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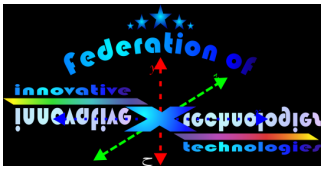
Our Vision of
Water and
Life in 2025



How did the world make so much progress in 25 years?
Five adjustments were crucial. The water crisis became widely recognised.

Land and water resource management became integrated—
with full stakeholder representation. Water services became subject
to full-cost pricing. Innovation and public funding for research increased.
And cooperation in international basins grew.

The year is 2025. Looking around, we see that our efforts begun at the turn of the century are starting to bear fruit. The loss of ecosystem functions and biodiversity has been reversed, and water resources are being rehabilitated. The integrated management of human social and economic activities, with care for catchments and groundwater units, forms the backbone of affordable and sustainable water supplies for communities, farms, and industries.

The world population now stands at 7.5 billion,[1] but everyone has access to safe water supplies. Agriculture produces enough food so that no one need go hungry. Reduced global water consumption by industry has accompanied substantially higher economic activity in what were the emerging and developing countries of 2000. Similar concern for freshwater and the environment has reduced the volume of waste from human activity and led to the treatment of most solid and liquid wastes before their controlled release into the environment.

Some countries lag in their development of representative social and political systems. As a result large parts of the world need further efforts to raise living standards and improve the quality of life for humans and all living things.

People come first…

In 2025 almost every woman and man, girl and boy in the world's cities, towns, and villages knows the importance of hygiene and enjoys safe and adequate water and sanitation. People at the local level work closely with governments and nongovernmental organisations, managing water and sanitation systems that meet everybody's basic needs without degrading the environment. People contribute to these services according to the level of service they want and are willing to pay for. With people everywhere living in clean and healthy environments, communities and governments benefit from stronger economic development and better health.

- Less disease
- Better nutrition
- Wiser management
- More powerful communities
- Higher farm yields

Many of the water-related diseases rampant at the end of the 20th century have been conquered. Revitalised international efforts to meet people's basic water and sanitation requirements have been combined with effective promotion of hygiene practices. Better primary health care and pollution control have greatly reduced the prevalence and severity of many diseases. Scientists around the world continue to identify links between cancers and chemical contamination of water, along with new methods for preventing and removing the contamination.

Water services are planned for sustainability, and good management, transparency, and accountability are now the standard. Inexpensive water-efficient equipment is widely available. Rainwater harvesting is broadly applied. Municipal water supplies are supplemented by extensive use of reclaimed urban wastewater for nonpotable uses (and even for potable uses in seriously water-short urban areas). On small islands and in some dry coastal areas, desalination augments the water supply. Many cities and towns use low- or no-water sanitation systems, for which communities and local authorities manage the collection and composting services.

Twenty-five years into the new century, all people—both cultivators and those who purchase their food—have access to adequate nutrition, with a minimum national average of 2,750 calories per person a day. Vibrant rural communities feel secure, with education opportunities, social services, and employment opportunities in and out of agriculture. They have reliable access to good transport and communication links with market and administrative centres and with regional and global economies. As a result farmers and other rural residents participate in the global rise in living standards. Agriculture in rainfed, drained, and irrigated areas operates sustainably in an equitable price environment, using water efficiently (box 4.1).

Secure and equitable access to and control of resources—and fair distribution of the costs and associated benefits and opportunities derived from conservation and development—are the foundation of food and water security. Efforts to overcome sector-oriented approaches and develop and implement integrated catchment management strategies continue to be supported by wider social and institutional changes. Many government institutions recognised at the turn of the century the groundwork of grassroots community-based initiatives—and built on this extensively. All new central government policies and legislation are subject to prior assessment of their impacts on different stakeholders and beneficiaries. Private and public institutions are today more accountable and oriented towards the local delivery of services and conservation of ecosystems than they were decades ago. They fully incorporate the value of ecosystems services in their cost-benefit analysis and management.

At local levels the empowerment of women, traditional ethnic groups, and poor and marginalised women and men has started to make local communities and weak nations stronger, more peaceful, and more capable of responding to social and environmental needs. Institutional structures, including river basin commissions and catchment committees, actively support the equitable distribution of goods and services derived from freshwater ecosystems. Both husbands and wives are members with voting rights in water user associations in farming communities. Clear property and access rights and entitlements ensure that individuals, companies, and organisations holding those rights meet their associated responsibilities. Enforcement by government regulatory agencies at the local, regional, and national levels is still important for resolving a number of conflicts, such as those between upstream and downstream users.

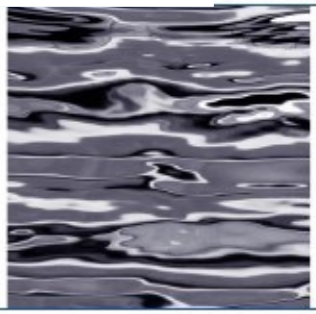
Box 4.1 A Sahelian future

Early on an April morning in 2025, on one of the vast floodplains of the Sahel, Ibrahim Diaw leads his herd of long-horned cattle to their dry-season pastures. The grazing routes for nomadic herders follow the areas under an ecosystem restoration programme initiated at the turn of the century. Using these migration pathways no longer results in violent conflicts with farmers, as it did 40 years before when intensive irrigated rice schemes were constructed throughout the plain.

Now Diaw's herd prospers through access to large expanses of restored perennial grasses, including those of the new Wahta Biosphere Reserve. Throughout the wet and dry seasons, water holes provide drinking water for his animals, and the floodplain "works" for the benefit of Diaw and other local people who can count on stable livelihoods based on recession agriculture, semi-intensive production, and artisanal and small-scale commercial fishing.

Diaw walks in the grass and thinks of the past—desiccated flats, 25 years without a single wedding in the villages, his father who thought that they had been forgotten by God. He thinks that efforts to mitigate the impacts of infrastructure development are about to pay off: the dikes have been put to good use, artificial flooding schemes are effective, and water is not wasted anymore.

Source: IUCN 1999.



Food and water security requires fair distribution of the costs and associated benefits

and opportunities from conservation and development

Extensive field research on water management policies and institutions in developing countries early in the 21st century focused on bringing average yields closer to what was being achieved by the best farmers. Closing the yield gap made the rural livelihoods of poor women and men much more sustainable. Countries that had a basic policy of food self-sufficiency and the capability to implement that policy have increased their yields and production. They did so by increasing the productivity of water through technical and institutional innovation, up to economic and technical limits. China and India are among them.

Because of water shortages, many countries are importing food. The percentage of food traded is about the same as in 2000, with the volume up 30–40%. But there has been a realignment of the countries involved in that trade, with lower-income countries represented to a greater extent. Negotiations on world trade at the beginning of the century paved the way for this. Arid countries, particularly in the Middle East, had a policy of being as self-sufficient as possible, but water limitations kept them from achieving self-sufficiency.

Drawing on technological innovations as well as traditional knowledge, agriculture has made large improvements. Genetically modified crops were initially introduced on a small scale given the lack of public and political support. The biggest advances in food production in the century's first decade were plant improvements through tissue culture and marker-aided selection, crop diversity (especially relying on locally adapted indigenous varieties), appropriate cropping techniques, and soil and water conservation. Now, as the industry has demonstrated its responsibility and gained credibility, use of genetically modified crops is common and has greatly increased the reliability of crops in drought-prone regions.

There has been a 10% increase in water withdrawals and consumption to meet agricultural, industrial, and domestic requirements. Food production has increased 40%. This was possible—in part—because people recognised that water is not only the blue water in rivers and aquifers, but also the green water stored in the soil. Recognition of its crucial role in the water cycle helped make rainfed agriculture more productive while conserving aquatic and terrestrial ecosystems.

Withdrawals for industrial and domestic uses account for half of new withdrawals, due to the high growth in income and consequent demand for water. Only a small percentage of the water delivered to these uses is consumed—most is returned after proper treatment to the ecosystems from which it was drawn. Industrial and domestic water reuse is common, and nonwater-based systems of sewage treatment and other methods of ecosanitation have been applied in many areas to reduce pollution and make full use of human waste as agricultural fertiliser. Seminatural and artificial wetlands are commonly used to improve polluted waters and treat domestic effluents. Countries that faced water scarcities early in the century invested in desalination plants—or reduced the amount of water used in agriculture, transferred it to other sectors, and imported more food.

China, India, Pakistan, and other countries have found it necessary to manage their groundwater better. The answer lay in groundwater recharge. India began doing this in the 1990s through flooded paddy (rice) cultivation in lands above the most threatened aquifers in the wet season. Paddy irrigation has high percolation losses and so is inefficient. But for groundwater recharge, and where water is available at low real cost (excluding subsidies), this apparent inefficiency was just what the doctor ordered. Other countries adopted this approach and others, such as community rainwater harvesting.

Concerns about polluting groundwater through leaching nitrates and other chemicals have also been addressed. Restrictions were placed on fertilisers, pesticides, and other chemicals in groundwater recharge areas after research on maximising the rate of recharge and controlling pollution. Ideally, the recharge areas are not to be used for any other purpose.

At the turn of the century recycling of treated wastewater for agricultural and industrial use was extensively practiced only in Israel, although Tunisia and a few other water-scarce countries were adopting the practice. Today Israel recycles 80% of its wastewater, and it is estimated that nearly half of all municipal wastewater in the world is recycled. This has made a major contribution to meeting the demand for increased consumption.

Rising energy demands in the 21st century have increasingly been met by renewable sources—including large dams in the Zaire basin, where there had been little harnessing of the massive hydropower potential. Many favourable sites are now harnessed, but compensation for environmental, social, and economic impacts has reduced the cost-effectiveness of new projects. In the Mekong River basin, for example, a limited number of dams have been constructed since the 1990s

• Better management of water resources

• Accelerated innovation

• More investments in cleaner water and lower use

because the cost of compensating the millions of fishers in the Tonle Sap wetland and downstream coastal areas made many projects unfeasible. Cheap and effective solar-powered desalination, now widely used in many arid and semiarid countries for domestic water supply, is increasingly affordable.

As forecast in 1999 by the Intergovernmental Panel on Climate Change, the frequency and magnitude of floods and droughts have increased. However, thanks to funding provided early in the century to the international agencies charged with studying the complex processes involved in the water cycle, the causes and patterns are now better understood and measures have been taken to reduce the impact on people and property.

...but we cannot live without the rest of nature

People came to realise that they didn't inherit the earth from their parents—but borrowed it from their children. Water management in 2025 is based on recognising the environmental goods and services that healthy catchments provide. Catchments require constant maintenance, largely provided by local communities, in erosion control, water quality protection, and biodiversity conservation, among other tasks. Strategic or unique natural ecosystems are now highly valued. And conservation programmes, including those for protected areas, usually reflect the needs and involvement of the local communities that depend on them.

Despite concerted efforts and some promising results, contamination of water bodies continues to threaten the environmental security of many societies, in both developed and developing countries. In some areas runoff from agricultural land still affects surface and groundwater resources, though major improvements have come from best management practices and integrated catchment management plans. In other areas contaminants from polluted sediments continue to affect many waterways. Since 2010 investments in the rehabilitation of rivers, lakes, and wetlands have increased, and in many places they now help restore the environmental goods and services these ecosystems provide. Through various means, including artificial wetlands and vegetated buffer strips along riverbanks and lakeshores, domestic effluents and agricultural runoff are controlled and purified.

Empowered communities and individuals, both women and men, regularly participate in all levels of decisionmaking on water resource management (box 4.2). In the United States

Box 4.2 For a fair share of clean water

The community of Asunción Llanque on the Bolivian shores of Lake Titicaca now negotiates every three years with urban and industrial groups and is assured its share of clean water. These groups have established a voluntary code of conduct that has reduced their effluent discharge dramatically since 2015. To ensure a safe water supply to urban areas and factories, the private sector and civil society have invested in conservation and rehabilitation activities in the Lake Titicaca catchment, including soil erosion control, afforestation, and wetland conservation. In many places traditional and innovative mechanisms empower women, men, youth, and the elderly. People from all ethnic groups and social classes now have more equitable access to resources and decisionmaking.

Source: IUCN 1999.

in 2000, all states, territories, and tribes had completed unified watershed assessments. Local involvement and coordination with stakeholders was an important element in all assessments. Now more equitable conditions give local communities rights, access to, and control over land, water, and other resources. Laws, markets, and regulations increasingly recognise local people's rights and needs, making possible the sustainable use of natural resources and reconciling livelihood needs with ecosystem functions and requirements.

Innovation in most areas of water resource management—supported by the best of science and traditional knowledge—has accelerated significantly. Innovation also supports development and management for freshwater and related ecosystems. Scientific analysis and modern technologies provide an analytical perspective to problem-solving. Traditional knowledge, the wealth of many generations of water resource management, is also a natural part of decisionmaking and management. The dialogue between scientists and the holders of traditional knowledge formed a cornerstone for many innovative resource management practices.

Investments in cleaner technologies and reduced water and wastewater use continue to help many industries lower their production costs while reducing their effluent taxes. Development investments are based on economic valuations and linked to compliance with the environmental assessment and management standards of the International Standards Organization (ISO) 14000 series. Engineering and construction companies and suppliers adhere to these standards because they provide a clear timeline for infrastructure planning and construction.

There is still much to do, but we have made the progress needed to mitigate the water crisis that reigned in 2000 and to advance to sustainable water use and development

Table 4.1 Renewable water use in the World Water Vision

In our Vision the water for irrigated agriculture is drastically limited, with 40% more food produced (partly from rainfed agriculture) consuming only 9% more water for irrigation. Industrial use goes down in developed countries, but the decline is more than offset by increases in the developing world. Municipal use goes up sharply in developing countries, to provide a minimum amount for all, and down in the developed world. Recycling and increased productivity lower the ratio of water withdrawn to water consumed for all uses.

	Cubic kilometres		Percentage increase 1995–2025	
User	1995[a]	2025[b]		Notes
Agriculture				
Withdrawal	2,500	2,650	6	Food production increases 40%, but much higher water productivity limits increase in harvested irrigated area to 20% and increase in net irrigated area to 5–10%.
Consumption	1,750	1,900	9	
Industry				
Withdrawal	750	800[c]	7	Major increase in developing countries is partly offset by major reduction in developed countries.
Consumption	75	100	33	
Municipalities				
Withdrawal	350	500[d]	43	Major increase and universal access in developing countries; stabilisation and decrease in developed countries.
Consumption	50	100	100	
Reservoirs (evaporation)	200	220	10	
Total				
Withdrawal	3,800	4,200	10	
Consumption	2,100	2,300	10	
Groundwater overconsumption	200[e]	0		Increased recharge of aquifers makes groundwater use sustainable.

Note: Totals are rounded.
a. The 1995 uses are provided for reference. These data are based on Shiklomanov (1999), rounded off.
b. World Water Vision staff estimates.
c. For industry it is recognised that developing countries need a major expansion in industrial water use. For the roughly 2 billion people in cities in developing countries that need livelihoods (both the current poor plus the increase in population) an average of 200 liters a person per day is used. This means a 400 cubic kilometre increase in diversions for industry in developing countries. At the same time, diversions for industry in developed countries can be drastically reduced. Better management and reduced losses lower the ratio of water withdrawn to water consumed.
d. Residential water use of poor people in developing countries needs to be drastically increased. Residential use in developed countries stabilises and is reduced.
e. Postel (1999).
Source: Shiklomanov 1999; World Water Vision staff; Postel 1999.

Governance systems in 2025 facilitate transboundary collaborative agreements that conserve freshwater and related ecosystems and maintain local livelihoods. Management and decisionmaking generally take place at the level where they are most effective and efficient, helping to set up more open dialogue, information exchange, and cooperation. Despite huge efforts, transboundary conflicts are still the most difficult water resource conflicts to resolve in 2025.

There is still much to do, but we have made the progress needed to mitigate the water crisis that reigned in 2000 and to advance to sustainable water use and development (table 4.1).

How we achieved our Vision

How did the world make so much progress in 25 years? Five adjustments were crucial. The water crisis became widely recognised. Land and water resources became systemically managed through an integrated framework. Water services became subject to full-cost pricing. Innovation and public funding for reasearch increased. And cooperation in international basins grew.

Recognition of the crisis and the need for action

In 1987 the Brundtland Commission told the world that our approach to development was unsustainable—but it had lit-

• Recognition of the crisis

• Stakeholder representation

• Full-cost pricing

tle to say about water. In 1992 the Rio Conference on Environment and Development, in its agenda for the 21st century (Agenda 21), addressed freshwater in chapter 18 of its report. But looking back from 2025, it is clear that the worldwide consultation on water and the environment—the World Water Vision exercise—helped awaken water and environmental professionals and the world public to the crisis in water.

It was known that a few countries were naturally short of water because they were arid. But there had not been a true awakening to the global threat of water stress caused by the rapidly increasing world population and the accompanying rapid increases in water use for social and economic development. Nor had the world truly appreciated the destructive impact that water withdrawals and the discharge of polluted waters were having on freshwater ecosystems.

This changed in 2000. Worldwide consultations shared information and ideas among thousands of water and environmental professionals and civil society representatives. The media of the world seized on the issue as well, raising awareness among decisionmakers and the public. At The Hague in March 2000, under the eyes of the world's media, participants in the Vision exercise and ministers from most countries met to discuss and debate the findings of the consultations and the recommendations of the World Water Commission. The participants launched the movement that made possible the water world that exists in 2025. At the 10th anniversary of the Rio conference, governments, international agencies, the private sector, and nongovernmental organisations announced concrete actions to address a range of water issues.

Stakeholder representation in integrated water resource management

The understanding that all social and economic decisions may have implications for the use of land and water and for the environment had been lost in the society of 2000. Before the industrial revolution, humans lived much closer to nature, understanding that they must live in harmony with it. Some aboriginal peoples retained this understanding in 2000. But the drive to improve economic well-being and security had led to the harnessing of nature for human use, without regard to sustainability.

Urbanisation alienated us even further from nature. Because of the complexities of technology and science, there was specialisation and segmentation of tasks. This created specialised institutions and cut off communication between specialists about the management of the whole. More important, because the technology of managing water was seen as a task to be left to specialists, ordinary citizens no longer had much of a role in decisionmaking on water management. With the weakness of this approach recognised by many in the 1990s, the World Water Commission underscored the basis for all actions to address the water crisis: integrated management of land and water resources at the basin or catchment level.

Even though the concept of river basin management had been around for decades, there was no ideal model for such an approach in 2000. Basin management was not organised in a way that empowered the residents of the basin with the authority and means to implement their plans. Nor was it always practical or essential to create institutions with administrative boundaries that coincided with watersheds.

Governments approached basin management in different ways. By 2010 most countries had legislation that facilitated community-based activities. Some made it obligatory to develop basin plans for the sustainable use of land and water to be eligible to participate in national economic and social programmes. Because stronger and better public management of land and water was badly needed, some governments reorganised their civil service and streamlined their legislation to reduce the number of agencies with responsibilities in the related sectors and to make them accountable to citizens at the local level. The most effective of these reorganisations started by making redundancy payments to marginal staff.

Most governments adopted legislation that clarified ownership of water or rights to access. In some cases water was declared a public good. Around the world a wide variety of local organisations were developed as appropriate to local circumstances. Among these were some modelled on river basin organisations, others on conservation authorities, and some serving the function of water markets. In 2025 all of them had one thing in common—representative participation by community women and men in decisionmaking. Women professionals trained in the water and environment disciplines in the first decade of the 21st century facilitated women's participation.

Full-cost pricing of water services for all human uses

Full-cost pricing was the most controversial of the World Water Commission's recommendations, for at least three reasons. First, until water began to become scarce in the 1990s,

Full-cost pricing was the most controversial of the World Water Commission's recommendations

it was looked on by many as a free good—a gift from God. Second, governments had long been subsidising the supply of water on the grounds that the poor could not afford it. Third, irrigation water was subsidised to generate employment and keep down the cost of food—again for low-income families, especially in cities.

The reality, of course, is that water is a renewable resource freely available to those on whose land it falls. But in most cases it must be collected, treated, transported, cleaned after use, and returned to watercourses. This requires infrastructure and services that cost something to provide. In addition, when water is scarce, tradeoffs are involved in deciding where it adds the most value, bringing in opportunity costs.

In the world of 2000, with water rapidly becoming more scarce, the Commission agreed with the Dublin principle that to create proper incentives for the management of water, water should be treated as an economic good. But the Commission recognised that full implementation of marginal cost pricing was too big a step to make at that time. Thus it recommended a first step: that the full cost of water services be recovered from users.

This recommendation, including its corollary "the polluter pays", was fairly acceptable to industrial consumers, who could recover the costs as part of the selling price of their products and services. It was also acceptable to communities seeking drinking water services, as they could see that it provided a source of new investments for system extensions to unserved customers. By 2010 public and private utilities were generally applying full cost recovery in these situations. Because some low-income households could not afford water, measures were introduced to subsidise these households so that they could pay for water to meet their basic needs. These households also contributed to the cost of their services in kind through their labour for installation and operation.

It was difficult to sell the concept that customers should pay the full cost of urban sewerage, because it was often perceived that the beneficiaries included others beyond those connected to the system. Sanitation was seen to have some public good characteristics, along with such water-related services as flood management—and both continued to require public financing (box 4.3).

It was much more difficult to sell the concept of paying the full cost of irrigation water. Yet it was critical that this water be

Box 4.3 Social Charter for Water

At the Second World Water Forum in March 2000, the French NGO Académie de l'Eau presented a Social Charter for Water. Based on a series of successful experiences identified by research and over a website over a period of months preceding the forum, the charter proposed a series of measures for community water mangement. When implemented simultaneously, those measures made it possible to organise the beneficiaries of water supplies to inform and sensitise them to issues of water management, educate them on possible solutions, and thus prepare them to work with water professionals to address their needs.

Académie de l'Eau also provided a toolbox of concrete actions and measures. And with its associates it launched a small fund with contributions from water utilities in the developed world to assist communities that wanted to test these approaches, increasing the scope of experiences from which to learn. The approach was first employed in the francophone countries of Africa, but through regional and worldwide networks it contributed much to the community movement throughout the world.

Source: World Water Vision staff.

valued, because it represented the bulk of water diverted for human needs. In 2000 suppliers of irrigation water (generally government agencies) were not even recovering most operation and maintenance costs. As a first step governments had begun decentralising responsibility for operation and maintenance to cooperatives or to private owners—a trend accelerated in the first years of the new century. Because farmers depended on the proper functioning of these systems for their livelihoods, they ensured operation and maintenance. Again, many farmers and especially lower-income users contributed their services as in-kind contributions to the cost. Appropriate low-cost technology such as treadle pumping of shallow groundwater was widely adopted for holders of small plots. All operation and maintenance subsidies were eliminated.

Indirect subsidies to operating costs, such as energy, were also eliminated. This had a major impact on water management in India, which in 2005–15 discouraged groundwater overpumping by gradually eliminating subsidies for the energy to pump water from wells.

New water storage facilities were built in the first 25 years of the century for irrigated agriculture and industrial water, as well as for recharging groundwater aquifers. Governments awarded more contracts to private operators to build, own, and operate these facilities, with awards going to those requiring the lowest transparent government subsidies.

• More public funding for research and innovation

• Increased cooperation in international basins

A new round of negotiations of the World Trade Organization in 2010 agreed to add water subsidies to the list of unacceptable subsidies to inputs for agriculture. As this policy was implemented in the years that followed, food prices from exporting countries rose slightly, improving farm incomes in developing countries. Prices eventually stabilised around their previous level, but low-income urban dwellers felt the pinch of higher food prices while they lasted.

The move to full-cost pricing was coupled with a continuing strong government presence in establishing and managing frameworks of regulatory policies and laws that provided long-term stability. This attracted badly needed infrastructure investments by local and international private businesses. At the same time, investments in public goods and subsidies targeted to low-income water users added to public budget expenditures. Government budgets related to water remained more or less at the levels of 2000 throughout the first quarter of the century. Costs now carried by consumers and the private sector were replaced by investments in public goods, subsidies to low-income women and men, and publicly funded research and development.

More public funding for research and innovation

At the turn of the century there was a dearth of innovative thinking and new technologies for water management, unlike the case for informatics and pharmaceuticals. The Commission realised that the likely cause was that water had not been valued and thus was of little interest to the private sector. Pricing water would eventually spark interest in the sector, but this might take time—and some research areas might never be of interest to the private sector. So the Commission encouraged governments to publicly fund such research, a process that bilateral donors and private foundations helped kickstart in 2000 when they committed to provide funds for water-related research in national laboratories in developing countries, using the model developed by the Consultative Group on International Agricultural Research.

At the turn of the century practitioners knew that urban environmental sanitation needed alternatives to traditional waterborne waste disposal. Pilot projects were implemented in 2000, with a network sponsored by the Global Water Partnership ensuring that experiences were shared. By 2010 communities were applying these lower-cost and more environmentally friendly approaches not only in low-density urban areas and perimeters but also in cities. Also in 2010 hyper-accumulating plants were bred to take toxins out of soil. Through biotechnology, micro-organisms in the soil were used to remove pollutants from groundwater.

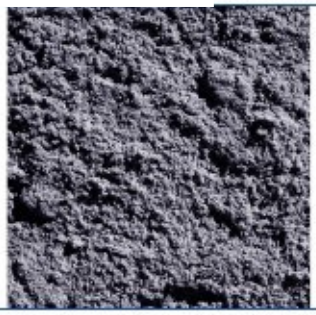
In an unexpected development in 2015, a Canadian research institute developed a strain of grain that had stalks more digestible by animals. The adoption of this strain by such countries as India, then using 500 million tons of cereal residues a year as livestock feed, had a tremendous impact on the feed grain required—and freed up water for other crops for humans. Laboratory work continued on molecular genetics. And there was enough public confidence that field trials had been completed for genetically modified plants combining drought resistance with high yields.

As a result of continuing reductions in the cost of information and communication technology, farmers could manage water and other inputs better—using global positioning systems, satellite connections, and remote-sensing data for precision farming. Using indigenous knowledge, national agricultural institutes were adapting such technologies to the needs of the location and the people in 2015. Qualified local consultants were able to use this information and technology to provide services to farmers at a fraction of what foreign consultants had charged in the previous century. All but subsistence farmers could now afford this technology.

Information technology also offered tremendous opportunities for the way water resource knowledge is distributed and used. By 2010 the large amounts of water-related information on the Internet were managed by networks of experts and resource managers, who categorised it and distributed regular updates on, for example, contacts, projects, laws, methods, tools, and best management practices.

Hydrological data were routinely collected under the guidance of the revitalised United Nations Agency Coordinating Committee's Subcommittee on Water Resources. Initiatives to share the data became widespread, forming the basis for new or updated bilateral and multilateral water-sharing agreements. Environmental data and the underlying understanding of environmental processes were also widely shared, communicated in terms suitable for use in education and public information campaigns and, most important, for river basin management.

In 2000 water resource managers were beginning to understand ecological functions and services. But when they tried to quantify the concepts for use in water resource management



People came to realise that they didn't inherit the earth from their parents— but borrowed it from their children

calculations, they found that very little was known. As a first step, countries recognised that discharge of all pollutants and contaminants to the environment must be minimized. The World Water Forum in The Hague launched research projects to obtain relevant data on the interaction of the water cycle and ecosystems for a variety of geographic and climatic conditions. And the research activities that supported integrated catchment management increased sharply after 2000.

By 2010 scientists from many developing countries had made major innovative contributions to freshwater resource management using funds for local research provided by donors and concepts for innovative water policies and institutions developed by the International Water Management Institute in Sri Lanka. This helped develop local capacity so that by 2015 project implementation depended far less on technical expertise from developed countries. Now in 2025 the minimal water requirements of most flora and fauna in wetlands and rivers are well known and used in planning and managing water resources.

At the turn of the century concern for the environment showed up only in environmental statements, impact assessments, and environmental action plans that were annexes to traditional water resource management plans. In 2000 the United Nations Educational, Scientific, and Cultural Organzation's (UNESCO) International Hydrological Programme began coordinating the teaching of these subjects to change this duality of thinking. It took a generation to train academics, professional teachers, and trainers at the new UNESCO Water Resources Capacity Building Institute in Delft, the Netherlands. But by 2015 environmental awareness was an integral part of engineering and water resource management practices.

As a result of similar training for primary and secondary school teachers, combined with more widespread access to education, children in 2015 were leaving school aware of the interconnectedness of their actions and the environment. Education and awareness programmes—such as Water, the Source of All Life and Our Catchments, Our Wealth—have sharply increased public understanding of ecosystem goods and services and general recognition of the need for water to maintain them. The greater education and awareness have become the impetus for broader public involvement. The view is now common that collective decisions should give due consideration not just to the next generation but to many future generations as well. And that view forms the basis for much of the discussion in catchment committees.

Increased cooperation in international water basins

In May 2000 not enough nations had ratified the United Nations Convention on the law of the Non-navigational Uses of International Watercourses to bring it into force, after taking more than 25 years to draft it and after the General Assembly adopted it almost unanimously. Although the principle seemed sensible, almost every national government found it either too strong or too weak—with positions often appearing to depend on whether a nation was upstream (too strong) or downstream (too weak) in international basins.

The Commission recommended that governments voluntarily accept the limitation of their sovereign rights to permit consultations and decisions based on integrated water resource management at the basin level. Some countries objected. Others were already applying the principle, and countries from the Middle East and from the Nile basin made presentations at the Second World Water Forum describing their cooperative efforts.

As more nations and communities applied the principle in their watersheds, it became clear that it was the right approach. It was only a short step to apply the approach to international basins, accepted in almost all international watercourses by 2020, when a new international convention codifying the principles and specifying dispute resolution mechanisms was ratified by countries of the United Nations.

Note

1. In the scenarios explored in chapter 3 world population in 2025 ranges from 7.3 to 7.8 billion. In our Vision we have assumed that increasing prosperity will continue the trend towards lower popuation growth—and used 7.5 billion people for 2025.