Challenges of Inclusive Water, Sanitation and Storm water management in Large Dense Unplanned settlements: A Case of Sangam Vihar, Delhi

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About the research study

AIM

What it takes to provide improved water, sanitation and storm water management in large dense unplanned urban settlements:

A case for inclusive water, wastewater and storm water infrastructure planning and execution.

OBJECTIVES OF THE STUDY

1. Understanding the water, used water and storm water challenges of dense unplanned urban settlements

- This is **largely missing in Urban Planning** – in the Regional Plans, Master Plans (Delhi Master Plan 2041) and even Zonal Plans, besides Development Plans.
- The **study analyses the existing status** of water supply, sanitation and storm water issues, **based on a household survey**. Bringing in **community perspective** alongwith an **assessment of the ongoing sewerage infrastructure** being installed.

2. Contribute to the Global South water sensitive cities framing

- To **test the framework** for strengthening the case for moving away from a normative and techno-managerial application of **what a water sensitive city can be.**
- The **study explores if retrofitting solutions** for water supply, sanitation and storm water, **is possible** for dense unplanned settlements.

About the research study

METHODOLOGY

Key stakeholders like Delhi Jal Board, Delhi Metro Rail Corporation, South Delhi Municipal Corporation, DUSIB, RWAs.

Desk research for basic understanding and **mapping of stakeholders**

Relevant **data collection from secondary sources** (incl. meetings)

Reconnaissance survey and mapping the current status

2 Consultation meetings conducted- 1 with sector experts and 1 with

Development of Research Plan and Questionnaires* for primary survey

Primary survey

(222 HH surveys and 22 FGDs)

Conducted in 13 blocks of Sangam vihar & few parts of Sainik farm

Focus Group Discussions with different stakeholders

Collaboration with sector experts for data analysis

Data analysis and identification of issues and challenges

Meta-analysis and conclusions

*Questionnaires for Individual HH survey and FGDs on 4 themes- Water, Sanitation, Stormwater and Socio-economic

Consultation meetings- One with Sector experts and another with Pradhan and RWA members.

Sangam Vihar

Est. in 1979, Sangam Vihar is described as the largest unauthorized colony in Asia.

Total Population is approx. **10.3 lakhs***

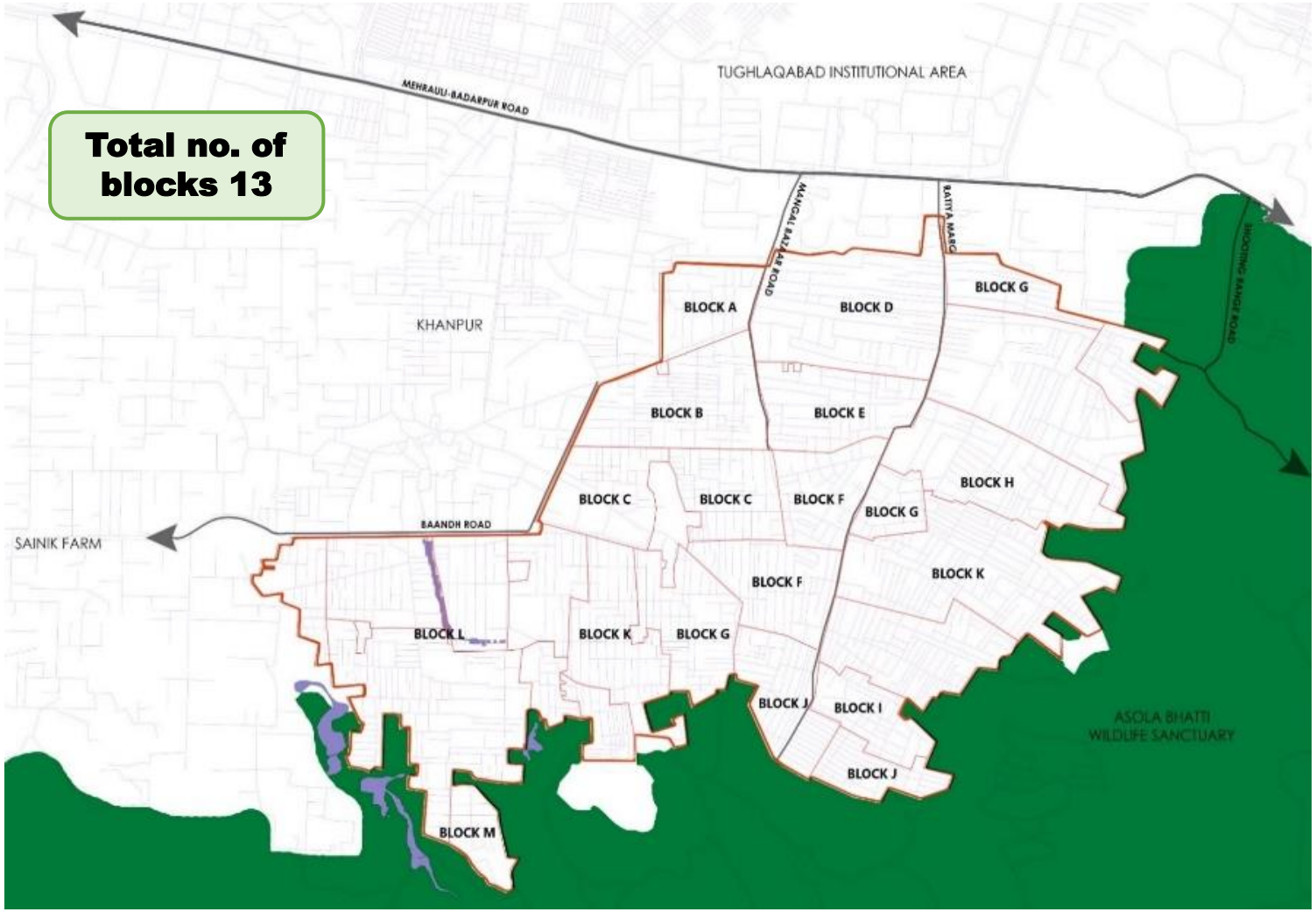
Total no. of HHs is approx. **60,000**

Total Area is approx. **5 sq.km**

Source: Primary Survey- CSE

Lack of data availability

- No population and household data
- No colony mapping (only found block boundaries through DDA and SDMC)
- No water consumption data
- No wastewater generation data
- No sewarge project document (only a tender document was available for phase 1)

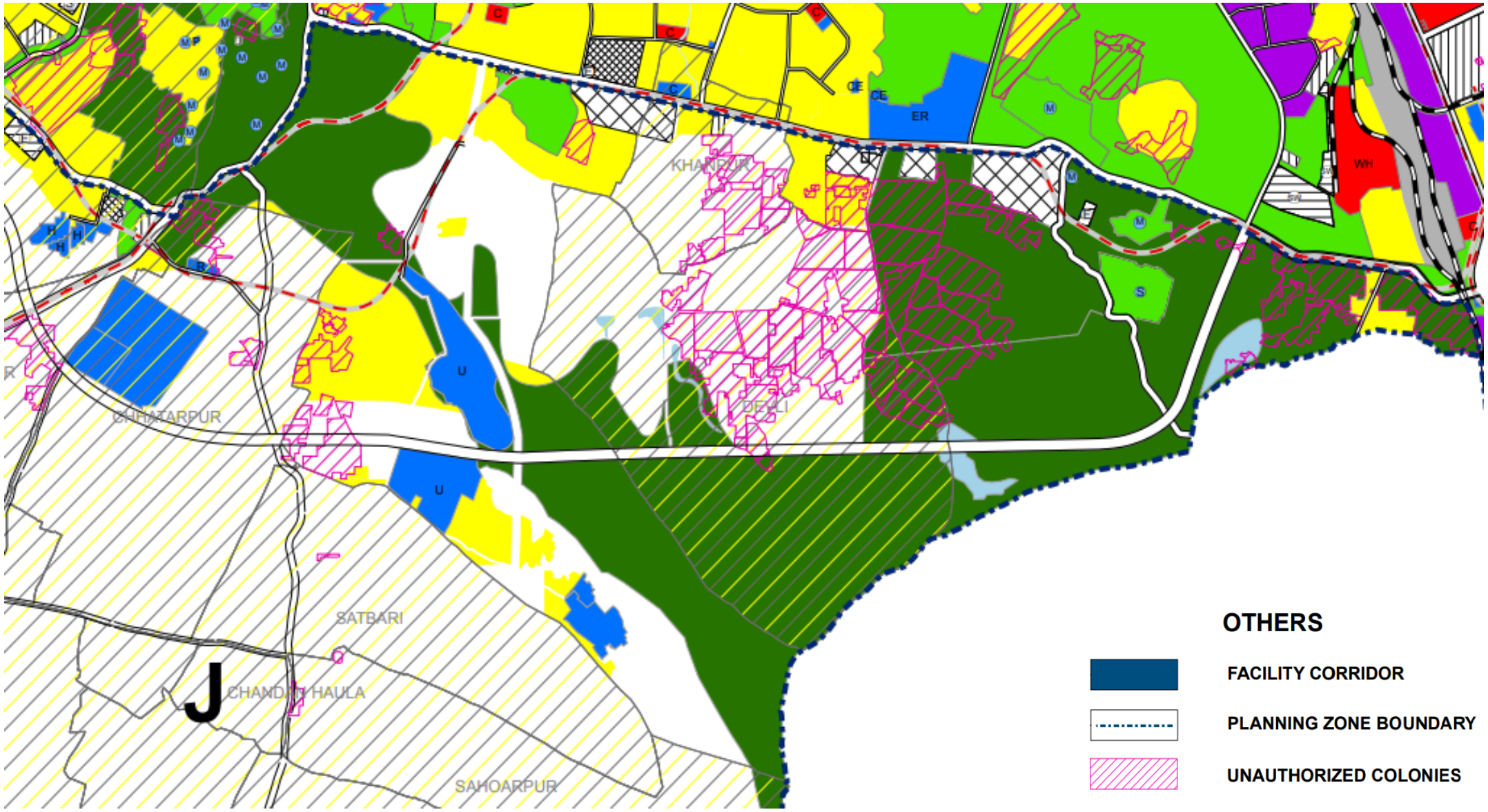


There are **no desk research or a field based study of water, storm water and sanitation services for very large unplanned settlements** of our cities – that **define the problem of infrastructure augmentation needed.**

There is a need to do a study that **identifies existing infrastructure challenges at a time when infrastructure of combined sewers is being laid out** and compliment that with the understanding of city water supply and sewerage infrastructure.

Landuse plan: Delhi

MPD 2041



Water challenges

Current sources of water

Water pipeline- Sonia Vihar

Private Borewells

DJB Tankers

Water Bottles (20L)

- **Irregular water supply- no water pipeline** in most blocks.
- Majority of the 13 blocks are **dependent on Borewells supplied water and water tankers** (both private and government) and **not on the Sonia Vihar water pipeline** of the Delhi Jal Board (DJB).
- For potable usage, 80% of the population relies on **purchase of bottled water**.

Huge gap in water demand and water supply.

Water quality is considered poor and unfit for drinking

Each HH invests in more than one storage tanks or large tanks of 2000 liters, and pump set.

High spending on purchase of non-potable water (Rs 400 a month) and **potable water** (Rs 400 to Rs 800 a month)

Water mafia

- **Water mafia exists** in all the three water supply sources – Borewells, Tankers and Piped water supply.
- It is a **result of poor piped water supply** and the resultant dependence of people on private sources of water supply.

Water: Meta-analysis

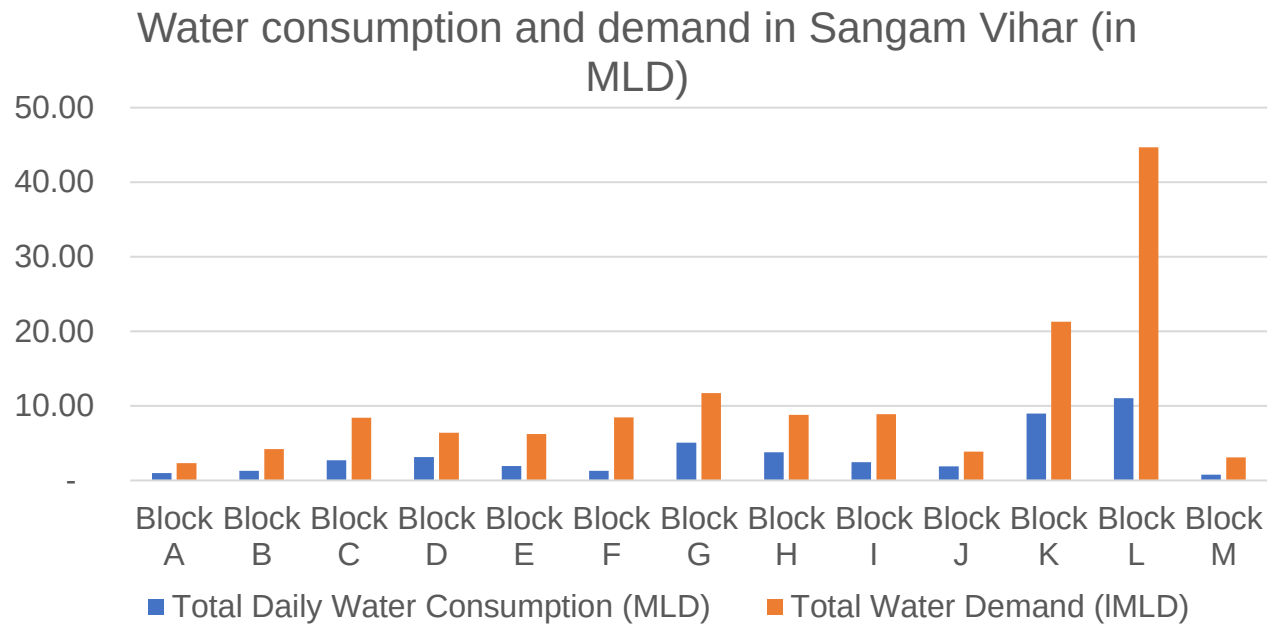
- Only **45.39 MLD of water is being supplied/consumed** by the 1 million residents of this dense unplanned settlement.

  Far below the 135 LPCD norms of CPHEEO

- As against the current supply, **the desirable water supply is 138.3 MLD.**

  It is based on a conservative estimation of total population of Sangam Vihar (a large number of informal workers whose water demand will be higher than what middle class residents consume).

- Based on the existing water supply and a normative demand, there is a **gap of 92.92 MLD of water supply.**



- **Planning for water augmentation-** If water supply is increased by approx. 50% from its current levels (as per the norms) – may impact the capacity of the Sewerage system being implemented in the area.
- **A major grey infrastructure push** is required.

In larger blocks like block L where the population is high, this gap between the total water demand and the volume of water available for use is **more than 3 times**.

Stormwater challenges

There is **no storm water planning** and **no infrastructure augmentation plan**

No conservation or reuse of stormwater

Chocked drains due to dispose of solid waste, and at times they are **encroached** by HHs.

The drains in most part of the study area are **not well maintained** or frequently cleaned by the MCD



The storm water that flows onto the MB Road, is now the responsibility of the **Delhi Metro Rail Corporation** (DMRC) – because the road is now **developed for a metro line**. DMRC is therefore required to address storm water management as a drainage challenge.

Urban Flooding

15 minute moderate rainfall leads to flooding of the Mehrauli-badarpur Road (called MB Road).

This is because the **slope is in one direction** – from south to north on the MB road. The south being the forest area.

Situation of the area after rains

Stormwater: Meta-analysis

Total storm water runoff generated from:

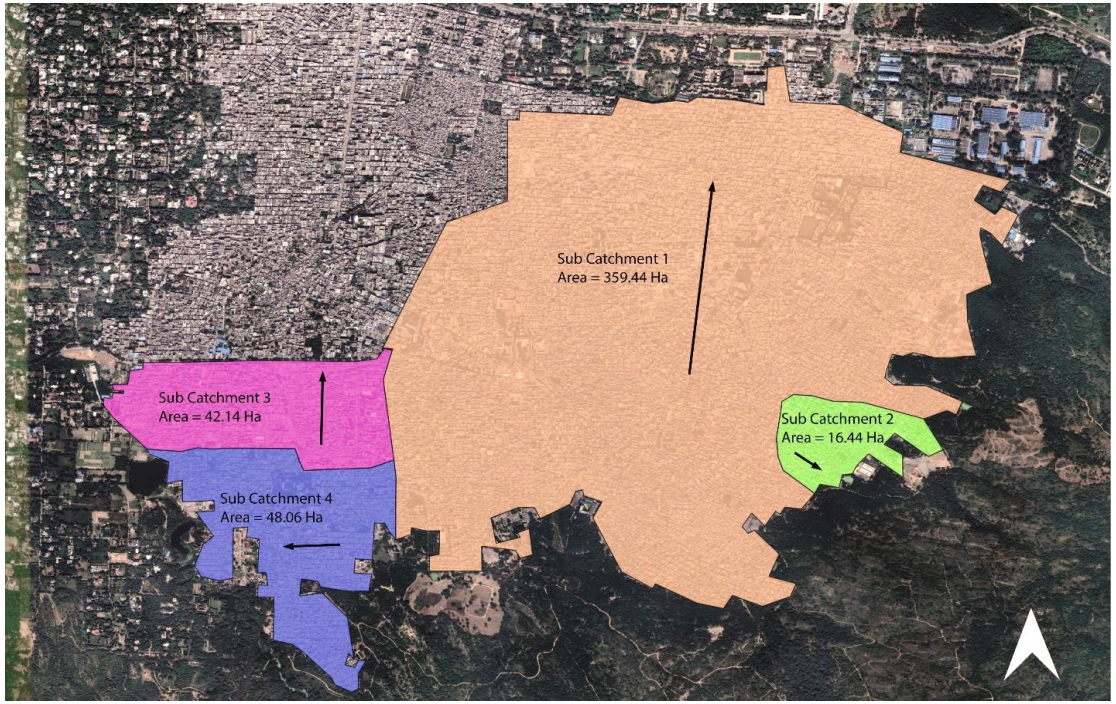
- **Normal intensity rainfall – 52 million liters** in a 15 minute rainfall spell
- **High intensity rainfall – 117 million liters** in a 15 minute rainfall spell

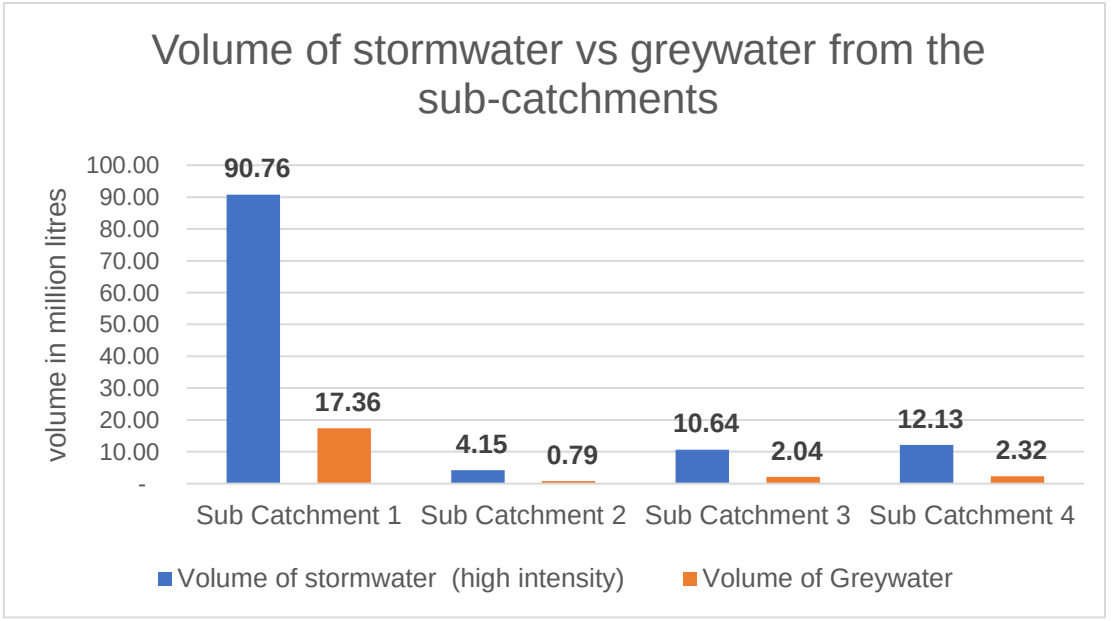
The entire volume of this storm water flows currently onto the MB Road.

90% of the study area is paved with concrete, **reducing the infiltration rate, and generating more surface runoff.**

SNo.	Catchment name	Flow Direction	Percentage Area
1	Sub Catchment 1	North	77.12%
2	Sub Catchment 2	South-East	3.53%
3	Sub Catchment 3	North*	9.04%
4	Sub Catchment 4	West	10.31%
	Total		100.00%

*90-95% of the flow is towards north, however a very less volume flows in the west direction as well





- **Planning for channelizing storm water** is a priority.
- A **major grey infrastructure push** for storm water management is required

Sanitation challenges

No sewer line in majority of the settlement, although work on sewer line is being carried out in nearby areas.

People are dependent on **on-site sanitation** systems.

Frequency of desludging varied from six months to three years.

Desludging is done by private desludgers who charge Rs1000/2000 per trip.

No CT/PTs

- **Underground sealed septage holding tanks** with no effluent coming out into the drains
- More than 70% of these tanks have **unlined bottoms**, allowing for increased soaking.

Solid waste

- Solid waste is trapped into majority of the drains
- **Irregular cleaning of drains and dhalao's** by MCD

DJB Sewerage project

DJB okays plans to lay 575km sewage lines in unauthorised colonies

Mar 06, 2022 02:47 AM IST

Delhi govt approves laying of sewer lines in unauthorised colonies of Sangam Vihar

PTI 19 April, 2023 12:03 am IST

Since 2017, DJB has initiated retrofitting of a sewerage system of **lateral (200- 300mm of diameter) and peripheral sewers (700mm diameter)**

Sewerage systems are not designed for handling 135 lpcd of water supply.

Sanitation: Meta-analysis

The primary survey of CSE estimated that the **total wastewater generated in Sangam Vihar** is approx. **36.31MLD** (based on 45 LPCD water supply currently).

Total black water generated is 9.08 MLD and the **total grey water generated is 27.23 MLD**.

Sewer lines:

- Many Sangam Vihar **residents expressed concerns** whether the new sewerage system will work or will it fail.
- The apprehension was regarding the large population of Sangam Vihar and the **seemingly small sized/dimension sewer pipes** being laid out.

- CSE assessed the design of the sewerage system- It **meets the requirements at the current low level of 45 LPCD** of water supply and subsequent waste water generation.

  At this level, the **retrofitted peripheral sewers will be able to handle the 36 MLD of black and grey water**.

- If the water supply in Sangam Vihar is increased to 135 lpcd that will lead to a generation of 108 MLD of used water, this **sewerage system will fail** and not be able to handle this quantity.

“A retrofitting solution for sewerage system for a large dense unplanned urban settlement is therefore not possible”

Conclusions

A Large scale augmenting of grey infrastructure for storm water, water supply and sanitation is required.

Leap frogging to a water sensitive cities outcome will not be possible without this grey infrastructure.

Thank You

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