

WATER AND CLIMATE CHANGE

**“If the greenhouse-effect gases are responsible for climate change,
fresh water is the first victim”!**

*Integrated and sound water resources management at the level of river basins
is obviously essential worldwide!*

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Abstract:

Global warming now seems to be unavoidable so adaptation of water management to climate change is urgently needed worldwide. Therefore quick action is required, for reducing costs and damage with regard to floods and droughts in particular.

Integrated and sound water resources management at the level of river basins is obviously essential, based on integrated information systems, on management plans or master plans and on the development of Programs of Measures.

Cooperation between riparian Countries should be strengthened for good management of transboundary rivers, lakes and aquifers with the participation of stakeholders and the civil society.

Keywords: Climate change; water resources management; river basin; cooperation; stakeholders' participation, basin management plan, non-regret measures, adaptation, flooding, drought, natural phenomenons, water saving, warning systems.

Text:

1. Introduction

Floods, shortages, pollution, wastage, destruction of ecosystems: the seriousness of the situation in many countries requires that comprehensive, integrated and consistent management of water resources is implemented to preserve the future and the human heritage.

Water has no national or administrative boundary. It is thus necessary to take into account the specific situation of the 276 rivers or lakes and several hundreds of aquifers over the world, whose resources are shared by at least two riparian countries or sometimes much more. Their joint management is thus strategic and a priority.

2. Adaptation of water management to climate change is urgently needed worldwide!

Global warming now seems to be unavoidable. One of the first consequences will be a change in the hydrological cycles.

Should ambitious measures be globally taken by all the countries to appreciably reduce their emissions of greenhouse-effect gases, the effect on climate would only be perceptible at best at the end of the century.

Changes in precipitations and hydrological cycles have already started and will undoubtedly be appreciable by 2040 or 2050: in less than a generation! It is necessary to react quickly, before it is not too late and it is clear that the control of gas discharges alone is insufficient to change this evolution within these deadlines.

During the past forty years, the number and intensity of floods and droughts have already increased, sometimes in a spectacular way. The melting of glaciers in particular, has an effect on water supply, especially in periods of low water level, and on the increase of flood hazards.

It is thus essential to adapt to the consequences of climate change, and, as regards basin organizations, water resources management policies in particular, by taking into account the new elements of climate change. It is especially necessary to quickly evaluate the hydrological consequences of this change, according to various scenarios.

Freshwater resources will be directly affected in the coming years, with for consequences, in particular and according to the regions:

- changes in the intensity and frequency of floods and droughts, increase of extreme hydrological and hydrogeological phenomena with the risk of human losses, destructions and catastrophic economic damage;
- modification of the flows of rivers coming from mountains, because of the melting of glaciers and reduction of the snow cover, and the corresponding impacts on the associated aquifers in particular;
- increased erosion caused by the modification of plant and soil cover;
- higher plant evapotranspiration leading to changes in ground and surface waters, decrease even in agricultural production, regarding irrigation in particular;
- changes in the flows to the river mouths, as well as salt water intrusion inland and in coastal aquifers, because of the increase of sea and ocean level and the reduction in the piezometric levels during the dry season,
- *changes in the relations between surface flows and the groundwater of subjacent aquifers (supply of aquifers or flows of groundwater into the river)*
- *a strong regional impact on the demand and production of energy, hydropower in particular...*
- *changed and unforeseeable conditions of water supply to large wetlands of local and international interest,*
- *a risk of increased prevalence of water-related diseases. ...*

Indeed, these effects will cumulate with the significant pressures linked to demographic growth, urbanization and development. The social, economic and ecological consequences are likely to be very significant. It is thus essential to work now to adapt water resources management policies.

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It is thus essential to adapt water resources management policies and mechanisms to face climate change. We must thus learn how to anticipate the damage and take the necessary measures to prevent or, at the very least, to minimize their negative effects, in short to adapt us!

3. Quick action will allow reducing costs and damage.

The International Network of Basin Organizations (INBO) is worried about the “no-action cost”!

Indispensable adaptation policies and mechanisms should be developed in each river basin, by urgently developing adapted research and knowledge acquisition programs to measure the hydrological and hydrogeological consequences of these changes according to various scenarios, and by drafting ambitious basin management plans or master plans and the programs of measures needed.

It should well be admitted that the urgency of launching programs for adaptation to climate change, in which water management is a central element, the core, has not yet reached the political world and has not been systematically introduced, as evidence, into the plans of most countries nor in the projects supported by international organizations nor in the Conference of Parties in Copenhagen in December 2009.

The implementation of regularly updated planning processes is well adapted to the uncertainty that remains on the forms that the phenomenon will take in each basin. This means that it is important to regularly update the management plans to face, in a pragmatic way, the various situations encountered and their evolution in the coming years, while relying on observation and increasingly fine projections of the climate effects.

The basin management and planning process is the best suited mechanism by which the demands on available water resources could be adjusted in the long term, in order to avoid persistent shortage and to give a clear response to the need for also managing the increasing flood hazards in most areas of the world

In a first phase at least, it is possible that the effect of climate change is interfered with or especially amplified by the continuation of human activities which have the highest impact on water resources, such as the increase in water abstractions for irrigation, the building of infrastructures which modify hydrology, the creation of obstacles to flows, the destruction of wetlands and the increase in pollution of any origin, etc...

The development of hydropower in addition to other forms of renewable energy will allow contributing effectively to the adaptation to climate change, while improving the living conditions of the poorest populations.

3.1. With regard to floods:

It is, first, necessary to make the “upstream-downstream” common cause a main item of consistent management on the scale of basins and sub-basins

Protection against floods must pass through a coordinated approach, combining:

- the protection of people and properties,
- the protection of groundwater intakes which can ensure supply water during floods,
- the reduction of vulnerabilities,
- the restoration of the open flows of rivers,
- the conservation and the re-building of the natural flood storage areas,
- the forecasting of events,
- the identification of zones at risk,
- the identification of protected emergency water intakes,
- the publication of “atlases” of easily flooded zones, including the flooded areas caused by the rising of aquifers,
- the control of urbanization,
- warning and education.

In the transboundary basins in particular, cooperation between riparian States, for jointly looking for coordinated solutions and for sharing information and responsibilities, should be promoted.

3.2. With regard to droughts:

Situations of water shortages, too often ignored, are a growing problem in an increasing number of areas and are likely to worsen in the future.

The availability of fresh water - in sufficient quantity and quality - may become, in a generation from now, one of the main limiting factors of the economic and social development in many countries.

Climate change will worsen the structural problems which already lead to water scarcity in many areas: on this subject it is useful to make a distinction between drought and scarcity, the latter being initially related to a permanent and structural imbalance between available resources and abstractions.

The prevention of recurring droughts can, no more, be done on a case-by-case basis, but must be planned in the long term, by solving the structural problems which occur, in order to prevent, in the best possible way, their effects and to avoid the total degradation of water resources.

It is essential to intensify efforts for better managing water demand and thus reducing the pressures on the resources especially in period of drought, by reducing, in particular, abstractions for irrigation which is the reason for the most significant abstractions in many areas.

Very often, the rarefaction of the resource will require looking for water saving, by, first of all, managing the demand but also by mobilizing non-conventional water and by reusing water, by systematically fostering ecologically sound solutions, socially acceptable and economically reasonable.

Mobilizing new resources and creating reserves should be planned after rationalizing water demands and only when it will be ecologically acceptable and economically reasonable. The economic incidence of water reuse on its efficient use should not be forgotten, in period of drought in particular.

Building new dams will not be enough without the implementation of water saving and recycling programs: the solutions will pass by proactive water management together with constant incentive measures for more rational uses facilitated by innovation and new technologies.

Plans for the Management of Water Scarcity should prioritize drinking water supply, making sure that water is equitably and soundly shared between the various uses, ensuring a better optimization of water and avoiding wastages.

They must ensure a better optimization of existing water resources, before planning the launching of projects for the mobilization of new resources.

Water saving, leak detection, recycling, the reuse of treated water, groundwater recharge, the desalination of sea water, research on low-consumption uses, must become priorities.

4. A new approach to water uses in agriculture should be looked for.

In a context of increased pressure on water resources and lands, the importance of the agricultural component should be stressed, as continuing the "business as usual" scenario would be irresponsible.

Feeding the world population today and in the future (9 billion inhabitants foreseen in 2075) implies using, in all the countries, an agriculture which is less water-consuming and less sensitive to climate hazards: to a very large extent that will require effective irrigation.

The farmers will be among the first victims of the fluctuations of water supply due to the variations of the climate.

Accompaniment to the changes in agricultural practices towards water saving should be planned with good dissemination of innovation in general, thanks to education, training, research and development.

Financial incentive mechanisms should be gradually developed for respecting water resources allocation and water saving (pricing, quotas, subsidies) and for facilitating access to credits for the modernization of plot irrigation.

The reduction of non-point pollution, as regards the use of fertilizers and pesticides, is also a prerequisite to maintain or recover good water status.

The issues of agricultural water should thus be clearly included into the integrated water resources management (IWRM) approaches in transboundary and national river basins.

5. Integrated and sound water resources management at the level of river basins is obviously essential worldwide!

Adaptation to the effects of climate change is initially a problem of better water management.

Admitting this obvious fact and implementing the necessary reforms are real development opportunities.

The basins of rivers, lakes and aquifers are the relevant natural geographical territories in which to organize this integrated and sound management.

Indeed, river basins are the natural territories in which water runs on the soil or in the sub soil, whatever are the national or administrative boundaries or limits crossed.

Significant progress has already been made since the 1990s:

River basin management experienced a quick development in many countries, which made it the basis of their national legislation on water or experimented it in national or transboundary pilot basins.

It is now widely recognized that water resources management should be organized:

- * **on the scale of** local, national or transboundary **basins** of rivers, lakes and aquifers, as well of their related coastal waters;
- * **with the participation in decision-making of** the concerned Governmental Administrations and local Authorities, **the representatives of different categories of users and associations for environmental protection or of public interest.** Indeed, this concerted participation will ensure the social and economic acceptability of decisions taking into account the real needs, the provisions to be acted upon and the contribution capabilities of the stakeholders in social and economic life.
- * **based on integrated information systems**, allowing knowledge on resources and their uses, polluting pressures, ecosystems and their functioning, the follow-up of their evolutions and risk assessment. These information systems will have to be used as an **objective basis** for dialogue, negotiation, **decision-making** and evaluation of undertaken actions, as well as coordination of financing from the various donors;
- * **based on management plans** or master plans that define the medium and long-term objectives to be achieved;
- * **through the development of Programs** of Measures and successive **multiyear priority investments**;
- * **with the mobilization of specific financial resources**, based on the « polluter-pays» principle and “user-pays” systems; by looking for geographical and inter-sectoral equalizations to gather the necessary amounts;

Legal and institutional frameworks should allow the application of these six principles in each country and at the regional level.

6. Cooperation between riparian Countries should be strengthened for good management of transboundary rivers, lakes and aquifers in particular.

For several centuries, many agreements have certainly been signed between riparian countries to ensure freedom of navigation or the sharing of flows and, since the end of the 19th century, for the building of hydropower dams.

It is now essential that cooperation agreements, conventions or treaties on pollution control, environmental protection or the prevention of floods and integrated management of these shared basins be initiated or signed between the riparian countries of these transboundary resources to achieve indispensable common cause at the basin level and develop a common vision of the future.

Although the United Nations Convention of 21 May 1997, on the uses other than navigation on the international rivers, did not yet come into effect, its principles are now more and more recognized as a basis for relations among the riparian States concerned.

Resolution A/RES/63/124, adopted in December 2008 by the General Assembly of the United Nations, offers to the States the framework for joint management their transboundary aquifers.

In addition, the European Water Framework Directive of 2000 (WFD) lays down an objective of good status in the national or international river basin districts of the 27 current Member States and the Countries applying for accession to the European Union.

Agreements on transboundary aquifer management should also be developed, taking into account their fragility and the time needed for the restoration of degraded situations.

Improving knowledge of water resources, aquatic environments and of their uses is essential to allow decision-making.

It is recommended to promote **the creation of information systems on water resources and their uses in each basin.**

Systems for warning against floods, droughts and pollution should be improved, developed and coordinated for better facing the natural disasters caused by water and for protecting human lives and properties.

It is necessary to promote the emergence in this field of means and competences for specific engineering and to support any work aiming at defining common standards and nomenclatures for data administration in order to allow exchanges, comparisons and syntheses of information between partners at all the relevant levels of observation.

If climate change can no more be doubted, significant uncertainties remain regarding its local impact and the best way of facing it in each situation. It is clear that acting now and very quickly is needed but also that it is necessary to reinforce research on climate in each large basin or areas

In a practical way, it is essential to test the sensitivity of each basin and the relevance of the management plans using various projection assumptions provided by climate models, in order to establish as finely as possible the combinations of measures to be taken with best cost-effectiveness, especially in the case of transboundary basins which require increased coordination and exchanges between riparian countries.

6. The participation of stakeholders and the civil society should be organized for a real mobilization of partners.

INBO recommends that this participation be organized in Basin Committees or Councils.

These Basin Committees should be involved in the decision-making related to water policy in the basin, with procedures that clearly define their role. In particular, they should be associated to the definition of long-term objectives, to the preparation of Management Plans or master plans, to the selection of development and equipment priorities and to the implementation of Programs of Measures and multiyear priority investment programs, as well as to the setting of financing principles and to the calculation of water taxes that concern them.

If the various partners are involved at the earliest possible time, the more will be chance of good acceptance of all the measures which will have to be taken and of a definition of a real intersectoral adaptation strategy. Each sector must be well informed on the possible effects of climate change on its activity

It is necessary to establish intersectoral links to foster exchanges of information and experience and coordination of actions in each basin.

Moreover, it is necessary that users, professionals or not, such as farmers, tree growers, fishermen, environmental associations, producers of hydropower, managers of navigation... adopt administrative, corporative or associative structures in basins and sub-basins.

Finally, **significant means** should be devoted to public **awareness** and **participation**, women and young people in particular, and to the **training** of their representatives regarding decision-making.

The transfers of research outcomes to water managers and decision makers, regarding socioeconomics and prospective analysis in particular, should allow improving and providing the basis of these decision-makings.

6.1. Users' contribution in water financing

The investments necessary for the sustainable management, conservation and control of water resources and ecosystems and for the exploitation and maintenance of public utilities and the renewal of installations require huge financial resources.

This adaptation will also require additional financial resources that will undoubtedly have to be found by adopting new mechanisms such as basin taxes, insurance systems or market instruments.

It is necessary to set up everywhere complementary financing systems that are based on the users' participation and common cause.

It is thus necessary to consider **specific and additional financial resources** by combining national or local administrative taxes, the pricing of community services, the creation of geographic and inter-sectoral equalization mechanisms and taxes specific to objectives retained through dialogue.

These arrangements should be an incentive to limiting wastage and to removing pollution by changing the users' behavior.

7. Conclusion

Integrated and sound water resources management is more than ever a priority when this scarce resource is already a limiting factor for sustainable development in many countries of the world.

Mobilization is essential for humanity to win the water battle and prepare the future. Organizing this management on a basin scale is an effective solution which deserves to be developed, fostered and supported.

INBO intends to actively contribute to the efforts for adapting to the effects of climate change:

- by supporting programs for identification of the threats, allowing anticipation, thanks, for example, to the development of integrated information systems,

- by allowing the populations to be better warned and informed on the evolutions and behaviors that are likely to overcome the difficulties,
- by protecting natural spaces in basins and adapting infrastructures within the framework of basin management plans,
- by supporting the development of better coordinated agricultural and forestry policies regarding deforestation control, irrigation and water storage in particular.

It is especially necessary:

- to improve the collection of information allowing a modeling of the phenomena and the development of scenarios leading to an identification of the most vulnerable black spots, to giving priority to the actions to be carried out and to a suitable answer;
- to reinforce the water management institutions to guarantee a long-term and rational meeting of the needs of the populations, industry, hydropower power, agriculture and fresh water fish farming, tourism and of the ecosystems.

Investing in water management is profitable! This produces immediate advantages but also creates a social, economic and environmental strength in the long term.

INBO member organizations have experience and expertise which they intend to pool at the disposal of all the countries and institutions which would like to follow them in an effective basin management approach.

Bibliography

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