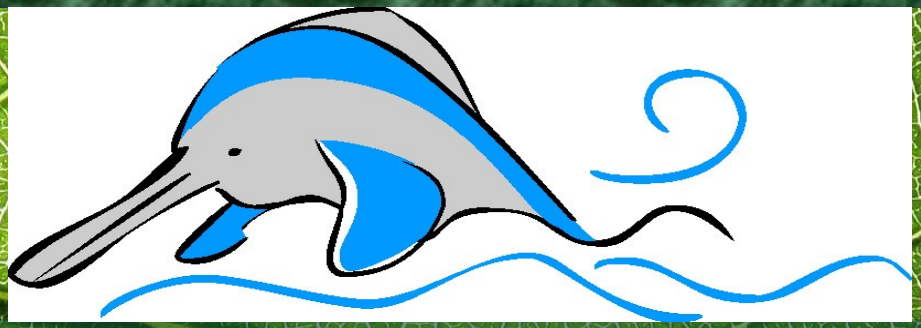
Emerging Threats for South Asian River Dolphin (Ganges river dolphin) *Platanista gangetica gangetica* and need for collaboration among Range countries for its conservation



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CIFRI Regional Webinar on River Dolphin 24-25 August 2020

River Dolphins

- River dolphins are iconic species that can serve as charismatic flagship for conservation of freshwater ecosystems but it is poorly understood and increasingly threatened.
- River dolphins are indicator species of the river ecosystem.
- South Asian river dolphin includes two sub species: Ganges river dolphin *Platanista gangetica gangetica* & Indus river dolphin (Bhulan) *Platanista gangetica minor*.

Indus river dolphin (Bhulan): National Mammal of Pakistan

- Endemic to Pakistan, now present in only about one fifth of its nineteenth- century range.
- Current population in the entire known range of Pakistan 1800-1900 (mostly in Indus river).
- Most of the known population in the 180-190km segment in Indus river in Sind province between Guddu & Sukkur barrages (Indus Dolphin Reserve) .
- Recently a small population of 5-11 individuals reported from Beas river in India.
- Legally protected in Pakistan – enlisted in Schedule III (2, 46-49) under Punjab, KPK & Sindh Wildlife Act & categorized as Endangered by IUCN (IUCN 1996).
- Large portions of Indus river dolphin habitat lost due to transformation of Indus river from a dynamic alluvial system into an artificially controlled and subdivided waterway by extensive water development.

Ganges river dolphin: National Aquatic Animal of India

- **Distribution Range**: Large alluvial & perennial rivers of the Ganga-Brahmaputra-Meghna (GBM) & Karnaphuli-Sangu (KS) basins in India, Nepal & Bangladesh, and the Sundarbans delta in India & Bangladesh.
- GBM river basin: a trans-boundary river basin with a total area of just 1.7 million square km distributed among India (64%), China (18%), Nepal (9%), Bangladesh (6%) & Bhutan (3%).

Estimated population size of Ganges river dolphin

- Global population: ranges from 4600-4900
- Grd population in India: 4090-4220 (85-87% of global population).
  - ❖ Brahmaputra + tributaries: 850-950
  - ❖Ganga + tributaries: in Uttar Pradesh about 1200, in Bihar about 1650, in Jharkhand + West Bengal less than 300, in Chambal 70-90 & in Yamuna 20-30.
- Grd population in Nepal: about 20-30 in Karnali, Narayani & Koshi rivers.
- Grd population in Bangladesh: about 170-180 in Karnaphuli and Sangu rivers, & 300-400 in Ganga-Brahmaputra delta & Sundarbans.
- Small populations present in a few artificial habitats such as the Farakka Feeder Canal & Ghaghara- Sharda Link Canal (India) & Karnaphuli-Sangu Feeder Canal (Bangladesh).
- Trans-boundary populations exist between India-Bangladesh & India-Nepal.

* **(compiled from miscellaneous data sources & personal communication with researchers)**

Conservation status of Ganges river dolphin

- Categorized as Endangered by the IUCN (IUCN 1996)
- Listed in the Appendix I of CITES
- Listed in the Appendix I & II of CMS
- Listed in Schedule I of the Indian Wildlife (Protection) Act 1972 in India
- Listed in First Schedule of Bangladesh Wildlife (Conservation & Security) Act 2012
- Listed in Endangered Mammal in National Park & Wildlife Conservation Act 1973 in Nepal

Identified Threats for River Dolphins

Fisheries By-catch mortalities

Deliberate killing for dolphin products such as meat & oil

Dams and Barrages

Alteration, Degradation & Loss of habitat

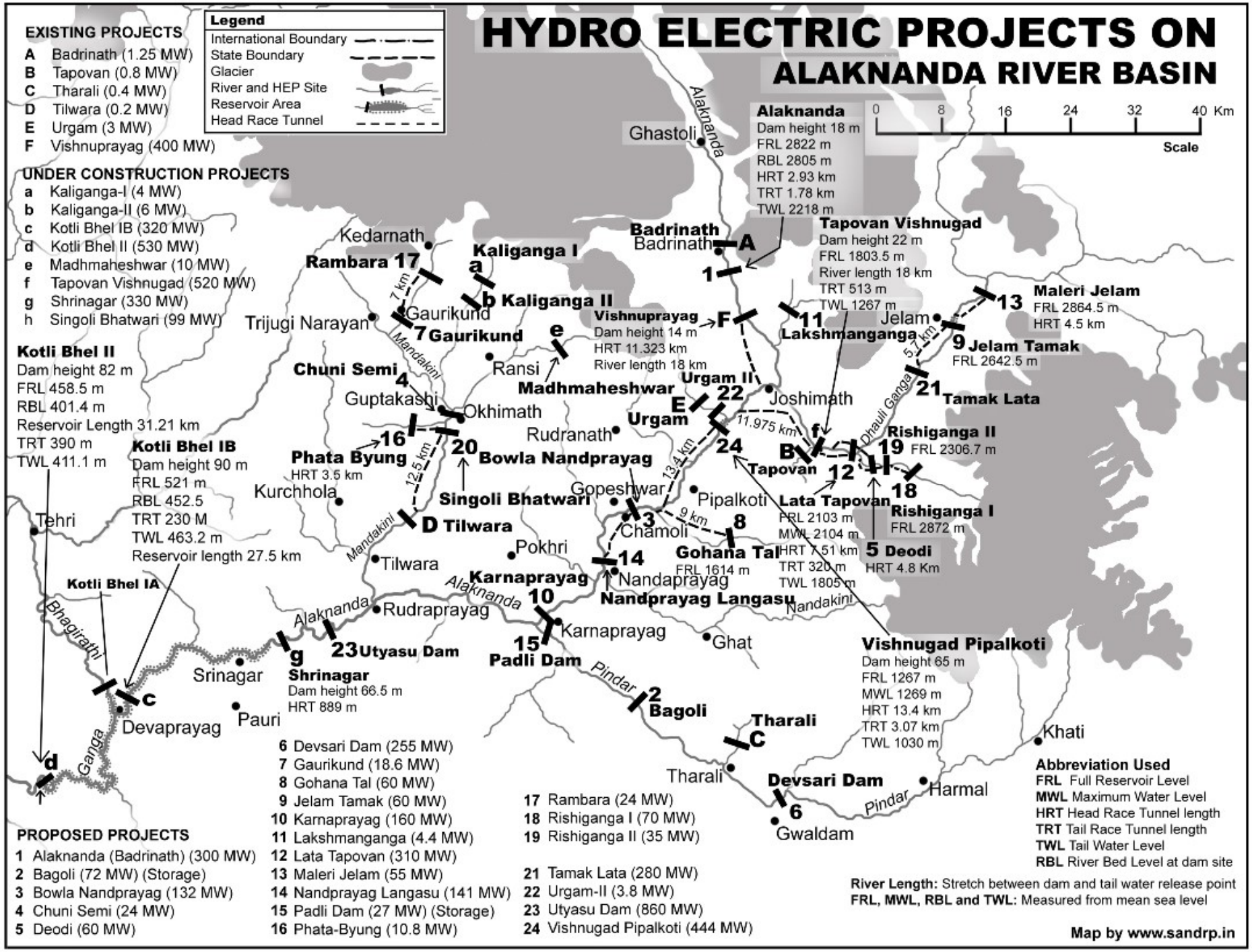
Pollution

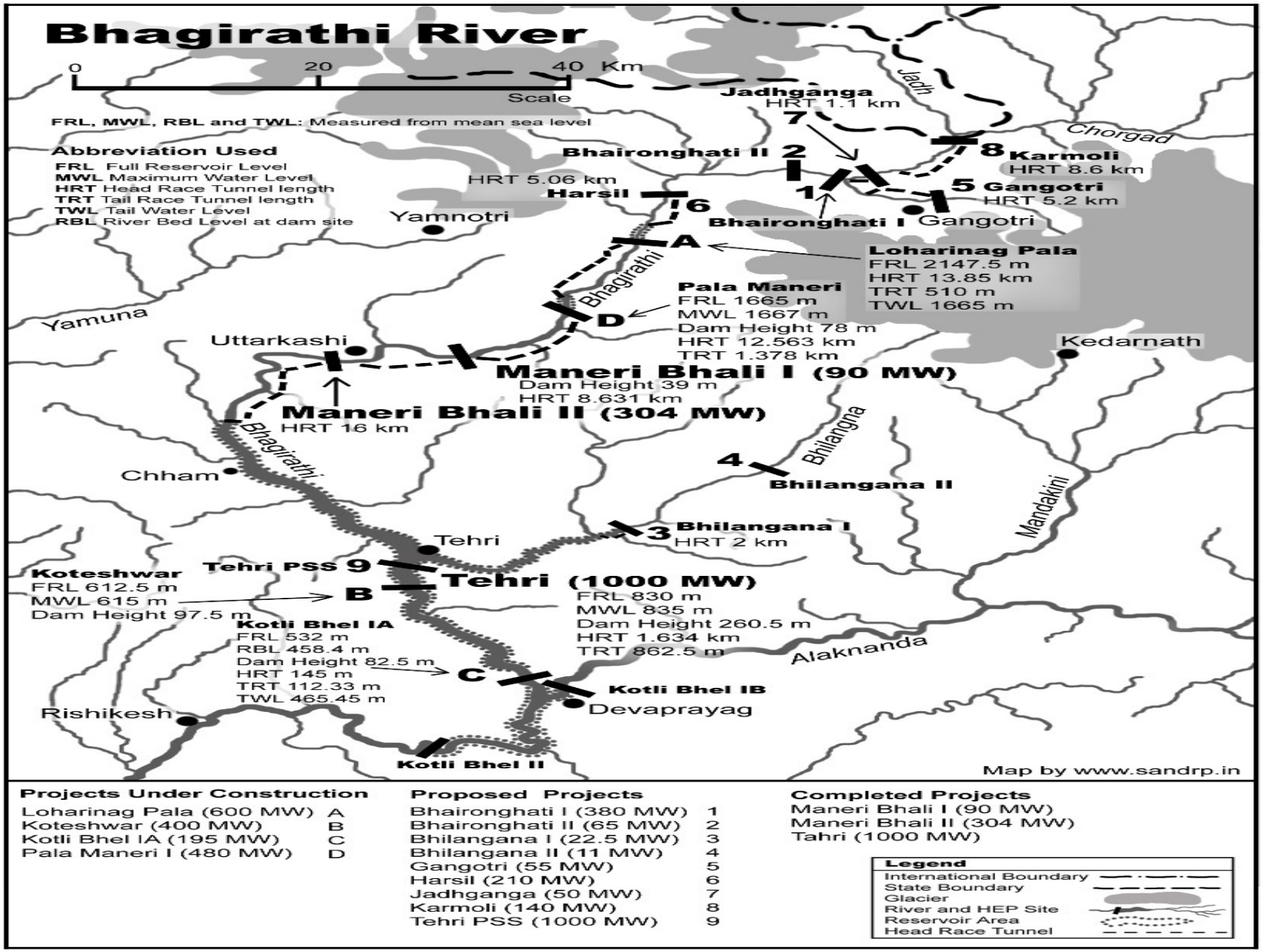
Developmental projects

Dry season water depth & flow in rivers

Lack of conservation focus

Threat of violence


HYDRO ELECTRIC PROJECTS ON
ALAKNANDA RIVER BASIN
Legend
International Boundary
State Boundary
Glacier
River and HEP Site
Reservoir Area
Head Race Tunnel
EXISTING PROJECTS
A Badrinath (1.25 MW)
B Tapovan (0.8 MW)
C Tharali (0.4 MW)
D Tilwara (0.2 MW)
E Urgam (3 MW)
F Vishnuprayag (400 MW)
UNDER CONSTRUCTION PROJECTS
a Kaliganga-I (4 MW)
b Kaliganga-II (6 MW)
c Kotli Bhel IB (320 MW)
d Kotli Bhel II (530 MW)
e Madhmaheshwar (10 MW)
f Tapovan Vishnugad (520 MW)
g Shrinagar (330 MW)
h Singoli Bhatwari (99 MW)
0 8 16 24 32 40 Km
Scale
Alaknanda
Dam height 18 m
FRL 2822 m
RBL 2805 m
HRT 2.93 km
TRT 1.78 km
TWL 2218 m
Tapovan Vishnugad
Dam height 22 m
FRL 1803.5 m
River length 18 km
TRT 513 m
TWL 1267 m
Vishnuprayag
Dam height 14 m
HRT 11.323 km
River length 18 km
Kotli Bhel II
Dam height 82 m
FRL 458.5 m
RBL 401.4 m
Reservoir Length 31.21 km
TRT 390 m
TWL 411.1 m
Kotli Bhel IB
Dam height 90 m
FRL 521 m
RBL 452.5
TRT 230 M
TWL 463.2 m
Reservoir length 27.5 km
Kotli Bhel IA
Shrinagar
Dam height 66.5 m
HRT 889 m
Lata Tapovan
FRL 2103 m
MWL 2104 m
HRT 7.51 km
TRT 320 m
TWL 1805 m
Gohana Tal
FRL 1614 m
Vishnugad Pipalkoti
Dam height 65 m
FRL 1267 m
MWL 1269 m
HRT 13.4 km
TRT 3.07 km
TWL 1030 m
Maleri Jelam
FRL 2864.5 m
HRT 4.5 km
Jelam Tamak
FRL 2642.5 m
Tamak Lata
Rishiganga II
FRL 2306.7 m
Rishiganga I
FRL 2872 m
Deodi
HRT 4.8 Km
Phata Byung
HRT 3.5 km
Bowla Nandprayag
Singoli Bhatwari
Tilwara
Karnaprayag
Nandprayag Langasu
Padli Dam
Utyasu Dam
Bagoli
Devsari Dam
Tharali
Kaliganga I
Kaliganga II
Rambara
Gaurikund
Chuni Semi
Madhmaheshwar
Urgam
Urgam II
Lakshmanganga
Kedarnath
Badrinath
Ghastoli
Trijugi Narayan
Guptakashi
Okhimath
Ransi
Joshimath
Rudranath
Gopeshwar
Chamoli
Pipalkoti
Kurchhola
Pokhri
Tehri
Srinagar
Pauri
Devaprayag
Rudraprayag
Karnaprayag
Nandaprayag
Ghat
Gwaldam
Harmal
Khati
Jelam
Alaknanda
Mandakini
Bhagirathi
Ganga
Pindar
Dhauli Ganga
Nandakini
7 km
12.5 km
13.4 km
9 km
5.7 km
11.975 km
Abbreviation Used
FRL Full Reservoir Level
MWL Maximum Water Level
HRT Head Race Tunnel length
TRT Tail Race Tunnel length
TWL Tail Water Level
RBL River Bed Level at dam site
River Length: Stretch between dam and tail water release point
FRL, MWL, RBL and TWL: Measured from mean sea level
Map by www.sandrp.in
PROPOSED PROJECTS
1 Alaknanda (Badrinath) (300 MW)
2 Bagoli (72 MW) (Storage)
3 Bowla Nandprayag (132 MW)
4 Chuni Semi (24 MW)
5 Deodi (60 MW)
6 Devsari Dam (255 MW)
7 Gaurikund (18.6 MW)
8 Gohana Tal (60 MW)
9 Jelam Tamak (60 MW)
10 Karnaprayag (160 MW)
11 Lakshmanganga (4.4 MW)
12 Lata Tapovan (310 MW)
13 Maleri Jelam (55 MW)
14 Nandprayag Langasu (141 MW)
15 Padli Dam (27 MW) (Storage)
16 Phata-Byung (10.8 MW)
17 Rambara (24 MW)
18 Rishiganga I (70 MW)
19 Rishiganga II (35 MW)
21 Tamak Lata (280 MW)
22 Urgam-II (3.8 MW)
23 Utyasu Dam (860 MW)
24 Vishnugad Pipalkoti (444 MW)



Projects Under Construction

Loharinag Pala (600 MW)	A
Koteshwar (400 MW)	B
Kotli Bhel IA (195 MW)	C
Pala Maneri I (480 MW)	D

Proposed Projects

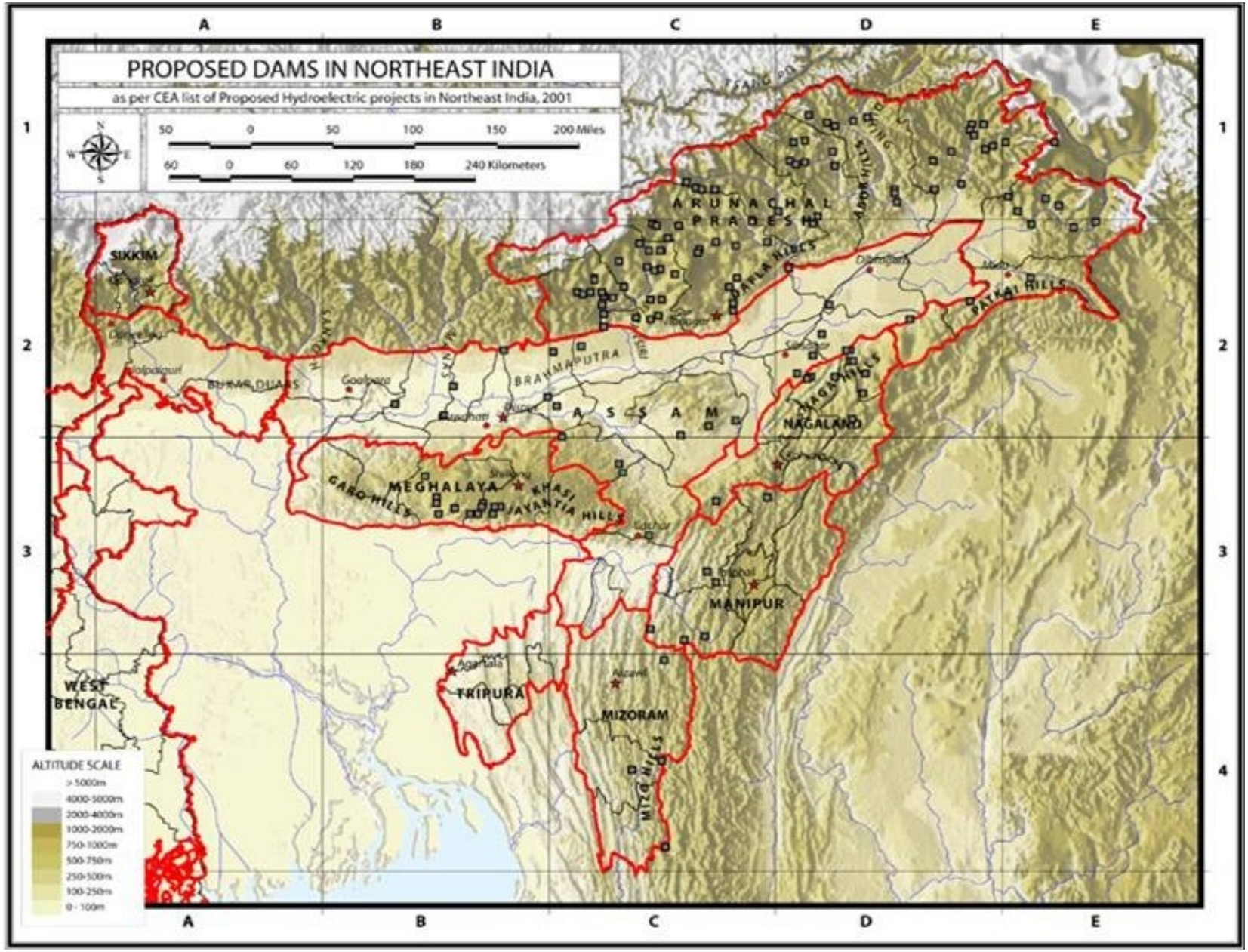
Bhaironghati I (380 MW)	1
Bhaironghati II (65 MW)	2
Bhilangana I (22.5 MW)	3
Bhilangana II (11 MW)	4
Gangotri (55 MW)	5
Harsil (210 MW)	6
Jadhganga (50 MW)	7
Karmoli (140 MW)	8
Tehri PSS (1000 MW)	9

Completed Projects

Maneri Bhali I (90 MW)
Maneri Bhali II (304 MW)
Tahri (1000 MW)

Legend

International Boundary
State Boundary
Glacier
River and HEP Site
Reservoir Area
Head Race Tunnel


PROPOSED DAMS IN NORTHEAST INDIA
as per CEA list of Proposed Hydroelectric projects in Northeast India, 2001
50 0 50 100 150 200 Miles
60 0 60 120 180 240 Kilometers
A B C D E
1 2 3 4
SIKKIM
ARUNACHAL PRADESH
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
WEST BENGAL
BRAHMAPUTRA
PATKAI HILLS
GARO HILLS
KHASI JAYANTIA HILLS
MIZO HILLS
ALTITUDE SCALE
> 5000m
4000-5000m
2000-4000m
1000-2000m
750-1000m
500-750m
250-500m
100-250m
0 - 100m

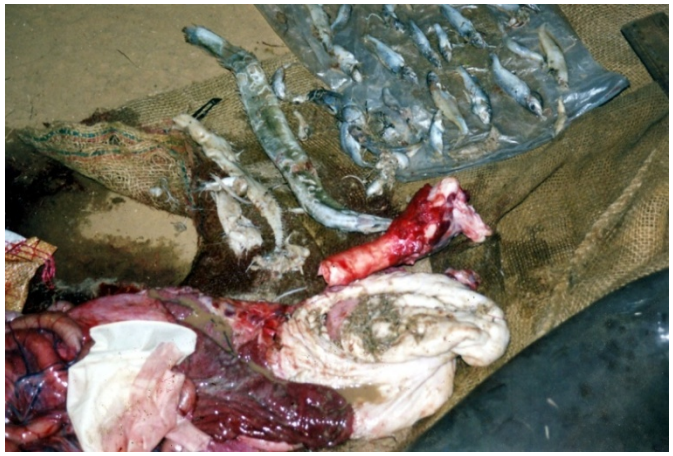
We are on the edge !

- ✓ Fragmented rivers with ‘no flows’ in between dams
- ✓ deteriorating water quality
- ✓ Flood plain farming under threat
- ✓ Fish catch and fisheries on the decline
- ✓ Riparian ecosystems losing continuity and diversity
- ✓ Flood plains cut off from flows
- ✓ Flows not reaching the delta and seas
- ✓ Salinity traveling deep inland

Threats: Over fishing

Dolphins killed due to entanglement in fishing nets

Threats: By-catch mortality



Threats: Illegal fishing

Illegal beach seine nets

Dolphin prey depletion

Illegal mosquito nets

Dolphin prey depletion

Threats: Directed killings

Harpoon

Blubber removed by poachers

Multiple hooks

Dolphin skeleton hidden by poachers

Emerging Threats: Unrecognized & non-existent until recently

- Inland Waterways development and infrastructure projects within India and across India, Nepal and Bangladesh
- River interlinking plans of India
- Trans-boundary water sharing in relation to waterways, river interlinking, and pending dam projects (especially in North East India that will affect Bangladesh significantly)
- Worsening geopolitics in South Asia in recent times that might impact bilateral and multilateral conservation plans, especially with Nepal and also with Bangladesh
- The future of inland fisheries and its relationship with dolphin conservation, and
- Impacts of climate change

Waterway development and river conservation -an emerging challenge

- National Waterways Act 2016
- 111 rivers declared as national waterways
- Rapid development of many rivers for large scale freight transport
- Ganga (National Waterway 1) being developed; Rs 5,369 Crore, with US$375 M aid from World Bank (Haldia-Allahabad)
- Plans to Dredge Brahmaputra as well

Waterway development-what it means for the Ganga?

- Round the clock movement of freight barges of 2-3 thousand ton, 30-60 per day
- Vessels fitted with onboard Sonars
- A 'Least Available Depth' of 2-3 m needs to be maintained
  - New Barrages are a possibility
  - Heavy engineering, cutting off meanders, braids
  - Dredging, armouring of riverbeds, large scale changes in the river bank

Key points of concern

- Threats like waterways and river interlinking can have serious consequences for uninterrupted flow of the river & the river dolphins' survival.
- River interlinking is based on the wrong notion that the Ganga basin has water "surplus". It is clearly seen from empirical data and climate predictions that the Ganga river basin has far less water today than it had ever before.
- Waterways are a basin scale disturbance because most rivers are set to be completely transformed by industrial scale expansion of waterways.
- Functional width of the river suitable for dolphins is narrow and is nearly exactly coincident with the navigation channel. Dolphins have little room to escape once dozens of large ships start moving every day.

Key points of concern

- All of the river reaches upstream of Farakka (approx. 500km from the mouth) develop shoals as reflected in the minimum depth falling below 2 m and 1 m. This means extensive river modification will be required to maintain navigable depth of 3 m. (data source IWAI).

- The use of high-frequency SONAR for hydrographic surveys by boats, and river dredging produce noises of various kinds which may put dolphins under stress. Typically, stress increases due to increased expenditure by animals on metabolic costs. These metabolic costs increase due to the need for the animals to increase their acoustic activity in response to constant noise that masks or muffles their ability to effectively echolocate. Dolphins tend to dive for longer times underwater as an evasive response to vessel traffic & dredging,

Is Dredging the solution?

- Dredging might appear to solve the issue in the short-term, but at huge costs to river ecology and people in the long-term

- Major concerns with dredging:
  - Channel instability
  - Re-deposition of sediment
  - Pollutant mobilization
  - Impacts on river dolphins and fisheries

Dry season discharge has been declining in the Ganges

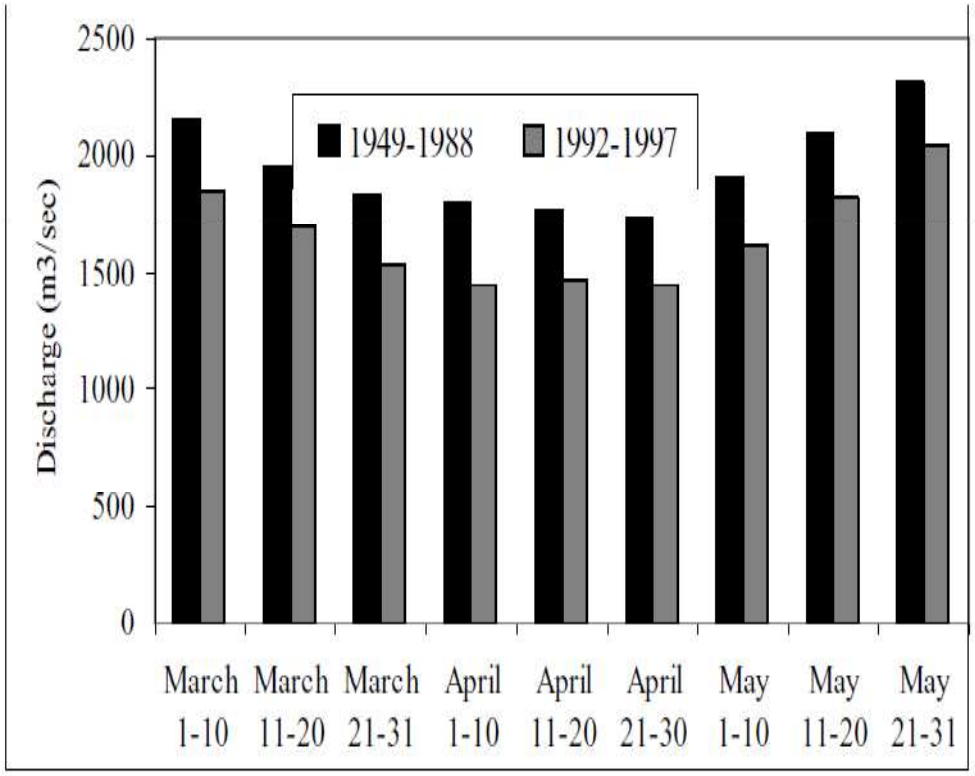
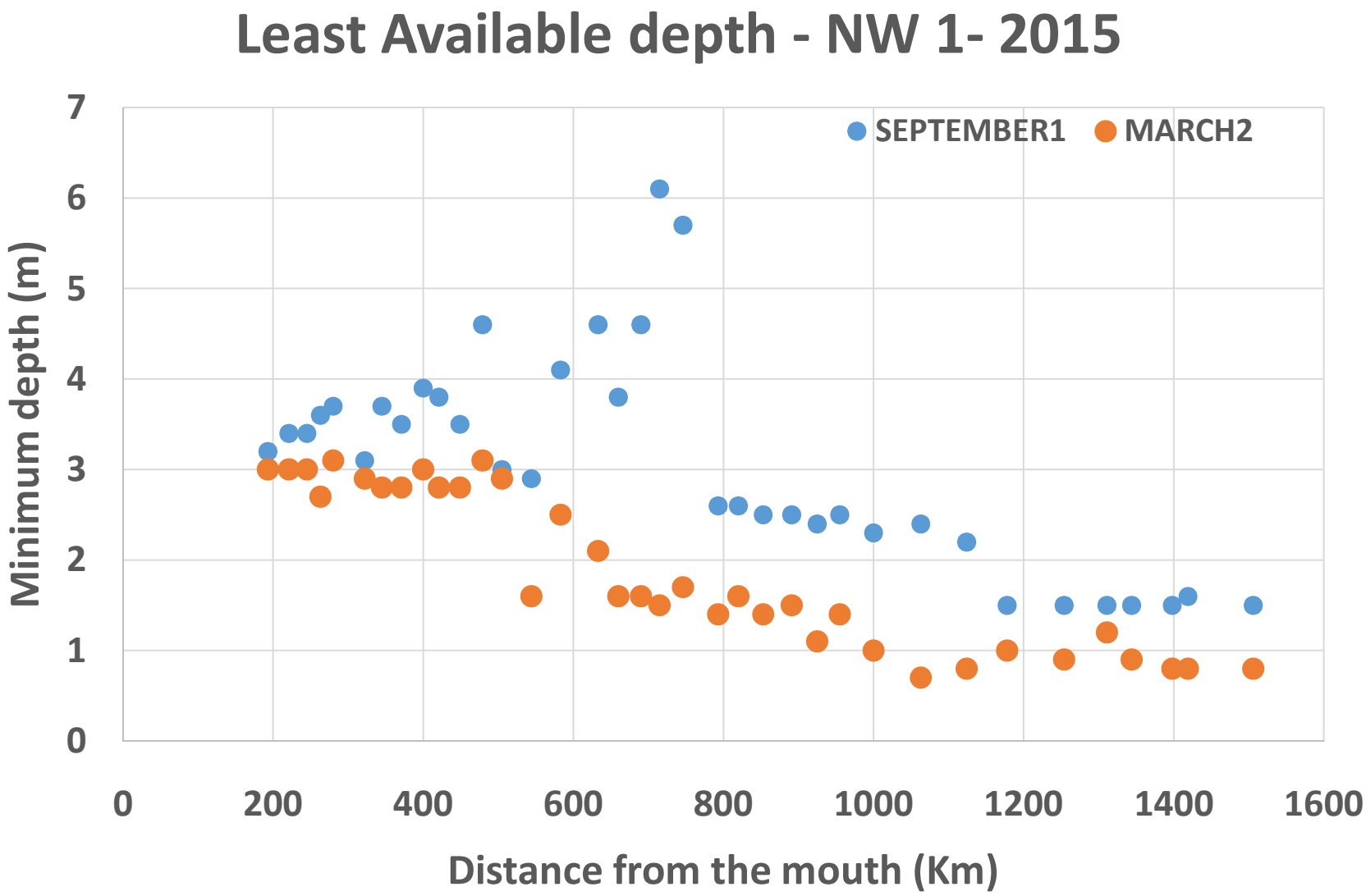
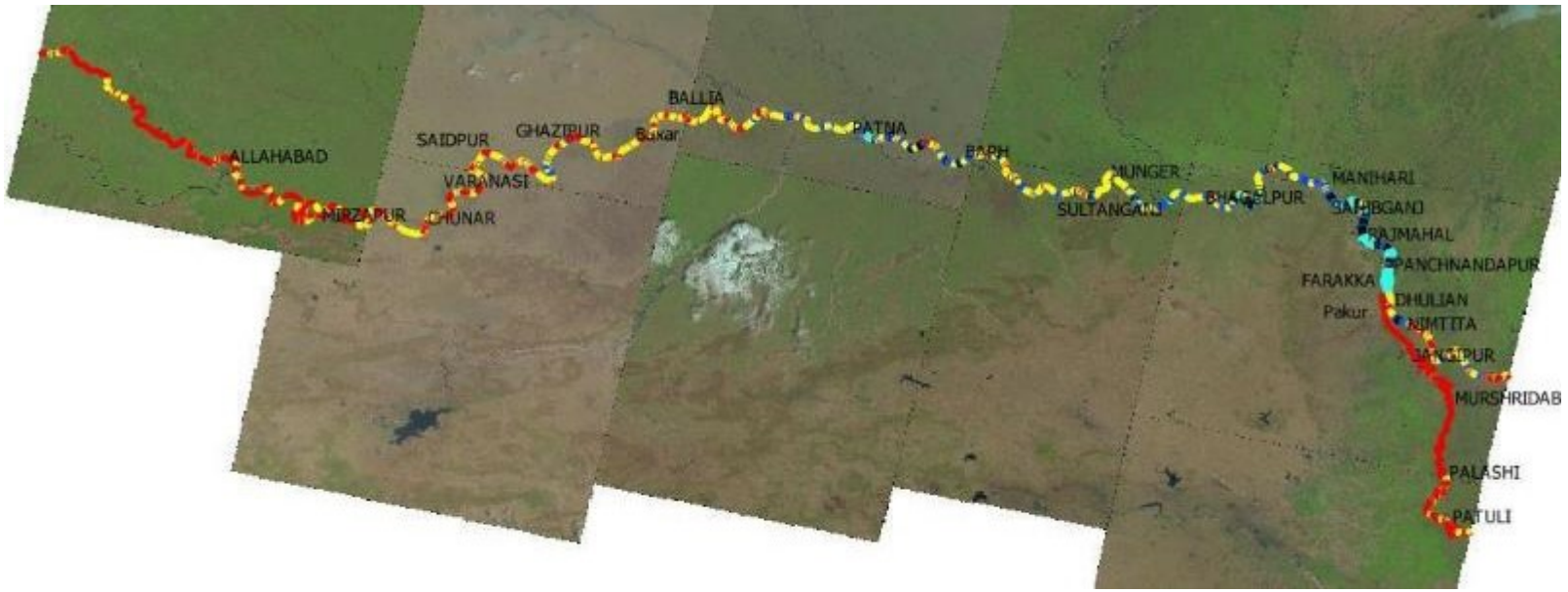


Figure 1.2. Ganges River discharge for March-May during 1949-1988 and 1992-1997 (Mirza, 2002).

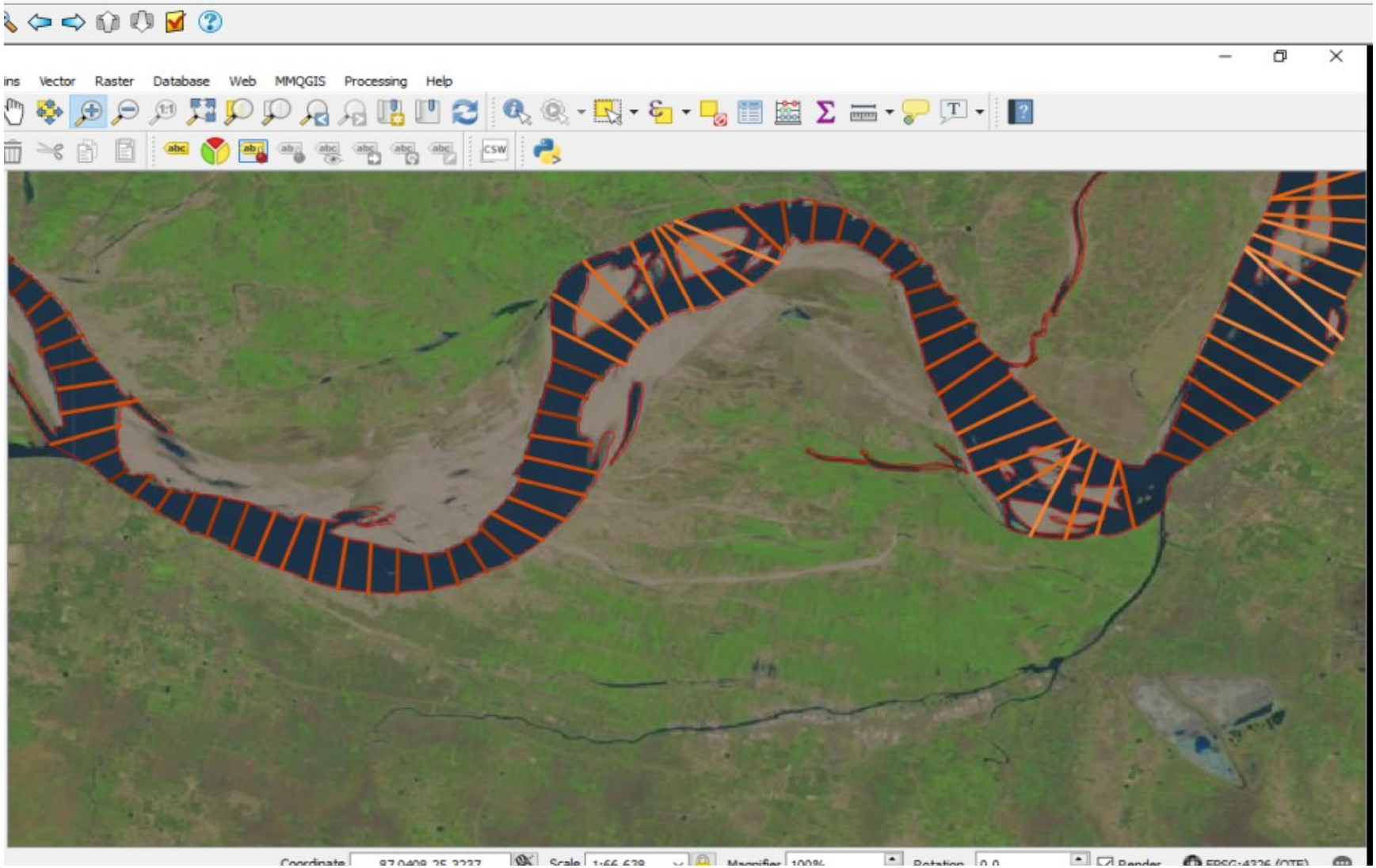

Least Available depth - NW 1- 2015
SEPTEMBER1
MARCH2
Minimum depth (m)
0
1
2
3
4
5
6
7
0
200
400
600
800
1000
1200
1400
1600
Distance from the mouth (Km)

Dry season width of Ganga <700m

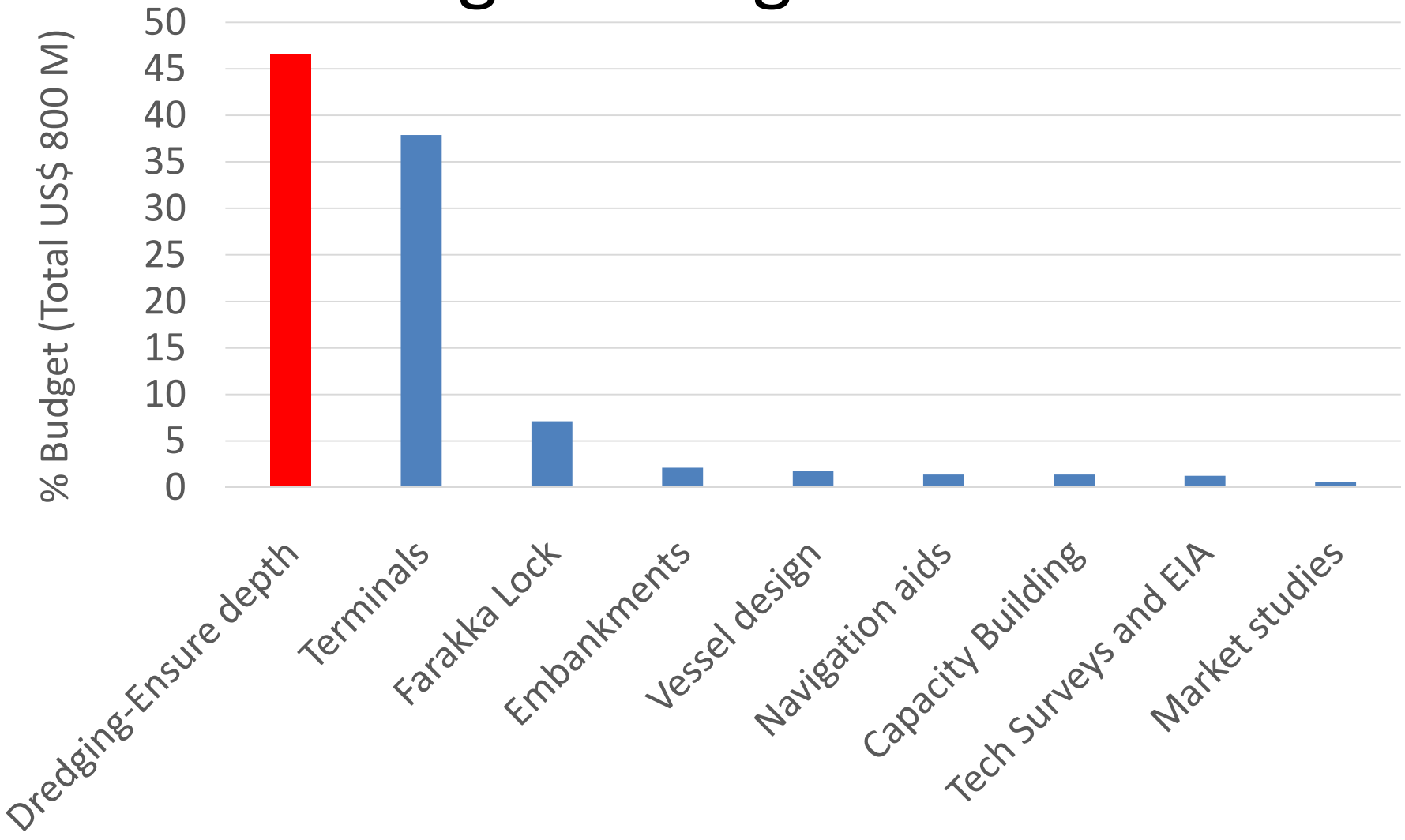


Red indicates width of 500 m or less, yellow 500-1000 m, Allahabad - Farakka

Dry season width of the river is less than 700 m



River modification activities have the largest Budget share



Source: World Bank March 2017

Dredging impacts on water quality of River Ganga

- Re-suspension of sediments and increase of turbidity due to dredging – a major concern for water quality.
- Potential impacts: spreading of sediments & associated contaminants in the surroundings, remobilization of contaminants in water phase enhancing the bioavailability & pollution risk, direct impact on organisms due to reduced transparency & consumption of oxygen.

Dredging & Water quality: Preliminary results from Vikramshila Gangetic Dolphin Sanctuary in Bihar

- We tested the hypothesis that dredging helps in release of sediment-bound contaminants in River Ganga in Vikramshila Sanctuary near Bhagalpur.
- Tested Arsenic in surface water of the river before & after dredging with the help of Field Test Kit (1.17927.0001 MQuant™ Merk KGa, Germany) in January, 2017.
- Sampling point – 75m upstream/downstream from the active dredger (near Vikramshila Bridge 25° 16' 450" N 87° 01' 547" E).
- Arsenic in Ganga water before dredging: 05 ppb

  Arsenic in Ganga water after dredging: 100 ppb

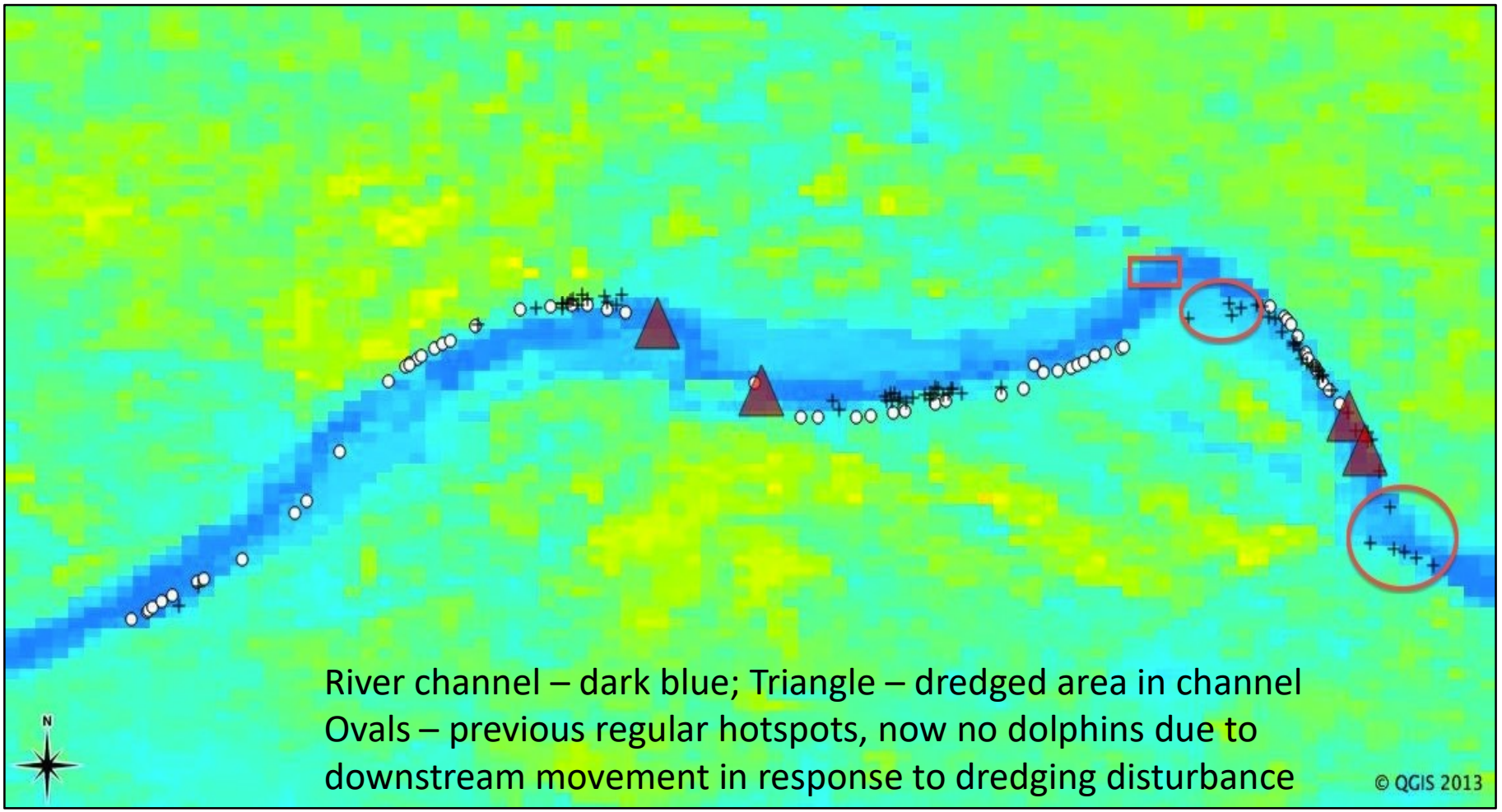
* Arsenic is toxic & bioaccumulates in the food chain of aquatic organisms, floodplain wildlife & ultimately human beings.
* Other contaminants such as Cu, Zn, Pb, Hg, Cr or synthetic pesticides can be present in river sediment & could be released into water column by dredging & transported downstream. Needs study for robust data.

Dredging Impacts on the Ganges River dolphin, India's National Aquatic Animal

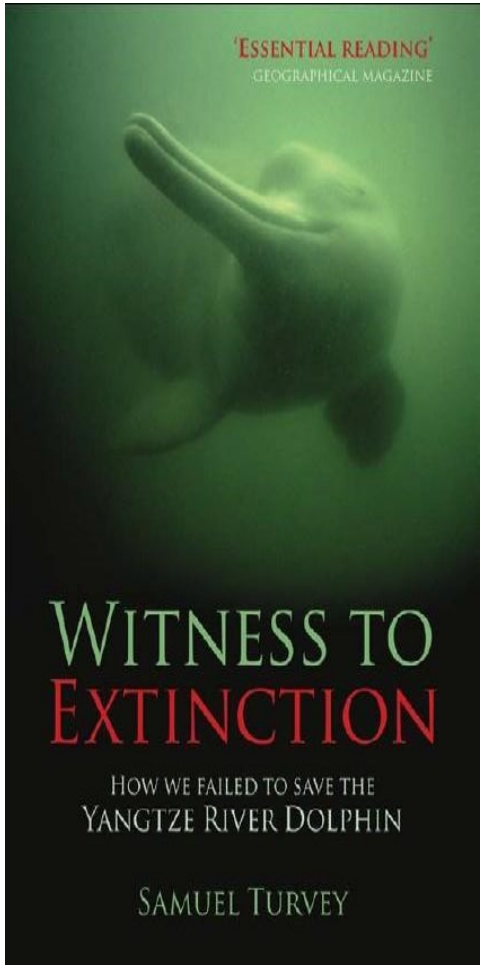
Dredging impacts on river dolphins

- **High risk of collision and propeller strike to Gangetic Dolphins.**
- **Dredging noise may adversely affect the endangered Gangetic dolphin which relies on sound for sensing of its environment.**
- **Dolphins seem to avoid dredged channels, possibly due to the combined effects of stress from noise, sediment disturbances, and risk of disorientation & move to relatively suboptimal river habitats.**
- **Positive feedbacks, i.e. more sediment deposition following dredging, can cause in-river habitat loss for dolphins.**
- **Dolphins show highly elusive diving & surfacing behaviors during dredging with diving periods more prolonged during background dredging than in times without dredging, which are an indication of acute stress.**
- **This information is based on our own field observations in Vikramshila Sanctuary.**

Sultanganj to Bhagalpur: Open circles indicate dolphin distribution in February 2013 and ‘Plus’ signs indicate that in February 2012



Lessons from the Yangtze and the Yangtze River Dolphin



Yangtze river dolphin of China declared EXTINCT in 2008

"The mighty Yangtze… which once upon a time used to be home to dolphins, paddlefish, a nd shad,… (now) is largest sewer of the world"

Future of the Ganges river dolphin is mirrored in the past of the Yangtze dolphin

Climatic Change: Key points of concern

- The Ganga basin rivers, until recently, have been seeing a net reduction in dry season flow due to a range of factors, including regulation by dams and barrages, rainfall deficits and long term declines in annual and seasonal rainfall, inadequate flood pulsing, and cumulative impacts of river water abstraction.
- Aberrations in dry season flow (especially sudden increases) might be due to two key effects of climate change: a) increase in rate of snowmelt due to high heat trapping in the Himalaya (browning due to global warming), and b) erratic and increased extreme rainfall events, many being unseasonal dry season rains. The increase in snowmelt might lead to local increases in dry season flow until a certain threshold, after which glacial disappearances might lead to continued drought years, after repeated rainfall deficit years as per current climate predictions.

Climatic Change: Key points of concern

❖Irrigation might be possibly the most important driver of climate-interacting impacts of river "habitat loss" and river fragmentation at the Ganga basin scale. For the river dolphin, this situation might be aggravated at the overall range of distribution scale.

Conservation Initiatives & Need for Collaboration among Range Countries

- **Conservation initiatives taken in India**
  - **Conservation of Ganges river dolphin through Ganga Action Plan Phase I (1985) & Phase II (1991)**
  - **Conservation Action Plan for Ganges river dolphin (2010-2020) by MoEFCC**
  - **NMCG's Biodiversity Documentation & Rejuvenation of Ganga Project (WII-GACMC 2017)**
  - **CAMPA funded Species Recovery Program for Ganges river dolphin**
  - **Recent Announcement by Hon'ble Prime Minister of India in Independence Day address to Nation on 15 August 2020 about launching 'Project Dolphin' on lines of 'Project Tiger', accordingly exercises going on for preparing a Conservation Action Plan for Ganges river dolphin for next ten years (2020-2030)**

Conservation Initiatives & Need for Collaboration among Range Countries

- **Conservation initiatives taken in Bangladesh**
  - **UNDP-funded program in the Sundarbans for the conservation of aquatic biodiversity including dolphins. Two important recent efforts towards this aim have been the formation of a South Asian River Dolphin Task team under the International Whaling Commission (IWC) & the Global River Dolphin Initiative by the WWF.**
  - **WCS-Bangladesh involved in long-term conservation efforts for Ganges river dolphin.**
  - **Expansion of Protected Area Network (Dolphin Sanctuaries).**
  - **Bangladesh Action Plan for Ganges river dolphin (2021-2030) now available.**
- **Conservation initiatives taken in Nepal**
  - **Nepal has small remnant populations and both the government and NGOs are involved in conserving river dolphins through community engagement programs.**

Global Conservation Initiatives & Need for Collaboration among Range Countries

- **Conservation initiatives by IUCN/Cetacean Specialist Group**
  - Last IUCN/CSG Conservation Action plan (Reeves et al. 2003) for the World's Cetaceans including River Dolphins in Asia had recommended actions that were urgently needed to improve the survival prospects of Ganges river dolphin in India & Bangladesh.
  - The Action Plan had recommended for monitoring of the status of dolphins in the areas that had been surveyed and found to had high dolphin densities, and those areas included the Vikramshila Gangetic Dolphin Sanctuary in Bihar, India and in Karnaphuli-Sangu and Kalni-Kushiyara river systems of Bangladesh.
  - Recommendations also included the training courses for researchers from India and Bangladesh, followed by joint field surveys in nearby river segments. Most of the recommendations made by IUCN/CSG in its Conservation Action Plan in 2003 have not been implemented yet.

Proposed Concerted Action Plan (2020) for Ganges river dolphin by CMS (UNEP/CMS/COP13/Doc.28.2.6/Rev.2/17-22 Feb. 2020

- Concerted Action Plan refers to actions needed for securing the connectivity of the riverine habitat within range countries and in trans-boundary regions (Nepal, Bangladesh and India).

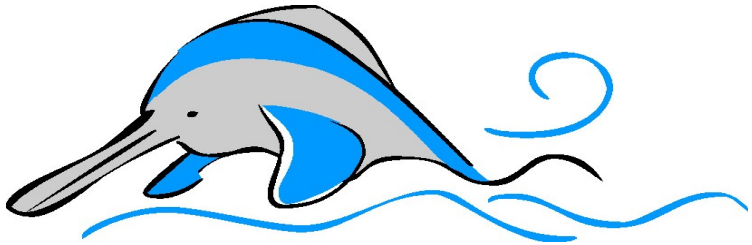
- The document primarily discusses potential interventions to better manage ecological water demand and conduct research on migration and dispersal of Ganges river dolphins.

- CMS in its Conservation Action document has identified following (sub) population of dolphins between range countries for better status assessment and protection: i) India- Bangladesh: Populations in Sundarbans, Brahmaputra/Jumna and Barak/Meghna sector in India and Bangladesh, and ii) India-Nepal: Populations in the Karnali (Ghaghra), Narayani (Gandak), and Sapta-Koshi (Kosi) rivers.

Future Ahead

- We must remember that ‘ Freshwater biodiversity declines much faster than terrestrial and marine species’ (Living Planet 2018).

- Wildlife knows no border.



- It is therefore in the interest of all the countries sharing international rivers/waters to work together in directions that will enable for better river management and biodiversity conservation including Ganges river dolphin.

Acknowledgements

- Dr. Jagdish Krishnaswamy & Nachiket Kelkar, ATREE Bangalore
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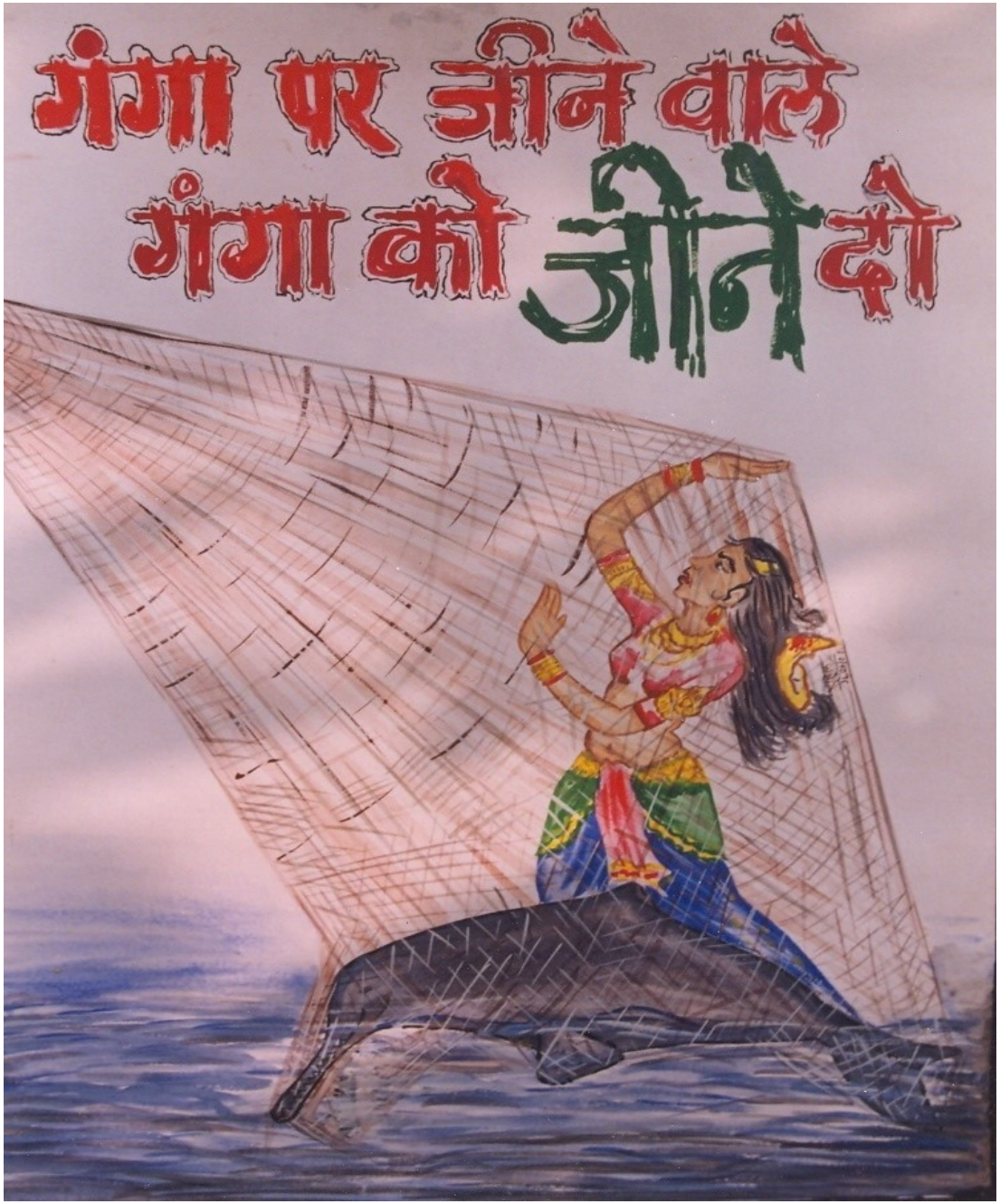
- Subhasis Dey & Dr. B. N. Kumar, T M Bhagalpur University
- Dept. of Forest & Environment, Govt. of Bihar
- NTPC Ltd. Kahalgaon, International Whaling Commission & other funding agencies



Thank You.