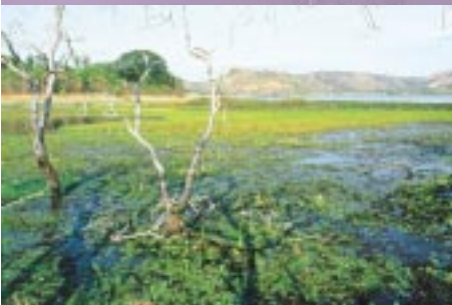




# Managing water wisely

Promoting sustainable development through  
integrated river basin management



**Living  
Waters**  
Conserving the source of life

# Managing water wisely

## Promoting sustainable development through Integrated River Basin Management



H. CLARK, WWF-UK

Freshwater ecosystems occupy less than one per cent of the Earth's surface, yet they deliver benefits worth trillions of dollars every year to agriculture, industry, communities and households. These same areas are rich in biodiversity, frequently supporting more species than terrestrial systems. However, this immense value is being squandered under the mounting pressure of pollution, drainage, dam construction and other human activities. The livelihoods of more than three billion people – the vast majority in developing countries – are adversely affected by a lack of access to safe water and sanitation.

That this amounts to a global crisis – and a fundamental obstacle to achieving the goals of poverty alleviation and sustainable development – is not in question. It has been graphically underlined by the World Commission for Water and other influential bodies. The challenge now is to implement effective solutions.

One of the most promising approaches to sustainable management of freshwater is offered by Integrated River Basin Management (IRBM) – a strategic means of balancing water management across whole river basins in order to achieve economic, social and environmental

goals. The basis for this approach was set out in Agenda 21 and has since been endorsed by the World Water Forum, the Convention on Biological Diversity and the Ramsar Convention on Wetlands.

On the basis of new research and extensive field experience, WWF has developed a series of seven *Guiding Principles* (page 7) for translating IRBM theory into effective field action. These are presented here for the first time. Simultaneously, through its *Agenda for Action* (page 8), WWF is calling on the World Summit on Sustainable Development to launch a bold, innovative and ambitious programme to secure integrated management of major river basins throughout the world.

### WWF case studies

WWF has prepared 11 case studies of river basin management in different regions of the world. Five demonstrate how poor planning and management of freshwater resources have adverse socio-economic and environmental consequences. The other six illustrate how, when properly implemented, integrated river basin management can be a building block for sustainable development. The main findings of the case studies are presented below.

For further information go to [www.wwf.org.uk/researcher/programme/themes/freshwater](http://www.wwf.org.uk/researcher/programme/themes/freshwater)



## The value of freshwater ecosystems

Freshwater ecosystems such as rivers, lakes, flooded forests and marshes, are crucial to the day-to-day existence of billions of people. They provide the water needed to support human lives and livelihoods and are vital to key economic sectors such as agriculture, fisheries and tourism. This critical socio-economic importance is derived from natural functions such as groundwater recharge, floodwater storage and erosion control. Freshwater ecosystems are also home to an astonishing diversity of plants and animals. Indeed, many of their socio-economic functions – food production and water purification, for instance – are dependent on this biodiversity.

Despite these enormous values, freshwater ecosystems are under threat throughout the world. Outright destruction and more insidious degradation mean that fewer and fewer areas are able to function naturally and provide the goods and services upon which so many people depend, particularly the rural poor. This becomes even more alarming when it is realised just how scarce freshwater ecosystems are in the first place, covering for less than one per cent of the Earth's surface.

As a result of the International Conference on Water and the Environment in 1992, the more recent reports of the World Commission for Water in the 21st Century and the World Commission on Dams, the international community has become acutely aware of a growing global water crisis. In its 2000 report *A Water Secure World*, the World Commission for Water pointed out that more than a billion people have no access to safe water and that three billion have no access to adequate

sanitation. The report concluded: “unless there are drastic changes, water shortages and environmental degradation will become the norm”.

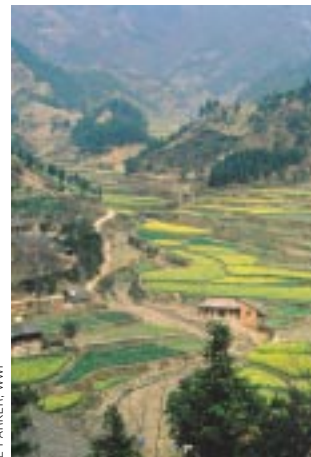
The loss of goods and services due to degradation of freshwater ecosystems has a disproportionate effect on the world's poor, since those who are forced to rely on subsistence and resource-based economies directly depend on the environmental health of their surroundings. For example, almost a quarter of all protein consumed by people in Africa is derived from river-based fisheries – mostly subsistence operations – that are vulnerable to degradation of water quality and quantity. The way in which water is managed is therefore a critical factor in achieving poverty alleviation and sustainable development. Integrated river basin management, based on sound ecological principles, will assist attainment of sustainable development goals. Continued poor management will be a major obstacle.

## The importance of river basins

River basins (also known as catchments or watersheds) are central to the water cycle, being the landscape units within which all surface water is gathered and made available for use. It is therefore common sense that strategic decisions about water management need to be taken at the basin level. However, river basins are delimited by physical and hydrological barriers alone, rather than administrative or political boundaries. Worldwide, there are 261 major transboundary rivers that between them drain 45 per cent of the Earth's surface, account for 80 per cent of river flow by volume, and are home to 40 per cent of the world's population. Their management is truly an international challenge and an essential ingredient for future economic and political stability in many regions.



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## The consequences of poor river basin management

A lack of integrated river basin management often results in decision-making dominated by powerful economic sectors such as navigation, dam construction and intensive agriculture. Typically, these interests drive land use changes that affect the whole river basin. The resulting allocation of water is seldom in the interests of sustainable development. It is only when freshwater supplies and other services provided by river basins are jeopardised, and competition for their use increases, that the need for joint planning by different stakeholders is realised.

Failure to resolve conflicting water needs and expectations among stakeholders at the river basin level scale is one of the chief driving forces behind the global water crisis. Furthermore, the absence of adequate and transparent basin-wide assessment and monitoring exacerbates the impacts of poor decisions by depriving those most likely to be affected of reliable information about anticipated consequences, risks and uncertainties.

In most countries, the arbitrary nature of property rights for water resources – combined with the failure of market mechanisms to incorporate the full economic value of naturally occurring goods and services – has resulted in highly inefficient and inequitable distribution of water resources. Furthermore, because of the flow of water from upstream to downstream parts of a river basin, the impacts of mismanagement may be felt far from the point of origin. This makes basin-scale management even more necessary and challenging.

Case studies undertaken by WWF show that, unless this challenge is met, misconceived developments result in the degradation and destruction of freshwater ecosystems with consequent loss of livelihoods for millions of people, particularly the rural poor. Five examples from Asia, Europe, North America and Latin America are summarised in the table below. For further information, go to [www.wwf.org.uk/researcher/programme/themes/freshwater](http://www.wwf.org.uk/researcher/programme/themes/freshwater)



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## Integrated River Basin Management – delivering economic, social and environmental benefits

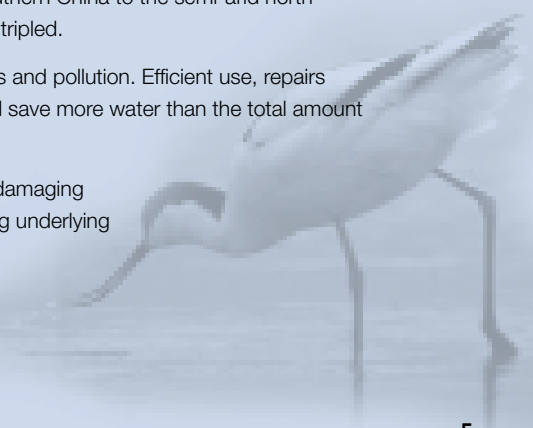
Integrated River Basin Management (IRBM) is now widely accepted as the most appropriate approach for delivering sustainable use of the world's limited freshwater resources. The basis for this approach was set out in Agenda 21 and has since been endorsed by the World Water Forum, the Convention on Biological Diversity and the Ramsar Convention on Wetlands. In the European Union IRBM has been encapsulated within the Water Framework Directive.

IRBM provides a basin-wide framework for making strategic decisions in favour of water management that is economically, socially and environmentally sustainable. It assumes that the needs and expectations of all “water stakeholders” must be assessed jointly, at a basin-wide level, and that final decisions must be based on the best possible environmental and socio-economic information. However, until recently IRBM has been a largely theoretical concept, with rather little information available about practical approaches and experience. WWF has therefore assembled a range of case studies – from Africa, Australia, Europe, Latin America and North America – that demonstrate how the principles of IRBM can be applied in practice to achieve successful outcomes. These are summarised in the table below. For further information, go to [www.wwf.org.uk/researcher/programme/themes/freshwater](http://www.wwf.org.uk/researcher/programme/themes/freshwater)

**Table 1: Case studies of poor river basin management**

Case study	Key findings
<p><b>Mekong Basin</b> (Burma, Cambodia, China, Laos, Thailand, Vietnam)</p>	<ul style="list-style-type: none"> <li>• High sedimentation rates in upper basin bring into question the projected life of hydro-power and navigation dams planned by China.</li> <li>• Dams will disrupt natural flooding, deplete fisheries and damage the livelihoods of millions of people downstream.</li> <li>• There are already conflicts within and between countries over water allocation, logging and fishing rights.</li> <li>• On a positive note the Mekong River Commission was established in 1995 and has membership of 4 of the 6 basin states. It is taking steps to engage all basin states, and also stakeholders, in integrated river basin management.</li> </ul>
<p><b>Upper Paraguay Basin</b> (Brazil, Bolivia, Paraguay)</p>	<ul style="list-style-type: none"> <li>• Waterway development plans would have profound effects on flooding patterns and sediment loads, severely damaging the Pantanal – one of the world’s richest wetland areas – and the livelihoods of millions of people.</li> <li>• Economic analyses excluded the environmental costs of the proposed development. When such costs are included, it is doubtful whether the scheme would have net economic benefits.</li> <li>• Local stakeholders had little opportunity to participate in assessment and decision-making processes.</li> </ul>
<p><b>Spanish National Hydrological Plan</b></p>	<ul style="list-style-type: none"> <li>• The NHP (a massive series of water infrastructure and inter-basin transfer schemes) fails to consider full environmental costs.</li> <li>• No strategic environmental assessment. Many inhabited rural areas and sites protected under EU legislation for their high biodiversity value would be permanently flooded.</li> <li>• Little effort to manage water consumption, with frequent over-abstraction from aquifers, unlicensed extension of irrigated areas, and inadequate control of tourism infrastructure in coastal regions.</li> <li>• Economic analyses distorted to show unrealistically low costs and overestimated benefits.</li> <li>• Lack of participatory process led to neglect of social and environmental values.</li> <li>• The NHP is in breach of EU legislation.</li> </ul>
<p><b>Mississippi and Missouri Basin, US</b></p>	<ul style="list-style-type: none"> <li>• Post-1940s development of the Missouri basin (major tributary of the Mississippi) based on dam-building – benefiting downstream states at the expense of upstream states.</li> <li>• Indigenous people excluded from the planning process and negotiation of water rights.</li> <li>• Inequities led to basin-wide litigation, loss of trust and destruction of working relationships.</li> <li>• Ecosystem functions ignored in favour of “hard” economic commodities.</li> <li>• 1993 floods in the Mississippi basin cost an estimated US\$16 billion, much of this due to constriction of the natural floodplain and failure of artificial flood embankments.</li> </ul>
<p><b>North-south water transfer, China</b></p>	<ul style="list-style-type: none"> <li>• Proposed water transfers from the Yangtse basin in southern China to the semi-arid north would be uneconomic for irrigation, even if grain prices tripled.</li> <li>• Water shortages exacerbated by wasteful use, leakages and pollution. Efficient use, repairs to the distribution system and pollution reduction would save more water than the total amount planned for transfer.</li> <li>• Pressing ahead with uneconomic and environmentally damaging water transfer is politically more convenient than tackling underlying problems of water use.</li> </ul>

CASE STUDIES



**Table 2: Case studies of promising approaches to river basin management**

Case study	Key findings
<b>Investment in watershed forest stewardship, Costa Rica</b>	<ul style="list-style-type: none"> <li>• Tax on fossil fuel use, and payments from private hydro-electricity company, pay forest owners for maintaining or restoring forest cover in upper basin.</li> <li>• Farmers, industries and communities downstream benefit from natural regulation of water quality and quantity offered by healthy forests.</li> <li>• Power company benefits from reduced sedimentation of dams.</li> <li>• BUT payments offered are not always enough for forest protection to be economically viable.</li> </ul>
<b>Working for Water Programme, South Africa</b>	<ul style="list-style-type: none"> <li>• Spread of invasive, water-hungry exotic trees and plants in several river basins has resulted in damage to water supplies and biodiversity costing \$billions.</li> <li>• Comprehensive socio-economic and environmental assessment led to Working for Water, the largest environmental management programme in Africa.</li> <li>• Programme employs 18,000 local people to clear invasive vegetation, thereby generating income and conserving water and biodiversity.</li> </ul>
<b>Danube Basin (primarily Austria, Bosnia &amp; Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Moldova, Romania, Slovak Republic, Slovenia, Ukraine, Yugoslavia)</b>	<ul style="list-style-type: none"> <li>• Second longest river in Europe and source of drinking water for 20 million people.</li> <li>• More than 80 per cent of original floodplain is lost due to engineering projects for navigation, irrigation and power supply. Pollution is also a major problem.</li> <li>• Cold War prevented basin-wide management approach until the 1990s, when the Danube Convention and implementing Commission were established to focus on transboundary cooperation and management based on sound data and monitoring.</li> <li>• Lower Danube Green Corridor combines wetland protection of 935,000ha and restoration of 225,000ha in the interests of pollution reduction, fisheries support, tourism development and biodiversity conservation.</li> <li>• GEF funding (US\$10 million) has recently been made available for actions that will help deliver IRBM through restoration and rehabilitation of floodplains.</li> </ul>
<b>New York City Watershed Agreement</b>	<ul style="list-style-type: none"> <li>• Agreement uses innovative financing to support protection of upper basin areas that supply water to NYC.</li> <li>• Covers land purchase, upgrading of sewage and storm water treatment, and support for best practice in farming and forestry.</li> <li>• Success depended on resolution of long-standing conflicts between urban and upper basin communities. This required partnership-based participatory approach.</li> <li>• Tangible benefits have accrued to both communities, with farmers obtaining higher productivity from their land and NYC having avoided the need to build multi-billion dollar treatment facilities.</li> </ul>
<b>Kouris watershed, Cyprus</b>	<ul style="list-style-type: none"> <li>• Socio-economic analysis showed that water shortages are due to “first come first served” allocation benefiting upstream users, but leaving downstream areas deprived of adequate flows.</li> <li>• More equitable and sustainable distribution proposed, based on assessment of economic value of competing uses, balanced by principles of social equity and ecological needs.</li> <li>• Resulted in new basin-wide management and water pricing structures.</li> </ul>
<b>Murray Darling Basin, Australia</b>	<ul style="list-style-type: none"> <li>• Basin generates 40 per cent of national income from agriculture and grazing, but blighted by collapse in water quantity and quality due to diversion for irrigation and build-up of nutrients and salinity. Also conflicting demands and priorities among different user groups.</li> <li>• Basin-wide Commission, re-established in 1988, focused on a framework programme for IRBM with specific objectives and an agreed timetable, including a cap on the volume of water extracted from 1996 onwards.</li> <li>• Commission has facilitated better decision-making and conflict resolution, and application of some economic measures, but progress in mitigating key threats to sustainability is still at an early stage.</li> </ul>

# Guiding principles for effective integrated river basin management

Through analysing general approaches to river basin management, and in particular drawing on the lessons learned from the 11 case studies mentioned above, WWF has distilled seven guiding principles for effective IRBM. Application of these principles will contribute significantly to translating the theory of IRBM into tangible action for sustainable development.

**1. Vision** Management of river basins should be governed by a long-term vision, agreed by consensus between all major stakeholders. The vision must give equal weight to the three pillars of sustainable development – economic, social and environmental concerns. In particular, its development should stress the need to maintain and restore ecosystem services and biodiversity in order to enhance local livelihoods.

**2. Integration** Policies, decisions and institutional frameworks must be integrated and must allow the sharing of costs and benefits of different management options. This means ensuring strong links between different sectoral activities such as water quality control, fisheries management, navigation, irrigation, water supply and land use. There should be explicit recognition that upstream and downstream parts of a river basin are interconnected, both hydrologically and ecologically, through the movement of water and species. In many cases, integration will be required across administrative boundaries.

To achieve effective integration at the scale of a whole river basin, a legally recognised planning forum, organisation or authority should be established. This would help to ensure that decisions do not simply reflect the “lowest common denominator” approach. While such a structure would need to provide leadership, it should be founded on genuine partnership, be independently chaired and include all key stakeholders from both public and private sectors, as well as from civil society. Sustainable funding mechanisms for the organisation and its programmes are essential.

**3. Scale** The primary scale for strategic decision-making must be the whole river basin. Operational decisions must then be taken in accordance with the basin-wide strategy, but can be made at sub-basin or local levels. This principle applies in all cases, including transboundary river basins.

The enormous diversity in the size and characteristics of river basins means that approaches suited to one location are not automatically transferable to another. Where different approaches are applied at different scales, as may well be the case in a large river basin, it is important to ensure exchange of information and experience. This will help to guarantee as much coherence as possible (e.g. between “top-down” and “bottom-up” approaches) in the pursuit of common environmental and socio-economic objectives.

**4. Timing** The timing of different elements of IRBM is critical. On one hand, it is important to base management decisions on sound information, strong institutional mechanisms and broad stakeholder participation. On the other hand, urgent action should not be postponed while tools, data and processes are perfected. It may be better to begin implementing river basin management sooner rather than later, using existing information and experience and applying the lessons learned to achieve continuous improvement. Deadlines need to be set for all kinds of reasons, but it is important that they do not become straightjackets. IRBM is not a neat linear process where one step has to be completed before the next can begin. In practice, different tasks can be tackled simultaneously.

**5. Participation** High priority must be given to establishing effective mechanisms for active public participation in planning and decision-making, right from the start of the IRBM process. Provision of genuine opportunities for participation means far more than simply distributing information or setting up a consultation exercise, and needs to be carefully adapted to the appropriate scale, target group(s) and issue(s). Participation initiatives must be managed carefully to ensure that they are transparent and accessible, that all opinions are respected and that expectations from all sides are clear at the beginning.

**6. Capacity** Capacity to engage in river basin planning needs to be maximised among all relevant actors. Capacity building, starting with awareness raising, is required for officials, planners and administrators, but also for economic sectors, local authorities and civil society, especially local NGOs. Investment of adequate financial and human resources into capacity building and participation processes is one of the keys to successful river basin management, especially in those parts of the world where existing capacity is likely to be most limited.

**7. Knowledge** The foundation for effective management is good scientific information. In particular, an understanding of freshwater ecosystems and key hydrological and ecological processes is essential and should be used to underpin all aspects of integrated river basin management. Similarly, socio-economic analyses are key to understanding the drivers behind water use and abuse. The information base must be regularly updated through an effective monitoring programme. This does not mean measuring everything all the time, but rather carrying out a strategic, targeted and integrated programme, the results of which can be used to inform and adjust management decisions. WWF advocates that for any IRBM process the ecological components should be based on a freshwater ecoregional assessment to establish a scientifically based, shared vision on how to conserve the freshwater plants and animals in each river basin (WWF has produced a freshwater ecoregional workbook that is available to practitioners; for more information go to [www.panda.org/livingwaters/pubs.html](http://www.panda.org/livingwaters/pubs.html)).

# An agenda for action

Based on the findings summarised in this paper, and on the occasion of the World Summit on Sustainable Development being held in Johannesburg from 26 August to 4 September 2002, WWF is calling upon governments to:

## develop and implement a global programme of Integrated River Basin Management, with priority given to transboundary rivers.

To ensure the success of such a programme, WWF is further urging governments to:

### By 2007:

- establish multilateral river basin management authorities for more than 50 per cent of the world's transboundary rivers;
- prepare and commence implementation of IRBM programmes that apply WWF's seven Guiding Principles for Effective IRBM, with particular attention to ensuring stakeholder participation, for the above river basins.

### By 2015

- establish river basin management authorities and implement IRBM for 80 per cent of the world's rivers and lakes;
- halve the proportion of people without access to safe drinking water;
- halve the portion of people lacking access to improved sanitation;
- reduce by a third the volume of water required to produce a unit of each of the world's major irrigated crops;
- reduce by 80 per cent the volume of water lost to leakage in urban water supply systems.

### Means of implementation:

- channel additional funding through the Global Environment Facility, development banks and aid agencies to implement IRBM in developing countries;

- redirect government subsidies away from the supply of below-cost water to large and commercial water-users and towards the implementation of these targets in developing countries;
- developed countries should financially support the implementation of IRBM in their own countries;
- support a major capacity building process – delivered through the Ramsar Convention, the Convention on Biological Diversity and the World Water Forum – to underpin the global IRBM programme.

### Institutional and reporting requirements

- enhance, by 2003, the mandate of the Ramsar Convention as the leading international instrument on integrated management of freshwater ecosystems (with a specific focus on ecological functions) by:
  - providing sufficient additional resources to the Ramsar Convention for enabling its active participation in the global IRBM programme;
  - requiring national reports to the Convention on Biological Diversity and Ramsar Convention; and
  - requiring the Ramsar Secretary General to report on the rate and effectiveness of implementation of this global programme at COP11 in 2011 and at the World Water Forum in 2012, with an interim report to be provided to the WSSD follow-up process in 2007.

#### For further information visit these websites:

[www.panda.org/livingwaters](http://www.panda.org/livingwaters)  
[www.wwf.org.uk](http://www.wwf.org.uk)  
[www.wwfus.org/global200/spaces.cfm](http://www.wwfus.org/global200/spaces.cfm)

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*1 Including not only rivers that cross international boundaries, but also those that cross significant intra-national administrative and political boundaries such as those between regions or states in federal or federative systems.*



WWF is grateful to HSBC for its support through the Investing in Nature programme. For more information, please visit: [www.investinginnature.com](http://www.investinginnature.com)



WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world's biological diversity
- ensuring that the use of renewable resources is sustainable
- promoting the reduction of pollution and wasteful consumption

**Let's leave our children a living planet**

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