

# The Congress of Local and Regional Authorities



## Chamber of Local Authorities

**22<sup>nd</sup> SESSION**  
**CPL(22)2**  
2 March 2012

### **Making cities resilient**

Current Affairs Committee  
Rapporteur: Per Bødker ANDERSEN, Denmark (L, SOC<sup>1</sup>)

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#### *Summary*

The objectives of this report are:

- to give a brief and general overview of the state of cities with respect to global trends in climate and other factors such as demographics and urbanisation;
- to analyse the factors that make a city resilient and the arguments for moving cities in this direction, providing brief best practice cases;
- to present the UNISDR Making Cities Resilient Campaign as a vehicle for cities to enhance their resilience.

The report suggests that cities be encouraged to join the UNISDR 'Making Cities Resilient' campaign, and recommends action in a series of areas including knowledge development and sharing, funding mechanisms, addressing different types of cities, and an integrated and multi-level governance approach to resilience building.

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<sup>1</sup> L: Chamber of Local Authorities / R: Chamber of Regions  
ILDG: Independent and Liberal Democrat Group of the Congress  
EPP/CD: European People's Party – Christian Democrats of the Congress  
SOC: Socialist Group of the Congress  
NR: Members not belonging to a Political Group of the Congress



**DRAFT RESOLUTION<sup>2</sup>**

(See [Resolution 339 \(2012\)](#) adopted on 22 March 2012.)

1. Urban areas and cities face climate threats such as rising temperatures, rising sea levels, heavy or declining precipitation, drought and also storms, which sometimes take on the proportions of disasters and have become more frequent in recent decades.
2. The high concentration of people in cities and the complexity of the systems which interact and provide goods and services further increase the potential damage to human beings and local economies.
3. Cities are therefore particularly vulnerable to these trends and must take up the challenge of reducing disaster risks and enhancing their resilience to climate change and disasters through mitigation and adaptation measures.
4. The Congress has long shown its concern about climate change and its impact on cities, in particular by proposing “40 measures in dealing with natural hazards” (2005)<sup>3</sup> and adopting Resolution 248 (2008) on “Climate change: building adaptive capacity of local and regional authorities” and more recently Resolution 317 (2010) on “Coastal towns and cities tackling threats from the sea”.
5. In the Slavutych Appeal launched in 2006,<sup>4</sup> 20 years after the Chernobyl disaster, the Congress set out principles to guide public authorities in the various areas of nuclear safety (such as the involvement of local and regional authorities, neighbourhood solidarity, transparency and consultation of citizens).
6. Following the Tohoku earthquake and tsunami which hit Japan on 11 March 2011, the Congress held a debate on 23 March 2011, during its 20th session, with the Secretariat of the International Strategy for Disaster Reduction (ISDR),<sup>5</sup> which called on it to support the United Nations world disaster reduction campaign, Making Cities Resilient. This call followed on from co-operation dating back more than 10 years with the Council of Europe under the European and Mediterranean Major Hazards Agreement (EUR-OPA).<sup>6, 7</sup>
7. The objectives of the campaign are:
  - a. to raise the awareness of citizens and governments of the benefits of reducing risks at the urban level;

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<sup>2</sup> Preliminary draft resolution approved by the Current Affairs Committee on 8 February 2012.

## Committee members:

*E. Yeritsyan (Chair)*, *B. Toce (Vice-Chair)* (alternate: *E. Sartorio*), *S. Aliyeva*, *A. Ambros*, *P.D. Andersen*, *A. Antosova*, *G. Arnardottir*, *S. Barnes*, *J. Barska*, *B. Belin*, *A. Beskow*, *N. Boltenko*, *A. Bryggare*, *V. Chilikov*, *A. Cook*, *I. De La Serna Hernaiz*, *M. Fiasella*, *B. Fleck*, *D. Ghisletta*, *V. Groysman*, *L. Güven* (alternate: *G. Doganoglu*), *H. Himmelsbach*, *P. Hugon*, *Y. Karayiannis* (alternate: *K. Virvidakis*), *A. Koopmanschap*, *A. Kordfelder*, *L. Kovacs* (alternate: *G. Illes*), *A. Kurti*, *J. Landberg*, *M.S. Luca*, *F. Madsen*, *I. Milatic*, *Y. Mishcheryakov*, *C. Oliver Jaquero*, *C. Oppitz-Plörer*, *A. Pellizzari* (alternate: *E. Verrengia*), *N. Pilius*, *A. Pivkova*, *F. Ramos*, *A. Ravins*, *O. Sainsus* (alternate: *S. Bohatyrchuk-Kryvko*), *H. Skard*, *J.-L. Testud*, *A. Toader*, *N. Toncev*, *E. Van Vaerenbergh* (alternate: *J. Michaux*), *J. Warmisham*, *P. Weidig* (alternate).

NB: The names of members who took part in the vote are in italics.

Secretariat of the Committee: *D. Marchenkov*, *J. Hunting* and *M. Grimmeissen*.

<sup>3</sup> Natural and industrial disasters - local authorities facing emergencies: 40 measures in dealing with natural hazards (2005).

<sup>4</sup> Recommendation 191 (2006) on Chernobyl, 20 years on: Local and Regional Authorities dealing with disasters.

<sup>5</sup> Set up by the UN General Assembly in 2000.

<sup>6</sup> A platform for co-operation between European and Southern Mediterranean countries in the field of major natural hazards. Established in 1987, the EUR-OPA Agreement has [26 member states](#), ie 23 Council of Europe members and three non-members of the Council (Algeria, Lebanon and Morocco):

[http://www.coe.int/t/dg4/majorhazards/presentation/presentation\\_en.asp](http://www.coe.int/t/dg4/majorhazards/presentation/presentation_en.asp)

<sup>7</sup> A memorandum of understanding between the Council of Europe and the Secretariat of the International Disaster Reduction Strategy (UNISDR) was signed in April 2008.

*b.* to use local government budgets in a smart way, which enhances the resilience of infrastructure and reduces disaster risk – in other words, mainstreaming disaster risk reduction into urban planning and development at the decision-making level;

*c.* to include disaster risk reduction in participatory development and planning processes at the city level to protect critical infrastructure.<sup>8</sup>

8. The campaign underlines the need to establish long-term partnerships to achieve these objectives.

9. As the efforts by the Congress are fully in line with the objectives of the campaign, it calls on local and regional authorities in Council of Europe member states:

*a.* to sign up to the UNISDR Making Cities Resilient campaign and thereby undertake to develop and implement a local adaptation process and contribute to the campaign as follows:

*i.* by sharing best practices with other cities focusing on governance, sustainable land use, urban planning and social aspects, while serving as replicators of best practices identified elsewhere;

*ii.* by developing partnerships with other local authorities in their countries, in Europe or in lower-income countries;

*iii.* by designing and testing innovative schemes in partnership with different players (including business), thereby creating knowledge transfers;

*iv.* by lobbying – themselves and/or through city networks – for enhanced awareness of disaster risk reduction;

*b.* to adopt an integrated approach to the issues of disaster risk reduction and climate change adaptation and mitigation (transport, communication, housing, urban green spaces, water and electricity supply, waste removal systems, food production, etc) and other non-climate related issues such as demographic impacts. The vision of a resilient city has to be a cross-cutting one, addressing quality of life, and be embedded within sustainability criteria;

*c.* to boost their capacity in terms of building resilience to climate change and natural disasters, disaster risk management and climate change adaptation;

*d.* to draw up and implement strategic programmes and action plans based on the integrated management system described in the explanatory memorandum.

10. The Congress also:

*a.* encourages the sharing of knowledge between national authorities of the Council of Europe member states and their cities and the development of sharing platforms.<sup>9</sup> In addressing disaster risk, climate change adaptation and resilience building, it is necessary to assign a high value to traditional knowledge and exploit its potential;

*b.* calls for the development of an overarching, equitable multilevel (European, national, regional and local) governance framework for disaster risk management and resilience building throughout Europe, which the action of European cities must fit in with.

<sup>8</sup> UNISDR “Making Cities Resilient – ‘My city is getting ready’ – World Disaster Reduction Campaign 2010-11: Frequently Asked Questions”. Available at: [www.unisdr.org](http://www.unisdr.org)

<sup>9</sup> Such as the EU’s Clearinghouse Mechanism (to be released in March 2012) and the existing weADAPT platform: <http://weadapt.org/>

## 11. Lastly, the Congress

a. intends maintaining the mutually beneficial links with the United Nations campaign and Council of Europe initiatives, in particular those of the European and Mediterranean Major Hazards Agreement (EUR-OPA) at local level and the holding of a conference on climate change and human rights in late 2012;

b. welcomes the decision by ICLEI Local Governments for Sustainability to hold annual congresses of resilient cities to share knowledge and experience, as well as the development of a common integrated approach, and instructs its Current Affairs Committee to continue its partnership with the organisation.

## EXPLANATORY MEMORANDUM<sup>10</sup>

### I. Introduction

1. As the areas of climate change adaptation and resilience become increasingly important and cross-cutting at all levels of the policy agenda, adequately framing and integrating research and implementation efforts becomes ever more crucial. However, sectors and fields that directly affect adaptation, resilience, and each other – including climate change mitigation, disaster risk reduction and management, urban and spatial planning, social policies, economic growth principles, industrial policies, water directives, etc. – presently operate mostly independent from one another, and thus in an inefficient way.

2. But all levels of governance are increasingly gaining awareness of the importance of integrating initiatives of different sectors into one common vision. One example is the White Paper “Adapting to climate change: Towards a European framework for action,” published by the European Commission (2009) and its subsequent actions such as the EU Adaptation Strategy due in 2013 and the Clearinghouse Mechanism.<sup>11</sup> Other integrative examples are increased research funding dedicated to adaptation, the UNISDR ‘Making Cities Resilient’ campaign and other related initiatives, the UN-Sasakawa Award for Disaster Reduction, and ICLEI’s World Congresses on Cities and Adaptation to Climate Change held annually since 2010.

3. The challenge is to integrate these efforts and build a coherent picture. Ideally, all of these initiatives would join forces and develop a strategic approach towards sustainability, which encompasses all focal areas concerned. Such a holistic approach would support, coordinate, encourage and synergise efforts and thus enable enhanced replication of best practices at regional and local levels. At the local level, indeed, resilience and adaptation efforts have traditionally been implemented widely, but to a large extent in an isolated way, often lacking efficiency, cross-sectoral cohesiveness, and without any guidance of overarching sustainability criteria.<sup>12</sup> In other words, the challenge identified at the national and supra-national levels (above) is reflected locally, too.

4. The task of integrating these areas, finding ways to align their actions and goals, and working with different levels of governance is a difficult endeavour. Further difficulty is added when the main objective of cities – providing good services and quality of life to its citizens, while building resilience to climate and non-climate impacts in a sustainable way – often lacks a comprehensive roadmap. Decision making regarding adaptation can often be further complicated because of the considerable levels of uncertainty of climate change trends and socio-economic developments, even in the face of increasingly frequent and intense climate change manifestations and natural disasters, and newly-available scientific data.

### II. The state of the planet, the state of cities

5. The impacts of humans on the planet are affecting the functioning of the climate system and placing stress on ecosystem services. In aggregate, the human population is using natural resources at a

<sup>10</sup> This explanatory memorandum is based on the document prepared by the Council of Europe consultants Mr Daniel Morchain and Mr Holger Robrecht, ICLEI – Local Governments for Sustainability, which is reproduced in the appendix to this report.

<sup>11</sup> See, for reference: [http://ec.europa.eu/clima/tenders/2011/208209/clearinghouse\\_concept\\_note\\_en.pdf](http://ec.europa.eu/clima/tenders/2011/208209/clearinghouse_concept_note_en.pdf)

<sup>12</sup> Ecologic Institute; ICLEI European Secretariat; REC & AEA for the Committee of the Regions (2011) “Adaptation to climate change – Policy instruments for adaptation to climate change in big European cities and metropolitan areas”.

faster speed than they can be replenished. Countries worldwide are facing desertification, biodiversity loss, increased temperatures, glacial melt, water scarcity and drought, floods and coastal erosion. Many factors - climate related or not - contribute to these new conditions. Non-climate factors include population growth, urbanisation trends, chronic poverty, socio-economic developments and resulting anthropogenic GHG emissions – an economic growth model coupled with resource consumption and depletion.

6. Cities are particularly vulnerable to climate change and natural disasters because of the large number of people living in relatively concentrated areas and the complexity of the systems interacting within them: infrastructure networks to transport people and goods, communications systems, water and energy distribution, sewers and waste removal systems, food production, housing and urban green spaces, etc.

7. Particularly in low-income countries, but also in high-income ones, cities face an additional burden as poor communities are often not covered by the systems' networks, but are rather served (at best) by informal structures lacking proper foundations. Whereas infrastructure systems are increasingly at risk of damage or failure from climate change impacts and other non-climate stresses, informal ones lacking appropriate structures and planning are, clearly, even more vulnerable. Furthermore, there are about one billion people living in informal settlements – or slums – which represent one in three of urban residents worldwide.<sup>13</sup>

8. The frequency of natural disasters appears to be increasing while “weather-related natural catastrophes and record temperatures (...) provide further indications of advancing climate change”.<sup>14</sup> Half of the world's population resides in areas where natural hazards may significantly impact them.<sup>15</sup> With an increasingly complex network of systems interacting and providing goods and services to cities, the potential damage of natural disasters to humans and infrastructure becomes ever higher –. A recent example is the Tohoku earthquake and tsunami which hit Japan on 11 March 2011.

9. In addition to physical systems that facilitate the interrelations between the city and its residents, climate change impacts also put pressure on ‘soft’ systems and – vice versa – unprepared soft systems can worsen the consequences /damages to the physical systems. These include governance structures and management procedures - in particular decision making processes – which are put to the test when extreme events strike cities, and also the complex grid of social and cultural interactions. To cope with climate threats and non-climate stressors, soft systems also need to be adjusted in order to deliver innovative solutions to the new challenges faced by city managers and residents.

10. Further to socio-economic stresses, urban areas and cities face climate threats such as:

- temperature increase leading to heat waves and – more particular to medium and large cities – urban heat island effects;
- sea level rise leading to storm surges and salt water intrusion;
- heavy precipitation leading to fluvial and urban drainage floods;
- storms (wind, rain, thunder and snow storms) leading to floods and physical damage to infrastructure;
- decreased precipitation leading to water scarcity and droughts;
- climate impacts leading to natural disturbances, e.g. wildfires, pests;
- climate impacts leading to earth movements (landslides, erosion); and
- climate impacts leading to increased human diseases.<sup>16</sup>

11. These climatic manifestations – which sometimes reach the magnitude of disasters – and their impacts and interactions with infrastructure system have a direct consequences on humans, including health problems and mortality, increased incidence of contagious and waterborne and pest-borne diseases, decreased production of food and higher commodity prices, etc.

<sup>13</sup> The World Bank Group (2011). “Guide to Climate Change Adaptation in Cities”.

<sup>14</sup> Munich RE. “Overall picture of natural catastrophes in 2010 – Very severe earthquakes and many severe weather events”. Press release: 3 January 2011.

<sup>15</sup> International Research Institute for Climate Prediction at Columbia University, *et al* (2005). “Natural Disaster Hotspots: A Global Risk Analysis”.

<sup>16</sup> Robrecht, H and Morchain, D. (2010) « Adaptation in cities and quality of life ». Background document for the workshop of the conference « Adaptation in cities & quality of life : time to intensify efforts». Brussels, November 2010.

12. Cities do, in some cases, also face structural challenges, such as insufficient funding, poor coordination of efforts and with stakeholders, limited knowledge and lack frameworks to support prevention/adaptation actions.

13. While they are focal points of vulnerability, they are also centers of prosperity, innovation, employment, economic growth and provision of services. They face the challenge of reducing disaster risks and enhancing their resilience through mitigation and adaptation measures articulated within a sustainable development path – where sustainability, and indeed resilience, is understood to encompass environmental, social and green economic growth.

14. Taking action against climate change and other impacts will almost invariably entail some risk due to a number of uncertainties as to how intense impacts will be in the future, or whether such impacts will affect a particular location. This should not block action or shy local governments away from investment, considering the higher costs of inaction.

15. The outcomes of the UNFCCC's COP in Durban in 2011 can be seen with optimism and as a sign of internationally coordinated efforts to take action to adapt to the new conditions to which citizens of the planet are all subject.

### III. A resilient city

#### A. What is a resilient city?

16. There are many definitions, ranging from very narrow to very broad and reflecting different cultural values. One common feature, however, is 'strength' – making communities and cities stronger against destabilizing forces that put their citizens and structures at risk. Generally, resilience is also linked to sustainable principles. To the World Bank, for example, "*a resilient city is one that is prepared for existing and future impacts, thereby limiting their magnitude and severity*". The World Urban Forum's Vancouver Working Group takes a more confined approach and links resilience to the ability of a city to expand its production base (e.g. from depending on one industry to attracting and embracing a broader base and economy).<sup>17</sup> Yet another definition links resilience directly to peak oil and names resilient cities those "*that can last, make it through crises, [possess] inner strength and resolve, as well as appropriate built form and physical infrastructure*".<sup>18</sup> The European Environment Agency (EEA) sees a resilient city as an "*urban ecosystem*" that is dynamic: consuming, transforming and releasing materials and energy in an adaptive way and interacting with other ecosystems, tackling mitigation and adaptation efforts and addressing quality of life through better and greener urban planning.<sup>19</sup> As a final and quite comprehensive approach, ICLEI's Bonn Resilient Cities conference defines a resilient city as:

*A city that supports the development of greater resilience in its institutions, infrastructure, and social and economic life. Resilient cities reduce vulnerability to extreme events and respond creatively to economic, social and environmental change in order to increase their long-term sustainability. Resilient city activities are sensitive to distinctive unique local conditions and origins. Efforts undertaken to prevent crisis or disaster in one area should be designed in such a way as to advance the community's resilience and sustainable development in a number of areas. As such, resilient cities define a comprehensive 'urban resilience' concept and policy agenda with implications in the fields of urban governance, infrastructure, finance, design, social and economic development, and environmental / resource management.<sup>20</sup>*

17. A resilient city needs to take into consideration two more points. One is that becoming resilient is a process that demands continual improvement and that is an ever-evolving effort. This process is adaptive because it aims at a continual improvement of the decisions taken (e.g. in rethinking urban planning, in increasing local renewable energy supply, or in putting alert systems into operation) and the actions implemented. These require regular and effective monitoring and evaluation. The

<sup>17</sup> Walisser, Brian; Brent Mueller and Celia McLean (2006). "The Resilient City". The World Urban Forum, Vancouver Working Group Discussion Paper.

<sup>18</sup> Newman, Peter; Timothy Beatley and Heather Boyer (2009). "Resilient Cities - Responding to Peak Oil and Climate Change". Island Press. Washington DC. As quoted in: <http://sustainablecitiescollective.com/brynaiones/28388/what-makes-resilient-city>

<sup>19</sup> European Environment Agency (2010). "The European Environment – State and Outlook 2010 – Urban Environment". Copenhagen.

<sup>20</sup> <http://resilient-cities.iclei.org/bonn2011/resilience-resource-point/glossary-of-key-terms/> Resilient Communities Program Concept (2002).

uncertainty of future developments in climate change and its implications are managed by more flexibility through robust, no- and low-regret actions and through periodical monitoring.

18. Still, uncertainty can block action by local governments or other stakeholders, even more in times of economic downturns. A recent report suggests that the present economic crisis has re-focused political agendas on issues of vulnerability, exposure to risk and threat of structural ruptures, moving priorities away from former top concerns of competitiveness, technological innovation and job creation.<sup>21</sup>

19. The process to enhance resilience also needs to be integrative because it works in a cross-cutting way with existing policies and processes across different sectors in order to take advantage of the efforts already invested by all levels of government. Another relevant feature is its inclusiveness, as it relies on the input from a broad range of stakeholders and different departments, ensuring a fair representation of all social groups and promoting their active participation in the climate adaptation process, independent of their level of influence.

20. The second point is that resilience should be embedded in the context of sustainability. Resilient solutions, largely addressed through climate change adaptation, climate change mitigation and disaster risk reduction need to contribute to the amelioration of environmental degradation and of the realities of poverty and inequality. Otherwise, solutions will not be effective in the long term.

21. Addressing disaster risk reduces vulnerability, as do sustainable measures to deliver climate change adaptation (and mitigation, at least in the long term). These two fields – disaster risk management and climate change adaptation – are becoming closer in their approaches and objectives, as disaster risk management moves from reaction to include prevention as a major objective.<sup>22</sup> These efforts enhance a community's resilience, and they contribute to sustainability and to the long-term prevalence of communities, cities, humans and biodiversity only if they are shaped with sustainability criteria.

## **B. The costs and benefits of being resilient**

22. There is abundant literature on the economic costs and benefits of adaptation and mitigation; whereas estimating the cost of resilience remains more 'obscure' and more difficult to define. Mitigation and adaptation efforts, as well as economic development initiatives, are linked, and advances in one are affected by the evolution of the others. Indeed, "any estimation of the costs of adaptation is necessarily contingent on a scenario of future mitigation".<sup>23</sup> In this explanatory memorandum we understand the cost of resilience to be linked to the cost of adaptation,<sup>24</sup> which includes the costs of disaster risk reduction. Adaptation aims to reduce vulnerability and enhances resilience. There are numerous estimations of the costs of adaptation measures at a global level, and some others focusing on developing countries.

23. "The World Bank projected \$9 billion to \$41 billion in annual costs to developing countries; the Stern Report \$4 billion to \$37 billion, an Oxfam paper at least \$50 billion, and a United Nations Development Programme study \$86 billion to \$109 billion (by 2015). [The] United Nations Framework Convention on Climate Change (UNFCCC) estimates (...) put annual global adaptation costs at \$44 billion to \$166 billion per year, including \$28 billion to \$67 billion for developing countries. Of the global total, \$8 billion to \$130 billion would be required for infrastructure investments, \$14 billion for agriculture, \$11 billion each for water systems and coastal zones, and \$5 billion for human health. (...)"

24. To cite a European example, Swiss Re recently estimated that the costs of a 100 year storm event could double by the 2080s with climate change on this continent.<sup>25</sup>

<sup>21</sup> Robert Lukesch, Harald Payer, Waltraud Winkler-Rieder: „Wie gehen Regionen mit Krisen um? Eine explorative Studie über die Resilienz von Regionen“. ÖAR Regionalberatung, Vienna.

<sup>22</sup> This is a desirable approach as every Euro invested on risk reduction saves between 5 to 10 Euros in economic losses from disasters. Source: A Needless Toll of Natural Disasters, Op-Ed, Boston Globe, 23 March 2006 - by Eric Schwartz (UN Secretary General's Deputy Special Envoy for Tsunami Recovery).

<sup>23</sup> Ackerman, F. and E.A. Stanton (2011). "Climate Economics: The state of the art". Stockholm Environment Institute.

<sup>24</sup> As mentioned in sections above, the costs of inaction are calculated to be even higher than the costs incurred when actively addressing climate change impacts, natural disasters and non-climate related impacts.

<sup>25</sup> Hunt & Watkiss 2007: ABI (2005).

25. Estimates vary considerably, given the enormity of the scale and the uncertain nature and magnitude of future events. They also rely on major assumptions which are further complicated by lack of thorough data. These factors weaken possible consensus on adaptation costs and hinder their decision making potential.<sup>26</sup> In addition, funding for adaptation remains insufficient due to the lack of interest by funding institutions.

26. On the other hand, as cities, are particularly vulnerable to climate change impacts (partly due to population density, location in many cases, e.g. next to rivers or in the coast, dependence on a network of systems and their complex interaction), massive investment is required to upgrade city systems and enhance the location's resilience. Indeed, it can be difficult and costly to adapt to climate change, from physical, economic and technological perspectives.

27. One smart way to reduce the need for dedicated adaptation funding and to efficiently use resources is to incorporate climate change, adaptation and resilience criteria into present investments on urban fixed assets (many of which stem from the private sector). This concept of 'resilience upgrading'<sup>27</sup> looks at enhancing the city's resilience by increasing its performance – its ability to deliver a high quality of life and quality services to its residents. Instead of approaching the topic of adaptation and disaster risk from a perspective of 'escaping risks', it rather looks at the benefits that smart, climate-proof investments can deliver to the city and to the service or product providers. This implies that service or product providers, public or private, will gain by conducting resilience-upgrading investments, in their *self-interest* to protect their own endeavours. Considering that \$10 trillion are spent annually on urban assets (which represents 300 times the available funding for adaptation), encouraging resilience-upgrading investments should be promoted widely.

28. The European Union's 2020 strategy is centered on smart, sustainable and inclusive growth. Growth in a world that is dominated by unsustainable practices, where the global population depletes natural resources and ecosystem services faster than the planet can replenish them, is a major challenge. The symbolism used by the Global Footprint Network to describe the problem of growth and unsustainable use of resources is an effective way to transmit the message: Today we consume the resources equivalent to 1.5 planet Earths – that is, it takes "the Earth one year and six months to regenerate what we use in a year" and to absorb the waste we generate – and by 2030 we are likely to need two planet Earths.<sup>28</sup>

29. The issue of growth and sustainability generates intense debates globally. Some believe that growth and sustainability, departing from the present state of the world, can simply not be pursued in parallel, and that sustainability has suffered a setback when growth is explicitly brought back to the EU agenda (even if under a *green* terminology) and remains a clear worldwide objective. Indeed, what climate resilient growth actually entails in practice is far from resolved, and is likely to need more than just 'climate proofing' of investments. Socio-economic trends will be a key determinant of the feasibility of a climate resilient (or sustainable) growth. The prospects are less than optimistic, as a strong increase of GHG emissions is expected in the next two decades, driven in particular by a substantial increase in energy demand in developing countries.

30. However, the recent outcomes of Durban (UNFCCC COP 17) show that international cooperation and the intention to commit to GHG reductions may be a likely, and positive, mid-term scenario. While the feasible paths are likely to be somewhere in between these two lines, there are clear indications that "development substantially increases the potential damages from climate change"<sup>23</sup>. Even so, a higher standard of living for the billions of people living in poverty is an ethical pursuit that will require economic growth and development, and which necessitates a fairer share of emissions per capita between developing and developed countries.

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<sup>26</sup> Agrawala, S., Crick, F., Jetté-Nantel, S., and Tepes, A. (2008). "Empirical Estimates of Adaptation Costs and Benefits: A Critical Assessment." In S. Agrawala and S. Fankhauser, eds. *Economic Aspects of Adaptation to Climate Change: Costs, Benefits and Policy Instruments*. Paris: OECD Publishing.

<sup>27</sup> The term was coined by ICLEI in: ICLEI (2011). *Financing the Resilient City: A demand driven approach to development, disaster risk reduction and climate adaptation - An ICLEI White Paper, ICLEI Global Report*.

<sup>28</sup> The Global Footprint Network: [http://www.footprintnetwork.org/en/index.php/GFN/page/world\\_footprint/](http://www.footprintnetwork.org/en/index.php/GFN/page/world_footprint/)



### C. A framework for resilience work at local level

31. Resilience work has to be conducted under a framework which ensures a holistic, integrated, inclusive and continually improving process. Such a framework is developed under the European project 'CHAMP – Local Responses to Climate Change'.<sup>29</sup>

32. The complicated system of cities and regions needs management on various levels and re-organising and integrating existing practices, plans and strategies. The Integrated Management System (IMS) described below systemizes the work, boosts efficiency and provides positive outcomes. It directs available resources towards defined goals and secures transparent and democratic decision making. It consists of five major steps repeated in annual cycles. Despite the cycles, revision is required once per election period – and preferably at the outset - unless evaluation at the end of a cycle suggests reconsideration.

33. At each step, immediate impact on the following as well as the prerequisites for stepping forward are to be considered. The cycle begins with a baseline review mapping the current state of sustainability factors in the city (1<sup>st</sup> step). Then, targets are set for the identified priorities as a result of the baseline review (2<sup>nd</sup> step). Political commitment (3<sup>rd</sup> step) is needed throughout the cycle and becomes most crucial when the outcome of the target setting, i.e., the strategic programme, is approved by the city council.

34. Completing the steps carefully that prepare the ground for implementing actions diminishes the risk of hardships during implementation. After these three steps of the cycle, the priority actions decided earlier are implemented and monitored (4<sup>th</sup> step) in order to gather information on the functionality of the system. During the 5<sup>th</sup> step - evaluation and reporting - collected information is evaluated and used for reporting success and possible draw-backs and provides the basis for a city council decision on how to continue in the next annual cycle.

35. Two cross-cutting elements need to be kept in mind throughout the steps of the cycle: involvement and communication as well as organisational setup. From the very beginning, it is important to plan who is involved and what they can contribute. Involving as many relevant actors as possible, setting up a well-functioning organisational of the management system will exert decisive impact on the success of the undertaking.

36. The model can be described as a journey with one step following the other, cities and regions having different starting points with an important assumption is that it may not be possible to achieve everything at the beginning. A number of road maps for this journey are available.<sup>30</sup> In terms of disaster risk management, the 40 measures proposed by the Congress offer valuable guidance.

#### *Baseline review*

37. The first important step of the IMS is to analyse the present sustainability condition of the city with the purpose to create a framework of information that will later serve as a basis for setting priorities, targets and monitoring progress. Improvements are visible only if they can be compared to a starting point. It is also an analysis of the pressures that have led to the current situation as well as their impact on various parts of society, economy and environment, as well as the policies and measures already in place.

38. The baseline review is a regularly repeated part of the IMS which should be conducted by a cross-sectoral working group. It determines the geographical and thematic scope. Available data on all relevant sustainability aspects should be collected and structured. Even if all data cannot be delivered during the first cycle, it serves to identify the gaps. The review should map legal requirements, data<sup>31</sup> on all significant aspects, emerging issues and trends, political priorities, departments and external

<sup>29</sup> Robrecht, H. and Hammerl, M. (2011) "INTEGRATED MANAGEMENT - Towards local and regional sustainability". Link: <http://www.localmanagement.eu/index.php/champ/home?language=en>. Also see: Managing Urban Europe-25; link: <http://www.localmanagement.eu/>, and European Communities (2007) "Integrated Environmental Management", link: <http://ec.europa.eu/environment/urban/pdf/iem.pdf>.

<sup>30</sup> The Aalborg Commitments in 2004, the Reference Framework for Sustainable Cities, the EU Covenant of Mayors.

<sup>31</sup> The Aalborg Commitments or other commitments or monitoring processes compose the recommended framework for the data collection.

organisations involved, existing instruments and systems, risks and opportunities. Based on the information and data available, political priorities can be set and the first strategic programme drawn up.

39. The baseline review is renewed at least once in an election period or more often if the evaluation either suggests significant deviation from targets or surrounding conditions have changed substantially as new trends and information emerged.

#### *Target setting*

40. The next step is to prepare the strategic programme and action plan based on the baseline review and its analysis of priorities to focus on during the following management cycle period and beyond. These documents define the city's or region's ambitions and help planning the way to implementation. This planning exercise is providing an idea of how to reach targets. It is distinct from any formal project or land-use planning. (Formal planning forms a part of the step Implementation & Monitoring.)

41. A common vision for the future development of the city should be established in a participatory way with a long-term orientation, setting goals for a 15-20 years period and balancing the environmental, social and economic dimensions. The vision should be reachable and inspiring, and find its starting point in the priorities.

42. The strategic programme is the document that sets mid-term targets and measures for the agreed priorities to be described using indicators as the main tool of communication. Based on indicators, measurable and time-related targets are formulated. If data are missing in the baseline review, the strategic programme should include measures to create these reference data and the corresponding indicators.<sup>32</sup> The action plan is broken down from the strategic programme with a 1-3 year perspective. It should display short-term targets derived from long-term ones and set out measures to fulfil both. The action plan should also define the allocation of human and financial resources as well as responsibilities for implementation.

#### *Political commitment*

43. Political commitment is pivotal and needs to be secured throughout the process. It should be seen as a driving force that stimulates the management cycle and therefore be sought from the very beginning of the process. Once this fundamental decision is made and capacities and procedures for the local Climate Change response management established, formal decision is required at least twice each agreed management period (usually an annual or bi-annual cycle): first, when setting up politically binding climate targets, and secondly for evaluating achievements, concluding the cycle and setting the basis for the following one.

44. During the third step, the strategic programme should be submitted to the city council for approval and legitimization. Many cities choose to also approve the action plan and the entire organisational setup. This formal and regularly renewed Council resolution should be aligned with the annual financial budget decision.

45. If the IMS is not accepted and backed by the city's politicians and the top management, its implementation may never take place due to a high degree of disregard and resulting inaction. Major political groups, the mayor and high-level politicians, stakeholders and the general public should be informed and involved in preparing the strategic programme and action plan. Debate is required and leads to political approval of the strategic programme by the city council to gain legitimacy.

#### *Implementation & monitoring*

46. With the implementation of the strategic programme and action plan, the management cycle reaches its very core: all the preceding assessment, target setting and planning has the overall objective of improving the way the city functions in terms of sustainable development. The implementation is a demanding task in terms of organisation and coordination of all the parallel actions

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<sup>32</sup> On the basis of practically used indicators in Europe, a "Set of Key Indicators for IMS" (available at: [www.localmanagement.eu](http://www.localmanagement.eu)) has been selected to provide orientation to cities and regions. These indicators may be used as a basis but adding specific regional or national key data and indicators need to be considered.

that will usually take place in decentralised responsibility. Turning measures outlined in the action plan into projects requests proper project planning including work-plan, roles and responsibilities for an individual action. These projects might be of different character depending on the issue and the target to reach (e.g. infrastructure projects, construction and design measures, land-use or mobility plans, procurement measures, information and awareness raising campaigns etc).

47. A crucial condition for implementing the action plan is a solid communication and involvement approach and the organisational setup. Cooperation with and between various stakeholders assures that the different actors buy in to the implementation process. Therefore, implementation is based on the “foundation” which is a combination of the action plan, the organisational setup and above all – communication and involvement.

48. In parallel, and for the purpose of being able to measure and report on results, the implementation of the strategic programme and its action plan should be monitored in an appropriate way and fed back to politicians. It allows seeing if actions are implemented with good results. This suggests that monitoring has two aspects, the implementation of actions and their impacts. The latter – environmental impacts – will in some cases only display in longer periods. In all other cases, monitoring will allow for taking corrective measures in case of deviation from the action plan or targets. Again, in order to be able to engage in monitoring, actions need to rely on targets based on indicators defined in the strategic programme.

#### *Evaluation & reporting*

49. After an intensive phase of implementing activities and with the monitoring data output at hand, it is time to evaluate achievements. The data collected through monitoring are used for evaluating both the results obtained through implementation and the way the management cycle is working.

50. Evaluation and reporting is the last step of the cycle and provides the basis for starting a new year with a new cycle. It analyses what has happened during the year in order to understand why things happened or failed. It provides politicians with a basis for further decisions on targets and actions. It provides the stakeholders, including the public, with a report on what the city has done during the year and how they have succeeded in fulfilling targets. The importance of this step is the actual city council decision on how to act on the results of the evaluation process. How will the knowledge gained be used to adapt or set the short-term targets for the next year? What actions should be implemented next year? Is there a need to revise the baseline review because of major changes in the city or its surroundings?

## **IV. The UNISDR Making Cities Resilient Campaign**

### **A. What is the campaign about?**

51. The ‘Making Cities Resilient’ campaign is an initiative of the UN International Strategy for Disaster Reduction (UNISDR) and a number of partners<sup>33</sup> to support cities, towns and their local governments from around the world in becoming resilient to the changing climate and to the increasing frequency and intensity of climate manifestations that result in disasters. This is particularly important at a time when urbanization trends are increasing, and with them the prevalence of informal settlements. The campaign seeks “*to empower local governments with stronger national policies to invest in risk reduction at local level, as part of urban and regional development plans*”. The campaign was originally planned to run from January 2010 until December 2011 and has been extended until 2015.

52. The objectives of the campaign are (i) to inform and raise the awareness of citizens and governments on the benefits of reducing risks at the urban level, (ii) to use local government budgets in a smart way, which enhances the resilience of infrastructures and reduces disaster risk – in other words mainstreaming disaster risk reduction into urban planning and development at the decision-making level – and (iii) to include disaster risk reduction in participatory development and planning processes at the city level to protect critical infrastructure<sup>34</sup>. An overarching objective of the campaign is to build long-lasting partnerships that will support the local, regional, national and supra-national actions and processes in the long term.

<sup>33</sup> They include UN-HABITAT, with its broader World Urban Campaign, along with other UN organizations, city associations and organizations such as UCLG, ICLEI and CityNet, among others.

<sup>34</sup> UNISDR “Making Cities Resilient – ‘My city is getting ready’ – World Disaster Reduction Campaign 2010-11: Frequently Asked Questions”. Available at: [www.unisdr.org](http://www.unisdr.org)

53. Mayors are the main target group of the campaign. Nevertheless, as a resilience building process requires a participatory approach, the actors involved also include all major stakeholders in the city/region.

54. The campaign has developed a list of ten point essentials for making cities resilient, which derives from the priority areas of the UNISDR's *'Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities'* and the principles of sustainable urbanization of UN-HABITAT, with a localized approach. Signatories are expected to implement as many of the following ten points as possible.<sup>35</sup>

1. Put in place **organization and coordination** to understand and reduce disaster risk, based on participation of citizen groups and civil society. Build local alliances. Ensure that all departments understand their role in disaster risk reduction and preparedness.
2. **Assign a budget** for disaster risk reduction and provide incentives for homeowners, low-income families, communities, businesses and public sector to invest in reducing the risks they face.
3. Maintain up-to-date data on hazards and vulnerabilities, **prepare risk assessments** and use these as the basis for urban development plans and decisions. Ensure that this information and the plans for your city's resilience are readily available to the public and fully discussed with them.
4. Invest in and maintain **infrastructure** that reduces risk, such as flood drainage, adjusted where needed to cope with climate change.
5. Assess the **safety of all schools and health facilities** and upgrade these as necessary.
6. Apply and enforce **realistic, risk-compliant building regulations and land use planning principles**. Identify **safe land for low-income** citizens and develop upgrading of informal settlements, wherever feasible.
7. Ensure that **education programmes and training** on disaster risk reduction are in place in schools and local communities.
8. **Protect ecosystems and natural buffers** to mitigate floods, storm surges and other hazards to which your city may be vulnerable. Adapt to climate change by building on good risk reduction practices.
9. Install **early warning systems and emergency management** capacities in your city and hold regular public preparedness drills.
10. After any disaster, ensure that the **needs of the survivors are placed at the centre of reconstruction** with support for them and their community organizations to design and help implement responses, including rebuilding homes and livelihoods.

## B. What are the activities of the campaign?

55. The campaign signatories have the opportunity to become engaged in several initiatives resulting from their commitment and supporting their objective of 'ticking' the ten points for making cities resilient. These opportunities are<sup>34</sup>:

- organising policy dialogues, workshops and other events to raise the profile of urban risk issues, create political space among different stakeholders, and provide opportunities for information and knowledge sharing;
- developing and applying tools aimed at reducing the vulnerability of cities. One example is the Local Government Self-Assessment Tool (LG-SAT), which has been tested in 23 cities that "provide data on 43 key indicators designed to measure the progress of local governments in implementing ten essential actions outlined by the Cities Campaign";<sup>36</sup> organising city-to-city learning and study tours with role model cities, in collaboration with the campaign partners;
- promoting and facilitating access to existing tools and resources for urban risk reduction, particularly through the campaign website and the mailing list.
- developing and contributing to high-visibility initiatives such as the One Million Safe Schools and Hospitals pledging initiative and the International Day for Disaster Reduction. It should be noted that there is no funding assigned to signatories.

<sup>35</sup> UNISDR „Strategy Outline for the 2010-2011 World Disaster Reduction Campaign on Making Cities Resilient, addressing urban risk". Available at: [www.unisdr.org](http://www.unisdr.org)

<sup>36</sup> The testing of the LG-SAT was conducted by UNISDR and ICLEI in cooperation with local governments, with funding from the World Bank and the European Commission's Humanitarian Aid branch, ECHO. Source: <http://www.unisdr.org/archive/24170>.

### C. What does the campaign offer to signatories?

56. First and foremost, joining the campaign represents a direct support to signatory cities in reducing their risk to disasters through implementing the ten essential points for making cities resilient.

57. Partnerships and alliances are pillars of the campaign. Cities and towns need to build fair and comprehensive participatory processes to successfully develop the resilience building process. The knowledge required to move in this direction is provided by the campaign's participating expert organizations, its Advisory Board and the signatory cities themselves, including through the improvement of urban and local governance. Networking opportunities with other signatories and through the city networks that support the campaign can also help to develop knowledge and raise awareness among the local government staff and among citizens. It also offers good visibility to partners in the international arena, and access to influential initiatives, global experts and policy makers.

58. The campaign partners also "*provide support by publicizing success and practice, creating space for learning and meeting and seeking to influence policy makers at all levels*". Furthermore, cities are automatically nominated to the '*UN-Sasakawa Award for Disaster Reduction*.'<sup>37</sup>

### D. How can European cities contribute to the campaign?

59. European cities can contribute to the aims of the 'Making Cities Resilient' campaign in several ways, including:

- i. Through sharing best practices with other cities focusing on governance, sustainable land use and urban planning, and social aspects – all in relation to disaster risk reduction. Technology transfer could represent a valuable part of this initiative.
- ii. Through developing partnerships with cities in low-income countries, as well as in the same (European) country/region, which deliver benefits both ways. For instance, the Swedish city of Växjö has a long history of collaboration with the Province of Bohol in the Philippines in issues of sustainable energy and natural resource management, just as the city of Bologna (Italy) with the Municipal Corporation of Guntur (India).<sup>38</sup>
- iii. Through designing and testing innovative schemes of operation and partnerships with different actors (including business), European cities may demonstrate leadership and pave the way for similar ideas to be replicated elsewhere, creating large potentials for knowledge transfer.
- iv. Through serving as replicators of best practices identified in other regions or continents, and potentially by 'upscaling' those to bigger cities. Practices that have been recognized by the UN- Sasakawa Award for Disaster Reduction, for example, could be transferred and adapted to localities in Europe, expanding the scope of further implementation.
- v. Through lobbying – by themselves and/or through city networks – for example, for enhanced awareness on disaster risk reduction, for mainstreaming of disaster risk management, and for increased support to low-income countries vis-à-vis national and supra-national levels.

60. The diversity of cultures, landscapes and ecosystems existing within the European continent, creates different conditions for cities which thrive and are impacted by a wide range of phenomena and natural disasters. They have the potential to design, collaborate and apply solutions of different types and develop best practices that can be applied elsewhere with the support and through the channels of the campaign.

### V. Conclusions

61. This explanatory memorandum describes the risks faced by cities, stemming from both climatic and non-climatic pressures. It then considers what the pieces that construct a resilient city may be, wherein resilience may lie (suggesting that it should be embedded within sustainability criteria) and how efforts of climate change mitigation, climate change adaptation and disaster risk reduction may be aligned; not least with the backdrop of 'sustainable' growth and economic development pressures placed in the highest priority of Europe's agenda today.

<sup>37</sup> Awarded to an individual or institutions that have taken active efforts in reducing disaster risk in their communities and advocates for disaster risk reduction. Source: <http://www.unisdr.org/we/campaign/sasakaw>

<sup>38</sup> Some of these collaborations take place in the context of the Europe Aid funded DREAMS project (<http://dreams.ecobudget.org/home/>).

62. The UNISDR 'Making Cities Resilient' campaign has attracted cities from regions all around the world – developed and developing – who have committed to making efforts to reduce the impacts of natural disasters, particularly their associated damages in monetary and human terms. The prolongation of the campaign until 2015 is a positive sign that should encourage cities to become further engaged in this initiative and to further build their resilience to climate change and natural disasters.

63. The activities of the Congress of Local and Regional Authorities have a potential to spur action, particularly if its scope of work effectively takes an overarching view that builds on disaster risk reduction and management, works with climate change mitigation and adaptation, and builds resilience within a sustainability vision.

**Appendix: Case studies**

**Venice, Italy**



Image:Flickr, wanderlass

The impacts of climate change are severely threatening the existence of the City of Venice. Rising tides are increasing the possibility of wide-spread and permanent flooding, which would devastate the historic city. In 1966 the city flooded, displacing 5,000 people from their homes and destroying €6 billion worth of artwork.

The increase in water levels also poses a threat to the brickwork covering the edges of the island, which is necessary to prevent erosion. Tides are rising above previously implemented safeguards and are permeating the stone, eroding mortar and leading to salination. This occurrence is also endangering the stability of water-front buildings.

In response to these conditions, the city authorities are undertaking a wide-ranging adaptation plan, aimed at reducing future impacts and making the tourist destination and cultural site safe.

As well as the maintenance carried out by public utility Insula spa, such as raising the margins of islands and canals, raising urban surfaces and restoring brickwork to prevent water seepage, the city is currently instituting a new system to tackle the problem of flooding.

The city lies in the middle of a lagoon and is separated from the sea by thin strips of land. The lagoon drains and fills up with sea water twice a day, through three inlets. The MOSE project (Modulo Sperimentale Elettromeccanico / Experimental Electromechanical Module) aims to protect against unusually high tides through blocking all three inlets via remote controlled underwater doors.

Rows of mobile doors (78 barriers) will close off the Venetian lagoon from the Adriatic Sea when sea level exceeds 110cm and up to 3 metres. The barriers will lay on the sea floor until high tides are forecast, when they will inflate and rise to the surface to act as floodgates.

Work on the project, which started in 2003 was designed to take into account the predicted sea rise as a result of global warming with a budget of €4.7 billion. It should be completed by 2014.

Providing smart technical solutions to prevent expected impacts of climate is an important aspect of a city's resilience building.

**City in profile**

**Size:**

- Megacity.....
- Large.....
- Medium or small.....

**Economy:**

- Developed country.....
- Emerging economy.....
- Developing country.....

**Climate classification:**

- Tropical.....
- Dry.....
- Temperate.....
- Continental.....
- Polar.....
- Alpine.....

**Climate change challenges faced:**

- Sea level rise.....
- Increased heavy precipitation..
- Decreased precipitation.....
- Increased temperature.....
- Wind storms.....

**Natural disasters faced:**

- Cyclones/Hurricanes
- Earthquakes/Tsunamis
- Earthquakes
- Volcanic eruptions
- Flooding

**Main socio-economic challenges faced:**

- Poverty/Lack of sanitation
- Lack of access to education
- Migration
- Income inequality
- Corruption/Lack of democracy
- Increased resource use
- Disease/malnutrition
- Insecurity

**Response (in this example):**

- Economic incentives.....
- Infrastructure improvement.....
- Use of natural systems.....
- Strengthening governance.....
- Other.....

**The city has developed an adaptation plan**

**Rotterdam, The Netherlands**



A water plaza. Image: <http://www.waterpleinen.com/Watersquares.pdf>

Rotterdam, the second largest city of The Netherlands, is highly exposed to climate phenomena and to climate change impacts. With large sections of its area located below sea level, the region is facing increased rainfall, more frequent floods, sea level rise and increasing temperatures.

Aware of its vulnerabilities, the city makes the climate threat an opportunity to enhance its attractiveness, accessibility, knowledge, innovation and business potential. Through an adaptation strategy 'Rotterdam Climate Proof', started in 2008, it expects to achieve 100% resilience by 2025. The strategy is based on three pillars: Knowledge, Actions and Exposure. The first one consists of enhancing the understanding of all stakeholders with respect to issues relevant to the city. Efforts are also dedicated to the development of knowledge sharing networks (e.g. 'Connecting Delta Cities').

Rotterdam is a city of Action, testing ground-breaking ideas on water management and delta technology. For instance, water plazas are especially designed to serve as recreation centers both in times of dry weather as well as of heavy rain – when the plaza provides the additional service of water storage. Another example is the future development of floating constructions and adaptive buildings.

Regarding Exposure, Rotterdam shows that difficulties can be overcome even when faced with significant obstacles; that delta cities can be resilient by cleverly embracing climate and non-climate challenges. The city collaborates with the national government as well as with cities and institutions abroad.

The three pillars of Rotterdam's climate adaptation strategy are further elaborated into five themes: flood management, accessibility, adaptive buildings, water system and urban climate. This case shows that resilience building and disaster risk preparedness require a thorough understanding of local realities, relevant exchange of knowledge, and political and stakeholder leadership that supports the implementation of innovative solutions. Rotterdam is a living proof that challenging the traditional conceptualization of systems is increasingly becoming a need rather than an option.

**City in profile**

**Size:**

- Megacity
- Large
- Medium or small

**Economy:**

- Developed country
- Emerging economy
- Developing country

**Climate classification:**

- Tropical
- Dry
- Temperate
- Continental
- Polar
- Alpine

**Climate change challenges faced:**

- Sea level rise
- Increased precipitation heavy
- Decreased precipitation/Drought
- Increased temperature
- Wind storms

**Natural disasters faced:**

- Storms/Cyclones/Hurricanes
- Earthquakes/Tsunamis
- Landslides
- Drought
- Flooding
- Coastal erosion

**Main socio-economic challenges faced:**

- Poverty/Lack of sanitation
- Lack of access to education
- Migration
- Income inequality
- Corruption/Lack of democracy
- Increased resource use
- Disease/malnutrition
- Insecurity

**Response (in this example):**

- Economic incentives
- Infrastructure improvement
- Use of natural systems
- Strengthening governance
- Other

**The city has developed an adaptation strategy**



## Manchester, United Kingdom



Manchester, with more than 400,000 inhabitants, is experiencing increasing effects of a changing climate among which floods, heat waves and a higher probability of storms.

In 2008, the *Commission for the New Economy* published the "Mini-Stern" report, which found that failure to adapt to the policy, legislative and physical demands of climate change could lead to a potential loss of £20bn to the economy of the City Region by 2020.

The University of Manchester, the City Council and Red Rose Forest worked in partnership to develop the Greater Manchester Local Climate Impacts Profile (GM-LCLIP). It identifies the principal weather related impacts which have occurred in the past 50 years and can then be used to predict the likely weather and climate related impacts. Climate modelling techniques will be used.

In addition, the vulnerability of priority services were assessed, as well as current and future weather events affecting the city.

The feasibility of objectively costing the risks and impacts of climate change was checked. This collaboration has helped to raise the awareness of the need of risk management and has developed new successful working partnerships.

The Greater Manchester Climate Change Strategy (GMCCS), published in 2011, identified four priority areas: Economy, CO<sub>2</sub> reduction, Adaptation and Culture Change. It aims at a rapid transition to a low carbon economy while creating future jobs and new industries in the 'green' sector. At the same time a reduction of emission by 48%/40% from 1990/2005 base years is planned by 2020. In the area of adaptation a special focus is put on the preparedness for a changing climate, in particular flood risk management and the management of heat waves. Besides, the city aims at an increased "Carbon literacy" embedded into the daily life and culture.

Manchester is already contributing to the delivery of GMCCS through programmes in conjunction with the nine other Greater Manchester Local Authorities, as the Green Roofs Programme Manchester.

### City in profile

#### Size:

- Megacity
- Large
- Medium or small

#### Economy:

- Developed country
- Emerging economy
- Developing country

#### Climate classification:

- Tropical
- Dry
- Temperate
- Continental
- Polar
- Alpine

#### Climate change challenges faced:

- Sea level rise
- Increased precipitation heavy
- Decreased precipitation/Drought
- Increased temperature
- Wind storms

#### Natural disasters faced:

- Storms/Cyclones/Hurricanes
- Earthquakes/Tsunamis
- Landslides
- Drought
- Flooding
- Coastal erosion

#### Main socio-economic challenges faced:

- Poverty/Lack of sanitation
- Lack of access to education
- Migration
- Income inequality
- Corruption/Lack of democracy
- Increased resource use
- Disease/malnutrition
- Insecurity

#### Response (in this example):

- Economic incentives
- Infrastructure improvement
- Use of natural systems
- Strengthening governance
- Other

#### The city has developed an adaptation strategy