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World Water Assessment Programme

The United Nations World Water Assessment Programme

Dialogue Paper

Water and Climate Change: Citizen Mobilization, a Source of Solutions

Marie-Joëlle Fluet, Luc Vescovi and Amadou Idrissa Bokoye

The International Secretariat for Water and Consortium Ouranos

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United Nations Educational, Scientific and Cultural Organization

World Water Assessment Programme

The United Nations World Water Development Report 3
Water in a Changing World

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Water and Climate Change: Citizen Mobilization, a Source of Solutions

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Introduction

Understanding the climate system is a major challenge, not least because of the difficulty of understanding its spatio-temporal evolution. This system is a complex machine in which the lithosphere, hydrosphere, cryosphere and biosphere are continually interacting, and in which rare events, such as volcanic eruptions and earthquakes, create unforeseen forces. Since the appearance of life on Earth, 3.5 billion years ago, the average temperature of our planet has fluctuated between 9 °C and 22 °C. Such major climate changes have had determining impacts on our natural ecosystems. The scientific community is in agreement that our climate evolves, with glacial periods and milder periods (Ascot, 2004), modulating according to the cyclical variations of the Earth's orbit ('Milankovitz cycles'). Studies based on marine sediments, ice-core boring and isotope ratios seem to confirm Milankovitz's theory. In addition, the increase of certain gases in the atmosphere, including CO_2, through the absorption of infrared radiation that has been emitted by the Earth's surface and the atmosphere, creates a greenhouse effect and has the potential of warming the climate of the planet's surface. Since the industrial age began, humans have released enormous quantities of these greenhouse gases into the atmosphere, thereby altering the physico-chemical dynamic and almost certainly provoking a rise in global temperatures and altered precipitation patterns.

Numerous human activities are directly linked to climate, and adapting to climate variability and the effects of climate change has always been a challenge for humankind. In particular, extreme weather events have always significantly affected human societies – through famines, migrations, epidemics, and, in some instances, the complete disappearance of communities or civilizations. According to Hodell et al. (2001), who have analysed the evolution of the climate of Mexico's Yucatan Peninsula, the end of the Mayan civilization was brought about by the effects of climate change: namely, the persistent drought in the mid-eighth century. Beyond such bio-physical climate impacts, in certain societies there has been an intimate connection between climate events and beliefs, lifestyles and traditions. These cultural manifestations give a meaning to climate extremes and their impacts and allow us to analyse the understanding and perception of climate in ancient or traditional societies. At the same time, such beliefs show the links that exist between culture and climate.

The contemporary world, above all since the Industrial Revolution, has been distinguished by a significant exploitation

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Uzbekistan children in the Fergana Valley. The region suffers from much poverty, several water-related diseases (typhoid, diarrhoea, hepatitis, dysentery), and a life expectancy that is 5 to 7 years less than the urban areas.

of natural resources. The adverse effects of this industrialization, include the degradation of air and water quality and the increase in greenhouse gases. These effects have led to a global realization of the fragility of our planet. The 1992 Earth Summit, in Rio de Janeiro, Brazil, raised the awareness of the international community concerning the environment and climate change, and above all, sent a strong signal to the world by laying the foundations of the concept of sustainable development. Besides government efforts, the success of the Earth Summit was largely due to the mobilization of the public and of civil society in the industrialized countries, as well to a growing awareness of the consequences of human activities on the environment, in particular on the increased emissions of greenhouse gases into the atmosphere. Since then, faced with climate stresses, the public has become increasingly aware of and more involved in efforts at adaptation and mitigation, with the objective of guaranteeing future generations a healthy environment. Today, a better understanding of the science of climate and the environment and of the importance of citizen involvement – achieved by popularization and dissemination of knowledge and environmental advocacy – has enabled a raising of public awareness. The climate remains a major concern in today's societies as it has been in societies of the past.

According to the International Secretariat for Water (ISW), and for the purposes of this article, 'citizens' are defined globally. Rooted in their communities, they are both actor and user. They may be silent – but their silence does not imply indifference, powerlessness or lack of an opinion – or committed, members of groups, able to act in their community or circle. Thus, according to the ISW, citizen involvement is motivated by values, without one necessarily belonging to a group. This definition is broader than the political concept, according to which a citizen is someone who exercises rights and acknowledges responsibilities in regard to the state and who may, in a democracy, criticize political decisions or seek office. The ISW uses this definition of the citizen as an actor, user and driver of change, with both personal and shared interests, catalyzed and conveyed through social and cultural mechanisms and/or methods of governance appropriate to local contexts.

The objective of this paper is to discuss the responses of communities in the current context of consideration of extreme events and climate change, and to do so while demonstrating the importance of the commitment of leaders in this process. We begin by defining climate change, adaptation and the vulnerabilities associated with this phenomenon; we then describe sustainable adaptation strategies linked to specific real-world cases, and, finally, we discuss and propose possible solutions through the experience of the ISW and its partners in development, an approach that we believe is essential in a context of climate change.

Extreme climate events and climate change

Definitions and findings

Climate change is, by definition, detected when a statistically significant variation in mean climate, or in its variability, persists for an extended period (typically 30 years).

Since the establishment of the Intergovernmental Panel on Climate Change (IPCC),[1] the scientific understanding of climate change has much improved. In their Fourth Report, published in 2007 (IPCC, 2007), the IPCC concluded that:

- Global warming is 'undeniable': 11 of the last 12 years were among the 12 warmest years since records have been kept (in 1850).
- Almost all of the observed temperature rise during the second half of the twentieth century is 'very probably' due to human activity.
- The increase in temperature projected for 2100 will be between 2 and 4.5 °C, with a doubling of the concentrations of carbon dioxide compared to pre-industrial levels. These 'best estimates' are averages, in a broader range of 1.1 to 6.4 °C (1.4 to 5.8 °C, in the previous report of 2001).
- All scenarios predict a reduction of sea ice in the Artic and Antarctica.

1 Created in 1988, under the aegis of the World Meteorological Organization and the United Nations Programme for the Environment, the IPCC aims to evaluate scientific and socio-economic information on climate change, its impacts and the different options to minimize these or adapt to them.

- It is highly probable that, in the future, extreme weather events such as heat waves and heavy precipitation will become more frequent and that tropical hurricanes will become more intense.
- In 2005, the atmospheric concentration of carbon dioxide (the most important greenhouse gas) largely exceeded the concentrations of the past 650,000 years.
- Past and future CO_2 emissions will continue to contribute to global warming and rising sea levels for more than a millennium.

A global reality, with local impacts

Extreme events remain the most worrisome manifestation of climate change. Indeed, it is during periods of extreme events that people most clearly reveal their reactions to the phenomena. A better detection and attribution of climate change relative to extreme events is a major scientific challenge. A more detailed knowledge of the role of climate change in the occurrence of extreme events will allow a better management of the risks and opportunities associated with them. The statistical definition of 'extreme' does not always agree with the public's perception. Lay people equate climate extremes with a weather event that directly alters their environment and socio-economic activities, such as the destruction of property and infrastructures. For instance, the same event will not be perceived in the same way in rural and urban areas.

Furthermore, in terms of the impacts on 'anthropogenic' (inhabited or modified) or natural ecosystems, the more significant and rapid the changes, the more the negative effects will dominate perceptions. However, at the regional scale the effects depend upon vulnerabilities, adaptability, resilience of the population, infrastructures and ecosystems, and may have contrasting effects – positive or negative. In North America, for example, the IPCC has found that communities generally demonstrate a great capacity to adapt and are not very vulnerable (IPCC, 2007*a*). However, certain North American groups – such as people dependent on climate-sensitive resources for their economic activity – are more vulnerable. In the northern regions of Canada, the IPCC projects higher temperatures, which could lead to the melting of the permafrost, thus weakening the soil and increasing the risk of subsidence. The

Box 1 Rainfall in the Sahel

The Sahel is a semi-arid strip of land, between the latitudes 10° and 20° North, stretching from the coast of Senegal to the Red Sea. This transition zone between the arid Sahara and humid tropical Africa is one of the regions of the world where the effects of climate change and climate variability and extremes are most pronounced. The region is particularly vulnerable to climate fluctuations, with a recurrence of dry and humid periods with climate extremes (Nicholson, 1995). Agriculture in the region consists of mainly rain-fed and subsistence farming. Moreover, many socio-economic activities depend on the management of temporary water resources.

While the mechanisms governing the dynamics of Sahelian climate are not yet understood by the international scientific community, it is clear that, for the population in the Sahel, adapting to climate variability and extremes and to climate change is a daily challenge, given their direct impact on socio-economic activities. The impact of climate change on the African continent has led to numerous studies (Batterbury and Warren, 2001; Gachon et al., 2007; Giannini et al., 2008), particularly the impact on agriculture (Sultan et al., 2005). The study of vulnerabilities and development of strategies for coping with climate hazards remain important fields of investigation on the continent.

The drought of the years 1970–74, by its severity in terms of both duration and extent, underlined the limits of immigration as a method of adaptation, with the heavy loss of human life and of livestock, as well as highlighting the sometimes adverse effects of this type of adaptation (conflicts of use, overpopulation of urban zones, social unrests, etc.). It should be noted that the abandoning of food crops in favour of commercial crops by the Sahelian states liberated from the colonial system in the 1960s increased the vulnerabilities of these populations. However, through the democratic opening of the Sahelian sates in the early 1990s, there has been a strong dynamism of the local populations and civil society in developing adaptation strategies to cope with the harmful consequences of climate change and variability. The mobilization of the Sahelian population revolves around the search for community solutions, in the spirit of traditional African social structures, by sector (agricultural, fisheries, or livestock) or gender (women's organizations). In addition, there is a consultation/collaboration with local government (traditional chieftaincy, collective territory). A combining of local know-how and 'modern knowledge' has led to several success stories in developing adaptation strategies, particularly in agriculture. The example of pilot projects with farmers, ranchers and fishermen within the framework of a project to support the adaptive capacities of Sahelian nations to climate change, a partnership between CIDA[1] and CILSS[2] (Lepage et al., 2007), emphasized the importance of community involvement at the local level for the success of adaptation actions. Another concrete example of adaptation to climate hazards is cotton production in West Africa. Indeed, despite an inequitable international commercial environment, African producers organized on the local level and in cooperative networks have been able to both adapt – thanks to farming techniques – to the inter-annual variability in the hydrological cycle that determines production, and to better market their products. Another successful adaptation has been that of women's organizations specializing in various sorts of market gardening, which have been able, through the use of traditional knowledge, to cope with fluctuations in water resources. These examples suggest that the community approach as an adaptation strategy is appropriate in the Sahel.

1 The Canadian International Development Agency.
2 Permanent Inter-state Committee for Drought Control in the Sahel.

melting of the permafrost could weaken infrastructures (e.g. oil and gas pipes), buildings and homes in the region. Through changes in their environment, northern communities will experience changes in their way of life (hunting and fishing grounds will shift, and certain traditional practices be abandoned), leading to a loss of traditional knowledge (IPCC, 2007*a*).

In terms of water resources, we may see a reduction in yields due to drought in certain parts of the Canadian Prairie and American Great Plains. In Québec, water management, which involves a number of uses and users, is heavily influenced by climate change, both in terms of higher temperatures and changes in rainfall. As described in *Water and Climate Change in Quebec* (Vescovi et al., 2009), the effects of climate change may (despite the uncertainties of current scientific methods) have major consequences potentially involving modifications of water management plans. Future water management in Québec will require a search for multidisciplinary and multi-institutional adaptive solutions. The future or potential impacts of climate change in Québec include:

1. to advance spring floods in southern and northern watersheds;
2. to increase the frequency of ice jams, and thus the risk of flooding of downstream municipalities;
3. to affect the level of the St. Lawrence River;
4. to alter the behaviour of the river's tributaries;
5. to affect the optimization of reservoir management regulating southern basins;
6. to cause an increase in irrigation needs for farmland;
7. to increase winter inflows to Hydro-Québec reservoirs (from November to April);
8. to possibly reduce summer inflows to Hydro-Québec reservoirs, due to a higher rate of evapotranspiration (higher temperatures); and
9. to increase the vulnerability of urban drainage and drinking water supply infrastructures in many Québec municipalities.

In the rest of the world, developing countries will, in general, be more affected by the negative effects of climate change, in particular because of poverty and a lesser capacity to adapt. Rising sea levels and changes in the availability of water resources will be major elements of this negative aspect. Regarding rising sea levels (resulting from a thermal expansion of the oceans and melting of continental ice), the IPCC (2007*a*) estimates that the loss of land that will result from a 1 m elevation of sea level will be 1% in Egypt, 6% in the Netherlands and 17.5% in Bangladesh. As most of Bangladesh lies at sea level, a rise in sea levels of 0.5 m would put some 6 million Bangladeshis at risk of flooding, exacerbating the impacts of monsoons. With regard to water resources, Gianni et al. (2008) have confirmed the significant trends of periods of drought observed in Africa over the course of the twentieth century. The virtual disappearance of Lake Chad in less than

Box 2 Flooding in Bangladesh

The case of Bangladesh is particularly interesting in terms of water and climate. The country is virtually a laboratory for the effects of climate change and variability and the impacts and vulnerability associated with them (Alexander, 1993): floods, high waters, tropical hurricanes, tornadoes, extreme precipitation, and sea levels, which, according to Ali (1996), will rise more than 3 m in the future. Bangladesh is a country of the Indian subcontinent located at the intersection of two major rivers, the Ganges and the Brahmaputra, which empty into the Bay of Bengal. The country is therefore extremely vulnerable to flooding, above all in a context of climate change. Some 90% of Bangladesh's 140,000 km^2 landmass is only 10 m above sea level. In addition, there is a strong correlation between densely populated areas (more than 1,000 inhabitants per km^2) and the areas of high water rise (WorldAtlas.com). While the river delta is an asset for agriculture (rice), this geography makes the area particularly vulnerable to recurrent flooding of rivers and the anticipated rise in sea levels (IPCC, 2007*a*).

The number of deaths caused by flooding in Bangladesh in the twentieth century totalled 3 million, with each flood resulting in millions being left homeless. Faced with these adverse impacts to human safety and agricultural production, in 1971 the Bengali government established a general framework for flood protection and combating floods, and an office of disaster management was created. Despite government efforts at the macroscopic and infrastructural level (construction of dikes, protected areas, areas of cultivation and an irrigation network), it is clear that social and economic vulnerability remain very high in many local communities, with millions left homeless during major floods. These communities are left in destitution on 'islands' formed by sediments left by the residing flood waters. This physical, social and economic precariousness is the daily reality of a significant number of the 160 million Bengalis.

Although there have been some non-governmental flood adaptation projects initiated, the state needs to support these efforts within a framework of adaptation and sustainable development, especially in a context of increasing poverty.

A notable example of a private initiative is the micro-credit project launched by Muhammad Yunus, for which he was awarded the 2006 Nobel Peace Prize. This instance of citizen mobilization has produced very positive results and is well suited to improving precarious living conditions. Micro-credit has enabled millions of vulnerable people in this region to gain some financial security, giving them means at the local level. Such private financing initiatives offer a way to adapt to climate risk through the investment of citizens, promoting, for example, better land use planning to reduce the risk areas.

20 years, as well as the flooding of the Zambezi River in 2007, no doubt constitute strong signals in terms of the impacts of climate on water resources. To these must be added the demographic pressures on the resource. According to the IPCC (2007*a*), the number of people who will be exposed to a risk of water stress in Africa will be between 75 and 250 million by the year 2020, and between 350 and 600 million by the year 2050. Given these projections, the problem of anthropogenic climate change, despite many uncertainties concerning trends for the twenty-first century for Africa (Gianni et al., 2008), must be integrated into local, regional and national development policies. This global dimension of climate change should make us understand that we all live on the same planet and that the most vulnerable populations – which are often also the least responsible for the phenomenon – will suffer the most dramatic consequences. We must, therefore, begin now to think of how to adapt to climate change, in particular with a view to reducing current vulnerabilities.

Adaptation and capacity building: for a better response to climate change

Faced with the challenges of climate change and climate hazards, communities provide concrete answers in terms of governance, strategies for managing the environment and infrastructures. In what follows, we elaborate the concepts of adaptation and vulnerability in order to better situate the potential fields of intervention of agencies involved in development, such as the International Secretariat for Water (ISW).

By definition, adaptation to climate change consists of a reaction and an adjustment within a natural or human system, in response to a climatic stimulus or its current or projected effects (Burton et al., 2002; IPCC, 2001), including climate variability and extremes.

The IPCC defines different types of adaptations:

1. anticipatory (or proactive) adaptation: before the impacts of climate change;
1. autonomous adaptation: an unconscious response to climatic stimuli, triggered by climate changes;
2. planned adaptation: resulting from political decisions, and based on an awareness of changing conditions and that actions are necessary to ensure well-being;
3. private adaptation: initiated by individuals, families or private companies;
4. public adaptation: initiated and instituted by government at all levels;
5. reactive adaptation: put in place after the impacts of climate change.

Since successful adaptation strategies largely depend on political decisions, we will focus in this article, on planned and public adaptation as defined by the IPCC (2001).

Adaptation and adaptive capacities are linked to vulnerability. According to the IPCC (2007*b*), the vulnerability of socio-economic and natural systems is a function of the positive and negative consequences of climate change and of possible adaptation solutions. Adaptive capacity – for institutions, ecosystems and individuals – is defined as the overall ability to adapt to potential damage and take advantage of opportunities or to cope with the consequences. Vulnerability may be influenced by several factors, including poverty and regional development.

In practice, vulnerability to climate change, like vulnerability to extreme climate events, is not strictly synonymous with poverty (Lepage et al., 2007; Adger et al., 2003; Schipper and Pelling, 2006), yet poverty exacerbates its effects (Dixon et al. 2003). Recent examples include the Saguenay flood of 1996, the ice storm in Québec in 1998, or Hurricane Katrina in the United States states in 2005, which affected all levels of society in the southern states in which it hit and severely affected their infrastructure. However, although all residents of these areas felt the adverse effects of these events, as usual it was the poorest who were most affected.

In general, as already mentioned, countries that lack infrastructure or have limited resources to respond to the effects of climate change are the most vulnerable and the most affected by extreme climate events (such as torrential rainfalls and floods or severe drought). As the UN Food and Agricultural Organization (FAO) has noted, the capacity of individual to adapt or respond to climate stresses is affected by their ability to earn a living, to obtain credit, or to have access to and control over resources (such as land, water and seeds), as well as their education.[2] Within the same country or even the same community, the effects of climate change are experienced, perceived and felt differently (IPCC, 2007a). Certain groups are more vulnerable to the phenomenon than others: in general, young people, women, marginalized groups and the poorest are the most vulnerable. In fact, in several traditional societies, the assigning of roles and tasks is clearly defined. Women are most often responsible for household chores and for collecting water, and so they suffer more from the effects of climate change. In communities where families do not have access to running water (for example, in several West African nations), when there is less water in the wells, or the wells have run dry, or where the distance one must walk to obtain water is longer, it is the work of the women that increases. In addition, because it is mostly women who are in charge of the informal

2 FAO, http://www.fao.org/newsroom/en/news/2007/1000724/index.html

economy, which is often linked to natural resources, there too, women are more susceptible to climate hazards. Moreover, vulnerability and adaptive capacity to climate change are often related to level of education, with the more highly educated having greater access to government services. Indeed, less-educated individuals are at greater risk of being socially marginalized, as their access to state services (loans, credit, training) is reduced because they have less information on the services offered (often not knowing what services are available, not speaking the administrative language or being illiterate) (Fluet, 2006). Moreover, most of the time, because they are excluded from the public debate, their needs and ideas are rarely integrated into policy.

The vulnerability and adaptive capacity of civil society and the structure of governance constitute key elements of the problem of climate change. At the community level, dialogue between citizens and the various levels of government is essential for the development of adaptation strategies.

Towards sustainable adaptation strategies

For preventative measure as well as adaptation to climate events to be effective, certain measures must be in place. It is these which we shall try to outline below, without, however, suggesting any single approach can be applied to all the various contexts.

A methodological framework focused on real-world situations

Traditionally, research on adaptation to climate change has consisted of developing climate change scenarios and creating impact models, then determining the impacts directly related to climate change (Downing, 2003; Lepage et al., 2007). However, this sectoral approach does not take into account the indirect impacts of climate change, such as the displacement of populations, increased incidences of certain diseases, reduced access to water, desertification, weakening of infrastructures and overexploitation of land, which also affect vulnerability to climate change. For this reason, some researchers favour an approach focusing on vulnerabilities (Lepage et al., 2007; Downing, 2003; Frakengerger et al., 2001; Handmer, 2003; Smit, 2003), which allows an identification of the elements of a community to strengthen, so that it will be better able to respond to the impacts of climate change. The goal is to increase adaptive capacities to cope with climate change and climate uncertainties (Lepage et al., 2007; Smit and Pilifosova, 2003).

Similarly, the 'no-regrets' development approach is a useful method to take account of the uncertainties relating to climate change. This approach promotes putting in place measures that will be useful in all circumstances, even if climate projections turn out to have been mistaken. It aims to improve the efficacy of practices in all sectors and to prepare for the consequences of projected climate change (Lepage et al., 2007), while at the same time combating poverty and building capacity.

To reduce the vulnerability of populations directly affected by the adverse effects of climate change and to involve citizens in all stages of developing adaptation strategies, the key to success is citizen mobilization.

Citizen mobilization: the key to success for responding to climate change

In developing adaptation strategies, a systematic taking into account requires the development of public policies and decision-making involving stakeholders to assure that the adaptation will be sustainable, responsible and integrated. Decision-making and development of climate change policies must include the various actors and stakeholders. For example, as stakeholders in studies of climate change, we would include individuals, communities, organizations, administrations, decision-makers, scientists and scientific organizations (Conde et Lonsdale, 2005).

It is important to include local stakeholders in all stages, because they know their environment and the changes in their area, and they understand the community and their needs. They also guarantee the sustainability of projects and their integration into policy and assimilation in the community itself.

The response and adaptability of citizens to climate change also depend upon various factors. Within the same community, adaptive capacity may vary, as discussed above, according to subgroup, socio-economic level and gender. At the state level, capacity depends on the government, its involvement with citizens, the involvement of local actors and stakeholders, democratization of power, transparency and the decisions that are made. Adaptive capacities are linked to services offered to the population, infrastructures and the state's relations with citizens.

To better define and help to visualize the link between citizen mobilization and the commitment of the state in a context of climate change, we present a few specific cases showing how local populations have demonstrated willingness and initiative and become involved in sustainable development strategies (see Boxes 1, 2 and 3).

The International Secretariat for Water (ISW) and climate change

The International Secretariat for Water (ISW), an international non-governmental organization established in 1990 in the framework of the International Drinking Water Supply and Sanitation Decade (1981–1990), has worked for nearly 20 years to promote access to drinking water, hygiene and sanitation, especially among the poor. The ISW believes that access to drinking water, hygiene and sanitation is essential in the fight against poverty.

Box 3 The International Secretariat for Water (ISW) and climate change

The expected impacts of climate change in Central Asia include rising temperatures, changes in precipitation patterns and melting glaciers. According to the IPCC (2007a), precipitation in the region increased significantly from 1900 to 2007 without, however, increasing the availability of water resources. Moreover, agricultural output in this region could decrease by 30% (IPCC, 2007a). Therefore, climate pressures will increase and the population must be prepared to cope. Adaptation strategies include informing the population, and reinforcing existing capacities (or implementing capacity, where lacking) to cope with these impacts.

In this area, the International Secretariat for Water (ISW) is already heavily involved in the region. While not addressing the specific issue of climate change, its actions to reinforce local capacities in Central Asia, particularly in the Fergana Valley, are without doubt a step in the right direction.

The Fergana Valley, a large closed basin of about 70,000 km^2 surrounded by mountain ranges, is one of the most populated Central Asian regions, with a population of nearly 11 million. It is shared by Kyrgyzstan, Tajikistan and Uzbekistan. Currently, more than 60% of the population has access to neither drinking water nor basic sanitation. The region suffers from much poverty, several water-related diseases (typhoid, diarrhoea, hepatitis, dysentery), and a life expectancy that is 5 to 7 years less than that of urban areas. Moreover, in this agricultural area, where the population depends on irrigation for its economic activities, access to water is a very important issue. Because of the many challenges related to water, in 1998 the ISW initiated its Rural Water Supply Project.[1]

Since its inception, this project has aimed to improve the health and living standards of rural populations as well as to introduce better hygiene practices in the Fergana Valley region. It is through integrated water resources management (administration and planning) and the implementation of technologies for efficient water use (Regallet et al., 2007) that this project was built. The success of the initiative has depended on management that is in harmony with local communities and the various stakeholders. The project is part of a broader programme of integrated water resources management, also supported by the Swiss Agency for Development and Cooperation in the Fergana Valley.

Through the ISW's field expertise and its projects in Central Asia, it has become clear that the basic tool for coordinating the activities of various levels in water management is public participation adapted to local and state institutional structures. As Regallet et al. (2007) have shown, the participation of stakeholders must not only be in management, but also in the planning and implementation of work, cost management and financing of projects. The experiences of ISW in the region have also shown that it is necessary to create water committees composed of representative of the community and subgroups of the regions concerned, different types of water users, environmental groups and organizations (administrative and state) involved in water management. The role of these committees must include management (regulation, access to service, development of new projects, and identification of water needs) as well as execution (supply, fundraising, annual planning, allocations) (Regallet et al., 2007). These committees also ensure local ownership of the project, a sense of belonging, greater efficiency in the implementation and internalization of all operating costs.

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A communal water source in the Fergana Valley in Uzbekistan, one of the most populated Central Asian regions.

Eight years after its establishment, the Rural Water Supply Project has been introduced in 28 villages, significantly improving the lives of more than 80,000 people. The work of the ISW has allowed the creation of the largest network operating in the Fergana Valley, bringing together the various stakeholders in water management.

The case of the Fergana Valley shows that populations are facing numerous difficulties in ensuring access to water: in terms of water supply, inadequate infrastructure, financial resources and governance. These difficulties, in a context of climate change, are likely to worsen and thus to diminish access to this already scarce resource, reducing living standards, increasing rural poverty, and increasing the costs of equipment and supplies, as well as creating conflicts of ownership and use between local and national stakeholders concerning access to water and its management. In terms of governance, an insufficient democratization of access to the resource is a source of potential conflict. For instance, regarding the associations of irrigation water users (Water Users Associations, WUA) in the Fergana Valley, problems of water accessibility are managed locally, and local management is sometimes organized hierarchically. In a context of scarcity of resources, this leads to latent conflicts between users, regions and countries, as well as exacerbating inequalities. The involvement of local stakeholders and civil society is essential to reduce potential tensions and mismanagement of resources.

The rational and efficient management of water remains a major challenge in this region because of the economic and technological choices of national stakeholders (cotton cultivation and intensive irrigation techniques). Finally, government investment in infrastructure is already very limited in the region, and may be insufficient to take account of the negative impacts of climate change if financial mechanisms with international donors (e.g. the UN Adaptation Fund) are not put into place. Yet, as concerns any infrastructure project, citizen involvement, as we have shown, must be taken into account.

1 This project was made possible by the financial support of the Swiss Agency for Development and Cooperation (SDC) and Oxfam Novib (Netherlands).

In the field of water, the ISW has developed skills in assisting local populations to develop capacity, creating synergies and reinforcing institutional capacities. The ISW also emphasizes: awareness, organizing information campaigns that put basin-level integrated water resources management (IWRM) at the heart of sustainable and equitable development. It works to develop regional alliances, support global networks and promote public information and advocacy.

Since its inception, the ISW has opted for a cross-cutting approach involving gathering together all types of competencies, beyond any ideological differences. The organization immediately developed collaborations with individuals, groups, organizations and institutions involved in international cooperation projects.

The ISW encourages the following actions, which involve the various stakeholders. The ISW's approach is based on nearly 20 years of experience and is perfectly applicable to a context of climate change. We emphasize however that these actions are suggestions, and that we are not proposing a unique solution but rather points to consider with the aim of cross-cutting interventions.

Introduce training, education and awareness programmes

This is the first step to undertake, even before implementing strategies for adapting to climate change. Such programmes ensure the participation of local stakeholders; in any intervention (e.g. drinking water or sanitation projects), it is essential to inform local stakeholders. With a complex phenomenon such as climate change, which is abstract and often remote from local concerns, local actors and decision-makers should focus on a strategy of raising awareness.

Set up structures for dialogue at the local level

By working with local stakeholders and involving citizens in the context of climate change, the choice of strategies and policies will reflect the concerns of the citizens, and the latter will be empowered and become more involved in their community for its overall well-being.

Promote exchanges between different interest groups

To build adaptive capacities, it is essential to enable citizens to interact with interest groups, NGOs, experts and decision-makers. Taking into account the views of citizens allows the development of effective solutions between public, private and volunteer partners.

Convergence of policies

The dialogue between local actors and decision-makers aims not just to reach consensus, but also to integrate objectives, strategies and policies in order to avoid duplication of activities.

Develop the participation of civil society

Not only must citizens be involved, but their participation must be developed. Such participation allows social mobilization in actions on the ground, in networking, and in the mobilization of local and international resources.

Invest in social capital

As Lepage et al. (2007) have shown, family, social, community, political and state networks, membership in groups, and access to institutions, all constitute, in a society, safety nets in situations of stress or crisis. These so-called social resources thus reduce stakeholders' dependence on the state and allow them to develop strategies that parallel government services.

Develop and integrate local knowledge

Local knowledge represents not only local needs but also a society itself. Citizens' knowledge of the past and of their environment and resources are all invaluable. To disregard such knowledge is to denigrate the local culture.

Small-scale interventions and creation of committees

These allow one to be aware of a community in all its complexity and to consider its various stakeholders. Moreover, they help prevent exacerbating existing inequalities or creating new ones. The integration of new projects at the local level has the potential to create new inequalities when the community is not taken into account in all its complexity.

Local empowerment

This allows an accelerated implementation of policies, while at the same time reducing the risks of failure through the direct involvement of local stakeholders. Through this local accountability, policies will adapt themselves to the local needs and realities.

Decentralization (financial)

Promote funding at the local level (e.g. for infrastructure, reinforcing capacities, health services and education) and reduce intermediaries so that funds actually reach the populations concerned and the organizations working in the field. However, such decentralization must be consistent with national policies and investments.

Promote project portfolios

Create alliances between citizens, local partners and government services in order to build project portfolios and thus promote access to substantial funding. And in this way attain a critical mass, in turn enabling the provision of basic services to rural and remote areas.

Conclusion and general recommendations

Global efforts in poverty reduction and capacity building may be significantly disrupted by the effects of climate change. Developing and accommodating strategies to adapt to climate change will require the involvement of experts – in the physical, natural, social and medical sciences, as well as business leaders and political leaders at the local, regional and international levels. Sandvik (2008) has recently shown that efforts to stop climate change will require that populations attain a real understanding of the phenomena, and so be more open to investment on the part of their governments to counter it. This will require not only advances in the natural sciences, but also in sociology and even psychology.

We therefore suggest building bridges between the natural and social sciences, to link adaptation to climate change to international development, and to work with local authorities in developing adaptation strategies in order to take into account local realities that may slow down or stimulate actions on the ground.

The impacts of climate change vary from one place to another, and from one social context to another, and capacities to respond to the phenomenon vary depending on public policies and the involvement of policy-makers. Moreover, although the majority of the scientific literature on the subject underlines the negative aspects of the phenomenon, climate change may benefit some groups and have some positive impacts. For example, climate change has sometimes allowed the development of new solidarity partnerships, for instance in the case of the 1998 ice storm in Québec, one of whose indirect impacts was the strengthening of social networks. Climate change may also lead to greater commitment on the part of states to vulnerable populations, with a view to preventing and relieving poverty. Finally, climate change highlights community networks and also reveals the strengths and weaknesses of these networks, allowing in turn for interventions more in tune with realties.

Since its inception, the ISW has always promoted the involvement of local actors and experts. It seeks to create frameworks for dialogue to promote exchanges, sharing of experiences and meetings between citizens, decision-makers and researchers, both in Québec and in developing countries. Moreover, as an international non-governmental organization (INGO), the ISW is recognized for its value as a 'bridge' that allows all stakeholders to assert their skills and complementarities. If citizens and decision-makers are aware of a problem and of the alternatives they can develop to improve living conditions, if they know the services offered to them by – and feel a recognition from, and the commitment of – the state, then community involvement will be more sustainable and better reflect realities. It is in this direction that the ISW wishes to continue to pursue its actions, within a context of climate change.

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SIE-ISW-SIA

The International Secretariat for Water (ISW) is an international non-governmental organisation created in 1990 during the International Drinking Water Supply and Sanitation Decade to assist with the implementation of the principles set forth in the Montreal Charter on Drinking Water and Sanitation – adopted in Montreal in June 1990. Together with its partners, the ISW is at the heart of development activities, strengthening institutions and promoting interaction between local populations, community associations, and NGOs and other international cooperation organizations.

OURANOS

Ouranos is a research and development consortium that brings together 250 scientists and professionals from different disciplines. It was created in 2001 as a joint initiative by the Quebec government, Hydro-Québec and Environment Canada, with the financial support of Valorisation-Recherche-Québec. Ouranos aims to acquire and develop knowledge on climate change, its impact and related socioeconomic and environmental vulnerabilities, in order to inform decision makers about probable climate trends and advise them on identifying, assessing, promoting and implementing local and regional adaptation strategies.

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