

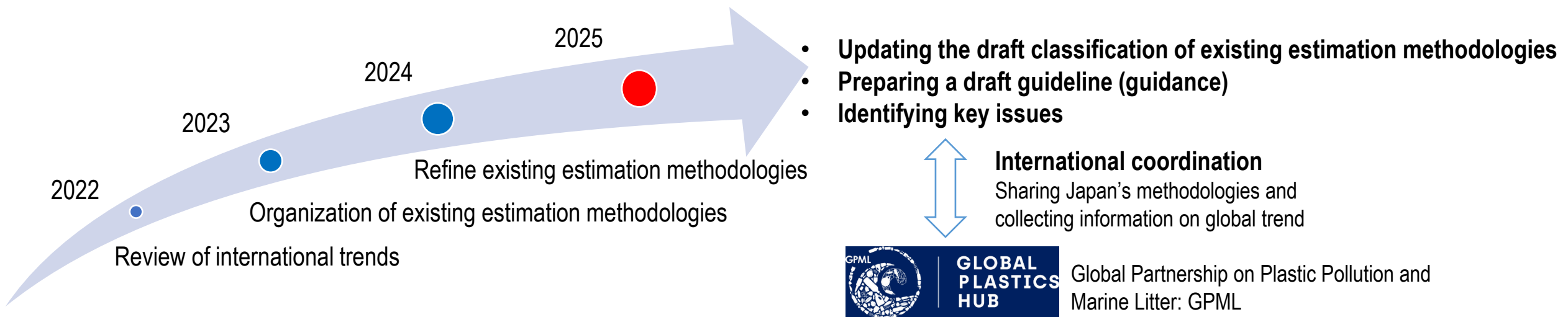
# **Project on Inventory Development Methodology for a Plastic Leakage into the Environment, Including the Marine Environment (FY 2025)**

## Objective: To develop estimation methods for inventory development of plastic leakage into the environment, including the marine environment

|                |                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                   |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Action</b>  | <ul style="list-style-type: none"> <li>To develop a guidance for estimation methods for inventory of plastic leakage into the environment, including the marine environment, which contains a catalogue of estimation methods and a process for selecting an appropriate estimation method.</li> <li>To verify the conductability of an estimation methodology using statistical data in Southeast Asian countries</li> </ul> |                                                                                                                   |
|                |                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                   |
| <b>Members</b> | Masahiro OSAKO                                                                                                                                                                                                                                                                                                                                                                                                                | Fellow, National Institute for Environmental Studies                                                              |
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|                | Go SUZUKI                                                                                                                                                                                                                                                                                                                                                                                                                     | Director, Office of Resource Recycling Technology, National Institute for Environmental Studies                   |
|                | Tadashi TOKAI                                                                                                                                                                                                                                                                                                                                                                                                                 | Professor Emeritus, Tokyo University of Marine Science and Technology                                             |
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|                | Jun NAKATANI                                                                                                                                                                                                                                                                                                                                                                                                                  | Assistant Professor, University of Tokyo, Graduate School of Engineering                                          |
|                | Tadanobu NAKAYAMA                                                                                                                                                                                                                                                                                                                                                                                                             | Prime Senior Researcher, Regional Environment Conservation Division, National Institute for Environmental Studies |
|                | Yasuo Nihei                                                                                                                                                                                                                                                                                                                                                                                                                   | Professor, Tokyo University of Science                                                                            |

# 0. Background, Objectives, Achievements to Date, and Survey Approach

- **Global/National plastic pollution issue:** Project on understanding of the amount of plastic leaked into the ocean in Japan conducted by the Ministry of the Environment, Japan (MOEJ) since **2020**
- **Overall project objective:** To develop methodologies for estimating plastic leakage (macroplastics and microplastics) and to establish a plastic leakage inventory for Japan
- **International trend review in 2022:**
  - ✓ Review conducted toward international harmonization of methodologies for estimating and assessing marine plastic litter
- **Achievements in 2023:**
  - ✓ Develop an outline of the guidelines for estimating plastic discharge into the environment and oceans that can be applied globally (including an organization of existing estimation methodologies)
- **Achievements in 2024:**
  - ✓ Refine existing estimation methodologies and examine their practicality and applicability
  - ✓ Confirmation of the overall direction toward development of the guidelines
- **Activities in 2025:**
  - ✓ Collection of information, including from **Africa and South Asia**, and interviews with experts and stakeholders
  - ✓ **Pilot study in Vietnam and Indonesia** as a **feasibility assessment** for macro-statistics-based estimation approach
  - ✓ Sharing Japan's methodologies and collecting information through **international platforms such as GPML**



# 1. Development of the Guidance

## Guidance on Estimation Methods for Inventory Development of Plastic Leakage into the Environment, Including the Marine Environment

### Contents

#### 1. Background and Objectives

- 1.1 Current status and challenges of global plastic pollution
- 1.2 INC discussion on plastic inventory, leakage estimation, research, scientific evidence, NAP, and monitoring, etc.

#### 2. What is Plastic Leakage Inventory

- 2.1 Current status and challenges of inventory, monitoring, and estimation
- 2.2 Science-based policy decisions and interventions

#### 3. Target, Scope, and Scale

- 3.1 Target Readers of the Guideline
- 3.2 Objectives of leakage estimation, estimation scale, dataset for estimation
- 3.3 Definition of terms

#### 4. Categorization of Estimation Methods

- 4.1 Introduction of Japan's inventory and methods
- 4.2 Categorization of existing plastic leakage estimation methods
- 4.3 Overview of existing plastic leakage estimation methods

#### 5. Selecting and Applying Existing Estimation Methods

- 5.1 Stepwise Workflow for Inventory Development and Method Selection
- 5.2 Linking Policy Use-Cases to Data Families and Estimation Tools (Step 1–3)
- 5.3 Quantifying Leakage Along the Plastic Value Chain Using Coefficients and Models
- 5.4 Methodological Gaps and Operational Usability

**Annex. Case Study (M1/M2 + F): Indonesia / Vietnam**  
(its outcome is to be published in 2026 fiscal year)

# 1-1. Update of the Draft Categorization of Existing Methodologies (After the Expert Meeting)

## 4.2 Categorization of existing plastic leakage estimation methods

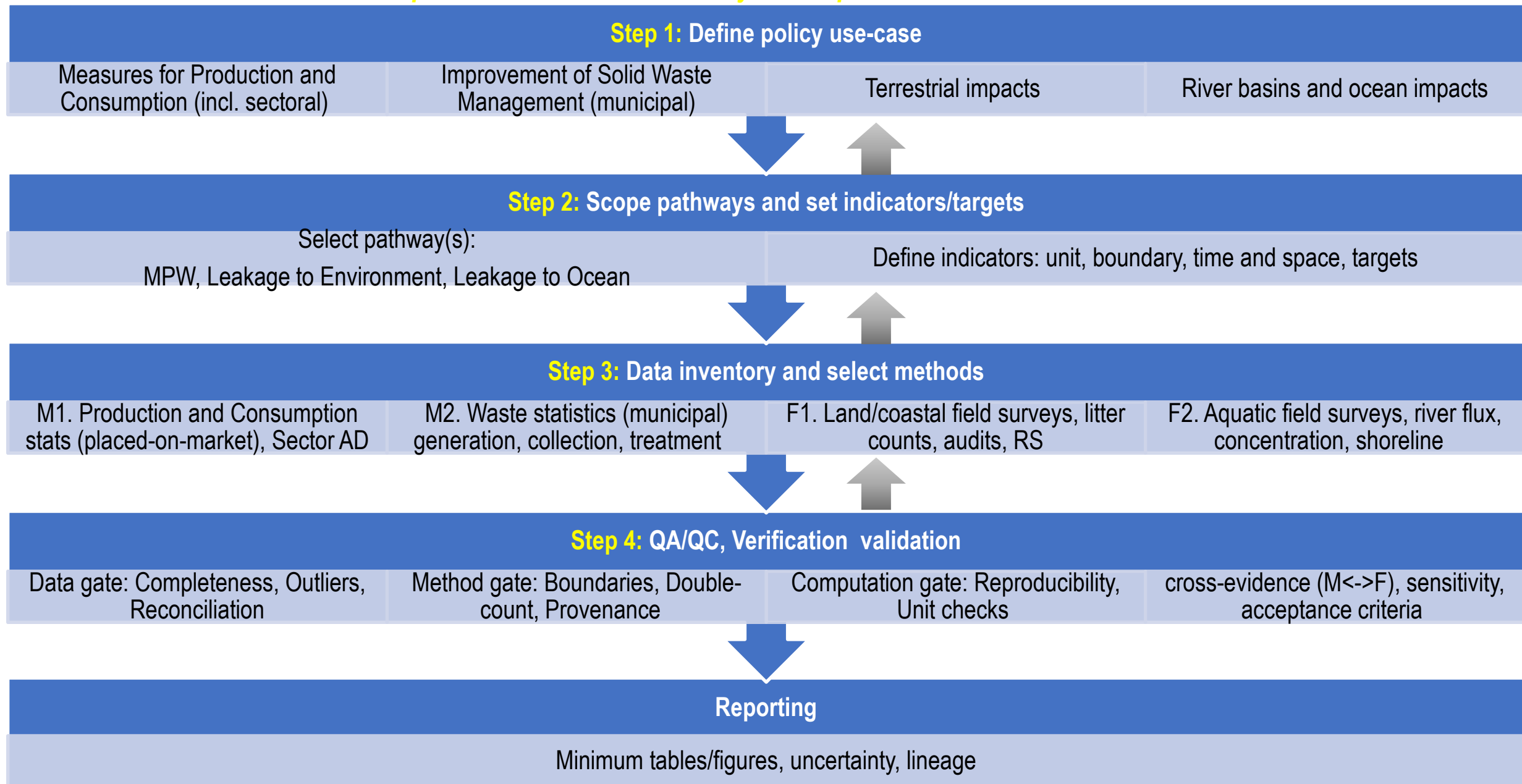
| Major Dataset |    |                                                           | Existing method                              |                                                                                                                                                                                                                                                                                                                                       | Output, Target Indicator | Data Source, Model, National Statistic, Leakage rate | Stakeholder / Measure                                                           |                                                                                         |                                                                                                                    |
|---------------|----|-----------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
|               |    |                                                           |                                              |                                                                                                                                                                                                                                                                                                                                       |                          |                                                      | Stakeholder                                                                     | Indicator                                                                               |                                                                                                                    |
| 1             | M1 | Production & Consumption (total plastic, sector, polymer) |                                              | <ul style="list-style-type: none"><li>Nakatani et al., 2020 (Input-Output Table)</li><li>Toolkit for the product-lifespan method, Basel Convention, 2022</li><li>CGE model ENV-Linkages, OECD, 2020</li></ul>                                                                                                                         |                          | Waste Generation                                     | ENVI/CGE, Input-Output Table, Physical Supply and Use Tables                    | Ministry of Industry, Ministry of Environment (MOE), Statistics Department, etc.        | Reduction, Substitution, SUP reduction/phase-out, green procurement, etc.                                          |
|               |    | Production & Consumption (item)                           | MacP                                         | <ul style="list-style-type: none"><li>MOEJ, 2024 (Macro-statistical approaches (using PET bottle /polymer type consumption data (M1) and leakage rate from filed survey (F))</li></ul>                                                                                                                                                |                          | Leakage to Ocean                                     | National Statistic, Discharge rate, etc.                                        |                                                                                         |                                                                                                                    |
|               |    |                                                           | MicP                                         | <ul style="list-style-type: none"><li>UNEP, 2018</li><li>ICF&amp;Eunomia, 2018</li></ul>                                                                                                                                                                                                                                              |                          | Waterway, Soil                                       | National Statistic, Discharge rate, etc.                                        |                                                                                         |                                                                                                                    |
|               |    |                                                           |                                              | <ul style="list-style-type: none"><li>ECHA, 2020</li></ul>                                                                                                                                                                                                                                                                            |                          | Waterway, Soil, Air, Waste Treatment                 |                                                                                 |                                                                                         |                                                                                                                    |
|               |    |                                                           |                                              | <ul style="list-style-type: none"><li>MOEJ, 2024 (Source- and item-based estimation methods)</li></ul>                                                                                                                                                                                                                                |                          | Water, Soil Ocean                                    |                                                                                 |                                                                                         |                                                                                                                    |
| 2             | M2 | Waste Management                                          | Waste Flow                                   | <ul style="list-style-type: none"><li>Waste Flow Diagram (WFD), GIZ, 2020</li><li>Toolkit for material flow analysis method, Basel Convention, 2022</li><li>Plastic Pollution Calculator (PPP), ISWA/UoL, 2019</li></ul>                                                                                                              |                          | Leakage to Land & Ocean                              | National Statistic, etc.                                                        | Ministry of Environment (MOE), Ministry of Interior (MOI), Local Government (LGs), etc. | 3Rs, improved waste collection, EPR, various recycling schemes, introduction of WtE, improved landfill sites, etc. |
|               |    |                                                           |                                              | <ul style="list-style-type: none"><li>National Analysis and Modelling (NAM) Tool, GPAP, 2022</li><li>SPOT Model, Cottom et al., 2024</li></ul>                                                                                                                                                                                        |                          |                                                      | National Statistic, Discharge rate, etc.                                        |                                                                                         |                                                                                                                    |
|               |    |                                                           |                                              |                                                                                                                                                                                                                                                                                                                                       |                          |                                                      | Global, National Statistic, Statistic model, etc.                               |                                                                                         |                                                                                                                    |
|               |    |                                                           |                                              |                                                                                                                                                                                                                                                                                                                                       |                          |                                                      |                                                                                 |                                                                                         |                                                                                                                    |
| 3             | F  | Field survey and Monitoring                               | Coastal and other Land Field Measurements    | <ul style="list-style-type: none"><li>Regional Assessment on Marine Litter in the East Asian Seas, CSIRO and COBSEA, 2024</li></ul>                                                                                                                                                                                                   |                          | Leakage to Land                                      | Survey, Statistic model                                                         | MOE, LGs                                                                                | Mitigation measures (Collection, Awareness-raising, etc.), Impact assessment of the mitigation measures            |
|               |    |                                                           |                                              | <ul style="list-style-type: none"><li>MOEJ, Beach litter survey, (latest result: 2025)</li></ul>                                                                                                                                                                                                                                      |                          | Leakage to Land & Ocean                              | Survey, extrapolation                                                           |                                                                                         |                                                                                                                    |
|               |    |                                                           | Aquatic (mainly Riverine) Field Measurements | <ul style="list-style-type: none"><li>Schmidt et al., 2017</li><li>Lebreton et al., 2017</li><li>Van Emmerik et al., 2019</li><li>Nihei et al., 2020</li><li>Meijer et al., 2021</li><li>Plastic Waste Discharges, World Bank, 2021</li><li>Mellink et al., 2022</li><li>MOEJ, Pumping station survey (latest result: 2025)</li></ul> |                          | Leakage to Ocean                                     | Survey, GIS,/Hydrological/ Social Economic related data source, Statistic model | MOE, Water & Marine related departments, LGs                                            |                                                                                                                    |
|               |    |                                                           |                                              |                                                                                                                                                                                                                                                                                                                                       |                          |                                                      |                                                                                 |                                                                                         |                                                                                                                    |

(Note)

- The estimation methods used by OECD (ENV-Linkages model + UOL + DTU) and UNEP (National Guidance on Plastic Pollution Hotspotting and Shaping Action) integrate data from both M1 and M2.)
- The current version does not yet fully address how to estimate direct plastic leakage into the ocean from at-sea activities such as shipping and fishing, or from particles released from marine paints and coatings. 5

## 1-2. Steps for Determining the Estimation Methodology

### 5.1 Stepwise Workflow for Inventory Development and Method Selection



# 1-3. Correspondence between Policy Needs, Data, and Existing Methodologies

## (5.2 Linking Policy Use-Cases to Data Families and Estimation Tools (Step 1–3))

### Step 1. Define policy use-case

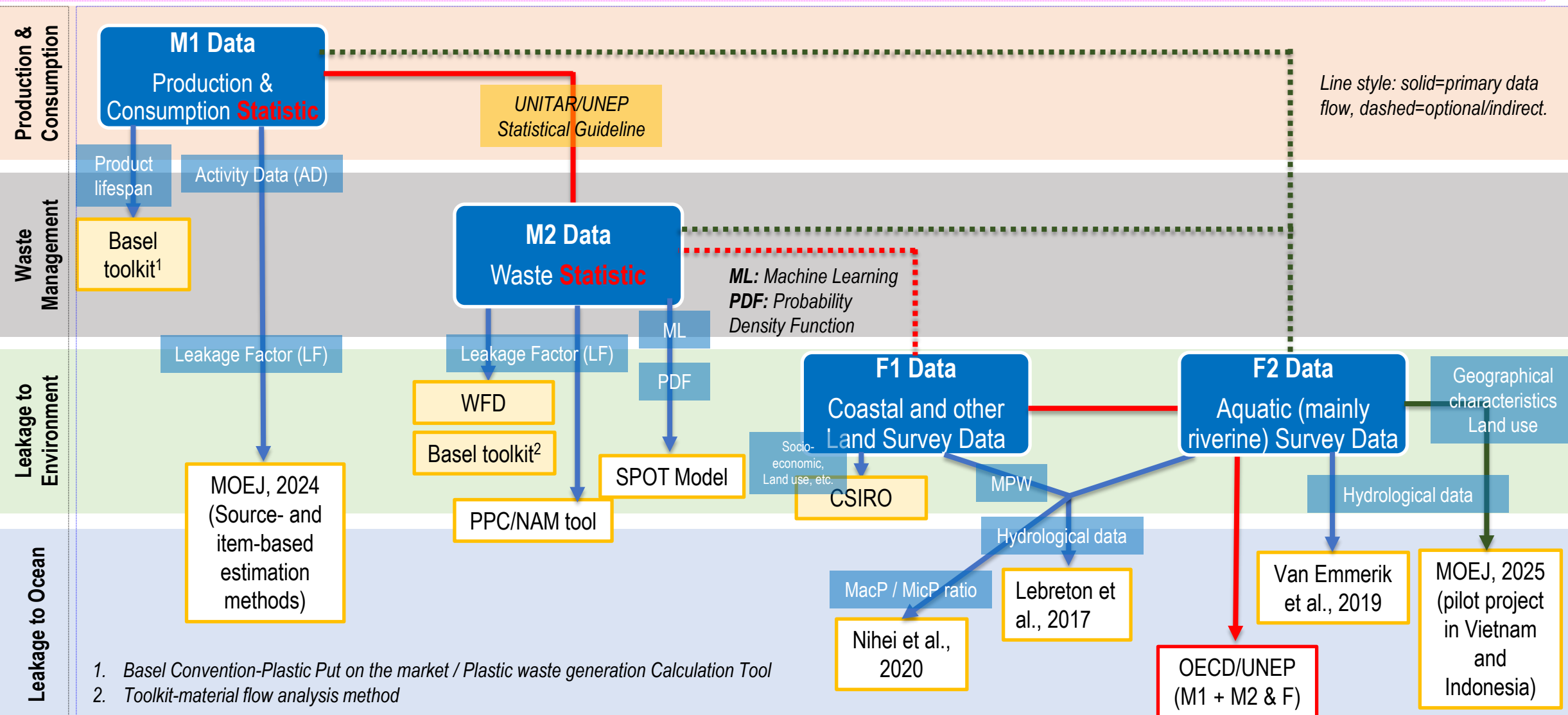
1. Measures for Production & Consumption

2. Improvement Solid Waste Management

3. Impact of terrestrial ecosystem

4. Impact on river basins and ocean

### Step 2. Scope Pathways & Set Indicators/Targets



### Step 3. Data inventory and select methods

1-4. Identification of Existing Methodologies and Gap Areas (5.4 Methodological Gaps and Operational Usability)

| Target Output \ Major Dataset |                                    | Data Families                                                                                                                                                                           |                                                                                                                   |                                                       |                                                                                                                                   | Research-Rich,<br>Toolkit-Limited |
|-------------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
|                               |                                    | M1. Production & Consumption (including Sector Activity Data)                                                                                                                           | M2. Solid Waste Management                                                                                        | F1. Coastal and other Land Field Measurements         | F2. Aquatic (mainly Riverine) Field Measurements                                                                                  |                                   |
| Output (Target)               | Production & Consumption           | <ul style="list-style-type: none"><li>Toolkit for the product-lifespan method, Basel Convention, 2022 (Plastic Put on the market Calculation Tool)</li><li>Input-Output Table</li></ul> | <ul style="list-style-type: none"><li>N.A.</li></ul>                                                              | <ul style="list-style-type: none"><li>N.A.</li></ul>  | <ul style="list-style-type: none"><li>N.A.</li></ul>                                                                              |                                   |
|                               | Solid Waste Generation, Waste Flow | <ul style="list-style-type: none"><li>Toolkit for the product-lifespan method, Basel Convention, 2022 (Plastic waste generation Calculation Tool)</li><li>Input-Output Table</li></ul>  | <ul style="list-style-type: none"><li>Toolkit for material flow analysis method, Basel Convention, 2022</li></ul> | <ul style="list-style-type: none"><li>N.A.</li></ul>  | <ul style="list-style-type: none"><li>N.A.</li></ul>                                                                              |                                   |
|                               | Leakage to Land (including MPW)    | <ul style="list-style-type: none"><li>MOEJ, 2024 (Source- and item-based estimation methods)</li><li>UNEP/EU (under development)</li></ul>                                              | <ul style="list-style-type: none"><li>WFD</li><li>PPC/NAM tool</li><li>SPOT Model</li></ul>                       | <ul style="list-style-type: none"><li>CSIRO</li></ul> | <ul style="list-style-type: none"><li>N.A.</li></ul>                                                                              |                                   |
|                               | Leakage to Sea                     |                                                                                                                                                                                         |                                                                                                                   | <ul style="list-style-type: none"><li>N.A.</li></ul>  | <ul style="list-style-type: none"><li>Lebreton et al., 2017</li><li>Van Emmerik et al., 2019</li><li>Nihei et al., 2020</li></ul> |                                   |

Matrix Table Above

**Purpose:** To identify the applicability of existing methodologies and methodological gaps at the intersections of Output × Data Family

**How to read:** Diagnose whether estimation is possible or not depending on the target output and the data family used

**Strength:** Helps identify areas where gaps remain or tool development is needed, and clarifies priority issues

# Proposal: Organizing Estimation Methodologies Based on Aquatic Field Data (F) and Developing a Toolkit (Addressing the Gap in the F2 Domain through the Development of a Practical Toolkit)

- Estimate leakage by (i) a survey at a **pumping-station screen** and (ii) **interval-camera image analysis** of waste.
- Three methods: 1. Land-use based, 2. Per-capita, and 3. Catchment-area based.

Drainage Pump Stations Screen at **Within a City / Outside of a City**

(A) **Amount of PW discharged per volume (kg/m<sup>3</sup>)**  
(B) **PW captured by cameras, not the Screen (kg)**

## Method 1

Multiply by (A) by

- **Annual runoff volume (m<sup>3</sup>) from rainfall in urban/ non-urban areas**

Multiply A by the **annual runoff volume (m<sup>3</sup>)** from the **catchment area** to calculate the **annual PW amount** at the **survey site (kg)** - (A')

## Method 2

Multiply A' by the **ratio** of

- **Total JPN Pop / Catchment Area Pop.**

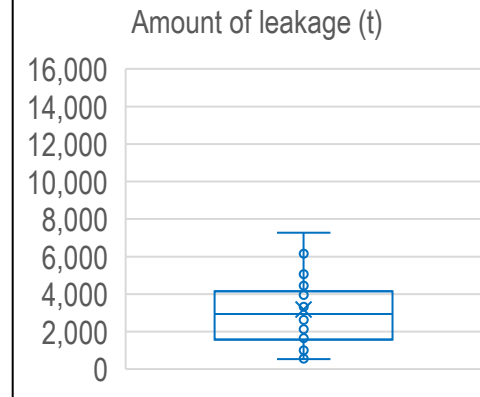
## Method 3

Multiply A' the **ratio** of

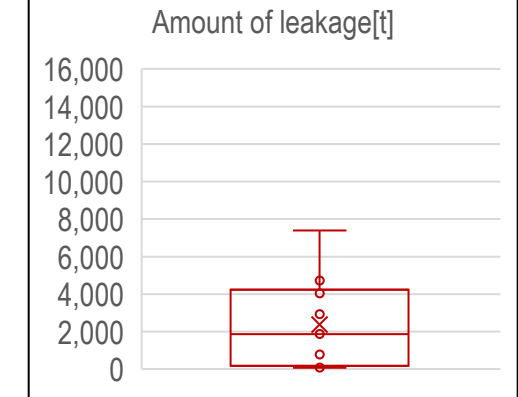
- **Total JPN area / catchment area**

**Macroplastics leakage amount from land to sea (t) in Japan**

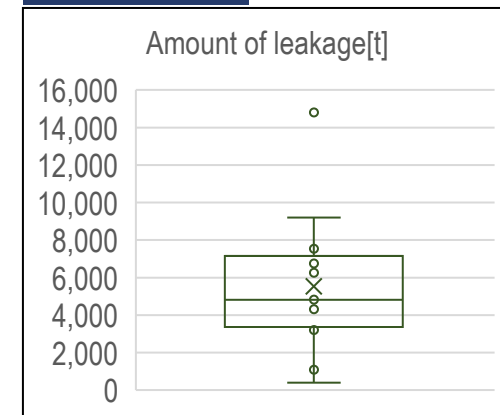
## Method 1



## Method 2



## Method 3



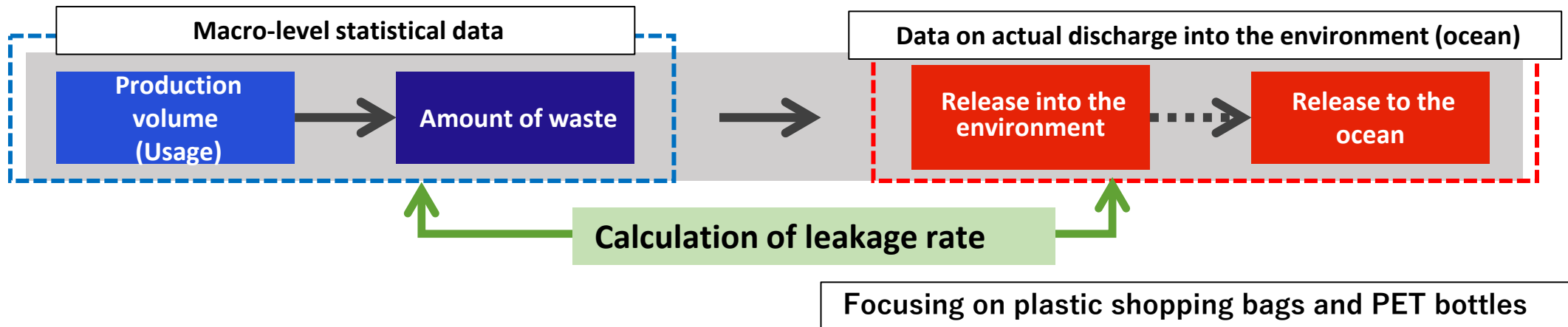
**FY2025**  
**Feasibility Study on Estimation Methods Utilizing**  
**Macroeconomic Data**  
**Results of the Field Survey**

- 1. Overall Purpose of the Surveys**
- 2. Methods for Estimating Leakage Using Macro-level Statistical Data**
- 3. Overview of the FY2025 Surveys**
- 4. Results of the FY2025 Field Surveys (Indonesia and Vietnam)**
- 5. Identification of Issues from the FY2025 Surveys**

# 1. Overall Purpose of the Surveys

## ■ Objectives of the FY2025 Surveys

- In addition to collecting additional statistical data for Indonesia and Vietnam, **we will conduct field surveys and calculate leakage rates using field data obtained through our surveys, with the aim of estimating plastic leakage volumes** (comparison with leakage volumes based on the FY2024 literature review). We will also refine leakage volumes taking into account national and regional land use patterns.
- **In Indonesia**, we will investigate the amount of plastic leakage into the environment through **image-based monitoring**, and **in Vietnam**, through **field surveys of waste composition**. Based on the survey results and statistical data on usage, we will determine leakage rates and apply these rates to all plastic products to estimate **the amount of plastic waste released from each country** (estimating leakage volume using field surveys and macro-level statistical data).
- Regarding the survey utilizing macro-level statistical data, the target **for the FY2025 survey** will be **plastic shopping bags, and PET bottles**—which were the **representative plastic products** targeted in the FY2024 survey—.



## 2. Method for Estimating Leakage Using Macro-level Statistical Data

### ■ Process for Estimating Leakage Volume Using Macro-Level Statistical Data

#### 1. Calculation of the Leakage Volume of a Specific Product into the Environment

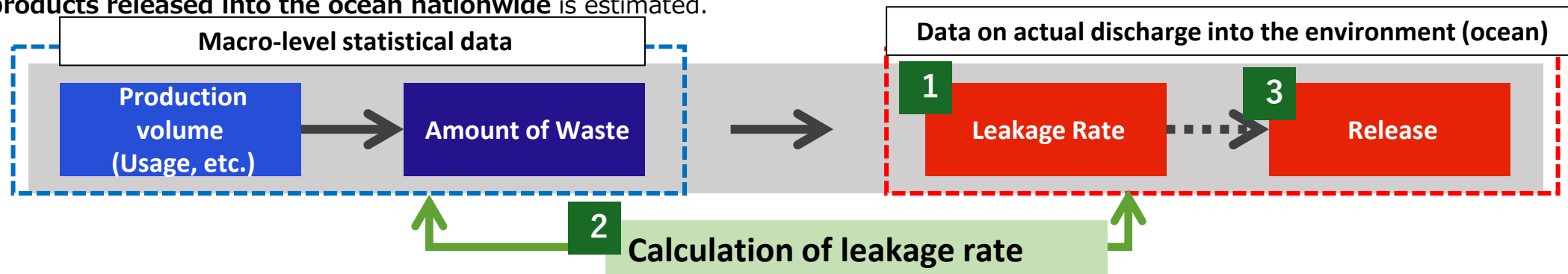
**Based on** on-site **field surveys**, we determine **the amount of leakage into the environment**, calculate the leakage per **unit area or per capita** within the catchment area of the target location, and then calculate the “amount of leakage into the environment” for a specific product nationwide. In the FY2025 surveys, for both Indonesia and Vietnam, we calculated the **amount of leakage into rivers (approximately equivalent to leakage into the ocean)**, targeting plastic shopping bags and PET bottles.

#### 2. Calculation of the Rate of Leakage into the Environment for Specific Products

The “**Rate of leakage into the environment**” for a specific product is calculated by dividing the “environmental leakage volume” of that product, as determined in Step 1, by the domestic statistical data for that product, such as “production volume, usage volume, and waste generation volume.”

#### 3. Estimating the total amount of plastic products entering the ocean

The leakage rates for specific products determined in Step 2 are applied to **the total plastic products in the country**. By multiplying the “production volume (usage volume)” of plastic products in the country by the “release rate into the environment,” **the total volume of plastic products released into the ocean nationwide** is estimated.



# (Reference) Inclusion in the guidance

The outcome of the field surveys will be described in the guidance to be published in 2026 fiscal year, and the estimation method used in the field survey corresponds to M1 in the guidance’s (Guidance on Estimation Methods for Inventory Development of Plastic Leakage into the Environment, Including the Marine Environment) classification of estimation methods.

| Estimation Methods (Primary Data Sources) |    |                                                                | Estimation Examples                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                    | Key Outputs and Target Metrics                                                   | Data Sources, Models, National statistics, outflow rates, etc. | Government Officials/Countermeasures (Examples)                                            |                                                                                                                                                |
|-------------------------------------------|----|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           |    |                                                                |                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |                                                                | Relevant Ministries                                                                        | Activities/Indicators                                                                                                                          |
| 1                                         | M1 | Production and Consumption (Total plastics, by Sector/Polymer) | • Nakatani et al., 2020, (Input-Output Analysis)<br>• Toolkit for the product-lifespan method, Basel Convention, 2022<br>• CGE model ENV-Linkages, OECD, 2020 |                                                                                                                                                                                                                                                                                                                                                                                    | Waste generation                                                                 | ENVI/CGE, Input-Output Tables, Physical Supply and Use Tables  | • Ministry of Industry.<br>• Fisheries Agency                                              | • Reduction in usage fees<br>• Substitutes<br>• Reduction of SUP<br>• Phase-out<br>• Green procurement<br>• Lost fishing gear, etc.            |
|                                           |    | Production and Consumption (by Product Category)               | MacP                                                                                                                                                          | • Macro-level estimates for PET bottles, Ministry of the Environment, 2024                                                                                                                                                                                                                                                                                                         | Environment (Land and Marine) Discharge Volume                                   | National Statistics, Discharge Rate, etc.                      |                                                                                            |                                                                                                                                                |
|                                           |    |                                                                | MicP                                                                                                                                                          | • UNEP, 2018<br>• ICF & Eunomia, 2018                                                                                                                                                                                                                                                                                                                                              | Water bodies, soil                                                               | National statistics, discharge rates, etc.                     |                                                                                            |                                                                                                                                                |
|                                           |    |                                                                |                                                                                                                                                               | • ECHA, 2018<br><br>• Ministry of the Environment, 2024 (Estimates by source and product category)                                                                                                                                                                                                                                                                                 | Water, Soil, Air, Waste Management<br><br>Water bodies, soil, marine environment |                                                                |                                                                                            |                                                                                                                                                |
| 2                                         | M2 | Waste                                                          | Waste Flow                                                                                                                                                    | • Waste Flow Diagram (WFD), GIZ, 2020                                                                                                                                                                                                                                                                                                                                              | Environment (Land and Marine) Discharge Volume                                   | National Statistics, etc.                                      | • Ministry of the Environment and<br>Ministry of the Interior<br>• Local Government System | • 3Rs<br>• Improvements in Waste Collection<br>• EPR<br>• Various recycling programs<br>• Introduction of WtE<br>• Landfill improvements, etc. |
|                                           |    |                                                                |                                                                                                                                                               | • Toolkit for Material Flow Analysis Method, Basel Convention, 2022<br>• Plastic Pollution Calculator (PPP), ISWA/UoL, 2019                                                                                                                                                                                                                                                        |                                                                                  | National Statistics, Discharge Rates, etc.                     |                                                                                            |                                                                                                                                                |
|                                           |    |                                                                |                                                                                                                                                               | • National Analysis and Modeling (NAM) Tool, GPAP, 2022<br>• SPOT Model, Cottom et al., 2024                                                                                                                                                                                                                                                                                       |                                                                                  | Global and national statistics, etc.                           |                                                                                            |                                                                                                                                                |
| 3                                         | F  | Field Data                                                     | Coastal and Land-Related                                                                                                                                      | • Regional Assessment on Marine Litter in the East Asian Seas, CSIRO and COBSEA, 2024<br>• Estimates of Coastal Plastic Waste, Ministry of the Environment, 2024<br>• Comprehensive Environmental Research Promotion Fund Project S-19, FY2021–2025                                                                                                                                | Land-based Runoff                                                                | Survey, Statistical Model                                      | • Ministry of the Environment<br>• Governance System                                       | • Mitigation Measures (Collection, Awareness Campaigns, etc.)<br>• Impact assessment of the results of the above activities, etc.              |
|                                           |    |                                                                | Water systems (River-centered)                                                                                                                                | • Schmidt et al., 2017<br>• Lebreton et al., 2017<br>• Van Emmerik et al., 2019<br>• Nihei et al., 2020<br>• Meijer et al., 2021<br>• Plastic Waste Discharges, World Bank, 2021<br>• Mellink et al., 2022<br>• Ministry of the Environment (Field measurements at wastewater treatment plants)<br>• Comprehensive Environmental Research Promotion Fund Project S-19, FY2021–2025 | Environmental (Terrestrial and Marine) Runoff                                    | Survey, extrapolation                                          |                                                                                            |                                                                                                                                                |
|                                           |    |                                                                |                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                    | Marine discharge volume                                                          | Survey, Statistical Model, Discharge Rate                      |                                                                                            |                                                                                                                                                |

(Reference) The OECD (which integrates models from the University of Leeds, the Technical University of Denmark, and others into the ENV-Linkages Modelling Framework) and UNEP (National Guidance on Plastic Pollution Hotspotting and Shaping Action) employ estimation methods that integrate data from M1 and M2

### 3. Overview of the FY2025 Surveys

Field surveys were conducted in Indonesia and Vietnam using different survey methods; the survey overview is as follows.

| Item                                        | Indonesia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Vietnam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| City                                        | Jakarta (city center, urban area)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Hanoi (approximately 20 km from the city center, an area with extensive farmland)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Location                                    | River (tributary of the Siden River)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Pumping station (connected to the Nué River)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Survey Method                               | Image-based monitoring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Waste composition survey<br>(Waste that could not be collected was estimated by image interpretation)                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Survey Dates and Period                     | November 25–December 22, 2025 (some data missing)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | December 4, 2025 (Waste Collection Day)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Season                                      | Rainy season (November–April)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Transition period from the rainy season to the dry season                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Ratio of Population                         | 1/4,992<br>(57,027 people within the basin: 284,438,800 people total)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1/4,208<br>(24,000 people within the basin: 109.8 million people total)                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Area ratio                                  | 1/536,054<br>(3.53 km within the basin : Total 1,892,410.09 km <sup>2</sup> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1/31,392<br>(Within the basin : 10.49 km <sup>2</sup> : Total: 329,241 km <sup>2</sup> )                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Calculation Method for Annual leakage (t/y) | <ul style="list-style-type: none"><li>Analyze the video to obtain the debris discharge area (m<sup>2</sup> /s) for each video</li><li>Convert to debris discharge weight (g/s) using the M/A value (from on-site samples)</li><li>Organize the cross-sectional areas at each water level, multiply them by the flow velocity in each video, and obtain the flow rate (m<sup>3</sup> /s) for each video</li><li>Derive the L-Q equation (a relationship between discharge and flow rate) from the debris discharge weight (g/s) and flow rate (m<sup>3</sup> /s)</li><li>Estimate the annual flow rate (m<sup>3</sup> /s) at the monitoring site using monitoring data and rainfall data</li><li>Substitute the annual flow rate (m<sup>3</sup>/s) into the L-Q equation to estimate the annual leakage volume</li></ul> | <ul style="list-style-type: none"><li>Calculate the total amount of waste present in the river at the time of the survey based on the waste volume calculated from the results of the waste composition survey and from image interpretation</li><li>Calculate the daily waste volume and multiply by 365 to estimate the annual discharge volume (t/y)</li><li>However, since the duration of waste accumulation is unknown in this case, minimum and maximum periods were set when calculating the daily waste collection volume</li></ul> |

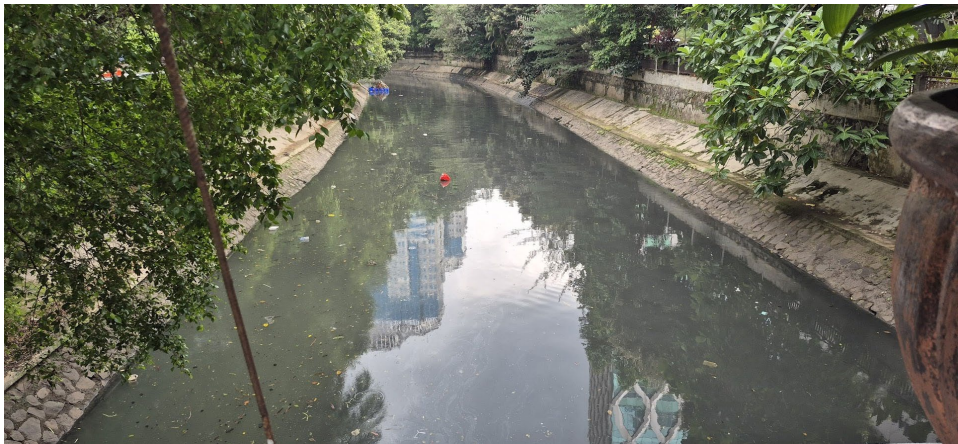
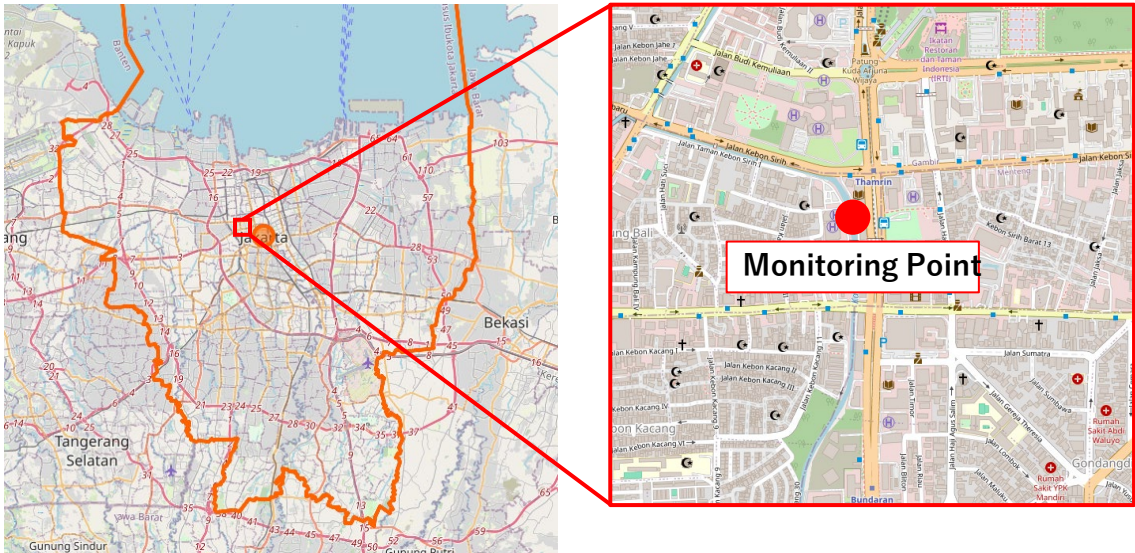
# Indonesia

- ① Report on Survey Sites
  - ② Field Survey Results
  - ③ Estimates of Annual Plastic Bag and PET Bottle Waste in Indonesia
  - ④ Organization of Statistical Data
  - ⑤ Estimation of Waste Discharge Using Macro-level Statistical Data
- Compilation of FY2025 Estimation Results for Indonesia

# ① Report on Survey Locations

We identified the following four locations as candidates suitable for conducting this year’s image-based monitoring. After careful consideration, we selected the tributary of the Siden River in front of the BRIN headquarters (in the Jakarta Bay basin, a tributary of the Kali Siden River) for continuous monitoring, taking into account the safety of the survey point, and installed monitoring equipment to conduct the survey.

| Site Name                     | Equipment Installation | Safety of the survey point | Water Level Data | Network | Notes                   |
|-------------------------------|------------------------|----------------------------|------------------|---------|-------------------------|
| Angkor Bridge                 | ✓                      | ×                          | ✓                | ✓       | Low-tide zone           |
| In front of BRIN Headquarters | ○                      | ○                          | ×                | ✓       | Security guards on duty |
| Carlet Sluice Gate            | △                      | △                          | ○                | ○       |                         |
| Mangarai Lock                 | ×                      | -                          | ○                | ○       |                         |



② Results of the on-site survey (1) Summary of the weight and volume of each type of waste

Collected samples at the waste collection point 800 m downstream (where an oil boom is installed) and analyzed the relationship between weight and area



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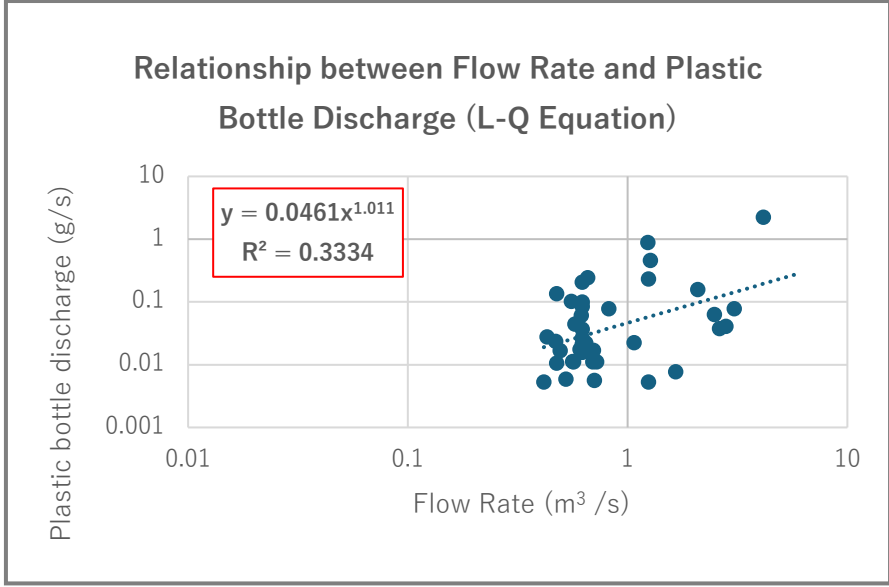
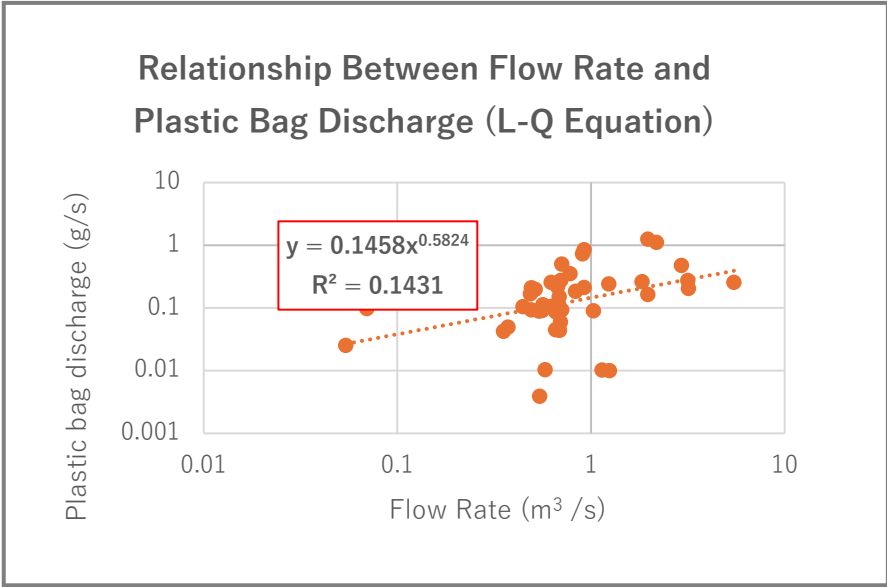


| Category              | Number of Samples | Relationship between weight and area (kg/m <sup>2</sup> ) |
|-----------------------|-------------------|-----------------------------------------------------------|
| Plastic shopping bags | 6                 | 0.137                                                     |
| PET Bottles           | 12                | 1.378                                                     |

## ② Field Survey Results (2) Summary of Analysis Results and Estimation of Annual Leakage at Monitoring Sites

Monitoring equipment was installed for approximately one month. Although there were some missing data due to issues with the network environment and power supply, a total of 351 video clips were acquired. By performing image analysis on this data, we derived the L-Q equation (a relationship between flow rate and discharge) from the river flow rate (m<sup>3</sup> /s) and the discharge of plastic bags and PET bottles (g/s) at the monitoring sites, as shown in the figure below.

| Date  | Acquired Number of Data | Remarks                        |
|-------|-------------------------|--------------------------------|
| 11/25 | 9                       |                                |
| 11/26 | 72                      |                                |
| 12/1  | 8                       | Data available during rainfall |
| 12/2  | 36                      |                                |
| 12/3  | 62                      |                                |
| 12/4  | 29                      | Data available during rainfall |
| 12/5  | 45                      |                                |
| 12/6  | 17                      |                                |
| 12/12 | 2                       |                                |
| 12/15 | 1                       |                                |
| 12/16 | 10                      |                                |
| 12/17 | 18                      |                                |
| 12/18 | 21                      | Data available during rainfall |
| 12/19 | 15                      | Data available during rainfall |
| 12/22 | 6                       |                                |
| Total | 351                     |                                |

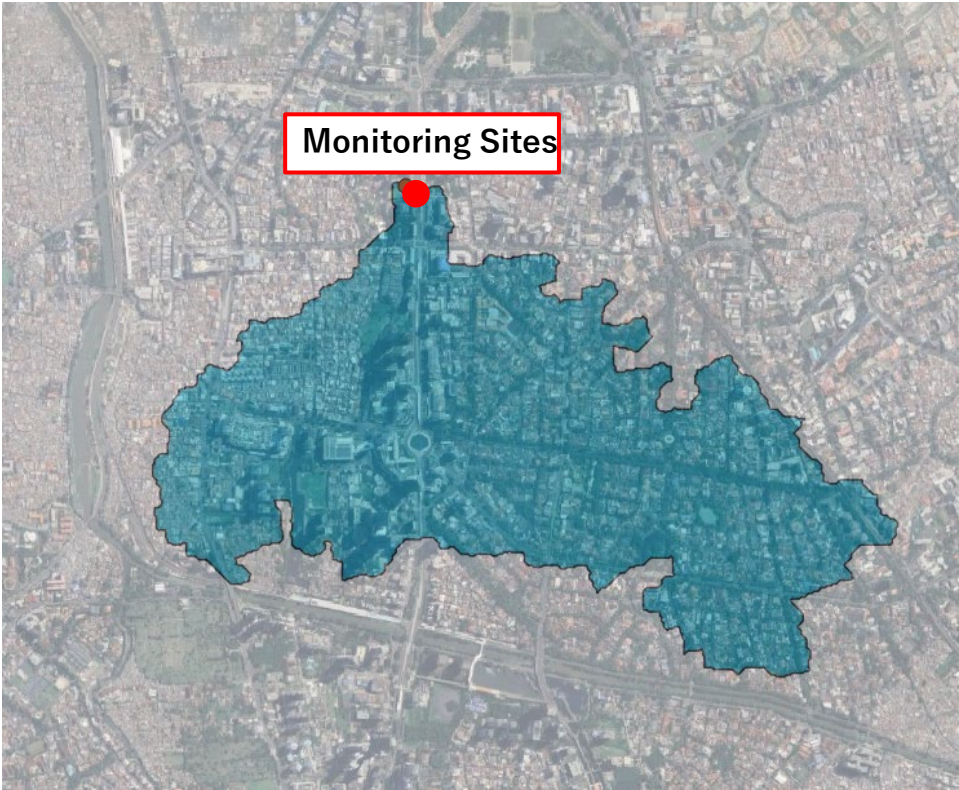


To determine the annual flow rates (m<sup>3</sup> /s) at monitoring sites for put in the L-Q equations, we utilized GPM IMERG Half Hourly (3IMERGHHL) rainfall data to establish the relationship between these flow rates and the data obtained from field surveys. By substituting the annual flow rates (m<sup>3</sup>/s) at these monitoring sites into the L-Q equation, we estimated the annual leakage of plastic bags and PET bottles at the monitoring sites.

To perform image analysis, we used PRIMOS\*, which is movie analysis system utilizing AI.  
\*Joint development of a new system called "PRIMOS" , that automatically detects and classifies river waste using AI (Ehime University in Japan)

### ③ Estimation of Annual Leakage Volume of Plastic Bags and PET Bottles in the Environment in Indonesia

We compiled data on leakage volume and catchment areas at monitoring sites, and used these data of catchment areas to calculate the annual leakage volumes of plastic shopping bags and PET bottles in Indonesia based on population and land area ratios.



| Item       | Catchment Area                                                   | Indonesia as a whole         |
|------------|------------------------------------------------------------------|------------------------------|
| Population | 57,027<br>(Based on Jakarta's population density, 16,155 people) | 284,438,800                  |
| Area       | 3.53 km <sup>2</sup>                                             | 1,892,410.09 km <sup>2</sup> |

④ Organization of Statistical Data (Indonesia)

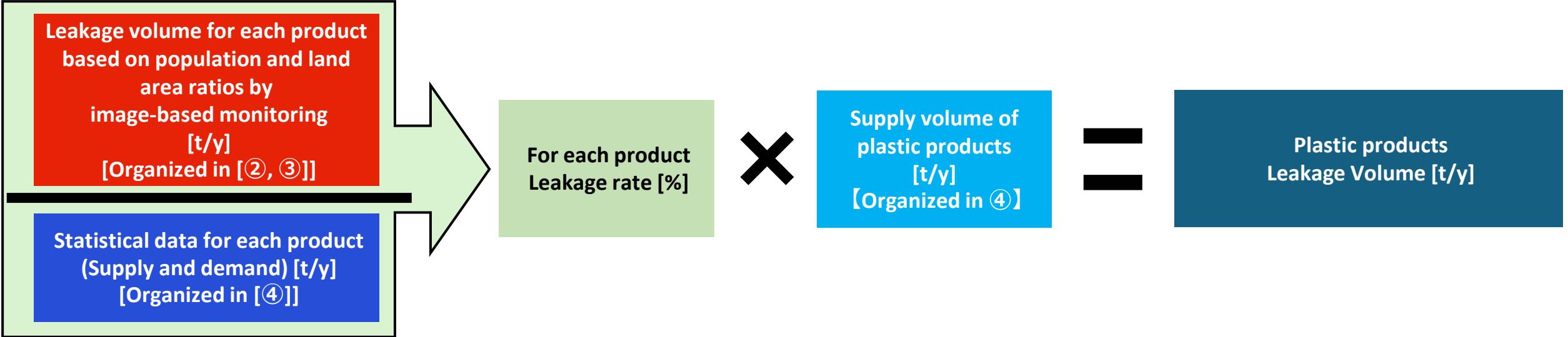
To estimate plastic leakage using macro-level statistical data, we have organized statistical data on plastic shopping bags, PET bottles, and total plastics in Indonesia (including production, consumption, and supply volumes) as follows.

| Item                   | Source                                                                                                                       | Value               | Remarks                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Plastic Bag Supply     | Data from the "INDONESIA COUNTRY REPORT 2024" published by INAPLAS (Indonesian Olefins, Aromatics, and Plastics Association) | 548,988 t<br>(6.5%) | <ul style="list-style-type: none"><li>6.5% of plastic raw materials are supplied as plastic shopping bags</li><li>Percentage in 2023</li><li>The figure is calculated by multiplying the total supply of plastic products by the percentage (6.5%)</li><li>Data is updated regularly and is expected to remain available in the coming fiscal year and beyond</li></ul>                                                            |
| PET bottles Demand     | From Evtriyandani et al. 2025, "Demands and Material Flow of Recycled Polyethylene Terephthalate (PET) in Indonesia"         | 303,054 t           | <ul style="list-style-type: none"><li>Average demand for PET resin used in Package Water (beverage bottles) from 2021 to 2023</li><li>Source cited in the paper: Direktorat Industri Kimia Hilir dan Farmasi (Directorate General of Downstream Chemical and Pharmaceutical Industries, Ministry of Industry, Indonesia)</li><li>Data will not been updated; further data collection is required for use in future years</li></ul> |
| Plastic product Supply | <b>Published data from BPS (Indonesian Central Statistics Agency) and Kemenperin (Ministry of Industry)</b>                  | 8,445,973 t         | <ul style="list-style-type: none"><li>Regarding supply volumes for 2025, the figures represent targets (the figures for 2023 and 2024 shown in the same document are actual results)</li><li>This data is updated regularly and is expected to remain available for the next fiscal year and beyond</li></ul>                                                                                                                      |

⑤ Estimating Waste Discharge Using Macro-level Statistical Data:Summary of Estimates for Fiscal Year 2025 in Indonesia

For plastic shopping bags and PET bottles, we estimated **its leakage rate at national level**, utilizing partial data gained in this filed survey and several parameters / statistics such as population and land area ratios / supply and demand data. We then used these leakage rates and statistical data to calculate the annual leakage volume for **all plastic products** using the following formula.

We also compared the estimated plastic waste leakage volume in Indonesia from the FY2025 field survey with the results of the plastic waste discharge volume estimates from the FY2024 literature review.



■ Estimated discharge volume based on FY2024 literature survey

| Target Items | Adjustment Factor   | Annual discharge volume of target Items (t/y) | Statistical Data of target Items (t/y) | Discharge rate of Target item (%) | Statistical data Of total plastic products (t/y) | Leakage volume of total Plastic Products (t/y) |
|--------------|---------------------|-----------------------------------------------|----------------------------------------|-----------------------------------|--------------------------------------------------|------------------------------------------------|
| PET bottles  | Ratio of Population | 2,004~4,008                                   | 298,113 (Supply)                       | 0.67~1.34                         | 4,206.000 (Usage)                                | 28,000~56,000                                  |

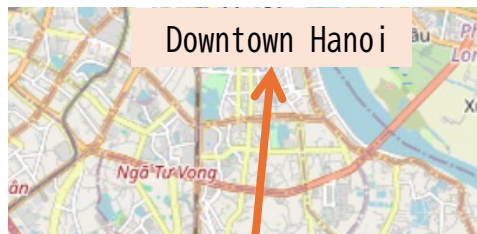
## 4. Results of the FY2025 Field Surveys

# Vietnam

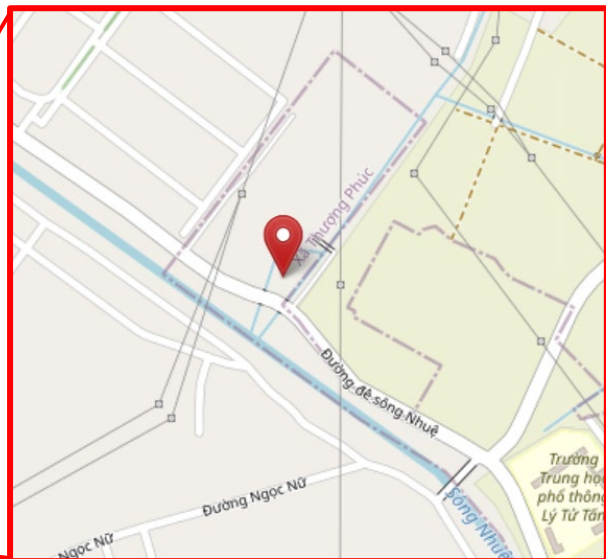
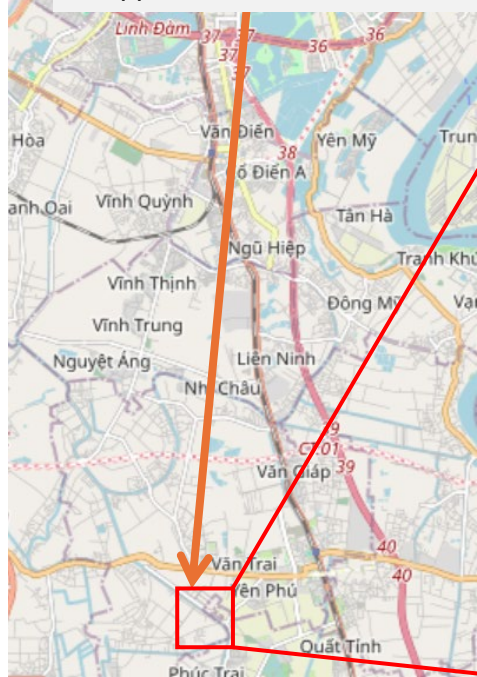
- ① Report on Survey Sites
  - ② Field Survey Results
  - ③ Estimates of Annual Plastic Bag and PET Bottle Waste in Vietnam
  - ④ Organization of Statistical Data
  - ⑤ Estimation of Waste Generation Using Macro-Level Statistical Data
- Compilation of FY2025 Estimation Results for Vietnam

# ① Report on Survey Locations

After conducting preliminary site inspections, “Trạm bơm Xém” (a pumping station connected to the Nué River) was selected as a site where waste composition surveys are feasible (sufficient waste can be secured) and where permission can be obtained.



Approx. 1 hour by car one way  
(Approx. 20 km as the crow flies)



November 20, 2025  
(site inspection)



December 1, 2025  
(On-site verification)



December 4, 2025: Survey day

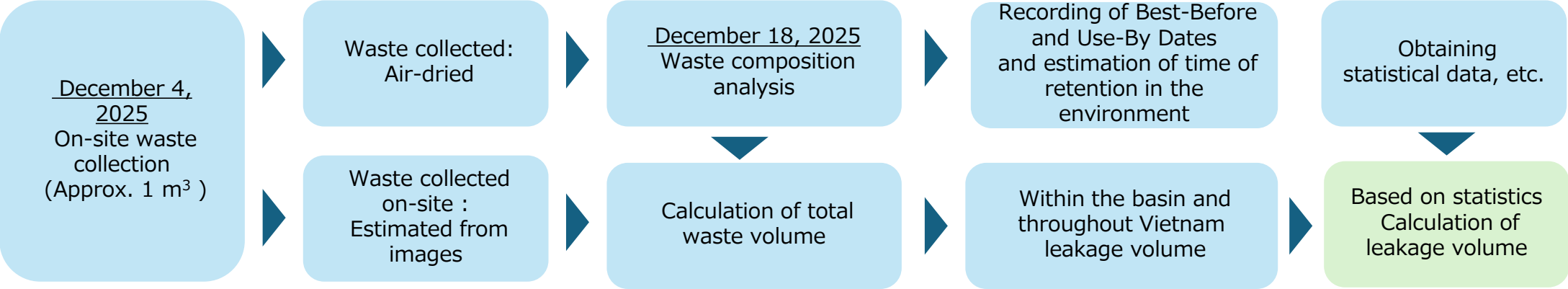


## ② Results of the on-site survey

On December 4, 2025, approximately 1 m<sup>3</sup> of waste was collected. It was then air-dried, and a waste composition survey was conducted on December 18.

The waste composition survey covered not only plastic bottles and plastic shopping bags but also the same items as those surveyed at Japanese wastewater treatment plants. Additionally, for items that could not be collected during the on-site waste collection (December 4), estimates of the waste volume (kg) were supplementally made by image interpretation.

For items with verifiable best-before or use-by dates, we estimated the duration they had been in the environment.



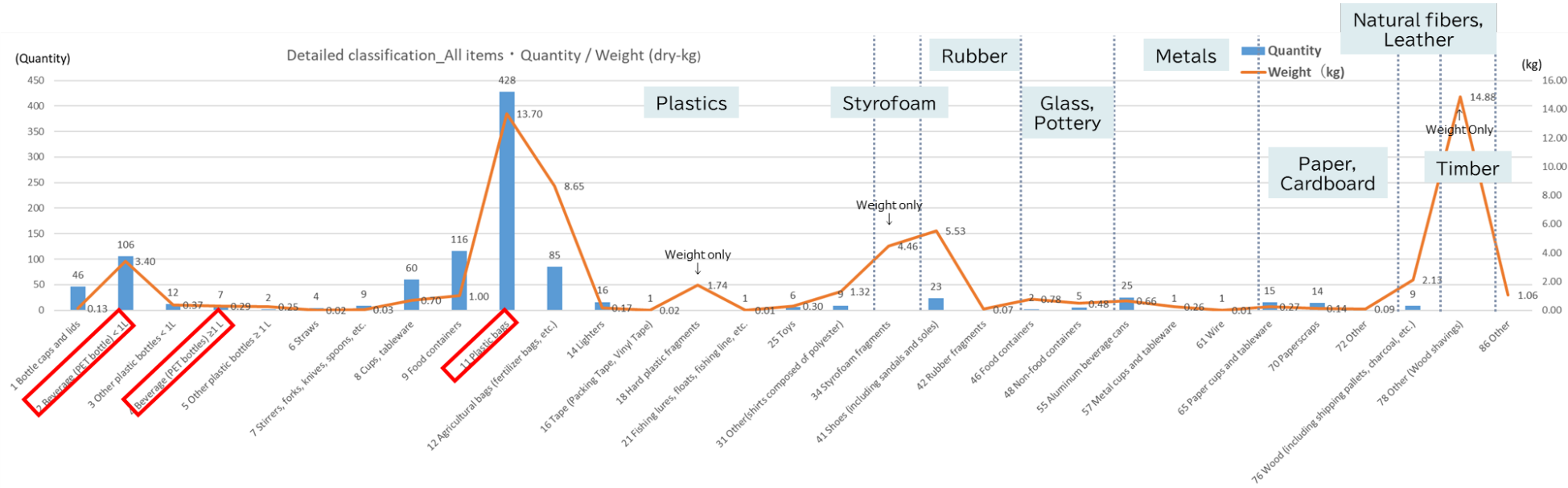
December 5, 2025: Drying



December 18, 2025: Scene during waste composition survey



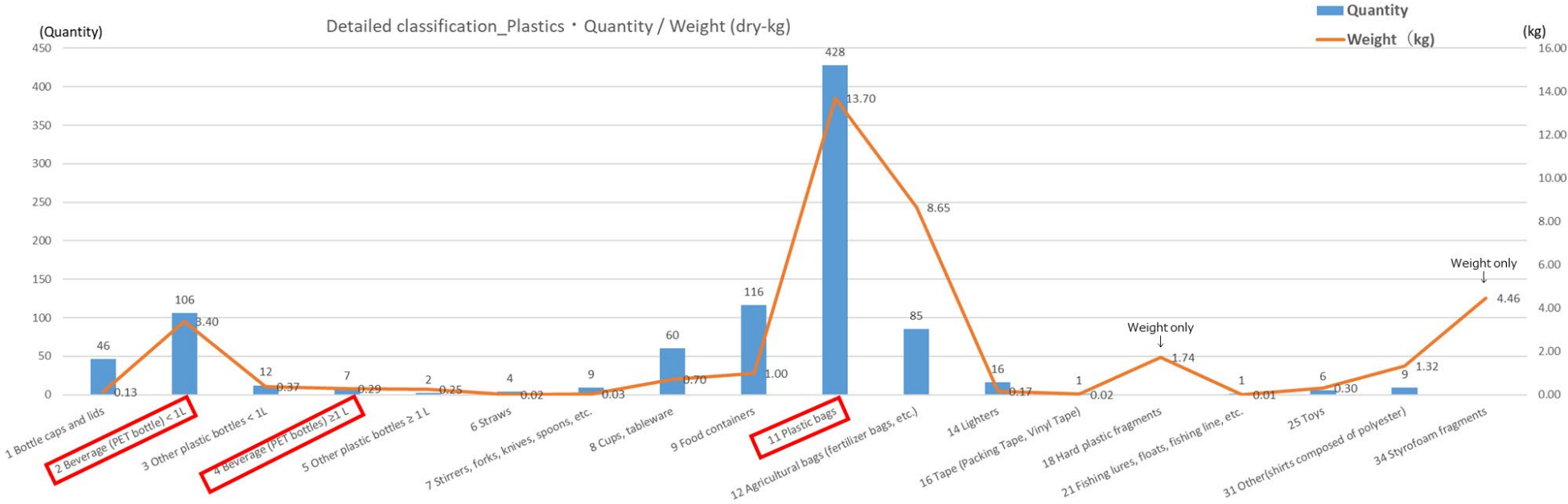
② Results of the On-Site Survey\_ (1) Results of the Waste Composition Survey (Subcategories)



Plastics accounted for the largest share in terms of both number of items and dry weight. Furthermore, "plastic shopping bags" accounted for the overwhelming majority in terms of both number of items and dry weight.

→ Top 5 by number:  
Plastic shopping bags: 428  
Food containers: 116  
Agricultural bags: 85  
PET bottles <1L: 106  
Cups and tableware: 60

→ Top 5 by weight:  
Plastic shopping bags: 13.7 kg  
Agricultural bags: 8.6 kg  
Styrofoam fragments: 4.5 kg  
PET bottles <1L: 3.4 kg  
Hard plastic fragments: 1.7 kg



② On-site Survey Results: (1) Results of the waste composition survey (subcategories) and (2) Estimation of waste volume based on image interpretation

Based on the results of the waste composition survey, the results for plastic shopping bags, PET bottles, and total waste volume—which are the target items of the leakage calculation—are as follows.

| Item                  | Quantity | Volume (L) | Weight (kg) |
|-----------------------|----------|------------|-------------|
| Plastic shopping bags | 428      | 230.00     | 13.70       |
| PET Bottle            | 113      | 90.50      | 3.69        |
| Total waste           | 1,003    | 855.46     | 62.90       |

\*PET bottles were classified as No. 2 "Beverage (PET bottles) < 1 L" and No. 4 "Beverage (PET bottles) ≥ 1 L."  
\*Weight is dry weight (kg).



For waste that could not be collected on-site, the volume was interpreted based on images. The total amount was estimated to be 94.001 kg (dry weight).

| Item                  | Interpretation from Images (Dry Weight, kg) |
|-----------------------|---------------------------------------------|
| Plastic shopping bags | 21.234                                      |
| Plastic bottles       | 10.459                                      |
| Total waste volume    | 94.001                                      |



② Field Survey Results\_ (3) Calculation of Total Waste Volume

Based on the results of (1) the waste composition survey and (2) the waste volume estimation from images, the total waste volume was estimated to be 156.900 kg (dry weight).

| Item                  | (1)<br>Waste Composition Survey<br>(dry weight, kg) | (2)<br>Estimates from Images<br>(Dry Weight, kg) | (3)<br>Total Waste Volume (dry weight,<br>kg) |
|-----------------------|-----------------------------------------------------|--------------------------------------------------|-----------------------------------------------|
| Plastic shopping bags | 13.700                                              | 21.234                                           | 34.954                                        |
| Plastic bottles       | 3,688                                               | 10,459                                           | 14,147                                        |
| Total waste volume    | 62,899                                              | 94,001                                           | <b>156,900</b>                                |

- (Reference)  
Overview of the Calculation Procedure for "Runoff from the Watershed and Vietnam as a Whole"
- 1) Calculate daily waste volume (t/day)

2) Calculate annual waste volume (t/year): 1) × 365

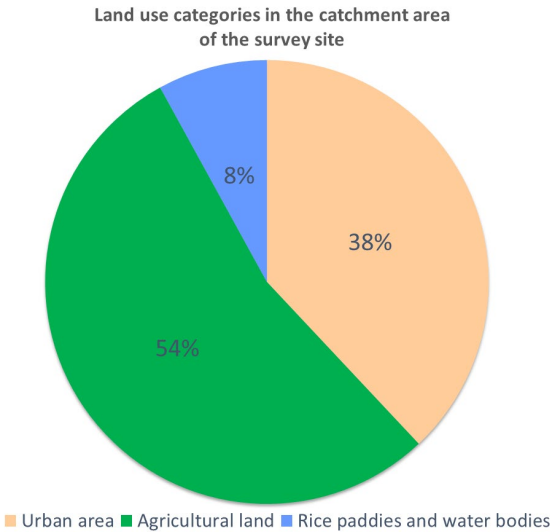
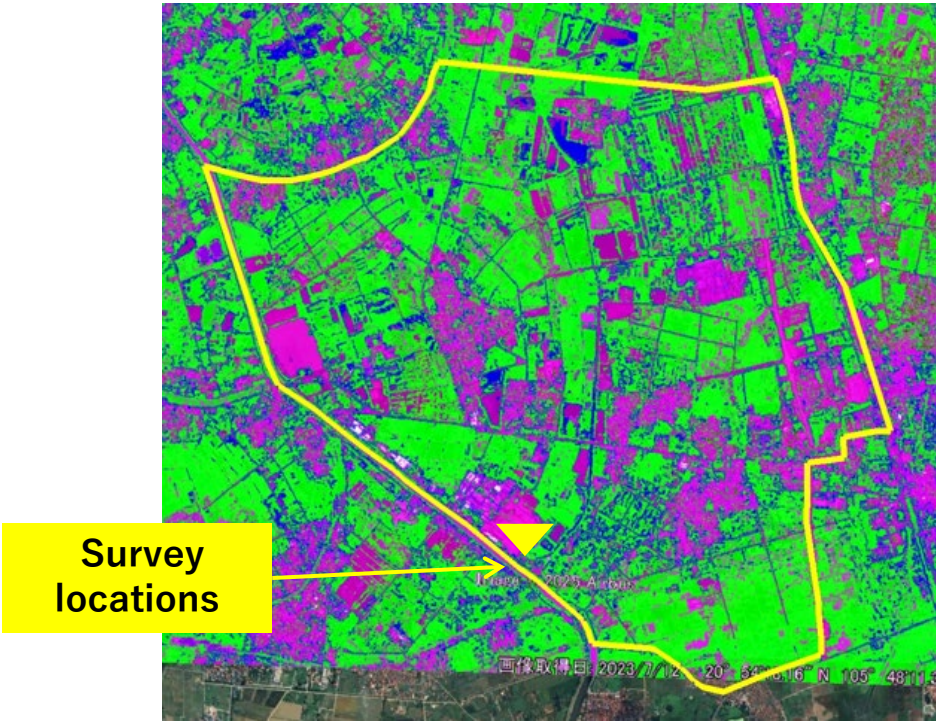
3) Calculate the ratio of the watershed to the whole of Vietnam: As in step 3

4) Estimate the outflow from all of Vietnam (t/y): (2) × the ratio calculated in (3)

### ③ Estimated Annual Volume of Plastic Bags and PET Bottles Leakage into the Environment in Vietnam

We compiled data on leakage volumes and catchment areas at monitoring sites, and used these catchment areas data to calculate the annual leakage volumes of plastic shopping bags and PET bottles in Vietnam based on population and land area ratios.

Note that since the duration of waste accumulation was unknown during the field survey in Vietnam, leakage volumes were estimated using two scenarios: the minimum and maximum durations.



| Item       | Catchment Area        | Vietnam as a whole      |
|------------|-----------------------|-------------------------|
| Population | 24,433                | 100,098,768             |
| Area       | 10.49 km <sup>2</sup> | 329,241 km <sup>2</sup> |

④ Organization of Statistical Data (Vietnam)

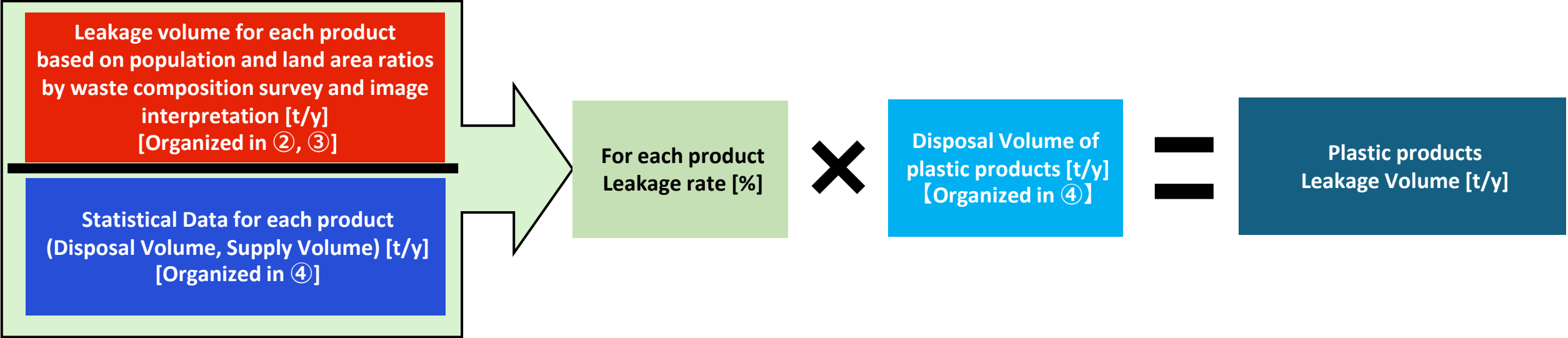
To estimate plastic leakage using macro-level statistical data, we have organized statistical data on plastic shopping bags, PET bottles, and other plastics in Vietnam (including production, consumption, and supply volumes) as follows.

| Item                                     | Source                                                                                                                                            | Value         | Remarks                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Amount of Plastic Shopping Bags Disposal | The World Bank, 2022, Toward a National Single-use Plastics Roadmap in Vietnam: Strategic Options for Reducing Priority Single-use Plastics       | 800,000 t/y   | <ul style="list-style-type: none"><li>• Data-will not been updated; further data collection is required for use in future years</li></ul>                                                                                                                                                                                                                                           |
| PET Bottle Supply                        | GA Circular, 2019, Full Circle: Accelerating the Circular Economy for Post-Consumer PET Bottles in Southeast Asia (From FY2024 literature review) | 203,774 t/y   | <ul style="list-style-type: none"><li>• Data-will not been updated; further data collection is required for use in future years</li></ul>                                                                                                                                                                                                                                           |
| Plastic Products Disposal Pattern 1      | WWF et al., 2023, REPORT ON PLASTIC WASTE GENERATION IN 2022 (From FY2024 literature review)                                                      | 2,930,000 t/y | <ul style="list-style-type: none"><li>• Used to estimate total product leakage based on the leakage rate of surveyed products</li><li>• 2021 data</li><li>• Data-will not been updated; further data collection is required for use in future years</li></ul>                                                                                                                       |
| Plastic Products Disposal Pattern 2      | Global Plastic Action Partnership, 2022, Vietnam Plastic Action Assessment and Roadmap Considerations                                             | 5,900,000 t/y | <ul style="list-style-type: none"><li>• Used to estimate total product leakage based on the leakage rate of surveyed products</li><li>• 2018 data</li><li>• The amount of imported and exported plastic waste and recycled plastic from imported scraps is not included</li><li>• Data-will not been updated; further data collection is required for use in future years</li></ul> |

⑤ Estimating Waste Discharge Using Macro-level Statistical Data: Summary of Estimates for Fiscal Year 2025 in Vietnam

For plastic shopping bags and PET bottles, we estimated **its leakage rate at national level**, utilizing partial data gained in this field survey and several parameters / statistics such as population and land area ratios / supply and demand data. We then used these leakage rates and statistical data to calculate the annual leakage volume for **all plastic products** using the following formula.

We also compared the estimated plastic waste leakage volume in Vietnam from the FY2025 field survey with the results of the plastic waste discharge volume estimates from the FY2024 literature review.



■ Estimated discharge volume based on a FY2024 literature survey

| Target items | Adjustment factor        | Annual discharge volume of target items (t/y) | Statistical Data of Target Items (t/y) | Discharge rate of Target item (%) | Statistical Data of total Plastic products (t/y) | Leakage volume o total Plastic products (t/y) |
|--------------|--------------------------|-----------------------------------------------|----------------------------------------|-----------------------------------|--------------------------------------------------|-----------------------------------------------|
| PET bottles  | Percentage of Population | 3,755~6,259                                   | 203,774 (Supply)                       | 1.84~3.07                         | 2,930,000 (Consumption)                          | 54,000~90,000                                 |

5. Identification of Issues from the FY2025 Surveys

|           | Survey Methods for Obtaining Field Survey Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Statistical Data and Target Items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | FY2025 Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FY2025 Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Indonesia | <p>&lt;Survey Methods&gt;<br/><b>Fixed Cameras in Jakarta</b></p> <p>&lt;Challenges&gt;<br/><b>Technology</b> (Use of Fixed Cameras):</p> <ul style="list-style-type: none"><li>• Power is supplied only at night, making it impossible to maintain sufficient network speeds, resulting in partial loss of videos and water level data.</li><li>• Since there are no existing water level gauges at this location, the correlation with flow rate is low.</li></ul> <p><b>Representativeness:</b></p> <ul style="list-style-type: none"><li>• Urban areas account for approximately 3.3% of the total land area in Indonesia. Additionally, Jakarta Province is actively engaged in marine debris collection.</li><li>• The field survey period is limited to a specific timeframe.</li></ul>                                                                                                                          | <p>&lt;Statistical Data&gt;</p> <ul style="list-style-type: none"><li>• <b>Supply data</b> for plastic products and plastic shopping bags is expected to remain available after fiscal year 2025 (updated periodically)</li><li>• For PET bottles, only <b>demand data</b> is available (no updates expected)</li><li>• To evaluate using different datasets, a detailed understanding of each dataset is necessary</li><li>• It is necessary to obtain statistical data on single-use plastics, which could serve as a lower bound for plastic product leakage</li></ul> <p>&lt;Estimation Results for Target Items&gt;<br/><b>Plastic shopping bags:</b> Estimates based on population ratio generally align with previously published figures. However, estimates based on land area ratio are significantly different from published figures.</p> <p><b>PET Bottles:</b> The estimated leakage rate was lower compared to that of plastic shopping bags. This is thought to be because PET bottles that discharged in the environment are collected by the informal sector.</p> |
| Vietnam   | <p>&lt;Survey Methods&gt;<br/><b>Waste Composition Survey at Pumping Station <del>Survey</del> in Hanoi</b></p> <p>&lt;Challenges&gt;<br/><b>Technology</b> (Waste Composition Survey):</p> <ul style="list-style-type: none"><li>• It is difficult to collect the entire volume of waste at pumping station.</li><li>• It is difficult to collect the enough volume of plastic waste of target items.</li><li>• It is necessary to prepare places to conduct drying and waste composition survey.</li></ul> <p><b>Representativeness:</b></p> <ul style="list-style-type: none"><li>• The survey was conducted during the transition between the rainy and dry seasons.</li><li>• The exact duration of waste accumulation was unknown.</li></ul> <p><b>Permission:</b></p> <ul style="list-style-type: none"><li>• Obtaining permission from the local authorities was quite complicated and time consuming</li></ul> | <p>&lt;Statistical Data&gt;</p> <ul style="list-style-type: none"><li>• For plastic bags, PET bottles and plastic products, the used statistical data is not be expected to update.</li><li>• In the future, it may be possible to obtain information on production and consumption volumes via the ACE-Biz project’s flow data.</li></ul> <p>&lt;Estimation Results for Target Items&gt;<br/><b>Plastic shopping bags and PET bottles:</b> Estimate based on both the population ratio and land area ration are underestimated compared to existing published data (the figure based on land are ration is slightly closer).</p> <p>→ This should be considered in light of the fact that the survey was conducted in areas where waste collection and management may not be properly managed.</p>                                                                                                                                                                                                                                                                                 |