

CURRICULUM_VITAE

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Education

Educational Qualifications				Subjects	Specialization (if any)
Name of the Degree exam	University/ Institution/ Board	Year of Passing	Division		
Madhyamik	WBBSE	2004	1 ST		
HS	WBCHSE	2006	1 ST		
BA (HONS)	Vidyasagar University	2009	1 ST	Geography (Hons)	
MA	Vidyasagar University	2011	1 ST	Geography	Urban geography and regional planning
Ph.D.	Indian Institute of Technology Kharagpur	2021	Thesis Title: Traditional Water Bodies, Ecosystem Services and Sustainable Natural Resource Conservation in West Bengal, India		

Skills

STATA, R Statistics, SPSS, MS Office, Vensim

Awards and Fellowships

➤ Travel grants to attend the 8th International Conference on Critical Geography in Athens, Greece	2019
➤ Junior Research Fellowship , Council of Scientific and Industrial Research (CSIR) with all India Rank 22nd.	2013
➤ UGC NET , University Grants Commission, Govt. of India.	2013
➤ UGC NET , University Grants Commission, Govt. of India.	2012

Research Interests

Socio-ecological system	Water Governance	Rural Development
Natural Resource Management	Political Ecology	Sustainable Development
Ecosystem Services	Climate Change Adaptation	Policy Analysis

Research Experiences

➤ Project Assistant at the Department of Industrial and System Engineering, Indian Institute of Technology Kharagpur-721302, India, in the project “Socio-economic Impact of Migration during COVID-19 Crisis in the Sundarbans Region: A Study of Sustainable Solutions using Geo-spatial Analytics”, Sponsored by Department of Science & Technology (DST), New Delhi.	11.2021-Present
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- **Research Associate** at the Department of Humanities and Social Sciences, Indian Institute of Technology Kharagpur-721302, India, in the project “Coping with Changing Climate: The Role of Sustainable Use and Management of Traditional Water Harvesting Systems in Odisha and West Bengal”, Sponsored by Indian Council of Social Science Research (ICSSR), New Delhi. 08.2014-02.2015

Teaching Experiences

Guest Lecturer at the Department of Geography, Silda C S College, Silda, Paschim Medinipur, West Bengal, India 11.2011-06.2013

Publications:

Peer Review Journals from PhD Thesis

1. **Chowdhury, K** and Behera, B. 2021 “Traditional Water Bodies and Cultural Ecosystem Services: Experiences from West Bengal, India.” **World Development Perspectives**, 24.
2. **Chowdhury, K** and Behera, B. 2021. “Economic significance of provisioning ecosystem services of traditional water bodies: empirical evidences from West Bengal, India”. **Resources, Environment and Sustainability**.
3. **Chowdhury, K** and Behera, B. 2021. “Institutional Dynamics and Water Resource Management: Case of Traditional Water Bodies in West Bengal, India”. **International Journal of Water Resources Development**.
4. **Chowdhury, K** and Behera, B. 2020. “Traditional Water Bodies and Ecosystem Services: Empirical Evidence from West Bengal, India.” **Natural Resources Forum**, 44: 1–17.
5. **Chowdhury, K** and Behera, B. 2018. Is declining groundwater levels linked with the discontinuity of traditional water harvesting systems (tank irrigation)? Empirical evidence from West Bengal, India. **Groundwater for Sustainable Development**, 7: 185-194.

Others Peer Review Journals

6. Pramanik, M., **Chowdhury, K.**, Rana, M.J., Bisht, P., Pal, R., Szabo, S., Pal, I., Behera, B., Liang, Q., Padmadas, S.S. and Udmale, P. 2020. Climatic influence on the magnitude of COVID-19 outbreak: a stochastic model-based global analysis. **International Journal of Environmental Health Research**.
7. Pramanik, M., Udmale, P., Bisht, P., **Chowdhury, K.**, Szabo S., and Pal, I. 2020. Climatic factors influence the spread of COVID-19 in Russia. **International Journal of Environmental Health Research**.

Media

The following news stories have featured my research:

1. Restoring tank irrigation can strengthen rural climate resilience (<https://india.mongabay.com/2019/01/restoring-tank-irrigation-can-strengthen-rural-climate-resilience/>)

Research Links

1. Google Scholar: <https://scholar.google.com/citations?hl=en&user=XL29XmsAAAAJ>
2. Research Gate: https://www.researchgate.net/profile/Koushik_Chowdhury4

Paper presented in Conferences:

Conference in Abroad

1. Presented a paper entitled **“Local Institutional Dynamics and Distributional Outcomes of Ecosystem Services: The Case of Traditional Water Harvesting Systems in West Bengal”** at **“8th International Conference on Critical Geography (ICCG 2019)”** on **In PERMANENT CRISIS? Uneven Development Everywhere War and Radical Praxis**; April 19-23 2019; held in **National Technical University of Athens, Athens, Greece**; organized by **The International Critical Geography Group (ICGG)**.
2. Presented a paper entitled **“Is Depletion of Groundwater Table Linked with Disappearance of Traditional Water Harvesting System (Tank Irrigation)?: empirical evidence from West Bengal, India”** at **ASBBS 25th annual conference** held in **Las Vegas, NV, USA**; organized by **American Society of Business and Behavioral Sciences** on 15-18 March 2018.

Conferences in India

1. Presented a paper entitled **“Household Perceptions of Ecosystem Services from Traditional Water Harvesting Structure in West Bengal, India”** at **“ANUSANDHAN 2019”** on **Multi-Disciplinary Approach towards Sustainable Development Role of Government, Academicians, Corporate, Civil Societies and Citizens**; February 21-22, 2019; **Indian Institute of Forest Management Bhopal; India**.
2. Presented a paper entitled **“Household Perceptions of Ecosystem Services from Traditional Water Harvesting Structure in West Bengal, India”** at **22nd Annual Conference of the Indian Political Economy Association (IPEA)** on **“Political Economy of Emerging Political Development and Ecological Challenges at the National and Global Levels”** held on December 14-15, 2018 at **Department of Economics, Jammu University, Jammu, India**.
3. Presented a paper entitled **“Tank degradation and Groundwater nexus: an empirical analysis from West Bengal”** at the **International Conference on natural resources management for sustainable development** organized by **Department of Geography and Resource Management, Mizoram University (a central University)** on 26-28 October 2017.
4. Presented the proposal entitled **“Managing water in a traditional way: Socio-economic and Ecological Analysis of Tank Irrigation in West Bengal”** at the **10th Doctoral Thesis Conference** organized by **IBS Hyderabad in collaboration with IGIDR Mumbai** on 20-21 April 2017.
5. Presented the proposal entitled **“Conservation of Environmental Resources Through Ethnic Practices: A Prototype Study on Santhal Community in Karkatia Village, Purulia District, West Bengal”** in the **annual workshop for junior scientist meet**, March 2011 at the **Netaji Institute for Asian Studies, Kolkata**.

Workshop attended:

1. Participated in the Dissemination Workshop on **“Qualitative Methods for Research in Socially Inclusive and Sustainable Agricultural Intensification”** organized at **IIT Kharagpur** during September 16-17, 2019 as a part of Research Project **“Promoting Socially Inclusive and**

Sustainable Agricultural Intensification in West Bengal and Bangladesh” sponsored by the Australian Centre for International Agricultural Research (ACIAR), Government of Australia.

2. Participated in the joint workshop on **"Rural Water Quality and Management"**, jointly organized by the **University of Edinburgh and Indian Institute of Technology Kharagpur**, during May 13-16, 2019.
3. Participated in the GIAN course on **“Managing and Governing Resource in the Anthropocene: Political Ecological Explorations from South Asia”** organized by **Department of Humanities and Social Sciences, at IIT Kharagpur**, November 26 and December 1, 2018.
4. Participated in the MHRD TEQIP-III Short Term course on **“Climate Change Risk on Sustainable Development in Rural India (Fact, Friction, Policy)”**, organized by **Rural Development Centre, at IIT Kharagpur**, 17-19 July 2018.
5. Participated in the week-long workshop on **“Quantitative Research Methods in Social Sciences Using SPSS”** organized by **Institute of Development Studies Kolkata**, January 30 – February 4, 2017.
6. Participated in the Short-Term course on **“Applied Economic Tools and Techniques for Managing Environmental Resources”**, organized by **TERI University**, 3-5 October 2016.
7. Participated in the Annual Research Methodology Course **“Research Skill and Data Analysis using R”**, organized by School of Management Studies, **Cochin University of Science and Technology**, 25-27 May 2016.
8. Participated in the QIP Short Term course on **“Theory and Application of Geospatial, geo-Imaging & Remote Sensing Technology”**, organized by **Department of Mining Engineering, at IIT Kharagpur**, 15-20 July 2013.

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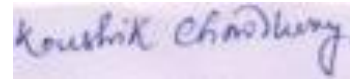
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Declarations:

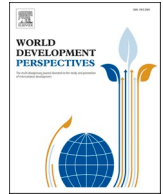
I do hereby declare that all the above information is true to the best of my knowledge.

Date: 25.11.2021

Place: Kharagpur



Signature



Traditional water bodies and cultural ecosystem services: Experiences from rural West Bengal, India

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ARTICLE INFO

Keywords:

Water bodies
Cultural ecosystem services
Trends
Drivers of changes
Sustainable resource use and management
West Bengal
India

ABSTRACT

One of the major challenges in the world today is to recognize, maintain and/or enhance beneficial contributions of nature to people with minimum distortions to the local ecology. Using both qualitative and quantitative methods and a context-specific perspective, the present study identifies and assesses various cultural ecosystem services people obtain from traditional water bodies in West Bengal, India. The study also explores the ways to incorporate cultural ecosystem services in management initiatives of traditional water bodies at local level. It is found that people obtain a variety of non-material benefits from the traditional water bodies which include artistic inspiration, cultural heritage, social relationship, and various services relating to religious, spiritual, aesthetic, recreational and environmental aspects. The cultural ecosystem services are often not documented in empirical studies and are declining due to socio-cultural and environmental changes in the region. It is observed that use of these cultural ecosystem services by households vary significantly with their cultural practices, socio-economic (e.g. wealth and social status of households) and demographic characteristics (e.g. age, gender and education level of household head). Thus, mainstreaming cultural ecosystem services that are generally not amenable to biophysical and/or monetary matrices can play a crucial role in sustainable use and management of traditional water bodies.

1. Introduction

Cultural ecosystem services are described as the non-material benefits people obtain from ecosystems in the form of one's spiritual enrichment, recreational benefits, and aesthetic experiences (Dickinson and Hobbs, 2017). Cultural ecosystem services are directly perceived by people and have links with cultural wellbeing of the communities (Ahmad et al., 2019; Wangai et al., 2017). Studies on cultural ecosystem services are frequently found in industrialized countries focusing largely on limited aspect of recreational services (Hermes et al., 2018) and ignore other subtle but quite obvious aspects of cultural ecosystem services including cultural identity and survival of the traditional communities which can be effectively used as policy tools for protection of local ecosystems (Clements and Cumming, 2017; Ho et al., 2018; Vieira et al., 2018).

Although the concept of cultural ecosystem services was first introduced and popularized by the Millennium Ecosystem Assessment Report (MEA, 2005), the role of local and indigenous knowledge in understanding nature's contribution to people has not been sufficiently taken

into account in scientific approaches (Parsons and Fisher, 2020). This is true because cultural ecosystem services are often regional, community-based and individual-specific as it depends on the personal interests of people as well as community that benefit (Polishchuk and Rauschmayer, 2012). Hence, study on cultural ecosystem services requires a context-specific approach rather than a generalized perspective in order to improve our understanding of local sensitivity towards cultural ecosystem services (Schmidt et al., 2017).

Studies on tank ecosystem have mainly highlighted various aspects of tank ecology including flora, fauna, and groundwater recharge, and ignored the cultural dimension of tank water bodies (Ariza et al., 2007; Reddy and Behera, 2009; Chowdhury and Behera, 2018). In recent years, authors have argued in favor of spiritual, religious, and cultural significance and identity of the landscape as instruments for conservation of ecosystem (Chowdhury and Behera, 2021; Ko and Son, 2018; Fraser et al., 2016). Thus, it is necessary to discuss the cultural ecosystem services that are meaningful to the imaginaries of local residents and stakeholders in their everyday life. Hence, household perception and uses of cultural ecosystem services may help to

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Economic significance of provisioning ecosystem services of traditional water bodies: Empirical evidences from West Bengal, India

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ARTICLE INFO

Keywords:

Tanks
Provisioning ecosystem services
Valuation
Livelihoods
West Bengal
India

ABSTRACT

The paper attempts to assess the economic values of provisioning ecosystem services people obtained from traditional water bodies, and identify and analyse determining factors that are likely to influence household collection of the same. Descriptive statistics and Poisson regression model has been used to analyse the data collected from 150 households residing around three selected tanks. The study finds that the average household income from agricultural activities linked with tank during 2016–2017 was estimated to be INR 1033 (16 USD), INR 7216 (112 USD) and INR 7044 (109 USD) for Alam Sahar, Harda Jhil and Rishi Bundh tanks, respectively. Regression analysis suggests that households with more female members and livestock, younger household heads and lower social caste backgrounds tend to obtain more provisioning ecosystem services from tanks. Households located far away from the tank collect less tanks products. The findings have important policy implications for poverty alleviation and addressing malnutrition and food security problems in rural India.

1. Introduction

People obtain a variety of benefits, both tangible and intangible, from ecosystems (Millennium Ecosystem Assessment, 2005). The concept of ecosystem services is referred as the economic, social and ecological contributions of ecosystems to human (De Groot et al., 2012; Pittock et al., 2012; Müller and Burkhard, 2012). Identification of various ecosystem services and their beneficiaries and/or users are essential for sustainable management of ecosystems. The complex and dynamic interactions between ecosystems and people have resulted in exponential rise of ecosystem services research in recent decade (Maestre-Andrés et al., 2016; Mensah et al., 2017). The economic value of ecosystem services reflects the relative importance of ecosystem services in monetary terms (Nieto-Romero et al. 2014). Valuation of ecosystem services and incorporation of these values into the decision making processes may help in sustainable use and management of ecosystem (Geijzendorffer et al., 2015). Moreover, reduction of rural poverty relies on continuous flow of the benefits from ecosystems (TEEB, 2010). The current social and neoliberal economic system have failed to recognize the important life-supporting function and economic and socio-cultural values of nature and hence it is responsible for large scale degradation of the environment (Potschin and Haines-Young, 2017).

Although it is conceptually understood that ecosystem services have an important role in promoting every aspects of human well-being, majority of existing studies have mainly focused on nature's contribution to overall well-being of people (Koko et al., 2020; Lapointe et al.,

2021; Marshall et al., 2018; Suich et al., 2015). It is observed that the concept of ecosystem services tend to bridge the natural and human spheres and viewed as an integral part of broader socio-ecological systems (Lamsal et al., 2015; Lele and Srinivasan, 2013; Maynard et al., 2015). It is also understood that in-depth study of people-nature interactions are often necessary to understand the benefits people obtain from ecosystem (Potschin and Haines-Young, 2017; Chowdhury and Behera, 2021), where inputs from human being constantly received across different stages of the production of ecosystem services (Palomo et al., 2016). Limited studies exist that have exclusively focused on the social distribution of the contributions of nature (Lakerveld et al., 2015; Cáceres et al., 2015; Zhang et al., 2016). It is important to note that although contribution of ecosystem has been specified as social coherence, security and freedom (MEA, 2005) but its equitable distribution among different segments of local communities are not given emphasis. Several studies point out that poor understanding of economic value of ecosystem services and its social distribution is one of the prime causes of mismanagement of ecosystem (Kubiszewski et al., 2013a; Costanza et al., 1997; Hartel et al., 2014; Sharma et al., 2015). Hence, lack of proper understanding of the actual economic value of ecosystem services within existing local socioeconomic settings may not capture the true value of traditional water bodies, which may result in less informed management decisions of tanks and that caused their degradation.

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Institutional dynamics and water resource management: the case of traditional water bodies in West Bengal, India

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ABSTRACT

In recent years, the adverse effects of growing water scarcity on the lives and livelihoods of poor people have become a major policy concern in India. This paper reviews the effectiveness of macro-level policies for rainwater conservation and critically examines micro-level local community institutions for the sustainable management of traditional water bodies. Using Ostrom's design principles and qualitative data from three different multipurpose tanks, the study finds that management decisions at the local level have benefited few influential members of local communities and deprived a large number of poor households from resource uses, making the local institutions ineffective.

ARTICLE HISTORY

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KEYWORDS

Institutions; tank management; socio-political-ecology; self-governance; West Bengal; India

Introduction

Traditional water bodies such as tanks are inextricably associated with the cultural and socio-economic conditions of people in rural India. Historically, these water bodies have played a significant role in promoting livelihood activities by maintaining an all-round socio-ecological balance in rural human settlements (Reddy & Behera, 2009a). These century-old water infrastructures were developed and maintained by rulers with the active participation of local communities for harvesting and storing rainwater and subsequently using it for irrigation, domestic uses and recharging groundwater throughout the year (Ariza et al., 2007; Siddaiah & Chandrakanth, 2011). In addition, these water infrastructures also help control floods and combat the adverse effects of prolonged droughts. In India, these traditional water bodies provide livelihood security to millions of poor people living especially in fragile semi-arid regions (Reddy & Behera, 2009b).

Traditional community-based local institutions that had managed water resources sustainably in India for centuries have come under tremendous pressure in recent decades because an emerging class of elites exploited their power to make decisions through political patronage, while the rapid spread of commercialization and consumerism in rural areas led to the encroachment of tank areas and the disintegration of collective action as well (Balasubramanian, 2006). In addition to increased uses of groundwater, the functioning of traditional tank institutions has also dramatically changed due to the altering laws of land ownerships and farmers' changed attitude towards surface water

ARTICLE

Traditional water bodies and ecosystem services: Empirical evidence from West Bengal, India

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Funding information

Council of Scientific and Industrial Research, Government of India, New Delhi, India

Abstract

Traditional water harvesting systems are multi-functional in nature and provide a variety of ecosystem services that contribute to the overall wellbeing of local people. This study aims to identify and analyze the factors influencing the variations in the level of awareness across households residing around three selected traditional water bodies in the Indian state of West Bengal. Ordinary least square (OLS) regression models have been used to identify and analyze the determinants of household perception on ecosystem services from tank water bodies. Results show that while a majority of households have strong perceptions on the provisioning and cultural ecosystem services of the tanks, the household perceptions on regulating and supporting services of the tank is found to be relatively weak. Households belonging to lower caste and poor are likely to be more dependent on ecosystem services from tanks than upper caste and rich households, and hence they have better perceptions of provisioning ecosystem services. Households' awareness about provisioning ecosystem services is negatively related to their level of education and wealth. It is observed that household awareness about regulating and supporting ecosystem services is positively associated with the level of education of the households, ownership of tube well and private tanks. While it is essential to consider household perception on all the ecosystem services for sustainable use and management of traditional water harvesting systems, incorporating the local norms, customs



Research paper

Is declining groundwater levels linked with the discontinuity of traditional water harvesting systems (tank irrigation)? Empirical evidence from West Bengal, India



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ARTICLE INFO

Keywords:

Traditional water harvesting structure
Groundwater
Tank degradation
Tank irrigation
West Bengal

ABSTRACT

The present study aims to identify and analyze factors responsible for the discontinuity of irrigation tanks and the declining groundwater levels in the Indian state of West Bengal, and attempts to establish the link between age-old water-harvesting structures such as tanks (surface water) and groundwater recharge. Using district-level secondary data from 1992 to 2011, a fixed effect and dynamic panel regression models have been estimated in order to identify the determinants of the performance of irrigation tanks and the decline of groundwater levels, respectively. The results indicate that, while the average annual rainfall positively influences the performance of irrigation tanks, the mechanization of the farms, the density of the wells, increased rural population and per capita income adversely affect the performance of tanks. The results of the determinants of the decline of groundwater levels show that, while the average annual rainfall, density of tanks and forest cover are likely to influence groundwater levels positively, the density of wells is found to be adversely affecting the groundwater levels in the state. The interaction between tank irrigation (surface water) and groundwater levels is found to be strong. Hence, both tank irrigation and well irrigation should be used as complementary methods, rather than substitutes in order to maintain a hydrological balance, and use and manage water resources sustainably in the long run.

1. Introduction

Sustainable management and the use of water resources is critical for the overall development of human society. In this context, it is important to understand the dynamic and complex links between groundwater and surface water and their interactions. This interaction takes place through physical linkage and the hydraulic connectivity of water among rivers, wetlands, tanks, and surrounding catchments. Surface lateral flow and infiltration or exfiltration enhance the interaction between surface water and groundwater (Sophocleous, 2002; von Brömssen et al., 2014). These groundwater and surface water interaction processes depend on the magnitude of the recharge and antecedent of soil-moisture and aquifer conditions (Wood et al., 1990; Biswas et al., 2017). In drought-prone regions, tanks are dug to harvest rainwater and are often used for percolation to recharge groundwater (Reddy and Behera, 2009). Degradation of tanks and the encroachments of their catchment areas can disconnect the link between surface and groundwater, resulting in the loss of both surface and groundwater that can jeopardize the sustainability of agriculture activities and the local ecosystem. Therefore, a comprehensive understanding of the link

between tanks and groundwater is important for an effective and sustainable use and management of water resources, especially in the context of rain-fed and drought-prone regions.

Globally, groundwater is an important source of water for people in rural areas, as about 85% of rural populations depend on groundwater for a variety of domestic and irrigation purposes (World Bank, 2010). India is one of the largest users of groundwater resources in the world, which extracts about 230 cubic kilometers per year (CGWB, 2014; Varua et al., 2018; Prasad and Rao, 2018). More than 63% of agricultural land in India is irrigated using groundwater (GoI, 2015). In arid and semi-arid areas, 60–100% of the water supply depends on groundwater (Hetzel et al., 2008). Overuse and over-extraction of groundwater is associated with the significant risks of depletion and the long-term irreversible degradation of water and contamination of groundwater (Prasad and Rao, 2018). Sixty percent Indian districts have already shown evidence of either groundwater depletion or contamination or a combination of both (Kulkarni et al., 2015).

Since independence in 1947 and especially from the 1960s, the importance of tank irrigation has shown a declining trend when the use of groundwater for irrigation started to grow rapidly as a result of the

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