INDUSTRIAL POLLUTION AND REMEDIES FOR THE PROTECTION OF ENVIRONMENT (Ganga Water Pollution) IN THE CITY OF KANPUR

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Abstract

The health status of residents living in areas with high Cr (VI) groundwater contamination (N = 186) were compared to residents with similar social and demographic features living in communities having no elevated Cr (VI) levels (N = 230). Subjects were recruited at health camps in both the areas. Health status was evaluated with health questionnaires, spirometry and blood hematology measures. Cr (VI) was measured in groundwater samples by diphenylcarbazide reagent method. Residents from communities with known Cr (VI) contamination had more self-reports of digestive and dermatological disorders and hematological abnormalities. GI distress was reported in 39.2% vs. 17.2% males (AOR = 3.1) and 39.3% vs. 21% females (AOR = 2.44); skin abnormalities in 24.5% vs. 9.2% males (AOR = 3.48) and 25% vs. 4.9% females (AOR = 6.57).

Keywords: Himalayan tributaries Contamination, Ganga

INTRODUCTION

Although India's rapid economic growth has improved the standard of living for many Indians, it has also had some negative effects. One consequence has been the large-scale pollution of India's rivers and waterways. This trend is expected to continue, and according to the World Bank, India's water resources will be under more pressure than those of any other country by 2020.

Like many of India's rivers, the Ganges River serves multiple purposes for the millions of people who live along its banks. Hindus, the predominant religious group in India, believe that the Ganges is the holiest river in the world and that its sacred waters have healing and restorative powers. They use the river for religious rituals and rites. Indians also rely on the Ganges' waters for food, drinking and bathing water, transportation, and agriculture.

Additionally, the rise in Indian manufacturing has resulted in an influx of new and dangerous pollutants. Factories dump hazardous chemicals and industrial byproducts into the Ganges, often in violation of environmental regulations. Aggravating the problem is the government's inability to effectively treat industrial and biological waste. Official estimates in 2008 showed that India's water treatment plants can only address 18% of the sewage its cities produce each day.

Even as pollution levels in the Ganges River continue to rise, recent judicial rulings may offer up a new defense of the sacred waterway. Allahabad High Court, in November 2011 ordered the closure of more than 100 tanneries that pour tons of toxic chromium into the Ganges each year in the industrial city of Kanpur.[1] The ruling was the latest in a series of decisions by the court that have stopped giant construction projects in the Ganges floodplain and mandated the construction of new waste treatment plants in cities along its banks.

Pollution's Problem

Pollution has only worsened on the Ganges during the years that Gupta and others have been battling in the courts, according to data seen by National Geographic News. Upstream of the confluence, where the Salori sewage canal meets the Ganges, biochemical oxygen demand—a measure of organic pollution—increased from an average of 3.5 milligrams per liter to nearly 5 mg/l between 2006 and 2011. The government limit is 3 mg/l. Coliform—an indicator of human and animal waste—reached a jaw-dropping average of 15,000 mpn* per 100 milliliters at Salori in September 2010, falling to 8,875 mpn/100ml by the time it reached the confluence a few miles away. The government limit for coliform in rivers is 500 mpn/100ml. At no time in 2010 were coliform levels at the confluence, where millions bathe each year, lower than 5,500 mpn/100ml. Upstream in Kanpur, chromium levels were more than 100 times the official limit.

Meanwhile, strict pollution norms and active interference of high court had forced the tanners of the city to execute their business under specified norms. With an aim to establish a centralized treatment plant, UP Leathers Industries Association, Janmau Tannery Association and Small Tanners constituted a special purpose vehicle (SPV) for environmental protection. The main agenda of SPV would be how centralized treatment plant could be constituted and how it could be conducted. Without centralized treatment plant, it would be difficult to expand and run the business of tanning. SPV is non-profitable organization. For smooth operation, a monitoring committee had also been set up. It comprises the director of industries, municipal commissioner, Central Pollution Control Board, State Pollution Control Board, Jal Nigam and members of Tannery Association. The committee would observe the discharge from tanneries and treatment in common treatment plant. Tanneries of the city were in dire need of a centralized treatment plant the present plant was not fulfilling the objective. A little error leads to passage of the waste directly into the river. So it was decided to go for a centralized treatment plant. Recently, the high court had punished a tannery for discharging its untreated waste and strict norms of pollution board forced the tannery owners to have a centralized plant. Now, to set up the plant, a special purpose vehicle was formed.[2]

INDUSTRIAL POLLUTION IN THE CITY OF KANPUR

Around the world, the vast majority of the tannery industry run their operations with good pollution controls, and does not expose local populations to health risk. The large shoe manufacturers carefully screen to make sure their suppliers have well-run facilities. Certainly, there is no health risk to wearing the leather products made by tanners. However, one can find many sites throughout the developing world with abandoned factories that used to make tanning chemicals, or poorly-run (usually small) tanneries, or legacy contaminated waterways with dangerous levels of chemicals. These places pose significant public health risks to local populations.

The leather manufacturing industry consists of several different processes, with one of the most important activities being the tanning of the raw hides. Tanning involves the processing of raw leather in order to make it more resilient and strong for use in a variety of different products. Tanning is a widespread, global industry that works with both light and heavy types of leather. Light leather is generally used for shoes and other soft products such as purses, and heavy leather is used for straps, belts, and in various machinery. The tanning process itself is made up of three general phases: acquisition and pretreatment of raw animal hides; treatment of the hides with a tanning agent; and drying and shining the hides before sending them to product manufacturers. Though these steps illustrate the general process, there are often many different processes that can be carried out at tanning facilities, and each may provide a variety of other services, such as bleaching, dyeing, finishing, and weaving of the hides.[3]

The two main types of tanning are chrome tanning and vegetable tanning, with chrome tanning making up a large majority of the industry. Chromium compounds are applied to protect hides from decay and to make them more durable against moisture and aging.[4] Chromium interacts with fibers in the raw hide during a bathing process, after which the tanned hides are wrung and prepared for finishing.[5] Other materials that may also be used in the pretreatment and tanning processes include sulfuric acid, sodium chlorate, limestone, and limestone soda ash.

Due to the repeated processes of soaking raw hides and wringing them out, the tanning process creates large amounts of wastewater that may be contaminated with many different chemicals. Because there is wide variety in the chemicals used during the tanning process, wastewater from this industry can have very different chemical makeups. However, chromium contamination and high chemical oxygen demand are typical problems associated with tannery effluents, both of which can pose serious risks to the environment and human health.[6]

In addition to creating potentially toxic wastewater, some tanneries also produce large amounts of solid waste that contain chromium, including: hide scraps, skins, and excess fats. Toxins from this waste can leach into nearby soil and water, placing nearby residents at risk of contamination.

Global Context

A large portion of the world's tanning industry operates in low- and middle-income countries, and the percentage of these countries contributing to light and heavy leather materials increased from 35% to 56% and 26% to 56%, respectively, between 1970 and 1995.[39] Many of these tannery sites are clustered together, creating heavily polluting industrial areas in many countries. In Hazaribagh, for example—a particularly large tanning region of Bangladesh that has over 200 separate tanneries—it is estimated that 7.7 million liters of wastewater and 88 million tons of solid waste are disposed of on a annually. These pollutants are responsible for the contamination of all nearby surface and groundwater systems with severely high levels of chromium.[7]

According to the information collected in Blacksmith's inventory of sites, South Asia, and in particular India and Pakistan, has the highest number of tanning industries, with South America also at risk of large populations being exposed to chromium contamination.

Exposure Pathways

Chromium from leather tanning can make its way into air, soil, food, and water, and the most common forms of exposure are through inhalation of dust or fumes and ingestion of or contact with contaminated water. Workers in tanning facilities can inhale airborne chromium and can also be exposed by dermal contact from improper handling.

Wastewater and solid waste from tanning operations often find their way into surface water, where toxins are carried downstream and contaminate water used for bathing, cooking, swimming, and irrigation. Chromium waste can also seep into the soil and contaminate groundwater systems that provide drinking water for nearby communities. In addition, contamination in water can build up in aquatic animals, which are a common source of food.

Soil that is contaminated by chromium waste also poses a health hazard, since toxic dust can be inhaled by both people and livestock.[8]

Health Effects

Chromium commonly occurs in two forms. Trivalent chromium (chromium III) is a naturally occurring element that is relatively stable and innocuous, and can be found in plants, animals, and soil. Hexavalent chromium (chromium VI) is far more dangerous for humans, and is usually created by anthropogenic causes.

Hexavalent chromium is a toxic human carcinogen that can cause or increase the rates of certain cancers. Inhalation of chromium VI, which occurs most frequently among workers, has been found to cause cancer of the respiratory system. Inhalation of dust contaminated with chromium can also lead to eye damage, ulcerations, swelling, asthmatic bronchitis, and irritation to the throat and nose. More chronic exposure can sometimes cause sores to develop in the nose and can even lead to the formation of holes in the nasal septum.[9]

Ingestion of chromium VI can cause stomach problems, such as ulcers, and can also be damaging for kidney and liver functions. Dermal contact causes a number of skin problems, including rashes, sores, and ulcers.

In addition, several studies have found evidence that chromium accumulation in the body can damage a person's ability to metabolize iron, which can lead to iron deficiency anemia.

What is Being Done

Blacksmith Institute has successfully implemented programs to help clean up and alleviate the impacts of chromium on human health and has found several cost-effective and efficient ways to help address the problem. Because trivalent chromium is far less toxic than chromium VI, water that is contaminated with chromium VI can be treated with an electron donor that converts the pollutant to its less damaging, trivalent state. Other studies have found that bone charcoal, which is produced by burning animal bones, has the ability to remove chromium from water.[10]

When soil and solid waste are contaminated with chromium, these materials can be effectively removed and disposed of in order to prevent further human contact with toxins. Other methods of removing chromium contamination from soil include vermiculture, which involves the use of worms to concentrate heavy metals. In addition, more recent studies have found that some forms of salt-tolerant bacteria may be able to decrease chromium contamination in soil.[11]

Methods

The health status of residents living in areas with high Cr (VI) groundwater contamination (N = 186) were compared to residents with similar social and demographic features living in communities having no elevated Cr (VI) levels (N = 230). Subjects were recruited at health camps in both the areas. Health status was evaluated with health questionnaires, spirometry and blood hematology measures. Cr (VI) was measured in groundwater samples by diphenylcarbazide reagent method.

Results

Residents from communities with known Cr (VI) contamination had more self-reports of digestive and dermatological disorders and hematological abnormalities. GI distress was reported in 39.2% vs. 17.2% males (AOR = 3.1) and 39.3% vs. 21% females (AOR = 2.44); skin abnormalities in 24.5% vs. 9.2% males (AOR = 3.48) and 25% vs. 4.9% females (AOR = 6.57). Residents from affected communities had greater RBCs (among 30.7% males and 46.1% females), lower MCVs (among 62.8% males) and less platelets (among 68% males and 72% females) than matched controls. There were no differences in leucocytes count and spirometry parameters. Living in communities with Cr (VI) groundwater is associated with gastrointestinal and dermatological complaints and abnormal hematological function. Limitations of this study include small sample size and the lack of long term follow-up.

Explanation

Chromium (Cr) is listed by the Environmental Protection Agency as one of the 129 priority pollutants and one of the 14 most noxious heavy metals. Exposure to Cr (VI) via inhalation route has been declared as carcinogenic by various agencies[12]. Levels above permissible limit have also been found at various residential areas[13]. Recently, Environmental Working Group, USA in 2010 reported that 89% water samples from cities in America had hexavalent chromium [Cr (VI)] levels much higher than California Safety Standards[14]. Despite this, Cr (VI) contaminated water has not yet attained a well-defined status of being toxic or safe. This is due to the limited number of studies on general population getting exposed to this metal.

The unique anti-corrosive and tanning properties of Cr favor its widespread application in chrome plating industries, leather tanneries, etc. However, not many industries follow norms of treating toxic waste before its release into the environment. This has resulted in increased ecological toxic burden leading to groundwater contamination. According to a report by Tata Environmental Research Institute, India, out of 7.2 million tons of hazardous waste from industries generated each year in India, 5.2 million tons is improperly disposed off[15]. Kanpur, one of the most industrialized cities of India, is a hub of tanneries and the industries manufacturing basic chrome sulphate (BCS). While the records of Central Leather Research Institute, India showed only 170 tanneries at Kanpur, a study conducted in 2000 found twice this number in just one tanning cluster[16]. Annually, these tanneries alone discharge more than 1500 metric tons of chromium sulphate as waste[17]. The waste from these industries has been illegally dumped in deep borings, open lands and in rivers through decades[18]. In 1997, Central Pollution Control Board, India reported Cr (VI) concentration upto 250 times higher than the WHO permissible limit (0.05 ppm) in areas at Kanpur[19]. A recent report was also in agreement with this[20]. Understanding the extent of this problem, Blacksmith institute, a non-profitable international organization has included Kanpur among list of the most polluted places in world[21]. Apparently, bids for the removal of hazardous wastes dumped illegally have been made; however, this problem is still unresolved[22].

We realized that ever since this unseemly sight of yellow water was noticed [3], [4], questions concerning its impact on humans have been raised. It is of relevance to find out health risk to the residents in these contaminated areas. Thus, we undertook population health assessment to know health risk to the residents from areas of Kanpur having Cr (VI) contaminated groundwater.

Materials and Methods

A cross-sectional retrospective study was carried out on the general population residing at Kanpur, a city in Uttar Pradesh, India (26.4670° North and 80.3500°East). We organized health camps among contaminated and non-contaminated communities to collect data on general health status of the residents. The permission and local assistance for arranging camps were obtained through meetings with authorized persons like village headman (gram- pradhan) and corporator. The Institutional Human Ethics Committee of IITR granted ethical clearance for this study.

In conclusion, this retrospective study highlights the possibility of risk on human health through hexavalent chromium contaminated groundwater. The residents in contaminated areas were having higher prevalence of self-reports for gastrointestinal and skin ailments along with clinical alterations and spirometric defects. To prevent further damage to the public health and environment, actions on regulation of industrial waste management are needed in parallel with groundwater remedial measures.

Ganga Action Plan-A critical analysis

The Ganga River

Ganga is not an ordinary river. It is a life-line, a symbol of purity and virtue for countless people of India. Ganga is a representative of all other rivers in India. Millions of Ganga devotees and lovers still throng to the river just to have a holy dip, Aachman (Mouthful with holy water), and absolve themselves of sins. We Indians are raised to consider Ganga as a goddess, as sacred. We tell our children and grandchildren the stories of how she came down to Earth through a lock of Shiva’s hair. The Ganga temples, countless rituals associated with Ganga and our belief that Ganga is a cleanser par excellence prove that Ganga has a status of a deity. Hundreds of verses have been used to extol her glory and greatness. Lord Krishna, Lord Rama, Lord Siva, Lord Vishnu including great saints like Sri Swami Sivananda, Sri Ramakrishna and others have all glorified her.

Ganga Action Plan (GAP)

Inertia in taking action to reduce the level of pollution stemmed largely from a widespread belief that the Ganga, as a holy river, had the ability to purify all that came into contact with it. Although there is some scientific evidence for the Ganga river's high capacity to assimilate (i.e. biodegrade) a large level of organic waste input, including pathogens, but no river can sustain its self-purifying power with this kind of over-use, misuse and abuse of its waters.

The Ganga Action Plan (GAP) originated from the personal intervention and interest of our late Prime Minister Mrs Indira Gandhi who had directed the Central Board for the Prevention and Control of Water Pollution, now Central Pollution Control Board (CPCB) to do a comprehensive survey of the situation in 1979. CPCB published two comprehensive reports which formed the base for GAP in Oct 1984 but was not presented to the nation formally due to assassination of Smt Indira Gandhi. In Feb 1985, the Central Ganga Authority (CGA) with the PM as Chairman was formed, with an initial budget of Rs 350 crore to administer the cleaning of the Ganga and to restore it to pristine condition by our late PM Sh Rajiv Gandhi. In June 1985, the Ganga Project Directorate (GPD) was established as a wing of the Department of Environment. GAP was launched on June 14, 1986 by Sh Rajiv Gandhi at Varanasi.

Failure of the GAP

The Ganga Action Plan launched in 1986 by the Government of India has not achieved any success despite expenditure of approximately 2,000 crore rupees. Even though the government claims that the schemes under the Ganga Action Plan have been successful, ground realities tell a different story. The failure of the GAP is evident but corrective action is lacking. GAP has been dubbed variously as Ganga Inaction Plan, Pumps and Pipes scheme, a Colossal Failure. Media report that there are GAPING HOLES in GAP and it's a shocking tale of official apathy and corruption. All the money has gone down the drain, People are quick to offer their opinion of why GAP has been doomed to failure. Mismanagement, corruption, and incompetence all rank high on the lists of accusations.

While launching the GAP, our late PM Rajiv Gandhi said:

> "The purity of the Ganga has never been in doubt. Yet we have allowed the pollution of this river which is the symbol of our spirituality. The felling of trees

> has caused severe floods, and silt and mud now flow into the Ganga making the river shallow so that boats cannot ply in it as they did before. Sewage and pollution from cities, industries and factories and dead animals are also being thrown into the Ganga. From now on, we shall put a stop to this. We shall see that the waters of the Ganga become clean once again. The Ganga Action Plan is not just a government plan. It has not been prepared for the PWD or government officials alone. It is a plan for all the people of India; one in which they can come forward and participate. It is upto us to clean the whole of Ganga and refrain from polluting it. This programme, starting at Varanasi here today will reach out to every corner of our land and to all our rivers. In the years to come, not only the Ganga, but all our rivers will be clean and pure as they were thousands of years ago."

Unfortunately, the statements/promises made by the late PM have been proven untrue. The expectations of the people have been belied and dazed to the ground.

The GAP I was extended as GAP II from 1993 onwards covering 4 major tributaries of Ganga, namely, Yamuna, Gomti, Damodar and Mahananda. The program was further broad-based in 1995 with the inclusion of other rivers and renamed as National River Conservation Plan (NRCP). Ganga could not be cleaned but 34 other rivers have been taken up for cleaning with the same failed model of "GAP". Various explanations abound as does speculation and apportionment of the blame for this failure. In the last 21 years, leadership and staff of GAP have come and gone, often without any vision and commitment. There have been reviews and monitoring from time to time at different levels but the problems identified were never addressed and the decisions taken were never enforced. The lower level officials most often were unfamiliar with the work done by previous groups.

Objective of GAP

The objectives of the GAP were broad: to abate pollution and improve water quality, to conserve biodiversity and develop an integrated river basin management approach, to conduct comprehensive research to further these objectives, and to gain experience for implementing similar river clean up programs in other polluted rivers in India. A plan of action was developed in order to achieve these objectives, those actions that addressed the major, direct causes of pollution in the Ganga were identified as "core sector" schemes, and those that address indirect sources or sources deemed to be direct but of a lower impact were called "non-core sector". Core sector schemes included the interception and diversion of domestic wastewater including the construction and rehabilitation of sewers and pump houses, while non-core sector schemes consisted of the installation of crematoria, river front development and aesthetic improvement, implementation of low cost sanitation systems, and miscellaneous activities such as water quality monitoring, research programmes, and identification and management of waste from grossly polluting industries.

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. However, as decided in a meeting of the Monitoring Committee in June 1987 under the Chairmanship of Prof MG K Menon, then Member, Planning Commission,[23] the objective of GAP was recast as restoring the river water quality to the 'Bathing Class' standard.

GANGA ACTION PLAN PHASE-1

The Ganga Project Directorate, Ministry of Environment and Forests, Govt. of India had identified 34 industries in UP under Ganga Action Plan Phase1 in 1985-86. The status of Pollution Control System installed in the industries is as following:-

1. Industries which have installed ETP 19
2. Industries which have installed ETP but are lying closed 9
3. Industries which are lying closed for many years 6

Total 34

The Central Pollution Control Board has identified another list of 83 industries located in UP which are discharging their effluent directly into River Ganga in addition to the 34 industries identified under Ganga Action Plan I. The latest status of effluent treatment plant in these 83 industries is as following:-

1. Industries which are complying the standards 59
2. Industries which are lying closed 24

Total 83

Limitations

Notwithstanding the delay in completion of the program, the implementation of pollution abatement schemes has been by and large satisfactory. However, certain major limitations have surfaced which are as given below:

- States particularly Bihar and UP are unable to provide timely and adequate funds for O&M of assets created under GAP.
- In Bihar, O&M has been grossly inadequate. The State Government has neither been able to provide funds nor the required power on a continuous basis for O&M of assets like STPs, pumping stations, crematoria etc. Thus, the operation of nearly all the assets has practically come to a halt.
- O&M of conveying sewers and intermediate pumping stations has been grossly neglected in UP. As a result, despite the facilities being available, raw sewage is still finding its way into the river at several places.
- Erratic and poor availability of power for operating the pumping stations, STPs and crematoria is a major bottleneck in UP. Although, for such installations dedicated power supply had been provided for, this has not been adhered to by UPSEB. As a result, in the event of power failures, raw sewage finds its way into the river and the treatment plants are adversely affected.
- O&M of facilities like toilets and bathing ghats has been neglected in general by the local bodies. Local bodies have also failed in discharging other civic functions in GAP towns.

- The stretch of the river from Farrukhabad to Varanasi in general and Kanpur in particular is very critical in terms of the availability of the minimum flow in the river. At Kanpur, the pollution load from both the municipal as well as industrial sources is significantly large and the dilution capacity of the river is severely limited. As a result, the desired improvement in the river water quality has not been achieved at Kanpur.
- It has been possible to minimize the organic pollution (which is indicated by BOD) reaching the river through the GAP. However, there has been only incidental reduction in the microbial pollution (which is indicated by the coliform counts). The present methods available to treat the microbial pollution are either hazardous to human health or cost intensive. Research projects have been commissioned to develop indigenous and appropriate cost effective technology.

GAP-A failure? Whose failure?

So far only 35% of the pollution load of the river Ganga has been tackled under GAP I. Works for tackling additional pollution load of about 30% are going on under GAP II. However, there is still a gap of nearly 35% which could not be addressed due to shortage of funds. In important towns like Hardwar, Kanpur, Allahabad and Varanasi alone, the additional funds required to tackle the remaining pollution load (over and above what has been done under GAP I & II) is estimated at Rs. 500 crore.

Kanpur -a case study - Ganga and GAP in Kanpur:

Because of Kanpur's high level of pollution, Kanpur was identified as a key player in the GAP activities. Approximately Rs.730 million were invested under GAP Phase I in Kanpur. The total sewage generated in Kanpur at the time of launching of the GAP was around 285 MLD (Million Litres per Day) out of which 162 MLD of sewage was tapped under GAP Phase-I and diverted to sewage treatment plants. The objective of these plants was to treat this 162 MLD of domestic sewage and 9 MLD of tannery effluent generated from 175 tanneries and supply the treated wastewater to nearby villages to irrigate their farmlands. Four Intermediate pumping stations were built along the Ganga, and all wastewater drains, or nallas, were intercepted and diverted to the pumping stations. The pumping stations were to release the wastewater into a common waste pipe leading to the main pumping station, which filters out solid waste and then pumps the remaining wastewater into three sewage treatment plants. Two of these plants (5 MLD STP & 130 MLD STP) treat domestic wastewater, using sedimentation after aerobic treatment and anaerobic stabilization, and together have a capacity for 135 MLD.

After completion of GAP-I, the Central government came out with a report in 1995, making the tall claim that the Ganga had shown 70% improvement due to GAP.

The primary objective of GAP Phase II is to tap and treat 200 MLD of sewage that remained untreated in GAP Phase I. This volume of untreated sewage is proposed to be diverted towards South outfall of the city for treatment and disposal. Under this scheme construction of two intermediate Sewage Pumping Stations, one main pumping station, nearly 10 kms long relieving sewers, 200 MLD treatment plant and disposal of treated waste water by developing sewage farm are proposed to be executed. The scheme also included water supply extension, the renovation and cleaning of old sewer lines, and the renovation and construction of additional pumping stations.

Status of GAP

As of today GAP has totally come to a standstill and almost all the assets are in shambles. Four tannery wastewater pumping stations do function, but are often overloaded, and when power is out in Kanpur (on an average up to 8 hours a day, sometimes 14 hours a day), the DG sets, provided to meet the power failure, run on a continuous basis but this is a very costly affair. This does not seem to be practical and feasible in the long run. The sewage treatment plants at Jajmau are facing a power shortage of an hour on an average daily basis. In addition, the 36 MLD UASB plant is functional with an efficiency of removing only 50% of BOD, COD and suspended matter, largely due to the fact that the order that tanneries remove the chromium from their waste stream before discharging into the conveyance system was not enforced, and the presence of the toxic heavy metals in the effluent rendered the use of biological treatment methods ineffective. On the other hand, under GAP II approximately Rs. 65 crore have been invested in Kanpur. The IPS are still incomplete and standing like white elephants while the procurement of land for 200 MLD treatment plant has been completed.

GAP has done little to improve the status of the Ganga in Kanpur, instead GAP has impacted the local environment, health and livelihood of the people adversely due to paucity of funds for O&M of assets created under GAP I. The Ganga Action Plan Phase I has failed on key counts both quantitatively and qualitatively. By quantitative failure we mean, the failure to tap significantly the discharge of raw domestic sewage and raw tannery effluents from entering the river waters.

GAP-A complete failure at Kanpur

It's almost impossible to say that GAP has succeeded in any respect in improving the condition of the river or river water quality at Kanpur. The conditions were better before the launching of the GAP. There was much more water flowing in the river and less amount of wastewater entering the river. Can we define the success in terms of percentage when the river water quality is visible to the naked eyes? Do we need any water quality data if the water looks brown and black and if it stinks? The GAP assets are a big liability for the local government. The government agencies at the local level are battling hard to keep the assets somehow alive. GAP is orphaned, no government agency is willing to own the responsibility.

The GAP failure is not specific to Kanpur only, it's evident in every GAP town. The story is the same all along the length of the river. The moot question is "Can we clean river Ganga, are we capable of doing it?" If the answer is "Yes", then why could we not clean it in more than 20 years? Who is responsible for this failure or who should be held responsible?

State governments never showed the interest and commitment. They were interested only in procuring funds from the Central Government. No Chief Minister has ever issued any statement regarding the pathos of river Ganga. GAP funds were diverted at will, O&M funds were never released in time. Preventive steps were never taken. There is a High

Power Committee at the State level, headed by the Chief Minister to monitor the progress of the GAP. I don't think that this Committee has ever met. This needs to be investigated.

CONCLUSION

The Government has yet to develop an explicit national policy on the environment. The Indian Constitution, in the 42nd Amendment, has laid the foundation in article 48A and 51A for a jurisprudence of environmental protection. Today, the State and the citizen are under a fundamental obligation to protect and improve the environment, including forests, lakes, rivers, wildlife and to have compassion for living creatures. These constitutional compulsions must vitalise the rule of law into weaving a dynamic policy on environment lest the paramount law be stuetified into a paper declaration. Our democracy, which rests on the people's welfare and active participation, must not surrender to Moneyocracy which damages our environment and denudes our ecology.

The battle against this menace, escalating day after day requires an operation-oriented jurisprudence and law-in-action. We have some pieces of recent legislation to fight water and air pollution which is copied from abroad. We have the old code of Criminal Procedure re-enacted with minor mutations which controls Public Nuisances and the Indian Penal Code which criminalizes offences affecting public health, safety and convenience. But sans militant enforcement they blush as boneless wonders on the statute book. Legal actions, pre-emptive and affirmative judicial action, regardless of adversarial blinkers are needed to enliven environmental law. Human survival hangs in the balance what with dangerous degree of pollution. Rapid economic development without ecological damage can be reached only if conservation becomes a way of life with every man, woman and child. Such community sensitivity will have to be accompanied by the desire and the capacity at the government level to subject developmental projects to an impact analysis based on principles of ecology, economics, employment generation and energy conservation.

References

1. Dan Morrison, For National Geographic News, *This story is part of a special National Geographic News series on global water issues.* Published November 23, 2011.
2. TNN Jun 16, 2013, 04.22AM IST.
3. Correia, V.M., T. Stephenson and S.J. Judd. "Characterisation of Textile Wastewaters – A Review." *Environmental Technology*, Vol. 15, No. 10 (1994): 917-929.
4. Leather Tanning." U.S. Environmental Protection Agency, 1997.
5. Leather Tanning." U.S. Environmental Protection Agency, 1997.
6. Song, Z., C.J. Williams and R.G.J. Edyvean. "Sedimentation of Tannery Wastewater." *Water Research*, Vol. 34, No. 7 (2000): 2171-2176.

7 Bhuiyan, M.A.H., et al. "Investigation of the Possible Sources of Heavy Metal Contamination in Lagoon and Canal Water in the Tannery Industrial Area in Dhaka, Bangladesh." *Environmental Monitoring and Assessment*, Vol. 175, No. 1-4 (2010): 633-649.

8 Möller, A., H. W. Muller, A. Abdullah, G. Abdelgawad, and J. Utermann. "Urban Soil Pollution in Damascus, Syria: Concentrations and Patterns of Heavy Metals in the Soils of the Damascus Ghouta." *Geoderma*, Vol. 124, No. 1-2 (2005): 63-71.

9 Health Effects of Hexavalent Chromium." OSHA Factsheet. Occupational Safety and Health Administration. U.S. Department of Labor. July 2006.

10 Dahbi, S., et al. "Removal of Trivalent Chromium from Tannery Waste Waters Using Bone Charcoal." *Analytical and Bioanalytical Chemistry*, Vol. 374, No. 3 (2002): 540-546.

11 Megharaj, M., S. Avudainayagam, and R. Naidu. "Toxicity of Hexavalent Chromium and Its Reduction by Bacteria Isolated from Soil Contaminated with Tannery Waste." *Current Microbiology*, Vol. 47, No. 1 (2002): 51-54.

12 IARC (1990) Monographs on the evaluation of carcinogenic risks to humans: Chromium, Nickel and welding. International Agency for Research on Cancer, Lyons. 38: 49–256, US EPA (1998) Toxicological review of hexavalent chromium

13 Zhang J, Li X (1987) Chromium pollution of soil and water in Jinzhou. J Chin Prevent Med 21: 262–264. Burke T, Fagliano J, Goldoft M, Hazen RE, Iglewicz R, et al. (1991) Chromite ore processing residue in Hudson County, New Jersey.

14 UNIDO (2000) Chrome balance in leather processing. Regional programme for pollution control in the tanning industry in South–East Asia: US/RAS/92/120/11-51.

15 Environmental Working Group (2010) Chromium (VI) – the Erin Brockovich chemical is widespread in U.S. tap water. Submitted by Denise Reynolds RD.

16 TERI (2003) Hazardous Waste Management in India. A policy discussion forum base paper. Tata Energy Research Institute, New Delhi, India.

17 Schjolden A (2000) Leather tanning in India: Environmental regulations and firms' compliance. F-I-L Working Papers No. 21.

18 CLRI (1996) Project report for setting up leather complex at Unnao. Central Leather Research Institute, Chennai India.

19 United Nations Industrial Development Organization, Austria. CPCB (1996) Groundwater quality in Kanpur, status, sources and control measures: GWQS/8/1996, Centre for Pollution Control Board, India. Down to Earth (2005).

20 CPCB (1997) Report on groundwater quality in Kanpur, status, sources and control measures: GWQS/8/1996–97. Central Pollution Control Board, India 1: 4–5.

21 Schaffener IR, Singh RK, Lamb STR, Kirkland DN (2010) Enhanced bioremediation pilot study of a Cr (VI)-impacted overburden groundwater system in Kanpur, Uttar Pradesh, India.

22 Blacksmith Institute (2007) Polluted Places- India. Final report January 2005-December 2007. Project implemented by Blacksmith Institute. Supported under Poverty and Environment Program (PEP), Asian Development Bank.