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Quality of life effected due to flooding on urban and Ruler Bihar (Munger)

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Abstract: *Quality of life (QoL) is a comprehensive concept used to assess a society's standard of living in all aspects of life. This research aims at developing an objective measurement of urban QoL by considering the flood effect on Munger and at its neighborhood level and applying the geographic information systems (GIS) technology to extract the Quality of life affected due to this characteristics. The paper also aims to address the notion of sustainable development and tries to understand its relationship with the notion of quality of life. Bihar is one of the important state of India, which falls under Ganga river basin. It is sub-divided into two unequal halves by the river Ganga that flows through the middle from west to east. The entire North Bihar is crisscrossed by the major rivers such as Gandak, Bagmati, Kosi, Mahananda etc. which all, meet the mighty Ganga on its left bank. All these rivers originate in Nepal from the Himalayas, which meet the river Ganges in the lower reach. Moderate to heavy rainfall in north Bihar and areas of Nepal resulted in flood in this reach, the velocity of flow reduces, whereas, the spread of water increases with addition problem of siltation. The problem of siltation has increased the bed of the river, thereby, reducing the carrying capacity, which in turn has again increased the spread of floodwaters covering a large area under flood. It has been noticed that one of the main reason of various problems in Bihar is flood only. The flooding in Bihar has affected the all spheres of life and thereby the sustainable development in the state.The target of our research was to map and monitor the situation during the floods and shortly after them and to draw proposals leading to an operative approach in the context of comprehensive flood protection in Munger Bihar.*

Keywords: *Quality of life, Floods in Bihar, Floods in Munger, Flood Management, Structural and Non-structural Measures.*

I. INTRODUCTION

Amongst various kinds of natural disasters, floods are frequent and quite common. Floods have devastating impacts in tropical and temperate regions, as they inundate large areas causing damage to agricultural crops and property, disruption in services, and loss of human lives. India is a highly flood-prone country. As per National Flood Commission report (1980), around 40 million hectares of land in India is prone to floods.

Bihar, in turn, is one of the most flood-prone states in India. Mainly, floods and about 76% of the population of northern Bihar lives under the recurring threat of affect northern Bihar devastation by floods. Floods in Bihar have become an annual disaster, which destroy thousands of human lives, apart from livestock and assets worth millions.

Flood causes enormous damage to life, property and infrastructure, which affects the social, economic, and environmental aspects of sustainable development. In other words, flood affects the hydrology, environment, life and policy in a particular watershed/ region. Bihar is one of the important state of India, which falls under Ganga river basin. The state of Bihar is sub-divided into two unequal halves by the river Ganga that flows through the middle from west to east.

The entire North Bihar is crisscrossed by the major rivers such as Gandak, Bagmati, Kosi, Mahananda etc. which all, meet the mighty Ganga on its left bank. All these rivers originate in Nepal from the Himalayas, which meet the river Ganges in the lower reach. In this reach, the velocity of flow reduces, whereas, the spread of water increases with addition problem of siltation. The problem of siltation has increased the bed of the river, thereby, reducing the carrying capacity, which in turn has again increased the spread of floodwaters covering a large area under flood.

General consequences of a flood : Flash flood causes immediate and huge impacts, whereas gradually occurring floods allows much time for evacuation and protection of properties. Impacts of flood depend on maximum depth of flooding, the extent of inundation in the floodplains, flow velocity and rate of rise of flood levels

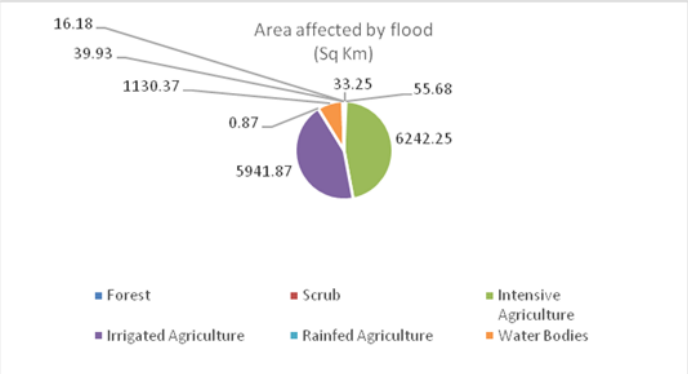
Flood impacts have social, economic and environmental consequence, which affect the sustainable development of any region.

Flood Status in Bihar Three fourths of Bihar's area and population lie in the natural floodplains of the Ganga and its Himalayan tributaries. About 6.880 million hectares out of 9.416 million hectarecomprising 73percent of the state is flood affected for approximately one-sixth of the flood prone area in India.
Major rivers flowing through North Bihar originates fromNepal and the Tibetan region of China. About 65% of the catchment area of Bihar's rivers falls in Nepal and Tibet and only 35% of the catchment areas Flood is a state extreme of high water level in a stream channel that results in inundation of land that is an attribute of physical environment and thus is an important of drainage basin. A rapid increase in flood proneness in Most ofthese areafalls underGanga and Brahmaputra basins

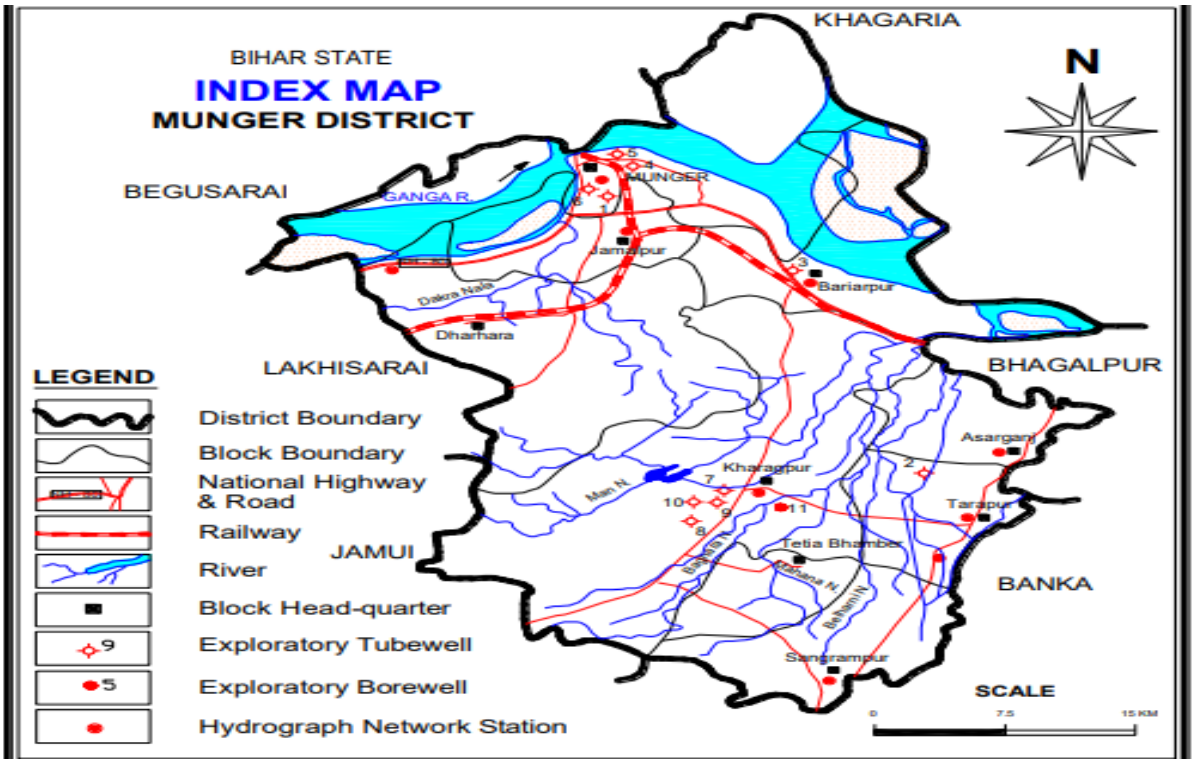
YEAR	Number of Affected									Crop Damaged (INR in Lakh)	House Damage		Public Property Damaged (INR in Lakh)	Deaths	
	District	BLOCK	VILLAGE	(INR in Lakh)		Area (in Lakhhectare)					Total	Value (INR in Lakh)			
				Human	Animal	Agriculture	Non-agricultural	TOTAL	Cropped					Human	Animal
2011 (p)	24	154	3588	84.171	5.98	2.842	0.639	3.001	1.279	5,627.00	28067	12874.1	3578.6	143	33
2010 (p)	8	41	489	7.22	0.56	0.631	1.112	1.743	0.03	202.45	8733	479.26	59.2	28	2
2009	16	91	1540	22.03	1.340	1.71	9.339	11-05	0.475	2182.57	7674	528.15	530.1	97	2
2008	18	116	2585	40.052	1.2.166	6.405	2.12	8.824	3.672	3420.25	207016	8451.4	9771.96	258	878
2007	22	269	18832	244.42	27.13	13..323	5.51	13.833	10.603	7683782	784328	83144.52	64241.5	1287	2423
2006	14	63	9511	10.89	0.1	1.52	0.297	1.81	0.8:7	706.63	18637	1225.03	8458.17	38	31
2005	12	81	1484	21.04	5.35	3.434	1.261	4.6	1.35	1184.5	5538	382.79	305	58	4
2004	20	211	9348	212.99	88.88	20.99	8.01	27	13.99	52205.84	929733	75809.51	103050	885	3272
2003	24	172	5077	78.02	11.98	9.943	5.14	15.08	8.1	8288.13	45282	2,032.10	1035.18	251	108
2002	25	8	8318	180.18	52.51	14.45	5.244	19.89	9.4	51149.81	419.014	52821.51	40392.2	489	1450
2001	22	194	8405	90.91	11.7	9.042	2.91	11.95	8.5	28,721.79	222.074	17358.44	18353.8	231	585
2000	33	213	12351	90.18	8.09	8.57	1.478	8.05	4.43	8303.7	343.091	20933.82	3780.88	338	2588

The loss of public property recorded by the Disaster Management Department of Bihar is taken from literature since year 2000, and is shown in Table –Source:Bihar Flood Management Information System Cell Report 2011

Land cover class	**Area affected by flood (Sq Km)**
Forest	33.25
Scrub	55.68
Intensive Agriculture	6242.25
Irrigated Agriculture	5941.87
Rain fed Agriculture	0.87
Water Bodies	1130.37
Barren land	39.93
Built-up area	16.18

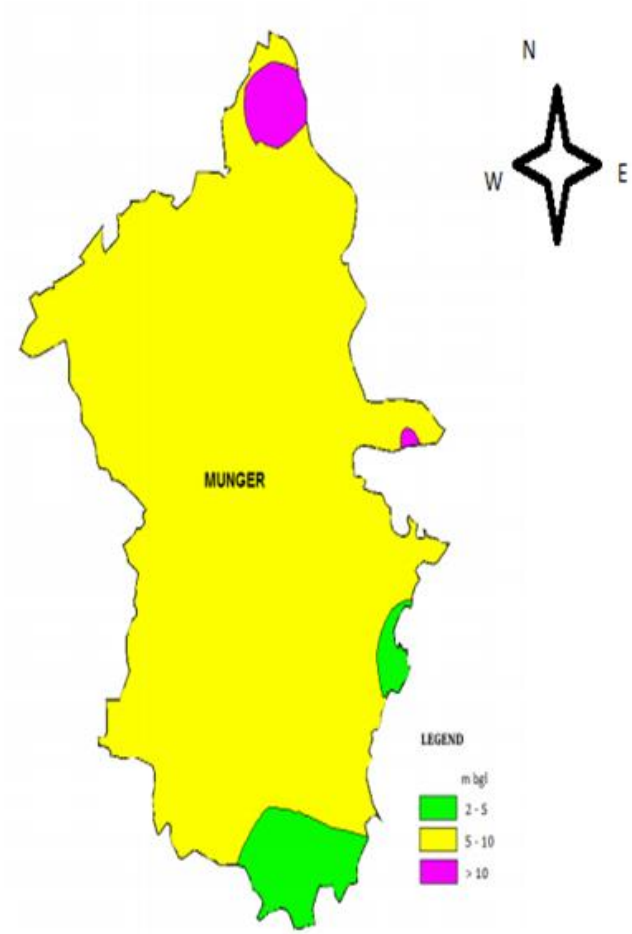


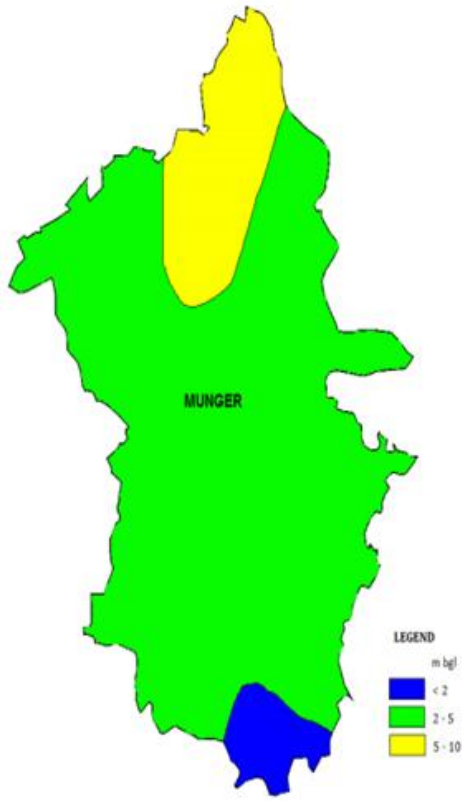
Munger District is located in the southern part Bihar and its headquarters are located on the southern of river Ganges. The district is spread over 1419.7Sq.km. Accounting for 3.3% of the area of Bihar. It lies between 240 22’ N TO 250 30’ AND Latitude and 850 30’ E to 870 3’E longitude. Munger city is located on Latitude 25023’16’’N and on Longitude 86029’ E on the right (Southern) bank of river Ganga, in the south eastern part of the State of Bihar.



S.No	Name of the Block	Geographical Area	No of Gram Panchayats	No. of Villages
1	Munger	23282	13	84
2	Jamalpur			
3	Bariarpur	22433	21	110
4	Dharahara	27,940	13	76
5	Teliabamber	37,917	25	186
6	Asarganj	13,051	19	109
7	Sangrmapur	11,736	10	64
	Total	**1,36,359**	**101**	**629**

As per 2001 census, the population of the city is 1, 88,050 persons extending an area about 18 Km2. Munger District, now a much smaller district after being split into a number of districts, has an area of 1419.0 Km2. The population of the district in 2001 was 11.38 lakhs. The district has for towns and 861 villages with an urbanization level of 27.94%. From administrative and development point of view, Munger is divided into three subdivisions namely Munger, Kharagpur, and Tarapur. There are nine development blocks namely Munger, Bariarpur, Jamalpur, Dharahara, Kharagpur, Tetia Bambar, Tarapur, Asarganj and Sangrmapur. There are about 903 villages in the district. The Munger district on an average is 30 to 65 meters above sea level. The average annual rainfall is 1231 mm.





Depth to water level map of pre-monsoon 2011 Depth to water level map of Post-monsoon 2011

Floods affect agriculture: Even after floodwaters recede, crops can continue to suffer damage and yield resulting losses. Flooding not only weakens plant defenses, but the soil and water conditions prevalent during flooding favor the development of many plant pathogens, so crops suffer increased disease problems after floods.

S.No	Assessment Unit/ District	Net Annual Ground water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground water draft for Domestic and Industrial Water Supply	Existing Gross Ground Water Draft for all Uses	Allocation for Domestic and Industrial Requirement supply up to year 25	Net Ground Water Availability for future Irrigation development	Stage of Ground Water Development (%)
1	Asarganj	1824	532	123	655	176	1116	35.9
2	Bariarpur	4078	334	159	494	238	3505	12.1
3	Dharahara	6756	721	179	900	268	5766	13.3
4	Jamalpur	2122	569	302	871	409	1144	41.1
5	Kharagpur	4585	1277	411	1688	575	2733	36.8
6	Munger	4635	*797*	411	1288	651	3186	27.8
7	Sangrmapur	2381	901	491	1036	203	1278	43.5

8	Tarapur	2356	1049	146	1195	218	1089	50.7
9	Tetia Bramber	2170	742	100	842	149	1279	38.8
	Total	30907	6922	2322	8968	2887	21096	33.3

(In hectare meter)

Assessment of Dynamic Ground Water Resources of the Bihar state Munger district (as on 31 March 2009)

Flood Management in Bihar In the above context, to minimize negative consequences and ill effects of flooding to maintain the sustainable growth of the state, there is a need of planning for flood management. Planning for flood management doesn't involve absolute control over flood but management of floods in such a way to achieve the most beneficial result within the circumstances. Flood management measures may be classified into two categories,

(i) structural involving like construction of embankments, flood retention walls, flood levees and channel improvements, detention basins, etc., and

(ii) (ii) non-structural including land-use planning, zoning of flood prone lands, redevelopment of flood-prone areas, compensation of incentives, insurance, silt management policy and flood forecasting & warning. Both the measures are not mutually exclusive rather complementary to each other

Affect farmers economically: Flooding in key agricultural production areas can lead to widespread damage to crops and fencing and loss of livestock. Crop losses through rain damage, waterlogged soils, and delays in harvesting are further intensified by transport problems due to flooded roads and damaged infrastructure.

Loss of stock and assets: Floods can cause huge losses of stock and assets. Company vehicles, fixtures, fittings, and saleable stock can all be damaged beyond repair. Whilst many of these items can be replaced, the costs can be huge and the claims process can drag on

Hence, it can be concluded that flood is the most significant hazard in Bihar, cause loss of life and property, and affect the economy in a recurring manner. Which not only the Ruler area , lands crop however the urban area school , business , It has affected all spheres of life in such areas and has caused adverse impact on sustainable developmentLack of adequate sanitation facilities and hygiene practices makes the situation more critical. Which result in degradation of the quality of the life of People.

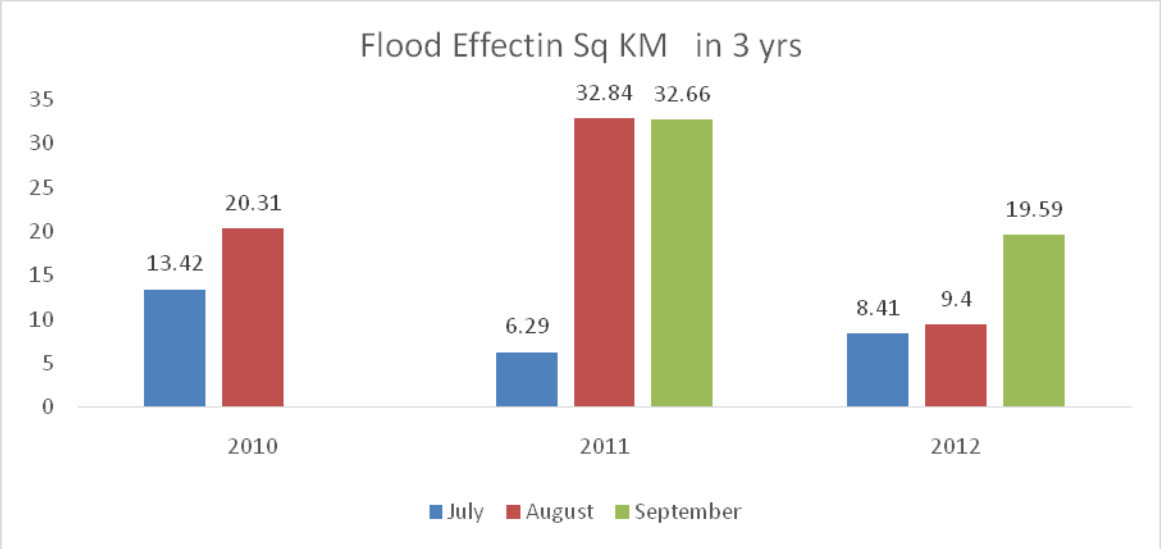
II. MATERIALS AND METHODS

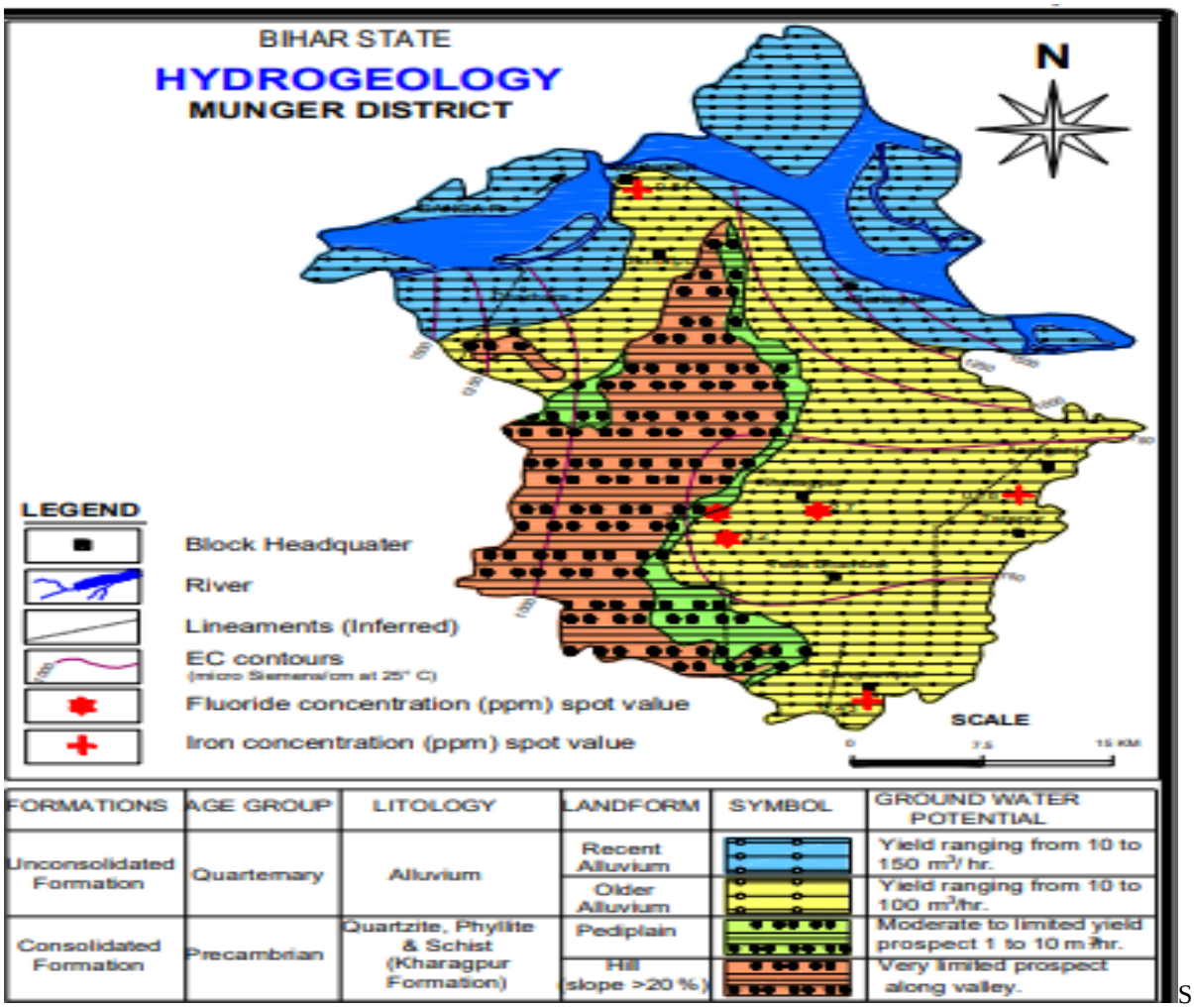
Data had been collected both from published and unpublished sources. The published data had been collected from government offices, census handbook, and municipality and corporation offices besides resource persons of the area. The unpublished data available from filed work, map analysis and data available from office and town planning department in the city of Munger had been used.

The average annual rainfall of the district is 1231 mm and about 80% of the rainfall is received during June to September by south-west monsoon. The climate of the district represents a transition between dry and extreme climate of northern India and the warm and humid of West Bengal. There are three distinct seasons in a year. The winter starts from November and last till end February. The summer starts by March end and lasts through May to mid-June and the monsoon sets in thereafter which continues until September. In the summer, temperature rise up to 420C, while in winter it dips down 20C.

YEAR	JULY	AUGUST	SEPTEMBER
2009	81.99	76.1	
2010	13.42	20.31	
2011	6.29	32.84	32.66
2012	8.41	9.4	19.59

Table Flood Affected Area 4 year's data - Inundated area (Sq.KM)

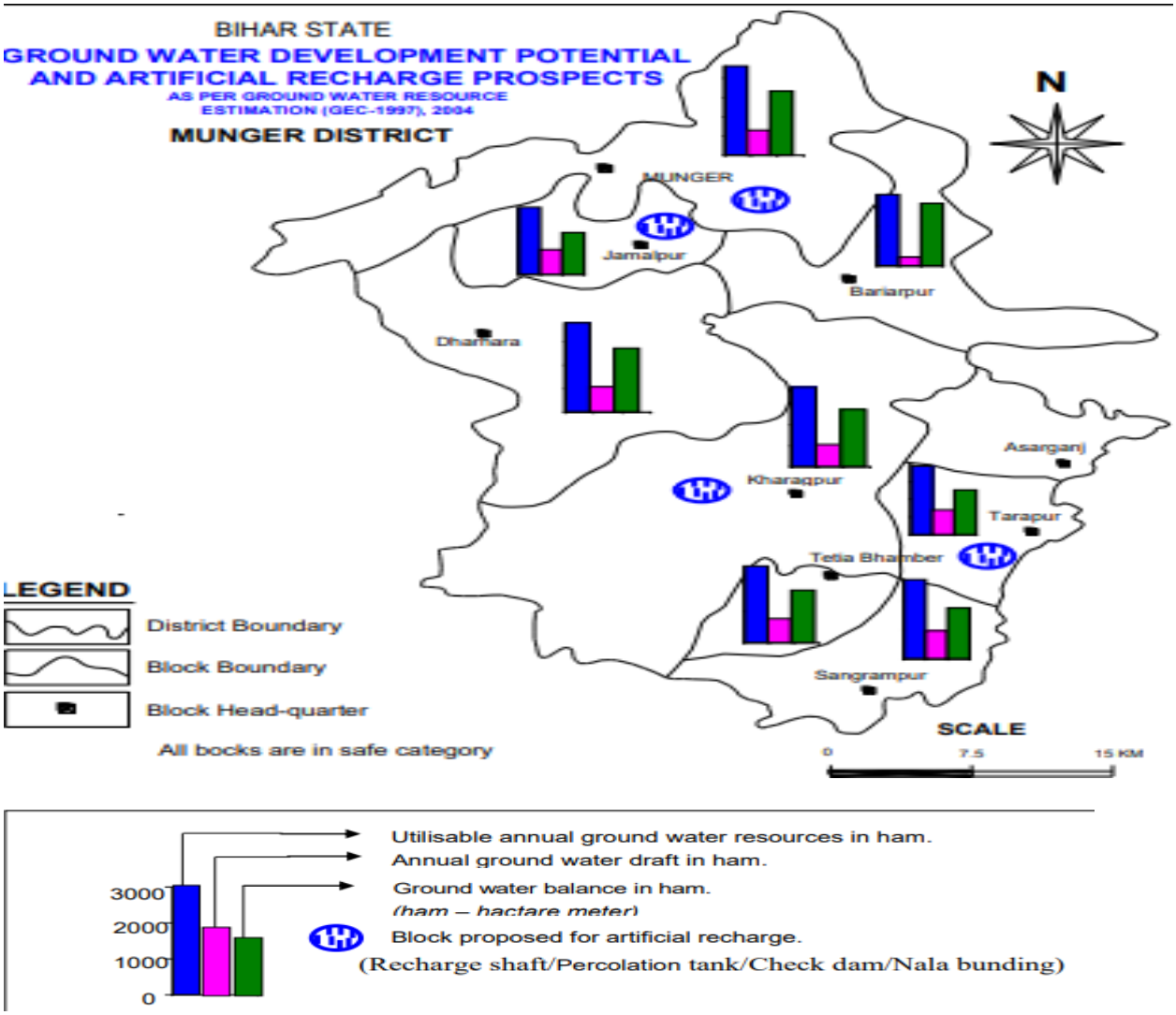




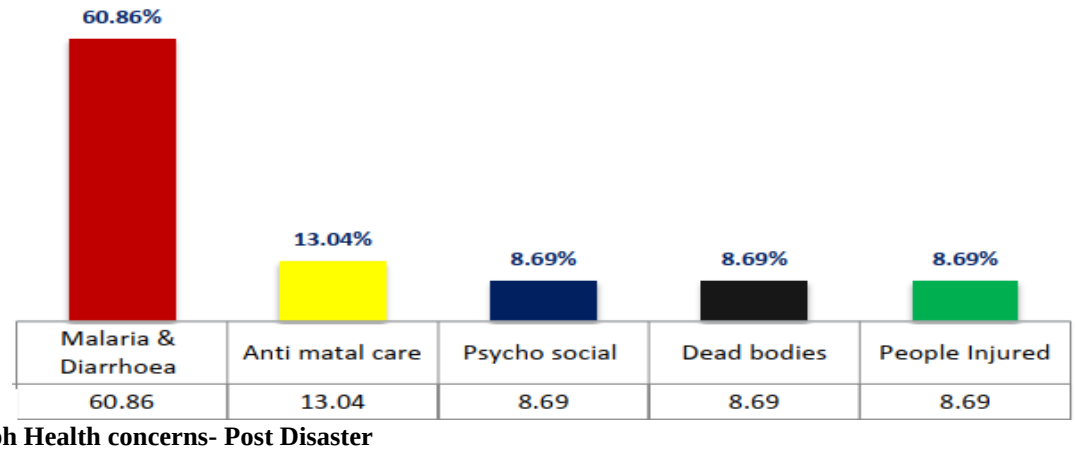
Source: Central Groundwater Board

Structural Measures Flood management works to this point enforced in Bihar comprise of construction and maintenance of embankments. It falls under short-term structural measures. These are generally in practice not due to its effectiveness rather due to low-cost and faster to construct. In Bihar 3732 km embankment has been constructed till March, 2013 and another 1555 kilometer is under construction and likely to be completed by next year. (WRD, Govt of Bihar 2014). Aggradations of river in Bihar necessitates raising and

strengthening of the embankments. However this raising stream bed levels, decreases their carrying capability and leading to drainage congestion in countryside. To overcome such problems, the strategy of developing the channel by de-silting and dredging is a better solution. However, due to involvement of high cost and other associated problems this method is in very
limited
Practice



Source: Environment Agency Flood and Coastal



Graph Health concerns- Post Disaster

Non-structural Measures Losses in recent years contemplate that structural measure alone cannot solve the problem. So it is felt necessary to adopt non-structural measure along with structural measures as an integrated approach to efficiently mitigate flood to master plan or governing laws.

III. DISCUSSION & CONCLUSIONS

Floods are a recurring catastrophe in Bihar. The major reason behind the flood could be the heavy rainfall in the upper catchment of rivers (Nepal area and Himalayan region) and increasing monsoon rains. Flood analysis in Bihar suggests that every year flood occurs in the state, though the intensity of flooding varies from year to year depending upon the variation in precipitation during monsoons. The northern of the state, along with some parts of the east, are particularly susceptible to flood. In general, Darbhanga, Kathihar, Muzaffarpur, Purnia, Khagaria, Munger, Patna, and Champaran districts get affected by flood during every year. Floods commence from July onwards and the peak period is August September.

Possible causes of the floods in Bihar can be enumerated as follows:

a) Heavy rainfall in northern river basins during monsoons causes rivers to overflow

b) Heavy rainfall in the Indian Himalayan region and Nepal which affects the lower course of river also causes overflowing

c) Sedimentation and shifting of river course lead to overflow of rain water and cause flash floods. Deforestation in the catchment area has led to increase in the silt content of the river flow.

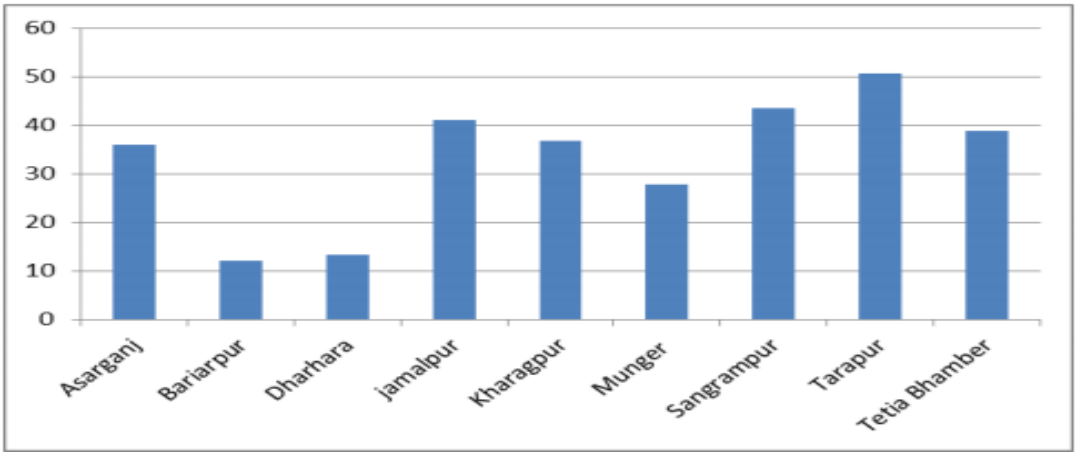
Water is needed for various human activities, and therefore, most of the civilizations have developed on the banks of rivers. However, as the density of people increases, the flood plains are encroached for various anthropogenic activities. As a result, flooding in such rivers has affected the people in its flood plain largely.

Government is taking various measures to deal with it However understanding the relationships between infrastructure systems and their interactions during disaster events is essential to help minimize the damage sustained in their aftermath.

There are committees formed at a national level that discuss and plan future policy regarding how to deal with these issues. However, there is a need for formation of state and local commissions to deal with these problems because they are reliant on the conditions of each area. Includes tackling flooding and pollution incidents, reducing industry's impacts on the environment, cleaning up rivers, coastal waters and contaminated land, and improving wildlife habitats

S.No	Block Name	Suitable Well type	Expected Discharge (LPM)	Recomm-ended depth (m)	Diameter of well	Suitable Drilling method	Type of pump	Success rate
1.	Asarganj	Tube well	100-500	50-80	6 inch	Rotary	Submersible	Good
2.	Bariarpur	Tube well	100-500	100-150	6 inch	Rotary	Submersible	Good
		Bore well	100-300	100-150	4 inch	DTH	Submersible	Moderate to poor
3.	Dharhara	Dug well	60-100	10-15	2.5-3.5 m	Manual	Centrifugal	Moderate
		Bore well	100-300	100-150	4 inch	DTH	Submersible	Moderate to poor
4.	Jamalpur	Dug well	60-100	10-15	2.5-3.5 m	Manual	Centrifugal	Moderate
		Tube well	100-500	100-150	6 inch	Rotary	Submersible	Good
		Bore well	100-300	100-150	4 inch	DTH	Submersible	Moderate to poor
5.	Kharagpur	Dug well	60-100	10-15	2.5-3.5 m	Manual	Centrifugal	Moderate
		Tube well	100-200	40-70	4 inch	Rotary	Submersible	Good
		Bore well	100-300	100-150	4 inch	DTH	Submersible	Moderate to poor
6.	Munger	Tube well	100-500	100-150	6 inch	Rotary	Submersible	Good
		Bore well	100-300	100-150	4 inch	DTH	Submersible	Moderate to poor
7.	Sangrampur	Tube well	100-300	40-50	4 inch	Rotary	Submersible	Moderate
		Bore well	100-300	100-150	4 inch	DTH	Submersible	Moderate to poor
8.	Tarapur	Tube well	100-500	70-100	6 inch	Rotary	Submersible	Good
9.	Tetia Bhamber	Tube well	100-300	20-40	4 inch	Rotary	Submersible	Good
		Bore well	100-300	100-150	4 inch	DTH	Submersible	Moderate to poor

Fig: Block wise data on type wells, design and suitable pump of Munger District.



Graph: Block wise stage of ground water development

Water Conservation and Artificial Recharge

The gross irrigated area of the district is about 60% of total cultivable area. However, the ground water development is low in overall sense scarcity of water affecting some part of the district as Water saving devises such as sprinkler and drip irrigation techniques would bring more area under irrigation. The district receives 1231 mm of annual rainfall on an average but most of rainwater goes as run off. Construction of suitable artificial recharge structure will help to reduce the run off as well as it also recharge the aquifers and maintain the soil moisture of the area. Contour bunding, check dam, gully plug, percolation tank etc. are some suitable structure in the hard rock area, while for porous formation recharge shaft and Percolation tank are more suitable. Before construction of these recharges structures, selection of suitable site is required for getting better benefits

IV. RECOMMENDATION

1. Ground water exploration has been done by CGWB in fluoride affected areas of Munger district indicate that all the potential fractures down to a depth of 100 m is contaminated by fluoride. The weathered zone tapped by the dug wells within 5 -15 m depths is also affected by fluoride contamination.
2. Community based fluoride removal plant can tackle the fluoride menace. There are numbers of fluoride removal techniques. Nalgonda techniques simple and effective.
3. Dilution of fluoride-contaminated water by rainwater harvesting is under investigation**.**
4. The stage of ground water development is around 33.3% indicating that there is a large scope for further ground water development however the artificial recharge including rainwater harvesting should be taken to augment the ground water reserve.
5. Suitable structure for artificial recharge in the area under porous formation are recharge shaft and percolation tank.
6. Suitable structures for artificial recharge in hard rock areas are contour bunding, check dam, gully plug, and percolation tank.
7. The district headquarter Munger to be taken up under artificial recharge of ground water, keeping in view of rapid increase in ground water draft. The ground water draft in Munger urban area is to the tune of 57.15 lakhs lpd. Roof top rainwater harvesting to be taken up to recharge the aquifer in Munger urban area

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