



NATURE FOUNDATION (INDIA)

B-23 Sector 65, NOIDA 201309 Phone: 0120-4210988/ 931262690 Email: naturefoundationindia@gmail.com
www.nfindia.org

PROJECT REPORT ON POLLUTION OF WATER BODIES



SUBMITTED BY:-

PRIYANKA MITTAL
Enroll. no.- 08609014
Jaypee Business School
Noida

SUBMITTED TO:-

NATURE FOUNDATION(INDIA)
B-23, IIInd floor, Sector-63
Noida

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DAYWISE ACTIVITIES

DAY	Activity(s) Carried out during Internship
1.(15-12-2008)	Discussion with chairman and assignment of projects
2	Designing of brochure for donation boxes
3	Painting of Bird houses
4	Working on the assigned projects
5	Edited the brochure
6	Working on assigned projects
7	Holiday
8	Visited schools for underprivileged and inauguration of Gyan Kiran II
9	Working on assigned projects
10	Designing the posters for bird house & say no to plastic projects.
11	Collected facts and statistics on birds, harmful effects of plastics and education in India
12	Coloring of posters
13	Completion and tentative submission of project report
14	Holiday
15	Designing of order form for the event “Indradhanush-2009”
16	Designing of banners for “say no to plastic” and “birdhouse” project
17	Formulation of strategy for project “General Stores” and preparing the information kit for the same.
18	Discussion on the event (INDRADHANUSH-2009) to be held on 3 January 2009
19	Final submission of project and editing of information kit on plastic bag
20	Event- Indradhanush-2009
21(4 th jan.2009)	Holiday

INTRODUCTION OF PROJECT

Water pollution is the contamination of water bodies such as lakes, rivers, oceans, and groundwater caused by human activities, which can be harmful to organisms and plants that live and depend on these water bodies.

Water pollution is a change in the chemical, physical, biological, and radiological quality of water that reduces its usefulness to humans and other organisms in nature. Pollutants such as herbicides, pesticides, fertilizers, and hazardous chemicals can make their way into our water supply. When our water supply is contaminated, it is a threat to human, animal, and plant health unless it goes through a costly purification procedure.

Water is a resource that has many uses, including recreational, transportation, hydroelectric power, agricultural, domestic, industrial, and commercial uses. Water also supports all forms of life and affects our health, lifestyle, agriculture and economic well being. As individuals, we use water for sanitation, drinking, and many other human needs, and we pay for the public water utilities that provide water. Although water flows from our faucets throughout the day, we often take the amount of fresh water available on Earth for granted. As the world's population increases, water consumption increases.

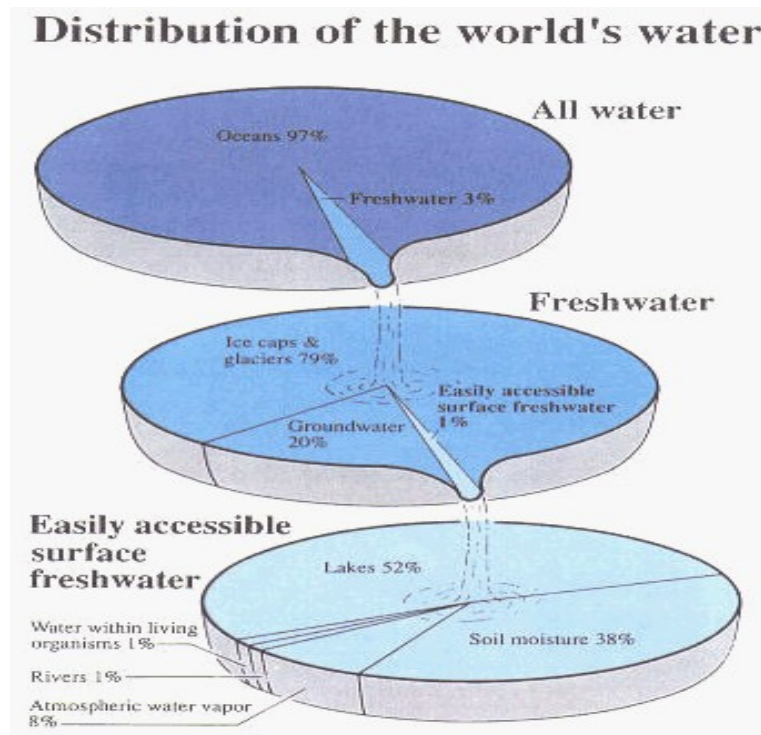
In urban areas the Indian government provided the masses with adequate water supply but the management of the water supply systems wasn't undertaken efficiently this has resulted in deteriorating condition of the water supply network. Thus majority is forced to pump out ground water to fulfill the water requirements that has in turn created a huge drop in the ground water levels.

Thus an effective strategy for water conservation is the need of the hour. The steps taken in this regard include water treatment plants, water pollution control so as to keep the water resources safe for other usage, careful scrutiny of water supply division and projects. The water supply department by adopting timely conservation methods can help solve the water shortage problem in India and deal with the ongoing water crisis in India.

Rainwater harvesting can also provide a solution to the water crisis in India. Certain areas in India receive plenty rainfall and thus creating huge rainwater harvesting water tanks can help is accumulation of natural water and then after some treatment can be utilized as a drinking water substitute.

EXECUTIVE SUMMARY

Comprising over 70% of the Earth’s surface, water is undoubtedly the most precious natural resource that exists on our planet. Without the seemingly invaluable compound comprised of hydrogen and oxygen, life on Earth would be non-existent: it is essential for everything on our planet to grow and prosper. Although we as humans recognize this fact, we disregard it by polluting our rivers, lakes, and oceans. Subsequently, we are slowly but surely harming our planet to the point where organisms are dying at a very alarming rate. In addition to innocent organisms dying off, our drinking water has become greatly affected as is our ability to use water for recreational purposes. .



When toxic substances enter lakes, streams, rivers, oceans, and other water bodies, they get dissolved or lie suspended in water or get deposited on the bed. This results in the pollution of water whereby the quality of the water deteriorates, affecting aquatic ecosystems.

Water pollution has many sources. The most polluting of them are the city sewage and industrial waste discharged into the rivers. The facilities to treat waste water are not adequate in any city in India. Presently, only about 10% of the waste water generated is treated; the rest is discharged as it is into our water bodies. Due to this, pollutants enter groundwater, rivers, and other water bodies. 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.

CAUSES OF WATER POLLUTION

Water pollution is caused by the following activities:

AGRICULTURE

To increase the amount of food produced, farmers use large amounts of chemical fertilizers and pesticides. The excess chemicals not used by the plants are washed by the rainwater into rivers, lakes and seas, polluting both surface water and underground water. In a new report, the UN Food and Agriculture Organization (FAO) says almost 500,000 tones of old and unused toxic pesticides have been abandoned on sites.

INDUSTRIALISATION

Factories and industries often release poisonous chemical substances into seas, rivers or lakes, resulting in the destruction of Mother Nature. An example of industrial sea pollution happened in Japan in the 1950s. A local factory had poured waste water containing mercury into the Minamata Bay for 20 years. Tuna fish in the bay absorbed the mercury and people ate the tuna. Many children were hence borned with birth deformities, people lost their hearing and sight and thousands eventually died.

SEA TRANSPORTATION

When ships transporting oil from one country to another get damaged en route, oil spillage occurs. One historic major disaster was the Exxon Valdez oil spill, in which an oil tanker sank off Alaska in 1989, leaking 240 000 barrels of oil into the ocean. To save cost, some ships also illegally dump unwanted oil from their engine rooms into the sea, thus polluting the oceans.

DOMESTIC ACTIVITIES

Waste products from the washing of clothes, dishes and lavatories, if untreated and discharged into the sea, promote the growth of algae which destroys marine life. Infectious diseases may also spread if sewage is not treated before it is discharged into the sea.

DUMPING

Sometimes, rubbish is irresponsibly dumped into the sea. There had been cases where fishes get tangled in old fishing nets or feed on packaging Styrofoam and they die.

EFFECTS OF WATER POLLUTION

Water pollution comes from many different sources and can effect many different things. The effects of water pollution are not only devastating to people, but they can kill animals, fish, and birds. some of the serious effects of water pollution are:

Effects of Run-off Pollution

Rain picks up dirt and silt and carries it into the water. If the dirt and silt settle in the water body, then these sediments prevent sunlight from reaching aquatic plants. If the Sun can't reach the plants, these perish. These sediments also clog fish gills and smother organisms that live on the bottom of the body of the water.

Effects of Oil Pollution and Antifreeze

If oil is spilled on the water, the effects on the ecosystem and the components are harmful. Many animals can be annihilated in case they ingest oil. Oil contaminated prey may be a reason of death for many. If the oil coats the feathers of birds, these may die. Oil and antifreeze makes the water have a foul odor and there is a sticky film on the surface of water that kills animals. Oil is the most harmful pollutant in the water.

Contaminated Ground Water Effects

If contaminated water enters the ground, there may be serious effects. People may become very sick and there is a probability of developing liver or kidney problems and cancer or other illnesses. An example is seen in Jaibheem Nagar slum in Meerut city which is being adversely affected by the groundwater contamination leading to a record number of 124 deaths in the last five years (2001-2006). A powerful film directed by Mr.Rajesh Khatri depicts in detail the reasons of water contamination and violation of human right to water.

Fertilizers and other chemicals

Nitrates in drinking water leads to diseases of infants that may lead to their death. Cadmium is a metal in sludge-derived fertilizer. This can be absorbed by crops. When people ingest this, they may cause diarrhea disorders, liver and kidney damage. The inorganic substances like mercury, arsenic and lead are the causes of pollution. Other chemicals can also lead to problems concerning the taste, smell and color of water. Pesticides, PCBs and PCPs are all poisonous to all sorts of life. Pesticides are used in farming, homes and forestry. PCBs are found as insulators in old electrical transformers. PCPs are found in products like wood preservatives.

Effects of Agricultural Water Pollution

Rain and irrigation water drains off cultivated land that has been fertilized and treated with pesticides, the excess nitrogen and poisons are mixed with it into the water supply. These pesticides are toxic and pollute the water in a different mode. Aquatic plants growth cause de-oxygenation of water and annihilate flora and fauna in a stream, lake and river.

Effects of Thermal Water Pollution

Machinery in the industries are cooled with water from lakes and rivers. This water reaches the river in a heated state. This water decreases the ability of the aquatic system to hold oxygen and increases aquatic organisms' susceptibility to disease, parasites, and the effects of toxic chemicals.

Effects of Heavy Metal Water Pollution

Heavy metals like lead, mercury, iron, cadmium, aluminum and magnesium are present in water sources. If these metals are present in the sediment, these reach the food chain through plants and aquatic animals. This causes heavy metal poisoning in case the level in the water is very high.

Some other effects of water pollution

In Rivers, oceans and seas, water pollution effects flora and fauna in them. Further, the birds and animals that consume this contaminated food supply can perish. Blood diseases, nervous system disorders and heart diseases are some of the effects of water pollution. Many toxins in polluted water lead to cancer. Rarely, the body's chromosomal makeup can be altered. Some of the less potent effects are skin lesions, vomiting and diarrhea.

Major water pollutants and their effect on human health		
Pollutant	Origin	Effects
Arsenic	pesticide industries and agriculture	toxic, eruptions on skin, carcinogenic
Cadmium	industrial waste discharge	may substitute calcium in bone structure, causes a disease - Itai-Itai in Japan is the main example
Chlorine	industries using chlorine bleach	physiological
Chromium	industrial waste, especially from tanneries	toxic and carcinogenic
Cyanide	pesticides	toxic and fatal
Lead	industrial, mine and smelter discharges, water pipes	causes a disease called plumbism
Nitrates and Nitrites	fertilizer industries	cause metaemo globinaemia in infants
Sulphates	leaching of gypsum or industrial waste discharges	have laxative effect in combination with magnesium or sodium in drinking water, may form hydrogen sulphide gas which is fatal for workers in sewers
Selenium	pesticides, industrial waste	carcinogenic, causes caries
Mercury	pesticides	toxic, causes foetal brain damage
Bacteria	sewage	cholera, typhoid, hepatitis, dysentery

WATER MANAGEMENT POLICIES OF GOI

The Government of India (GoI) has formed various water management systems and authorities in India. These include Central Water Commission, Central Ground Water Board, National Water Development Agency, National Projects Construction Corporation Ltd. etc. for efficient water resources management. Various water reservoir projects were also taken up by the Ministry of Water Resources like construction and management of dams on various rivers.

Water Reservoir Dams and Projects:

As a solution to the water crisis in India, the government took up building of huge dams and water reservoirs that provided multiple solutions. The dams built on various rivers provided safety against the floods that used to frequent these rivers, effective use of natural water resource, providing irrigation facilities to the surrounding field and farms and also in the production of hydroelectricity.

The major dams and water reservoirs in India include:

- Nagarjuna Sagar Dam, Andhra Pradesh
- Sardar Sarover Project build on river Narmada, Gujarat
- Bhakra Nangal Dam build on river Sutlej, Himachal Pradesh
- Gobind Sagar and Maharana Pratap Sagar Dam, Himachal Pradesh
- Krishna Raja Sagara Dam on Cauvery River, Karnataka
- Tunga Bhadra Dam
- Neyyar Dam, Kerala
- Narmada Dam Project, Madhya Project
- Hirakund Dam Build on Mahanadi River, Orissa
- Farakka Barrage

GANGA ACTION PLAN PHASE I

A pioneering effort to control the pollution of Indian rivers was launched in 1985 by implementing the Ganga Action Plan Phase I (GAP), which has come to an end in March 2000 with a total spending of 452 crores. The GAP-I envisaged to intercept, divert and treat 882 mld (Million litres per day) out of 1340 mld of wastewater, generated in 25 class-I towns in 3 States of Uttar Pradesh, Bihar and West Bengal. In the first phase of GAP, only about 35 per cent of the pollution generated in towns along the Ganga has been tackled.

OBJECTIVE

At the time of launching, the main objective of GAP was to improve the water quality of Ganga to acceptable standards by preventing the pollution load reaching the river and to recast and restoring the river water quality to the 'Bathing Class' standard which is as follows:

Bio-Chemical Oxygen Demand (BOD)	3 mg/l maximum
Dissolved Oxygen (DO)	5 mg/l minimum
Total Coliform	10,000 per 100 ml
Faecal Coliform	25,00 per 100 ml

Achievement of this plan

- 259 schemes completed against the target of 261 schemes,
- 865 mld(million litre per day) sewage treatment capacity was created,
- 25 towns of Uttaranchal, U.P, Bihar and West Bengal were covered.

GANGA ACTION PLAN II

The GAP was envisaged in 1991 to clean the tributaries of Ganga under the second stage

GAP-II and was approved for implementation in stages between 1993 and 1996 and includes works for:

- (a) Pollution abatement of river Ganga as well as its tributaries Yamuna, Gomti, Damodar and Mahananda
- (b) In 25 class-I towns left out in Phase-I.
- (c) In the other polluting towns along the river

The CCEA (Cabinet Committee on Economic Affairs) approved the GAP-II in various stages during April 1993 to October 1996. The States of Uttar Pradesh, Bihar, West Bengal, Delhi and Haryana were to implement the GAP-II by treating 1912 mld of sewage. GAP-II was scheduled for completion by December 2000 but could not be completed. **The total approved cost for Ganga Action Plan Phase-II was Rs. 1498.86 crore. Under this 594 schemes were sanctioned and 373 were completed with a total expenditure of 969.25crores till may 2006.**

NATIONAL RIVER CONSERVATION PLAN

It was realized later that this is not only the Ganga and its tributaries, but other rivers of India must also be cleaned. This led to the launch of National River Conservation Plan (NRCP) in 1995 to clean several other important rivers flowing through various states. The NRCP is responsible for maintaining wholesomeness of water quality of major rivers by implementing various pollution abatement schemes.

Presently, the centrally sponsored scheme of National River Conservation Plan - NRCP is under implementation in 160 towns along polluted stretches of 34 rivers spread over 20 States at an approved cost of Rs.4736 crore.

The **objective** of NRCP is to check pollution in rivers through implementation of the following pollution abatement schemes to bring the river to bathing quality standards:

- Interception and diversion works to capture the raw sewage flowing into the river through open drains and divert them for treatment;
- Sewage treatment plants for treating the diverted sewage;
- Low cost sanitation works to prevent open defecation on river banks;

A total of 935 schemes were sanctioned under NRCP out of which 571 were completed with a expenditure of 2070crores till may 2006 and 1771mld capacity was created in addition to GAP-I

Analysis of Yamuna:-

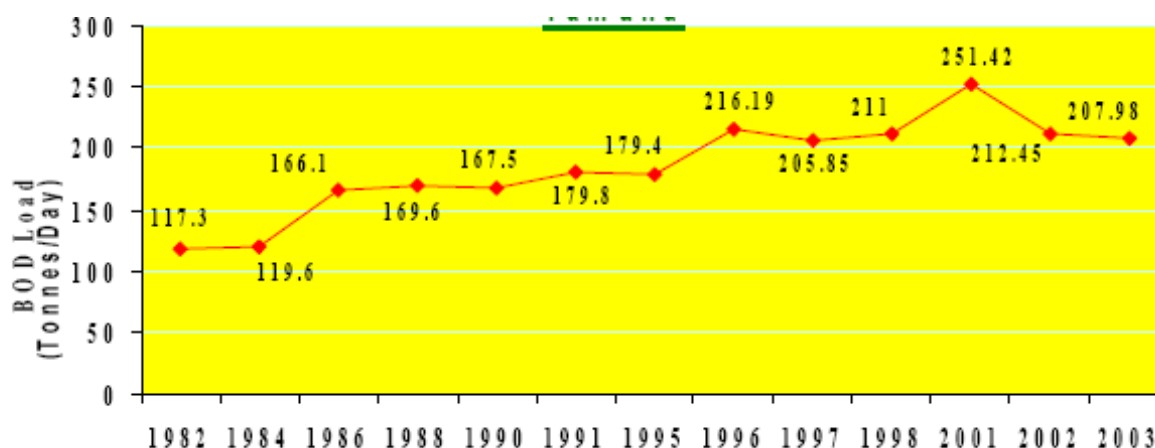
The main source of pollution of water in Yamuna in Delhi is domestic sewage which constitutes 94 percent of the total sewage generated in the NCT of Delhi while the balance is contributed by industrial sewage. The categorization of water for its different uses is based primarily on parameters of Dissolved Oxygen (DO), Bio-Chemical Oxygen Demand (BOD) and Total Coli form (TC).

PARAMETER	PRESCRIBED STANDARD
Dissolved oxygen(DO)	Not less than 5 mg per litre
Bio chemical oxygen demand(BOD)	Not more than 3 mg per litre
Total coli form(TC)	Not more than 500 per 100 ml

The Delhi Jal Board (DJB) is the executing agency entrusted with the construction and maintenance of sewage treatment plants, sewage pumping stations and trunk sewers and for treatment of domestic sewage in the NCT of Delhi. The Board functions under the administrative control of the Department of Urban Development of the Government of Delhi.

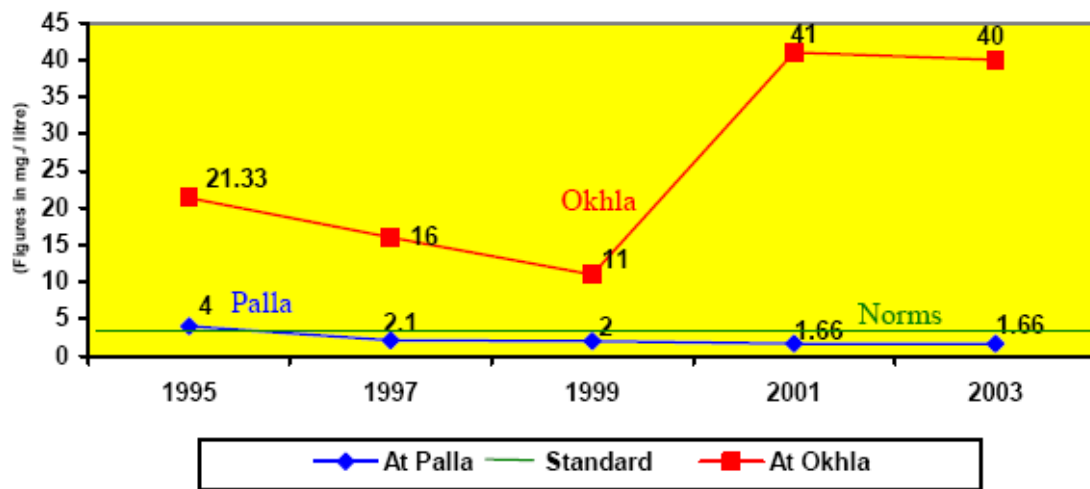
Delhi is divided into five drainage zones of Okhla, Keshopur, Rithala-Rohini, Coronation and Shahdara.

Year wise trend of BOD input in river Yamuna



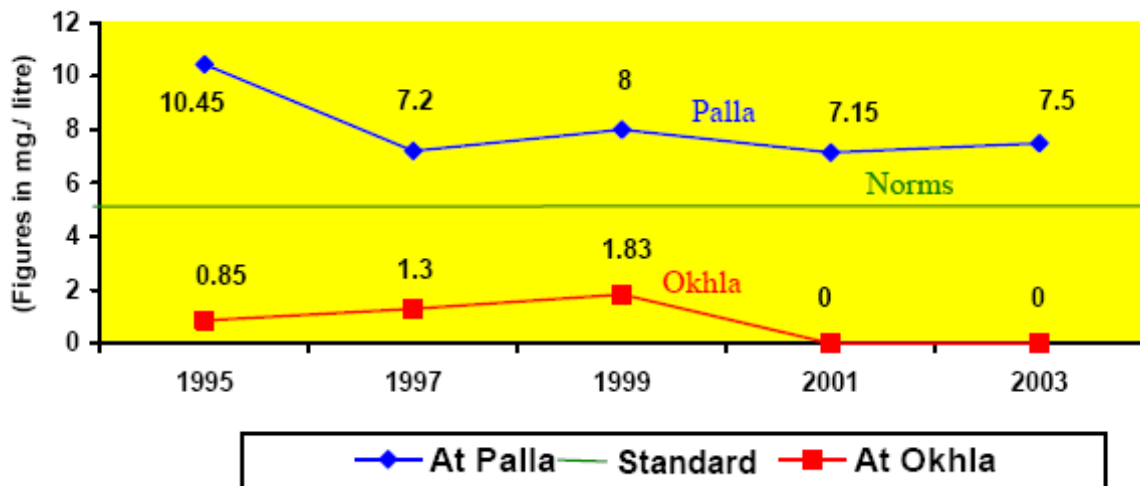
The BOD load contributed to the river by the sewage from open drains/nallahs out falling into the river increased from 117.3 tonnes/day in 1982 to 207.98 tonnes/day in 2003. No steps had been initiated to effectively trap and treat the pollutants being discharged through the drains.

BOD trend year wise at Palla and Okhla in river Yamuna(Delhi stretch)



Note: Higher BOD than norms is indication of higher level of pollution/ poorer water quality.

DO trend year wise at Palla and Okhla in river Yamuna(Delhi stretch)



Trend of total Coli Form at Palla and Okhla Barrage

Location	Bathing Standards	1995	1997	1999	2001	2003
Palla	Not more than-500/ 100 ml	950.00	8,967.00	5,199.00	7,500.00	1,08,666.66
Okhla Barrage	-do-	5,72,500.00	32,9,312.00	2,57,667.00	92,33,333.00	693,33,333.00

- Dissolved Oxygen (DO) which is the most important parameter for sustaining a healthy revering eco-system was not present in the Delhi stretch of the river during any part of the year;
- Free ammonia which is toxic to fish and micro-organisms was present far above the acceptable levels; in the range of 1.47 mg/l to 6.73 mg/l as against the acceptable level of 0.02 mg/l;
- There was concentration of heavy metals like copper, lead, nickel, zinc and mercury far in excess of the limits prescribed by the Environment Pollution Act. Zinc particularly was present in very high concentrations in the river;

Plan targets of treatment capacity and achievements

	Existing total sewage treatment capacity	Total sewage generation	Target creation of additional treatment capacity	Additional capacity created
9 th five year plan (1997-2002)	280mgd	756mgd	601mgd	202mgd

ANALYSIS AND INTERPRETATION

- India's most ambitious river cleaning project, the Ganga Action Plan (GAP), is a colossal failure. The project is 13 years behind schedule. Despite spending Rs20,000 crore to clean the Ganga, the river remains polluted.
- The 2006 official audit of the Ganga Action Plan says the plan has met only 39percent of its target of sewage treatment.
- It further says that every state government involved has grossly misused GAP funds to the tune of more than Rs.36crore.
- There were shortfalls in allocation of resources. Of the total domestic sewage of 5044mld, in 110 towns selected for pollution abatement along the banks of river Ganga and its tributaries, the GAP addressed itself to process only 2794mld.
- There was diversion and misuse of funds of around Rs36.07crore on establishment, operation and maintenance of plants, construction of circle office, purchase of vehicle, computer, Xerox machine, custom duty, supervision charges on low cost sanitation etc., which were not covered under the programme and construction of STPs,(Sewage Treatment Plant).
- The assets created in the Scheme suffered impairment and closure because of technical design flaws, inter se mismatch of the schemes and their components, problems in land acquisition, contract mismanagement, lack of adequate maintenance, and in general because of lackadaisical attitude of the States and their implementing agencies.
- Technologies adopted by the NRCD for construction of STPs were often questionable in as much as they could not adequately address the problem of reducing bacterial load in the river to the desired level.
- The water quality of Yamuna instead of improving deteriorated over the period 1999-04 despite expenditure of Rs. 871.67 crore since 1994.
- DJB had not created treatment capacity to match the actual sewage generation in the NCT of Delhi. The IX five year Plan did not incorporate any provision to trap the sewage from the unsewered areas covering about 40 percent of the population. Even during the first two years of the X Plan, no action had been initiated in this regard.
- The total treatment capacity set up by the end of the IX Plan (March 2002) was only 482 MGD which was 274 MGD short of the estimated sewage of 756 MGD.
- While the water at Palla conforms to the bathing standards in terms of DO and BOD, by the time Yamuna leaves Delhi at Okhla, the water deteriorates to far below the `bathing standards` and is, in fact, unfit for any use.
- The capacity of the soil to retain oxygen required for biological decomposition of partially decomposed or un-decomposed organic matter contained in sewage is reduced hindering decomposition of organic matter resulting in “sickness of soil.”

When government measures prove inappropriate certain private organization also come forward to solve the problem of water pollution and **The pioneer in this was Magsaysay Award winner Shri Rajendra Singh** who started rural development and employment generation in 1985 at Gopalpura village by Water Conservation. He played a catalyzing role

in the building of 8600 johads (water harvesting structures) in 1058 villages spread over 6500 sq.km.

In 1995 he led a "**Nadi Pahar Bachao Yatra**" from Galta ji in Jaipur to Gangotri in Uttarkashi. The aim of this yatra, carried out between June 5 (World Environment day] and June 27 was to create mass awareness to preserve the sanctity and purity of rivers and the green cover of the mountains. Since 1996, he initiated **Jal Bachao Johad Banoa**, which is organised from Dev Uthani Gyaras in the first week of November to December for forty days.

He has also initiated a National Water March (Rashtriya Jal Yatra) on December 23, 2002 from Gandhi Samadhi, Rajghat, New Delhi and covered 30 states including northern and southern states including 144 river basins.

MEASURES TO REDUCE WATER POLLUTION

For government:-

- Government of Delhi should pay prompt attention to trapping and treatment of all sewage presently flowing through these drains and should prepare a comprehensive plan to complete the works in a time bound manner.
- Institutional mechanisms need to be established for timely coordination with other concerned civic and land owning agencies so as to minimize delay and hindrances in execution of works.
- Proposals for creation of treatment capacity must be based and prioritized with reference to the estimated sewage generation in the relevant catchments areas which should be estimated after taking all factors into account including population trends and availability/supply of water.
- Systems and procedures need to be strengthened to ensure accurate measurement of both the quantity of treated sewage being discharged as well as its quality with reference to the prescribed parameters.
- **IMPOSE LAWS:** Local authorities can impose huge fines for those caught for illegal dumping. If the amount of waste dumped is huge, jailing or even caning could be imposed. For example, in the Region of Waterloo in Canada, people can be fined up to C\$5000 if they are guilty of such offences.

For NGO:

- **EDUCATION:** Inform and educate farmers of the harm pesticides can cause. For example, some organizations have programs to teach farmers alternative ways to control pests and weeds and also farmers will be taught how to dispose of excess pesticides and herbicides safely. Campaigns and public education held by the government are also useful in informing and educating people about the consequences of littering, and in helping people develop proper waste disposal habits.
- **ORGANIC FARMING:** A relatively new way of farming known as organic farming has been increasingly popular among countries such as the United States. In organic farming, no artificial chemicals are used, thus with no doubt at all it will reduce the amount of pesticides and herbicides used.

CONCLUSION

Clearly, the problems associated with water pollution have the capabilities to disrupt life on our planet to a great extent. Congress has passed laws to try to combat water pollution thus acknowledging the fact that water pollution is, indeed, a serious issue. But the government alone cannot solve the entire problem. It is ultimately up to us, to be informed, responsible and involved when it comes to the problems we face with our water. We must become familiar with our local water resources and learn about ways for disposing harmful household wastes so they don't end up in sewage treatment plants that can't handle them or landfills not designed to receive hazardous materials.

Domestic and industrial sewage generated within the NCT of Delhi is the main source of pollution of the river Yamuna during its passage through the NCT. Despite over ten years of efforts and expenditure of Rs. 872 crore since 1994 on establishment of sewage treatment infrastructure for treatment of domestic and industrial sewage before its release into the river, the quality of water at the point where the river leaves Delhi has deteriorated drastically with large amounts of untreated sewage still falling into the river.

The water quality of the river at the point of its entry into Delhi at Palla is adequate to sustain aquatic life and conforms to water quality of "bathing" standards in terms of Dissolved Oxygen (DO) and Bio-chemical Oxygen Demand (BOD). However, at the point of its exit from Delhi at Okhla, the water quality of the river is unfit for any purpose with the BOD being 40 mg per litre against the norm of not more than 3 mg per litre while the DO deteriorates to almost nil against the norm of not less than 5 mg per litre. The coli form pollution which is already sub-standard at 217 times the norm when the river enters Delhi also deteriorates further to 1.39 lakh times the norm at the time of its exit from the NCT.

We have to preserve existing trees and plant new trees and shrubs to help prevent soil erosion and promote infiltration of water into the soil. . As we head into the 21st century, awareness and education will most assuredly continue to be the two most important ways to prevent water pollution. If these measures are not taken and water pollution continues, life on earth will suffer severely.

Global environmental collapse is not inevitable. But the developed world must work with the developing world to ensure that new industrialized economies do not add to the world's environmental problems. Politicians must think of sustainable development rather than economic expansion. Conservation strategies have to become more widely accepted, and people must learn that energy use can be dramatically diminished without sacrificing comfort. In short, with the technology that currently exists, the years of global environmental mistreatment can begin to be reversed.

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