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## River Yamuna: Past Perfect, Future Imperfect

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### Abstract

The river Yamuna, once a lifeline of plains of North-Western India and an important tributary of river Ganga has been reduced to a sewer due to the combined callous attitude of the people residing on its banks and the Government. The dying river can be saved and restored to its pristine status only with the timely intervention of the Government and the people alike. The paper discusses not only the causes and the impact of various sources of pollution but also the short and long term measures of fighting pollution which if implemented in the right earnest can restore the glory of the river.

**Key Words:** Lifeline, sewer, dying river, pollution, causes, impact, measures, restore, glory.

### Introduction

Unchecked population growth accompanied by haphazard industrialization and urbanization has led to large discharge of industrial waste and sewage into Yamuna which is one of the most polluted rivers in the world, especially around Delhi, which dumps about 57% of its waste into the river. Delhi, the capital of India is best known for pollution of the Yamuna River, which looks like a sewer. New Delhi is not at par with other major cities of the world despite its magnificent flyovers, towering buildings, huge multiplexes, fun parks, metro and much more. A number of reasons are behind Delhi's ailing position and pollution of river Yamuna is one of them. From big industries and factories to people living in big colonies, slums and rural areas, all pollute the river with impunity. If London is famous for beauty of its river the Thames, Delhi is known for pollution of the Yamuna River. Once the lifeline of Delhi, Yamuna has now become the most polluted water resource of the country. It seems to serve the most exemplary example of the hypocrisy and negligence, a Government and citizens could display. A number of projects

were launched by the government to clean the Yamuna, but till date nothing has happened. Not only the government, but also several NGOs are working to clean it. Yet, the situation is worsening day by day.

Delhi chief minister Sheila Dixit had claimed that Yamuna would be cleaner up to 70 per cent, before the Commonwealth Games in 2010. Ironically, the Delhi government itself submitted an affidavit before the Supreme Court stating that the Yamuna clean drive would not be completed before 2012. In its affidavit, Delhi Jal Board (DJB) said that the river remained a 'sewage canal' due to the 143 unauthorized colonies, 1,080 slums and villages that present a problem in collection of sewage water that flows into the Yamuna untreated.

But this failure is not only of Government action but also public cooperation. People continue to wash their clothes in the river and let their cattle bathe in. The public continues to drain in untreated human, animal and chemical wastes into the water, which have been degrading its water quality. In fact, people continue to dispose off the ashes of the dead into this river, as per the Hindu rituals. And these citizens themselves do not fail to criticize the Government for its delayed action.

### **Pristine River in the Past**

The river Yamuna, the largest tributary of river Ganga, has been one of the most prominent and sacred rivers of India through the ages. Yamuna, according to the legends, was the daughter of Surya, the Sun God and sister to Yama, the God of Death. Consequently, popular belief is that those who take a dip in its holy water are not tormented by fears of death. The river Yamuna, originates from the Yamunotri glacier near Banderpoonch peaks (38°59' N, 78°27' E) in the Mussourie range of the lower Himalayas at an elevation of about 6387 m above mean sea level in district Uttarkashi (Uttaranchal). The Tons and Giri rivers are the important tributaries of Yamuna and principal source of water in mountainous range. The river Yamuna traverses a route length of about 1200 km in the plains from Saharanpur district of Uttar Pradesh to the confluence with river Ganga at Allahabad. Such is the Impact of Yamuna and other North Indian rivers that the entire region is regarded as most fertile land in the Indian subcontinent. The total area it covers before merging with majestic Ganga is 345,850 square km.

The main tributaries joining in this reach include the Hindon from eastern bank and the Chambal, the Sind, Betwa and the Ken from south-western bank. The catchment of the Yamuna river system covers parts of the states of Uttaranchal, Uttar Pradesh, Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh and the entire state of Delhi. Each one of these major tributaries in turn have its own tributary system. The importance of Yamuna in the Indo-Gangetic Plains is enhanced by its many canals, some dating back to as early as 14th century A.D. by the Tughlaq dynasty, which built the Nahr-i-Bahisht (Paradise), parallel to the river. It was later restored and extended by the Mughals in the first half of seventeenth century, by engineer Ali Mardan Khan, starting from Benawas where the river enters the plains and terminating near the Mughal capital, Shahjahanabad, the present city of Delhi. As the Yamuna enters the Northern plains near Dak Pathar at a height of 790 meters, two canals namely, the Eastern and Western Yamuna Canals commence from the Assan barrage about 11 kilometers from Dak Pathar in Doon Valley, the canals irrigate vast tracts of lands in the region, then once its passes Delhi, it feeds the Agra Canal built in 1874, which starts from Okhla barrage beyond the Nizamuddin bridge, and the high land between the Khari-Nadi and the Yamuna and before joining the Banganga river about 20 miles

below Agra. Thus during the summer season, the stretch above Agra resembles a minor stream. A heavy freight canal, known as the Sutlej-Yamuna Link (SYL), is being built westwards from near its headwaters through the Punjab region. The canal starts near Palla village near Delhi, and though the state of Haryana has completed its portion, Punjab is against its construction, and the state legislature passed the "Punjab Termination of Agreement Act 2004", which declared earlier agreements null and void.

The stretch of the river from its origin to Okhla in Delhi is called "Upper Yamuna". A Memorandum of Understanding (MoU) was signed amongst the five basin states, namely Himachal Pradesh, Uttar Pradesh, Uttaranchal, Haryana, Rajasthan and Delhi, on 12 May 1994 for sharing of the water of Upper Yamuna. This led to the formation of Upper Yamuna River Board under Ministry of Water Resources, whose primary functions are regulation of the allocation of available flows amongst the beneficiary states and also for monitoring the return flows; monitoring conserving and upgrading the quality of surface and ground water; maintaining hydro-meteorological data for the basin; over viewing plans for watershed management; monitoring and reviewing the progress of all projects up to and including Okhla barrage.

### **Geography and wildlife**

The catchment area of the river, especially till it touches the plains, is replete with alpine, semi alpine, temperate and sub-tropical vegetation, and vast areas are under forest cover, and supports extensive animal life. Yamuna is the frontier of the Asian Elephant. West of the Yamuna, there are no elephants to be found over 900 km of the western Himalayas and their foothills. The forests of the lower Yamuna offer ideal corridors for elephant movement. The principal forests to be found here are of sal, khair (acacia), and sissoo (rosewood) trees, and the Chir Pine forests of the Shivalik Hills.

In the past the river used to be the main source of life for drinking water, communication and irrigation. Thus serving as the lifeline for the human kind. The pollutants were limited to storm water drains. But with the post-world war II in general and post-independence in particular, India witnessed massive deforestation leading to soil erosion and related problems. Simultaneously industrialization and emphasis of modern living gained momentum. All the major industries are on the bank of one or the other river. Yamuna outnumbers any other river in the number of industries on its banks. This is because it passes through many major (post-independence) industrial cities. But real problem of Yamuna pollution starts when it passes through state of Delhi. Research shows that before it passes through Delhi, the water quality is very much under control. The stretch between Wazirabad and Okhla barrage in Delhi is only 2% of its catchment area, but it contributes about 80% of the river's total pollution load.

### **Causes of pollution in River Yamuna**

In the capital New Delhi and its surrounding areas, Yamuna is one of the most polluted rivers in the world in spite of the numerous efforts made to keep it clean. The main reason behind this is the high density of the population living in the city and the dumping of untreated water and waste into the river. To add to it the attitude of government is lax towards it and the projects meant for the cleansing of the river are not implemented properly. The water in this river remains stagnant for nine months in a year that further aggravates the situation. The major

causes of pollution of Yamuna are outlined as below:

### **Dumping of untreated domestic waste**

The Yamuna's 22-km stretch in Delhi is barely 2 per cent of the length of the river, but contributes over 70 per cent of the pollution load. The municipal sector is the main source of water pollution in terms of volume. Delhi generates about 3,296 million litres per day (mld) of sewage while the city's installed waste water treatment capacity is only 2,330 mld. More than 937 mld of waste is not treated. Out of Delhi's 2,330 mld treatment capacity, 37 per cent is under-utilised and hence 1,270 mld of untreated sewage is allowed to enter the river every day. Thus, substantial quantity of untreated sewage and partially treated sewage is discharged into the Yamuna every day. Even the quality of treated effluent does not meet the stipulated specifications implying that even the treated effluent is contributing to the deterioration in water quality. As a result Biochemical oxygen demand (BOD) load has increased by 2.5 times between 1980 and 2005 - from 117 tonnes per day (TPD) in 1980 to 276 TPD in 2005. The faecal coliform count, which indicates the presence of disease causing micro-organisms, is nearly 25,000 times more than the limit prescribed for bathing.

The Capital has 18 drains discharging treated and untreated wastewater/sewage into Yamuna. The Najafgarh drain contributes to 60% of the total wastewater and 45 per cent of the total BOD load being discharged from Delhi into the Yamuna. 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 Delhi. The DJB functions under the Department of Urban Development of the Govt. of Delhi. The DJB has 30 Sewage Treatment Plants at 17 locations in Delhi but most of them are non-functional. DJB has not created treatment capacity to match the actual sewage generation in Delhi. As a result the water quality of Yamuna has not shown the desired improvement owing to large gap between the demand and availability of sewage treatment capacity and lack of fresh water in the river.

### **Pollution due to Industrial runoff**

The Yamuna's 22-km stretch in Delhi is barely 2 per cent of the length of the river, but contributes over 70 per cent of the pollution. According to the CPCB, 70% of the pollution in rivers is from untreated sewage. The remaining 30% is from industrial source, agricultural run-off, garbage, etc. As per the Delhi Master Plan 2001, there are 28 approved industrial estates in Delhi. The Supreme Court directed the Delhi Govt. in February 1996 to construct Common Effluent Treatment Plants (CETPs) in these industrial estates to treat industrial sewage. Accordingly Delhi Pollution Control Committee (DPCC) appointed the National Environmental Engineering Research Institute (NEERI) in March 1996 to prepare a detailed project report including design and specification of the CETPs. Delhi State Industrial Development Corporation (DSIDC) was supposed to undertake construction of the CETPs as per technical knowhow provided by the NEERI. NEERI recommended construction of 15 CETPs in 21 industrial estates by 1998 at a total cost of 90 crores. DSIDC could take up construction of only 10 CETPs and that too by 2004 at a total cost of 123.12 crores. Even these have been found to be not working to their full capacity. The planning and provisioning of infrastructure has not kept pace with the increase in population, resulting in rural villages, shanties and colonies without adequate sewerage infrastructure. Only around 54 percent of the population is connected to this sewerage

network, leaving 46percent of the population uncovered. The colonies, villages and Jhuggi Jhopri (JJ) clusters without sewerage facilities are mainly in outer Delhi areas and the wastewater generated is presently flowing into river Yamuna.

### **Pollution caused by religious practices**

The damage done to the river in the garb of religious practices is immense. Immersion of ashes of the dead as per Hindu rituals and of Durga puja idols continues unabated. About 1300 durga pujas are organised in Delhi every year. 30 tonnes of toxic elements go into Yamuna due to idol immersion every year says a 2008 study. Hundreds of Durga Puja idols are immersed every year in the river, much to the annoyance of pollution watchdog bodies and environmentalists. Everything that goes into making an idol -- plaster of Paris, paints, the decorative items -are bad for the river. Plaster of Paris, used in the coating of the mud and hay structure, turns into sludge and chokes aquatic life, besides adding to the general cocktail of suspended particles. The paints used on idols contain toxic heavy metals like lead, arsenic, zinc-oxide, and mercury, says a study by the Central Pollution Control Board (CPCB). "This is poisonous contamination and the last thing the dying river in Delhi needs," said environmentalist Ravi Agarwal of NGO Toxics Link. "It is as good as injecting a lot of poison into the river every year." According to NGO Toxic Watch, around 30 tonnes of paint are immersed in Delhi's Yamuna every year. "One-hundredth of a spoonful of mercury thrown into a mid-sized lake turns its water unfit for drinking. Imagine what this amount of poisonous substance must do to the Yamuna," said Gopal Krishna of Toxic Watch.

The authorities know all this. Every year, Delhi Pollution Control Committee (DPCC) tests the water before and after idol immersion. Over the years, puja organisers and idol-makers are trying to rid idols of toxic substances. But the claims of replacing toxic material with 'green' ones have not translated into reality. Experts say parts of the riverbank should be earmarked with enclosures to allow immersions there. The sludge should be manually lifted from the river after the immersion.

The Municipal Corporation of Delhi, the Delhi Development Authority and the Delhi government had together told Delhi High Court in 2006 that they would make 13 such enclosures at several points on Yamuna. "But one has been made at Nigambodh ghat. And no authority penalises the puja organisers for the immersion," said activist Vinod Jain, who is fighting a case against authorities over pollution in Yamuna.

### **Impact of Pollution in River Yamuna**

Although the government of India has spent nearly \$500 million to clean up the river, the river continues to be polluted with garbage while most sewage treatment facilities are underfunded or malfunctioning. The Performance Audit of Water Pollution in India by the Comptroller and Auditor General (Report 21 of 2011-12) too has confirmed it. According to Gitanjali Tare, Principal Director of audit (scientific departments), and Vinod Rai, Comptroller and Auditor General of India, "*The cost of penalty is far cheaper than the cost of prevention of pollution. There are no effective deterrents for the polluters...The resources available for prevention of pollution, treatment of polluted water and ecological restoration of polluted water-bodies are woefully inadequate*". In addition, the water in this river remains stagnant for almost 9 months in a year aggravating the situation. While the water of river Yamuna at the entry point of Delhi at village Palla is relatively clean and conforms to the bathing standards in terms of DO and BOD, by

the time river Yamuna leaves Delhi at Okhla, the water deteriorates to far below the 'bathing standards' and is, in fact, unfit for any use. Delhi alone contributes around 3,296 MLD (million litres per day) of sewage in the river. Organic pollutants and pathogens in wastewater make up approximately 75% to 80% of the river's pollution load, while most other pollution comes from industrial discharges. As a result Yamuna water is now unfit to support any life.

Although raw water requirements for Delhi are likely to be met by water stored in the Tehri dam, sewage treatment remains a sore point. "2,083 mld of wastewater is generated within the sewered areas of Delhi," notes a recent Central Pollution Control Board (CPCB) report. "Even in the sewered areas, all sources of wastewater (including households) are not connected to the sewerage system. As a result, a significant volume of wastewater generated remains untapped and finds its way into open drains." It comes as no surprise, then, that Delhi treats only 35 per cent of its sewage. Water pollution has number of effects. The effects could be classified as

- \* effects on ecosystem
- \* effects on animal health
- \* effects on human health

### **Effects on Ecosystem**

1) Besides inorganic nutrient input, with the inflow of waste water, decomposition of organic wastes, plant nutrients such as nitrates and phosphates takes place. This promotes the growth of oxygen consuming algae (algal bloom), especially the blue-green algae. The growth of oxygen consuming algae, which deoxygenates water killing fish and other animals is referred to as *eutrophication*. Among the first casualties is aquatic flora and fauna, which support many birds and animals.

2) Addition of oxygen not sufficient to support life: A Central Pollution Control Board study on river water quality at the upstream of Wazirabad shows dissolved oxygen (DO) level at 7.5 mg/l and BOD level at 2.3 mg/l which is well within the parameters prescribed by the Union Ministry of Environment and Forests for 'bathing standards'. However, downstream Okhla, the DO level declined to 1.3 mg/l with the BOD at 16 mg/l, indicating considerable deterioration in water quality due to discharge of sewage and industrial effluents. The coliform count at Wazirabad is 8,506/100 ml whereas at Okhla, it increases to 3, 29,312/100 ml, as against the prescribed standard of 500/100 ml.

Dissolved Oxygen or DO stands for the amount of fresh oxygen present in river water which supports aquatic fauna and flora and which in any case should not be less than 5 mg/l. Biological oxygen demand or BOD stands for the amount of oxygen regained by the microorganism of polluted water to complete the decomposition of organic matter present in the water. The term is usually used to know the amount of oxygen consumed. Higher the amount of oxygen consumed, higher is the degree of organic pollutants. BOD is expressed in milligrams of O<sub>2</sub> per litre of water. It should not exceed 3mg/l but as cited above BOD shoots up to 16mg/l after leaving Delhi.

3) Addition of non-degradable broad-spectrum pesticides, which cause mass destruction of aquatic life.

4) Depositions of deleterious chemicals in soil leading to loss of soil fertility: The capacity of the soil to retain oxygen required for biological decomposition of partially decomposed or undecomposed organic matter contained in sewage is reduced hindering

decomposition of organic matter resulting in “sickness of soil”.

### **Effects on Animal Health**

Large scale death of aquatic and terrestrial animals: Till about a hundred years ago, areas along the Yamuna River were graced by wild animals and over 440 species of birds, fish and other aquatic animals. Unfortunately, excessive industrialisation and urbanisation coupled with explosive population growth has resulted in choking of river Yamuna so much so that the entire stretch of the river in Delhi is now devoid of any kind of aquatic life. There is a concentration of heavy metals like copper, zinc, lead, nickel and mercury far in excess of the limits prescribed by the Environmental Pollution Act in the waters of river Yamuna. The high concentrations of these heavy metals have been found to be toxic to fish and micro-organisms. Fish getting killed in large numbers due to excessive pollution in Yamuna have been reported from time to time. The Gangetic dolphin (*Platanista gangetica*) which is at the apex of freshwater ecosystem was last sighted in the river in 1967. Some of the adverse effects of pollution are long term but nonetheless equally worrisome like accumulation of bioaccumulative and non-biodegradable pollutants in animal bodies. Some organochlorine pesticides (like DDT, BHC, Endrin) are known for bioaccumulative and biomagnifiable characters. Bioaccumulation is a concept wherein pesticides are not subjected to disintegration and excretion from animal/human body. Due to bioaccumulative characters, these pollutants pass through the food chain and food web. While passing through the organisms, the concentration of pollutants gets increased. This is called bio magnification. Some organochlorine pesticides cause health hazards like impotence, cancerous tumors beyond a threshold limit of accumulation.

### **Effects on Human Health**

Sewage is a potential carrier of various pathogenic fungi, bacteria and parasites which pose serious community health hazards like cholera, typhoid, jaundice etc. The outbreaks of these diseases in the National Capital of Delhi is an annual feature. The health hazards from water contaminated with sewage arise from both consumption of sewage grown plant products without cooking or processing as well as from direct contact with sewage. According to a study conducted by the Environmental Science Division of the Indian Agricultural Research Institute New Delhi in 2002, vegetables grown in areas like Yamuna Pushta, Okhla, Najafgarh, Alipur and Ballabgarh were found to have a significantly higher level of contamination of zinc, lead and cadmium. The consumption of pesticide laden vegetables and toxic fish has led to increased incidence of tumours, ulcers, skin disorders and gastrointestinal diseases among the population residing in the floodplains of the river especially the poor. The waste waters of Yamuna also provide excellent breeding place for mosquitoes and disease causing vectors resulting in regular occurrence of outbreaks of dengue especially during the monsoons. Last year alone, as many as 2000 cases of dengue were reported in the National Capital.

### **Measures to Control Pollution in River Yamuna**

Yamuna is dead in a city that expresses no gratitude towards the river that meets more than 70 per cent of its water demand (before it turns into a virtual drain at Wazirabad in west Delhi). If towns (like Agra) downstream do what Delhi is so ruthlessly doing to the river, then even this 'river-nullah' might turn into a multitude of open sewers and drains. As

environmentalist Sunita Narain said cryptically: "The River is dead. It just has not been officially cremated."

It is not that the Govt. has not made efforts to clean up the river. Under the Yamuna Action Plan (YAP) which is being implemented since 1993 by the National River Conservation Directorate(NRCD) of the Ministry of Environment and Forests a total of 21 towns of Haryana and Uttar Pradesh including Delhi with special focus on the latter have been covered. The Japan Bank for International Cooperation (JBIC) is participating in the Yamuna Action Plan in 15 of the above 21 towns on the direction of the Supreme Court of India with soft loan assistance of about Rs. 700 crore, while GOI is providing the funds for the remaining 6 towns added later. The projects taken up under YAP include interception and diversion of raw sewage, setting up of Sewage Treatment Plants, creation of low cost sanitation facilities, setting up of electric/improved wood crematoria etc. Besides YAP, the Government of NCT of Delhi has taken up sewerage and sewage treatment works under other schemes to fully address the pollution load being discharged into Yamuna. Still, the water quality of Yamuna has not shown the desired improvement owing to large gap between the demand and availability of sewage treatment capacity and lack of fresh water in the river. This information was given by the Former Minister of State for Environment and Forests (independent charge) Shri Jairam Ramesh in a written reply to a question by Sh Bhagat Singh Koshyari in Rajya Sabha on November 23, 2009. According to NGO, Centre for Science and Environment( CSE) YAP adopted the Thames model, which based on a centralized sewage treatment system meant that huge sum of money and a 24-hr power supply were needed to manage the treatment plants, while only 8-hr power supply was available, contributing to their failure.

It may not be possible to check water pollution completely but it can be considerably reduced with the joint efforts of Government and the people. There is an urgent need to adopt some short as well as long term measures to restore the pristine glory of Yamuna.

### **Short Term Measures:**

These include following-

1. Immediate closure of all the unauthorized activities which discharge industrial effluents, sludge, oil and chemicals.
2. Provide proper garbage collection system to prevent citizens from dumping the same into the river.
3. The government of India should enforce stringent regulations of toxic discharge into rivers. Heavy penalties should be imposed on those found polluting the river.

### **Long Term Measures:**

Long term measures to minimize pollution in Yamuna River include the following-

1. Plan for sewers on both the banks of Yamuna River and provide Sewage treatment plants at various locations. Such plants can be provided wherever proper drainage lines exist today.
2. Dredge the entire length of Yamuna river bed to improve its carrying capacity.
3. Creation of tourism and sports opportunities along the river so that people connect emotionally with the river.
4. Creation of nature reserves to preserve biodiversity of the river: The Delhi Development

Authority (DDA) is doing its bit in this regard by developing bio-diversity parks in the national capital of India, Delhi. These parks are unique landscapes, which, like nature reserves, aim to harbour hundreds of vanishing species living together in the form of diverse communities and provide ecological, cultural and educational benefits to the urban society. The prime goal of the parks is conservation and preservation of ecosystems of the river Yamuna.

5. Introduction of cost effective, new sewerage system for human and industrial waste disposal: We should learn from the other countries that are looking for other alternative paradigms for the sewage disposal. Dry sanitation or the sanitation which uses less or almost no water for the waste disposal is what which we should look for. The modern sanitations systems should be based upon traditional science of recycling but should use the latest technologies to do so.
6. Encourage water harvesting to revive Yamuna: Water harvesting is the area of research, which has to be exploited to its fullest in order to save our river systems. Union ministry of urban affairs and poverty alleviation had recently (2001) passed a notification making rainwater harvesting mandatory in Delhi. There was a new lease of life to the rivers in Rajasthan when water harvesting structures were built in Alwar district in Rajasthan.
7. Maintenance of Minimum Flow in the Yamuna: The dry weather flow in the river Yamuna along Delhi is nearly zero. This has resulted in almost total depletion of the self-cleansing capacity of the river of Wazirabad. Pollution in the Yamuna cannot be controlled fully unless a minimum flow is maintained in the river. It is mentionable that sewage treatment plants are designed for reducing the pollution in sewage to a certain economically achievable level only. The rest of the pollution is controlled by the dilution available in a water body. To maintain the water quality of the river within the bathing class standard, nearly 10 times the discharge of the fully treated municipal waste water is required.
8. Change in mindset: People, particularly those living along the banks of the Yamuna, should realise that it is a sacred river and not a garbage ground or a dustbin to throw waste. One of the tasks of Yamuna action plan is to launch a massive awareness campaign among people here so that they can change some of their habits, which tend to become a major source of polluting the river. The Delhi Government and the Slum Department of the Municipal Corporation of Delhi have already planned a massive awareness campaign. Various environmental groups too are making efforts.
9. Stop further encroachment on the river bed: Here we need to mention that the Govt. itself has flouted ecological norms by allowing construction of the Commonwealth Games 2010 village on the flood plains of the Yamuna. A floodplain defines a river and the surrounding city. Keeping houses and other buildings away from the river in New Delhi is extremely important to avoid flooding. The construction of the Games Village has already caused a drop in the ground water table.

Clearly, there is a lot of activity to improve the quality of Yamuna water. In spite of all these efforts, it will be quite some time before we see Yamuna again in its former glory.

**References:**

- 1) <http://www.expressindiacom/news/ie/daily/20000408/ina08010.html>.
- 2) Daniel Pepper (June 4, 2007). "India's rivers are drowning in pollution". Fortune (magazine). [http://money.cnn.com/magazines/fortune/fortune\\_archive/2007/06/11/100083453/index.htm](http://money.cnn.com/magazines/fortune/fortune_archive/2007/06/11/100083453/index.htm).
- 3) Singh, Nandita and Singh O.P. 'Managing Water Pollution in Urban India: Problems and Prospects.' <http://www.worldwaterweek.org/documents>.
- 4) Ajmal, Mohammad, A.Khan, Mujahid and Nomani, Azhar.A, Distribution of heavy metals in plants and fish of the Yamuna river(India), *Environmental Monitoring and Assessment*, Vol.5 No.4,361-367.
- 5) [www.cseindia.org/category/topics/river-pollution](http://www.cseindia.org/category/topics/river-pollution).
- 6) [www.environmentportal.in/content/state-pollution-yamuna](http://www.environmentportal.in/content/state-pollution-yamuna).
- 7) <http://economictimes.indiatimes.com/environment/pollution/mcds-tall-claim-on-yamuna/>
- 8) <http://www.hindu.com/2007/04/16>
- 9) [merinews.com/article/giving-yamuna-another-shot-at-life/1579834.shtml](http://merinews.com/article/giving-yamuna-another-shot-at-life/1579834.shtml)
- 10) "CAG castigates Delhi Govt over Yamuna river pollution". Indian Express. April 8, 2000. <http://www.expressindiacom/news/ie/daily/20000408/ina08010.html>.
- 11) "Projects fail to control pollution in Yamuna: CAG" Hindustan Times. January 02, 2012.