



International Lake Environment Committee Foundation



United Nations Environment Programme - Division of Technology,
Industry and Economics - International Environmental Technology Centre

Lakes and Reservoirs

*... how to involve the public in protecting them
from degradation*



www.unep.org

United Nations Environment Programme
P.O. Box 30552 Nairobi, Kenya
Tel: (254-2) 621234
Fax: (254-2) 623927
E-mail: cpinfo@unep.org
web: www.unep.org



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Lakes and Reservoirs: ...how to involve the public in protecting them from degradation (UNEP-IETC/ILEC Vol. 4)

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UNEP-IETC and ILEC 1091 Oroshimo-cho, Kusatsu, Shiga 525-0001, Japan

Text: M. Trudel, E. Wysokinska, W. Williams and W. Rast
Editing: J. Barmies
Design and production: Vicente Santiago, Maki Tanigawa
Cover: Maki Tanigawa

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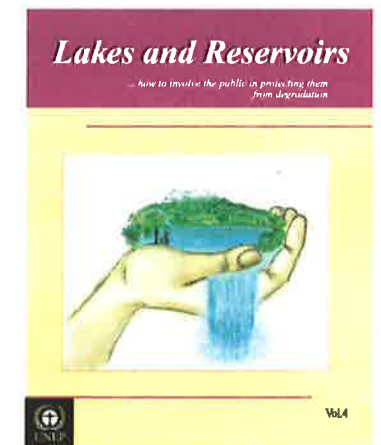
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Volume 4



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"We are all part of it"

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This booklet complements the other three volumes of the UNEP-IETC Short Series, by addressing the need to protect and properly manage lakes, reservoirs, rivers and other freshwater bodies. Although the previous three volumes contained short sections related to this topic, the specific goal of this booklet is to provide a greater insight into the process of encouraging citizens to participate and become more involved in the protection and care of freshwater resources.

This volume explains why public participation in the management and conservation of the planet’s fresh waters is essential; why the earth’s lakes, rivers and watersheds in general, if they are to survive as natural assets capable of sustaining humanity, need the participation of the public in protecting them; why they not only need the protection provided by governments and official organizations, but also the protection that can be provided by individuals and by non-governmental organizations, particularly in view of the fact that it is now believed that the big change likely to occur in managing water resources will occur when all the participants of society have the power to manage their resources. Together with the others of this series, this volume was developed to assist in facilitating this important process of empowerment, understanding and acting.

With this present volume, this Short Series comes to an end. In developing and disseminating this Short Series, the primary goal was to provide readers with information about freshwater resources and the environment. Volume One focused on lakes and reservoirs, particularly their similarities and differences, as well as their management implications. Volume Two discussed the watershed, beginning with its collection of water from rain and snow until the end of its journey to the sea. In Volume Three, the problem of accelerated eutrophication, which is affecting thousands of freshwater bodies around the world, was discussed and analysed. This present volume discusses the protection and care of these valuable resources, including the urgent need to raise public awareness of the value of these freshwater resources.

We cannot properly finalize this Foreword, or the Short Series, without acknowledging and thanking all those who have written or contributed to the preparation of the different volumes. Unfortunately, some of these individuals left us during this process, most notably the late Professor Milan Straskraba and Professor William D. Williams. These individuals were among the premier scientists in their fields, and will be missed by their professional colleagues as well as their many friends. We also wish to express our appreciation to the respective agencies that made this effort possible, by providing funds, personnel and equipment.

The design and production of this Short Series was totally an in-house effort, and we believe the final product was worth the effort. We hope that our readers share this view.

S. A. Halls

Steve Halls
Director
United Nations Environment Programme
Division of Technology, Industry and Economics
International Environmental Technology Centre

山崎 圭

Kei Yamazaki
Director General
International Lake Environment Committee Foundation

Why is public participation needed to protect freshwaters?

Everybody, whether citizens of a town, village or other type of settlement, wants to drink safe water, breathe clean air and enjoy the beauty of the landscape. Human life is affected by the aquatic environment, as well as being dependent on the behavior of other individuals of the community.

Many human activities can have adverse impacts on the quality of freshwater. These activities include the discharge of wastewaters from plants and factories (pollution), storm-induced water drainage from agricultural and urban areas, salinization, and the introduction of exotic animals and plants. Restrictions of various kinds are needed to manage such activities, thereby also protecting freshwater resources. The restrictions are often legal in nature. If they are to be effective, however, active public acceptance and voluntary implementation is essential. Legal restrictions (e.g., criteria for waste discharges) can be applied to point source industrial wastewater discharges, and can generally be enforced without great difficulty. Voluntarily-implemented restrictions usually apply on a wider scale, often to small and diffuse impacts (whose impacts may actually be more important in some situations than those of point source discharges) and are generally more difficult to enforce. In fact, if these restrictions are to be effectively implemented and enforced, the willing and active cooperation and support of the public is essential.

One clear answer to the question of why public participation is needed to protect freshwaters, therefore, is that it is needed to implement certain management measures that may be difficult, if not impossible, to enforce without it.

Another reason is that members of the public can often be very important in changing government views when these views are 'tunnel vision' in nature, driven by vested or sectoral interests, or simply uninformed. An excellent example is provided by the Mono Lake Committee (USA), a small group of conservation-minded citizens in California who banded together to try to change the views of the Los Angeles Water Authority on the values of Mono Lake (Photo 1). They were successful,



Photo 1: Mono Lake in California.

thereby saving one of California's most beautiful lakes from the severe degradation suffered by downstream Owens Lake. More details on this effort are given later.

Public participation provides individuals and groups with the means to inform decision-makers about their views on given water issues. This is a crucial reason for public participation in all processes involved in the protection of freshwater bodies. Public participation also is a mechanism whereby people can express themselves and act with

mutual responsibility to promote equity and sustainability, so as to achieve a desired goal.

Another clear answer, therefore, is that public participation, by supporting conservation bodies, has been, and remains, a strong mechanism for protecting the natural aquatic environment.

Public participation is also good sense from the perspective of governments and water resource managers. Why? There are many components to this answer as shown in Table 1.

Table 1. Important points for public participation.

- In democratic societies, government policy agendas, in this case with respect to freshwater resources, are fundamentally defined by the public;
- Policies and decisions that include significant inputs from public participation (consultation) are to some extent publicly 'owned' (commonly-used phrases in these cases refer to public 'ownership' and 'empowerment');
- Public participation enables governments and water managers to 'tap into' local knowledge;
- Everyone affected by decisions will not feel their views were not considered (even if they were not completely utilized);
- In many countries, large parts of lake and reservoir catchments are owned by the public (i.e., by individuals rather than the state);
- Following public participation, decisions can often be reached more quickly (there are likely to be fewer, time-consuming objections);
- It is good business sense to give the customer (i.e., the public) what it wants; and
- Best practice environmental management (BPEM) recognizes the good sense of proactive community consultation.

Why it is important to protect freshwaters

Freshwaters — lakes, reservoirs, rivers and streams — have many uses and values. All freshwaters, however, are also subject to impacts from human activities, which can cause loss or degradation of these uses and values. Protection from human impacts, therefore, is an important consideration. What these impacts are, and what effects they have, is discussed in the next section. The discussion herein focuses on the uses and values of freshwater resources.



Photo 2: Amagase dam along the Seta river built to stop flooding downstream. The water is used to supply the city of Osaka and also produces hydropower.

The most obvious use of freshwater has economic considerations, particularly as a water supply for agriculture, the industry, cities and towns (Photo 2). Because these economic uses are essential for the economic well-being of human populations, large volumes of water typically are needed for such purposes. Furthermore, because it is relatively easy to price the volume of water used for such purposes, economic considerations of freshwater supplies overshadows their many other uses and values.

Notwithstanding this reality, other uses and values of freshwater are also significant, and must be kept firmly in mind. It is also important to recall that not only is the quantity of water important, but also its quality. In many cases, human activities not only consume water (consumptive use), they can also profoundly and adversely affect water quality. As the basis for further consideration, a brief summary of the major uses and values of fresh waters is provided below.

Economic uses

Water is needed by human beings for drinking, washing, cooking, and for sanitation. The recommended basic requirement for domestic purposes is about 50 litres a day. Thus, for a world population of almost 6 billion people, the total volume of freshwater needed for domestic use annually is at least $110 \times 10^9 \text{ m}^3$. The volume of water needed by agriculture to grow the food to keep the population alive also must be added to this total. Agricultural water needs are much greater than human consumption needs, given that 600 and $1,800 \text{ m}^3$ is needed each year to grow the food for one individual. Industry also uses large volumes of water. Including hydropower, navigation and fishing, over $6,000 \text{ km}^3$ of water are presently used each year (estimates vary) for activities with economic considerations, of which about 67% is used for irrigated agriculture, and less than 3% for domestic purposes.

Recreational uses

Many freshwater bodies are used for sports activities, boating (Photo 3), sightseeing, swimming, photography and other active or



Photo 3: Boating at Tupper Lake in Denmark.

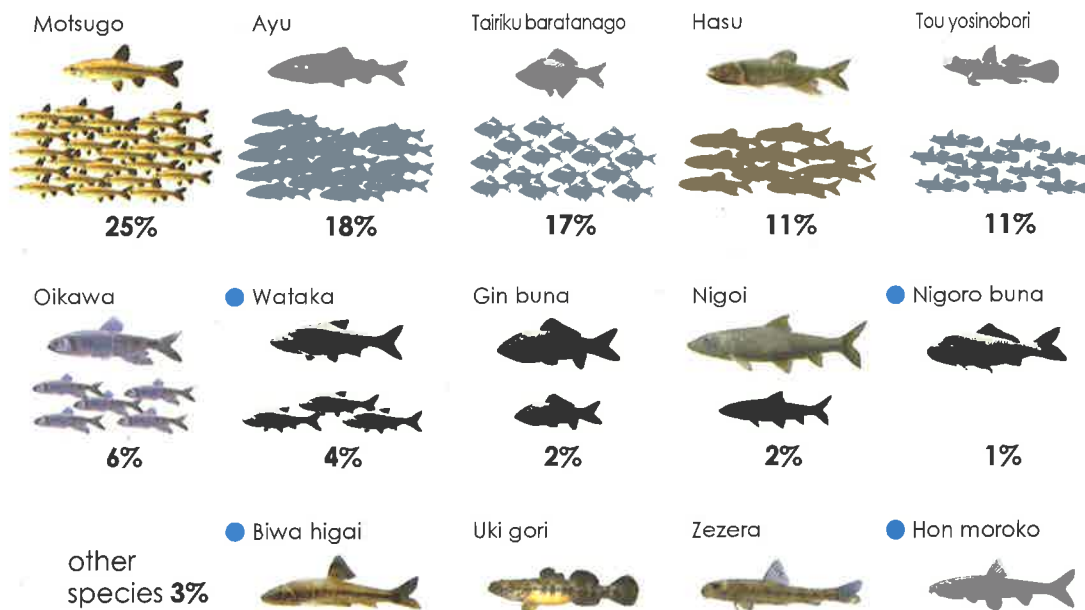


Photo 4: Koi carp caught by an angler or sports fisherman in Lake Biwa (Japan).

passive recreational pursuits. They are also important for sports and commercial fishing. Angling (Photo 4) deserves special mention, primarily because a number of non-native or exotic fish species have been introduced into lakes and reservoirs by individual anglers or associations for sport fishing. Unfortunately, due to lack of knowledge about their impacts, introducing fish from other places into a new environment lacking their natural controls (e.g., predators, environmental conditions), has resulted in some cases in the decimation of existing native fish species, while also affecting entire local fisheries as well. There are many examples of this phenomenon, with Lake Biwa, Japan, being one of them (Figure 1). The introduction of blue gill (*L. macrochirus*) and black bass (*M. salmoides*) to Lake Biwa has affected both native and non-native species (particularly in some parts of the lake), including ayu (*P. altivelis*), wataka (*I. steenackeri*), motsugo (*P. parva*), hasu (*O. uncirostris*), and tairiku-baratanago (*R. ocellatus*). To avoid this problem, it is essential that fisherman and anglers, as well as those engaged in aquaculture or fish farming activities, consult with experts, aquatic biologists or ecologists, as well as local government officials responsible for fisheries before introducing any new species to freshwater bodies.

1971

● native and non-native species



1998

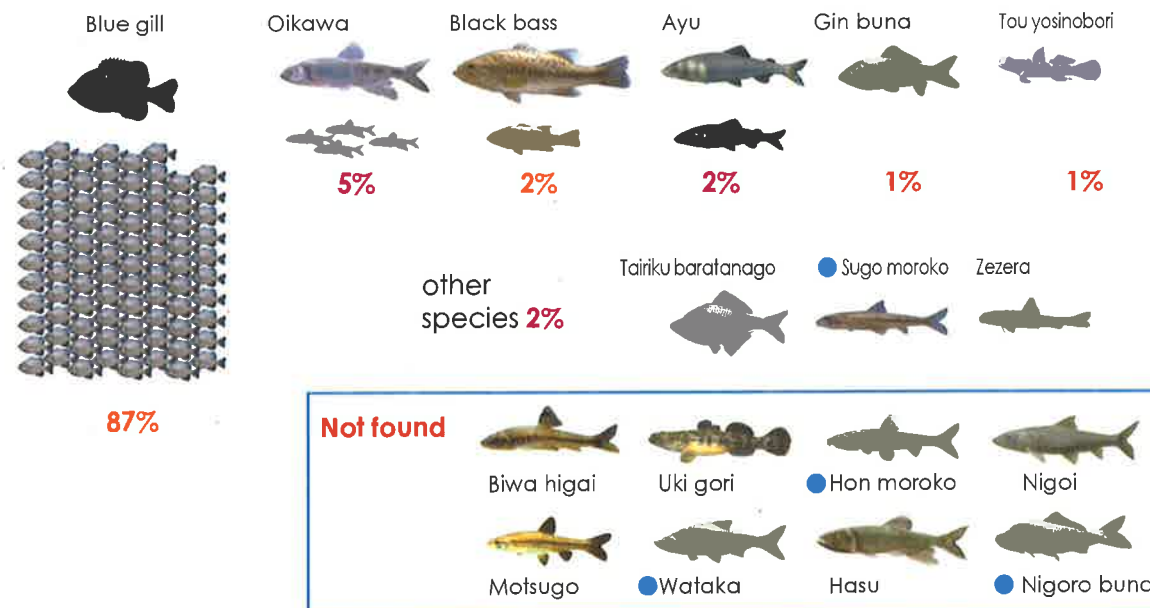


Fig. 1: Variation of fish diversity (as percentage) in one section of Lake Biwa (Japan) due to the introduction of blue gill and black bass.

Aesthetic values

Often termed 'inspirational' or 'spiritual' values, these values are impossible to place a price on – indeed, there are some who say these values are priceless! However, although difficult to quantify, such values have long attracted the attention of poets, artists, writers and the religious.

Cultural values

Many lakes and rivers have played a critical role in human history, forming an integral part of our common cultural heritage. Religion and socio-cultural values are part of the human existence. Also a beautiful place for praying (Photo 5), they can facilitate lasting participation in achieving the goal of integrated watershed management for sustainable water use.



Photo 5: Lake Temple and Mosque in Sulawesi, Indonesia.

Educational uses

As discrete, biologically-comprehensive and accessible habitats, lakes, rivers and other bodies of inland water also represent unique educational 'tools' for informing and educating the public.

Scientific values

The biota and ecological processes of freshwater bodies have long attracted attention from a number of scientific disciplines, being the subject of countless investigations. Such investigations are very important, primarily because they tell us how parts of the living world are structured and how they function, as well as what the past was like, and perhaps what the future may be.

Ecological values

As integral parts of the global hydrologic cycle, pathways for the circulation of essential elements, and repositories for a significant fraction of the world's biodiversity, freshwaters have an important ecological role in sustaining the planet's life-support systems. These so-called 'ecosystem services', like many other non-recognized-economic values, are difficult to value economically, although studies are underway to develop tools for assessing these services. One estimate is that the annual value of ecosystem services provided by wetlands, lakes and rivers in the world are worth about US\$ 6.6 trillion dollars (Photo 6).



Photo 6: A small portion of the ecosystem services worth in dollars.

Who is the 'public'?

A broad definition of the public is that it is the people within a country or locality, or the community within a specified region. It comprises people of diverse interests and attitudes, and groups of people distinguished on the basis of common interests. People in different locations or societies can have differing cultural, ethnic or religious backgrounds, different family and social values, and different educational and social levels. Groups comprising the public include residents, business people and industrialists, environmentalists and farmers. Not all have the same concerns with respect to the management and conservation of freshwaters - indeed, many people and groups may have conflicting views on this issue. For the purpose of this discussion, however, the public may be taken to represent all those people and groups in the local community with an interest in the management and conservation of freshwaters, whatever their individual views, supportive or otherwise.

What the public should know

For the public to participate fully and effectively in the protection of freshwaters, it should be aware of, understand or have some general knowledge of three things. First, it should be aware that freshwaters are an integral part of our planet's life-support systems. Second, it should understand the

nature and magnitude of major impacts on freshwaters. And third, it should know something about mechanisms and legal matters appropriate to needed management and protection activities regarding freshwater.

Freshwaters as integral parts of the planet's life-support systems

Our freshwater represents the precipitation that reaches the land surface in the form of snow or rain, and which subsequently gives rise to lakes and rivers (and reservoirs when rivers are dammed) on its journey back to the sea. Some of it penetrates the earth's surface to form groundwater. Although some rain may be temporarily stored in 'closed' lakes (i.e., lakes without surface outlets to the sea), all the water that has fallen over land will eventually reach the sea again. The global pathway followed by freshwater in its movement through the environment is essentially circular, and is termed the hydrological cycle (Figure 2). Some more

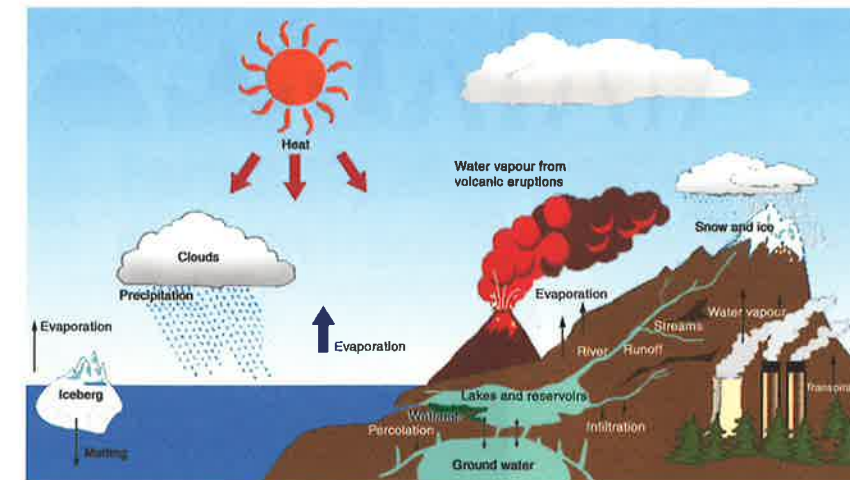


Fig 2: Earth hydrologic cycle.

details can be found in the earlier Short Series booklets. It is often and appropriately referred to as the earth's plumbing system.

Lakes and rivers, however, contain not only water and the dissolved and suspended materials carried in it, they also contain plants and animals which can transform and utilize energy in sunlight. Photosynthesis, respiration and decomposition are key biological processes involving freshwater bodies. In a sense, therefore, freshwater systems form part of the earth's energy system.

The types of plants and animals present in freshwaters are many and varied, and freshwaters are truly among the most diverse of

all natural habitats on earth. They are said to have a high biodiversity (Photo 7). This property also is important in the global scheme of things, primarily because high biodiversity is regarded as an effective way of dealing with natural disturbances (in the same sense that a broad portfolio of stocks lessens the risk of financial disaster when one or a few of them suffer significant financial disturbances). Thus, the high biodiversity observed in freshwater systems can be regarded as part of the earth's security system.

Considered from this perspective, therefore, freshwaters can be regarded as important components of the earth's plumbing, energy and security systems.



Photo 7: Lake Elementeita in Kenya - a jewel in biodiversity. The pink dots are flamingos.

The overall impacts of human beings on many of the world's freshwaters have been significant, often irreversible, and almost always adverse. These impacts include a significant loss or degradation of freshwater values and uses, including decreased biodiversity and water quality, unhealthy conditions and changes in the natural characteristics of freshwaters.

Photo 8: Liquid and solid waste disposed in canals and water bodies.



There are six major causes of the impacts, including 1) pollution (considered as a significant, deleterious change in the natural character of a waterbody, as a result of the addition of substances or heat produced by human activities- Photo 8); 2) catchment changes (including urbanization, deforestation; Photo 9), irrigation, burning of natural vegetation and overgrazing; 3) direct hydrological changes (drainage of natural water bodies -Photo 10, construction of reservoirs and impoundments, changing of water levels, diversion of stream flows and linkage of river



Photo 10: drainage of a wetland in Honduras.



Photo 9: deforestation caused by logging.

systems); 4) exploitation of flora and fauna; 5) introduction of alien species (animals and plants from other regions - Figure 1); and 6) climate and atmospheric changes (including temperature, rainfall patterns - Photo 11, humidity and concentrations of carbon dioxide).



Photo 11: Yangtze river flooding record in 1998 (29.43 m.); Wuhan city, China.

Forms of public participation and environmental education

Public participation is basically concerned with involving, informing, and consulting the public in the planning, management, and other decision-making activities that can be considered as part of the political process (Photo 12). The process encourages and provides opportunities for the public to express their views, and for governments to learn about the views of the public, and to find opportunities to build a bridge between the two entities. The participation of people in such activities is a dynamic group process, and should encourage actions that build trust and credibility for the process, and among the participants, at all times.

Public awareness issues and concerns about the quality of the environment have

triggered several forms of public participation directed to environmental protection. The forms of public involvement in the decision-making process depend on its nature. Some forms of public involvement are used to establish a local strategy for water resources conservation, others are used to resolve emergency conflicts arising from a clash of conflicting interests (Photo 13), and still others are employed in the implementation of local and regional projects directed to the conservation and use of water resources.



Photo 13: A public manifestation against the construction of a dam.



Photo 12: Citizen consultation in Nepal.

One common form of public participation is through the activities of environmental groups. The involvement of social organizations, non-governmental organizations (NGOs), and volunteer organizations is often seen as a necessity for organizing and mobilizing community support and for turning a programme into a local, regional or national



Photo 14: Garbage collection by local citizens in Lake Biwa in Japan.

movement (Photos 14 and 15). The work of NGOs exemplifies the complimentary nature of these interventions in legal, health and social spheres with natural resource management efforts. For a given watershed development

programme, NGOs can play a role in catalyzing watershed management efforts and strengthening government capabilities and resolve. The capabilities of individual NGOs depend on their levels of devotion to the issue, and on their technical and social understanding (Table 2).

Another way to involve people is through public agencies (e.g., creation of a steering committee) that facilitate broad cooperation between stakeholders and the efficiency of activities being undertaken. Yet another way to involve people is through a citizen advisory committee that supports the work of local authorities, and constitutes a bridge between social groups and authorities, but which may have limited influence on the decision-making process. Public panels, on the

other hand, are typically independently-elected representatives of a given community that have the capability of identifying problems and solutions for individual freshwater bodies or river basins.

There are also a number of activities where individuals can get directly involved, including clean-up campaigns, participation in meetings and fora to insure consideration of community needs, monitoring of water quality, etc. As one example, participation in the 'Clean the World Campaign' of Rio Ceballos, in the province of Cordoba, Argentina, was used to make people aware of the importance of the reservoir. In response, public awareness materials were produced, and the community participated in workshop and clean-up activities.



Photo 15: NGO and citizen activities for the protection of Lake Chapala.

Table 2. Examples of collaboration in different parts of the world between NGOs, citizens and Governments to protect lakes

Lake	Country (ies)	Problems	Some Relevant Actions	
			Citizens	Government
Laguna de Bay	Philippines	Pollution, Eutrophication and Siltation	Community Mobilization and communities, participation in river councils	Sharing responsibilities with NGOs, and the Private sector
Chapala	Mexico	Lack of water inflow Pollution Law enforcement Extinction of local fish species Reduction of fisheries Wetlands destruction Shore vegetation destruction	Community Mobilization, Clean-up campaigns, Reforestation, Removal of weeds, and Exchange of information	Clean up of weeds, building of Water Museum, creation of fishfarms, interact with NGOs and citizens to recuperate the lake
Peipsi	Russia-Estonia	Pollution, Signs of overfishing	Establishment of the Peipsi Centre for Transboundary Cooperation, Env. Education Activities, cooperation with the municipalities	Adoption of treaties and signing of agreements, and environmental protection
Victoria	Kenya, Uganda and Tanzania	Desiccation Pollution Salinization	Training activities and Environmental Education, Opposition of methods for the removal of water weeds	Collaboration in restoration projects and steps to, harmonize legislation between the countries

Environmental education is one of the most effective tools for public involvement. It must be approached, however, as a continuous, lifelong process that involves learning about nature through scientific knowledge, arts, personal experience and imagination.

The first, and perhaps most important, link in the chain of environment education is at the nursery school level. The education of children, supported by positive home models, yields the best results. Environmental education of the youngest of our citizens should be conducted according to the motto, 'to know, to love, to protect'. Some of the best places to realize and demonstrate this principle is with water environments, particularly since rivers or ponds, lakes or streams may be found everywhere (Photo 16).

The next stage of education is at the primary- and secondary-school level, where the above motto should be broadened to consider a number of the aspects identified in Table 3.



Photo 16: March for water, Canada.

The best results, regardless of age, typically is gained when educational activities are conducted in direct contact with nature, thereby facilitating emotional links and the participation of schools in monitoring and research projects. This form of active education also allows students to use their acquired knowledge.

One example of a joint international cooperation activity is The 'Blue Thumb' Program, which promotes protection of

freshwater resources. This Program was conducted throughout Poland, beginning in 1977 in cooperation with the NGO organization, 'Water for People', from Denver, Colorado, in the United States. Thus far, at least 600 educators, media representatives, and 3,000 school children and young people have participated in the program. School children in primary and secondary schools have organized 'Blue Thumb' clubs for carrying out their own water resources protection activities. The program results, there are published in Cracow

Table 3. Some important aspects related to environmental education in primary and secondary schools (Pamolar book):

- Developing an ability to observe, study, search, collect and interpret information about the water environment and its conservation;
- Learning about natural laws and relationships occurring in the water environment;
- Outlining general ecological principles;
- Developing the ability to solve problems associated with protection of lakes and reservoirs on the basis of acquired knowledge and the adopted system of values;
- Perceiving lakes and reservoirs as valuable elements of the landscape, and an indispensable component of the spatial order;
- Emphasizing the interdependent, causal relationships between land, freshwater and marine environments;
- Perceiving the water environment as an indispensable element for health and a good standard of living;
- Stressing concepts of sustainability;
- Initiating and maintaining contacts with local government authorities and other organizations representing local communities, schools of higher education, centers and institutes of environmental education, and state administration agencies and institutions;
- Initiating and participating in national and international programs to increase environmental awareness;
- Joining national and international water environmental monitoring projects;
- Extending and undertaking practical actions to protect freshwater bodies;
- Demonstrating the positive role of children and school pupils in education and in increasing the awareness of adults;
- Initiating and conducting environmental education in one's local community.

in the Bulletin, 'The Blue Thumb', with financial assistance from the Clean Water Fund, to insure their widespread distribution.

Using a mix of tools is often a factor in insuring success, since it emphasizes different means of communication, and can reach audiences through learning patterns that they identify as part of their own nature.

Another means of facilitating children's education is via camps, meetings, excursions and field trips organised by schools. The possibilities are only limited by the imagination and enthusiasm of the teachers and pupils (Photo 17).



Photo 17: Floating school in Lake Biwa. A ship built for educational purposes.

The next appropriate stage of environmental education is at the high school and university level. All available forms of environmental education can be used to provide students with direct contact to environmental issues focusing on the use and protection of environmental resources and the development of environmental awareness.

Within tertiary institutions, courses can be built around school curricula, and can be both multi- and inter-disciplinary in nature. The available courses should cover not only the strictly environmental issues, but also the relevant social, legal, ethical, economic and political issues.

As previously mentioned, environmental education should be viewed as a continuous, lifelong process.

General or specialized environmental education should also be conducted, as appropriate, by adults, by specialized teams of teachers with various subject backgrounds (Photo 18), by employees of the state and local government, and by local administrators and leaders.



Photo 18: Specialized training course for experts in modeling.

Also, museums and aquarium are excellent places where the public can learn about the environment (Photo 19).



Photo 19: Children and families enjoying the contact with aquatic life at the London aquarium in the UK.

How can the public be informed and involved?

There are many ways for the public to obtain information about freshwaters and the human-induced impacts that affect them. One way is via the media, which can play a key role in shaping environmental public awareness, and in transmitting environmental messages to the public (Photo 20). The media can also be very useful in identifying and highlighting



Photo 20: TV recording of a public pro environmental gathering.

freshwater problems for specific water bodies, and the consequences if they are ignored. Thus, the level of awareness of individuals working for the media is very important, including the incorporation of media representatives into the stakeholder group for various forms of planned contacts with the public. In fact, cooperation with the media represents one of the simplest and quickest ways to reach public opinion.

A modern and powerful source of information for those with access to a computer and telephone connection is the World Wide Web (Internet). Internet searches can immediately identify relevant information and data sources of local, national and international interest. At the same time, however, the Internet does not contain all the existing

information about any topic. Further, not all the information and data obtained in this manner is necessary useful. Some international sites (URLs) of particular interest in regard to freshwater resources include:

Table 4. Web page address of relevant Environmental Organization.

- Global Water Partnership (GWP)
<http://www.gwpforum.org>
- International Institute for Sustainable Water Resources
<http://www.swt.edu/iiswr>
- International Lake Environment Committee (ILEC)
<http://www.ilec.or.jp>
- International Rivers Network
<http://www.irm.org>
- International Water Management Institute
<http://www.iwmi.org>
- LakeNet
<http://www.worldlakes.org>
- Ramsar
<http://www.ramsar.org>
- United Nations Environment Program
<http://www.unep.or.jp>
- World Conservation Monitoring Centre
<http://www.wcmc.org.uk>
- World Conservation Union (IUCN)
<http://www.iucn.org>
- World Water Council
<http://www.worldwatercouncil.org>
- Worldwide Fund for Nature (WWF)
<http://www.panda.org>

Note: URLs often change. Those listed were correct as of October 2002

The Internet can also be used to link or connect members of the public. Data and information can be exchanged, shared and spread, collaborative arrangements can be made, and mutual support groups can be developed in this manner. In this way, the Internet can facilitate two-way communication within the public arena.

More traditional sources of information and data include libraries, government and non-governmental organizations, and research centres, as well as individual teachers, lecturers, scientists and other professional persons. A simple expression of interest to an organization can often elicit the regular receipt of newsletters, bulletins, magazines, fact sheets and update pages. Radio and TV programmes also should not be forgotten as sources of information, and as a means of influencing the public.

The public obviously can be involved in the protection of freshwaters at a variety of levels, ranging from the relatively inactive to the vigorously proactive (Photo 21).



Photo 21: Citizens of Bogota (Colombia) in a 'green' march asking for the protection of the environment.

To convey messages and involve different target groups to actively participate in such efforts, the use of educational material, including magazines and newsletters for children and adults that contain articles, stories, games and crosswords on environmental issues, are also quite useful. The example discussed below shows how, starting from an educational magazine aimed at school children, it is possible to use other tools and invite different target groups to participate not

only in the magazine, but also in translating their ideas into actions directed to the protection of their local environment.

The World Conservation Union (IUCN) started an environmental education programme in the mid-1980s, spearheaded by a 24-page magazine called 'Walia' (Photo 22), that was published three times a year. The magazine has a familiar form of address, directly involves the reader, and creates a sense of closeness and a need to react. Once the magazine is distributed, the publishing team visits targeted schools and challenges students to speak up about environmental issues

and to think about solutions to environmental problems. Visual aids (e.g., posters, games and demonstration activities) are used during these visits. Students are then asked to interview key people in the community in order to collect information, thereby also learning about traditions, tales, legends, environmental protection practices in previous times, and present rural practices. Once this information is collected, it is possible to start discussions on potential actions. A Walia club is established, providing young, motivated readers with an opportunity for action. Teachers help them to find local partners, and governmental and traditional authorities to support practical activities. The experience of this integrated approach is still ongoing, and has provided valuable knowledge on how to establish environmental education programmes in different parts of Africa, each with their own colours, taking into account different problems and priorities.



Photo 22: Cover of the Walia Magazine.

The United Nations Environment Programme published in the year 2000 a book by the Young People of the World entitled "PACHAMAMA Our Earth - Our Future" (Photo 23). This book is designed to serve as an introduction to young people to the environmental challenges during the 21st century. It describes the state of the world's environment and what action governments and young people are taking to address the problems facing humans. The book was prepared using contributions from thousands of young people around the world, it includes personal accounts and poems amongst other parts.

Where the Internet is not available, or is not part of people's daily lives, a mix of approaches, based on indigenous efforts, tradition, culture, religion and mores of the

local people, and with facilitated efforts including governments, can facilitate the process of involving individuals in the management of freshwater bodies. In many developing countries, in addition to religious practices and ceremonies, the use of traditional rites and special events can provide specific information on environmental problems, using non-technical language. Their very attractive form of communication for broad audiences combines entertainment, religious belief and education (Photo 24).

Other forms of cultural expression, such as drama and art, can play an important environmental education role in some situations. Where people are passive recipients, such activities can ignite their imagination and sensitivity. Alternatively, one may express feelings in paintings, graphics or in words.

The example of 'The Month of Art' in Senegal demonstrates how it is possible to link traditional expression with modern children's work, and with thoughts and scientific research. Based primarily on painting and story telling, an exhibition of the children's work was prepared, and subsequently dedicated to scientists attending an international meeting to discuss coastal resource management issues. This opportunity demonstrated that making a link as soon as possible between scientists and local people faced with an issue is a key to success in protecting natural resources.

The use of religion and cultural heritage expressions, and heroes and spirits from the past can be examined as an effective communication pattern for freshwater management issues. In this manner, they are resurrected and re-examined in an education process directed to a better future.

In fact, the public can be involved in many ways in regard to their different cultural and social situations, as highlighted in Table 5.

Table 5. Ways in which the public can be involved in addressing protection of water resources

- By influencing the attitudes of friends, family and associates;
- By conserving water in the home and garden;
- By obeying both the spirit and the letter of the laws directed to freshwater protection;
- By making a donation to an appropriate organization, or by including it as a beneficiary in a will;
- By seeking information on relevant policies of political parties, and voting appropriately;
- By writing to local politicians to clearly express one's views. Many politicians know from experience that one letter expressing an opinion is actually expressing the opinion of many of his/her constituents that have not written a letter;
- By writing letters to newspapers on topical issues of interest and concern;
- By using other forms of communication (TV, radio, drama, Internet) to communicate views;
- By writing magazine articles;
- By responding to government requests (advertisements) for public participation in consultative committees, steering groups or management boards;
- By joining or forming non-governmental organizations concerned with freshwater protection, and by volunteering to serve as an executive member of such organizations;
- By monitoring the status of nearby water bodies; and
- By being involved in local efforts and in groups engaged in rehabilitating aquatic habitats.

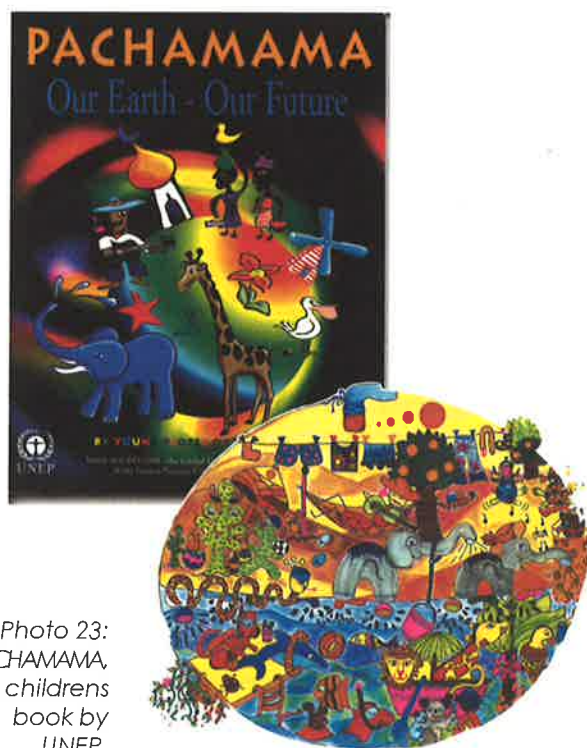


Photo 23: PACHAMAMA, a childrens book by UNEP.



Photo 24: Using traditional media 'Tiori Ble Diarra group' use masks to convey discussion surrounding environmental issues, Mali.

Case studies

Lake Washington

Lake Washington (Photo 25) is a large freshwater lake in northeastern Washington State, USA. It is 65 m deep and 65 km long. The city of Seattle developed on its shores in the 19th Century, and by 1922 there were 30 sewage outfalls into the lake. A major sewerage scheme to divert sewage was completed in 1936. However, the continued expansion of Seattle and nearby lakeshore communities quickly overwhelmed its capacity. As a result, the condition of the lake deteriorated, with many of its uses and values threatened. By the 1950s, it was clear that serious environmental problems would occur if protective actions were not immediately undertaken.

Accordingly, a scheme to divert sewage to the sea (via Puget Sound) was proposed, and after much debate, often acrimonious, it was implemented. Sewage diversion began in the



Photo 25: Lake Washington.

1960s, and by 1967 all effluent formerly discharged into Lake Washington was diverted. The conditions in the lake quickly improved. The important point of this story is that it was public action and an informed public vote that insured the success of the scheme.

Mono Lake

Mono Lake (Photo 26) is a large, permanent salt lake located east of the Sierra Mountains of California, USA. Before 1940, it was over 200 km² in area, had a maximum depth of 57 m, and a salinity of about 50 g L⁻¹. It was important as a feeding and breeding site for migratory waterfowl, had an endemic brine shrimp, was of cultural value to the local Indian community, and was regarded by many as a lake of outstanding aesthetic appeal. However, in 1941, its freshwater inflows began to be diverted. As a result, the lake's water level fell, its salinity rose, and many of its values were threatened or began to degrade. By 1980, the water level of the lake had fallen 14 m, and its salinity had risen to about 90 g L⁻¹. In response to these events, a small public group (the Mono Lake Committee) was formed, and began to actively lobby the government to reverse the decision to divert inflows from the lake. After much effort and protracted debate, the group was successful and a legal decision rescinded the right for inflows to be diverted. The important point of this account is that an active and



Photo 26: Mono Lake.

committed public group, without government support - and indeed at times in the face of active government opposition - was able to bring about the protection of the lake.

Aral Sea

The Aral Sea (Photo 27) is a large, closed lake in central Asia, bounded by Uzbekistan and Kazakhstan. Its inflows are the Syr and Amu Darya. Significant diversions of these rivers for agricultural irrigation began in the 1960s. As a result of these diversions, the area and volume of the lake in the year 2000 had decreased to about a third of pre-1960 values. Its salinity during the same period rose from about 10 to over 50 g L⁻¹. These changes have led to the loss or significant degradation of the lake's uses and values, including the collapse of its previously vigorous commercial fishery, and the disappearance of its conservation values.



Photo 27: Aral Sea.

Furthermore, the lake can no longer serve as a local transport route, and its cultural identity has been lost. Because of the oppressive political climate prevailing at that time, little public debate was tolerated, and that which did take place was unwelcome and ineffective. As a result, the lake was lost as a natural entity, with the governments of Uzbekistan and Kazakhstan now concluding that it is no longer economically feasible to restore it, despite the many negative environmental impacts that have subsequently developed (including increased salinization, an increased frequency of dust storms involving large areas of now-exposed lake bottom, a more severe local climate, and a deterioration of human health conditions in the region). An important point

to emphasize here is that one of the conclusions of the Brundtland Report (Our Common Future) was that sustainable development requires "a political system that secures effective citizen participation in decision making".

Lake Pedder

Lake Pedder (Photo 28) was a small (about 9 km²), shallow freshwater lake in southwestern Tasmania, Australia. It was regarded as a lake of outstanding aesthetic appeal, with its most scenic attraction being an eastern beach of pink-tinted fine-grained sand. Despite its beauty and location within a National Park, it was inundated (flooded) in 1972 by the Tasmanian Hydro Electricity Commission, as part of plans to provide a huge water storage area (the Serpentine-Huon impoundment). The flooding sparked a large public reaction both within the island of Tasmania and continental Australia, which resulted in the national government forming a Committee of Enquiry. Among the findings of this committee is that the government of Tasmania and its Hydro Electricity Commission (a government body) had withheld information from the public, and had been unwilling to consider public viewpoints. Unfortunate as the loss of Lake Pedder was, it offered important lessons to the public and the government of Tasmania. Further plans to flood natural areas in the same region were abandoned in the face of huge public opposition. The relevant court case now forms an important legal precedent in environmental law in Australia.



Photo 28: Lake Pedder.

Selected further readings

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Fig. 1: Adapted from a figure in the homepage of World Meteorological Organization
<<http://www.wmo.ch/web-en/wmofact.html>>

Fig. 2: Adapted from data of Shiga Prefecture Fisheries Research Institute (1971) and a panel from the Lake Biwa Museum, Japan (1998)

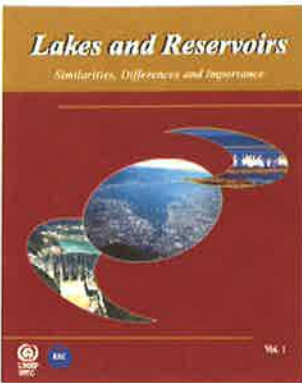
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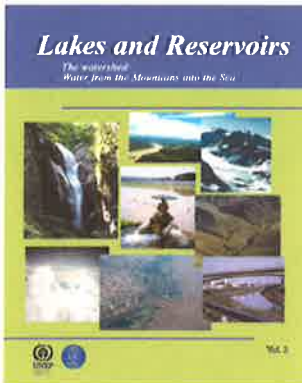
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Note: The above web sites might be changed in due time.

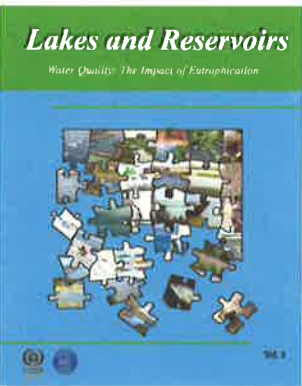
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