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DELTA WATERSHED MANAGEMENT AND URBAN FLOOD CONTROL

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Abstract: **This report deals with the Delta Watershed Management and Urban Flood Control. It studies the effect of flooding and how to reduce flood effect. The basic premise of the room for the river is essentially to provide more space for the water body so that it can manage extraordinary high water level during floods. We can reduce flood plain by Deepening the summer bed, strengthening of dykes, relocation of dykes, reducing the height of the groynes, increasing the depth of the side channels and removing obstacles. A key aspect of the project is also to improve the surroundings of the river banks through fountains and panoramic decks. The landscapes are altered in a way that they turn into natural sponges which can accommodate excess water during floods. Due to the increase in flood size in India it is necessary to find out various method to reduce flood. As flood is a dangerous natural disasters which directly affected on human being. Therefore, there is a need to find method to reduce flood plain. In this project we adopted main two concepts: first Room for river and second one Sponge city concept (SPC). This two method gives exact result to reduce flood size. In Room for River we can increase the depth of side channels so that size of flood will be reduce. We also strengthen the dykes. In Sponge city concept indicates that a city could be functioned as a sponge that has great resilience to environmental changes and natural disasters.**

Keywords-*Deeping summer bed, strengthening of dykes, Height of gyrones, Sponge city, LID, Evaluation of the effect.*

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I INTRODUCTION

A flood is an overflow of water that submerges land that is usually dry. In the sense of "flowing water", the word may also be applied to the inflow of the tide. Floods are an area of study of the discipline hydrology and are of significant concern in agriculture, civil engineering and public health. Human changes to the environment often increase the intensity and frequency of flooding, for example land use changes such as deforestation and removal of wetlands, changes in waterway course such as with levees, and larger environmental issues such as climate change and sea level rise.

Floods are considered second only to wildfires as the most common natural disaster on Earth.

Flooding may occur as an overflow of water from water bodies, such as a river, lake, or ocean, in which the water overtops or breaks levees, resulting in some of that water escaping its usual boundaries, or it may occur due to an accumulation of rainwater on saturated ground in an areal flood. While the size of a lake or other body of water will vary with seasonal changes in precipitation and snow melt, these changes in size are unlikely to be considered significant unless they flood property or drown domestic animals.

Floods can also occur in rivers when the flow rate exceeds the capacity of the river channel, particularly at bends or meanders in the waterway. Floods often cause damage to homes and businesses if they are in the natural flood plains of rivers. While riverine flood damage can be eliminated by moving away from rivers and other bodies of water, people have traditionally lived and worked by rivers because the land is usually flat and fertile and because rivers provide easy travel and access to commerce and industry.

II PROPOSED METHODOLOGY

We are implementing method for reducing flood size. So we apply following method,

1Natural restoration of water

2Sponge city.

2.1 Natural restoration of water

RESTORING OF NATURAL RIVER SYSTEMS

Restoration of Natural Land Drainage Systems Natural Land Drainage Systems play an important role during flood mitigation. Its perfect natural flood resilient infrastructure, more effective than the artificial dam controls for flood monitoring. Due to the developmental works of the mankind, neglecting the further consequences, we have tampered it to greatest extent. Further it has already jeopardised the entire ecological balance of the nature. The erratic precipitation, flash floods, draughts, global warming etc. all are ill-effects of the same. Now, the time has come to make hard work towards restoration of natural imbalance to the original one, at least partially.

2.2 Sponge City

A sponge city is a city that is designed to passively absorb, clean and use rainfall in an ecologically friendly way that reduces dangerous and polluted runoff. Associated techniques include permeable roads, rooftop, rainwater harvesting, rain gardens, green space and blue space such as ponds and lakes. Properly implemented a sponge city can reduce the frequency and severity of floods, improve water quality and allow cities to use less water per person. Associated strategies such as green space can also improve quality of life, improve air quality and reduce urban heat island.

Yet another term on the growing list next to regenerative, sustainable, green, eco, resilient, low-impact, future proofing, zero-carbon, and the list goes on. Strange as it may sound, this term is the implementation of innovative water management strategies that would gradually transform these cities into “Sponge Cities”

The Sponge City indicates a particular type of city that does not act like an impermeable system not allowing any water to filter through the ground, but, more like a sponge, actually absorbs the rain water, which is then naturally filtered by the soil and allowed to reach into the urban aquifers. This allows for the extraction of water from the ground through urban or peri-urban wells. This water can be easily treated and used for the city water supply.

III HEC-RAS Software

HEC-RAS is a computer program that models the hydraulics of water flow through natural rivers and other channels. Prior to the 2016 update to Version 5.07, the program was one-dimensional, meaning that there is no direct modelling of the hydraulic effect of cross section shape changes, bends, and other two- and three-dimensional aspects of flow. The release of Version 5.07 introduced two-dimensional modelling of flow as well as sediment transfer modelling capabilities. The program was developed by the United States Army Corps of Engineers in order to manage the rivers, harbours, and other public works under their jurisdiction; it has found wide acceptance by many others since its public release in 1995.

The Hydrologic Engineering Canter (HEC) in Davis, California, developed the River Analysis System (RAS) to aid hydraulic engineers in channel flow analysis and floodplain determination. It includes numerous data entry capabilities, hydraulic analysis components, data storage and management capabilities, and graphing and reporting capabilities

3.1FUNCTIONALITY

The basic computational procedure of HEC-RAS for steady flow is based on the solution of the one-dimensional energy equation. Energy losses are evaluated by friction and contraction / expansion. The momentum equation may be used in situations where the water surface profile is rapidly varied. These situations include hydraulic jumps, hydraulics of bridges, and evaluating profiles at river confluences.

For unsteady flow, HEC-RAS solves the full, dynamic, 1-D Saint Venant Equation using an implicit, finite difference method. The unsteady flow equation solver was adapted from Dr. Robert L. Barkau's UNET package.

HEC-RAS is equipped to model a network of channels, a dendritic system or a single river reach. Certain simplifications must be made in order to model some complex flow situations using the HEC-RAS one-dimensional approach. It is capable of modeling subcritical, supercritical, and mixed flow regime flow along with the effects of bridges, culverts, weirs, and structures.

IV HYDRODYNAMIC STUDY FOR KRISHNA BASIN

One dimensional unsteady flow analysis is done using Version 5.07 of the HECRAS software developed by the Hydrologic Engineering Centre of the US Army Corps of Engineers. This software has ability to carry out:

•Steady flow water surface profile computations.

•One- and two-dimensional unsteady flow simulations

•Movable boundary sediment transport computations

•Water temperature and constituent transport modeling.

The software has capabilities to solve 2D full Saint Venant shallow water equations (with optional momentum additions for turbulence and Coriolis effects) or the 2D Diffusion Wave equations, as chosen by the user. The 2D unsteady flow equations solver uses an Implicit Finite Volume Algorithm, allowing for larger computational time steps with improved stability and robustness in handling subcritical, supercritical and mixed flow regimes. The 1D and 2D solution algorithms are coupled through time steps. Each cell and cell face are defined as table to have properties like elevation-volume, elevation- area, elevation wetted perimeter and roughness based on the resolution of the terrain model which is much smaller than the grid size of the mesh used for 2D computation. This allows much faster computation without losing details. It also has detailed flood mapping and flood animation capabilities. This software has following facilities:

•Modeling with geo-referenced geometry of the channel along with bends and meanders. RAS mapper can be used to represent the river geometry.

•Modeling of the tributaries.

•Modeling inline structures.

•Superimposition with Google maps.

•To animate water surface profiles in various reaches at various time instances and over the cross sections. It makes easy to understand and observe.

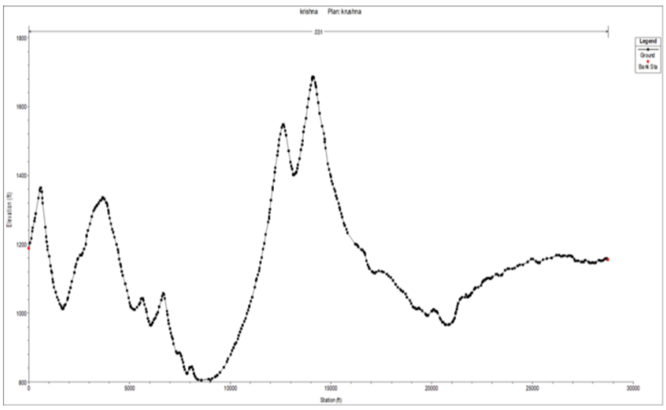
•Animation of flood inundation with respect to time. If the geometry is georeferenced, the Ras mapper (in built in HEC RAS) has facility to superimpose flood inundation on Google maps and animate unsteady flow results.

•Graphical representation of the velocity distribution along the reach of the rive r and also across the cross section. In the cross section, vertical as well as horizontal velocity distribution can be presented in color contours.

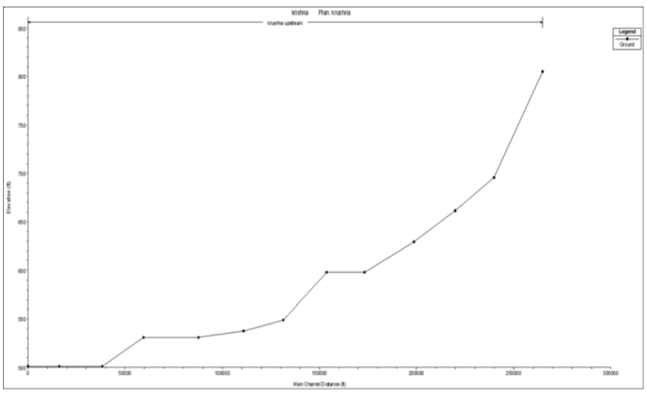
4.1 GEOMETRIC DATA OF RIVER

	Reach	Length (km)	Surveyed Cross Sections	Interpolated Cross Sections	Total Cross Sections	Year of Survey
Krishna	Karad Bridge to Yerala Confluence at Brahmnal	95	48	44	92	2012
Krishna	Brahmnal – Warna Confluence at Haripur	12.6	18	08	26	2012
Krishna	Haripur - Rajapur	48	19	27	46	2012
Krishna	Rajapur-Almatti	211	31	189	220	2008
Yerala		32.9	07	63	70	2012
Warna	National Highway – Confluence at Haripur	58.8	20	36	56	2012
Panchganga	KolhapurConfluence at Kurundwad	93.7	34	101	135	2012

4.2 GRAPHICAL REPRESENTATION OF RIVER FLOW



GRAPH 1. STATION VS ELEVATION



GRAPH 2. MAIN CHANNEL VS ELEVATION

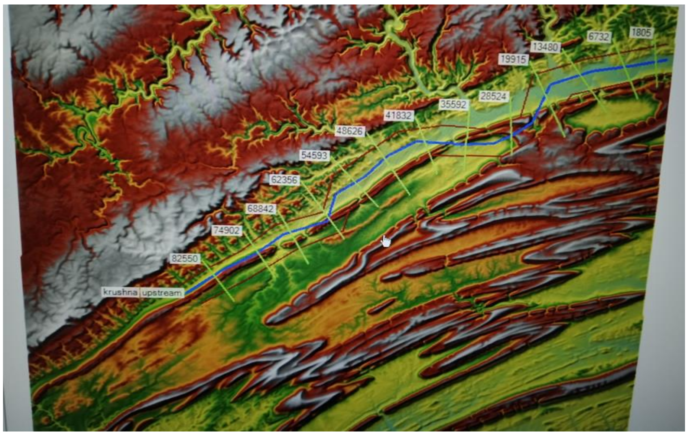


Fig.1 KRISHNA RIVER BASIN DESIGN ON HEC-RAS SOFTWARE

V RESULT

Where the depth of the basin is useful, it has to be increased by 50-70% and where it is more, it has to be increased by 25% Due to which the discharge capacity will increase and the flood will be reduced.

VI CONCLUSION

The river Krishna flows, a near plain land, between Sangli and the State border. It is a general phenomenon that the river takes meandering course, while traversing on a plain land.

Thus, River Krishna has so many curves and meanders. The velocity of the river is comparatively less while traversing curves and meanders.

The Sangli city is on one of the curve of River Krishna and Kolhapur city is on the curve of river Panchganga

The lateral slope of the flood plains is very gentle. The flood plains are almost flat. This has resulted into spreading of flood on larger area on both the banks of the river.

REFERENCES

[1].Room for the River: Delivering integrated river basin management in the Netherlands, December 2012, International Journal of River Basin Management 10(4):369-382DOI: 10.1080/15715124.2012.739173

[2].A Framework for Flood Risk Analysis and Benefit Assessment of Flood Control Measures in Urban Areas Chaochao Li 1,2,*, Xiaotao Cheng 1 , Na Li 1 , Xiaohe Du 1 , Qian Yu 1 and GuangyuanKan 1 1 State Key Laboratory of Simulation and Regulation of Water Cycle in River Basin, Research Center on Flood & Drought Disaster Reduction of the Ministry of Water Resources, China Institute of Water Resources and Hydropower Research, Beijing 100038, China.

[3].Room for river'' measures and public visions in the Netherlands: A survey on river perceptions among riverside residents Mirjam de Groot1 and Wouter T. de Groot1,2 Received

5 August 2008; revised 16 February 2009; accepted 21 April 2009; published 7 July 2009.

[4].Connecting Water and Heritage for the Future Carola Hein, Henk van Schaik, Diederik Six, TinoMager, Jan (J. C. A.) Kolen, MauritsErtsen, Steffen Nijhuis and GerdyVerschuure-Stuip

[5].Water Meadows as European Agricultural Heritage Hans Renes, CsabaCenteri, Sebastian Eiter, Bénédicte Gaillard, Alexandra Kruse, ZdenˇekKuˇcera, Oskar Puschmann, Michael Roth and Martina Slámová.

[6].Archaic Water: The Role of a Legend in Constructing the Water Management Heritage of Sanbonkihara, Japan Izumi Kuroishi