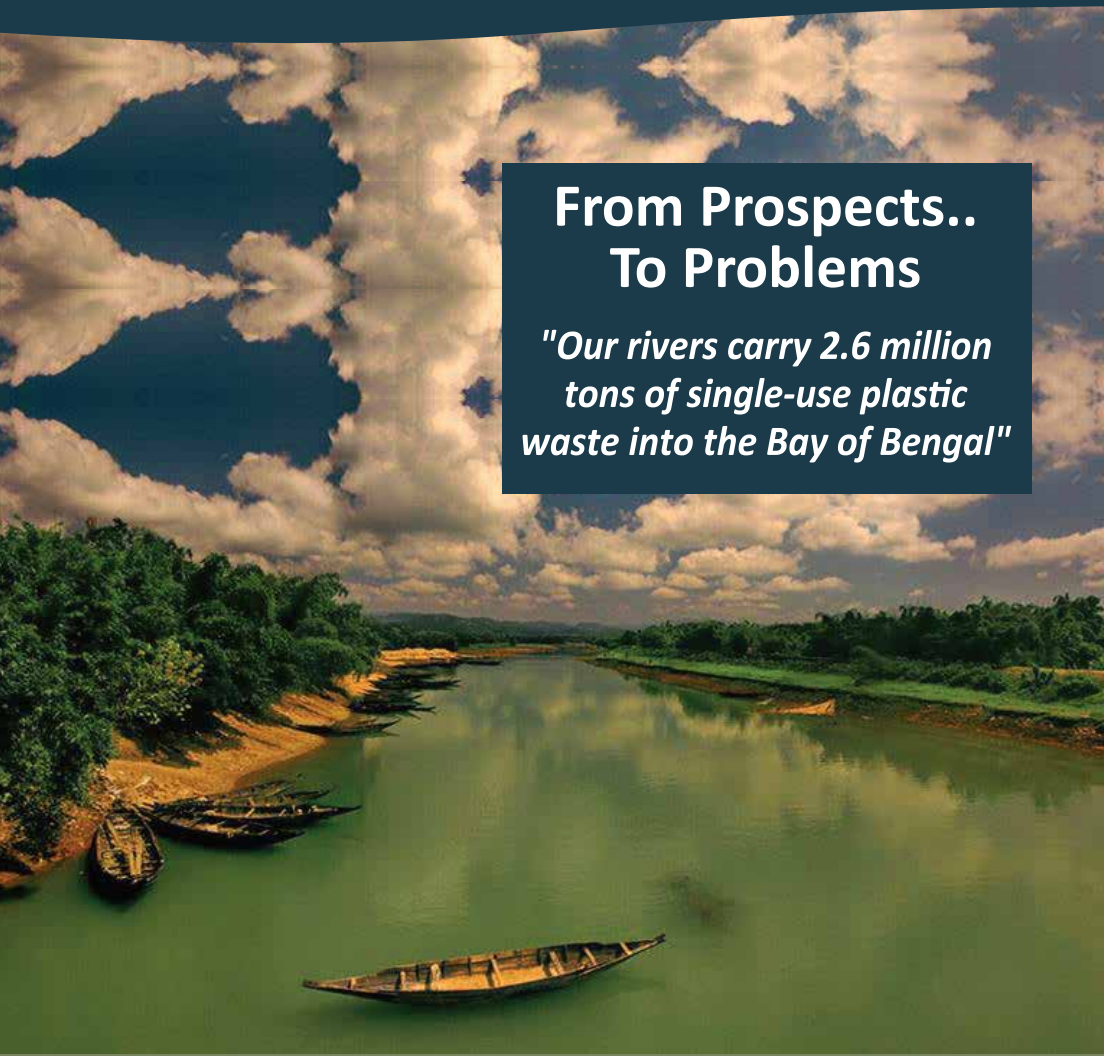
The Tragic Tale of Our Rivers



From Prospects.. To Problems

"Our rivers carry 2.6 million tons of single-use plastic waste into the Bay of Bengal"

A Situation Analysis Report By

Environment & Social Development Organization - ESDO

In Association with

Plastic Solutions Fund

ESDO

PLASTIC SOLUTIONS FUND

gaia

Beat Plastic Pollution

Report Summary

The Tragic Tales of Our Rivers: From Prospect to Problem

(A Situation Analysis Report of Assessing Transboundary Movement of Single-use Plastic Waste Through River Channels in Bangladesh, 2022)

The Tragic Tales of Our Rivers: From Prospect to Problem

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Environment and Social Development Organization- ESDO is an action research oriented non-profit and non-government organization based in Bangladesh. It is an environmental action research group dedicated to a toxic-free, zero-waste planet. This entails fighting pollution and building regenerative solutions in cities through local campaigns, shifts in policy and finance, research and communication initiatives, and movement building. ESDO is working relentlessly to ensure biological diversity since its formation in 1990. It is the pioneer organization that initiated the anti-polythene campaign in 1990 which later resulted in a complete ban of polythene shopping bags throughout Bangladesh in 2002.

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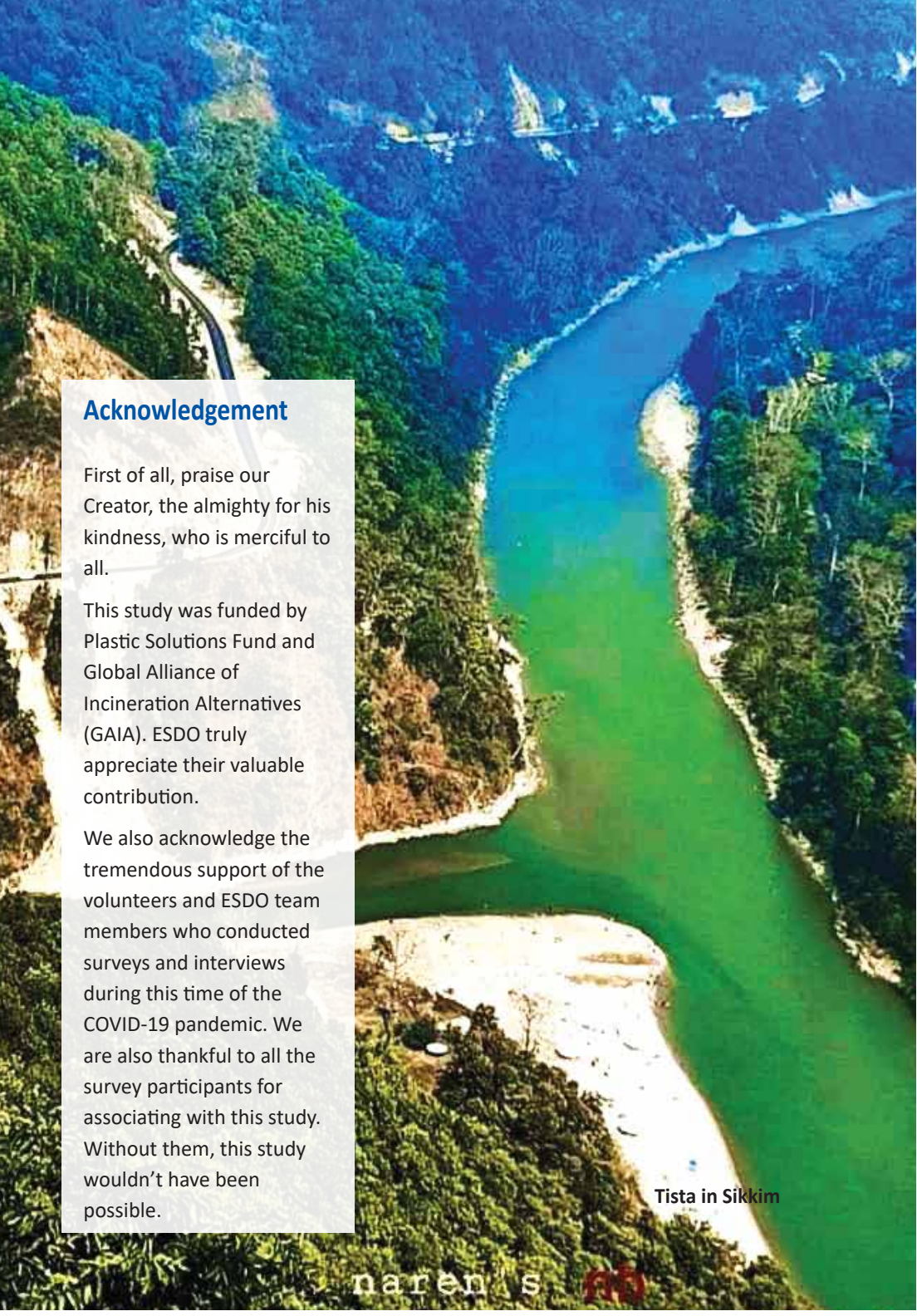
We also acknowledge the tremendous support of the volunteers and ESDO team members who conducted surveys and interviews during this time of the COVID-19 pandemic. We are also thankful to all the survey participants for associating with this study. Without them, this study wouldn't have been possible.



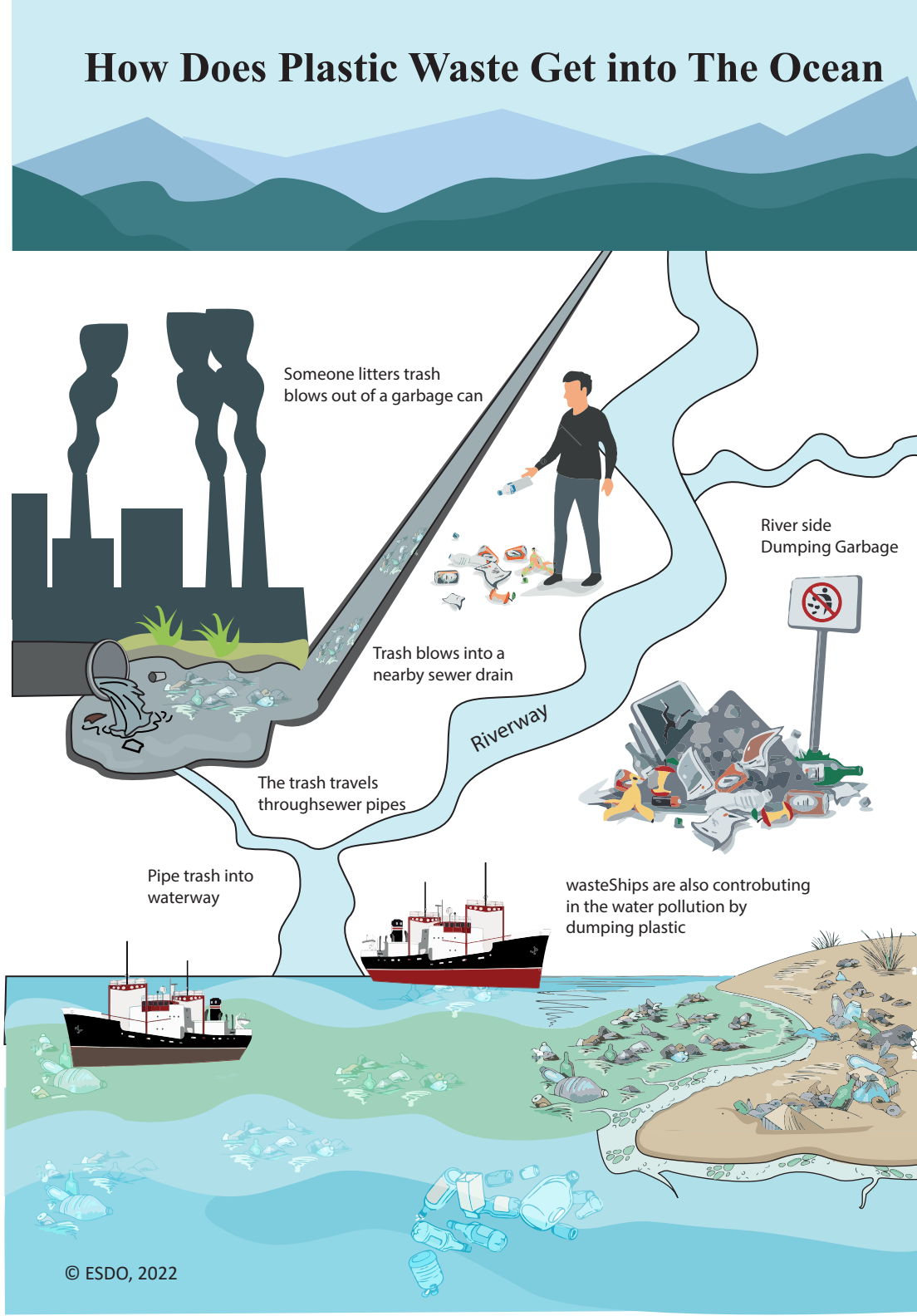
Tista in Sikkim

Overview

Our water bodies have become a toxic pool of waste, contaminated by everything from drifting plastic packs to synthetic waste. In the simplest terms, contamination of water bodies implies pollution of that water. Consequently, water pollution occurs when lakes, seas, rivers, repositories, and so on are mismanaged. Bangladesh, a small South Asian country located on the eastern flank of India. The United Nations Environment Programme (UNEP), has published in their report regarding the production and usage of plastic worldwide that around 73,000 tonnes of plastic waste end up in the sea everyday through the rivers Padma, Jamuna and Meghna in Bangladesh. Besides domestic waste, there is waste from India, Nepal and China floating down the Ganges, Jamuna and Brahmaputra (Mahmud, 2018). Bangladesh is already facing severe challenges in managing waste, which is one of the prime reasons for the environmental pollution of this country. Bangladesh ranked 10th for producing the largest amount of plastic waste. Emphasizing the transboundary movement of plastic waste, it is high time we assess the sources by which transboundary movement is occurring like whether the waste source is solely organic or most of the wastages are imposed in our ways by surrounding nations and to be more precise what is the reason behind this.

The southern boundary of Bangladesh is the Bay of Bengal and it shares more than 4000 km of border with India[1], which is naturally our largest trade partner. In the extreme southeast, Bangladesh's neighbor is Myanmar. Bangladesh has 5150-8046 Km of navigable waterways including 2575-3058 km cargo routes[2]. To assess the possible ways of transboundary movement of plastic waste all the aspects through which movement is occurring need to be considered and for that, we need a full understanding of plastic, plastic products, and their lifecycle.

How Does Plastic Waste Get into The Ocean



This study is an exclusive assessment done by Environment and Social Development Organization (ESDO) in collaboration with Plastic Solutions Fund and Global Alliance of Incineration Alternatives (GAIA). The primary goal of these programs is to increase regional collaboration to reduce the transboundary movement of hazardous plastic waste and convene advocacy with government agencies and regulators to push forward policy decisions.

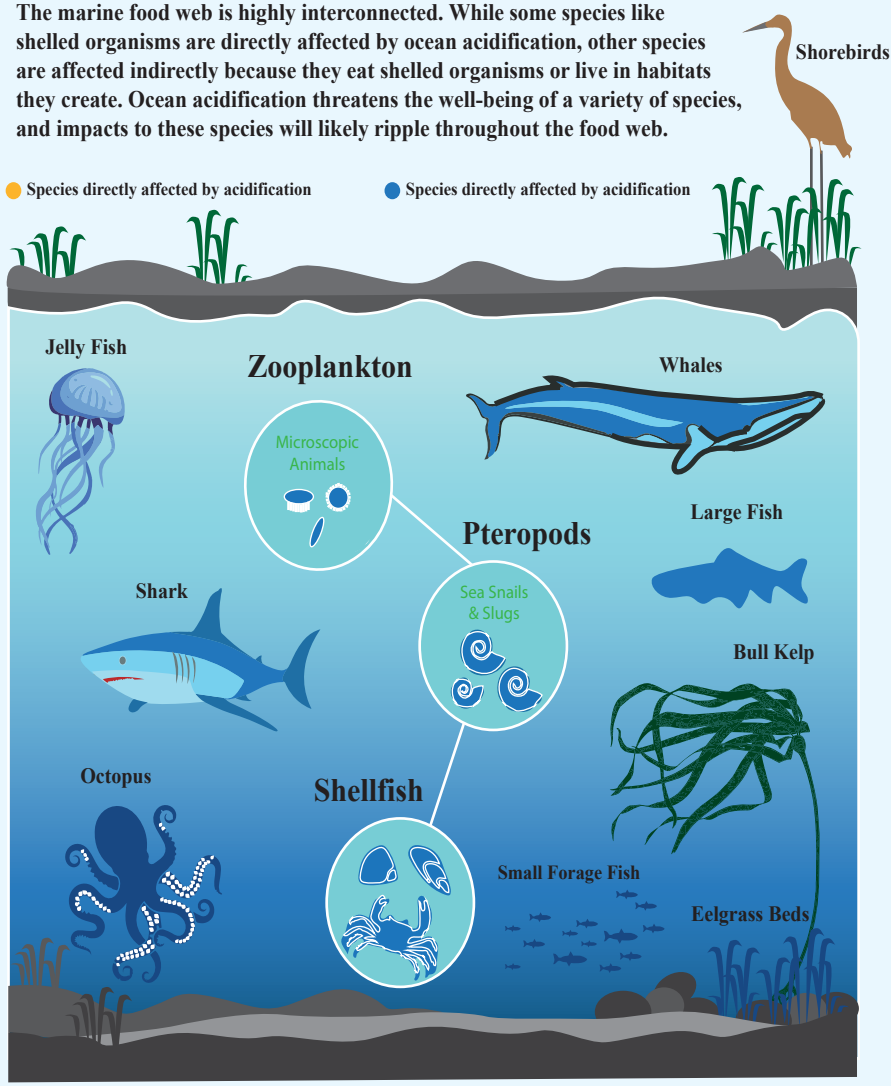
We collected waste from every study point for three consecutive days in three different seasons (dry season, pre-monsoon, and monsoon) to assess the volume of single-use plastic flowing through our rivers on a daily basis. A total of 26 points were studied, and 18 rivers were covered in this study. **The transboundary rivers of Bangladesh carry approximately 15,345 tons of single-use plastic waste every day, of which 2802 tons originate from India and Myanmar – 2519 from India & 284 from Myanmar. Approximately 2.6 million tons (2,637,179) of single-use plastic waste enter our Bay of Bengal every year, of which nearly half a million tons (4,70,439) are transboundary wastes** *(4,03,327 tons from India & 67,112 tons from Myanmar per year)*[3].

This report highlighted the current scenario of plastic pollution in our aquatic systems, particularly through transboundary movement. Hopefully, this report will be useful in the decision-making process for the conservation of degraded riverine ecosystems in Bangladesh.

1. https://www.env.go.jp/en/recycle/asian_net/Annual_Workshops/2007_PDF/Presentations/S2.03_Bangladesh_Country_paper-.pdf
2. https://www.nationsencyclopedia.com/Asia-and-Oceania/Bangladesh-TRANSPORTATION.html
3. Yearly calculation was done considering 270 days a year for calculating the minimum amount of waste (9 months)

The food web and ocean acidification

The marine food web is highly interconnected. While some species like shelled organisms are directly affected by ocean acidification, other species are affected indirectly because they eat shelled organisms or live in habitats they create. Ocean acidification threatens the well-being of a variety of species, and impacts to these species will likely ripple throughout the food web.



Washing State Blue Ribbon Panel on Ocean Acidification (2021): Ocean Acidification from Knowledge to Action, Washington State's Strategic Response. H Adelsmand and L Whitely Binder (eds). Washington Department of Ecology, Olympia, Washington. Publication no. 12-02-015. Chan, F., Boehm, A.B, Barth, J.A., E.A, Dickson, A.G., Feely, R.A., Hales, B., Hill, T.M., Hofmann, G., Lanson, D., Klinger, T., Largier, Newton, J., Pedersen, T.G., Somero, G.N., Sutula, M., W. W., Waldbusser, G.G, Weisberg, S.B., and Whiteman, E.A. The West Coast Oceam Acidification and Hypoxia Science Panel: Major Findings, Recommendations, and Actions, California ocean Science Trust, Okland, California, USA . April 2016. Welch, Craig. "Acidification Eating Away at Tiny Sea Snails. Sea Change. The Seattle Times." The Seattle Times, N.p, n.d. Web. 03 Aug. 2016. Busch, D.s., Harvey, C.J., and McElhany, P.2013 Potential impacts of ocean acidification on the Puget Sound food webs.- ICES Journal of Marine Science, 70:823-833.

Background

Bangladesh isn't safe from plastic peril. In light of the steadily expanding use of plastic in various businesses, particularly bundling, Bangladesh remains one of the top plastic-contaminated nations. Pictures of clogged-up waterways because of the erratic removal of plastic bottles mostly portray the gravity of the issue. In Bangladesh, 3,000 tonnes of plastic waste are generated every day. In total generated waste plastic comprises 8% which is numerical, that is 800,000 tonnes. Some 14 million polythene bags are used daily in Dhaka city. Those often end up in rivers and the ocean, posing a hazard to sea life. In Old Dhaka alone, around 250 tonnes of non-recyclable products, such as straws and plastic cutlery, are sold every month. The growth in bio-waste production is 5.2% while that in plastic waste is 7.5% (Islam M. , Shocking Statistics on Plastic in Bangladesh, 2019).

In 2017, a study was reported by Environment and Social Development Organization-ESDO, showing that most of the used plastic and polythene end up in landfills and water bodies across the country. There is no process to collect or recycle them. However, despite being aware of the detrimental effects of plastic, 61% of the people in the country use polythene bags. There are over 100 factories in different areas of Dhaka, including Lalbagh, Hazaribagh and Sadarghat, and Chattogram that produce polythene bags (Islam M. , Shocking Statistics on Plastic in Bangladesh, 2019).

According to a recent study conducted by ESDO, it was found that at the end of the very first month of the official lockdown to prevent COVID-19 spread in Bangladesh, about 14500 tons of hazardous plastic waste has emerged from the dramatically increased use of single-use surgical face masks, hand gloves, hand sanitizers and polythene bags in communities and health care facilities. About 11.2% of this waste comes from the use of surgical face masks, 21.5% from polythene made normal hand gloves, 20% from surgical hand gloves, and 40.9% from the single-use polythene shopping bags used for carrying food items, and 6.4% from empty containers of hand sanitizers (Study, 2020).

In Bangladesh, food and personal care packaging are the largest contributor to single-use plastic waste. Sachets are also an emerging source of single-use plastic waste, which are used mostly for packaging food items and personal care products in small quantities such as – ketchup, coffee sachet, mini packs, and tetra packs of shampoo, conditioner, toothpaste, etc.

Photo Credit: ESDO, 2022

Sachet is growing popularity in both urban and rural areas. Sachets are completely non–recyclable and hence are considered as major sources of single-use plastic pollution around the globe.

Bangladesh is a riverine country. According to the Bangladesh Water development board (BWDB) about 405 rivers currently flow in Bangladesh (during summer and winter). It has 405 rivers including 57 transboundary rivers, among them 54 originated from India including three major rivers the Ganges, the Brahmaputra and the Meghna. And rest three trans-boundary rivers originated from Myanmar (Surface Water Processing Branch, BWDB, 2020). Although the number stated are ambiguous in some sources (Bangladesh Water Development Board, n.d.). The number differs widely due to lack of research on the counts and the fact that these rivers changes flow in time and season. Historical sources state about 700 to 800 rivers (somewhereinblog.net, n.d.) but most of them have dried out or are extinct due to lack of attention and pollution.

Rivers covered about 24140 km of total length and consisting several streams, canals, lakes, khals, beels and haors. Seasonal variation of temperature and rainfall truly make the river and tributaries magnificent. The impact of plastic waste on the marine environment is mostly assessed based on the presence of so-called microplastics, a frequently pronounced term that is still a nascent area of research. With the surge in plastic usage, microplastic concentration in the marine environment continues to rise along with the increasing threat to marine life as well. Microplastics have been detected on seashores and seabed of six continents, with fibers being the most predominant shape (Juliana A.Ivar do, 2014). Whatever the origin, microplastics embrace the same fate in the marine environment and impose the similar and same extent of detrimental effect on marine biota, and ultimately on human life. With their progressive fragmentation to smaller size, micro-plastics become increasingly available for ingestion by a wide range of marine organisms and it has been demonstrated that a considerable amount of ingested plastic was found in various marine creatures including fish, seabirds, decapod crustaceans, amphipods, lungworms, and barnacles (Matthew Cole P. L., 2013). These marine biota mistake microplastics for natural prey due to the similarity in size, shape and color of the microplastics and the natural food source.

SAVE OUR OCEANS

12%
oil spills contribute to the oil in the ocean.

TRASH
4 bn pounds of trash and sewage enters ocean per year.

400 yrs
is the amount of time plastic takes to decompose

INGESTION
Plastic damage aquatic creatures. They block digestive tracts, diminish the urge to eat and lead to starvation or death.

ENTANGLEMENT
Marine life can get caught and killed in derelict fishing nets and other plastic debris.

DID YOU KNOW?
China and Indonesia are the world's biggest contributors of plastic pollution in the ocean. Combined, they account for one-third of total ocean pollution.

Plastic makes its way to the depths of the ocean. Crustaceans in the Mariana Trench, the ocean's deepest point, have ingested plastic.

WAYS TO HELP

REDUCE USAGE OF SINGLE USE PLASTICS
REUSE PLASTIC PACKAGING
RECYCLE RATHER THAN THROW AWAY

EDUCATE THOSE AROUND YOU ABOUT RECYCLING, HELP SPREAD THE WORD

REFUSE AND BAN SINGLE USE PLASTIC

Illustration Courtesy: Behance

How Does Trash Get Into the Ocean?

1. Someone litters, or trash blows out of a garbage can.
2. Trash blows into a nearby sewer drain.
3. The trash travels through sewer pipes...
4. ... and into waterways.
5. Eventually, that trash reaches the ocean, where it can harm fish and birds.
6. Heat from the sun breaks down large plastic trash into smaller pieces, which float from coast to coast.

Budget Dumpster

A study showed, in North Pacific Central Gyre, small plastic fragments are mistaken for natural food source by a low-trophic, mesopelagic family of fish-the Myctophidae, which are in turn preyed upon by squid, tuna, whales, seabirds and fur seals and thus facilitate their way to various compartments of the oceanic food chain including the one for human (Christiana M.Boerger, 2010).

Apart from the physical damage, consumed small plastic detritus can introduce toxic chemicals in living organisms in two ways (Chris E. Talsness, 2009). Firstly, the chemicals used as additives, such as phthalates as plasticizers and PBDE, might leach out during the post-ingestion period from the disintegrating plastic debris. Though these chemicals are meant to improve the properties of plastics, their presence in living organisms is associated with carcinogenic and endocrine-disrupting effects (Jörg Oehlmann, 2009). Secondly, the microplastics can act as a vector for carrying different hydrophobic organic contaminants into the marine biota. Their large surface-to-volume ratio makes them susceptible to the accumulation of persistent organic pollutants (POPs), such as PCBs, PBDEs, PAHs, and phenanthrene, even in a more concentrated manner than in the surrounding water (Adil Bakira, 2014).

The trans-boundary rivers of Bangladesh (Banglapedia: National Encyclopedia of Bangladesh, n.d.); where the assessed rivers in this study has been highlighted:

Up Stream	Atrai, Punarbhaba, Tentulia, Tangon, Kulik or Kokil, Nagar, Mahananda, Dahuk, Karatoya, Talma, Ghoramara, Deonai-Jamuneshwari, Buri Tista, Tista, Dharla, Dudhkumar, Brahmaputra, Jinjiram, Chillakhali, Vogai, Nitai, Someshwari, Jadukata, Damalia/Jalukhali, Nawagang, Umiam, Dhala, Piyain, Shari-Goyain, Surma, Kushiyara, Sonai-Bardal, Juri, Manu, Dhalai, Longla, Khowai, Sutang, Sonai
Middle Stream	Haora, Bijoni, Salda, Gumti, Kakrai-DakatiaBetna-Kodalia, Bhairab-Kobadak, Mathavanga, Ganges, Pagla
Down Stream	Silonia, Muhuri, Feni, Karnafuli, Raymangal, Ichamati-Kalindi, Sangu, Matamuhuri, Naf

Potential sources of fresh water pollution by microplastics include effluent from waste water treatment plant (WWTP), runoff from industrial plastic production sites, urban, and agricultural areas, and atmospheric fallout. Laundry washing machines are also responsible for discharging a large amount of microplastics into waste water in fibrous form, with one study estimating that around 1,900 fibers are discarded from a single wash (Mark Anthony Browne, 2011).

Meghna River in Chadpur

Photo Credit: ESDO, 2022

In a study, the downstream outlet of a WWTP in the North Shore Channel in Chicago (USA)was found to contain around 9.3 times microplastics than in the upstream, which depicts the contribution of WWTP in discharging microplastics to fresh water system (Amanda McCormick, 2014). Microplastics can accumulate in agricultural lands from widespread plastic mulching used in farming and atmospheric fallout of the airborne particles originated in nearby areas (Rillig, 2012). They can also appear in farming land through another potential source of microplastics sewage sludge, typically used as fertilizer and for landfilling (Leslie, 2012).

Efforts to quantify the presence of microplastics in marine species of Bangladesh has largely been neglected until very recent time, though the pace is not in an expected manner. It has been reported that 500 – 20,000 microplastics/km were floating on the surface water of the Bay of Bengal (Marcus Eriksen, 2018). In another study, researchers reported a total of 443 microplastic items in the intestines of three marine species of Bay of Bengal, namely Harpadon nehereus, H. translucens and Sardinella gibbosa, on average ranging from 3.20 to 8.72 items per species (M. Shahadat Hossain, 2019). Again, two shrimp species (Metapenaeus mono-cerous and Penaeus monodon) in the Bay of Bengal were found to ingest 22 different types of microparticles (Shahadat Hossain, 2020). These findings suggest that microplastics are also present in our marine environment and related research should be augmented by considering it as a potential threat to public health.

While there has been a lot of studies, though insufficient, on the source and fate of microplastics in marine environment, but their fate in continental aquatic environment or in fresh water ecosystems has largely been neglected. However, the few studies that have been done to date confirm that microplastics are also noticeably present in fresh water system and causing deleterious impact on aquatic biota likewise in marine environment. Several authors investigated the sediments and surface water of different lakes, rivers, and reservoirs around the world and found a considerable amount of microplastics in fresh water system. The tremendous amount of microplastics estimated in fresh water system of several developed countries implies that the scenario is even more dangerous in developing countries like Bangladesh, though no apparent effort has been taken to quantify it.

Apart from polluting soil compartment, these microplastics contaminate the waterbody through surface runoff to canals and rivers by irrigation or rain water. Alike marine biota, aquatic biota also ingests and accumulate microplastics and encounter the same adverse effects.

Hurt et al. (Giuseppe Bonanno, Ten inconvenient questions aboutplastics in the sea, 2018) investigated two fish species, 72 gizzards had and 24 largemouth bass, in two agricultural reservoirs in the midwestern U.S.A. and found microplastics in 100% of the fish sample. In another study, 83% of a fresh water fish species Hoplosternum littorale were observed to have microplastics in their gut, mostly microfibers (Jacqueline Santo, 2017). Thus, the microplastics in fresh water fish, being a crucial part of human food web, may pose more threat to human health than the sea fish as the former ones are more frequently consumed. Apart from fresh water or sea fish, humans are also consuming microplastics from other food sources that includes table salt, sugar, honey, and beer (Gerd Liebezeit, 2018).

Often scientists positively correlate microplastics abundance with human population density (Mark Anthony Browne, 2011), which infers that Bangladesh, being a very populated country, is at a high risk of being polluted by microplastics, especially the water bodies. However, till now, there has been little or no systematic study to assess the amount of microplastics in different environmental compartments nor the impact of microplastics on living creatures. With the rivers and water bodies occupying 5% of the land surface (Abu Musa, 2007), Bangladesh needs more rigorous assessment of the plastic presence in water bodies and take necessary steps to prevent further pollution since this environmental compartment is crucial for maintaining ecological balance. Apart from environmental and ecological damage, substantial amount of economic cost is also associated with the plastic wastes stuck in water bodies as they require frequent clean-up activities.

Physical fragmentation is caused by mechanical influences such as waves, and abrasion through sediment (Barnes, 2009). The retention mechanisms and time scales of plastic on riverbanks and in floodplains remain largely unresolved, especially as sedimentation rates and river characteristics play an important, yet unknown role (Lechthaler, 2021). Different results were found in different studies. It was found in one study that macroplastic retention times of shorter than six months (Roebroek, 2021), whereas another study found by investigating the use-by dates on medical packaging, showed that 37% of the litter was discarded before 1984 (Tramoy, 2020).

Objective of the study

- To find out the current status of single-use plastic pollution in transboundary rivers in Bangladesh
- To assess the source of single-use plastic waste in river channels & the contribution of neighboring countries among the single-use plastic waste in river channels
- Understand general perception of single-use plastic product consumption and management
- Review and gaps analysis of the national and international regulations of plastic pollutions

Methodology

The survey conducted in different areas was questionnaire survey and single-use plastic waste sample collection from streams and surrounding bank areas. Particularly SQAA&KII method was used (survey questionnaire, desk assessment, data analysis, and key informant interview). To prepare this extensive report, the relevant data have been collected from both primary and secondary sources. The initial review was expanded relevant terms and included the following websites and sources.

Field Testing

An initial field testing was conducted prior to staring the main survey to understand if the set method was right or wrong to proceed. The team covered 10-15 surveys on consumers to cross check the questionnaires and analyzed the collected data with proper indicators. After sorting few minor errors, the questionnaires were revised and distributed for the main survey.

Baseline Survey

The baseline survey had been conducted through questionnaires and carried out from December 2020 to July 2022 on total 7020 people from different society like educated people, students, boatman, fisherman, shopkeepers etc. Set of structured questionnaires were formed to ensure getting all relevant data from targeted segment. Amid the Covid-19 pandemic, ESDO's volunteers had gone physically in different locations of Bangladesh and conducted questionnaire survey different segment of people.

Sample Collection

Besides survey, single-use plastic waste sample collection from streams and surrounding bank areas. Single-use plastic waste were collected for three days in each location in each season and the weight of the wastes were measured for the estimation. For assessing the situation of Pre-Monsoon, 26 points for 18 rivers were studied from March 2021 to June 2021. For understanding the monsoon scenario 26 points for 18 rivers were studied from July 2021 to October 2021. For assessing dry season situation, 26 points for 18 rivers were studied from November 2021 to February 2022.

Sample Size

The baseline survey was conducted among 7020 consumers. Around 11,700 samples of single-use plastic waste were collected from transboundary streams and surrounding bank areas which are mentioned in the study area.

	Season	Time Frame	Study Days	Surveyed People Per Day/point	Total Surveyed people	Collected Samples Per Day/point	Total Collected Samples
26 Points (18 Rivers)	Pre-Monsoon	March'21 - June'21	3	30	2340	50	3900
	Monsoon	July'21 – October'21	3	30	2340	50	3900
	Dry	November'21 – February'22	3	30	2340	50	3900
				Total	**7020**	**Total**	**11,700**

Study Areas

SL Name	River Name	Survey Location	Latitude Longitude
1	Mahananda	Tetulia Old bazar, Tetulia	26°29'40.1"N 88°19'59.2"E
2	Dahuk	Near Ancient Shive Temple, Tetulia	26°29'34.2"N 88°19'57.3"E
3	Korotoya	Omar Khana Bazar, Panchgar-Banglabandha Highway	26°27'11.3"N 88°33'33.7"E
4	Dharla	Mogolhat Camp Road, Lalmonirhat	25°59'34.9"N 89°27'36.4"E
5	Teesta	Dimla, Tepa kharibari, Nilphamari (Purbo Chatnai)	26°11'33.0"N 89°00'23.5"E
6	Dudh Kumar River (Brahmaputra)	Bhurungamari, Shilkhuri, Kurigram (Jatrapur)	26°09'42.0"N 89°41'00.2"E
7	Brahmaputra	Katma Krishnanagar, Bangladesh	24°59'17.2"N 89°41'33.8"E
8	Brahmaputra	Near Kazi Bazar, Tangail	24°15'41.4"N 89°48'19.0"E
9	Brahmaputra	Teota, Shibalaya Upazila,Manikganj District.	23°50'43.3"N 89°46'42.3"E
10	Shomeshwari	Durgapur, Netrokona	25°07'05.3"N 90°40'34.2"E
11	Kangsha River	Near Challish Kahania Beparipara Jame mosque, Barhatta Netrakona	24°57'40.0"N 90°47'35.3"E
12	Surma	Pashchim Laxmipur, Kanaghat, Zakiganj, Sylhet	24°59'05.4"N 92°15'45.2"E
13	Kalni River	Momochan Adarsha Dakhil Madrasa, Ajmiriganj, Habiganj District	24°30'28.7"N 91°11'57.6"E
14	Kushiara	Bara Thakur, near custom ghat, Jakiganj, Sylhet	24°52'21.9"N 92°21'54.0"E
15	Meghna	Char Chattala, Ashuganj, Brahmanbaria District	24°01'59.6"N 90°59'21.4"E
16	Padma	Near Mirganj Post Office, Charghat Rajshahi	24°13'47.0"N 88°44'45.6"E
17	Padma	Goalondo Ghat, Uttar Daulatdia, Rajbari	23°45'32.9"N 89°47'21.5"E
18	Padma & Meghna	Chadpur	23°14'00.6"N 90°39'00.2"E
19	Meghna	Char Alexandar, Ramgati, Lakshmipur	22°38'48.6"N 90°55'17.3"E
20	Muhuri	Near Bilonia Memorial Park Porshuram Thana, Feni	23°14'32.6"N 91°26'50.7"E
21	Pussur	Dublar Char, Mangla, Bagerhat	21°45'43.0"N 89°32'34.7"E
22	Ichamoti	Ramjannagar, Shyamnagar, Shatkhira	22°12'10.2"N 89°04'31.7"E
23	Naf	Hochkar Khal, Teknaf	20°52'38.1"N 92°18'08.7"E
24	Naf	Teknaf Boatline Bazar	20°52'29.2"N 92°18'16.2"E
25	Bay of Bengal	Sabrang Teknaf	20°50'06.8"N 92°18'43.4"E
26		Ukhia, Cox's Bazar	21°17'30.4"N 92°04'12.1"E

Pashchim Laxmipur, Kanai Ghat
Jakiganj, Sylhet

Shomeshwari, Durgapur
Netrokona

Ramjannagar, Shyamnagar
Shatkhira

Figure 8: Study Points For Brahmaputra

Figure 7: Study Points For Teesta

Figure 6: Study Points For Ichamoti

Figure 5: Study Points For Korotoya

Figure 4: Study Points For Meghna

Figure 3:Study Points For Padma

Figure 2: Study Points For Naf

Figure 1: Study Points For Surma

Findings

From River to Bay of Bengal: Single-use Plastic Waste Average Scenario

SL Name	River Name	Total Waste entering into the Bay of Bengal ton/day	Total transboundary Waste entering into the Bay of Bengal ton/day
1	Mahananda	10.00633333	1.000633333
2	Dahuk	10.14706667	1.52206
3	Korotoya	11.23013333	1.123013333
4	Dharla	10.9166	1.63749
5	Teesta	12.02466667	4.809866667
6	Dudh Kumar River (Brahmaputra)	412.9125	111.16875
7	Brahmaputra	386.2590983	88.83959262
8	Brahmaputra	385.8652446	77.05869012
9	Brahmaputra	379.9719279	67.63320399
10	Shomeshwari	415.311	62.29665
11	Kangsha River	387.0338333	135.4618417
12	Surma	441.3466667	123.5770667
13	Kalni River	430.7013333	99.06130667
14	Kushiara	428.848	94.34656
15	Meghna	584.192	140.20608
16	Padma	391.3163333	101.7422467
17	Padma	393.5524267	82.6460096
18	Padma & Meghna	518.0050625	77.70075938
19	Meghna	492.912	54.22032
20	Muhuri	499.7253333	59.96704
21	Pussur	374.8586667	44.98304
22	Ichamoti	448.5946667	62.80325333
23	Naf	495.4423333	49.54423333
24	Naf	480.1083333	62.41408333
25	Bay of Bengal	635.187	63.5187
26		730.86	73.086
Total		**9767.32856**	**1742.368491**
From India			**1493.805474**
From Myanmar			**248.5630167**

Mahananda River

The Mahananda River is a trans-boundary river that flows through the Indian states of Bihar and West Bengal, and Bangladesh. It is an important tributary of the Ganges. The Mahananda, until now, remained the only major Indian river where Ganges dolphins were known to be present. In a population estimate of the Ganges River dolphin in the Mahananda river in Bihar and West Bengal, a total of 190 individuals were counted by two teams of scientists from the Wildlife Conservation Trust (WCT). This survey, claimed to be the first such assessment, adds to the state-wide tally of dolphins in Bihar primarily, which was around 1700, the highest for any state in India. Over 70% of the 190 dolphins recorded were in the stretch of the river that lies in Bihar's districts (Seema Sharma, 2022). Among the surveyed people, 100% consumer said that people throw their plastic and other garbage in river while visiting or walking by. However, in terms of fishing gear the people of Tetulia Old bazar said that this area is not promising for fishing, and maximum 1/2 fishing gear are lost in a week but that is a very sudden issue. However, the floating items spotted by the nearby people are mostly single-use plastic items.

Korotoya, Omar Khana Bazar Panchgar-Banglabandha Highway

Dahuk, Near Ancient Shive Temple, Tetulia

Dahuk River

Dahuk is a transboundary river, which originates from the marshlands Southwest of 'Jugibhita' the 'Rajganj' block in the 'Jalpaiguri' district in India. It traverses the international border and crosses the 'Trinoihat' union at 'Tetulia' Upazila in 'Panchagarh' district of Bangladesh (BWDB, 2011).Traveling to the South, Dahuk river flows through the western part of 'Tetulia' Upazila and, finally, it enters India (BWDB, 2011). The main Dahuk stream is a major right-bank tributary of the 'Mahananda' (IUCN, 2014), but it has no branch river in Bangladesh (BWDB, 2011). Among the surveyed sample of plastic waste, around 15% of the samples were not Bangladeshi products.

Teesta, Dimla, Tepa kharibari, Nilphamari (Purbo Chatnai)

Korotoya River

The Karatoya, known as Phuljhur rises in the Baikunthapur jungles in the extreme north-west of Jalpaiguri district (West Bengal, India) and forms for some distance the boundary between Dinajpur and Rangpur districts. It, then, meanders through Rangpur and Bogura. The Karatoya is one of the rivers that has changed over the years. Previous rivers that the Karatoya connected to include the Teesta and Kosi river (History of Ancient Bengal. Calcutta: G. Bhardwaj & Co, 1971). The Korotoa river in Bogra is nearly choking as the waters run low and pollutants are pumped in from the municipality sewerage and local industries. The dissolved oxygen rate is three times below the recommended rate for seven to eight months a year, mostly during the dry seasons when the water flow dips further, according to monthly reports by the environmental office in Bogra (Shabuj, 2018). Moreover, the reports show some rate of chemical oxygen demand (COD) and a lack of biological oxygen demand (BOD), which jeopardises river water quality. Among the surveyed people, 100% consumer said that people throw their plastic and other garbage in river while visiting or walking by. However, in terms of fishing gear the people of - Omar Khana Bazar, Panchgar-Banglabandha Highway said that this area is not promising for fishing, and no fishing gear get lost. However, the floating items spotted by the nearby people are mostly single-use plastic items. Around 20% of surveyed local people said they have said packets, particularly fertilizer packets from India in the river banks. Among the surveyed sample of plastic waste, around 10% of the samples were not Bangladeshi products.

Dharla River

Dharla River one of the trans-boundary rivers of Bangladesh. It enters the country at lalmonirhat through Changra Bandha of patgram. In its upper course, it is known as the Jaldhaka or Singimari. Near Patgram upazila, it again flows back to India and continues an easterly course. Suddenly it turns south and enters Bangladesh for the second time through kurigram and then follows a meandering course. Dharla is a tributary of the Brahmaputra River. Among the surveyed people, 90% consumer said that people throw their plastic and other garbage in river while visiting or walking by. However, in terms of fishing gear the people of - Mogolhat Camp Road, Lalmonirhat said that hardly 2/3 fishing gear get lost in a week. However, the floating items spotted by the nearby people are mostly single-use plastic items. Around 15% of surveyed local people said they have said packets, particularly fertilizer packets from India in the river banks. Among the surveyed sample of plastic waste, around 15% of the samples were not Bangladeshi products.

Teesta River

Teesta River, a tributary of the Jamuna River (Brahmaputra River), flowing through India and Bangladesh (Amy Tikkanen, n.d.), is an important river of the northern region of Bangladesh. It rises in the Pauhunri Mountain of eastern Himalayas, flows through the Indian states of Sikkim and West Bengal through Bangladesh and enters the Bay of Bengal (Mullick & Babel, 2011). In India, it flows through Mangan District, Gangtok District, Pakyong District, Kalimpong district, Darjeeling District, Jalpaiguri District, Cooch Behar districts and the cities of Jalpaiguri and Mekhliganj. It joins Brahmaputra River at Phulchhari Upazila in Bangladesh. Among the surveyed people, 80% consumer said that people throw their plastic and other garbage in river while visiting or walking by. However, in terms of fishing gear the people of - Dimla, Tepa kharibari, Nilphamari (Purbo Chatnai)-Dalia, Rangpur said that on an average around 12-15 fishing gear get lost in this river in a week. However, the floating items spotted by the nearby people are mostly single-use plastic items. Around 80% of surveyed local people said they have seen more plastic bags, packets floating in during monsoon. Among the surveyed sample of plastic waste, around 40% of the samples were not Bangladeshi products.

Brahmaputra River, Teota, Shibalaya Upazila, Manikganj District.

Dhāla River-Mogolhat Camp Road, Lalmonirhat

Brahmaputra River

The Brahmaputra, also known as the Yarlung Tsangpo in Tibet, the Siang/Dihang River in Arunachal Pradesh, and Luit in Assamese, is a transboundary river that flows through Tibet, India, and Bangladesh. It is the 9th largest river in the world by discharge, and the 15th longest (Wikipedia, n.d.). It flows southwest through the Assam Valley as the Brahmaputra and south through Bangladesh as the Jamuna (not to be confused with the Yamuna of India).

Brahmaputra River-Near Kazi Bazar, Tangail

In the vast Ganges Delta, it merges with the Ganges, popularly known as the Padma in Bangladesh, and becomes the Meghna and ultimately empties into the Bay of Bengal. This river is about 3,848 km (2,391 mi) long (Scientists pinpoint sources of four major international rivers, 2011). The Brahmaputra is an important river for irrigation and transportation in the region. It is a classic example of a braided river and is highly susceptible to channel migration and avulsion (Catling, 1992). In Bangladesh, the Brahmaputra is joined by the Teesta River (or Tista), one of its largest tributaries. Below the Tista, the Brahmaputra splits into two distributary branches. The western branch, which contains the majority of the river's flow, continues due south as the Jamuna (Jomuna) to merge with the lower Ganga, called the Padma River (Pôdda). Among the surveyed people, 80% of consumers said that people throw their plastic and other garbage in rivers while visiting or walking by. However, in terms of fishing gear, the people of - Bhurungamari, Shilkhuri, Kurigram (Jatrapur) – Bhurungamari, Rangpur said that on average around 7-12 fishing gear get lost in this river in a week. Around 14% of surveyed local people said they have seen plastic bottles & paper bags as waste that are not available locally. Among the surveyed sample of plastic waste, around 25% of the samples were not Bangladeshi products. Around 75% of surveyed local people said they have seen more plastic bags, and packets floating in during monsoon. The Brahmaputra River is contaminated with microplastics. In a study, it was found that microplastic abundance in the Brahmaputra River varied from 20–240 MP/kg dw for a size range between 150 µm and 5 mm and 531–3485 MP/kg dw for microplastics size 20–150 µm (Tenzin Tsering, 2021). For assessing the situation of the Brahmaputra River, a total of four different points was assessed including a point from the river Dudh Kumar. Most of the main course of the Dudhkumar lies in India. The other three points assessed for the Brahmaputra River were in Katma Krishnanagar, Near Kazi Bazar, Tangail; Teota, Shibalaya Upazila, Manikganj District.

Shomeshwari River

Someshwari River, known as Simsang River in the Indian state of Meghalaya which originates from the Nokrek Range and flows into Bangladesh. Simsang River is a major river in the Garo Hills of Meghalaya and Netrakona District of Bangladesh. Among the surveyed people, 80% of consumers said that people throw their plastic and other garbage in rivers while visiting or walking by. However, in terms of fishing gear the people of Durgapur, Netrokona said that near to no fishing gear get lost in this river in a week, but they mostly use the current net for fishing. Around 60% of surveyed local people said they have seen plastic bottles & paper bags as waste that are not available locally.

Very interestingly, around 40% of the respondent said they have noticed shipping plastic waste via these riverways. Among the surveyed sample of plastic waste, around 15% of the samples were not Bangladeshi products. Kangsha River is a river in the northern parts of the Mymensingh and Netrakona districts of Bangladesh. The Someshwari is one of the rivers that join it from the north. We have surveyed near Challish Kahania Beparipara Jame mosque, Barhatta Netrakona to assess the situation of Kangsha River's single-use plastic waste situation and also to assess the flow of the plastic waste from the Shomeshwari river.

Meghna River - Char Alexandar, Ramgati, Lakshmipur

Surma River

The Surma River is a major river in Bangladesh, part of the Surma-Meghna River System. It starts when the Barak River from northeast India divides at the Bangladesh border into the Surma and the Kushiyara rivers. It ends in Kishoreganj District, above Bhairab Bazar, where the two rivers rejoin to form the Meghna River. The waters from the river ultimately flow into the Bay of Bengal. For assessing the transboundary plastic waste scenario in Surma River our survey location was Pashchim Laxmipur, Kanaghat, Zakiganj, and Sylhet for Surma River. At first sight, the Surma River in Sylhet city would look like a drain with a narrow knee-deep waterline filled with waste everywhere. This is what pollution has done to the 249 km river that once was the lifeline for the people living in a vast area. Around 200 wide chars have appeared in the river from Zakiganj to Sylhet and most of the river dries up during the dry season. As a result, it turns into a playground for children. People also cultivate vegetables on the chars in the areas like South Surma, Gopalganj, Kanaighat, and Tukerbazar. The water of the Surma River is not suitable for drinking purposes.

Muhuri River-Near Bilonia Memorial Park Porshuram Thana, Feni

Naf River - Teknaf Boatline Bazar

Average Biochemical Oxygen Demand (BOD) at Baluchar is 27.33 mg/L, at Shibgonj 33.83 mg/L, at Uposhahor 34.83 mg/L, at Chalibonbar 42.42 mg/L, at Masimpur 44.33 mg/L, at Surma u/s 39.5 mg/L, at Surma d/s 47.17 mg/L. BOD at Goalichara channel and Surma river are higher than the 2 mg/L permissible value of Environment Conservation Rules (ECR) (1997) due to the high concentration of sewage discharged directly into the water. Among the surveyed people, 85% of consumers said that people throw their plastic and other garbage in the river while visiting or walking by. However, in terms of fishing gear the people of Pashchim Laxmipur, Kanaghat, Zakiganj, and Sylhet said that on average around 4-5 fishing gear get lost in this river in a week. Around 20% of surveyed local people said they have seen plastic bottles & paper bags as waste that are not available locally. Among the surveyed sample of plastic waste, around 28% of the samples were not Bangladeshi products. Around 75% of surveyed local people said they have seen more plastic bags, and packets floating in during monsoon.

Kushiyara River

The Kushiyara River is a distributary river in Bangladesh and Assam, India. It forms on the India-Bangladesh border as a branch of the Barak River, when the Barak separates into the Kushiyara and Surma. The river, after being joined from the left (south) by the Monu River, flows northwest past the villages of Aorangapur, Tajpur, and Pāilgaon, where it is joined by the small Itakhola River and assumes a westward direction. After the village of Mārkuli the river heads southwest past the village of Pāhārpur to the village of Ajmiriganj Bazar. After that the river forms several braided streams and heads southwest where it is rejoined by the Surma from the right (north) and becomes the Meghna River, just north of the town of Bhairab Bazar. Altogether, the Kushiyara runs about 160 kilometers. For assessing the single-use plastic waste scenario in Kushiara river stream, we have surveyed near custom ghat, Jakiganj, Sylhet for Kushiara river scenario assessment & Momochan Adarsha Dakhil Madrasa, Ajmiriganj, Habiganj District for Kalni river situation assessment as the Kushiyara is also known as the Kalni River after it is joined by a major offshoot (distributary) from the Surma. Among the surveyed people, 95% consumer said that people throw their plastic and other garbage in river while visiting or walking by. However, in terms of fishing gear the people of near custom ghat, Jakiganj, Sylhet said that on an average around 4-5 fishing gear get lost in this river in a week. Around 20% of surveyed local people said they have seen plastic bottles & paper bag as waste that are not available locally. Among the surveyed sample of plastic waste, around 22% of the samples were not Bangladeshi products. Around 85% of surveyed local people said they have seen more plastic bags, packets floating in during monsoon.

Padma-Meghna River

The Meghna River is one of the major rivers in Bangladesh (Chowdhury, 2012), one of the three that form the Ganges Delta, the largest delta on earth, which fans out to the Bay of Bengal. A part of the Surma-Meghna River System, Meghna is formed inside Bangladesh in the Kishoreganj District above the town of Bhairab Bazar by the joining of the Surma and the Kushiyara, both of which originate in the hilly regions of eastern India as the Barak River. The Meghna meets its major tributary, the Padma, in Chandpur District. The Padma is a major river in Bangladesh. It is the main distributary of the Ganges, flowing generally southeast for 120 kilometers (75 mi) to its confluence with the Meghna River near the Bay of Bengal (Allison, 1998). The city of Rajshahi is situated on the banks of the Padma river (Hossain ML, 2005). For Padma River, we surveyed two different points: Near Mirganj Post Office, Charghat Rajshahi & Goalondo Ghat, Uttar Daulatdia, Rajbari. For the Meghna River, we surveyed Char Chattala, Ashuganj, and Brahmanbaria District. Our surveyed point for Padma-Meghna connecting point was located in Chandpur, a small district of Bangladesh. It is a part of the Chittagong division, but previously it was a part of the greater Comilla division. The city is significant for the meeting place of two mighty rivers, and for this reason, Chandpur is visited by many tourists throughout the year. One is the mighty Meghna, and the other is the mighty Padma. For Meghna River plastic waste transboundary assessment, we also surveyed char Alexandar, Ramgati, Lakshmipur, and Chittagong, Bangladesh. Among the surveyed people, 80% consumer said that people throw their plastic and other garbage in river while visiting or walking by. However, in terms of fishing gear the people of Chadpur said that near to 2/3 fishing gear get lost in this river in a week and around 90% of the fisherman said that they mostly use plastic net for fishing. However, the floating items spotted by the nearby people are mostly single-use plastic items. Very interestingly, around 40% of the respondent said they have noticed shipping plastic waste via these riverways. Among the surveyed sample of plastic waste, around 10% of the samples were not Bangladeshi products.

Muhuri River

Muhuri is a transnational river between India and Bangladesh. Rising in Tripura, it flows into Bangladesh where it merges with the Feni near the latter's mouth to the Bay of Bengal. The Muhuri is also known as the Little Feni (Bangladesh, 2017). The Muhuri rises in the Lushai Hills of Tripura and flows west into Bangladesh which it enters through the Parshuram upazila of Feni district. In Bangladesh, the river separates the Feni and Chittagong districts before flowing out into the Bay of Bengal (Chowdhury, Muhuri River, 2012).

Among the surveyed people, 90% consumer said that people throw their plastic and other garbage in river while visiting or walking by. However, in terms of fishing gear the people of Bilonia Eco Park, Porshuram Thana, Feni said that near to 6/7 fishing gear get lost in this river in a week and around 90% of the fisherman said that they mostly use plastic net for fishing. Very interestingly, around 15% of the respondent said they have noticed shipping plastic waste via these riverways. Among the surveyed sample of plastic waste, around 12% of the samples were not Bangladeshi products.

Pasur River

The Pasur River is a river in southwestern Bangladesh and a distributary of the Ganges. It is a big river in the Sundarbans area as an extension of the Rupsa River. Flowing further south the river meets the shibsa at about 32 km north of its mouth and debouches into the sea keeping its original name Pasur (Chowdhury, Pasur River, 2021). It meets the Shibsa River within the Sundarbans, and near the sea the river becomes the Kunga River. It is the deepest river in Bangladesh (Murshed, 2021). Among the surveyed people, 90% of consumers said that people throw their plastic and other garbage in rivers while visiting or walking by. However, in terms of fishing gear, the people of Dublar Char, Mangla, and Bagerhat said that near to 6/7 of fishing gear get lost in this river in a week and around 90% of the fisherman said that they mostly use the plastic net for fishing. Very interestingly, around 15% of the respondent said they have noticed shipping plastic waste via these riverways. Among the surveyed sample of plastic waste, around 12% of the samples were not Bangladeshi products.

Ichamoti River

Ichamati River is a transboundary river that flows through India and Bangladesh and also forms the boundary between the two countries (Islam, Sirajul; Jamal, Ahmed A, 2012). Our survey location for assessing Ichamoti river was in Ramjannagar union, Shyamnagar Upazila, Satkhira District, in Khulna Division, Bangladesh. Among the surveyed people, 90% consumer said that people throw their plastic and other garbage in rivers while visiting or walking by. However, in terms of fishing gear the people of Ramjannagar, Shyampur, and Shatkhira said that near to 10/12 of fishing gear get lost in this river in a week and around 60% of the fisherman said that they mostly use the plastic net for fishing. Among the surveyed sample of plastic waste, around 14% of the samples were not Bangladeshi products.

Muhuri River

Muhuri is a transnational river between India and Bangladesh. Rising in Tripura, it flows into Bangladesh where it merges with the Feni near the latter's mouth to the Bay of Bengal. The Muhuri is also known as the Little Feni (Bangladesh, 2017). In Bangladesh, the river separates the Feni and Chittagong districts before flowing out into the Bay of Bengal (Chowdhury, Muhuri River, 2012). The Muhuri acts as the border between India and Bangladesh in the Tripura-Noakhali sector. Among the surveyed people, 95% of consumers said that people throw their plastic and other garbage in the river while visiting or walking by. However, in terms of fishing gear the people near Bilonia Memorial Park Porshuram Thana, Feni said that near to 6/8 of fishing gear get lost in this river in a week and around 60% of the fisherman said that they mostly use the plastic net for fishing. Among the surveyed sample of plastic waste, around 12% of the samples were not Bangladeshi products

Surma River- Pashchim Laxmipur, Kanaghat, Zakiganj, Sylhet


Kushiara River-Bara Thakur, near custom ghat, Jakiganj, Sylhet


Meghna River Meghna Char Chattala, Ashuganj, Brahmanbaria District

Naf River

The Naf River is an international river marking the border of southeastern Bangladesh and western Myanmar (Sifatul Quader Chowdhury, 2012). It flows into the Bay of Bengal in the Indian Ocean, between the Bangladeshi Cox's Bazar District of the Chittagong Division, and the Burmese Rakhine State. Among the surveyed people, 80% of consumers said that people throw their plastic and other garbage in rivers while visiting or walking by.

However, in terms of fishing gear, the people of Hochkar Khal & Teknaf Boatline Bazar said that near to no fishing gear get lost in this river in a week and around 90% of the fisherman said that they mostly use the cotton net for fishing and 60% of the nets are burnt. However, the floating items spotted by the nearby people are mostly single-use plastic items. None of the respondents said they have noticed shipping plastic waste via these riverways. Among the surveyed sample of plastic waste, around 10% of the samples were not Bangladeshi products.

Bay of Bengal

The Bay of Bengal is the northeastern part of the Indian Ocean, bounded on the west and northwest by India, on the north by Bangladesh, and on the east by Myanmar and the Andaman and Nicobar Islands of India. Its southern limit is a line between Sangaman Kanda, Sri Lanka, and the northwesternmost point of Sumatra, Indonesia. It is the largest water region called a bay in the world.

Many major Rivers of India and Bangladesh flow west to east before draining into the Bay of Bengal. The Ganga is the northernmost of these rivers. Its main channel enters and flows through Bangladesh, where it is known as the Padma River, before joining the Meghna River. However, the Brahmaputra River flows from east to west in Assam before turning south and entering Bangladesh where it is called the Jamuna River. This joins the Padma whereupon the Padma joins the Meghna River that finally drains into Bay of Bengal. The Sundarbans is a mangrove forest in the southern part of the Ganges-Brahmaputra Delta which lies in the Indian state of West Bengal and in Bangladesh. The Brahmaputra at 2,948 km (1,832 mi) is the 28th longest River in the world. It originates in Tibet. The Hooghly River, another channel of the Ganga that flows through Kolkata drains into the Bay of Bengal at Sagar in West Bengal, India.

The Bay of Bengal is rich in marine resources and produces 6 million tons of fish that correspond to nearly 4 percent of the total global catch. It is an important source of animal protein for nearly 400 million people in this region. But the Bay is heavily littered with plastics and huge amounts of plastic waste are found on the shorelines, on the seabed, and suspended in the water column. The corals of St. Martin Island are almost dead, littered with marine debris, plastic packages, and food wrap discarded by hundreds of tourists daily. The Bay of Bengal and the South China Sea are the new plastic hotspots in Asia. Every year about 2 lakh tons of plastics enter the Bay of Bengal from Bangladesh. According to the Earth Day Network of USA (2018), Bangladesh is the 10th most plastic polluting countries in the world. Population pressure, poor waste management practices and shipbreaking are primarily responsible for that. Every year, 60-65 ships are broken in Chattogram and Khulna (Islam M. M., 2019).

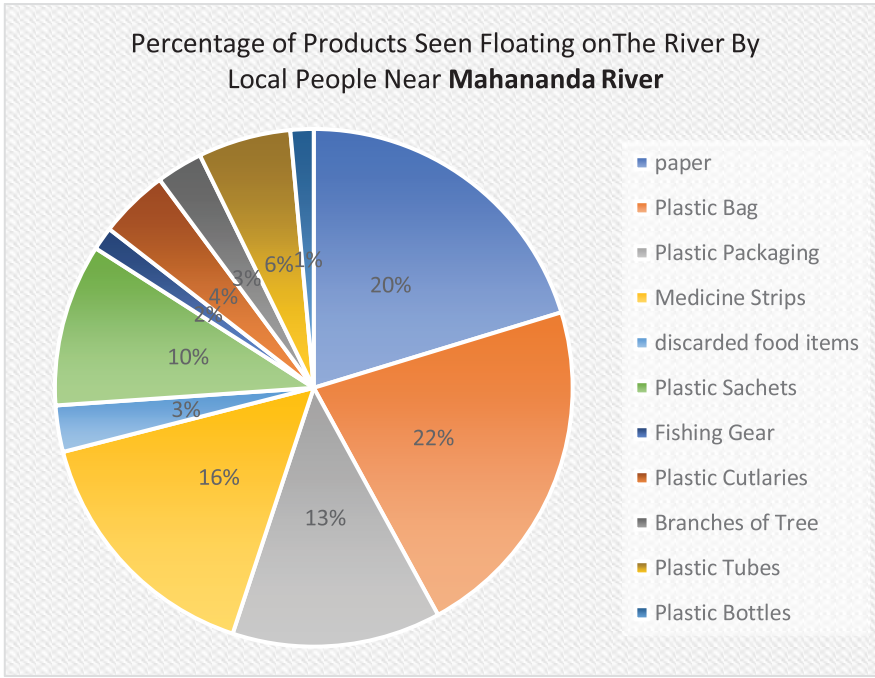
According to a 2018 report by South Asian Seas Program (SASP), marine litter or debris, which include plastic wastes, is a fundamental problem due to its harmful effect on the environment, wildlife and human health in the Bay of Bengal. Tortoises have stopped coming to the shore at Cox's Bazar beach due to the environment pollution. In a survey for the report, the researchers found that a total of 6,705 pieces of waste products were found on a 18.5km stretch of the four sea beaches – Laboni and Inani in Cox's Bazar, and Ananda Bazar and Patenga in Chittagong. Among the litter, 63% were found to be plastic. Plastic bags were found to be the most common type of litter: at least 2,182 pieces of plastic bags were found on the beaches. The survey also found 589 pieces of insulation and packaging foam, 470 pieces of cigarette butts and filters, and 300 bottles. Moreover, most of the industries in Bangladesh are situated near the major river systems such as the Buriganga, Shitalakkhya, Balu, Turag, Karnaphuli, Rupsa, and Meghna. All of their untreated waste ends up in the Bay of Bengal further increasing pollution (Aziz, 2022).

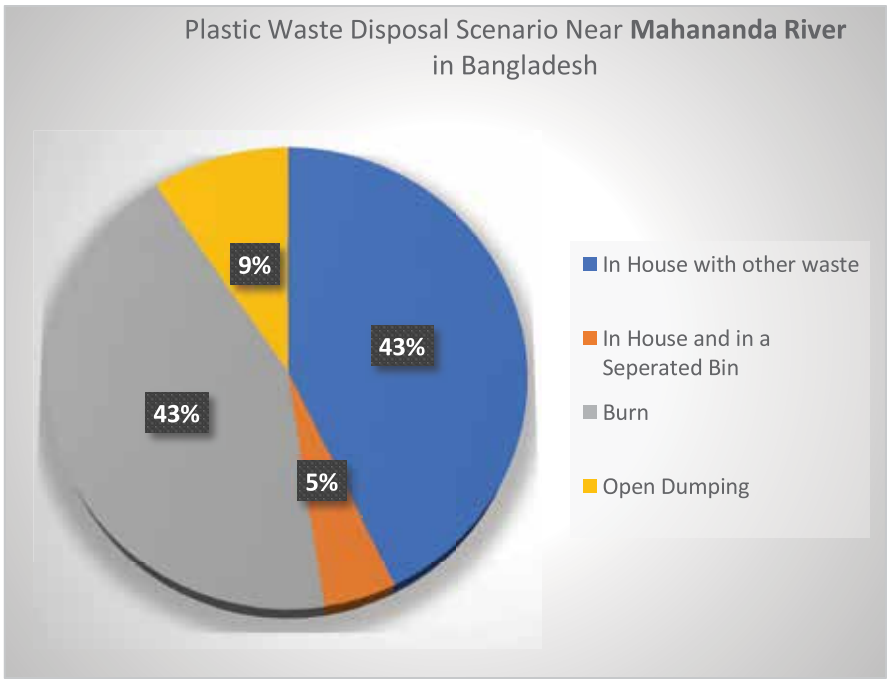
Among the surveyed people, 80% of consumers said that people throw their plastic and other garbage in the river while visiting or walking by. However, in terms of fishing gear the people of Sabrang Teknaf & Ukhia, Cox's Bazar said that on an average 10-15 fishing gear get lost in the stream per week in the Sabrang Teknaf area, and around 4-5 fishing gear get lost in the stream per week in Ukhia, Cox's Bazar. Around 90% of the fisherman in Sabrang Teknaf said that they mostly use the cotton net for fishing, whereas around 70% of the fisherman in Ukhia, Cox's Bazar said that they mostly use the plastic net for fishing. Around 70% of the fishermen burn their fishing nets in Ukhia, Cox's Bazar and around 65% of the fishermen burn fishing nets in Sabrang Teknaf. However, the floating items spotted by the nearby people are mostly single-use plastic items. Around 70% of the surveyed people said they have seen products in the stream which is not locally found and these are mostly plastic bottles. None of the respondents said that they have noticed shipping plastic waste via these riverways. Among the surveyed sample of plastic waste, around 10% of the samples were not Bangladeshi products.

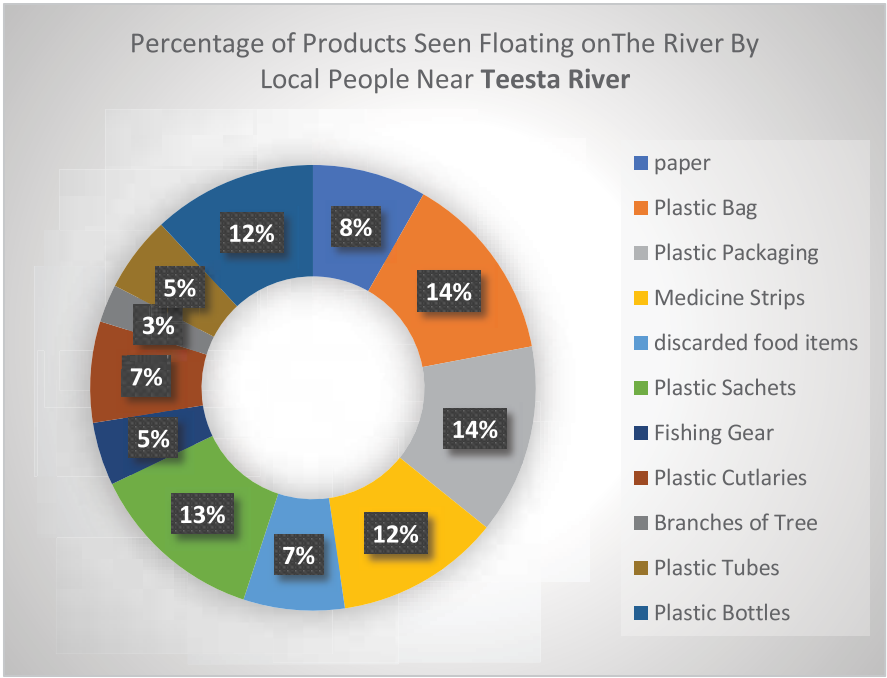
Ichamati River-Ramjannagar, Shyamnagar, Shatkhira

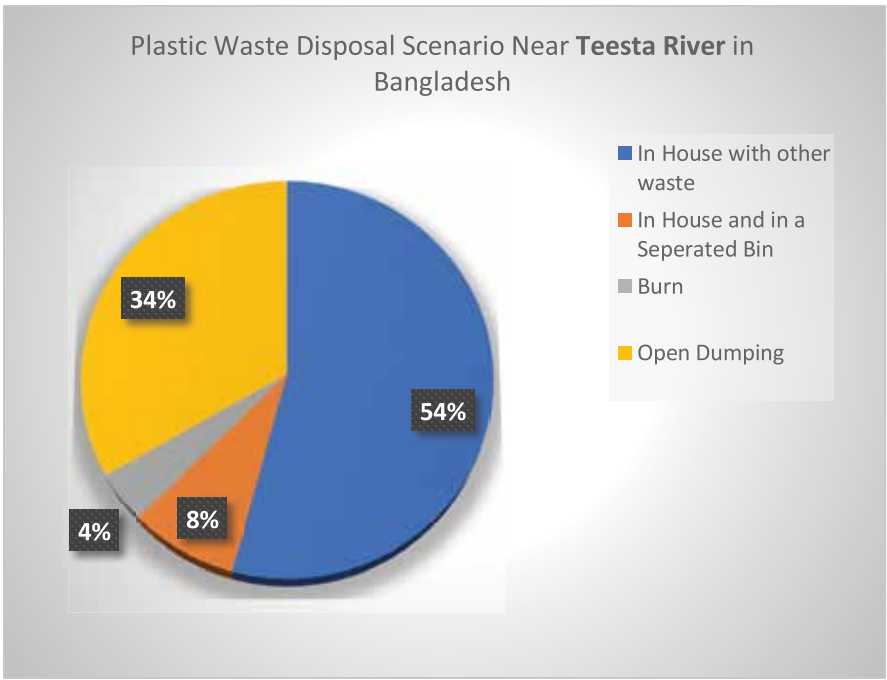
Bay of bengal - Ukhia, Cox's Bazar

Bay of Bengal-Sabrang Teknaf

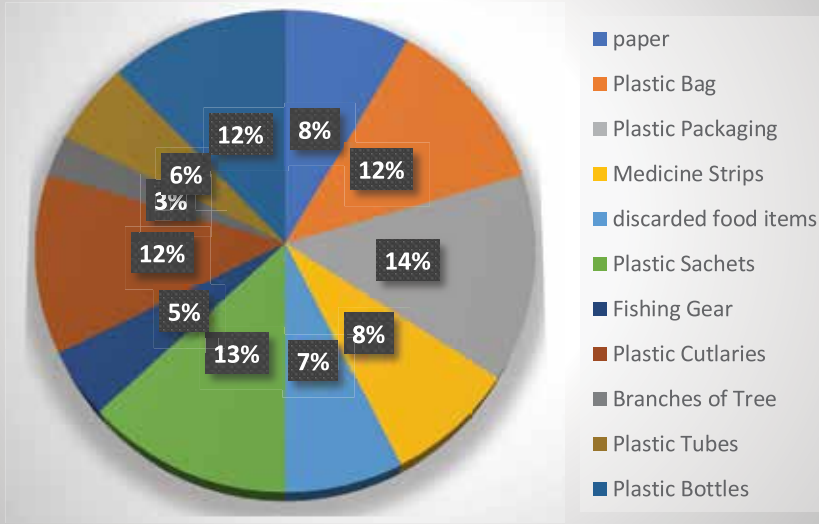

Percentage of Products Seen Floating onThe River By Local People Near **Mahananda River**
20%
22%
13%
16%
3%
10%
2%
4%
3%
6%
1%
paper
Plastic Bag
Plastic Packaging
Medicine Strips
discarded food items
Plastic Sachets
Fishing Gear
Plastic Cutlaries
Branches of Tree
Plastic Tubes
Plastic Bottles


Plastic Waste Disposal Scenario Near **Mahananda River** in Bangladesh
43%
5%
43%
9%
In House with other waste
In House and in a Seperated Bin
Burn
Open Dumping

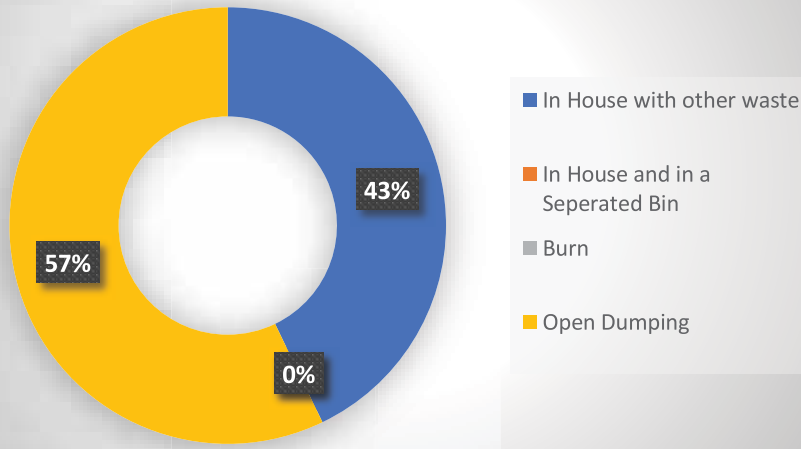

Percentage of Products Seen Floating onThe River By Local People Near **Teesta River**
8%
14%
14%
12%
7%
13%
5%
7%
3%
5%
12%
paper
Plastic Bag
Plastic Packaging
Medicine Strips
discarded food items
Plastic Sachets
Fishing Gear
Plastic Cutlaries
Branches of Tree
Plastic Tubes
Plastic Bottles

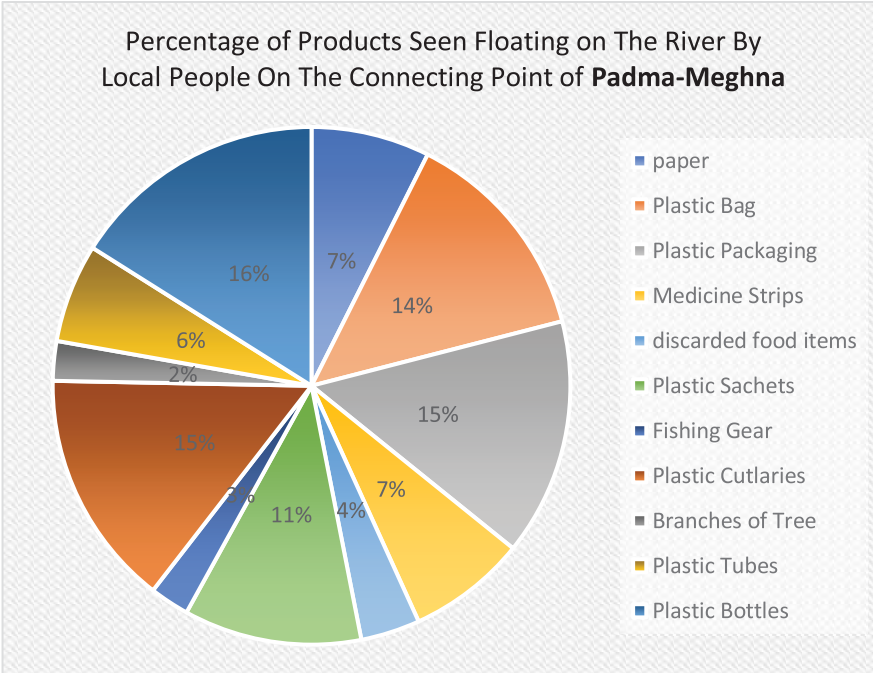

Plastic Waste Disposal Scenario Near **Teesta River** in Bangladesh
54%
8%
4%
34%
In House with other waste
In House and in a Seperated Bin
Burn
Open Dumping

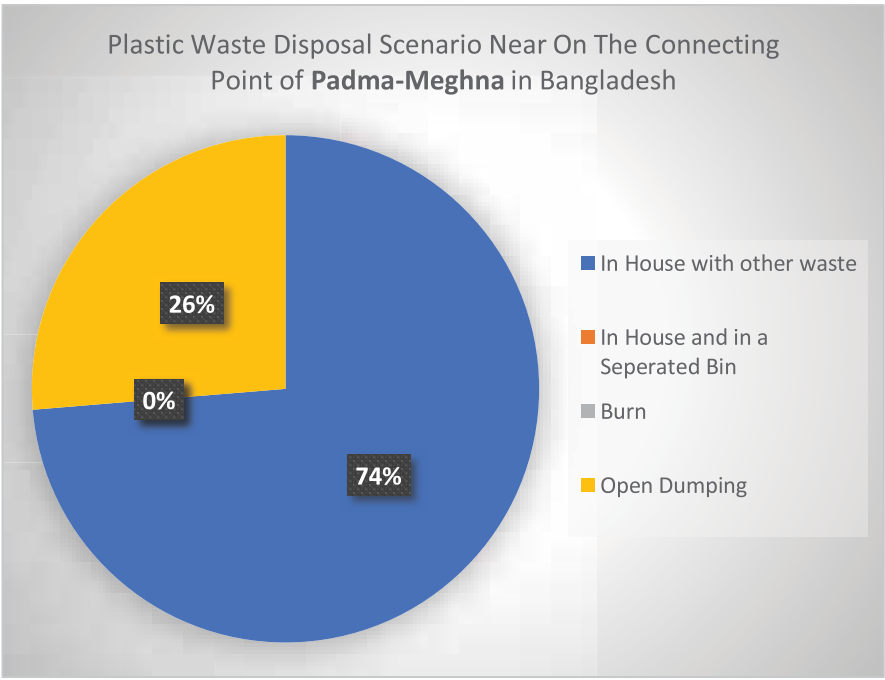
Percentage of Products Seen Floating onThe River By Local People Near **Brahmaputra River**

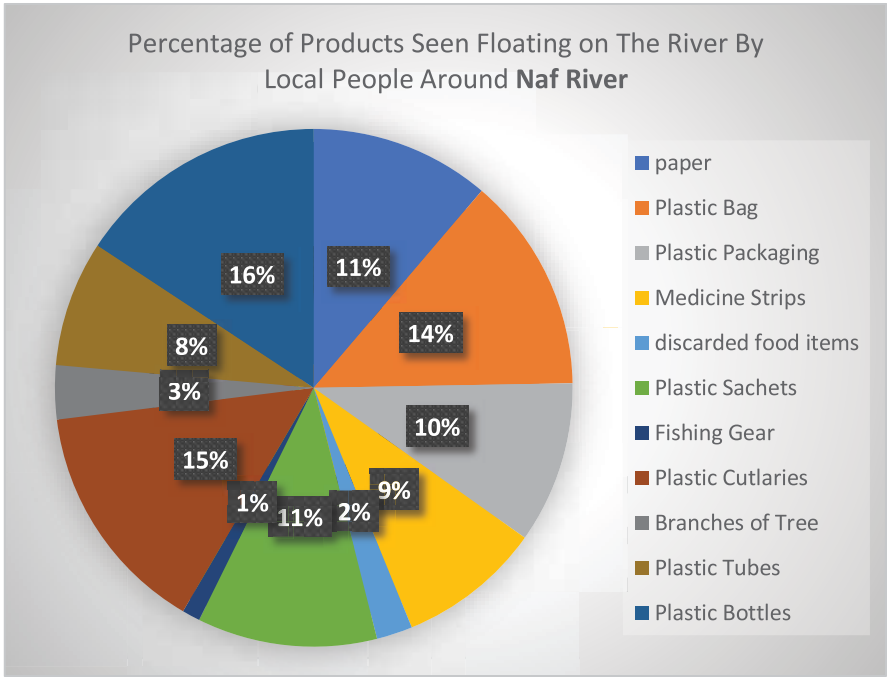


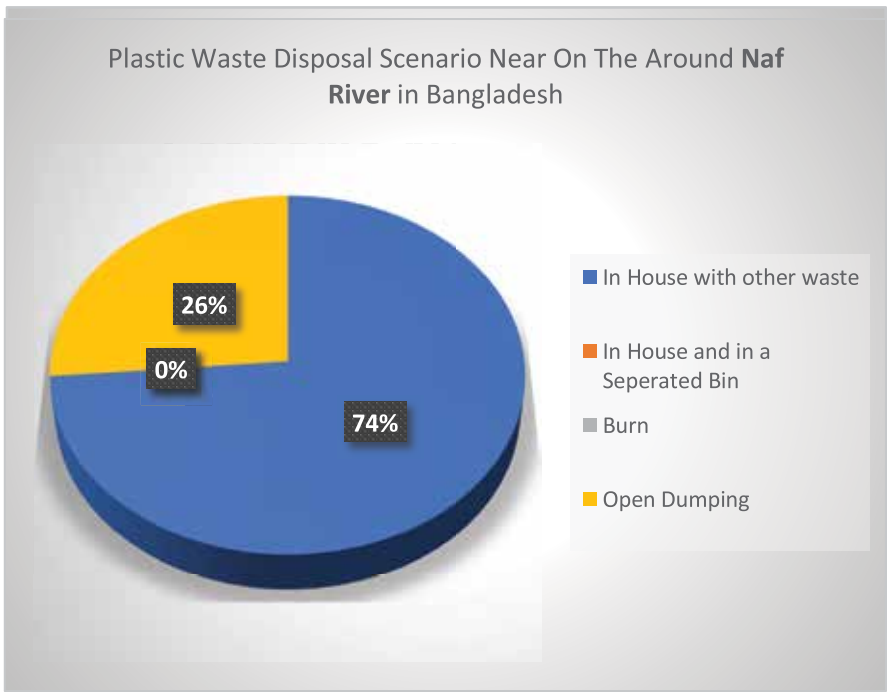
Plastic Waste Disposal Scenario **Near Brahmaputra River** in Bangladesh




Percentage of Products Seen Floating on The River By Local People On The Connecting Point of **Padma-Meghna**
7%
14%
15%
7%
4%
11%
3%
15%
2%
6%
16%
paper
Plastic Bag
Plastic Packaging
Medicine Strips
discarded food items
Plastic Sachets
Fishing Gear
Plastic Cutlaries
Branches of Tree
Plastic Tubes
Plastic Bottles


Plastic Waste Disposal Scenario Near On The Connecting Point of **Padma-Meghna** in Bangladesh
26%
0%
74%
In House with other waste
In House and in a Seperated Bin
Burn
Open Dumping


Percentage of Products Seen Floating on The River By Local People Around **Naf River**
11%
14%
10%
9%
2%
11%
1%
15%
3%
8%
16%
paper
Plastic Bag
Plastic Packaging
Medicine Strips
discarded food items
Plastic Sachets
Fishing Gear
Plastic Cutlaries
Branches of Tree
Plastic Tubes
Plastic Bottles


Plastic Waste Disposal Scenario Near On The Around **Naf River** in Bangladesh
26%
0%
74%
In House with other waste
In House and in a Seperated Bin
Burn
Open Dumping

Single-use Plastic Pollution in Transboundary Rivers of Bangladesh: Average Scenario

SL Name	River Name	SUP waste Weight ton/day	Indian/Mayanmar SUP waste Weight ton/day	Total Waste entering into Bay of Bengal ton/day	Total transboundary Waste entering into Bay of Bengal ton/day
1	Mahananda	500.3166667	50.03166667	10.00633333	1.000633333
2	Dahuk	507.3533333	76.103	10.14706667	1.52206
3	Korotoya	561.5066667	56.15066667	11.23013333	1.123013333
4	Dharla	545.83	81.8745	10.9166	1.63749
5	Teesta	601.2333333	240.4933333	12.02466667	4.809866667
6	Dudh Kumar River (Brahmaputra)	635.25	158.8125	412.9125	111.16875
7	Brahmaputra	594.2447667	136.6762963	386.2590983	88.83959262
8	Brahmaputra	564.5325283	118.551831	385.8652446	77.05869012
9	Brahmaputra	530.4565019	90.17760532	379.9719279	67.63320399
10	Shomeshwari	638.94	95.841	415.311	62.29665
11	Kangsha River	595.4366667	208.4028333	387.0338333	135.4618417
12	Surma	551.6833333	154.4713333	441.3466667	123.5770667
13	Kalni River	538.3766667	123.8266333	430.7013333	99.06130667
14	Kushiara	536.06	117.9332	428.848	94.34656
15	Meghna	730.24	175.2576	584.192	140.20608
16	Padma	559.0233333	145.3460667	391.3163333	101.7422467
17	Padma	491.9405333	103.307512	393.5524267	82.6460096
18	Padma & Meghna	690.6734167	103.6010125	518.0050625	77.70075938
19	Meghna	657.216	72.29376	492.912	54.22032
20	Muhuri	624.6566667	74.9588	499.7253333	59.96704
21	Pussur	468.5733333	56.2288	374.8586667	44.98304
22	Ichamoti	560.7433333	78.50406667	448.5946667	62.80325333
23	Naf	582.8733333	58.28733333	495.4423333	49.54423333
24	Naf	564.8333333	73.42833333	480.1083333	62.41408333
25	Bay of Bengal	705.7633333	70.57633333	635.187	63.5187
26	Bay of Bengal	812.0666667	81.20666667	730.86	73.086
Total Waste (Tons/Day)		**18879.13207**	**3433.658491**	**12123.91555**	**2143.925563**
From India			2518.844017	From India	1493.805474
From Myanmar			283.4986667	From Myanmar	248.5630167
Total Waste (Tons/Year)		**4144452.412**	**756632.5246**	**2637178.711**	**470439.4925**
From India			680087.8846	From India	403327.478
From Myanmar			76544.64	From Myanmar	67112.0145

Single-use Plastic Pollution in Transboundary Rivers of Bangladesh: Monsoon Scenario

SL Name	River Name	SUP waste Weight ton/day	Indian/Mayanmar SUP waste Weight ton/day	Total Waste entering into Bay of Bengal ton/day	Total transboundary Waste entering into Bay of Bengal ton/day
1	Mahananda	621.27	62.127	12.4254	1.24254
2	Dahuk	613.76	92.064	12.2752	1.84128
3	Korotoya	609.89	60.989	12.1978	1.21978
4	Dharla	698.3	104.745	13.966	2.0949
5	Teesta	728.51	291.404	14.5702	5.82808
6	Dudh Kumar River (Brahmaputra)	754.32	188.58	490.308	132.006
7	Brahmaputra	701.5176	161.349048	455.98644	104.8768812
8	Brahmaputra	666.44172	139.9527612	466.509204	90.96929478
9	Brahmaputra	639.7840512	108.7632887	479.8380384	81.57246653
10	Shomeshwari	778.97	116.8455	506.3305	75.949575
11	Kangsha River	712.98	249.543	463.437	162.20295
12	Surma	671.64	188.0592	537.312	150.44736
13	Kalni River	597.87	137.5101	478.296	110.00808
14	Kushiara	634.52	139.5944	507.616	111.67552
15	Meghna	958.9	230.136	767.12	184.1088
16	Padma	732.96	190.5696	513.072	133.39872
17	Padma	645.0048	135.451008	516.00384	108.3608064
18	Padma & Meghna	796.3039	119.445585	597.227925	89.58418875
19	Meghna	863.01	94.9311	647.2575	71.198325
20	Muhuri	789.76	94.7712	631.808	75.81696
21	Pussur	549.78	65.9736	439.824	52.77888
22	Ichamoti	687.93	96.3102	550.344	77.04816
23	Naf	726.54	72.654	617.559	61.7559
24	Naf	732.43	95.2159	622.5655	80.933515
25	Bay of Bengal	938.76	93.876	844.884	84.4884
26		1027.98	102.798	925.182	92.5182
Total		**18879.13207**	**3433.658491**	**12123.91555**	**2143.925563**

Mahananda River (Siliguri, India)

Korotoya River (Bogra, Bangladesh)

Single-use Plastic Pollution in Transboundary Rivers of Bangladesh: Pre-Monsoon Scenario

SL Name	River Name	SUP waste Weight ton/day	Indian/Mayanmar SUP waste Weight ton/day	Total Waste entering into Bay of Bengal ton/day	Total transboundary Waste entering into Bay of Bengal ton/day
1	Mahananda	511.78	51.178	10.2356	1.02356
2	Dahuk	520.65	78.0975	10.413	1.56195
3	Korotoya	630.65	63.065	12.613	1.2613
4	Dharla	526.43	78.9645	10.5286	1.57929
5	Teesta	598.76	239.504	11.9752	4.79008
6	Dudh Kumar River (Brahmaputra)	632.09	158.0225	410.8585	110.61575
7	Brahmaputra	587.8437	135.204051	382.098405	87.88263315
8	Brahmaputra	558.451515	117.2748182	362.9934848	76.2286318
9	Brahmaputra	536.1134544	91.13928725	348.4737454	68.35446544
10	Shomeshwari	621.98	93.297	404.287	60.64305
11	Kangsha River	587.98	205.793	382.187	133.76545
12	Surma	565.09	158.2252	452.072	126.58016
13	Kalni River	597.87	137.5101	478.296	110.00808
14	Kushiara	528.34	116.2348	422.672	92.98784
15	Meghna	687.98	165.1152	550.384	132.09216
16	Padma	529.76	137.7376	370.832	96.41632
17	Padma	466.1888	97.899648	372.95104	78.3197184
18	Padma & Meghna	573.1289	85.969335	429.846675	64.47700125
19	Meghna	619.182	68.11002	464.3865	51.082515
20	Muhuri	627.54	75.3048	502.032	60.24384
21	Pussur	478.96	57.4752	383.168	45.98016
22	Ichamoti	565.87	79.2218	452.696	63.37744
23	Naf	545.65	54.565	463.8025	46.38025
24	Naf	498.87	64.8531	424.0395	55.125135
25	Bay of Bengal	734.65	73.465	661.185	66.1185
26		842.32	84.232	758.088	75.8088
Total		**15174.12837**	**2767.458459**	**9533.11475**	**1712.70408**

Teesta River (Dimla, Nilphamari, Border with India)

Pollution in Brahmaputra River (Guwahati, India)

Single-use Plastic Pollution in Transboundary Rivers of Bangladesh: Dry Season Scenario

SL Name	River Name	SUP waste Weight ton/day	Indian/Mayanmar SUP waste Weight ton/day	Total Waste entering into Bay of Bengal ton/day	Total transboundary Waste entering into Bay of Bengal ton/day
1	Mahananda	367.9	36.79	7.358	0.7358
2	Dahuk	387.65	58.1475	7.753	1.16295
3	Korotoya	443.98	44.398	8.8796	0.88796
4	Dharla	412.76	61.914	8.2552	1.23828
5	Teesta	476.43	190.572	9.5286	3.81144
6	Dudh Kumar River (Brahmaputra)	519.34	129.835	337.571	90.8845
7	Brahmaputra	493.373	113.47579	320.69245	73.7592635
8	Brahmaputra	468.70435	98.4279135	328.093045	63.97814378
9	Brahmaputra	415.472	70.63024	311.604	52.97268
10	Shomeshwari	515.87	77.3805	335.3155	50.297325
11	Kangsha River	485.35	169.8725	315.4775	110.417125
12	Surma	418.32	117.1296	334.656	93.70368
13	Kalni River	419.39	96.4597	335.512	77.16776
14	Kushiara	445.32	97.9704	356.256	78.37632
15	Meghna	543.84	130.5216	435.072	104.41728
16	Padma	414.35	107.731	290.045	75.4117
17	Padma	364.628	76.57188	291.7024	61.257504
18	Padma & Meghna	702.58745	105.3881175	526.9405875	79.04108813
19	Meghna	489.456	53.84016	367.092	40.38012
20	Muhuri	456.67	54.8004	365.336	43.84032
21	Pussur	376.98	45.2376	301.584	36.19008
22	Ichamoti	428.43	59.9802	342.744	47.98416
23	Naf	476.43	47.643	404.9655	40.49655
24	Naf	463.2	60.216	393.72	51.1836
25	Bay of Bengal	443.88	44.388	399.492	39.9492
26	Bay of Bengal	565.9	56.59	509.31	50.931
Total		**15174.12837**	**2205.911101**	**7644.955383**	**1370.475829**

Shomeswari River

Bay of Bengal

Recommendation & Conclusion

After Malaysia Airlines Flight 370 vanished from radar separates March 2014 while on its way from Kuala Lumpur to Beijing, the quest for it reached out from Indonesia toward the southern Indian Ocean. It enthralled a worldwide crowd for quite a long time. No indication of the destruction showed up. On a few events, when satellite pictures uncovered assortments of items skimming on the ocean surface, trusts took off that they would end up being airplane parts. However, they weren't. It was all junk—bits of broken steel trailers, deserted fishing gear, and obviously, plastic shopping sacks. It was the very first occasion when so many people were watching the effects of their improper garbage dump. However, the concern didn't sustain as the way it should have been.

Research and Survey

To sum up the genuine scenario, more research and survey need to be done to evaluate the SUP waste situation

Assessments

Based on research data, amount and source of transboundary movement plastic waste can be identified along with feasible ways of managing the transboundary movement.

Implementing Regulations

Regulation need to be revised and created as per requirment along with implementation for:

- Plastic Waste Treatment
- Regional cooperation for tackling transboundary movement
- Unauthorized trading of plastic waste
- Ratifying Basel Amendments

Technical Advancement

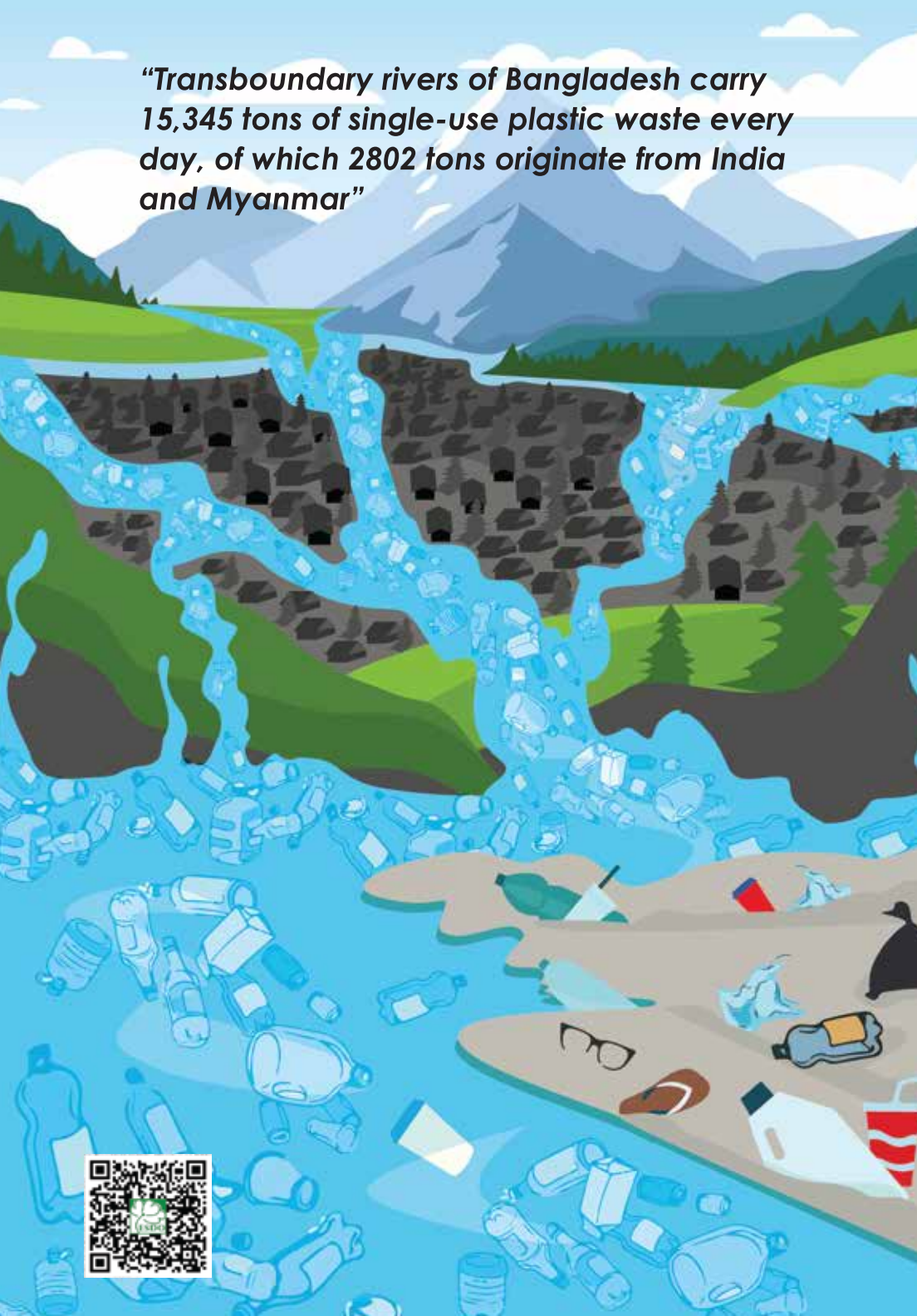
Technical Advancement is highly needed to:

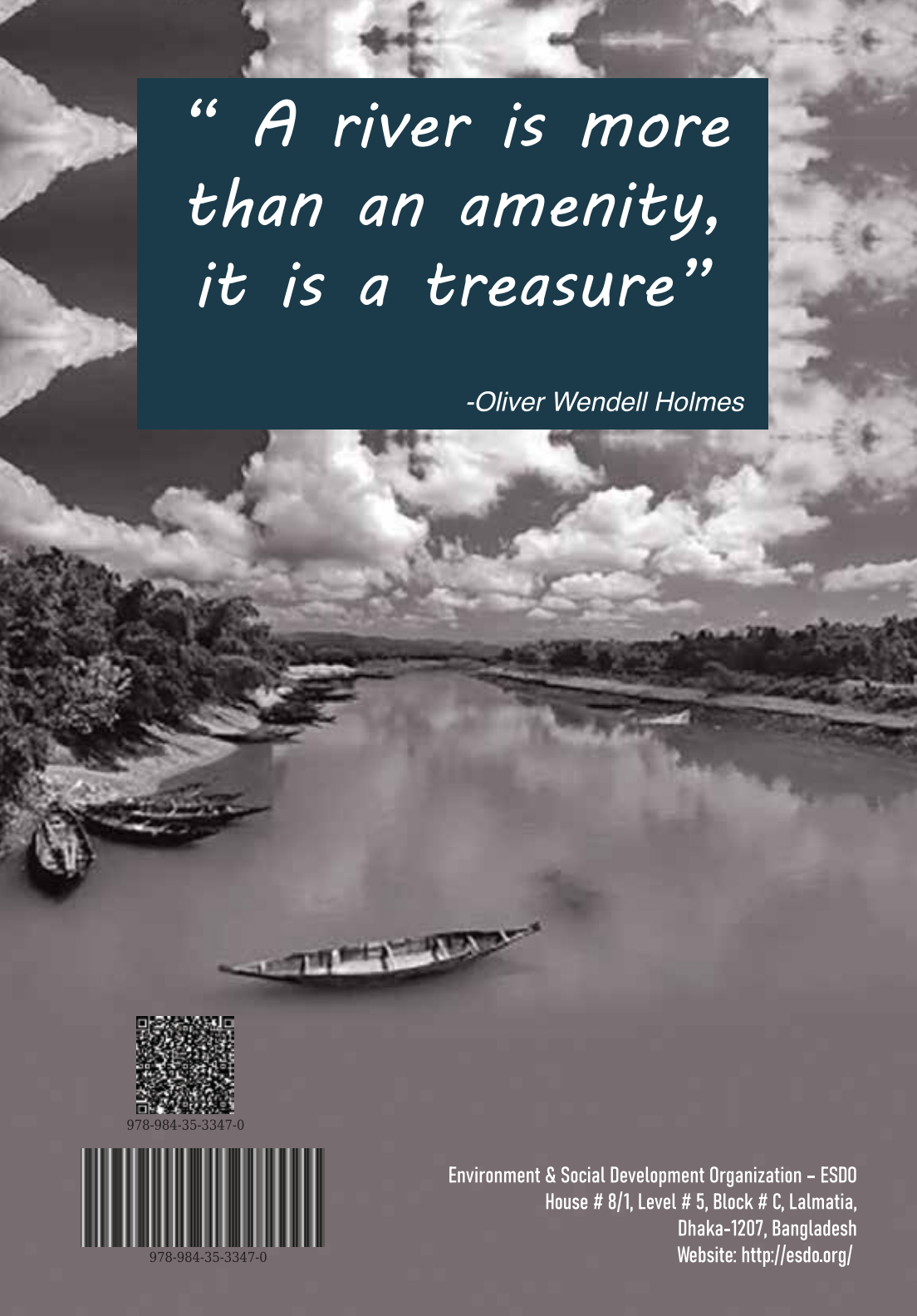
- Manage plastic waste
- Uplift current plastic pollution scenario
- Manufacture alternatives of single use plastic
- Monitor and control plastic waste trade

Public Awarness

Educating mass people about the adverse effect of plastic and its proper disposal method is highly required

Notwithstanding, the huge amount of hazardous plastic waste is not a problem where we do not know what the solution is. Straightly, all we have to do is to learn how to segregate and pick up our garbage and how to recycle it and refuse it on every possible occasion. It is a matter of building the necessary institutions and systems ideally before our ocean turns, irretrievably and for centuries to come, into a thin soup of plastic. The chemicals added to plastics to give them desirable properties, such as malleability, and the even tinier Nano-plastics that micro-plastics presumably degrade into are also a matter of great concern as those might pass into the tissues of fish and humans.


"Transboundary rivers of Bangladesh carry 15,345 tons of single-use plastic waste every day, of which 2802 tons originate from India and Myanmar"



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