona, a set of adaptation actions are included and designed as real projects to be implemented in the very short period. The main aim was to organize and structure all the project ideas into an Integrated Urban Adaptation Policy. To this aim, a standard format has been made in order to easily share the project ideas among the stakeholders, picking up a lot of useful information for the start up phase of the project.	
DESCRIPTION	
• Time horizon	• Monitoring indicators
• Responsible	• Critical aspects
• Correlated planning	• Financial resources
• Expected results	• Parties to be involved

4.4.4.2. Prioritization of adaptation options/measures

After the identification of possible adaptation options/measures and creation of the adaptation options/measures portfolio (see section 4.3) and the description of options/measures (see section 4.4.4.1.), the next step is to assess and prioritize the measures. Prioritization requires a systematic evaluation of measures based on a a set of criteria. This allows measures with the same adaptation objectives to be compared and then prioritized. As ACT Guidelines state "…there is no 'one size fits all' prescription for determining which adaptation measures are better than others. It is therefore very important that the Adaptation Team defines a specific set of criteria that will guide the assessment of different adaptation options for the community." Selection and prioritization of measures can be carried out by a number of tools such as expert judgment, Delphi method, focus groups, brainstorming, cost-benefit analysis etc. In the case of urban adaptation planning an approach that resembles the Multi Criteria Analysis (MCA), which is considered to be a useful tool while taking decisions in comparatively complex situations, is suggested. It is most applicable in situations where there is a need to make a choice among several alternatives. The urban adaptation planning certainly fits in the requirements for MCA. It explicitly uses multiple criteria in decision-making (which are not always monetary!) that are typical in evaluating options. MCA should not be considered as a complicated tool and its relatively simple form could be carried in the municipal adaptation planning context. Finally, because of its characteristics, MCA is a relevant technique for adaptation planning, because the prioritization of the adaptation options should be made in close interaction with all actors involved in the adaptation planning process.

The following major steps of MCA are proposed:

- Step 1: Sectoral stakeholders workshops (output: the first list of priority measures)
- Step 2: Detailed analysis and prioritization of adaptation measures (output: ranking of adaptation measures)
- Step 3: Selection of the highest priority mesures to be implemented in the first Adaptation Action Plan (output: the list of the highest priority measures)

The **first step** in carrying out MCA is to involve a wider group of relevant stakeholders in identification of measures. The objective is to rank adaptation measures in each sector by their importance. While this step is organised by the Adaptation Team, which is in charge of preparing the documentation for the workshops, logistics and facilitation (see bullet points below), the focus of attention should be on the sectoral experts that will be invited to attend sectoral workshops.

The portfolio of adaptation options/measures (see section 4.3.) serves as the basis for discussion in the workshops. The stakeholders from municipal administration, professional organisations, academia, private sector, NGOs and other are invited to participate in sectoral workshops (number and subject of workshops can vary among municipalities depending on available resources and nature of the climate change issues in a certain municipality).

The following basic principles for workshop design will help coordinate them effectively:

- Advanced Planning and Design: An effective workshop requires advance planning and design including identification of the desired objectives and outcome of the workshop, deciding who will be invited, and developing an effective agenda.
- Providing Workshop Materials to Participants Well in Advance: It is very helpful if workshop participants have early information on the objectives of the workshop, the workshop agenda, and the decision-making process that will be used.
- Separating Content from Process: The content, or what the workshop is discussing should be kept distinct from the workshop process, which is how the discussion happens and how the group makes decisions. It's very important that ahead of the workshop a process for how it will be run and how decisions will be made.
- Effective Facilitation: Workshop that are well facilitated typically are more effective at achieving their intended outcomes than those that are not. Whenever possible, it is best to engage trained facilitators who can remain neutral on the workshop topics but who have enough topical knowledge to ask insightful questions of the participants.

At sectoral workshops, stakeholders create the first list of priority measures by ranking them using the following criteria (listed according to the importance of the criteria):

1. importance of the implementation of a certain measure within the respective sector having in mind the sectoral adaptation objectives and the sectoral vulnerability;
2. implementation of a certain measure has to start during the first Plan; and
3. implementation of a certain measures could start at a later period.

Measures within each criterion are ranked in the ascending order (the most important measure gets the smallest point). The highest ranked measure is one that gets the smallest number of points.

The result of the first step of the prioritization process, achieved through stakeholders' workshops, is ranking of adaptation measures from the portfolio for each sectors.

The objective of the **second step** of the MCA is to carry out a detailed analysis of adaptation measures, following the ranking created during the first MCA step. This step is implemented by the sectoral experts that are members of the Adaptation Team.

This step results in the very precise ranking on the basis of more detailed prioritization criteria than is the case in the first MCA step. Most of the approaches to prioritization follow the logic of a feasibility matrix that needs to be prepared to rank and select measures. The table 11 is a suggestion how to rank adaptation measures in each sector and which criteria may be used.

Table 11: Feasibility Matrix for each sector

Criteria Group	Specific criteria	Outcome	Comment	Rank	Objective
Financial	Amount of financing needed	Direct cost of implementation of measure	Higher value means lower cost	1-5	max
Implementation	Possible obstacles in implementation	There are obstacles that need to be removed to start implementation	Higher value means there are no obstacles or they are not important	1-5	max
	Fast implementation possible	Fast implementation possible	Higher value means faster implementation	1-5	max
	Temporal harmonization with legal/strategic framework	Temporal harmonization exists	Higher value means better harmonization	1-5	max
Climate	Reduction of vulnerability	Vulnerability reduced through implementation of adaptation measures	Higher value means reduced vulnerability	1-5	max
	Reduced environmental pollution	Pollution reduced as a result of implementation of adaptation measures	Higher value means reduced pollution	1-5	max
	Increase of urban ecosystem resilience	Increased resilience as a result of implementation of adaptation measures	Higher value mans increased resilience	1-5	max
	Reduction of GHG emissions	Reduced GHG emissions as a result of implementation of adaptation measures	Higher value means higher level of reduction	1-5	max
Economic	Urgency of implementation to reduce economic risks	Reduced economic risks as a result of urgent implementation of adaptation measures	Higher value means greater urgency	1-5	max
	Contribution to economic efficiency	Improved economic efficiency as a result of implementation of adaptation measures	Higher value means higher efficiency	1-5	max

	Contribution to the job creation	New jobs created as a result of implementation of adaptation measures	Higher value means higher generation of new jobs	1-5	max
Environmental	Better protection of natural/heritage resources	Improved protection of natural/heritage resources created as a result of implementation of adaptation measures	Higher value means better protection	1-5	max
	Contribution to the urban biodiversity conservation	Improved biodiversity conservation as a result of implementation of adaptation measures	Higher value means better conservation	1-5	max
Social	Reduction of inequality	Reduced inequality as a result of implementation of adaptation measures	Higher value means higher reduction of social inequality	1-5	max
	Improved health	Health improved as a result of implementation of adaptation measures	Higher value means higher improvement of population health	1-5	max

The criteria in the above matrix are generic and such table has to be prepared for each sector. The elements of the Feasibility Matrix are indicative and its contents has to be adapted to the specific context of the municipality. The purpose of the above table is primarily to show the approach to detailed prioritization of the adaptation measures. Each municipality should select the criteria that best describe its risk and vulnerability level. Each measure has to be analysed using all of the criteria selected in the matrix.

The total value of all criteria has to be calculated for each adaptation measure. The following table can be used for that purpose (Table 12):

Table 12: Calculation of value for each measure

Measures				**Measure 1**	**Measure 2**	**Measure 3**	**Measure n**
Group of criteria	**Specific criteria**	**Rank**	**Weight**	**Ranking**			
Financial	Amount of financing needed	1-5					
Implementation	Possible obstacles in implementation	1-5					
	Fast implementation possible	1-5					
	Temporal harmonization with legal/strategic framework	1-5					
Climate	(selected criteria from Table 11)	1-5					
Economic	(selected criteria from Table 11)	1-5					

Environmental	(selected criteria from Table 11)						
Social	(selected criteria from Table 11)						
			TOTAL				

In the table 12 above the column of weighting is inserted. Its relative values have to be defined by the experts in the Adaptation Team. The total amount of weighting is 100 (%). The Adaptation Team agrees on the allocation of weights between different criteria. The resulting allocation of weights is then used for all measures. The table 13 below presents a hyptothetical example of calculation of ranks within a certain sector. The total value of the rank is obtained by multiplication of the weight (expressed in %, i.e. 14% turns into multiplier 0.14). All the measures, once the calculation is completed, are ranked on the basis of the total value of their rankings for each criteria.

Table 13: An example of ranking of measures within a hypothetical sector

Measures of the sector				Ranking							
Group of criteria	Specific criteria	Rank	Weight	Measure 1		Measure 2		Measure 3		Measure n	
				Rank	Value	Rank	Value	Rank	Value	Rank	Value
a	b	c	d	e	f(dxe)	g	h	i	j	k	l
Financial	Amount of financing needed	1-5	14%	3	0.42						
Implementation	Possible obstacles in implementation	1-5	16%	4	0.64						
	Fast implementation possible			4	0.64						
	Temporal harmonization with legal/strategic framework			5	0.8						
Climate	Reduction of vulnerability	1-5	23%	5	1.15						
	Reduced environmental pollution			5	1.15						
	Increase of urban ecosystem resilience			3	0.69						
	Reduction of GHG emissions			4	0.92						
Economic	Urgency of implementation to reduce economic risks	1-5	21%	5	1.05						
	Contribution to economic efficiency			5	1.05						
	Contribution to the job creation			5	1.05						
Environmental	Better protection of natural/heritage 5resources	1-5	19%	5	0.95						
	Contribution to the urban biodiversity conservation			5	0.95						
Social	Reduction of inequality	1-5	7%	3	0.21						
	Health improved as a result of implementation of adaptation measures			4	0.28						
			TOTAL		11.95						

The **third step** of the MCA exercise is the selection of the **highest priority measures**, i.e. measures that will be implemented during the first Plan. For that purpose, it is important to consult the results of the RVA, which has indicated which are the most vulnerable sectors that need the most urgent attention. Also, the objectives as well as the vision of the Strategy should also be taken in consideration. The decision-makers can also decide which measures, in terms of their level of importance, should be taken for implementation in the first Plan.

4.4.5. Implementation arrangements

The implementation arrangements for the Strategy need to cover the following aspects:

- Financing the adaptation measures: First, potential sources of financing need to be identified. Second, the framework cost of implementation of measures has to be calculated. Finally, priorities for financing have to be identified.
- Adaptation action plans: The Strategy will be implemented through action plans, which will include the elaboration of concrete measures for a specific five-year period. Action plans are adopted by the municipality. Action plans will give each measure a description, a method of implementation, a sequence of realization of measures, the deadline for execution, the obligated parties and the measures implementation coordinators. Action plans are separate documents. However, the first Plan is adopted together with the Strategy.
- Strengthening the capacity for adaptation: A programme for strengthening capacity at municipal level has to be developed based on the study that has assessed the knowledge base and knowledge gaps in early stages of the adaptation planning process.
- Institutional framework for the implementation of the Strategy: The basic principle for defining the institutional framework for the implementation of the municipal Strategy is that it does not foresee the establishment of new institutions and bodies and that the mandates of the existing municipal organizational units will be fully respected. This does not mean that changes in institutional frameworks will not be proposed in the future if the circumstances surrounding climate change and adaptation have changed.
- Stakeholders engagement: Stakeholder engagement includes a variety of practices to ensure involvement of the public and specific interest groups in public decisions and implementation. It is an essential component of good climate change adaptation planning to promote the principles of transparency, inclusivity, accountability, and fairness. It is expected to contribute to effective governance as policies and practices developed with stakeholder input are more likely to be adopted and fulfil their goals. Engaging multiple stakeholders in all stages of climate change adaptation planning requires that the concept of 'stakeholder engagement' is thought of as a process rather than an activity with a clear beginning and end. It is also most often the case that there may exist arrangements, conflicts, and issues between various actors engaged in climate change issues that need to be carefully recognized and acknowledged prior to proposing a new course of action. Thus, the process of engaging stakeholders in climate change adaptation planning and policymaking is iterative and cyclical, requiring that the outcomes and decisions reached in previous iterations be revised frequently.

- Monitoring: Effective implementation of the Strategy must be supported by an appropriate monitoring system for the implementation of measures and activities and the monitoring of the impact of these measures and activities in reducing the damage caused by climate change. The indicator system for monitoring the implementation of measures and activities of the Strategy and the indicator system to monitor the impact of these measures arise from the set of measures that will ultimately be accepted for the Strategy as a whole, and in particular for the measures to be implemented in the first Plan. Monitoring information will provide a basis for making periodic evaluations of the implementation of the Strategy. When defining individual adaptation indicators, there will be a need to take into account the following:
  - Check whether some of the indicators for other similar processes are being used, or see if some of the existing indicators can be used for monitoring of adaptation to the climate change.
  - Analyse whether some of the effects of adaptation are the consequence of some other processes, not just of the implemention of the measures envisioned by the Strategy.
  - Develop a combination of process indicators (indicators indicating that only a certain measure has been taken and the expected results of each of its activities are achieved) and performance indicators - adaptation indicators that point to a real change in a system as a result of applying a specific measure of the Strategy.
  - Check whether the data needed to control the performance of the indicators is collected in a relatively simple and inexpensive way. This requirement is much easier to implement in case of process indicators.

  Municipalities are strongly encouraged to consult the SECAP adaptation template for monitoring purposes and, in particular, the list of process and performance indicators contained in it (www.covenantofmayors.eu/IMG/xlsx/SECAP_Template.xlsx).

4.4.6. The Common Index (Table of Contents) of the Strategy

The Table of Contents of the Strategy consists the following principal elements:

Acknowledgements
Preface
Executive Summary
Glossary
List of Acronyms

i. Introduction and structure of the document
ii. Background and context
iii. The strategic vision (Vision Statement)
iv. Goals and objectives
v. Description of the current and projected climate change in the area
vi. Assessment of the vulnerability and risk posed by climate change (summary of the RVA)
vii. Priorities for adaptation: measures and activities per sector
viii. Recommendations and guidelines to build and/or strengthen the adaptive capacity in various sectors
ix. Implementation arrangements.

4.5. Adaptation Action Plan

Plan is developed after the Strategy. However, the first Plan is adopted together with the Strategy. Its aim is to assist in concrete application and implementation and laying down future steps for its further implementation. The Plan is therefore a **short-term document** (e.g. up to 5 years), which includes a number of specific adaptation measures and actions that are prioritised and linked to the risks and vulnerabilities previously identified. The Plan should also identify the financial resources allocated as well as the actors responsible for the implementation of the actions. For its implementation, the Plan will require the "signing up" of a wide number of community stakeholders who will have the authority to implement the adaptation actions so that it may be more difficult to adopt compared to a Strategy.

The Plan has to identify the priority measures and activities, in particular those that have been selected for implementation during the prioritization process (steps one and two). These measures and actions have to be outlined for each sector. An example of the presentation of one action in the local Plan is given in Table 14 (LAP Ancona), while the example of a presentation in the national plan is given in Table 15 (Croatian Strategy for Adaptation to Climate Change).

Because Plan is a short-to medium-term plan, it is necessary to develop a detailed budget for each action, which includes division of costs, if possible per year, and an identification of sources of financing.

Plan also has to contain a table indicating the risks in its implementation as well as suggestions for reducing and/or eliminating the expected risks and obstacles.

Finally, the Plan has to have the monitoring system developed, which essentially is a list of indicators, usually for each sector. The indicators are derived from the Strategy itself, in particular from its goals and objectives.

The contents of the Plan is relatively simple and it should be composed of the following:

i. Introduction
ii. Main elements of the Strategy: vision, objectives, measures (brief summary of the Strategy)
iii. Process of prioritisation of measures and activities (brief explanation how the prioritisation process was carried out)
iv. Priority measures and activities (detailed presentation of measures and activities per sector)
v. Funding (description of funds needed and potential sources of financing)
vi. Indicators for the implementation of the Plan
vii. Monitoring and evaluation

Table 14: Measures of the adaptation action plan for Ancona

SHEET N. C02 - Portonovo: coastal defence by moving back the bathing establishments and restaurants

TIMEFRAME	5 Years
RESPONSIBLE ORGANISATION	Infrastructure, Transport and Energy Service - Coastal Defence
RELATED PLANNING	• DGR 225/2010 • Integrated Coastal Zone Management Plan

EXPECTED RESULTS

- Provide an overall plan for the area, to be implemented in subsequent phases, for redevelopment of the wetlands in order to anticipate and implement a program of rehabilitation and requalification extended to the entire district
- State the aspects of natural and landscape protection and enhancement as essential factors for the creation and development of projects and programs implementing the PPE provisions in force and the Park Plan
- Ensure the use and usability of the bay under conditions compatible with the values site found within a natural park, in the belief that proper attendance constitutes the first correct form of protection and enhancement

MONITORING INDICATORS	POSSIBLE PROBLEMS
• Extension of the new mobility network/final total extension • Extension of new technological systems/final total extension • Surface of the water	-
ECONOMIC RESOURCES	**SUBJECTS TO GET INVOLVED**
1.360.000 €	• Marche Region • Parco del Conero Organisation

Table 15: Presentation of a measures of the spatial planning and coastal management sector in the Croatian Strategy for Adaptation to Climate Change

Measure and activity designation and activity title	**Priority designation within the Adaptation Strategy** **Activity category**	**Activity description / Implementation method**	**Implementation period**	**The responsible authority and associates in implementing the measure/ activity**	**Estimated total cost (million kuna)** **Potential funding sources**	**Implementation indicators**
PP-01-01. Implementation of targeted research on the impact of sea level rise on the most vulnerable parts of the coast as a basis for the preparation of priority intervention plans	P5 IR	Conducting thematically and spatially targeted research on sea level rise at the most vulnerable parts of the coast, including endangered parts of the zones of valuable cultural heritage as a basis for the preparation of priority recovery plans and spatial development planning that will be more resistant to climate change impacts. Implementation through allotted funding for this thematic area in the programmes of stimulation of research and development activities in the field of climate change in coordination with the ministries responsible for construction and spatial planning, and culture.	2019 – 2022	Ministry responsible for environmental protection Ministry responsible for science, EPEEF, Croatian Science Foundation	4.0 EPEEF EU funds (ERDF)	• Number of completed research projects in accordance with contractual obligations. • Number of spatial and other recovery plans in which findings from the research projects were used. • Number of locations/areas covered by the research.

4.6. Time needed for the preparation of the Strategy and Plan

As suggested earlier in this document, the process of the preparation of the Strategy and the first Plan consists of the following steps:

1. **Vulnerability and risk assessment**: critical precondition that informs the decision makers and other stakeholders of the severity of the climate change issue and the risks that they may face in the future.
2. **Definition of the Vision Statement on adaptation**: the moment when decision is taken what is that the stakeholders would like to do and how they intend to cope with the challenge of climate change in their area. This decision also entails definition of the goals and objectives.
3. **Identification of the adaptation options**: identification and selection: Based on the vulnerability and risk assessment, and a desired future that the city wants to achieve, the stakeholders explore options within a framework of adaptation scenario and embark on analysis and selection of the option that will best fit their vision as well as available resources to undertake action.
4. **Drafting and adoption of the Strategy**: the most critical activity because it entails definition of steps that need to be taken toward achieving resilient cities that will be able to cope with the climate change challenges; development of the Strategy is a consensus building process that has to correspond to the main principles of governance. The Strategy results in recommendations and measures to be taken.
5. **Drafting and adoption of the Plan**: follows the Strategy and covers shorter periods with detailed actions that are embedded in the recommendations and measures proposed by the Strategy.

It is very difficult to estimate the exact time that is needed for the preparation and adoption of the Strategy and Plan. However, based on the experience, the following minimal estimates may be considered as realistic:

- Vulnerability and Risk Assessment: 4 months
- Definition of the Vision Statement: 1-2 months
- Identification of the adaptation options: 2 months
- Drafting of the Strategy: 2-3 months
- Drafting of the Plan: 1-2 months

The total of 10-13 months for the entire process (not counting the start-up activities, and the time needed for adoption) is highly indicative and it depends on the conditions (technical capacity and financial resources) in each municipality and the width of the scope of sectors involved. The estimate of the time needed is not related to the activities of the SEC ADAPT project but should be a guidance used exclusively for future adaptation activities in the municipalities.

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