

# Towards a strategy on human capacity building for integrated water resources management and service delivery

Water  
educational  
training



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**Towards a strategy on human capacity building  
for  
integrated water resources management and service delivery**

**Water-Education-Training**



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# Executive summary

## Introduction

The Long-Term Vision for Water, Life and the Environment (World Water Vision) underlines the growing importance of the freshwater resources for ecosystems and in particular for humankind as a part of it. Management of water resources penetrates the entire society touching the different administrative entities, stakeholder groups, social classes, urban and rural populations, generations and gender.

Education, training and awareness raising have been identified as key elements in forging a strategy to prepare humankind for the challenges of the twenty-first century. The concept of the 'learning society' means a continuous process of adapting and reorienting approaches. This Strategy Paper describes the considerations, basic principles, themes and elements as a basis for the formulation of strategies and programmes at the *local, country, regional or global* levels. It has benefited from the outcome of the World Water Forum (March 2000) and further consultations with interested stakeholders.

## Scope and target groups

Water-related education concerns first of all the knowledge of the hydrological cycle. This concerns the entire profile of terrestrial freshwater resources assessment, monitoring, and management. Beyond this scientific knowledge of the natural processes the Strategy also addresses the demographic, technological, economic, social, environmental, governance and gender related aspects of water and its interrelations with the human society.

The Strategy reflects the whole scope of education, including the formative years at pre-school, primary and secondary educational levels, vocational training, university and professional education at undergraduate and postgraduate levels, lifelong continuing education and training, as well as the *informal and innovative ways of knowledge and information transfer*. Education via distant learning, self-study, role-play and simulation techniques, internet knowledge transfer and other forms of computer-aided learning are examples of this process supplementing the traditional classroom-based methods. An additional dimension reflects the different target groups such as policy makers, managers within and outside the water sector, professionals, technicians and service personnel. Public awareness-raising activities need to be directed to all stakeholders and include traditionally under-served groups like women and youth. Water is everybody's business!

Within this broad picture, universities and other institutions of higher learning and continuing professional education are called upon to push the frontiers of innovation in both content and methodology of education. This focus does not mitigate the importance to include water and related subjects into elementary and secondary school curricula. Higher education includes the preparation of teachers and trainers to their tasks to educate the young generation. In this context the essential role of research in education and training can not be over-emphasized. Addressing the growing complexities of integrated water resources management can only be achieved by adequate research input and the continuous redefinition of the competencies knowledge and skills to be acquired during the periods of education and training, preparing for up to date competencies on the job.

Three groups of stakeholders are being targeted in the Strategy, namely, Education and Training Providers, Users and External Support Agencies. In order to match the demand for education with the supply of educators and trainers, the target groups need to interact with each other through networking and other forms of communication.

It is recognized that if education and training is to be fully effective it needs to be linked with institutional reform and enabling policy/legal frameworks, which together constitute the building blocks of capacity building.

### Global scenarios

The Long-Term Vision on Water, Life and the Environment envisages three global reference scenarios:

- Conventional Water World (CWW);
- Water Crisis (WAC);
- Sustainable Water World (SWW).

The analyses of the implications of demographic, technological, economic, social, environmental, governance and gender drivers and their interactions with the reference scenarios of the Long-Term Vision constitute the underpinnings of the Strategy.

### Principles

The Strategy Paper also reflects on current professional, ethical and political principles and their implication. Four principles have been identified, namely:

- Principle of environmental awareness;
- Principle of solidarity;
- Principle of integrated water resources management;
- Principle of subsidiarity.

### Lead themes

Educational challenges must be viewed within the prevailing societal context, which reflects present day's political, economic, social and ethical constellation. If the horizon of the Strategy is twenty-five years, it is obvious that it cannot outline in detail what in one generation's time might be appropriate. But the Strategy can point out concepts, principles, elements and steps that are flexible enough to accommodate changes and aspirations beyond our present perception. The Strategy can be visualized as a process that is set into motion, and that will reinvent itself along the course of time. This process can be characterized by its double lead themes, namely innovation and collaboration.

'Innovation' deals with both content and techniques of education. It reflects the duality of research and education, including that of research for education.

'Collaboration' represents the consultative processes of formulating, refining and implementing the Strategy. It capitalizes on joint experience, networks, resources and efforts at all levels. The Strategy advocates an acceleration of innovation and collaboration through the formation of clusters as a complement to ongoing education and training efforts. Clusters are designed to bring about rapid action without bureaucratic constraints. They would be responsible for a set of specific activities, for example, inter-sectoral education and training, water and environment programmes in primary and secondary education, innovative learning methods, training in the private sector, human resources development assessments, training for conflict resolution etc. They could be patterned after task forces or working groups and rely on existing entities where suitable. They would remain in business for a limited time (1–2 years), go out of existence and be absorbed by existing institutions, which would mainstream their work. Financing of the clusters would be the responsibility of their members (who would need to approach public or private sector funding, where necessary). Education and training are long-term activities and therefore any innovation process must necessarily be conceived in a sustainable way.

### Concept of the Strategy

Key elements of the Strategy can be derived from strategy statements contained in a number of major documents presented and discussed during the Second World Water Forum and Ministerial Conference, The Hague, 17–22 March 2000. They represent an up-to-date menu of expressed needs, aspirations, ideas and strategies of a multitude of stakeholders.

The W-E-T Strategy to be adopted will have to be flexible to provide guidance in human resources development in spite of the likely deviations from our predicted future. Irrespective of this uncertainty a strategy of human capacity building must be future oriented. Consequently its main target audiences are:

- The policy makers, whose decisions prepare the framework for the future;
- The educators and trainers who prepare people to adapt to and to shape the future; and
- The young generation who will live in and 'implement' our future.

The Ministerial Declaration of The Hague calls for a common water culture to be achieved at all levels. Consequently the educational and training strategies have to account for the whole range of educational levels and target groups. Education for women and public awareness raising, besides being a channel of knowledge transfer, can also be seen as a means of empowerment for full participation in the Water World.

New content to be transferred and new information technologies call for innovative and collaborative approaches, such as using cost-effective networks while also sharing knowledge and experience in the process. Joint human capacity building can be the strongest means to achieve the common water culture.

Irrespective of this global mandate the W-E-T Strategy should be applied selectively, responding to well researched demands at regional and national scales, to provide the necessary competencies. Consequently it is more appropriate to develop W-E-T strategies adapted to the local implementation levels than to pursue a single global one in much detail.

### From strategy to action

In order to translate the Strategy into action, a five-pronged approach is proposed to meet the needs for water-related education and training in the formative years, vocational training, university education, continuous learning and research capacity strengthening. In order to maximize effectiveness, full advantage needs to be taken of contemporary methods, which ensure that education and training: (a) are learning-based, demand-oriented, quality assured, participatory and hands-on, and (b) make use of information and communications technology, distance learning and institutional twinning arrangements.

Assessments of human resources development (HRD) – education and training needs and resources – are recommended to be undertaken at the national, regional or municipal level, as appropriate. These assessments would produce an inventory of what exists, identify gaps and formulate the elements of a short-term action plan (3–5 years) with a long-term outlook (10–15 years). The duration of these assessments would be 3–6 months. National specialists from educational institutions and operational agencies, companies and other entities in the public and private sector would carry them out. Matching demand for HRD with supply is an essential feature of such exercise. Where applicable, developing country governments are encouraged to request that external support agencies fund HRD activities as part of their development co-operation programmes, from the assessment through the implementation stages.

In parallel with education and training issues, it is essential to deal with employment issues. Both public and private sectors need to provide adequate salaries as well as professional and financial incentives. Water service charges paid by the customers (either through direct payments or taxes) are the single most important and promising source of revenues to cover employment costs. In view of the political and social sensitivity of water charges in many countries, public awareness campaigns could be organized to explain the cost and cost recovery mechanisms of supplying and treating potable and irrigation water.

The Strategy Paper presents examples of promising initiatives such as CAPNET, WaterNet, GOUTTE of Water, WBI distributed learning, ETNET, TECHWARE. These are to be supplemented by others to be identified as work progresses on strategy formulation.

In conclusion, the Strategy Paper documents a serious and perhaps unprecedented attempt to create awareness, establish collaborative networks and bring about commitments for long-term efforts in water-related education, training and awareness raising. The structure of interlinked elements of the Strategy is shown in the following Figure.





# 1 Introduction

... the key to sustainable, self-reliant development is education – education that reaches out to all members of society through new modalities and new technologies in order to provide genuine lifelong learning opportunities for all ... We must be ready, in all countries, to reshape education so as to promote attitudes and behaviour conducive to a culture of sustainability.

*Preface to Educating for a Sustainable Future: a Transdisciplinary Vision for Connected Action,  
UNESCO: EPD-97/CONF.401/CCD.1. Nov. 1997*

Building human and institutional capacity is the foundation of sustainable water resources management and service delivery. The importance of capacity building was recognized during the Second World Water Forum and Ministerial Conference, The Hague, 17–22 March 2000. The Ministerial Declaration on Water Security in the twenty-first Century included the following statement:

We will work together with other stakeholders to develop a stronger water culture through greater awareness. We will identify best practices based on enhanced research and knowledge generation capacities, knowledge dissemination through education and other channels and knowledge sharing between individuals, institutions and society at all appropriate levels. This will include co-ordination at regional and other levels, as appropriate, to promote arrangements for coping with water-related disasters and for sharing experience in water sector reform. It will also include international co-operation in technology transfers to, and capacity building in developing countries.

The Second World Water Forum gave impetus to UNESCO, UNDP, IHE-Delft, the World Bank Institute and UNU/INWEH to initiate a program of action on water sector capacity building focusing on education and training. Their work is guided by the present Strategy Paper. This Paper is the result of extensive consultations during and after the Forum. The consultations benefited from an earlier framework paper on water, education and training, which was presented and discussed during a whole-day special session at the Second World Water Forum dedicated to this subject. The Strategy Paper must be seen as 'work in progress' which will be updated and adjusted periodically in the light of experience and comments.

Although the Strategy Paper concentrates on the development of the human resource, it must be placed in the wider context of capacity building and its constituent components such as policy and legal frameworks, institution building, community management, human resources development including education and training. Because of the increasing complexities and problems of the water sector, capacity building must address the whole gamut of issues and opportunities of integrated water resources management. In other words, holistic approaches need to complement sector-oriented approaches.

It is recalled that the concept of capacity building was articulated during the first global UNDP Symposium 'A Strategy for Water Sector Capacity Building,' held in Delft, The Netherlands in 1991. The Symposium concluded that capacity building consists of the following three elements:

- creation of an enabling environment with appropriate policy and legal frameworks;
- institutional development, including community participation; and
- human resources development and strengthening managerial systems.

Subsequent consultations and field experience led to the addition of a fourth element:

- sustainable funding.

As stated, taken together, these elements reflect a holistic, rather than a narrow-focused, approach towards water resources management. For example, an institution cannot function without well-trained staff. Well-trained staff cannot function in an outdated institution, and neither institution nor staff can achieve their full potential in the absence of an enabling policy and legal environment and adequate financial resources. Participatory approaches, information exchange, awareness raising and

networking have become noteworthy modalities supportive of the capacity building process. Of equally importance is the crosscutting issue of gender as one of the core capacities to be developed.

Strengthening the local 'capacity builders' constitutes the heart of capacity building. It will enhance, over time, the locally available human capacity to acquire new knowledge and skills without significant external support.

The genesis of the capacity building concept and its subsequent application happened in the context of contemporary notions about integrated water resources management – the so-called Dublin/Rio principles, referring to the International Conference on Water and the Environment, Dublin, January 1992, and the United Nations Conference on Environment and Development, Rio de Janeiro, June 1992.

Education and training matters have also been addressed in recent meetings and reports such as:

- UNESCO's recent identification of education as the key element in forging a world-wide strategy to prepare humankind for the challenges of the twenty-first century: the concept of the 'learning society';
- the Report to UNESCO of the International Commission on Education for the Twenty-first Century, 1996, calling for a complete reorientation of approaches and interactions making learning one of the basis of human coexistence;
- the White Paper of the European Commission on Teaching and Learning-Towards the Learning Society (1995);
- the International Symposium on the Learning Society and the Water Environment (2–4 June 1999, Paris, organized by UNESCO/IHP, ETNET ENVIRONMENT WATER, TECHWARE, IAHR, IAHS, OIE and co-sponsored by WMO and UNEP);
- the XXXVIII<sup>th</sup> Congress of IAHR, August 1999, in Graz, Austria, which supported the concept of an international initiative on Water, Education and Training (W-E-T);
- The WMO Symposium on Continuing Education and Training (CET) on 10 November 1999 in Teheran, Iran, provided further opportunity to debate the emerging W-E-T Vision;
- The special session on Water, Education and Training at the Second World Water Forum in the Hague, the Netherlands (March 2000) was a key event in the formulation of this Strategy Paper.

The Strategy Paper starts with an analysis of the scenarios and drivers of the World Water Vision and their relevance to awareness raising, education and training. This is followed by a description of the scope of the Strategy and target groups. Subsequently, the underlying principles of the Strategy are discussed in terms of environmental awareness, solidarity, integrated water resources management and subsidiarity. Based on these principles the Paper then outlines the key elements of the Strategy, in particular the five-pronged approach to education and training, and employment. The Paper concludes with examples of current and prospective initiatives, which can help jump-start the Strategy into action.

## 2 Identifying the scope and target groups of the Strategy

### 2.1 Introduction

The scope of the Strategy is determined by the scenarios of the Long-Term Vision on Water, Life and the Environment prepared for and discussed at the Second World Water Forum. These scenarios were prepared in an unprecedented effort involving thousands of stakeholders throughout the world who were willing to share their visions and strategies on water issues.

The Strategy Paper is issued for the purpose of setting the stage for both increased awareness and tangible action at national, regional and international levels. For example, at the international level, meetings and programmes offer opportunities for pleading the cause for water education and training: e.g. forthcoming conferences such as the International Conference on Freshwater (Bonn, December 2001), World Summit on Sustainable Development (Johannesburg, September 2002) and the Third World Water Forum (Kyoto, March 2003); undertakings like the World Water Assessment Programme and Development Report. Specifically, an International Symposium on Human Capacity Building through Innovation and Collaboration will be held in November 2001 in Delft, the Netherlands, to identify and set in motion collaborative action in promising areas of water education and training.

### 2.2 Possible futures: scenarios to be considered

The Long-Term Vision on Water, Life and the Environment envisages three global reference scenarios:

- Conventional Water World (CWW).
- Water Crisis (WAC).
- Sustainable Water World (SWW).

The analyses of the implications of demographic, technological, economic, social, environmental, governance and gender drivers and their interactions with the reference scenarios of the World Water Vision (see Annex 1) constitutes the underpinnings of the Strategy. The following Table illustrates the implications of the scenarios and drivers of the World Water Vision for education, training and awareness raising. It represents an attempt to visualize the implications and must not be seen as a prescription of any kind.

**Table 1** Drivers, reference scenarios and their implications for education and training

	S C E N A R I O S		
	Conventional Water World (CWW)	Water Crisis (WAC)	Sustainable Water World (SWW)
DRIVERS		(as compared to CWW)	(as compared to CWW)
<b>Demographic</b>			
<i>Total population size 2025</i>	Increasing number of young people to be educated: pressure on educational system	Same as CWW	More chance for successfully meeting education needs of young generation increased need for CET, PA

	S C E N A R I O S		
	Conventional Water World (CWW)	Water Crisis (WAC)	Sustainable Water World (SWW)
DRIVERS		(as compared to CWW)	(as compared to CWW)
<i>Urbanization</i>	Further concentration of learning facilities in the cities	Same as CWW	Same as CWW
<i>Migration patterns</i>	Language problem in education, multilingual countries/societies emerge	More than CWW impact	Less than CWW impact
<b>Technological</b>			
<i>Information technologies</i>	Chances for public, informal education, CAL use increase, innovative education methods	CWW statement regionally true, elsewhere not much change.	More than CWW impact
<i>Biotechnology</i>	New bio-awareness to be created through education	Less than CWW impact	More than CWW impact
<i>Water use efficiency</i>	Large scale PA + public info and CPD needed	Missed opportunities to launch PA and info offensives	More than CWW impact
<i>Water pollution</i>	PA, environmental, chemical, biological, hygienic education	Less than CWW impact	More than CWW impact
<i>Resistant crops</i>	Education of rural communities	Same as CWW but only regionally	Environmental awareness + education of rural communities more than CWW
<i>Water sanitation</i>	PA + technology teaching + training	Increase PA to avoid collapse of systems	More than CWW impact
<i>Desalinization processes</i>	Technology transfer + PA	Much less than CWW impact	Broader than CWW impact
<b>Economic</b>			
<i>Total volume of production</i>	Strong investment need for E&T	CWW impact can not be matched	Stronger investment needed than CWW
<i>Structure of production</i>	Technological education need increases	Rural educational need prevails	More than CWW impact
<i>Water- infrastructure</i>	Increased need for CET, CPD and technical education	No job opportunities, negative feedback for E&T needs	More than CWW impact
<i>Trade</i>	Not relevant	Not relevant	Not relevant
<b>Social</b>			
<i>Lifestyles and cultural preferences</i>	E&T + PA needs increase	Less chance for education and training	More than CWW impact

	S C E N A R I O S		
	Conventional Water World (CWW)	Water Crisis (WAC)	Sustainable Water World (SWW)
DRIVERS		(as compared to CWW)	(as compared to CWW)
<i>Poverty</i>	Educational needs as means of empowerment & poverty eradication	Depresses E&T needs and opportunities	More than CWW impact
<b>Environmental</b>			
<i>Committed Climate change</i>	Environmental awareness, rethinking rural education	More need than CWW, less means to achieve it	Less than CWW impact
<i>Water-related diseases</i>	PA, hygienic education	Much more need than CWW, less means to achieve it	Less than CWW impact
<i>Salinization</i>	PA, rural education	More need than CWW, less chance to achieve it	Less need than CWW
<i>Exhaustion and/or pollution of surface and ground water</i>	Technical education need	Needs as CWW, less chance to achieve it	Same as CWW impact
<i>Integrity and health of aquatic ecosystems</i>	IWRM + ecology training needs	Educational & training needs increased, less opportunity to match them	More than CWW impact
<b>Governance</b>			
<i>Institutions</i>	Need for IWRM education	General decrease of educational opportunities	IWRM educational need, management of education needs
<i>Market dominance</i>	Not relevant	Not relevant	Not relevant
<i>Power structure (international, national)</i>	Not relevant	Not relevant	Not relevant
<i>Conflicts</i>	Negotiations skills training needed	More need than CWW, less chance to achieve it	Co-operation/negotiation skills training needed
<i>Globalization</i>	More international education	Less than CWW impact	More than CWW impact

CET: Continuing Education and Training; PA: Public Awareness; E&T: Education and Training CPD: Continuous Professional Development; CAL: Computer Aided Learning; IWRM: Integrated Water Resources Management

## 2.3. Analysis of scenarios

An analysis of the possible implications of the scenarios for the Strategy brings about the following observations.

### 2.3.1 Demographic drivers

- Irrespective of the occurrence of any of the reference scenarios it is expected that the number of (young) people to be educated will increase. This increase is the consequence of population growth, or, as in the case of SWW, is caused by the higher educational demand of a more affluent population.

- Demand for education will continue to increase in urban and peri-urban areas as a result of natural population growth, exacerbated by rural exodus, migration, refugee movements and economy-triggered displacements. All these processes cause serious stress on educational systems. In addition, language problems and cultural factors have to be considered by the educational systems.

### 2.3.2 Technological drivers

- The already ongoing and certainly accelerating development of the information society, more or less on global scale, will provide educators with the new media both to use in formal and informal, professional and vocational education and training. The potential of this media for public information and awareness raising is enormous.
- The potential benefits of the new media can only be fully capitalized, if teaching methods are also developed to match the available and improving technique. Courses taught on the internet or by video are examples of this trend.
- Biotechnology and its potential benefits and impacts should be communicated to a large public. In this respect both research and education are challenged. The former one to provide credible assessments of potential consequences of biotechnology (especially genetically modified crops, etc.); the second to help avoiding both needless concern and exaggerated public expectations. Biotechnological developments are likely to redefine water and wastewater technology thus triggering considerable need of respective technological education at all levels. Education is the best way to ensure a rational approach towards the assessment of the potentials and risks of biotechnology.
- Water use conservation and efficiency are recognized as effective techniques allowing ‘more crop per drop.’ This process is not only a formidable public awareness challenge but also necessitates technological education from professional to irrigator (farmer) level. While water use efficiency is required in all water use sectors, the biggest problem and the biggest potential savings are in irrigated agriculture. It is expected that biotechnological exploits will also enable water savings, thus underlining the need to develop new techniques and their use to disseminate them. Should the WAC Scenario to become a reality the inherent missed educational steps would further aggravate the situation.
- Water pollution can be considerably reduced by public awareness campaigns raising of hygienic standards through education and public information.
- Resistant crops, either traditionally bred or genetically modified, once decided to be used wide scale, would need proper introduction to the agricultural communities.
- Water sanitation needs are expected to trigger considerable technology transfer and education along the whole profile from professional education to public information.
- Desalination is expected to become cheaper due to the anticipated decrease of energy prices and improved technology. These research results must be translated through technology transfer, education and training into common practice in parts of the world where desalination is a viable option to satisfy water demands.

### 2.3.3 Economic drivers

- Economic development, even outside of the immediate water sector would imply strong improvement of education and training, especially focusing on the provision of the respective technological and service capabilities needed by the growing economy.
- The structure of the economic production has an influence on the E&T needs. Industrial and agricultural development tendencies imply different educational and training needs.
- The water infrastructure, its creation and maintenance, needs technical education at all levels, including continuing education and training (CET) and continuing professional development (CPD). However, in case of the Water Crisis Scenario (WAC) this need may decrease considerably due to the overall deterioration of water services.

#### 2.3.4 Social drivers

- Improved social security, affluence and the desire to keep this status can be seen as strong stimuli for the increase of E&T and public awareness raising activities.
- Poverty on its own constitutes a very 'negative' driver unless there is the political will and economic power to eradicate it. In this case E&T become one of the most essential means of empowerment to break the vicious cycle of poverty.

#### 2.3.5 Environmental drivers

- The observed tendencies of the anticipated climate change imply the need for increased public awareness (PA) raising as well as reorientation of the agrarian population (new crops, irrigation techniques, water availability and distribution, extreme events, etc.).
- Water related diseases are credited to cause millions of deaths annually. PA, especially for public hygiene, is a must.
- Salinization is considered as the consequence of inappropriate agricultural practices. Therefore its avoidance and management, once occurred, is closely related with PA and massive rural educational programmes.
- The lack of freshwater of proper quantitative and qualitative characteristics would have to trigger, beyond public awareness raising, research and well conceived technological education addressing both traditional and high technologies.
- The environmental concern, the realization that healthy aquatic ecosystems are needed for sustainable future, together with the logically emerging new management paradigm of Integrated Water Resources Management (IWRM), imply the need for ecological education for both the future generation and in form for CET and CPD also for the present generation of professionals. IWRM on its own should also be moved from conceptual stage into fully-fledged 'operationalization' implying more research and education together with education of participatory decision making techniques and PA raising.

#### 2.3.6 Governance drivers

- IWRM, while could be identified as a 'brainchild' of holistic views and subsequent concepts, implies also redefinition of role and form of governance. In this respect massive educational efforts are needed in technical, ecological and legal-administrative sense.
- IWRM –once operationalized- would not only enhance the long-range efficiency of caring for and sharing of water. It would expose potential conflicts more pronounced. Conflict prevention, mitigation and resolution will be very much part of the daily tasks of water managers of the early twenty-first century, at local, regional, national and international levels. Therefore the educational need for the conflict resolution, negotiation skills, and consensus building through public participation processes will substantially increase at all levels of governance and public involvement.

#### 2.3.7. Gender-related drivers

While the original reference scenario setting of the World Water Vision and consequently the previous Table and Annex 1 do not include gender issues as potential drivers. However, these are certainly relevant as far as education and training, these important steps towards gender equity and empowerment are concerned.

Different needs and priorities of women and men should be recognized. As far as education and public participation is concerned, women should acquire or be enabled to acquire capabilities to express their needs and let their voices be heard in IWRM matters.

## 2.4 Overarching priorities

Based on the above scenarios the following topics are retained as a basic set of potential overarching priorities of the Strategy:

- Public awareness raising.
- Education (both technological and multidisciplinary) and training
- Technology development, transfer and adaptation.
- Negotiation and conflict resolution and mitigation techniques.
- Integrated water resources management (IWRM).
- Exploration of the potential of the new media, learning to use them.

The immediate 'consequence' of identifying IWRM as a priority implies that IWRM should not remain at the conceptual level. Rather, it is a call for a new paradigm to be pursued at different levels of water management practice and thus also that of education and training. Among the more pressing educational issues to be pursued in this context are multidisciplinary, negotiation and conflict mitigation educational techniques.

## 2.5 A strategy for whom?

Water-related education concerns first of all the knowledge of the hydrological cycle. This concerns the entire scientific profile of terrestrial freshwater resources assessment, monitoring, and management.

Beyond this scientific knowledge of the natural processes the Strategy should also address the demographic, technological, economic, social, environmental, governance and gender related aspects of water and its interrelations with the human society. Thus it needs to be defined within the context of integrated water resources management (IWRM).

The paramount objective of the Strategy is to contribute to meeting society's needs of educated citizens at all professional levels and in general. Ideally, specific needs and objectives will be analyzed within national and regional contexts.

As stated in Chapter 5, educational and training programmes should reflect the whole scope of education, including the formative years at pre-school, primary and secondary educational levels, vocational training, university and professional education at undergraduate and postgraduate levels, lifelong continuing education and training, as well as the informal and innovative ways of knowledge and information transfer. Education via distant learning, self study, role play and simulation techniques, internet knowledge transfer and other forms of computer aided learning (CAL) etc. are examples of this process supplementing the traditional classroom-based methods.

The different target groups should include policy makers, managers within and outside the water sector, professionals, technicians, service personnel etc. In addition, the public awareness-raising component should be explicitly addressed focusing on stakeholders, with particular reference on women and youth. Water is everybody's business! Although university undergraduate and postgraduate education and continuing professional education are of paramount importance, this does not mitigate the importance of including water and related subjects into elementary and secondary school curricula. Higher education includes the preparation of teachers and trainers to their tasks to educate the young generation.

The crucial role of research in the education and for education as the preparation for the future can not be over-emphasized. Continuous renewal can only be achieved by adequate research input and the continuous redefinition of the competencies knowledge and skills to be acquired during the periods of education and training, preparing for up to date job competencies. This process can be enhanced through the participation of every stakeholder.

The following target groups of the Strategy have been identified. In order to ensure continuing relevance of the demand for and supply of education and training, an interactive and feedback relationship between these target groups would be necessary.



### **Education and training providers**

- Universities, university networks
- International education and training institutes (e.g. IHE, WEDC, AIT)
- National and regional training institutes (public and private)
- Primary and secondary education
- Open universities (for the public at large)
- Public sector water agencies which have their own training programmes
- Private (water supply) companies which have their own training programmes
- Consultancy firms
- International and national water associations (e.g. IAHS, IAHR, IWRA, IWA, ICID)

### **Users**

- Ministries, provincial and municipal agencies, districts and community offices
- Public sector water agencies and companies
- Private (water supply) companies
- River basin organizations
- Water councils
- Water associations
- Individuals as recipients of education and training and alumni
- The public

### **External Support Agencies (ESA)**

- National, regional and local authorities and other entities responsible for education and training programmes and budgets
- UN System Agencies such as UNDP, GEF, UNESCO, FAO, WHO, WMO, UNDESA, UNEP, UNICEF
- Development banks such as the World Bank, AsDB, ADB, EBRD, IADB
- The European Commission
- Bilateral agencies (e.g. DGIS, DFID, CIDA, SIDA, GTZ)
- Non-governmental organizations (e.g. WaterAid, Programme Solidarité Eau, GREEN)
- Potential donors such as business and commercial banks and private foundations

**TOWARDS A STRATEGY ON HUMAN CAPACITY BUILDING FOR INTEGRATED WATER RESOURCES MANAGEMENT AND SERVICE DELIVERY**

**Water-Education-Training (W-E-T)**

**MANDATE**

- 2nd World Water forum Ministerial Declaration: *Water Security for the 21st Century*
- Vision Statements
- The Learning Society

**PRINCIPLES**

- Principle of Environmental Awareness
- Principle of solidarity
- Principle of IWRM
- Principle of subsidiarity

**TARGET GROUPS**

**PROVIDERS**

- Universities
- Water associations
- Private companies
- Public agencies
- Schools
- Training institutes

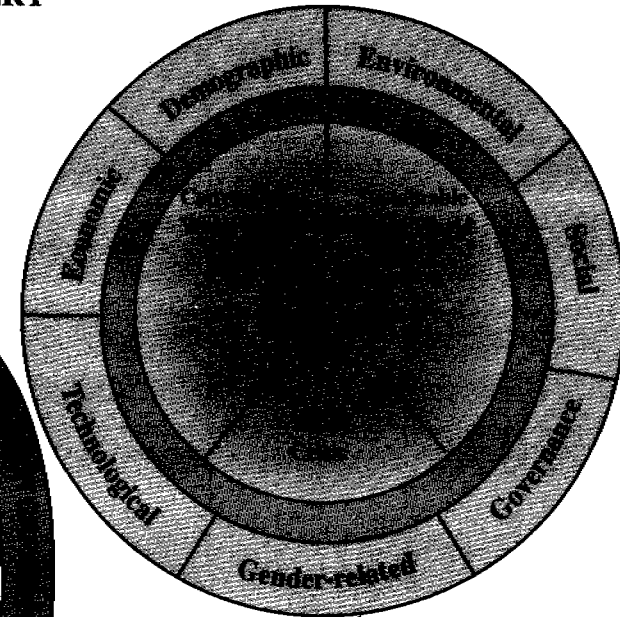
**EXTERNAL SUPPORT AGENCIES**

- UN System Agencies
- Bilateral agencies
- NGOs
- Development Banks
- European Commission
- future donors

**USERS**

- Ministries and other governance agencies
- Public sector water agencies and companies
- Private sector water supply companies
- River basin organizations
  - Water councils
  - The public

**To meet society's needs of educated professionals and citizens at all levels**



*5 pronged approach*

**OVERARCHING PRIORITIES**

- Public awareness raising, especially in rural context
- Technological education training and technology transfer
- Negotiation and conflict resolution and mitigation techniques
- Integrated Water Resources Management (IWRM)
- Exploration of the potential of the new media

**EDUCATION IS THE KEY ELEMENT FOR A WORLDWIDE STRATEGY TO PREPARE HUMANKIND FOR THE CHALLENGES OF THE XXI<sup>ST</sup> CENTURY**

## **3 Defining the principles of the Strategy**

### **3.1 General comments**

This chapter summarizes the principles believed to be essential for the present and even more for the sustainable future of water education and training.

### **3.2 Principle of environmental awareness**

Environmental awareness in water resources management is reflected, at present, in the still somewhat peripheral requirement of environmental statements, impact assessments and action plans associated with the 'real' water resources development plans or management activities, but usually not as integrated parts of them. As future generations of water resources experts will emerge, this duality should disappear. Environment-mindedness must become one of the bases of engineering, resources management and scientific concern. Unless this new 'attitude' is incorporated into the – at present still rather disciplinary – approaches pursued, the concept of integrated water resources management and the overall requested environmental remediation could not be fully implemented. The education of environment mindedness cannot be seen as an ad hoc action but as a task for a generation to gradually train academic and professional teachers and trainers. First, they need to be able to convey principles, techniques and above all the mentality to their students and trainees. Consequently, the Strategy stresses the means and intellectual input towards the environmental education of educators in order to launch a 'snowball effect'.

In a broad sense the environment mindedness implies the adherence to the principle of conflict modelling, avoidance and resolution between the objectives of mankind and the requirements of nature in order to secure sustainability. The principle of a 'new water ethics' (as defined by UNESCO in 1997 during the first World Water Forum in Marrakech, Morocco) extends this environmental mindedness with additional dimensions, including the basic human right to safe drinking water, the principle of equity in water-sharing, the conflict mitigation in the use of transboundary waters, etc.

Like environment-mindedness, the 'new water ethics' has also important educational implications. However, the professional 'breakthrough' can only be achieved through the educational 'operationalization' of these principles. Therefore, the Strategy should give due emphasis to sensitize educators, to develop respective material, to provide case studies, both success stories and negative examples. As education is the key towards sustainability, this key should 'match the lock' and produce graduates, trainees, etc. who have absorbed the above-mentioned principles and thus are able to translate them into practice.

### **3.3 Principle of solidarity**

The principle of solidarity is the expression of the profound human compassion for problems, which can impact any of us. Water issues are global ones, however crises, shortages, ecological disasters, floods and droughts may be regional or local phenomena. Yet, solidarity implies that water is everybody's business and a water problem, anywhere in the world, matters everybody. Consequently education and training related problems, as being closely associated with our aspiration of a common sustainable future, are challenges to be faced together. The principle of solidarity implies help, first of all as assistance for self-help. Solidarity is one of the emotional bases for co-operation. International IGO's and NGO's have predominantly been created to translate the solidarity principle into practice. In terms of education and training solidarity can be emphasized and implemented through scholarships, co-operative frameworks, exchange programmes, monetary and in-kind donations and soft loans.

However solidarity should not be interpreted as a mandate to create uniformity, imposing educational and training programmes, curricula and syllabi. Solidarity is neither a right to be convoked seeking external help without appropriate efforts and contributions by the beneficiaries themselves. Therefore the principle of solidarity can not be separated from the principle of subsidiarity (see Section 3.5).

### 3.4 Principle of integrated water resources management

Water resources-oriented education should be conceived by keeping in mind the specific contribution of each subject (sub-discipline) to the overall scope of integrated water resources management. This statement is crucial as far as the entire educational infrastructure is concerned, but it certainly becomes more than a 'guiding principle' as far as the different forms of continuing education and training, on the job training, etc. are concerned. The principle of integrated water resources management does not negate the importance of the individual disciplines and the academic virtue of the in-depth teaching of and research in particular subjects, however it clearly states and accepts the applied characteristics of water resources-related research and education. The acceptance and observation of this social demand would not only enhance the efficiency of the educational efforts but will certainly trigger a positive feedback towards improved water resources development and management.

### 3.5 Principle of subsidiarity

Education, especially that of the children, implies a very close relationship between educators and those to be educated. Therefore any initiative, which ensures education within a uniform cultural and linguistic set-up, should be stimulated. Education taking place within a national framework is likely to be more efficient than within an international one.

The principle of subsidiarity in the context of this Strategy Paper implies that any E&T activity should be executed at the 'lowest possible' level. External support agencies should get involved in the implementation only upon request by national governments. On their part, international organizations, programmes and initiatives derive their justification from the fact that they fulfil tasks and provide services that the Member States alone would not be able to deliver. Obviously international organizations should not execute tasks that national governments, NGO's or other organizations can perform. The subsidiarity principle also implies that post-graduate and continuing education and training for the purpose of preparing professionals to solve international water management problems should best be carried out in an international context.

## 4 Framing the concept of the Strategy

### 4.1 Introduction

Educational challenges must be viewed within the prevailing societal context, which reflects present day's political, economic, social and ethical constellation. If the horizon of the Strategy is twenty-five years, it is obvious that it cannot outline in detail what in one generation's time might be appropriate. But the Strategy can point out concepts, principles, elements and steps that are flexible enough to accommodate changes and aspirations beyond our present perception. The Strategy can be visualized as a process that is set into motion, and that will reinvent itself along the course of time. This process can be characterized by its double lead themes, namely innovation and collaboration.

'Innovation' deals with both content and techniques of education. It reflects the duality of research and education, but also that of research for education.

'Collaboration' represents the consultative processes of formulating, refining and implementing the Strategy. It capitalizes on joint experience, networks, resources and efforts at all levels.

The Strategy advocates an acceleration of innovation and collaboration through the formation of clusters as a complement to ongoing education and training efforts. Clusters are designed to bring about rapid action without bureaucratic constraints. They would be responsible for a set of specific activities, for example, inter-sectoral education and training, water and environment programmes in primary and secondary education, innovative learning methods, training in the private sector, human resources development assessments, training for conflict resolution etc. They could be patterned after task forces or working groups and rely on existing entities where suitable. They would remain in business for a limited time (which could be 1–2 years), go out of existence and be absorbed by existing institutions, which would mainstream their work. Financing of the clusters would be the responsibility of their members (who would need to approach public or private sector funding, where necessary). Education and training are long-term activities and therefore any innovation practices must necessarily be conceived in a sustainable way.

### 4.2 Key elements and statements

Key elements of the Strategy can be derived from the strategy statements contained in a number of major documents presented and discussed during the Second World Water Forum and Ministerial Conference, The Hague, 17–22 March 2000, organized under the auspices of the World Water Council. These documents were prepared in an unprecedented effort to involve thousands of stakeholders throughout the world in sharing their visions and strategies on water issues. They represent an up-to-date menu of expressed needs, aspirations, ideas and strategies of a multitude of stakeholders. Rather than being prescriptive, the Strategy encourages its users to sample the menu and select those items, which best fit their needs. The key elements are perhaps best summarized in the following Ministerial Declaration:

Final Report, Second World Water Forum and Ministerial Conference, Ministerial Declaration of The Hague on Water Security in the twenty-first Century

We will work together with other stakeholders to develop a stronger water culture through greater awareness. We will identify best practices based on enhanced research and knowledge generation capacities, knowledge dissemination through education and other channels and knowledge sharing between individuals, institutions and society at all appropriate levels. This will include co-ordination at regional and other levels, as appropriate, to promote arrangements for coping with water-related disasters and for sharing experience in water sector reform. It will also include international co-operation in technology transfers to, and capacity building in developing countries.

These elements are elaborated in the following representative sampling of statements from the referenced documents.

#### World Water Vision – Making water everybody's business

A key part of the necessary innovation will be increased awareness of water issues throughout the population and education and training of people capable of bringing out the necessary changes – that is, capacity building in the water sector. A crucial factor to mobilize resources for capacity building and research will be to give water its proper value.

Donors need to provide strategic assistance in developing policies, regulations, institutional capacity, human resources, and the technical and scientific competencies required to manage the resource base and water services in a fully integrated fashion.

#### World Water Vision, Commission Report, A Water Secure World, Vision for Water, Life and the Environment

Finally, a special effort to involve youth is essential. From schools to universities to youth groups, education about water issues, coupled with opportunities for genuine participation, will be essential.

#### A Vision of Water for Food and Rural Development

Develop a local capacity for education and training of water and food production-related professionals and researchers, facilitate the exchange of existing knowledge between local users and technicians and professional water managers and establish linkages between education institutions and water research organizations.

Establish attractive career development programs for water-related professionals to ensure sufficient capacity and capability for planning, regulation and policy making related to water resources use and management. Give preference to women professionals to improve their participation in water management, particularly at higher levels of governance and management.

Synthesize existing knowledge on agricultural water management and make it available in readily accessible formats to policymakers, their advisers, and researchers in developing countries. Recognize the near-zero marginal cost of distributing such knowledge in electronic form and make full text versions and data-bases available at low or no charge.

*An important element in the achievement of the vision is the development of new or situation adapted technologies to improve productivity of water, to increase the yields and to improve the livelihoods of rural people. This requires substantial investment and support in research and research capacity at both international and national levels. Specific proposals include biotechnology research on crops and topics not likely to attract private sector interest and the development of affordable and effective lower-impact pesticides and herbicides (including biological agents) and negotiate world-wide phase-outs of more persistent agricultural chemicals.*

#### Vision 21: A Shared Vision for Hygiene, Sanitation and Water Supply and Framework for Action

Relatively limited attention is usually paid to financing of human resource development. This is an essential input, without which the overall effectiveness of financial investment is put at risk.

Capabilities need to be strengthened to ensure that everybody knows how and why the use of facilities can improve their lives. Education should form an essential component. In particular, it is vital to increase children's knowledge, motivation and good habits of health and self-care.

To make the Vision a reality, a hands-on approach needs to be pursued vigorously. The human resources to be mobilized can be developed effectively through a five-pronged approach: formative years; vocational training; university education; continuous learning; and research capacity strengthening.

Reaching targets...at household and community levels needs the support of enabling conditions... such as political commitment and leadership, empowerment and capacity building both locally and at higher levels, and the availability and application of different institutional options for service provision.

Building capacity for monitoring and assessment...becomes an essential factor.

Building the capacity to achieving Vision 21 will require strong resource centres carrying out research, advocacy, information exchange, training and the strengthening of capacities at the grass roots, as an invaluable support the water, sanitation and hygiene sector. Such support centres exist in every region.

## **Vision for Water and Nature. A World Strategy for Conservation and Sustainable Management of Water Resources in the twenty-first Century**

Primary and secondary education are the cornerstones of modern societies. The integration of environmental learning into school curricula – for example, information about the goods and services provided by ecosystems, the richness of species in rivers, lakes and coastal areas, and the cause-and-effect relationship between human actions and environmental conditions – forms the basis for environmental awareness and environmentally-responsible behaviour, now and in the future.

Universities and technical institutes should also further develop curricula for freshwater and related ecosystem management. These should include interdisciplinary programmes for engineers, socio-economists and social scientists, managers and environmental scientists to ensure that a holistic view of eco-system management is shared by all relevant disciplines. Almost everywhere, scientists need special training to improve their communication with resource managers and the public, and to become more responsive to local needs.

Likewise, NGO's should develop training programmes for both community involvement and national capacity in environmental management.

Only a combination of traditional and new knowledge will provide the base for understanding needed for sustainable water management. The empowerment of a responsible and capable scientific community in the South is required, and should result in the development of an effective research capacity within a single decade in many countries.

Building capacity to increase the understanding of gender implications for water management, as part of an effort to empower women so that they can acquire the skills to enter water management at the senior level. This involves an increase in technical and scientific education offered to women.

### **Mainstreaming gender in water resources management. Why and how ?**

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Gender training for men and women working in water-related national and regional bodies, non-governmental organizations and private water companies.

Gender training for men and women working in water-related national and regional bodies, non-governmental organizations and private water companies.

## Framework for action: towards water security

Knowledge alone is not enough. National and local water resource managers and service providers need to be able to use this knowledge to design and manage effective water management systems, based on new concepts of integration in water management, demand-based services, participatory decision-making and the ecological functions of water. Enabling these individuals to use water-wise knowledge well will require programmes of training, capacity building and human resources development. Policy makers and politicians, whose decisions affect water management, must also be helped to use the wisdom that is becoming available.

### 4.3 Outline of the Strategy

The W-E-T Strategy to be adopted will have to be flexible to provide guidance in human resources development in spite of the likely deviations from our predicted future. Irrespective of this uncertainty a strategy of human capacity building must be future oriented. Consequently its main target audiences are:

- The policy makers, whose decisions prepare the framework for the future;
- The educators and trainers who prepare people to adapt to and to shape the future; and
- The young generation who will live in and 'implement' our future.

The Ministerial Declaration of The Hague calls for a common water culture to be achieved at all levels. Consequently the educational and training strategies have to account for the whole range of educational levels and target groups. Education for women and public awareness raising, besides being a channel of knowledge transfer, can also be seen as a means of empowerment for full participation in the Water World.

New content to be transferred and new information technologies call for innovative and collaborative approaches, such as using cost-effective networks while also sharing knowledge and experience in the process. Joint human capacity building can be the strongest means to achieve the common water culture.

Irrespective of this global mandate the W-E-T Strategy should be applied selectively, responding to well researched demands at regional and national scales, to provide the necessary competencies. Consequently it is more appropriate to develop W-E-T strategies adapted to the local implementation levels than to pursue a single global one in much detail. This rationale is reflected in the title of this Paper.

Demands and aspirations are summarized in the Section 4.2 in the various Vision Statements, whereas Chapter 5 presents illustrative examples conceived and implemented in the spirit of this W-E-T Strategy.



## 5 Moving from strategy to action

### 5.1 General comments

In order to translate the Strategy into action, a five-pronged approach is proposed to meet the needs for water-related education and training in the formative years, vocational training, university education, continuous learning and research capacity strengthening. In order to maximize effectiveness, full advantage needs to be taken of contemporary methods, which ensure that education and training: (a) are learning-based, demand-oriented, quality assured, participatory and hands-on, and (b) make use of information and communications technology, distance learning and twinning.

### 5.2 A five-pronged approach

The five-pronged approach involves the following levels and types of education and training:

- (i) *formative years*: encouragement of water literacy, gender roles and involvement with the environment in primary and secondary education, which is critical if the next generation is to be prepared to face increasingly complex water and environmental problems. The approach would also stimulate interest among young men and women in a future career in water-related professions, whether in engineering, environmental sciences or water resources management. Water education during the formative years can also be seen as a wise pre-planned effort in the area of public awareness raising.
- (ii) *vocational training*: is highly relevant because technicians are charged with the operation, repair and maintenance of the equipment. Such training ranges from technicians who operate sophisticated water supply and sewerage treatment plants to community level water supply and irrigation pump mechanics and caretakers. Technicians must not only learn what is needed today but also how to meet the needs of tomorrow. Much can be learned from utilities which use clearly targeted on-the-job training programmes. Poverty and gender considerations may require on-site training, since many trainees, especially women, may not be able to leave their families for any length of time. Furthermore, rural communities and small towns in particular will need to mobilize their own resources if they want to attract and retain well-trained technicians for repair and maintenance. Vocational training programmes need to be complemented by special programmes for 'social technicians.' These are the people who specialize in 'software' such as participatory development techniques, community organization, business planning, loan applications, and book keeping.
- (iii) *undergraduate and postgraduate education* in engineering, hydrology, economics, environmental sciences, water resources management and other water disciplines will produce the leading water professionals of the future. In order to tackle complex water-related problems they need to have the ability to interact with each other on water quantity and quality issues, particular from the points of view of irrigation engineers, water and sanitation engineers, hydrologists, environmentalists, economists, lawyers and other specialists. Some of the important skills to be learned by water professionals are techniques for conflict prevention and resolution. Of special interest to this level of education are the many learning tools available nowadays such as information and communications technology, distance learning, twinning of institutes, exchange of teachers and students, linkages with professional associations, and national, regional and global networking. In order to attract more funding for the water sector, water professionals need to be trained in the mobilization of conventional and non-conventional sources of funding.
- (iv) *continuous learning* will ensure that the water professionals keep up-to-date with the latest developments impacting the water sector. This type of learning needs to be planned and funded by both the public and the private sector. Its cost could be factored in the price of water services.
- (v) *research capacity strengthening*: a sustained effort in this area is recommended as an investment in researchers, whose task it is to challenge conventional approaches and to find new ways of addressing engineering, social, economic and environmental issues. The unity of

research and education is essential. Knowledge should not be only the reflection of the state-of-the-art. It should also enable people who acquire the knowledge, to extend the frontier of our understanding. Thus the methodology of research should also be taught.

*Assessments of human resources development (HRD) – education and training needs and resources* – are recommended to be undertaken at the national, regional or municipal level, as appropriate. These assessments would produce an inventory of what exists, identify gaps and formulate the elements of a short-term action plan (3–5 years) with a long-term outlook (10–15 years). The duration of these assessments would be 3–6 months. National specialists from educational institutions and operational agencies, companies and other entities in the public and private sector would carry them out. Matching demand for HRD with supply is an essential feature of such exercise. Where applicable, developing country governments are encouraged to request that external support agencies fund HRD activities as part of their development co-operation programmes, from the assessment through the implementation stages.

In parallel with education and training issues, it is essential to deal with employment issues. Both public and private sectors need to provide adequate salaries as well as professional and financial incentives. Water charges paid by the customers (either through direct payments or taxes) are the single most important and promising source of revenues to cover employment costs. In view of the political and social sensitivity of water charges in many countries, public awareness campaigns could be organized to explain the cost and cost recovery mechanisms of supplying and treating potable and irrigation water.

### 5.3 Strategy formulation for human resources development

Ideally, the formulation of a strategy for human resources development (HRD) along the lines of the above Five-Pronged Approach should be undertaken as an integral part of a water sector policy review and strategy formulation exercise. The main subjects covered in a water resources management strategy are:

- the demographic, social and economic conditions and policies of the country or region;
- water quantity and quality issues;
- infrastructure and services for water delivery in different sectors;
- water laws and regulations;
- institutional reform including decentralization and river basin management;
- human resources development;
- the role of economics including water pricing and incentives;
- environmental issues;
- health considerations;
- stakeholder participation;
- an action plan including programmes and projects

As can be appreciated, human resources are central to both the preparation and implementation of a water resources management strategy. Therefore, education and training programmes must be tailored to the sectoral, intersectoral and multidisciplinary aspects of the water sector.

### 5.4 Instruments for action: institutes, programmes and projects

This section provides examples of promising ongoing and prospective collaborative efforts in the form of capacity building institutes, programmes and projects. They range from international education and training institutes to ‘train the trainers’ types of programmes through inter-university partnerships and exchange programmes, to global and regional networks, to public-private partnerships, to public awareness raising. These examples do not refer specifically to classical educational and training programmes. However, actions inspired by the Strategy should enhance and build on existing educational and training programmes, courses and efforts, where possible.

#### 5.4.1 The International Institute for Infrastructural, Hydraulic and Environmental Engineering, IHE-Delft

IHE is a leading international institute dedicated to scientific research, postgraduate education, training and capacity building in the fields of water, environment and infrastructure, almost exclusively geared to the needs of developing countries. IHE offers various Masters and PhD level courses as well as tailor-made short courses. All courses are conceived to educate participants, to develop a problem-solving attitude, taking into account the multidisciplinary setting of problems and aiming at achieving sustainable solutions. IHE-trained professionals (mostly from developing countries) are prepared to work on technical and managerial challenges at local, national and international levels.

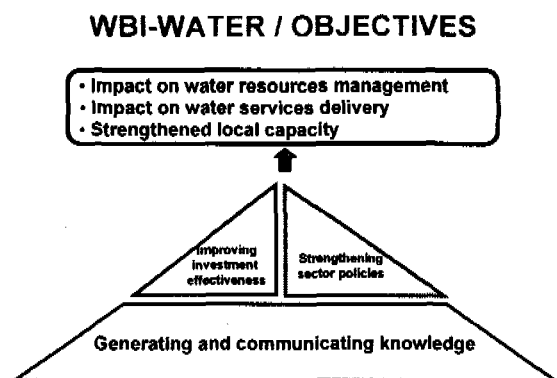
One of its major programmes is the Water and Environmental Resources Management Programme, which evolved in response to the concepts on integrated management for sustainable use of resources by the International Conference on Water and Environment in Dublin (1992), the Rio Earth Summit, and contemporary concepts on capacity building. The Programme has two study branches: Water Quality Management (WQM) and Water Resources management (WRM). The branches are intertwined and integrate quality and quantity aspects. Understanding the physical system, management, decision-making and institutional arrangements are common features of both branches. The WQM course highlights environmental and water quality aspects, whereas the WRM course focuses on water resources, hydrology and the planning and management of resources allocation.

In all courses, a mix of modern knowledge transfer methods is used, such as lectures, workshops, role-plays, video, internet, European study tours, and field visits. The corps of lecturers consists of 80 permanent academic staff members and 450 guest lecturers from various organizations and countries. IHE is currently setting up a network potentially linking its over 12000 alumni throughout the world – a most valuable resource built up since 1957. As a follow-up of the aide-memoir signed by four ministers of the Government of the Netherlands and the Director-General of UNESCO, IHE is being developed to become the UNESCO-IHE Institute for Water Education, thus implementing its international activities under a truly global mandate. ([www.ihe.nl](http://www.ihe.nl))

#### 5.4.2 Water Policy Reform Capacity Building Programme

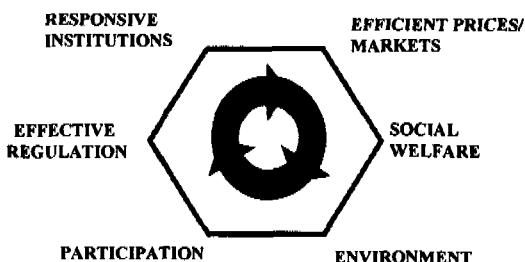
The World Bank Institute is the Bank's knowledge and training arm, and as such, is actively engaged in water issues. The Institute's Water Policy Capacity Building Program assists developing countries prepare and implement policies leading to sustainable water resources management and water services delivery, by providing knowledge services on policy issues to a wide range of stakeholders. Since its inception in 1994, the program has reached over 8,000 decision-makers and stakeholders in 45 countries, leading to significant policy reforms. This demand-driven program is supported by the Bank, donor governments, and client governments.

According to WBI, only through sound analysis and sharing of knowledge among all stakeholders of development can sector policies be strengthened and investments be made effective and sustainable. Only then can lasting solutions be achieved in solving our water challenges. As shown in the above figure, the program focuses on key policy issues and responses involving the creation and use of markets; economic and environmental regulation; and approaches promoting inclusion and participation.



Source: World Bank Institute

**POLICY GOALS FOR A SUSTAINABLE WATER SECTOR**



Recently, the World Bank established the Global Development Learning Alliance which is committed to providing quality programming drawn from a variety of public and private sources, including the World Bank Institute. Learning programmes fall into three broad categories: Courses, Seminars, and Global Dialogues. Courses and Seminars combine two-way multimedia videoconferencing sessions complemented with print packages, CD-ROMs, interactive Web communications, or face-to-face tutorials. Some are fully Internet-based. Global Dialogues are stimulated through short videoconferences allowing participants to work together to address pressing issues that call for a common international agenda or require a local policy response. ([www.worldbank.org/wbi](http://www.worldbank.org/wbi))

**5.4.3 International Network for Capacity Building on Integrated Water Resources Management (CAPNET)**

The purpose of CAPNET, which is becoming operational in 2001, is to foster human resources development for integrated water resources management (IWRM) through the strengthening of individual and, through them, institutional capacities in a number of countries and regions. CAPNET's objectives will be achieved through networking, awareness creation, training and education, and development of relevant materials/tools. As an associated programme of the Global Water Partnership (GWP), CAPNET will serve as a global network which operates as a support programme for regional and national networks of IWRM training and education institutions, which will deliver the actual capacity building. Although UNDP and the Netherlands are the initial sponsors of CAPNET, other multilateral, bilateral, non-governmental and private sector organizations are expected to join this multi-country, multi-donor undertaking. ([www.cap-net.org](http://www.cap-net.org))

**5.4.4 WaterNet**

The WaterNet project, which started in 1999, aims at establishing a regionally-based network for education, training and research on integrated water resources management in Southern Africa. It facilitates professional course development and the establishment of a regional modular Master's Degree. It also promotes regional research activities and a professional association. To achieve these goals five funds are being created: a research fund, an exchange fund for lecturers, a fellowship fund for students, a staff development fund and a nodal strengthening fund for participating institutes. WaterNet will use the experience gained by the University of Zimbabwe with the modular MSc course in water resources engineering and management.

One of the main objectives of the post-graduate programme is to coin a common language of the central concepts in IWRM. This will allow present and future water managers to effectively communicate with experts from other disciplines, such as resource economists, environmentalists, lawyers, planners, community representatives, scientists, health professionals and engineers. WaterNet is supported by the Netherlands (DGIS), Sweden (SIDA) and other donors.

WaterNet may have inspired similar initiatives in other regions such as Central Asia and Central Europe where similar networks are currently being considered. ([www.gwpsatac.org.zw/waternet.html](http://www.gwpsatac.org.zw/waternet.html))

#### 5.4.5 Strengthening Capacity for Global Knowledge Sharing in International Waters

The purpose of this global project is to improve global management of transboundary water systems by increasing capacity to replicate best practices and lessons learned in each of the GEF supported international waters operational programmes. Phase I integrates three initiatives:

- the International Waters Distance Learning Project (IW:LEARN), which uses new communication technologies for an 'international waters knowledge community' so that people managing these ecosystems can better teach and learn from each other. ([www.iwlearn.org](http://www.iwlearn.org))
- the TRAIN-SEA-COAST Project (TSC) will establish six new regional centres for course development guided by participatory needs and resources assessment. IW:LEARN will co-operate with TSC in targeting new areas for the development of TSC curricular materials and identify selected TSC courses/modules, which can be converted into distance learning formats. ([www.un.org/depts/los](http://www.un.org/depts/los))
- The biennial GEF International Waters meetings are arranged for a portfolio-wide strategic planning and exchange of project experience and lessons learned. (IW:LEARN)

#### 5.4.6 Participatory Approach to Education (FAO/World Bank)

A participatory approach to education can be found in the FAO manual 'Participatory Curriculum Development in Agricultural Education' – a training guide. The manual focuses on involvement of stakeholders in curriculum development with the objective to promote mutual learning and to revise and actualize the curriculum with involvement of stakeholders, in particular the prime stakeholder farmers. This is a guiding principle of the Agricultural Knowledge and Information Systems (AKIS) for rural development, in which education, extension and research services – public or private – respond to farmers needs for knowledge to improve their productivity, income, welfare and manage the natural resources on which they depend in a sustainable way. (FAO/World Bank, 2000).

#### 5.4.7 WMO Educational Guide

As an example of the practical implementation of the principles of subsidiarity and solidarity (see Sections 3.3 and 3.5) the World Meteorological Organization (WMO) is currently producing a fourth edition of one of its major publications: Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology. This revision will appear in two separate volumes. The first volume on Meteorology is now available, and an editorial panel is actively working on the Hydrology volume. As an example of interagency co-operation UNESCO has nominated a representative to the editorial panel, and has made available the collective experience encapsulated in the UNESCO Studies and Reports in Hydrology and other publications on the education and training of hydrologists and hydrological technicians. ([www.wmo.ch/web/etr/classif.html](http://www.wmo.ch/web/etr/classif.html))

#### 5.4.8 Water and Education for Teachers (WET)

Project WET is an example of water awareness raising and knowledge transfer at primary and secondary education level. Project WET is an international, interdisciplinary, water science and education program for formal and non-formal educators of kindergarten through grade twelve students. It is a source of information and materials, professional development training courses, networking assistance, and a valuable resource for organizations that have questions about water education and creating their own education initiatives. Since the inception of Project WET in 1984, the program has attracted global interest. The goal of the Project WET program is to facilitate and promote the awareness, appreciation, knowledge, and stewardship of water resources through the development and dissemination of classroom ready teaching aides. The need for Project WET was identified by both educators and water managers. Educators need materials that are relevant, hands-

on, and engaging for students. Water policy makers, managers, and scientists have a critical need for public understanding of and involvement in water issues. ([www.montana.edu/wwwwet](http://www.montana.edu/wwwwet))

#### 5.4.9 UNESCO/UNDP/IHE/WBI/UNU-INWEH Programme of Action and Symposium

The World Water Forum gave impetus to UNESCO, UNDP, WBI, UNU-INWEH and IHE-Delft to initiate a program of action on water sector capacity building focusing on education and training. Their work is guided by the present Strategy Paper. A major element of this initiative is the International Symposium on Human Capacity Building in the Water Sector through Innovation and Collaboration (Delft, The Netherlands, November 2001).

The objectives of the symposium are to:

- (1) Encourage and create collaborative clusters as a vehicle to implement innovative and promising education and training programs; and for this purpose to:
- (2) take stock of effective policies, institutional and implementing arrangements for water education and training; and in particular, to review analytical and decision making processes, instruments, tools and best practices including learning modalities (e.g. use of information and communication technology, role-playing, distance learning and traditional methods);
- (3) articulate the needs for education and training (demand) and the means to meet the needs (supply) for the short and long term, consistent with the GWP Framework for Action.

The symposium concentrates on the steps to be taken to go from strategy to action. It will be guided by the themes of innovation and collaboration ([lvp@ihe.nl](mailto:lvp@ihe.nl)).

#### 5.4.10 International Hydrological Programme (IHP)

UNESCO has recently identified education as the key element in forging a worldwide strategy to prepare humankind for the challenges of the twenty-first century. The concept of the 'learning society' calls for a reorientation of approaches. The International Hydrological Programme (IHP), the sole fresh-water oriented research programme of the UN System, responds in an integrated way to the growing concerns over the resource water and the ever increasing need for education, training, knowledge transfer and public awareness raising at all levels ([www.unesco.org/water/ihp](http://www.unesco.org/water/ihp)).

The IHP does not only address hydrology in research and education, but rather the entire scientific profile of terrestrial freshwater resources assessment, monitoring and management. Knowledge, Information and Technology Transfer (theme 8 of Phase V of IHP) reflects the whole scope of education, including pre-school, primary, secondary and tertiary educational levels, lifelong continuing education and training, as well as informal and innovative ways. In addition, the public awareness raising component is explicitly addressed. Within the broad set-up, the characteristics of IHP, as a scientific programme will be reflected by emphasizing university – postgraduate degree – and continuing professional education. As far as public awareness is concerned, priority target groups are the youth and the present-day (political) decision-makers. In the forthcoming Phase VI (2002–2007), Theme 5, W-E-T will play a crucial role. Activities will be grouped in the following four focal areas:

- Teaching techniques and material development
- Continuing education and training for selected target groups
- Crossing the digital divide
- Institutional development and networking for W-E-T

#### 5.4.11 Global Organization of Universities for Teaching and Training and Ethics of Water (GOUTTE of Water)

GOUTTE of Water is conceived as a global water-oriented, umbrella organization of universities and other educational networks, active in teaching and training. GOUTTE of Water will also be engaged in the transfer of teaching experience. It is designed to:

- (1) address education, training and research issues at undergraduate and postgraduate level;

- (2) to be a forum where collaborating entities and their programmes can be discussed, compared and concerted; and
- (3) to help shape a 'New Water Ethics' in academia and in future practice.

This global network would be based on cells combining partners from developing and developed universities. Cells are expected to be focused on common interest or interdisciplinary context and are formed to use one common language of communication while the global network might rely on several cells using different languages. At a later stage GOUTTE of Water could assume advisory functions in accreditation, degree comparison, programme reviews and quality assessment in partnership with governments, multilateral and bilateral organizations and other partners. ([www.unesco.org/water/ihp](http://www.unesco.org/water/ihp))

#### 5.4.12 Research and Ethical Network Embracing Water (RENEW)

The World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) sponsors a global Research and Ethical Network Embracing Water (RENEW), which identifies and endorses examples of best ethical practice in all aspects of freshwater use. Organizations so recognized are invited to participate in the Network, where collaboration and cross-fertilization is fostered among members.

Research centres, education and training facilities, water suppliers and regulators, industrial and agricultural users, organizations concerned with information transfer and exchange, as well as with promoting the empowerment of all water stakeholders, will be among the disciplines and interests eligible for membership of RENEW. The network will include a number of regional centres selected on both geographical considerations and, on the strength of their ability to contribute most effectively to innovation and dissemination of best ethical practice. These centres will provide facilities to host visiting researchers, students and workshops on all aspects of the ethical use of freshwater. They will be selected by COMEST/UNESCO trustees. ([www.unesco.org/ethics/en/connaissances/comest\\_info.htm](http://www.unesco.org/ethics/en/connaissances/comest_info.htm))

A primary goal is to promote public awareness, education relating to water conservation and protection, and dissemination of knowledge and information about research findings and methodology to improve freshwater quality, as well as on best practices and technology. Special attention will be paid to the role of women as decision-makers and managers in acquiring and using water.

RENEW would work in tandem with a parallel UNESCO proposal: GOUTTE of Water. The ethical dimension of this partnership lies in the explicit commitment to provide moral leadership in forming and educating professionals and scientists sensitized to the accepted principles of sustainability, environmental consciousness and equity.

The Australian National University (ANU) has established the first RENEW centre, representing the Southeast Asia-Pacific region. In August 2001 the Nordic-Baltic RENEW was created. Its regional centre is the University of Bergen in Norway.

#### 5.4.13 Examples of Water-Related TEMPUS Projects

TEMPUS is a joint European Programme in support of innovative inter-university co-operation and networking. Over the past ten years Tempus has supported a number of initiatives a sampling of which follows: ([ewa.wietsma@users.whh.wau.nl](mailto:ewa.wietsma@users.whh.wau.nl))

- Co-operation on methods of sustainable, environmentally sound river basin administration.
- Creation of an interdisciplinary partnership of 25 universities from 10 countries. Forum for an implementation of joint educational, training and mobility programme through student and staff movements between West and East, East and West, East and East and short intensive courses.
- Improvement of university education on environmental protection through updating curricula and teaching material in Central Europe.
- Restructure the curricula at 8 Polish universities including the creation of a 4-year PhD programme and a postgraduate course, both in the area of environmental protection and to develop a Geographical Information Systems Training Centre.

- Incorporation of environmental/ecological concepts in Civil and Agricultural Engineering courses at eight Hungarian universities and institutions of higher education; setting up new PhD programmes in environmental engineering and in IWRM, organizing international interdisciplinary PhD Workshops and hydrological field experiments.
- Introduction of new degree courses, at both Bachelor and Master levels, at two Polish partner universities and launching an interdisciplinary and inter-faculty study programme in environmental engineering and management.

#### 5.4.14 European Thematic Network (ETNET 21)

ETNET 21, the European Thematic Network of Education and Training for Environment-Water focuses on the relation between research and technological development in the domain of environment-water as producers of knowledge and skills, and the learning processes, methods and tools to enhance the transfer of this new knowledge and skills into the higher education system, including continuing education, training and professional development systems.

ETNET 21 identifies what are the research priorities and how to transfer the results to those who can apply them in order to meet the society's requirements and concerns. It builds upon existing networks, bridges the gap between researchers and educators, creates synergies between these two professional communities in the environment-water field and brings the many stakeholders together in this broad multidisciplinary field. ([www.etnet.vub.ac.be/eAbout/](http://www.etnet.vub.ac.be/eAbout/))

#### 5.4.15 L'Académie de l'eau

L'Académie de l'eau launched a study based on the Framework Paper of the Core Group of the W-E-T Initiative. Its objective is to focus on the aspects of awareness raising and information of the public. Conclusions of the study are based on a survey, which involved more than 30 countries from all over the world (mainly francophone countries). The outcome crystallizes in a 100-page document, which will constitute a solid base for the development of a water uses handbook. It will also be a comprehensive book on the different water education and training methodologies used world-wide. ([academie@oieau.fr](mailto:academie@oieau.fr))

#### 5.4.16 Awards

International recognition is an efficient way to honour extraordinary services. Through the award of prestigious prizes the work rendered for water, education and training could be given a higher appreciation. The Water World knows a number of well-esteemed prizes such as the Stockholm Water Prize including its junior version, the International Hydrology Prize of IAHS, WMO and UNESCO, the Grand Prix (and associated specialized prizes) of the City of Cannes, associated with the Réseau méditerranéen de l'eau (The first Water-related UNITWIN Network based on UNESCO Water Chairs), awarded since 2000 and the biennial UNESCO/Great Man-Made River International Water Prize sponsored by the Libyan Arab Jamahiriya to reward water research achievements in arid areas. This prize will be awarded first in 2001. Scientific/technical NGO's have several awards, prizes and distinctions to reward and stimulate excellence. Some examples are the King Hassan II Prize of Morocco and WWC, the Crystal Drop Award and the Ven Te Chow Memorial Lecture at the IWRA Congress, the Arthur Ippen Award of IAHR and the Leon Tison Award of IAHS.



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## Annex 1

### Overview of drivers and their value in the three World Water Vision global scenarios

	S C E N A R I O S		
	Conventional Water World (CWW)	Water Crisis (as compared to CWW) (WAC)	Sustainable Water World (as compared to CWW) (SWW)
<b>DRIVERS</b>			
<b>Demographic</b>			
<i>Total population size 2025</i>	Total 8 billion; 6.6 in the South (S)	About the same	Total 7.5 billion (6.2 in the S)
<i>Population growth rate</i>	1.2 percent/year (1.4 in the S)	About the same or slightly lower (because of higher mortality)	1.05 percent/year (1.1 in the S)
<i>Urbanization</i>	61 percent Urbanized (56 percent in the S)	About the same or slightly lower	About the same as CWW
<i>Migration patterns</i>	High pressures for migration S to North (N)	Higher pressures (and stronger barriers)	Low pressures for migration S to N
<b>Technological</b>			
<i>Information technologies</i>	Widely available and used for increasing water management efficiency	Widely available, but application to enhance water efficiency not effective due to other constraints.	Widely available and used for increasing management efficiency and effectiveness (including water management) and social participation.
<i>Biotechnology</i>	Widely available and used for new varieties	Privately appropriated and not widely available	Widely available and used for new sustainable crop systems and water purification
<i>Water use efficiency</i>	Increases overall, and particularly in arid areas	Increases but much less	Increases overall, faster than in CWW
<i>Water pollution</i>	Pollution per unit gradually decreases	Decreases but only marginally, due to lack of access to technology	Pollution per unit decrease much faster than in CWW
<i>New drought-, pest- and salt-resistant crops</i>	Massive development and dissemination of new varieties leading to expansion of potentially arable land and yield increases in marginal lands	Development of resistant varieties ; dissemination curtailed in countries unable to pay the royalties	Same as CWW, but combined with ecotechnologies and integrated in new agricultural systems
<i>Water sanitation</i>	Investment in S grows as fast as the economy	Investment in S falls down due to economic crisis	Investment in S grows faster than overall economy; ecotechnologies used
<i>Desalination processes</i>	Widely available	Expensive; only adopted in rich, arid, zones	Widely available

**S C E N A R I O S**

<b>DRIVERS</b>	<b>Conventional Water World (CWW)</b>	<b>Water Crisis (as compared to CWW) (WAC)</b>	<b>Sustainable Water World (as compared to CWW) (SWW)</b>
<b>Economic</b>			
<i>Total volume of production</i>	To 83.1 trillion (40.8 in S)	About 50 percent lower than CWW	To 90 trillion (60 in S)
<i>Structure of production</i>	Gradual dematerialization; agriculture growths in absolute terms	Little dematerialization in the S; agriculture growths in absolute and relative terms in the S	Fast increase of the non-material economy
<i>Water- infrastructure (availability and condition)</i>	Grows at same rate as the economy	Deteriorated gradually in S, or behaves erratically	Grows faster than overall economy
<i>Trade</i>	Universal	Some countries or regions become excluded from the global markets	Universal and strategically regulated
<b>Social</b>			
<i>Lifestyles and cultural preferences</i>	Converge to current level in the N	Preferences are the same, but real lifestyles in S and N gradually diverge	Convergence in S and N to lifestyles less material-intensive than current in the N
<i>Poverty</i>	Absolute poverty remains constant; relative poverty decreases	Relative and absolute poverty increases	Absolute poverty eradicated
<b>Environmental</b>			
<i>Committed Climate change</i>	Increased variability, agro-ecologic shifting	Very dramatic shifting, variability and global warming	Less dramatic than in CWW because of strong emission policies
<i>Water-related diseases</i>	Gradually diminishing	Gradually increasing due to low investment and climate change	Remaining only in small pockets
<i>Salinization</i>	Gradually reduced	Increasing	Stopped
<i>Exhaustion and/or pollution of surface and ground water</i>	Gradual increase	Faster increase	Stopped; water withdrawals reduced to sustainable levels
<i>Integrity and health of aquatic ecosystems</i>	Gradual decrease	Generalized decrease including dramatic ecological collapses	Recovering

**S C E N A R I O S**

<b>DRIVERS</b>	<b>Conventional Water World (CWW)</b>	<b>Water Crisis (as compared to CWW) (WAC)</b>	<b>Sustainable Water World (as compared to CWW) (SWW)</b>
<b>Governance</b>			
<i>Institutions</i>	Appropriate; new arrangements made	Institutional breakdown; arrangements increasingly dysfunctional	Strong and adequate institutions created; new shared goals; wide participation
<i>Market dominance</i>	Universal	Free market only in some rich regions	Universal, but internationally regulated
<i>Power structure (international, national)</i>	Asymmetrical but becoming more pluralistic	Asymmetrical and authoritarian; militarization of water and other scarce natural resources	Much more pluralistic than in CWW
<i>Conflicts</i>	Localized and manageable	Ubiquitous and increasing, particularly over natural resources.	Practically absent
<i>Globalization</i>	Accelerating	Spasmodic but widening	Accelerating



## Annex 2

### Acronyms and Abbreviations

ADB	African Development Bank
AIT	Asian Institute of Technology
AsDB	Asian Development Bank
CAL	Computer-Aided Learning
CAPNET	International Network for Capacity Building for Integrated Water Resources Management
CET	Continuing Education and Training
CIDA	Canadian International Development Agency
COMEST	World Commission on the Ethics of Scientific Knowledge and Technology
CPD	Continuing Professional Development
CWW	Conventional Water World
DFID	Department for International Development (UK)
DGIS	Directorate General for International Cooperation (The Netherlands)
EBRD	European Bank for Reconstruction and Development
ESA	External Support Agencies
E&T	Education and Training
ETNET	
Environment-Water	European Thematic Network of Education and Training
FAO	Food and Agricultural Organization
GEF	Global Environmental Facility
GOUTTE of Water	Global Organization of Universities for Teaching, Training and Ethics (Transfer of Teaching Experience) of Water
GREEN	Global Rivers Environmental Education Network
GTZ	Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Co-operation)
GWP	Global Water Partnership
HRD	Human Resources Development
HWRP	Hydrology and Water Resources Programme (of WMO)
IADB	Inter-American Development Bank
IAHR	International Association of Hydraulic Engineering and Research
IAHS	International Association of Hydrological Science
ICID	International Commission on Irrigation and Drainage
IGO	Intergovernmental Organization
IHE	International Institute for Infrastructural, Hydraulic and Environmental Engineering, Delft, The Netherlands
IHP	International Hydrological Programme (of UNESCO)
INWEH	International Network on Water, Environment and Health
IWA	International Water Association
IW:LEARN	International Waters Learning Exchange and Resource Network
IWRA	International Water Resources Association
IWRM	Integrated Water Resources Management
NGO	Non-Governmental Organization
OIE	Office International de l'Eau
PA	Public Awareness (raising)
RENEW	Research and Ethical Network Embracing Water
SIDA	Swedish International Development Agency
SWW	Sustainable Water World

TAC	Technical Advisory Committee (of the GWP)
TECHWARE	Technology for Water Resources
TEMPUS	Trans European cooperation scheme for higher education
TSC	Train-Sea-Coast Programme
UN	United Nations
UNDESA	United Nations Department on Environment and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Funds
UNITWIN	University Twinning (UNESCO Interuniversity Network created by UNESCO Chairs)
UNU	United Nations University
WAC	Water Crisis Scenario
WBI	World Bank Institute
WEDC	Water, Engineering and Development Centre, Loughborough University, United Kingdom
W-E-T	Water-Education-Training
WET	Water Education for Teachers
WHO	World Health Organization
WMO	World Meteorological Organization
WQM	Water Quality Management
WRM	Water Resources Management
WWC	World Water Council



## Annex 3

### Glossary

This section attempts to introduce and to describe briefly the most important terms and conceptual elements of the present report. It relies on respective literature (Gilbrich, 1997, Bogardi et al, 1995, Delors et al, 1996, etc.) (UNDP Symposium, A Strategy for Water Sector Capacity Building, IHE, Delft, 1991) and accepted terminology in the area of water-related education and training. This annex is, however, not a complete glossary, as it does not contain all possible entries, but confines itself to the elements relevant in the context of the present Strategy Paper.

#### General concepts and terms

*Bottom-up approach:* describes proposed or implemented actions conceived, initiated and executed by those groups which are most affected by the respective action (beneficiaries, service providers, etc.) These 'grass root' initiatives usually need 'top-down' encouragement, acceptance and funding to develop their full potential.

*Business enterprise sector:* includes all firms, organizations and institutions whose primary activity is the production of goods or services for sale to the public. Private, non-profit institutes serving the same target group are also included.

*Capacity building:* is the sum of efforts to enhance and utilize the skills and capabilities of people and institutions at local, national, regional and global levels, aimed at sustaining development. The concept of capacity building was articulated during the first global UNDP Symposium 'A Strategy for Water Sector Capacity Building,' held in Delft, The Netherlands in 1991. The Symposium concluded that capacity building consists of the following elements:

- Creation of an environment with appropriate policy and legal frameworks
- Institutional development, including community participation
- Human resources development and strengthening managerial systems
- Subsequent consultations and field experience led to the addition of a fourth element: sustainable funding.

*Environmental awareness:* describes the process and product of the sensitization of concerned citizens, the affected public, the individual professionals and professional, educational and administrative organizations with regard to environmental issues. Environmental awareness can thus be interpreted as (part of) public awareness, but it covers also a professional attitude (to be strengthened) towards a more conscious approach in resource development and management. In this regard (institutional and professional) environmental awareness is a prerequisite of IWRM.

*Government sector:* is composed of all ministries, departments, offices and other bodies which furnish, (but normally do not sell to the community), those common services which cannot otherwise be economically provided, and administer the state, including security, environmental, economic and social policy of the community.

*Higher Education or Tertiary Sector:* is comprised of all universities, colleges of technology, and other institutes of post-secondary education, whatever their source of finance or legal status. It also includes all research institutes, experimental stations etc. operating under the direct control of, administered by, or associated with, higher education establishments.

*Human Resources Development (HRD):* includes awareness-raising, education, training at all levels, research capacity building, information exchange, and involves employment practices, career structures and professional and financial incentives.

*Integrated Water Resources Management (IWRM):* broad paradigm of the (new) philosophy of water resources management calling for a holistic approach. IWRM is a process which aims to ensure the coordinated development and management of water, land and related resources to optimize

economic and social welfare without compromising the sustainability of environmental systems. In the broadest sense IWRM means the simultaneous considerations of water quantity and quality aspects of both surface and groundwater resources embedded into a systems analytical approach with reference to other sectoral activities such as industries, aquaculture, agriculture, public health, environmental protection, etc. IWRM needs inter- and multidisciplinary approaches and public participation, public awareness raising etc.

The GWP/TAC has identified the following nine elements of IWRM: water sector assessments, water policy and strategy, water legislation and standards, institutional framework, participatory planning and management, allocation across (sub) sectors & conflict resolution, functions and values of water resources, transboundary issues, and linkages between land, water and ecosystems. There is an obvious education and training need to 'produce' the experts who will be able to implement IWRM in practice.

*Public Awareness:* describes the process and the product of the sensitization of concerned citizens and the affected public and their 'grass root' representation of the different issues related to the consequences of (water resources) development, management, strategies etc. Public awareness reflects the (expected) response of individuals, irrespective of the nature of the issue (political, economic, ecological, etc.)

*Stakeholder:* the general term to describe an agency, interest group, company, individuals, water users, bulk water suppliers and communities or representations thereof, taking part in IWRM or in the related participatory processes.

*Sustainable Development:* a much-used term of the recent years, having many definitions. In the broader sense it is described as (actions towards) the fulfilment of the aspirations of the present generation without jeopardizing the future generations to achieve their own (perceived) objective.

*Sustainability:* generalized concept of the previous entry, describing the perception of a state or an action to have lasting effects (usually benefits). While it is seldom found, sustainability should be associated with an (estimated) time scale, to be used as a true quantified indicator.

*Top-Down Approach:* describes proposed or implemented actions conceived, initiated and executed following legislative or executive orders (hierarchical approach).

## Educational and training concepts and terms

*Accreditation:* is the recognition of an educational institution as maintaining standards that qualify the graduates for admission to higher or more specialized institutions or for professional practice.

*Certificate (of Attendance):* document issued by an organizer of an educational or training event (usually CET), attesting the participation and eventual successful completion of the respective programme. In contrast to degrees and diplomas, certificates are not recognized as professional qualification and are usually ineffective to foster career prospects.

*Competency:* specified knowledge and skill to fulfil a given job.

*Continuing (professional) Education and Training (CET):* any formal or informal education and/or training activity conceived for recipients who possess already an accredited vocational, professional or academic qualification in the respective or related field.

*Continuing Professional Development (CPD):* CET activities in a specified profession leading to the achievement of competencies needed to perform new tasks.

*Curriculum:* is the totality of an organized learning experience of a distinct professional profile. It provides the conceptual structure and sets the time frame to acquire a recognizable degree, and describes its overall content, e.g. the curriculum of a five-year degree programme in 'civil engineering' at a certain higher education institution: The curriculum is the choice of the student out of the programme which is the totality of what the university offers. A course is the totality of an organized learning experience in a specific area, e.g. the course on 'fluid dynamics' within the curriculum 'civil engineering'.

*Degree, Diploma:* nationally recognized documents of professional and academic qualification issued by an accredited institution or ministry.

*Donor:* in the sense of education and training (E&T) an individual or organization providing means (in cash and/or kind) to support E&T activities without being involved in the implementation otherwise.

*Education:* formal and informal processes being associated with the transfer of knowledge to an individual. Any action leading to increasing one's knowledge.

*Formal Education and Training:* E&T, which is carried out by, accredited private or public institutions (schools, universities, colleges, vocational training centres, etc.). Traditionally formal education relies on classroom teaching, tutorials, examinations, etc. along a fixed curriculum. Formal education and training, once successfully absolved, leads to acknowledged vocational and/or academic qualifications (diploma, academic degree, etc.).

*Informal Education and Training:* describes E&T activities conceived to respond to imminent or latent needs, focusing more on the transfer of necessary knowledge and skills than their formal accreditation. Informal education (and training) relies traditionally on 'on-the-job training', self-study, mentoring, in-house CET activities, etc.

*Knowledge:* is the ability of understanding and rational, scientific and strategic thinking. It is a universal and time independent human ability that fulfils satisfies the puzzle-solving mind of mankind and allows the individual to adapt more easily to a changing environment.

*Learning Society:* a paradigm with various definitions, describing the broad social acceptance that the principle of lifelong learning should penetrate all walks of life. In a more focused sense, 'learning society' implies that companies, industries (the economic world), incorporate learning (CET) into their regular activity programme, thus abolishing the 'pejorative' duality of productive work and CET. In more philosophical terms, 'learning society' assumes a general desire and proactive attitude to raise everybody's educational level. In the ideal case, the whole society participates in this learning process.

*Lifelong Learning:* a recently emerging concept acknowledging the increasing pace of knowledge renewal and additional skills to be acquired, thus rendering one's professional life to become a continuous process of formal and informal education, training (CET) and eventually retraining (CPD).

*Post-Graduate Education and Training:* in some publications this is equated to all types of educational activities following the first (professional, academic) degree. Thus M.Sc. and Ph.D. programmes are considered together with CET activities leading to certificates of attendance. In the context of this Strategy Paper the term 'post-graduate education' is used with reference to additional degree programmes only.

*Recipient (beneficiary):* in the sense of E&T, individuals, groups and organizations being the subject of E&T activities. Those knowledge and skills are expected to increase as a consequence of E&T measures.

*Retraining:* concentrated formal process (including informal CET elements) enabling an individual to continue vocational and professional activities in a different (disciplinary) field other than the one determined by his/her primary qualification. Retraining can be a form of CPD.

*School:* formal educational institution providing services at primary and secondary level. Graduates of the secondary school level are usually qualified to enter the academic or higher professional educational institutions and programmes. Schools (secondary level) may adopt professionally orientated curricula, thus providing specialized, skill-orientated knowledge at technician level.

*Service provider:* in the sense of E&T, institutions (universities, schools, training centres or other organizations) and individuals actively involved in the planning and implementation of E&T.

*Skill:* is the ability in mental and/or physical performance. It is generally a local and time dependent characteristic and strongly linked to the so-called technologies available in a given environment. It fulfils the problem solving-mind of mankind and is essential for the individual to operate efficiently in a given society.

*Syllabus:* is the prescription of details on a specific course, such as what will be learned (and when), the texts to be read, the areas in which expertise is expected to be demonstrated. It may contain

descriptions of methods of teaching and assessment to be used. Syllabi are considered as the detail descriptions of elements of a curriculum.

*Train-the-Trainers*: educational and training concept describing the effort to transfer the necessary knowledge and skills to individual(s), enabling them to transfer special abilities, information, knowledge and awareness to certain target groups. Along these lines 'trainers' are usually trained to deal with marginalized groups, rural communities or other groups usually cut off from regular educational and training programmes due to geographical distances, language barriers, educational disadvantages, poverty, etc.

*Training*: formal and informal process being associated with the transfer of abilities and skills to an individual. Any action leading to increasing one's skills.

*Training Centre*: educational and training institution focusing on (usually non-degree) CET activities for vocational and professional training and retraining. Training centres may operate as independent educational entities or as part of an enterprise or agency.

*University*: formal educational institution of higher learning providing services at academic (scientific) level. The central mandate of universities is to provide academic degree(s)-orientated educational programmes, relying on the interaction of research and teaching. Traditionally, university programmes are discipline-orientated. At higher academic levels there are many promising interdisciplinary initiatives. Universities usually provide educational programmes at different levels:

- undergraduate: B.Sc., B.Eng., BA
- graduate honours class degree
- Master of Science (MSc), Master of Engineering (MEng), Dipl. Ing., etc
- research degree Ph.D. (doctorate)

In a modern learning society universities are expected to increase their outreach activities by providing consulting services, CET, etc.

*W-E-T World*: in context of the present W-E-T Strategy Paper this term is used to describe the entity of those persons, agencies and educational and training institutions which (who) are directly involved in water-related research, education and training.

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