International Journal of Innovative Research in Engineering
Volume 3, Issue 3 (May-June 2022), PP: 48-53
www.theijire.com
ISSN No: 2582-8746

Plan to Control Bihar Flood

Kaushar Imam[1], Shubham Kr Singh[2], Amit Jaiswal[3], Suryakant Choubey[4], Shashikant Shukla[5]
[1,2,3,4] *Final Year Students (B. Tech), Civil Engineering Department, Greater Noida Institute of Technology, Greater Noida, Uttar Pradesh, India,*
[5] *Assistant Professor, Civil Engineering Department, Greater Noida Institute of Technology, Greater Noida, UttarPradesh, India*

How to cite this paper:
Kaushar Imam[1], Shubham Kr Singh[2], Amit Jaiswal[3], Suryakant Choubey[4], Shashikant Shukla[5], "Plan to Control Bihar Flood", IJIRE-V3I03-48-53.

***Abstract**: Floods are India's most common natural disaster. As a result, we lose our livelihood everyyear, which hurts our socioeconomic culture. Bihar is the state in India that has been hit the most by floods, with around 7 million hectares of land impacted, accounting for roughly 70% of the state's total land area. It also has an impact on infrastructure development. As a result, the vast majority of people migrate. As a result, a flood management plan is required to reduce the negative repercussions and ill impacts of flooding. The majority of the time, decision-makers in Bihar opt forstructural interventions such as embankment construction, flood retention walls, flood levees, and channel improvement. reservoir, massive filleter, detention or retention basin, and so forth However, structural changes alone are thought to be insufficient to lessen the negative effects of floods in thestate. As a result, non-structural interventions such as flood plain management policies, building bye-laws, and flow and silt control policies are needed. It considers how to use flood plains wisely while also allowing them to be vacated for river use when the situation calls for it. The goal of this study is to illustrate the seriousness of flood impacts on state development and to analyze flood management options in Bihar.*

***Key Word:** Ganga Basin, flood control plan, detention basin.*

I. INTRODUCTION

History of flood in Bihar

Floods have been a recurring occurrence in India, resulting inmassive losses of lives, property, livelihood systems, infrastructure, and public utilities, all of which have harmed the region's development. Bihar is a state in India that is bordered in the north by Nepal. The Ganga, the state's main drainage system, flows eastward for 432 kilometers across Bihar, dividing the state into two unequal parts. Two important rivers, the River Kosi and the River Gandak drain the plains north of the Ganga (Fig.1).

The Ganga's flow is controlled by the Farakka barrage in West Bengal. Upstream of Farakka, from Ballia in Uttar Pradesh to Bhagalpur in Bihar, sediment has collected. As a result, the riverbed has risen in height. As a result, the state isexperiencing record flood levels.

All of these rivers originate in Nepal, except the river Kosi, which has a catchment in Tibet. As a result, the rivers of NorthBihar primarily share basins with rivers from Nepal and Tibet.The water that flows from the Tibetan portion of the catchment also crosses through Nepal. In Nepal, deforestationis rising to meet domestic fuel demands and reclaiming of land for industrial purposes, significantly degrading the vegetative cover in catchment areas. Soil erosion has increased in several places as a result of this practice Floodingis a hydrological extreme of high-water levels in a stream channel or on a bank that causes flooding of land that is not normally flooded. It usually happens when there is a lot of rain, and it becomes a danger when people die. "The pattern shows that floods in the Bihar Plains have become more intense and frequent over time, causing human misery as wellas damage to crops, habitation, and infrastructure."

A group of rivers that originate in Nepal carry a large amountof silt and discharge it into the Bihar plains. Around 65 percent of the catchment area of these rivers is in Nepal/Tibet,whereas only 35 percent is in Bihar.

The plains of north Bihar have experienced the most floods inthe previous 30 years. Bihar saw major floods in the years 1978, 1987, 1998, 2004, and 2007 witnessed of high magnitudes.

Source: - (https://www.journalijar.com/article/16355/impacts-of- flood-and-its-management-%E2%80%93-a-case-study-of-bihar/) [1]

Flood Impacts: - Flood impacts can be split into two categories. Primary consequences of water contact include loss of life, cattle, and property, damage to infrastructure suchas roads, bridges, and trains, and disruption of utilities such aspower, telephone lines, and water supply lines, among others.Flooding has a secondary impact, such as service disruptions,and prolonged health and hunger effects. Secondary impacts result in indirect losses, and their negative effects persist overlengthy time scales, sometimes becoming even more significant. These include long-term health effects from watersupply and sewage disposal system failures, as well as food and other basic shortages caused by transportation network failure.

Figure 1: - Map Showing Catchment of Major Rivers inNorth Bihar

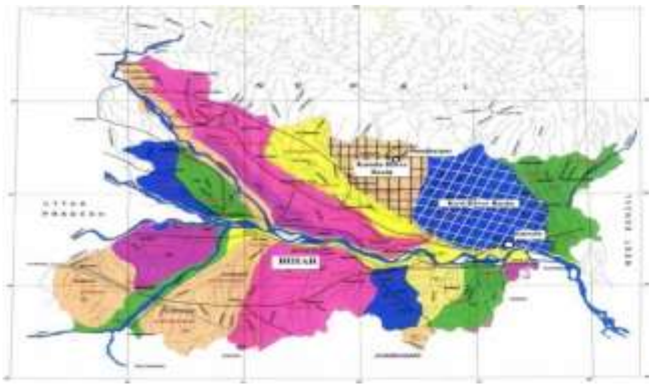

Figure 2: - basins map of the Kamla and the Kosi Riveralong with their adjoining river basins

Source: -** (https://www.researchgate.net/figure/Basin-map-of-the-Kamla-and-the-Kosi-rivers-along-with-their- adjoining-river-basins_fig1_261098367)* ***[2]

II. METHODOLOGY/PLANNING OF WORK DETENTION BASINS: -

1. Why do we need detention?

Increases in impervious surfaces such as roads, homes, and parking lots increase the rate and amount of stormwater runoffduring storms, resulting in flooding downstream. This extra runoff is captured and stored through detention. It's one of several strategies available to help reduce downstream floods.

Posted on April 30, 2015, by Bill Leber

Figure 3: - Stormwater Basins

Source: - (https://info.wesslerengineering.com/blog/stormwater- basins-detention-retention-ponds) [3]

Detention and retention basins are the two most commonforms.

THE IMPORTANCE OF DETENTION ANDRETENTION PONDS.

The main difference between a detention basin and a retentionbasin is the presence or absence of a constant pool of water or pond. A low flow opening regulates the water level. The orifice is commonly a metal or concrete structure called a riser. A detention pond, sometimes known as a dry pond, hasan orifice level at the bottom of the basin and no permanent water pool. All of the water evaporates between storms, and the land is usually dry. A riser and orifice at a higher positioncreate a persistent pool of water in a retention basin or pond. A retention pond appears to be a typical pond; however, it is used to reduce stormwater runoff.

The basins are useful for holding and delaying stormwater runoff from neighboring areas, particularly in locations where asphalt or concrete development has occurred. Stormwater runoff from these surfaces is significantly faster than in naturally occurring places, and it must be channeled to guarantee that the runoff happens at the proper rate. Water cleansing and treatment are restricted. Only flood flows are controlled by dry basins or detention basins. By minimizing pollutants and sediments, a retention pond can improve waterquality.

A. Dry Detention Basins

Dry detention ponds are most effective in areas of ten acres ormore. Water quality is harder to control in smaller locations, therefore choices may be more appropriate.

A modest slope is used to divert water in dry detention ponds.To ensure the proper amount of water flow through the system, the intake must be no more than 15% higher than theoutflow. The technique works by allowing for a huge water collection area, or basin. The water then slowly drains into theoutlet at the bottom of the building. Concrete blocks and other

structures can be used as a deterrent to impede the flow ofwater and collect garbage.

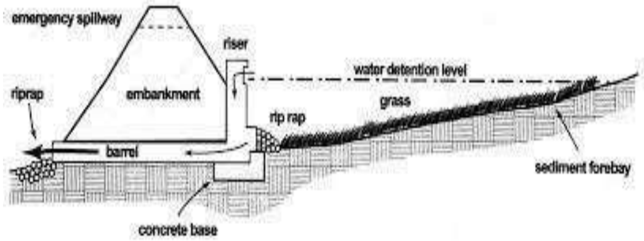

Figure 4: - Dry Detention Pond Cross-Section

a. **Advantages**

- Surrounding areas have a vegetative buffer that canendure dry or rainy circumstances.
- Implementation may be less expensive than a wetretention pond due to the smaller size.

b. **Disadvantages**

- It necessitates a lot of space.
- Does not affect water quality.
- Can serve as a mosquito breeding ground;
- Can reduce property value, although retention pondscan increase it.

Effectiveness:

Dry detention basins have a very limited ability to eliminate TSS as compared to lengthy dry detention basins or wet basins. A dry detention basin is designed to drain fully in lessthan 24 hours, resulting in reduced sediment settling and the possibility of resuspension in future storms. Extended dry detention basins have a minimum detention length of 24 hoursand include elements such as sediment forebay, micro pool, or shallow marsh in their design to help with pollutant removal.

B. Wet Retention Ponds

Wet retention ponds are a type of stormwater management device that collects and treats contaminated stormwater runoff. Wet retention ponds control stormwater quantity and quality by catching and retaining stormwater runoff. Natural processes in the pond then work to eliminate contaminants. To promote bank stability and aesthetic benefits, retention ponds should be surrounded by natural vegetation.

Storm drains are connected to a wet retention pond via a network of subterranean pipes, transferring water to the pond.The system permits enormous amounts of water to enter the pond, while the outlet releases little amounts of water as needed to keep the water level at the correct level. Standing water is always hazardous to one's health. This is a potential drowning hazard, especially for children. Ponds can alsoattract mosquitoes, which can aid in the transfer of diseases.

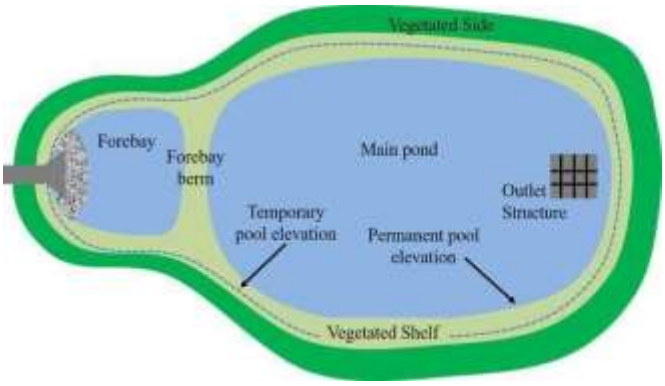

Figure 5: - Wet Retention Basin
Source – (https://content.ces.ncsu.edu/plant-selection-for-infiltrating-wet-ponds-in-north-carolina)

a) **Advantages**

- If enough area is available, retention ponds arestraightforward to construct.
- Collects and improves the quality of water.
- Process water without the use of any additionalequipment.
- Stormwater collection and flood control haveimproved.
- New habitats are being established.
- It is suitable for recreational usage.

b) **Disadvantages**

- Can be a drowning hazard.
- Requires a large amount of land.
- Negative water quality implications if not correctlydesigned.

III. FUNCTIONS AND DESIGN:

Figure 6: - A Detention Basin in Sydney,Australia

Detention basins are stormwater best management techniques that provide basic flood protection as well as theability to control major floods such as those that occur onceevery 100 years.
The ponds aid in the management of surplus urban runoffcaused by newly built impermeable surfaces such as highways, parking lots, and rooftops.

Figure 7: - Detention Basin

Source – (https://www.geoace.com/case/Environmental-Protection/Geosynthetic-Detention-Basin-at-Shalu-Interchange%2C-Taiwan)

A basin works by allowing massive amounts of water to enterwhile limiting outflow through a small aperture at the structure's lowest point. The capacity of underground and downstream culverts and washes to handle the release of the contained water determines the size of this aperture.

The inflow area is frequently built to safeguard the structure from certain sorts of harm. The speed of entering floodwater is reduced by using offset concrete blocks in the entrance spillways. Large rocks may be collected in debris drop vaultsin these constructions. These vaults are large holes beneath the structure's entryway. Large boulders and other debris canfall into the holes without damaging the rest of the building since they are broad enough. After each storm, these vaults must be emptied.

Extended detention dry basins improve on basic detention designs by extending storage time, for example, to 24 or 48 hours following a storm. Because more suspended particles
Source – (https://en.wikipedia.org/wiki/Detention_basin)

are removed, longer storage times tend to enhance water quality.
Design embankments and spillways under state dam safety rules. All dry detention basins must include an emergency spillway that can bypass storm flow without causing damageto the impounding structure. Provide public or private right-of-way maintenance access with a minimum width of 15 feetand a maximum slope of 5:1. This access should include the forebay, safety bench, and outflow structure, but not theemergency spillway unless it is specifically intended for that purpose. Use vegetative buffers along the basin's border to control erosion and remove more sediment and nutrients.

Figure 8: - Retention Dam (San Antonio Express-News)November 3, 2000
Source - (https://www.mysanantonio.com/news/local/article/SA-Gears-A-look-inside-Olmos-Dam-12942019.php)

IV.MAINTENANCE CONSIDERATIONS

The orifice must not become blocked or clogged, which is oneof the most significant maintenance tasks for any of these basins. Keeping the pipes clean will keep the ponds and basinsrunning smoothly. Keeping up the maintenance can save money in the long run.

- Identifying and fixing areas of erosion - Check for gulliesand other disturbances on the bank a few times a year, especially after large storms.
- eliminating sediment and debris - Keeping pipes clean and free of debris ensures optimal operation. To avoid difficulties, remove debris from around and inside pondsbefore it reaches the outlets.
- Vegetation upkeep varies depending on the type of vegetation that surrounds the basin. Some grasses requireweekly mowing, while others can be mowed only a few times a year.

V. CONCLUSION

To lessen runoff, we can plant trees in the catchment region,which will aid in flood management.
We are suggesting constructing the Detention Basin orRetention Basin to control the flood of Bihar.
We can use a dozer to remove the silt from the bed of a river.

VI.ACKNOWLEDGMENT

I would like to take every opportunity which is given by Mr. Shashikant Shukla, MR. Anuj Sharma and Dr. Rajesh KumarSharma (HOD Civil Dept.) - GNIOT, –Students Activities, and other faculty members who helped in preparing the project report. I extend my sincere thanks to one and all of theGNIOT family for the completion of this project report.

References

[1]. Kansal M L, Kumar AK and Kumar P, (Jan.17-12, 2017), pp. March 2017 (https://www.journalijar.com/article/16355/impacts-of-flood-and-its-management-%E2%80%93-a-case-study-of-bihar/)

[2]. Sehgal V., Sahay R., And Chatterjee C., pp. 2014 (https://www.researchgate.net/figure/Basin-map-of-the-Kamla-and-the-Kosi-rivers-along-with-their- adjoining-river-basins_fig1_261098367)

[3]. Bill Leber, Stormwater master plan blog April 30-2015 (https://info.wesslerengineering.com/blog/stormwater-basins-detention-retention-ponds)

[4]. DFID, 2003, Promoting Institutional and Organizational Development: London, March, Department for International Development.(https://www.fao.org/forestry/institutions/68654/en/)

[5]. GoB (2003): Irrigation, Flood Management, and Water Drainage Rules, Water Resources Department,Government of Bihar.

[6]. FMIS Flood Report 2009, Water Resources Department, Government of Bihar. (https://wrd.fmiscwrdbihar.gov.in/)

[7]. GoB (2009): Economic Survey 2008-09, Ministry of Finance, Government of Bihar, Patna.

[8]. GoB (2010): Kosi Flood 2008: Assessment Report, World Bank, Global Facility for Disaster Reduction and Recovery.

[9]. Atkins (2010) Bath and North East Somerset Flood Risk Management Strategy Report (www.bathnes.gov.uk)

[10]. Government ofBihar, Department of Water Resources Annual Report 2010-2011. (http://www.cwc.gov.in/sites/default/files/17_10_2011Final%20Draft%20AR%202010-11_rev.pdf)

[11]. Blanc, J, Arthur, S and Wright, G (2012) Natural flood management (NFM) knowledge system: Part 1- Sustainable urban drainage systems (SUDS) and floodmanagement in urban areas.

[12]. Anand Vardhan and Shantjeev Kumar (2020): - Riverbank-Embankment Protection from Flood Flow Erosion[13]. Admad N and Hassan Q (October 2021): - flood and sediment management in Kosi River, India