Yamuna Action Plan, India

Formidable Challenge of River Pollution and Sanitation Crisis

1. Background

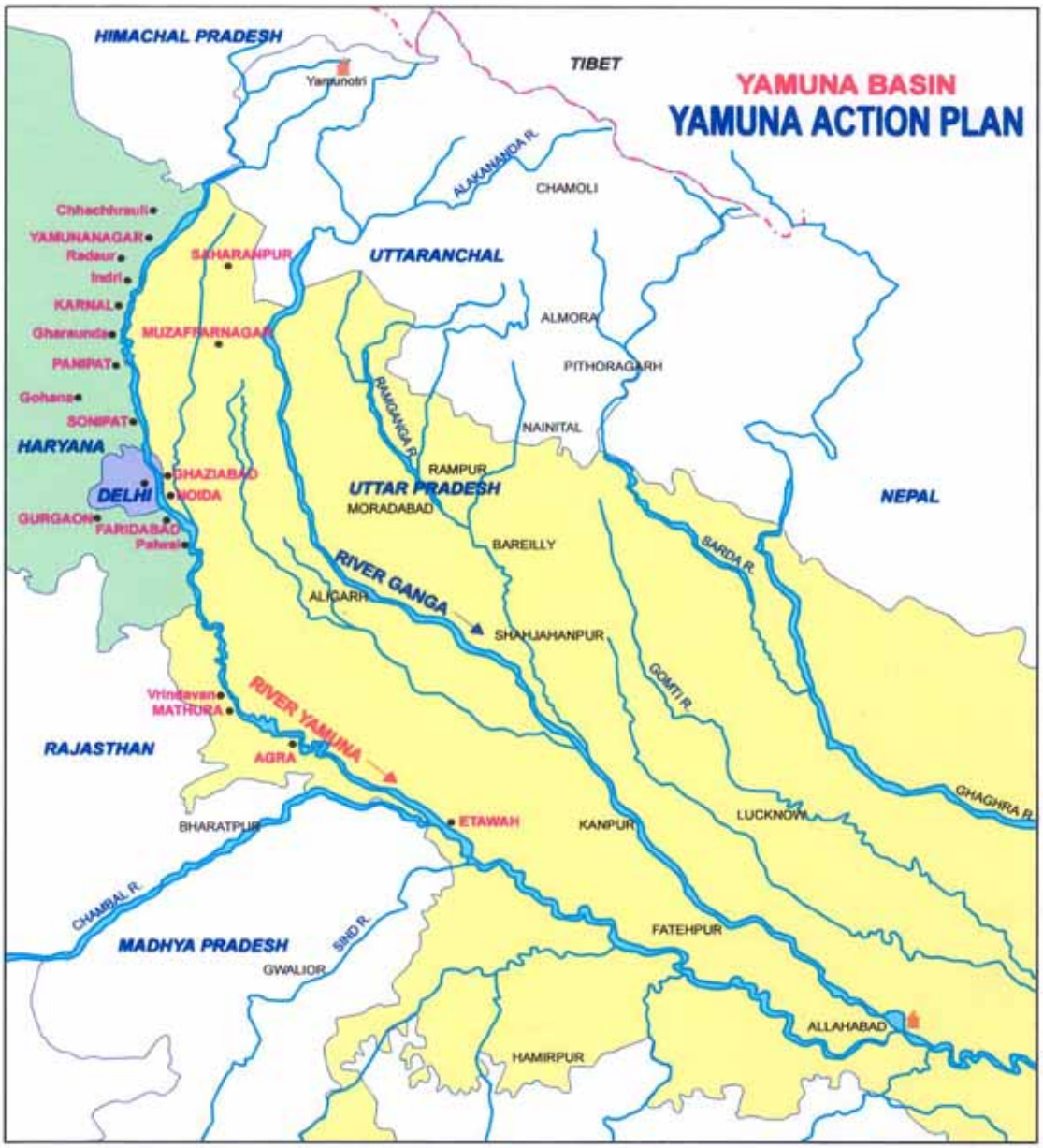
Establishment of National River Conservation Directorate (NRCD)

In India, big cities have been experiencing rapid growth of urban population and industrialization. The river water quality across the country has experienced deterioration. Therefore, it was inevitable for the Government of India to prepare plan for sustainable pollution abatement in rivers across the country. River Ganga, being one of the most sacred and largest in the country, was identified for priority intervention in 1985. A study was carried out by the Central Pollution Control Board (CPCB), India, and the results were presented in the report titled "*Basin, Sub-basin Inventory of Water Pollution - Ganga Basin*" in 1984. This report emphasized on the pollution level of River Ganga and its tributaries and attention was drawn towards pollution abatement. This also resulted into launching of a program called "Ganga Action Plan (GAP)," by the Government of India in 1985, as a five-year program with the aim of improving water quality in Ganga River. A government body called the "Central Ganga Authority" was formed under the chairmanship of the Prime Minister to develop policy decisions and to monitor the plan. An organization called "Ganga Project Directorate" was established in the Ministry of Environment and Forests (MoEF) by the Central Ganga Authority to deal with the program under the GAP. Later on, the activities of GAP was also extended to other rivers including Yamuna, Gomati, Damodar. The National River Conservation Plan (NRCP) was formulated and the Ganga Project Directorate was transformed into the present body, the "National River Conservation Directorate (NRCD)."

Pollution of Yamuna River

Yamuna is the largest tributary of river Ganga and the main source of fresh water in Northern India. Originating from Himalayas, its total length is 1,376km covering a

catchment area of 366,220km^2 (Figures 1 and 2). Besides irrigation, the river provides a source of drinking water and bathing. Three major barrages are located on river Yamuna, namely Tajewala, Wazirabad, and Okhla, diverting water for irrigation and other uses.



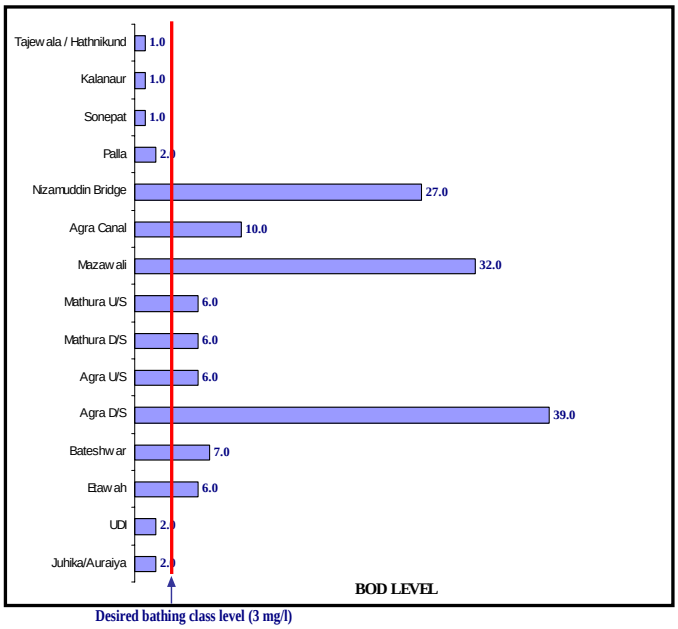
(Source: Project Management Consultants for YAP II, 2007)

Figure 1: Major Towns along River Yamuna and its Basin

Figure 2: Nazafgarh Drain in Delhi, located at the right bank side of Yamuna River

The river water in upper segment is relatively unpolluted. Downstream of Tajewala, domestic and industrial wastewaters from urban and rural areas are discharged into the river.

The Delhi Reach, located between two barrages, has practically no perennial flow of its own and receives partly treated and untreated wastewater effluents from Delhi. Therefore, this stretch is the most polluted segment. The BOD load is observed to be 27mg/l (almost similar to treated wastewater) at Nizamuddin Bridge in Delhi (Figure 3).



(Source: Project Management Consultants for YAP II, 2007)

Figure 3: Current Status of Yamuna River Water Quality

Yamuna water downstream of Okhla barrage up to the confluence with the Chambal River is eutrophicated and BOD loads at Mazawali and Agra downstream is above 30mg/l. This prohibits the usage of the river Yamuna as a source of water for potable water scheme in Agra and the water of the river Ganga needs to be transported to Agra by a 138km pipeline.

2. YAMUNA ACTION PLAN PHASE – I (YAP-I)

Implementation of YAP-I

To tackle pollution in river Yamuna, YAP-I was launched by the Ministry of Environment and Forests (and implemented by NRCD) in 1993 with Japan's ODA loan amounting to 17.77 billion yen with a interest rate of 2.6% and repayment period of 30 years including a 10-year grace period. Under YAP-I, 15 Class-I towns including six in Haryana, eight in Uttar Pradesh State and Delhi were covered. Pollution arising from the domestic sector was considered to be of major concern and given the highest priority. At the time of project formulation it was estimated that by 1997 (the design year) the total population in 15 towns would be 34.75 million and corresponding sewage generation was estimated to be 2.953

million m^3/day. Excluding Delhi, none of these towns had any sewage treatment arrangements. Thus, there was a need to prioritize and develop wastewater collection and treatment facilities in these towns. The project was originally planned to be completed by April 2000, but was later extended until February 2003.

Broadly two types of schemes were taken up in YAP-I including sewerage and non-sewerage components. Sewerage schemes comprised construction of drain interceptors, diversion sewer lines, sewage pumping stations, and rehabilitation and construction of sewage treatment plant (STP) (Figure 4). The sewer networks and house connections were not included in the YAP-I because of the difficulty of gathering the relevant basic data and records.

Figure 4: Sewage Treatment Plant Built By This Project

Altogether 29 STPs were constructed with a total treatment capacity of about 726,000m^3/day. Non-sewerage component included works on low-cost sanitation, river front development, improved crematoria, plantation, and public participation and awareness. Under low-cost sanitation works, total 1,216 sets of public toilets were constructed. Improved wood based crematoria were established at 98 locations and river front improvement works were carried out at nine locations. Public participation workshops were also organized 7023 times during the entire project period to raise the level of public participation and awareness related to pollution abatement activities.

[Sewerage Components]

Delhi: STP

Key factors which affected the attainment of objectives of YAP-I are related to original strategy on coverage, end of pipe approach, technology and a limited time horizon. While wastewater loads from Delhi alone were estimated to be 70% of the total load, its coverage was proportionally lower under the sewerage component of YAP-I. Moreover, the capacity of old existing STPs in Delhi remained underutilised to the extent of 25-45% because of limitations in the collection system. As a result, untreated sewage continued to flow into the river through a series of storm water drains. Similarly, some STPs discharging to Yamuna River remained underutilised due to a combination of limitations in the wastewater collection system and power availability.

O&M of Sewerage Facilities

Municipalities and agencies which were responsible for O&M of sewerage facilities were constrained to maximise the operational efficiency of the system due to a combination of factors related to skills, finance, management systems, power supply disruptions and upstream sewerage infrastructures. The lacks of basic data and records on the sewer networks and house connections hamper the authority to establish the proper cost recovery policy. Some STPs do not meet the effluent standard. In some cases, O&M of facilities have been contracted to private agencies. In YAP-I, the major consideration was to target and control immediate pollution loads from the domestic sector. Accordingly, whatever sewage treatment capacity was created, it was designed for the 1997 population load. However by 2002, the population of these towns had increased and created a shortfall.

When YAP-I schemes were designed, the wastewater discharge standards did not mandate STP effluents to comply with bacteriological standards. As a result, the STPs did not include effluent disinfection facilities.

Non Point Sources

The strategy in YAP-I did not adequately address non-point sources of pollution such as Dairy farms, Dhobighats, Slaughterhouses, etc. The Community Toilet Complexes prevented to a certain extent the practice of open defecation and yielded consequent benefits in terms of improved hygiene and sanitary conditions in target communities.

[Non Sewerage Component (Community Toilet Complex, Improved Crematoria, Public Awareness Raising and Municipal Reform of the City of Agra)]

Necessity of Basic Sanitation Facilities

Basic sanitation facilities to cope with water-borne diseases include safe water supply, sewerage implementation and onsite sanitation. Incidents of water-borne diseases in Delhi, the capital of India, are still high as shown in Table 1. The table shows the downward trend of the number of incidents but it is still high. It is urgent to install these sanitation facilities in India. The basic policy of sanitation is to implement sewerage in urbanized areas and to provide onsite sanitation facilities in rural areas, based on which JBIC makes efforts to provide onsite sanitation as well as sewerage when and where necessary.

Table 1. Number of Incidents of Water-Borne Diseases

Year	Dysentery	Typhoid	Cholera	Total
2001	48,296	889	958	50,143
2002	58,715	882	1,267	60,864
2003	53,718	1,233	837	55,788
2003	51,387	1,948	1,527	54,862
2004	19,772	1,305	1,305	22,382

Source: Environmental Assessment by Experts at Post Evaluation of Projects, 2004

Public Toilets Installed under the Japan's ODA loan and their Use

1,216 sets of public toilets with 28,846 units were installed under the Japan's ODA loan as non sewerage component in six cities of Haryana, eight cities in Uttar Pradesh and Delhi. The number of users is estimated to be 50 per seat per day. More than 200,000 people are supposed to use public toilets per day. However, frequency of use of toilets varies according to income level of users because public toilets are not charge free except for women and children. The number of female users is as low as 10% that of male users, probably because most of NGO members in charge of maintenance of public toilet are men. It is well known that more woman use public toilets where female NGO members are engaged in their maintenance (Figure 5).

Figure 5: Cleaning Staff in Public Toilet (Faridabad)

Although children younger than twelve can use toilets free of charge, open defecation is common among those children in slum areas. It is indispensable to teach them the importance of sanitation.

Operation and Maintenance of Public Toilets and the Role of NGO

Operation and maintenance of public toilets is covered by user charge. User charge is 1 rupee per time in Delhi and Agra. Season tickets for families are issued in Agra for 25 rupees

per month. Operation and maintenance work is done by NGO that is awarded through open bidding. The contract is for five years.

NGO dispatch operators and sweepers to public toilets and they are in charge of operation and maintenance of toilets 24 hours a day. Because of this, these public toilets are much cleaner than normal ones. In New Delhi only, 959 public toilets were installed, about 300 units ceased to operate because of difficulties of maintenance by NGOs due to the low utilization..

Crematoria

Improved crematoria were installed in three states of Delhi, Uttar Pradesh and Haryana to prevent unburnt bodies from being discarded to Yamuna River and thus to prevent the river from being polluted. In case of Haryana State, installed crematoria are used 150 times a month, which implies the frequency increased 72% during the period between 2001 and 2004. On the other hand, some people say that they will never use these crematoria because these facilities are located inconveniently both geographically and religiously.

It is expected, however, that more poor people who could not use it in the past for economical reasons will use it in the future because of the lower tariff than before.

Importance of Public Participation and Awareness

Intensive public awareness raising activities were conducted during the project implementation. 75% of participants reported that the activities were useful and 50% of them reported that they utilized the knowledge obtained for the sanitation improvement.

Municipal reform of the City of Agra

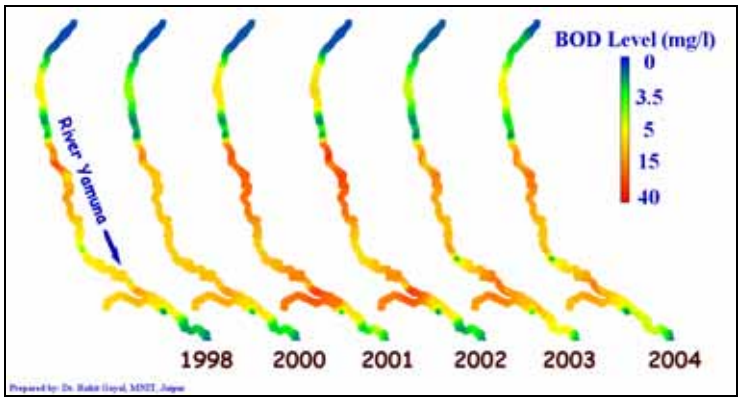
JBIC supported a technical assistance study to rejuvenate the municipal reform process in the City of Agra. The study was launched against the backdrop of several futile governmental efforts and posed significant challenges such as lack of political will, passive bureaucracy, and stiff resistance by municipal staff. Given this context, the study was

carefully configured to follow a four-pronged approach – intensive city-level consultation for consensus building, disseminating best practices in municipal reforms to sensitize corporation staff, executing demonstration projects to build conviction among stakeholders and regular media briefings to ensure transparency. Several novel ideas such as constitution of a well-balanced counterpart reform team, face-to-face interactions with reform champions from other cities, exposure visits, and learning-by-doing pilot projects were strategically built into the study to ensure wide acceptability for comprehensive reforms.

The reforms program, launched in a high-profile ceremony in 2002, has led to significant tangible improvements such as efficient solid waste collection services and street lighting through public-private partnerships, a four-fold increase in property tax collections, formation and activation of citizen welfare associations. Though there are still several challenges, what is important is that the reform process is now irreversible. The reforms program, now widely known as the "Agra model" is being replicated in other national programs.

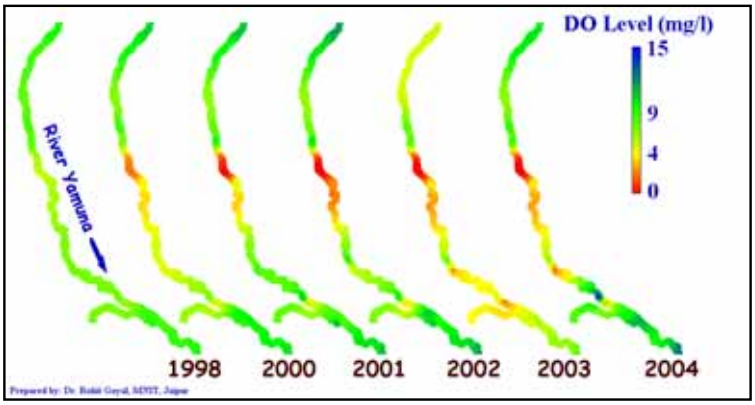
[Effects of Sewerage and Non Sewerage Components on River Water Quality]

Yamuna Action Plan Project is roughly divided into two components of sewerage and non sewerage. Both components have been implemented as planned in general. However, water quality improvement of Yamuna River is not readily visible (Figures 6 and 7). Based on the data of NRCD, it is observed that BOD concentration in Yamuna river has improved in the upper reaches during 1998 to 2004. However, deterioration has been observed in the middle and lower reaches possibly due to factors such as population growth, increased industrial activities, and reduced river flow.



Source: NCRD

Figure 6: Changes in the BOD Concentration in the Yamuna River (FY 1998 to FY 2004) (mg/l)



Source: NRCD

Figure 7: Changes in the DO in the Yamuna River (FY 1998 to FY 2004) (mg/l)

3. YAP-II: POLLUTION CONTROL ENHANCEMENT IN YAP AREA

Based on the success and lessons learned from YAP I, JBIC signed a new Loan Agreement in March 2003 for the ongoing YAP Project as a continuation and expansion of the earlier program. The Loan Agreement provided financial assistance of 13.33 billion yen. Besides construction and rehabilitation works of STPs and trunk sewers, the following components are included in YAP-II.

- Public Participation and Awareness (PP&A) Programs on public involvement in the decision-making process by utilizing numerous NGOs
- Public Relations / Information Program in Delhi
- Institutional Strengthening and Capacity Building of the Urban Local Bodies (ULBs)
- Capacity Building for NRCD (which is executing agency for this Project)
- Water Quality Monitoring Program
- O&M Study on YAP-I Assets
- Engineering Technology Transfer to ULBs in Haryana

The YAP-II project commenced in December 2004 and is expected to be completed by November 2009. Delhi being major polluter receives a proportionally higher share of fund allocation in this program. Under YAP-II, sewerage components include construction and rehabilitation of trunk sewer, Okhla STP extension, Keshopur STP rehabilitation in Delhi; construction of STPs and SPSs in UP.

In addition to physical implementation of these facilities, capacity building and technology transfer are also important for more efficient and effective implementation and operation of sanitation facilities. For this purpose, JICA (Japan International Cooperation Agency) has dispatched experts to the executing agencies and has conducted training for staff members of these agencies in collaboration with Japan Sewage Works Agency and Sewerage Business Management Center.

4. Formidable challenge ahead

Despite the serious efforts under YAP-I, the pollution of Yamuna River has worsened and it is affecting the life of the residents alongside the river. The challenge is formidable. Pollutants contained in domestic, industrial and agricultural waste largely contribute to the water pollution in Yamuna River with the pollutant ratio of 20%, 17% and 63% respectively. YAP-I and YAP-II address mainly the issue of domestic wastes. It is very difficult to control agricultural wastes for their nature. On the other hand, it is frequently observed that

untreated industrial waste water flows into the sewer. In order for the investments under YAP-I and YAP-II to be effective for the pollution control of Yamuna River, industrial effluents should be controlled according to the relevant affluent standards established by CPCB (Central Pollution Control Board).

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