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Article in SSRN Electronic Journal · April 2013

DOI: 10.2139/ssrn.2254498

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## **A Review of Flood Control Policy in Bihar (India)**

**K.M.Singh**

Bihar is the second largest state in respect of population and ninth in area in India and is the most flood-affected state in the entire country. It is the northern part of the state which is most affected by the floods. Of the total geographical area of 1738.8 million ha. of the state 44.47 (25.33%) is affected by floods in North Bihar. Floods in Bihar plains date back to antiquity and were instrumental in rise and fall of several empires in the region. It were floods in the early 7<sup>th</sup> century B.C. which provided the basis for rise of agriculture based permanent societies in this region. Development in form of railways and highways created impediments in the way of rivers causing recurrent floods in the plains of Bihar. The absence of culverts on these rail and road bunds made the situation more serious.

It was in the Patna Conference (1937) that a leading British engineer Bradshaw Smith pointed out that embankments invited disaster but his advise was ignored. It was then calculated that without embankments, a serious flood was witnessed once every 50 years, while in 22 percent cases in a 100 years span, the floods were less than of normal intensity, in 55 percent cases it maintained natural intensity, in 21 percent cases of an intensity a little above normal and only in 2 percent of surveyed years was it a little over the normal intensity which could be said to be severe. By 1970's the embankments girdled the banks of the major rivers for thousands of kilometers and floods became a regular feature in Bihar plains. Today total length of embankments in Bihar measures 3454kms. Nothing illustrates the dismal scenario on the flood control front in Bihar than the 1987 floods, that year the floods engulfed 33 of the then 39 districts of the state, causing losses worth Rs.12090 million.

Water Resources Department of Bihar in its Flood Report 1999 says that such embankments built on rivers that frequently change course can at best be termed as short term measure. It adds that since 1951 to 1998 a whopping amount of Rs.530794.10 million has been spent on flood control measures and still only a small degree of protection could be provided because it is impossible to control floods altogether, at best the damage could be minimized. The report further adds that it is not

possible to predict the place and magnitude of erosion caused by rivers, and there is always a danger of the rivers breaching the embankments at any place, therefore the devastation by floods even in so-called protected areas cannot be ruled out. The report further says that in absence of any long term measures there is no other alternative but to increase the height of the embankments, but it fails to enumerate the long term measures. It is noteworthy that embankments for urban areas and other important places are designed on 100 years flood frequency and for rural areas on 25 years flood frequency, but 1987 and 1998 floods have proved this notion wrong and further raising the height of embankments has become imperative to protect these areas.

### **Problems due to embankments:**

A significant problem due to embanking has been that of drainage congestion, especially in North Bihar, which is a high rainfall zone with a large run-off area. During heavy rains this water accumulates at all the points where embankments of two rivers meet. Since an extensive network of rivers drains North Bihar and because they have been embanked to a great extent, this aspect of congestion has assumed alarming dimensions. Now the floods, which earlier used to recede in a week, take months. The National Commission on Floods has stated that the continued rise of riverbeds has created problems of seepage and drainage, aggravating water logging apart from embankments, communication networks like railways and highways with inadequate provision for waterways have played a major role in aggravating the problem. All major roads and railways run east to west cutting across the natural flow and drainage of the rivers in North Bihar. Inadequate waterways and bridges build up the volume and velocity of flood waters resulting in the rivers attacking the banks at the upstream and even the downstream with added fury eroding its banks and inundating the country side.

### **Greater emphasis on flood protection:**

How far the flood protection work has dominated the flood control strategy in Bihar can be gauged from the fact that in 1885-86, Rs. 240 million was sanctioned out of which only Rs.48.3 million was spent on new embankments, rest was spent on anti-erosion work like raising the embankments etc. In 1990-91 Rs. 405 million was sanctioned out of which Rs.9 crore was spent on establishment cost, Rs. 10 crore on new

embankments and remaining on strengthening the existing embankment network. If at the present rate flood protection measures are to be taken up then it would take another 105 years to complete the job, as 353.8 million ha still needs to be protected.

### **Flood control—some suggestions:**

Experts are of the view that till now the emphasis has been on flood modification apart from reducing drainage congestion, some measures enumerated to minimize floods the havoc are to apply;

1. A suitably modified agronomic practice,
2. Rescheduling of agricultural operations,
3. Flood plain zoning,
4. Implementation of land reforms,
5. Extensive utilization of ground water resources, thus creating the capacity for ground water storage of excess run-off water,
6. Providing suitable technology for flood-proof housing in the affected areas,
7. Elimination of middlemen in flood protection schemes,
8. Reducing in the interference from politicians and local political pressure groups.

Due to topographical and economic factors, protection cannot be provided to all the areas prone to flooding as well as same degree of protection need not be provided to all the areas. Protection should be provided on the basis of frequency of flooding and based on this, areas should be categorized as protect able up to 25, 50 or 100 years,

Basically, there are two types of measures namely: structural and non-structural, for mitigation of flood damage. The major thrust, so far, in flood management in India has been in the form of structural measures, mainly construction of embankments. But this as discussed earlier created more problems than it could possibly solve, because the investments on structural measures encourage people to move into known hazard areas fully expecting and often receiving administration's help. Due to its cost

effectiveness and speedier implementation, the main thrust should now be on non-structural management measures, which can broadly be classified as follows:

**(a) Modifying the susceptibility to flood damage:**

Flood modification if taken alone leaves a residual flood loss. This strategy expressed, as actions to avoid dangerous, uneconomical and undesirable use of flood plains should usually be accompanied by measures to modify the susceptibility to flood damage, by:

1. Land use regulation,
1. Flood plain management,
2. Development and redevelopment policies,
3. Structural changes, and
4. Flood proofing.

**(b) Modifying the loss burden:**

The second approach to flood management is to modify the incidence of loss burden, is actually a strategy for mitigating the losses by means of action designed to assist the individual and the community in the preparatory, survival and recovery phases of floods. Although the flood insurance has so far not been widely adopted in India, it has several advantages as means to lessen the burden of farmers. It enables an individual property owner to spread an uncertain but potentially large loss, uniformly over a long period of time. Flood insurance does not reduce the loss potential, but provides a mechanism for spreading it over time and large number of individuals. The advantage of this is that only those activities that can afford the premia can continue occupation and insurance requirements in mortgage agreements can become a factor in stimulating the adoption of flood proofing measures.

Before, initiating any action on flood insurance, National Flood Commission has recommended that the state Governments should carry out realistic evaluation of the flood damage, river basin-wise and under three separate categories namely, unprotected areas, protected areas susceptible due to failure of protective works, and areas between embankments and the river.

## **Flood Plain Zoning:**

Flood plain zoning (FPZ) aims at disseminating such 'potential loss information' on a wider basis so as to regulate indiscriminate and unplanned development in flood plains and is relevant both for protected and unprotected areas. FPZ recognizes the basic fact that the flood plains are essentially the domain of the rivers and as such all development activities in flood plains must be compatible with the flood risk involved. Heavy encroachment on flood plains has been responsible for increasing trend of damage over the years. On the basis of maps prepared after studying the flood cycles, experts have suggested that important structures such as homes defense and telecom installations, hospitals etc. be build farthest from the riverbed at elevated sites along the river banks. Less important structures like parks and playgrounds could be built in low - lying areas, which according to FPZ would entail minimum damage in event of floods.

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**Table-1: Flood affected area, population and length of embankments in Bihar**

Region	Population (1991) (In million)	Area (milliom ha.)	Population density Per sq. Km.	Flood Affected area (Millon ha.)	Length of embankments (Km.)
North Bihar	4013.1	585.0	686	444.7 (76.02)	29252
South Bihar (now Jharkhand)	4624.3	1153.8	482	175.1 (17.51)	502
Total	8637.4	1738.8	497	646.1 (37.10)	3454
Urban areas	1135.3	27.8	4094	----- (13.14)	-----
Rural areas	7502.1	1711.0	438	----- (86.86)	-----

Figures in the parentheses denote the percentage of areas affected by floods.

**Table-2: Flood prone and catchment area of main rivers of Bihar.**

River	Flood prone area (million ha.)	Catchment Area in Nepal (sq.Km.)	Catchment Area in Bihar ( sq.Km.)	Total catchment area (sq.Km.)
Sone	37.0	-----	17651	71250
Punpun	61.3	-----	8530	8530
Kuil	63.4	-----	16580	16580
Badua	10.5	-----	1738	1738
Chandan	11.3	-----	538	538
Burhi Gandak	82.1	2420	8911	11331
Gandak	33.5	35470	4188	39658
Ghaghra	25.3	70303	2927	73230
Bagmati	44.4	7884	6569	14453
Kamla	37.0	2744	4333	707
Kosi	101.5	62620	12667	75387
Mahananda	51.5	7157.70	615010	13307.80
Ganga	129.2	-----	19322	113163
Total	688.0	188598.70	718964	439872.80

**Table-3: Basin-wise flood prone area, protected area and length of embankment**

<b>Basin</b>	<b>Protected area (million ha.)</b>	<b>Length of embankment(Km.)</b>
Gandak	62.4	456.04
Burhi Gandak	40.1	656.80
Bagmati	16.7	222.15
Kosi	97.0	888.50
Kamla	28.1	155.50
Ghaghra	07.9	125.20
Punpun	02.6	40.60
Chandan	00.8	65.00
Mahananda	12.1	247.80
Ganga	24.6	537.83
Sone	02.1	51.64
Kuil&Harohar	-----	7.00
Total	294.4	3454.06

**Table-4: Details of flood prone, protected area and length of embankments (region-wise)**

<b>Particulars</b>	<b>Area (million ha.)</b>
Total flood prone area in Bihar	646.1
Total flood prone area in North Bihar	444.0
Total flood prone area in South Bihar	201.4
Total protected area in Bihar upto 31.3.1998	294.4
Total protected area in North Bihar	271.6
Total protected area in South Bihar	22.8
Total length of protective embankment in Bihar	3454 Km.
Total length of protective embankment in North Bihar	2952 Km.
Total length of Protective embankment in South Bihar	502 Km.



**Table-5: Capital expenditure on flood control projects in Bihar (1999-2000)**

<b>Name of scheme</b>	<b>Budget allocation (Million Rs.)</b>
North Bihar flood control scheme	257.0
Kosi flood control and embankment strengthening	30.3
South Bihar flood control scheme	32.9
Top-priority flood control scheme	43.3
Drainage scheme	---
Barauni-Begusarai industrial area flood control scheme	12.8
<b>Total</b>	<b>376.3</b>