

Smart Technology for Detecting and Monitoring **Plastic Waste** in Waterways

November 2025

About Yachiyo Engineering Co., Ltd. (YEC)

Business Domain : **Infrastructure Engineering Consultants**

Establishment : 29 January 1963

Annual Sales : USD 182 million (FY 2024-2025)

No. of Staff : 1,366 (as of Jul. 2025)

Headquarters : 5-20-8, Asakusabashi, Taito-ku, Tokyo, Japan
intl@yachiyo-eng.co.jp

Overseas Office : **Jakarta, Myanmar**, Nepal, Nigeria, **Philippines**, Sao Paulo, **Vietnam**

URL : <http://www.yachiyo-eng.co.jp/e/>

Our Field



Private Sector



Urban Development



Transportation



**Solid Waste
Management**



Sewerage & Sanitation



Water Resources
Management



Disaster Risk
Management



Electricity

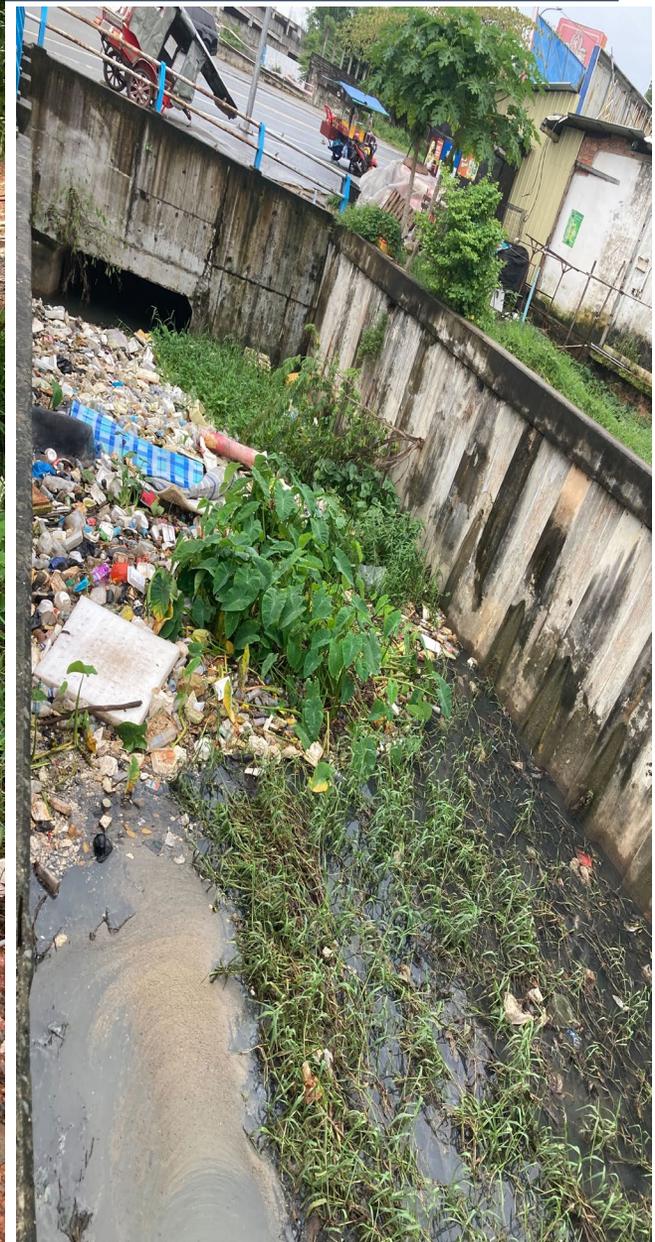


ICT



Architecture

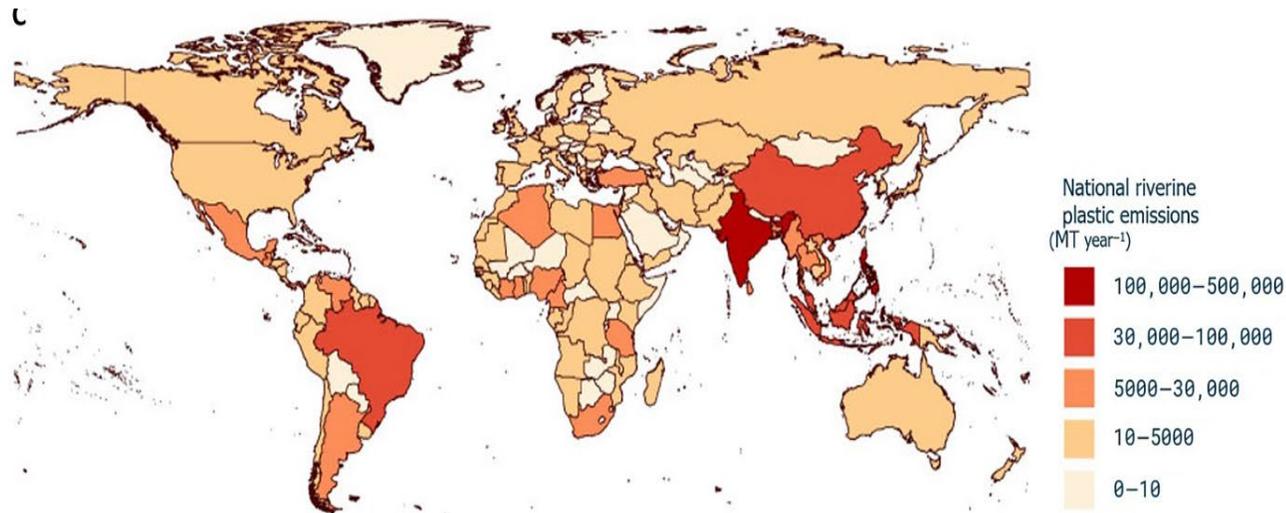
Coastal and Riverine Conditions in the ASEAN



Marine Plastic Litter in the ASEAN Region

- Based on factors such as population density and economic conditions, estimates of land-based marine plastic waste generation (2010 estimates) by country show that **five of the top ten countries include ASEAN countries.**

(Source) Jambeck et al: Plastic waste inputs from land into the ocean, Science (2015)



Estimated Marine Plastic Litter Emissions by Country

Exhibit: Meijer et al. (2021)

Global Marine Plastic Waste Emissions Estimates (2010)

country name	Plastic waste generated (10,000 tons/year)
1st China	132-353
2nd Indonesia	48-129
3rd Philippines	28-75
4th Vietnam	28-73
5th Sri Lanka	24-64
6th Thailand	15-41
7th Egypt	15-39
8th Malaysia	14-37
9th Nigeria	13-34
10th Bangladesh	12-31

Exhibit: Jambeck et al: Plastic waste inputs from land into the ocean, Science (2015)

Riverine Debris Characters

- Much transported during overflow
- Float on water surface
- Includes natural (driftwood, leaf, etc.) and anthropogenic (plastics, lubbers, etc.) debris

Required Technology

- Simple, Secured, Automated
- Effective imaging
- Distinguish plastic litters on water surface

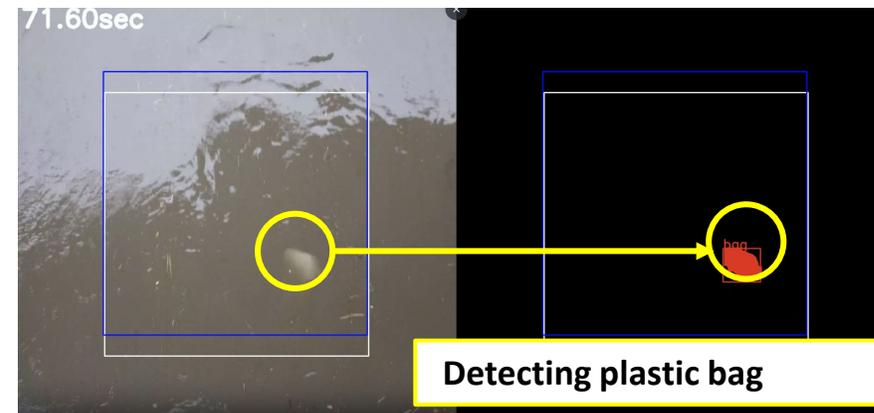
PRIMOS can assess the amount (area) of plastic waste on river surfaces and automatically detect and classify the types of debris using AI.

(Jointly developed by Prof. Kataoka of Ehime University, Japan and Yachiyo Engineering.)

River monitoring



Image Analysis (PRIMOS)



Introduction Process of PRIMOS

STEP 1:
Installation of
monitoring equipment

- Selection of monitoring locations (waterways/ rivers)
 - Installation of monitoring equipment (camera and water level sensor)
 - Measurement of water level and river width
-

STEP 2:
On-site plastic waste
survey

- Preliminary field survey for weight conversion of plastic waste observed in PRIMOS and planning for prevention of plastic litter
-

STEP 3:
Analysis (PRIMOS)

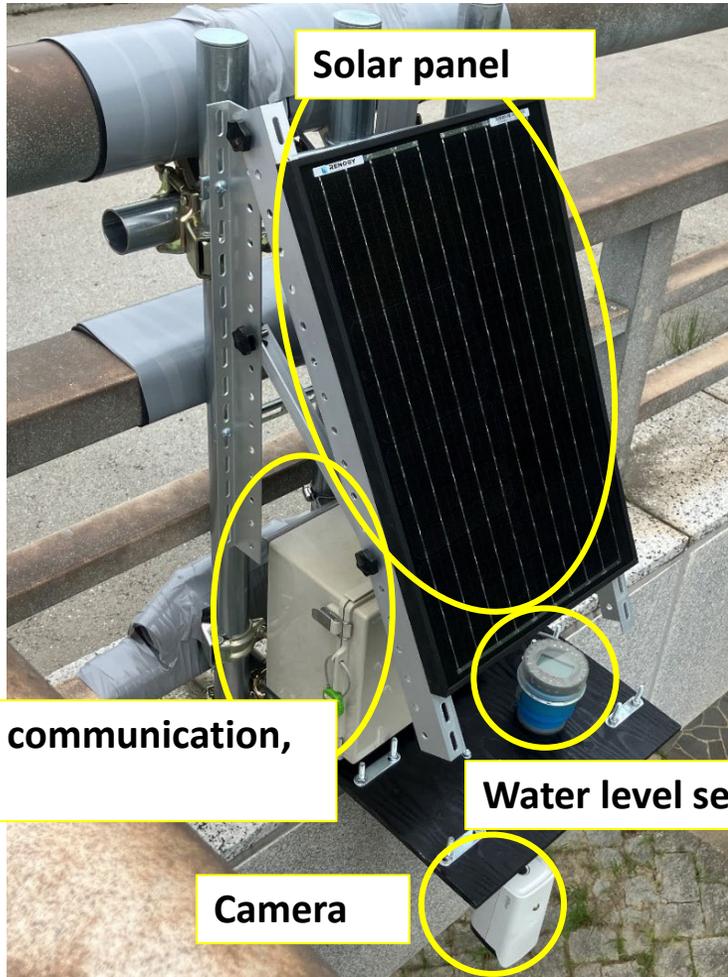
- Analysis of acquired video data and calculate number of plastic litter by type
-

STEP 4: Estimation of
discharge volume

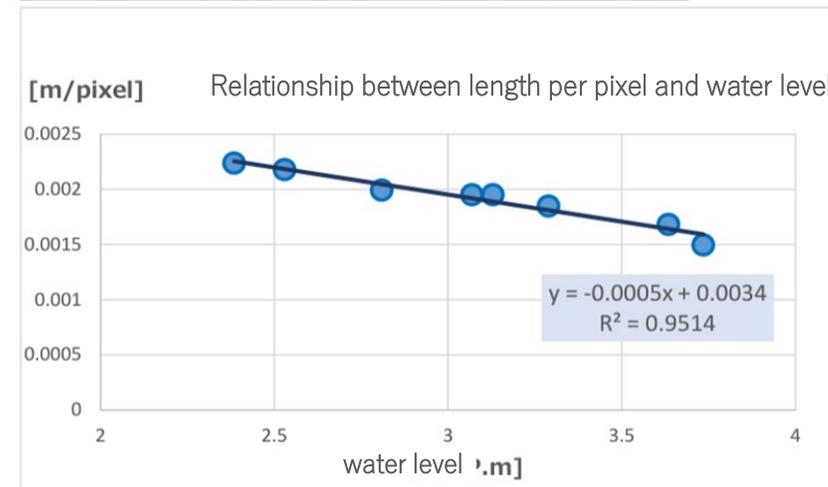
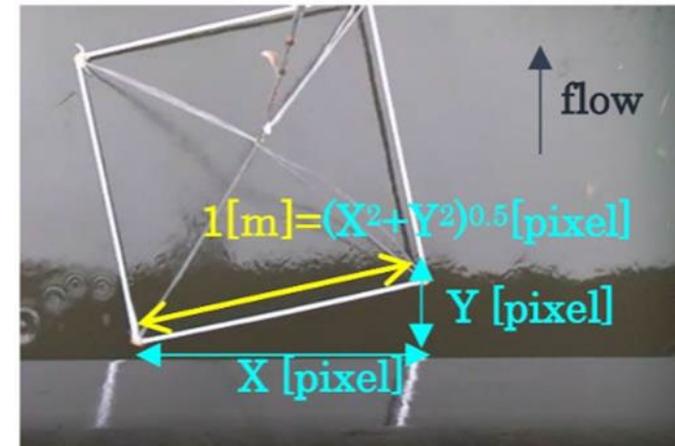
- Estimation of discharge rate and volume of plastic litter in waterway/ river

STEP 1: Installation of Monitoring Equipment

Example of equipment



Configuration of pixels and water level



(Source) Manual for the Survey on the Actual Situation of Plastic Waste Inflow into the Seto Inland Sea (MOE-J)

STEP 2: On-site Plastic Waste Survey

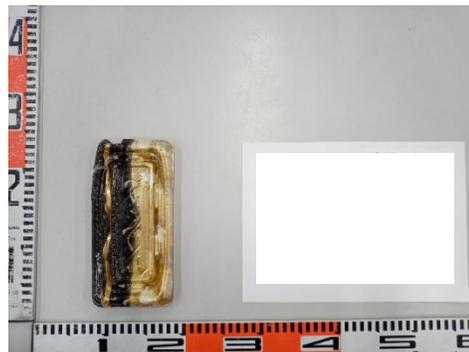
A plastic waste survey will be conducted on-site to determine the unit area weight (M/A). This coefficient is used to convert the area output from the PRIMOS analysis into mass.

Plastic waste weight per unit area (kg/m²)

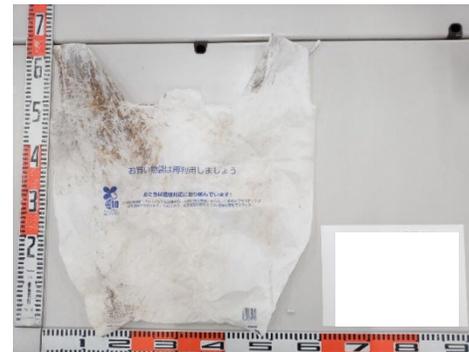
Measure the area and weight (dry weight), and determine the coefficient for converting area to mass.

$$\frac{\text{Total weight of plastic waste (kg)}}{\text{Total area of plastic waste (m}^2\text{)}}$$


PET bottles



Food containers

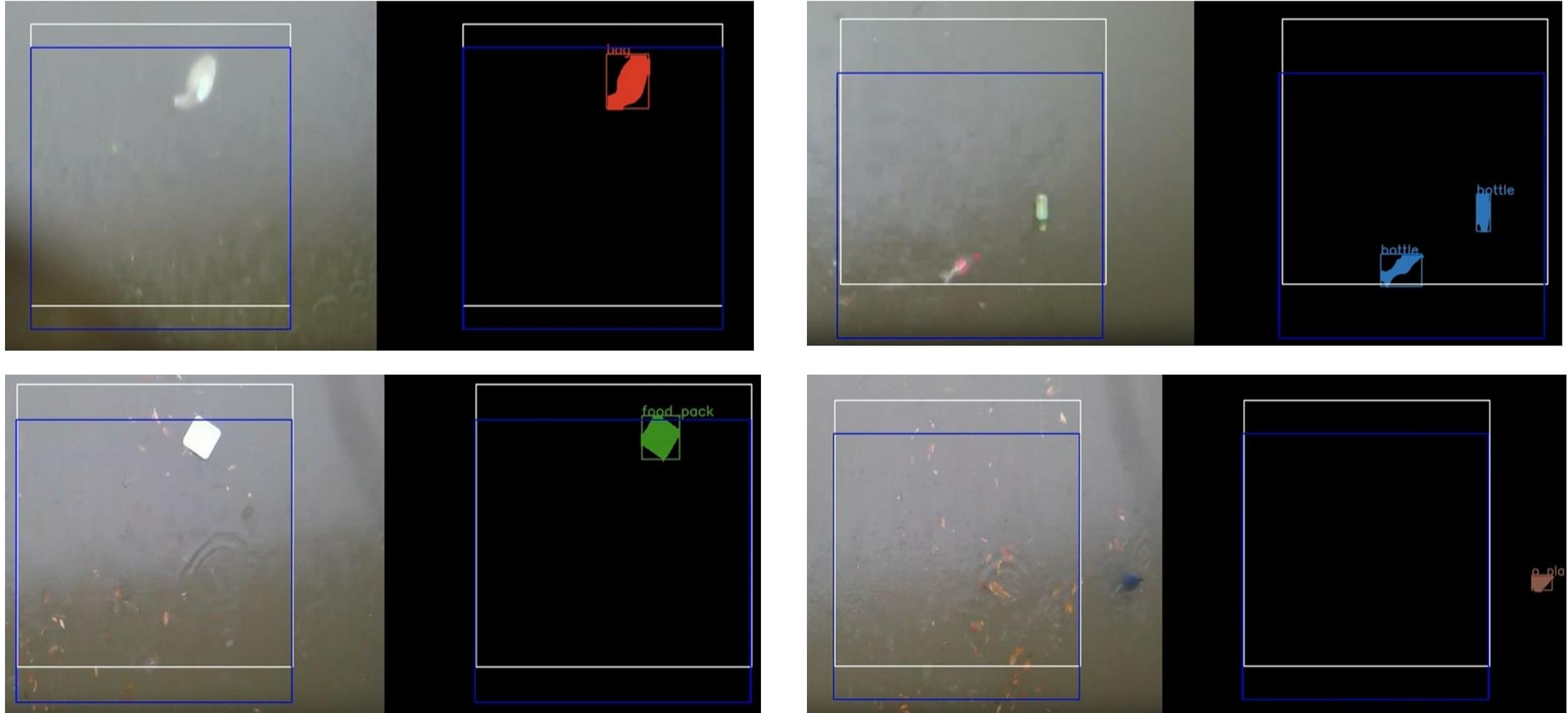


Plastic bags



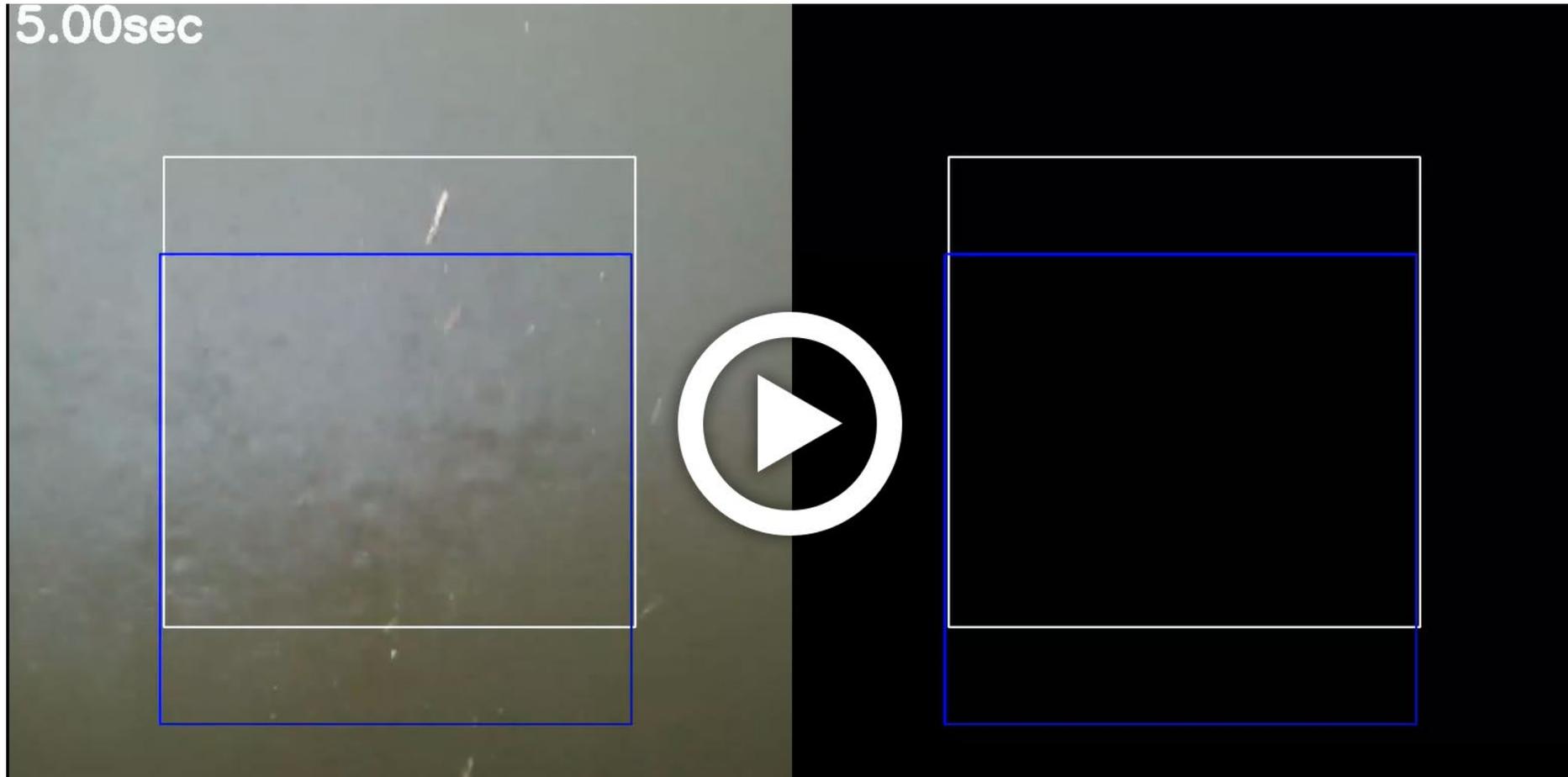
Other plastics

STEP 3: Analysis (PRIMOS)



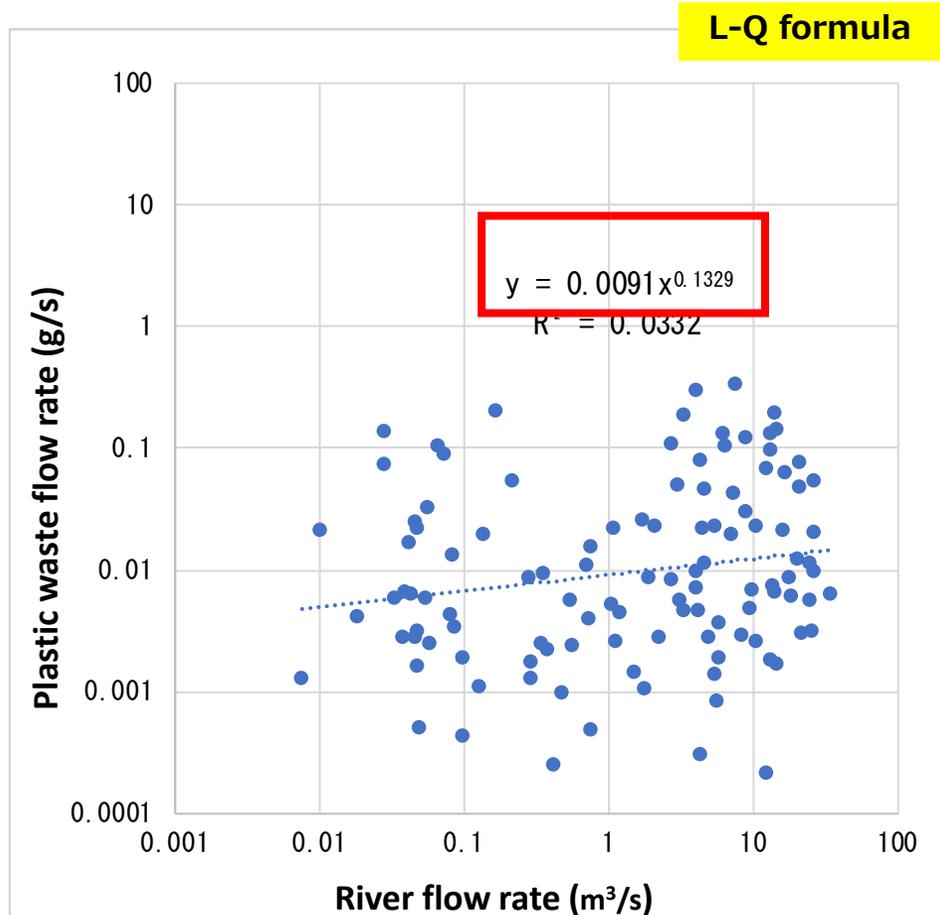
Identification of "Plastic bottles," "food packs," "plastic bags," "other plastics"

STEP 3: Analysis (PRIMOS) -Video-



STEP 4: Estimation of waste discharge volume

Using the estimated "plastic waste flow rate (g/s)" from the analysis results and the "flow rate (m³/s)" of the target river, we organized the plastic waste volume and river flow rate to estimate the annual discharge volume.



Plastic waste outflow from "Province A" in Japan [t/year]

Estimation target	Annual plastic waste outflow (t/year)
Entire prefecture (Seto Inland Sea side)	35.6
[Reference] Prefecture as a whole	38.6

Plastic waste discharge per person [g/year/person]

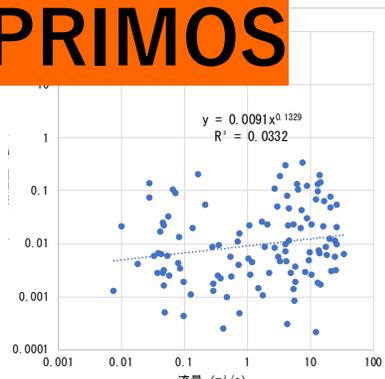
Year	Annual plastic waste discharge per person (g/year/person)
2024	28.
Jambeck et al. (2015)	186.31–496.82

PRIMOS for Changing Social Behavior

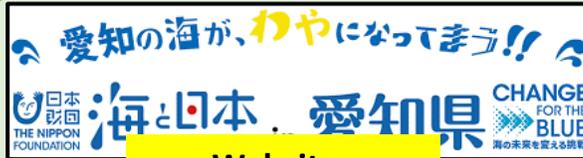
Scientific data of riverine plastic



PRIMOS



Dissemination of riverine litter situation using various media



Websites
SNS



Policy making on river environment protection and plastic recycling



Promotion of environmental education



Promotion of community activities





YACHIYO
Engineering

ITO Katsuya
e-mail:

Supervisor, International Division
kt-ito@yachiyo-eng.co.jp