CATALYST

CAPACITY DEVELOPMENT FOR HAZARD RISK REDUCTION AND ADAPTATION

BEFORE DISASTER STRIKES: TRANSFORMATIONS IN PRACTICE AND POLICY

European Mediterranean Region

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CATALYST

Funded by: the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement 283177
Duration: October 2011 - September 2013
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EUROPEAN COMMISSION

SEVENTH FRAMEWORK PROGRAMME

CATALYST

- *CATALYST was conceived to compile and disseminate the best knowledge currently available in the fields of Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA).*
- *CATALYST's added value lies in its Think Tank: more than 120 regional experts who supported the identification of best practices and policies that could transform a region's approach to DRR/CCA.*
- *CATALYST's regional and multi-regional workshops and virtual meetings have fuelled a productive exchange and circulation of ideas, suggestions and knowledge, leading to the development of four Best Practice Papers.*
- *CATALYST's Best Practice Papers are aimed at policymakers. Based on the knowledge of the Think Tank Members, they describe what the CATALYST project considers to be key practices that could lead to transformations in a region's capacity for DRR and CCA, and to improve the early planning of regional strategies to reduce risks resulting from natural hazards and climate change.*
- *To avoid a one-size-fits-all approach to DRR and CCA, CATALYST's Best Practice Papers have been specifically tailored to four extremely disaster-prone regions of the world – East and West Africa, Central America and the Caribbean, European Mediterranean and South and South-East Asia.*
- *This Best Practice Paper examines the European Mediterranean Region.*

Contents

Why CATALYST?

We cannot avoid living in the shadow of natural hazards. But we can, indeed should, take adequate measures to reduce the risks that hydro-meteorological hazards – likely to become more intensified by climate change – and geological hazards pose to our lives, and mitigate the impact on people, assets, and the environment.

CATALYST – Capacity Development for Hazard Risk Reduction and Adaptation – is an EU FP7-funded project aimed at strengthening capacity development for Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA). The project has focused on four of the most disaster-prone areas in the world – East and West Africa, Central America and the Caribbean, the European Mediterranean, and South and South-East Asia, seeking to identify the best knowledge available in DRR and CCA.

CATALYST's added value stems from a multi-regional Think Tank which is global in extent but regional in implementation: more than 120 experts from the four regions have analysed current regional DRR and CCA practices and identified some of the best approaches available today. The interdisciplinary nature of this group of experts, including representatives from intergovernmental and governmental organisations, NGOs, the scientific community and the private sector, has ensured the merging of diverse knowledge and the identification of key gaps in risk reduction measures. It has provided international networks of researchers, practitioners and policymakers with tools to strengthen existing activities, and may ultimately contribute to more focused and efficient action plans.

CATALYST REGIONAL FOCUS

1.

Living in a vulnerable place

Planet Earth is a living system with natural equilibria and resilience. However, population growth, increased food demand, urbanisation, and activities with high impacts on ecosystems, are dramatically changing our world. At times, the Earth fails to cope with perturbations that challenge its balance, and the escalation in natural disasters observed worldwide during the last decades is a sign we should take into greater consideration.

Natural disasters have always swept the Earth, prompting people to learn to live with some degree of risk. With time, prosperous communities have succeeded in setting up strategies to protect themselves. But vulnerable populations who rely on natural resources to make a living have often massively suffered from the fury of natural elements.

Today, the risk posed by natural disasters is oftentimes reinforced by systemic and human-induced climate change that alters both the frequency and the magnitude of extreme events. According to the Centre for Research on the Epidemiology of Disasters (CRED, www.cred.be) at the Université Catholique de Louvain, natural disasters increased by 233% from 2000 to 2009 compared with the period 1980 to 1989, and by 67% compared with the period 1990 to 1999 (see Table 1 for more details on disaster events). As the Food and Agriculture Organization notes (FAO, 2008)[1], the expected frequency and intensity of extreme climate events is likely to worsen the scale of disasters, with multiple side effects affecting agriculture production, food availability, human health, and a potential rise in social conflicts. Since the beginning of the 1970s, public-political awareness of how disasters evolve and the scientific understanding of their causes have grown in parallel. At that time, however, approaches to mitigate their impact on society were based on previous experience and were, in general, poorly coordinated.

The risk posed by natural disasters is oftentimes reinforced by human-induced climate change that alters both the frequency and the magnitude of storms.

Today, the approaches to Disaster Risk Reduction are based on preparedness, response, and on mitigation and prevention. In addition, DRR and CCA principles are being adopted by (inter)governmental agencies and NGOs as well as private companies and research organisations.

[1] Climate Change and Disaster Risk Management. Technical Background Document from the Expert Consulation Held on 28 to 29 February 2008. FAO, Rome. [Online] Retrieved from: http://bit.ly/164mMtL

NUMBER OF SIGNIFICANT DISASTERS

	Drought	Extreme temperature	Earthquake	Flood	Mass movement wet	Storm	Volcano	Wildfire
East Africa	58	-	14	191	12	56	5	2
Central America and Caribbean	21	9	24	155	16	198	7	5
West Africa	15	1	-	133	4	12	-	1
South East Asia	14	-	50	259	51	155	20	7
South Asia	13	43	63	273	37	97	-	1
European Mediterranean	4	38	31	110	-	46	1	28

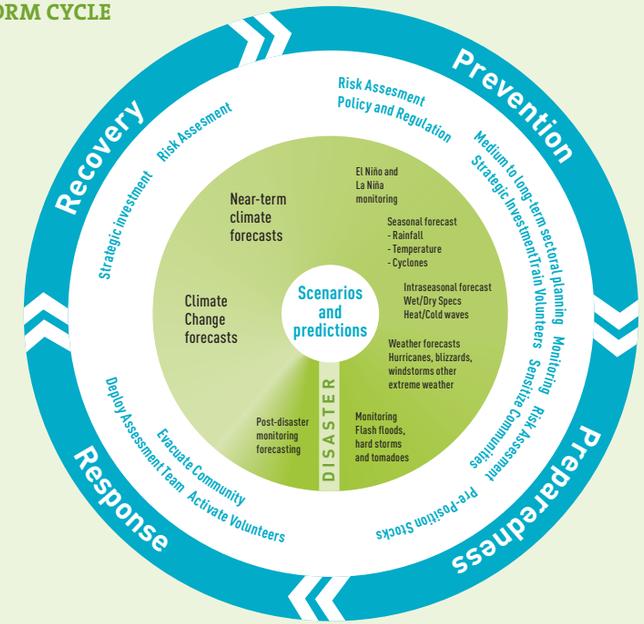
TABLE 1: *Numbers and categories of significant disasters that have plagued CATALYST's geographic sub-regions over the period 2000-2010 (based on CRED's Emergency Events Database EM-DAT, www.emdat.be).*

1.1 From emergency response to DRR planning

Until the 1990s, disaster management was essentially exercised as emergency response. Disaster management refers to measures which are implemented once a calamity has hit a region, calling for capacities to contain the damage and protect human lives. But experience has taught us that natural hazards can best be dealt with by additionally adopting a DRR approach that also builds upon adaptation and preparedness. Addressing risks with the goal of reducing them denotes the existence of an *a priori* policy objective and of strategic actions aimed at anticipating future events, to reduce exposure and vulnerability, and improving resilience.

Today, much emphasis is therefore not only placed on the avoidance of adverse impacts of hazards, but also on managing the residual risk over the long term within the framework of Disaster Risk Management (DRM). We are now witnessing the evolution of policies that include a requirement for Disaster Risk Reduction planning. In parallel, rising awareness of the role of CCA is fuelling coordinated efforts in these fields (see the figure below on the integration of climate information into the DRM cycle).

DRM CYCLE



1.2 One solution *does not* fit all

Reducing the risk of natural disasters, e.g. by lowering social vulnerabilities, requires a wide range of actions. This calls for the identification of the drivers of disasters and of strategies to decrease their impact, through coordinated and systematic efforts. At the same time, it requires the implementation of measures that enhance safety and resilience of people and their goods; the adoption of political strategies aimed at a far-sighted use of land and territory; the enhancement of preparedness and recovery, and well-devised communication plans at all levels. Today, effective strategies to reduce natural risks must consider that Climate Change Adaptation also plays an important role in Disaster Risk Reduction, as highlighted in, for example, the Hyogo Framework for Action (see QR code).

Equally important is the fact that different regions of the world have specific biophysical and socioeconomic characteristics, for example, the difference in vulnerability patterns that rural and urban communities exhibit. Rural areas have a sound heritage of traditional knowledge that often goes underestimated. It is important to keep these differences in mind and to maximise the benefits coming from both environments and experiences through policy and planning mechanisms.

THREE LEVELS OF ACTION

Actions within the frame of DRR and CCA should unfold at three different levels, merging the needs of smaller communities with policies at the international stage. If properly coordinated, these actions ensure that interventions have a continuum and develop the capacities of individuals, organisations and societies.

- **Community-level approach** – Small communities react to disasters on the bases of local concerns and priorities. Successful risk reduction measures should build upon local strategies, and promote the development of early-warning systems, policy changes and communication strategies aimed at protecting the most vulnerable groups.
- **National-level approach** – Comprehensive actions and coordination among ministries are desirable, along with *ad hoc* legislation and nationally adapted plans of action.
- **International-level approach** – It is important to identify the existing knowledge promoting cross-cutting coordination, and securing, at the same time, political commitment and financial resources.

2.

European Mediterranean Region

In the European Mediterranean region, there has been an average of 58 disasters per year between 2001 and 2010, making it one of the more disaster-prone regions in the world. High population density and substantial levels of tourism increase human exposure to the hydro-meteorological and tectonic hazards that threaten the region.

2.1 Key vulnerabilities

In the European Mediterranean region (EUM), droughts, earthquakes, floods, storms, wild fires and heat waves are the most common hazards. However, and perhaps surprisingly, despite the strength of research and policy making at the regional level, the biggest obstacle in enacting local DRR in the EUM region is that it is often not a priority and therefore does not receive enough attention and resources. If more resources are to be put into DRR, then awareness of the importance of preparedness and adaptation needs to be raised among authorities and the public.

Climate projections suggest a decrease in water availability of 20 to 30 percent, or 40 to 50 percent depending on the scenario.

This Best Practice Paper focuses on three hazards which CATALYST Think Tank Members (TTMs) from the region felt to be most important to manage: droughts, earthquakes and floods.

As noted above, drought is common in the European Mediterranean region. According to the Centre for Research on the Epidemiology of Disasters (CRED) Emergency Events Database (EM-DAT), from 1975 to 2011, droughts in this region caused approximately US$14 billion in damage, mainly as a result of reduced crop yields (see Table 2).

The frequency of this hazard event is predicted to increase in the future. According to climate model projections[2], temperatures are going to increase in the region, and overall rainfall will likely decrease. Spain may well face year-long droughts in increasing quantities; southern France may also have to contend with droughts lasting months. This situation will put increasing pressure on river and groundwater resources, leading to water scarcity. Climate projections suggest a decrease in water availability of 20 to 30 percent, or 40 to 50 percent depending on the scenario. This will result in further agricultural yield losses in the region, and potential shortfalls in domestic water supply.

[2] Behrens, A. et al. (2010). Future Impacts of Climate Change Across Europe. CEPS Working Document No. 324. (www.ceps.be/ceps/dld/2972/pdf)

NUMBER OF NATURAL DISASTERS	Drought	Earthquake	Extreme temperature	Flood	Mass movement wet	Storm	Volcano	Wildfire	TOTAL
Damage (US$ million)	14.390	62.832	10.827	35.440	1.379	28.545	3	6.917	160.333
People affected (x 1000)	9,200	6,885	18	2,597	14	4,593	7	28	23,342
Deaths	0,940	29,351	58,330	860	360	454	10	200	89,565

TABLE 2: *Total damage, people affected and deaths by disaster type for the period 1975-2011. Source: EM-DAT: The OFDA/CRED International Disaster Database http://www.emdat.be – Université Catholique de Louvain*

3.

A focus on three hazards

Between 1975 and 2011, earthquakes caused the highest economic damage and the second highest number of fatalities of all potential hazards in the region. Floods have resulted in the second highest levels of damage in monetary terms. And while drought has contributed to less than half the economic damage caused by floods, this will change as the frequency and intensity of these events increase.

1970
• First Italian law to assist populations hit by natural hazards

1976
• Friuli Venezia Giulia (Italy) earthquake (940 dead, 2400 injured; 43 villages severely damaged)

1980
• France established the Plan d'Exposition aux Risques

1992
• The Italian National Service of the Civil Protection founded; the European Community Humanitarian Aid Office (ECHO) established

1996
• A Council Regulation mandated the European Community Humanitarian Office (ECHO) to provide emergency assistance to disasters' victims

1997
• Marche and Umbria (Italy) earthquake (80,000 buildings damaged)

Major natural disasters and milestones in DRR and CCA since 1970

3.1 Faultlines

Earthquakes pose a threat to the European Mediterranean region, since the north-eastern Mediterranean region is located on active tectonic faults. Istanbul, built on the Great Marmara fault, has, on average, experienced a major earthquake once every century. In 1999, an earthquake struck Izmit, Turkey, causing 17,000 deaths and EUR 11 billion in damages. In 2009, the L'Aquila earthquake struck in the region of Abruzzo, Italy. A thousand people were left homeless, more than 10,000 buildings were damaged, and the total damage was EUR 2 billion.

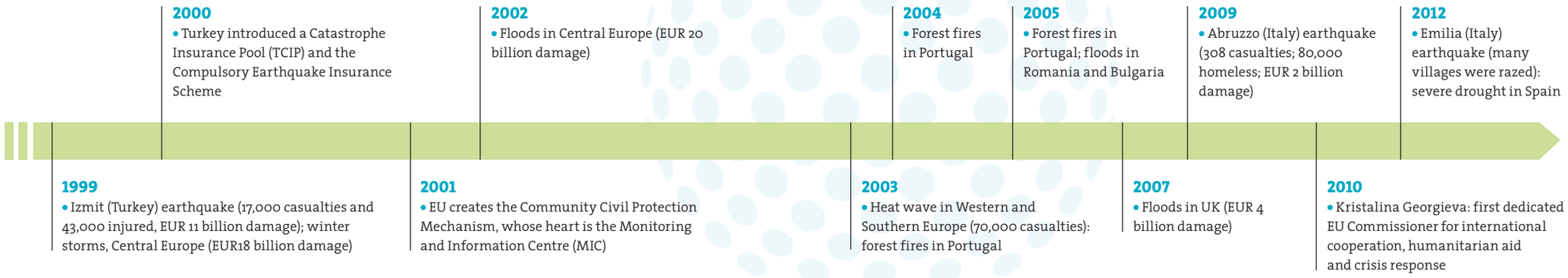
Recent research has stressed that Istanbul's existing earthquake early warning system (EEWS) in place since 2002 should be continuously improved by, for example, adjusting the placement of seismometers or changing the early warning algorithm for calculating seismic hazards.

Urban areas are, predictably, more vulnerable to earthquakes than rural areas, not only because of their density and more complex built environment (larger buildings, closer proximity, denser utilities systems, etc.), but also for reasons related to construction techniques. Construction techniques may be often outdated, or building codes are not enforced, and fragile buildings cannot be strengthened without large investments.

The risk of future earthquakes is a grave concern in the region. It is estimated that Istanbul faces a 30 to 60 percent chance of suffering a major earthquake within the next 25 years[3].

Recent research has stressed that Istanbul's existing earthquake early warning system (EEWS) in place since 2002 should be continuously improved by, for example, adjusting the placement of seismometers or changing the early warning algorithm for calculating seismic hazards.

[3] Behrens, A. et al. (2010). Future Impacts of Climate Change Across Europe. CEPS Working Document No. 324. (www.ceps.be/ceps/dld/2972/pdf)



Major natural disasters and milestones in DRR and CCA since 1970

3.2 Flood hazards

Two different types of flooding hazards may strike this region: flash flooding from rivers, and coastal flooding by seawater. Across the European Mediterranean countries, flooding results in the second-highest levels of damage in monetary terms[4]. In the two decades from 1990 to 2010, Italy, France, Spain, Greece, Slovenia and Albania registered flood damages of EUR 21.4 billion, mostly due to floods striking tourist coastal towns built without adequate protection, or rivers with floodplains where land use has been changed from forestry and agriculture to industry and housing[5].

Flash flooding takes the form of localised, sudden-onset floods and is commonly associated with extreme rainfall delivering a lot of rain in a short space of time, on land that is already either too dry or too wet. In this region, projections suggest that the likelihood of extreme rainfall events occurring will increase, leading to a higher risk of river flooding in winter[6], and this will be exacerbated by the increasing numbers of droughts. Drought worsens the problem of flash flooding, since high levels of rain falling on dried-out land will run off across it and down gulleys and river systems, rather than soak away into the ground.

A potentially serious hazard in the EUM region is coastal flooding. The Intergovernmental Panel on Climate Change (IPCC) has identified potential increases in coastal flood damage, due to storm surges, tsunamis and sea level rise.

According to the European Commission, by 2100, a half metre rise in sea levels in the region would double the probability of flooding in landmark coastal cities[7].

[4] van der Keur, P. et al. (2013) European Mediterranean Regional Workshop, in Hare M. & van Bers, C. (Eds), CATALYST Regional workshop reports. Version 1. July 2013. (www.catalyst-project.eu)

[5] Centre for Research on the Epidemiology of Disasters (CRED), Emergency Events Database EM-DAT, www.emdat.be

[6] Mysiak, J. et al. (2012) CATALYST Report on issues, gaps and opportunities, network coverage. CATALYST project deliverable D2.2., version 1,0 (www.catalyst-project.eu)

[7] Behrens, A. et al. (2010) CEPS Working Document No. 324/ February 2010 (www.ceps.eu)

3.3 Monitoring and forecasting floods and droughts

Monitoring networks that measure precipitation and river discharge often lack the fine resolution to detect flash floods, and thus forecasting of such events is uncertain. The EU-funded HYDRATE[8] project has sought to improve the scientific basis of flash flood forecasting by extending the understanding of past flash flood events, as well as advancing and harmonising a European-wide innovative flash flood observation strategy, and developing a coherent set of technologies and tools for effective early warning systems.

The European Union is developing parties that could support the EUM region in monitoring and risk management such as the EDO, aimed at providing a wide picture of the occurrence, severity, extent and duration of droughts.

Drought forecasting is also recognized as a difficult task. The state-of-the-art seasonal forecast models show drought onset conditions only a few weeks in advance, which limits the ability to predict drought conditions in time for proactive responses. The European Union is developing institutions that can support drought monitoring and risk management. One of these is the European Drought Observatory (EDO), which seeks to provide a European-wide picture of the occurrence, severity, extent and duration of droughts, including direct access to information provided by national, regional and local services. These data are freely accessible from the JRC website (http://edo.jrc.ec.europa.eu). The European Committee of the Regions has proposed to turn the EDO into a broader-mandated European Water Observatory, "validating and ensuring the uniformity of available information on the condition of European water resources"[9].

[8] http://www.hydrate.tesaf.unipd.it/

[9] Committee of Regions, ENVE-V-008, 2011 (http://bit.ly/1b90V50)

4.

From goodwill to best practices

CATALYST partners and Think Tank Members (TTMs) have discussed the state-of-the-art measures employed and actions undertaken by governments as well as non-governmental organisations in the European Mediterranean countries to reduce risks associated with natural disasters and to cope with climate change. The following pages provide recommendations for best practices that have the potential to transform Disaster Risk Reduction and Climate Change Adaptation in the EUM region.

4.1 BP 1: building a stronger institutional foundation

The European Mediterranean region, with its high development standards, belongs to a privileged world. However, it still needs to strengthen the institutional approach to disaster risk reduction and climate change adaptation at both local and national levels. A new approach would call for the integration of policies at all levels and for more focus on the implementation and enforcement of existing legislation that supports risk reduction and adaptation.

The Procedure

At the national level, integrated actions should be institutionalized by merging disaster risk reduction and climate change adaptation planning into national schemes. CATALYST's TTMs suggested that, when national action plans are missing, countries of the EUM region should adopt the National Adaptation Programme of Action (NAPA) process. Steps for integration include analysing current and future climate change scenarios, compiling and communicating national adaptation plans, and developing a (long-term) national adaptation implementation strategy[10].

Disaster Risk Reduction and Climate Change Adaptation are two sides of the same coin, and should be addressed by incorporating both into national planning.

Spain suffers from a highly irregular distribution of water resources[11]. Therefore, it has developed a multi-scale water management strategy which includes the development of drought plans, supported by a national drought indicator system, for every river basin. Those plans facilitate the prediction of possible impacts that drought-prone areas might suffer, and favour mitigation actions by establishing links between the drought status and the management actions to be implemented in each river basin. A major outcome of this initiative is a catalogue of management actions that offers strategies to reduce water demand and establish priorities in water usage, as well as the provision of emergency actions.

A further example, Italy's National Action Plan, addresses drought and desertification[12]. This plan was enacted within the legally binding context of the United Nations Convention to Combat Desertification. It aims at facilitating coordination among stakeholders through better sharing of knowledge and information on drought development and related measures. The plan also supports the generation of lower level Regional Action Plans through technical assistance and training activities.

[10] http://unfccc.int/resource/docs/publications/publication_ldc_napp_2013.pdf

[11] Estrela and Vargas (2012), http://bit.ly/1bh8qb2

[12] http://bit.ly/16ug5jo

Applicability of the practice

Policy and legislative integration is resource intensive. Political agendas should allot adequate resources to implementing drought management plans, focussing their efforts on engaging both human and organizational capacities. The willingness to change current practices and the legislative incentives to build a sustainable culture of integrated planning are vital elements of a stronger legislative foundation.

4.2 BP 2: assuming leadership

Leadership, especially by governments, is critical for improving the management of communication, and launching and maintaining new measures. However, a major obstacle to improved leadership on DRR in the European Mediterranean region is that risk reduction and climate change adaptation are seldom considered a priority and do not receive enough attention and resources.

Strong leadership may also be derived from public-private partnerships, a trend that has been pursued in the EUM region for at least 20 years. Synergistic work with the private sector can allow the scientific community and public authorities, in some cases, to have a significant impact on drought and flood management. This success is due to the ability to support many forms of entrepreneurial and collaborative approaches by engaging in a broader spectrum of partnerships.

The procedure

Spain has opted to increase leadership capacities in hazard risk management as a result of climate change impacts and the need to be better prepared for drought. In order to support leadership, and in line with other similar EU initiatives, Spain and Portugal are developing leadership capacities among students and professionals for leadership through training. Practitioners in the EUM region interested in leadership training may enrol in various short and long term programmes. One example of the training available is the course on drought management plans and climate change responses available from the National Research Council of Italy's Water Research Institute, (see QR code). The Climate Service Centre (CSC) in Germany offers Self-Leadership and Empowerment Seminars (SLE-Seminars) for disaster risk reduction (www.climate-service-center.de).

Applicability of the practice

Effective leadership relies on several fundamental elements, most importantly, the legal integrity of governments and administrations. An important gap in the effectiveness of leadership is the need to deal with corrupt practices. At the same time, effective leadership calls for a shift from the "actions when needed" approach to the "learning from mistakes" approach, thus avoiding the unintentional consequences of poor interventions.

In several areas of the European Mediterranean region, such as Spain and Italy, many groundwater wells for irrigation were established some decades ago. A number of these wells, within some river basins, are still illegal. This situation results in a chronic lack of knowledge about the volumes of extracted water which makes this a difficult context in which to address the problem. Gaps in data collection and inadequate monitoring of hydrological data in recent decades can trigger water conflicts, increasing uncertainty and ambiguity at the preventative and organizational levels.

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4.3 BP 3: integrating flood and drought management

Drought and flood hazards interact and may pose what is technically known as *multiple hazards* to society, with droughts, for example, having the capacity to increase the chances of flash flooding (as described on page 12). It therefore makes sense to manage these two hazards

together, i.e. to adopt long-term and integrative, preventative strategies for managing both flood and drought risks (see the concept of Integrated Flood Management)[13].

As the occurrence of extreme drought and flood events increases in the region, governments will no longer be able to rely on purely structural measures to manage these events: systems of dykes and water supply infrastructure cannot be endlessly expanded. Responsible agencies and organisations need to implement long-term adaptation and risk reduction measures that include more non-structural approaches. These decisions may result in the implementation of politically unpopular measures. As a result, building on leadership through multi-sectoral collaboration is not only desirable, but necessary.

The procedure

Measures identified by the Think Tank Members for managing both flood and drought risks involve strengthening the links between urban and rural communities, in order to implement mutually-supportive strategies aimed at reducing the impacts of these hazards. For example, in urban areas, excess rainwater could be supplied to nearby agricultural areas in times of drought, in return for rural communities giving over agricultural land in floodplains to be flooded, and thus reducing the flood risk in the urban areas. The latter strategy is exemplified by "room for rivers" (see QR code). Alternatively, when drought strikes, an emergency tax on agricultural water use might be applied to fund flood water retention areas, thus providing water for domestic and agricultural use during future shortages. As an alternative, farmers give up the right to irrigate their land during drought in exchange for state compensation[14]. Institutional arrangements could be set up so that urban areas with high water consumption may support prevention and preparedness measures, and provide financial compensation for losses suffered by rural farmers as a result of floods and droughts. In these ways, the urban-rural nexus can be instrumental in providing both risk reduction and disaster relief.

Strengthening the links between urban and rural communities can be instrumental in achieving both risk reduction and disaster relief.

[13] www.apfm.info/publications/concept_paper_e.pdf

[14] http://bit.ly/1epL6Y6

Applicability of the practice

To implement these practices, substantial barriers must be overcome. Adequate budgets must be allocated; the 'room for rivers' approach, for example, needs substantial financial resources. But leadership, governance, multi-sectoral negotiation and enforcement measures are also part of this picture. Communication campaigns to inform the public are also an intrinsic component of a successful strategy.

The transfer of surplus water from urban to rural areas requires sound infrastructure investments, and once the urban areas begin to require the surplus water for their own needs, such schemes would be hard to reverse if and when the urban area needed the water. The political cost of stopping supplies to rural areas tends to be too high. Adaptive legislation and agreements, which allow for changes in the water transfer regimen (should the circumstances, or climate, change), have to be set up.

ROOM FOR RIVERS

The risk of flooding can be reduced by providing extra room for rivers, so that, if they overflow, damage is either eliminated or minimised. This requires changes in land ordinance as well as zoning laws to limit the presence of humans, buildings and vulnerable infrastructures on identified floodplains. To reduce the damage caused by drought, or to recharge groundwater basins and to protect vulnerable cities, the creation of natural flood water storage (retention) areas would be advisable. Leaving "room for water" in coastal areas in case of storm surges would be a similar strategy. Example: Cologne (Germany) is employing "room for rivers" measures to protect infrastructure and livelihoods from particularly dangerous, 200-year flood risks. The latest room for river measure to be implemented is the "Köln-Worringen" water retention area, which has the potential to divert 30 million cubic metres of flood water away from the city, into a polder that normally contains agricultural land, a nature conservation area and some buildings. The water authority has the power to close off access to the polder area before and during flood events.

The city knows it cannot rely on dykes in all flooding situations (see QR code).

4.4 BP 4: enhancing preparedness to earthquakes

Europe has many urban areas endowed with robust infrastructure for dealing with disasters. Fire brigades, police, military forces, Red Cross/ Red Crescent, hospitals and other services and facilities guarantee their action in emergency situations. However, when a major disaster such as an earthquake occurs these services are often overwhelmed. Since earthquakes usually occur with little or no warning, comprehensive planning and preparation are essential for reducing causalities and damage. There is much untapped potential for more widespread and effective response to earthquake events. Part of the potential lies in the role that citizens may have. The willingness to help (volunteerism) among citizens is often high just after such events, but, in general, they lack adequate training to be more effective in providing assistance. Citizen training and awareness raising programmes are often inexpensive and easy to implement.

The procedure

Training citizens – especially with first-response courses – can significantly enhance earthquake preparedness and response. Through simulation training, citizens learn where they should convene when an earthquake has struck and, as part of a citizen-based first-response team, they learn how to direct other citizens. Such training can be implemented for any group at any level, including schools, which might incorporate specific training as a part of their curricula. Raising awareness on the contents of an emergency kit is particularly valuable for households.

After disaster strikes, often systems of preparedness improve. The European Mediterranean for example could benefit from the practices of Mexico City with its obligatory city-wide simulation training that requires the participation of all public institutions every year on the anniversary of the 1985 earthquake. The region can also look to Istanbul for good practices. First of all, while unobligatory for all public institutions, in Istanbul there are earthquake drills in schools. Istanbul also has neighbourhood containers containing materials related to search and rescue and immediate recovery. Evacuation routes and shelter areas are displayed by signs and maps. The city has community teams active in emergency situations, for example escorting the public to safety, disseminating information, etc., as well as NGOs, such as the Civic Coordination Against Disasters which provides support to the work of volunteers and practitioners[15].

Contact: Dr. Ebru Gencer – Centro Euro-Mediterraneo sui Cambiamenti Climatici (CMCC, see QR code), Venice, Italy (ebru.gencer@gmail.com).

Applicability of the practice

It is impossible to foresee earthquakes, but avoiding their destructive power is, to an extent, feasible. Preparedness, that is the ensemble of precautions and actions that need to be taken before an earthquake strikes, must be implemented before the "next quake", with the aim of avoiding or reducing damages to properties, goods and people in times of urgency and emergency.

However, preparing for the next earthquake is not always easy. Family and community actions may be organized following specific sets of guidelines, which major international organizations, as well as local stakeholders, provide[16-17]. On the other hand, poor urban planning may

FINANCING METHODS

All the practices described require adequate funding, which should come primarily from central governments through taxation (perhaps via drought-specific taxes). As well, insurance companies might be encouraged to support these programmes in the form of a public-private partnership programme, bearing in mind their incentive to reduce payouts for insured losses due to flood disasters. As implied above, there is a potential symbiosis between measures for creating urban-rural compacts and room for rivers: the former can help fund room for river programmes, and the latter can be used as a justification for creating the new compacts.

The redistribution of money from urban to rural areas might take the form of green water credits, as practiced in the southern Mediterranean, in Morocco, and elsewhere in Africa (Kenya), as well as Asia (China).

[15] Columbia University, 2002. International Urban Planning Studio Disaster Resistant Istanbul Report. New York: Columbia University

[16] http://www.fema.gov/earthquake/earthquake-safety-home

[17] http://www.ready.gov/community-preparedness-toolkit

play a significant role when new buildings are constructed without attention to earthquake-proofing or historical buildings are not properly protected against an earthquake.

Examples of the earthquake preparedness measures that governments could implement include the allocation of funds for the seismic upgrading of buildings and developing emergency plans in order to guarantee citizens a safer urban environment in the event of an earthquake.

4.5 BP 5: integrating local and scientific knowledge

All types of hazards require mechanisms and procedures that facilitate the sharing of knowledge across administrative levels, and between sectors and geographic regions. Much knowledge is generated by scientific and governmental organizations, who collect and analyze hazard-related information. However, local or indigenous knowledge is increasingly recognized as a critical element, a repository of the collective folk memory and experience on hazards. Integrating local knowledge in monitoring and early warning systems can help both risk management organizations and the communities at risk. In the case of drought, people-centred monitoring has proven to provide reliable data on a wide range of social impacts. Supplemented by data from remote sensing and data assimilation techniques, data collected at the community level may then be combined with scientific information to improve decisions on risk and adaptation measures.

INDICATORS OF DROUGHT IMPACT

Biophysical Characteristics

Economic sector affected	Indicator
Lake level	• Variation from the hydrometric zero
Farmers' income	• Per capita income • Productivity/ha • Quality of production
Ecosystem quality	• Extension of reeds (i.e. grasses at the water's edge) • Quality of reeds • Water transparency • Water temperature
Tourism income	• Annual number of tourists • Average duration of stay
Fishing income	• Income • Quantity of fish • Quality of fish • Presence of fish species vulnerable to stress conditions

The procedure

A community-based drought risk management initiative has been established in the Lake Trasimeno area of Central Italy. The drought monitoring system is based on merging the community's perceptions with scientific knowledge, and allows local level assessment of drought impact. Through a participatory process, the community was involved in the development and measurement of a set of drought impacts indicators (see box on p. 22).

Applicability of the practice

Efforts to integrate scientific and local knowledge of hazards are promising. In Italy, the community-based monitoring of the direct impacts of drought provided more reliable data than those for indirect impacts. For example, losses in agricultural yields are easily quantifiable and can be measured locally. Indirect effects, however, tend to be more complex. For example, an increase in unemployment as a result of lower farm production levels may be triggered by a number of factors, including drought. In such instances, local knowledge is necessarily complemented by other forms of knowledge such as aggregated socio-economic data.

People may have to evacuate buildings at a moment's notice, and need to take the essentials with them. This means having enough food, water and supplies for a 72-hour survival. Guidance for preparing a survival kit are found at: www.ready.gov/build-a-kit

The European Drought Observatory (EDO) – a new agency that will also make use of community-based information – is currently under development. As a joint initiative by bodies within the European Commission and the Member States, EDO will provide consistent and timely information on the occurrence, severity, extent and duration of droughts, making it freely available from the Joint Research Centre (http://edo.jrc.ec.europa.eu).

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Take home messages

Experience in Disaster Risk Reduction and Climate Change Adaptation confirms that these two fields require merging into planning and management. CATALYST has analyzed recent knowledge in these fields and extracted recommendations that should be adopted to obtain effective results that would minimise risks from hazards.

- **Strong institutional foundations are the key** – The EUM region still needs to strengthen institutional approaches to Disaster Risk Reduction and Climate Change Adaptation at both local and national levels. A new approach would call for the integration of policies at all levels and for more focus on the implementation and enforcement of existing legislation that supports risk reduction and adaptation.
- **Leadership is a powerful tool** – DRR and CCA must receive a higher priority in the European Mediterranean region so a shift can be made across the region from the reactive "emergency approach" towards a well-planned, proactive one, with governments and administrations engaging in preventative actions and effective communication.
- **Success stems from integrating approaches** – In the EUM region, droughts and floods should be jointly addressed as part of integrated water management. Both DRR and disaster relief can be supported by strengthening the link between rural and urban communities through institutionalised mutual support.
- **Earthquakes need preparedness** – People need to be prepared for earthquakes. Specific training programmes aimed at raising awareness on what to do, as well as emergency plans should be provided to populations in at-risk areas. Volunteers to support rescue and evacuation, and simulation training are vital. The enforcement of building codes that reduce the risk of building collapse should be adopted.
- **Scientific and local knowledge must both be taken into account** – Local knowledge is recognized as a valid element that should be integrated with scientific information to improve risk management and guide better focused actions. The scientific community should merge local experience with state-of-the-art technologies and expertise, fuelling a two-way participatory process to risk management and CCA.

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Texts and editing: Cristina Serra, TWAS; Peter van der Keur, GEUS – *Further acknowledgements to:* seeconsult GmbH – *Design:* Studio Link, Trieste – *Printing:* Stella, Trieste – *Photo credits:* cover Hammonia; p. 2r emilius da atlantide; p. 2l Il Fatto Quotidiano; p. 4 Wikipedia/FEMA News Photo; p. 8, 16, 17, 21 Roberto Serra / Iguana Press; p. 10 Luca Menini; p. 14 larsmlehmann; p. 18 Giulio Longhi Giulietto86; IBC Flickr/Nashville Corps, Flickr/DFID Rafiqur Rahman Raqu, Morguefile/hotblack

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a project funded by the European Union Seventh Framework Programme (FP7/2007-2013)
under grant agreement 283177