DISASTER MANAGEMENT: PERSPECTIVES AND ROLE OF CIVIL SOCIETY ORGANIZATIONS IN BIHAR FLOODS

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ABSTRACT

The present research paper tries to portray and depict 'Flood' as a major natural disaster and as a recurrent phenomenon in the state of Bihar especially the north Bihar plain. It also intends to assess and investigate role of civil society organizations for flood management in the plains of Bihar

Bihar is blessed with a number of perennial rivers originating in the heart of snow-fed Himalayas. Flooding represents a major risk to riverside populations and floodplains, in addition to causing substantial impacts on the environment, including aquatic fauna and flora, bank erosion and other aspects.

Keywords:Bihar Floods, Disaster Management, Civil Society Organizations, Resilient, Self-reliant.

I.THE BACKGROUND

This study will examine and unravel the untiring and indefatigable role of civil society organizations for flood management in the plains of Bihar. In particular, the study intends to emphasize and underline the incessant efforts put on the part of civil society and other stakeholders in reckoning the normal pace of life through peoples' management, resilient and self-reliant techniques in the flood prone districts of north Bihar. Rescue and relief is ensured through the provision of safe drinking water supply, hygienic sanitation, construction of robust houses and timely delivery of medical facilities.

Bihar is blessed with a number of perennial rivers originating in the heart of snow-fed Himalayas. In fact, the northern plains of Bihar witness annual and recurrent floods bringing huge destructions and mammoth devastations. Geographically speaking, the bed slopes and nature of sandy rocks of the river course are crucial factors responsible for land degradation and heavy silt concentration in the runoff thus accentuating the enigma and havoc of flood.

Flooding represents a major risk to riverside populations and floodplains, in addition to causing substantial impacts on the environment, including aquatic fauna and flora, bank erosion and other aspects. Although it is a natural phenomenon, flooding is often exacerbated by the presence of riverside infrastructures -- such as dams, piers, and landing wharves and by poor development practices including riverside "development," excessive clearing, encroachment upon waterways, dredging, which may cause changes in the hydrological balance of the

waterways involved (Brookes 1985, Nolan and Marron 1995) [1a and b]. A number of researchers have studied the physical, sedimentological and biological impact of flooding on the receiving environment (Irvine and Drake 1987, Kochel 1988, Friedman *et al*., 1996, Asselman and Middelkoop 1998, Palik *et al*., 1999, Sinha and Friend 1994) [2a,b,c,d,e and f]. Meanwhile, other researchers have investigated anthropogenic factors and the impact of urban development on changes to the river system and increased flooding (Hollis 1975, Roberts 1989, Costa and O'Connor 1995, Awadallah *et al*., 1999) [3a, b, c and d].

The State of Bihar, in India is blessed with the two Hindu mythological holy Rivers viz., Alaknanda and Bhagirathi. They unite at Devprayag and the combined river is known as the mighty Ganges. As many as 17 tributaries join it, both on the left and right bank. Being the master drain of Ganga basin, this river drains 26 per cent of area in India divided into 23 river systems (Ganga Flood Control Commission (Patna), Annual Report 2010-11)) [4]. There is no denying of the fact that the immense water potential of the Ganga river system is a boon for the fertile agricultural tracts in Bihar. But at the same time, improper utilization of water, defective storage system aided with huge siltation make this precious resource wasted thereby inundating the low lying areas. Hence, the havoc of flood is the ultimate outcome.

FIGURE 1: RIVER BASINS OF BIHAR

Source: Water Resource Department, Government of Bihar.

It is established that flood is treated as a forced majeure and cannot be altered altogether but the extent of damage and devastations by this natural fury can definitely be minimized and controlled through active involvement of civil society and other stakeholders. Thus, based on the introductory discussions, present research paper aims at concerted effort to outline and investigate the recurrent problems of flood in Bihar viz-a-

viz the role of civil society organizations in providing rescue and relief measures to flood victims and the vulnerable communities therein.

II. A BRIEF INTRODUCTION OF FLOODS IN BIHAR

The state of Bihar being the 12th largest state in terms of geographical size at 38,202 sq mi (94,163 km²) and 3rd largest by population roughly commences from 24° 20'10'' N to 27° 31' 15''N latitude and longitudinally and varies from 82° 19' 50'' E to 88° 17' 40'' E. With almost 38 districts, 14 Urban Agglomeration[1] and 199 towns (both statutory and non-statutory or census towns)[2], it occupies a strategic position by giving shelter to 8.58 per cent of India's population. The Bihar plain is divided into two unequal halves by the river Ganga which flows through the middle from west to east. The recurrent phenomenon of floods in Bihar presents an example at par with other catastrophes in the state. In fact, flooding has been the most common problem associated with the plains of Bihar since time immemorial. The 1987 floods, considered the worst in the century, engulfed 33 of the state's 39 districts, and the losses were estimated at Rs 1,200 crores (CSE 1991) [8]. The embankments suffered 125 breaches and out of 3.4 million hectares of net cultivated area in north Bihar, floods submerged 1.7 million hectares.

Source: National Disaster Risk Reduction Portal (Accessed on 20th December, 2017)

[1] Urban Agglomeration is an extended city or town area comprising the built-up area of a central place (*usually a municipality*) and any suburbs linked by continuous urban area.

[2] All areas such as Municipality, Corporation, Municipal Council, Nagar Panchayat, Cantonment Board, etc., statutorily notified under Municipal Act by the State Government fall under this category.
Non-statutory towns basically include Census Towns, which are formed for the purpose of Census.

It is estimated that there are 39 flood prone districts in India of which 15 are located in Bihar (GoI, 2006). According to the Rashtriya Barh Ayog, 16.5 per cent of the entire flood prone area within the country is located in Bihar while 22.1 per cent of the total flood affected population within the country resides in the flood plains of the state. It is also estimated that the flood prone area of Bihar which was only 25 lakh hectares in 1954, the Second Irrigation Commission of the Government of Bihar has reassessed the flood prone area within the state at 68 lakh hectares in 1994 (Mishra, 1997) [5].

Floods bring in their wake extensive damage of human lives and livelihoods. The 2008 Kosi floods in Bihar are estimated to have affected a population of 33.45 lakh people (GoB 2008) [6a and b].Various estimates put the financial implications of this damage as between Rs.500 crores (GFDRR, 2010) to nearly Rs.2,000 crores (UNDP, 2008) [7]. In addition to these sectors, major damages were caused to the livelihoods, health, education, social, and environment sectors. 273,000 acres of arable land has been rendered fallow due to sand-casting with long-term implications for agriculture and livelihoods (GFDRR, 2010). In terms of fatality and devastations, however, the floods of 2007, 2008 and 2013 holds prominent significance rendering lakhs of people homeless and at the mercy of nature, thus, paralyzing the entire economic fabric of the society.

The state of Bihar is divided into two physical zones by the naturally occurring river, the Ganges. Out of the total geographical area of 94.2 thousand square kms, while the northern part of the states comprises of 53.3 thousand square kms; the southern part consists of 40.9 thousand square kms. The northern part, especially, is more prone to floods. In fact, the variations in rainfall intensity and distribution, temperature, soil characterization and topography are found to be significantly associated with floods. *Chaur, Maund, Diara and Tal* are some of the special feature uniquely associated with the landscape in north Bihar plains. Chaurs are natural saucer-shaped depressions in which river water gets collected. Maund refers to deep depressions left in alluvial plains by a river shifting course. Tal denotes a vast stretch of backwaters south of the natural levee of the Ganges River. Diaras are basically tracts of silt-enriched land made available for habitat/cultivation when flood waters recede. All these features are found to be submerged during rainy season and frequently associated with flooding.

TABLE 1: RIVER BASINS IN BIHAR - AT A GLANCE

Name of the Basin	Catchment Area	Length of River in Bihar	Embankment Constructed	Flood Prone Area	Protected Area
	(Sq. Km)	(Km)	(Km)	(Sq. Km)	(Sq. Km)
Ganga	19322	445	596.92	12920	4300
Kosi	11410	260	387.51	10150	9300
Burhi Gandak	9601	320	704.26	8210	4010
Kiul Harohar	17225	-	14	6340	NIL

Punpun	9026	235	37.62	6130	260
Mahananda	6150	376	225.33	5150	1210
Sone	15820	202	59.54	3700	210
Bagmati	6500	394	400.79	4440	3170
Kamla Balan	4488	120	184.9	3700	2810
Gandak	4188	260	511.66	3350	3350
Ghaghra	2995	83	132.9	2530	790
Chandan	4093	118	83.18	1130	80
Badua	2215	130	NIL	1050	NIL
Lalbakeya	-	-	54.35	-	-
Adhwara	-	-	181.5	-	-
Bhuthi	-	-	54.7	-	-
Total	**-**	**-**	**3629.16**	**68800**	**29490**

Source: Water Resource Department, Government of Bihar.

Table 1 elucidates that the rivers Gandak and Kosi are the most important tributaries of the Ganga responsible for the recurrence of yearly floods which otherwise could have been harnessed for the growth, development and prosperity of ‘granary bowl of India’ i.e. Indo-Gangetic plains.

III. THE PHYSICAL SETTING OF NORTH BIHAR PLAINS

The North Bihar Plains covering an area of about 52,500 km has clear cut boundaries characterized with the linear boundary of the Himalayan Siwalik foothills in the north and the southern boundary of the meandering Ganga demonstrating in true sense a “megafan”, or in more common terms, an 'inland delta'. This esteemed geographical landscape is a play field of eight major rivers, all ultimately meeting the mighty Ganges. These eight major rivers are namely Ghaghra, Gandak, Budhi Gandak, Bagmati, Kamla, Bhutahi Balan, Kosi and Mahananda; majority of which have their catchments in the steep and geologically nascent Himalayas. Together, they are responsible for inundating a large part of Bihar and thus bring about the havoc of recurrent floods in north Bihar plains almost every year, sometimes even twice or thrice in a year. Hydro-meteorology, river morphology, neo tectonics and afforestation of the sources areas are the main attributable factors inducing flooding in the region.

In order to understand the occurrence of floods in Bihar, we must conceptualize the hydrological characteristics and analysis of river morphology. The most important feature in north Bihar plain is the Gandak-Kosi-Mahananda interfluves witnessing very frequent shifting of river channels and the resultant floods. In fact, the

rivers draining north Bihar carries high discharge and very high sediment load. Such a high discharge of the rivers exceeding the carrying capacity of the embankments results due to reduction in the velocity of rivers as they enter the plains in Bihar. A reduction in the velocity also reduces the carrying capacity of silt, load and sediments by the rivers. Hence, silt starts depositing at the river beds causing a rise in the river bed and ultimately leading to bank erosion. Even at times, due to heavy silt deposition, the mouth of the river gets blocked and chocked to find alternate routes thereby flooding new areas. Practically, all the rivers except Burhi Gandak have an aggrading characteristic, the technical term for the tendency of a river to deposit detritus upon a valley floor (CSE, 1991 and Government of Bihar's Flood Management Information System).

IV.OBJECTIVES OF THE STUDY

In the light of preceding discussion, the main objective of the research paper is:

1. To discuss and analyze the role of civil society organizations in flood management in various districts of Bihar
2. To outline, investigate and thus, rapid assessment of the techniques and scientific tools to realize the objectives of a self-reliant economy.

V. DATABASE

Having determined the purpose and objectives of the study, information is sought on various sources of database within the research framework. The present research is solely based on information sought from various secondary databases along with first hand information gathered from manuals, periodical, published government's reports, esteemed journals etc. As far as the data for occurrence of floods in the state of Bihar and the role of civil society organization is concerned, the following sources are worth mentioning-

- Water Resources Department, Government of Bihar.
- Central Water Commission, Patna.
- Ganga Flood Control Commission, Patna.
- Published reports and manuals from some of the nodal non-profit organizations such as *FANSA* (The Freshwater Action Network South Asia), *ACWADAM* (Advanced Center for Water Resources Development and Management) and *MPA* (Megh Pyne Abhiyan).

VI. CAUSES AND SOCIO-ECONOMIC IMPACT OF FLOODING IN NORTH BIHAR PLAINS

Flood is a natural phenomenon triggered by multitude of factors. In fact, the mechanisms and the forces under laying this natural fury have already been discussed earlier in section 3.2. However, some of the important

factors specific to the flood plains in Bihar needs to be addressed and understood. These are elucidated as,

1. **Construction of embankments** (between high land and low land) does not keep pace with the flooding propensity and thus, embankments failed during each major flooding event. In fact, in a report for river Kosi **'*Kosi Deluge: The Worst is Still to Come*'**, it is found by civil society organizations that embankments straitjacket the river. Due to heavy siltation, the bed of the river rose several feet higher than the adjoining land. As a result, with every little downpour, these low lying areas get inundated. It is found that almost 16 per cent of land area in Bihar is subject to permanent flooding there by disrupting the normal pace of life.

2. **Deforestation** in the catchment area has led to increase in the silt content of the river flow.

3. **Construction of Farrakha barrage** disrupting the dynamic equilibrium of the river Ganges hindering the natural oscillation of the river within its meandering belt. Heavy sedimentation, reduction in cross-sectional area and widening of the river are the major outcomes that led to increase in flood frequency and magnitude.

There is no denying of the fact that, flooding causes extensive damage to life, property and loss of land. People are rendered homeless and are subjected to growing epidemics in the flood affected area. Numerous studies and researches have validated the existence of strong correlation coefficients between Bihar's floods and the state's poverty (IGC, 2010). Agriculture and farming practices are considered to be the pre-dominant economic activity of the region. Nearly 70 per cent of the populations are directly dependent on agriculture for their livelihood. The extremely high man-land ratio coupled with low yields of the major cereal crops is hailed as the main reason for high incidence of poverty in the state. The International Growth Centre (IGC) India-Bihar Programme concludes that the current economic returns from agricultural sector in North Bihar constitute less than 10 per cent of what is technically feasible (ICG, 2010) [9].

Poor drainage, stagnant water, contaminated drinking water, unsafe excreta disposal, inappropriate shelters and insecure environment leads to environmental risks and health hazards during floods. Ad-hoc drinking water and sanitation lead to further deterioration of health during floods

VII. CIVIL SOCIETY ORGANIZATION: A BOON IN FLOOD MANAGEMENT

Having discussed, the fury and enigma of flood, leading to mammoth devastations in Bihar, the role and active involvement of civil society organizations become all the more imperative. The civil society should work in collaboration with the government to ensure proper, timely and affective implementation of the rescue and relief operations at the times of emergencies like flood and more so when the emergency is a recurring phenomenon. ***FANSA*** (The Freshwater Action Network South Asia), ***ACWADAM*** (Advanced Center for Water Resources Development and Management) and ***MPA*** (Megh Pyne Abhiyan) are some of the non-profit organizations possessing an expertise base in various branches of Earth and Water sciences. All these organizations have developed a campaign in collaboration with resource groups to handle technical issues concerning drinking water, groundwater dynamics, sanitation, water quality, agriculture, disaster response and social mobilization. In

particular, these are found to be more active in the challenging regions such as the flood stricken areas in north Bihar.

Through research and training activities, the resource individuals have facilitated campaign‘s progression in thoughts, comprehension and solutions as well as in developing linkages for enhancing campaign‘s scope, ability and impact. They intend to cater to transformed ecology triggered by incessant floods. Their ultimate aim is to provide alternative farm based livelihood in an agrarian economy like Bihar and a functional network of grassroots organizations. The rehabilitation initiatives and programmes mainly focus on the medical facilities, construction of robust houses, provision of safe drinking water, ensuring safe and hygienic sanitation etc. Their untiring efforts have led to the development of 'knowledge base' and many other inputs that led to improved implementation and benefits to the distressed communities in Bihar.

VIII.IMPLEMENTING MGNREGA IN FLOOD PRONE AREAS OF NORTH BIHAR

Schedule I of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) lists flood control and protection as one of the top priorities for works to be undertaken under MGNREGA. It has been leveraged to provide financial resources to generate employment for rural families especially in the rain-fed and flood prone areas. With the passage of the MGNREGA in 2005 by the Indian Parliament, an unprecedented commitment was made by the states with the state of Bihar being no exception to this.

The CSO along with Panchayati Raj Institutions (PROs) made MGNREGA a success and a watchdog of not merely giving rise wage employment but leading to equity, food self-sufficiency and sustainable livelihoods in rural India. It is also believed that MGNREGA affords an unprecedented opportunity for governance reform at the grass root level. It intends to provide nature-based livelihood opportunities especially in the rain-fed areas with the target of providing relief to the most vulnerable sections of the society. Women folk, Dalits, Adivasis, landless people, small and marginal farmers, physically challenged and old people are given prime care and greatest importance.

CSO has gone a long way to facilitate reform of policies and practices to help the disadvantaged sections in the flood prone areas of Bihar. The funds generated can be potentially used for rehabilitation works along with deepening and desilting of the main drainage channels where flooding occurs. It requires mutual co-adherence between social engineering and the several panchayats including civil society organizations at large level.[3]

IX. CASE STUDY: MEGH PYNE ABHIYAAN

A larger part of the community in north Bihar is found to be vulnerable to epidemics and diseases of various kinds due to stagnating flood water. Non availability of safe drinking water and lack of sanitation (WATSAN) are the two primary concerns in the flood prone regions of north Bihar.

[3] National Consortium of Civil Society Organizations on MGNREGA, December, 2011

Megh Pyne Abhiyan (MPA) and Samaj Pragati Sahayog (SPS) are two major CSOs that have achieved significant milestones in the flood prone panchayats of Khagaria and W. Champaran districts of Bihar. Megh Pyne Abhiyan (MPA), literally cloud water campaign, has been working in Bihar since 2005 as a campaign. Based on intensive surveys and interactions with village communities spread, the collaborative civil society effort has come up with an action plan which suggests that an outlay of Rs.4 crores in the selected panchayats could generate more than 2 lakh person-days of employment and effectively help in controlling floods across nearly 9,000 hectares. Through the effort, it is possible to effectively protect about 1.5 crore people of the state from the ravages of floods.

The local partners of MPA's such as Gramyasheel, Kosi Seva Sadan, Samta, Ghoghardiha Prakhand Swarajya Vikas Sangh (GPSVS) and Water Action did wonders in their own unique ways in generating awareness among the masses and spreading 'informed knowledge' about the status of groundwater and its impact on human health. They played an active role in the provision of safe drinking water system for the flood prone areas of north Bihar keeping in view the presence of diverse contaminants in groundwater. Arsenic was found to be the chief constituent in groundwater along with Iron, flouride and highly diffused microbiological contamination.

Another major issue be facing the vulnerable community in the region is the grim status of proper and hygienic sanitation systems. There exists complete lack of sanitation facilities with widespread open defecation. Sanitation is a UN declared human right, and without access to it, many communities are left vulnerable to a multitude of health impacts and disasters. *Camilla Wirseen*, founder of *Peepoople* (Sweden) is of the opinion that safe and hygienic sanitation and the ability to care for personal hygiene in private are essential for the health, dignity and well-being of all. *Peepoo* is a single-use, self-sanitizing, bio degradable toilet that after use turns into valuable fertilizer. *Peepoople's* mission is that everyone whoso desires shall have access to hygiene and dignified sanitation.

Construction of Jal Kothi, Phaydemand Shauchalay along with development of Matka Filters are some of the examples reflecting the initiatives and the effort put on the side of civil society organizations to provide safe drinking water and hygienic sanitation in many of the flood prone districts of Bihar

X. SYSTEM OF ROOT INTENSIFICATION (SRI): A SOLUTION TO AGRICULTURAL CONCERNS IN NORTH BIHAR (PRADAN)

One of the innovative and pioneering approaches to cater to the growing concerns of flood related problems in north Bihar is to realize the potential of system of root intensification (SRI) . It is implemented as a system, as a tool ….and not a measure. It is an established fact that flood causes huge damages to the standing crops thereby drastically lowering the agricultural productivity and the resultant food grain crises. It has a direct and adverse impact on economic prosperity of the region. It is also assessed that the agricultural productivity of north Bihar is one of the lowest in the country with fragmented land holdings. Hence, SRI acts as a boon to improve the economic condition of the people dependent on agriculture. Such a system works on the basic principle of roots

intensification of the crops which is aided by fertile land and high water table. Since majority of the north Bihar plains are reeled under heavy flood waters in monsoon season, the mechanism is to grow summer crops such as paddy, onion, garlic, wheat, vegetables with the help of organic feeds. Such crops are harvested well before the heavy showers and thus, food security is ensured during floods.

XI. PHED's INTERVENTIONS IN THE ALLUVIAL FLOOD PRONE AREAS OF NORTH BIHAR

As a nodal department in the state, PHED was responsible for rural water supply, sanitation and hygiene. It works on the moto: 'There should be toilet in each rural household, school, Aaganwadi and community toilet and the state should be open defecation free'. In an endeavor to reach the mission of providing safe drinking water facility and proper sanitation ground, emphasis were laid on the need to change people's mind-sets and also foster involvement of people and communities. In this connection, it should be recapitulated that Bihar stands out to be the first state in India where subsidy is provided even to the families above poverty line for construction of toilets. In the flood affected areas of Bihar, UNICEF has constructed toilets that are on a raised platform, ensuring that the toilet does not get inundated during floods.

As far as availability of water supply is concerned, PHED has done commendable job. The traditional dependence on groundwater which is often found to be contaminated has been reduced with the help of DFID-SWASTH project. In fact, tremendous success has been achieved in exploring new and novel ways of tapping surface water for drinking purposes in rural Bihar. Rain water harvesting was encouraged to ensure the availability of water during flood crises.

XII.RECENT FLOODS IN BIHAR (2017): THOUGH FACTS AND FIGURES

Bihar is India's most flood prone state, with 76% of the population in north Bihar living under the recurring threat and nightmare of flood devastation. Such havoc is caused due to excess rainfall in the monsoon season and the silting of the major rivers traversing the state.

The most recent flood in Bihar i.e. in 2017 is believed to be one of the most disastrous floods in the state after the '2008 and 2013 Bihar flood'. This flood was result of sudden increase in water discharge due to torrential rain in the foothill of the Himalayas in Nepal and adjoining areas in Bihar between August 12 and 20 led to flash flood in various rivers[4] — Gandak, Burhi Gandak and Bagmati, Kamla, Kosi and Mahananda — due to heavy rain in the catchment areas of the major rivers of North Bihar in Nepal.[5] More than 17.1 million people in 2,371 panchayats under 187 blocks in 19 districts have been affected, officials say.[6] Over 8.5 lakh people have lost their homes, with Araria district alone accounting for 2.2 lakh homeless people. The State Health

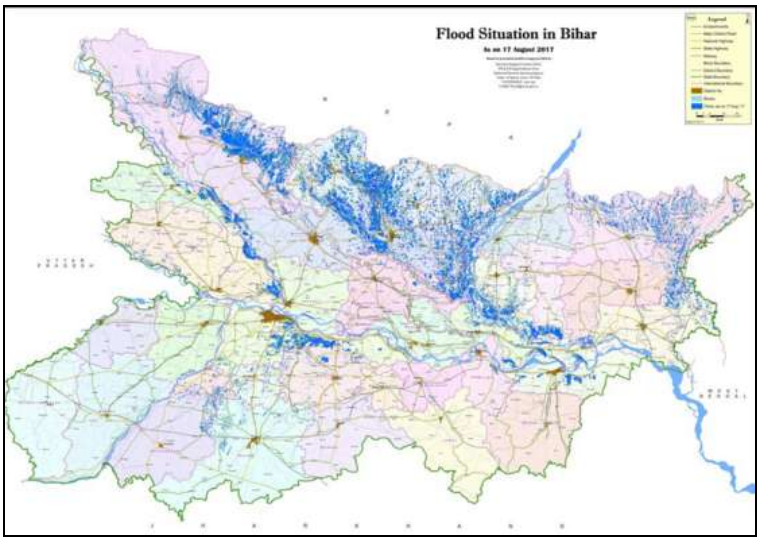
[4] Sethi, Aman (10 September 2017). "Araria to Kishenganj, Bihar's decades-old flood tragedy has a worrying new trend". Hindustan Times.

[5] "Alert sounded in north Bihar plains". The Times of India. 12 August 2017.

[6] BBC News. Retrieved 5 September 2017.

Department started 306 Health Check up Camps and 128 Veterinary Camps in the Flood affected areas. Bihar cabinet sanctioned Rs 1,935 crore under Bihar Contingency Fund for relief and restoration work in the flood-hit districts in the state.[7]

FIGURE 2: FLOOD SITUATION IN BIHAR (AS ON 17TH AUGUST, 2017)



Source: Flood Management Information System, Water Resource Department, Bihar.

FIGURE 3: FLOOD STRICKEN KISHENGANJ RAILWAY STATION IN NORTH BIHAR

Source: https://en.wikipedia.org/wiki_2017/bihar_flood (accessed on 20th December, 2017)

[7] Cabinet approves Rs 1,935 crore for flood relief". The Times of India. 30 August 2017.

XIII. SUMMING UP

There should be sound, rational, logical and technical understanding between the hydro-geological characteristics of the land on one hand and the hydro-metrological & morphological analysis of the rivers on the other. Provision of relief, rescue and rehabilitation for the vulnerable communities in north Bihar rests on the dynamism between the two processes through a set of well defined scientific methods and techniques. Sinha specifies that technology options for sanitation and drinking water should go hand in hand, because both supplement each other. Both get hugely affected without the absence or limited presence of the other. It also demands mobilization of human resources for dealing with the local problems and in executing need based interventions. In fact, following points need special attention:

- Dynamic water quality surveillance needs to be promoted in areas which are affected by water contamination
- Drinking water and sanitation is gaining importance within the government priority
- Integrating local efforts with government flagship schemes

It is an established fact that safe drinking water and hygienic sanitation are mutually correlated and have a crucial role in ensuring good health indicators. Significant milestones have been achieved on these fronts in the flood affected areas in north Bihar. Filters, providing safety against iron and arsenic contamination and toilets with raised floor areas surrounded by four walls can ensure sustainability of livelihoods and as safeguards against flood waters. All these efforts would ensure a healthy existence and sustainability for enhanced working and functioning.

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