Geo-Communication Seminar 2015

Floods Clim'ability and Riverscapes-ICEDS-Kagawa University-2018

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Proposed Title of the Study

Future Prospects of Indigenous Knowledge and Practices in South and Southeast Asia to Mitigate Floods in a Eurasian Trans-cultural Contextualization

Key Terms

‘local and indigenous knowledge’, ‘local knowledge’, ‘indigenous knowledge’, ‘traditional ecological knowledge’, ‘traditional knowledge’, ‘indigenous technical knowledge’, ‘endogenous knowledge’, ‘Flood’, ‘Mitigation’, ‘Resilience’, ‘Adaptation’, ‘Disaster’, ‘Risk Reduction’, ‘Hydrology’, ‘Hazard’, ‘Climate Change’, ‘Socio-Hydrology’, ‘Transcultural Contextualization’.

Introduction and Background

- Flood has physical, environmental, economic and social impacts nearly in a proportionate way. Flood risks are related to hydrological uncertainties, linked to social, economic and political uncertainties as well.
- Flood damages are expected to continue increasing due to socio-economic development and climate change.
- Natural hazards are non-linear and complex events shaped by and resulting from the combination of not only geophysical and meteorological factors but also (and mainly) political, economic, socio-cultural, and psychological (or perceptual) phenomena and factors.

On the other hand……

- Indigenous knowledge assumes a source for problem-solving strategies for local communities but it is still difficult to understand, undervalued, unrecognized, uncovered, impede, not quantified, haphazard in nature and undocumented in a definite contextualization. Stimulating responsiveness to flood effects by communities and to develop appropriate adaptation strategies and methods, we need to comprehend indigenous knowledge and practices undoubtedly.
- It is already proven by the researchers that the indigenous land-use practices are the best way of mitigation and adaptation strategy to cope with future climate change effect.

Introduction and Background

- The importance of the perceptions, experiences, and knowledge of indigenous peoples has gained prominence in discussions of climate change and adaptation in developing countries and among international development organizations.
- Incorporating indigenous knowledge can add value to the development of sustainable climate change mitigation and adaptation strategies. It also promotes mutual trust, acceptability, common understanding, and the community's sense of ownership and self-confidence.
- But the extent to which indigenous knowledge enhanced resilience to floods was influenced by geophysical locations, exposure to flooding and socio-economic abilities.
- Thus, huge research reports have been urged to integrate Indigenous knowledge and practices to climate risk reduction strategies with western climate information for more than a decade.

Rationality and Importance

- Failure of flood controlling engineering structures around the globe created ongoing debates to reach in a positive solution to mitigate flood.
- Beyond prevailing debates on correct strategies to indigenous knowledge and practices for disaster risk reduction, there is a growing demand among investors to integrate local knowledge into formal mitigation and adaptation policies though
- Need to strengthen dissemination of indigenous knowledge and to integrate modern approaches that strengthen indigenous knowledge in climate change adaptation and resilience.
- Studies are necessary to address the reliability and validity of the identified indigenous knowledge indicators of flood mitigation.
- Designing a policy framework comprising both scientific and indigenous knowledge is vital to facilitate disaster risk reduction.
- It is important to promote the transmission of local and indigenous knowledge to increase community resilience.

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Rationality and Importance

- Fear of disappearances of highly valuable indigenous knowledge and practices generally demands collection, compilation and systematization.
- Indigenous knowledge and practices provided a very high level of performance for generations, thus it needed the support of some technological intervention and reinforcement.
- The integration of local and indigenous knowledge and practices with science will enable communities to develop the best strategies to adapt to climate change and mitigate impacts of climate-related hazards.
- Integrating local knowledge into disaster risk management can improve the quality of disaster management plans.
- Thus, local and indigenous knowledge needs to be integrated with science before it can be used in policies, education, and actions related to disaster risk reduction and climate change.

Debates on Indigenous Knowledge

Julie Dekens (2007) identified some research debates that should be taken into consideration for my future research on indigenous knowledge. The debates are:

1. How to document and identify local knowledge on disaster preparedness?
2. Who is really going to benefit from the studies on and uses of local knowledge?
3. How do the studies and uses of local knowledge employ and serve the dominant power relationship?
4. Who is going to represent the people who do not have the power?
5. How can we legitimize local knowledge without its being presented in 'conventional' scientific terms?
6. How to foster the cooperation of local communities with external institutions on an equal basis?

Source: Dekens Julie (2007). Local Knowledge for Disaster Preparedness: A Literature Review. International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal

Literature (Flooding)

Number of research articles covering different aspects of flooding for Bangladesh from 1990 to 2014

SN	Aspects of flooding	Number of research articles
1	Structural control	35
2	Flood insurance	02
3	Flood frequency analysis	04
4	Hydro-meteorological and geophysical processes	33
5	Climate change/flood risk adaptation	21
6	Flood risk management planning and policy	35
7	Integrated flood management	12
8	Flood forecasting and early warning	31
9	Flood risk assessment	40
10	Flood Impacts	53
	Total	145

Azhar Abbas, T.S. Amjath-Babu, Harald Kächele, Muhammad Usman & Klaus Müller (2016) An overview of flood mitigation strategy and research support in South Asia: implications for sustainable flood risk management, doi: 10.1080/13504509.2015.1111954

Diversity Found in Flood Research

- Cartography (the science or practice of drawing maps)
- Climate change global warming issues
- Environmental Effects
- Epidemiology and nutrition studies
- Geographic and planning research
- Geomorphology (the study of the physical features of the surface of the earth and their relation to its geological structures)
- Geopolitics
- History of flood
- Agriculture

- Hydrological Dynamics
- Management strategies
- Meteorology
- Morphology (a particular form, shape, or structure.)
- Policy strategy
- Political economy
- Psychology
- Risk dynamics (analysis and management)
- Safety and Adaptation Research
- Socio-cultural study
- Socio-economic and political context

Flood Research: Recent Issues

- Flood Recovery
- Flood Risk Assessment (Inequality, zoning, risk index)
- Flood Impacts
- Flood Management (Political economy, Basin management)
- Flood Adaptation (coping strategies)
- Exposure and Resilience to Flood
- Flood governance
- Climate change and flood

- Flood and human health
- Flood zoning and house coding
- Flood and Media
- Flood and Insurance
- Flood Warning
- Hydrological dynamics and flood
- Ecological concern and flood
- Flood and refugee
- Trends, Frequency and Magnitude of Flood
- Flood relief and recovery

Research Titles' Diversities on Indigenous Knowledge and Practices for Flood Mitigation: Recent Issues

1. Local ecological knowledge and incremental adaptation to changing flood patterns.
2. Indigenous and scientific knowledge for resilience building.
3. GIS and local knowledge in disaster management.
4. Natural Hazard Knowledge and risk perception.
5. Climate change adaptation through local knowledge.
6. Indigenous knowledge, coping strategies and resilience to floods.
7. Integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction and climate change adaptation.
8. Indigenous knowledge system and local adaptation strategies to flooding.
9. Use of Indigenous knowledge in forecasting cyclone.
10. Combining indigenous knowledge and western knowledge in reducing vulnerability to environmental hazard.
11. Combining indigenous knowledge and scientific knowledge for flood forecast.
12. Indigenous knowledge and conventional science.
13. Indigenous technical knowledge inputs for effective disaster management.
14. Resilience of the poorest: coping strategies and indigenous knowledge.

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Research Titles' Diversities on Indigenous Knowledge and Practices for Flood Mitigation: Recent Issues

15. Management of natural disaster through indigenous technical knowledge.
16. Indigenous Knowledge on Disaster Mitigation.
17. Integrating indigenous perspectives with government policy.
18. Traditional ecological knowledge as adaptive management.
19. Local strategies for flood mitigation.
20 Indigenous coping mechanisms in combating flood.
21. Using traditional methods and indigenous technologies for coping with climate variability.
22. Enhancing climate governance through indigenous knowledge.
23. Traditional Knowledge on Disaster Management.
24. Local ecological knowledge in ecosystem management.

Flood Research: Major Paradigm

The Major Paradigm Shifted on Flood Research:

1. Human Ecological Approach to Social Historical and Political Economy Approach

Human Ecological Approach: Initiated by White (1945), sophisticated by Burton and Kates (Early 1960's); All are descended from the idea of Barrow's notion of geography as human ecology.

Social Historical and Political Economy Approach: Criticized that human ecological approach had not paying enough attention to social and cultural factors of adjustment. Included 'socio-political and historical context', 'behavioral and decision making models', and 'social structural perspective (local landholdings, land tenure systems)'.

2. Structural Mitigation Approach to Non-Structural Mitigation Approach:

Structural Mitigation Approach (before 1980's): Practiced from the early civilization. South, Southeast and East Asia, Europe. Major suggestions - levees, floodwalls, dams, floodways and spillways, channels, controlled overtopping, closure structures, Reservoirs, land reshaping, erosion protection, dikes, floodways, polders and fills, drainage, water diversion.

Structural solution, Technical engineering approach, objectivist and ignoring constructivism view. Big Budget.

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Flood Research: Major Paradigm, continue…

Non-Structural Mitigation Approach (after 1980's): Increasing costs of structural solutions, growing environmental concern. Major suggestions-Natural systems, Risk mapping, Hazard forecasting, early warning systems, and emergency plans, Land-use planning and zoning, Construction standards and building codes, Acquisition and relocation, Insurance, awareness and improving information, flood related database, monitoring, training and exercise. Cost effective. Integration with structural solution.

3. Flood Protection to Flood Adaptation:

Flood Protection: Complimenting physical structure, Hydrological control. Create distance between people and flood. Reduce probability of flooding, flood defense.

Flood Adaption: Concept of living with flood, resilience, socio-economic context of flood, environmental justice.

4. Flood management to flood preparedness:

Flood Management: Management strategies – Flood mitigation, Flood preparedness, Flood recovery and flood rehabilitation.

Flood Preparedness: Encouraging to maximum utilization of local coping strategy and resilience to live with flood.

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Other Important Paradigms

1. Political economy of flood.
2. Protection motivation theory (PMT) has become a popular theory to explain the risk-reducing behavior of residents against natural hazards.

Research Questions

- What extent indigenous knowledge might reduce flood risk for a community?
- How Social Hazard Map can help a community to mitigate flood damage/flood risk?
- How and in what extent Social Risk Knowledge (SRK) is useful for a community to adapt with flood?
- In what circumstances does ‘South and Southeast Asia’s flood mitigation model in a Eurasian Trans-cultural Contextualization’ fit for a new paradigm in academic arena?

Research Purpose

- To collect, compile, systematize, understand, quantify, recognize, cover, integrate, promote and disseminate of indigenous knowledge and practices.
- To integrate indigenous knowledge and practices with science and engineering solution of flood.
- To creates pathways of extent of indigenous knowledge in flood prediction, adaptation and mitigation.
- To count latent functions and impacts of flood for finding a new flood mitigation model applicable for South and South Asia in a Eurasian Trans-cultural contextualization.
- How floods can be realized/recognized? And then go for what type of measure should be taken to mitigate

Conceptualization of the Present Research Theme

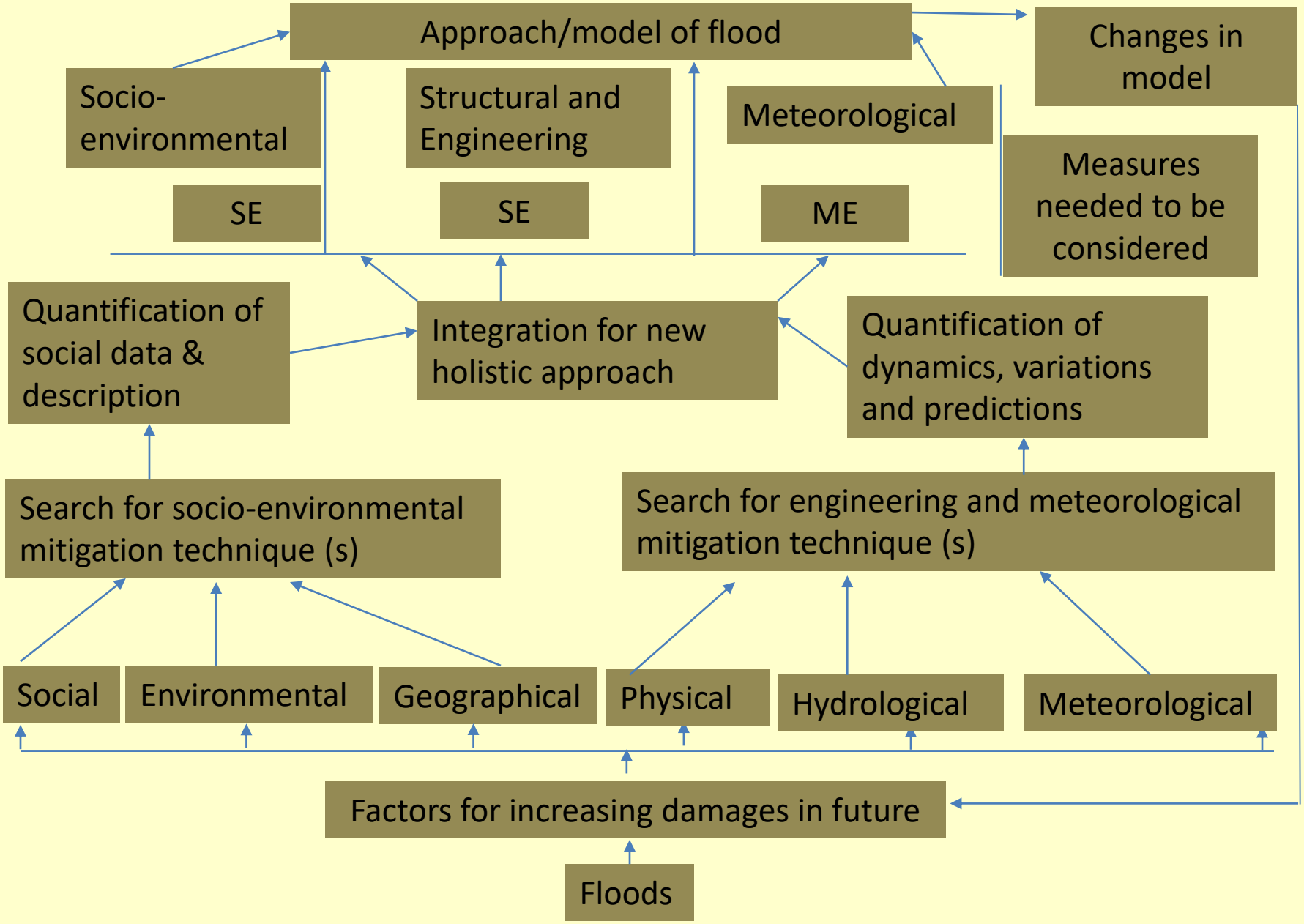
Major Challenges

A. Integration of social Issues/variables/data or social research output with Science and Engineering Research/Scientific Modelling of Flood.

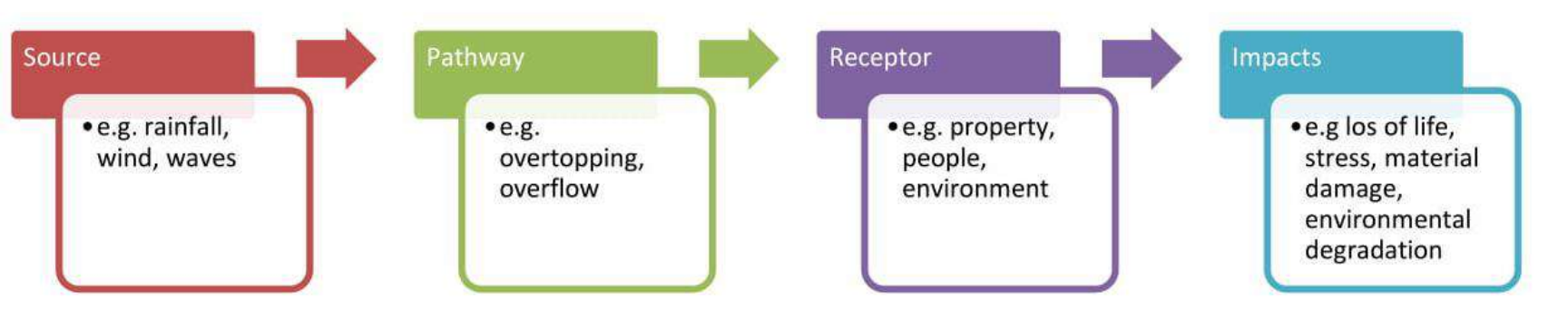
B. Identification of the best integrating framework that deals with both social science and engineering variables.

C. Demonstrate a new publishable and acceptable integrated multidisciplinary framework of flood mitigation framework usable for transcultural contextualization.

Conceptualization of the Research Theme



General Guidelines for Flood Modeling to Conceptual Frame



Source: The Source-pathway-receptor-impacts model, based on the DEFRA/Environment Agency R&D Technical Report FD2302/TR1 (Sayers, Gouldby, Simm, Meadowcroft, & Hall, 2003). From: Flood Modeling Guideline for Responsible Authorities Scottish Environment Protection Agency (SEPA)

This flood modeling approach is a well-established framework in flood risk management. It provides a basis for understanding the causal links between the source of flooding, the route by which it is transmitted and the receptor, which suffers some impact.
Core perception of the General guidelines:
Sources: weather events or conditions that result in flooding (e.g. heavy rainfall, rising sea level, waves etc.)
Pathways: routes between the source of flood waters and the receptor. These include surface and subsurface flow across the landscape, urban drainage systems, wave overtopping.
Receptors: the people, industries and built and natural environments that can be impacted upon by flooding
Impacts: the effects on exposed receptors.

Note: The severity of any impact will vary depending on the vulnerability of the receptor. For any area there may be multiple sources, pathways and receptors which interact with each other.

Inter-disciplinary Flood Mitigation Model and Framework: Looking for Social Science and Engineering Solution

1. Social Hydrology Model: (a recent dimension in flood perception)

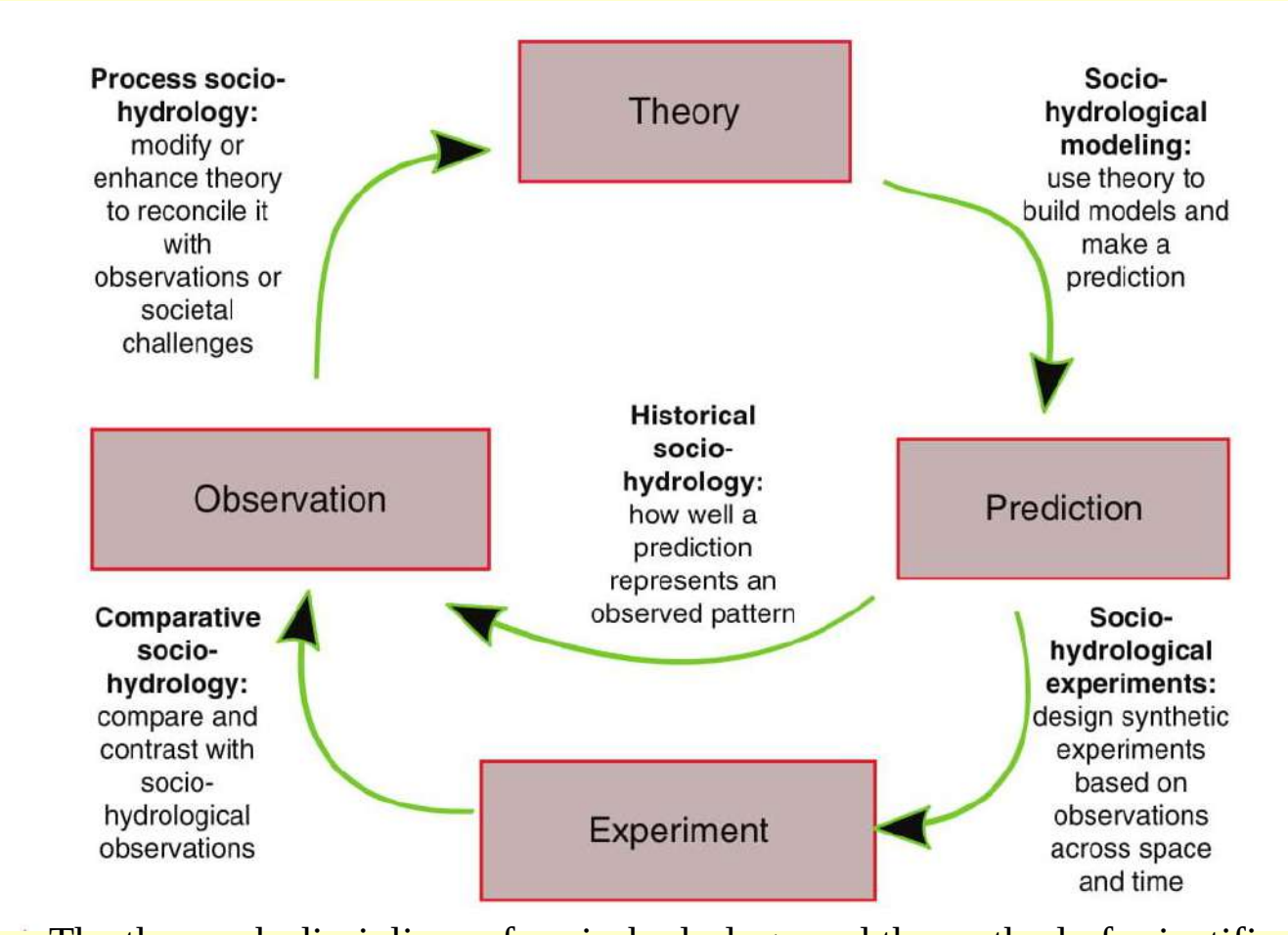
Sub-disciplines of socio-hydrology:

a. Historical socio-hydrology: with the aim to understand a coupled system from its immediate or distant past, whichever applicable.

b. Comparative socio-hydrology: with the aim to compare and contrast different coupled human–water systems across socioeconomic, climatic, and other gradients.

c. Process socio-hydrology: with the aim to understand and hypothesize about the nature of observed social and hydrological processes that contribute to the dynamics of the coupled human–water system.

Social Hydrology Model:
Method of scientific inquiry into Socio-Hydrology Model



Source: *WIREs* Water 2016. doi: 10.1002/wat2.1193

The three sub-disciplines of socio-hydrology and the method of scientific inquiry. This demonstrates that the standard method of scientific inquiry can be implemented to the diversity of coupled human–water systems using the three different but complementary pathways of socio-hydrology.

1. Social Hydrology Model

Example of Data Presentation in Socio-Hydrology Perspective

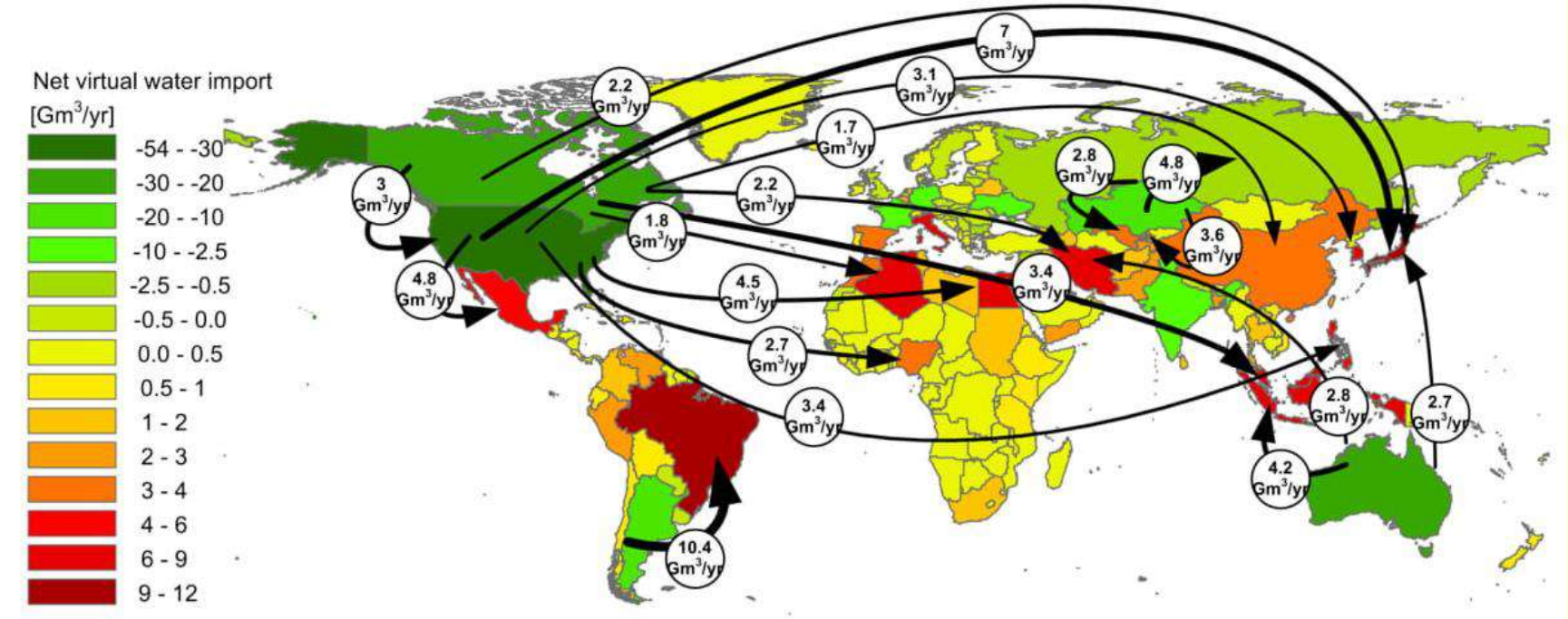
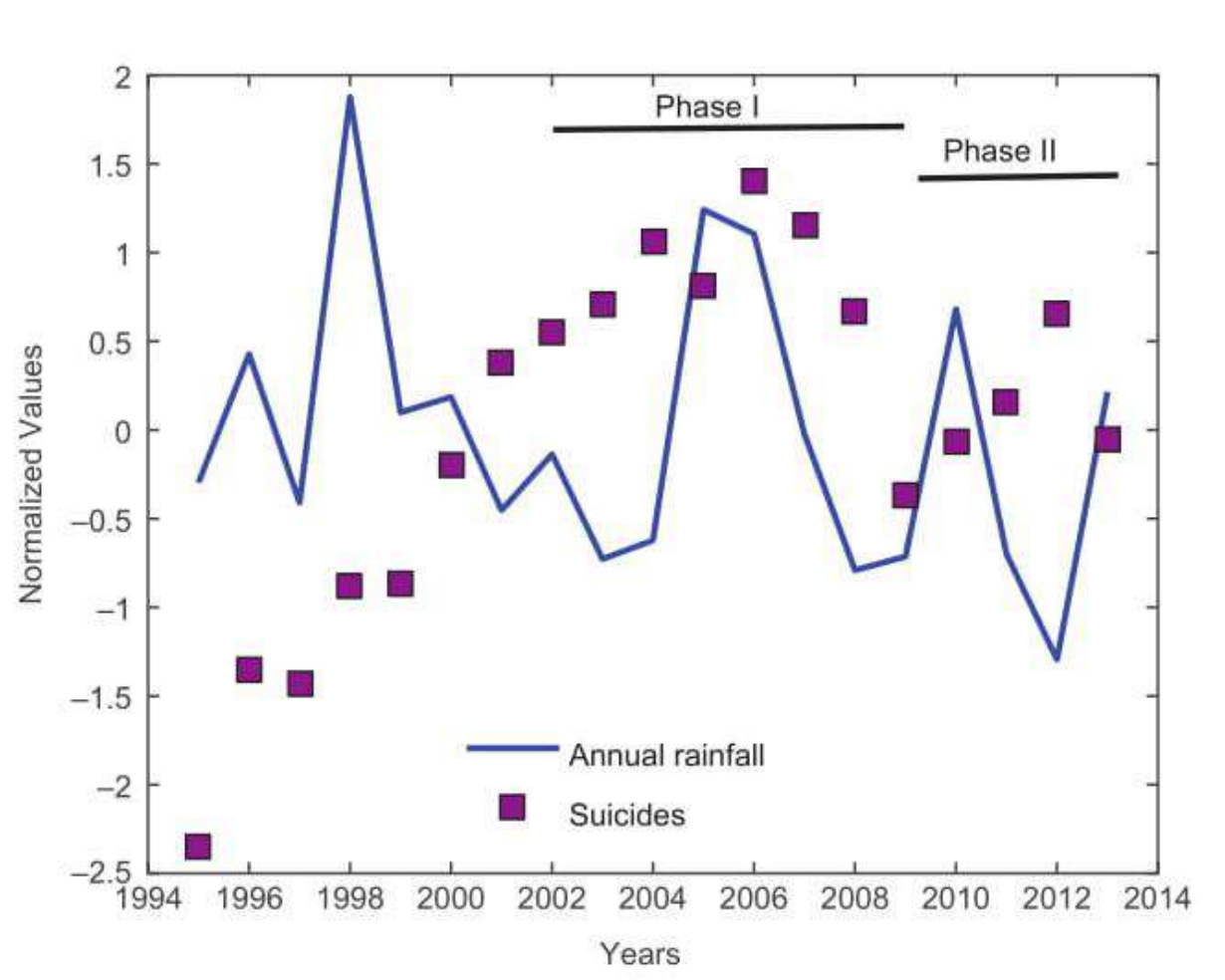


Figure: National virtual water balances and net virtual water flows related to trade in wheat products in the period 1996–2005.

Source: M. Sivapalan, H. H. G. Savenije and G. Blöschl (2012), *Hydrological Processes*, Wiley Online Library. DOI: 10.1002/hyp.8426

1. Social Hydrology Model

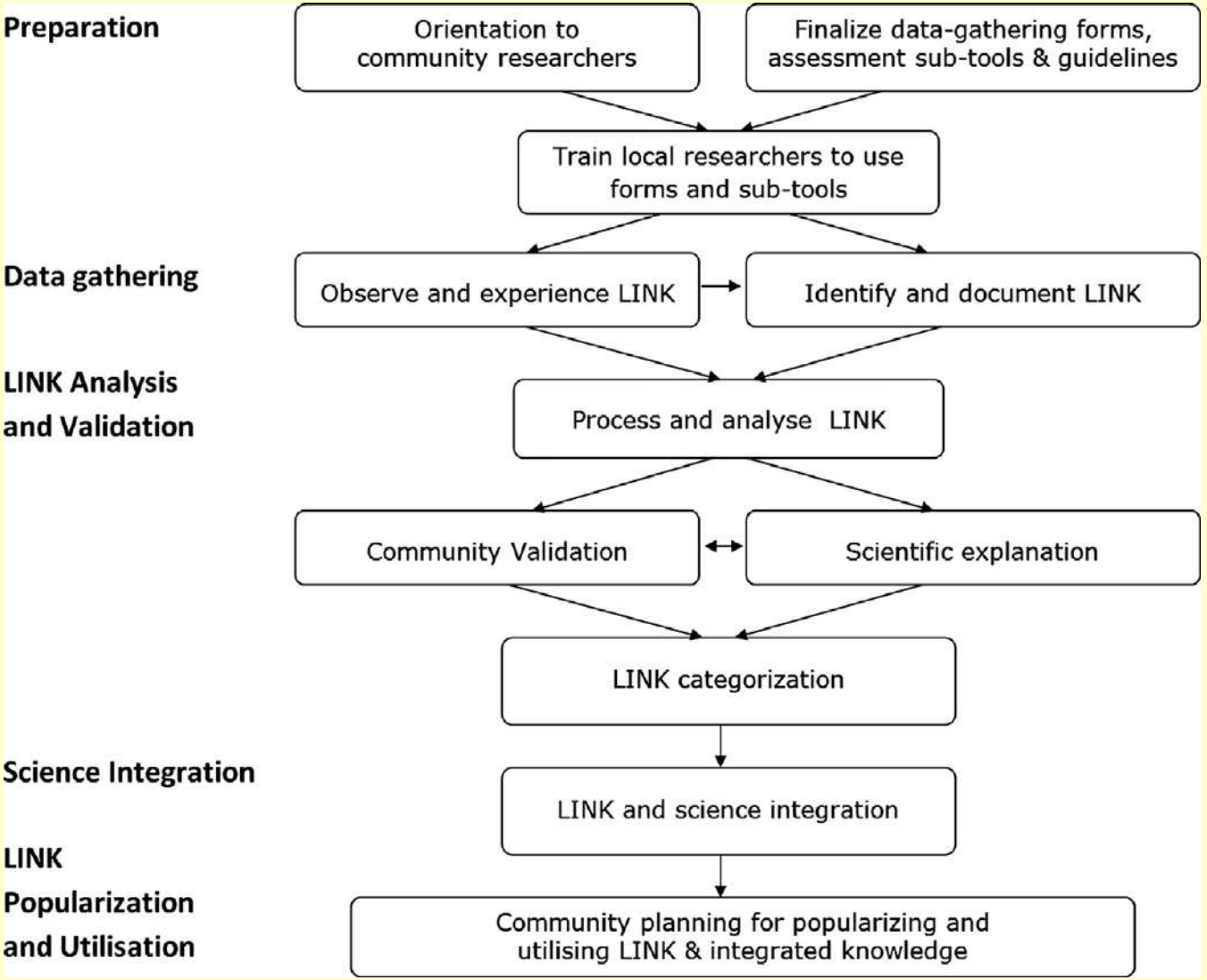
Example of Data Presentation in Socio-Hydrology Perspective



Source: www.tropmet.res.in, https://psainath.org/maharashtra-crosses-60000-farm-suicides/.
Cited in: *WIREs* Water 2016. doi: 10.1002/wat2.1193

Figure: Annual rainfall and farmer suicide rates for Maharashtra state in India.

2. LIVE: (Model) Scientific Knowledge



*LINK= Local and Indigenous Knowledge

Local and Indigenous knowledge and practices inventory, Validation, and Establishing Scientific Knowledge (LIVE Scientific Knowledge),

Source: Hiwasaki, L., Luna, E., Syamsidik , & Shawd, R. (2014), Process for integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities. International Journal of Disaster Risk Reduction , 10(2014), 15-27. doi: http://dx.doi.org/10.1016/j.ijdrr.2014.07.007

2. LIVE: (Model) Scientific Knowledge

Observation of Celestial Bodies (Sun, Moon, Stars, Comets)

Name of Barangay:_____ Name of Local Researcher:_____

1 Observation Number	2 Date and Time	3 What observations of the sun, moon, stars or other celestial bodies have you seen?	4 What is the meaning or prediction of this observation?	5 What did you do when you observed this celestial body?	6 Did the meaning or prediction actually happen? Yes No	7 When and what time?

Figure: Sample data-gathering form for local and indigenous knowledge for disaster risk reduction in LIVE Scientific Knowledge

2. LIVE: (Model) Scientific Knowledge

Table 1: LINK Observed or Experienced During Period _____

Name of LINK Observed or Experienced	Frequency of Observation during the period	Percentage

Table 2 : Time of Occurrence of the Events Predicted by the Observations

LINK Observed	Occurrence of the Predicted Events From the Time of Observation of the LINK to the Occurrence of the Predicted Events					
	Within 12 hours	13 hours to 1day	2 – 4 days	5-7 days	8-10 days	Did not occur

Points for Analysis:

Quantitatively:

If the event predicted by the LINK observed did not occur at all, then the LINK observed is not a good predictor of the event.

The longer the time between the observation of the LINK and the occurrence of the predicted event, the lesser the effectiveness of the LINK.

Qualitatively :

Description of the LINK, the time of observation, the meaning of the LINK or the occurrence of event being predicted by the LINK, the behavioral response of the observer.

Description of the event predicted by the LINK, date and time of occurrence, impact of the event.

Figure: Data Processing Sub-Tool in LIVE Scientific Knowledge: Frequency Table for local and indigenous knowledge (LINK) observations and Experiences (Sample Quantitative Processing of Aggregated Data).

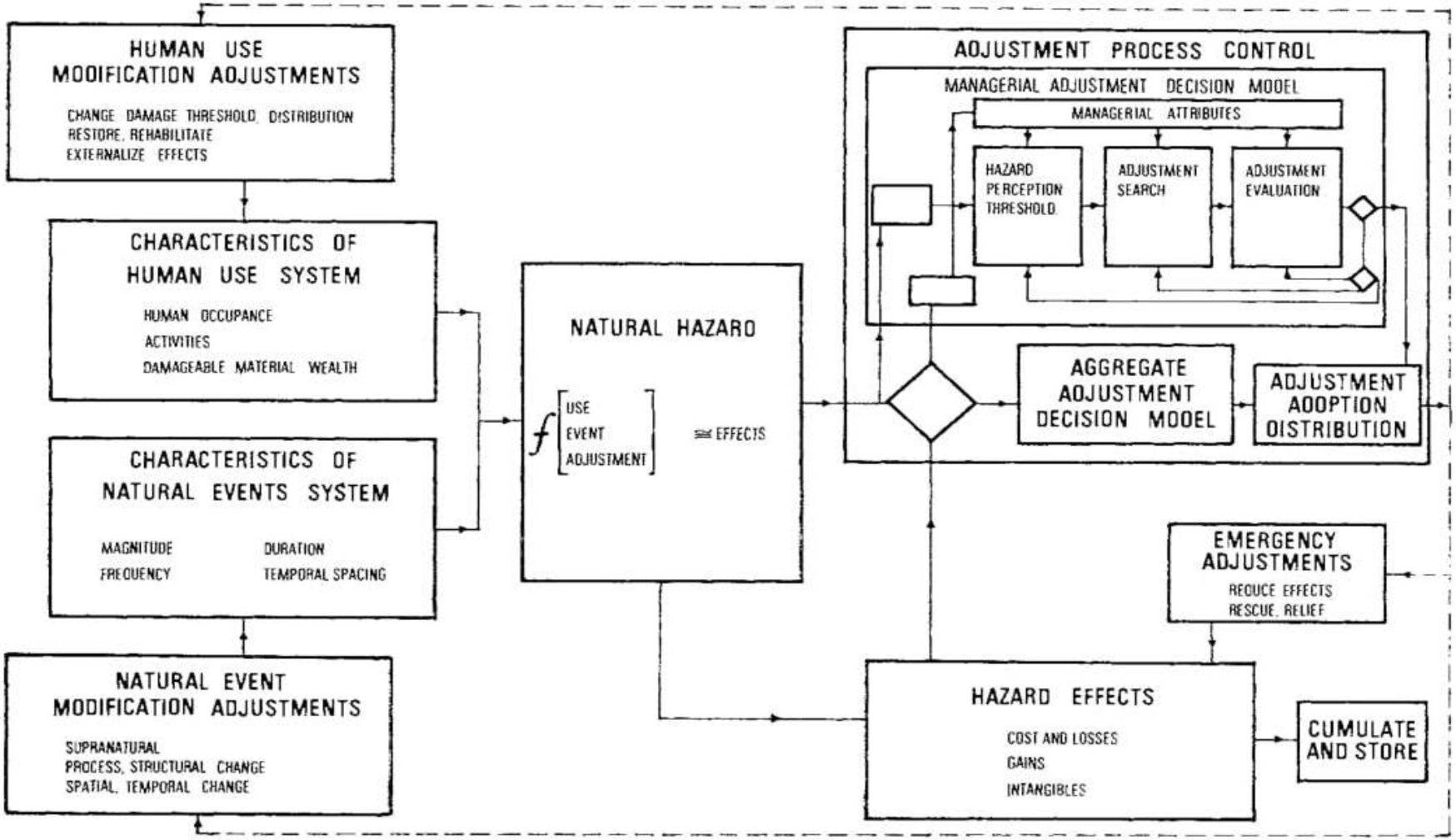
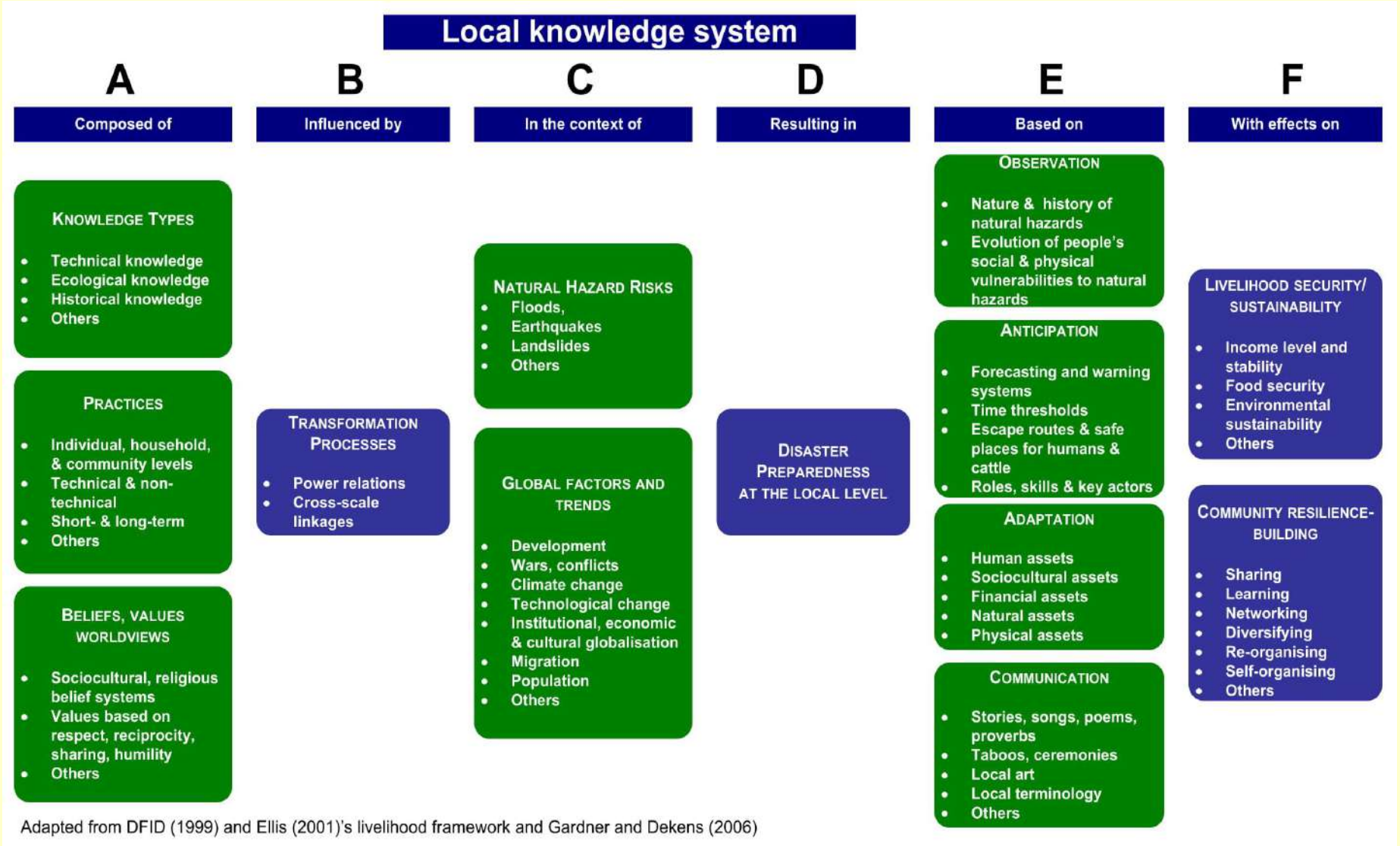


Fig. 3. Human adjustment to natural hazards: a general systems model.

3. Human Adjustment to Natural Hazards: A General System Model:

Source: Kates, R.W., (1971). 'Natural Hazard in Human Ecological Perspective: Hypotheses and Models', Economic Geography, Vol. 47, No. 3, pp. 438-451



Adapted from DFID (1999) and Ellis (2001)'s livelihood framework and Gardner and Dekens (2006)

4. Local Knowledge for Disaster Preparedness

Source: Dekens Julie (2007). Local Knowledge for Disaster Preparedness: A Literature Review. International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal

Research Methodology

Key concern (data collection areas) before methodological orientation

- Hydrological dynamics, Rainfall statistics, Satellite image, Tropological maps, Aerial photos, Empirical and measured data, Existing flood controlling mechanism, Land use pattern, irrigation, cropping pattern, Manifest and Latent impacts of flood, Water governance, Water policy, transnational comparison, and Socio-economic variables.

- **Research Design:** Mixed method (quantitative and qualitative approach), Emphasize on quantitative methods and tools. Using scientific and sociological methods to develop a transcultural contextualization for Eurasian Perspective.

- **Sampling Technique:** Probabilistic approach and non-probabilistic approach will be used.

- **Sampling Frame:** Still not defined.

- **Sample Size:** Still not determined, will be settled after supervisors guidelines.

- **Study Population:** Targeted population will be based on after selection of study location.

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Research Methodology

Study Location: Yoshino river basin, Japan; Padma-Jamuna river basin, Bangladesh and Rhine river, Germany.

Data Collection: For social, environmental and geographical data (Survey, Focus Group Discussion, Key Informant Interview, Observation, Satellite image, Geographical map, Remote sensor), For Hydrology and Meteorological data (determined after consultation with supervisor)

Data Analysis: Quantification of social data will be based on LIVE science model, GIS and SPSS will be used for geographical, social and scientific data analysis.

Data Presentation: Hypothesis testing will be the key logical conclusion of the study to support the study objectives. And both probabilistic and descriptive analysis will present the research findings. A new transcultural contextualization framework/model will be presented for future research based on Eurasian perspective.

The Originality of the Research

What is new?

- Integrating indigenous knowledge and local practices with structural and engineering flood mitigation research.
- Reliability and validity measurement for indigenous knowledge and local practices through interdisciplinary research approach.
- Transcultural contextualization of flood research in Eurasian perspective.
- Targeting study location in Europe, East Asia and Indian subcontinent with the purpose of searching for a new acceptable and publishable framework for flood mitigation highlighting indigenous knowledge and local practices.
- Quantification of socio-economic and environmental variables to integrate with structural/hydrological/meteorological model of flood.

Research Benefits

The benefits of the present research:

a. Collection, Systematization, Quantification, Recognition, Promotion and Dissemination of indigenous knowledge and practices for multicultural contextualization will show a new direction of searching indigenous knowledge and practices.

b. Using indigenous knowledge and practices in a integrating framework (social science and engineering g) of flood mitigation with transcultural contextualization for Eurasian Perspective is a new way of conceptualization of flood study.

c. Develop a flood and flood mitigation model (using social science variables and engineering flood controlling tools), a framework and a model that will be applicable for East and South-east Asian nations. Policy makers and researchers can use these tools for future investigating and policy making.

d. Develop a social map and a social risk knowledge (SRK) that will guide community to mitigate flood damages.

Thank You!

Any Question?