

Integration of Urban Drainage with green spaces to give solution to depleting ground water table special reference to Delhi.

Abstract

Storm water drainage is meant to carry storm water (rain water) and any other clean surface water. It is fundamentally not suitable or designed for carrying sewage or industrial waste water or even septic tank effluent. Even the effluent from the sewage treatment plant cannot be discharged into it . Therefore, one of the urgent tasks should be to make plans for diversion of all waste water (both domestic and industrial) from surface drains.

Keywords – Decentralisation, Water table

History

Historically it is said that the drainage system of Old Delhi was largely developed by the Mughals whereas of New Delhi by the British.

Nallahs existing in Delhi like Najafgarh nallah ,Barapullah, Kushaknallah were all tributaries of the Yamuna that originated from the ridge.

The nallah acted as storm water drain that ensured that the city does not flood. They are natural drainage systems also catchment areas during rains.

Current Condition

Storm water drainage of Delhi is a complex situation, owing to the combination of a number of natural and man-made drainage systems – six drainage basins, large natural drains, storm water drains along the roads and combined sewer cum storm water drains (sometimes as a bypass arrangement for blocked sewer lines). However, most of the water collected through different drainage systems finally get discharged into the river Yamuna.

Open drains have become receptacles of garbage till they are completely filled up, leading to overflowing of sullage and storm water. As a result, in the rainy season the

drains are unable to take the flow and spill over, flooding the roads. The drainage system in the slums is either absent or

inadequate. In some areas the levels of the road have gone up with repair and renovation or new roads have been built.

Flooding of the roads and water logging of colonies, even with showers of medium intensity, is quite common, leading to difficult living conditions, inconvenience and traffic congestion.

Existing Drainage Infrastructure

Delhi, topography created a drainage system that carried rain and storm water from the higher elevations of the West to the Yamuna, providing a natural drainage. While the Eastern, low-lying side was originally a part of the flood plain of the river and considered un-inhabitable due to frequent floods. However, settlements in this area also began with the immigration after year 1947.

The city has been divided into six drainage zones

- (i) Northern Zone,
- (ii) Western Zone,
- (iii) Central North West and South-East Zone,
- (iv) Central South and South-East Zone,
- (v) East Zone and
- (vi) South Zone.

The length of natural drain in the city is 350 km. Man-made drainage System The total length of drains is 1700 kms spread over 12 municipal zones.

There are around 1300 drains. For a fast-growing mega city spread over 1483 square kilometres with built areas, undulated and ridge areas, having multiple drainage basins and finally holding a population of 14 million, it is a very complex task to have a detailed overview of the overall drainage situation and translate this into a workable comprehensive drainage plan.

Problems –

High elevations of foot paths and edges

Storm water are divided as Lateral drains carrying water from buildings and run off from streets then joining the Trunk lines (Drains) which culminate into Nallahs or river directly. With long lengths of drains the required slopes are high which result in

increasing the depths or inert levels of drains. This also raises the level of foot-paths at edges, which indirectly cause inconvenience to pedestrians.

Choking of inlets and Flooding of streets

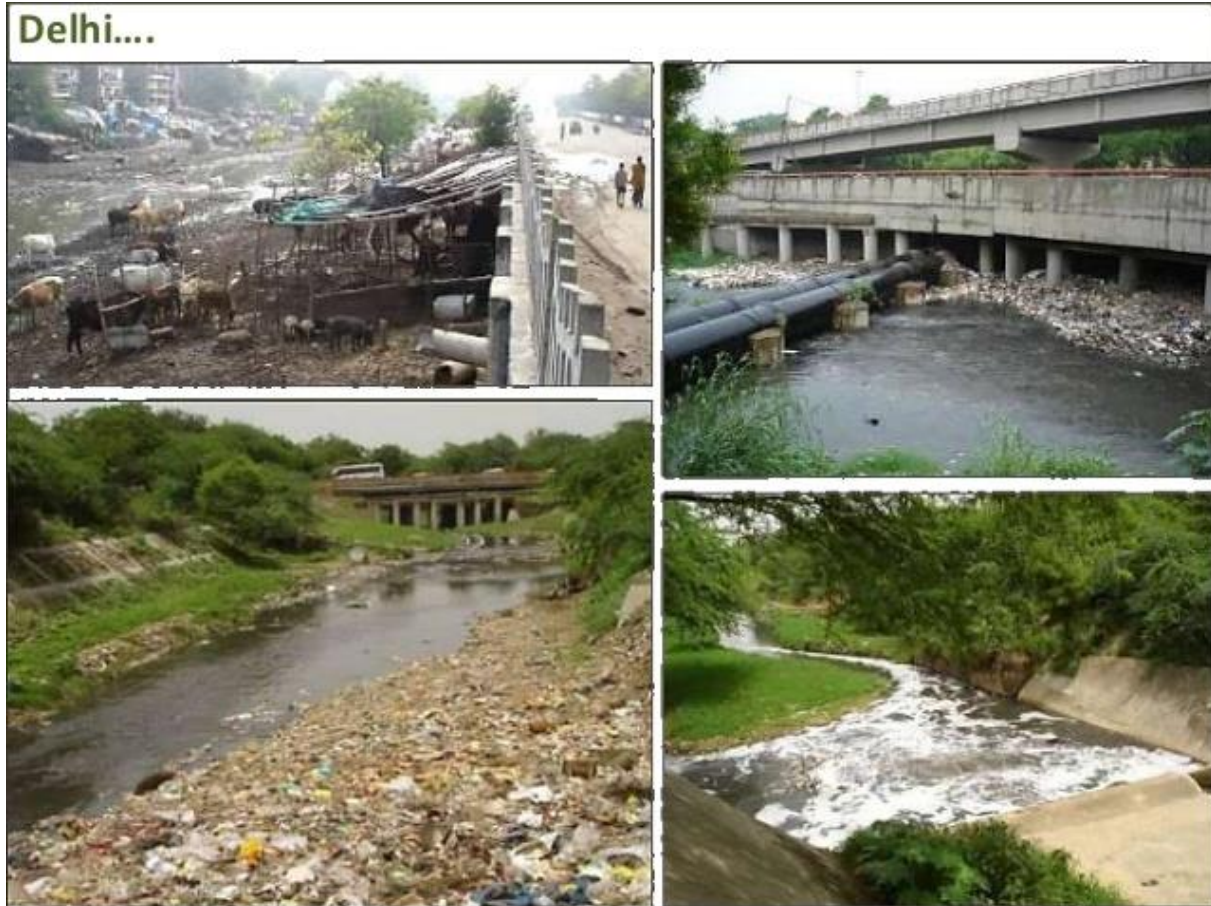
Simultaneously dumping the waste and construction debris on road or pushing the road sweeping into the nearby drain, every incoherent action leads to worsening of the state of the drainage system. The drain slabs are not repaired on time leaving convenient openings for pushing garbage and trash matter inside the drain thus fail to carry any storm flow and

contribute to water-logging and flooding. To aggravate the situation these flooded or waterlogged area serve as the abode for vectors that spread diseases like malaria, filarial or dengue.



About 46% of Delhi, where nearly 4.5 million people live, has no sewerage system. In these areas, filth flows freely through storm-water drains leading to flooding finally entering into Yamuna without being treated.

This also hampers recycling of millions of litres of stormwater and destroys peripheral greenery and biodiversity.



Depleting Water Table

A STUDY commissioned by the Delhi government on the groundwater status in the capital has found that the water table is over-exploited and disposal of solid waste into water bodies has led to depletion of the natural water table.

Except for a small area in central and north districts of Delhi, the water table is exploited in other areas due to direct boring in residences and farming land. The average exploitation level is around 170 per cent.

The main reason being “retardation of water inflow by intervening roads, structures, walls and footpaths into water bodies” and “diversion of rainwater into the drainage system, disposal of solid waste collection system and construction of marginal bunds resulted in disconnection of water bodies from annual monsoonal flooding”. Other causes include dumping of excavated earth, construction waste and debris into water bodies, added the report.

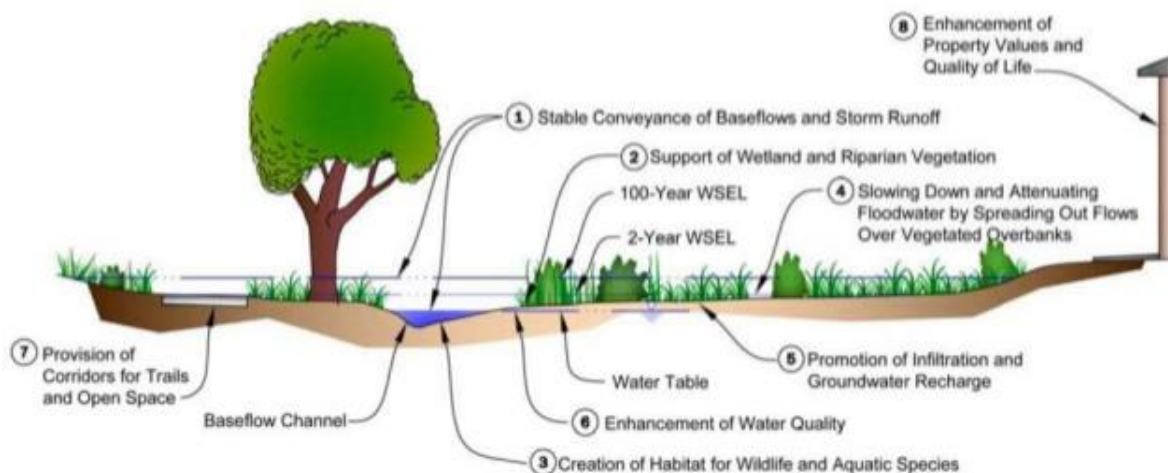
Solution

It has been found that there are sizeable 480 water bodies in various locations that have the potential for water recharge. There would be many more areas within the district and local level parks and green belts where more low-lying catchment area can be identified with proper survey.

Fragmentation of drains into smaller lengths

Integrating these many small and big catchment areas with storm water drains at respective local and sector levels by culminating the storm water drains in these local green areas, instead of taking through long lengths of arterial drains and then trunk drains finally to Yamuna, will help in overcoming both problems of flooding and depleting water tables. Storm Water will be collected in nearby green open spaces at a low-lying area, which will become a water body and help in rejuvenating the water table at those areas.

Functions and benefits of healthy small water bodies



Source: Douglas County Storm Drainage Design and Technical Criteria Manual

Advantage of having natural drainage system is support of riparian and wetland vegetation alongside creating habitat for wildlife and aquatic species. This will also help in infiltration of water resulting in ground water recharge with passage of time. Along with slowing down of

effect of floodwater by spreading out flows over vegetated overbanks will enhance the quality of water and quality of life which will bring in increase in property value.

Easier Maintenance

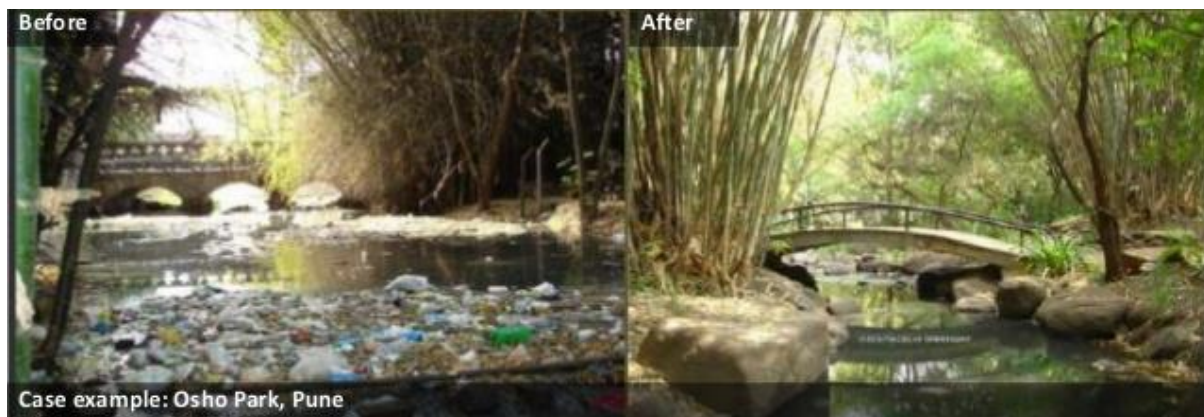
The concept of fragmentation or reducing lengths of storm water drain will eventually reduce the cost of construction. Fragmentation of drains will make maintenance easier as only that part will have to be taken up and not the whole length of connecting storm water drains.

Decentralisation of sewage drains and sewage plants

Similarly, the waste water can also be fragmented into smaller lengths and carried to decentralised sewage plants ' which can be established at local level .

The drains could use decentralised biological wastewater treatment no treat the waste water and reuse the same for irrigation and create a landscaped parkway like "OSHO PARK" in Pune.

The sanitised drain then could be used for creating picnic hubs, jogger's park, a connection to achieve interconnectivity between various residential neighbourhoods, etc.



Conclusion

- Roads and drains need to be planned, designed and constructed together so that there is a proper linkage between them and they serve the purpose of not only drainage and collection of

surface water on the roads but also facilitate road sweeping and separate collection of solid waste.

- Some of the drains are from the Mughal period and have heritage value. These need to be revived in a suitable manner keeping in view their historical content and their present context. These could, for example be vehicles of ground water recharge through a green sheet of grass and shrubs and a functional lined drain in the middle to carry the lean time discharge.
- There should be strict instructions to the construction agencies to clear all debris and construction material from within the drains before covering the slabs. This is crucial for proper functioning of the drains.
- The problem needs to be solved from the very root in a long term sustainable way.

References

Source -Hindustan Times Monday, Apr 30, 2018 e-paper
Restoring Natural Drainage System of Delhi - SlideShare
<https://www.slideshare.net/iramaziz/restoring-natural-drainage-system-of-delh>
DRAINAGE MASTER PLAN FOR NCT OF DELHI
Written by Sumegha Gulati | New Delhi | Published: November 22, 2014
Source -Hindustan Times Monday, Apr 30, 2018 e-paper
Indian Express - Tuesday, May 01, 2018