



# **Enhancing Community Adaptation in Vulnerable Riverine Islands**

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# **Background**



Average per capita water availability is sufficient enough but spatio-temporal asymmetry is great, which is a matter of concern for policy makers. Fig. Earth reaches beyond six of nine planetary boundaries (Richardson et al., 2023)



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# Land use change



## **Rivers in Asian region**

- Rivers are one of the most important geological features in this region, playing a key role in shaping histories, cultures, societies and economies.
- They provide freshwater for drinking, irrigation and hydropower; are home to unique plants and animals that contribute to well-functioning ecosystems; support transportation, recreation/tourism and many other functions.
- However, in lieu of triple planetary crisis (climate change, biodiversity loss, and pollution) and land degradation; river environment are under extreme pressure which affects overall human well-being as well.



## **IWRM and Nexus approach**

- Complex nature of water resource management at the basin scale, needs a clear vision on the following:



### Integrated Water Resource Management (IWRM)

Siligato (2007)



#### Why riverine islands?

- 1. Huge productive zone
- 2. Very prone to hydro-meteorological hazards (frequent extreme weather conditions)
- 3. Densely populated area and extreme effects on the communities because of their poor adaptive capacities (limited resources/infrastructure as well as institutional setup)

Objective- How socio-hydrological approach can help to design possible adaptation and mitigation measures for positively enhancing the relation between water resources and human well-being?



## **Socio-hydrology and some results**





Dataset- Water quality/quantity, (primary data generated in case observed data was not there), Socio-economic data (Field based surveys (FGDs/KII/HH), Spatial data, Policy documents Qualitative and quantitative analysis

Figure- Mouza-level relative ranking of risk and vulnerability for Sagar Island, India. Bera et al., (2022) Water, 14, 823. MDPI (IF- 3.530)

## **Socio-hydrology and some results**



under

Fig- Plausible scenario based future of water resources in Indian site





Khatun et al., Global Environmental Change, 77, 102610. Elsevier Publication. (IF- 11.16)

>Furthermore, these non-migrants enjoyed higher socioeconomic and sociopsychological advantages and availed more local support from different government and non-government organizations than involuntary non-migrants.

>Again, mutual assistance, connection with social groups, natural resource access, sense of secured livelihood, stable societal atmosphere, and participation in decision-making in society appeared to build their higher degree of social capital compared to involuntary non-migrants.

## Key take away message

≻This project was a holistic approach first of its kind in this region, strives to addresses crucial hydrological queries regarding human–nature interaction along with socio-economic, capacity, institutional, policy related issues in riverine islands.

>It is evident that triple planetary crisis with land degradation results in water insecurity. Since water is the limiting factor to socioeconomic growth, it lead to a series of **cascading effects like changes in livelihood**, **financial hardship**, **mental health**, **occupation shift**, **migration**, **loss of self esteem** etc.

>Socio-hydrological an holistic approach was successfully applied to explore the nexus of human-water relations at different scales in three different study areas under different socio-economic/environmental conditions, which was further applied to improve adaptive measures to manage local water needs while mitigating undesirable changes to the hydrological cycle.

➢ Result shown that both top-down and bottom-up approach, stakeholders participations, citizen science, diligent data monitoring, data sharing, numerical simulations with retrofitting approach to answer plausible what-if questions for designing various policy measures are the key ingredients for achieving water security and human well-being

≻The research outcome was helpful to sketch projections of alternatives that explicitly account for plausible and coevolving trajectories of the socio-hydrological system, which will yield both insights into cause–effect relationships and help stakeholders to identify safe functioning space.

## **Overall project outputs**

- Policy output Established great collaborations in these three countries, generated enough robust scientific data to help policy/decision makers
- <u>Scientific output-</u> Significant outputs in terms of publication (<u>peer reviewed journal articles (n=13), book chapters (n=2) and</u> <u>one conference proceeding</u>).
- <u>Capacity development-</u> Hands on training for socio-hydrological approach and some of necessary models/tools were provided to around 40 peoples from three countries

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Alle		Article		E E	water Supply Resilier	ace in a Tropical Island	Assessment of household-level	dustation strategies to water stress	Integrated Approach to Quantify II	he Impact of Land Use		aquaculture production areas in Satkhira,
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Ohder Charge	nexus of human mater relations could be applied to improve adaptice measures to manage incid water needs while mitigating underlately doorpers to the hydrological cycle. Easile hydrological models as an integrated task on he	Restruct 7 May 200	to expected to the by approximately 1.5 at the current power two in the domestic and agricultural requirement, while this value goes up to accound	30% for a higher prowth his	nett A Cae Study in Cae Day 5 Yatnam Pare 200 72,073	a increasing water domand. The modelling could showed that	water sources play a significant role in adopting a	staptation strategies. Results from the endogenous switching regression	Integrated Approach to Quantity the and District Land (R* = 0.000). Withorton Impact of Land Use and Land Coner (R* = 0.993), and watherbody, built-up, a	sty, built-up, and agricultural LCLU, were prediction for TD5 and barron LLUC were prediction for TD5 (R <sup>2</sup> = 0.922). Built-up	Editor: Bijosh Kathikisden Verbil, Dyi Hot Duy Titr: Dei Hot Duy Tan, VET MM	tion sites in the Satikhira district from 2017-2019. We used Shuttle Radar Topographic Mis-
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1. Introduction	about 50% of the world population depends on groundwater to meet their potable water demand (UNESCO, 2015), it is reported that about	000		74	shell Whyteshe 201 the future water clemands, we argu- tescurress for fashwater alternativ	se that upgrading and constructing new monvoirs, excitilizing to and investing in water supply facilities an among the most	kiy water supported to graded contrast, con		Reated. 55 Newsber 202 Accepted: 19 December 202		bend it of hangemony in the poor review	that the highest number of aquaculture ponds were observed in January, with a size of more
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challenge [2]1. Or 2.4 billion consider	(Solul Environmental Change 77 (2022) 102810	devices a	https://doi.org/10.1007/s10113-621-01864-1			LOS ONE			sites human land use has severely uses. at solution and use has severely resources [1]. In particular, it is well	r harmed the quality and quantities of available water II known that rivers function as integrators of land-water	Max Col april 1371/carral pore 027030	ponds in the study area, strimp production and export are decreasing because of a lack of
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	*Ronomia Disipline, Khaha Daiweity 1000, Ragialadi		Despite confronting severe climatic risks, many people prefer to rem	uin in climate hazard prone areas rather th	n migrate. Environmen-		<ol> <li>Department of Geography, Gauhati University, Gui Environment and Remote Sensing, Government of Ja</li> </ol>	ahati, Assam, India, 2 Department of Ecology, mmu and Kashmir, Kashmir, India, 3 Centre for Olimate				
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	Mophene cumstances voluntary non-migration decisions occur is crucial. Only a handhil of studies have investign Guntal whether individuals and groups who decide to stay put in the face of climatic hannels consider their decision	pand an to	in society appeared to build their higher degree of social capital ( $\chi$	$^{2}(4) = 57.80  \wp < 0.000)$ compared to in	oluntary non-migrants.	remote sensing and field-based approach to assess the temporal anti-tion and bit as reviewing						
	be an adaptive action. In this regard, this mady contributes to the existing literature by empirically investigat the voluntary non-enjaration decision as an adaptation strategy through an exploration of the factors affect	eting Ting	All these leadures lead to a laborable environment that ultimately d	rove the respondents to become voluntary	soo mgrants.	of meanders: A case study on River Manu in North-	Abstract					
	this decision. We employed a symmetric random sampling sectoripse and selected 627 respondents from te climatic based-prose countil districts: Khulus and Soldhim, Using the Generalized Structural Equation No.	DND Iddd	Keywords Voluntary non-migration - Climatic shock - Climati	ic risk - Social capital - Bangladesh		Eastern India, PLos Olie 17(7); e02/1190. https:// doi.org/10.1371/journal.pone.0271190	, ibscruce					
	(2004), we found that voluntary non-migrants (64% of total respondents) appeared to onjoy the signific advantary of arcran to their comparation, have need provident and works process. Furthermore, the sec	ione eld				Editor: Bijesch Kathikkodan Veettil, Daj Hoc Day	A common phenomenon associated with allu- ally forming cutoffs. Doint has deposite and on	wal rivers is their meander evolution, eventu-				
	psychological, and reasonic apportantities local as their existing location (e.g., better income propo- attendable locae costs review of financial heir device rest-dearers periods, and della ideation them to dea	erts,	Introduction	at risk (Adger et al. 2014). In recent y	rars, extreme climatic	Tar: Dai Hoc Duy Tan, WET NAM	migration and meander cutoff. The present st	udy focuses on identifying the meanders of				
	that location), as well as their access to local natural resources, strengthened their social capital and it informed their instance in size. Together, there interact respects a describility to classific their in-	free .	Extense excites mate (e.g. dependent conference and	events displaced approximately 24.9	million people glob-	Received, January 14, 2022	River Manu and their cutoffs. Moreover, this s	tudy compares the temporal evolution and pre-				
	motivated them to choose voluntary non-migration as an adaptation option.	-	floods), many of which are thought to be exacerbated by	South Asia alone (IDMC 2020). By :	050, one in 45 people	Accepted : June 24, 2022	dicts the progress of selected meanders of Ri	ver Manu. In the present research, the Survey				
			climate change, affect the livelihoods and safety of people	is expected to be displaced globally	fue to climate change	Freeworks a 2022 Detract of all Tables an even	technique were used to examine the evolution	of the Manu River meander. Subsequently, a				
	1. Introduction Bangladesh, the largest John in the world, has unique prograp	phie		II 2014).	agenen Programme	access article distributed under the terms of the	field visit was done to the selected cutoffs and	I meanders of River Manu to ascertain the				
	Ginnie change has unevenly affected different areas across the both slow exset (e.g., depret of one level size) and in highly sensitive	*** **	Communicated by Biohawjit Mattick and accepted by Topical Collection Chief Eddor Christopher Roser	To cope with climate risks, mig	ation is often chosen	Draubse Dominions Attribution Literate, which permits anrestricted use, distribution, and	present status and collect data. It has been of	bserved that many outoffs have undergone				
	planet, with adverse impacts, and developing countries have been the cyclenee, flooding, and heavy memore minut extreme climatic ever supers effected (Table et al., 2011; Table et al., 2	*162	This satisfy is and white Trained Pathetics or Participants	driving force of economic growth a	nd is associated with	reproduction in any medium, provided the original	to agricultural fields. The width of River Manu	has decreased in all the selected bends from				
	2000: Makayim et al., 2000). Through the increased frequency of significantly affect Bacquates is population and their activities tability	ling	Non-Migration: Francoorks, Methods, and Cases			Outo Availability Statement All relevant data are	1932 to 2017. The sinuosity index has change	ad from 2.04 (1932) to 1.90 (2017), and the				
	free, includes, interest midal, and Books (Comberline, 2016; Faul. free, includes, interest midal, and Books (Comberline, 2016; Faul.	and	10 Md. Nasif Abum	Rajib Shaw		within the paper and its <u>Septorting information</u>	length of the river has decreased by 7 km in 8	5 years (1932–2017). The decrease in length				
	et al., 20223, these ampacts appear to have affected people's sociosco- coardine senior and socioscological coardinious around the gibbe by changing valuesable coardines in terms of classes with 2022, New	net	nast assatilizen kuachd	staw@stckeie.ac.g		ten. Easting: This mean through is supported by the	curvature of the bank soil samples were calo.	lated, indicating that the soil is poorly graded				
	land-one partenne (Malanjan et al., 2000; Mallala & Schanne, 2000). & Educal, 2001; Adard & Badaa, 2016; Call et al., 2017; Tamora et	ni,	kamar@ige.or.p	<sup>1</sup> Economics Discipline, Social Science: University (20)8. Kholma Ranctadesh.	choot, Khutna	Asia Pacific Network for Global Change Research	and falls under the cohesionless category. Ba	ised on cross-section analysis, sediment dis-				
			Faterna K hatan hara ku 190 amad com	<sup>2</sup> Natural Resources and Ecosystem Serv	an, Institute	(API8) under Collaborative Regional Research Programme (CRRP) with project reference number	charge, grain-size analysis of the bank mater	al, channel planform change, and radius of				
	<ul> <li>Corresponding author at: Economics Discipline, Khalas University (200, Bangladed, Erect addresser lateral artifizional new (7). Datami, and abused results as del (MAX. Abuse), artic costed/france as del (X. Abie), inverse wavered/wavered/interaction.</li> </ul>	e al	Rajarshi Davguta	for Global Environmental Strategies (C Kanagawa 240-0115, Japan	ES), Hayama,	CR81 P20 19-01 MY Karrer.	curvature, it can be stated that almost all the s cutoff. The highest probabilities were observe	elected bends nave the probability of future of in band 3 (Jalai) and band 4 (Chhontail)				
	(J. Namer), count description, etc. (R. Alsan), handlick@va.cl (R. Mallek), learner@(pr.or.); (F. Kanar),		dagapta@iges.or.jp	<sup>1</sup> Graduate School of Media and Governa	nce, Shotan Figisawa	Competing informatic The authors/have declared that no correcting internatic acid?						
	https://doi.org/18.1066/j.gbomedia.2022.100600 Received 20 September 2022; Received in revised form 15 September 2022; Accepted 17 October 2022		Bran Alan Johnson johnson@iges.nt.jp	Campus, Neso University, Papasava, Jap	un .							
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			Debleded online: 11 December 2021		Surfaces	DO CONTRACTOR AND A DESCRIPTION OF A DES		1 ( 22				

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## ご清聴ありがとうございました。

Thank you very much for your attention.

