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ศูนย์ความเป็นเลิศด้านวิศวกรรมสิ่งแวดล้อม
ศาสตราจารย์ อรุณ สรเทศน์
Professor Aroon Sorathesn
Center of Excellence in Environmental Engineering

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International Webinar on

"Microplastic in Environment"

3rd August 2022

Building Capacity for Microplastic Monitoring and Evidence-based Policymaking

August-03, 2022



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Background

Plastic waste has become a major component of riverine and coastal pollution. Recently, the abundance and effects of small plastics, namely microplastics, raise an increasing concern as several studies have shown the harmful effects of microplastics on organisms upon ingestion. Microplastics can also act as vectors to transfer endocrine-disrupting chemicals and other pollutants from the environment to organisms. Currently, most microplastic studies are concentrated in developed countries such as Europe, North America, and the East Asian region. Few studies on the subject have been carried out in the Southeast Asian region. However, countries in the region are facing significant challenges in plastic waste management. In the top 10 countries that have mismanaged plastic waste, 5 countries belong to ASEAN. Therefore, it is necessary to communicate among researchers to work together with this emerging pollutant, so as to find environmental measurements for the prevention of microplastic pollution and to support sustainable plastic waste management.

This webinar is co-organized by Sirindhorn International Institute of Technology (SIIT), Thammasat University, in celebrating the 30th anniversary of SIIT, Chulalongkorn University, Thailand, and the Institute for Global Environmental Strategies (Japan).

The objectives of this international webinar are:

- To understand sources and measurements for prevention/control of microplastic pollution in the environment.
- Capacity building of researchers working on microplastics.
- To create a research network for microplastic pollution.

Topics

- Monitoring, distribution, sources, and abundance of microplastics.
- Environmental measurements for microplastic pollution.
- Removal technologies for plastics and microplastics from the aquatic environment.
- Microplastic accumulation in biota and impacts.
- Other topics are relevant to microplastic research.

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BUILDING CAPACITY FOR MICROPLASTIC MONITORING AND EVIDENCE-BASED POLICYMAKING

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Microplastics (MPs) and plastic-related chemical pollution are widely discussed in the literature. The presence of MPs in environmental compartments create adverse impacts on ecological systems and potential exposure of human through several pathways. Hence monitoring plays an important role in upstream and downstream mitigatory measures. The present study focussed on capacity building of potential stakeholders for the MPs monitoring and regulatory measure development. The situational analysis and training need assessment (TNA) of the two countries, Sri Lanka and Vietnam was extensively conducted by using a structured questionnaire, and then information validation was conducted through stakeholder consultations and technical experts (national, regional, and international). Two working groups consisting of thematic leaders, consultants, and local and international experts were formed for each country for the TNA. The study recognized and proposed, a) education, b) resources and c) institutionalization three main areas for capacity building. The education of the potential stakeholders included a foundation course module on MPs and an advance course module on MPs sampling, analysis, and data reporting for the identified stakeholders in the MPs monitoring chain. The identified area included the selection of sampling locations and sampling methods for water, wastewater, fertilizer, and soil; pre-treatment and transportation samples under the required conditions; selection and development of analytical methods for water, wastewater, fertilizer, and soil samples; identification and quantification of plastic polymer, their state, and potential risk; methods used in data analysis and reporting with minimum information; and use of appropriate data sharing platforms and citizen science data usage.

Keywords: microplastics; capacity building; monitoring; evidence-based policy; training needs assessment.

Building Capacity for Microplastic Monitoring and Evidence-based Policymaking

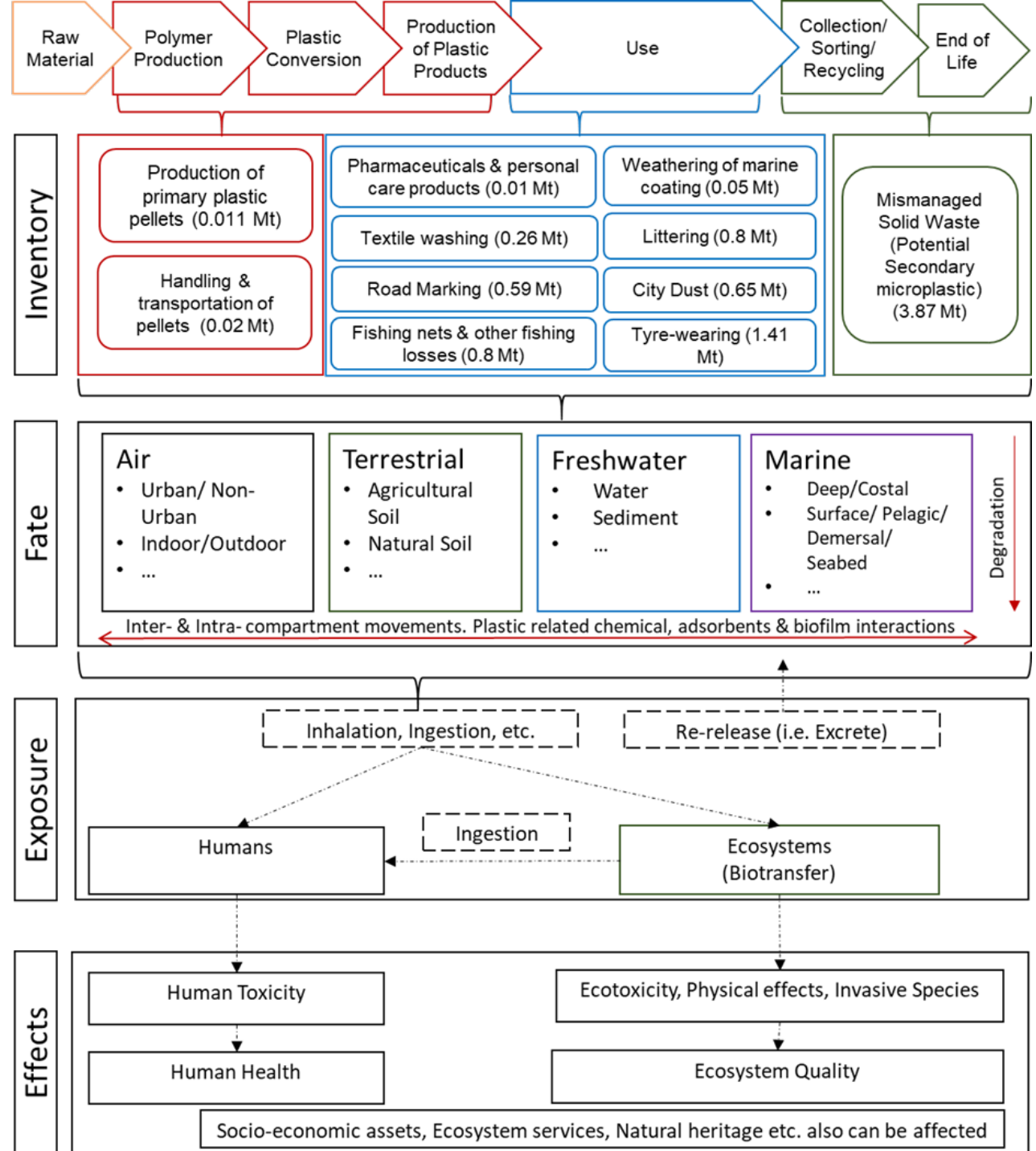
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Microplastics:

- Leakage
- Fate
- Exposure
- Effects




FAIR Data: Essential for Optimizing the Impacts of Funds and Generating Information for Evidence-based Policymaking.

Along with the increasing recognition of microplastic pollution and its effects at global, regional and national levels, sources of funding for priority research on microplastics are also increasing.





While funding will certainly generate data, however, ensuring such data are (FAIR) is essential to informing policy and mitigation strategies (Jenkins et al., 2022).



- Findable
- Accessible
- Interoperable
- Reusable



 **frontiers**
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Current State of Microplastic Pollution Research Data: Trends in Availability and Sources of Open Data






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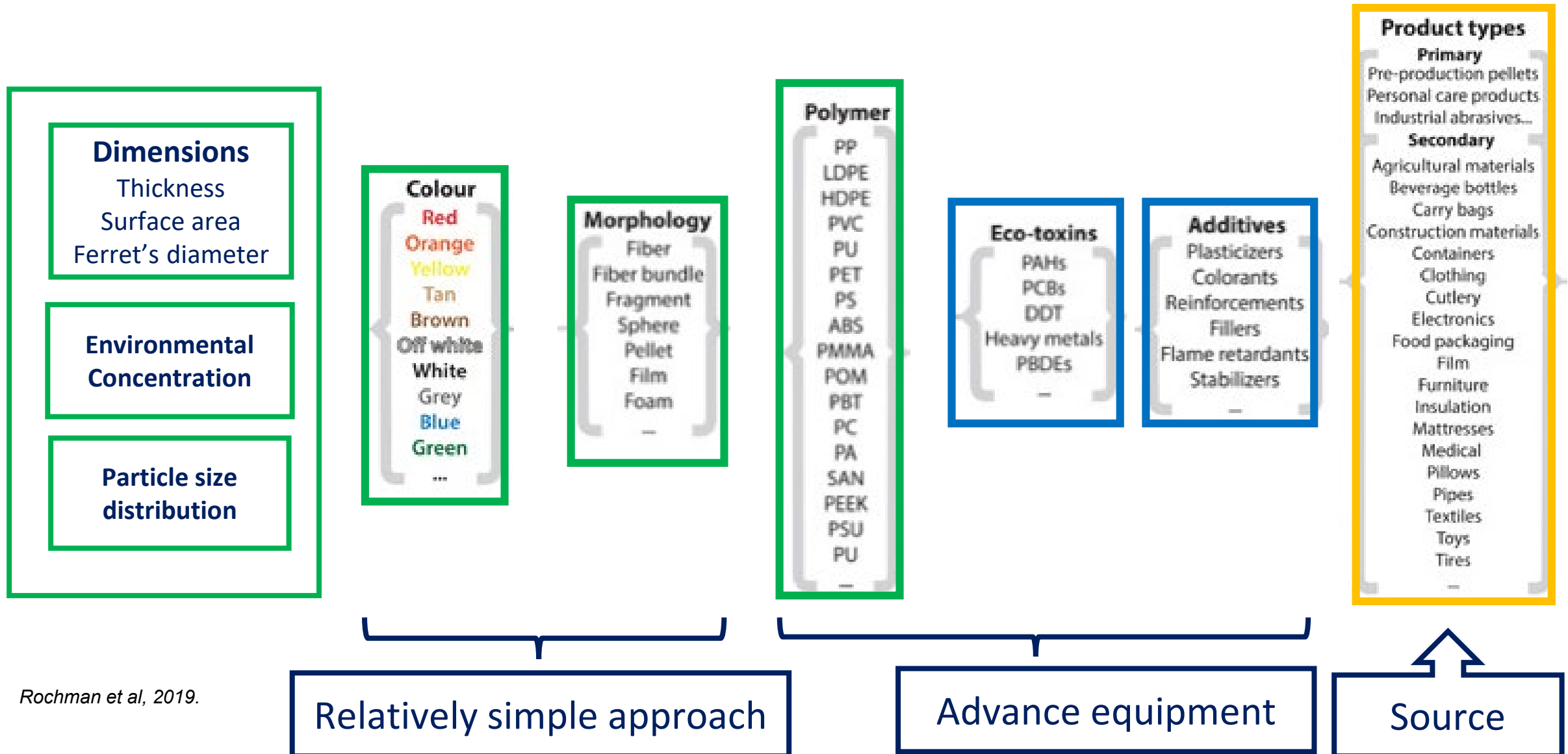
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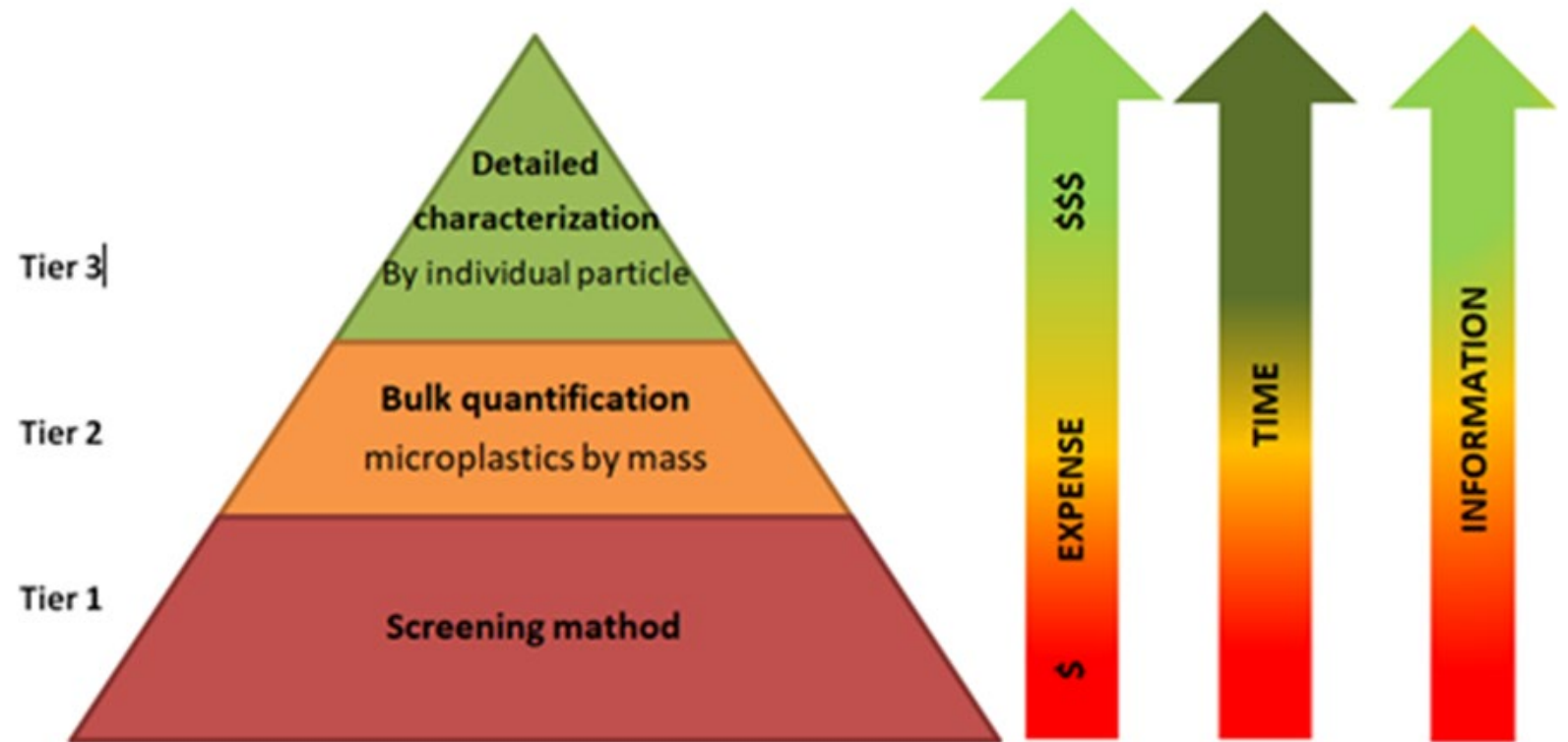
Properties of Microplastics



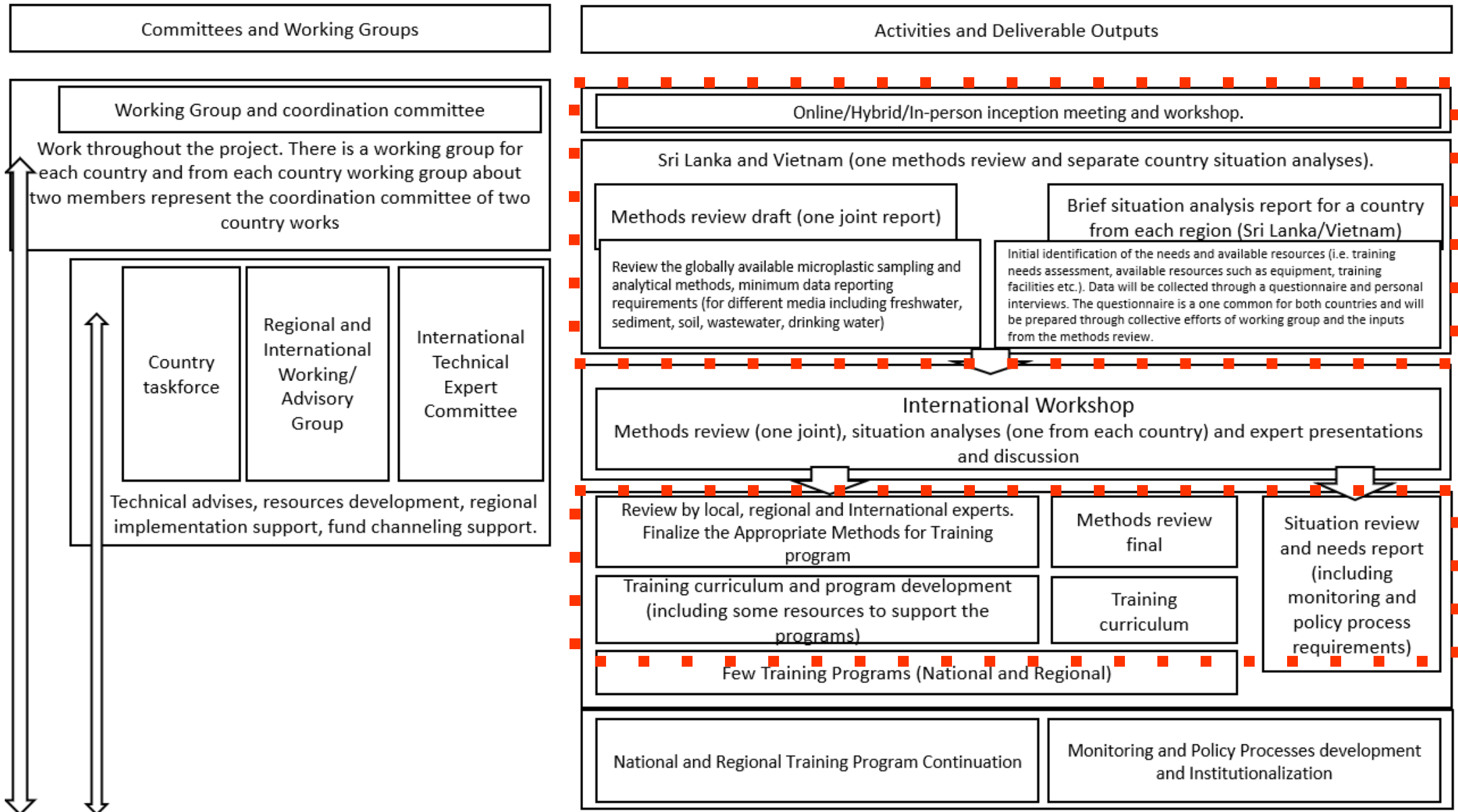
Rochman et al, 2019.

Tiered Microplastic Monitoring Process

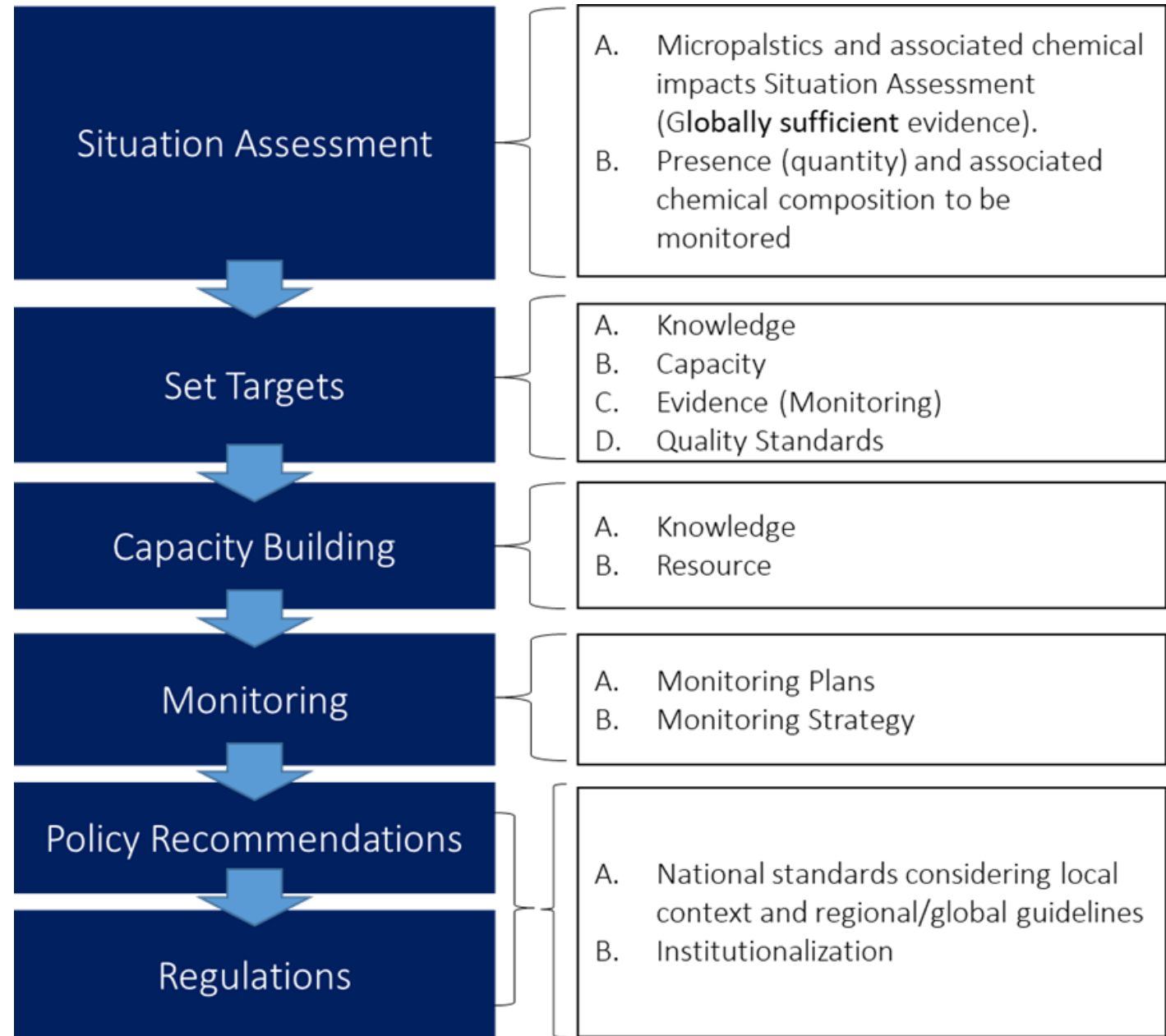
- Expenses, time, Information
- Initial screening
- Bulk quantification
- Detailed Characterization



Working Groups and Activities



Steps for Achieving the Objectives of Capacity Building for Microplastic Monitoring and Evidence-based Policymaking



TNA: Research Approach

The data required for this study were obtained mainly through the use of a structured questionnaire.

Quantitative information was collected from different focus groups and other general stakeholders. The following steps were followed in carrying out this study:

- 1) Detailed literature survey of indexed journals and internationally published reports
- 2) Determining and designing the survey for data collection
- 3) Collecting empirical knowledge through questionnaires, field visits, workshops, and expert opinion [Key Informant Interview (KII) and Focus group discussion (FGD)]
- 4) Producing a preliminary report
- 5) Validation of information via stakeholder consultations and inputs from the subject experts (national, regional, and international)

A working group including thematic leaders, consultants, and local and international experts was formed to initiate and conduct the TNA preparations. The questionnaire was then drafted incorporating inputs from the thematic experts before being finalized.

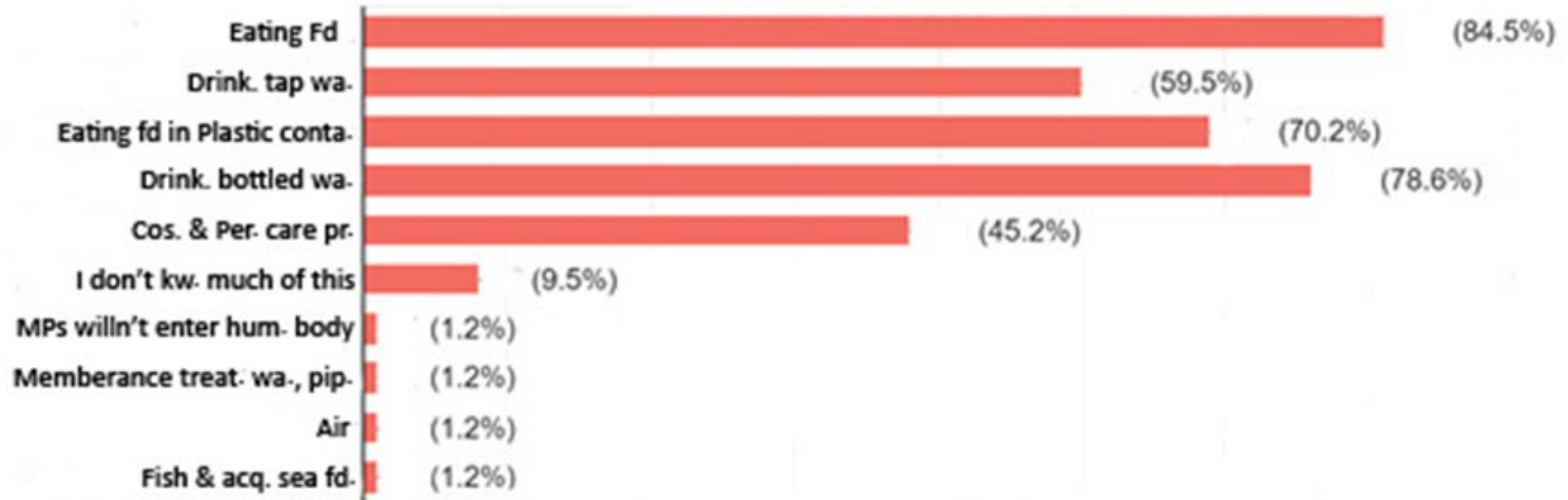
Awareness: Impacts of Microplastics Related to Pollution



Marine and human health impacts are widely discussed in early literature and in the public media.

However, the recent findings and discussions are having some lag.

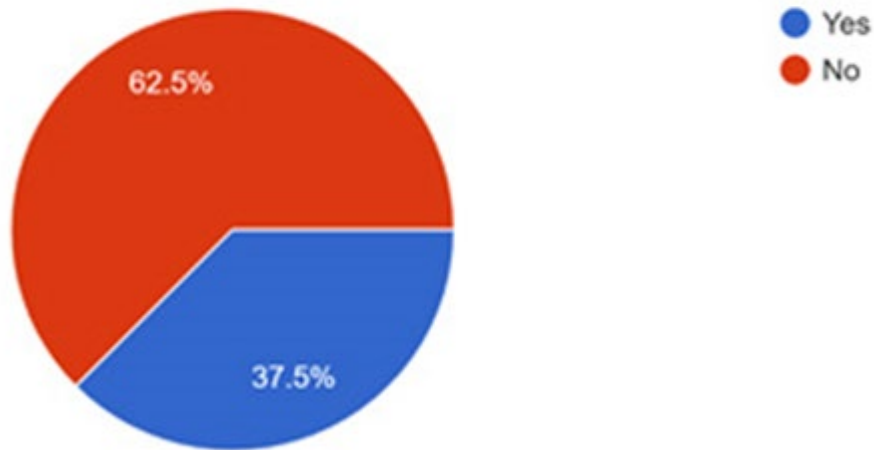
Awareness: Human Exposure to Microplastics



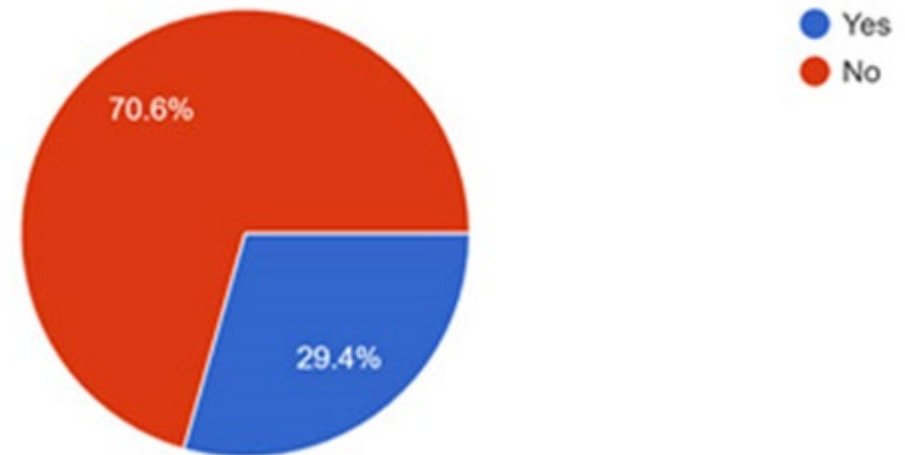
Lack of awareness on certain exposure pathways can be identified.

Publications: Publications (international and national) related to microplastics-related pollution published by the targeted institutes

publish international papers on microplastics

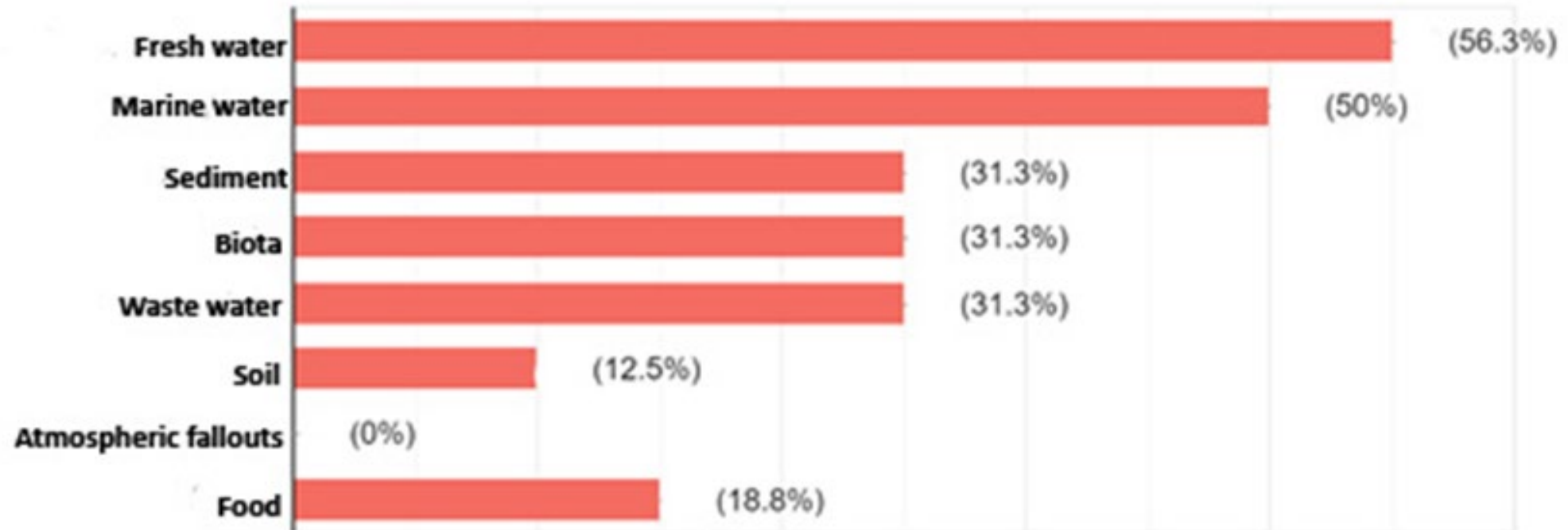


publish national papers on microplastics



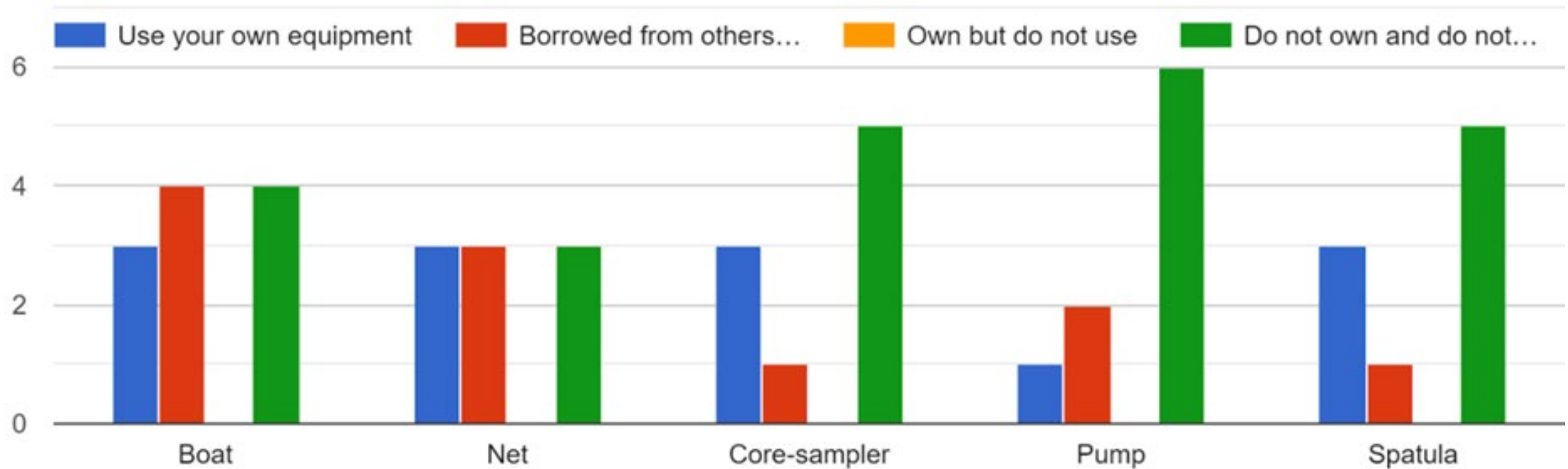
Inland microplastic pollution related information for Sri Lanka is unavailable. National level publications and platforms are to be provided to gather the information.

Areas of Study Microplastics by Institutions



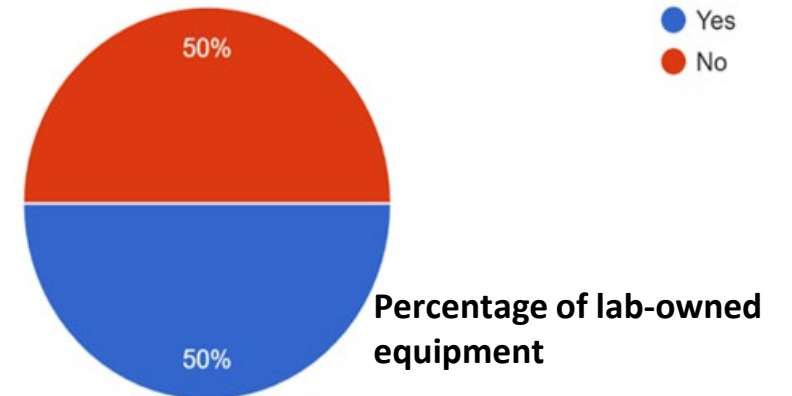
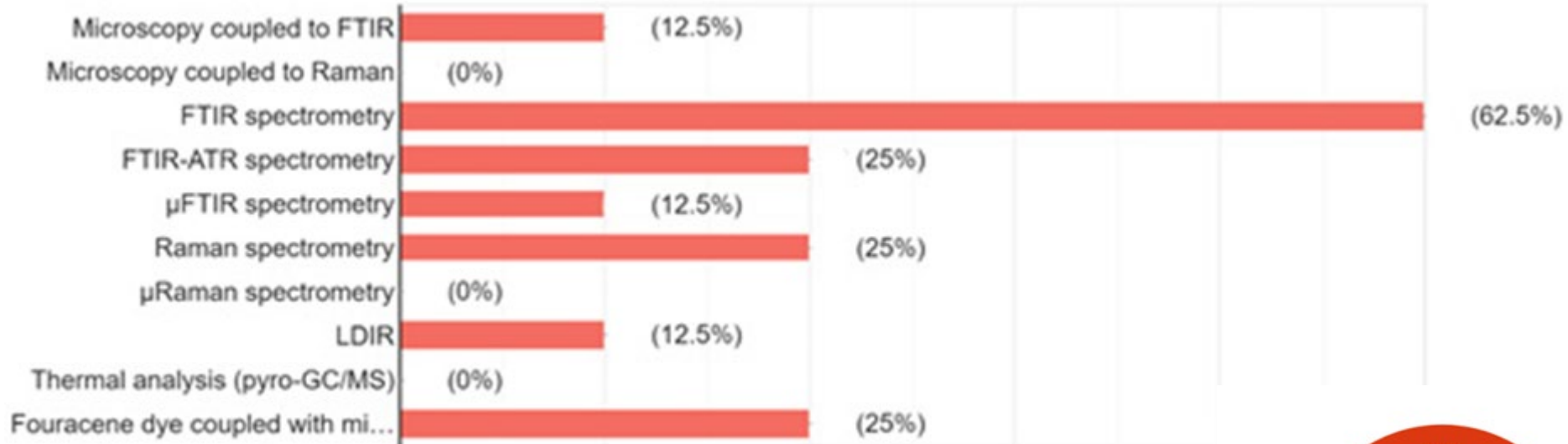
Institute scope cover the most of the compartments related to the microplastic pollution.

Usage and Ownership of Equipment



Sampling equipment usage: Own and borrow, both are commonly practiced.

Techniques and Instruments using



FTIR based analyses were reported as common method in the country.

Certain institutes need to reach other institutes for the polymer analysis

Observed Common Urban Water Cycle in Sri Lanka



Gaps and Capacities Identified

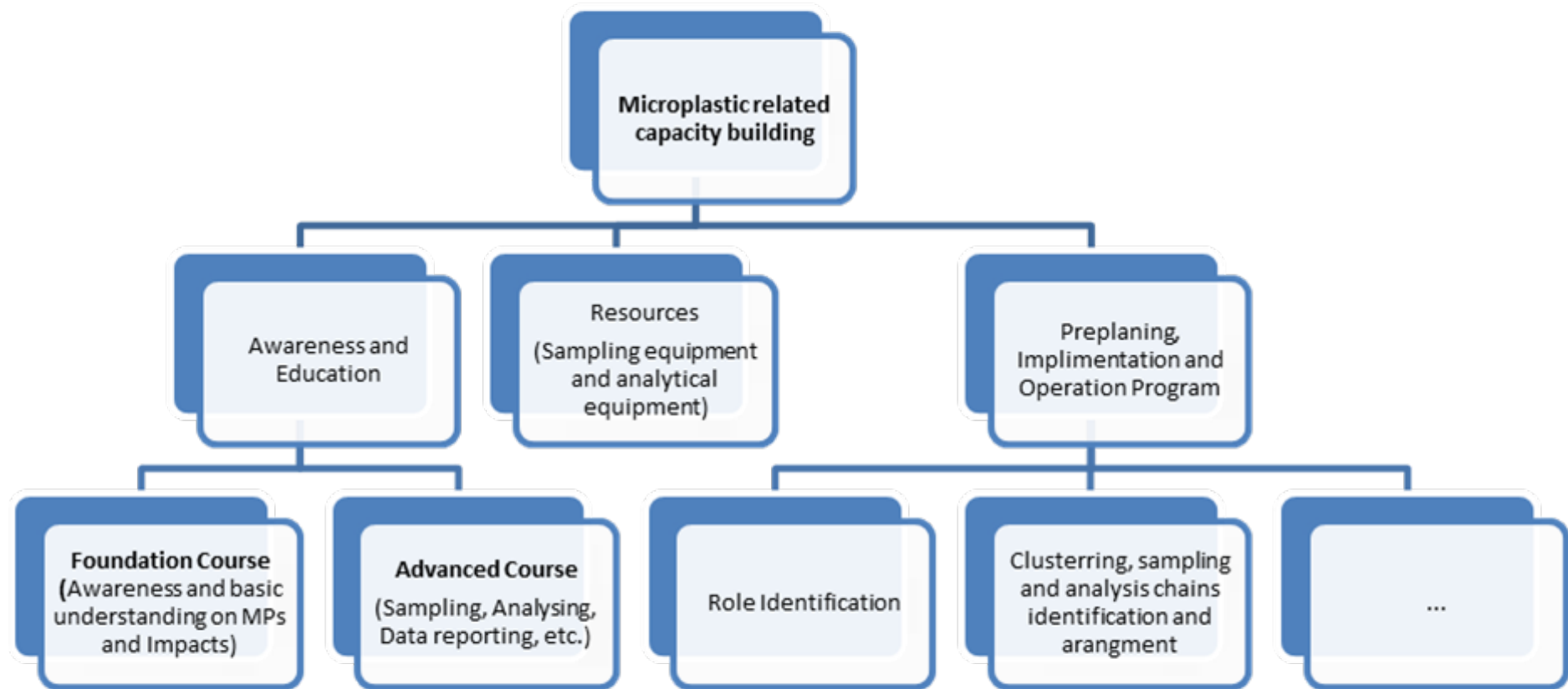
Awareness

- Certain gaps exist in comprehension of the impacts of microplastics.
- Lack of awareness may lead to the lack of attention regarding plastic pollution and microplastics among the potential stakeholder communities, thus potentially hindering their engagement in microplastics monitoring and policymaking processes.
- The majority were in favor of having a monitoring system for microplastics
- Training programs needs to be institutionalized, and individual training modules need to be planned in detail, together with development of supporting resources.

Knowledge/skills and infrastructure/facilities for microplastics monitoring

- At institutional level, lack of technical knowledge and skills has been identified as one factor behind the lack of monitoring despite monitoring being within a particular organization's scope.
- Sampling practices are highly dependent on the available facilities of institutes.
- Institutionalization and coordination of facilities and stakeholders for resource sharing and where/how to access resources are essential.
- Identification of the role of each institution and different sections within institutions.
- Some lab equipment is available for analysis tasks; however, the scope and channeling of equipment for monitoring programs is currently unclear, and thus need to be delineated.
- MOWS currently lacks micro-Raman/FTIR facilities, and while institutional collaboration could resolve this bottleneck during training activities, long-term monitoring programs for drinking water necessitate more concrete provision of facilities.
- At present, some organizations possess organized laboratory systems, and the national water supply and drainage board has a cluster-based system involving regional and central levels. Capacity-building activities should be aimed at further strengthening such systems to enable comprehensive island-wide monitoring programs.

Proposed Training Module



Awareness

- Certain gaps exist in comprehension of the impacts of microplastics.
- Lack of awareness may lead to the lack of attention regarding plastic pollution and microplastics among the potential stakeholder communities, thus potentially hindering their engagement in microplastics monitoring and policymaking processes.

Training Module

Designed two course modules for Sri Lanka for the capacity building program

- Foundation course
- Advanced course

Table 3: Foundation course module

Module Title	Foundation course on microplastic monitoring and evidence-based policy measures
Duration	One day (355 min. excluding breaks)
Classroom lecture	190 min.
Group exercise and discussion	165 min.
Objectives	To provide a basic understanding of the origin of microplastics, their fate and health impacts, and mitigatory technologies – particularly aimed at policymakers, researchers, laboratory analysts, students, and water practitioners.
Learning	On completion of the training participants will be to:

Table 4: Advanced course module

Module Title	Advanced course on microplastic monitoring and evidence-based policy measures
Duration	Four days (1,540 min., excluding breaks)
Classroom lecture	505 min.
Group exercise and discussion	1,035 min.
Objectives	To provide the knowledge needed to understand the origin of micro-plastics, their fate, and health impacts, design experiments, develop analytical methods; conduct detailed investigations for monitoring and mitigatory technologies – aimed particularly at policymakers, researchers, laboratory analysts, students, and water practitioners.
Learning Outcomes	On completion of the training participants will be able to: <ul style="list-style-type: none"> Describe and trace the origin of microplastics Recognize the elements, processes, and mechanisms that affect the water and soil environment Explain and research on the health impacts of microplastics Describe and implement mitigating principles, strategies, and implementation Gain hands-on experience in sampling, pre-treatment, analysis, and data reporting Design and conduct detailed monitoring programs on microplastics
Outline of Sessions	<ol style="list-style-type: none"> 1 Registration and self-introduction of participants 2 Introduction to the program 3 Origin of microplastics and adverse health impacts 4 Recognizing the elements, processes, and mechanisms that affect the water and soil environment, and mitigatory technologies 5 Group activities using case studies and group presentations 6 Field visit (Introduction followed by hands-on experience) <ol style="list-style-type: none"> 1. Identification of sampling points 2. Sampling methods-Water (depth, bottom), Soil 3. Preservation methods 4. Transportation to laboratory 7 Laboratory analysis (Introduction followed by hands-on experience) <ol style="list-style-type: none"> 1. Sample preparation 2. Introduction to analytical instrument operation (micro-Raman and micro-FTIR), troubleshooting 3. Sample measurements, QC, and data analysis 8 Test report preparation and data reporting 9 Presentation based on case studies 10 Identification of policies for microplastics in different countries <p>Discussion, Q&A, Way forward</p>
Recommended Textbooks, websites and references	<ol style="list-style-type: none"> 1. Jenkins et al. (2022) Current State of Microplastic Pollution Research Data: Trends in Availability and Sources of Open Data. https://www.frontiersin.org/articles/10.3389/fenvs.2022.912107/abstract

Training Needs Assessment Report (TNA) Report: Vietnam

Ho Chi Minh City University of Technology (HCMC-UT)
Institute for Global Environmental Strategies (IGES)
Vietnam Institute of Seas and Islands (VISI)

June 2022



TOWARDS MICROPLASTIC MONITORING AND EVIDENCE-BASED POLICY MEASURES

Training Needs Assessment Report (TNA): Sri Lanka

By

Institute for Global Environmental Strategies (IGES)
Joint Research Demonstration Center for Water Technology (JRDC)
National Institute of Fundamental Studies (NIFS)
University of Peradeniya, Sri Lanka (UOP)

June 2022

Conclusions and Future Works

- FAIR data is important for making evidence based policy
- Certain gaps exist in comprehension of the impacts of microplastics.
- Lack of awareness may lead to the lack of attention regarding plastic pollution and microplastics among the potential stakeholder communities. At institutional level, lack of technical knowledge and skills has been identified as one factor behind the lack of monitoring despite monitoring being within a particular organization's scope.
- Sampling practices are highly dependent on the available facilities of institutes.
- Institutionalization and coordination of facilities and stakeholders for resource sharing and where/how to access resources are essential.
- Identification of the role of each institution and different sections within institutions and then coordination.
- Developed training programs to be conducted national and regional level capacity building.

Thank You!



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