International Conference organized by WALMI at Delhi 18 & 19<sup>th</sup> May, 2017 Invited talk on

#### "Exploration in search of incessant Ganga: A social and environmental assessment to resolve erosion and siltation issues"

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#### GENERAL OBJECTIVE: UNDERSTANDING SUSTAINABILITY BY EMPIRICAL STUDY

Developmental gains will crumble if India follows a model of growth that is resource and energy intensive- forest covers thinning, rivers degraded, pollution growing

The term sustainability is complex

- Study help to conceptualize, operationalize, contextualize, or synthesize sustainability
- Findings provide a theory for understanding sustainability within the context

Findings reveal

- (a) the relationship between humanity/communities and the environment,
- (b) the ways in which people come to understand those relationships; and

(c) the responsibilities individuals have because of those relationships.

## Specific objectives of presentation

- Creating awareness regarding typical issues of Ganga river meandering (shifting to left and right bank)
- Share case study findings of Bhagalpur district in Bihar, & Malda Murshidabad district in West Bengal with regards to social and environmental assessment related to erosion and silting in river Ganga,
- > Deliberate on erosion and siltation issues of Ganga river bank,
- Generating opinion to resolve issues of displacement of population,
- To forward recommendations as consensus is difficult (Central/State/Gram Panchayat) and issue is in cross roads



### About Ganga river basin

Ganga is an inter-state river of Bihar and West Bengal and trans-boundary river of India and Bangladesh

It originates at Gomukh in Uttarakhand and travels through Uttar Pradesh, Bihar, Jharkhand, West Bengal and finally meets in Bay of Bengal after entering in Bangladesh.

It's a national river recently conferred with the status of living entity by the Hon'ble Supreme Court of India.

It enters West Bengal near Rajmahal and flows in a southeasterly direction. It divides into two near north of Dhulian in Murshidabad district and enters Bangladesh as the Padma or Pôdda, and the other flows through West Bengal as the Bhagirathi River and Hooghly River in a southern direction.

### Background of study

- The Farakka Barrage in West Bengal, was constructed with the aim of serving the need of preservation and maintenance of Calcutta Port by improving the navigability of Bhagirath-Hoogly river system.
- The increased upland supplies from Ganga at Farakka into Bhagirathi is also likely to reduce salinity in the river system to ensure sweet water supply to Calcutta and surrounding areas.
- Barrage is 2245 metre long across the River Ganga with rail-cum-road bridge, necessary for river training works and a Head Regulator on the right side (ii) A 213 metre long barrage across the River Bhagirathi at Jangipur (iii) A Feeder canal (38.38 km. long) of 1133 cumec (40000 cusec) carrying capacity which is constructed at the right of Farakka Barrage. This supplies water to the Farakka Super Thermal Power Station (2100 MW).



## Methodology

Social assessment conducted in community

- Environmental assessment conducted by Team of researchers, and scientists from National Environmental Engineering Research Institute (NEERI), Zoological Survey of India and Botanical Survey of India
- Collected plant samples, recorded vegetation, soil and water samples along with photogrphs and G.P.S. data and Interacted with locals, NGO's and others and conducted survey at erosion affetced areas at Loharpur, Vashipur, Sikdarpur, Maheshpur, Farakka Barrage river basin, Farakka terminal ghat, Mahadev Nagar (of Murshidabad district), Murshidabad Ferry Ghat, and Parlalpur, Bangitola G.P. Kalichawk, Panchkuri Tala (of Malda district), Panchandpur, Jangipur
- Meeting with authorities BDO, Farakka, GM Farakka Barrage, SDO Jangipur, ADM Murshidabad, MLA Farakka, Ex MP Farakka and group of Panchayat members and Pradhans and interacted with nearly 1000 people/ members of affected communities.

## **Objectives of field visit**

- To understand impact of Farakka Barrage with regards to silting and erosion of Ganga river basin
- > To find reasons of changing course of Ganga
- Explore the causes of sedimentation in Ganga
- Explore the causes of erosion in Ganga
- Botanical changes due to erosion and sedimentation of Ganga
- Zoological changes due to erosion and sedimentation of Ganga
- To carryout survey for ecological and environmental impact assessment with regards to Ganga erosion and silting
- Find impact of erosion and sedimentation on public life
- Explore solutions for Ganga erosion and silting
- Recommend economical and ecological sustainable solutions to curb erosion and sedimentation
- Recommend solutions for rehabilitation of displaced population
- Submit memorandum to government for appropriate action







Mission initiated with Ganga river aerial survey of Bhagalpur district – Feb 26<sup>th</sup>



### Google map showing surveyed areas

Near Panchkuritola Panchkuritola Vill.

**Malda Dist** 

Farakka Barrage office

#### Murshidabad Dist

Maheshpur Vill. Parlalpur Parlalpur ferryghat Mahadebnagar Vill.

Loharpur Vill.

# The G.P.S. data of the visited areas are given in the below table (See Google Map).

Sr. No.	Location	G.P.S. Reading	Altitude	District
1.	Loharpur, P.S. Sikdarpur	24°38′34.90″N	75 feet	Murshidabad
		87°59′41.78″E		
2.	Parlalpur Ferry Ghat	24°41′10.59″N	63 feet	Malda
		87°57′57.67″E		
3.	Parlalpur Village	24°41′10.39″N	54 feet	Malda
		87°57′59.52″E		
4.	Maheshpur Village	24°41′41.30″N	92 feet	Murshidabad
		87°56′41.04″E		
5.	Maheshpur Village North	24°41′49.76″N	62 feet	Murshidabad
		87°56′41.14″E		
6.	Riverbed Maheshpur Village	24°41′55.80″N	59 feet	Murshidabad
		87°56′42.94″E		
7.	Mahadebnagar Gram panchayat	24°41′34.48″N	97 feet	Murshidabad
		87°56′15.67″E		
8.	Panchkuritola Village, Kaliachak-2	24°58′33.65″N	96 feet	Malda
		87°58′50.23″E		
9	Bangitola, Near Panchkuritola	24°58′46.37″N	106 feet	Malda
	Vinase Kaliachak-2	87°59′32.88″E		

Social assessment initiated at Malda district on17<sup>th</sup> -18<sup>th</sup> March, 2017



No prior announcement of gate opening of barrage cause loss of 4–5 villages & submerge 40,000 hectare agricultural land

#### Laharlitula across Ashoktula village

Attabur Shaikh and wife Jeburnara lost 8 bigha land and shifting places for livelihood



communication and commutation is improved due to FB but rehabilitation issue is untouched





Birnagar there was erosion 17Km from Udhwah nallah and houses were affected. Ganga channel needs Manikchawk to Murshidabad needs systematic maintenance and handling of gates opening of the Barrage



Badotala, Shakhopada and Mushkinagar submerged under water and people forced to live on railway track Maheshpura Tuhina Khatoon expressed agitatedly schools houses fishery affected and night we live in fear of erosion and our community is purposely ignored

Ashrafful Haq mention river need proper flow as inner current towards village is increasing drastically







At Maheshpur



At Kaliachowk people gathered to request to save the temple





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Vashipur erosion has followed by drying of river.



 Loharpur where Brick making small scale furnace on the bank of Ganga river

#### Mining of sand for Land and road-NH34 filling

all gates of the Barrage working and silt management is not mandate







## **Empirical observations**

- River bank erosion is taking place definitely at several places on the banks of Ganga in the downstream of Farakka barrage.
- In these areas, some of the civil structures on the bank have been found to have partially sank within the river bed while huge quantity of eroded soil have made into the riverbank, reducing the depth of river and making elevated walkable areas along the riverbed
- Siltation was observed to have started from within about 500 m of the lock gate downstream of Farakka Barrage



- CSIR-NEERI Team has referred to the historical geographical images of Farakka Barrage and its downstream areas from Google Earth to understand the behaviour of water flow and siltation pattern downstream of the Farakka Barrage vis a vis two of the villages (Char Sujapur and Par Lalpur) that were visited during the above field visit (Plates 1-10).
- It can be seen from the above images that siltation has grown over the right bank at downstream of barrage, apparently by about 2010. Large elongated silted areas are now conspicuous in the right and middle of Ganga riverbed downstream of Farakka Barrage within Indian territory



- From 1986-2006, the major siltation was occurring just downstream of barrage on the left bank, which was primarily responsible for closing the mouth of a small waterway veering inland from left bank (Plate 1-3).
- Since 2010 Large elongated silted areas are conspicuous in the right and middle of Ganga riverbed downstream of Farakka Barrage within Indian territory (Plate 7-10).
- Such siltation pattern has evidently changed the course of river and surely has reduced water carrying capacity of the river downstream of Farakka Barrage.
- Aggravated riverbank erosion in times of monsoon when sluice gates on barrage are opened for allowing excess water to flow downstream of barrage.
- Shifting of places (Char Sujapur), which was far from riverbank during 1986–2006, has actually came close to the present bank confirming that land on the bank of the village has been eroded over the years. (eg.Forth Dhuliayae)

Farakka Barrage vis a vis water flow, erosion and siltation pattern at Char Sujapur and ParLalpur

Par Lalpur

ndsat/Copernicus Dhuliyan

Imagery date: 31.12.1986

Plate :1



siltation was occurring just downstream of barrage on the left bank from 86-2006



Kans

Google Earth









## Situation in last 30 years

- It can be seen from the above images that siltation has grown over the right bank at downstream of barrage, apparently by about 2010.
- Large elongated silted areas are now conspicuous in the right and middle of Ganga riverbed downstream of Farakka Barrage within Indian territory (Plate 7-10).
- ▶ From 1986–2006, the major siltation was occurring just downstream of barrage on the left bank, which was primarily responsible for closing the mouth of a small waterway veering inland from left bank (Plate 1–3).
- Such siltation pattern has evidently changed the course of river and surely has reduced water carrying capacity of the river downstream of Farakka Barrage.
- Apart from studying Google earth images for evaluating the course of Ganga river over last 30 years, the other observations made during the field visit

Plate 11 The sinking structure of a Mandir at Parlalpur



Plate 13 The eroded soil of riverbank consumes a sizeable portion of riverbed Par Lalpur

like bull headed spurs, dip trees, porcupines, gunny bags, geo-synthetic covers, boulders bars, boulder crates with nets, etc. have been eroded.

Plate 12 A primary school washed away due to erosion in Ganga bank at Par Lalpur

Washing away of erosion control measures

extensive bank erosion in the left bank on the downstream where all measures

**Plate 15** The side walls of the mining pit wherefrom sandy deposits from riverbed is mined.



Plate 14 View of siltation downstream of barrage from a distance



Plate5Bambooporcupinesdeploymentby irrigation dept, WB



#### **REMEDIES IN PRACTICE**

**Plate 4** Night view of the concrete porcupines erected by Farakka Barrage Authority at Char Sujapur village

Plate 6 A bamboo porcupine is being toppled into water from a boat at the bank

#### CONCRETE PORCUPINES

•In the village Char Sujapur village bank, Farakka Barrage Authorities have installed concrete porcupine structures in series starting from the bank towards the riverbed in series of about 6-7, each bound to each other by iron rods so that they remain together (**Plate 4**).

•RCC porcupines are laid over the bank slopes and also protrude into the river section to induce siltation near the bank.

• These structures are made to attract large debris along with silt during times of heavy water flow.

•It attract debris and silt more and more and slowly rebuild the broken banks.

•As per the locals, these structures have induced siltation at bank on this particular stretch at Char Sujapur.

**\*\*\***However, their overall performance and efficiency need to be studied and observed for some more years.

#### BAMBOO PORCUPINES

•Irrigation Department of West Bengal has just started a project on dropping bamboo porcupines near the bank at villages of Maheshpura, Mahadevnagar and other areas to help attract siltation at the bank (**Plate 5-6**).

•These structures are composed of bamboo poles bound together in definite fashion to make a cagelike structure at the lower side, wherein a few boulders have been filled that would make the structure heavy and lay at the bottom of the riverbed.

•These structures are about 5-7 ft wide, 5-6 ft high and 2-3 ft deep and are individually toppled into the riverbed from boats and are not tied to each other.

\*\*\*It remains to be observed whether these structures **are able to survive the fierce flow of water during monsoon when sluice gate of the barrage are opened.** As per authorities if the first siltation occurs, it would attract further siltation and the structures will be totally covered by silt and therefore, the bamboo structures won't be decomposed easily. Efficacy need detailed and long-term observations and study for at least two seasons. **Important Finding BSI**: As a result of the present study, a total number of 47 species of angiosperms belonging to 45 genera of 26 families have been identified .Among the total species, dicotyledones comprise 21 families, 34 genera and 35 species and monocotyledons comprise 5 families, 11 genera and 12 species. Out of the total 26 families, dicotyledones represent 80.76 % and monocotyledons represent 19.23 %. Out of the total 45 genera, the dicotyledonous and monocotyledonous genera are 75.55 % and 24.44 % respectively. Out of 48 species, dicotyledones represent 74.46 % and monocotyledons represent 25.53 %.

The ratio of dicotyledones and monocotyledons is nearly 2.91:1. The genus to species ratio is 1: 1.04 which is almost equal and conforms the less diversity of plants in the study area.

	Number of Genera	Number of Species
Dicotyledones	34	35
Monocotyledons	11	12

### Impact on vegetation

- The team during the course of survey found out that many villages like Panchkuritola, Bangitola along the bank of Ganga in Kaliachak-2 P.S. of Malda District; Maheshpur village and Loharpur village in Farakka P.S. of Murshidabad have witnessed heavy soil erosion and loss of vegetation, human lives and livestock during the recent flood.
- The main reason of flood seems to be formation of sand islands (chur) in the middle of the river due to siltation which bifurcated the course of river at many places downstream of Farakka barrage.
- Due to island formation in the middle of river, more water pressure created on both the banks of river resulting into the heavy erosion which is also witnessed by **less diverse vegetation** in Ganga basin area
- Due to the soil erosion and annual flood, both the population and productivity of Mango, Coconut, Areca nut, Ber plants have drastically been reduced in the Ganga basin area. The Jhau (*Tamarixdioica* Roxb. ex Roth) population has very much reduced and is on the verge of extinction in the river basin area.



Plate3 A. Croton bonplandianus Baill.; B. Datura metel L.; C. Argemone mexicana L.; D. Eclipta prostrata (L.) L.; E. Sesamum indicum L.; F. Phyla nodiflora (L.) Greene; G. Chrozophora rottleri (Geiscler) Adr. Juss. ex Spreng.; H. Polygonum plebeium R. Br.



Plate 4 A. Clerodendrum infortunatum L.; B. Erythrina suberosa Roxb..; C. Ficus benghalensis L.; D. Heliotropium indicum L.; E. Mecardonia procumbens (Mill.) Small; F. Grangea maderaspatana (L.) Poir.; G. Hemigraphis hirta (Vahl) T.Anderson; H. Dentella repens (L.) J.R. Forst. & G. Forst.



Plate 5: A. Bagmari river; B. Plantation of Chrysopogon zizanioides (L.) Roberty C. Chrysopogon zizanioides (L.) Roberty; D. Alternanthera paronychioides A. St.-Hil.; E. Rumex dentatus L.; F. Ranunculus sceleratus L.; G. Xanthium strumarium L.



Plate 6: A. Mollugo pentaphylla L.; B. Gnaphalium indicum L.; C. Mallotus nudiflorus (L.) Kulju & Welzen; D. Holoptelea integrifolia (Roxb.) Planch; E. Ammannia baccifera L.; F. Cyperus compressus L.; G. Leucas cephalotes (Roth) Spreng.; H. Mangifera indica L.

### List of species recorded during the present study.

- Achyranthesaspera L.
- Alternantheraparonychioides A.St.-Hil.
- Alternantherasessilis (L.) R.Br. ex DC.
- Ammanniabaccifera L.
- Arecacatechu L.
- ArgemonemexicanaL.
- AzadirachtaindicaA.Juss.
- Chrozophorarottleri (Geiseler) A.Juss. exSpreng.
- Chrysopogonzizanioides (L.) Roberty
- Clerodendruminfortunatum L.
- Cocosnucifera L.
- Croton bonplandianusBaill.
- Cynodondactylon (L.) Pers.
- CyperuscompressusL.
- CyperusrotundusL.
- *Daturametel* L.
- Dentellarepens var. serpyllifolia (Wall. ex Craib) Verdc.
- Mollugopentaphylla L.
- Persicariahydropiper (L.) Delarbre
- Sesamumindicum L.
- *Tamarixdioica*Roxb. ex Roth
- Mallotusnudiflorus(L.) Kulju&Welzen
- *Vallisneria spiralis* L.
- Xanthiumstrumarium L.

- *Ecliptaprostrata* (L.) L.
- *Eichhorniacrassipes* (Mart.) Solms
- *Eragrostisgangetica* (Roxb.) Steud.
- ErythrinasuberosaRoxb.
- Evolvulusnummularius (L.) L.
- FimbristylisaestivalisVahl
- GnaphaliumindicumL.
- *Grangeamaderaspatana* (L.) Poir.
- Heliotropiumindicum L.
- *Hemigraphishirta* (Vahl) T.Anderson
- Holopteleaintegrifolia Planch.
- Hydrillaverticillata (L.f.) Royle
- Ipomoeacarnea Jacq.
- Leucascephalotes (Roth) Spreng.
- Lippiaalba (Mill.) N.E.Br. ex Britton &P.Wilson
- Mangiferaindica L.
- Mecardoniaprocumbens (Mill.) Small
   Phoenixsylvestris (L.) Roxb.
   Phyla nodiflora (L.) Greene
   Polygonumplebeium R.Br.
- Ranunculus sceleratusL.
- *Rumexdentatus* L.
- *Senna occidentalis* (L.) Link



#### Special grass for River Bank Stabilization Technique

Plate 7 Frontal view of banks near Baghmari rivulet at Mahadevnagar being planted with saplings of Vetiver (*Chrysopogonzizanioides* (L.) Roberty)

•Vertiver plants have very extensive (more than 3 m in length) fibrous root system that could cover substantial soil volume and could hold soil effectively, thereby minimizing erosion

•They can grow within a high range of soil pH (3-10). Due to long roots and high tensile strength, this grass is resistant to the high velocity streams and checks the erosion.

•The plantation is just the beginning of this experimental effort that needs to be taken up on large-scale by involving more local populace. and its efficacy must be observed for at least two flood seasons.

•Prior to commissioning Farakka Barrage in 1975, there are records of the Hilsa migrating from Bay of Bengal right upto Agra, Kanpur and even Delhi covering a distance of more than 1600 kms.

•Hilsa in Padma river (Ganga in India) downstream Farakka has also declined sharply due to decreasing water and blockage of migration routes

•Fisherfolk have not been compensated for the losses they suffered. Hilsa here was the backbone of the fishing economy. Hilsa (*Tenualosa ilsha*) and *Macrobrachium* prawns, both Ilish (Hilsa) and Chingri (*Macrobrachium*)

•According to fisherfolks Farakka Fish Lock is a gated structure (24 & 25) in a Barrage that needs to be operated specifically to facilitate migration of fish from the downstream to the upstream or vice versa to breed, feed or complete their lifecycles.

•In the downstream size and recruitment (population) of Hilsa was affected due to arrested migration at Farakka. Upstream it was worst. However it is reported that previous year huge amount of hilsha was available and at cheaper rate which needs to be studied



- Gram Sabha resolutions are not considered before developmental work
- Rehabilitation and settlement of community after displacement is ignored

>No proper records maintained



#### Highlights of observations

• The reduction in cross-sectional area and constant formation of meanders between Rajmahal Hills and Farakka has **changed the direction of flow**, which is no longer co-axial to the barrage.

• The **agro economy has been affected** drastically due to loss of fertile land in Malda Murshidabad districts.

• The bank erosion between the Farakka Barrage and Jalangi, a stretch of about 100 km, has reportedly become a matter of serious concern.

• Generally, human settlements reportedly gets damaged during monsoon season when water is released from the barrage.

• Erosion and population displacement problem is substantial for downstream of the Farakka barrage in Murshidabad. About 50,000 people became homeless near Dhuliyan and its adjoining areas.

• Due to drying of river ground water level reduced and thus people are affected due to Loreased concentration of arsenic, iron and flouride. Malda Murshidabad people have buy drinking water

## Suggestions

- During this visit, the above team met several stakeholders like GM, Farakka Barrage Authority, BDO (Farakka), SDO (Jangipur), Local MLA (Farakka), ADM (Berhampur) as well as many villagers residing in the affected areas
- Interventions in the form of construction of dams, barrages, embankments, hydroelectric projects etc pose a great challenge to the maintenance of ecological integrity of the river ecosystem.
- Serious adverse impacts on ecological health of the river including water quality, fisheries and other biodiversity
- Hence this study present recommendations to minimize degradation





Meeting with panchayat members of Kaliachawk গাঁও কিটা কিটা মটিয়ে দিতে পারে না কেবল মানুষ নিজেই পাল্লকির উন্নতি ঘটাতে

এসো সৰাই মিলে গ্রাম

• স্বাস্থ্য বিধানের দশটি বাং • বাড়িতে এবঃ বিদ্যালয়ে নিয়মিত শৌচাগার ব্যবহা

পরে ও খাবার আগে বাংজা দেওয়া খাবাৰ কাৰ্ন্তি হবে • বাইরে कति कल, १



#### Panchanandpur 10Km shifted, Island of no man's land





A group of MLA's participated In convention for suggesting solution







### **Preliminary Suggestions**

NEERI suggested it may be considered

- To construct a series of large and heavy monolithic walls/structures obliquely towards the water flow direction at the downstream side of barrage at selected hot spots of erosion on the riverbank to divert the force of gushing water towards the riverbed, thus reducing the cutting force of water.
- Boulder pitching of selected areas on riverbank may also be considered on priority areas where further erosion of riverbank might lead to huge economic loss or loss to human lives.
- Dredging of deposit from the riverbed will be a gigantic task to execute, needing huge funding and time. Also, relocation of such huge and loose deposit to alternative locations could be problematic and could put that alternative site under the danger of permanent destruction by this sandy and unproductive deposit. So, such an option does not seem to be viable ecologically and environmentally.

\*\*\*\*Financial implications could be substantial for all above

### Summary & Conclusion

- Siltation process existed before the formation of Farakka Barrage (in 1972) but with slower pace.
- ▶ 1978 onwards, erosion and siltation speed up but after1998 onwards erosion and siltation occurred on a large scale.
- Due to siltation process, many islands (*chur*) have been formed in the middle of the river which is of loose sand type. These islands of sand in the middle of river divided the river flow in two and somewhere more than two channels.
- Due to heavy erosion, many villages washed away and people got displaced. Rehabilitation of displaced population remain unattended
- Concrete porcupines have been used in many parts in patches near Farakka Barrage. Its effectiveness needs to be studied in detail.
- Bamboo porcupine is also being used in Maheshpur village by the irrigation department which needs to be studied in detail for its effectiveness cleast upto first monsoon.

#### Cont--

- Erosion matter is of fine sand which is of no use and the plantation done on such areas are not able to hold the soil.
- Farakka block Maheshpur, Arjunpur Nayansukh, and in Malda Parlalpur, Shobhapur, Sujapur all people **livelihood is mainly dependent on fishing** and are worst affected. Erosion has **affected economic and socio-cultural aspects** and created drastic change in many places over the period in Farakka Malda and Murshidabad.
- The concrete **porcupines set** by Farakka barrage project of Central government and bamboo porcupines setting by Irrigation department (anti erosion engineering dept) of State Government used as measure to curb silting and erosion **needs proper coordinated work** for effective solution.
- Due to State Government land abolition policy (area affected by Ganga river erosion) people of affected areas are badly suffering it must be reformulated in favor of the displaced population who lost their land and property due to Ganga erosion caused by Farakka Barrage.
- As Dhulian town in Laxminagar, Samsarganj block is safe for nearly 30 years due to the spur. Hence in same manner it must be replicated at other places for safety purpose. For immediate relief from erosion if Spur (500m boulders) haid four at each side in Farakka to downstream Maheshpur and Farakka to Parlalput.

### Strategy for action plan

- As Farakka barrage has intercepted flow of Ganga and in absence of incessant flow the maintaining of the life sustaining eco-logical purity of river is impossible.
- We need to accept international and inter-state Ganga river system and with inclusive and collective mutual approach
- There is need to involve NGOs and Experts to carryout field visits for diagnostic experiences
- With long term vision history of Ganga in relation to Farakka Barrage, its biodiversity and integrative vision, Ganga rejuvenation mission must be taken up involving NGOs and experts
- Wide range of studies of Ganga river basin, its tributaries needs to be conducted to evolve response to climate change and its impact on human population
- Investigative field study is imperative to understand the socio-economic loss from the barrage and suggest measures to resolve it
- **Dredging for national water ways** and other benefits whether in Bihar or West Bengal must **be thoroughly studied** in context to its role in Ganga river bank erosions
- Integrated and joint efforts must be taken by Bihar and West Bengal Government for Ganga rejuvenation mission, so as to get their fair share of Ganga water and share national responsibility of fulfilling obligations to provide water to Bangladesh.

Organic farms, r-must be promoted and adopted in entire Ganga basin

### Recommendations

Honble President of India and Hon'ble Prime Minister to provide permanent relief/solution for people living in Char Isands near Malda & Murshidabad districts. 2022 PM has declared no man will be homeless

a) During last few decades the **course of Ganga has been shifting the eastward causing erosion of precious lands and household properties** belonging to various blocks of Malda Murshidabad Districts.

b) An estimated area of more than 200 Sq. Km only in Malda District belonging to 67 mouzas have been eroded during last four decades. There are nearly 1 Lakh homeless erosion victims of both districts and some of them are compelled to settle on newly emerged land (Char) along the opposite bank.

c) Such people are **denied all civic amenities as granted under constitution of india, even they are not allowed to cast their votes**.

d) District Authorities have declared **Char as no-man's land thus living** them with identity crisis. All rights and facilities enjoyed by the citizens of Inducto extended to these unfortunate people

## Cont---

Imperative to set up:

Centralized river monitoring authority

State Government must set up a river management authority as there is no centralized authority



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- Rudra, K. (1992): Exploration to the Bhagirathi off-take (in Bengali) Biswa Biksha.vol.2, No. 2., pp. 27-33.
- More details about Vetiver plants being used in bank stabilization and porcupines are available in a Central Water Commission document (www.cwc.gov.in/main/downloads/Handbook-05-Jun-12.pdf).

DEVELOPMENT IS ESSENTIAL BUT NOT AT THE COST OF ENVIRONMENTAL DEGRADATION, INDIA NEEDS STRATEGIES FOR GROWTH PLAN WITH GREEN GOVERNANCE MODEL FOR SUSTAINABLE DEVELOPMENT

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It is estimated that Ganga carries a silt load of 736 Million Tonnes (MT) annually, out of which about 328 MT of sediment gets deposited in the upstream of Farakka Barrage, has made river shallow and ship transport impossible.

This has led to a situation where we have the barrage and the impacts of two countries and millions of people, without even achieving objective for which the project was developed.







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Thank you