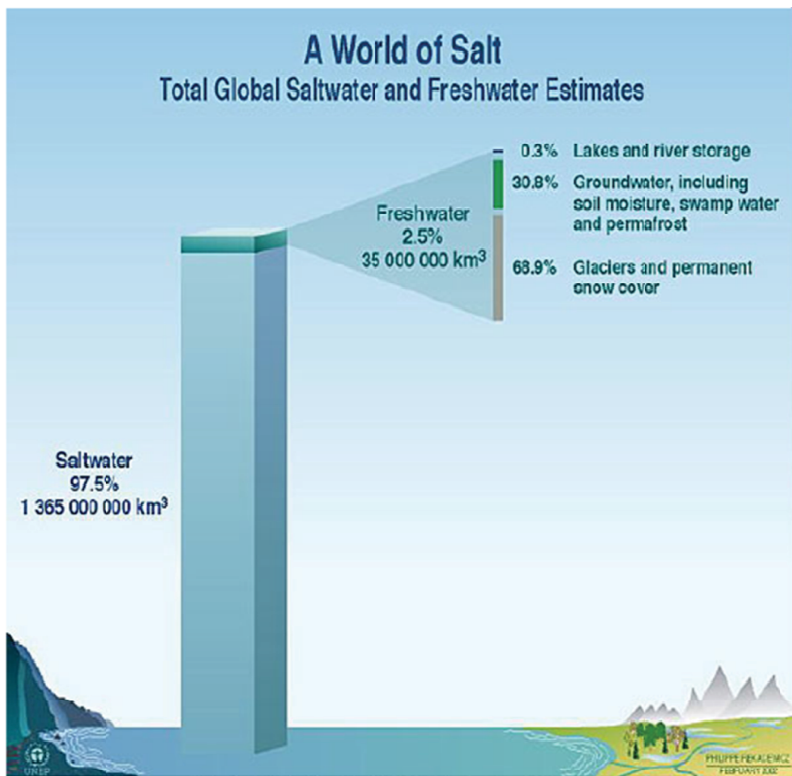


Chapter 1: Introduction

“Every year, more people die from the consequences of unsafe water than from all forms of violence, including war”

1.1 About Water Resources

Clean, safe and adequate freshwater is vital to the survival of all living organisms and the smooth functioning of ecosystems, communities and economies. Water-based ecosystems



Source: Igor A. Shildomenov, State Hydrological Institute (SHI, St. Petersburg) and United Nations Educational, Scientific and Cultural Organisation (UNESCO, Paris), 1999.

provide a diversity of services vital for human well-being and poverty alleviation. Supporting and regulating services (such as nutrient cycling) are critical to sustaining vital ecosystem functions that deliver many benefits to people. The delivery of fresh water is a particularly important service both directly and indirectly. In addition, water sources have significant aesthetic, educational, cultural and spiritual values and provide invaluable opportunities for recreation and tourism.

Water Pollution is the presence of harmful and objectionable material in water in sufficient concentrations to make it unfit for use. Water contamination weakens or destroys natural ecosystems that support human health, food production and biodiversity. Water-borne diseases kill millions people, particularly those under the age of five, world-wide every year. Livelihoods such as agriculture, fishing and animal husbandry are affected by poor water quality. Biodiversity, especially of freshwater ecosystems is under threat due to water pollution.

Water is very important to life and polluted water is a huge concern. Polluted water can lead to serious problems with disease and death of plants and vegetation, humans and animals. Water pollution prevention helps to ensure that there is enough clean water to allow for healthy growth and development of the earth, humans and animals. Prevention and control of water pollution assures that the water can remain safe for consumption of plants and vegetation, humans and animals.

What is water pollution?

It is the presence of harmful material in water in sufficient concentrations to make it unfit for use.

Categories of water pollution

Point source pollution occurs when harmful substances are emitted directly into a body of water. It is easy to monitor and regulate.

Non-point source pollution occurs when pollutants are delivered indirectly through transport or environmental change. Non-point sources are difficult to monitor and control. Today, they account for the majority of contaminants in ground water, streams and lakes.

1.2 Water pollution in India

India's 14 major, 55 minor and several hundred small rivers receive millions of litres of sewage, industrial and agricultural wastes. The most polluting source for rivers is the city sewage and industrial waste discharge. Presently, only about 10 *per cent* of the waste water generated is treated; the rest is discharged as it is into our water bodies. Due to this, pollutants enter rivers, lakes and groundwater.

Such water, which ultimately ends up in our households, is often highly contaminated and carries disease-causing microbes. Agricultural run-off, or the water from the fields that drains into rivers, is another major water pollutant as it contains fertilizers and pesticides. Ground water accounts for nearly 80 *per cent* of the rural domestic water needs and 50 *per cent* of the urban water needs in India. It is generally less susceptible to contamination and pollution when compared to surface water bodies.

1.3 Water quality criteria in India

To set the standard for the desired quality of a water body, it is essential to identify the uses of water in that water body. In India, Central Pollution Control Board has developed a concept of *designated best use*.

According to this concept, out of the several uses of water of a particular body, the use which demands highest quality is termed its *designated best use*. Five *designated best uses* have been identified. This classification helps the water quality managers and planners to set water quality targets and design suitable restoration programmes for various water bodies.

Table 1: Water quality criteria in India

Designated Best Use	Class of water	Criteria
Drinking water source without conventional treatment but after disinfection	A	<ul style="list-style-type: none"> ▪ Total Coliforms Organism¹ MPN²/100ml shall be 50 or less ▪ pH³ between 6.5 and 8.5 ▪ Dissolved Oxygen(DO)⁴ 6mg/l or more ▪ Biochemical Oxygen Demand (BOD)⁵ - five days 20°C 2mg/l or less
Outdoor bathing (Organised)	B	<ul style="list-style-type: none"> ▪ Total Coliforms Organism MPN/100ml shall be 500 or less ▪ pH between 6.5 and 8.5 ▪ Dissolved Oxygen 5mg/l or more ▪ Biochemical Oxygen Demand - five days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	<ul style="list-style-type: none"> ▪ Total Coliforms Organism MPN/100ml shall be 5000 or less ▪ pH between six to nine ▪ Dissolved Oxygen 4mg/l or more ▪ Biochemical Oxygen Demand - five days 20°C 3mg/l or less
Propagation of Wildlife and Fisheries	D	<ul style="list-style-type: none"> ▪ pH between 6.5 to 8.5 ▪ Dissolved Oxygen 4mg/l or more ▪ Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	<ul style="list-style-type: none"> ▪ pH between 6.0 to 8.5 ▪ Electrical Conductivity at 25°C micro mhos/cm Max.2250 ▪ Sodium absorption Ratio Max. 26 ▪ Boron Max. 2mg/l
	Below E	Not Meeting A, B, C, D & E Criteria

Source: Central Pollution Control Board

1.4 Audit scope

At the **Centre**, audit scope covered the programmes and schemes for control of pollution of rivers, lakes and ground water in MoEF/MoWR. It also covered functioning of NRCDD, its role in planning, implementation/monitoring and monitoring activities of CPCB/CGWB, relating to river, lake and ground water pollution relating to the period 2006-07 and 2010-11. Records of Water Quality Assessment Authority (WQAA) were also examined in light of the responsibilities allocated to them.

In the **States**, audit scope covered adequacy of data relating to river, lake and ground water pollution. It also extended to the study of the implementation and monitoring of

¹ Coliforms organisms like faecal bacteria are an indicator of water quality.

² Most Probable Number.

³ It is a measure of the acidity or basicity of a solution. Since pH can be affected by chemicals in the water, pH is an important indicator of water that is changing chemically.

⁴ DO is a relative measure of the amount of oxygen that is dissolved or carried in the water body. Adequate dissolved oxygen is needed and necessary for good water quality.

⁵ BOD is a chemical procedure for determining the uptake rate of dissolved oxygen by the biological organisms in a body of water and is widely used as an indication of the quality of water.

programmes (NRCP and NLCP) for the control of pollution of rivers and lakes by the designated agencies. Audit scope related to the States also covered implementation and monitoring of schemes, if any, for the control of pollution of ground water.

For this, we test-checked records of the State governments, implementing agencies (mainly municipalities and lake development authorities), State Pollution Control Boards and WQRC in the States covering the period 2006-07 to 2010-11.

1.5 Audit methodology

The audit methodology was guided by the following:

(a) Stakeholders' Conference on Environment Audit

In July 2009, the office of the Comptroller and Auditor General of India organised a Stakeholders' Conference on Environment Audit to flag major environmental issues in India and to identify significant areas for audit enquiry in the future. Experts from Civil Society organisations, from Ministries of Environment & Forests and Urban Development, from the Indian Meteorology Department and representatives/corporate bodies working in the field of environment attended the Conference.

Some vital issues highlighted during the Conference were:

- Audit should look at issues of ecological sustainability, equity in distribution of environmental resources and efficiency of environmental programmes.
- Audits should take place during the process of implementation of the programmes so that inputs can be provided to improve performance.
- Need to evolve standards for involvement of public/public participation in agencies handling environment as well as in the audit of the environment.
- Need to emphasize on social audit where involvement of local communities in the audit process is important.
- Need to disseminate audit reports more widely.

(b) International Conference on Environment Audit-Concerns about Water Pollution

Once the topic had been identified, we held a two-day *International Conference on Environment Audit-Concerns about Water Pollution* in March 2010. This conference was attended by members of various Civil Society Organisations, Government Agencies, International Agencies and Regulatory Bodies like Jheel Samrakshan Samity, Arghyam, Tarun Bharat Sangh, WaterAid India, Ministry of Environment and Forests, Central Pollution Control Board, Central Ground Water Board, Jammu & Kashmir Lakes & Waterways Development Authority, International Union for the Conservation of Nature, Food and Agriculture Organisation, GTZ etc. The Heads of Supreme Audit Institutions from Austria, Bhutan, Maldives and Bangladesh also shared their concerns about water pollution.

The Conference flagged important areas of concern with regard to river, lake and ground water pollution. Some of the issues raised during the Conference were:

- Lack of coordination and ownership between the different agencies that are involved in its implementation;

- Need for the government to review the low levels of budgetary priority given to environment programmes in the country;
- Need to strengthen truly representative public participation in governmental programmes;
- Need to co-relate the reality that the number of citizens dependent on water bodies for livelihood with the creation of programmes for conservation;
- The imperatives of a comprehensive river basin approach for curbing river pollution as opposed to the extant town-based approach;
- The requirement of legislations for maintaining minimum amount of water/flow in lakes and setting standards for nitrogen and phosphorus as measures of water quality;
- Commitment from Supreme Audit Institutions to carry their mandate of environment audit forward and be more proactive in the field of environment audit.

(c) Advertisement in newspapers

We put out advertisements in various national and local newspapers all across India, inviting suggestions from the general public regarding the water pollution problems faced by them. We received more than 500 e-mails and letters. All these inputs facilitated us in the framing of audit objectives, sub-objectives and questionnaires for our Performance Audit. Some of the issues raised by the public were:

- Pollution of River Chandrabhaga
- Pollution of River Yamuna
- Pollution of groundwater in Maharashtra
- Pollution of Bellandur Lake
- Pollution of Dal Lake
- Depletion of groundwater in Kerala

Once areas of audit enquiry and audit questions were framed, our audit methodology consisted of document analysis, responses to questionnaires, examination of reports & records at various levels to collect audit evidence. Based on the feedback from these consultations, we decided to take up a Performance Audit of "Water Pollution in India" during 2010-11.

An Entry Conference with the Ministry of Environment & Forests was held on 30 July 2010 wherein the audit objectives, scope of audit, audit criteria and audit methodology were discussed. Exit Conference on 6 June, 2011 was held with MoEF where audit findings were discussed.

1.6 Audit Objectives

The review was undertaken to ascertain whether:

- *Inventory of water sources has been prepared and whether the overall status of quality of water in rivers, lakes and groundwater has been adequately assessed in India;*
- *Risks of polluted water to health of living organisms and the impact on environment have been adequately assessed;*

- *Adequate policies, legislations and programmes have been formulated and effective institutions been put into place for pollution prevention, treatment and restoration of polluted water in rivers, lakes and ground water;*
- *Programmes for pollution prevention, treatment and restoration of polluted water in rivers, lakes and ground water have been planned, implemented and monitored efficiently and effectively;*
- *Funds were utilised in an efficient and economic manner to further the aim of reduction of water pollution;*
- *Adequate mechanisms have been put in place by the government to sustain measures to tackle water pollution; and*
- *Programmes for the control of pollution had succeeded in reducing pollution levels in ground water and surface water and restoring water quality.*

1.7 Audit criteria

The following audit criteria were utilised:

- a. The Water (Prevention and Control of Pollution) Act, 1974.
- b. Agenda 21 document of the World Commission on Sustainable Development of the United Nations Conference on Environment and Development, held in Rio in June 1992.
- c. Guidelines for implementation and monitoring of National River Conservation Plan and National Lake Conservation Plan.
- d. National Water Policy, 2002.
- e. National Environment Policy 2006.
- f. Implementation guidelines for Integrated Water Resources Management, specifically Integrated River Basin Management and Integrated Lake Basin Management.
- g. Guidelines of United Nations Environment Programme (UNEP).

1.8 Audit sample

We selected the audit sample on the basis of assessment of risks like expenditure, criticality of the project in pollution control and feedback received from the public to the advertisement placed in newspapers.

- Out of 1079 projects for pollution control of 24 rivers across 19 States being implemented, we scrutinized 140 projects being implemented for control of pollution for 24 rivers.
- Out of projects for conservation of 58 lakes in 14 States, we studied 22 projects for conservation of lakes across 14 States.
- Out of a total of 6053 blocks across India, we examined 116 blocks for implementation and monitoring programmes relating to ground water pollution.
- Audit also studied the administrative structures and activities related to water pollution in 25 States of India.

Details of sample selected are attached as **Annexure 1**.