



Issues in World Water and Their Educational Implications

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Note: This issues paper was prepared for the 1st meeting of the UNESCO Working Group on Water Education and does not necessarily represents the views of UNESCO.

This document relates to Activity 4.2 of the Terms of Reference for the UNESCO Working Group on Water Education and Capacity Building for Sustainable Development (GWESD). The role of the Working Group is to advise UNESCO, the International Hydrological Programme and their partners on key issues, initiatives and strategies for raising awareness and advancing water education for the community, via the mass media and other communication channels, and for the school and vocational education and training (VET) education sectors.

The GWESD is a body established by the Science and Education Sectors of UNESCO, in response to 166 EX/Decision 3.6.1 and IHP-IC resolution XVII-12 that called for the establishment of a working group on water education and for the development and implementation of an intersectoral strategy on education for the management of water as an integral component of DESD. The Working Group will directly contribute to the United Nations Decade of Education for Sustainable Development and function within the context of the Millennium Development Goals, and the International Decade for Action, 'Water for Life'. The Working Group will operate under the leadership of UNESCO-IHP and will lead activities towards and contribute to the implementation strategy of the Thematic Programme 8 on Education for Sustainable Water Management of the UNESCO Action Plan for DESD.

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INTRODUCTION

Of all the social and natural crises we humans face, the water crisis is the one that lies at the heart of our survival and that of our planet Earth.

UNESCO Director-General Koïchiro Matsuura

1.1 Water is life

The conservation of resources, such as water, is one of the major considerations of sustainability. The others, including social equity, appropriate development and popular participation, are very important but their achievement rests upon the capacity of the Earth to continue to provide the common good resources—air, water, land, soils, plants, fauna—that make it possible for life to carry on. The escalating impacts of human activities upon the Earth have produced a diverse range of problems, many of which have a global impact. For example: atmospheric warming and climatic change; the destruction of rainforests; species extinctions; accelerating rates of land degradation; population-resource imbalances, urban decay; the disposal of toxic wastes; and, a range of other threats. All of these can be seen manifest in the quality of some of our rivers and water bodies. Thus, water is a driving force for sustainable development, vital to all living organisms and ecosystems, and essential to human health, food production, and social and economic development.

Water is central to many ecological processes and has no substitute. But, accessible freshwater is in short supply and amounts to about 0.5% of the world's total water stock. Water supply and water quality are increasingly seen around the world as some of the most serious environmental problems facing human societies. The sheer scale of human impact—a combination of our population numbers and the lifestyles we choose to live—has left millions of people impoverished with respect to water. Nearly one and a half billion people have no access to clean drinking water. This number will double in twenty years if current trends of diversion, depletion and pollution are allowed to continue. Much of the little water that is available to these people is of declining quality and moving still further from reach as water tables recede, rivers are diverted to meet other priorities, supplies become degraded, and water cycles are disrupted by changes in the weather. The rate of deepening crisis is so far-reaching that as much as two-thirds of the world's population may be living in a state of serious water deprivation by the year 2025.

1.2 The role of education

Political commitment, education, and community action are the keys to a more sustainable water future. Education has been singled out for particular attention, such that, around the world and to the highest levels there is a general understanding that education is a key part of meeting the challenge to foster the values, behaviour, and lifestyles required for a sustainable future.

Education is the most effective means that society possesses for confronting the challenges of the future. Indeed, education will shape the world of tomorrow. Progress increasingly depends upon the products of educated minds: upon research, invention, innovation and adaptation. Of course, educated minds and instincts are needed not only in laboratories and research institutes, but in every walk of life. Indeed, access to education is the sine qua non for effective participation in the life of the modern world at all levels. Education, to be certain, is not the whole answer to every problem. But education, in its broadest sense, must be a vital part of all efforts to imagine and create new relations among people and to foster greater respect for the needs of the environment.¹

¹ UNESCO (1997) *Educating for a Sustainable Future: A Transdisciplinary Vision for Concerted Action*, Background Paper prepared for International Conference, Thessaloniki, paragraph 38.

This is further recognised in the International Implementation Scheme for the UN Decade of Education for Sustainable Development (2005-2014), which states that the overall goal of the Decade is to:

. . . integrate the values inherent in sustainable development into all aspects of learning in order to encourage changes in behaviour that allow for a more sustainable, economically viable and just society for all, a world where everyone has the opportunity to benefit from education and learn the values, behaviour and lifestyles required for a sustainable future and for positive societal transformation.²

Thus, education is both a key dimension of the international response to sustainable development, in general, as well as a key in responding to the world water crisis. The response is both in the changes to the content of education and the ways that it is taught. Education about water issues must occur at all levels to raise awareness of the issues, to equip people with the skills, knowledge and values to play a role in both protecting the water resource into the future and to use it effectively in the present to maximise their human potential.

This is also a significant time for the promotion of water education with the implementation of two UN-declared International Decades for Action in concurrent effect, the Water for Life International Decade for Action 2005-2015 and the Decade for Education for Sustainable Development 2005-2015. These follow on from the 2003 International Year of Freshwater 2003 and a series of four World Water Fora in the past ten years. Water has a prominence in international attention that it has not had previously.

1.3 Outline

This paper addresses world water issues and their implications for education. It firstly outlines the key issues for water as they have been identified in important documents such as, but not limited to, the two United Nations World Water Development Reports, the UNDP 2006 Human Development Report on the theme of “Beyond Scarcity: Power, Poverty and the Global Water Crisis”, the World Water Council’s World Water Vision, and the International Hydrological Programme’s 2003 Water-Education-Training Strategy. Each of these documents identifies, groups and prioritises the issues differently; however, it is possible to discern common themes across these documents. In addition to the substantive themes some issues may be considered cross-cutting as their effect and impact applies across the board. The information presented in this document is by no means a definitive summary of what is available. Rather it serves to provide a context for discussion in the final section of the document about the educational implications that the issues.

In this report the key water issues have been arranged to correspond firstly to the WWAP two challenges (Life and Well-being, Management) into which the three themes of the World Water Development Report (Water and Poverty, Water and Environment, Water and Governance) have been put. A further two issues that cut across the challenges are also described. Together, these include:

Challenges to Life and Well-being

Water and Poverty

- Supply
- Sanitation
- Health

Water and Environment

- Scarcity
- Natural disasters
- Pollution
- Trans-boundary water issues

Challenges for Water Management

Water and Governance

- Financing
- Valuation
- Integrated Water Resources Management

Cross-cutting Issues

- Monitoring
- Capacity building

Once the key issues are clearly identified, the paper will then explore the implications of for water education in four target areas: Water education in schools, Water education in Technical and Vocational Education and Training (TVET), Water education in the community, and Water

² UNESCO Executive Board (2005) UNESCO’s Contribution to the Implementation of the UN Decade of Education for Sustainable Development (2005-2014). 172 EX/INF.4

education in the mass media. The purpose of this issues paper is to set out the background and principles upon which an international work plan for advancing water education in these four areas can be developed.

BOX 1 WATER – The State of the Resource³

- World population distribution and human settlement patterns are based upon locally sustainable freshwater supplies in the form of run-off and/or river and stream flows.
- Yet, of the world's total population, 20% has no sustainable natural water supply, 65% shares low-to-moderate supplies, and only 15 % has an abundant supply.
- Groundwater systems globally provide 25 to 40% of the world's drinking water.
- The last 5 years of the 20th century were characterized by continuous glacier melting. This decline impacts on both the sustainability of the water resources in basins and on their ecosystems.

Coastal and freshwater ecosystems

- Population growth and economic expansion are together placing huge demands on coastal and freshwater ecosystems. Water withdrawals, for instance, have increased six-fold since the 1900s—twice the rate of population growth.
- Freshwater species are more threatened by human activities than species in other realms. On average, freshwater species populations fell by about 50% between 1970 and 2000—a sharper decline in terrestrial or marine biomes.

Protecting and promoting human health

- To ensure our basic needs, every individual needs 20 to 50 litres of water free from harmful contaminants each and every day.
- Sanitation coverage in developing countries (49%) is only half that of the developed world (98%).

Water for food, agriculture, and rural livelihoods

- Although it is only 10% of the water used in agriculture, irrigation claims 70% of all freshwater withdrawals.
- About 13% of the world's population does not have access to enough food to live a healthy and productive life, yet the ability, technology and resources needed to produce enough food for everybody does currently exist. Lack of health, financial or natural resources such as land and water, and lack of skills to link productive activities with remote markets and ensure employment, are all related to poverty.

Water and industry

- Given proper incentives, industry can cut its water demand by 40-90%, even with existing techniques and practices. However, water conservation policies need to be fair, feasible and enforceable.

Water and energy

- Only about 25% of the world's dams are involved in producing hydropower.
- Europe makes use of 75% of its hydropower potential, while Africa has developed only 7%. This is a possible future cornerstone of Africa's development.

Managing risks

- Developing countries are disproportionately affected by disasters; their losses are about 5 times higher per unit of gross domestic product (GDP) than those of rich countries.
- From 1992 to 2001, about 90% of all natural disasters were of meteorological or hydrological origin.

Sharing water

- There are currently more than 3,800 unilateral, bilateral or multilateral declarations or conventions on water: 286 are treaties, with 61 referring to over 200 international river basins.

Valuing and charging for water

- The Ramsar Convention covers more than 1400 wetland sites around the world for preservation and protection—a testimony to the international recognition of the environmental, social and economic importance accorded to these ecosystems.
- The private sector's proportion in the water and sewerage sectors in developing countries is, on average, only 35%, whereas in the developed world it constitutes 80% of the market, in particular because of already high coverage rates and an institutional climate conducive to private investment.

Enhancing knowledge and capacity

- When taught proper hygiene at primary schooling, children are transformed into health educators for their families, thereby passing on vital information and skills that can reduce household vulnerability to deadly diarrhoeal diseases by at least 40%.
- Girls make up most of the 115 million children currently out of school.
- Women produce between 60 and 80% of the food in most developing countries. They are major stakeholders in all development issues related to water, yet they often remain on the periphery of management decisions and planning for water resources.

³ World Water Assessment Programme (2006) *UN World Water Development Report 2*, UNESCO Publishing, Paris.

KEY WATER ISSUES

2.1 Challenges to life and well-being

Water is essential for the preservation of the natural environment. Water is also indispensable for human health and well-being. One of the Millennium Development Goals is to reduce by half the proportion of people without access to safe drinking water by 2015 and to stop unsustainable exploitation of water resources. At the World Summit in Johannesburg in 2002, two other goals were adopted: to aim to develop integrated water resource management and water efficiency plans by 2005; and, to halve, by 2015, the proportion of people who do not have access to basic sanitation. A major effort is required to fulfil these commitments and extend access to these essential services to those who remain unserved, the majority of whom are poor people. To achieve these things a number of challenges and key issues have to be met. These are summarised in Box 1 and described in the following sections.

Challenges to life and well-being cover issues related to the ways we use water and the increasing demands we are placing on the resource. Signs of stress and strain are apparent across every sector: health, ecosystems, cities, food, industry and energy. With population growth and continuing pollution, these pressures are likely to increase.

2.1.1 Water and poverty

Without safe water and sanitation, people cannot lead healthy, productive lives. To ensure our basic needs, we all need 20 to 50 litres of water free from harmful contaminants each and every day. More than one billion people lack access to safe drinking water and more than twice that number lack adequate sanitation, particularly in developing countries. This has life-threatening consequences – more than two million people in developing countries, most of them children, die each year from diseases caused by lack of access to safe drinking water, inadequate sanitation and water-borne diseases. Because people who are poor are most likely to get sick, and ill health perpetuates poverty, it triggers a vicious cycle that hampers economic and social development. Thus, the lack of access to safe drinking water and sanitation is directly related to poverty and indirectly to the lack of investment in these systems.

Key issues in this theme are: Supply, Sanitation and Health

Supply

People require water for a wide range of activities essential to their livelihoods, including both domestic (drinking, washing, cooking and sanitation) and productive needs (vegetable gardening, livestock, brewing beer, brick making, among many others). Supplying water for these different needs can contribute to poverty alleviation. However, formal domestic water services often fail to address these different water needs in an integrated way. They typically focus only on the health benefits and not on the other livelihood impacts water can bring. The discrepancy between the needs of people and the design and management of water services leads to a number of problems, particularly by failing to capitalize on the benefits that catering to multiple needs can bring, and sometimes jeopardizing the sustainability of water services.

Despite the potential, few water supply systems, and the institutions governing them, have been designed with people's actual livelihood needs and behaviour in mind. Few water services really achieve their full potential, and worse still they sometimes lead to new problems and conflicts. In some locations, systems are only designed to provide basic amounts of water, and so deny people the opportunity to use water for small-scale productive uses. In other places, irrigation systems have been developed to provide water only for crop production, yet many people in arid areas also depend on the irrigation canals as their only source of drinking water. When there is a mismatch between people's water needs and supply, the sustainability, efficiency and equity of the services frequently become threatened. If the total amounts supplied are not sufficient, some people may use more than their fair share of water, even if through unauthorised connections, leaving others without any.

Ignoring people's actual needs denies them the opportunity to get all possible benefits out of the water supply; it can also lead to the collapse of the water service itself. The root cause for this seemingly paradoxical behaviour, i.e. providing water supply services that only partially meet people's needs, lies in the division of the water sector into a number of discrete sub-sectors: drinking water and sanitation, irrigation, water and environment, among others. These sub-sectors hardly ever work together, coordinate their actions or try to address issues relevant to all of them in an integrated way. Traditionally, the drinking water sector has focussed predominantly on minimizing health risks, and hence hardly ever incorporated the productive needs of poor people. Equally, the irrigation sector is concerned with water for crop production only. Water requirements for cattle are often not considered by irrigation engineers. While users rarely see their water needs from a sub-sector point of view, the reality is that institutions and projects operate almost exclusively within their own narrow area of interest.

Sanitation

Today, almost one in two people in the developing world lacks access to improved sanitation. Many more lack access to good quality sanitation. Sanitation can reduce the incidence of infectious diseases by 20% to 80% by inhibiting disease generation and interrupting disease transmission. While the provision of sanitation for all has been a key development goal for several decades, progress has been slow. The goal of the United Nations with the International Water Supply and Sanitation Decade (1981–1990) was to achieve worldwide availability and use of readily accessible, safe, reliable and adequate community water supplies and sanitation by the year 1990. While significant improvements were made, the goal was not met. International activities to ensure that people have access to safe water have not been able to keep pace with population growth – although coverage rates are improving, the number of people without access to safe water continues to grow.

Without a rapid increase in the scale and effectiveness of sanitation programmes, the Millennium Development Goal target No. 10 for 2015 will be missed by a wide margin. Without basic sanitation the benefits of access to clean water are diminished—and the health, gender and other inequalities associated with the sanitation deficit systematically undermine progress in education, poverty reduction and wealth creation.

Sanitation improvements can broaden the real choices and substantive freedoms that people enjoy, acting as a catalyst for a wide range of human development benefits. They can protect people—especially children—from ill health. They can lift people out of poverty, reducing the risks and vulnerabilities that perpetuate cycles of deprivation. They can raise productivity, boost economic growth and create employment. And they can build people's pride in their homes and communities.

Health

Human health is an essential component of sustainable development. Human health depends on the provision of safe, adequate, accessible and reliable drinking water supplies, adequate sanitation, minimized burden of water-related disease and healthy freshwater ecosystems. A third of all deaths in the world are due to infectious and parasitic diseases. About 1.7 million deaths a year worldwide are attributed to unsafe water, sanitation and hygiene, mainly through infectious diarrhoea. Nine out of ten such deaths are in children, and virtually all of the deaths are in developing countries.

The goal of providing access to safe drinking water in sufficient quantities and proper sanitation for all is critical for developing countries but other related issues are also of great concern for developed countries. The risk of toxic chemicals and metals in water still seem insignificant by comparison with the health hazards of microbiological contamination, but the increasing magnitude of chemical pollution is leading towards an even more critical problem in the future, involving more complex technical matters.

Thus, the connections between water and health can be traced through the following five disease pathways and improvements in sanitation and pollution controls will help in each of them. They are: Waterborne microbiological diseases, Water-hygiene diseases, Water-contact diseases, Water habitat vector-borne diseases and Waterborne chemical diseases. Adequate water management and practices can also reduce the vectors of diseases such as malaria.

2.1.2 Water and environment

The possible negative impact of human activity on the environment must be considered when managing water resources in a sustainable way. It is not sustainable to withdraw water for use in agriculture, industry and everyday needs without also taking account of the needs of

ecosystems and life-support systems. Animals and plants, landscapes and wetlands need clean water too. In many cases, wastewater must be recycled so that pollution is minimized. Special areas like estuaries, which play an important part in supporting the delicate and complex food chain of many birds and fish, may require comprehensive protection. Human beings must learn to respect the resource base on which life ultimately depends and to see land and water as two sides of the same coin. For this reason, decisions should be taken at a natural (e.g. river basin, catchment, watershed, ecosystem) level.

The world's soaring demand for freshwater is also causing increasing environmental stress. This is characterised by ongoing deterioration of natural capital and growing pressures on natural systems. The stream flows of about 60% of the world's largest rivers have been interrupted by dams. From inland waters, 24% of mammals and 12% of birds are threatened. About 10% of freshwater fish species have been studied in detail and about a third of these are thought to be threatened.

Key issues in this theme are: Scarcity, Pollution and Trans-boundary issues

Scarcity

Experts in the field agree that the quantity of water is often more important than the quality in terms of its impact on human health. Water use has grown at more than twice the rate of population increase over the last century, making sustainable, efficient and equitable management of scarce water resources a key challenge for the future. It is estimated that by 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world's population could be living under water stress conditions. Water shortages are most acute in the driest areas of the world, which are home to more than 2 billion people and to half of all poor people.

Coping with water scarcity requires addressing a range of issues, from protection of the environment and global warming to equitable distribution of water for irrigation, industry and household use. Even people in areas with plenty of freshwater experience water scarcity when they are unable to gain access to enough water for their basic needs.

Agriculture is the number-one user of water worldwide, accounting for about 70% of all freshwater withdrawn from lakes, waterways and aquifers around the world. The figure is closer to 90% in several developing countries, where roughly three-quarters of the world's irrigated farmlands are located. Because of the impact of agriculture, much of the answer to water scarcity can be found in farming-related techniques that harvest more rainfall, reduce waste in irrigation and increase productivity, and in changes in crop and dietary choices. Sound water resource management at all levels can help countries adopt flexible approaches that allow more people to have the water they need while preserving the environment.

Water scarcity is also a gender issue in many countries where women bear primary responsibility for water collection. Water scarcity means more time and energy spent by women collecting water and less on productive economic efforts. Girl-children may also be taken out of school to help meet household needs or care for those who have fallen ill – often leading to lower literacy levels, diminished well-being and constrained economic opportunities.

Natural disasters

The droughts that flow from water scarcity are but one of many water-related natural disasters that may beset a community. Excess water during floods is very often a major problem for many communities, both urban and rural. While flooding is a natural phenomenon, the incidence and severity of flooding is the result of human impacts upon the environment. A major factor here is deforestation, which results in additional soil erosion and river bottom depositons and consequent flooding. It also includes changes to river basin dynamics by channelling and urban development, especially on flood plains. Salt-water intrusion into ground water from sea-level rise is a major threat to groundwater supplies in coastal and island communities, also.

Pollution

Pollution is further reducing freshwater resources. Some two million tons of industrial, human, and agricultural wastes per day are disposed of in receiving waters. The poor are the worst affected, with half of the population in developing countries exposed to polluted water sources. These figures may rise as populations grow and move in search of limited water for themselves and their animals. By 2025, three-quarters of us may live within 100 kilometres of the sea, putting immense pressures on coastal ecosystems.

Pollution also affects the health of humans, plants and wildlife, and destroys wetlands and other ecosystems. Increased monitoring and use of environmental impact assessments, wastewater quality requirements, and the development of legislative frameworks are needed to prevent pollution.

Trans-boundary issues

National water governance is about striking a balance among competing users—agriculture, industry, households and the environment. Countries may legislate for water as a national asset, but rivers, lakes and aquifers cross political boundaries. Trans-boundary waters extend hydrological interdependence across national frontiers, linking users in different countries within a shared system. Managing that interdependence is one of the great human development challenges facing the international community.

The challenge is partly institutional. Competition for water within a country can create conflicting demands, confronting policy-makers with choices that have ramifications for equity, human development and poverty reduction. National institutions and legislative bodies provide mechanisms for addressing these choices. For water that flows across borders, there is no equivalent institutional structure. This has implications. As water becomes scarce relative to demand, trans-boundary competition for shared rivers and other water resources will grow. Without institutional mechanisms to respond to these trans-boundary problems, competition has the potential to lead to disruptive conflicts.

Water has the potential to fuel wider conflicts but also to act as a bridge for cooperation. Throughout history governments have found innovative and cooperative solutions to trans-boundary water management tensions, even in the most difficult political environments. When states go to war it is usually over something far less important than water. Managing shared water can be a force for peace or for conflict, but it is politics that will decide which course is chosen.

2.2 Challenges for Water Management

Patterns of human settlement and land occupation today are quite unlike anything known before, in terms of both numbers of people and relative amount of territory concerned. The level of mobility of persons and goods has been facilitated by rapid and extensive changes in communications and transportation technologies. When this is coupled with an increasing world population and with economic structures that allow, and even encourage, global mobility of production and capital, the traditional landscape of human settlement has become unrecognisable. If the expansion of human settlement was often tied to water systems before, it has become increasingly detached from that restraint. Large-scale infrastructure such as dams and reservoirs, irrigation pipes, and groundwater pumping allows for populations and settlements beyond the horizon of the water source. People, agriculture, and industry still generally go 'where the water is,' but in a globalising world even water has become a mobile commodity in modern society—its location and availability manipulated by human decision as never before. Take as examples, the Snowy River project in Australia that diverted water back inland to provide irrigation and power supply, the network of water pipelines that links the Colorado to Southern California, very large dam projects like the Three Gorges dam in China or the Ananda Marga Water project in India. The technology of water infrastructure allows a temporary release from geography and hydrology, but at a cost.

Perhaps above all else, the water crisis is one of management rather than a crisis of the resource. This is a particularly complex and sensitive challenge because it moves the debate about sustainability of water resources into processes of political, social and institutional change. Thus, management challenges respond to the stewardship and governance of water to address questions about how the competing needs, uses and demands for water be met? They focus on propagating existing or developing new tools to encourage an efficient and equitable use of the resource. Various UN and other agencies are involved in meeting these challenges.

2.2.1 Water and governance

The water crisis is more than a resource issue – it is an issue of proper management. Many countries agree that good governance means allowing every sector of society to participate in the decision-making process and that the interests of all stakeholders should be taken into account. However, mechanisms for doing so are not always in place, even if decentralization and the increasing involvement of civil society are worldwide trends. International cooperation and assistance may play a crucial role – particularly in developing countries – by helping to strengthen institutional capacity.

Good management requires both the appropriate levels of information and knowledge as well as the capacity/skills/processes/techniques to be able to implement effective management policies.

Key issues in this theme are: Financing, Valuation and Integrated Water Resources Management (IWRM)

Financing

The release of financial resources for water has come to a plateau. According to the second World Water Development Report only 12% of official development assistance to the water sector reaches those most in need. And only about 10% is directed to support development of water policy, planning and programmes. Private sector investment in water services is also in declining as many multinational water companies have begun withdrawing from or downsizing their operations in the developing world because of the high political and financial risks. Despite its many shortcomings, the private sector still has an important role to play. Financially strained governments with weak regulations, it finds, are a poor alternative for addressing the issue of poor water resources management and inadequate supplies of water services.

Current thinking about water financing has to change. It has been focused too narrowly on how to create a greater supply of water financing without addressing the demand for it. There is a need for a sharper focus on issues from the demand-side that are affecting financing levels: tariff structures, regulation, local capacity and access to various finance options for local governments and service providers. It is necessary that National Governments develop policies to address these issues, while recognising that water is a local affair and that its sustainable management requires the empowerment of local governments and the development of their fiscal, management and human resource capacity.

Valuation

In many societies the whole notion of putting a price tag on something as intrinsically valuable as water is unacceptable. Yet services must be paid for. There is also much disagreement about how to balance the costs of provision and wastewater treatment with the goal of equity and finding ways to meet the needs of poor and vulnerable populations. Creative new partnerships between the public and private sectors need to be developed, along with accounting and taxation systems, that take full account of environmental and social factors.

Integrated Water Resources Management (IWRM)

Over the past decade, awareness has grown over the need to develop sustainable practices for the protection, management and efficient use of water resources. Natural units, such as river basins and aquifer systems, are becoming widely recognized and increasingly adopted by national and regional programmes. However, the combination of different economic, environmental and social pressures often results in increased water use, competition and pollution – in addition to highly inefficient water supply practices. Responsibility for this lies in the fact that decision-making, at almost all levels, remains principally driven by short-term economic and political considerations and lacks the long-term vision needed to implement sustainable development practices. If our water resources are to continue providing valuable and beneficial services, there must be a higher level of commitment and awareness towards developing and maintaining long-term integrated approaches and solutions—a new water governance and management paradigm is required. Such a new paradigm is encapsulated in the IWRM concept, which has been defined as ‘a process which promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital eco-systems’.

It is evident that things are evolving rapidly in the area of environmental management and planning, and particularly in terms of how our choices are framed. Conferences and publications about ‘ecosystem management’ are increasingly commonplace, and there is a frenetic energy of reorganisation at all levels of government. Part of the reason for this shift toward more holistic approaches in environmental management and planning practice can be attributed to a response to mounting global environmental challenges, such as a rapidly increasing population, food security, the depletion of natural resources, declining biodiversity, and climate change. A case has been made at all levels of government that meeting these challenges will require integrated, multifaceted approaches rather than piecemeal technical problem solving. The change in perspective to whole of system management, that is, management based on ecosystem boundaries rather than political boundaries, can also be traced both to the rise and maturation of the science of ecology itself, and to the continuing

and concerted effort to translate ecological ideas into practical approaches. One could take the relationship further and observe that with the rise of ecosystem approaches to natural resource management is parallel to the process of (re)-defining the fundamental role of humans in nature.

While ecosystem thinking presents an improvement on using political maps, on an ecological basis, river basin/catchment/watershed boundaries are also somewhat artificial. There are still elements of the whole environment (soil types, species dispersion/range, air sheds and flows) that extend beyond the defined boundaries. A number of problems need to be overcome in the transition to ecosystem-scale management. They include:

- A need for greater coordination between regulatory authorities.
- A fear of how a change in management framework may affect established activities within the defined boundary that stems from misunderstanding about ecosystem management in the public and regulated community.
- The confusion due to the interchangeability of terms.
- A lack of trust in a new system by agency staff, leaders and managers who would rather not have to relinquish the security of past practices that have been developed over many years of administration.

IWRM explicitly challenges conventional water development and management systems. It starts with the recognition that traditional top-down, supply led, technically based and sectoral approaches to water management are imposing unsustainably high economic, social and ecological costs on human societies and on the natural environment. Business as usual is neither environmentally sustainable, nor is it sustainable in financial and social terms. As a process of change which seeks to shift water development and management systems from their currently unsustainable forms, IWRM has no fixed beginnings and will probably never end. The global economy and society are dynamic and the natural environment is also subject to change, IWRM systems will, therefore, need to be responsive to change and be capable of adapting to new economic, social and environmental conditions and to changing human values.

IWRM is not an end in itself but a means of achieving three key strategic objectives.

- efficiency to make water resources go as far as possible;
- equity, in the allocation of water across different social and economic groups;
- environmental sustainability, to protect the water resources base and associated ecosystems.

It is important to keep in mind that the IWRM is a process of change; a process which can start from small beginnings. There is no such thing as a perfect IWRM system and the search for perfection can lead to action atrophy.

2.3 Cross-cutting issues

Meeting the challenges and issues outlined above will require individual determination and political will. As well as direct action on each of these issues, for example, the development, dissemination and application of beneficial technologies or practices with respect to water, programmes of widespread public awareness raising, and appropriate levels of financing, there are two challenges that need to be met across the board and which will help to link separate initiatives potentially having the effect of increasing their effectiveness in their individual sphere through forms of social learning and the efficiencies of scale. The first of these is a requirement to build the capacity for good water management and the application of sustainable water technologies. The second is implementation of ongoing processes of monitoring so that efforts can be maximised where they are most needed, programme efficacy and progress towards goals can be assessed.

2.3.1 Monitoring

National authorities and resource managers need sound scientific data on which to base their projections and decision-making. Stakeholders need access to other kinds of information and educational opportunities if they are to understand and participate in the process as responsible citizens. Ongoing monitoring of the state of the resource is essential to meeting this information requirement. There are a number of areas where monitoring will be required, they include:

The hydrological cycle

The roles and interactions of the hydrological cycle components are often not fully appreciated and it is difficult to set up adequate protection and prevention strategies. Climate, particularly precipitation and temperature, is the primary driver of water resources, interacting with landmasses, oceans and topography. Yet, all components of the hydrological cycle – precipitation, infiltration, runoff, evaporation, and transpiration – must be taken into account when developing water management plans. It is important that the role played by each is better understood.

Groundwater and aquifer systems

More data are needed on groundwater and aquifer systems, particularly for developing countries where the lack of adequate surface water resources is most extreme. Groundwater and aquifers can be of great value, particularly in arid regions where surface water is often scarce, but the risks of over-exploiting these resources is high. Increased financial investment is needed to increase understanding of groundwater resources and aquifer systems.

Human influence

In many regions of the world, human influence is becoming more important than natural factors. River regimes are being very significantly influenced in many regions through the construction of dams and diversions. Landscape change, or the removal, destruction or impairment of natural ecosystems, has the greatest critical impact on the sustainability of natural water resources. Deforestation, urbanization and increase in areas of farmland all significantly influence the quality and quantities of water flows.

Water quality

Poor quality water and unsustainable supplies limit national economic development and can lead to adverse health and livelihood conditions. Today, we are reasonably able to recognize the impacts of pollution and excessive groundwater and surface water withdrawals on water quality and quantity. At national and river-basin levels, there is an emerging awareness of the need for good data on water quality. This is essential to evaluate impacts and to design improved water use and re-use strategies to meet quality and quantity demands.

Water resources assessments (WRA)

Water resources assessments (WRA), the process of monitoring (measuring, collecting and analysing) the quantity and quality of water resources, provide scientists, engineers and managers as well as policy makers and planners a foundation on which many decisions can be made. It is the basis for the formulation of policies and legislations striving for sustainability of water resources. There are economic, social and environmental benefits from periodic water resources assessments in all basins and aquifers, and in individual nations as well as on a regional level, especially where trans-boundary water resources exist.

2.3.2 Capacity building

To best make any ground against the issues outlined in the previous two sections requires good research and technology applied with skill and the conviction of strong positive values towards water sustainability. Capacity building in the water sector will help to develop each of these.

The IHP Water-Education-Training Strategy proposes a five-pronged approach to developing capacity to meet the challenges of water issues, involving education and training at all levels, starting with the encouragement of water literacy in the formative years in primary and secondary education. This is critical if the next generation is to be prepared to face increasingly complex water and environmental problems. This would also stimulate interest among young people to look to a future career in water-related professions, whether in engineering, environmental sciences or water resources management.

Following this is vocational training because technicians are charged with the operation, repair and maintenance of the technologies of water management. Rural communities and small towns will need to mobilize their own resources if they want to attract and retain well-trained technicians for repair and maintenance. As well as technical vocational training, there needs to be people who well trained in the 'software' of water management such as participatory development techniques, community organisation, business planning, loan applications, and book keeping.

Capacity building through the relevant disciplines in higher education will produce the leading

water professionals of the future. In order to tackle complex water-related problems graduates need to have the ability to interact with each other on water quantity and quality issues—this means planners, engineers, social and environmental scientists, economists, lawyers and other specialists. Some of the important skills to be learned by water professionals are techniques for conflict prevention and resolution.

Continuous professional development 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.

The issue of capacity building speaks to the importance of water education.

IMPLICATIONS FOR WATER EDUCATION

Improving current standards of water management will require increases in general public awareness of the issues and their capacity for working towards a more sustainable water future. However, the difficulty of “selling a good idea” should not be underestimated, even where it has the endorsement and support of government or civil society. Individual or community practices are more difficult to change and may not always be accomplished simply through information and awareness-raising. Indeed, a key problem is the lack of any clear relationship between knowledge and impact. As UN World Water Development Report 2 states:

Even though there exists in the world at large the know-how and knowledge to solve many, if not most, of the world’s pressing water problems, this knowledge is often slow to make an impact.⁴

This failure is due, in large part to the use of outmoded approaches to education and capacity building. Nevertheless, the shift to sustainable development will depend as much on education and social change as on science.

3.1 Drivers of change and educational implications

A project by several of the world’s major providers of water education and training has identified the drivers of change in the world water environment that have significant implications for water education⁵. These are summarised below.

Category of driver	Details	Implications for Education
Demographic	Growth in the size of total population Changing patterns of settlement	Governments need to make sure that the provision of quality basic education grows to meet increases in population. The demands on education will be exacerbated by increasing urbanisation, migration, refugee movements and economy-triggered displacements.
Technological	Information technology Biotechnology Water conservation and efficiency Water pollution Drought resistant crops Water sanitation Desalinization	New opportunities and significant potentials for education, training and awareness-raising from ongoing global development of information technologies need to be capitalised on. Teaching methods must be developed to match the needs of information technologies to fully capitalise on their education potential. Biotechnologies are likely to have significant impacts on water and wastewater technology thus triggering considerable need of respective technological education at all levels. Education must provide the ability to think critically and ethically about these new developments. This is not only a formidable public awareness challenge but also requires technological education at all levels. The biggest potential savings are in irrigated agriculture where education and capacity building for farmers is a major need. Pollution can be considerably reduced by public awareness campaigns raising of hygienic standards through education and public information. Drought resistant crops would need proper introduction to agricultural communities. Water sanitation needs are expected to trigger considerable technology transfer and education along the whole profile from professional education to public information. As desalinisation becomes cheaper, technology transfer,

⁴ World Water Assessment Programme (2006) *op.cit.*

⁵ UNESCO-IHP (2003) Water-Education-Training – Towards a strategy on human capacity building for integrated water resources management and service delivery.

		education and training will be required to introduce this into common practice in parts of the world where desalination is a viable option to satisfy water demands.
Economic	Economic development Structure of economic production Water infrastructure	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. Industrial and agricultural development tendencies imply different educational and training needs. The creation and maintenance of water infrastructure needs technical education at all levels.
Social	Improved social security Poverty	Affluence is a strong stimuli for the increase of education and training, and public awareness raising activities. Poverty is a significant 'negative' driver unless there is the political will and economic power to eradicate it. Education and training are essential means of empowerment to break the vicious cycle of poverty.
Environmental	Climate change Water related disease Salinisation Freshwater Aquatic ecosystems	The anticipated effects of climate change imply the need for increased public awareness raising as well as reorientation of the agrarian population (new crops, irrigation techniques, water availability and distribution, extreme events, etc.). Credited to cause millions of deaths annually. Awareness raising, especially for public hygiene, is a must. Results from inappropriate agricultural practices. Therefore its avoidance and management is closely related with awareness raising and rural education programmes. To combat the diminishing supply of freshwater would have go beyond public awareness raising, research and well conceived technological education addressing both traditional and high technologies. The realization that healthy aquatic ecosystems are needed for a sustainable future, together with the emerging new management paradigm of Integrated Water Resources Management (IWRM), imply the need for ecological education for future and current water professionals.
Governance	Integrated Water Resources Management (IWRM) Conflict prevention, mitigation and resolution	IWRM implies a redefinition of role and form of governance. In this respect massive educational efforts are needed in technical, ecological and legal-administrative sense. IWRM would not only enhance the long-range efficiency of caring for and sharing of water. It would make potential conflicts more pronounced. However, IWRM on its own should also be moved from conceptual stage into fully-fledged 'operationalisation' implying more research and education together with education of participatory decision making techniques and PA raising. Dealing with conflict will be very much part of the daily tasks of water managers, 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 increased at all levels of governance and public involvement.
Gender-related drivers	Gender equity	The different needs and priorities of women and men should be recognized in education and training provision. 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.

This analysis of the drivers of change in the world water environment and their implications for education provides some clear indications where particular efforts need to be made in water education. While the report provided a case study of the US Water and Education for Teachers (WET) programme⁶, this UNESCO-IHP led project focused primarily, however, on education at the tertiary, post-graduate and professional levels of education. International cooperation in water education and capacity building at these upper levels has been a hall-

⁶ See www.projectwet.org

mark of the IHP programme for many years. Chapter 13 in the UN World Water Development Report 2 focused strongly on the importance of these specialist, professional levels of water education and training. This is an important chapter of the report as many countries still require many more water scientists, engineers and managers to improve the reliability of their water supplies and the contribution of water to human well-being and sustainable development. There can be no argument about that.

However, there is also a major need for education, training and capacity building for sustainable water management at sub-tertiary levels, including for students at school and in technical and vocational education and training (TVET) and for the general public and the media. The scientific research, policy and legislative tools commonly used for achieving a sustainable water future will remain top-down interventions that will need to be repeated time and time again, unless the changes in cultural contexts that are required are also made in the collective minds of the people involved. Thus, a major dimension of the securing the future of water will depend upon a wider range of community-wide educational processes that can bring changes in the values, workplace practices and lifestyle decisions that underpin unsustainable water management. This is the process

3.2 Social learning

Social learning represents the 'human dimension' of sustainable water management - an aspect that is now recognised to play a key role in all natural resource management.⁷ Social learning is "the process by which changes in social conditions occur – particularly changes in public awareness and changes in how individuals see private interests linked with the shared interests of their fellow citizens".⁸ These two aspects give social learning both a cognitive and a moral dimension which, in relation to social learning for sustainable water management both depend upon and develop (i) knowledge and understanding of water management issues, (ii) positive experiences that clarify and promote a water sustainability ethic, (iii) ethical discernment to integrate personal wishes and community needs in judgements about water issues, and (iv) commitment and skill to act, both individually and as part of a wider community.⁹ Most importantly, social learning recognises that "social and ecological sustainability ultimately depend on our capacity to learn together and respond to changing circumstances".¹⁰

Thus, social learning is a key process in the long-term transition to a sustainable society. However, more focused questions need to be explored about the role of education in achieving sustainable development goals. If the root causes of unsustainable development (or, in this case, the use of water) are prevailing values, and social (economic, political, cultural) arrangements, then an instrumentalist "input-output" approach to education for sustainable development will be ineffective. Such instrumental rationality tends to overlook the cultural bases of unsustainable development and the contextual nature of learning. Thus, rather than viewing "sustainability as policy designed to achieve a certain state of affairs", sustainability might be more usefully viewed, at least in terms of education, as "a frame of mind".¹¹ Focusing on "sustainability as a frame of mind", rather than as an aspect of policy, requires an open and engaged dialogue over what is important in life, the value of nature, trends in human-environmental conditions and ethical ways of achieving a sustainable future. In comparison with seeing education for sustainable development as a matter of teaching 'relevant' knowledge and developing 'positive' attitudes and behaviour, as set down in policy documents, this view of education may be "discomforting", but it "promises to be more productive in the long term than proceeding on the basis of easy assumptions about the goals of sustainable development as though it were a policy whose chief problems are of implementation rather than meaning".¹²

This perspective on social learning for sustainable development is similar to the idea of

⁷ Pahl-Wostle, C. and Hare, M. (2004) Processes of social learning in integrated resources assessment, *Journal of Community and Applied Social Psychology*, 14, 193-206.

⁸ Webler, T., Kastenholz, H. and Renn, O. (1995) Public participation in impact assessment: A social learning perspective, *Environmental Impact Assessment Review*, 15 (5), 443-463.

⁹ Fien, J. and Skoien, P. (2002) Social Capital and Action Competence in Two Catchment Management Groups, *Local Environment*, Vol. 7, No. 3, 269-282.

¹⁰ Keen, Brown & Dyball (2005). Keen, M., Brown, V. And Dyball, R. (2005) *Social Learning in Environmental Management: Towards a Sustainable Future*, Earthscan, London.

¹¹ Bonnett, M. (1999) Development: A coherent philosophy for environmental education, *Cambridge Journal of Education*, 29/3, pp. 313 – 324; Bonnett, M. (2002) Education for sustainability as a frame of mind, *Environmental Education Research*, 8(1), pp. 9 - 20

¹² Bonnett (2002) *ibid.*

“sustainability as learning” developed by Scott and Gough¹³, and has significant implications for the way in which education for sustainable water management is conceptualised, including:

- Sustainable water education is not a strategy to be used with school children alone. It is very important for the general community, the media and work-related training as well.
- Sustainable water education is not a processes of top-down teaching; rather it is a process of dialogue between all relevant stakeholders, and from which the result is increased motivation and competence to actually work to meet sustainable water management goals.
- The knowledge-attitude-behaviour model of education is not the most effective for sustainable water education. At least, it will not automatically transform people from being un-knowledgable, uncaring and wasteful. There are at least four reasons for this:
 - The relationship between knowledge and behaviour is not a direct one. We often do many things we know are not appropriate.
 - Behaviour change, e.g. based upon convincing advertising messages, usually is short term and rarely results in lasting change.
 - Behaviour change models can often be counter-productive as they can undermine individual self-determination and self-motivation.
 - Specific behavioural changes tend to fragment responsibility for sustainable development issues and ‘blame the victims’ by presenting them as personal problems – and then individuals can say, “What can one person do?”
- As a result, the knowledge-attitude-behaviour model tends to produce docile responses and therefore does not readily encourage the types of critical thinking, empowerment and competence that are essential for social learning.

On the other hand, a social learning approach to sustainable development (or water) education is based upon the following assumptions:

- Sustainable water education provides a means of building the capacity of citizens to value all the services that water provides and able to make considered choices about how those services should be managed.
- Sustainable water education seeks to create awareness of contexts, visions, possibilities and costs – not just of the symptoms of problems.
- Criteria and options for decisions regarding sustainable practices are a result of the ‘to-ing and fro-ing’ of public discussion and debate through transparently communicating and debating alternatives.
- Achieving sustainable water management is not a behavioural manipulation but relies, instead, on regard for the plurality of perspectives within society.
- Sustainable water education recognises the social, economic and political interests of all stakeholders.
- Sustainable water education is process—not product—driven. It relies more on the creation of cost-effective opportunities for dialogue than media products.

There are opportunities for water education in all traditional education sectors and through the use of mass communications technologies. These are described in the following sections.

3.3 Water education in schools

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, a sustainability ethic, and the development of civic competence, now and in the future.¹⁴

The challenge of addressing water issues in schools is on four levels. Firstly, it is at the level

¹³ Scott, W. & Gough, S. (2003) *Sustainable Development and Learning, Framing the Issues*, RoutledgeFalmer, London.

¹⁴ IUCN (2000) *Vision for Water and Nature. A World Strategy for Conservation and Sustainable Management of Water Resources in the Twenty-first Century*, IUCN with World Water Council.

of objectives – what are the personal, academic and community-wide benefits of learning about water? Secondly, it is at the level of content – what needs to be taught about water issues? Thirdly, it is at the level of process – how do we best communicate/teach about water issues? And fourthly, it is at the level of capacity – what knowledge and skills are required among teachers to be able to create and provide quality and effective learning experiences about water issues for their students. Each of these needs to be addressed in any school-based sustainable development activities.

However, education is not just about what happens in “official” classroom lessons. If the curriculum is defined as “the sum of all the formal and informal teaching and learning experiences provided by a school” then sustainable water education (or education on any sustainable development theme) cannot just be added to the curriculum as a new subject. Rather, it is a dimension to be emphasised in every aspect of school life. It is also, for example, in the school governance structures, in the maintenance of the school grounds and facilities, in after school clubs, special events and commemorative days in the school calendar, and so on. It needs to infuse the whole of the school curriculum.

3.3.1 Objectives of water education

Education for Sustainable Development is relevant to all aspects of the curriculum because it seeks to develop the capacity of young people to respond to and manage change within a context of optimism and hope. It can give them the motivation and skills to work for the collective good of the planet, and inspire the changes in lifestyles and behaviours that will help ensure a better quality of life for themselves and others. Four categories of objectives may be identified in relation to sustainable water education:

<i>Knowledge</i>	An understanding of concepts and principles related to water sciences, the relationship between water and human society, and strategies for ensuring sustainable water management.
<i>Values and attitudes</i>	A water ethic based upon a commitment to carefully balancing environmental social and economic concerns in making decisions concerning water.
<i>Thinking and decision making skills</i>	An ability to analyse evidence, think critically about water-related issues and make decisions based upon sustainability values and the precautionary principle.
<i>Active and informed citizenship</i>	The motivation and skills to work with others to help ensure sustainable access to clean water.

All four categories of objectives are vital to achieving the cognitive and the moral aspects of social learning, and are best served through an interdisciplinary learner-centred approach..

3.3.2 Knowledge and understanding

Meaningful learning requires students to integrate ideas from many different perspectives rather than compartmentalise what they learn into discrete ‘boxes’ of knowledge. As a result, teachers need to be flexible and skilled in accessing and integrating knowledge from different sources and disciplines. Solving society’s problems requires inputs from many disciplines or specialisations. Just as a variety of specialists need to work together to solve problems in the world outside the classroom, disciplines should not be separated unnecessarily inside the classroom either. It is possible for teachers to emphasise interdisciplinary teaching and learning in their own classes, e.g. through the topics and examples they choose.

However, while education is more than the transmission and exposition of discrete pieces of knowledge it does have a requirement for accurately presented factual information. The knowledge required for sustainable water management is very broad and at times both complex and technical. Agencies and professionals involved in water issues need to work with curriculum specialists and the developers of education materials in order to produce quality materials that provide this information in the languages that can be understood by teachers and in ways that they are able to then present this to their students.

3.3.3 Techniques for water education

The principles of effective teaching and learning that are a necessary part of reorienting education towards a sustainable water future must be “fit for purpose”. There are certain teaching and learning strategies that are more suited to teaching water issues than others; indeed, the ‘medium/process’ of learning is an important part of the ‘message’.

At the heart of all learning is the way we process our experiences, especially our critical reflections on our experiences. Experiential learning techniques in particular have been found to better lend themselves to teaching and learning about sustainability issues. Experiential learning is a process that develops knowledge, skills and attitudes based on consciously thinking about an experience. Thus, it involves direct and active personal experience combined with reflection and feedback. Experiential learning is personal and affective in nature, influencing both feelings and emotions as well as enhancing knowledge and skills. Experiential learning engages students in critical thinking, problem solving and decision making in contexts that are personally relevant to them. This approach to learning also involves making opportunities for debriefing and consolidation of ideas and skills through feedback, reflection, and the application of the ideas and skills to new situations.

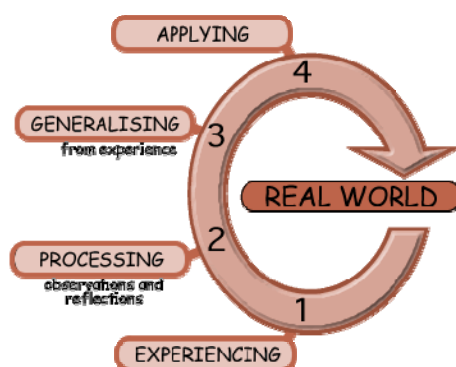


Figure 1: The Experiential Learning Process¹⁵

Many countries have developed extensive water education programmes based upon the experiential learning model. Many of these provide active “hands-on” learning, such as the materials developed by Project WET (Box 2) as well as guidelines and science kits for engaging students in water quality monitoring and community action programmes (Box 3).

BOX 2
Project WET¹⁶

The centrepiece of the Project WET program is the Project WET Curriculum and Activity Guide. This 561-page guide is a collection of multidisciplinary water-related activities for ages 5 through 18 that are hands-on, easy to use, and fun! The lessons incorporate a variety of formats, such as large and small group learning, whole-body activities, laboratory investigations, discussion of local and global topics, and community service projects. The guide also features cross-reference and planning charts, a glossary, and background material on activity development and field-testing.

People’s relationships to water are a major theme of the Project WET Curriculum and Activity Guide. The guide connects students to a thorough water education program including water’s chemical and physical properties, quantity and quality issues, water user group needs, and ecosystems and management strategies. The Project WET Curriculum and Activity Guide and the activities within it are (claimed to be) universal in their methods of teaching about water. Over 21 countries are using the Project WET Guide and over eighty countries have inquired about sponsoring Project WET. The Project WET Guide is currently translated from English into Spanish and Japanese, and also a Philippines English version. Smaller Project WET Sampler booklets and Water Every Drop Counts Kids In Discovery Series Booklets have been translated into Arabic, French, Hungarian and Vietnamese, and soon to be in Turkish.

UNESCO IHP and Project WET have made an agreement to develop the Spanish version as a Latin American regional programme for water education.

Box 3
Water Kits - Giving Away the Tools of Science¹⁷

¹⁵ UNESCO (2005) *Teaching and Learning for a Sustainable Future*, UNESCO, Paris, Module 18. (CD-ROM and website [Available on-line at www.unesco.org/education/tlsf].

¹⁶ See www.projectwet.org

Share-Net, a collective that produces low-cost educational materials in South Africa, develops water quality monitoring materials for schools. Adapting the process to local conditions meant that the equipment had to be cheaper and simpler than the apparatus used in the USA. Jam tins and small cardboard boxes, packed with simple tools to test for coliform (sewage) contamination, turbidity (soil erosion), nitrates (fertiliser levels), pH and so on, were distributed. A booklet with instructions for using the kit to monitor water catchment quality was included in the box. It used the acronym ACTION to guide learners through the processes of: Asking (local residents about the changing quality of their river or stream); Checking (various visible features of the catchment); Testing (using the apparatus provided); Informing (residents and authorities of the findings); Outlining (a catchment conservation plan); and Networking (involving others in catchment action).

The water testing kits proved very popular with teachers and pupils alike, with sales of between 2000 and 2500 kits each year since 1993. They were inexpensive and flexible enough to stimulate the imagination of both students working on 'gold medallist' science projects and farm school pupils wanting to test the quality of the drinking water in their rain tank. Soon a network of water quality monitoring projects around the country developed, with the contents of the water kits and associated lesson plans adapted to local conditions and need, supported by local workshops and networking around the materials.

However, Share-Net cautions that water testing kits and related technologies are not ends in themselves. The kits need to be used to support better educational processes, within the larger role of schools to promote conceptual, emotional and citizenship learning which, in their turn, can bring the capacity for social and environmental change.

3.3.4 Capacity building

There are over 60 million teachers in the world. Each one is a key agent for bringing about the changes in values and lifestyles we need for a healthy and sustainable future. For this reason, innovative teacher education is an important part of educating for a sustainable future. A great many resources have been prepared for teachers to help them fulfil this role in relation to water education. However, on inspection, many of these are actually teaching notes and classroom exercises and resources that teachers can use with their classes. Resources and strategies for enhancing professional skills for using teaching and learning strategies that can help students achieve the wide range of skills, knowledge and values objectives of sustainable water education are much rarer. Project WET addresses this issue in an innovative way by supplying project resources only to teachers who have undertaken special training.

However, much more extensive pre- and in-service teacher professional development in water education is vital to realising the potential of education for meeting the challenges of water education. UNESCO has good experience in this in the area of education for sustainable development, generally. For example, it has published Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability from the experiences of such programmes in 30 Teacher Education Institutes in 28 countries.¹⁸ UNESCO has also developed a 100 hour multimedia teacher education programme, Teaching and Learning for a Sustainable Future, which is available on the Internet and as a CD-ROM. See Box 4.

BOX 15

Teaching and Learning for a Sustainable Future: A Multimedia Teacher Education Programme¹⁹

Teaching and Learning for a Sustainable Future is a multimedia teacher education program produced by UNESCO. It contains 100 hours (divided into 25 modules) of professional development for use in pre-service teacher courses as well as the in-service education of teachers, curriculum developers, education policy makers, and authors of educational materials. The programme which is available in two multimedia formats – a CD-ROM and an

¹⁷ Taylor, J. and Janse van Rensburg, E. (2002) Share-Net: Environmental education resource networking in a risk society, in D. Tilbury, R. Stevenson, J. Fien and D. Schreuder, eds, *Education and Sustainable Development: Responding to the Global Challenge*, IUCN Commission on Education and Communication, Gland.

¹⁸ UNESCO (2005) *Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability*. [Available on-line at unesdoc.unesco.org/images/0014/001433/143370E.pdf].

¹⁹ UNESCO (2005) *Teaching and Learning for a Sustainable Future*, UNESCO, Paris. (CD-ROM and website [Available on-line at www.unesco.org/education/tlsf].

Internet program available at URL: <http://www.unesco.org/education/tlsf/index.html> – enables educators to plan learning experiences that empower their students to develop and evaluate alternative visions of a sustainable future and to work creatively with others to help bring their visions of a better world into effect.

Content

The programme contains 25 modules, divided into 4 thematic sections:

- Curriculum Rationale: Exploring global realities; Understanding sustainable development; A futures perspective in the curriculum; Reorienting education for a sustainable future; Accepting the challenge
- Teaching about Sustainability Across the Curriculum: Sustainable futures across the curriculum; Citizenship education; Health education; Consumer education
- Interdisciplinary Curriculum Themes: Culture and religion for a sustainable future; Indigenous knowledge and sustainability; Women and sustainable development; Population and development; Understanding world hunger; Sustainable agriculture; Sustainable tourism; Sustainable communities
- Teaching and Learning Strategies: Experiential learning; Story-telling; Values education; Enquiry learning; Appropriate assessment; Future problem-solving; Learning outside the classroom; Community problem solving

Evaluation

The development of the programme involved an international reference group, advice from over 50 programme specialists in UNESCO, consultations across the UN system and extensive international evaluation by several hundred teachers and educators, sustainable development experts and multimedia specialists. The evaluation comments include:

'In my country, more and more people are paying much attention to sustainable development, but there is a need for more materials and resources. So this program will be very helpful, especially in pre-service teacher training.' (China)

'I have been grappling with these issues for many years. It was wonderful to see that it has all been pulled together in such a broad, systematic, inspiring and practical way.' (South Africa)

'As schoolteachers, we can say that this program is very valuable and complete. We discovered a lot of innovations, new teaching methods and new methods of presentation of information that were not known to us before.' (Uzbekistan)

'The depth and interdisciplinary design of the program, as well as the possibilities for widespread dissemination, will place it as a landmark work toward focus, learning, and internationalisation of the values required for sustainable living.' (Earth Charter Secretariat, Costa Rica)

Adaptation and Translation

UNESCO is aware that no single teacher education programme can suit the needs of all potential users. Thus, the programme was designed to facilitate translation into other languages and adaptation to respond to regional, national, or local needs. A partnership of UNESCO, the Government of South Africa, the SADC Regional Environmental Education Centre, several universities and the Wildlife and Environment Society of South Africa completely adapted the original programme to publish a southern African version. Japanese and Spanish versions have also been published.

3.4 Water education in Technical and Vocational Education and Training

A key factor in achieving a sustainable water future will be having sufficient numbers of competent technicians and professionals working in the water sector. This will be the responsibility of Technical and Vocational Education and Training (TVET). From the drivers listed above, this capacity is especially relevant to those working to achieve: water sanitation and hygiene goals; the conservation and efficiency of water in agricultural uses; the control and mitigation of water pollution from industry and from other non-point sources including urban and peri-urban sources; and the use of water for the production of energy.

The joint 2002 ILO and UNESCO Recommendations on Technical and Vocational Education

for the Twenty-First Century states that, as “a vital aspect of the educational process in all countries” TVET should:

- (a) Contribute to the achievement of the societal goals of greater democratisation and social, cultural and economic development, while at the same time developing the potential of all individuals, both men and women, for active participation in the establishment and implementation of these goals, regardless of religion, race and age;
- (b) Lead to an understanding of the scientific and technological aspects of contemporary civilization in such a way that people comprehend their environment and are capable of acting upon it while taking a critical view of the social, political and environmental implications of scientific and technological change;
- (c) Empower people to contribute to environmentally sound sustainable development through their occupations and other areas of their lives.²⁰

Given these imperatives, TVET should not only cover the ‘hardware’ of the water sector but also needs to be directed to developing the appropriate ‘software’ skills. This is will be dedicated personnel for such things as participatory resource appraisals, consultations, negotiations between different stakeholder and user groups for example. But it will also be a certain amount of training in these kinds of skills for those that are responsible for the more technical aspects of the water sector, for example those involved in infrastructure development and maintenance. An example of how one NGO, the Palestinian Water Training Institute is seeking to develop this broad range of vocational skills is provided in Box 5.

BOX 5

The Palestinian Water Training Institute²¹

The Palestinian National Authority has created hundreds of village councils and municipalities in several Palestinian villages and cities previously lacking local governance. The large numbers of technical and administrative staff of these newly established entities lack the experience and skills needed to meet their new responsibilities, and need to be trained. On another level, both youth and women in Palestine are in dire need for training and development, especially in marginalized rural areas

Some of these training needs are being met by the Palestinian Hydrology Group (PHG), a Palestinian non-government non-profit organization striving to promote the role of civil societies including women in managing local water and its related environmental resources to ensure transparency, good water governance and just and equal provision of water and sanitation services to the rural and marginal communities.

PHG established the Palestinian Water Training Institute (PWTI) in 2004 to provide specialized vocational training in water, environment, management and computer skills. It particularly works with the members and staff of local and village councils, in addition to members of women and environmental clubs and associations in Palestinian rural areas. For example, the training course on Management of Public Water Cisterns covers topics such as:

- Principles of water management and sharing with others
- Water allocation and quota development
- Proper management of communal water facilities
- Principles of water composition and its relation to public health
- Pollution sources and abatement of water pollution at household level
- Quality of rainwater in comparison to other water sources at household level
- Proper collection and storage of rainwater
- Tinkered-water quality from source to consumer
- Simple water treatment methods (i.e. solar disinfection, chlorination, sedimentation and filtration)
- Water demand and consumption variation over the year
- Basic water quality monitoring program

²⁰ UNESCO and ILO (2002) *Technical and Vocational Education for the Twenty-First Century: ILO and UNESCO Recommendations*, UNESCO, Paris and ILO, Geneva, p. 9.

²¹ See <<http://www.phg.org/pwti/web/files/about.htm>>

3.5 Water education in the community

Traditionally, community-focused water education has been based upon simple messages about “doing the right thing” in relation to water conservation. Such approaches (which could be described as “engineered awareness”), however, generally fail to account for the complexity of human behaviour. Indeed, as the understanding of human motivations and behaviour and of the complexity of water issues has improved, increasingly new approaches are being developed, especially in relation to issues such as sanitation and hygiene, irrigation practices, catchment management water scarcity and conservation and managing water-based conflicts. This is where the participatory principles of social learning are important (see Section 3.2).

However, even in the area of behaviour change, for example for water conservation or healthy sanitation practices, it is now understood that the assumed linear relationship between knowledge, attitudes and behaviour does not provide valid assumptions upon which to develop programmes - and scholars in attitudinal research, environmental education and social marketing have been aware of this for over two decades.²² As a result many critics have identified awareness and information campaigns as a low impact strategy for achieving lasting improvements. At least two reasons for this have been identified. The first relates to the behaviour- and time-specific outcomes of such programmes. There is little evidence that even successful behaviour change programmes in one field of environmental behaviour help people to continue such behaviours when the effects of the information ‘intervention’ wears off or when people face decisions in a different area of consumption. The second relates to the fundamentally undemocratic nature of expert, government or teacher inspired conceptions of desirable and responsible environmental behaviour. Such approaches are also often ineffectual because they fail to foster intrinsic motivation for living sustainably. Indeed, a comprehensive review of research on the psychological aspects of changing consumption behaviour has revealed that the most significant of all factors are (i) intrinsic motivation and (ii) awareness of appropriate consumption actions, and (iii) skill in practising such actions.²³

On the other hand, research in social psychology has provided an understanding of the complex interplay of determinants of human behaviour - in which personal characteristics interact with aspects of the social milieu to form attitudes or a predisposition to act in a certain way. However, another range of factors such one’s emotional state, an informal cost-benefit analyses of likely actions and consequences and one’s confidence in one’s ability to actually take specific actions, along with embedded patterns of behaviour (habits) See Figure 2.

As a result of such understandings, advanced social marketing strategies, based upon an understanding of social psychology and the need for participatory approaches, have been developed and proven to be very successful. For example, both DfID (UK) and USAID have supported extensive social marketing campaigns in the area of water and sanitation in Africa and Asia, and published widely available and used handbooks, such as the DFID Guidance Manual on Water Supply and Sanitation Programmes²⁴ and Best Practices in Social Marketing Safe Water Solution For Household Water Treatment.²⁵ Other excellent resources in this regard are Fostering Sustainable Behaviour and Environmental Education & Communication for a Sustainable World: Handbook for International Practitioners.²⁶ A case study of the success of such approaches to improving water practices in Jordan is provided in Box 6.

²² Ramsey, C. and Rickson, R. (1976) Environmental knowledge and attitudes, *Journal of Environmental Education*, 8 (1), pp. 10-18; Hines, J., Hungerford, H. and Tomera, A. (1986/87) Analysis and synthesis of research on responsible environmental behaviour, *Journal of Environmental Education*, 18 (2), pp. 1-8; Newhouse, N. (1990) Implications of attitude research for conservation behavior, *Journal of Environmental Education*, 22 (1), pp. 26-32; Axelrod, L. and Lehman, D. (1993) Responding to environmental concerns: What factors guide individual action? *Journal of Environmental Psychology*, 13, pp. 149-159; Booth, E. (1996) *Starting with Behavior: A Participatory Process for Selecting Target Behaviors in Environmental Programs*, GreenCOM, Academy for Educational Development, Washington DC; Byers, B. (1996) *Understanding and Influencing Behaviors in Conservation and Natural Resources Management*, African Biodiversity Series, No. 4, Biodiversity Support Program, Washington DC.

²³ De Young, R. (1996) Some psychological aspects of reduced consumption behavior: The role of intrinsic satisfaction and competence motivation, *Environment and Behavior*, 28 (3), pp. 358-409.

²⁴ See <http://wedc.lboro.ac.uk/publications/details.php?book=0%20906055%2058%20X>

²⁵ See <http://www.psi.org/resources/pubs/usaaid-wwd.pdf>

²⁶ See http://www.greencom.org/greencom/books/eec_handbook.asp

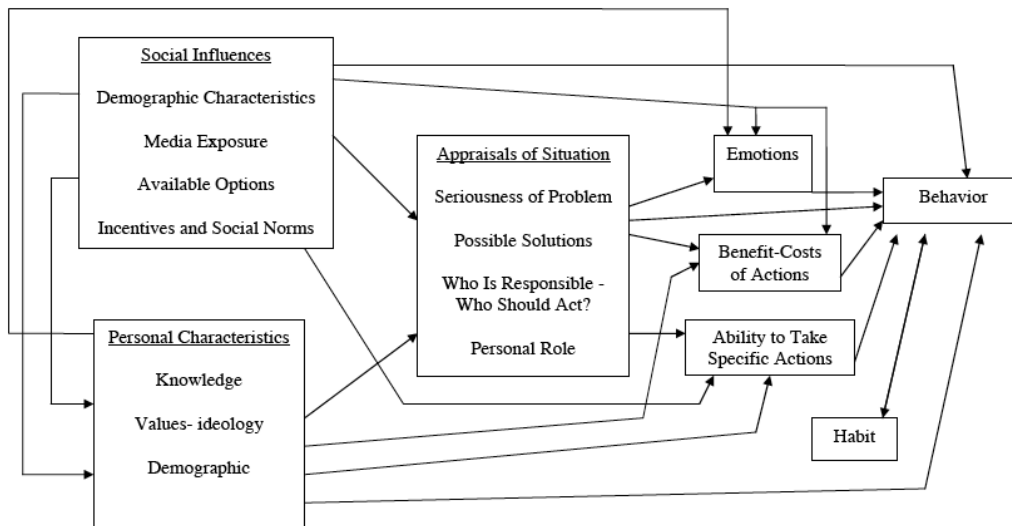


Figure 2: Social psychology and conservation behaviour²⁷

BOX 6

Social marketing for water conservation in Jordan²⁸

Jordan has extremely limited natural water supplies and a rapidly increasing population. The first step was to use social marketing research to learn what was driving consumer behaviour and what factors were impeding effective water-use reform. The research revealed that plumbing leaks, outdated and inefficient infrastructure, and outmoded irrigation techniques were wasting as much as one-third of the water usage. There were no national codes or standards for plumbers, and water-saving devices (such as faucet aerators) were practically nonexistent. The public had little knowledge of the problem and even less understanding of possible solutions.

Thus the WEPIA project took aim at four primary objectives: 1) reduce water consumption by the largest consumers, 2) increase knowledge and practices about water efficiency to the general population, 3) improve advocacy efforts to deliver educational programs and 4) build a deep, nationwide foundation for wholesale change.

The success of the project relied on developing partnerships throughout the country, and implementing culturally appropriate consumer outreach. The Jordanian government and many of its agencies provided financial, technical and labour support. Trade associations (hospitals, hotels, etc.) actively participated, as did a large university. Vocational and energy management corporations offered training and free audits.

A significant portion of the campaign's resources was aimed at women, who are mainly responsible for water use in the home. The campaign encouraged women to start home-based businesses selling water conservation devices to other women, and trained women as plumbers, where they could easily reach the target audience with the conservation message. Jordanian law prohibits a male plumber from entering a home when a woman is there alone.

A highly visible public service campaign – featuring radio and television advertising as well as billboards and special events – not only changed attitudes but also created incentive for volunteers to assist the program. The print and electronic media delivered important messages associated with water conservation. Codes were changed and school curricula were revised to educate students in this area.

The results were dramatic. Awareness of water-saving devices, which was 11 percent in 2000, soared to 88 percent in 2004. A WEPIA retrofitting program reduced water consumption by Jordan's largest water-users by 18 percent. It is projected that water usage will drop by more than 30 million litres per year through 2010 and more than 70 million litres per year from 2010-2020.

²⁷ Patchen, M. (2006) *Public Attitudes and Behavior About Climate Change*. Purdue Climate Change Research Center Available at www.purdue.edu/www.purdue.edu/climate/climate

²⁸ See http://www.cee1.org/resrc/news/06-04nl/02_marketing.html

Water education within the community needs to go beyond social marketing for behaviour change, however. This is particularly so in the case of farmers and other members of rural communities where irrigation consumes perhaps as much as 75 percent of human water use. Here, community-based catchment management approaches are vitally important. This requires active participation in the development and flow of information and a shift away from traditional practices of participation as a discrete activity to a process-oriented approach that maximizes opportunities for all stakeholders to design, gather, synthesize, evaluate, modify, learn from and use information related to water processes and management. There are three fundamental reasons why co-management must include active roles for the public:

- *As sources of information and knowledge:* While water researchers are the primary source of scientific information and interpretation, the public has a critical dual role as (i) a source of information and (ii) a point of interpretation and adaptation. Local residents and communities-of-place also have an intimate knowledge of local ecology and social processes and, as the progenitor of social values, they are both an important source of information on water management and the locus for change at the same time.
- *To build trust and broaden support:* Co-management is a dynamic process. As such for it to work, the public must be allowed to actively participate in the process rather than be in a “catch-up” role through simply being informed of it. Social learning is an important and integral part to co-management, but this will not happen to the same extent if the public is not part of the process. Additionally, excluding the public from co-management means ignoring the political nature of land management, thereby increasing the likelihood that the process itself will not be trusted or supported locally.
- *To generate ideas and challenge established thinking:* Scientists and managers tend to favour well-trodden paths which can limit imaginative solutions. The public is more likely to question convention wisdom and practice and act as a catalyst for creative new directions in management.

There is no single formula in community-based co-management of water resources. The complexity of issues, the range of institutions, and the diversity of thinking, values and knowledge among stakeholders prevent this. Each situation requires its own process solution. However, Box 7 identifies some key principles, for effective facilitation of social learning through co-management while Box 8 is a case study of the national Waterwatch programme in Australia that involves community-based water quality monitoring in over 7000 sites across 200 catchments in Australia.

BOX 7

Strategies for enhancing social learning in community-based catchment management²⁹

Involve people early and maintain involvement: Citizen participation in environmental management has proven to be most effective if it involves people early, especially in providing community input into designing the participation process itself. People should then be kept continuously informed and involved throughout the process. Continued public involvement is especially important during periods when key decisions are to be made.

Use a range of strategies: The use of a range of participation strategies enhances the inclusiveness of a decision process and provides multiple opportunities for learning - both in terms of learning by participants about the different elements of a decision and by water managers about which methods are most effective for each stakeholder group or community.

Less is more – small group activities: Small group activities tend to provide the most effective participation in environmental management as most people prefer the opportunities for dialogue that is afforded by working together in small groups where individuals are seated as equals around a table in an informal setting.

Be inclusive: To be effective and democratic, co-management must be inclusive and representative of all stakeholder groups, including communities-of-interest and communities-of-place. This requires that specific involvement techniques should be targeted to specific populations and activities. Conflict and non-cooperation are often due to perceived threats to

²⁹ Adapted from White, C. (2005) *Integrated adaptive ecosystem management: A role for the citizenry in environmental decision-making*. Paper presented to seminar at University of Bath, June.

the interests of particular groups. Yet, it is the groups that may be most directly affected that should be actively encouraged to participate.

Value local knowledges: The development of local knowledge and its incorporation into co-management processes can provide information and perspectives on resources, patterns and processes, and even management actions that are not part of the common scientific knowledge base. People who live and work within or near ecosystems know much about them, particularly those who have done so themselves for many years and/or have multi-generational ties to a certain area. Local experience, including with land use and resource management decisions on private lands, may provide valuable insight and historical information.

Make information accessible: Participation in co-management can only be truly collaborative if all the information necessary for effective decision-making is equally accessible to everyone involved. Greater access to information both increases opportunities for public participation and trust. It can lead to further exchange and ongoing improvement of information as it is shared and evaluated from the range of different perspectives represented in affected communities. Improvements in information accessibility must also address the capacity of the participating public to fully use and understand it. This understanding of information sharing creates two important roles for social learning: it should seek to develop the skill capacity of public to understand and use the information; and it should seek ways to present and format the information that are appropriate to the needs and capabilities of the different potential users.

Positive working relationships: Social learning depends upon healthy relationships among the primary players in co-management processes. Where people distrust each other and are unable to communicate productively, they will be incapable of reaching, implementing or accepting decisions.

Facilitative leadership: Multifaceted leadership must be recognised and encouraged in order to stimulate an atmosphere of creativity and inclusiveness. The ideal leader is, at once, an educator, provider of information, a developer of viable alternatives, an interpreter of law and regulation, and a representative of those not able to participate. An ideal leader is a skilled and sensitive facilitator and guide who can convey the range of community of interests, but also one who actively participates in dialogue and can intervene with strong leadership direction and focus when necessary.

BOX 8

Waterwatch Australia³⁰

Waterwatch began in response to growing concerns over declining water quality, and as a means for the Commonwealth Government to work with State and Territory governments to encourage community based solutions to environmental problems. Waterwatch is now an important element in the conservation of waterways. Our water systems are threatened by unsustainable levels of water extraction, the destruction of aquatic and riverbank habitat, weed growth, algal blooms and rising levels of salinity, silt and pollutants.

Waterwatch is a national community water quality monitoring network that encourages all Australians to become involved and active in the protection and management of their waterways and catchments. It was established by the Australian Government in 1993. There are now nearly 3000 Waterwatch groups monitoring water quality at over 7000 sites throughout 200 catchments. The Waterwatch network has over 50 000 volunteers involved in the monitoring of waterways. The high level of community involvement has been attributed to the considerable education and awareness components of the program. The network is made up of individuals, community groups and school groups who undertake a variety of biological and habitat assessments as well as physical and chemical tests to build up a picture of the health of their waterways.

Waterwatch groups conduct biological and habitat assessments plus physical and chemical water tests. So, over time, Waterwatch groups can determine if the health of their waterways and catchments are improving, declining or being maintained. Based on their findings, Waterwatch groups have initiated solutions to improve the quality of their waterways, including: fencing areas of riverbanks, removing litter from waterways, eradicating weeds and invasive species, and reducing the use of pesticides and other pollutants.

³⁰ Adapted from www.waterwatch.org.au

The objectives of Waterwatch are:

- An increased awareness and understanding of the importance of healthy waterways and the relationship to land uses within the catchment.
- Communities monitoring their local waterways
- Community involvement in planning and action to address waterway and catchment issues
- Effective partnerships between all sectors of the community working towards healthy waterways
- Financial and institutional support for the Waterwatch Australia network

Major achievements include:

- Waterwatch Australia, established in all States and Territories is expanding catchment by catchment under strategic direction of State/Territory-based steering committees.
- Across Australia data is collected by monitoring groups using nationally adopted protocols for nine parameters (macroinvertebrates, dissolved oxygen, temperature, pH, conductivity, turbidity, reactive phosphorus, nitrogen and riparian habitat assessment) and recorded using nationally agreed units and national site code systems.
- Waterwatch generates an extremely high level of support from the private sector, State/Territory governments, community groups, local and regional management agencies. On average, \$1 from the government is matched by \$4 contributed from other sources.
- Over 130 regional coordinators are supported to varying degrees by Waterwatch Australia. The coordinators train others to get involved in water monitoring.
- Waterwatch operates in every major metropolitan centre as well as in the bush. It has created partnerships and mutual understanding between urban and rural dwellers leading to greater cooperation in catchment management.
- State Waterwatch programs have established an annual "snapshot" of the health of our waterways as a regular part of National Water Week. Over 80,000 people now participate in National Water Week each year.
- Waterwatch Australia has developed a National Database Program that allows community data to be pooled, analysed and interpreted at the catchment level and beyond. The system can also produce reports for use by water management authorities. All Waterwatch groups use a standard database so results can be easily exchanged, and merged at either State or National levels.
- All state and territory Waterwatch programs have developed internet pages that are linked together. This helps groups communicate and to exchange advice and data with other groups - either in Australia or overseas.
- Waterwatch Australia has developed national community monitoring procedures and data confidence guidelines to ensure that community data is being collected in a consistent and credible way.

Community-based catchment management challenges many current institutional arrangements and requires support from community stakeholders and broader communities-of-interest, as well as the scientific community and catchment managers. It requires opening up decision processes and, within legal and administrative constraints, sharing responsibility among managers, scientists and the public for decisions and for the development of information upon which they are based. This inclusive approach advances the social learning objectives of co-management by providing a forum to generate ideas and improve knowledge and understanding, and offers opportunities to build trust and broaden support for natural resource management activities. Allowing people to own "science" by making it accessible through social learning permits stakeholders to question assumptions, re-interpret findings, seek applications and develop better process and solutions.

3.6 Water education in the mass media

An awareness of water issues is important in every society. While direct participation and personal communication tends to be the most effective means of raising awareness of issues in smaller communities, it is not always the most efficient strategy for communicating a message widely. To achieve this, we must rely on mass communication through the mass media. Mass media has been used to help raise public awareness of health and environment issues in the past and the lessons learnt from this experience can be applied to raising awareness about water issues.

Developments in information technologies have extended the reach of the mass media to new audiences. They have also increased the interactivity of mass media so that audiences are able to move beyond being the passive recipients of 'messages' to active participants in helping to weave the story. In effect, new information technologies have democratised the media where it is possible for anyone with a relatively low level of technology and skill to be the "reporter".

Examples of mass media communication include:

- Printed materials – for example, billboards, brochures, cartoons, comics, pamphlets, posters and resource books
- Websites and email discussion lists
- Media interviews, feature articles and announcements in newspapers, magazines and electronic publications accessible via the Internet
- Media interviews and news items on local radio and television
- Broadcast SMS messages to mobile telephones

A 2006 UK Office of Communications report, *Media Literacy Audit – Report on Adult Media Literacy*, examined the 'media literacy' of adults, including people with disabilities and those from different cultural traditions.³¹ The report concluded that television remains the most familiar, and popular, media platform for most people. It is found that mobile telephone technology is fast eclipsing traditional mass media – for example, newspapers – in key markets such as young people.

In the developing world, print media and radio broadcasts remain as a very important means of mass communication, but the availability of other media is growing. Radio has been used effectively for awareness-raising in many countries particular for issues about sexual health and as a means of agricultural extension.

Mainstream mass media and professional journalists have a key role in bringing and spreading awareness on water sector issues. They can mobilize people and policy makers for solving the water related problems. However, as well as a good command of the communication skills that working in the sector demands, a good understanding of water issues including their sociological, economic and environmental aspects is essential. Raising awareness in water issues can only be effective if those producing the 'news' have a proper understanding of water issues for themselves.

Reporting on complex systems, technical subjects, and areas where there are conflicting opinions require special skills. Many of those working in the mass media sector have these skills already. However, capacity for reporting about and, more importantly, providing analysis of water issues among media professionals appears to be marginal. This capacity could be developed through better and closer relationships between water professionals and those who write, compile or edit in the mainstream media. There is certainly a need to build the knowledge and capacity of journalists in order for them to know understand water future scenarios and forecasts, the terminology and techniques involved in different water management and ecology, and the key issues for water (for example those that are described earlier in this paper). This is relevant both for those who are currently employed in the media sector but it must also become a reality in the training of new media professionals. Editors also need to recognise the importance of a "water beat" along with the crime beat, political beat, agricultural beat, rural beat, and environmental beat. To help to overcome this, water professionals, journalism educators and practising journalists should sit together and discuss to develop water journalism in the curricula of journalism education and practice. Regular interaction between journalists and scientists is also a necessary process so far as making people aware on water related issues.³²

BOX 9

Educating media practitioners for change³³

Media workshops were held in September 2005 in the People's Republic of China (PRC) to close the information gap on water issues in the country. As part of ADB's Water Awareness Program (WAP), these workshops raise awareness on water issues throughout Asia.

³¹ See www.ofcom.org.uk/advice/media_literacy

³² See *Water Voice*, World Water Forum 2. On-line at www.210.169.146/html/for/en/fshow.298.html

³³ See <http://www.adb.org/water/WAP/2005/PRC/closing-water-information-gap.asp>

The reasons for choosing the PRC as a venue were compelling. There are few countries in the world that are being more directly impacted by water issues. Despite having the world's fourth largest fresh water reserves, the PRC, with a population of 1.3 billion, is likely to face severe water challenges over the coming years. While supporting 21 per cent of the world's population, PRC has just seven per cent of its water supplies.

From water pollution to urban and rural water supply to the intense demand for water from the PRC's growing industries, farms and sprawling cities to the contradictions between the problems of drought in the north and flooding in the south and the dwindling water of the Yellow River, the PRC faces many water sector challenges that can only be addressed through a coherent and integrated national water policy, a change in behavior and a greater understanding of the challenges the country faces.

More than 90 journalists from 23 provinces and 4 municipalities gathered in Beijing, Shanghai and Chengdu to attend two-day workshops arranged by ADB in collaboration with PRC's Department of Environment and Resource Conservation, National Development and Reform Commission (NDRC). A number of small local publications were invited alongside the larger and national media like the Shanghai Morning Post and Xinhua News Agency to ensure as wider cross-section of media and potential readerships as possible.

Wang Yao, editor *Elite Reference*, a leading Beijing weekly newspaper and an attendee at the Beijing workshop, summed up the goals and hopes for outcomes of the workshops well: "From *People's Daily* to *Hebei Daily*, *Henan Daily*, *Shanxi Daily* and Xinhua News Agency, this is the first time I have seen so many journalists together in one room discussing water in depth - such a critical issue to the PRC."

Sessions at the workshops tackled such key issues as integrated water resources management and the need for a coherent and integrated national water policy in the PRC; the water quality challenges the PRC is currently facing and measures that need to be undertaken to improve it; and the twin issues of urban and rural water supply and sanitation.

The goal for the workshops was clear - to increase journalists' understanding of water issues in the hope that they will become passionate about water, that they will become better equipped to write objectively about water issues, and that they will be able to use their influential positions to educate their readers and viewers on the complexities around water and the importance of water sector reform.

Since 2003, more than 200 journalists participated in 12 workshops in Cambodia, Thailand, Vietnam, Malaysia, India, Pakistan, Bangladesh, Kazakhstan, and Indonesia, and are now part of a network sharing ideas on water issues and writing extensively on the subject. One such outcome of the workshops has been the Asia Water Wire <www.asiawaterwire.net> where journalists who attended the workshops have the opportunity to write compelling, highly personal stories about local people facing extreme water challenges.

Wang Yao concluded, "The issues-based approach, the global viewpoint and the diverse collection of speakers will ensure that this workshop leaves a lasting legacy in creating a greater awareness toward water issues in the PRC. It is now up to us journalists to go away and educate our readers. Influencing one Chinese journalist can lead to hundreds of thousands of readers having a better understanding of water."

3.5 A Synthesis

This section of the paper has reviewed developments, principles, issues and examples in water education across the four key audience groups of school students, students in technical and vocational education and training, the general public and the media. Perhaps, the final remark that needs to be made is that education in any of these alone is not as effective as a multi-sectoral approach in which education, training and capacity building is coordinated. An excellent example of this may be found in the case of the Ghana Public-Private Partnership to Promote Handwashing which is summarised in Box 10.

BOX 10**The Ghana Public-Private Partnership to Promote Handwashing³⁴**

The Initiative has implemented a highly professional communications program. The program uses the power of commercial marketing, through three main integrated communications channels: mass media, Direct Consumer Contact, and a district level program through schools, health centres and communities. The communication strategy, in addition, includes a Public Relations and Advocacy component that targets policy makers and opinion leaders and promotes the provision of handwashing infrastructure in schools and public latrines.

Mass Media: During Phase One of the campaign, the program utilized state-of-the-art marketing strategies to promote handwashing with soap based on concepts that are most effective with mothers and basic school children. The campaign materials focused on disgust based on nurture as the key driver for behaviour change for mothers and caregivers and on disgust based on acceptance by family for children. The guiding concept for this phase of work was "your hands are only truly clean if washed with soap". Two radio adverts and two TV adverts were produced. The two radio adverts and one of the TV advert targeted mothers and caregivers, while the remaining TV advert targeted children. The radio and television adverts were supported by posters and billboards sited in all 110 district and 10 regional capitals of the country, and the distribution of below-the-line materials such badges, T shirts, branded poly bags and soap. The radio and TV adverts ran for six months with a blitz in the first three months of the campaign.

Direct Consumer Contact. An event management firm visited two districts per region in six regions in Phase One and conducted 128 high-impact events in schools to reach 103,313 school children, 2,930 teachers and 926 food vendors, and 132 events in health centres and communities for 11,500 mothers. DCC is used as an interpersonal communication strategy that provides information on handwashing with soap in an innovative and interactive manner and provides a platform for the audience to have any concerns and/or questions addressed.

District Level Program: Handwashing Steering Committees in Ghana's 110 districts developed handwashing action plans for implementation of the District Level programme. Each district has been supported with funding from the World Bank Assisted Community Water and Sanitation Programme Phase Two (CWSP II) to organize a district launch event. In addition, orientation workshops were held for members of district and regional steering committees on the vision, objectives, rationale and strategy for the PPPH Initiative in Ghana. The objective of the District Level Program was to ensure that all government facilities, health centres, schools, community infrastructure deliver the handwashing with soap message; advocate for the provision of handwashing facilities and soap in public and school toilets, especially as over 60% of the target audience use public toilets. District-level activities to support the campaign continued throughout 2004 and the first half of 2005.

Public Relations and Advocacy. Targeted at opinion leaders and strategic audiences, this strategy component delivered continued press and media coverage in support of the aims of the handwashing campaign. A number of radio and television talk shows and interviews were broadcast on national media and district-specific FM radio stations. An advocacy brochure that outlined the strategy for the initiative was also produced and distributed to strategic audiences and partners.

The evaluation of the first six months of the communication campaign, undertaken in August 2004, confirms that the campaign has on the whole been effective in creating awareness about the importance of and critical times for washing hands with soap. However, to maintain visibility, promote behaviour change, and maintain handwashing with soap, the PPPHW Initiative needs to continue to remind target audience of the handwashing with soap message.

In the first half of 2005, the mass media program was back on air on Ghana Television (GTV), the national television station, to re-echo the handwashing message to the target audience. In January 2005, there was a repeat broadcast of the television discussion program in the six main local languages. In addition, several feature articles about the program appeared in a number of newspapers including two widely-read ones: Junior Graphic, a weekly paper targeted at school children, and Public Agenda, a bi-weekly private newspaper targeted at opinion leaders.

³⁴ See <http://www.globalhandwashing.org/Country%20act/Ghana.htm>

WHERE TO FROM HERE?

The role of the UNESCO Working Group on Water Education and Capacity Building for Sustainable Development (GWESD) is to advise UNESCO, the International Hydrological Programme and their partners on key issues, initiatives and strategies for raising awareness and advancing water education for the community, via the mass media and other communication channels, and for the school and vocational education and training (VET) education sectors.

This issues paper was prepared to provide a background to world water issues and to stimulate discussion among members of GWESD.

The paper will be discussed at a GWESD meeting, 11-13 April 2007, as part of a process of developing principles and priorities for a UNESCO water education programme. As such, the programme will reflect UNESCO's concerns as:

- An advocate of human rights; in this case, water as a human right
- An advocate of gender inclusiveness, emphasising the importance of education for women and girls and their roles in family health and well-being associated with water
- As an advocate of the use of science for sustainable development and the importance of the natural and social sciences in providing not only the information base for educational programmes but also research into appropriate strategies for education, training and capacity building
- As an advocate of basic education and its importance in improving access to sustainable livelihoods and the management of natural resources.

UNESCO brings to the deliberations of the GWESD several key resources, including:

- Its role as Lead Agency for the UN Decade of Education for Sustainable Development, for which it has developed an Action Plan based upon several Thematic Programmes. Thematic Programme 8 is Water Education. The GWESD will be invited to advise UNESCO on how Thematic Programme 8 may be reoriented and operationalised.
- Its role as the Secretariat of the International Hydrological Programme (IHP), which provides not only wide expertise in water issues and a comprehensive set of materials that may be used for educational purposes, but also international networks of national IHP Committees and of IHP staff in regional offices around the world.
- Its membership of UN-Water, a network of 24 international agencies that can be partners in a variety of education projects
- Its role as the Secretariat of the World Water Assessment Programme that publishes the *World Water Assessment Programme*.

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| World Water Council | http://www.worldwatercouncil.org/ |
| World Water Forum | http://www.worldwatercouncil.org/index.php?id=6 |

3.5 A Synthesis

This section of the paper has reviewed developments, principles, issues and examples in water education across the four key audience groups of school students, students in technical and vocational education and training, the general public and the media. Perhaps, the final remark that needs to be made is that education in any of these alone is not as effective as a multi-sectoral approach in which education, training and capacity building is coordinated. An excellent example of this may be found in the case of the Ghana Public-Private Partnership to Promote Handwashing which is summarised in Box 9.

The Initiative has implemented a highly professional communications program. The program uses the power of commercial marketing, through three main integrated communications channels: mass media, Direct Consumer Contact, and a district level program through schools, health centres and communities. The communication strategy, in addition, includes a Public Relations and Advocacy component that targets policy makers and opinion leaders and promotes the provision of handwashing infrastructure in schools and public latrines.

Mass Media: During Phase One of the campaign, the program utilized state-of-the-art marketing strategies to promote handwashing with soap based on concepts that are most effective with mothers and basic school children. The campaign materials focused on disgust based on nurture as the key driver for behaviour change for mothers and caregivers and on disgust based on acceptance by family for children. The guiding concept for this phase of work was "your hands are only truly clean if washed with soap ". Two radio adverts and two TV adverts were produced. The two radio adverts and one of the TV advert targeted mothers and caregivers, while the remaining TV advert targeted children. The radio and television adverts were supported by posters and billboards sited in all 110 district and 10 regional capitals of the country, and the distribution of below-the-line materials such badges, T shirts, branded poly bags and soap. The radio and TV adverts ran for six months with a blitz in the first three months of the campaign.

Direct Consumer Contact. An event management firm visited two districts per region in six regions in Phase One and conducted 128 high-impact events in schools to reach 103,313 school children, 2,930 teachers and 926 food vendors, and 132 events in health centres and communities for 11,500 mothers. DCC is used as an interpersonal communication strategy that provides information on handwashing with soap in an innovative and interactive manner and provides a platform for the audience to have any concerns and/or questions addressed.

District Level Program: Handwashing Steering Committees in Ghana's 110 districts developed handwashing action plans for implementation of the District Level programme. Each district has been supported with funding from the World Bank Assisted Community Water and Sanitation Programme Phase Two (CWSP II) to organize a district launch event. In addition, orientation workshops were held for members of district and regional steering committees on the vision, objectives, rationale and strategy for the PPPH Initiative in Ghana. The objective of the District Level Program was to ensure that all government facilities, health centres, schools, community infrastructure deliver the handwashing with soap message; advocate for the provision of handwashing facilities and soap in public and school toilets, especially as over 60% of the target audience use public toilets. District-level activities to support the campaign continued throughout 2004 and the first half of 2005.

Public Relations and Advocacy. Targeted at opinion leaders and strategic audiences, this strategy component delivered continued press and media coverage in support of the aims of the handwashing campaign. A number of radio and television talk shows and interviews were broadcast on national media and district-specific FM radio stations. An advocacy brochure that outlined the strategy for the initiative was also produced and distributed to strategic audiences and partners.

The evaluation of the first six months of the communication campaign, undertaken in August 2004, confirms that the campaign has on the whole been effective in creating awareness about the importance of and critical times for washing hands with soap. However, to maintain visibility, promote behaviour change, and maintain handwashing with soap, the PPPHW Initiative needs to continue to remind target audience of the handwashing with soap message.

In the first half of 2005, the mass media program was back on air on Ghana Television (GTV), the national television station, to re-echo the handwashing message to the target audience. In January 2005, there was a repeat broadcast of the television discussion program in the six main local languages. In addition, several feature articles about the program appeared in a number of newspapers including two widely-read ones: Junior Graphic, a weekly paper targeted at school children, and Public Agenda, a bi-weekly private newspaper targeted at opinion leaders.

³⁵ See <http://www.globalhandwashing.org/Country%20act/Ghana.htm>

WHERE TO FROM HERE?

The role of the UNESCO Working Group on Water Education and Capacity Building for Sustainable Development (GWESD) is to advise UNESCO, the International Hydrological Programme and their partners on key issues, initiatives and strategies for raising awareness and advancing water education for the community, via the mass media and other communication channels, and for the school and vocational education and training (VET) education sectors.

This issues paper was prepared to provide a background to world water issues and to stimulate discussion among members of GWESD.

The paper will be discussed at a GWESD meeting, 11-13 April 2007, as part of a process of developing principles and priorities for a UNESCO water education programme. As such, the programme will reflect UNESCO's concerns as:

- An advocate of human rights; in this case, water as a human right
- An advocate of gender inclusiveness, emphasising the importance of education for women and girls and their roles in family health and well-being associated with water
- As an advocate of the use of science for sustainable development and the importance of the natural and social sciences in providing not only the information base for educational programmes but also research into appropriate strategies for education, training and capacity building
- As an advocate of basic education and its importance in improving access to sustainable livelihoods and the management of natural resources.

UNESCO brings to the deliberations of the GWESD several key resources, including:

- Its role as Lead Agency for the UN Decade of Education for Sustainable Development, for which it has developed an Action Plan based upon several Thematic Programmes. Thematic Programme 8 is Water Education. The GWESD will be invited to advise UNESCO on how Thematic Programme 8 may be reoriented and operationalised.
- Its role as the Secretariat of the International Hydrological Programme (IHP), which provides not only wide expertise in water issues and a comprehensive set of materials that may be used for educational purposes, but also international networks of national IHP Committees and of IHP staff in regional offices around the world.
- Its membership of UN-Water, a network of 24 international agencies that can be partners in a variety of education projects
- Its role as the Secretariat of the World Water Assessment Programme that publishes the *World Water Assessment Programme*.

5.0 SELECTED BIBLIOGRAPHY AND RESOURCES

5.1 Key Documents

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United Nations Development Programme (UNDP) Human Development Report 2006 - Beyond scarcity: Power, poverty and the global water crisis. www.hdr.undp.org/hdr2006/

UNESCO (n.d.) Water-Education-Training: Towards a strategy on human capacity building for integrated water resources management and service delivery. <http://unesdoc.unesco.org/images/0012/001262/126258eo.pdf>.

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UNESCO (2006) World Water Development Report 2– Water a Shared Responsibility. <http://unesdoc.unesco.org/images/0014/001454/145405E.pdf>

5.2 Organisations

UN-Water <http://www.unwater.org/>

International Decade for Action Water for Life 2005-2015 <http://www.un.org/waterforlifedecade/>

International Hydrological Programme <http://www.unesco.org/water/ihp/>

World Water Assessment Programme <http://www.unesco.org/water/wwap/>

World Water Council <http://www.worldwatercouncil.org/>

World Water Forum <http://www.worldwatercouncil.org/index.php?id=6>

