BRAHMATWINN

Coping with flood risk by improving adaptation strategies: integrating scientific and local knowledge, enabling stakeholder participation.

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FEEM

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Outline

1. BRAHMATWINN
2. Integrated Indicator Table
3. Responses to cope with flood risk
4. Gap analysis
5. Conclusions
6. Current research

1. BRAHMATWINN

- FP6 research project, June 2006 – December 2009
- enhance capacity to carry out a harmonized integrated water resources management (IWRM) approach as addressed by the European Water Initiative in headwater river systems of alpine mountain massifs already impacted from climate change
- establish a transfer of professional IWRM expertise, approaches and tools based on case studies carried out in twinning European and Asian river basins

http://www.brahmatwinn.uni-jena.de/index.php?id=5314&L=2

1.1 Case studies

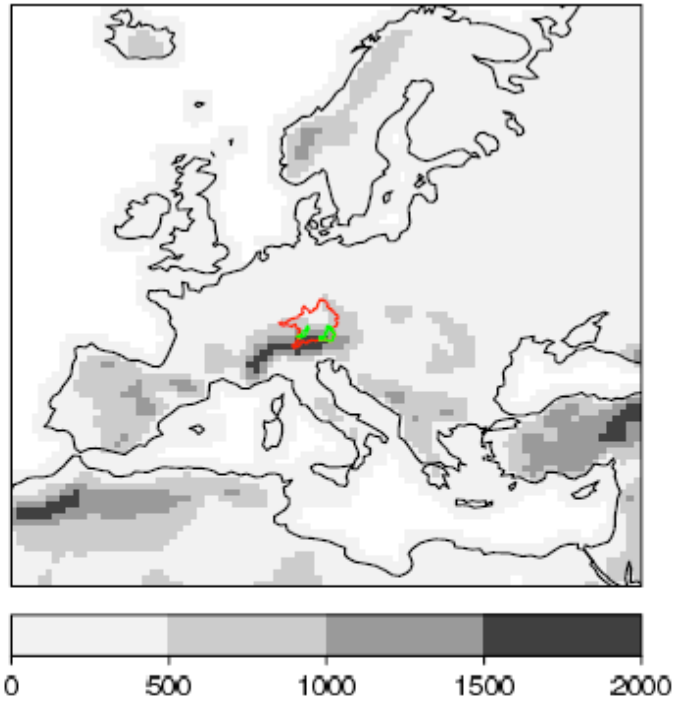

Figure 1: Orography (m) used for the regional climate simulations with the CLM. The colored areas denote the Upper Danube (red), the Lech (left), and the Salzach (right) river basins.

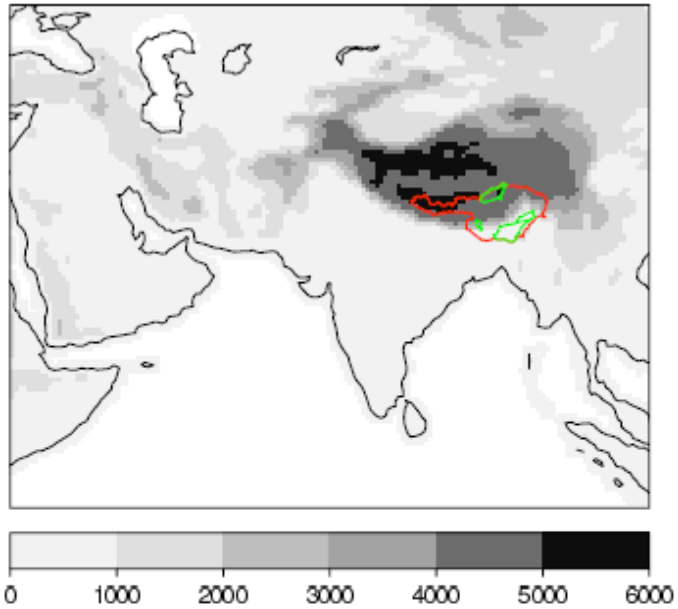

Figure 2: As for Fig. 1, but for the South Asian computational domain with the Assam region (bottom right) and the Upper Brahmaputra (red), the Lhasa (top) and the Wang-Chu (bottom left) river basins.

1.2 Research consortium

Friedrich-Schiller University, Jena, Germany (Coordinator)
International Centre for Integrated Mountain Development, Nepal
Indian Institute of Technology Roorkee, India
The Royal University of Bhutan
Institute for Tibetean Plateau Research, China
Center for Agricultural Resource Research, China
Ludwig-Maximilian University, Munich, Germany
Johann Wolfgang Goethe University, Frankfurt Main, Germany
Z_GIS, Universität Salzburg, Austria
University of Vienna, Austria
University of Southampton, United Kingdom
University of Dundee, United Kingdom
University of Oslo, Norway
Fondazione Eni Enrico Mattei, Italy
H.G. Geodata Solutions GmbH (SME), Germany
3Kon GmbH (SME), Germany
Vodni Zdroje a.s. (SME), Czech Republic

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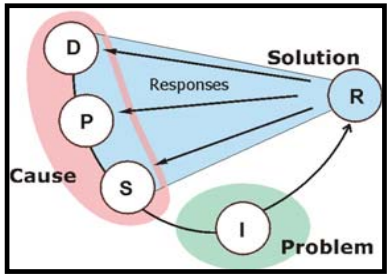
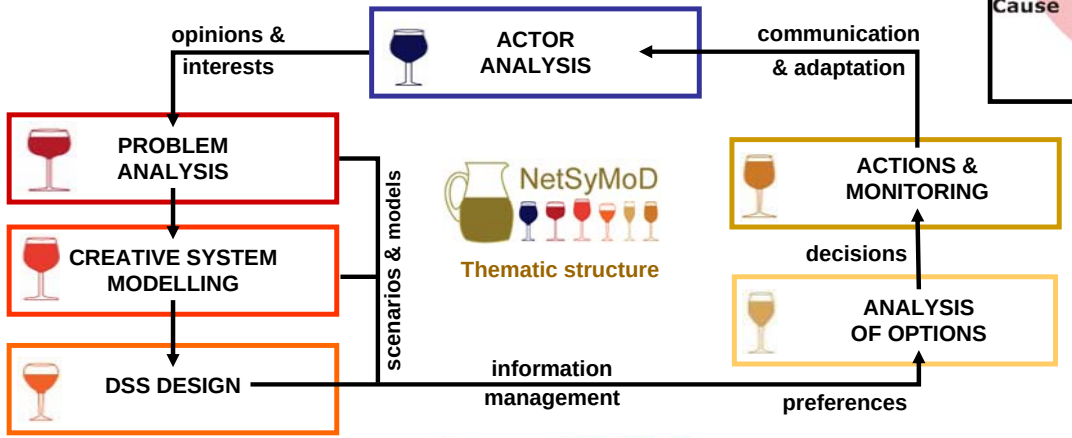
1.3 Context

- Climate change adaptation
  - glacier retreat and decreasing water availability
- Social-ecological system and IWRM
  - participatory process and knowledge integration
- Frameworks and tools:
  - DPSIR, NetSyMoD and mDSS



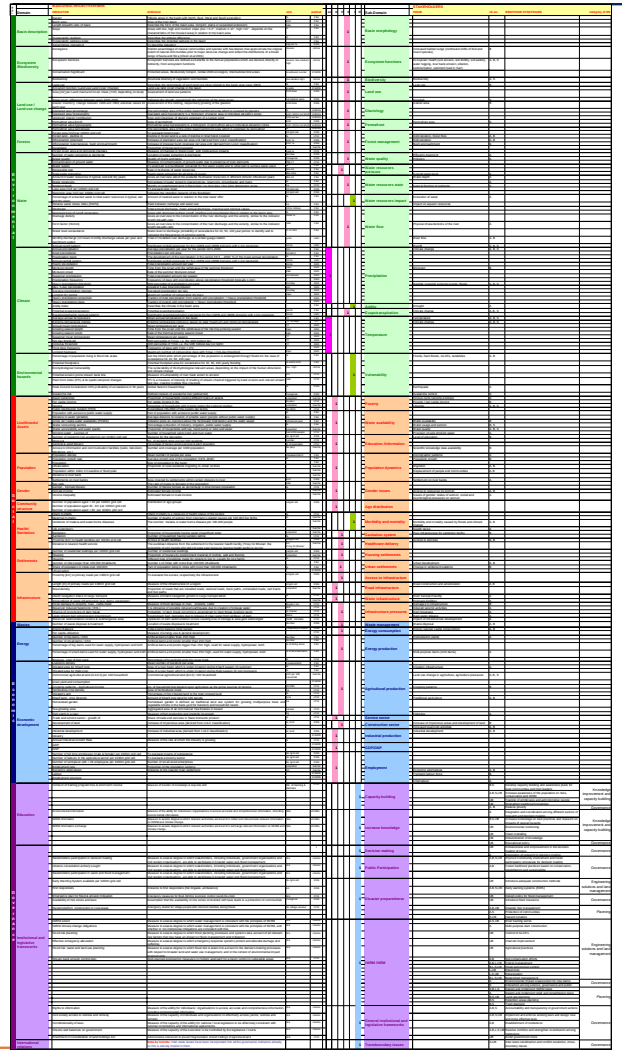


2. Integrated Indicator Table

Goal: establish a biunivocal relation between research outcomes and stakeholders' needs in the field of IWRM

BRAHMATWINN RESEARCHERS	Theme	Domain	Sub-Domain	LOCAL ACTORS	
Indicators				Issues	Responses
	Environmental				
	Social				
	Economic				
	Governance				

2. Integrated Indicator Table



			2	12	12	11	4	9	= 49
Theme	Domain	Sub-Domain	ED	D	P	S	I	R	
Environmental	Basin description	Basin morphology				1			
	Ecosystem /Biodiversity	Ecosystem functions				1			
		Biodiversity				1			
	Land use / Land use change	Land use				1			
		Glaciology				1			
		Permafrost				1			
	Forests	Forest management				1			
	Water	Water quality				1			
		Water resources pressure			1				
		Water resources state				1			
		Water resources impact					1		
		Water flow				1			
	Climate	Precipitation	1						
		Aridity					1		
		Evapotranspiration				1			
		Temperature	1						
	Environmental hazards	Vulnerability					1		
Social	Livelihoods/ Assets	Poverty		1					
		Water availability		1					
		Education /Information		1					
	Population	Population dynamics		1					
	Gender	Gender issues		1					
	Community structure	Age distribution		1					
	Health/ Sanitation	Morbidity and mortality					1		
		Sanitation system			1				
		Healthcare delivery			1				
	Settlements	Housing settlements			1				
		Urban settlements			1				
	Infrastructure	Access to infrastructure			1				
		Road infrastructure		1					
		Water infrastructure		1					
		Infrastructure pressures			1				
Economic	Wastes	Waste management			1				
	Energy	Energy consumption			1				
		Energy production			1				
	Economic development	Agricultural production			1				
		Service sector		1					
		Construction sector			1				
		Industrial production		1					
		GDP/GNP		1					
		Employment		1					
Governance	Education	Capacity building						1	
		Increase knowledge						1	
	Institutional and legislative frameworks	Decision making						1	
		Public Participation						1	
		Disaster preparedness						1	
		IWRM /NRM						1	
		General institutional and legislative frameworks						1	
	International relations	Transboundary issues						1	

	S-d	Ind
ENV	17	83
SOC	15	50
ECON	9	34
GOV	8	23
tot	49	190

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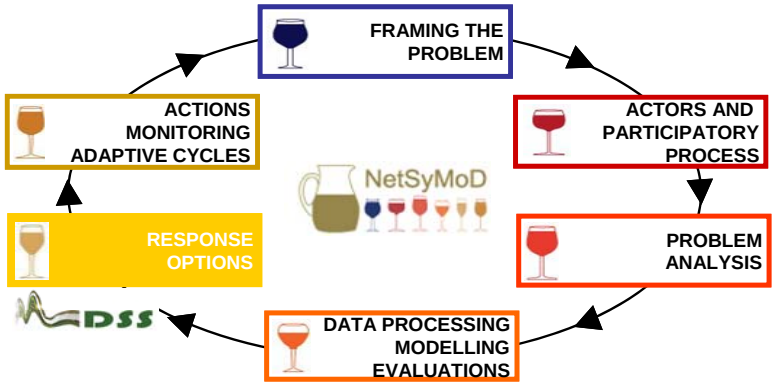
Theme	Domain	BrahmaTWinn PROJECT PARTNERS INDICATOR	definition	Sub-Domain	STAKEHOLDERS RESPONSE STRATEGIES
Governance	Education	Conduct of training programmes & short-term course	Measure of transfer of knowledge & requisite skill	Capacity building	Develop capacity building and awareness plans for local communities and their leaders Increase awareness of the population on risks, conservation and WRM Training of employees and administrative people Strengthen traditional knowledge Reduce poverty
		Environmental information	Measure of the ability for individuals / organisations to access accurate and comprehensive information, including environmental information.	Increase knowledge	Integration and coordination among different sectors of research and decision making Increase knowledge on best practices and research on impacts of natural hazards Environmental monitoring Flood modelling Dissemination of knowledge Educational policy
		IWRM information	Measure to assess degree to which relevant authorities are bound to collect and disseminate relevant information on IWRM and climate change.		
		IWRM information exchange	Measure to assess degree to which relevant authorities are bound to exchange relevant information on IWRM and climate change.		
	Institutional and legislative frameworks			Decision making	Inclusiveness and empowerment in the decision making process Integration of research in decision making
		Stakeholders participation in decision making	Measure to assess degree to which stakeholders, including individuals, government organisations and civil society organisations, are able to participate in broader water and flood management.	Public Participation	Improve Community involvement and foster participatory processes for decision making Foster livelihood practices based on conservation, rehabilitation and sustainability
		Citizens consultation actively sought	Measure to assess degree to which stakeholders, including individuals, government organisations and civil society organisations, are able to participate in broader water and flood management.		
		Stakeholders participation in water and flood management	Measure to assess degree to which stakeholders, including individuals, government organisations and civil society organisations, are able to participate in broader water and flood management.		
		Early Warning System available per 1000m grid cell		Disaster preparedness	Introduce adequate construction methods Early warning systems (EWS) Design policy for flood management Introduce flood insurance Disaster risk management Protection of communities Hazard zonation
		First responders	Distance to first responders (fire brigade, ambulance)		
		Emergency plan for flood & erosion mitigation	Emergency measures for flood-fighting & erosion control round-the-clock		
		Availability of risk zones and laws	Assumption that the availability of risk zones connected with laws leads to a protection of communities		
		Raised platform construction in rural areas	Emergency shelter for village people with minimum facilities during floods		
		IWRM extent	Measure to assess degree to which water management is consistent with the principles of IWRM	IWRM /NRM	River training works Multi-purpose dam construction Control of GLOFs Channel improvement Agricultural practices Soil conservation efforts Forest management Flood and erosion control Reservoirs Renaturation Watershed management Environmental Impact Assessment for new dams Interaction among science, governance and public Design and implement IWRM plans Design and implement relief and rehabilitation plans Land use planning Retention areas planning Town planning
		IWRM climate change obligations	Measure to assess degree to which water management is consistent with the principles of IWRM, and whether or not institutional obligations are consistent with this.		
		Flood risk planning	Measure to assess degree to which flood planning processes and systems take account of all relevant risk factors that may have an impact on flood management and mitigation.		
		Effective emergency alleviation	Measure to assess degree to which emergency response systems protect and alleviate damage and suffering.		
		Flood risk: water and land use planning	Measure to assess degree to which flood risk is taken into account in the decision-making processes with respect to broader land and water use management, and in the context of environmental impact assessments.		
		Stream-bank erosion control plan	Well-planned engineering measures on holistic approach for erosion control in vulnerable areas		
		Rights to information	Measure of the ability for individuals / organisations to access accurate and comprehensive information, including environmental information.	General institutional and legislative frameworks	Accountability and transparency in government actions Implement and enforce existing laws and design new and more effective laws Establishment of institutions Resolve conflicts and strengthen coordination among institutions Avoid government crisis
		Civil society access to redress and remedy	Measure of the capacity of individuals and organisations to effectively access justice, redress and remedy.		
		Constitutionality of laws	Measure of the capacity of the ability for national / local legislation to be effectively consistent with national constitutions and international agreements.		
		Checks and balances on government	Measure of the capacity of the executive to be controlled by the legislature / courts.		
		Enactment of consolidation of land holdings Act	Administrative instrument to prevent fragmentation of land holdings of agricultural land		
	International relations		**Note by UnivDu:** Inter-state issues have been incorporated into all the governance indicators already, so this is already implicit in them.	Transboundary issues	Inter-state coordination and conflict resolution, cross-boundary issues

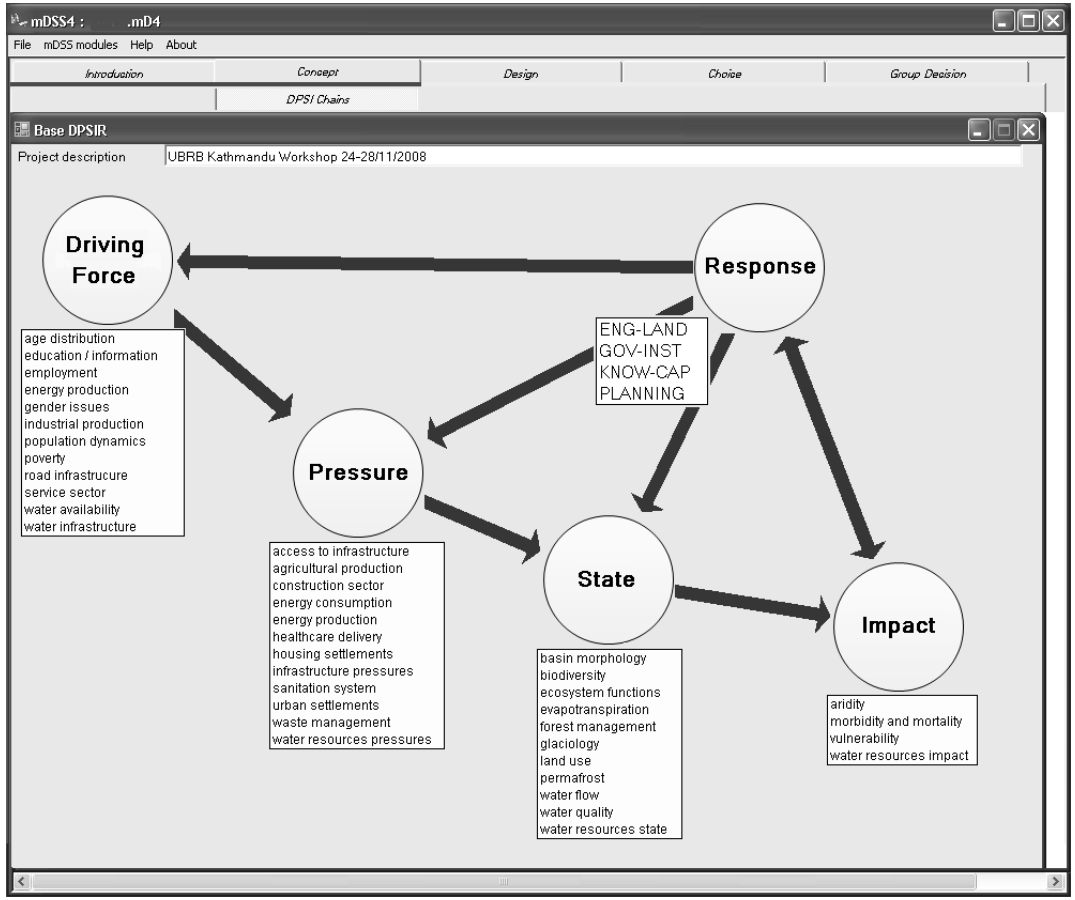
3. Responses to cope with flood risk

Goal: design IWRM responses to cope with flood risk

- NetSyMoD: DSS design
- Decision making process: mDSS
- Participatory setting: 2 workshops
- Stakeholders: end-users of BRAHMATWINN outcomes

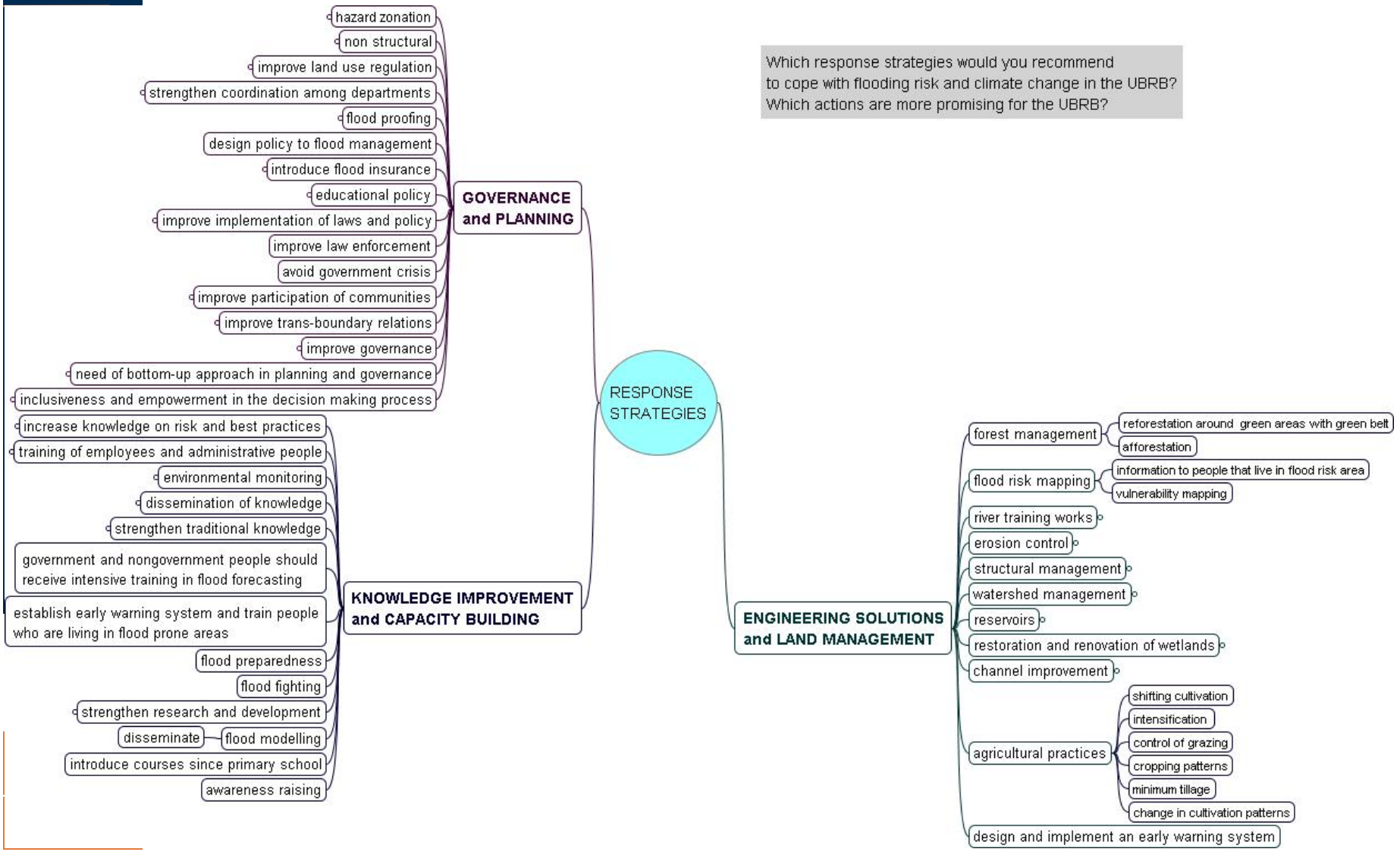


3.1 mDSS: DPSIR

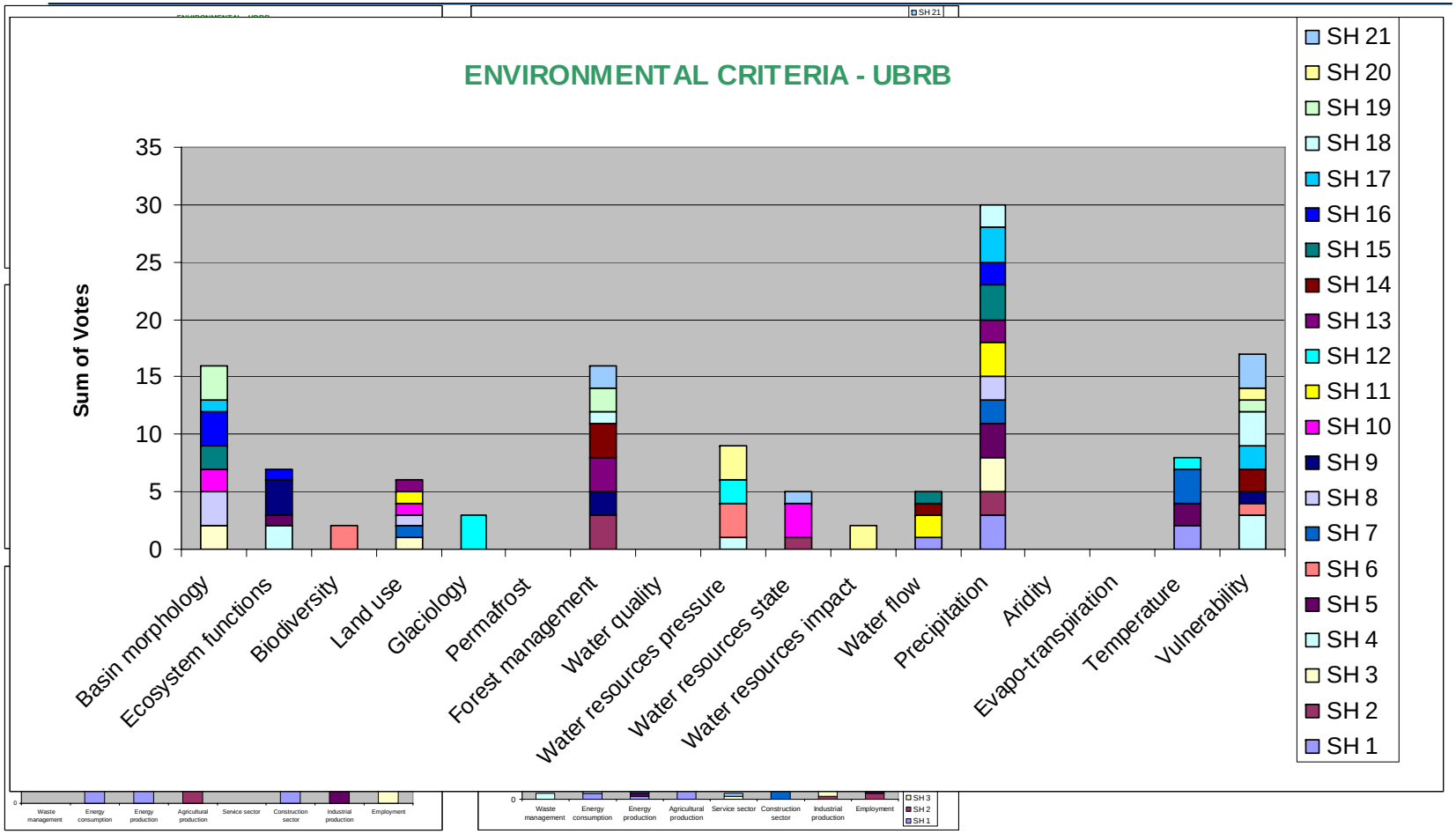


3.2 Brainstorming

Which response strategies would you recommend
to cope with flooding risk and climate change in the UBRB?
Which actions are more promising for the UBRB?



3.3 Criteria selection



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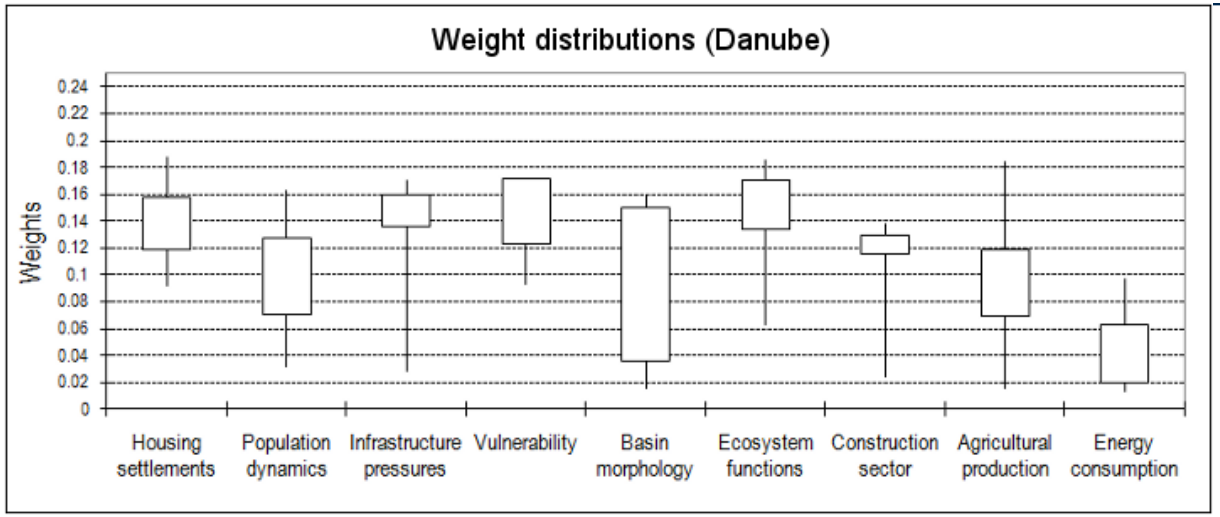
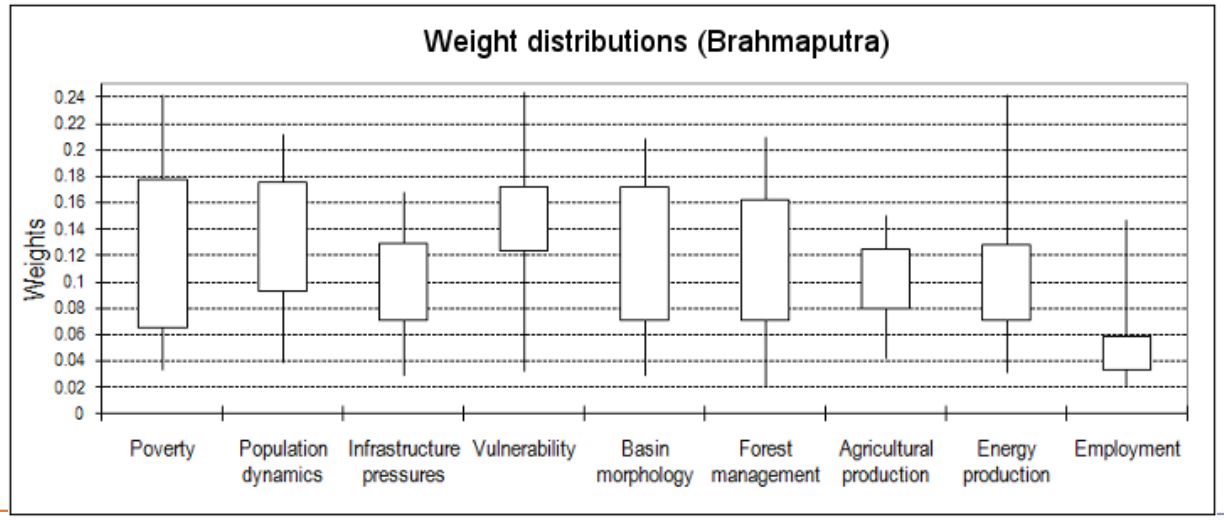
3.4 Criteria weighting

UDRB WS criteria selected	weight	UBRB WS criteria selected	weight
Vulnerability ENV	**0.144**	**Vulnerability ENV**	**0.145**
Housing settlements SOC	0.138	Forest management ENV	0.113
Ecosystem functions ENV	0.143	**Population dynamics SOC**	**0.132**
Infrastructure pressures SOC	**0.133**	Poverty SOC	0.125
Agricultural production ECON	**0.111**	**Basin morphology ENV**	**0.125**
Construction sector ECON	0.099	**Agricultural production ECON**	**0.103**
Population dynamics SOC	**0.097**	Energy production ECON	0.101
Basin morphology ENV	**0.091**	**Infrastructure pressures SOC**	**0.100**
Energy consumption ECON	0.043	Employment ECON	0.056

3.5 Criteria weights distribution





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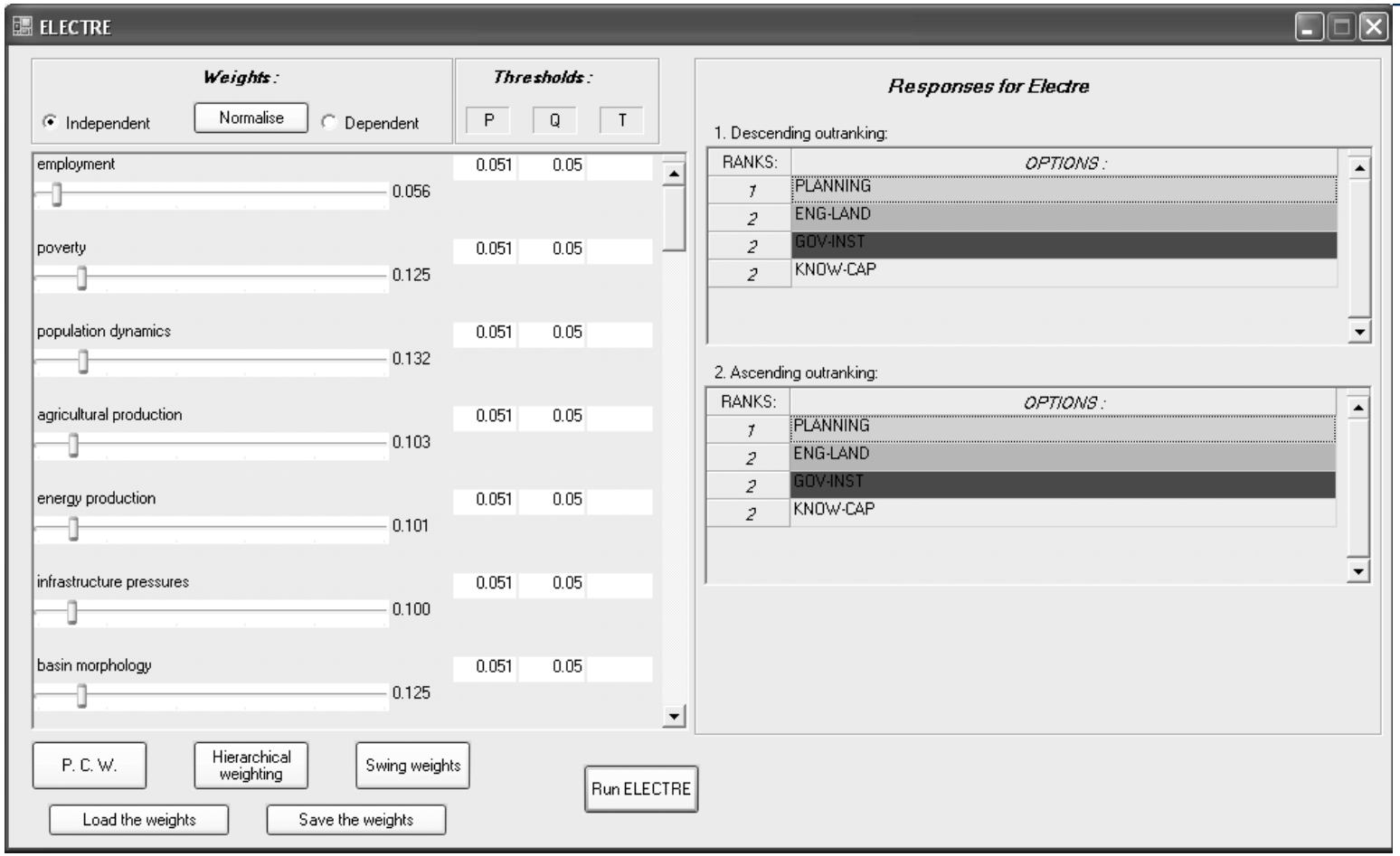
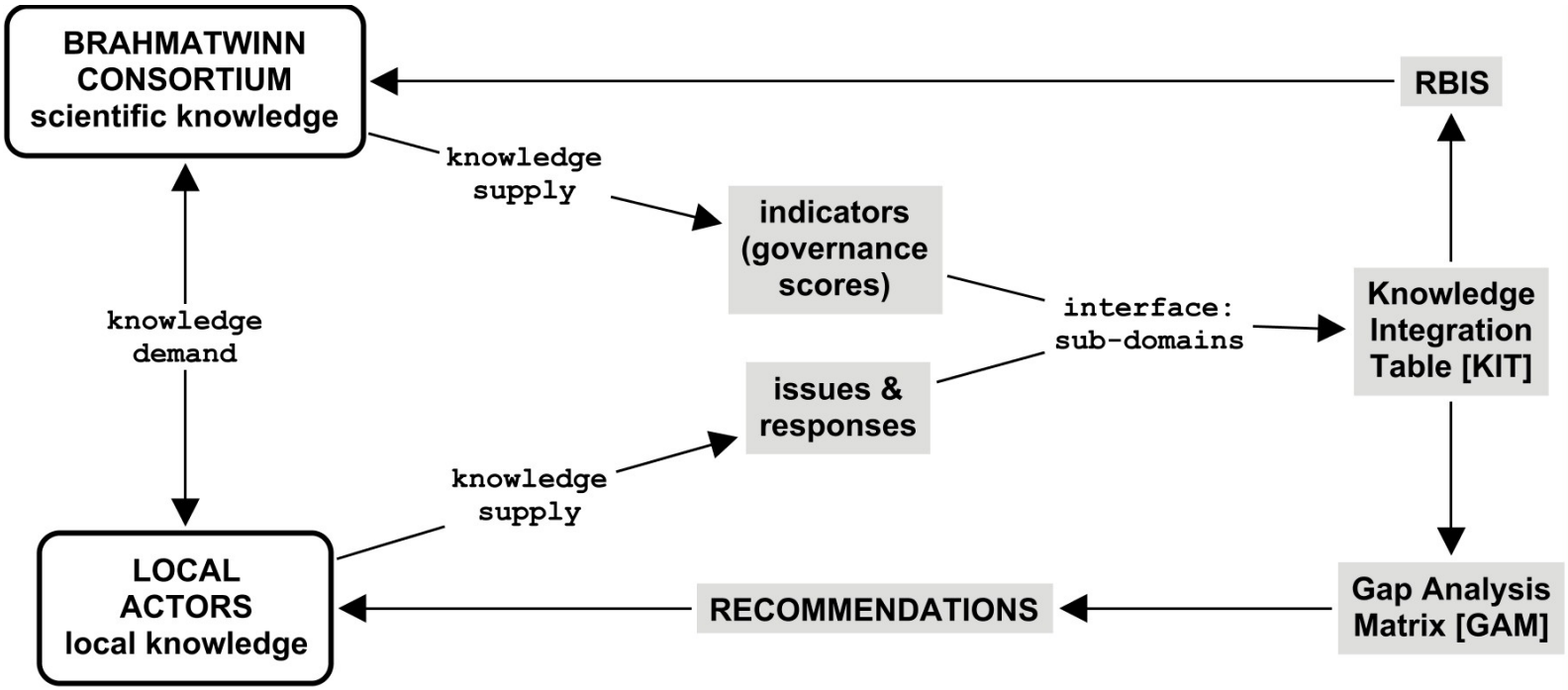
3.6 Preferred Response



4. Gap Analysis



4.1

Governance scores

Theme	Domain	BRAHMATWINN RESEARCHERS			Sub-Domain	LOCAL ACTORS
		indicators	Score [%] law	Score [%] imple-mentation		responses
GOVERNANCE	Education	(1) Availability of environmental information to the public where requested, including actual copies of the documentation containing or comprising such information.	84	60	Increase knowledge	Integration and coordination among different sectors of research and decision making; Increase awareness and knowledge on best practices and research on impacts of natural hazards; Environmental monitoring; Flood modelling; Dissemination of knowledge; Educational policy.
		(2) Clear and coherent roles and responsibilities for the effective collection and generation of information related to IWRM and Climate Change.	52	68		
		(3) Clear and coherent roles and responsibilities for the effective exchange of data and information relevant to IWRM and Climate Change.	49	40		
	Institutional and legislative frameworks	(4) Rights of stakeholders established and maintained, including civil society organisations, and disadvantaged or underrepresented groups to participate in decision-making	77	43	Public Participation	Improve community involvement and foster participatory processes for decision-making, policy-making and implementation of laws; Foster livelihood practices as long-term practices, based on conservation, rehabilitation and sustainability.
		(5) Consultation of citizens actively sought by government institutions on policy issues, budgetary priorities and development decisions	80	63		
		(6) Effective participation of all stakeholders, including civil society organisations, in water and flood management	43	20		
		(7) Water management conducted in accordance with IWRM	25	18	IWRM /NRM	Establishment of institutions; Resolve conflicts and strengthen coordination among institutions; Protection of communities; Early Warning systems; River training works; Multi-purpose dam construction; Control of GLOFs; Channel improvement; Agricultural practices; Relief and rehabilitation.
		(8) Clear rights and obligations in relation to IWRM and Climate Change	33	15		
		(9) All relevant risks are taken account of and mitigated in flood planning	17	9		
		(10) Effective emergency alleviation and response system that limits risk and protects people, property and environment?	61	38		
		(11) Flood risk taken into account in broader land / water use management and environmental impact assessment	24	8		
		(12) Enforceable and adequate rights of access to information (including environmental information)	97	70	General institutional and legislative frameworks	Accountability and transparency in government actions; Implement and enforce existing laws and design new and more effective laws; Inter-state coordination and conflict resolution, cross-boundary issues.
		(13) Civil society access to redress and remedy	94	49		
		(14) System to challenge a law on the basis that it violates international law or the constitution	88	70		
		(15) Checks and balances between different branches of government	88	70		

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4.2 Gap Analysis Matrix (GAM)

BRAHMATWINN RESEARCHERS	Theme	Domain	Sub-Domain	LOCAL ACTORS	
indicators				issues	responses
	environmental				
	social				
	economic				
	governance				

BRAHMATWINN governance indicators		LOCAL ACTORS responses
law	implementation	

4.3 Allocation of indicators to responses

BRAHMATWINN RESEARCHERS: governance indicators															
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
			X	X	X							X			Community involvement in decision making
									X						Early Warning System
								X	X						Protection of communities
									X	X					Relief and rehabilitation
						X	X	X							IWRM
X	X			X	X							X			Awareness of the population on risks, conservation, and WRM
						X									Establishment of institutions
			X	X											Policy making and implementation of laws
							X			X				X	Coordination among institutions
			X	X	X	X				X	X				Long-term vision and measure VS. short-term engineering solutions
		X				X							X		Inter-state conflict, cross boundary issues

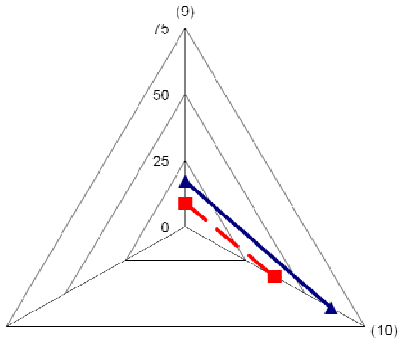
LOCAL ACTORS: responses

4.4 GAM: results

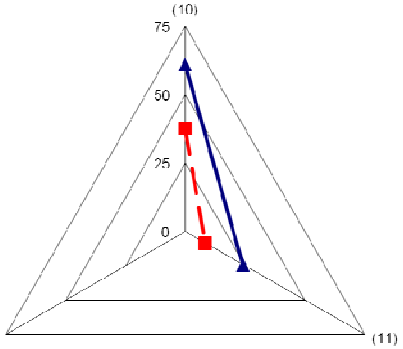
BRAHAMATWINN RESEARCHERS: governance indicators			
law [%]	implementation [%]		
73	44	Community involvement in decision making	LOCAL ACTORS: responses
61	38	Early Warning System	
39	23	Protection of communities	
43	23	Relief and rehabilitation	
25	14	IWRM	
70	52	Awareness of the population on risks, conservation, and WRM	
25	18	Establishment of institutions	
78	53	Policy making and implementation of laws	
48	31	Coordination among institutions	
58	37	Long-term vision and measure VS. short-term engineering solutions	
54	43	Inter-state conflict, cross boundary issues	

4.5 GAM: results

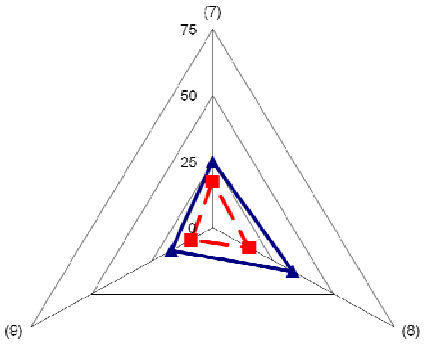
protection of communities



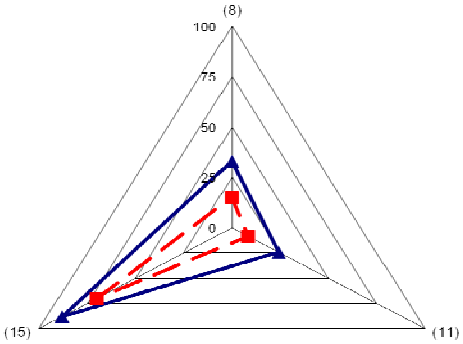
relief and rehabilitation



IWRM



coordination among institutions



Qualitative governance indicators:

- **(7) Water management conducted in accordance with IWRM**
- **(8) Clear rights and obligations in relation to IWRM and Climate Change**
- **(9) All relevant risks are taken account of and mitigated in flood planning**
- **(10) Effective emergency alleviation and response system that limits risk and protects people, property and environment**
- **(11) Flood risk taken into account in broader land / water use management and environmental impact assessment**
- **(15) Checks and balances between different branches of government" as all other governance indicators relative to the Sub-domain**

solid blue lines and triangles: law

dashed red lines and squares: implementation

5. Conclusions

- Methods have been developed and tested to operationalize IWRM and CCA
- Communication and exchange of information by means of IIT: interaction among researchers and stakeholders
- Participatory process to design responses and cope with flood risk using mDSS raised interest among SH
- GAM to define recommendations for IWRM governance improvement
- Stakeholders gave good feedback on processes

Publications

Ceccato, L., Giannini,V., and Giupponi, C. (2011) Participatory assessment of adaptation strategies to flood risk in the Upper Brahmaputra and Danube river basins. Environmental Science and Policy, doi:10.1016/j.envsci.2011.05.016

Giannini, V., and Giupponi, C. (2011) Improving water governance through science and stakeholder dialogue: experience from Assam (Northeast India). CMCC Research papers RP0115.

Giannini, V. and Giupponi, C. (2011) Integration by identification of indicators, Adv. Sci. Res., 7, 55-60, doi:10.5194/asr-7-55-2011.

Giannini, V., Ceccato, L., Hutton, C., Allan, A.A., Kienberger, S., Flügel, W.-A., and Giupponi, C. (2011) Development of responses based on IPCC and "what-if?" IWRM scenarios, Adv. Sci. Res., 7, 71-81, doi:10.5194/asr-7-71-2011.

Giannini, V., A.A.Allan, C.Hutton, C.Giupponi, F.A.Johnson. (submitted) Adaptive IWRM responses to cope with “what if?” scenarios. IN: W.A. Flügel & N.Sharma (Eds.). Applied Geoinformatics for Sustainable Integrated Water resources Management (IWRM). Results from the EU-project BRAHMATWINN. The Netherlands, Springer

Giupponi, C. & V.Giannini. Participatory Planning for Climate Change Adaptation in the BRAHMATWINN Project. Presented in: International Congress on Environmental Modelling and Software, Ottawa, Canada (5-8 July 2010) International Environmental Modelling & Software Society (iEMSs)

Giannini, V. et al. (2009) A participatory approach for defining response strategies to reduce risk and vulnerability from flooding in a changing climate. IOP Conf. Ser.: Earth Environ. Sci. 6 362005 doi:10.1088/1755-1307/6/36/362005

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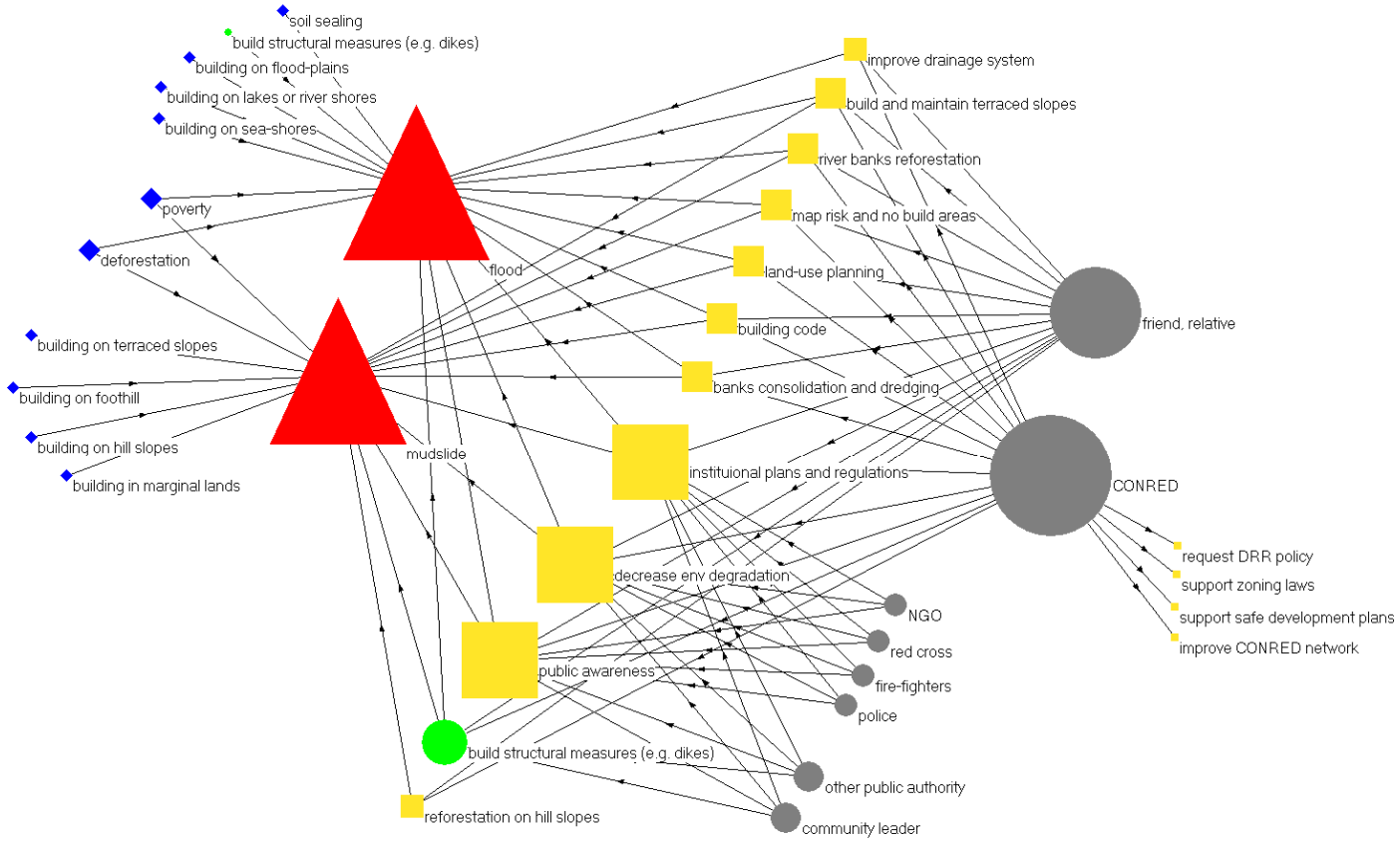
6. Current research



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