IDENTIFICATION OF THE EXISTENCE OF MICRO PLASTIC IN TURAG RIVER

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This Thesis Report is presented to the Faculty of Science and Information Technology Daffodil International University in Partial Fulfillment of the Requirement for the Degree of Bachelor of Science in Environmental Science and Disaster Management.

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D E C L A R A T I O N

I am Sayma Chowdhury, Student of Environmental Science and Disaster Management, Daffodil International University declaring that this research project has been done by me under the supervision **of Dr. Mahfuza Parveen, Associate Professor, Department of ESDM, Daffodil International University**. I am also assuming that this research project and any part of this research has not been published for an award of any degree or diploma.

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CERTIFICATE APPROVAL

I am pleased to certify that the thesis report on **"Identification of the Existence of Micro plastic In Turag River"** prepared by Sayma Chowdhury, holding ID no: 181-30-176 the Department of Environmental Science and Disaster Management, is Approved for Presentation and Defense.

Sayma Chowdhury works as an independent researcher under my supervision. She completed the work with potential fulfillment of the requirement for the degree of BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT, which has been examined and recommended for approval and acceptance.

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Dr. Mahfuza Parveen,
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D E D I C A T I O N

I am dedicating this paper to all my teachers, my Department Head **Dr. A.B.M. Kamal Pasha sir** and **MD. Azharul Haque Chowdhury sir** also **Dr. Mahfuza Parveen mam** and **Md. Sadril Islam khan sir**. I should also mention my parents that I could not have made it without their contribution to my life. So, I am dedicating this thesis paper to them.

ACKNOWLEDGEMENT

On the very outset of this report, I would like to extend my sincere & heartfelt obligation towards all the personages who have helped me in this thesis work. Without their active guidance, help, cooperation & encouragement, I would not have made headway in the project.

I am extremely thankful and pay gratitude to Associate professor my supervisor Dr. Mahfuza Parveen. I am ineffably indebted to Dr. A.B.M Kamal Pasha for conscientious guidance and encouragement to accomplish this thesis. I also want to thank Senior Lecturer, Md. Azharul Haque Chowdhury for their encouragement, effort and guidance throughout this experience. At last but not least gratitude goes to all my friends who directly or indirectly helped me to complete this project report.

Abstract: In recent times microplastic pollution in freshwater has turned into a devastating form. In the present study, we investigated the existence of microplastic from the Turag River in 2021. The study has been used three sediments samples and three surface water samples. The study has been used one of the most visited and populated spots of the Turag river area that is the boro Bazar ghat area. The first sample was been taken directly from the boro Bazar ghat area and the other two samples were taken from 500 meters north of boro Bazar ghat and 500 meters south of boro Bazar ghat. After collecting the sample, the sample was examined in our lab where we have used KOH for making digestion of organic matters and after that, the microplastic was identified with the help of a microscope and bare eyes, the size of the particle was not identified in this study but we have successfully identified 2 types of microplastics. One is the particle of microplastic another is a filament of microplastics. The microplastic we have identified in this study has shown the characteristics and color with which we could identify the microplastic sample. Then the study made a comparison between the results found in the Turag River with the result from other rivers throughout the world. The study has compared both results and concluded that the microplastic which we have identified was quite similar with other microplastic with has been identified worldwide other rivers

Key Words: Microplastic, Pollution, Human health, Organism impact, Turag River, Dhaka, Bangladesh

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CHAPTER 1: INTRODUCTION

1. Introduction

The production of Synthetic polymer which is also called plastic has increased in the 20th century and it has become a significant problem for the modern world. According to (Yao et al., 2017) the total amount of plastic production in our current century is 250 mt/year. The high production of plastic and its low biodegradation characteristic has made it a concern for the environment (Yao et al., 2017). Microplastic is a plastic material that is <5mm and can be found in the ocean and river bodies. The amount of microplastic has been increased in the water bodies in recent decades because of the dumping of plastic in ocean and river water which is ultimately producing microplastic in water. The quantities of microplastic are increasing because the plastic is breaking down into millions of small pieces due to the degradation processes. That's why it has become a modern world concern for the ecology and the surrounding environment (Li et al., 2015). Because of the presence of microplastic and its morphological features, microplastics are threatening the life of biota via direct and indirect interactions. Microplastic contains substratum sorption of various persistent organic pollutants (POPs). It can be a potential risk factor because of these characteristics which tend to release as a certain contaminant (Su et al., 2016). Microplastic can also be a problem for marine organisms. When microplastic is suspended in the water it can hinder the transmission of light which can affect the organism in the bulk water. Also, it can be swallowed by the organism of the marine and river environment. On the other hand, microplastic can release toxic material which most of the time is attached to the surface of microplastic. Microplastic can be a bigger threat when it serve as a carrier, accumulating and associating with toxic chemicals which can cause a serious damage to orgamism on their food web (Hu et al., 2020).

Additionally, widespread ecological influences are predicted for microplastics. Microplastic particles <5 mm in size can be originated from numerous sources. Most of the time synthetic cleansers and cosmetics use microplastics to enhance the product properties. Thus, microplastics are most likely arriving in the marine environment by runoff from treating services or metropolitan sewage treatment plants (Yao et al., 2017).

Freshwater has different types of uses in our society, such as it can be used as a source of drinking water and fisheries. Sometimes a high population density can surround the freshwater systems, and such aggressive anthropogenic activity can cause different types of contaminants, including microplastics, into the waterbody (Su et al., 2016). Due to massive urbanization, the Turag River

has become polluted in different ways. Microplastic is one of the pollutants, which can be identified in this research study. Because Turag river pollution is creating serious issues for the organism of that water body (Hafizur et al., 2017).

1.1 Objectives of the study:

1. To identify the microplastic in Turag river water.
2. To observe the impact of Microplastic pollution on Turag river and its organism
3. To learn the impact of microplastic pollution on human health in Turag river.

1.2 Diverse types of microplastics

Microplastic mainly varies with color dimension and patterns and composition and is categorized in different types.

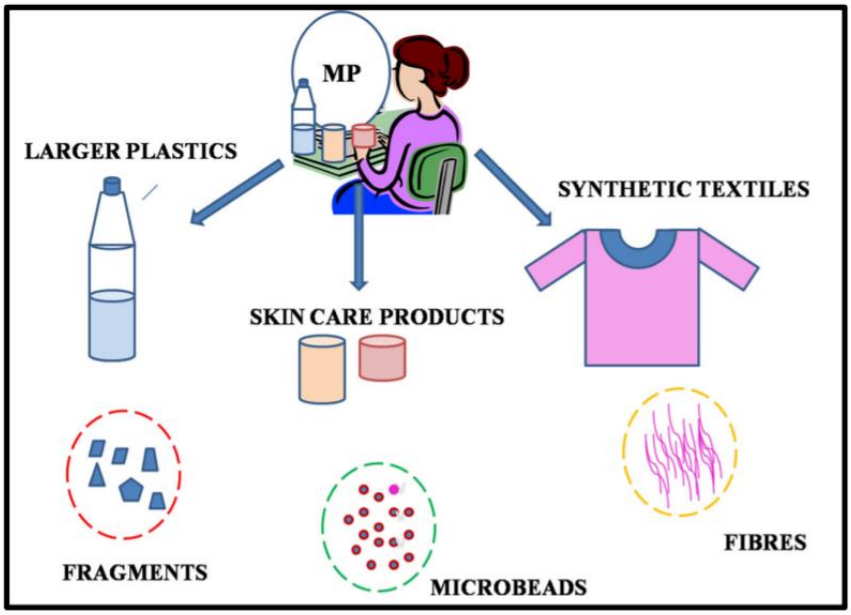

Figure 01: Diverse types of microplastics

Particles that are greater than 25 mm, between 5 to 25 mm, 1 to 5 mm, and 1 nm to 1 μm were called macro, meso, micro, and nano plastic. (Lee et al., 2015) Based on the source microplastic is categorized as primary and secondary microplastic. Primary microplastic is generated in the products for personal care like toothpaste, scrubbers, and other cosmetics (Duis & Coors, 2016). Microplastic comes from beauty products that are mainly 0.25mm. in size. Microplastics usually

show various sizes and granules in the same products. The release of primary microplastics from houses, industrial units and sewerage occurs straight into the environment. Microplastics from skincare products are usually transported through the sewage system with wastewater (Vickers, 2017). Apart from the direct discharge of microplastic, the debris of larger microplastics can be fragile under UV light and heat which can make them fragmented into smaller particles with the help of mechanical forces likes winds and ocean currents (Thompson, 2015). The majority of microplastic is made in the marine environment due to the breakdown in different environmental conditions. Fragmentation of larger plastics depends on the temperature and amount of UV radiations (LI et al., 2016).

Secondary microplastics are formed with the help of incremental decline or breakdown by ultraviolet light, wave scratch, or microbial deprivation of large plastics that are already in the environment. Environmental microplastics deteriorate to generate nano plastics 100 nm, which have virtually unknown plights and toxic properties in comparison with other plastic debris (Koelmans, 2015).

CHAPTER 2: LITERATURE REVIEW

2. Literature review: The study has reviewed different types of research papers around the world. The different research paper has been used to include different types of data in this study. The main methodology has been taken from the research paper from (Bruge et al., 2020) named *Plastic ingestion by planktivorous fishes in the North Pacific Central Gyre'.* The next paper we reviewed in this study was conducted by (Osorio et al., 2021) named *'Microplastics Occurrence in Surface Waters and Sediments in Five River Mouths of Manila Bay* which was used to maintain Quality Assurance and Quality Control. Then the next paper was used to compare both data, one of them was our primary data and another one was the secondary data. Secondary data was used from the paper conducted by (Jiang et al., 2019) named 'Microplastic pollution in the rivers of the Tibet Plateau, Environmental Pollution. The second comparison was done with the help of another paper written by (Strand et al., 2015) named Marine litter in Nordic waters. Nordisk Ministerråd where we have shown how similar our findings are with the findings which are being found by different researchers from different areas. Then the study has shown the impact of microplastic pollution on human health where we have used secondary to show how it impacted real life. For this data we have used a research paper conducted by (Dick & Juliette, 2021) titled 'Microplastics and human health'. In the next step, this study has shown the Microplastic pollution impact on organisms where we have used secondary data from the different authentic research paper. The first paper we have used for the information was written by (Lusher et al., 2013) titled 'Occurrence of microplastics in the gastrointestinal tract of pelagic and demersal fish from the English Channel'. The next paper was used to show the biological consequence which was written by (Boerger et al., 2010) and was titled 'Plastic ingestion by planktivorous fishes in the North Pacific Central Gyre', Marine pollution bulletin. The next paper was used to show how many microplastic particles are taken up by different organisms, for that a paper conducted by (Gouin, 2020) was used. Title of the paper was 'toward an improved understanding of the ingestion and trophic transfer of microplastic particles: Critical review and implications for future research'. The next paper showed the amount of microplastic was taken by a water organism for that we have taken information from multiple research paper. One of them was written by (Desforges et al., 2015) titled 'Ingestion of microplastics by zooplankton in the Northeast Pacific Ocean'. Another one was conducted by (Sun et al., 2018) titled 'Retention and characteristics of microplastics in natural zooplankton taxa from the East China Sea'.

CHAPTER 3: STUDY AREA

3. Study area: The research study has been completed in a specific river of Dhaka city which is one of the most populated cities in the world, specifically the target river of the study was the Turag river at the point of Boro Bazar ghat area which is very close to Gabtoli bus terminal and it is under Dhaka north city Corporation (DSCC). The geographical position is 23.786646, 90.337688. For the study, the sample has been collected from three different points of the Boro Bazar ghat area. There is an embankment that was constructed in 1980 which is now known as Shadarghat-Gabtoli road (Huq, 2016). There is a significant amount of change can be noticed in the socio-cultural characteristics of the area, because of the unplanned population growth, new settlements are being constructed without following any proper planning and rules. In total, 3 water samples and 3 sediment samples from the Turag river area were collected, in which, Three sediment samples (S1, S2, S3) and the water samples (W1, W2, W3) are located on the bank of the river.

Table 1: Geographical location of sample area

Area	Latitude	Longitude
Sample 1	23.786646	90.337688
Sample 2	23.786173,	90.337802
Sample 3	23.787538,	90.338606

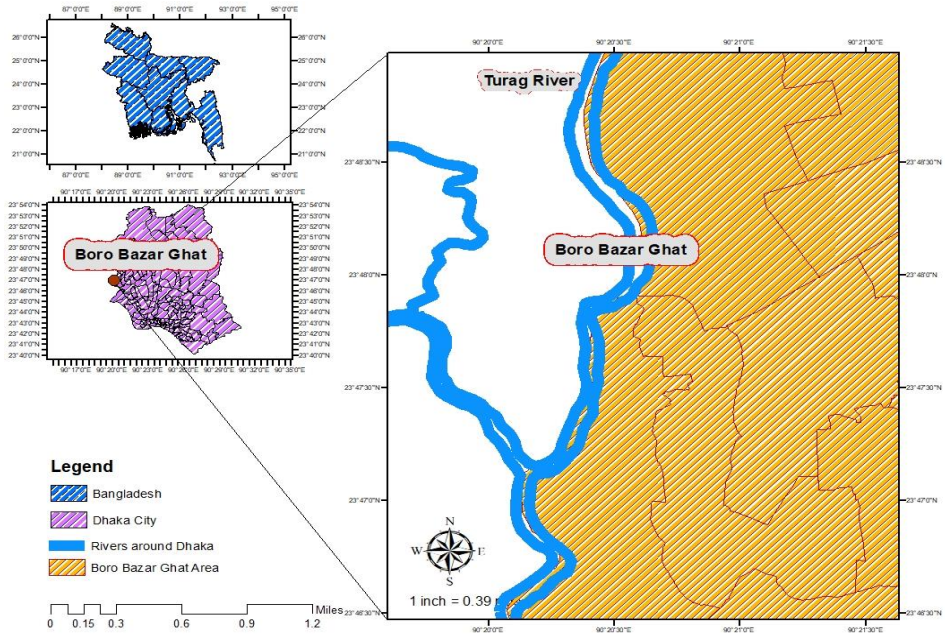

Figure 02: Study Area

CHAPTER 4: METHODOLOGY

4. Methodology: The methodology is the process or the way of doing any kind of study of research work. The researcher should have defined a particular or authentic way of doing work before starting the research. Because the form of the study process has some direct impact on the final result that the researcher expects to have. So, it plays a significant role in analyzing a study collection. Depending on the study topic, a researcher makes his methods of the study. Nevertheless, every methodology starts with a study area. That means a research area must select before beginning research.

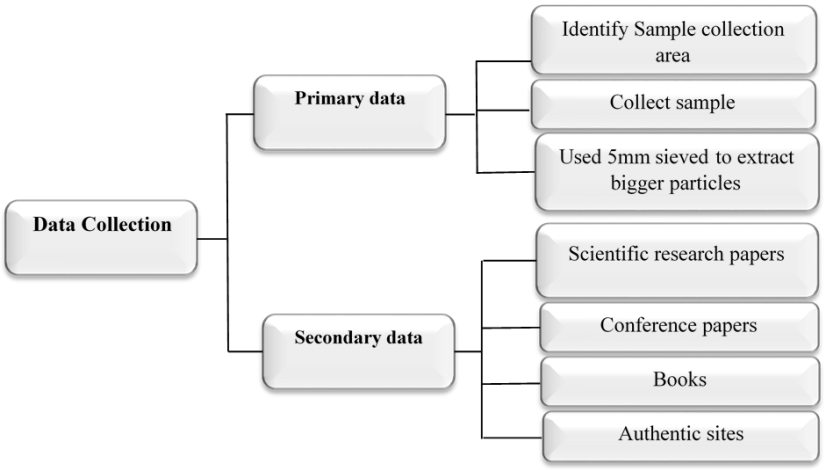

Figure 03: Methodology Diagram

4.1 Primary data collection: All sediments and water sample from the Turag river was collected on November 20, 2021. The water sample was collected directly from the turag river water and the sediment was collected from 0.5 meters beneath the surface water(Osorio et al., 2021). The sediment and the water sample were being collected with great care so that they does not get contaminated with other materials above or beneath the surface. During the water sample collection, the time has been taken to collect the data with the normal river flow so that if there is any microplastic on the water body can be collected in the sample collection bottle. Also, the sediment was being collected with less water sample.

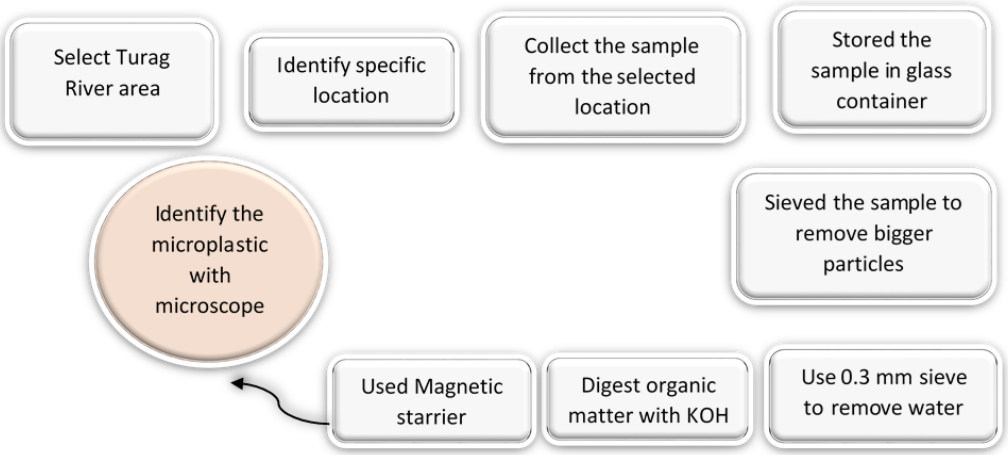

Figure 04: Primary data collection process

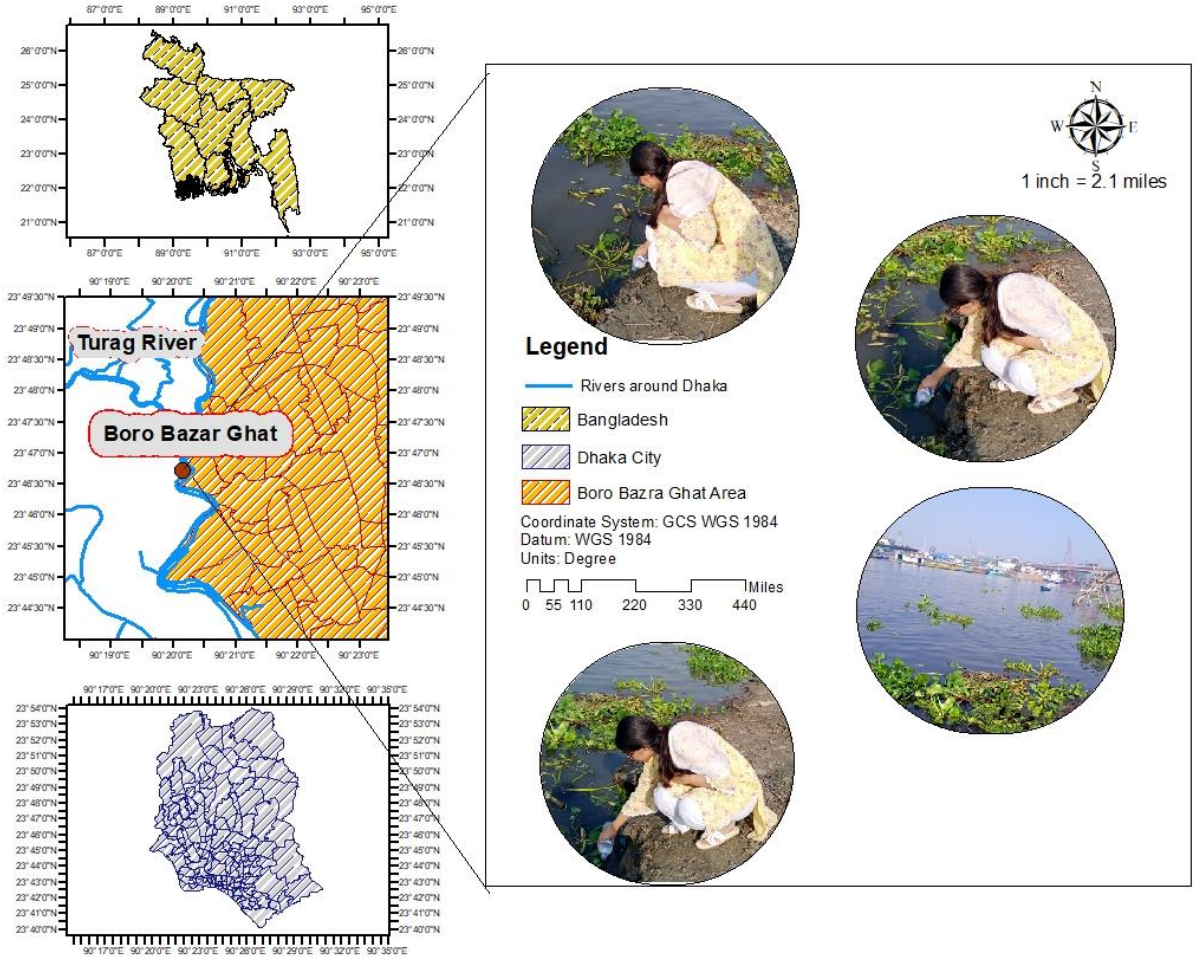

Figure 05: Primary data collection Diagram

4.2 Secondary Data Collection Secondary data was collected by various research articles, books, newspaper articles, reports, scientific reports, etc. All the data was collected with proper authenticity and with proper referencing. Mainly the data was collected from different research articles which have been published throughout the year.

4.3 Sample processing method: The study has collected samples directly from the Turag River. After collecting the sample the sample was being sieved. There were two different types of sieves which was used to purify the sample. The study used 0.3 millimeter and 5 millimeters sieved(Bruge et al., 2020). The 5 mm sieved was being used to extract the bigger particle from the sample and the bigger particle was being rinsed to make sure that there was no smaller particle left with the bigger one. After completing the rinsing and extracting the big particles from the sample, the study used the 0.3 mm sieve to extract the microparticles. Then the microparticles was being rinsed with distilled water and then collect the sample was from the 0.3 mm sieve. The sample was collected in a glass container.

4.4 Sample analysis process: After collecting the microparticle sample from the river water it was brought to the lab for further analysis. First, the sample was being shifted from the glass container to a beaker the glass container was being rinsed with distilled water. A portion of the sample was primarily observed with a binocular microscope where it was identified there is a lot of organic matter available in the sample. To digest the organic matter the study used Potassium Hydroxide (KOH). The study used 10% KOH of the weight of the total sample. 500 ml beaker was used to complete the digestion process. The total sample weight was 100 mg and 10 mg KOH was being used to complete the digestion process. Then the sample was put on the steering hot plate and the magnetic starrier was put in the sample. The Temperature was set to 50 degrees and the rotation was set to 800 rpm and it was being starred for 24 hours. After rotation and mixing for 24 hours with KOH digest all the organic matter and the sample becomes organic matter free. After cleaning the organic matter from the sample the study could analyze the inorganic matters in the sample so the sample was being sieved again with the 0.3 mm sieve and extracted the inorganic matter. Then the inorganic matter has taken as a sample in a Petri dish and added some distilled water into the sample so that the inorganic matter like plastic from the sample can be identified easily. After

adding the water the petri dish was directly put under the microscope with great care. Then the microscope was used to identify the microplastic with the bare eye(Bruge et al., 2020).

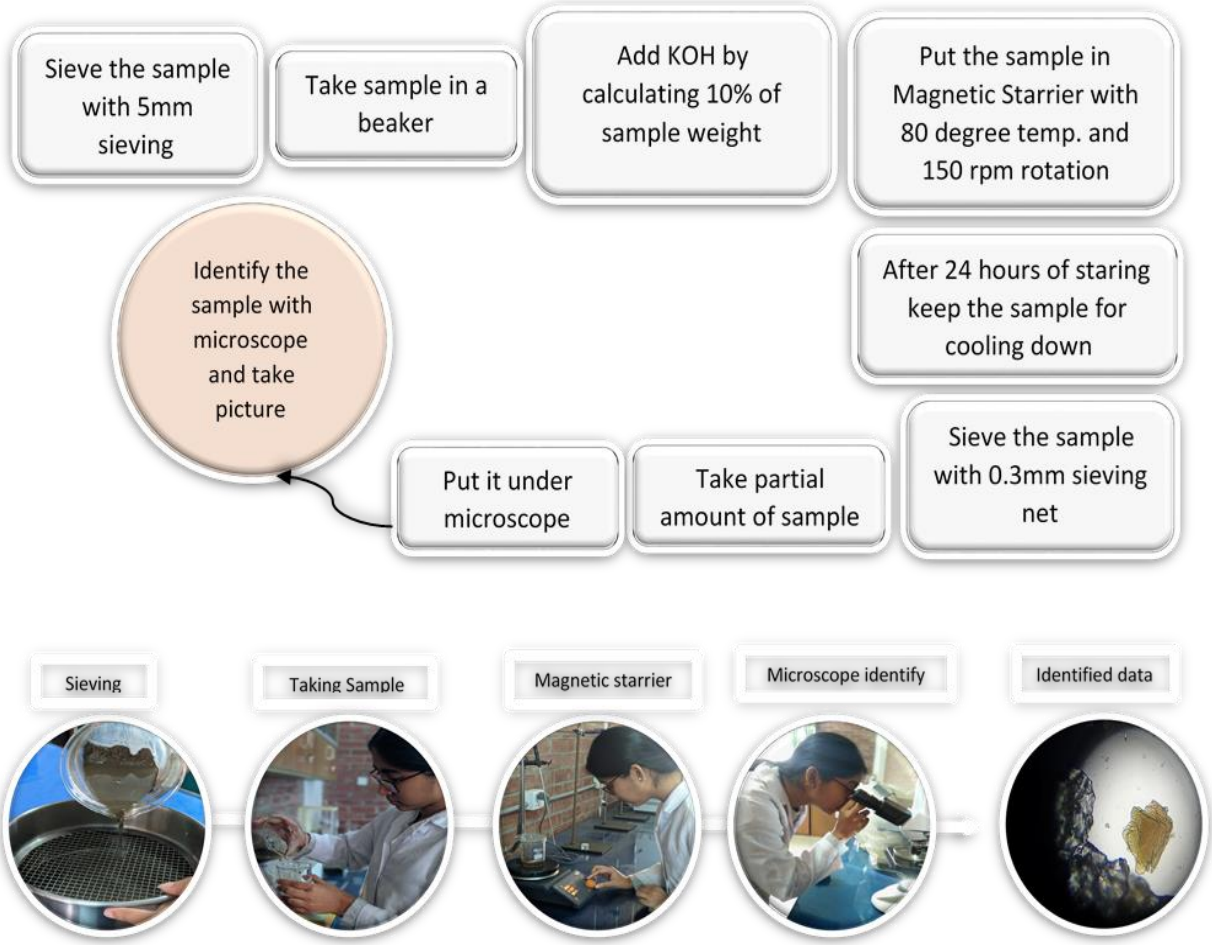

Figure 06: Sample analysis process Diagram

4.5 Quality Assurance and Quality Control:

The study did not use any plastic container to collect and store samples so that they cannot be contaminated with microplastic, mainly for those which cannot be seen with bare eyes. The containers were properly labeled, stored in a box, and transported to the laboratory within the same day for processing. Individual protective equipment like laboratory gowns, safety masks, and nitrile gloves was always worn by the investigators during the experiment and analysis. The collected sediment sample was being transformed into a clear glass beaker and stored separately to avoid any kind of outer contamination. Samples stored in glass Petri dishes were always covered with silver foil to prevent any kind of contamination. The beaker and all the transfer apparatus

were washed with distilled water multiple times to minimize any sample loss owing to the adhesion of microplastics on the walls of the filter apparatus, and all washing solutions were filtered through the same glass fiber filter. Filters were air-dried and subsequently sealed individually in Petri dishes (Osorio et al., 2021).

4.6 Identification and Quantification of Microplastics

The sample was examined with a microscope with a magnification level of 10x to 60x and after identifying the microplastic from the sample, the picture has been taken with a 16-megapixel smartphone camera. To ensure a better quality image the picture has been taken with minimal digital zoom. All the particles were sorted according to their color, size, and shape (depending on physical characteristics) using the classification from previous studies(Osorio et al., 2021).

Figure 07: Identification and Quantification of Micro plastics

CHAPTER 5: RESULT AND DISCUSSION

5. Identification of microplastics from Sample

5.1 Sample number one sediment (S1): In total, the study was collected 6 six samples from the Turag river. Three samples are the surface water sample and the other three are sediments from 1 meter deep of the Turag water so that it can be identified if there is any microplastic in water and sediments. The study was started with the sediment sample S1 and made 50 ml of the sediment sample and add 10% KOH in respect of total sample mass. The KOH helped the sediment to digest the organic matter and made the sample clear to identify with the microscope and bare eyes. Then the sample was carefully identified with the bare eye and unfortunately, Sample-1 (S1) has shown some microplastic in water. The microplastic was identified with its distinguished color and pattern with makes it different from surrounding sediments and inorganic particles.

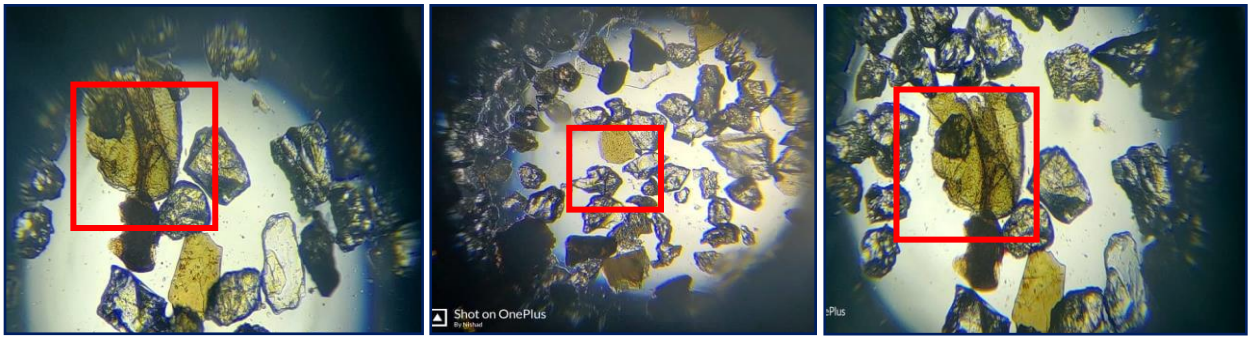

Figure 08: Sample number one (S1)

5.2 Sample number one water (W1): The water sample was collected from the same place of the sediment collection area. The water was being collected in a glass jar so that the sample cannot be contaminated with microplastic from outside. When water sample 1 was being analyzed it was found clean and the study failed to identify any microplastic in that sample. A microscope was being used to identify microplastic from the sample after being digested with KOH in magnetic starrier.

Figure 09: Sample number one (W1)

5.3 Sample number two water (W2): In the water sample of sample number two the study has found similar inorganic materials. So it could be identified that the water sample of the sample collection point two also has microplastic into it. The microplastic which was identified in the water sample has shown the same color and properties as like sample one sediment analysis result. By comparing both of the samples we can easily relate both of the results and can justify that sample collection point two and its water also holding microplastic into it.

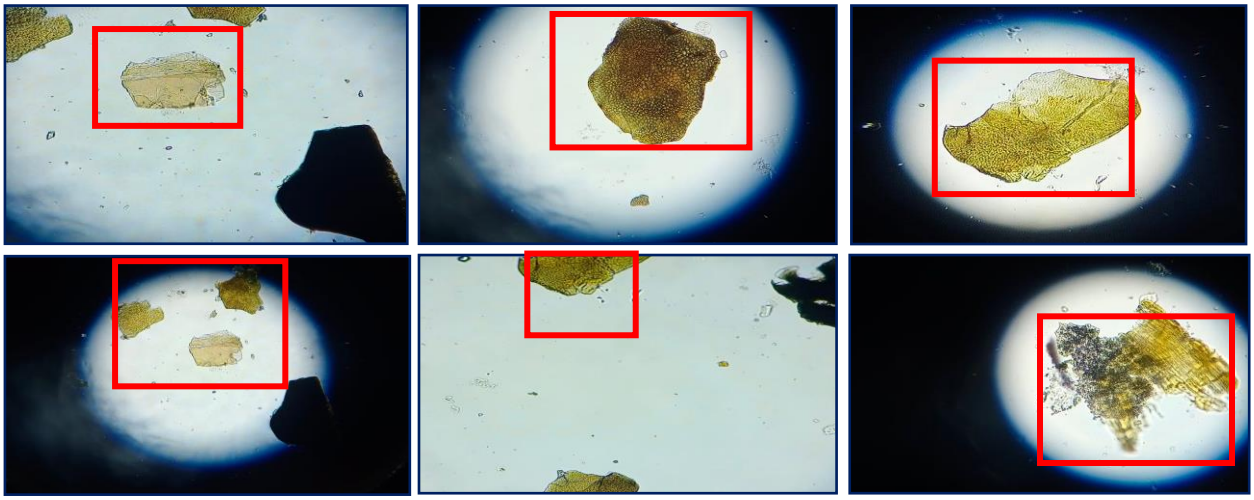

Figure 10: Sample number two (W2)

5.4 Sample number two sediment (S2): The study was started with the sediment sample S2 and made 50 ml of the sediment sample and add 10% KOH in respect of total sample mass. The KOH helped the sediment to digest the organic matter and made the sample clear to identify with a microscope and bare eyes. Then the sample was carefully identified with the bare eye and unfortunately, Sample-2 (S2) has shown some microplastic in sediment. The microplastic was identified with its distinguished color and pattern which makes it different from surrounding sediments and inorganic particles.

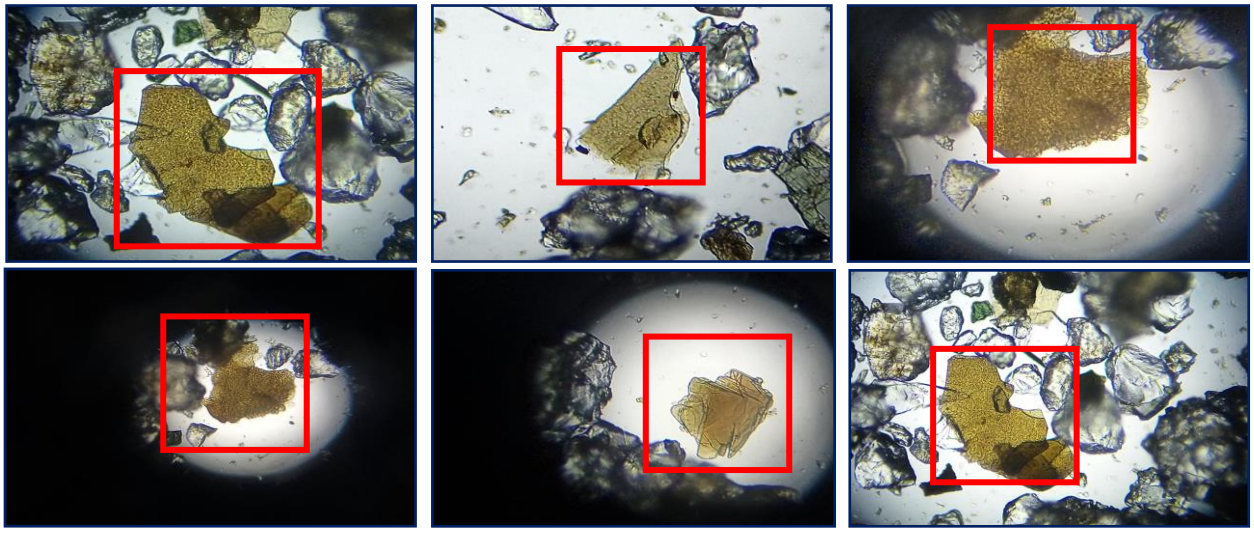

Figure 11: Sample number two (S2)

5.5 Sample number three water (W3): The study was started with the water sample W3 and made 50 ml of the water sample and add 10% KOH in respect of total sample mass. The KOH helped the sediment to digest the organic matter and made the sample clear to identify with the microscope and bare eyes. In sample three water we have found another type of microplastic in it. We have found filament of microplastic in that sample. The microplastic was identified with its distinguished color and pattern which makes it different from surrounding sediments and inorganic particles.

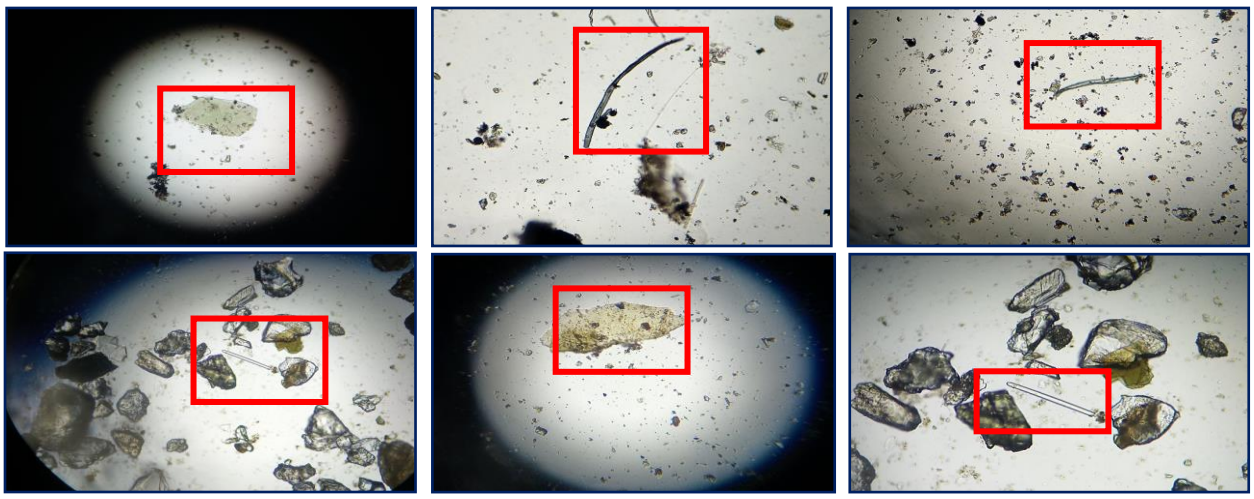

Figure 12: Sample number three (W3)

5.6 Sample number three sediment (S3): In the water sample of sample number three the study has found similar inorganic materials which is exactly a replica of sample one sediment (S1). So it could be identified that the sediment sample of the sample collection point three also has microplastic into it. The microplastic which was identified in the sediment sample three has shown the same sample color and properties as like sample one sediment analysis result. In sample three sediment we have found another type of microplastic in it. We have found filament of microplastic in that sample.

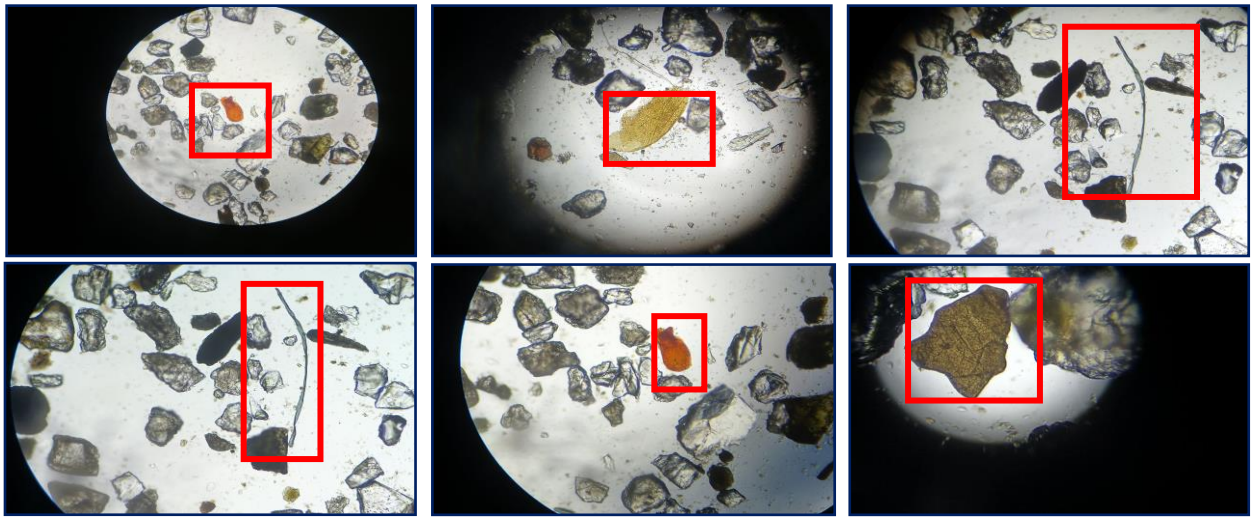

Figure 13: Sample number three (S3)

5.7 Comparison between primary and secondary findings: The research has shown the comparison between the primary data and the secondary data which we have collected from different sources. (Jiang et al., 2019) also have found four types of microplastic in his study. They

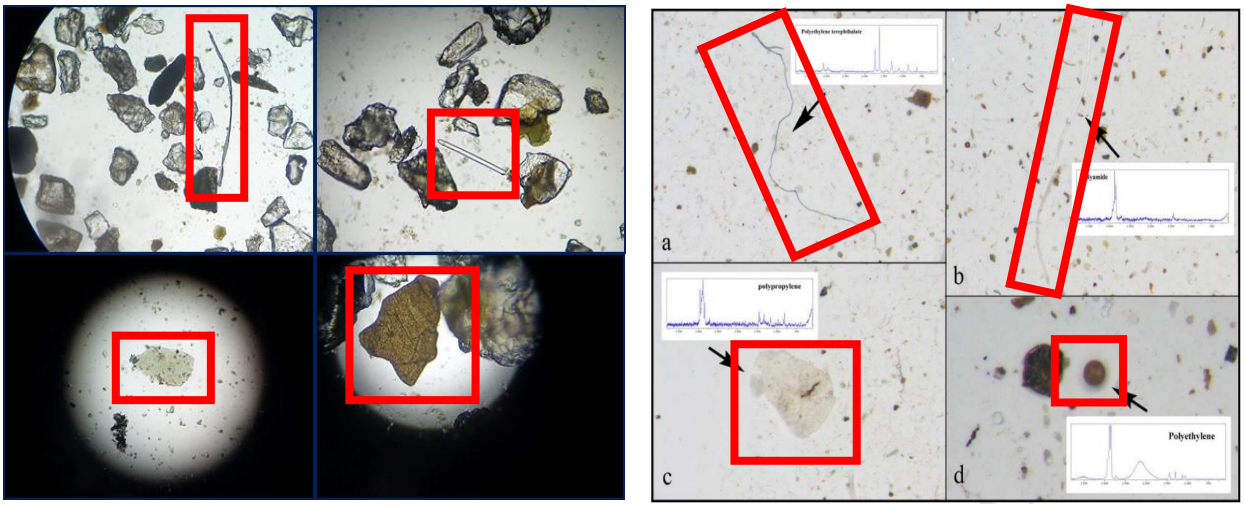

Figure 14: Comparison between primary and secondary findings

are Colorful fiber (a), transparent fiber (b), fragment (c), and pellet (d) which are identically similar to the result which the study has got during the research work. The left side picture is identified in our lab and the right side picture is showing the finding of (Jiang et al., 2019). The study has found colorful fiber which has been shown in the first picture and the second picture is showing the transparent fiber and the third one is identifying the fragment and the last one is the pellet. Fortunately, the study findings are almost similar to the secondary data which is assuring that the result we found is microplastic. (Strand et al., 2015) also have found microplastic in the study.

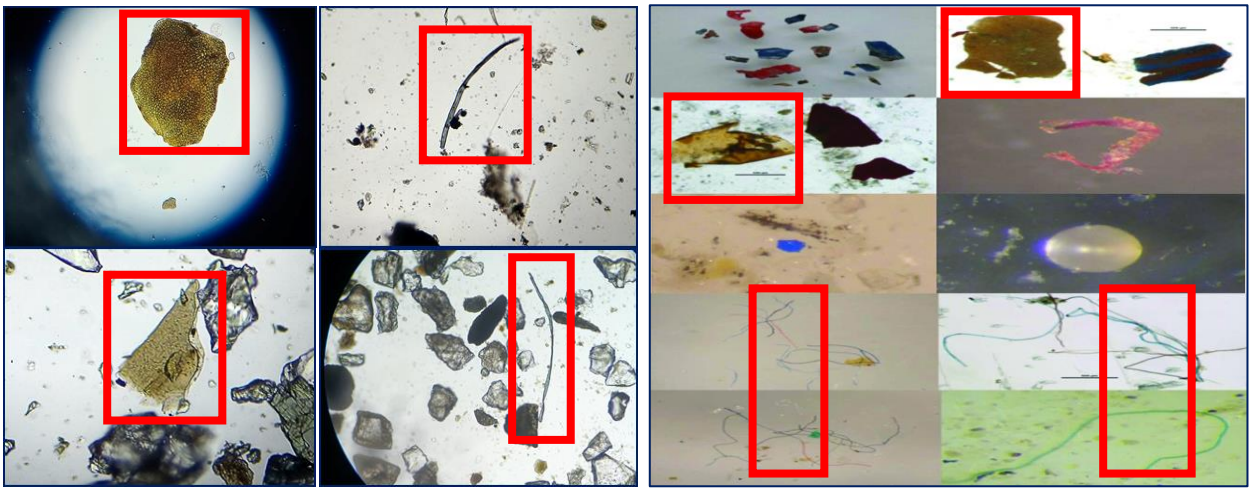

Figure 15: Comparison between primary and secondary findings

In that study, microplastic was found which is similar to our study findings. In that study, researchers have also found three different kinds of microplastic which are colorful fiber, fragments, and pallet. The Left side pictures are showing the findings in our research study and the right side pictures are showing the finding from (Strand et al., 2015). If we compare both pictures we can easily identify that the particle we have found in our study is microplastic particles.

5.8 Microplastic and human health: Microplastic is a problem of our modern era. Microplastic can be created for different reasons. It can be created by the weathering and break of plastic objects, car tires, clothing, paint coatings, and leakage of preproduction pellets and powder. Microplastic is highly contaminated in diverse patterns, shapes, and sizes. It can be spheres, fragments, and fibers and it can also contain a mixture of chemical compounds which can make it highly contaminant. Therefore the biofilms which are growing on the microplastic can be a source of harmful microorganisms (Dick & Juliette, 2021).

Mainly microplastic interns in the human body by inhalation and ingestion and potentially causes health effects on the human body. It can increase the risk of death from cardiovascular and respiratory diseases or lung cancer. Microplastics can cause physical, chemical, and microbiological toxicity.

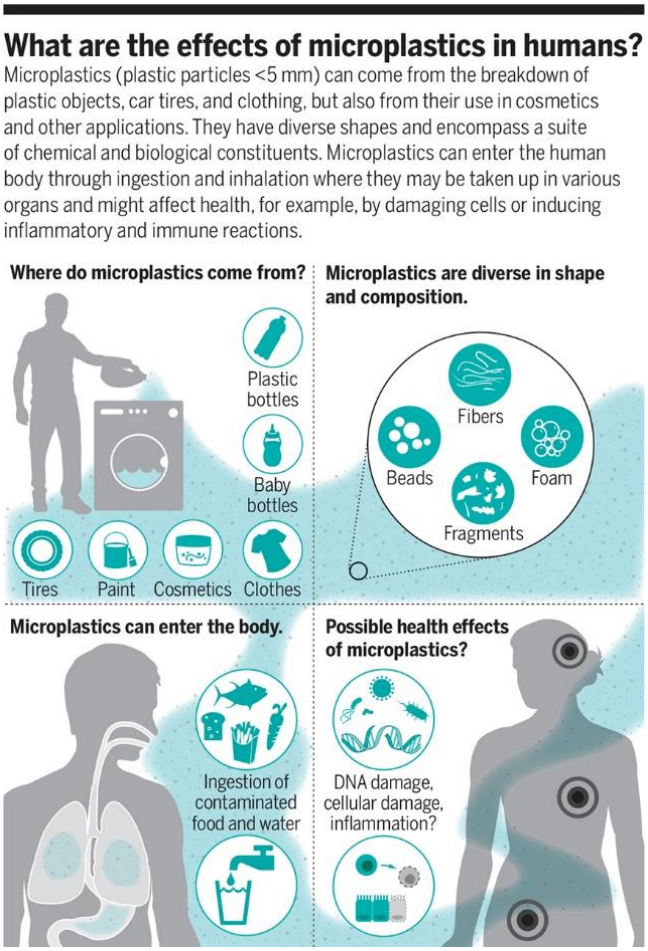

Figure 16: Microplastic and Human Health

Microplastic can create a lot of biological effects which can also make physical toxicity that leads to oxidative stress, secretion of cytokines, cellular damage, inflammatory and immune reactions, and DNA damage, as well as neurotoxic and metabolic effects(Dick & Juliette, 2021).

5.9 Microplastic pollution impact on organisms: (Lusher et al., 2013) found that in fish there are 36% of microplastic available because of microplastic pollution. It was examined in the English Channel where 10 different species of fishes was examined. On average 1.9-0.1 particle was found

from those fishes. The main source of that microplastic was polymers being polyamide and polyester which are highly used in fishing industries all over the world(Lusher et al., 2013). The biological consequences are still unclear and the findings are comparable to those from the North Pacific Central Gyre which was reported by (Boerger et al., 2010).

Table 2: Microplastc pollution impact on organisms

Marine organisms susceptible to microplastic ingestion and their encounter pathways.

Species	Encounter pathway
Marine algae e.g. *Scenedesmus*	Adsorbs nanoplastics, especially when positively charged.
Grazing microzooplankton e.g. the marine ciliate *Strombidium sulcatum*	Size-based selectivity indicates potential to ingest microplastics of appropriate size.
Benthic deposit feeders e.g. the polychaete *Arenicola marina* and the holothurian *Holothuria floridana*	The sea bed is a sink for high density microplastics; size based, deposit feeding strategies adopted by *A. marina* indicate potential to ingest microplastics of appropriate size; *H. Floridana* selectively ingests plastic particles, showing a preference for fibrous shapes.
Benthic scavengers e.g. the crustacean *Nephrops norvegicus*	Fibrous microplastics have been found to accumulate in marine sediments; gut content analysis has shown plastic microfibers are being ingested in the environment; ingestion is passive via food it scavenges or sediment.
Mesozooplankton e.g. echinoderm larvae, calanoid copepods, chaetognaths	Low density microplastics present on the sea surface with greatest abundances in gyres and industrial harbours; size-based selectivity indicates potential to ingest microplastics of appropriate size.
Benthic suspension feeders e.g. the bivalve *Mytilus edulis*	Susceptible to sinking microplastics; have been found to ingest microplastics despite low qualitative value.

An increasing number of microplastic is impacting organic matter. A higher amount of textile fibers are creating microplastic in the water. A significant amount of microplastic particles are taken up by different organisms which shows high temporal and spatial variability(Gouin, 2020). In zooplankton microplastic fibers are being found about of 43.9-93% which has a different kinds of microplastic items in it(Desforges et al., 2014)(Sun et al., 2018)(Zheng et al., 2020) and unfortunately it is similar to proportions in other texa such as clams, shrimps and fish.

Table 3: Microplastics in organismic field samples.

Taxa	**Area**	**Percentage of animals that ingested MPI [%]**	**Amount of MPI per individual [MPI/ind.]**	**Percent MPF of total MPI found [%]**	**Reference**
Zooplankton Copepod (Neocalanus cristatus)	Northeast Pacific Ocean	1 MP in 34 copepods,	0.026	43.9	(Desforges et al., 2015)
Euphausiid (Euphausia pacifica)	Bohai Sea, China	n.r.	0.001–0.056	93	(Zheng et al., 2020)

10 zooplankton species					
10 zooplankton species	Yellow Sea, China	n.r.	0.13 (for Copepoda) 0.35 (for Pteropoda)	54.6	(Sun et al., 2018)
Bivalve Manila clams (Venerupis philippinarum)	Baynes Sound, British Columbia	100	8.4 ± 8.5	90	(Davidson & Dudas, 2016)
Blue mussel (Mytilus edulis)	French-Belgian-Dutch coastline	100	0.2 ± 0.3 (MPI per g mussel)	n.r.	(Van Cauwenberghe et al., 2015)
Blue mussel (Mytilus edulis)	Halifax Harbour, Nova Scotia, Canada	n.r.	34	100 (investigated only MPF)	(Mathalon & Hill, 2014)
Crustacean Norway lobster (Nephrops norvegicus)	Clyde Sea, Great Britain	83 (macro- & microplastics)	n.r.	100	(Murray & Cowie, 2011)
Brown shrimp (Crangon crangon)	English Channel	70	1.2 ± 1.0	96.5	(Devriese et al., 2015)
Caridean shrimp (Palaemon sp.)	South Adriatic Sea	42.8	1.2 ± 0.4	76.2	(Avio et al., 2020)
Other invertebrate taxa Barrel jellyfish (Rhizostoma pulmo)	Center Adriatic Sea	28.6	2.0 ± 1.2	37.7	(Avio et al., 2020)
Purple sea urchin (Paracentrotus lividus)	South Adriatic Sea Center Adriatic Sea	27.3 42.8	1.3 ± 0.6 1.7 ± 0.6	72.7 42.9	(Avio et al., 2020)
Fish 6 planktivorous fish species	North Pacific Central Gyre	35 (macro- & microplastics)	2.1 ± 5.8 (range: 1–83 items ingested)	~ 3	(Boerger et al., 2010)

19 fish species	Yellow sea, China	34	1.0–2.6	67	(Sun et al., 2019)
24 fish species	Beibu Gulf, South China Sea	49.1	0.2 ± 0.08	96	(Koongolla et al., 2020)
21 fish species	Chinese coastal and freshwaters	e100/95.7 (coastal/freshwater species, respectively)	1.1–7.2	46.3–100	(Jabeen et al., 2017)
9 commercial fish species	Estuary in north Jakarta, Indonesia	97.1	12.2 ± 9.8	89.6	(HASTUTI et al., 2019)
Tropical freshwater fish (Hoplosternum littorale)	Pajeú river basin, Brazil	83 (macro- & microplastics)	3.6	46.6	(Silva-Cavalcanti et al., 2017)

Microplastic items (MPI) per individual are given as mean or range (min – max). Proportion of microplastic fibers (MPF) of total MPI are specified (n.r. – not reported).

CHAPTER 6: RECOMMENDATION AND CONCLUSION

6. Recommendation: After evaluating all the perspectives of microplastic we can ensure that microplastics can be a great threat for our future generation and also for the organism around us. So we recommend,

- Microplastic could be considered under environmental monitoring studies as it is already at a stage of being at risk for the environment.
- More studies should be available so that we can have more information about the microplastic intake by an individual organism.
- Investigate the sources of microplastic pollution and the need to decrease single-use plastic in our society.
- Also, we need to analyze the leaching potential of microplastic in the environment.
- Different policies and protocols should be assigned by the government so that plastic use mainly the plastic in a single-use category gets Detroit.

7. Conclusion: Though Microplastic is not the largest pollution creator in river water the amount of microplastic can lead to a devastating contamination impact on river water. The microplastic sample in the sediment is showing us it can be a problem for future generations. From the study, we can realize that low-density microplastic has the most impact on river water. Fiber microplastic is also encountered in the process of the study. And we have seen those microplastic can be contaminated with other chemical contamination after that any organism which will intake that microplastic with their regular food could be contaminated. Mainly the fish species are at risk because the fishes usually gather their food from different plants and organisms from the river water and microplastic are attached with those things also microplastic was found in the sediment and water sample so the fish can intake those microplastic easily as their food and it can be a great risk for the human population because we eat fish in our regular days. If the fish body gets contaminated it can be transferred or cause different diseases in our body. Although microplastic is not a severe problem for river water it has the potential to become a disaster in the future. So we have to concern about microplastic from now so that we can prevent pollution tomorrow.

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Appendix: