Flood mapping

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ABSTRACT

Flooding is natural disaster in which large quantity of water in less time. Also due to heavy rainfall, melting of snow area, increasing water level in natural bodies. Flood can be defined as excess of water which overflow the artificial or natural boundary is of streams. As flood plain are the places where human settlements mostly prefer to settle due to proximity to river, soil, rich water supply and good available transport. Due to urbanization catchment areas are formed which increase flood peak and its volume in less time. Due to flooding loss of life, economy of country, structural loss. For this engineering problem available tools QGIS and SWMM5. To find out the flooding level problem and solve the problem using tools. In this tools designing landuse pattern for identify the case study flooding area. Most of urbanized area is responsible for flooding. Due to urbanization pervious area is converted into impervious. Impervious area increases water depth on surface. QGIS tool purpose is for site selection which shows in result available lower elevation area which collect the all basin area strom water collect. The reduction in peak with respect time we implement on SWMM5. In SWMM5 having Option practices for reduce the stromwater head in less time.

Key Words: Flood Mitigation, QGIS, Landuse, Land Pattern, Stromwater, Digitization, Urbanization & Impervious area,

INTRODUCTION

Flooding is a natural and recurring phenomenon. "Flooding is a general temporary condition of partial or complete inudation of normally dry areas from overflow of inland or tidal water or from unusual and rapid accumulation or run off. A flood can be defined as "a temporary covering by water of land normally not covered by water". This includes floods from rivers, floods from heavy rain and floods from the sea. Flood is an excess of water or any great amount of water which overflows the artificial or natural boundaries of a stream, river or other body of water onto normally dry land. Also, flooding may

result from the volume of water within the body of water such as river or lake, which overflows or breaks levees with the result some of the water escapes its usual boundaries. Flooding creates problems generally in monsoon. Flooding can have catastrophic impacts on the people, the economy, and the environment. A person's ability to prepare and cope with a flooding event is highly individual, though there are demographic studies which suggest ways to identify a more vulnerable population. The population directly affected by the flood (in the form of direct damages to property or loss of life) generally suffers the largest impact. However, the population indirectly involved in flood events is also affected, and suffers damages. A flood can be caused by the overflow of rivers, dam failures, flash flooding, tsunamis, hurricanes, or storm surges. Urban areas situated on the low-lying areas in the middle

or lower reaches of rivers are particularly exposed to extensive riverine floods. In most major river basins, flood plains are subjected to annual flooding. Often, urban growth expands over some of the floodplains; reducing the area into which floods can naturally overflow. The land is the

most important factor in the assessment of flooding in highly urbanised catchments. This study focuses only on the floods which are caused by the overflow of Godavari River flowing through Nashik city, Maharashtra, India he objective of this study is to assess the flood mitigation of Godavari Basin. The average annual rainfall of Nashik city is 812 mm and due to unplanned urbanization, the vulnerability of the city is increased when it comes to flooding. To assess flood in Nasik city SWMM5 tool is used in which rain barrel is calculated, then Rain garden tool is used.
To infiltrate the storm water on roadways permeable pavement is used. The infiltration trench is used to percolate the storm water. QGIS tool is used for site selection which
shows the result as a low elevation area. Using supervised classification the land use and land cover are generated and divided into four land use pattern i.e, Built up, Farm, Open land and water bodies. The slope is generated from Digital elevation map of Shuttle radar topography mission. After running a query lower elevated area is determined.

To monitor the flow of storm water in Nashik city and to determine flooding zones this method can be applied.
More than 3 billion people will move into cities over the next 30 years and to accommodate them all will require increased densification that dramatically changes the urban landscape. This built up landscape is dominated by impervious surfaces which no longer allow the rainfall to infiltrate into the soil and will instead result in increased overland flow that contributes to more widespread flooding. At the same time climatic variability is increasing and the combination of urban densification and climate change will result in increasing runoff events that will result in increased flood risk. When we change land use we
change the way the water is distributed in the hydrological cycle. A portion of the precipitation can either be evapotranspired, converted into surface runoff, Stored in the soils or percolated into groundwater. When we convert a forested watershed into a paved urban landscape a much larger portion of the rainfall becomes surface runoff, which in traditional management is then conveyed directly into urban streams though an elaborate system of stormwater pipes. It is becoming increasingly apparent that conventional stormwater drainage systems are ill prepared to deal with increasing rain events and a drastically changed land surface.

OBJECTIVE AND PROBLEM STATEMENT

Flooding can have catastrophic impacts on the people, the economy, and the environment. A person's ability to prepare and cope with a flooding event is highly individual, though there are demographic studies which suggest ways to identify a more vulnerable population. The population directly affected by the flood (in the form of direct damages to property or loss of life) generally suffers the largest impact.
However, the population indirectly involved in flood events is also affected, and suffers damages. A flood can be caused by the overflow of rivers, dam failures, flash flooding, tsunamis, hurricanes, or storm surges. Urban areas situated on the low-lying areas in the middle or lower reaches of rivers are particularly exposed to extensive riverine floods. In most major river basins, flood plains are subjected to annual flooding. Often, urban growth expands over some of the floodplains; reducing the area into which floods can naturally overflow. The land is the most important factor in the assessment of flooding in highly urbanised catchments. This study focuses

only on the floods which are caused by the overflow of Godavari River flowing through Nashik city, Maharashtra, India.

- To provide proper mitigation to the study area by using SWMM5 and QGIS
- To develop flood exposure map by integrating the land use and flood map data by using QGIS
- To know long term simulation of water runoff quantity and quality by using SWMM5
- To know the hydrological components by collecting sub catchment area divided into impervious and pervious area with the help of SWMM5.
- Flood plain mapping of natural channel systems.

METHODOLOGY

Assessment of flood exposure has been done by combining existing methodologies and some innovative procedures. This section provides introduction to methodologies used in the study and the discussion on evaluation of non-structural flood management measures. For development of methodology data such as discharge from flood simulation model is required. Then this discharge data along with land use data and river morphology are inputs to the mapping tool (QGIS). Rainfall runoff plays important role in surface urban flooding. The runoff data describes the characteristics of the ground surfaces in the system, and the rainfall-runoff model which is used for each. This lets us know how much of the rainfall falling on the catchment area becomes runoff and at what rate does it enters the drainage system. For this reason rainfall run-off has to be computed to know the discharge carried by the river channel due to the current rainfall. Due to this rainfall runoff modelling required.

CONCLUSION

The Stormwater Management Model (SWMM 5.1) model have been used by using various site selection criteria to demonstrate the simulation of water surface depth at Mithi river subcatchment. The water depth has been obtained at Powai site with and without considering the effect of Best Management Practices (BMP's). Four cases are taken for site selection for applying Best Management Practices (BMP's) implementation such as rain garden for open area, rain barrel for the urban area, infiltration trenches for the open area, permeable pavement for the road area and combination of all these techniques are applied in model and from that it is concluded that urban area is most suitable for applying rain barrel system give the minimum water depth as compare to others. The methodology is developed by using Quantum Geographic Information System (QGIS) model shows the perfect suitable site location for applying Best Management Practices (BMP's). The contour shows the elevation. In case study area, urbanised area is maximum available spacing for applying Best Management Practices (BMP's) for rain barrel. Finally it is concluded that rain barrel system is most suitable with compare to other techniques. In other techniques there is limitation in stormwater holding capacity because it is purely depend on water table level of that particular area. Decreasing capacity of soil to hold stormwater may lead to increase in flood level. In rain barrel system we can provide number of rain barrels and can increase the storing capacity to mitigate the flood.

REFERENCES

[1] Aaron A. Jennings, Ata A. Adeel, Alex Hopkins, Alexandra L. Litofsky & Steven Wellstead (2013), Rain Barrel

Urban Stormwater Management Performance", ASCE Pg. No. 757-765 **h**

[2] K. L. Katsifarakis, M. Vafeiadis and
N. Theodossiou (2015), "Sustainable Drainage and Urban Landscape Upgrading Using rain gardens. Site Selection in Thessaloniki, Greece" S ciencedirect Elsvier Agriculture and Agricultural Science Procedia 4 Pg. No. 338 – 347

3] Marcio H. Giacomoni, Emily M. Zechman and Kelly Brumbelow (2012), " Hydrological Footprint Residence: Environmentally friendly Criteria for Best Management Practices" Journal of Hydrologic Engineering ASCE, Pg. No. 99-108

[4] Maya P. Abi Aad, Makram T. Suidan and William D. Shuster (2010), "Modelling Technique od Best Management Practices: Rain Barrel and Rain Garden Using EPA SWMM-5" Journal of Hydrologic Engineering ASCE, Pg. No. 434-443

5] M. J. Braune and A. Wood (1999) "Best Management Practices Applied To Urban Runoff Quantity and Quality" ElsevierScience Ltd on behalf of the IAWQ Waf. Sci. Tech. Vol. 39, No. 12, Pg. 117-121.

[6] Nivedita G Gogate and Pratap M Rawal (2012)," Int. Conf. on Advances in Design and Construction of Structures '' ASCE Pg. No. 132-140

[7] Gautam. M, Acharya. K and Stone.
M. 2010. Best Management Practice for Stormwater Management in Desert Southwest. Journal of Contemporary Water Research & Education, 146: 39-49.

[8] Hunt. W. 2010. Introduction to Stormwater Management. Journal of Contemporary Water Research and Education, 146: 1-2. [3]Akram. F, Rasul. M and Khan. M. 2014. A Review on

Stormwater Harvesting and Reuse. International journal of Environmental, Ecological, Geological & Mining Engineering, 8(3): 188-197.

[9] Migosi.P. 2014. Effects Of Urban Stormwater Management Strategy In Reducing Flooding: A Case Of Mombasa.
International journal of Managerial Studies & Research, 2(4): 82-90.

[10] Nichols. P, Lucke. T. 2015. Local Level Stormwater Harvesting and Reuse. Journal Sustainability, 7: 8635-8648.