



SITE PRIORITIZATION FOR IBFI

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Inception Workshop on Index Based Flood Insurance (IBFI) for Agriculture Risk Management

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Hotel Gargee Grand, Patna*

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Objectives and Project Outputs

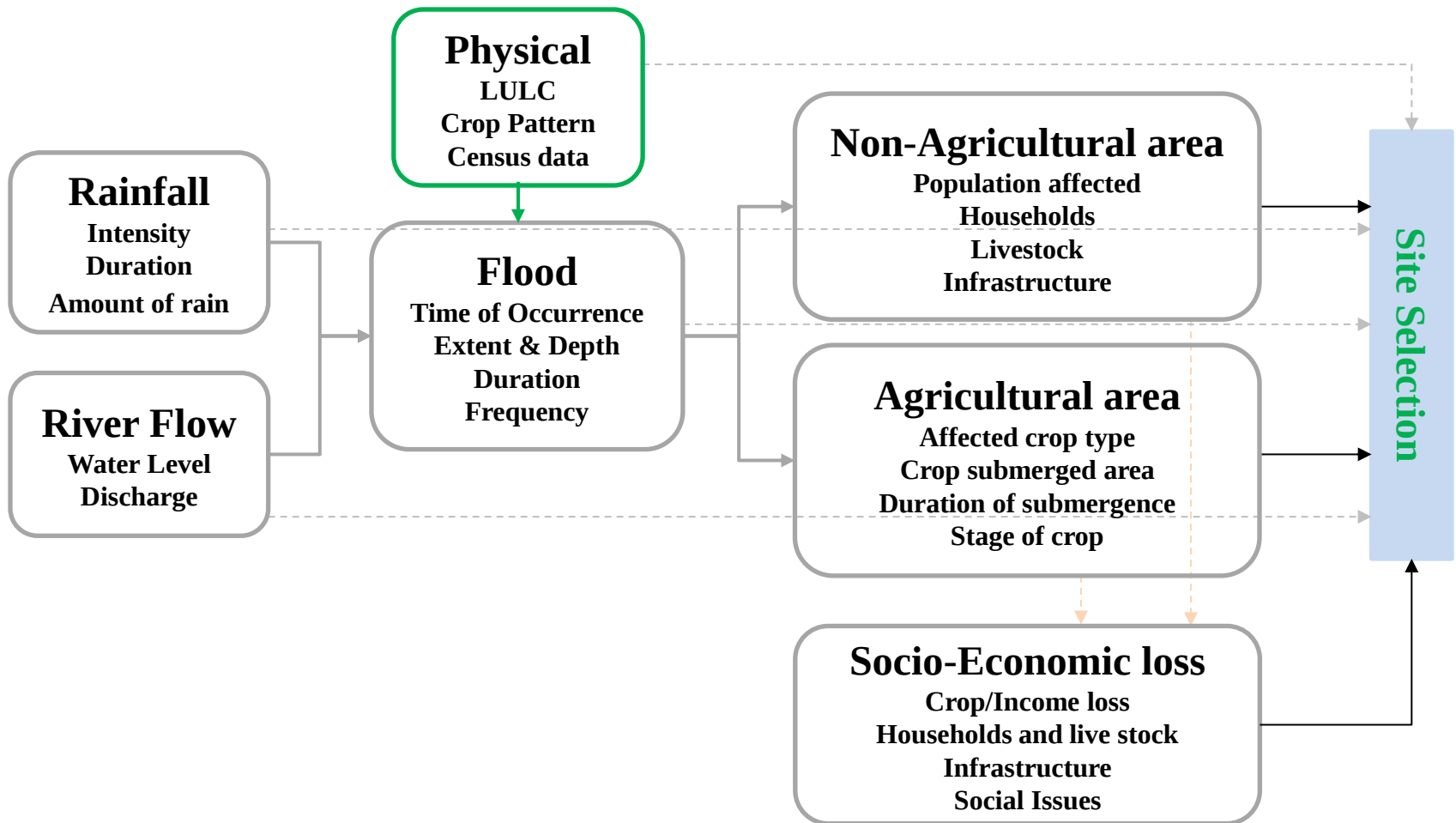
Outlines of presentation

- Historical flood events and its impact on agriculture and population in flood plain.
- Data integration and parameters for proposed IBFI site selection
- Data used to design IBFI for agriculture
- Selection of pilot area to implement IFBI

Key Outputs of Project

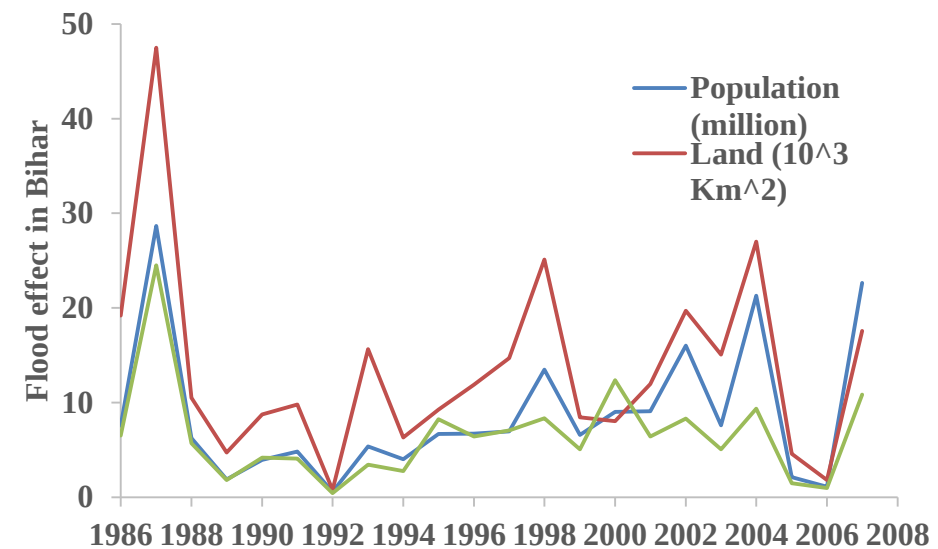
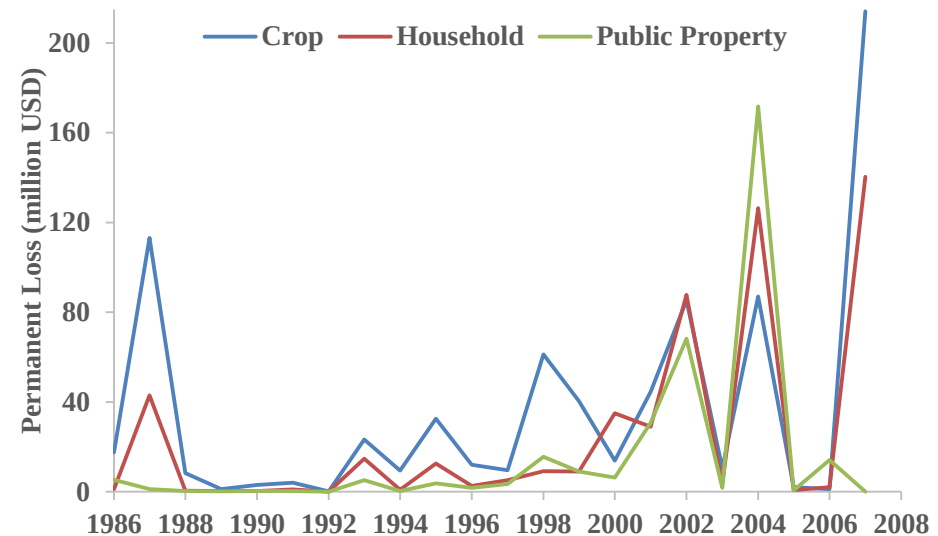
- Development of flood hazard models (FHM) to define flood risk zones
- Integration of FHM parameters with crop life cycle
- Design a index based flood insurance and implement that in pilot area
- Provide efficient and cost-effective Flood insurance program

Data Integration & Site Prioritization



Impact of Flood on Agriculture and Peoples in Bihar

- Bihar is most flood-prone state in India and its 73% of land is flood affected
- North Bihar is more susceptible due to high discharge and sediment loads from river originating in Nepal.
- 2008 and 2007 are two major flood events in recent past from different origin
- 2004 has witnessed largest extent of flood



Source: 2007 Kosi flood report

Parameters and Data source

Hydrological

- Fluvial/Monsoonal/Combine
- Flood Parameters (Extent, Intensity, Frequency, time of Occurrence)
- River Flow (discharge, water level)

IWMI database (2001-2014, MODIS derived Data), state and federal Govt. agencies' reports and other literatures, In-situ measurements and IMD grid data (1980-2012), WRIS

Agriculture

- Crop land under inundation
- Stage of crop during inundation
- Duration of crop submergence in water

Reports and data from Agriculture dept., BDMA/FMIS (2001-2012), IndiaStat, Remote sensing derived data developed by IWMI, IFPRI etc.

Economic

- Crop Loss
- Number of Peoples affected/loss of life
- Loss of Live Stocks/Fodder, infrastructure

Reports and data from Agriculture dept., BDMA/FMIS

Physical

- Geography (Land use, individual's land hold etc.)
- Farmer economic condition
- River basins

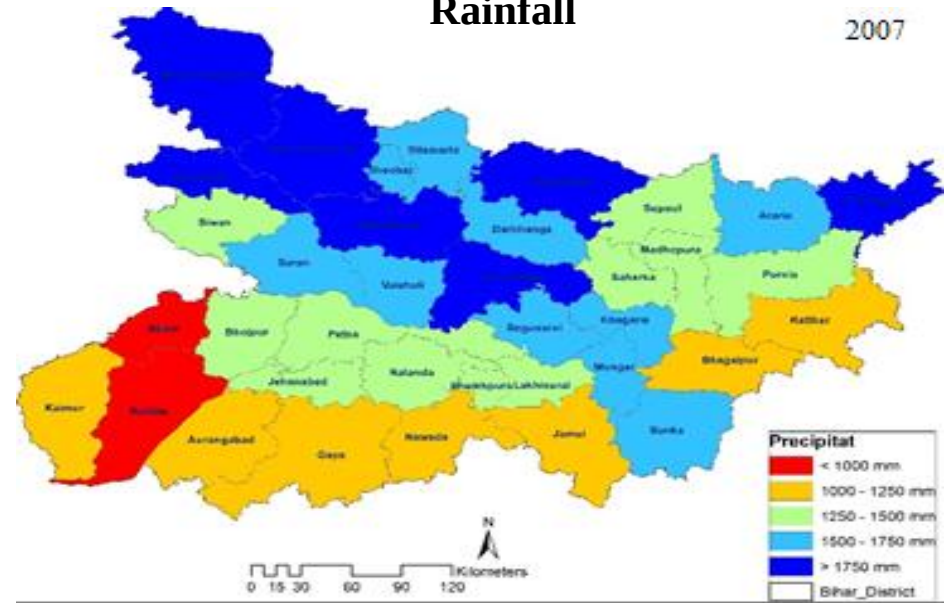
India Census 2011; WRIS-India: Bihar Statistical handbook 2007, 2012: state economic survey data, digital terrain data

Site Prioritization Analysis: Hydrological Data (1/2)

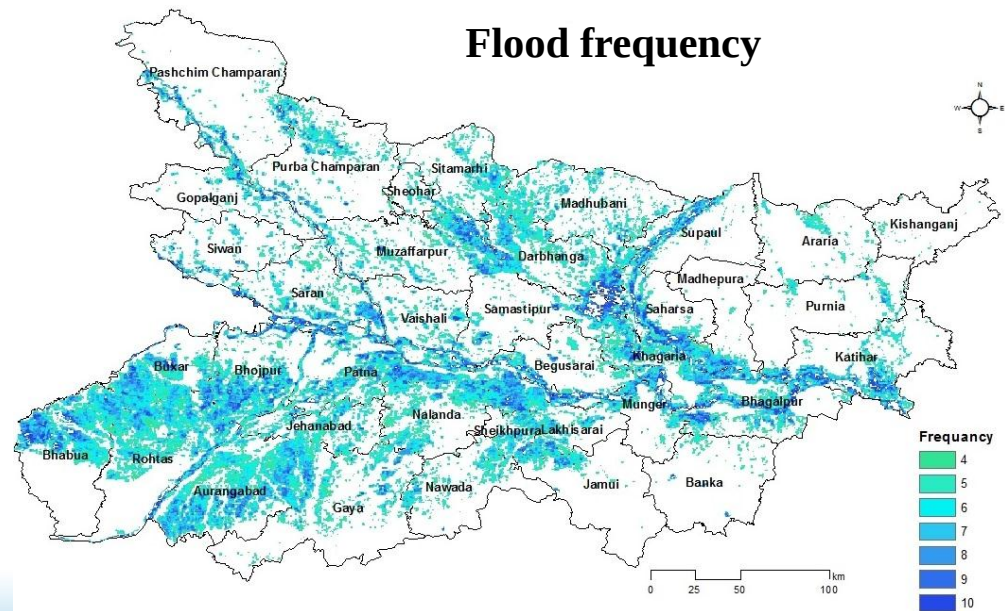
Rainfall

2007

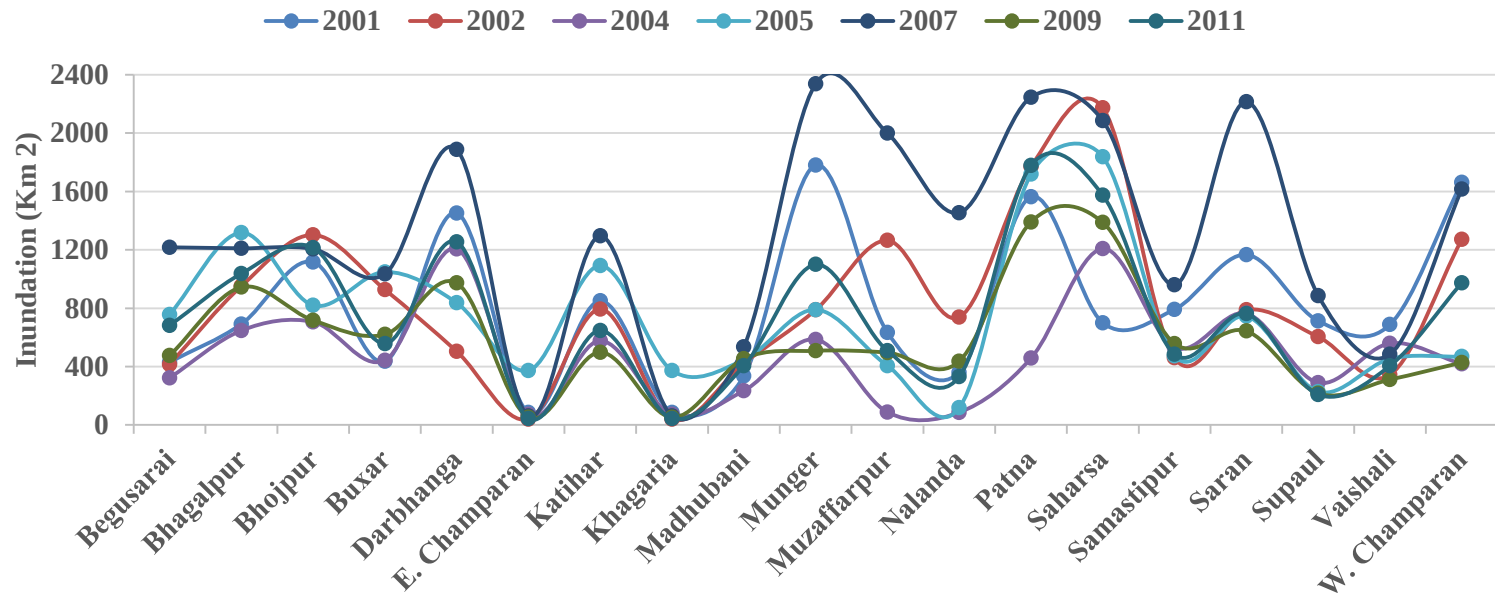
- Analyzed long-term historical rainfall data from IMD in different districts of Bihar
- Prepared inundation map from MODIS and calculated flood extent, duration, frequency and compared with data from FMIS, BDMA and other reports
- River flow information from altimeter and in-situ measurements



Flood frequency

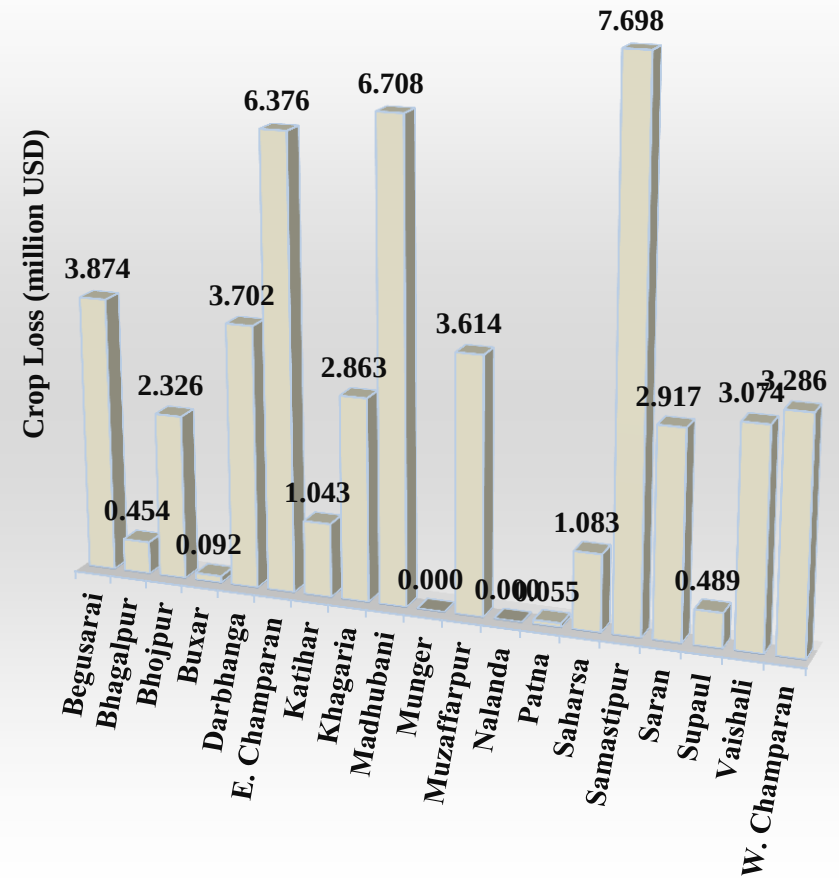
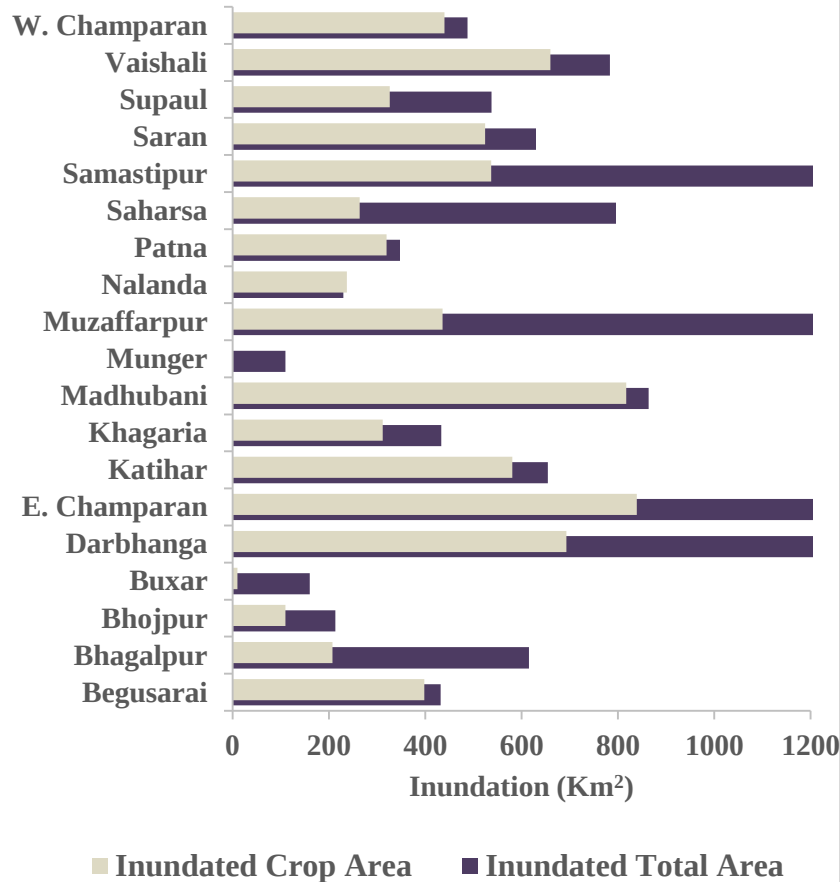


Site Prioritization Analysis: Hydrological Data (2/2)



- Many of Districts in Bihar from MODIS images show high inundation
- Flooding in Dharbhanga, Muzaffarpur, and Sitamarhi from MODIS shows high correlation in magnitude with literature data

Site Prioritization Analysis: Submerged crop, total area & crop loss



Source: 2007 Kosi flood report, Bihar Statistical Year Book,

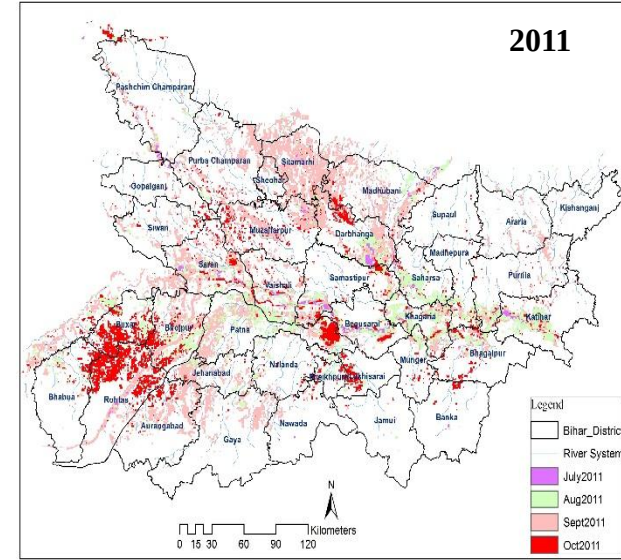
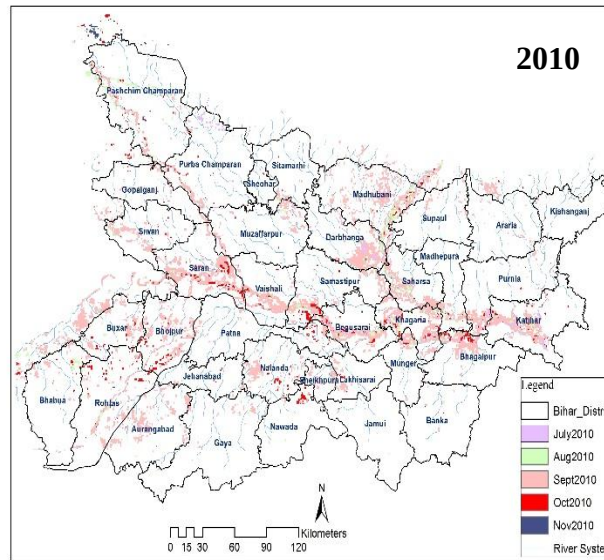
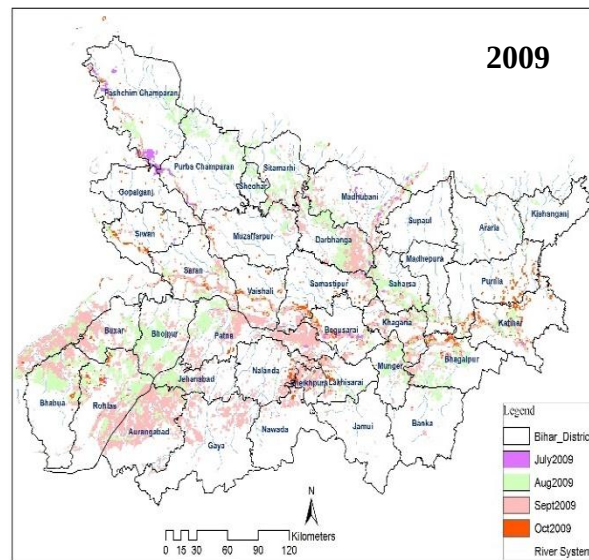
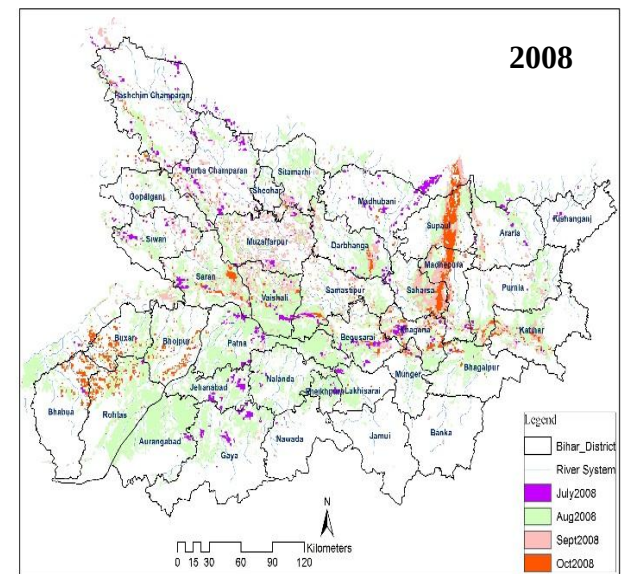
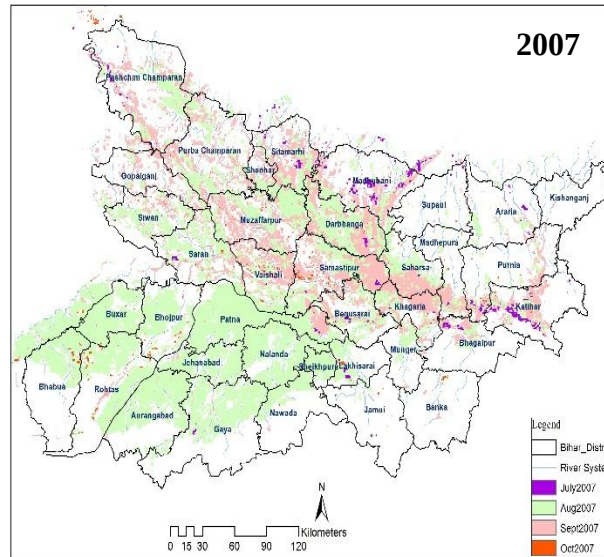
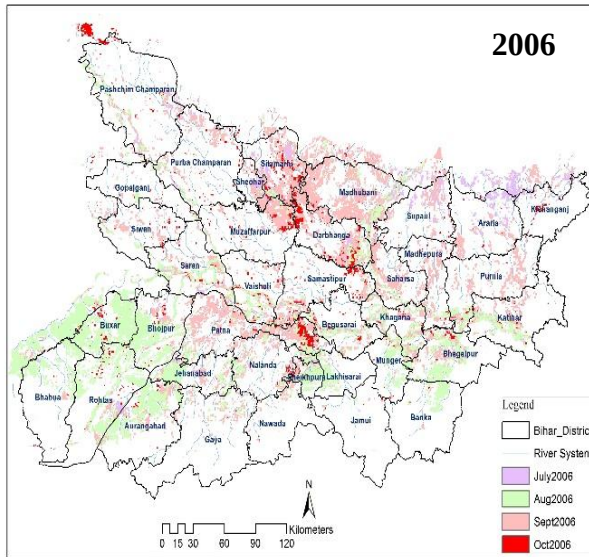
District(s) Selected For Pilot Area

Districts	Rainfall	Submerged Total Area	Submerged Crop area	Crop loss (million USD)	No of Villages	No of Peoples
E. Champaran	1199.58	1655.7	838.8	6.376	52840	1406400
Muzaffarpur	1023.91	2211.8	435.7	3.614	22378	1125429
Samastipur	937.24	2832.5	536.7	7.698	29391	819857
Madhubani	1048.16	864	817.1	6.708	36580	948571
Darbhangha	931.21	1320	692.9	2.326	4996	1746571
W. Champaran	1250.26	440	488	3.286	NA	244143
Vaishali	1013.3	783.3	660	3.074	12	542750
Saran	954.85	524	630	2.917	86	555000

- Some districts which records high rainfall, flood frequency and inundation but crop submerged and crop loss is comparatively low

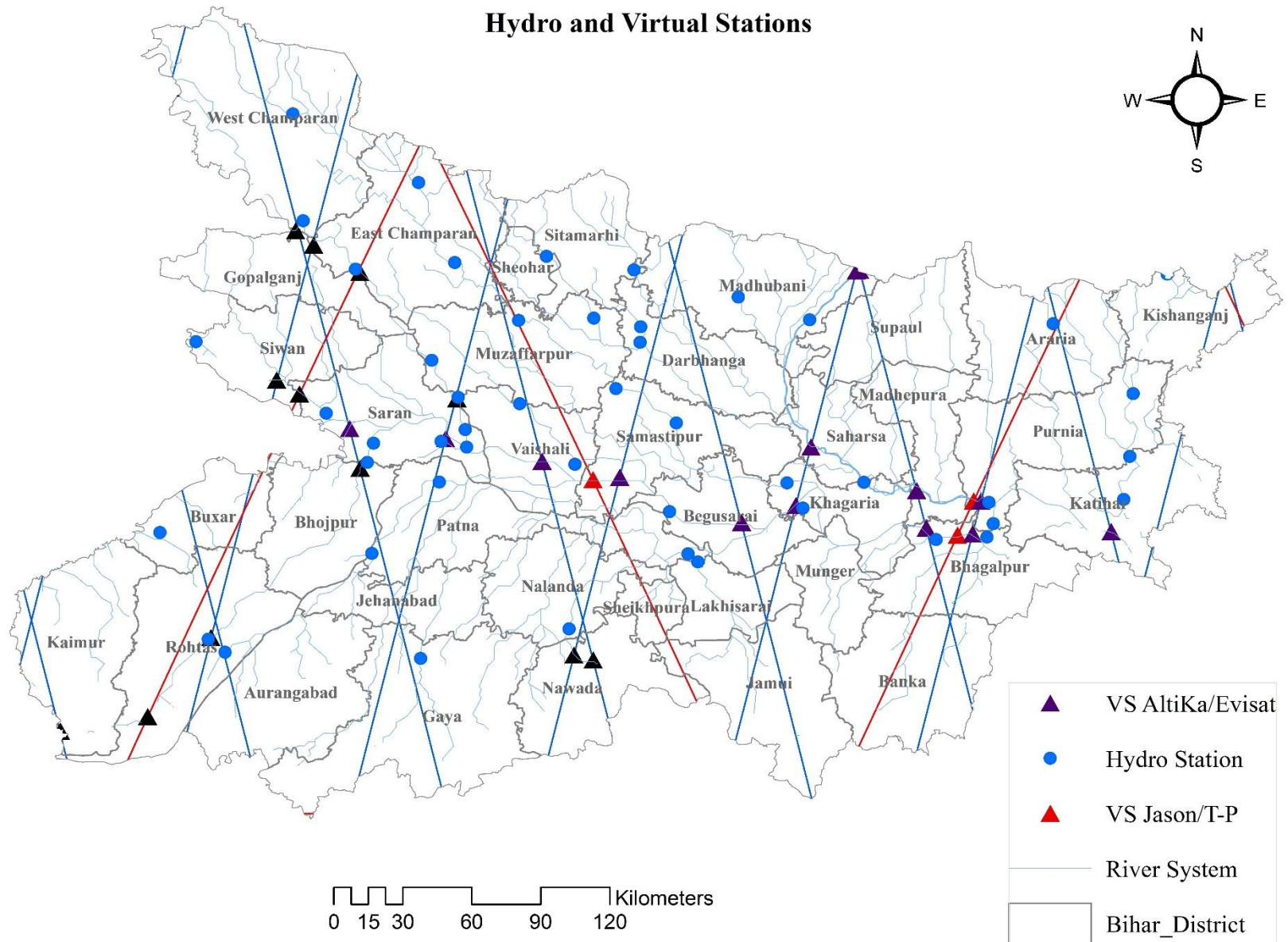
Thank You !

Bihar Inundation Map 2006-2011



In-situ & Altimeter based Hydrological stations

Hydro and Virtual Stations



Climate Of Bihar

Agro-Climatic Zones	Districts	Soil Types	Annual rainfall (mm)	Water Logging
Zone I (Northern West)	W. Champaran, E. Champaran, Siwan, Saran, Sitamarhi, Muzaffarpur, Sheohar, Vaishali, Madhubani, Darbhanga, Samastipur, Gopalganj, Begusarai	Sandy Loam, Clay Loam	1040-1450 (1245)	Flood prone
Zone II (Northern East)	Purnea, Katihar, Saharsa, Supaul, Araria, Madhepura, Khagaria, Kishanganj.	Sandy Loam, Clay Loam	1200-1700 (1450)	Flood prone
Zone III (Southern East-West)	Sheikhpura, Munger, Jamui, Lakhisarai, Gaya, Bhagalpur, Banka, Rohtas, Bhojpur, Buxar, Patna, Bhabhua, Arwal, Nalanda, Nawada, Jehanabad, Aurangabad.	Sandy Loam, Clay Loam, Clay	990-1240 (1115)	Drought prone

District(s) Selected For Pilot Area

Districts	Hydrological data					agriculture			demographic and infrastructure			Economic loss (million USD)		
	Rain (mm) IMD	no of rainy days	inundated Area (Km2)	Inundation days avg.	Flood Frequency	affected crop+non- crop area	affected crop area	rice production (mt)	No of Peoples	households	village	crop loss	household damage	Infrastructure loss
Muzaffarpur	1023.91	50	1750.16	58.67	5	2211.8	435.7	13205.0	1125429	679.67	22378.00	3.614	0.020	0.000
Samastipur	937.24	48	1822.09	75.56	5	2832.5	536.7	8237.0	819857	367.33	29391.00	7.698	0.003	0.858
Madhubani	1048.16	44	1151.47	32.00	5	864.0	817.1	8456.2	948571	407.00	36580.33	6.708	9.396	0.179
Darbhanga	931.21	49	1697.56	42.67	6	1320.0	692.9	6822.6	1746571	975.00	27767.67	3.702	0.004	0.083
Bhojpur	940.20	42	1336.56	42.67	6	213.3	110.0	280.4	321000	210.00	4996.00	2.326	0.647	4.168
Begusarai	961.27	42	994.28	60.44	5	431.7	398.0	900.2	295400	238.50	20421.50	3.874	0.000	0.071
Bhagalpur	1291.47	50	1717.69	70.22	7	615.0	207.3	877.7	235333	339.00	4145.00	0.454	0.088	0.071
Buxar	864.23	39	1016.09	42.67	6	160.0	10.0	0.0	171000	12.00	0.00	0.092	0.000	0.000
East Champaran	1199.58	53	1137.97	40.00	6	1655.7	838.8	26519.4	1406400	1159.00	52840.00	6.376	0.000	0.000
Katihar	1249.55	53	1611.16	79.11	7	581.0	654.3	58551.4	355286	235.00	0.00	1.043	0.006	0.000
Khagaria	1011.70	49	1303.25	56.89	6	433.6	311.4	2082.8	487143	113.33	16282.50	2.863	0.038	0.092
Munger	955.49	48	813.78	48.00	8	110.0	0.0	288.5	0	0.00	0.00	0.000	0.000	0.000
Nalanda	811.97	44	1004.69	34.67	6	229.8	237.0	0.0	242333	104.00	0.00	0.000	0.000	0.000
Patna	884.06	45	2467.28	73.78	7	347.5	320.0	1446.8	324250	230.00	0.00	0.055	0.000	0.000
Saharsa	1098.92	46	962.44	51.56	7	796.3	264.0	7628.6	319667	89.67	6118.67	1.083	0.076	0.004
Saran	954.85	48	1799.84	78.22	6	524.0	630.0	4466.0	555000	169.00	86.00	2.917	0.002	0.000
Supaul	1262.26	55	766.75	48.89	5	537.4	326.0	6156.0	193143	87.33	6224.67	0.489	0.245	0.002
Vaishali	1013.30	46	1252.06	59.56	6	783.3	660.0	4066.0	542750	104.00	12.00	3.074	0.002	0.000
West Champaran	1250.26	50	1148.41	53.33	5	440.0	488.0	30938.8	244143	20.00	0.00	3.286	0.000	0.007