



## PLOW Learning Resource: Water Resource Management

### *Important Note:*

This learning resource was developed as part of the Professional Development for Livelihoods Advisers Website (PLOW) which was operational between 2006-2008.

PLOW was funded by the Department for International Development (DFID) and supported the professional development of DFID livelihoods advisers. PLOW hosted 17 learning modules of which this is one. Modules were produced using guidance provided by the Livelihoods Technical Competence Framework that described technical competencies, knowledge, and experience required by DFID Livelihoods Advisers.

PLOW modules were designed to help advisers get up to speed on areas of the competency framework, to prepare for new postings, or to refresh existing knowledge on particular subject areas. They were produced and developed by a partnership comprising the Programme of Advisory Support Service (PASS) and Livelihoods Connect based at the Institute of Development Studies (IDS). Each module was written by an expert or experts in the subject and provided:

- an overview of the subject in a briefing note;
- key texts;
- a summary of recent policy debates;
- points on where to find other resources; and
- a glossary of key terms used in the briefing note.

Although the learning modules produced were written with the DFID Livelihoods cadre in mind they were accessible to a global audience through the website.

Twelve of the original PLOW modules are now hosted on the Evidence on Demand website. This PLOW module was produced between 2005 and 2008 and has not been updated since. Some of the material that it draws upon may no longer represent current thinking and some of the links to resources may no longer exist. Nevertheless, we believe that it is still a useful resource that provides useful reference material.





## Water Resource Management

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Water is critical to the interaction between people and their livelihood base, and water resources management is essential to maximize their economic and social welfare, equitably and without compromising the sustainability of vital ecosystems.

The reliance of many countries on agricultural based growth, together with the increased demands of industry and rapid urbanisation are changing patterns of water demand. Irrigation is the biggest user of water in developing countries (up to 85% of total water consumption), but other pressures include the need to extend sanitation coverage, hygiene education and drinking water; protect and restoring water resources and eco-systems; meeting the challenge of urbanisation; and responding to common natural disasters such as floods.

This briefing note sets out some of the critical issues and key references for an introduction to water resources, particularly in the context of livelihoods. Although water is a very broad and cross-cutting topic that cannot be covered adequately in such a short note, it is hoped that the references and issues raised will provide the reader with enough information to lead them towards a particular area that may be of relevance to them.

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## Briefing Notes

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## What is Water Resources Management?

Water is critical to the interaction between people and their livelihood base. Water is important for survival, health and quality of life, and is implicit in life expectancy rates, hunger and malnutrition levels, poverty rates among women, employment migration, urbanisation rates, flood displacement, and even school retention rates. There is general consensus that the only way to bridge the gap between the demands for agricultural, domestic and industrial water is through effective water resources management.

Water underpins many economic sectors. The quantity, quality and management of water resources are therefore critical to economic growth and development. The reliance of many countries on agricultural based growth, together with the increased demands of industry and rapid urbanisation are changing patterns of water demand (FAO, 2003). Irrigation accounts for 85% of water consumption in developing countries, and improving water productivity (in particular irrigation efficiency) can be effective for improving food security, nutrition, and rural livelihoods. Other solutions such as water harvesting, flood recession farming and water conservation practices add significant flexibility to traditional irrigated agricultural methods.

The approach to water resources management has, in the past, been sub-sectoral, focusing on water supply, sanitation and irrigation for food production as separate entities. Integrated water resource management (IWRM) builds on single sectoral learning but moves towards a participatory multi-faceted management perspective for all interests in water resources. IWRM therefore takes account of all natural aspects of water resources, all sectoral interests and shareholders, the spatial and temporal variation of resources and demands, relevant policy frameworks and all institutional and legal levels and requirements. Ultimately, cohesive decision-making concerning the development and management of water resources for various uses must be made and agreed upon by all relevant stakeholders.

## How Does Water Affect the Poor?

Many of the vital problems faced by the poor in developing countries are related to water, and water significantly contributes to the achievement of the Millennium Development Goals in four key ways:

1. **Productive activities** (food production through agriculture and fisheries, small scale industry, employment);
2. **Ecosystem health** (flood and drought impacts, water quality and effects on food production, fish stocks, grazing lands);
3. **Hazards** (floods, droughts, climate change, pollution);
4. **Health and welfare** (through water quality, quantity, accessibility).

Although there has been a successful global effort in utilising water resources to raise food production; water supply and sanitation are less developed services. The significance of water resources management was confirmed by the commitment of the International Community at the Johannesburg

Summit in 2002, to develop Integrated Water Resource Management (IWRM) and Water Efficiency Plans by 2005, with particular support being committed to developing countries. Water's role in meeting the MDGs is clear as far as drinking water and sanitation are concerned, however the target of developing IWRM plans has proved to be overly ambitious, relying on policy change and significant regional, political will, as well as technical issues and sectoral change. Currently UNEP and other major organisations are trying to '*accelerate the process*' in developing IWRM and Water Efficiency Plans. The complexity in water management and the conflicting need and uses of water are clear, indicated by the difficulty and lack of progress made in achieving this target.

Rather than splitting water across the MDG's in a target driven manner it is better to think about the way in which water affects the everyday lives of people, as it provides an effective entry point to tackle a wide range of issues such as maternal health, school attendance, food production and environmental sustainability, and in tackling these elements integrated water resource management proves to be a useful tool to address the broader elements of conflict reduction and inter-sectoral learning, pro-poor growth and improved service delivery (DFID 2004).

## Water Resources Under Pressure

The main drivers forcing change in the way water resources are managed are:

1. **Resource pressure** - increased economic activity puts additional pressure on finite water resources, forcing the poor to overexploit their already degraded resources (water, soil, forests, etc). This causes further negative impact on water resources where pollution controls do not exist.
2. **Demographic pressure** - at present approximately one third of the world's population live in countries which experience medium to high water stress.
3. **Pollution impacts** - deterioration of water quality influences downstream water uses, threatens human health and the environment and increases competition for water. Ineffective sanitation is one of the biggest polluters of freshwater, yet freshwater is finite and faces increasing competition due to the expanding global population. Polluted water requires resources and energy to mitigate the pollutant effects. In extreme cases, where water can not be released back into the hydrological cycle it is no longer fit for human and ecosystem use and is lost. This affects many of the MDG's including the morbidity and mortality of children.
4. **Governance issues** - the water crisis has been called a crisis of governance. Shortcomings in management of resources such as water, soil, and forests all affect water users. Management of water has often been driven by opaque and isolated institutions. Traditionally sectoral approaches to water resources management can lead to fragmented and uncoordinated approaches. Recent calls for global institutional reform in the water world highlight the fact that no single organisation deals with the full facet of water management challenges, exacerbating poor donor coordination and delivery to poorer nations. The lack of a single coordinating organisation makes it difficult to track progress and highlight areas of concern in the water arena.

In order to understand and act on the above pressure areas there are major challenges in terms of decision-making, dispute arbitration and learning (both within river basins and across international borders) and the promotion of more equitable resource allocation, especially in areas experiencing social, political and economic tension.

## Water Priority Areas

Five priority areas, common to much of the world, emerged from a global consultation on water (GWP 2000):

1. *Protecting and restoring water resources and eco-systems.* Protection of the water resource base lies at the heart of future water sustainability. Surface and groundwater quality, and the threats posed by pollution, are problems both for people and for the eco-systems on which all life depends.
2. *Achieving water-food security - the role of irrigation.* Agriculture uses more water than any other area of human activity. Food and water security are therefore inextricably linked, and can only

come from concerted action to achieve more crop productivity from every drop of water used for agriculture, especially in the light of rapid population growth. Institutional structures, cost recovery, subsidies, and operation and maintenance systems all affect water use efficiency and productivity. Devolving responsibilities to water user groups is part of the solution, but the support of efficient and responsive irrigation agencies is required. Divergent perceptions of irrigation - on the one hand essential for food production, on the other a wasteful and polluting water user - must be reconciled, and conjunctive use must be better understood.

3. *Extending sanitation coverage and hygiene education.* Service coverage for the effective disposal of wastes, especially human wastes, is inadequate in most developing countries - a situation which needs to be urgently addressed on grounds both of public health and human dignity. Poor people consistently rate better water and sanitation as one of their highest priorities (DFID , 2004), and real progress is being made in many parts of the world, but water resources are always under pressure from conflicting uses which, at the national scale, can be seen as overshadowing provision of safe water and sanitation to the poor. There is an urgent need to ensure that water and sanitation are treated as priorities in national development and poverty reduction processes.
4. *Meeting the challenge of urbanisation.* Almost 50% of the world's population now live in towns and cities and this proportion is rapidly rising. The pace of urbanisation is exacerbating problems of urban water management. Countries which have higher rates of urbanisation are often those with the least resources, and rapidly growing populations.
5. *Improving the management of floods and understanding hydrology and climate change.* Floods are the most common natural disaster and cause more deaths and damage than any other type. Yet floods also sustain aquatic life and riverine biodiversity, recharge aquifers, enrich soils and, in some of the world's poorest areas, provide an important means of irrigation. The challenge is to reduce the negative impact of floods on human lives and livelihoods. Approaches should be holistic, integrated with other planning spheres at the catchment level, and also address the fact that many poor people live in increasingly high risk locations.

## Implementing Water Resources Management

Actions to use or control water for specific purposes are aimed at, social well-being, security, economic gain and the preservation of eco-systems, in line with the Dublin Principles. In allocating water resources there is general agreement that the supply of water for basic human needs has priority (Gleick 1996). Following this is the requirement to maintain essential life support ecosystems (van Hofwegen 2001). These aspects can be considered first order priorities for water resource management. Second order priorities cover other societal needs, decided by socio-economic criteria where water is considered following the Dublin Principles, including agriculture, and industry.

To pursue IWRM a process needs to be established. Different international processes exist, with the Global Water Partnership developing an IWRM toolbox (GWP 2003) based around three functions:

1. *Enabling Environment;* the laws, investments and policies which are the framework for other tools, building on the lessons of developed nations enhanced by indigenous and local knowledge in order to localise processes;
2. *Organisational Framework and Capacity;* the building of appropriate institutions, and building capacity within these institutions for efficient collaboration between all actors;
3. *Management Tools;* integrated use of appropriate tools including on water resources assessment, planning, efficiency in water use, social change, conflict resolution, regulation, economics and information exchange

The significant commitment by the international community, made at the World Summit on Sustainable Development in Johannesburg in 2002, pledged governments to develop integrated water resources management (IWRM) and water efficiency plans by 2005. The experience of attempting to implement this commitment has highlighted:

- the need to develop effective national water policies and laws to cover water resources, the environment and water supply and sanitation.
- the need to develop long term planning skills, to understand the return water has to stable economic growth and the need for sufficient infrastructure to manage water, including identifying the investment needs for infrastructure maintenance to ensure long term water security.

- that policies should be coherent with other national strategies promoting growth and poverty reduction, and also with policies on decentralisation and private sector development.
- that policies should be aligned with international commitments on polluter pays principles and prevention of pollution, flood risk and transboundary arrangements.
- that by identifying the key institutions IWRM fulfils a capacity building and institutional learning role, helping to build strong partnerships between ministries and institutions responsible for water related activities and impacts and to foster commitments to reform which will be required for a sustainable future.

The River Basin is viewed as a fundamental building block for the development of water resources and in identifying allocation efficiencies for water. As river basins and water use matures and changes over time it is possible to see similar patterns, and to learn from these physical and institutional changes. Physical changes influence quality and quantity of water. The institutional changes relate to legislation, organisational structures, social contracts and relationships. These relationships play a central role, within a 'Constitutional Framework' as to how the resource is managed. As water resources within basins become more stressed and competition for them more severe, the basins approach 'closure' (Molden, 1997) where no water is available for other uses. As river basins develop and approach this state the relationship between water use, water users, and the institutions involved in managing the resource become more refined and critical decisions have to be made. Participation by relevant stakeholders is important if the appropriate balance on potential uses is to be achieved.

## Action for the Future

It is clear that action needs to take place to adequately implement integrated water resources management. There is a growing need to:

- Mobilise support - at the highest political levels to raise awareness about water use and water stress.
- Mobilise financing - without adequate resources the process of IWRM will fail. Institutional support and integrity, adequate technical and managerial abilities and finances are required to move things forward beyond the debate over water resources. This includes understanding the costs of inaction in delivery water security.
- Identify Entry points - by adopting a broad based approach, involving stakeholders at every step all investments should be looked at from different sectoral viewpoints. As an entry point, water provides access to many poor people and opportunities may exist to add further value to investments and adopt a more integrated approach. This approach would allow identification of opportunities for scaling-up.

Water is not an easy issue with many conflicting demands. The competition for water becomes more acute where domestic, industrial, agricultural and environmental demands compete in single river basins and reconciliation becomes a series of trade-offs where arbitration is needed. Priority water resources issues have briefly been identified here. For further information and more details on current issues the references below provide a good starting point.

## Key Texts

### **Water for People, Water for Life**

The United Nations World Water Development Report, The World Water Assessment Programme, 2003

The World Water Assessment Programme (WWAP) builds on the achievements of many previous international initiatives; using the mandate, credibility and capacity of the UN system, managed by UNESCO, to give an authoritative picture of the state of the world's freshwater resources and our stewardship of them. This 'Report' is the first edition of what is expected to be a periodic review, continuously updated and aims to influence strategies and practices at the local, national and international levels. It places particular emphasis on developing-country situations and provides information and support to capacity-building. Chapter 1 'The World's Water Crisis' gives an excellent overview

### **Catalyzing Change: A Handbook for Developing Integrated Water Resources Management (IWRM) and Water Efficiency Strategies** Global Water Partnership, 2005

The Global Water Partnership (GWP), initiated in 1996, is a working partnership among all those involved in water management: government agencies, public institutions, private companies, professional organisations, multilateral development agencies and others committed to the Dublin-Rio principles. The GWP's approach, through promotion of Integrated Water Resources Management (IWRM) takes a broad view, which examines a more complete range of solutions, and considers how different actions affect, and can reinforce, each other. This document, prepared by the GWP Technical Committee (TEC), provides the knowledge needed to act on the 2002 World Summit on Sustainable Development (WSSD) recommendation.

## Policy Debates



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## Water Strategy

DFID has focused its priorities on the key strategic issues for achieving the Millennium Development Goal on Water.

**Addressing the Water Crisis: Healthier and more productive lives for poor people**, DFID, 2001.

**Water Action Plan: A DFID Policy Paper**, DFID, 2004

**Unlocking the Door to Social Development and Economic Growth; How a More Integrated Approach to Water can Help**, GWP. Policy Brief

**Towards Water Security: A Framework for Action**, GWP, 2000. In particular see Tackling Urgent Water Priorities, pages 55-72

**MDG Mid-Term Assessment Report 2004**. WHO/UNICEF Joint Monitoring Programme (JMP).

## Water and Poverty Alleviation

Achieving access to safe water and sanitation will help eradicate poverty and achievement of the MDGs 1.1 billion people do not have access to safe water. The importance of addressing the water issue (and importantly sanitation) is recognised internationally and there are political commitments to resolving the situation, as illustrated by the commitments made at the World Summit on Sustainable Development at Johannesburg in 2002.

**Drinking Water, Sanitation and Electricity**, World Development Report 2004: Making Services Work For Poor People

**Water and Poverty - Fighting Poverty through Water Management**, J. Soussan 2004





## Water and Pro-Poor Economic Growth

Infrastructure is increasingly recognised as a critical factor in enabling economic growth. Access to water (whether for consumption, maintaining good health or production of food or income) is key to enabling sustainable development and economic well-being.

**Infrastructure and the Millennium Development Goals**, Paper Commissioned for the DAC POVNET Task force on Infrastructure for poverty Reduction, C. Willoughby 2004

**Listening to the Voices of the Poor** in Can Anyone Hear Us? Voices From 47 Countries, Deepa Narayan et al for the Poverty Group, PREM, World Bank, December 1999

### Water Resources Management

Water Resources are cross-cutting and their successful management is essential both for sustainable use of the natural processes and for development through a number of sub-sectors such as for energy (hydropower), domestic use (water supply and sanitation), productive use for industry or food (irrigation/drainage and fisheries), and for eco-system (environmental management). An integrated water resources perspective ensures that social, economic, environmental and technical dimensions are also taken into account in the management and development of water resources.

**Towards Water Security: A Framework for Action**, GWP 2000. See specifically, Tackling Urgent water Priorities pp 55-72

**Integrated Water Resources Management**, TAC Background Papers No.4 GWP (2000a)

### Water and Food

Increasing population and economic growth are placing increasing demands on the use of water resources. The growing of food is by far the largest user of water (70% of withdrawals) and there is a significant challenge to be faced in increasing the productivity of water used for agriculture, leaving more water for other users and the environment - getting more crop per drop (or more nutrition per drop). Other issues relating to water and food include increasing the turnover of irrigation systems in the future and the need to protect farmers rights to water to protect water supplies for future food production and the livelihoods which depend on agriculture. The historical approach to water has been internal looking, and water users now, within the context of IWRM will have to expand and broaden their understanding to take into account other uses of water for the future.

**Building Policies and Institutions** in Shaping the Future of Water for Agriculture, a Sourcebook for Investment in Agricultural Water Management, World Bank 2005

**Balancing Water for Food and the Environment** in World Water and Food to 2025, Dealing with Scarcity. IFPRI/IWMI; MWRosegrant, X. Cai and SA Cline, 2002

### Water, Supply Sanitation and Health

**DFID Guidance Manual on Water Supply and Sanitation Programmes**, WELL 1998

<http://www.lboro.ac.uk/well/resources/Publications/guidance-manual/guidance-manual.htm>

**Health, Environment and the burden of disease**, DFID, 2003

### Water and Governance

The competing needs, used and demands for water have resulted in the development of management tools for the stewardship and governance of water.

**Governing Water Wisely for Sustainable Development**, in Water for People, Water for Life The United Nations World Water Development Report, 2003

**Managing River Basins: An Institutional Perspective** in Irrigation and River Basin Management: Options for Governance and Institutions. Svendsen, M., ed. (2005)

### **Climate Change and Water**

What are the implications of climate change on water resources? How does the significance of variability and vulnerability in changes to and rainfall patterns and water availability vary by region?

**Climate Change and Food Security**, Devereux, S. and J. Edwards, 2004, IDS Bulletin, 35 (3)

### **Water and Ecosystems**

The importance of maintaining the environment is increasingly understood and has international commitment from the declarations in Rio de Janeiro and Johannesburg and are incorporated in the Commission for Sustainable Development. This commitment recognises the possible negative impact of human activity on the environment and that care is required in drawing water from nature for use in agriculture, industry, and everyday life. Animals and plants, landscapes and wetlands need clean water too.

**Protecting Ecosystems for People and Planet**, a Chapter of the WWDR United Nations GEMS/Water Programme

### **Water and Finance**

The EU Water Initiative aims to improve efficiency of water related development activities by providing a platform to co-ordinate and streamline existing and future EU actions.

**Financing Water For All** presented at the 3<sup>rd</sup> World Water Forum 2003, J. Winpenny et al

### **Africa and Water**

Africa faces a difficult situation regarding water resources. Agricultural production in Africa is insufficient and unpredictable because it is, at present, essentially, rainfed. Geography and climate constrain the degree to which irrigated areas can be increased and upgrading rain-fed systems, via supplementary irrigation and better land/water management practices, will be key to improving productivity and growth in the short term. Long-term, increased agricultural productivity and production will require better stewardship of water, as well as policy frameworks that ensure allocation is equitable and sustainable.



## Further Reading

Research and technical resources to explore Water Resource Management themes in more depth

### Global Water Partnership (GWP)

Web: <http://www.gwp.org/>

The Global Water Partnership is a working partnership among all those involved in water management: government agencies, public institutions, private companies, professional organisations, multilateral development agencies and others committed to the Dublin-Rio principles. Today, this comprehensive partnership actively identifies critical knowledge needs at global, regional and national levels, helps design programs for meeting these needs, and serves as a mechanism for alliance building and information exchange on integrated water resources management. The mission of the Global Water Partnership is to *"support countries in the sustainable management of their water resources"*. Recommended resource is the Toolbox which provides a range of tools that users can select or modify to their needs and local circumstances

### International Water Management Institute (IWMI)

Web: <http://www.iwmi.cgiar.org>

Publications: <http://www.iwmi.cgiar.org/pubs/mindex.htm>

Founded in 1984, IWMI is one of the 16 research centres which come under the auspices of the Consultative Group on International Agricultural Research (CGIAR). The headquarters of IWMI are in Sri Lanka, and the Institute has three other residential offices in Pakistan, Turkey and Mexico. IWMI aims "to contribute to food security and poverty eradication by fostering sustainable increases in the productivity of water through better management of irrigation and other water uses in river basins" Recommended resource is 'publications'.

### International Food Policy Research Institute (IFPRI)

Web: <http://www.ifpri.org>

Email: [ifpri@cgiar.org](mailto:ifpri@cgiar.org)

Washington based international research centre within the CGIAR network focusing on economic growth and poverty alleviation in low-income countries, improvement of the well-being of poor people, and sound management of the natural resource base that supports agriculture.

### International Programme for Technology and Research in Irrigation and Drainage (IPTRID)

Web: <http://www.wca-infonet.org/iptrid/infonet/index.jsp>

IPTRID (the International Programme for Technology and Research in Irrigation and Drainage), is hosted by the United Nations Food and Agriculture Organization (FAO). It includes the WCA infoNET information system; a database of information on water conservation and use in agriculture.

### United Nations Environment Programme (UNEP)

Web: <http://www.unep.org/>

Provides leadership and encourages partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations. Head office in Nairobi and includes a 'Freshwater Portal of the Environment Network'; also manages the Global International Waters Assessment (GIWA). Recommended resource is the Freshwater Portal: <http://www.unep.org/themes/freshwater/>

### World Water Council (WWC)

Web: <http://www.worldwatercouncil.org/>

The World Water Council is the International Water Policy Think Tank dedicated to strengthening the world water movement for an improved management of the world's water resources and water services. Its mission is "to promote awareness, build political commitment and trigger action on critical water issues at all levels, including the highest decision-making level to facilitate the efficient conservation, protection, development, planning, management and use of water in all its dimensions on an environmentally sustainable basis for the benefit of all life on earth".

### **The World Water Assessment Programme**

Web: <http://www.unesco.org/water/wwap/>

The WWAP focuses on assessing the developing situation as regards freshwater throughout the world. The primary output of the WWAP is the periodic World Water Development Report

### **The Food and Agricultural Organisation of the United Nations (FAO)**

Web: <http://www.fao.org/>

The FAO leads international efforts to defeat hunger. Serving both developed and developing countries, FAO acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information.

### **African Water Issues Research Unit**

Web: <http://www.up.ac.za/academic/libarts/polsci/awiru/>

The African Water Issues Research Unit (AWIRU) is a not-for-profit applied research organisation based at the University of Pretoria, established to develop an African capacity to understand the complexity of African water management and development issues. AWIRU's objective is to generate water management solutions that are politically, socially, economically, environmentally and culturally sustainable in Africa. AWIRU operates in unison with the goals of the New Partnership for Africa's Development (NEPAD), aiming to strengthen transboundary water governance at all levels throughout southern Africa. Cooperation over water resources shared between states, regions and economic sectors can spill over into enhanced regional integration.

### **The World's Water**

Web: <http://www.worldwater.org/links.htm>

The World's Water website accompanies a book published every two years which provides reference on worldwide freshwater resources and the political, economic, scientific, and technological issues associated with them. The site provides links to a multitude of organisations concerned with water, and data on freshwater resources.

### ***DFID Resource Centres***

WELL Environ Health, Water, sanitation (WELL) Administered by HPD

<http://www.lboro.ac.uk/well/index.htm>

A resource centre network providing services and resources in water, sanitation and environmental health. Includes enquiry and document service, project specific consultancies, review of proposals and documents, training and capacity building. Service on demand (resource centre agreement) and by call-down contract against the enabling agreement.

Contact details: WELL at WEDC: Anne Blenkinsopp WEDC, Loughborough University, Leicestershire LE113TU. Tel: 01509 222633.

### **OASIS Consortium**

Provides advisory support regarding all aspects of Water and Sanitation. Help desk service available.

Contact details: Geoff Pearce, Marketing and Business Development, Natural Environment Research Council, centre for ecology and hydrology, Maclean Building, Crowmarsh Gifford, Wallingford, Oxon, Ox10 8BB. Tel: 01491 838800.

### **Geosciences Resource Centre (BGS) - <http://www.bgs.ac.uk/>**

Provides advisory support re all aspects of Geophysical and Mining plus some water inputs. Includes enquiry service, supply of consultants, Geoscience's website.

Contact details: David Greenbaum, British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham NG125GG. Tel: 0115 9363100.



**Dublin Principles** The Dublin Principles were set out in an International Conference in 1992 and concisely stated the main issues of water management namely that:

- Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment;
- Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels;
- Women play a central part in the provision, management, and safeguarding of water;
- Water has an economic value in all its competing uses, and should be recognised as an economic good

**Global Water Partnership** The Global Water Partnership (GWP) was initiated in 1996. It includes all those involved in water management: government agencies, public institutions, private companies, professional organisations, multilateral development agencies and others committed to the Dublin-Rio principles. GWP promotes Integrated Water Resources Management (IWRM)([link](#)) which examines a more complete range of solutions to current water management issues.

**Integrated Water Resources Management (IWRM)** IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

**Water use and demand** Water use can be distinguished into three different types. Withdrawals or abstractions where water is taken from a surface or groundwater source, and after use returned to a natural water body, Consumptive water use or water consumption that starts with a withdrawal or an abstraction but in this case without any return flow. Non-consumptive water use where there is in situ use of a water body (e.g for navigation, fish, recreation, effluent disposal and hydroelectric power generation). Water demand is defined as the volume of water requested by users to satisfy their needs.