

The Mexico World Water Forum's Ministerial Declaration 2006: A Dramatic Policy Shift?

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ABSTRACT *This paper analyzes the scope of the Fourth World Water Forum's Ministerial Declaration (Mexico, 2006) in the context of globally accepted water management principles. Two major declarations related to global water policy are scrutinized, i.e. Chapter 18 of Agenda 21 (1992) and the Third World Water Forum's Ministerial Declaration (Kyoto, 2003). Ten globally accepted water management principles were identified that were not properly addressed in the Mexico Ministerial Declaration. Even though holistic and Integrated Water Resources Management has been widely propagated as the best water management practice, the Mexico World Water Forum's Ministerial Declaration undertakes a dramatic structural shift in global water policy by favouring a non-holistic and fragmented approach to water management.*

Introduction

World Water Forums, organized by the World Water Council and held every three years since 1997, are the largest international events in the field of water. The key aim of this series of global water events is to enable multi-stakeholder participation and dialogue to influence water policy making at the global level, thus assuring better living standards for people all over the world and more responsible social behaviour towards water issues in line with the pursuit of sustainable development (FWWF, 2006).

The World Water Forums have been recognized to constitute an open, multi-stakeholder participatory process, which builds on the knowledge, experience and input of the global water community. This process has led the movement from the World Water Vision, a unique prospective exercise on the future state of global water resources, whose results were presented at the Second Forum held on 17–22 March 2000 in The Hague, to the establishment of concrete actions and commitments derived from the Third Forum held in March 2003 in Kyoto (WWC, 2006).

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On 16–22 March 2006, the Fourth World Water Forum was held in Mexico City. The Forum had three guiding principles:

- (1) to benefit from the value of local knowledge and experience as a key factor in the success of water policy making;
- (2) to produce concrete and policy-oriented outputs aimed at supporting local action on a worldwide scale; and
- (3) to enable dialogue between policy sectors and stakeholders to address the complex and cross-cutting nature of water problems.

Approximately 20 000 people from around the world participated in 206 working sessions. Participants included official representatives and delegates from 140 countries, which included 120 mayors, 78 ministers, 150 legislators, 1395 journalists, experts, NGOs, companies and civil society representatives (WWC, 2006). On 22 March 2006, The Ministerial Conference adopted the Mexico Forum's Ministerial Declaration (hereafter Mexico Declaration).

It is worth noting that the World Water Forums are not organized by the United Nations, therefore their declarations, e.g. Kyoto Declaration and Mexico Declaration, are not binding in nature but are rather bona fide recommendations. However, Ministerial Declarations of the World Water Forums decidedly influence global water policies and water resources management practices.

Since these declarations have global significance and contribute noticeably in shaping national and international water policies worldwide, this paper attempts to scrutinize the scope of the Mexico Declaration in comparison with globally accepted water management principles. For this comparative analysis, the paper chooses two major water related declarations, i.e. Chapter 18 of Agenda 21 adopted by the 1992 United Nations Conference on Environment and Development, and the Third World Water Forum's Ministerial Declaration (2003) (hereafter Kyoto Declaration).

This study reveals that the Mexico Declaration failed to address the complex, interconnected and multi-dimensional facets of water management. Therefore, in the long run they would promote unsustainable water management and might become counterproductive in achieving the water related Millennium Development Goals (MDGs)¹ and Integrated Water Resources Management (IWRM) objectives². This paper concludes that the Mexico Declaration is a dramatic shift in global water policy and promotes a non-holistic and fragmented water management approach.

International Water Events

During the last three decades several international events have been held with a focus on water issues. Among them, the following eight events have been the most influential:

- (1) United Nations Conference on Water (Mar del Plata 1977)
- (2) International Conference on Water and Environment (Dublin 1992)
- (3) United Nations Conference on Environment and Development (Rio de Janeiro 1992)
- (4) Second World Water Forum & Ministerial Conference (The Hague 2000)
- (5) International Conference on Fresh Water (Bonn 2001)
- (6) World Summit on Sustainable Development (Johannesburg 2002)

- (7) The Third World Water Forum (Kyoto 2003)
- (8) The Fourth World Water Forum (Mexico 2006)

Rahaman & Varis (2005) critically analyzed the outcomes of the Mar del Plata, Dublin, The Hague, Bonn and Johannesburg events. Biswas & Tortajada (2007) made a comprehensive international survey on the impacts of these meetings (up to Kyoto). This paper concentrates on the outcomes of the Rio de Janeiro, Kyoto and Mexico events.

The UN Conference on Environment and Development (UNCED), also known as The Earth Summit, was held in Rio de Janeiro from 3–14 June 1992. A total of 178 UN member states, 2400 NGO representatives and approximately 17 000 other participants attended the conference. This Summit, in which 108 heads of state or governments of the world participated, was the most influential of its kind. The key declaration adopted in Rio was Agenda 21, which was endorsed by 178 states. Chapter 18 of Agenda 21 dealt exclusively with fresh water issues (UNCED, 1992).

The Third World Water Forum was held on 16–23 March 2003 in Kyoto, Japan. Over 24 000 people attended the Forum. The Forum included a two-day Ministerial Conference, resulting in the release of a Ministerial Declaration known as the Kyoto Declaration. The declaration dealt with a range of water issues, including: water resources management; safe drinking water and sanitation; water for food and rural development; water pollution prevention and ecosystem conservation; and disaster mitigation and risk management (TWWF, 2003).

Unfocused Water Management Principles in the Mexico Declaration 2006

The Mexico Declaration recognizes the access of drinking water and sanitation as one of the most important aspects of water management (Paragraphs 2, 4, 5, 6, 9). It emphasizes the role of UN organizations to support member states to reach water and sanitation targets. In this connection, it calls for the exchange of best practices and lessons learned on international water and sanitation practices (Paragraph 4), and also recognizes the important role of parliamentarians and local authorities (Paragraph 9). It acknowledges the importance of innovative practices such as rain water management and the development of hydropower in some regions and the involvement of relevant stakeholders in the planning and management of water services (Paragraph 3). The declaration emphasizes the necessity to foster and assist building capacities and cooperation at all levels to mitigate water related disasters and to increase resources from all sources to the developing countries to achieve internationally agreed development goals and targets (Paragraphs 7 and 8).

It further stipulates that the governments have the primary role in promoting improved access to the safe drinking water, basic sanitation, secure tenure and adequate shelter, through improved governance, appropriate enabling environments and regulatory frameworks and adopting a pro-poor approach and with the active involvement of all stakeholders (Paragraph 8). The declaration reaffirms its commitment many times to the decision of the 13th Session of the United Nations Commission of Sustainable Development (CSD-13) adopted in April 2005, but fails to recognize that the scope of CSD-13 was in human settlements, drinking water and sanitation, and that is only one facet of water management.

Even though the Mexico Declaration attempted to provide policy guidelines for sustainable water management, 10 globally accepted key principles that build up the skeleton of both Agenda 21 and the Kyoto Declaration are excluded from the declaration. Principles that deserve special consideration for promoting efficient and effective water management and development worldwide, but not focused on in the Mexico Declaration, include:

- ecosystem conservation;
- water for food security and rural development;
- impact of global climate change on water resources;
- inland fisheries and aquaculture;
- transboundary river basin management;
- public participation;
- sustainable forest management;
- data and information sharing, technology transfer, research and development;
- environmental and social costs of hydropower development; and
- integrated water resources management.

This section reveals and discusses these principles. Chapter 18 of Agenda 21 provides comprehensive policy guidelines for implementing these principles. For the clarity of the analysis, these guidelines are also discussed in this section.

Ecosystem Conservation

Water is fundamental to the biochemistry of all living organisms. The earth's ecosystems give humans an environmental security by providing staples, such as fish, medicines and timber products, services such as flood protection and water quality improvement and biodiversity. Water availability is the key controlling factor in maintaining ecosystems. Keeping this point in mind, both Agenda 21 and Kyoto Declaration call for ecosystem conservation.

The very first sentence of the Chapter 18 of Agenda 21 recognizes fresh water resources as an indispensable part of all terrestrial ecosystems (Article 18.1). Article 18.2 continues:

The general objective is to make certain that adequate water supplies of water of good quality are maintained for the entire population of this planet, while preserving hydrological, biological and chemical functions of the ecosystems . . .

Article 18.8 again stipulates that water is an integral part of the ecosystem and water resources have to be protected, taking into account the functioning of the ecosystems and the perennial nature of the resources, in order to satisfy and reconcile needs for water in human activities. It further states that in developing and using water resources, priority has to be given to the satisfaction of the basic needs and the safeguarding of ecosystems.

“Protection of water resources, water quality and aquatic ecosystems” is one of the seven programme areas identified by Agenda 21 (Article 18.5). Articles 18.35–18.46 describe the basis, objectives, activities and means of implementation for this programme area. Article 18.35 mentions that holistic management and recognition of the interconnectedness of the elements related to fresh water quantity and quality are prerequisites for the long-term development of the global fresh water resources.

It acknowledges uncontrolled and untreated domestic sewage and industrial wastewater; poor agricultural practices; erosion; sedimentation; deforestation and desertification, etc., all of which result in adverse effects on ecosystems.

Article 18.36 recognizes that “the complex interconnectedness of freshwater systems demands that freshwater management be holistic and based on a balanced consideration of the needs of people and the environment”. Article 18.38(a) stipulates that the objective to integrate water quality elements into water resources management is to maintain ecosystem integrity, according to a management principle of preserving aquatic ecosystems, including living resources and of protecting them from any form of degradation on a drainage basin basis. Article 18.39(g) recommends that all states, through bilateral and multilateral cooperation, should adopt an integrated approach to the environmentally sustainable management of water resources, including the protection of aquatic ecosystems and fresh water living resources.

Article 18.40 describes the detailed activities for the protection and conservation of water resources; water pollution prevention and control; the development and application of clean technology; groundwater protection; protection of aquatic ecosystems; protection of fresh water living resources; monitoring and surveillance of water resources and waters receiving wastes; and development of legal instruments. All these could be implemented by all states in order to protect water resources, water quality and aquatic ecosystems.

Article 18.40(a) stipulates that all states, according to their capacity and available resources, could introduce mandatory environmental impact assessment of major water resources development projects potentially impairing water quality and aquatic ecosystems. Article 18.40(h) calls for the development of national and international legal instruments to protect the quality of water resources, particularly for monitoring and controlling of national and transboundary water pollution; the long-range atmospheric transport of pollutants; accidental and/or deliberate spills in national and transboundary water; and implementing environmental impact assessment.

Articles 18.41–18.46 elaborate means of implementation of the programme area: “Protection of water resources, water quality and aquatic ecosystems”. These are financing and cost evaluation (Article 18.41); scientific and technological means (Articles 18.42–18.43); human resources development (Articles 18.44 water resources 18.45) and capacity building (Article 18.46). Agenda 21 emphasizes the need for cooperative research to develop solutions for technical problems (Article 18.42) and monitoring and assessment of complex aquatic systems through multi-disciplinary studies involving collaboration between North-South research institutes and joint research projects (Article 18.43). It stresses that human resources development is a key to capacity building and a prerequisite for implementing water-quality and ecosystems protection strategies and activities (Articles 18.39, 18.44, 18.45).

Like Agenda 21, the first paragraph of the Kyoto Declaration recognizes the importance of water in ecosystem conservation: “Water is a driving force for sustainable development including environmental integrity, and the eradication of poverty and hunger, indispensable for human health and welfare.” In Paragraphs 23 to 26, the Kyoto Declaration also explicitly acknowledges the necessity of water pollution prevention and ecosystem conservation. Paragraph 23 recognizes the need to intensify water pollution prevention in order to reduce hazards to health and the environment and to protect ecosystems, including control of invasive species. In this connection, it recommends promotion of traditional water knowledge and public awareness through public

information and education to prevent water pollution and unsustainable use of water resources.

Paragraph 24 states that in order to ensure a sustainable water supply of good quality, it is necessary to protect and promote the sustainable use of ecosystems that naturally capture, filter, store and release water such as rivers, wetlands, forests and soils. Paragraph 25 recommends all states, "to review and, when necessary, to establish appropriate legislative frameworks for the protection and sustainable use of water resources and for water pollution prevention". To address water resources management and development challenges arising from degradation of watersheds and forests, Paragraph 26 of the Kyoto Declaration calls for continued efforts to combat deforestation, desertification and land degradation through sustainable forest management, restoration of degraded lands and wetlands, and the conservation of biodiversity.

Both Agenda 21 and the Kyoto Declaration seek to stimulate the ecosystem approach and the holistic approach to manage water resources by using an ecosystem based management approach. The Mexico Declaration only notes with interest the importance of enhancing the sustainability of ecosystems (Paragraph 3), without providing any policy guidelines and recommendations for ecosystems conservation and pollution prevention.

Water for Food Security and Rural Development

The main limitation to increasing food production is water. Currently, approximately 800 million people in developing countries are chronically undernourished (FAO, 2003). Globally, 80% of the water consumption is used for irrigation purposes, less than 20% for industry and a mere 6% for domestic purposes. In the developing world, agriculture consumes 85% of total used water. More than 60% of global food production is attributed to rain-fed agriculture, and nearly 40% attributed to irrigation (Rosegrant *et al.*, 2002). If the population increases by 65% over the next 50 years, approximately 70% of the population will face water shortages and 16% will have insufficient water to grow their basic food requirements (Selborne, 2000).

For many parts of the developing world, water for agriculture is one of the dominant factors for food security, the economy, the alleviation of poverty and rural development. The International Water Management Institute (IWMI) study in the Walawe Left Bank System, Sri Lanka, concludes that access to irrigation contributes to food security, a balanced diet and reduced vulnerability and poverty at the household and community levels (Hussain & Hanjra, 2002).

Both Agenda 21 and the Kyoto Declaration recognize water requirements for food production and rural development as one of the most important aspects of water resources management. Water for sustainable food production and rural development is included as one of the seven programme areas proposed by Agenda 21 for the fresh water sector (Article 18.5). Articles 18.65 to 18.81 describe the basis of action, objectives, activities and means of implementation for this programme area. Article 18.65 states:

The sustainability of food production increasingly depends on sound and efficient water use and conservation practices consisting primarily of irrigation development and management, including water management with respect to rain-fed areas, livestock water-supply, inland fisheries and agro-forestry.

It also notes that soil erosion, mismanagement of natural resources and acute competition for water have influenced the extent of poverty, hunger and famine in developing countries. It calls for the development and application of water saving technologies and management methods and enabling rural communities to adopt new approaches for both rain-fed and irrigated agriculture.

Article 18.68 proposes four strategic principles for holistic and integrated environmentally sound water management in the rural context. These are:

- (1) Water should be regarded as a finite resource that has an economic value with significant social and economic implications, reflecting the importance of meeting basic needs.
- (2) Local communities must participate in all phases of water management.
- (3) Water resources management must be developed within a comprehensive set of policies for human health, food production, preservation and distribution, disaster management plans, and environmental protection and conservation of the natural resources base.
- (4) It is necessary to recognize and actively support the role of rural populations, with particular emphasis on women.

Consistent with Article 18.69, the International Action Programme on Water and Sustainable Agriculture Development (IAP-WASAD)³ was initiated by the Food and Agricultural Organization (FAO) to assist developing countries in planning, developing and managing water resources on an integrated basis to meet current and future needs for agricultural production, taking into account environmental considerations. Article 18.76 outlines the detailed guidelines for all states to implement nine activities, i.e. water-supply and sanitation for the unserved rural poor; water use efficiency; waterlogging, salinity control and drainage; water quality management; water resources development programmes; scarce water resources management; water supply for livestock; inland fisheries; and aquaculture development.

Like Agenda 21, the Kyoto Declaration also identifies water for food and rural development as one of the most important aspects of water resources management, in Paragraphs 19 to 22. Paragraph 19 reads:

Water is essential for broad based agricultural production and rural development in order to improve food security and eradicate poverty. It should continuously contribute to a variety of roles including food production, economic growth and environmental sustainability.

It also calls for improvements in agricultural water user efficiency and a reduction in unsustainable agricultural practices.

Paragraph 20 of the Kyoto Declaration stresses the need for effective and equitable water use and management, and extending irrigation in areas of need. To do so, it calls for community-based development that should result in income-generating activities that contribute to poverty eradication in rural areas. Paragraph 21 calls for innovative and strategic investment, research and development and international cooperation for the improvement of agricultural water management. In this regard, it encourages demand driven management, participatory irrigation management, rehabilitation and the modernization of existing water

facilities, water harvesting, water saving/drought-resistant crop varieties, water storage and the dissemination of agricultural best practices.

Paragraph 1 in The Mexico Declaration affirms the critical importance of fresh water for agricultural and rural development. However, unlike Agenda 21 and the Kyoto Declaration, it does not provide any policy guidelines for agricultural water management and rural development.

The Impact of Global Climate Change on Water Resources

Although subject to enormous uncertainties about future global climate change, the relationship between rising levels of greenhouse gases and the earth's temperature is well proven. Global warming because of an enhanced greenhouse effect is likely to have significant effects on the hydrological cycle (Arnell, 1999). The Fourth Assessment Report of the Intergovernmental Panel on Climate Change projected that global warming will lead to an increase of both floods and droughts (IPCC, 2007).

Both Agenda 21 and the Kyoto Declaration emphasize the necessity of incorporating the impacts global climate change in national and regional water policies. The first Article of the Chapter 18 of the Agenda 21 states that:

Global climate change and atmospheric pollution could also have an impact on freshwater resources and their availability and, through sea-level rise, threaten low-lying coastal areas and small island ecosystems.

Impacts of global climate change on water resources is one of the six programme areas proposed by Agenda 21 for the fresh water sector (Article 18.5). Articles 18.82–18.90 deal with the impacts of global climate change on water. Article 18.82 states that higher temperatures and decreased precipitation would lead to decreased water supplies and increased water demands; they might cause deterioration in the quality of fresh water bodies, putting strains on the already fragile balance between supply and demand in many countries. It further mentions:

Even where precipitation might increase, there is no guarantee that it would occur at the time of year when it could be used; in addition, there might be a likelihood of increased flooding. Any rise in sea-level will often cause intrusion of salt water into estuaries, small islands and coastal aquifers and the flooding of low-lying coastal areas; this put low-lying countries at great risk.

Consistent with the United Nations Framework Convention on Climate Change (UNFCCC, 1992)⁴, Article 18.84 set the following objectives to deal with the impacts of global climate change on water resources:

- (1) to understand and quantify the threat of the impact of climate change on fresh water resources;
- (2) to facilitate the implementation of effective national countermeasures; and
- (3) to study the potential impacts of climate change on areas prone to droughts and floods.

Article 18.85 recommends all states to implement the following activities:

- (1) monitor the hydrological regime, including soil moisture, groundwater balance, penetration and transpiration of water quality, and related climate factors;
- (2) develop and apply techniques and methodologies for assessing the potential adverse effects of climate change, through changes in temperature, precipitation and sea-level rise on fresh water resources and the flood risk;
- (3) initiate case studies to establish whether there are links between climate changes and the current occurrences of droughts and floods;
- (4) assess the resulting social, economic and environmental impacts;
- (5) develop and initiate response strategies to counter the adverse effects;
- (6) develop agricultural activities based on brackish-water use; and
- (7) contribute to the ongoing research activities within the framework of current international programmes.

Articles 18.86–18.90 discuss the means of implementation of the programme. These are financing and cost evaluation (Article 18.86); scientific and technical means (Article 18.87); human resources development (Article 18.89) and capacity building (Article 18.90).

Consistent with Articles 18.84 and 18.85(g) of Agenda 21, Paragraph 12 of the Kyoto Declaration states:

We will further encourage scientific research on predicting and monitoring the global water cycle, including the effect of climate change, and develop information systems that will enable the sharing of such valuable data worldwide.

Unfortunately, the impacts of global climate change on water resources are totally excluded from the Mexico Declaration. Regrettably, even the term 'global climate change' is not mentioned in the declaration, let alone the guidelines for coping with the potential impacts of global climate change on water resources.

Inland Fisheries and Aquaculture

Fisheries and aquaculture are imperative for human survival, poverty reduction, and for providing an inexpensive source of protein to meet the nutritional demand in most parts of the world, and therefore should command special attention within integrated water development and management (Rahaman & Varis, 2005).

Chapter 18 of Agenda 21 recognizes this important role of inland fisheries and aquaculture for sustainable development and the linkages between fisheries and aquaculture with water resources development and management (Article 18.3). Article 18.40(f) recommends controlling and monitoring water quality to allow the sustainable development of inland fisheries. It further proposes protecting the ecosystems from pollution and degradation for the development of fresh water aquaculture projects. Article 18.67 states that:

Freshwater fisheries in lakes and streams are an important source of food and protein. Fisheries of inland waters should be so managed as to maximize the yield

of aquatic food organisms in an environmentally sound manner. This requires the conservation of water-quality and quantity, as well as of the functional morphology of the aquatic environment.

Article 18.74 mentions that the objectives with regard to water management for inland fisheries and aquaculture include the conservation of water quality and water quantity requirements for the optimum production and prevention of water pollution by aquacultural activities. Through IAP-WASAD, Agenda 21 seeks to assist member countries in managing the fisheries of inland waters and development of environmentally sound approaches to the intensification of aquaculture (Article 18.74).

Article 18.76(h) recommends that all states should implement five activities related to inland fisheries:

- (1) develop the sustainable management of water resources as part of national water resources planning;
- (2) study specific aspects of the hydrobiology and environmental requirements of key inland fish species in relation to varying water regimes;
- (3) prevent or mitigate modification of aquatic environments by other users or rehabilitate environments subjected to such modifications on behalf of sustainable use and conservation of biological diversity of living aquatic resources;
- (4) develop and disseminate environmentally sound water resources and management methodologies for the intensification of fish yield from inland waters; and
- (5) establish and maintain adequate systems for the collection and interpretation of data and water quality and quantity and channel morphology to the state and management of living aquatic resources, including fisheries.

Article 18.76(i) recommends four further activities for aquaculture development. These are:

- (1) develop environmentally sound aquaculture technologies;
- (2) introduce appropriate aquaculture techniques and related water development and management practices in countries not yet experienced in aquaculture;
- (3) assess environment impacts of aquaculture with specific reference to commercialized culture units and potential water pollution from processing centres; and
- (4) evaluate the economic feasibility of aquaculture in relation to alternative use of water, taking into consideration the use of marginal-quality water and investment and operational requirements.

The Kyoto Declaration recognizes the role of inland fisheries for attaining food security, even though it does not explicitly address the role of aquaculture, Paragraph 22 reads:

Inland fisheries being a major source of food, freshwater fish production should be addressed through intensified efforts to improve water quality and quantity in rivers and protection or restoration of breeding areas.

Quite surprisingly, the Mexico Declaration totally overlooked inland fisheries and aquaculture.

Transboundary River Basin Management

An increasing number of countries are experiencing water stress, yet in most river basins mechanisms and institutions to manage disputes over water resources are either absent or inadequate. The need for integrated, cooperative solutions is particularly urgent in the 263 river basins which are shared by two or more states, and in which nearly half of the territory and population of the world are located. Integrated planning for efficient watershed management is hampered by the difficulties of coordinating between riparian states with diverse and often conflicting needs (UNESCO & Green Cross International, 2003).

Transboundary water conflicts are ubiquitous, both in the Third World and in the rich industrial nations. Water conflicts in international river basins around the world create serious political, economic and social instability, both regionally and internationally. The examples of inter-state conflicts include: Nile basin in Africa, Tigris and Euphrates in the Middle East, Parana Basin in South America, and Ganges-Brahmaputra-Meghna basins in Asia (Petrella, 2001). Promoting and implementing integrated management through transboundary cooperation at a river basin scale could control the state of the world's water and reduce water conflicts between the nations (Rahaman & Varis, 2005).

Article 18.4 of Agenda 21 recognizes the importance of the transboundary cooperation and cooperative management of the shared water resources. It states:

Transboundary water resources and their use are of great importance to riparian States. In this connection cooperation among those States may be desirable in conformity with existing agreements and/or other relevant arrangements, taking into account the interest of all riparian States concerned.

Article 18.10 stipulates that:

In the case of transboundary water resources, there is a need for riparian States to formulate water resources strategies, prepare water resources action programmes and consider, where appropriate, the harmonization of those strategies and action programmes.

Article 27(a) recommends all states should cooperate in the assessment of transboundary water resources, subject to the prior agreement of each riparian state concerned. For the protection of water resources, water quality and aquatic ecosystems, Article 40(h) recommends developing international legal instruments for controlling accidental and/or deliberate spills in transboundary water bodies.

The Kyoto Declaration also acknowledges the obligation of transboundary water cooperation between riparian states. Paragraph 11 states: "Recognizing that cooperation between riparian states on transboundary and/or boundary watercourses contributes to sustainable water management and mutual benefits, we encourage all those states to promote such cooperation."

Unfortunately, the Mexico Declaration does not recognize the vital importance of transboundary cooperation and the integrated management of international river basins. Even the word 'transboundary' is missing from the Mexico Declaration, let alone addressing this crucial aspect of world water resources management.

Public Participation

One of the key challenges towards achieving efficient and effective water resources management is to create a management system where formal decision makers work together with the scientific community, water users, local communities and other stakeholders through a coordinated approach (Falkenmark *et al.*, 2004). The importance and challenge of working for a better and more effective involvement of stakeholders in water resources development and management through consultation, collaboration and coordination with civil society, private enterprises, farmers, women, local communities and other water users and interests groups must be properly addressed (Rahaman *et al.*, 2004; Rahaman & Varis, 2005).

Agenda 21 stresses the vital need of public participation for efficient and effective water resources management. Article 18.9(c) suggests that one of the four principle objectives of integrated water resources development and management is

to design, implement and evaluate projects and programmes that are both economically efficient and socially appropriate with clearly defined strategies, based on an approach of full public participation, including that of women, youth, indigenous people and local communities in water management policy-making and decision-making.

Article 18.12(n) recommends that all states should develop public participatory techniques and their implementation in decision making, with special focus on women's role in water resources planning and management. Article 18.12(o) calls for the delegation of water resources management at the lowest appropriate level. Article 18.19 emphasizes the necessity of human resources development through education and training programmes related to water management to enhance the participation of stakeholders. Article 18.22 calls for governments to create an enabling environment to achieve the lowest appropriate level management approach.

Articles 18.34, 18.45 and 18.50(c) suggest that to improve water use efficiency at the local level, it is necessary to strengthen managerial capabilities of water users groups through support, assistance and training to the local population, especially women, youth, indigenous people and local communities. To ensure safe drinking water and sanitation objectives, Articles 18.50(b) and 18.54 encourage water development and management based on a participatory approach, involving users, planners and policy makers at all levels. They further call for high degree of community participation to ensure that planning, decision making, implementation and evaluation of domestic water supply and sanitation projects are to be taken at the lowest appropriate level.

For urban water resources management, Articles 18.59(d) and 18.59(f) recommend all states should promote public participation, mobilize and facilitate local water associations for rational water utilization; protect water quality in urban environments; and the management of water supply and sanitation systems. Article 18.68(b) recognizes the role of local communities for holistic and integrated water management in the rural context. It emphasizes that the "local communities must participate in all phases of water management, ensuring the full involvement of women". Article 18.68(d) further stipulates that recognizing and supporting the role of rural populations, with particular emphasis on women, is a key strategic principle for water management in the rural context. Articles 18.20, 18.45, 18.53, 18.62 and 18.80 recommend fostering stakeholder participation through education and training.

The Kyoto Declaration calls for community-based water management approaches by promoting the participation of all stakeholders and ensuring transparency and good governance in all actions (Paragraph 3). It stresses the need for capacity building of the stakeholders (Paragraph 4) and participation of all stakeholders in order to develop integrated water resources management and efficiency plans consistent with the World Summit on Sustainable Development's (WSSD, 2002) plan of implementation (Paragraph 10).

The Mexico Declaration also calls for the necessity of public participation in its Paragraph 3: "Further reaffirm the importance of the involvement of relevant stakeholders, particularly women and youth, in the planning and management of the water services, and as appropriate, decision-making process". Thus the declaration only acknowledges the stakeholders' participation in the planning and management of the "water services" rather than 'water resources'. The inclusion of the phrase "as appropriate" restricts the explicit right of all stakeholders in the policy and decision-making processes regarding water management.

The Mexico Declaration's Paragraph 9 recognizes the important role of parliamentarians and local authorities to increase sustainable access to water and sanitation services and to support integrated water resources management, and calls for efficient collaboration with and between these actors. By only acknowledging the role of top-level decision makers in water resources management, it ignores the bottom-up management approach. Thus, it supports or promotes the top-down management approach, whereas the bottom-up water management approach has been widely propagated and endorsed by the international water communities during the last three decades (Rahaman *et al.*, 2004; Rahaman & Varis, 2005).

Horizontal collaboration and management at the lowest appropriate level through stakeholder participation is emphasized in Agenda 21 and the Kyoto Declaration, while the Mexico Declaration implicitly endorses vertically oriented and fragmented management of water resources.

Sustainable Forest Management

We must recognize the importance of forests in soil and water management by encouraging their preservation. The poorest of the poor are the most vulnerable to deforestation and mismanagement of forests. Sustainable forest management prevents erosion, filters and regulates the flow of fresh water, protects coral reefs and fisheries and harbour animals that pollinate, controls pests, buffers disease and maintains biodiversity etc. (UN, 1992; Pearl & Melnick, 2006). One example of the interconnection between water and forestry is the Ganges basin, where an increase in salinity due to low dry season flow in the downstream part of the Ganges delta causes deforestation in Sunderban, the world largest mangrove forest, which is also a world heritage site (Rahaman, 2005).

Both Agenda 21 and the Kyoto Declaration call for sustainable forest management. Article 18.59(a) of the former states that:

All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could implement the activity for the Promotion of research into the contribution of forests to sustainable water resources development.

Annex III (Articles 3 & 4) of Agenda 21 stresses the integrated management of forests, land and water and firmly recognizes the role of forests in protecting fresh water resources, watersheds and ecosystems (UN, 1992).

Paragraph 24 of the Kyoto Declaration calls for the sustainable use of the forests in order to ensure a sustainable water supply of good quality. Paragraph 26 recognizes the necessity of sustainable forest management:

In view of rapid degradation of watersheds and forests, we will concentrate our efforts to combat deforestation, desertification and degradation through programs to promote greening, sustainable forest management, the restoration of degraded lands and wetlands, and the conservation of biodiversity.

The Mexico Declaration totally ignores the need for sustainable forest management and its pivotal role for achieving efficient water resources development and management worldwide. Even the word 'forest' is missing from the Mexico Declaration.

Data and Information Sharing, Technology Transfer, Research and Development

Data and information sharing, technology transfer to developing countries, research and development for appropriate technologies are of paramount importance for achieving sustainable water resources management. Agenda 21 and the Kyoto Declaration both acknowledged that data and information sharing, technology transfer and research and development are vital for formulating policies to achieve integrated water resources development and management.

Articles 18.12(j) and 18.14 of Agenda 21 stress the need for international scientific research cooperation on fresh water; the transfer, adaptation and diffusion of new technology to developing countries; and the development of interactive databases, forecasting methods and economic planning models in order to achieve the objectives integrated water development and management.

For successful water resources assessment, Article 18.25(a) recommends ensuring that water resources assessment technologies are available to all countries. Article 18.25(c) suggests ensuring that the assessment information is fully utilized in the development of water management policies. Article 18.27(b) suggests establishing databases on the availability of all types of hydrological data at the national level and to ensure standards of the data. It also calls for upgrading procedures to store, process and analyze hydrological data and ensure that the data and forecasts are easily available to potential users.

Article 18.27(c) recommends all states should conduct the following activities for data dissemination:

- (1) identify the need for water resources data for various planning purposes;
- (2) analyze and present data and information on water resources in the forms required for planning and management of countries' socio-economic development and for use in environmental protection strategies and in the design and operation of specific water-related projects; and
- (3) provide forecasts and warnings of flood and drought to the general public and civil defence.

Article 18.27(d) calls for establishing or strengthening research and development programmes at the national, regional and international levels to support water resources assessment activities. Article 18.29 stresses the importance of research to develop global hydrologic models to analyze the impact of global climate change and of macro-scale water resources assessment; to close the gap between terrestrial hydrology and ecology at different scales; and to study the key processes in water-quality genesis. As per Article 18.30, technology transfer, adaptation and diffusion, and the development of new technology are important for water resources assessment. Article 18.34 calls for close collaboration between information producers and users.

Articles 18.42, 18.50(c) and 18.52 stipulate the necessity of research and development of appropriate technical solutions and data and information sharing among various water stakeholders. For urban water management, Articles 18.61 and 18.76(a) emphasize the promotion and development of appropriate technologies for the water supply, sanitation and waste treatment in low-income countries. Article 18.61 urges the facilitation of the exchange of international information so that the availability of low-cost technologies could be easily transferred at the local level. Article 18.78 calls for promoting research and development and data dissemination among planners, technicians, farmers, fishermen and other stakeholders to ensure agricultural, fisheries and aquaculture development. Article 18.79 recommends technology transfers both horizontally and vertically between stakeholders. To address the impact of global climate change on water resources, Articles 18.85, 18.87 and 18.88 again necessitate research and development, technology transfer, and information and data sharing.

The Kyoto Declaration, like Agenda 21, acknowledges the necessity of research and development as well as data and information sharing. Paragraph 12 of the Kyoto Declaration encourages scientific research on predicating and monitoring the global water cycle, including the effect of climate change, and developing information systems that will enable data sharing worldwide. Paragraph 21 necessitates research and development, international cooperation and the dissemination of information and data for the progressive improvements of agricultural water management. Paragraph 28 calls for enhancing the sharing and exchange of data, information, knowledge and experience at the international level in order to minimize water related disasters, such as floods and droughts.

Unfortunately, the need for data and information sharing, research and development and technology transfer are excluded from the Mexico Declaration.

Environmental and Social Costs of Hydropower Development

Hydropower development projects are very much interlinked with the overall regional development framework around the world. The connection between water and energy is frequently ignored. Hydropower contributes 19% of global electric power generation (WWDR, 2006) and is particularly vital to meet the development needs of the developing world. More than 2 billion people in developing countries do not have access to reliable forms of energy (WWDR, 2006) and approximately 2.5 billion people have little access to commercial electricity services (WWDR, 2003).

Hydroelectric power contributes to poverty alleviation and industrial growth (WWDR, 2003). Biswas (2004a) notes that if properly planned and implemented, hydropower development projects can be used as an effective means for socio-economic and environmental welfare. The World Commission on Dams suggested that considering environmental and social costs, systematic consultation with affected people, sharing costs

and benefits more equitably between riparian states are all of paramount importance for the proper planning and implementation of hydropower development projects. It considers that the end result of any dam project must be the sustainable improvement of human welfare (WCD, 2000).

Agenda 21 stresses the needs to include environmental and social considerations, in addition to economic considerations, in hydropower development projects. Article 18.3 recognizes the interconnections between hydropower generation and socio-economic development. Article 18.18 stipulates that the public and private investment strategies should incorporate environmentally and socially benign hydropower projects. Article 18.76(e) recommends all states should plan and develop multi-purpose hydroelectric power schemes by making sure that environmental concerns are duly taken into account.

The Kyoto Declaration, like Agenda 21, recognizes the necessity of environmentally sustainable and socially equitable hydropower development projects. Paragraph 15 of the Kyoto Declaration states: "We recognize the role of hydropower as one of the renewable and clean energy sources, and that its potential should be realized in an environmentally sustainable and socially equitable manner".

Paragraphs 1 and 3 of the Mexico Declaration recognize the importance of the development of hydropower projects but, unlike Agenda 21 and the Kyoto Declaration, it does not acknowledge the necessity of incorporating environmental and social costs of such projects.

Integrated Water Resources Management

Between 1977–2003, international water professionals, in alliance with all concerned stakeholders, pursued the use Integrated Water Resources Management (IWRM) to promote holistic water management practices worldwide (Biswas, 2004b; Rahaman & Varis, 2005). The Global Water Partnership defined IWRM:

as a process, which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

They emphasized that water should be managed in a basin-wide context, under the principles of good governance and public participation (GWP, 2003). However, Biswas *et al.* (2005, p. viii) observe that the discussion on IWRM in international forums tends to forget that we should not only talk about the management of water resources but also focus on the development of water resources in specific regions. Water resources development and management should be undertaken in an integrated manner to achieve socio-economic and environmental welfare.

Chapter 18 of Agenda 21 recognizes the importance for integrating water resources development and management in Article 18.3:

The widespread scarcity, gradual destruction and aggravated pollution of freshwater resources in many world regions, along with the progressive encroachment of incompatible activities, demand integrated water resources planning and management.

It further states that:

The multi-sectoral nature of water resources development in the context of socio-economic development must be recognized, as well as multi-interest utilization of water resources for water supply and sanitation, agriculture, industry, urban development, hydropower generation, inland fisheries, transportation, recreation, land management and other activities.

Integrated water resources development and management is included as one of the seven programme areas proposed by Agenda 21 for the fresh water sector (Article 18.5). Articles 18.6–18.22 elaborately describe the basis, objectives, activities and means of implementation of integrated water resources development and management.

According to the Article 18.7, the overall aim of integrated water development and management is to satisfy the fresh water needs of all countries for their sustainable development. Article 18.8 states IWRM is based on the perception of water as an integral part of the ecosystem, a natural resource and a social and economic good, whose quantity and quality determine the nature of its utilization. IWRM, including the integration of land-and water related aspects, should be carried out at catchment basin or sub-basin levels (Article 18.9), and economical efficiency and social equity should be ensured (Article 18.9(c)). Article 18.9(a) states that one of the key objectives of IWRM is to promote a dynamic, interactive, iterative and multi-sectoral approach to water resources management, including the identification and protection of potential sources of fresh water supply, which integrates technological, socio-economic, environmental and human health considerations.

In accordance with Article 18.16, water resources development and management should be planned in an integrated manner. Environmental, economic and social considerations based on the principle of sustainability should be incorporated; the requirements of all water users, as well as the prevention and mitigation of water-related hazards, should be included; and an integral part of the socio-economic development planning process should be constituted.

Paragraph 10 of the Kyoto Declaration stresses the need to provide tools and the required assistance to developing countries for developing IWRM and water efficiency plans: “As we aim to develop integrated water resources management and water efficiency plans by 2005, we will assist developing countries, and countries with transition, by providing tools and further required assistance”.

Unfortunately, the Mexico Declaration does not provide any mechanisms to develop and implement IWRM at the field level.

Conclusions

By far, Chapter 18 of Agenda 21 provides the most comprehensive policy guidelines for sustainable water resources management. Regrettably, with time, the international water communities and relevant academic studies and literature are overlooking the guidelines provided by the Chapter 18 of Agenda 21. The major declarations related to water that are not discussed in this paper, e.g. Mar del Plata 1977; The Hague 2000; Bonn 2001 and Johannesburg 2002, are also not fully in line with Agenda 21. As an example, the principles of ecosystems conservation, transboundary river basin management, fisheries

and aquaculture, and sustainable forest management are not properly addressed in these declarations (Rahaman & Varis, 2005). However, the Fourth World Water Forum's Ministerial Declaration (Mexico, 2006) undertook the most dramatic policy shift compared with the other water declarations.

This paper comparatively analyzed the water principles incorporated in three influential world water declarations, i.e., Chapter 18 of Agenda 21 (1992), the Third World Water Forum's Ministerial Declaration (Kyoto, 2003) and the Fourth World Water Forum's Ministerial Declaration (Mexico, 2006). The study revealed that the Mexico Declaration does not incorporate the following 10 globally accepted water management principles:

- (1) There are no policy guidelines and recommendations for ecosystem conservation.
- (2) There are no policy guidelines for achieving food security and rural development through agricultural water management.
- (3) The impacts of global climate change on water resources are not included.
- (4) The role of inland fisheries and aquaculture towards effective water resources management are not included.
- (5) The Mexico Declaration does not recognize the necessity for transboundary river basin management.
- (6) There is no clear guideline for the active participation of all stakeholders in the management of water resources.
- (7) The Mexico Declaration does not recognize the interconnection between water and sustainable forest management.
- (8) The need for data and information sharing, technology transfer and research and development.
- (9) There is no instruction for incorporating the environmental and social consideration in hydropower development projects.
- (10) There is no guideline to implement Integrated Water Resources Management.

The challenges of the development and management of water resources are closely linked at local, national and global levels. The future of the world water security will be decisively affected by the ways in which countries manage their water resources. Primarily because of the importance of the Fourth Mexico World Water Forum's Ministerial Declaration in shaping national and regional water policies worldwide, the exclusion of major water management principles discussed above would produce fragmented and unsustainable water management. While both Agenda 21 and the Kyoto Declaration recognize the multi-dimensional and multi-sectoral facets of water management and provide detailed policy guidelines for holistic and integrated management of water resources, the Mexico World Water Forum's Ministerial Declaration undertakes a dramatic structural shift in global water policy in favour of non-holistic and fragmented water management approaches.

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Notes

1. On 8 September 2000, the United Nations Millennium declaration adopted by the General Assembly of the United Nations set eight Development Goals, widely known as Millennium Development Goals (MDGs), to be achieved by 2015. For details about MDGs see: *UN Millennium Development Goals*. Available at <http://www.un.org/millenniumgoals/> (accessed 15 June 2005).
2. The three strategic objectives of IWRM are to ensure environmental sustainability, social equity and economic development (GWP, 2003). Rahaman *et al.* (2004); Rahaman & Varis (2005) discuss the IWRM concept and IWRM objectives in detail.
3. The overall objective of the IAP-WASAD programme is to assist Member Nations to improve the management of their water resources in order to achieve food security and sustainable agricultural development. More information is available at <http://www.fao.org/ag/agL/aglw/mandate.stm#wasad> (accessed 9 July 2006).
4. UNFCCC was adopted in New York on 9 May 1992. The Convention came into force on 21 March 1994. The full text is available at <http://www.globelaw.com/Climate/fcc.htm#RatificationAcceptanceandApproval> (accessed 10 July 2006).

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