

# Reduction of Wastewater Discharge into Surface Water through Hydraulic Assessment of Trunk Sewers in Nashik

## Context

In 2008 Ministry of Urban Development (MoUD) approved the National Urban Sanitation Policy (NUSP) with the aim to improve the sanitation situation in urban areas of India.

According to official figures, 12.6% of urban households do not have access to latrines and defecate in the open. Although sewerage systems widely exist, over 37 per cent of faecal matter is not disposed of safely. These critical conditions impose significant public health and environmental cost to urban areas threatening the long-term growth trajectory of the India's urban centers that currently contribute 60% to the national GDP<sup>1</sup>.

The National Urban Sanitation Policy (NUSP) based on the 74th Constitutional Amendment Act (1992), aims to strengthen Urban Local Bodies (ULBs). The overall goal of the policy is to transform urban India into sanitised, healthy and liveable cities and towns. Particular focus is given to improvement of hygienic conditions for the urban poor and women through cost-efficient technologies. The NUSP incorporates a paradigm shift and follows integrated concepts in the design and implementation of sanitation strategies. All cities and states are requested to act at par with the NUSP to develop State Sanitation Strategies (SSS) and City Sanitation Plans (CSPs) respectively. A City Sanitation Plan is a planning document that shall achieve the stepwise implementation of the goals spelt out in NUSP whereas SSS creates an enabling environment for the latter.

As part of its programme 'Support to the National Urban Sanitation Policy (SNUSP)', Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH supports the MoUD in the aforementioned implementation of policy guidelines.

Planning, construction and renovation of centralised sewerage systems form core interventions while designing CSP Action Plans for cities in India. This requires a coherent planning and assessment of the existing systems including components such as sewage characteristics, flow regime, hydraulics of collection systems, trunk sewers and treatment processes in Sewage Treatment Plants (STP).

The city of Nashik has a functional sewerage system of approx. 560 km in length covering more than 95 % of the city area. As other Indian cities Nashik's sewerage system is marred by functional deficiencies such as system overload and siltation in some pockets, overflow and excess dilution of wastewater. These functional deficiencies results in overflow of domestic wastewater into water bodies in the city including River Godavari leading to significant surface water pollution.

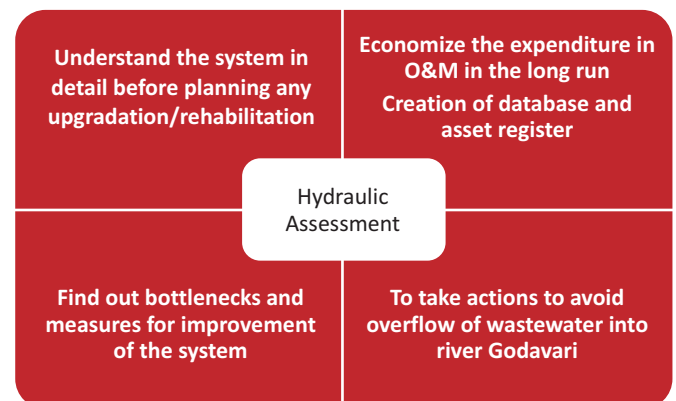
In 2015 the city of Nashik will host one of the largest religious fair of India, the next Kumbhmela. During this festival River Godavari plays a significant role since more than 5 million pilgrims visiting the premises will take holy dip in its water.

Project name	Support to the National Urban Sanitation Policy
Commissioned by	German Federal Ministry for Economic Cooperation and Development (BMZ)
Project Region	Nashik, Maharashtra
Leading Executing Agencies	Nashik Municipal Corporation, Nashik
Country	India
Overall term	Thirteen months

For preventing further pollution of the river and limiting health risks for pilgrims and the residing population Nashik Municipal Corporation (NMC) with the support of GIZ undertook a hydraulic assessment of the trunk sewer along the river Godavari. Upgradation of these trunk sewers based on proper information and adequate data has been identified as the priority intervention of the CSP for the city of Nashik.

## Objectives

As part of the CSP implementation NMC and GIZ aimed at making the existing centralised sewerage system of the city fully functional to prevent further pollution of river Godavari.



Detailed description of objectives of Hydraulic Assessment

The concrete intervention aimed at

- providing a clear and complete understanding and mapping of the deficiencies of the trunk sewer
- defining necessary measures for upgradation of the system.
- bringing the performance of the system up to the designed requirements

## Approach

Until now deficiencies in sewerage systems were mostly tackled in a fragmented and disconnected manner without a clear overview of the entire system. This led to inefficient solutions since the location of the root of the problem might differ from the place,



View of River Godavari

where negative effects can be witnessed. Therefore in this case hydraulic assessment was chosen as a suitable and systematic approach.

The scope of work covers the 16.5 km stretch of trunk sewers along the right and left bank of the river Godavari, which carries approximately 50% of the total wastewater generated in the city and showed functional deficiencies in the past.

The “Manual of Sewerage and Sewage Treatment” developed by CPHEEO\* was used as a guideline for developing the specific methodology covering primary and secondary research, data mapping and modelling.

The design period for this project was set at 30 years assessing the functionality and capacities of the system until 2041.

As a first step secondary research was conducted through a desk review of all existing material on the trunk sewers available with NMC (CDP, CSP, Master Plan, maps and drawings).

For primary data collection, extensive field survey including conditional and flow assessment of trunk sewers was taken up.

All the data collected on the trunk sewers and the L sections of laterals were then mapped on the GIS platform of NMC using AutoCAD software.

For the hydraulic modelling, as the final step of this intervention the relevant area, which is connected to the main trunk sewers through laterals, was defined according to the City Master Plan and its population for the design period of 30 years was projected. Then information on position and distance between manholes, the diameter and slope of the sewer, the current water supply and the peak discharge of wastewater of 2013 and 2041 was fed into the specialized Sewer CAD software. The capacities of the trunk sewers were simulated for 2013 and 2041.

## Output

The main output of the hydraulic assessment was the functional evaluation of the existing trunk sewers. The evaluation showed that the trunk sewer has the capacity to transport the present

(2013) and future (until 2014) wastewater flow. Furthermore, it can accommodate the quantity of wastewater, which is currently overflowing at 10 locations along both sides of the river. The quantity of overflow was measured with 7-8 MLD\*\* per day. Elements that need to be repaired such as improper joining of laterals, broken manholes, and siltation in some pockets were identified and the replacement of effected sections of the trunk sewer inadequate for the demand of 2013 is proposed.

Additional insights provided by this assessment were that surface drains joining the river are carrying untreated wastewater from slum settlements and this waste needs to be deviated. The efficiency of sewage pumping stations could and should be improved by increasing the capacity of pumping machinery and replacing selected pumps.

Finally a systemic overview of the entire system was achieved and properly documented.



Flow measurement by 'V' Notch

## The way forward

With support from GIZ, NMC prepared a detailed action plan including short and medium term actions to control the overflow into the river and implement the recommended up-gradation of the system. Beyond the specific technical solutions this intervention shows a systematic approach to avoid fragmented and ad-hoc interventions in sanitation infrastructure and offers a detailed technical road map for the assessment of centralised sewerage systems. Especially the practice of documentation needs to be ensured in the future by producing and continuously updating build up designs and maps.

This knowledge will be up-scaled and made available to other cities and states in India.

\*CPHEEO – The Central Public Health and Environmental Engineering Organisation.

It is the technical wing of the Ministry of Urban Development, Government of India, and deals with the matters related to Urban Water Supply and Sanitation Including Solid Waste Management in the Country.

\*\*MLD = Million Liters per day