

# Natural Drains:

## For A Concrete Identity & Parallel Use

By Dr. Poonam Ahluwalia, Susmita Gupta & Dr. Rajeev Garg

In urban growth centers of developing nations like India, there is an increasing emphasis on cleaning natural storm-water drains or *nallabs*. Cleaning natural drains is becoming a challenge for most municipal authorities owing to many factors such as discharge of untreated wastewater, encroachment, etc. The current study highlights few such issues and proposes feasible makeover alternatives for these drains such as using them for decentralized treatment, rain water harvesting, parking facilities, green zones etc.

### Introduction

Each urban growth center (UGC) has its unique drainage pattern defined by open streams or *nallabs*. The rainwater runoff finds its own course to these open streams or *nallabs* (also referred to as natural drains). In most urban areas, the Institutional Responsibility for these natural drains lies with Public Works Department (PWD) which is responsible for its maintenance and also for the development of other planned/proposed drains and cross drainage works in the form of culverts and bridges required for effective drainage of the UGC. Owing to unplanned and unprecedented growth of urban centers in developing nations like India, local authorities responsible for these drains are facing several critical issues and challenges. The next section lists a few key issues associated with these drains.

### Critical Issues With Natural Drains

Most of the natural drains are encroached upon and disposal of debris along the side of their course is a common view. The City's storm-water system, unlike the sanitary sewer system receives no treatment before the water travels through a series of canals or ditches to the nearest waterway. This means that whatever enters the storm inlets on the side of roads during rain events or from illegal dumping, is what ends up directly in the nearest stream, river, lake or other watershed. The area required to be maintained as right of way for the drains is increasingly being utilized for right of way for water pipe lines,

electric cables, telecommunication cables and television cables. The drains are increasingly being used for discharging sewage and industrial effluent, especially from unauthorized colonies where an adequate sewer conveyance system is not in place. The problem is aggravated by the fact that the maintenance of storm-water drains are least attended with the only response evidenced is during excessive damage to the drains. The common issues which are increasingly becoming critical for effective drainage of most UGCs include:

1. Encroachment of *nallabs*
2. Silting of drains due to constant blockages
3. Unpleasant odor of dirty water flowing in the drains
4. Absence of comprehensive data on storm-water drainage network
5. Choking of *nallabs* due to disposal of debris and garbage into the drains
6. Stability of drainage cross-sections-dislocated and damaged old lining of the drains
7. Free access to dispose wastewater from nearby habitation and establishments into the natural drains
8. Inadequate attention to cleaning of natural drains and to clearance of excess floral growth on the drains
9. Indiscriminate laying of services pipes and lines along the drains by other departments and agencies

Lack of adequate measures to combat the above stated issues have resulted in several instances of frequent mass floodings in the area. One such instance pertains to Mumbai wherein following the damage caused by severe floods in Mumbai in 1985; the BRIMSTOWAD project was initiated by Municipal Corporation of Greater Mumbai. A report was submitted by researchers and engineers in 1993, but the suggested measures largely remain unimplemented. Mumbai was again hit by a

disastrous flood in 2005, which necessitated a study by the central water and power research station in Pune, which submitted its recommendations in 2006. A few of the important remedial measures suggested were:

- Widening of the waterway from Mahim causeway to Dharavi Bridge to 100m.
- Widening of the bed width from 175m (existing) to 200m between Dharavi Bridge and CST bridge area.
- Widening of Vakola Nalla from 40m to 60m.

The work was planned to be executed in 2 phases. Phase-I involved dredging, desilting and widening. Phase-II involved construction of a retaining wall, beautification and construction of service roads.

The measures such as those stated above not only require a strong will on the part of municipal authorities but also support from the masses. There have been several instances wherein natural drains despite widening measures by the local authorities have been rendered ineffective owing to encroachment by a section by the masses. The case of Bangaluru aptly highlights the issue. As per Dainik Jagran (Web News), the Bruhat Bangalore Mahanagara Palike (BBMP) identified nearly 958 structures in 2007, being used for both residential and commercial purposes that have almost completely choked four major storm-water drains. The BBMP's report had listed UGD and water supply pipes, and electricity cables running inside the storm-water drains as responsible for flooding during the rains.



Figure1: Jogging Track / Senior Citizens' Pavilion

As is evident from the above instance, there is a tendency to view natural drains and its right of way, as no man's land and potential real estate. An online edition of India's National Newspaper (Hindu), dated Nov 09, 2010, based on the survey of Kukatpally storm-water drain, states that 'Encroachments are leading to narrowing of drains, flooding'. The issue is symptomatic of various issues following a long standing plan for a decade to modernize storm-water drains crisscrossing the twin cities. Encroachments on the drains or alongside them, have led to the narrowing of water channels causing flooding in different parts of the City whenever it rains.

As per Deccan herald dated 1st January 2011: unmindful of the consequences, people dump waste and debris in the drains. The people residing near the drains, in the absence of sewerage pipes, are letting out sewage directly into the rain water drains. The worst culprits are solid waste management contractors. They have been found to be using the vacant space available along and close to the drains as dumping yards.

During the rains, the wastes turn into silt and obstruct the flow of water. Drains, during the rainy season, often overflow because of the encroachment of the drains itself. While the rich are found putting up commercial establishments right on top of the drain or on the sides adjoining the drains, the poor have constructed their pigeon-hole dwellings adjacent to the retaining walls of the drains. The article further reported several deaths caused due to over-flowing drains since 2007.

The above cases are only a few of the myriad of information available on the internet on the issue of encroachment of



Figure 2: Children's Play Area

natural drains and the impending result of water logging/ mass flooding instances in UGCs. A SWD is an independent utility and an integrated part of the natural drainage system. Hence, any planned/ unplanned/ authorized/ unauthorized infrastructure on these drains or multi usage of the SWDs without addressing the hydrology of the area or viewing the issue in a holistic manner would adversely affect the whole system (Dr. T.V. Ramachandra of center for ecological sciences, Indian Institute of Science).

The following section lists key strategies suggested by various local bodies for integrated drainage solutions.

### Strategy & Identification of Interventions

To build a robust storm-water drainage network and to achieve the storm-water drainage vision for UGCs, following have been discussed by various PWD committees as strategies for Integrated Drainage Solutions:

- a) Rehabilitation of natural drains: This would require a reconnaissance survey by the PWD/ governing Municipal Corporation and an idea of block cost estimate for restoration, rehabilitation, training and cleaning the natural drainage system.
- b) Removal of unauthorized structures and encroachment on natural drains: Regulatory framework for removal of unauthorized structures and encroachment of natural drains should be included under municipal acts as a policy to prevent further encroachment and usage of natural drainage for other purposes.

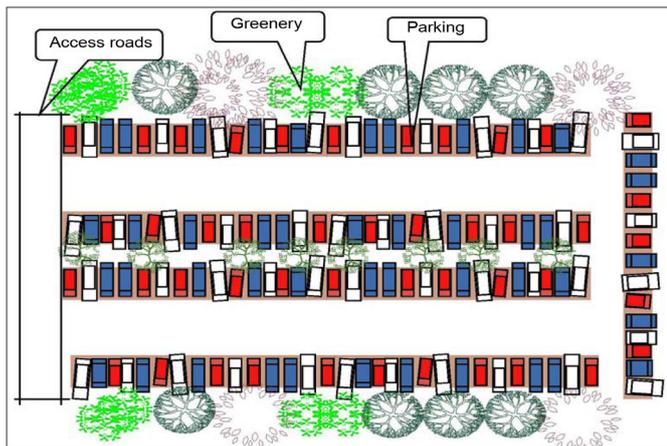


Figure 3: Parking in Residential & Commercial Areas

- c) Construction of rainwater harvesting structures: Rainwater harvesting can be covered for augmenting the recharge of the diminishing ground water table.
- d) Construction of roadside drains as per drainage design: Roadside drains should be constructed as per the design requirements, with specifications to handle the run off water and to provide cross drainage works for effective drainage of the rainwater into natural drains.
- e) Regular cleaning of drains to avoid silting: Regular cleaning would help avoiding silting and desilting of drains and eventually improve the efficiency of the drain capacity

There is no guarantee that the encroachment once removed is not likely to happen again in the future. More than the funds, a definite plan to free the natural drains from such impending problems is required. The following section suggests Utilizing Architectural/ Urban Planning Solutions for Concrete Identity and Defined Use for ‘No Man’s Land’

### Utilizing Architectural/ Urban Planning Solutions & Defined Use For ‘No Man’s Land’

Width of natural drains range from 20-200m depending on the area contributing to the runoff. The length of such drains is usually in the range of several hundred kilometers. These natural drains can be looked to as right of ways for enhancing the city scape writ to different land uses of urban areas.

Such a no man’s land could be fruitfully utilized to provide recreational ownership to the inhabitants, ease out traffic

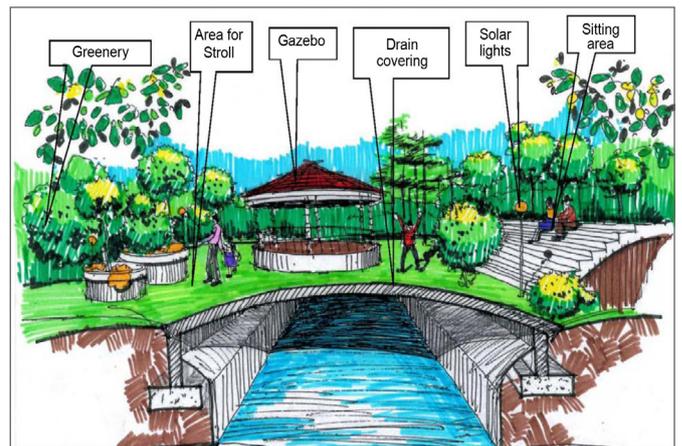


Figure 4: Public Area / Community Spaces

movement, and provide the much needed parking space and other green solutions/interventions such as constructed wetlands/greenways, etc. Various architectural solutions/concept of beautification can be considered for different cases/site conditions in view of the following factors:

1. Surrounding conditions
2. Requirement of particular zone / sector
3. Span of drain/space available after covering of drain

Natural storm-water drains can be covered after lining the cross sections (which need to be decided giving due consideration to the peak and lean flows and the embankments available for utilization thereof).

The covered drains with top paved areas provide clean zones which could be easily utilized as per requirement and would aid in promoting further control on the required sanitation. The bed of the drains could be developed as greenways (to control pollution load such as BOD) or as recharging structures to enhance ground water table without intervention from the public masses.

The aeration could either be proposed through natural means such as obstructions to increase turbulence or through mechanical means. Ducts, fashioned as hoardings/shade areas can be planned as raised structures to leave the foul gases at a higher elevation.

They may be developed as walking or jogging tracks along them. Alternatively, they may be intermittently covered up and the raised pavilions can act as passive recreational areas for senior citizen/kids. Trees and plantation integrated with the drainage system can beautify the surroundings. Active areas in form of play areas for children with swings/see-saws can be developed over covered drains. Drains adjoining roads can be developed as parking lots (single or multilevel). The space could also be utilized as a destination for weekly haat bazaars and act as social integration areas for its rural hinterland promoting the local cultural heritage.

When passing through high density/congested areas these drains can be developed to act as road bye-pass (which could be one/two way, depending on the width of the canal) along with a green boulevard/plantation on either side. Creating such recreational areas would significantly enhance the micro climate.

This could further generate revenues as such developments can be easily proposed on PPP modes. Even parks can be developed and maintained by neighborhood associations. Such proposed development of the drains would significantly help provide breathing spaces to high rise jungles. Such areas can be proposed to be illuminated with solar lights, so as to cause no burden on the urban electricity load. An artist's impression, of a few of the options mentioned above are depicted in Figure 1-6.

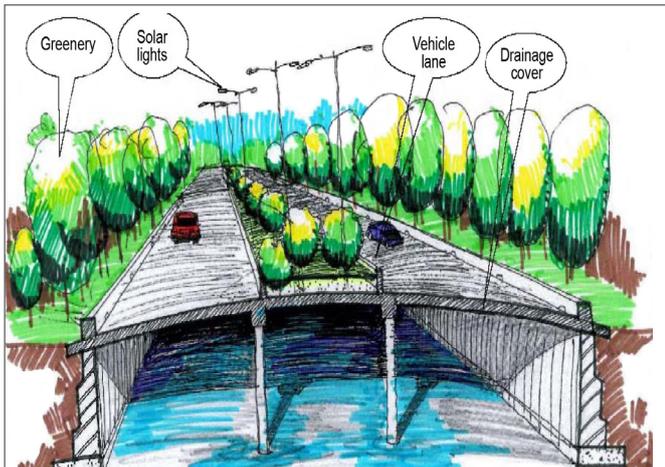


Figure 5: One Way / Two Way Sector / Zone / Bye-Pass Road

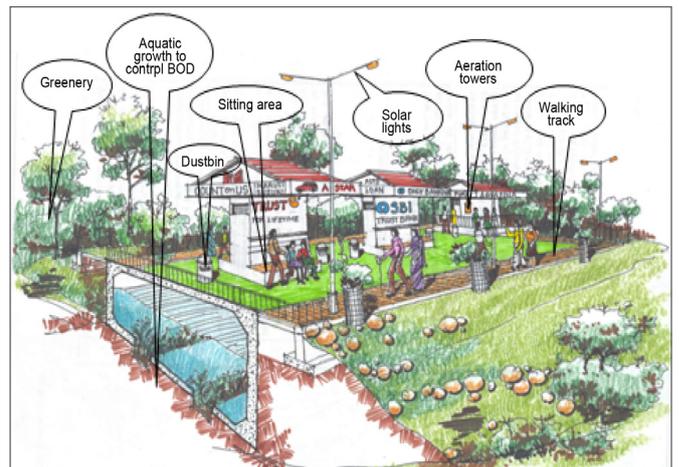


Figure 6: Treatment / Greenway

Such a proposed development which provides these areas with a definitive role, would ease of the implementation of the issues such as rehabilitation, controlling encroachment on these areas by slum dwellers and also prevent them from becoming garbage dumps.

### Summary & Conclusion

The townships existing/coming up in the identified drainage basins of India need integrated and holistic approach/efforts to preserve the natural drainage pattern/natural right of way for runoff. Utilizing natural drains in innovative ways by providing them with a concrete identity and land use would help control encroachment of these areas, thereby promoting hygienic conditions. Further, utilizing them for green solutions/ decentralized treatment/ breathing zones for the UGCs would contribute towards environmental sustainability of the area.

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Dr. Poonam Ahluwalia currently works for TATA Consulting Engineers Limited, as the Senior Manager (Environment). She received her PhD from IIT Delhi (India) and has more than 16 years of experience in research and consultancy. Her areas of interest are water and wastewater systems, risk assessment, storm water drainage, rain water harvesting and solid waste management.



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