Review of the interceptor plan for the Yamuna

Analysis by

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Contents

I. Introduction

The interceptor project is projected by the Delhi Jal Board (DJB) as a panacea to the pollution problems of the river Yamuna. An analysis of the detailed project report on this project shows that the project, as it is designed, will not result in a clean river. It will be more money down the drain.

It was in response to the criticism over the failure of the efforts to clean the Yamuna including the Union ministry of environment and forest (MoEF) sponsored Yamuna Action Plan (YAP) that the DJB came up with the idea of interceptor sewers. So far Delhi government has spent over Rs 1,500 crore just to connect 50 per cent of Delhi's population to its sewerage network. Delhi has the largest sewerage infrastructure—6,000 kilometres (km) sewers and 2330 million litres per day (mld) sewage treatment capacity. CSE in its report *Sewage Canal: How to clean the Yamuna* pointed out that a paradigm shift is needed in our approach to clean the river. An approach moving away from the standard hardware—sewer and STP—approach. It called for a plan understanding the linkages between water, sewage and pollution and most importantly the need for authentic data. (**See presentation on Yamuna**)

The interceptor sewer project is yet another hardware project which if implemented will be costlier than all the projects executed till date for cleaning the 22-kilometer (km) stretch of the river. The plan is to tap minor drains discharging sewage into three of Delhi's largest drains at the cost of Rs 2454 crore. Laying of interceptor sewers is just one part of the whole project. There are other components including augmentation of existing capacity of STPs at mouth of Delhi gate and Sen Nursing Home drains, rehabilitation of two major trunk sewers to intercept 13 drains out falling into the Yamuna and most importantly construction of new sewage treatment plants (STPs) after achieving full utilization of existing ones. These are parallel and mandatory efforts required to make interceptors work.

DJB in all its communications to the Supreme Court and the media has maintained that the project cost is Rs 2454 crore which includes expenditure to operate and maintain the interceptors for ten years. What is hidden from public is the fact that the total investment (at current rates) required for the interceptor sewerage project as a package will be anywhere about Rs 5,600 crore. This works out to almost Rs 250 crore per kilometer of the river flowing in the city.

But the larger question is will it ultimately clean the river. CSE's analysis shows that the river cannot be restored to class C bathing quality water as ordered by the Supreme Court (in 2001) and as agreed by the DJB. What is surprising is the fact that the detailed project report is silent on the quality of the river after the implementation of the project. What it says as justification of the project is, "The objectives of the project is to provide a commercially, technically viable and feasible solution on a priority basis that can be provided within a short span of time which is effective abatement of pollution in the river Yamuna and improving water quality making it best fit for the designated use." A closer look at the detailed project report (DPR) published by the DJB reveals many lacunae. The most glaring ones are:

1. The entire design is based on the wastewater generation from official water supply at the rate of 225 litres per capita per day (lpcd). It overlooks huge amounts of waste generated from the groundwater extraction in the city. In other words the volumes of wastewater to be intercepted are under estimated. This

had been the one of the causes for the failure of the past efforts to clean the Yamuna.

2. The project is based on several very critical assumptions—failure to satisfy or meet these assumptions would lead to the failure of the project. The DPR states: "Parallel efforts are required by the DJB to complete the ongoing and planned sewerage infrastructure projects. These are then expected to reduce the amount of dry weather flows into the sub drains; eliminate the dry weather flow discharges in the sub drains where no interceptions have been provided; and capacity augmentations and performance improvements of the various STPs to ensure that intercepted flows are adequately treated before being allowed to discharge back into the drains."
3. Last but not the least, the project will not restore the river to class C—bathing quality (Biochemical oxygen demand (BOD)-3mg/l) waters as ordered by the Supreme Court of India. The project promises to reduce the BOD discharged by Najafgarh and Shahdara drains to about 12 mg/l that too under the condition that if and only if all planned interceptions take place. No projections for coliform counts are available. The report is also silent on the water quality parameters in the river Yamuna after the implementation of the project.
4. No plan for synchronization with the current activities is also presented.

Detailed analysis is presented below:

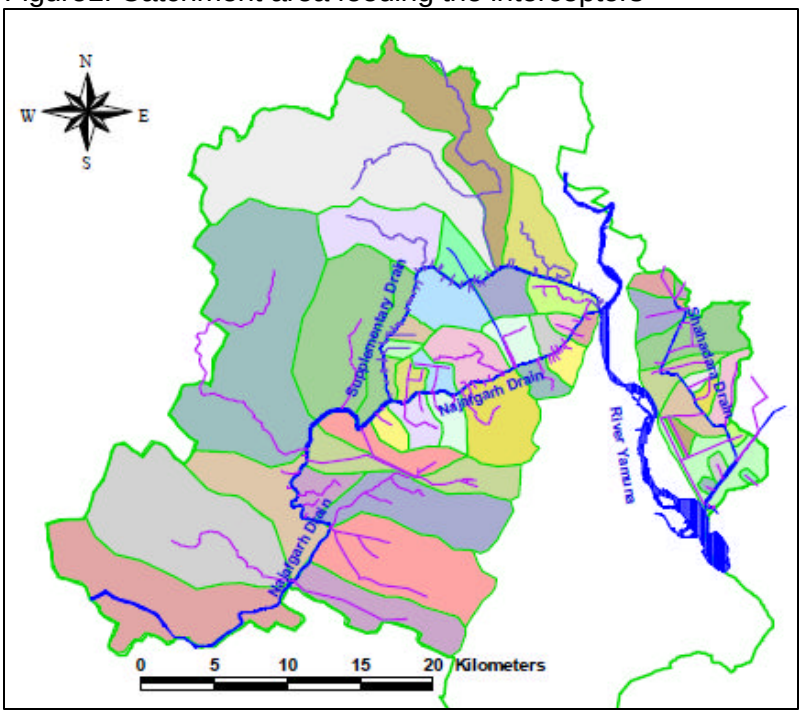
II. The interceptor project: an overview

According to the DJB, the interceptor sewer project is an integrated approach towards zero sewage flows in the drains and the river. There are four major components. The first and the most important being the laying of interceptor sewers to tap the minor drains carrying sewage into three of the major drains—Najafgarh, Supplementary and Shahdara. This will be implemented during 2009-2012.

According to the DJB, these drains constitute 70 per cent of the sewage discharged into the river Yamuna. There are 22 drains out falling into the Yamuna from Delhi. The other components of the massive interceptor scheme include augmentation of existing capacity of STPs at mouth of Delhi gate and Sen Nursing Home, intercepting 13 small drains into the Bela road and ring road trunk sewer after rehabilitation and the construction of sewerage treatment plants (STPs) after utilisation of existing ones. Detailed project reports on the first component, the interceptor sewers, has been prepared by the consultants appointed by the DJB. Though the DPR states that the failure to implement the components 2-4 will lead to the failure of the whole project, the entire focus of the DPR is on interceptors. [1]

According to this report sixty kilometers (km) sewers will be laid parallel to these three drains to tap about 135 minor drains. Overall there are 188 drains falling into the three major drains. Interceptors will tap sewage from 597 sq. km. (i.e. 40 % of NCT Delhi). Intercepted sewage will then be diverted into the existing sewage treatment plants (STPs). Target horizon period is 2036. The interceptor sewer will then function as additional trunk sewers and will start taking flows existing sewer network as they reach capacities over the design horizon years. This is stated to be a 2 in 1 concept.

Figure1: Catchment area feeding the interceptors



Source: Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December

The project was first proposed by the DJB in 2006 for laying 150 km sewers to tap minor drains. This was later revised (in 2007) to 115 km sewers. The matter was presented before the Supreme Court (SC) of India and on March 21, 2007 the SC in the case and "quiet flows the *mailee* Yamuna" [WP[C] 725/1994] constituted an expert committee, which comprised experts from Central Water Commission, Ministry of Urban Development, Central Pollution Control Board, Central Ground Water Board and the Indian Institute of Technology Delhi and Roorkee to assess the techno-economic feasibility of the interceptor sewers in comparison with a plan to set up STPs at the mouth of the drains out falling into the Yamuna. The CEO of the DJB was the member convener of the committee. The committee in its report suggested that the DJB to estimate the volumes (including the predicted flows by 2030) after accounting for the refurbishment and repairs of existing sewers and sewering the unconnected areas. It also cautioned that to restore the river, the STPs needed an upgradation from the current quality standards. [see Box: Recommendations of the expert committee]

To detail out the concept with technical inputs the DJB awarded a project management services contract to the Engineers India Limited (EIL)—a public sector undertaking and signed the contract on January 28, 2008. EIL will be paid 9 per cent of the total project cost as consultancy fee. A consultant CH2M HILL (India) was roped in by the EIL to assist in field investigation works and preparation of a techno-economic feasibility study, preparation of design reports. A detailed feasibility report was submitted in September 2008. In the name of stakeholder consultation DJB and EIL preferred to hold discussions with only government officials and engineers from different line departments and land

owning agencies. Public at large, civil society groups and independent experts were not consulted.

Key recommendations of the expert committee:

The expert committee on DJB's New Scheme of Interceptor Sewers was set up to evaluate the socio-techno economic feasibility of the interceptor sewers vis-à-vis a plan top setup STPs at the mouth of the drains out falling into the river. It is important to note that the committee was not to look into the aspect whether there was an alternate approach to clean the Yamuna. The committee comprising technocrats and bureaucrats vouched for a hardware plan—sewers and STPs.

Given a clear-cut task, the committee constituted by the SC met four times to finalised their report in April 25, 2009. The committee, whose member convener was the CEO of the DJB, found the interceptor option technically and environmentally desirable option. It said that the second option would require Rs 4,600 crore and also it would treat and retreat the waste from various drains.

The committee while supporting the interceptor sounded cautious. In its concluding remarks the report states, "while it is a step in the right direction in contributing to abatement of pollution in river Yamuna, the concept of effective implementation would need further engineering inputs like the correct measurement of flow in drains after rehabilitation of sewers, correct assessment of size of sewers and quality of flow. It also said DJB had to satisfy itself with these inputs before proceeding with the project. Highlights of the recommendations are given below:

1. The ideal solution is to have proper sewerage system for all colonies whether authorized or unauthorized, because it is the right of every citizen to appropriate drinking water, sewerage and sanitation services.
2. Non functional sewerage system should be set right.
3. The existing STPs should be upgraded from their current treated effluent standards of BOD 20 mg/l and 30 mg/l suspended solids. The overall objective shall be to achieve the desirable level of coliform count, BOD, Suspended Solids as well as dissolved oxygen. But suggested this upgradation after achieving existing standards
5. Additional possibilities of reuse of treated water by locating potential users could be explored
6. The interceptor shall carry only sewage and no storm water

DJB has conveniently used the report to push the interceptor sewers and many of the other recommendations mentioned above including the quality of treated STPs and reuse of treated water has been over looked.

III. Design aspects of interceptor plan:

The design is based on inaccurate data and unrealistic assumptions. As a result, the investments may not result in a clean river. A detailed assessment is given below:

i. Design philosophy: The entire design is based on several assumptions. This will have its implications on the success of the interceptor project.

- **Assumption I:** 'Existing works or plans by DJB in the catchment areas of the sub-drains which will reduce or completely eliminate dry weather flows in the sub-drains' as a basis for the projection of dry weather flows and subsequent design of the system. These include rehabilitation of trunk sewers and / or laying of new sewerage systems in existing unsewered areas. Existing sewers reaching its design capacities within the project horizon years will discharge into the interceptor sewers
- **Assumption 2:** STP outfalls, irrigation canal outfalls, effluents from Common Effluent Treatment Plants will not be intercepted and that STP and CETP effluents are within the effluent discharge standards.
- **Assumption 3:** Wastewater generation is calculated based on an official water supply of 225 lpcd. The drain flows have been calculated based on the ongoing or planned trunk sewer rehabilitation works undertaken within the sub-drain catchment area in the short term;

In reality many of these are difficult to achieve.

ii. Wastewater data

- Despite the recommendations of the committee on interceptor to get correct measurements of flow, it seems that the DJB and EIL has based all its calculations on the official water supply at the rate of 225 lpcd. This was the same approach adopted by the DJB in its earlier attempts to clean the Yamuna. And most importantly, these unrealistic and under estimated sewage volumes have attributed to the failure of Yamuna clean up efforts. According to the estimates of CSE, in Delhi about 60 per cent of the domestic water use is from groundwater, for which no estimates are available.
- As a result, the volume of sewage calculated for the year 2008 was less than the actual observed flows monitored by the CPCB during 2007. For instance, in the Najafgarh and Supplementary basin the flow data estimated by EIL is 1,100 million litres per day (mld) less than the annual average flows observed by CPCB during 2007. It is also important to note that the differential increases during the peak flows. (See table: Under estimated sewage flows).
- The scenario in Shahdara is no different—here the EIL flow data is about 40 mld lower than the Central Pollution Control Board's (CPCB) 2007 estimates. However, in 2008, the average annual flow in Shahdara was 975 mld. Therefore a gap of 460 mld!
- It is also interesting to note that the predictions for 2036, almost matches with the 2007 observations of the CPCB. Given this, it is obvious that the interceptor will not be able to cater to sewage flows in future.

Table: Mismatch in flow estimates

	Predicted flows		
	EIL 2008	EIL 2036	CPCB 2007
Najafgarh + supplementary	963	2042	2110 (2007 data)
Shahdara	513	788	555 (2007 data); 975 (2008 data)

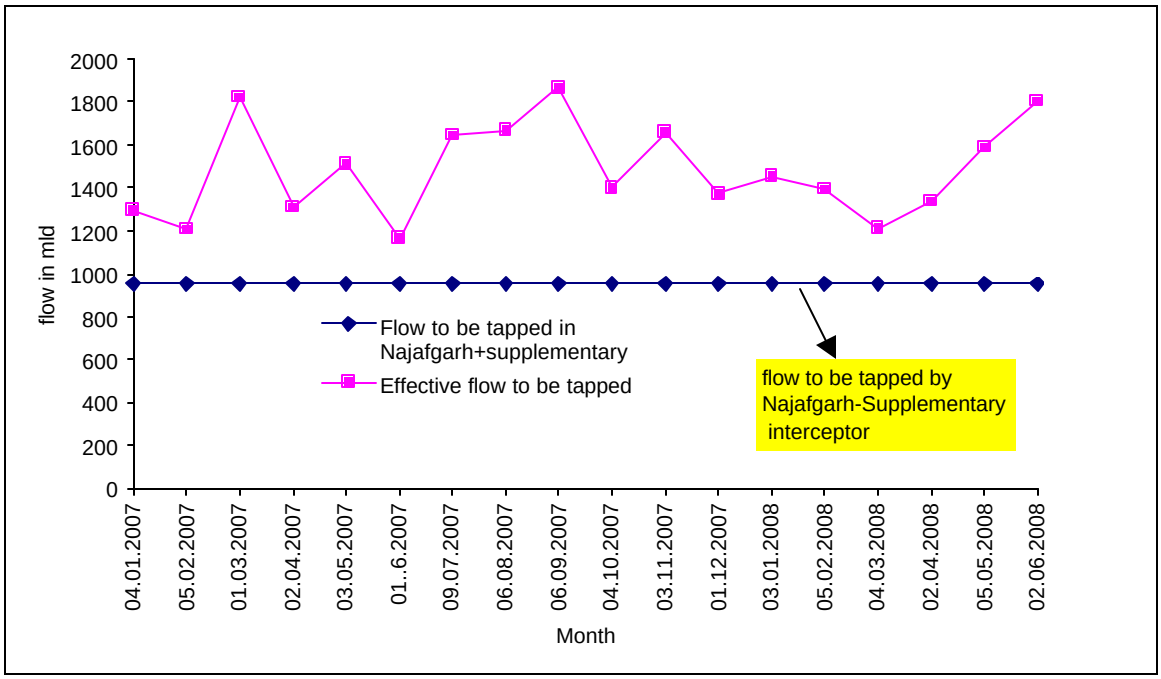
Note: all values in mld; EIL estimates based on 225 lpcd;

- ***Najafgarh & Supplementary drain:*** According to CPCB monitoring data for the year 2007, the annual average flow in Najafgarh and Supplementary drains at their outfalls into the Yamuna, was 2110 mld. The modeling by EIL estimated the total flow in the basin to be about 1600 mld. A gap of 500 mld! [Maximum recorded flow in the first half of 2008 was 3400 mld during August 2008]

  It is also important to note that the Najafgarh drain receives wastewater from Haryana and freshwater flow from the western Yamuna Canal to the tune of 610 mld. To be on a conservative side, if we deduct this flow (as it is not to be tapped by interceptors as per EIL's design) the effective flow in 2007 works out to 1500 mld. In other words EIL's flow predictions for 2036 almost matched with the actual observed in 2007! That too based on an assumption that Haryana would stop its discharge into the Najafgarh. If it doesn't then the interceptor will not be able to tackle the load.

  There is yet another catch: Even out of the estimated 1600 mld, according to EIL plan little less than 60 per cent would be tapped (950 mld) to the interceptor sewers. (See Graph 1: flow in excess of interceptor design in Najafgarh-supplementary basin)

See Graph 1: flow in excess of interceptor design in Najafgarh-supplementary basin



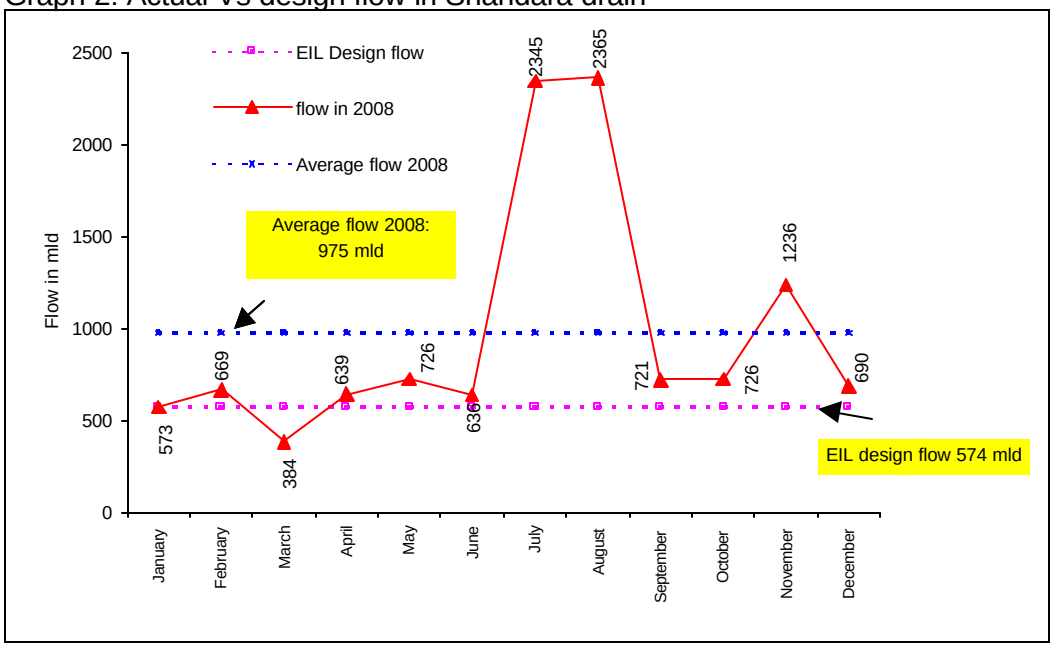
Note: Effective flow is arrived at by deducting the freshwater flow from western Yamuna Canal (450 mld) and sewage discharge from Haryana (160 mld) from the volumes observed by CPCB during 2007.

Source:

1. Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December
2. Compiled from the water quality monitoring reports of the Yamuna and drains in Delhi, Central Pollution Control Board, 2007-2008, *mimeo*

- **Shahdara:** According to EIL report during 2008, the wastewater generation in the Yamuna Vihar and Shahdara command is to the tune of 513 mld. However according to the monitoring by the Central Pollution Control Board, during 2008 the average flow in the Shahdara drain was 975 mld. (see graph 2: actual Vs design flow in Shahdara drain). [During 2007 the average flow was 555 mld].
    - Of the total flow in the Shahdara drain there are flows from Uttar Pradesh is about 160 mld. If we deduct this then the waste generation in Shahdara region works out to about 813 mld.[2] Shahdara interceptor will tap only about 460 mld.

Graph 2: Actual Vs design flow in Shahdara drain

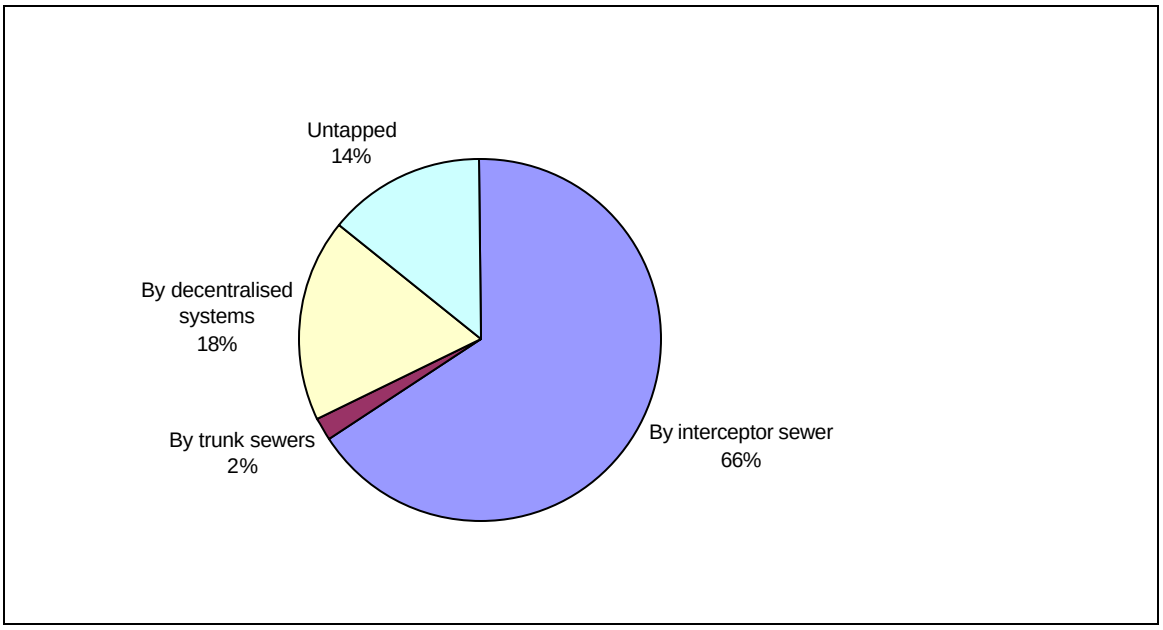


Note: Design flow is for a horizon year of 2036
Source: Central Pollution Control Board, 2008

iii. Not all waste will be tapped: *During rainy season, as per design, flows will be diverted into the drains. This is because the intercepting chambers will automatically shut down. During non rainy days, 66 per cent flow in drains will be tapped and diverted to STPs for treatment.*

- It is clear that not all waste will be tapped. According to the EIL design, the interceptors will tap only 65 per cent of the dry weather flow in the three drains. Of the rest 20 per cent will be tapped by trunk sewers and decentralized systems and there are no plans for the rest 15 per cent. (See Graph 3: Interceptor will tap only 66 per cent of the sewage flowing into Najafgarh)
- During monsoon the wet flows will be discharged into the drains. In its submission to the committee on interceptors DJB accepted that a ”suitably designed interceptor will be constructed in the drains to tap sewage during non rainy days when there is only sewage/sullage in drains. Flow during wet days will be let in to the drains.” This means that during rainy days the interceptor sewers will not tap sewage from the sub drains.
- The DPR’s introductory chapter claims that 135 drains out of 188 will be tapped into the interceptors. However in reality only a little over 100 drains will be tapped. These sub drains contribute to about 66 per cent of the volume of flow as reported by the EIL. (see Table 1: Flows to be tapped by the interceptors)
- In Najafgarh where almost 50 per cent of the project investment will be made, only about 58per cent of the flow will be tapped into the interceptors. Rest (about 450 mld) the EIL says will be taken care of by trunk sewers and decentralized systems. There are no plans for about 10 drains with a flow of 230 mld.
- In Shahdara drain almost 86 percent of the flow will be tapped into interceptors. There are no plans for about 80 mld flow.

Graph 3: Interceptor will tap only 66 per cent of the sewage flowing into Najafgarh



Note: it is assumed by the EIL that the untapped flows (from common effluent plants (about 30-40 mld as per current utilisation) and others will be within discharge standards.

Table 1: Flows to be tapped by the interceptors

	No of drains	Total volume in Mld	Drains to be intercepted to IS	Volume to be intercepted to IS	Sub drains to be intercepted to trunk sewers and decentralised systems	Volume to be intercepted to trunk sewers to STP and decentralised systems	Sub drains not intercepted	Volume not intercepted
Najafgarh	65	1101.2	28	656	27	391.6	10	53.6
Supplementary	82	531.7	45	296.4	1	52	36	183.3
Shahdara	41	574.3	34	496.2	0	0	7	78.1
Total	188	2207.2	107	1448.6	28	443.6	53	315

Source: Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December

iv. Sewage treatment Vs generation:

According to EIL's assessment, overall in the three drains, a shortage of 1000 mld treatment capacity exists. As of now the treatment capacity available is to the tune of 1,500 mld. As per EIL among the various packages, only Rithala has an excess of 40 mld between sewage generation and treatment. EIL report also states by 2036, the treatment capacity would increase to 2,300 mld leaving a gap of 760 mld. (see table 2: sewage generation Vs treatment capacity in interceptor packages).

As pointed out earlier, these figures seem to be an under estimate. For instance the actual gap in Shahdara works out to about 520 mld as compared to 290 mld as reported by EIL.

Table 2: sewage generation Vs treatment capacity in interceptor packages

	Package name	Existing capacity 2008	GAP 2008	Capacity 2036	GAP 2036
1	Dwaraka/Najafgarh	112.5	-77.4	202.5	-184.95
2	Nilothi/Keshopur	504	-367.65	594	-202.95
3	Coronation Pillar	180	-277.2	180	-311.4
4	Rohini/Rithala	427.5	41.85	787.5	150.75
5	Shahdara North	90	-244.8	202.5	-82.35
6	Shahdara South	202.5	-126	405	-137.25
	Total	1516.5	-1051	2371.5	-768

Note: all values in mld; - indicates the shortage in treatment capacity

Source: Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December

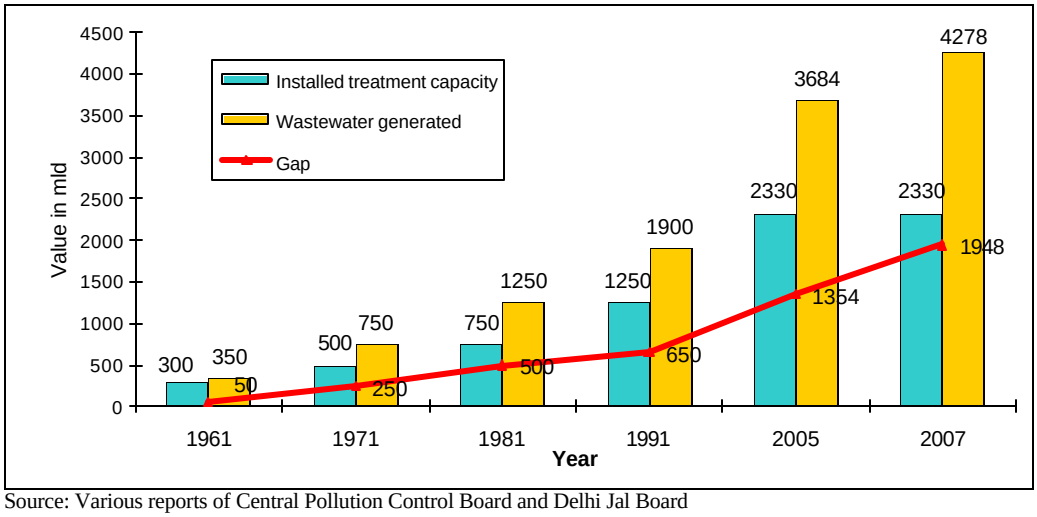
The gaps are even higher when we look at the city as a whole. According to the monitoring by CPCB, 65 per cent of the wastewater generated is disposed off untreated into the river Yamuna. Delhi today has a STP capacity of 2,330 mld of which only 1500 mld is utilised. According to DJB, another 450 mld STP capacity was to be augmented by 2009. There is very little progress made on this front. (see box: status of sewage treatment in Delhi)

Status of sewage treatment in Delhi:

According to the monitoring by the CPCB, during 2007 the wastewater discharge from Delhi was to the tune of 4,300 mld. This is almost 600 mld higher than the sewage volumes observed during 2005-2006. Today, the gap between treatment capacity and waste generation is over 1900 mld. If we account for the under utilisation of installed capacity, the amount of untreated wastewater discharged into the Yamuna is to the tune of 2,800 mld.

The growth in sewage treatment capacity has not kept pace with the increase in population and waste. It is true that population growth in Delhi is phenomenal. So is the increase in the amount of waste that the city generates. Statistics reveal that treatment capacity increased 7-fold (from 300 mld in 1960 to 2,330 mld in 2008) in the last 40 years as compared to twelve fold growth in wastewater generation. (See Graph: Gap in wastewater generation and treatment in Delhi).

Graph: Gap in wastewater generation and treatment in Delhi



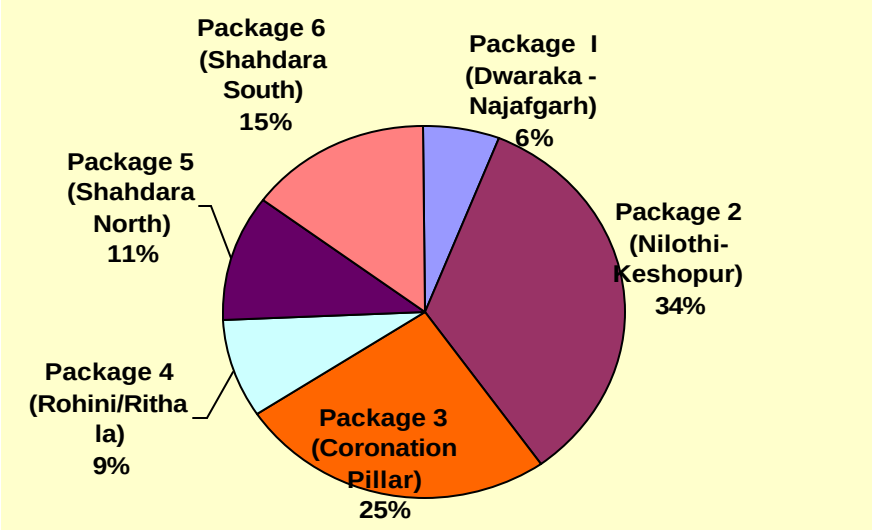
Source: Various reports of Central Pollution Control Board and Delhi Jal Board

IV. Investment plan

According to the DPR prepared by the EIL, total cost of the interceptor sewer project is Rs 2,454.8 crore. Of this Rs 1,842 will be the capital cost and about Rs 638 crore for a ten-year operation and maintenance cost. About Rs 127 crore is allocated under the head general and preliminary expenses. The Delhi government is pinning its hopes on the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) of the ministry of urban development to raise 35 per cent funds. This is excluding the costs of other components like ongoing sewer rehabilitation

The whole project is divided into 6 packages catering to the catchments of existing STPs—Dwaraka & Najafgarh, Nilothi & Keshopur, Rohini & Rithala, Coronation Pillar [Najafgarh & Supplementary basin], Shahdara north (Yamuna Vihar) and Shahdara south (Kondli) [Shahdara basin]. Of the total investment including the operation and maintenance, 50 per cent is allocated for Najafgarh and the rest divided between Supplementary and Shahdara (see Graph 4: Package wise investment plan)

Graph 4: Package wise investment plan

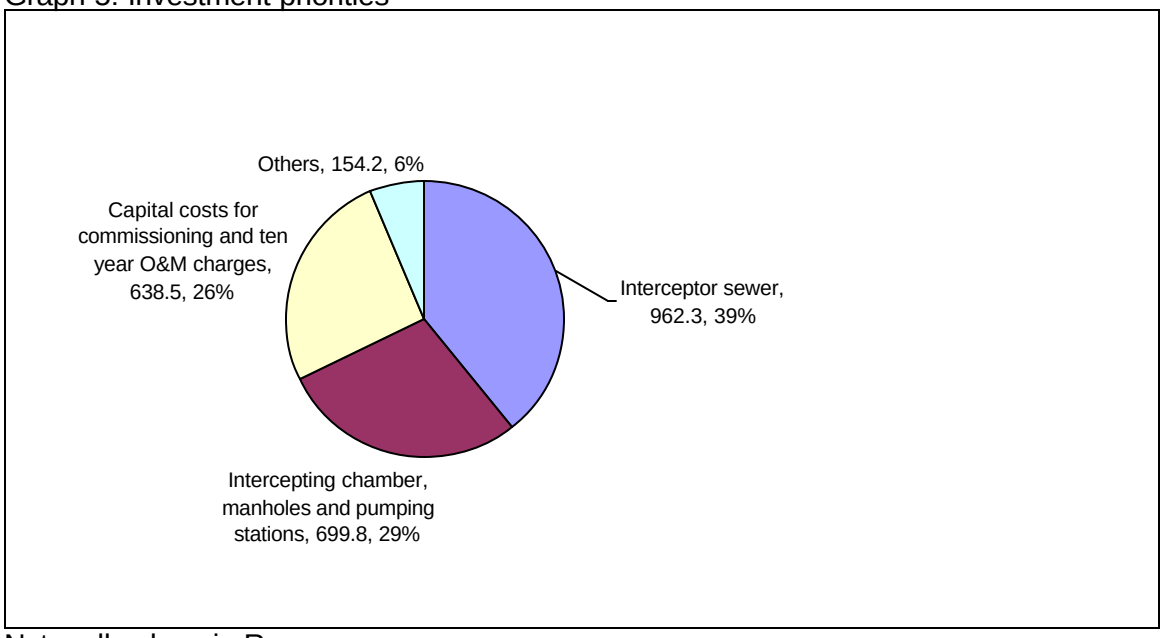


Source: Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December

Of the total costs, about 70 % will be spent on sewer lines and pumping stations. Sixty-kilometer pipelines will be laid at the cost of Rs 963 crore. This translates to Rs 16 crore per km of sewers. See also annexure 1: Detailed investment plan). About 26 per cent is earmarked (Rs 638 crore is earmarked for ten year operation and maintenance). See graph 5: investment priorities;)[1]

[1] The cost for sewers had been fluctuating. In the initial proposal for 150 km interceptors the DJB estimated a cost of Rs 3,150 crore. In other words Rs 21 crore a Km. In the next revision, this dipped to Rs 10 crore per km of sewers. (Rs 1,950 crore (of this Rs 1,250 crore for sewers) for laying 115 km sewers). Here about 35 per cent was earmarked for treatment capacity augmentation.

Graph 5: Investment priorities



Note: all values in Rs crore

Source: Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December

What is the true cost of the project?

As mentioned earlier the interceptor project comprises four components and Rs 2454 crore is the investment just for the interceptor sewer component. By its own submission the detailed project report prepared by the consultants of DJB admits that the investment in interceptor sewers would work only if some more investments are made to complete the ongoing sewerage rehabilitation project and YAPII. According to DJB's presentation before the committee on interceptors sewer the rehab will cost Rs 900 crore. There are no estimates available on the amount of investment required for sewage treatment capacity augmentation. According to assessment by CSE, to meet the current gap in sewage treatment (1948 mld) Rs 2,200 crore would be required. This brings the total cost of the interceptor package to Rs 5680 crore. According to the information sourced by the Centre for Science and Environment, the total cost of all the four components put together at current estimates will work out to atleast Rs 5,680 crore. This is excluding the operation and maintenance cost of the components other than interceptors.

In a nutshell, the investment in interceptor sewers is about 50 per cent of the total planned projects in the name of Yamuna clean up. (see Table 3: Actual cost of the interceptor project).

Till 2007, Delhi government has spent in the range Rs 1,200 –1500 crore to lay 6,000 km sewers and set up 2,330 mld sewage treatment capacity. In 2005 another Rs 387 crore was sanctioned under YAPII. (See annexure 2: Cost of Yamuna clean up by 2012). Once the interceptor project is implemented the total investment will go up to Rs 7000-7200 crore. In other words, Delhi would have spent Rs 320 crore per kilometer of the river stretch.

Table 3: Actual cost of the interceptor project

Component	Description	Rs Crore	As per centage of total
1	Interceptor sewers including ten year O&M charges	2,454	43%
2	STP Augmentation at Delhi gate and Sen Nursing (115 mld) excluding O&M	130	2%
3	Sewer rehabilitation (2004-2005)	170	3%
	Sewer rehabilitation JBIC (YAP II)	185	3%
	Sewage treatment plant (YAP II)	202	4%
	Sewer rehab (Delhi govt funds-51 km ten trunk sewers)	377	7%
4	STP augmentation after utilising existing capacity (gap as on 2007is 1948 mld)	2,164	38%
	Total	5,682	100%

Note: STP augmentation costs based on DJB norms of Rs 90 lakh per mld.

But the question is will this bring the Yamuna back to life?

V. Impact on the river

Despite a massive investment, the interceptor project offers no respite to the quality woes of the river. It is surprising to note that the DPR makes sweeping statements on 'significant improvement of river water quality' but fails to give water quality targets for the river. Nowhere in the report, there is a mention of restoring the river to bathing quality as directed by the Supreme Court. On April 10, 2001, the Supreme Court (SC) directed "it is imperative that at least by March 31, 2003, the minimum desired water quality of the river is achieved, so that it can no longer be called '*mailee* (dirty) Yamuna." In addition, the order said that the dissolved oxygen (DO) levels in the entire stretch of Yamuna be maintained at a minimum concentration of 4 milligrammes per litre (mg/l). This was in accordance to the river water quality criteria developed by the CPCB. Though many years have passed by, the river is still dirty. [see factsheet: state of pollution in the river Yamuna]

EIL undertook a water quality modeling for the drains and not the river after the commissioning of the project in 2012. Here again baseline data on quantity and quality are quite different and under estimated as compared to the actual. The DPR claims that project if implemented will reduce the wastewater flow into the river by about 86 per cent. On the contrary the data presented shows that only 66 per cent flows will be tapped on to the interceptor sewers. Most importantly the figures used by EIL are underestimated to the tune of 500 mld.

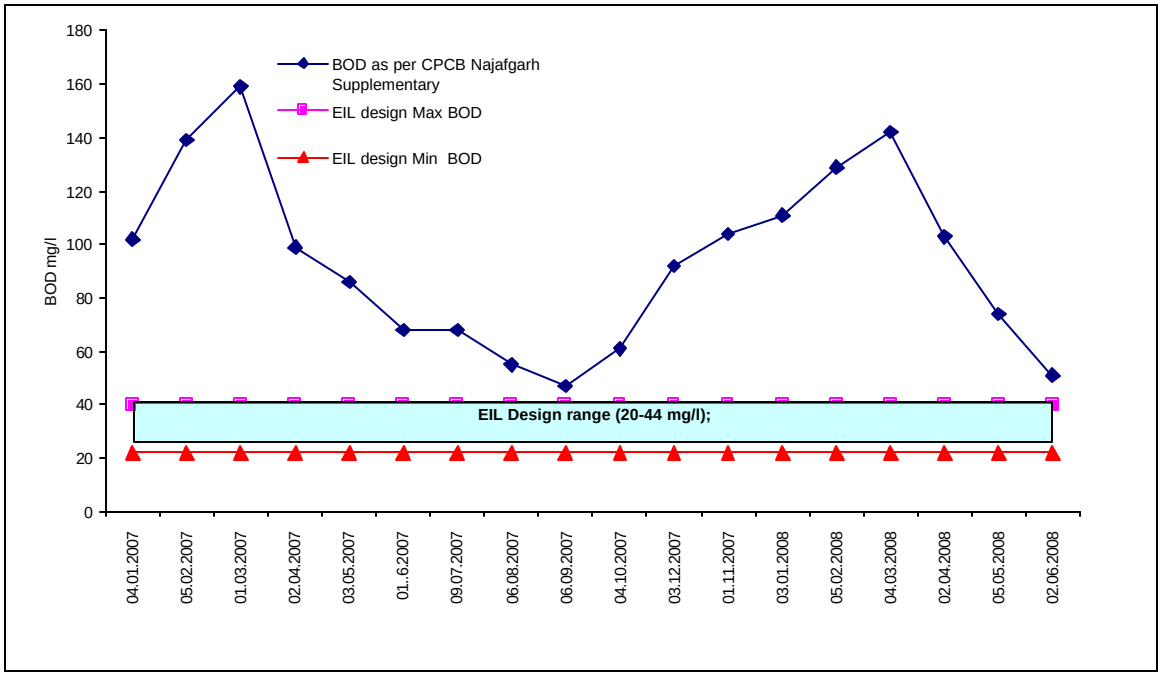
Modelling has been done for BOD and total suspended solids (TSS). It has totally overlooked the issue coliform contamination, which is of great significance in the Delhi stretch of the Yamuna. More over it was assumed that all the STPs and CETPs would adhere to the water quality standards. Based on the model, EIL claims that the BOD

reduction in the Najafgarh and Shahdara will be to the tune of 60%. What impact this will have in the river is not specified.

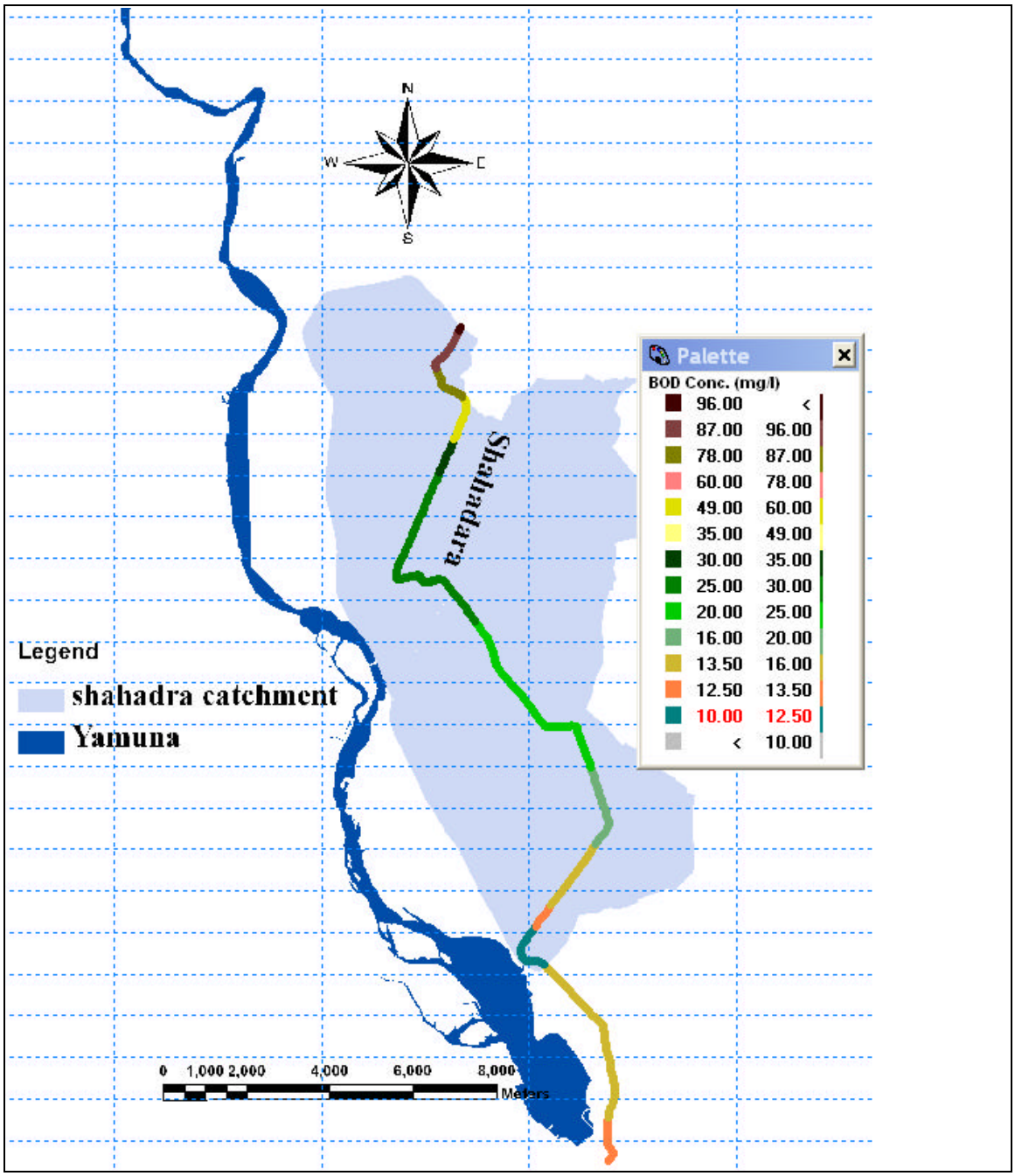
The larger issue here is the inaccurate baseline data used for modeling itself. There are glaring mismatches between the data used for modeling and the actual observed values of CPCB.

- As per the EIL report, the maximum baseline BOD data is taken as 45 mg/l for Najafgarh and 40 mg/l for the Shahdara drain. This is much less than the concentrations observed by the CPCB monthly monitoring data for 2007-2008. Maximum values as per CPCB monitoring for 2007-2008 respectively for Najafgarh and Shahdara drains, are 67 mg/l (average: 46 mg/l) and 159 mg/l (average 90 mg/l).
- In Shahdara drain the design values are exceeded for throughout 2007 and 2008. (See graph 6: BOD data used for modeling of water quality is far less than the actual observations –case of Shahdara drain)

Graph 6: BOD data used for modeling of water quality is far less than the actual observations –case of Shahdara drain



Map: EIL's modeling of water quality in Shahdara drain; no commitments for the river



Source: Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December

Issue of dilution overlooked: The next major miss in the whole planning exercise was the lack of freshwater for dilution in the river Yamuna. Yamuna does not have the dilution for almost 9 months a year and what flows in the river is the waste of Delhi. In

order to bring down the treated effluent to bathing levels i.e., 3 mg/l, it is imperative to have either dilution in the river or else improve the treatment system in Delhi STPs. [Delhi STPs are designed to treat sewage to BOD 20 mg/l and TSS 30 mg/l. Majority of the STPs are not designed to meet any coliform standards.] Both options have not been considered by the EIL.

Even if the entire sewage in Najafgarh and Shahdara were treated to BOD 20 mg/l, Yamuna would need 18 billion litres of freshwater to dilute it to bathing levels. If we assume that the river water quality will be same as in the drains as predicted by EIL (12 mg/l) then the dilution requirement will be 10 billion litres per day. This is almost 4.5 times the water drawn by DJB for Delhi's water supply. And it is also a fact that such a luxury is never available for Yamuna.

In other words, besides the assumptions, to make the interceptor plan successful, the almost 4 times the drinking water supply is required as dilution. (see table 4: There isn't any dilution in the river)

Table 4: There isn't any dilution in the river

Drains	Flow in mld	EIL's predicted BOD in drains	BOD if all waste in the drain is treated	Freshwater required (in mld) for dilution to achieve bathing level (BOD 3 mg/l) as per EIL	Dilution required as per BOD 20
Najafgarh	2116	12	20	8464	14106
Shahdara	555	12	20	2220	3700
				10,684	17,806

VI: Annexure

Annexure 1a: Detailed cost breakup

Components	Package I (Dwaraka - Najafgarh)	Package 2 (Nilothi-Keshopur)	Package 3 (Coronation Pillar)	Package 4 (Rohini/Rithala)	Package 5 (Shahdara North)	Package 6 (Shahdara South)	Total
General & preliminaries	7.4	44.2	30.1	10.5	14.5	19.7	**126.4**
Interceptor sewer	29.7	376.2	220.6	67.7	101.8	166.3	962.3
Manholes	1.4	26.7	15.2	10.8	11.5	14.5	80.1
Intercepting chamber	15.8	75.8	50.7	21.7	26.7	42.9	233.6
Sewage pumping stations	36.4	123.8	113.2	30.5	48	34.2	386.1
Capital costs for commissioning and O&M	2.9	5.4	5.2	3.9	3.5	5.5	26.4
10 year O&M	56.6	180.2	178.1	63.3	61.6	72.3	**612.1**
Provisional sums	3.2	5.1	5.2	4.8	4.6	4.9	27.8
Total	153.4	837.4	618.3	213.2	272.2	360.3	2454.8

Source: Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December

Annexure 1.b: Summary of investment

Sno	Package name	Intercepting Chambers (no)	Intercepting sewers (metres)	Pumping stations (no)	Capital cost Rs crore	Annual O&M cost
1	Dwaraka	3	2252	2	96.8	56.6
2	Nilothi/Keshopur	40	23400	2	657.2	180.2
3	Coronation Pillar	35	11854	3	440.2	178.1
4	Rohini/Rithala	19	4876	1	149.9	63.3
5	Shahdara North	16	6028	1	210.6	61.6
6	Shahdara South	19	11594	1	288	72.3
	Total	132	60,004	10	1842.7	612.1

Source: Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December

Annexure 2: Cost of Yamuna clean up by 2012

S No	Capital investments to clean Delhi stretch of Yamuna	Rs Crore
1	YAP-I	17
2	YAP extended	163
3	17 STPs with a capacity 2330 mld[1, 2]	750-1000
4	15 common effluent treatment plants	256
5	Sewer rehabilitation	100
A	Sub total (till 2005)	1286-1536
6	Sewer rehabilitation (2004-2005)	170
7	Sewer rehabilitation JBIC (YAP II)	185
8	STP (YAP II)	202
9	Sewer rehab (Delhi govt-51 km ten trunk sewers)	377
10	Interceptor project	2454
11	STP Augmentation at Delhi gate and Sen Nursing (based on DJB norms of Rs 5 crore per mgd)	130
12	STP augmentation after utilising existing capacity (gap 1948)	2164
B	Sub total of proposed investments by 2012	5682
	Total for 22 km of Yamuna	**6968-7218**

Source: Calculated by CSE

References:

[1] Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December
[2] Anon 2008, Detailed Project Report for Laying of Interceptor Sewer along Najafgarh, Supplementary and Shahdara Drain for Abatement of Pollution in River Yamuna, Engineers India Limited and CH2M HILL (India) Pvt Limited, New Delhi, December