

Environmental Degradation and River Rejuvenation

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ABSTRACT

The first quarter of the 21st century has been defined by escalating environmental catastrophes—climate change, pollution, and biodiversity loss—driven by fossil-fuel dependency and “K-shaped” economic inequality. While global efforts primarily focus on emission reduction, carbon sequestration through river rejuvenation offers a vital nature-based solution. This study critically examines India’s Detailed Project Report (DPR-2022), arguing that its emphasis on 13 major rivers overlooks the ecological and carbon-sink potential of hundreds of smaller rivers and tributaries.

By focusing on West Bengal’s vital streams, such as the Buriganga, Anjana and Marali, this empirical research explores a dual-purpose framework: restoring healthy riverine ecosystems to act as natural buffers and leveraging rejuvenation to stimulate rural and peri-urban livelihoods. By integrating local ecology with economic stability, the study assesses how small-river restoration can mitigate climate change while effectively curbing distress migration to urban centres.

Keywords: Hauntology, Ecosystem Services, Floodplain Zones (FPZ).

1. INTRODUCTION

Background

The first quarter of the 21st century has been marked by significant environmental catastrophe and growing inequality in the economy. Environmental catastrophe refers to climate change, pollution and loss of biodiversity. These are largely results of K-shaped developmental process and fossil fuel-based transportation system. In order to mitigate the problem of climate change two types of solutions have been advanced: first reduction of carbon emission by adopting emission free technology and second enhancement of carbon sequestrations through rejuvenation of rivers. The recent Detailed Project Report (DPR-2022) on rejuvenation of 13 major rivers by government of India is an example in this context. It has been argued that healthy riverine eco-systems, including wetland and forests act as significant carbon sinks,

storing carbon and acting as natural buffers against climate change. The DPR-2022 however does not take into account the problem associated with rejuvenation of small rivers. It should be mentioned that India has hundreds of small rivers and tributaries within its major basins, while West Bengal alone features several dozens of significant streams like Kulik, Jalangi, Anjana, Churni that are vital to its landscape. In view of this an attempt has been made to consider the rejuvenation of small rivers. In another point that has not been properly addressed in (DPR-2022) is the interlinkage between river rejuvenation and promotion of livelihood in rural areas and peri-urban areas which in turn prevents migration from rural areas. In short, the objectives of this empirical study are to fold: first to assess the aspects of river rejuvenation of small rivers and second to assess the impact of this attempt on migration from rural areas.

2. THE METHODOLOGY

The methodology adopted here to study dimensions of rejuvenation of small rivers has four distinctive features. First instead of technocratic profit driven model the eco-system services approach has been adopted. Secondly as majority of the minor rivers are moribund the lens of ‘hauntology’ that is addressing the spectre of what this water-bodies once were have been applied. Thirdly as this study is an empirical one a detailed geo-morphological investigation has been conducted with a view to capture the river’s existence. Lastly, to understand human perceptions of the river, a psychometric tool developed by Rensis Likert was used.

The idea of Eco-system services has been propagated by ecologist Paul and Anne Ehrlich in 1984. These two researchers have developed the concept of Eco-system services which constitutes provisioning services, supporting services, cultural services and regulatory services. This new orientation had been widely accepted at the Brisbane Declaration 2007 and 2018. In other words, the new orientation emphasizes the interrelationship between the river and inhabitation of the surrounding area.

The method of ‘hauntology’ has been developed by Jaques Derrida in 1990 to assert the validity of Marxian thought in the era of neo-liberalism. This idea has been used here to convey the specter between river’s existence and non-existence. In other words, the lens of hauntology has been used to identify the specter of a waterway that persist in the cultural memory of the people despite its physical absence from modern maps.

The absence of river in the modern map necessitates a detailed geomorphological investigation into the physical condition of the moribund river. It helps one to grasp the reality of the situation and to gauge for systematic excavation plan of the river. This study focuses on human perceptions about river. A structured questionnaire has been designed around four pillars eco-system services-provisioning services, supporting services, cultural services and regulatory services. In short, methodology adopted here has four distinctive features-(i) the concept of eco-system services has been adopted (ii) the method of hauntology have been applied to trace the presence of rivers in the minds of people, (iii) a detailed geomorphological status of the three rivers has been done and (iv) Likert scale have been used to quantify human perception about river.

The Study Area

Nadia district, situated at the northwest apex of the world's largest delta, is characterized by a "moribund" geomorphology where river systems are divided into north-south flowing main channels like the Bhagirathi and Hooghly, and west-east connecting minor rivers such as the Buriganga, Anjana and Marali. While the major rivers maintain flow, the minor rivers have become "silent" due to source interruptions and anthropogenic pressures, embodying Garrett Hardin's "Tragedy of the Commons" through encroachment and pollution. This environmental decay is intrinsically linked to a sharp demographic shift; Census data reveals that the rural population growth rate in Nadia plummeted from 21.62 percent in 2001 to a mere 2.85 percent in 2011, signalling a crisis in the rural economy and forced urban migration. With an agrarian structure dominated by small and marginal farmers—particularly in blocks like Chakdah and Ranaghat-I—the health of the local economy depends on these water bodies. As Paul Ehrlich's theories suggest, rejuvenating rivers like Anjana, Buriganga, Marali are essential to restore ecosystem services, providing the necessary "supporting" and "provisioning" functions to sustain agriculture and arrest rural depopulation. Consequently, river restoration in this "infatuated delta" is not merely a conservation effort but a vital strategy for improving the Human Development Index and securing the livelihoods of Nadia's dense population.

3. THE FINDINGS

The River Anjana

River Anjana is flowing in Nadia from West to East. It was once a vibrant 23-mile confluent waterway connecting the Jalangi and Churni rivers. At present it has been

reduced to a stagnant channel by centuries of human interference, ranging from 17th-century royal dams to modern urban encroachment. Today, while 89% of its city-stretch is classified merely as an "Anjana canal," the rural sections from Dogachhia to Byaspur retain a "specter" of their former ecological beauty. However, even in these rural belts like Dharmadaha and Patulipara, the river faces severe threats from shallowing, algae overgrowth, and the conversion of floodplains into agricultural land or construction sites. This decay has forced a shift in local professions and weakened the traditional human-river interrelationship.

The condition of the river Anjana in detailed have been stated below

State of River Anjana (Length : 23 Km) at some selected places- 2021						
Sl. No	Places	Rural / Urban	GP	BLOCK WITH PLCN NUMBER	State of River Anjana	People's perception
1	Krishnanagar	Urban			Direction of flow: North to South, Connection with river Jalangi was blocked about 200 years ago. A church built in 1860 exists on the flood plan on the river. Lost and converted into canal	Channel should be restored
2	Dogachi	Rural	Dogachi	KNA-1(510)	Direction of flow: West to East, Anthropogenic intervention: River is compartmentalised for fisheries in ten places.	Flow of water should be maintained
3	Dharmadaha	Rural	Chakdignagar	KNA-1(521)	Direction of flow: North to South, Ankle deep water, Anthropogenic	Channel should be properly excavated

					intervention: Reguler cultivation on flood plain.	
4	Arbandhi	Rural	Arbandhi-I	Santipur(729)	Direction of flow: North to South, Anthropogenic intervention: Unauthorised construction on the river bed. River is filled with water hyacinth	Unauthorised construction should not be done
5	Ballavpur	Rural	Arbandhi-I	Santipur(730)	Direction of flow: River takes a huge turn from North to South-East, Filled with water hyacinth, Permanent 'vasals' are visible on the river bed	Water hyacinth should be removed
6	Patulipara	Rural	Badkulla-I	Hanskhali(631)	It is on the other side of Ballavpur, Anthropogenic intervention: A big temple built recently is found on the flood plain. River is filled with water hyacinth.	Water hyacinth should be removed
7	Anjangerh	Rural	Barasat	RHA-I	Direction of flow: West to East. Anthropogenic intervention: A permanent gheri is on the river bed for fishing. A small temple is also visible on the bank of the river.	Channel should be cleared from any obstruction

8	Gangni	Peri-Urban	Barasat	KNA-I (743)	Direction of flow: West to East. Anthropogenic intervention: Retting of jute in the river. Knee deep water, partially filled with water hyacinth	River should be excavated
9	Chandandaha	Rural	Barasat	RHA-I(762)	Direction of flow: West to East. Anthropogenic intervention: Encroachment of the river, Retting of jute in the river, River lost its width, due to erection of parallel embankment on both side of the river.	Width of the river should not be reduced
10	MugraII	Rural	Barasat	RHA-I(576)	Direction of flow: West to South-East. Anthropogenic intervention: Retting of jute in the river. Permanent 'vasals' are visible in the river. Knee deep water in the river.	Restoration of the channel should be properly done
11	Byaspur	Rural	Khisma	RHA-I(765)	River empties into river. Anthropogenic intervention: Orchards are visible on the flood plain.	Installation of sluice gate is necessary

					Bounded with water hyacinth and weeds. Dried in summer season.	
Note: Census of India has identified every village by assigning permanent location code number (PLCN) As against this in three tier Panchayet System a village is identified with Gram Panchayet (GP)						
Copyright: SANKHA SUBHRA NATH email: n.sankha@gmail.com, Contact No. 9433565062						Disclaimer: This is an academic study, with no intention to hurt anybody.
Source: Field visit July-August 2021						
Curtsey BADKULLA VIGYAN PARISAD						

The River Buriganga

A river may lose its flow due to natural reasons or due to anthropogenic reasons. But resuscitation of river is entirely the resultant of conscious collected human intervention. In other words, rejuvenation of river is the effect of conscious human activities. The classic example is Pete Seeger's intervention with respect to River Hudson in New York during 1960 – 1979. "His genius was in recognizing that salvation of the river Hudson could come from grassroots activism", said Robert Kenned Jr Remarkedly, the effort to save the Hudson worked. Under public pressure the Poly Cholermated Biphenyl (PCB) were banned in the 1970s. The Environmental Protection Agency of USA (EPA), in 1980 designated 200 miles stretch of River Hudson as a clean-up.

Serger's concept of environmental activism i.e., grass-toot activism has been found to be formalized in the theoretical structure of Nebel Laurite Elinor Ostrom (1990) 'the theory of governing the common pool resources' It is a model of how community can manage shared resources in a substantial way. This theoretical structure gave an impetus for practitioners in the field of environmental protection. In 2007, the Brisbane Declaration and global action agenda has been adopted it

highlights the significance of environmental water allocations for humans and fresh water dependent eco system. The declaration set out is mine point global action agenda. In 2018 the Brisbane Declaration has been reviewed with the addition of a new element. The new element is the emphasis given to full and equal participation for people of all cultures and respect for the rights, responsibilities and environmental water decisions (Arthington 2018, p12 cited here from Enderson 2019 p2). With this basic idea, the intervention of human with respect to channel Buri Gangs at Chakdah has been analysed. The analysis has been done under three sections Era of Realization, Era of grass-root activism and the Government in Action.

Era of Realization

1. 2000-2004: Devastating millennium flood of 2000 (Rudra, 2015 p12). Due to flood the ward no. 10 & 11 Chakdaha Municipality has been under water for at least 15 days. The deluge reveals the importance of the river towards drainage of rain water.
2. 2004-2005: The arsenic level in drinking water has been found to be very high in some wards of Chakdha Municipality. It has been realized that there is a link between reduction in the flow of water in Buriganga and alarming level of arsenic in drinking water.
3. 2011: The new government has been approached to solve the issue.

Era of Grass-root Activism

1. 2016: A meeting has been organized at Ranaghat with the stake holders of river Buri Ganga i.e. with the farmers and fish farmers residing on the banks of the channel. The following four aspects has been identified at the meeting (a) assurance of livelihood of the stake holders, (b) proper drainage of the rain water (c) maintenance of ground water level and (d) protection of the area from erosion of river.
2. 2017-18: A series of agitations including marches, squatting, picketing has been organasied. Dakshin Banga Matshayajibi Forum has taken a leading role in this respect.
3. 2019: A memorandum with duly signed by about 1000 stake holders of the river has been submitted to the various Govt. offices. Dakshin Banga Matshyajibi Forum has taken a leading role in this respect also.

4. 2020-21.: At least ten RTI had been done to know the stand taken by the government in this respect.
5. 2024: A survey has been conducted by a student of IGNOU assisted by Chakdha Biggyan o Sanskritik Sangastha during January and February among the stake holders of river Buri Ganga. The basic objective of the survey has been assessing the perception of the stake holders towards the river.

The Government in Action

1. 2023: A work order dated 31.05.2023 has been released by the office of the Executive Engineer, Nadia, Irrigation Division, toward resuscitation of Buriganga river (the drainage channel as stated by Government) for a length of 3400 metre. After a continuous dredging programme for a period of 120 days, the water flows uninterruptedly from Sanyal Char to Mosner Math.
2. 2024: The work order for the second phase of work has been released on 10th June 2024. During July 2024, the dredging work has been found to be at full swing at two points Mosner Math and Ganga Prasadpur.
3. An irony is that a field visit to the Buriganga in January 2024 reveals a different picture. The river has been found to be filled with unwanted weeds. It reflects the negligence of the authority in maintaining waterflows in the river. One important point is that peoples of the surrounding area expressed their opinions in the formation of a River Rejuvenation Committee.

In short, the river Buriganga is basically an ox-bow lake of river Hooghly. In the early days of Independence, it was vibrant. However, for the last two or three decades it has been turned into a moribund river. The deterioration of the river caused displacement of fishermen, rising level of arsenic in Chakdaha municipality and severe shortage of ground water. After a prolonged grassroot activism during 2010 to 2020 Buriganga draws the attention of the Government and excavation started. The Buriganga's revival was catalyzed by "grassroots activism," as seen in the Hudson River's history and Elinor Ostrom's theories on common-pool resources. Following the devastating 2000 floods and rising arsenic levels, local stakeholders, led by groups like the Dakshin Banga Matsyajibi Forum, utilized marches, RTIs, and memorandums to activate state capacity. This pressure resulted in a 2023 government work order that successfully dredged 3,400 meters of the channel, restoring uninterrupted flow. The comparative study suggests that while the Anjana suffers from a lack of

integrated planning, the Buriganga's success proves that when local "social capital" is leveraged, stagnant water bodies can be transformed back into healthy ecosystems that provide essential provisioning and regulating services, ultimately securing rural livelihoods and environmental resilience.

The River Morali

The River Morali is also a East to West flowing river of Nadia. It connects river Hooghly in the West and River Jamuna in the South-East. At present it has been turned into moribund river. Drawing on Jacques Derrida's theory of hauntology, the study of the Morali River seeks the "specter" of a waterway that persists in cultural memory despite its physical absence from modern maps. While the 1937-38 map by Prabhas Ghosh delineates its full 15 km crooked course through Nadia's Chakdah block, current 2024 Google maps only capture a 10 km fragment between the Satsalokir and 1080 beels. Field observations in late 2024 reveal a landscape of "existence and non-existence," where picturesque stretches like the Lakshmipur Bridge coexist with severe encroachment. Much like Hemingway's Santiago, local fishermen face the tragedy of "water without fish," yet the successful rejuvenation of the nearby Buriganga fuels hope. Reviving the Morali's full course is now viewed as an essential intervention to restore drainage, control arsenic levels, and provide a lifeline to 40,000 fishing families.

Tracing the Morali River through Nadia's landscape reveals a complex "nervous system" of waterways, extending to the historic village of Chowberia—birthplace of Dinabandhu Mitra—where the river acts as a symbolic fence before its swastika-shaped confluence with the Yamuna. Ground observations in late 2024 highlight a "Tragedy of the Commons," with the riverbed falling victim to the aggressive footprints of the real estate sector and infrastructure neglect. From Hume-pipe bottlenecks in Mathurapur to the "ghostly" invisible stretches in Na-Hata, the river fluctuates between physical reality and memory. By blending geoarchaeological remote sensing with Derrida's hauntology, researchers have successfully mapped these hidden channels, fostering a renewed hope for the Morali's rejuvenation led by local scientific organizations.

The Morali River's 27 km course, split into three distinct segments, faces a graduated crisis of degradation requiring urgent intervention. From its origin at Uttar Ghugia to the Satsalokhi Bheel, the river is throttled by hume pipes and earthen embankments, necessitating major dredging. While the middle segment remains picturesque, the final 10 km stretch toward the Jamuna confluence is severely endangered by "anthropogenic intervention," with concrete constructions and

encroached floodplains in villages like Nahata and Chowberia. Restoring this vital waterway—essential for supporting Nadia’s small-scale farmers and 40,000 fishermen—demands a systematic excavation plan. Utilizing 20-ton excavators at an estimated rate of 30 cubic meters per hour, the project aims to clear weeds and re-establish the river's integrity. Such rejuvenation is the only path to reviving the local ecosystem services and arresting the rural-urban migration triggered by this environmental "Tragedy of the Commons."

River MARALI: A Phase wise Description and Level of Dredging Required
SEGMENT 1: Uttar Ghugia to Satsalokhi Bheel (Lenth 7km) Direction of flow: West to South East

Block / Panchayat	Sl.No	Village PLCN (2001)	Population (2011)	State of The River	Level of Dredgaing Required
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SEGMENT 1: Uttar Ghugia to Satsalokhi Bheel (length 7km) Direction of flow: West to South East					
Chakdah	1	Uttar Ghugia	424	River originates from Buri Ganga	Moderate
Chakdah / Dubra	1	Mahanala (2400)		River under NH12. passage is about 7mt only	Moderate
	2	Ichapur (2200)	2349	An earthen embankment has been erected across the river	Major
	3	Marasa (2700)	2811	River passed through the hume pipe	Major
	4	Bhatpara			
	5	Neulia (2500)	3062	A magnicifent Bheel. (Area: 3522 acre). Dag No: 489. Khatiyan No: 790	Minimum
	6	Parari (1700)	2228	River is filled weeds and water haynench	Moderate
	7	Mathuragachi (1600)	2974	River is flowing over the plain land.	Major

	8	Mathurapur	327	River has been passed through a hume pipe.	Major
SEGMENT 2: Satsalokhi Bheel to 1080 bheel (Lenth 10km) Direction of flow: North to South East					
Chakdah / Hingnara	1	Darappur			Minimum
	2	Ballavpur	1519	Constrasring feature on both side of the bridge	Minimum
	3	Hariankha (3700)	6585	Condition good. The River is picturesque	Moderate
	4	Hingnara (4300)	1687	Beautifull sight	Moderate
	5	Metepara (Muktipara)	824	Beautifull sight	Moderate
	6	Purulia (4500)	2000	The River is Picturesque	Moderate
	7	Radhanagar	1349	The River is Picturesque	Moderate
	8	bagrabpur (4100)	840	The magnicifent 1080 Bheel. (Area: 33 acre)	Moderate
SEGMENT 3: 1080 Bheel to River Jamuna (Lenth 10km) Direction of Flow: North West to south East					
Bongaon / Digha	1	Lakshmipur	2018	A serious encroachment on River	Major
	2	Satashi (0300)	1637	River has been encroached	Major
	3	Mamudpur (0700)	2054		Moderate
	4	Nahata (Ichhalampur)	6886	severe antrogepogenic intervantion. Concrete construction on the flood plain of the River.	Major
	5	Purnanagar			Major
	6	Dakshin Kanekpur (0800)	1547	Anthropogenic intervantion. A bathroom is consturation on the flood plain of the River.	Moderate

Haringhata	1	Nimtalabazar		Perilious condition Filled with weeds	Major
Bongaon / Chowberia	1	Chowberia (1100)	8039	Severe anthropogenic intervention	Major
	2	Chak Chowberia		Marali meets with River jamuna.	Moderate
	3	purba Satberia			Moderate

About excavation:

- i) Excavator: EX - 200 (20 tons) ii) Av. volume of soil per bucket = 0.9cmt (31.75cft)
 iii). Av. Volumn of soil excavated per hour = 30cmt (1150cft) iv) Rate of excavator per hours = rs.2600 - rs.3000

Courtesy: Dakshin Banga Matshyajibi Forun, Chakdha Bighyan O Sanskritik and Durgapur Social Education Trust, Durgapur

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The socio-economic analysis of Marali River stakeholders reveals a mature, educated demographic, with over 90% of respondents aged 31–60 and 54.5% holding graduate degrees. While 90.9% are employed—primarily in teaching, agriculture, and fishing—income levels are modest, with 45.5% earning ₹20,001–₹50,000 monthly. Housing is relatively stable (54.5% Pakka), but land ownership is minimal, as 63.6% own under one acre. Critically, 90.9% observe significant water availability deterioration, while 72.8% report declining water quality. This environmental decay directly impacts local resilience; although 63.7% value the stream for flood protection, a similar percentage now experiences moderate-to-high waterlogging. The survey results paint a stark picture of the Marali River's decline, defined by a "Tragedy of the Commons." While 100% of respondents recognize the river's critical role in groundwater recharge and 81.8% value its aesthetic importance, the reality is one of severe degradation. Over 72.8% report significant contamination, and 90.9% perceive a nearly unanimous crisis of streambed encroachment. Culturally, engagement remains high for rituals (91% participation), yet recreational use has plummeted, with 54.5% reporting no such activity. Most tellingly, 90.9% of the community perceives restoration efforts from authorities as non-existent or minimal. This data confirms that while the community's "hauntological" connection to the river remains strong, the absence of state-led rejuvenation is pushing this vital ecosystem toward a point of no return.

This dissertation demonstrates that the health of the Marali River is a vital determinant of rural prosperity in Nadia, West Bengal. Spanning 27 km across three distinct segments, the river's physical decay—from vibrant stretches to "ghostly" disappearances—was mapped using Jacques Derrida's hauntology to retrace lost channels. Survey data confirms a powerful socioeconomic link: while 90.9% of the population is employed, they face an environmental crisis where 72.8% prioritize the stream for domestic needs and 100% recognize its critical role in groundwater recharge. Following the successful 2023 rejuvenation of the Buriganga, which revived the local western economy, stakeholders in Dubra and Hingnara hold high aspirations for a similar breakthrough. With 63.7% viewing the river as essential for flood protection, its restoration is seen as the primary solution to curbing distress migration and securing a sustainable future for the district's marginal farmers and fishing communities.

A Comparative Study of the Three Rivers

Sl. No	Description of the items	River Anjana	River Buriganga	River Morali
1	Total length of the river	23km	8km	27km
2	Is river perennial	No	No	No
3	Major towns on the bank of the river	Krishnanagar	Chakdah	Chakdah & Bongaon
4	No of drains contributing to pollution	NA	6	NA
5	Name of the drains contributing to pollution of the river	NA	Drains at ward no. 12 is worst	NA
6	Total Number of industries discharging waste water directly	NIL	Paper Mill	NA
7	Whether there exist river rejuvenation committee constituted by state government or local government	No	No. However people thinking of a committee for supervision.	No
8	Presence of Eco-system services	Negligible	Negligible	Negligible

4. CONCLUSION

A paradoxical situation prevails in the management of river systems of India. The major Indian rivers received significant Government attention through forestry interventions etc. the minor rivers- the true lifelines of rural landscapes are frequently neglected and left in a moribund state. The present study considers three moribund rivers of district Nadia, West Bengal such as Anjana, Marali, Buriganga. Both Anjana and Morali remains a spectre of the former itself causing displacement of occupation of several thousand fishermen and migration from adjoining villages. As against this Buriganga offers a blue-print for successful restoration. The Buriganga's success proves that when local "social capital" is leveraged, stagnant water bodies can be transformed back into healthy ecosystems that provide essential provisioning and regulating services, ultimately securing rural livelihoods and environmental resilience.

NOTE 1: GUIDELINES FOR RIVER REJUVENATION COMMITTEE

In compliance to the direction of Hon'ble National Green Tribunal, Principal Bench, New Delhi in respect of O.A. No. 673/2018, the Government of West Bengal constituted the River Rejuvenation Committee (RRC) for preparation of such action plans for effective abatement of pollution, rejuvenation, protection and management of the identified polluted

River stretches, for bringing the polluted river stretches to be fit at least for bathing purposes and identified the following components for such action plan, although all the components may not be applicable for all the polluted river stretches:

1. Identification of polluting sources
2. 4. Trade and sewage generated in the catchment area of polluted river stretch
3. Functioning status of STPs/ETPs/CETP
4. Interception and Diversion of sewage carrying drains to the STP
5. Solid waste management including quantification and characterisation of solid waste, Bio-medical waste management, e-waste and processing facilities, quantification and characterisation of solid waste
6. Protection and management of Flood Plain Zones (FPZ)
7. Rain water harvesting, ground water charging

8. Adopting good irrigation practices
9. Address issues relating to ground water extraction
10. Maintaining minimum environmental flow of river and plantation on both sides of the river
11. Plantation on both sides of the river
12. Setting up of biodiversity parks on flood plains by removing encroachment.
13. Utilization of treated sewage so as to minimize extraction of ground or surface water.

Source: Action Plan for Rejuvenation of River Churni Nadia, West Bengal (July, 2020).

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