

RESILIENT/ADAPTIVE AGRICULTURE IN FLOOD AFFECTED AREAS

and

URBAN CLIMATE CHANGE RESILIENCE

(Case of Gorakhpur City)



Towards Climate
Resilient communities in South Asia
New Delhi, 13-14 Dec. 2012



Dr. Shiraz Wajih

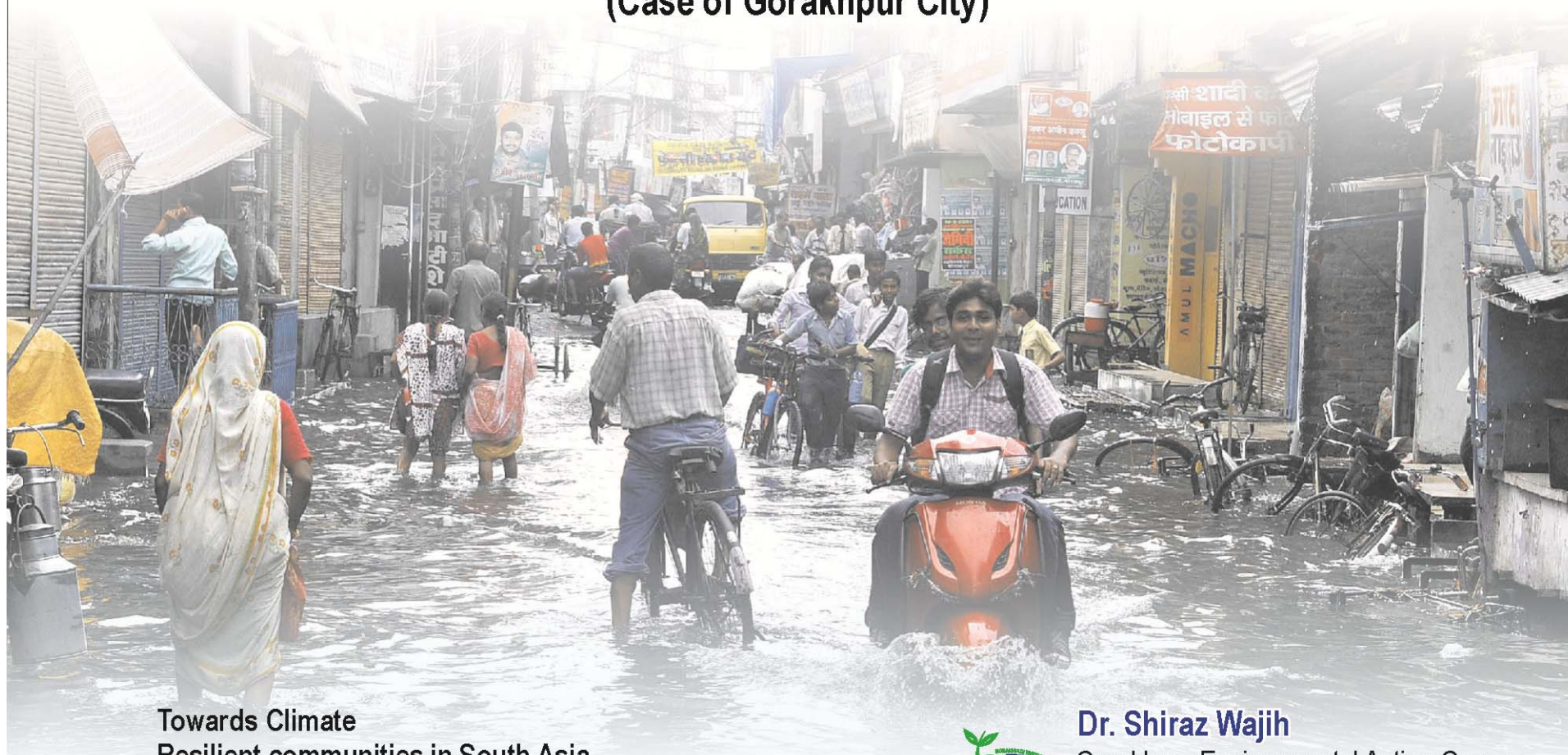
Gorakhpur Environmental Action Group
Post Box # 60, Gorakhpur

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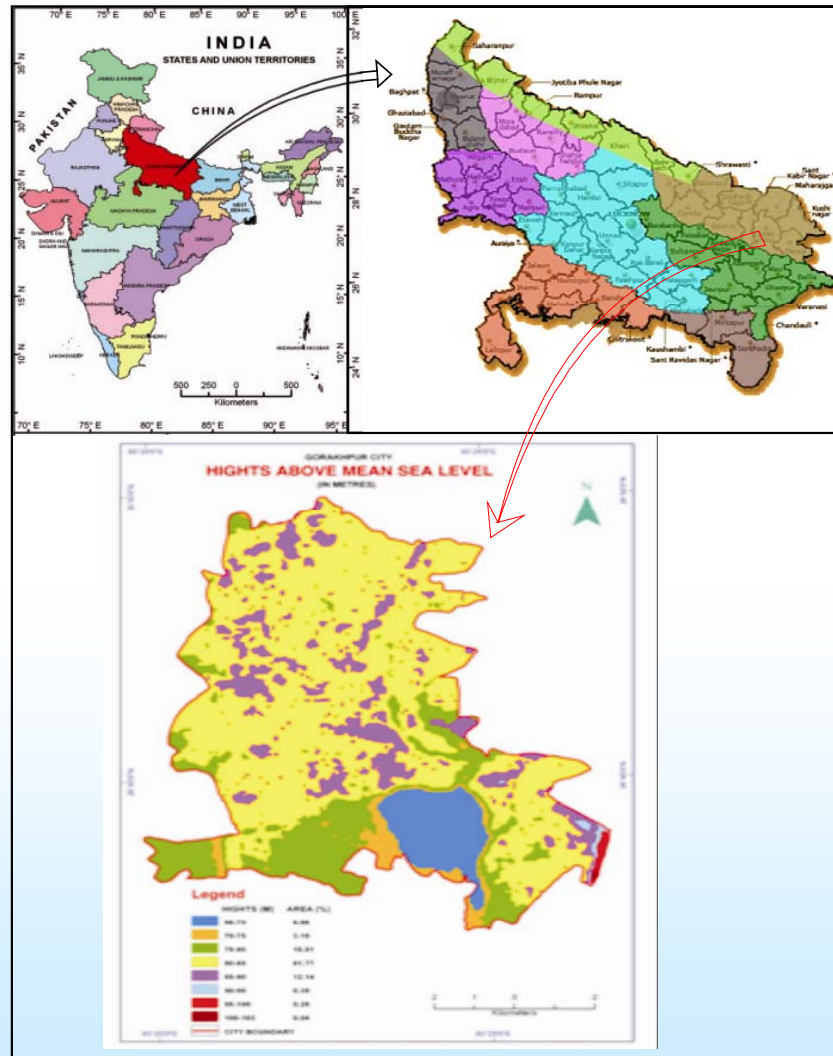


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Location Map



Agriculture in U.P.

- Production
- Livelihoods

U.P.

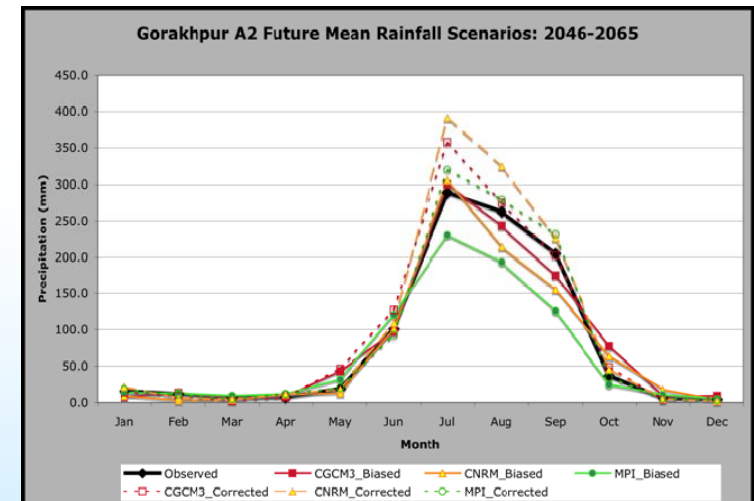
- 30 % to state income
- Largest employment provider
- Direct employment to 35.5. million population
- Small-Marginal-Landless : More than 90%
- Average land holding 1 acre
- 70 percent land under problem
- Large scale Urban migration due to production losses

Flood : Changing trends

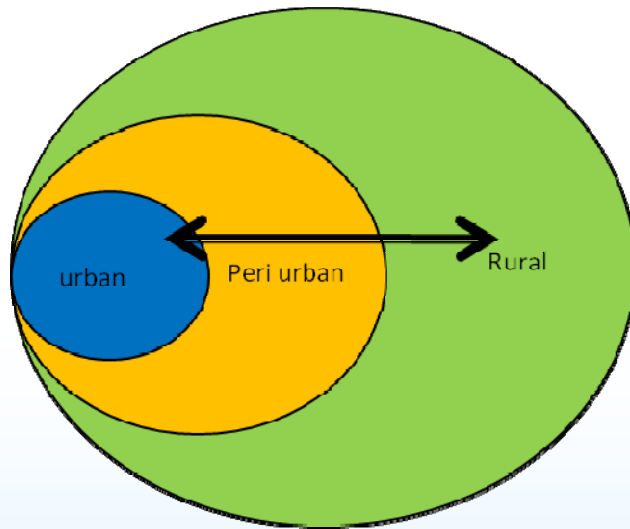
- Change in time, volume, pattern etc.
- Increasing frequency of flash floods
- Smaller rivers- major causes
- Dry spells during monsoon
- Temperature increase during winters
- Increasing duration of water logging

Rainfall Pattern

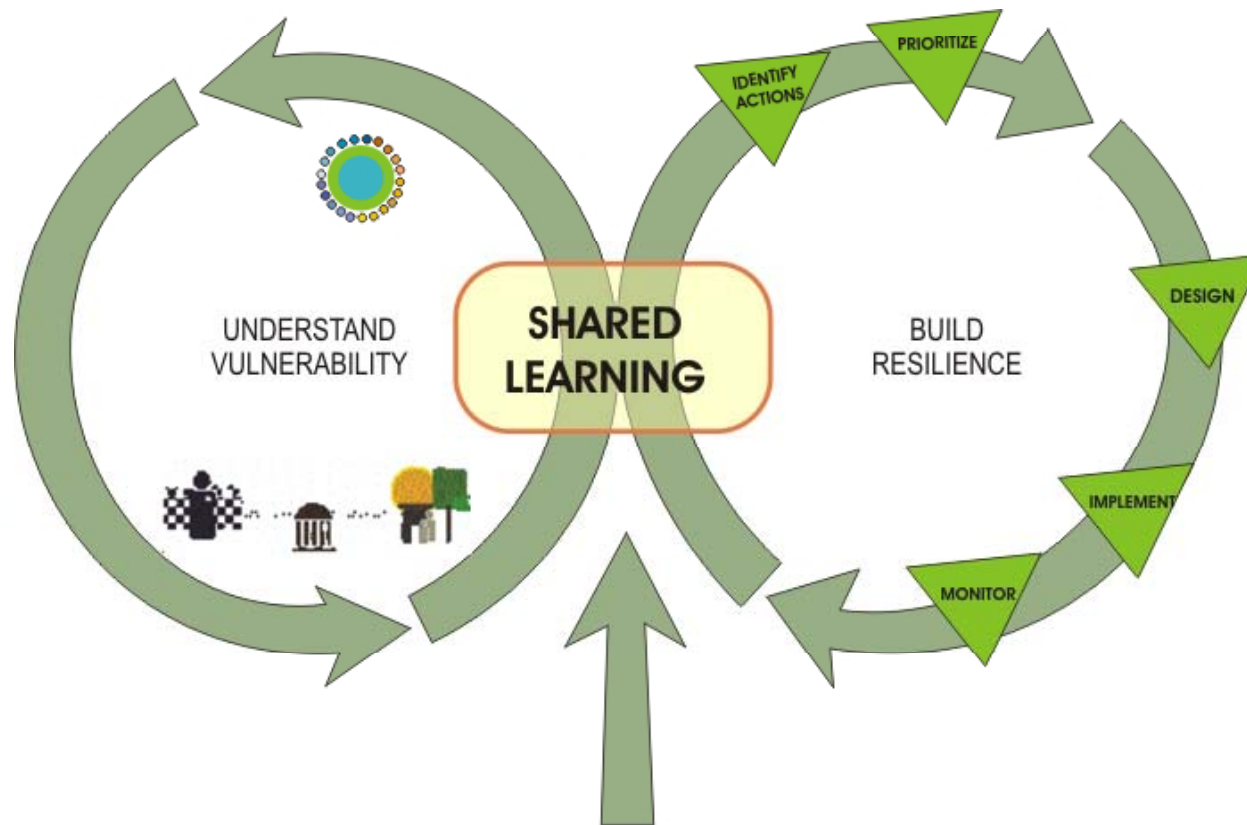
	Historic	A2R1	A2R5	B1R3	B1R4
January	18.2	8.57	4.98	8.21	6.98
February	16.01	5.9	6.37	6.3	6.23
March	20.97	2.88	4.87	6.26	3.17
April	40.76	3.78	3.93	4.15	3.88
May	127.09	86.56	152.99	81.95	188.08
June	366.55	410.21	410.33	389.39	470.72
July	648.29	568.56	511.56	568.01	604.46
August	476.05	503.08	503.48	504.58	500.5
September	321.58	346.54	353.27	364.59	292.65
October	86.9	36.09	26.74	20.08	23.59
November	8.38	1.21	1.76	1.46	1.8
December	19.47	116.61	9.05	8.7	8.28



Vulnerability (Resilience)



- Basic infrastructure
- Social Institutions
- Economic base
- Natural environment



Resilience Framework



What?

- *Systems* comprise elements and linkages: ecosystems, infrastructure, knowledge
- Key characteristics: flexibility and diversity, modularity and redundancy, safe failure



Who?

- Focus on *agents* (individuals, organizations, groups): their behavior, socio-economic position, authority, marginalization, etc
- Key capacities: Responsiveness and (re-) organization, resourcefulness and planning, capacity to learn.

Urban Resilience Framework



How?

- ***Institutions***: the rules or practices that guide how agents interact with each other and with systems
- Key factors: access (rights / entitlements); decision-making; information

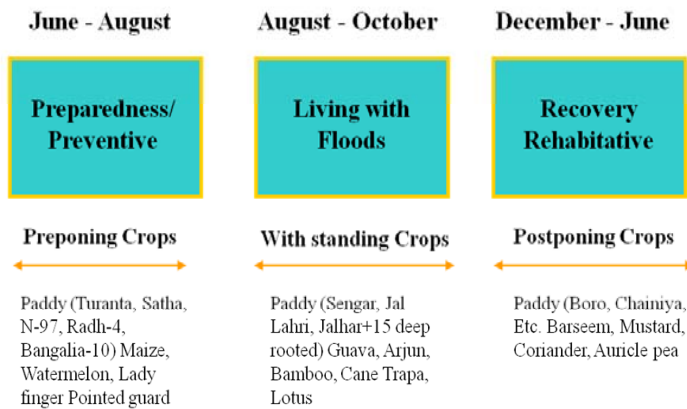


Fragile systems / low capacity agents / weak institutions + **exposure** = **VULNERABILITY**

Resiliency in Flood affected area developed through

Criteria	Examples
Redundancy	Diversity : Livestock, agriculture
Flexibility	Robustness of Farm System, Drainage
Responsiveness	Time & Space Management in Cropping System
Capacity to learning	ITK, experiment etc

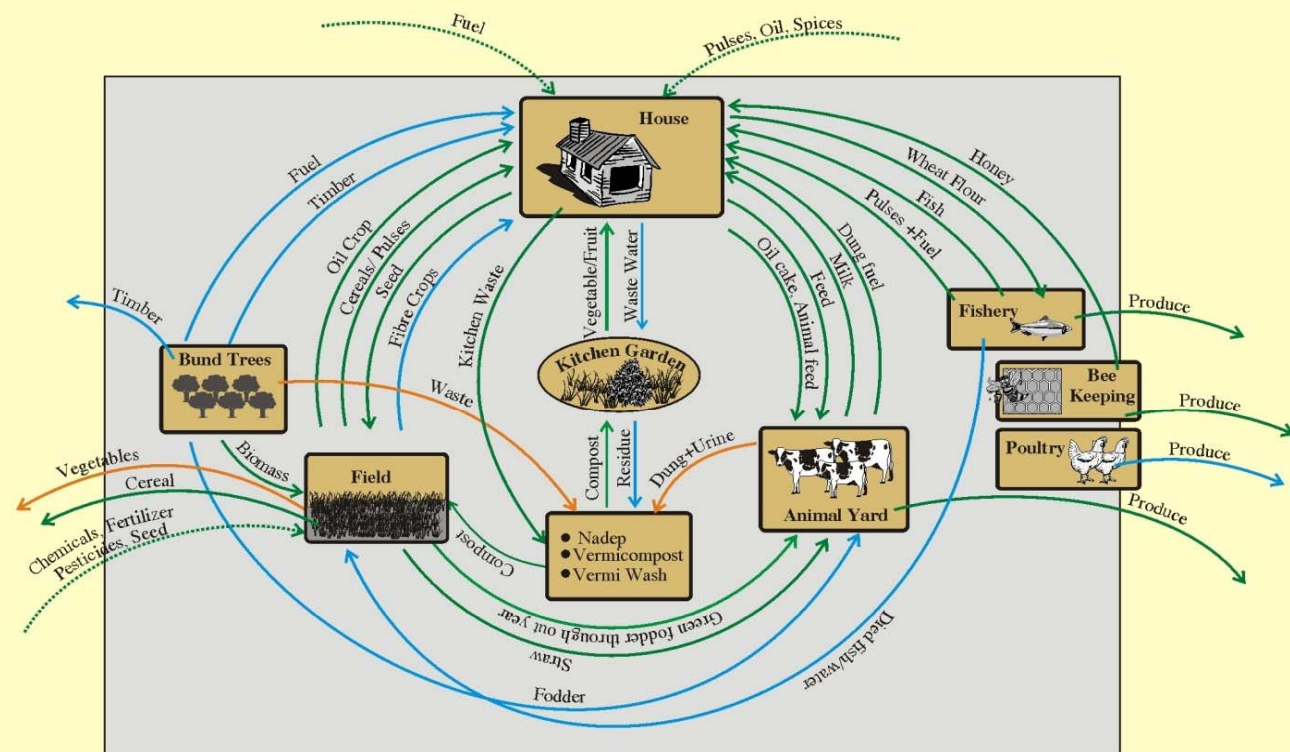
Time Management



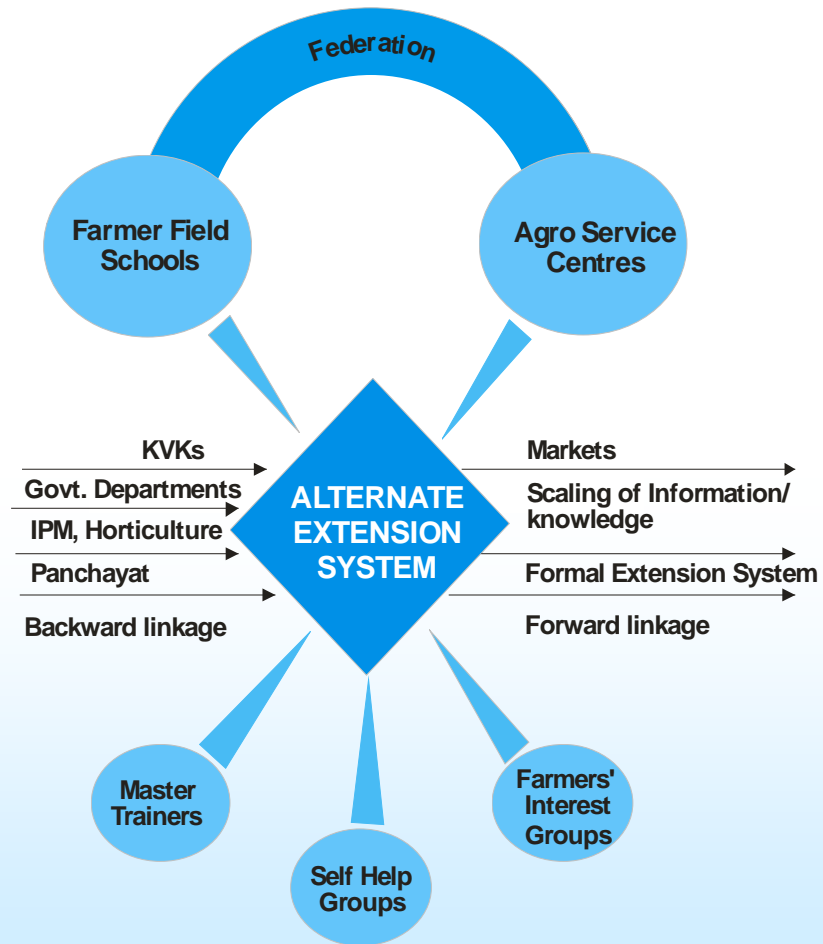
Multi-tier cropping



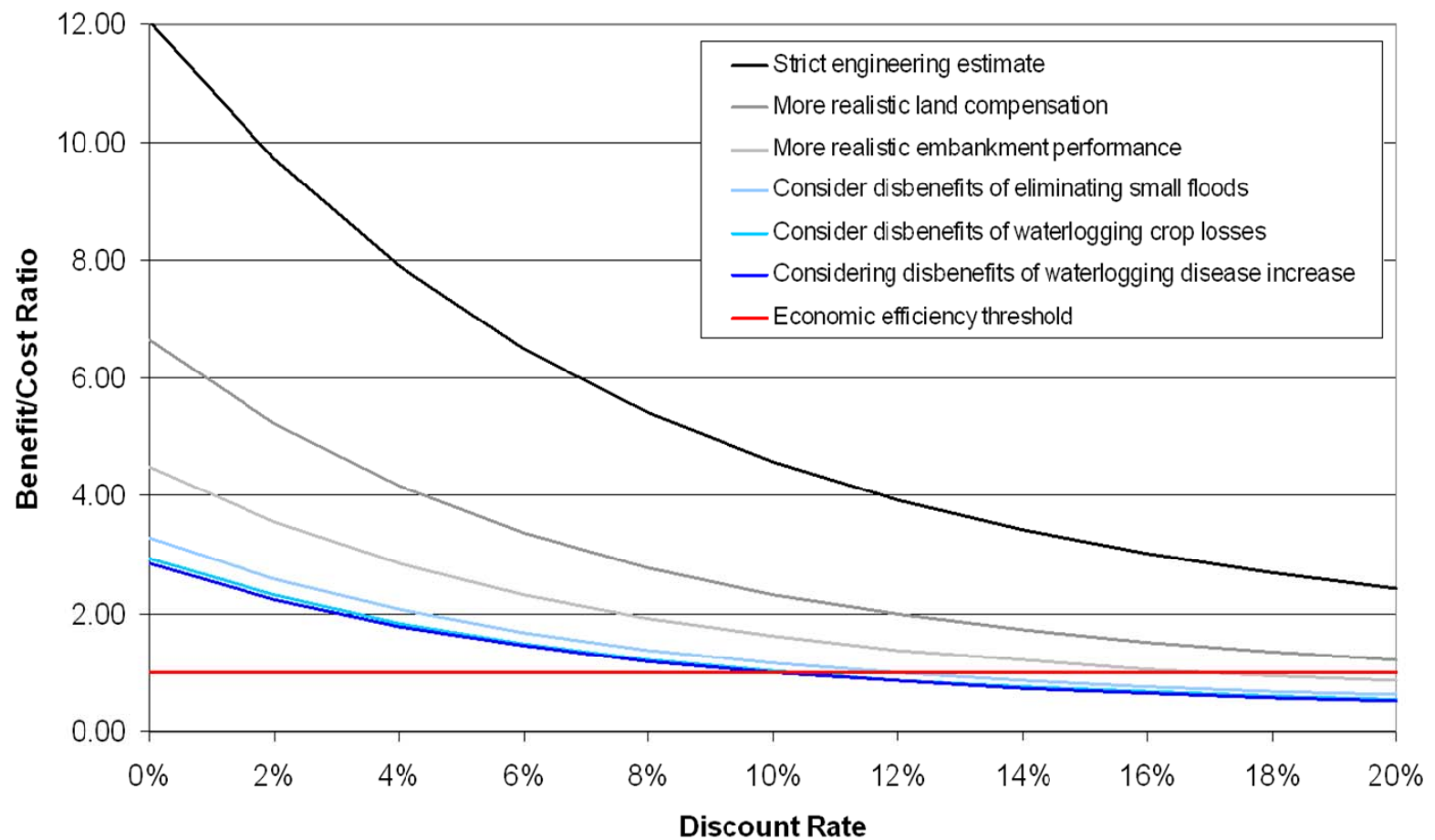
Integration of Farm Sub System



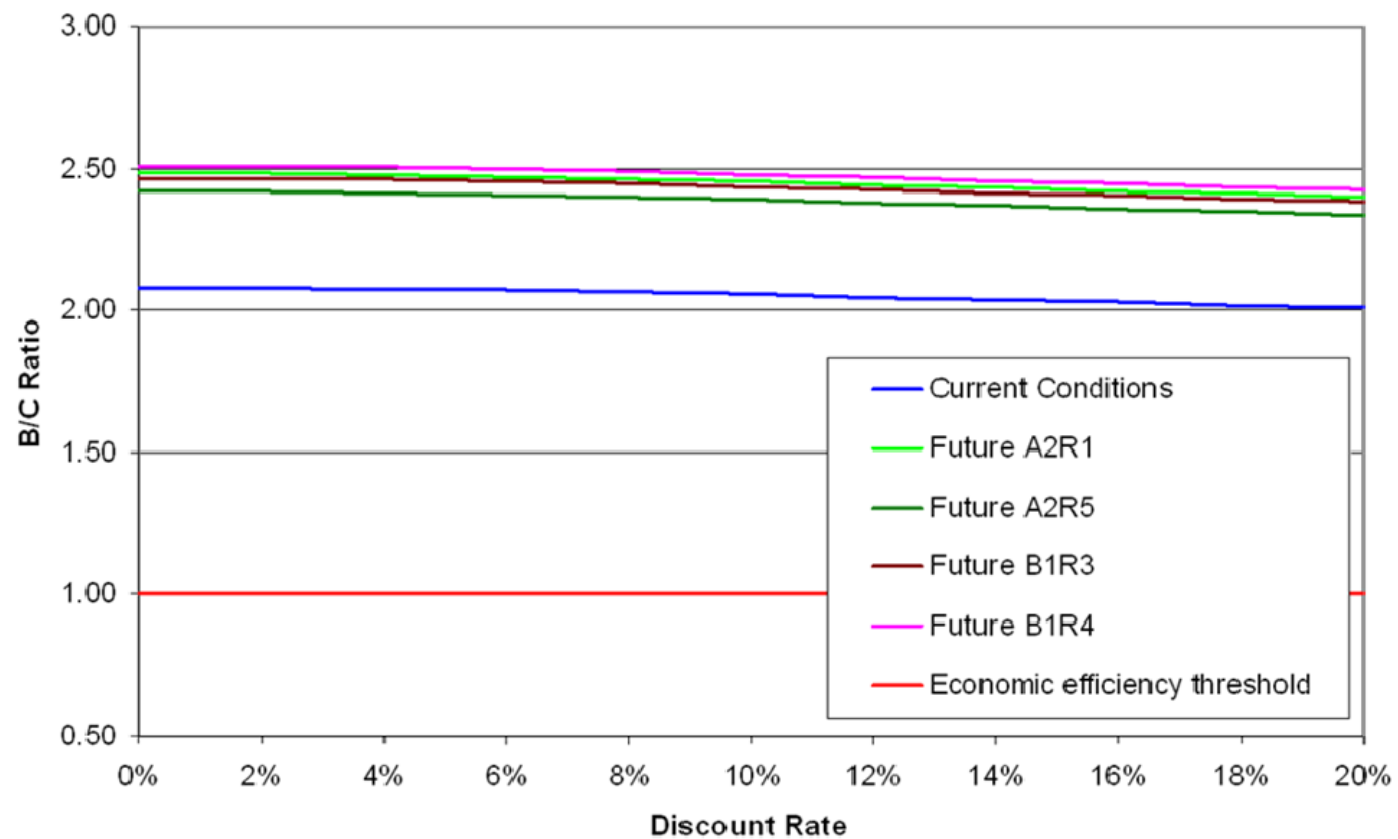
Model of Alternate Extension System



Results of CBA for historical Embankments Performance



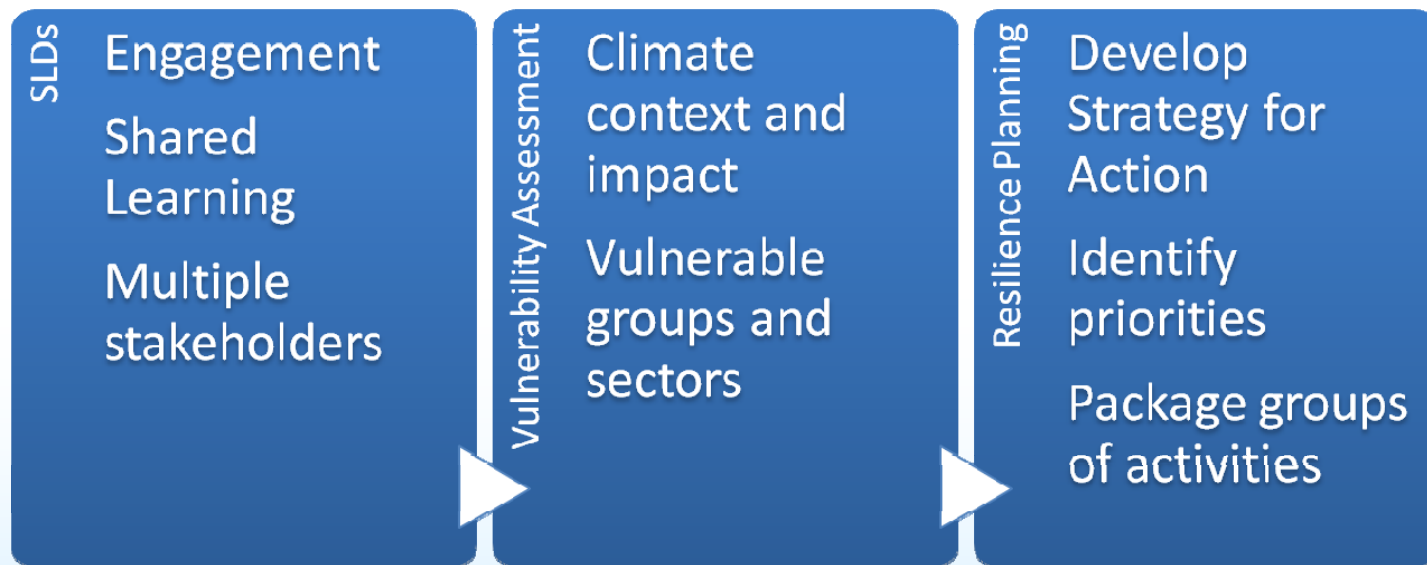
Results of CBA for people-centered Flood Risk Reduction



100%

	Financial Loss Categories										
Interventions	Housing	Assets	Crops	Seeds	Livestock	Fodder	Debt Servicing	Wages	Health/Medical	Food & Grain	Infrastructure
Individual Level											
Raise house plinth	X	X			X	X				X	
Raise fodder storage unit					X	X					
WatSan package							X		X		
Community Level											
Early warning		X									
Elev. Handpumps & Toilets					X				X		
Flood shelters		X			X				X	X	
Community grain bank							X				
Community seed bank							X				
Maintain key drainage points	X	X	X	X	X	X	X	X	X	X	X
Self help groups							X				
Purchase community boat								X			
Societal Level											
Flood adapted agriculture			X								
Strengthen overall healthcare							X	X	X		

Resilience Planning in Context



Climatic Change

CAUSES

Natural

Behavioral

Polices
& politic

Action
required

THE RISK FRAME

Effects

Water Logging

Solid waste

sewerage

Effects

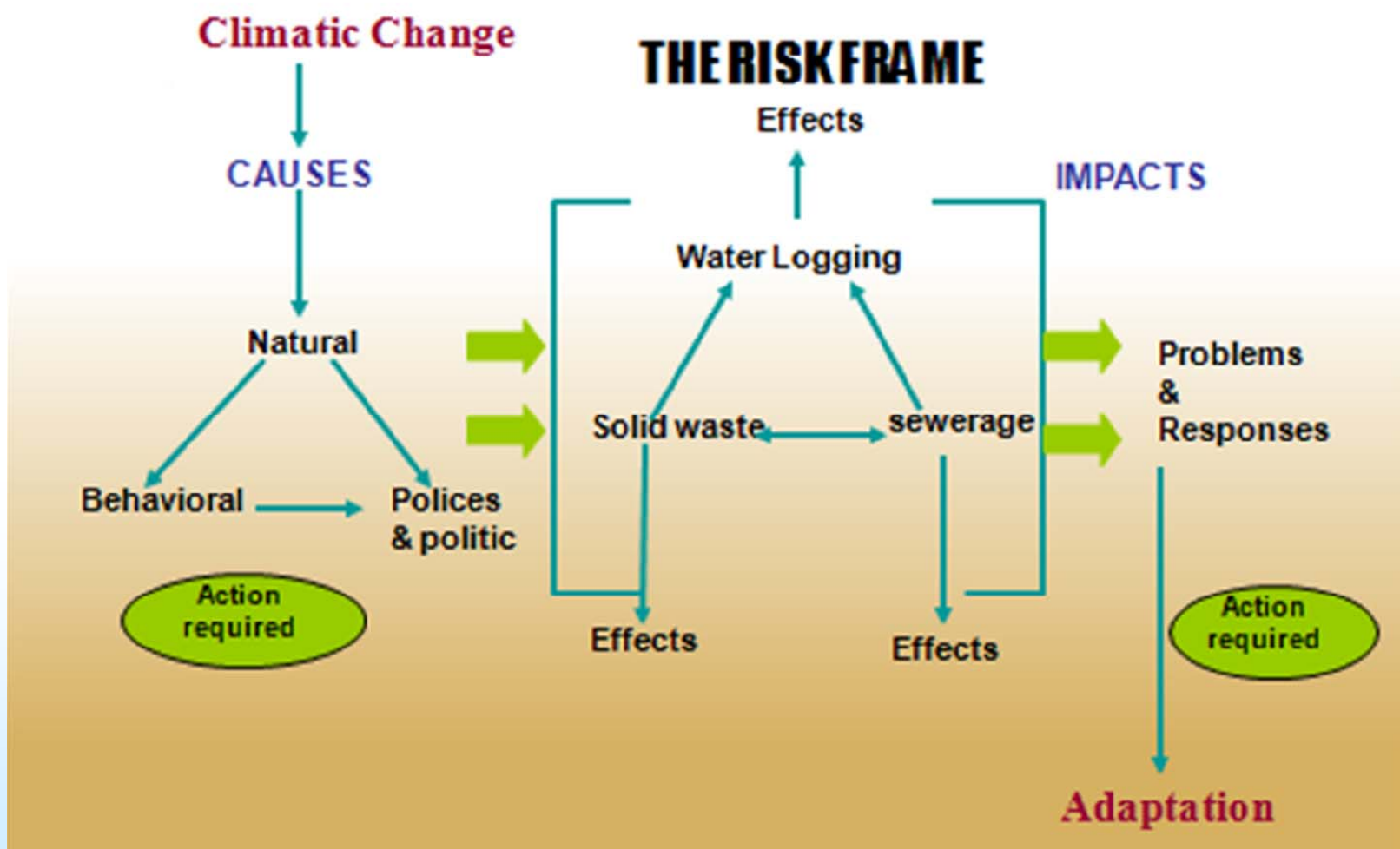
Effects

IMPACTS

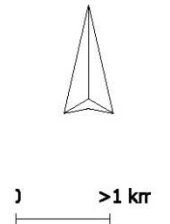
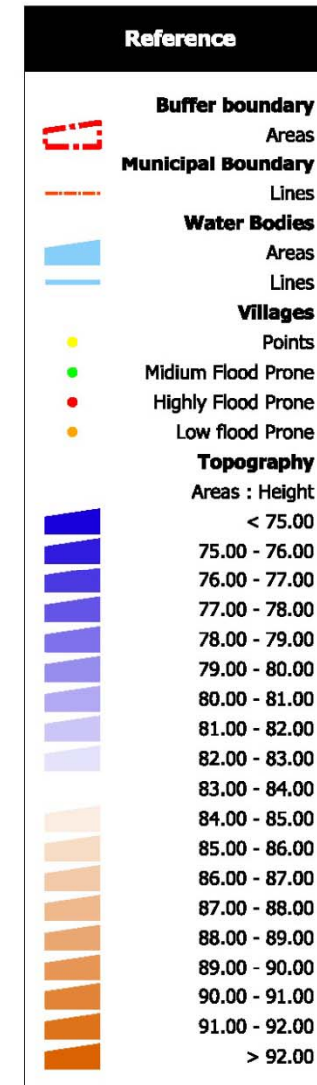
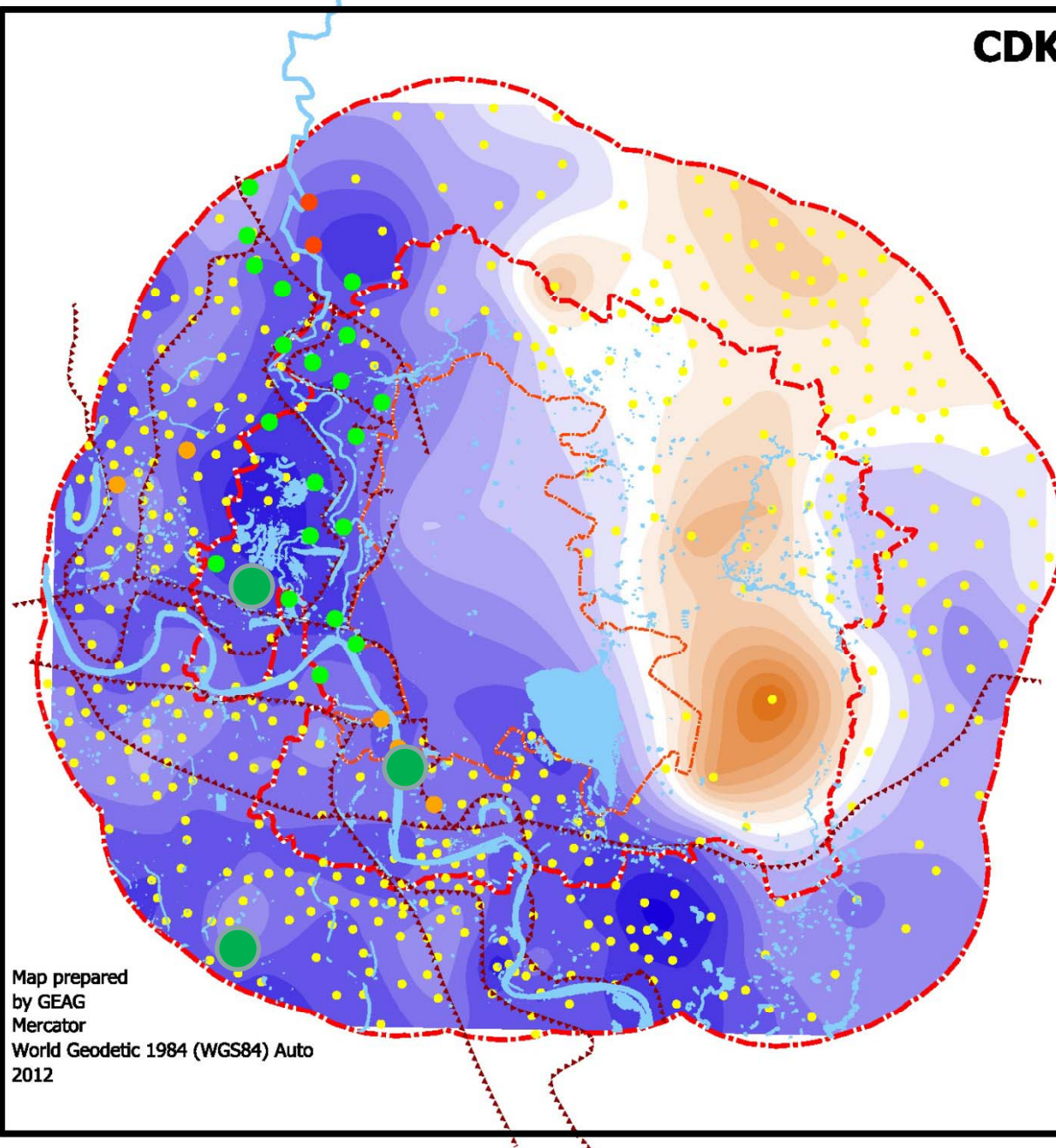
Problems
&
Responses

Action
required

Adaptation



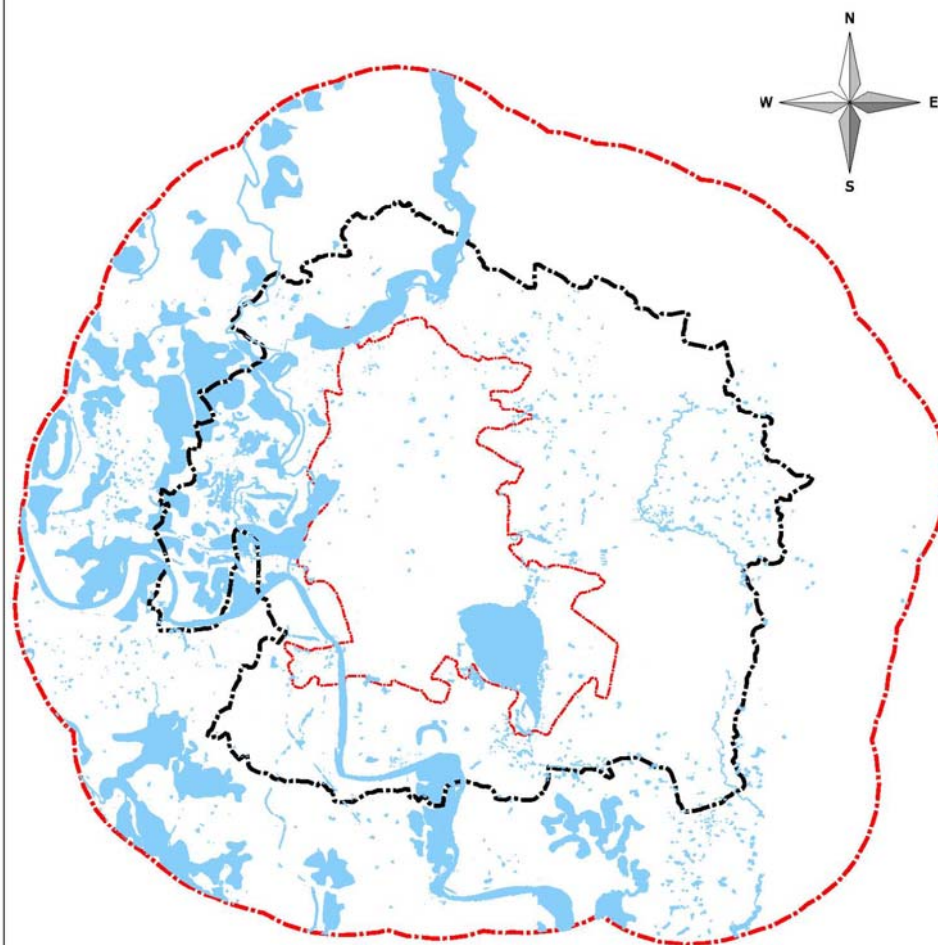
CDKN Intervention villages Gorakhpur



Map prepared
by GEAG
Mercator
World Geodetic 1984 (WGS84) Auto
2012

Flood Inundation and Water logged Areas in 1998 of Peri-urban Gorakhpur

Based on analysis of RADARSAT -SAR Data of 23 August 1998



Courtesy
Decision support Centre(DSA) RS and GIS Application
Area, National Remote Sensing Centre
Department of Space
Govt of India
Hydrabad- 500625

0 >1 km

Reference	
	Municipal Boundary
	GDA Boundary
	Buffer Boundary
	Flood and Water Logged Area