

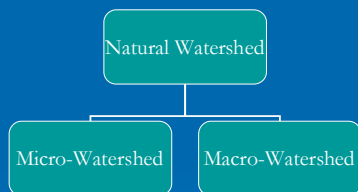
PROBLEM OF URBAN FLOODS IN DEVELOPING CITIES OF DEVELOPING WORLD

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INTRODUCTION

- > Importance of Water
- > Development of Civilizations around water bodies
- > Importance of port cities in India
- > Population growth with the span of time
- > Unplanned growth crept in
- > Even one of the best planned cities have never been developed with the perspective of urban floods

NATURAL WATERSHEDS



PROBLEM OF URBAN FLOODS

- Urban floods and consideration of natural watersheds have never been considered by our planners

UNDERSTANDING PROBLEM OF URBAN FLOODS BY CALCULATIONS

Assume

- Dimensions of the area for consideration is 1 Square kilometer
- The area is an urban area fairly populated
- The area is covered by Buildings, Roads and Pavements.
- Urban Floods occur at places where rain fall is 800 mm annually

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Then,

$$\text{Area} \times \text{Rain fall} = \text{Available Water}$$
$$1000000 \times 0.8 = 800000 \text{ Cum}$$

i.e. 800 mm of rain falling on an area of 1 Square kilometer amounts to 800000 Cum of water to be taken care of annually

- Assuming 25% of it is lost in evaporation and absorption then the balance amount of water is 600000 Cum.
- Hence the quantity of water to be taken care of daily works out to be $600000/365 = 1643.83$ cum of water daily
- Which equals to 1643830 Litres/Day (This water is sufficient for 13698 persons @ 120 liters/day/capita)

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Again if we assume that 80% of the rain falls during monsoon season of four months

- Then it means that $640000 \text{ Cum}/120 \text{ Days} = 5333.33 \text{ Cum/Day}$ and less 25% for evaporation and absorption
- Which leaves the balance of about **4000 Cum/Day of water** to be discharged safely through drainage system during **120 days of Monsoon**.
- Intensity of rain fall can be further worked out depending upon the pattern of rain fall distribution which will result in further increase in the peak availability of water to be taken care of within a given time frame work of an hour, a day or a week.

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- A rain fall of 50 mm in a day over an area of 5 Square kilometer is equal to
- $5000000 \times .05 = \mathbf{2,50,000 \text{ Cum}}$. (this is what happens in City like Mumbai or Kolkata)

REASONS BEHIND URBAN FLOODS

- Settlement in the drainage stream of the existing Natural Micro Watershed.
- Covering of drainage area with concrete or impervious materials.
- Change in the size of Watershed area and drainage line due to construction of obstructions like roads, elevating the area by filling with impervious materials.
- Construction of drains without consideration of discharge, slope and further Out fall. (in many cases one drain ends in to other settlement without further connectivity and other drain in to previous settlement)
- Construction of embankments and raising the level of Roads above plinth level or ground level of adjoining buildings.

CONSEQUENCES OF DESTRUCTION OF NATURAL WATERSHEDS

- Accumulated and unabsorbed water due to rainfall going nowhere.
- Change in direction of natural flow due to obstructions.
- Drop in water table due to less or no absorption
- Flooding of area because of non existing or insufficient drainage system.
- Stress on existing drainage system due to increased runoff.
- Choking of existing drainage system due to mixing of sewage in storm water and thus increased runoff.

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- Creation of uncomfortable weather due to increased evaporation and foul smell.
- More pressure on energy needs due to more cooling requirements.
- Urban floods mixed with sewage creating health hazards like Cholera, typhoid, Hepatitis, Skin Diseases, Malaria, Flu etc. not only in the city but for the other settlements down stream of the city in question.

NEED OF THE HOUR & SUGGESTIONS

- ❖ Identification of water sheds existing within the city and out side for projected growth.
- ❖ Preparation of drainage plan of the city according to newly developed ridge lines. (Micro Watersheds)
- ❖ Based on scientific modeling, proper calculation of quantity of runoff based on maximum rain fall and sewage generation per day or per hour from each artificial or human created Micro Watershed.
- ❖ Construction of scientifically designed and improved drainage system.
- ❖ Separate drainage system for storm water and sewage.
- ❖ Make bifurcation of sewage and storm water with provisions to construct storm water drain in front and sewage drain at the back of the house.

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- ❖ Study of absorption capacity of ground of each micro water shed of city.
- ❖ Collection and discharge of storm water in to natural drainage
- ❖ Collection and draining of sewage separately to treatment plant and then either discharged safely or used according to needs.
- ❖ Identification of future projected ridge lines or proposed change in micro water shed such as size and water absorption capacity.
- ❖ Future growth and development to be granted strictly according to designed drainage plan of the city.
- ❖ If storm water is collected separately from houses then it can be used for replenishing the ground water by construction of water harvesting structures.
- ❖ Removing burden on existing drainage system by reconstruction and maintaining them.

Conclusions

Geographical area of Cities be mapped out in terms of Watersheds and well defined ridge lines, the proposed and existing drainage systems must be properly identified and scientific study must be carried on in that respect, proper investigation of the chances of improvement of the existing system and further settlement according to drainage plan. These measures can be helpful in reducing Urban Floods in the Developing Cities of Developing World.

*Water Available From Urban Floods Is A Blessing In Disguise
If Dealt Properly*
THANKS !