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CLASS

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PROJECT TITLE

ASSESSMENT OF MICROPLASTICS IN LOCAL WATER BODIES

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INTRODUCTION

Plastic waste is one of the biggest environmental problems in today's world. When larger plastics break down into smaller pieces less than 5 mm in size, they are called microplastics. These particles are invisible to the naked eye but are found in rivers, ponds, and lakes. Fish, birds, and even humans can swallow them through food and water. This project aims to study whether our local water bodies are polluted with microplastics.

SELECTION OF PROBLEM AND BACKGROUND

Plastics have become a part of our daily life — from bottles, bags, and packaging to clothes and household items. While plastics are useful, their waste has become a huge problem for the environment. One of the biggest issues is that plastics do not fully decompose. Instead, they break down into tiny pieces called **microplastics** (smaller than 5 mm).

Our local water bodies such as **ponds, rivers, lakes, and canals** are often used for washing clothes, throwing garbage, or draining wastewater. This means they receive plastics from many sources:

- **Household waste** (plastic bags, wrappers, bottles)
- **Laundry waste** (synthetic fibres from clothes released during washing)
- **Cosmetic and personal care products** (like scrubs containing microbeads)
- **Improper waste disposal** (littering, open dumping near water)
- **Industrial and market areas** (where plastics are heavily used)

Over time, these plastics break down into microplastics that float in water or settle in sediments. Unlike larger plastics, they are invisible and harder to remove. Aquatic animals like fish, snails, and insects may swallow them, mistaking them for food. Eventually, microplastics may even enter the **human food chain**.

This project addresses the problem because:

1. **Local data is missing** – While newspapers and global studies talk about plastic pollution, very few reports exist about microplastics in small, local ponds and rivers.
2. **Hidden pollution** – Unlike big bottles or bags floating in water, microplastics are invisible and often ignored.
3. **Community impact** – People nearby may use the same water for washing, bathing, or even farming. Studying microplastics will show them the dangers of careless plastic use.

4. **Awareness and solutions** – By identifying the problem in our own surroundings, we can encourage schools, families, and communities to reduce single-use plastics and improve waste management.

OBJECTIVES

The main purpose of this project is to find out whether microplastics are present in our local water bodies and to understand how serious the problem is. The following detailed objectives will guide the study:

1. **To collect samples of water and sediments from different local water bodies**
    - Water will be collected from ponds, rivers, lakes, and canals.
    - Sediment (mud/soil from the bottom) will also be collected since many microplastics settle at the bottom instead of floating.
2. **To detect and confirm the presence of microplastics**
    - Using simple methods like filtration, density separation with salt solution, and visual observation.
    - To prove that even ordinary water bodies around us are not free from plastic pollution.
3. **To classify the microplastics into different categories**
    - **Fibres** (tiny thread-like particles usually from clothes).
    - **Fragments** (broken pieces of larger plastics).
    - **Films** (thin layers like plastic bags).
    - **Beads** (tiny round particles often from cosmetics).
4. **To measure and compare the quantity of microplastics at different sites**
    - Counting the number of particles per liter of water or per kilogram of sediment.
    - Comparing rural sites (village ponds) with urban sites (town rivers or canals) to see which are more polluted.
5. **To identify possible sources of microplastics in the study area**
    - For example, washing clothes near ponds, open dumping of garbage, market waste, industrial discharge, or daily use of single-use plastics.
6. **To study the ecological and health risks of microplastics**
    - Understanding how aquatic animals like fish and snails may eat microplastics.
    - Considering how these particles might reach humans through food or water.
7. **To suggest preventive and control measures**
    - Simple steps for students, families, and the community such as reducing single-use plastics, proper waste disposal, and awareness campaigns.
    - Recommendations that can be shared with local authorities or school eco-clubs.

ABSTRACT

This study will quantify and characterise microplastics in selected local water bodies (surface water and sediments), identify likely sources, and assess ecological risk. Using a combination of field sampling, laboratory separation (density separation, chemical digestion), microscopic identification, and polymer confirmation (FTIR/Raman where available), we will report abundance (particles·L^{-1} for water; particles·kg^{-1} dry weight for sediment), size distribution, shape types (fibres, fragments, films, beads), and polymer composition. Statistical comparisons across sites and correlations with land-use and potential point/non-point sources will be performed. Outputs include a baseline dataset, source-pathway suggestions, and practical mitigation recommendations targeted at municipal authorities and community stakeholders.

GUIDING PRINCIPLE

Microplastics can be separated from water and sediment using simple methods such as filtration and density separation. By adding salt solution, plastic particles float while heavier material sinks. Using a magnifying glass or microscope, these particles can be seen and counted.

1. **Collect representative samples** of water from different local sources (e.g., pond, river, lake).
2. **Filter and isolate particles** from the water using fine mesh or filter paper.
3. **Differentiate plastics from natural debris** by considering properties such as:
    - Color (microplastics are often bright or synthetic looking).
    - Shape (fibers, fragments, beads are not naturally occurring forms).

- Texture (plastics are smooth and uniform compared to irregular organic matter).
- Reaction to water (microplastics float more often due to lower density compared to natural sediments).

4. **Quantify the number of particles** by observing under magnification and recording data.
5. **Correlate findings with human activity** near the water body to understand likely sources.

This approach is based on **environmental monitoring principles**: that if a pollutant is present in the environment, it can be detected through systematic sampling and careful observation. Even with basic school-level tools, students can apply the scientific method to detect pollution and draw meaningful conclusions.

HYPOTHESIS

Water bodies near towns and areas with more human activity will have higher levels of microplastics than water bodies in villages with less pollution.

Independent Variables

- Type of water body (pond, river, lake, canal)
- Location (urban vs rural area)

Dependent Variables

- Number of microplastic particles found
- Type of microplastics present

MATERIALS

1. Glass bottles for water collection
2. Stainless steel/glass containers for sediment
3. Fine cloth or sieve
4. Salt for density separation
5. Magnifying glass or school microscope
6. White paper sheets for sample collection
7. Gloves and masks
8. Notebook for observations

PROCEDURE

1. Select 2–3 water bodies such as a pond, river, and lake.
2. Collect 1–2 liters of water in glass bottles.
3. Filter the water through a fine cloth or sieve.
4. Prepare salt water (saturated solution) and add the filtered material.
5. Plastics float while heavy particles sink.

6. Collect floating particles on white paper.
7. Observe the particles using a magnifying glass or microscope.
8. Record the number, type, and color of microplastics.
9. Repeat for sediment samples.

RISK FACTORS AND SAFETY

Risks during Sample Collection

- **Physical Risk Near Water Bodies**: Collecting water from ponds, rivers, or lakes may involve slippery banks, uneven surfaces, or strong currents (in rivers). Students may risk falling or injuring themselves.
- **Biological Risk**: Water bodies may contain harmful bacteria, algae, or parasites. Direct contact with water should be minimized, and gloves should be used.
- **Environmental Disturbance**: Careless sampling may disturb aquatic plants, animals, or habitats. Samples must be collected responsibly in small amounts.

2. Risks During Sample Handling

- **Cross-Contamination**: If equipment (bottles, filters, tweezers) is not cleaned properly, plastics from one sample may mix with another, leading to inaccurate results.
- **Airborne Microplastics**: Tiny fibers from clothes (especially synthetic fabrics) or dust in the environment can fall into open samples. Students should avoid wearing synthetic clothing during experiments and keep samples covered when not in use.

- **Improper Storage**: Leaving samples uncovered or in dirty containers may result in mixing of natural dirt with plastics, making analysis difficult.

3. Risks in Identification Process

- **Misidentification**: Natural fibers (like cotton or plant debris) may be mistaken for microplastics. Careful observation, repeated trials, and recording distinguishing features are necessary to reduce this error.
- **Overestimation or Underestimation**: Because school-level microscopes have limited magnification, very small microplastics (<0.3 mm) may be missed, or large organic particles may be mistakenly counted as plastics.

4. Equipment-Related Risks

- **Use of Sharp Objects**: Tweezers, scalpels (if used), or glass containers may cause cuts or injuries if not handled properly.
- **Breakage of Glassware**: Beakers, test tubes, or glass bottles may break during handling, leading to potential injury.
- **Microscope Safety**: Students should avoid looking directly into the microscope light for long periods to prevent eye strain.

5. Limitations of the Study

- The absence of advanced lab tools (FTIR, Raman spectroscopy) means that final confirmation of plastic type cannot be made. Results are more qualitative than quantitative.
- Seasonal differences (rainy vs. dry season) may affect results, as water flow and waste dumping vary.
- Only surface water is tested, but microplastics may also accumulate in sediments or deeper layers, which are harder to study at school level.

6. Safety Precautions to Follow

- Always work in pairs or under teacher supervision when near water bodies.
- Wear gloves, masks, and protective clothing while collecting and handling samples.
- Use clean glass or metal containers (avoid plastic bottles, as they may shed particles and interfere with results).
- Clearly label all samples to avoid confusion.
- Dispose of filtered waste and used gloves safely in designated bins.
- Wash hands thoroughly after handling samples or equipment.

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