Scientific Journal of Impact Factor (SJIF): 4.14
e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 3, Issue 4, April -2016

Challengesfor Sustainable storm water drainage and its solutions

Khyati N Baleva[1] , Snehal N Baleva[2]
[2] MPLAN (U.R.P.), CEPT University, Ahmedabad
[2]ME Civil Engineering, LDRP Institute of Technology and Research, Gandhinagar

Abstract-*infrastructure is a necessary component for drainage of urban runoff, non-structural approaches are important complementary measures, focusing on actions to prevent and mitigate problems related to flooding, as well as those related to pollution and deterioration in environmental health conditions. As these rely predominantly on behavioral changes to be effective, a participatory approach is recommended within a strategic framework of urban storm waterplanning. Increasing development activities have called badly for the necessity of discharging runoff safely into environment. If heavy storm with high runoff is heat due to improper drainage facilities, most of existing storm water drains are in dilapidated stages and not working properly. Losingself-cleansing, no proper maintenance. The understanding precipitation data clearly, know the infiltration indices, concentrationtime, intensity of rainfall, runoff etc..The Storm water drainage problem change with region.*

Keywords – Storm water, Drain, Issues, waterlogging, runoff

I INTRODUCTION

Storm water drainage:-A storm drain is defined as that portion of the storm drainage system that receives runoff from inlets and conveys the runoff to some point where it is then discharged in to a channel, water body, or piped system. It consists of one or more pipe connecting one or more inlets. A storm drain may be a closed conduit, open conduit or some combination of two. The terminology "storm sewer'' which has been in general use for many years is gradually being replaced with the term '' storm drain'' to differentiate between sanitary sewer and storm drains.

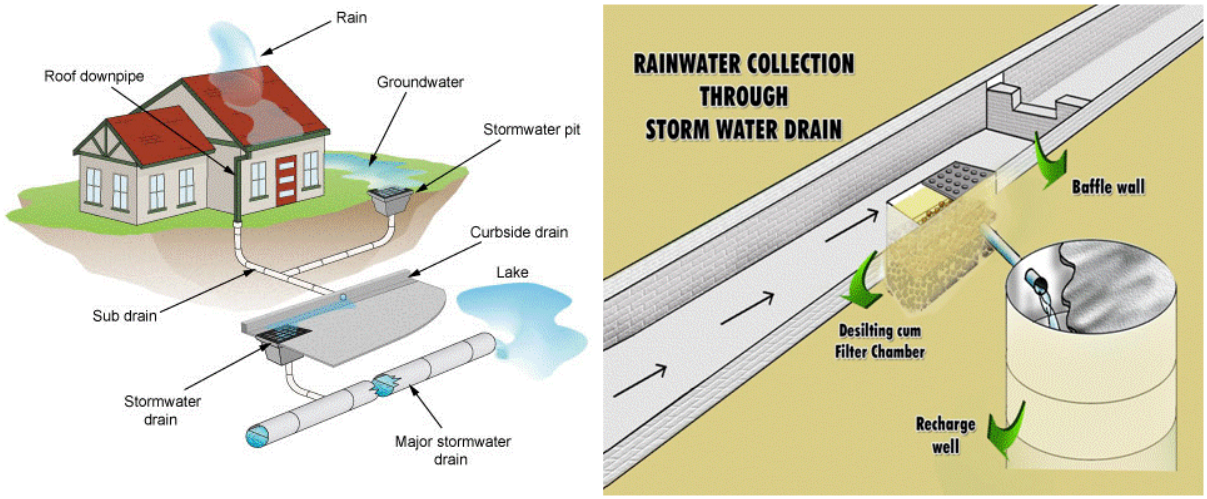


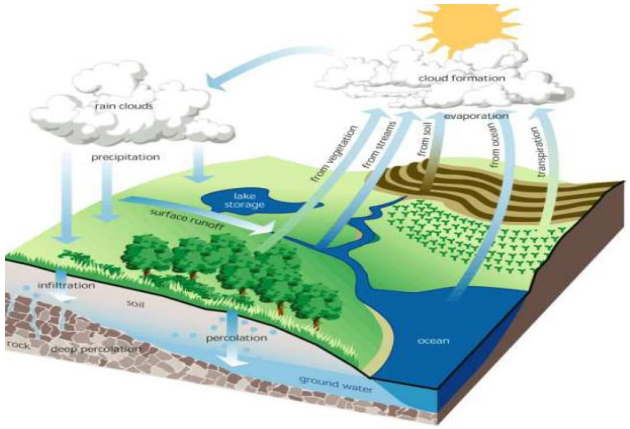
Figure: Household Drainage System

Purpose of storm water drain:-

The purpose of storm water drain is to collect storm water runoff from the roadway and convey to an outfall. Storm drain design generally consists of three major parts:

- System planning which includes data gathering and outfall location
- Pavement drainage which includes pavement geometrics and inlet spacing
- Location and sizing of the mains and manholes
- To solve the problem of waterlogging

Hydrological cycle



-Precipitation (Rainfall)
-Snowmelt
-Runoff
-Infiltration
-Subsurface Flow
-Evaporation
-Transpiration
-And many more processes.

Figure:Hydrological cycle

Storm water Runoff

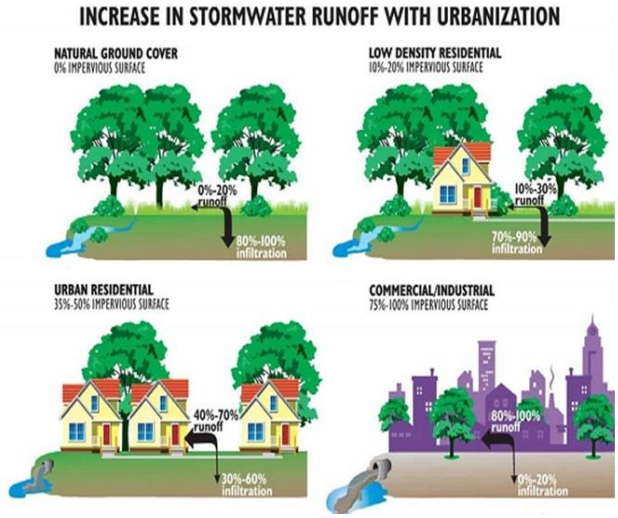


Figure :storm water runoff with Urbanization

- **Natural Ground cover**
  Runoff: 0%-20% Infiltration: 80%-100%
- **Low density residential**
  Runoff: 10%-20% Infiltration: 70%-90%
- **Urban residential**
  Runoff: 40%-70% Infiltration: 30%-60%
- **Commercial**
  Runoff: 80%-100% Infiltration: 0%-20%

II Storm water drainage problems and their solutions

Excessive water from drain spout

Problem: Due to Improper drainage system excess ground water flow around foundation and basement walls Damage

Solution: connecting down spout to an underground pipe with a built in catch basin which diverts water away from foundation.

Excessive water in landscape area

Problem: Excess water can drown your shrubs, flowers and other sensitive plants, to rubbing your landscape investment.

Solution: Installing catch basins and atrium grates protects roots systems from rot by drawing water away from garden areas prone to pudding.

Poor Soil Drainage Conditions

Problem: As above, wherever there are low spots in your lawn, or poor slope or soil conditions, and there's nowhere to send the water, you'll get peddling and a muddy mess.

Solution: storm water retention system captures excess water so it can slowly leach into the soil.

Tree root remove from storm water pipe

Problem: Tree roots send out new growth, which is drawn toward the moisture and nutrients present in your sewer pipes. In many cases, it begins with a very small hole or crack that allows an entry point for the roots. From there, the problem gets steadily worse, leading to pipe damage and unbelievable clogs Tree root growth can also affect storm drain, causing clogging, flooding in nearby areas during heavy rains, and other issues

Solution: Hydro jetting service may be needed to fix the problem

Unprotected storm water drain

Problem:-The photo above shows sediment that has been eroded off an adjacent building site and getting into an unprotected storm water drain. This is not acceptable.

Solution:-This photo shows the use of sand bag bunds to protect a storm water drain. This is acceptable

Waterlogging in yard

Problem: If your yard suffers from wet soil conditions, frequent flooding or standing water from even the smallest amount of rainfall you should consider installing some underground yard drainage. Standing water can destroy your grass and plants and ruin your landscape. It's also good

Solutions:-To solve water logging in yard install soil drainage and lawn drainage

Impervious surface – Pervious surface

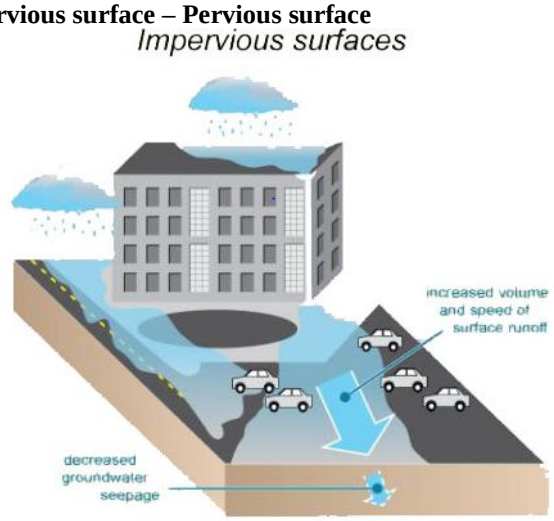


Figure: Impervious Surface

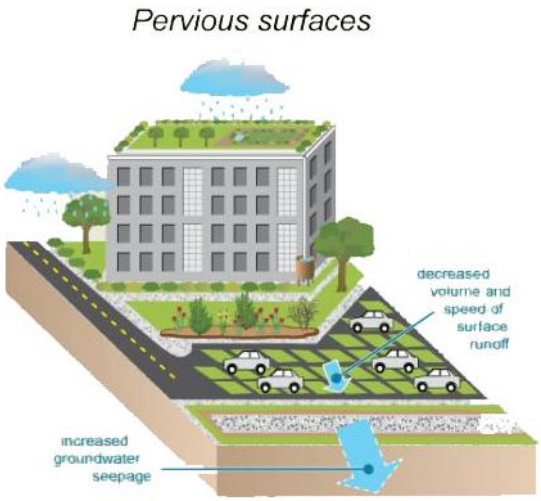


Figure: Pervious Surface

Impervious 'hard' surfaces (roofs, roads, large areas of pavement, parking lots) increase the volume and speed of storm water runoff. This swift surge of water erodes stream beds, reduces ground water infiltration and delivers many pollutants and sediment to downstream waters.

Previous 'soft' surfaces (green roofs, rain gardens, grass paver parking lots, infiltration trenches) decrease volume and speed of storm water runoff. The slowed water seeps into the ground, recharges the water table and filters out many pollutant and sediment before they arrive in downstream water.

III PAVEMENT DRAINAGE PROBLEM AND SOLUTIONS

Drainage aspects of hilly road should be given due emphasis, as insufficient drainage may leads to two basic problems. First, pitched pavements are likely to get damaged and washed away by water during rainy season, if drainage is not proper. This is particularly because the subgrade of the road gets damaged with deposition and infiltration of water into it. Secondly, hydroplaning, a common phenomenon observed when a thin film of water that increases in thickness as it flows to the edge of the pavement is of major concern, as because it leads to the loss of traction of vehicle. Depth of water on pavement depends on the factors such as length of flow path, surface texture, surface slope, and rainfall intensity. All these factors should be considered for design of longitudinal and transverse pavement slope, curb and gutter, and in the design of inlet to the roadside drain. Depending on rate of flowing water and existence of debris and sediment different kind of inlet such as, grate inlets, curb-opening inlets and combined inlets can be used. For actual design of these items more details of these aspects should be studied by the designer.

IV TO PROTECTSTORM WATER DRAINAGE FROM SEDIMENT

Silt fence

Surface water carries lots of sediment from construction site and other deforested areas located uphill. Such sediment entering into the drains reduces efficiency of the drainage system. Silt Fence is a low cost temporary measure that can prevent sediment entering into the drainage system while allowing sediment-free water to pass through it. Depending on the gradation and size of the suspended silt, different types of screen need to be used.

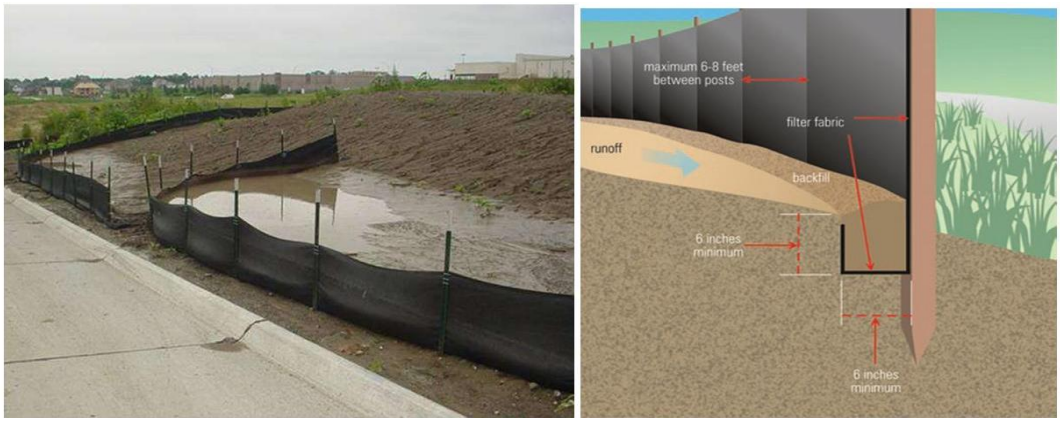


Figure: Silt fence

V To Prevent Storm water Drainage from Flood

Flood mitigation

Many new houses have on-site detention facilities constructed as part of their home drainage system. The facilities, usually large concrete basins built beneath driveways, are designed to capture storm water runoff from a residential lot and hold it a little longer to reduce the impact of downstream flooding The stored water drains slowly through a small opening near the base of the tank to the storm water system. When many properties in flood prone areas have these detention systems, the downstream flood 'peak' during large storms is reduced and flood damage minimized. Local councils set regulations for on-site detention systems; check with your local council to see if your new home needs one. On-site detention facilities capture storm water runoff from a residential lot and hold it a little longer to reduce the impact of downstream flooding.

CONCLUSION

To solve waterlogging problem we have to provide sustainable storm water drainage.

REFERENCES

[1] Northern Virginia lawn care and fertilizer
[2] Before & After: NJ Sewer Cleaning and Sewer Repair
[3] Green township Ohio
[4] EPA United States Environmental Protection Agency
[5] Northern Virginia landscaping and drainage

