



Diversion, Conveyance, Treatment & Disposal of Sewage and Sullage Flowing into Gangaji at Varanasi-Technology Selection, Detailed Designing and Execution

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1. Background

At the outset it has to be fully acknowledged and sincerely accepted that the works for diversion, conveyance, treatment and disposal of the Varanasi sewage and sullage flowing in to Gangaji, implemented under GAP-I at a substantial cost of around Rs. 50 Crores, have not been a cause of satisfaction to any one who was not personally or financially involved in the planning or execution of these works-pilgrims and bathers find Ganga ji as polluted and unaesthetic as earlier, Nagar Nigam and citizens find life being made much worse by sewage backing up in the trunk-sewer due to the new gate blocking the old out-fall, while residents of villages around Dinapur and Varuna confluence (like Kamauli) feel that virtual hell has been opened upon them by the bypassed, partially treated or "treated" effluents. To all these people numbering over 95% of all people concerned with pollution of Gangaji at Varanasi, the implementation of GAP-I at Varanasi has been a TOTAL FAILURE. The remaining 5%, with obvious stakes in the implemented works and technology, continue to defend these with arguments like (a) the designs implemented were under-capacity and inadequate due to financial constraints (b) sewage flows and characteristics have vastly changed in the last decade (c) there were minor flaws in the design and execution (d) any technology is bound to have some flaws and shall create

some problems and difficulties for some people and (e) there are no practical or feasible alternatives. They are unwilling to accept that their priorities and approach have been at fault. Obviously the decisions for technology-selection, detailed-designing and execution of GAP-II cannot be left on this same adamant and biased group of vested interests and alternative approaches have to be tried out. A risk of failure of a new approach is better than a well-known disaster like the proverbial deliberate jumping into a well for quenching ones thirst.

2. Objectives and Approach

2.1 It has to be accepted that the most critical use of Gangaji at Varanasi is for cultural/religious bathing, 'Achaman', worshipping and other rites on its city-side left bank, particularly some 'ghats' considered pious. The first and foremost objective thus has to be to ensure aesthetic and health-promoting features in these critical areas. The indicating parameters shall be floating and suspend matter, colour, odour, taste, coliforms and toxic chemicals and monitoring shall need to be carried out close to left bank in the intensely used areas. The success of the effort shall have to be judged by demonstrating the critical bathing areas to be made aesthetically 'Clean' and health-wise safe and not by talking of improvements in mid-stream levels of DO or BOD

2.2 For this, the diversion of all sewage



and sullage flowing into Gangaji on the city-side left bank in the BHU to Varuna confluence reach shall have to be all the time reliable and foolproof, with no room for by-passes, overflows, weepages joining and fouling the bank visibly, except during periods of maintenance, aptly scheduled and announced well in advance (minimum 72 hours notice published in newspapers and displayed on ghats). Any use of pumps or other powered mechanical equipment in such diversion gets obviously obviated due to chances of unscheduled and frequent breakdowns in power and such equipment.. The diversion has to be essentially by gravity, whatever the problems in or cost of such an alternative. Alternatives that cannot meet the basic objective are not worth considering, however simple, cheap, practical or otherwise attractive they may be made to look. And when sincere efforts have not even been made to try it out, rejecting the idea of a low-level interceptor to receive and convey out of the reach all inflows from the critical areas as 'impractical' can only be the result of a mind-set, bias or outright vested interest.

2.3 As in case of diversion, the objectives and priorities for location and design of treatment and disposal have to be clearly decided and understood. Here again removal of health-impairing pollutants like fecal coliforms and chemical toxicants as also of aesthetics impairing foam, colour and odour shall need to be given primacy over conventional concern for removal of bulk organics or eutrophication causing nutrients. Economics and recovery of resources shall be of value, but cannot be allowed to cloud-up vision about basic objectives.

3. Diversion and Conveyance of Sewage /

Sullage

3.1 Two alternative proposals, for diversion and conveyance of Varanasi sewage/sullage (so that it does not flow into and foul up Gangaji), have been put forth. One by UP Jal Nigam and the other prepared by Sankat Mochan Foundation and sponsored by Varanasi Nagar Nigam. These are briefly examined in following sections.

3.2 The U.P. Jal Nigam proposal follows the same approach and technology of diverting away sewage/sullage by strengthening the city sewerage system and depending on pumping to lift any flows or weepages reaching banks of Gangaji back into the sewer system. If the objective were to design and appropriate sewerage system for Varanasi city as would be done for an ordinary mega-city, the Jal Nigam approach, would be OK. But Ganga Action Plan is not an urban infrastructure improvement plan and its objective is to ensure cleanliness and piety of Gangaji, especially in critical reaches, and not merely to provide better sewerage system for Varanasi. Since the UP Jal Nigam proposal shall not ensure all-time, reliable and fool-proof diversion as discussed in para 2.2, this proposal shall have to be appropriately modified or abandoned. UP Jal Nigam claiming to have experienced and knowledgeable engineers supporting this proposal should put on stake their future professional careers and pensions against ensuring fulfilment of objectives as defined in Para 2.2. if it still wants its proposal to be considered.

3.3 The other proposal is based on the concept of using a low-level interceptor-sewer along the 'ghats' on the city-side left bank of the river to receive all sewage/sullage flowing



towards the river, including even the smallest drains and weepages by gravity and to convey the collected waste-waters outside the critical reach, again by gravity flow, and without any pumping, for appropriate further handling. The soundness, reliability and capability of this proposal to meet the desired objectives has been accepted by all including Dr. I.C. Agrawal, the expert assigned to evaluate the proposal by NRCD (See Merit No. 1 on p 14, bottom para on p 23, remarks on bottom left of p 25 of the report by Dr. I.C. Agrawal of April 1996 for NRCD). Yet the proposal and even the basic concept are rejected merely on basis of details of technical design and difficulties during construction and maintenance. What would have been proper, is to accept the basic concept and develop a better design as also appropriate technology to execute it and resolve the anticipated (or imagined) practical problems. UP Jal Nigam and NRCD have, to-date, failed to adopt this approach. They should do it now, rather than following the cult of convenience, they should adopt what is likely to deliver the goods.

3.4 In their revised proposal of Sept 97, and the signed memoranda regarding their acceptance of the proposal and willingness to bear with the problems or difficulties it may cause during construction and maintenance from bathers, ghatias, citizens and inhabitants of Sota area, SMF have virtually answered all the doubts raised on their earlier design by Dr. I.C. Agrawal and NRCD. The crucial objections were (a) relating to hydraulic gradients and self-cleaning velocities which have been resolved by design modification and (b) objections from, or inconvenience of various groups of people as apprehended by the commentators. And Jal Nigam as a mere

construction agency, and with no long term stake in the success of the works, have no business to keep raising new doubts and questions. There may still be questions regarding details of construction technology, and obviously there is scope for further improving upon some design details. Let the revised proposal be accepted and taken up for construction and an appropriate technical committee appointed to consider further design improvements and construction details.

4. Treatment and Disposal of Intercepted Sewage

4.1 The sewage treatment proposals made by UP Jal Nigam, once again true to their mind set, give preference to Activated Sludge and UASB technologies which require less land and are more cost-effective when removals of coliforms, colour, toxicants or nutrients are not the important concerns. Accepting coliforms to be now some-what important they do talk of adding "maturation ponds" to reduce coliforms in some ASP/UASB plants. But UP Jal Nigam rejects ponding as the basic treatment due to (a) non-availability of adequate land (b) exorbitantly high cost of land when available and hence much higher financing and interest and depreciation costs and (c) apprehensions of nuisance in neighbourhood. They forget that under Indian conditions and to meet the objectives at Varanasi (coliforms, colour, toxicants, nutrients not reaching Gangaji) ponding offers the most effective solution and if the land at Sota as proposed by SMF were to be used, the problems of availability and cost of land would disappear. Of course it needs to be proved, if it has not been already adequately proved, that this shall not hurt the flow-regime



of the Ganges. And would Tehri Dam or the new barrage at Kanpur not affect the regime of Gangaji? To this author, SMF analyses have satisfactorily shown that the effect of installing ponds at Sota as proposed by SMF shall be negligible if any.

4.2 AIWPS as developed at University of California and proposed by SMF for Varanasi are some what more complex and sophisticated than Duncan Mara or conventional waste-water ponds. But the overall scheme appears to be very well suited for the objectives and conditions of Varanasi. To this author, the only defect of the scheme is providing, too large factors of safety at several stages. This might have been done to play absolutely safe and even oversafe, at this what would be the first trial of this lay-out in India.

The name and prestige of an institution like UC Berkeley and an expert like W.J. Oswald is not a small stake. This author (whom Jal Nigam officers called Bhishma Pitamaha of Environmental Engineering in India) is willing to stake his own professional reputation and all he has including life on the proposal delivering goods.

4.3 It is strongly recommended that the

proposal of Prof. Oswald & Green/SMF/ Nagar Nigam Varanasi be approved for implementation and an appropriate technical committee as proposed in last sentence of Para 3.4 entrusted with the task of finalising the detailed designs.

5. Execution

Having selected a Ghat-Sewer and AIWPS for implementation, there can be absolutely no question to leave the execution to UP Jal Nigam who have opposed these "tooth and nail" all these years. The obvious decision would be to put Varanasi Nagar Nigam (the ultimate beneficiary, lawful owner and the agency to operate and maintain the assets created) in charge of execution with a strong technical advisory committee appointed by the responsible to NRCD. The committee should avoid having any-one who has worked for UP Jal Nigam (or an equivalent organisation in any state of India) at any time to save the child from the clutches of step-mothers. It could have professors, municipal engineers, engineers from private sector etc. from India or abroad. The committee should clear design details and fund releases.