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Chapter- 9

Tri-County Disparities in Hilsa Conservation Management Reveal Varying Approaches Among India, Bangladesh and Myanmar

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Keywords: Disparity, Conservation, Sustainability, Tri-country

Abstract:

The Hilsa is a valuable, migratory fish species in the rivers, estuaries and coastal regions of India, Bangladesh and Myanmar. However, these bistate conservation partnerships across these three nations have revealed inconsistencies in the approaches to conservation management as influenced by their policy systems, legal instruments and actors' agendas. This study explores the changes in the three-counties' conservation efforts with regard to the Hilsa fish; these include: protection of its natural habitat, regulation of fishing activity and involving the community. While Bangladesh has taken strong regulatory approaches such as seasonal closure and no take zones, India continues to support community-based approaches and context-oriented co-management strategies. Myanmar, on the other hand has been found to have 'low regulatory enforcement' thereby denying conservation efforts required impetus. These disparities are further conditioned by socio-economic differences, and with reference to Hilsa fisheries especially, differences in dependence on this fish resource for food and income. From 2010 to 2015, estimates show that Bangladesh accounted for the largest Hilsa fish catch at 86.7%, followed by India at 8%, and Myanmar at 4%. Various natural and man-made factors currently hinder Hilsa fishing and threaten its future sustainability, necessitating immediate intervention. This manuscript examines the efforts undertaken by India, Bangladesh and Myanmar to ensure the sustainability of Hilsa fishing, along with their future strategies for control and enhancement.

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Introduction:

Hilsa (*Tenualosa ilisha*), an anadromous fish belongs to clupeids family with reference to Sardines and Herrings (Royce, 1996). It is one of the most important species in marine fisheries along the Bay of Bengal, Indian Ocean, Arabian Sea, and the Persian Gulf Suresh (2017). In 2010–2015, 86.7% of Hilsa production was reported by Bangladesh, followed by India (8%) and Myanmar (4%). Most of the Hilsa fish found in India is produced from the Hooghly-Bhagirathi fishery area in West Bengal. Hilsa fisheries hold a significant socio-economic importance in these areas; they directly engage 2.5 million people in Bangladeshi fisheries sector and still provides 50% of average household animal protein in Myanmar, and it greatly entitled to Myanmar's economy where the marine fisheries continuously lay the fifth largest proportion in its GDP and foreign exchange earnings (DoF; 2018). Marine fish production has continually increased, but per capita fish consumption has gone down due to factors such as population increase and effect on the environment. This underlines the nervous urgency of sustainable Hilsa stock which was threatened by habitat degradation, overfishing and lack of proper regulation.

Nowadays, the rate of Hilsa catch in inland fisheries in the three countries mentioned above is going down, and it has caused concern in the domestic economy (Rahman et al., 2000; Amin et al., 2001; Haldar et al., 2001; Mazid, 2001; Rahman et al., 2001; Amin et al., 2002; BOBLME, 2015b; Suresh et al., 2017). For this purpose, the BOBP-IGO (Bay of Bengal Programme Inter-Governmental Organization) on March 14-15, 2008, at the Central Inland Fisheries Research Institute (CIFRI), presented a trilateral (India, Bangladesh and Myanmar) plan for the management of the Hilsa fishery at Barrackpore (Kolkata) and it was considered that a 'Hilsa portal or website' will be developed for the Bay of Bengal region, alongside the establishment of a data collection and compilation mechanism in member countries (Bay of Bengal News, March - June, 2008). Here this review highlights the commendable Hilsa conservation efforts in these three countries, those are essential for the development of the Hilsa fishery sector and the enhancement of economic conditions across the tri-national area.

Current status of the cherished Hilsa and its fishery in the three mentioned countries:

The "queen of fish" Hilsa, given the geographical identification of Bangladesh, is valued not only for its nutrition and taste but also for the economic development and livelihood of millions of people in the Indo-Pacific region (NAAS, 2018).

In India, Hilsa typically lives for up to six years, but due to recent high levels of exploitation of mature female fishes and juveniles, most are caught at two or younger. This accelerated fishing pressure has caused exploitation rates to soar from 0.37 to 0.81 since 2012, indicating a concerning trend in mortality attributable to fishing activities (Hossain et al., 2019). The annual capture of juvenile hilsa reaches about 38 tonnes, valued at Rs. 0.15 crores, translating to a yearly loss of approximately Rs. 76.95 crores if these fish were allowed to grow for one year to attain a size of 250-300 grams within the Hooghly-Bhagirathi River system (Suresh et al., 2017). This population decline is primarily attributed to the extensive use of small mesh gillnets

(less than 60 mm mesh size), which result in the capture of a significant number of juvenile hilsa, particularly in riverine habitats (Chacraverti, 2021). Although large-sized (61.4 cm) Hilsa were caught in the Tapti River in Gujarat, it was marked as highly exceptional (Bhaumik et al., 2012).

In Myanmar, Hilsa is renowned for its high market value, driven by solid and consistent demand from export markets, especially in India and China (BOBLME 2015a). Besides, small-scale fishers in the Ayeyarwady region heavily depend on Hilsa catches as a significant income source (Soe et al., 2018). Here, the offshore vessels account for the majority (55%) of the Ayeyarwady Region's Hilsa catch, with the remainder coming from artisanal fishers who use boats and fixed traps in both freshwater and inshore marine waters, managed collectively (DoF, 2019). Despite Myanmar's tendency to over-report capture fisheries statistics, this discrepancy is likely influenced by the belief that certain inland capture fisheries, such as the Hilsa fishery, yield approximately 50% more fish than officially recorded — commonly known as the 'hidden harvest' (Kelleher et al., 2012).

Rivers that are fundamental to the three-nation hilsa fishery:

Many rivers (Fig.1) of the three countries are associated with the hilsa fishery; those are mentioned below.

In India, on both the west coast in rivers like Narmada (Kulkarni, 1950), Tapti / Tapi, and Purna, and the east coast in waterways such as Hooghly-Bhagirathi, Brahmaputra, Krishna, Kaveri, and Godavari, Hilsa are plentiful.

In Bangladesh, the abundance of Hilsa is mainly centered on the Padma, Meghna and Brahmaputra rivers.

On the other hand, In Myanmar, the Ayeyarwady riverine Delta as well as the adjacent Rakhine State and possibly also Mon State (Baran et al. 2017), is crucial for Hilsa fishing, as it targets the spawning and nursing grounds of the Hilsa shad (*Tenualosa ilisha*, locally known as Nga Tha Lauk), fulfilling both local needs and supplying the national market (Belton et al., 2015).

The species of Hilsa (belongs to the genus *Tenualosa)* are widely distributed and visible in all three countries:

In India, out of the five species belonging to the genus Tenualosa of Hilsa i.e., Hilsa Shad, *Tenualosa ilisha* (Hamilton- Buchannan, 1822); Toli Shad, *T. toli* (Cuvier- Valenciennes, 1847); Longtail Shad, *T. macrura* (Bleekar, 1852), Reeve's Shad, *T. reevesii* (Richardson, 1846) and the Laotian Shad, *T. thibaudeaui* (Durand, 1940) only two species [1. *Tenualosa ilisha* and 2. *Tenualosa toli* (Fig.2)] are observed (FAO, 1974), of which *Tenualosa ilisha* is used for various research purposes in India (Pillay, 1958).

On the other hand, *Tenualosa ilisha* is also noticeable in Bangladesh and Myanmar (Blaber et al., 2001).

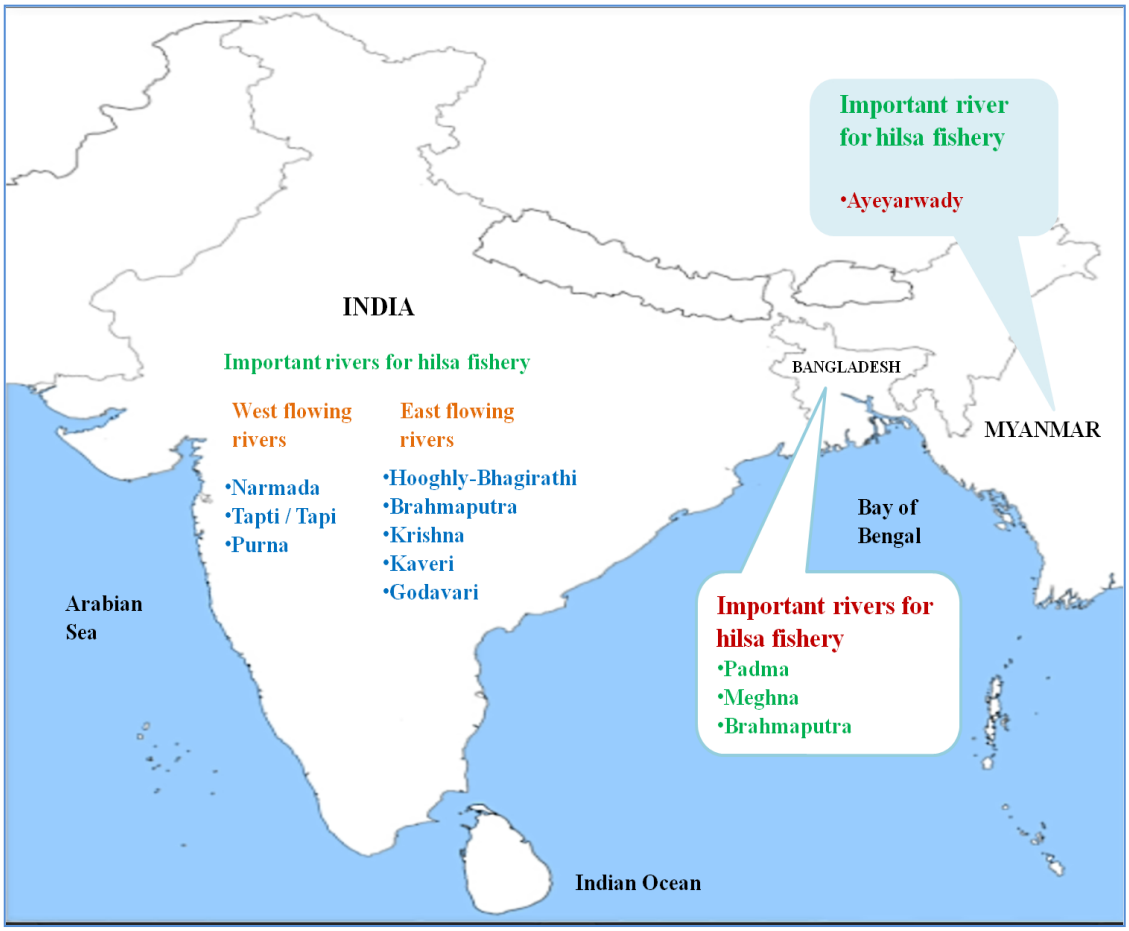

Figure 1. Tri-national (India, Bangladesh and Myanmar) map with names of essential rivers in the Hilsa fishery.

Comparative analysis of the Hilsa spawning seasons in the three countries:

Hilsa undertakes migrations from the sea to freshwater rivers specifically for spawning. This migration pattern supports the survival of Hilsa larvae and plays a crucial role in the species' reproductive success and population dynamics (Bhaumik and Sharma, 2012). So, determining the spawning season of Hilsa is particularly important in Hilsa conservation because the stricter the halt on Hilsa fishing during this period, the more significant its survival rate increases. This spawning season of Hilsa is highly dependent on its ecosystem. Therefore, different scientists have described this period in other ways, as mentioned below.

In India, the peak spawning season of Hilsa is mainly in monsoon (Hora and Nair, 1940a; Kulkarni, 1950; Jones and Sujansingani, 1951; Karamchandani, 1961) and winter (Jones and Menon, 1951; Sujansingani, 1957). However, in some cases, Hilsa can be seen spawning in other months and even throughout the year (Raja, 1985).

After reading various articles, it is clear that in Bangladesh, there are basically two spawning seasons of Hilsa, one is the monsoon (Ahmed, 1954; Raja, 1985) and the other is the post monsoon (Islam et al., 1987).

In Myanmar, the Hilsa spawning season is observed three times a year. August to September marks the principal spawning period for Hilsa in the Ayeyarwady Delta, with additional spawning likely occurring during January to February and April to May (Bladon et al., 2019).

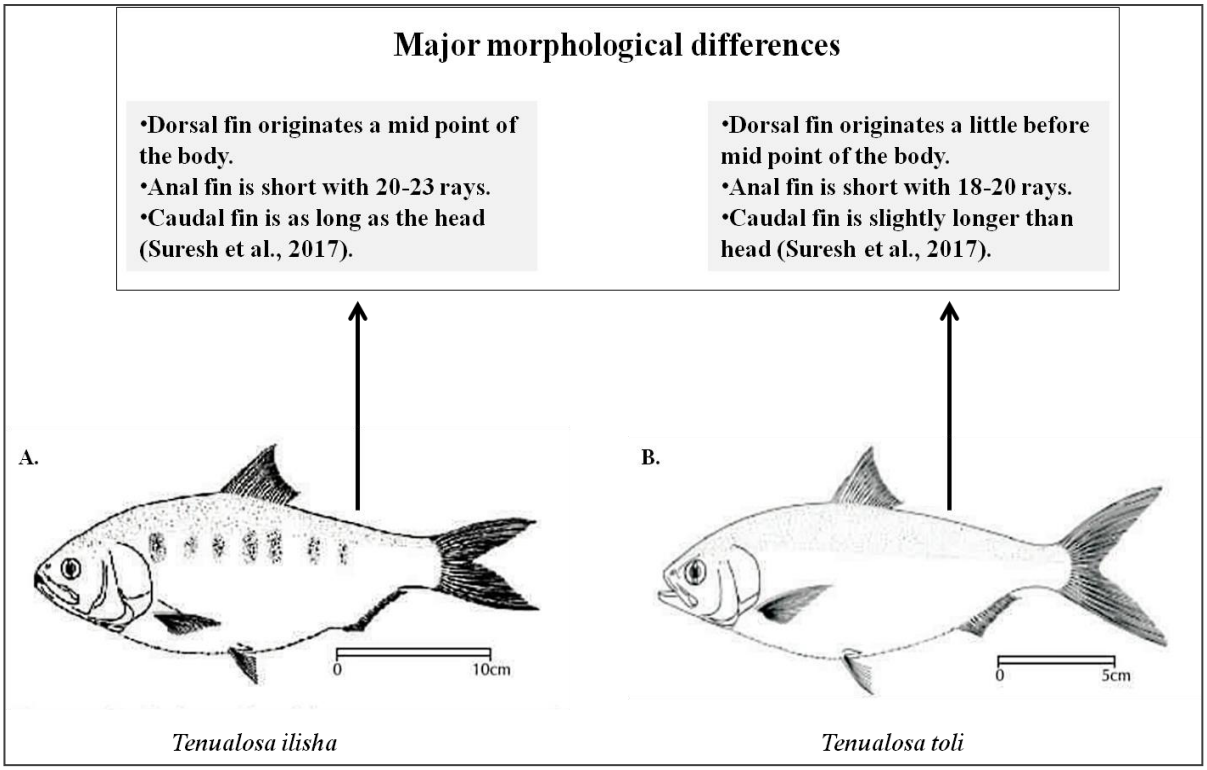

Figure 2. Sketch of A. *Tenualosa ilisha* and B. *Tenualosa toli* (Source: FAO, 1974) with their significant morphological differences.

What? Variables that could affect the future viability of the Hilsa fishery:

Hilsa undertakes migrations from the sea to freshwater rivers specifically for spawning. This migration pattern not only supports the survival of Hilsa larvae but also plays a crucial role in the species' reproductive success and population dynamics (Bhaumik and Sharma, 2012). But, In India, the installation of barrages and dams along major east and west coast rivers, especially the Hooghly - Bhagirathi [like Farakka barrage (De et al., 1994)] and Narmada, has blocked the Hilsa's migratory paths to their breeding habitats in the upper stretch of riverine zones, causing the Hilsa fisheries in these rivers to collapse (Nair, 1958), as a result, Hilsa landing at estuarine zone can be observed more (Raja, 1985). In addition, both in India and Bangladesh, the indiscriminate use of Hilsa nets with a small mesh size that is less than 60mm (Chacraverti, 2021), as well as the natural and man-made physico-chemical changes in sea and river water, are hurting the future survival rate of hilsa.

In Myanmar, there is a disproportionately high pressure on the freshwater fishery because Hilsa caught in freshwater are more likely to include juvenile fish and mature female fish with ripe gonads, which are often targeted during their spawning runs (Khaing et al., 2019). Due to

their seasonal inland migration, Hilsa is vulnerable to threats from land-based activities such as habitat destruction and water contamination (BOBLME, 2015b). That means the key factors influencing the sustainability of Myanmar's Hilsa fishery include overfishing of juveniles and brood female Hilsa using small-mesh nets (BOBLME, 2015c) and habitat destruction, compounded by water pollution and climate change (BOBLME, 2015b; Baran et al., 2017; Khaing et al., 2018).

Who? Will ensure the future sustainability of the Hilsa fishery:

The effectiveness of livelihood-focused development interventions often hinges on carefully implementing alternatives, compensation mechanisms, and incentive structures (Wright et al., 2016). Practical alternative livelihood aims to bolster conservation by diversifying income streams and reducing the necessity for natural resource exploitation (Roe et al., 2015). On the other hand, the effectiveness of incentive schemes hinges on their ability to offer tangible resources as encouragement, particularly when behavioral adjustments do not align with agreed-upon criteria (Wunder, 2013).

But in India, no such incentive has been arranged for fishers. So, the ban period is not given that importance in Hilsa fishing. Several fishery-oriented institutions have been working for Hilsa conservation for a long time. For example - In 2012, the Indian Council of Agricultural Research (ICAR) initiated the first comprehensive study for ensuring the future sustainability of the Hilsa fishery on "Stock characterization, captive breeding, seed production, and culture of Hilsa (*Tenualosa ilisha*)" under the National Agricultural Science Fund (NASF). Subsequently, Central Inland Fisheries Research Institute (CIFRI) spearheads this effort in collaboration with other ICAR fishery institutes and the University of Shantiniketan, West Bengal (Annual Report of CIFRI, 2016). Besides, various schemes seem to be implemented for fishermen [like the recent 'Samudra Sathi Scheme' in West Bengal, whereby workers engaged only in fishing across sea will receive INR 5000/- only per head per month for two months i.e. May and June (Sinha, 2024)] are challenging to implement promptly and none of these are Hilsa fishing focused because in this case the ban period of Hilsa fishing is not given importance. On the other hand, some traditional customs prevalent among Bengalis play a unique role in Hilsa conservation. For example, Bengalis traditionally eat a pair of Hilsa (locally known as 'Joda Ilish') on the day of 'Vijaya Dashami' (usually in October) and then do not eat Hilsa fish until Saraswati Puja (usually February), resulting in relatively less Hilsa catch during this primary spawning season of Hilsa (Suresh et al., 2017).

In Bangladesh, ban periods on Hilsa fishing are strictly observed. The annual eight-month ban on fishing activities, including selling juvenile Hilsa fish, spans from November 1st to June, covering extensive riverine, estuarine and coastal regions totalling 7,000 square kilometres (Nishat et al., 2019). On the other hand, the country-wide ban on fishing for gravid Hilsa reflects a proactive approach to fisheries management, emphasizing the importance of protecting critical breeding periods for 22 days i.e., 14th October to 4th November (Rahman et al., 2017). The provision of 10 kg of rice bi-monthly and, in some cases, amounts by the

government during the early phase of the Hilsa sanctuary ban aimed to alleviate food insecurity among impacted populations. However, the current compensation framework is aimed solely at Hilsa fishers and overlooks the broader impact on other fishers whose livelihoods are similarly disrupted during ban periods (Bladon et al., 2016).

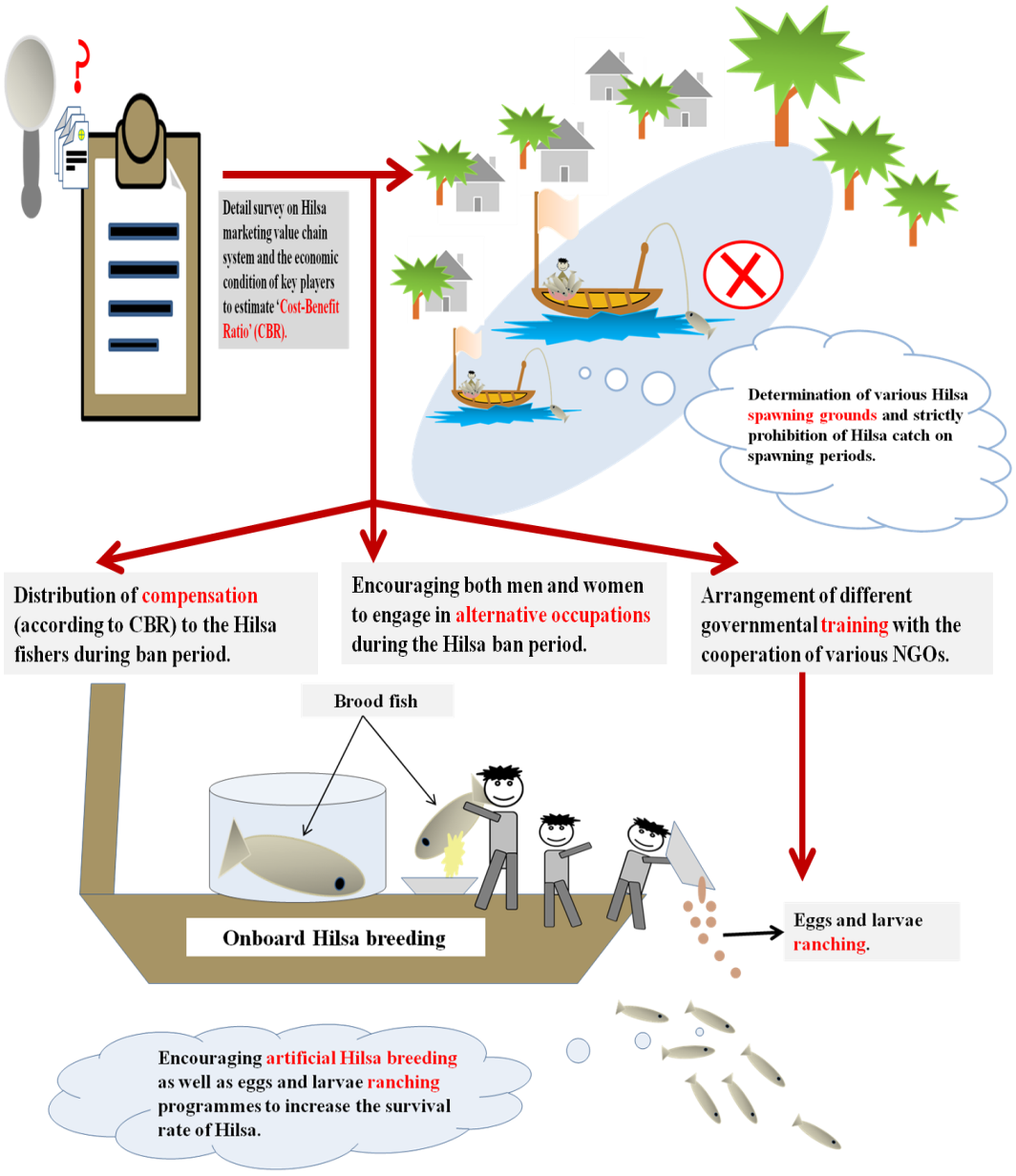

Figure 3. Proposed plans for the future conservation of Hilsa and its fishery sector.

Policymakers are considering incentive-based conservation strategies in Myanmar to promote sustainable hilsa fishing practices. These approaches resemble 'payments for ecosystem services' that involve providing economic incentives to encourage compliance with

current and future fishing regulations. By compensating fishers for any losses resulting from regulatory measures, these schemes are expected to foster greater adherence and sustainability than purely punitive enforcement methods (Bladon et al., 2018). National and regional regulations [Freshwater Fisheries Law (1991) and Marine Fisheries Law (1990)] play a critical role in safeguarding Hilsa and other commercial fish species; for instance, freshwater and inshore marine fisheries are closed annually from May to July to preserve spawning grounds and support recruitment. Although these implementations were initially slow, progress has been steady with increased awareness and community participation (Tezzo et al., 2018).

Conclusion:

Hilsa fishing and its fisheries have a significant role in the domestic economy and lifestyle of the residents of the three countries. So, it is our responsibility to make the Hilsa fishery sustainable. In this case, Bangladesh government has taken various measures more strictly than the other two countries (specifically, than India), so we need to implement the following plans (Figure 3) for their accurate assessment, which will be able to make the Hilsa fishery sustainable.

At first, a detailed survey on the Hilsa marketing value chain system and the economic condition of critical players to estimate the 'Cost-Benefit Ratio' (CBR) is to be done. Then, various Hilsa spawning grounds are to be determined, and the Hilsa catch on spawning periods and the use of small mesh-sized gears throughout the year are strictly prohibited. Besides, compensations (according to CBR) should be distributed to the Hilsa fishers during the ban period, and they should be given training on breeding and ranching of Hilsa. Last but not least, both men and women are to be encouraged to engage in alternative occupations during the Hilsa ban period.

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