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Quantities of marine debris along the coastline in South Korea have significantly decreased

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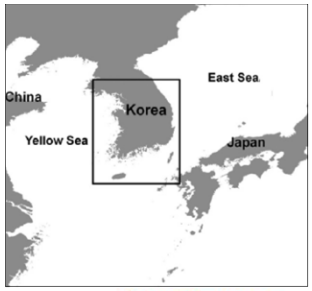
INTRODUCTION

- To produce in-situ data on quantities, source, and composition for management and policy
- To initialize active response among neighboring countries
- To enhance cooperation between government and civil societies

Framework of Korea Marine Debris Monitoring Program

- January 2008~November 2017 (10 years)

METHOD_Site selection



- Nationwide coverage (at 20 sites and additional 20 sites)
- Sand or pebble substrate
- Beach length over 100m
- Accessible but no regular cleaning
- Survey by non-profit organization should be available

Example of site

- 20 sites (since March 2008)
- Additional 20 sites (since September 2014)

Malic.or.kr

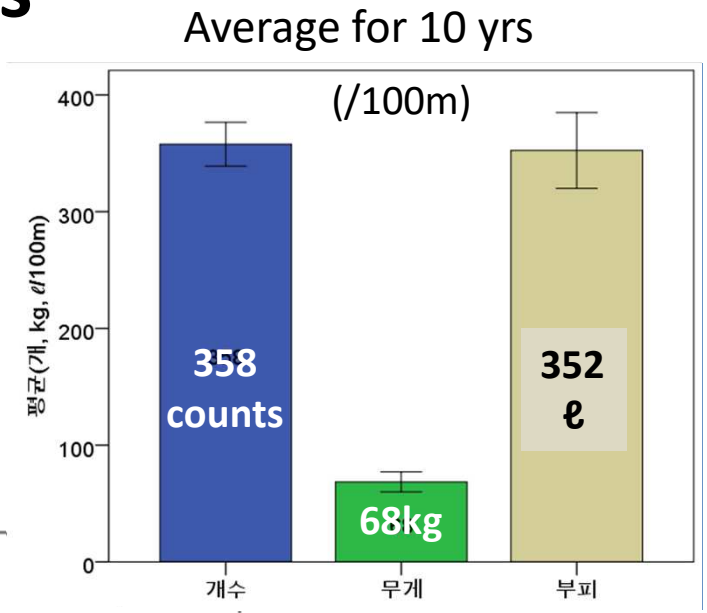
METHOD_Classification

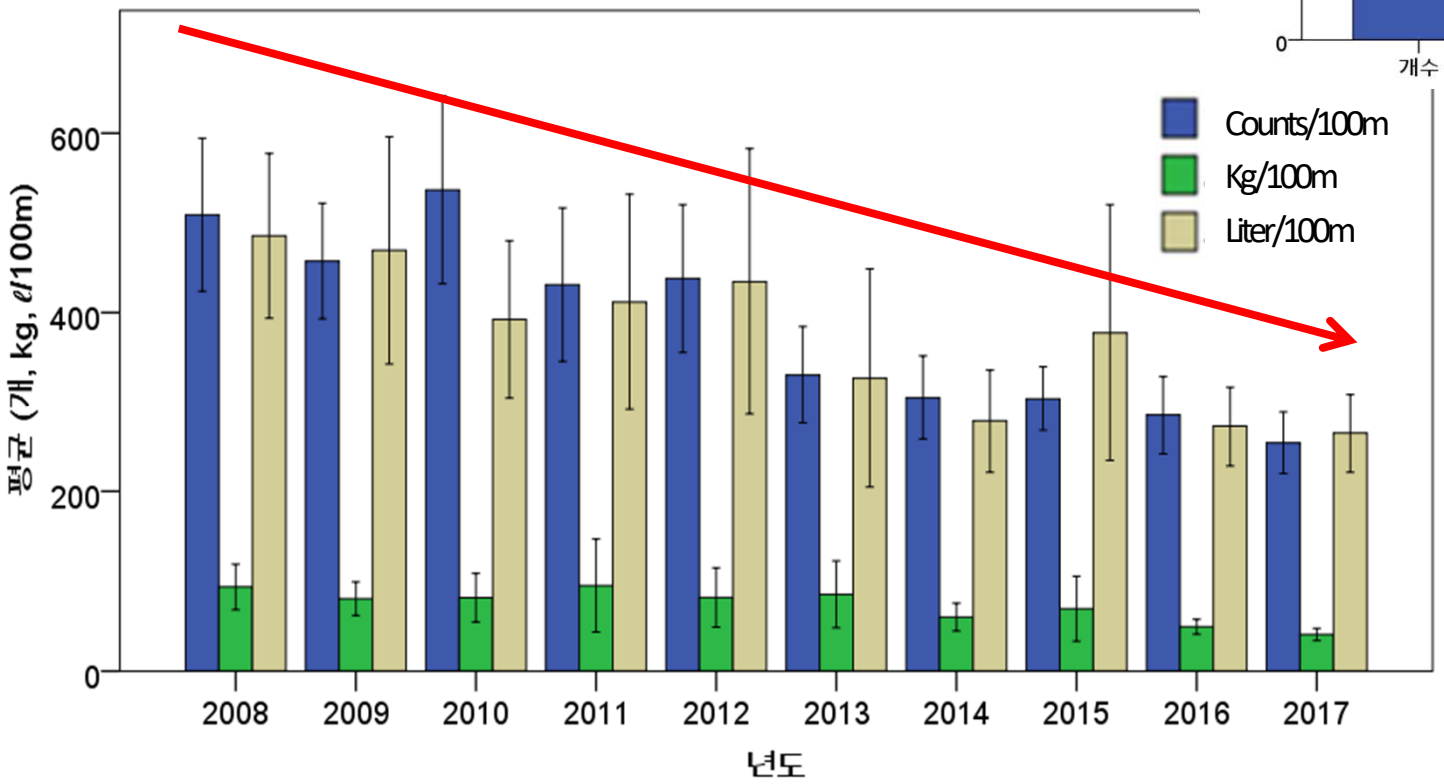
- Target: marine debris larger than 2.5 cm within 100m length of beach
- Category 1: overseas vs domestic origin
- Category 2: composition
- Category 3: item
- Period: 2 month (±5 days), cleanup after survey
- Units: number (count) for 100 items, weight (kg) and volume (ℓ) for 12 categories
- Identification of overseas debris: information of debris surface

- Training of surveyors: 1~3 workshops each year

RESULTS_Quantities

- 560,000 items, 108 tons, 560,000 liters in total were surveyed.
- Quantities (count, weight, and volume) of marine debris have significantly decreased for 10 years.



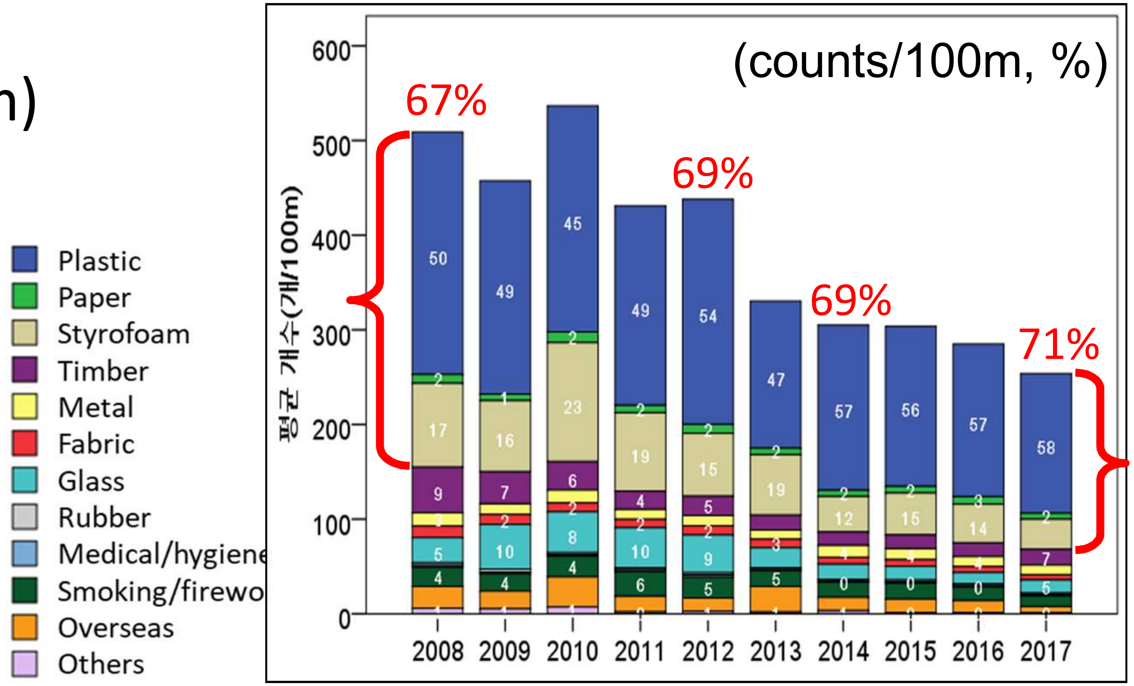


RESULTS_Source, composition and temporal trend

- Domestic debris accounted for 95% regardless of units.
- Domestic debris decrease in all units whereas overseas debris decrease only in number (▼) (*$p<0.05$*).

Categories	count/100m	kg/100m	ℓ/100m
Domestic	▼	▼	▼
Overseas	▼		

- Plastics (+Styrofoam) decrease (*$p<0.05$*) but maintain high proportion.



RESULTS_Abundant items

- 10 items ranked within top 10 in number in most years.
- 16 items ranked at least once for 10 years.

Categories	Items	Frequency within top-10 rank
Styrofoam	**Styrofoam buoys (2.5~50 cm)**	**10**
Plastic	**Beverage bottles (<2 liter)**	**10**
Plastic	**Plastic lids, caps**	**10**
Plastic	**Plastic bags**	**10**
Plastic	**Ropes (2.5~50 cm)**	**10**
Glass	**Beverage bottles**	**10**
Plastic	**Plastic food wrappers**	**10**
Styrofoam	**Miscellaneous items**	**8**
Plastic	**Miscellaneous items**	**8**
Plastic	**Ropes (50cm <)**	**7**
Plastic	Plastic buoys	1
Overseas	Beverage bottles	1
Smoking/firework	Cigarette/cigarette filters	1
Timber	Timber for ships, aquaculture	2
Plastic	Packaging band (50cm <)	1
Styrofoam	Styrofoam fishing box	1

RESULTS_Abundant items, source and temporal trend

- 8 items among 16 most abundant ones decrease in number.

Categories	Items	Source	Decrease (*p<0.05*)
Styrofoam	**Styrofoam buoys (2.5~50 cm)**	**Sea-based**	▼
Plastic	**Beverage bottles (<2 liter)**		
Plastic	**Plastic lids, caps**		
Plastic	**Plastic bags**		▼
Plastic	**Ropes (2.5~50 cm)**	**Sea-based**	▼
Glass	**Beverage bottles**		▼
Plastic	**Plastic food wrappers**		▼
Styrofoam	Miscellaneous items		
Plastic	Miscellaneous items		
Plastic	Ropes (50cm <)	**Sea-based**	▼
Plastic	Plastic buoys	**Sea-based**	
Overseas	Beverage bottles		
Smoking/firework	Cigarette/cigarette filters		▼
Timber	Timber for ships, aquaculture	**Sea-based**	▼
Plastic	Packaging band (50cm <)		
Styrofoam	Styrofoam fishing box	**Sea-based**	

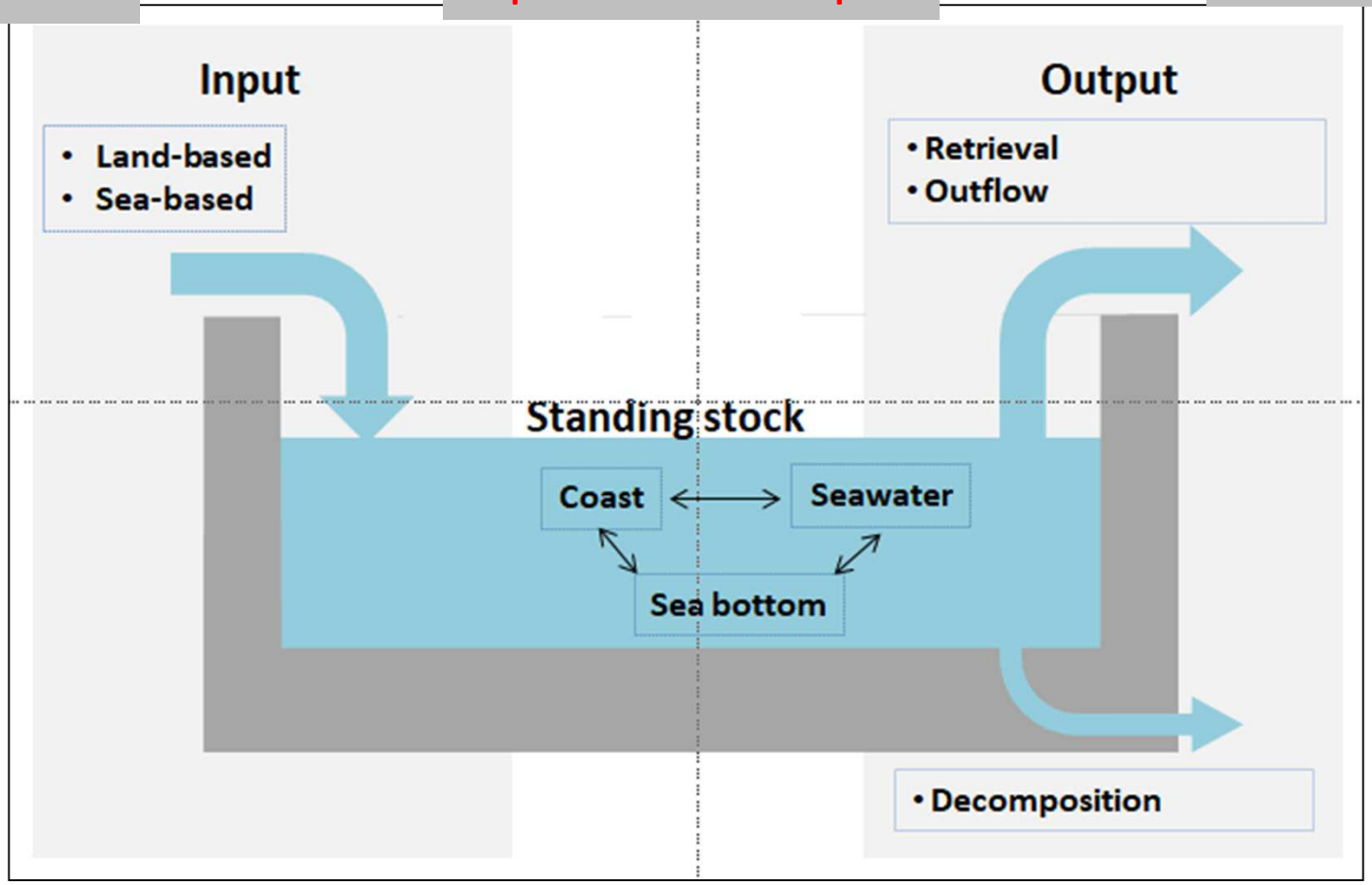
DISCUSSION_Input vs Output

- Causes of overall decreasing trend in domestic debris

Input ↓ ↓ ↓

Input <<<< Output

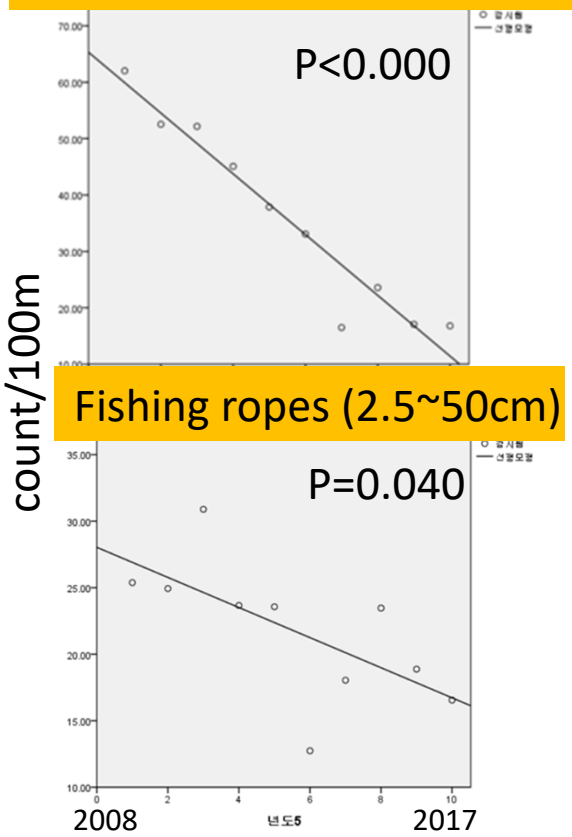
Output ↑ ↑ ↑



DISCUSSION-Reduced input

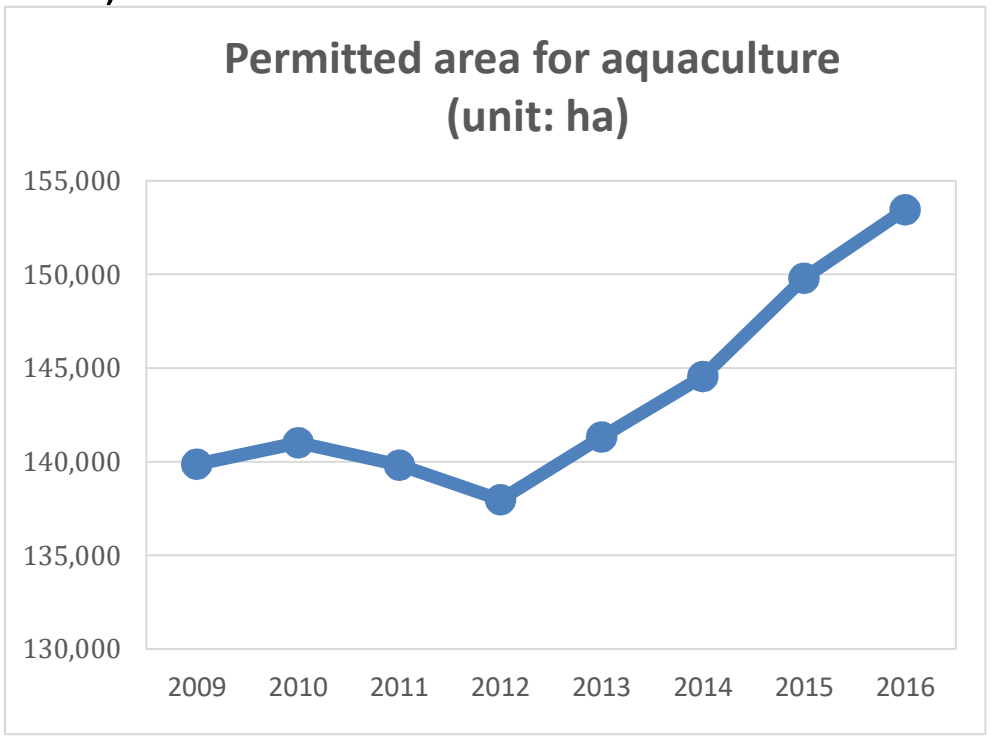
- Governmental intervention
  - Support to exchange to high-density Styrofoam buoy (2009) and , national management plan with priority (2014~), support durable alternative buoys (2015~), and for fishermen's volunteer retrieval

Styrofoam buoys (2.5~50cm)



Fishing ropes (2.5~50cm)

- Raising awareness by OSEAN & government (2010~)

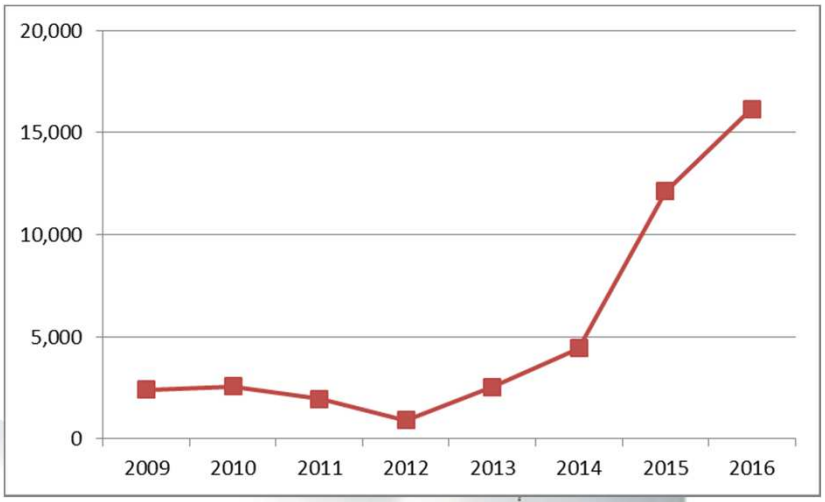


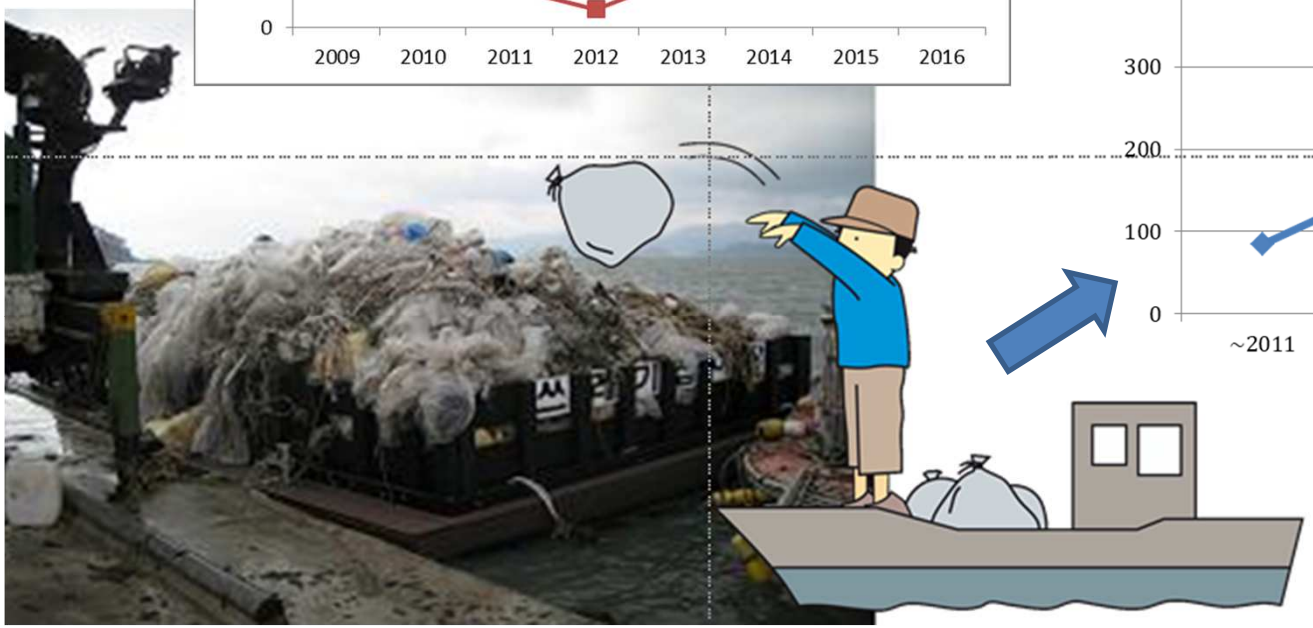
Source: National Statistics

DISCUSSION-Increased output

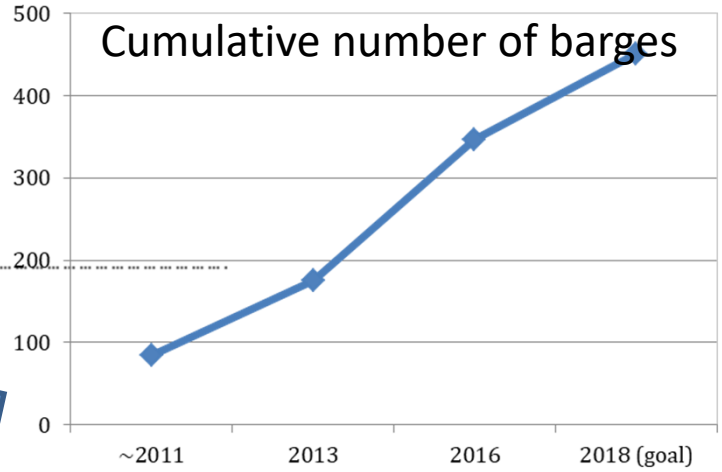
- Increase of retrieval by government and fishermen

  - Retrieved quantities of coastal debris by government (ton/yr)





  - Increase of floating reception barges at fishing ports for fishermen's volunteer retrieval



(Source: MOF & KOEM, 2017)

DISCUSSION & CONCLUSION

- Stable surveys had been conducted for 10 years: rare changes in site location, surveyors, and regular surveys
- Clear decreasing trend in especially aquaculture-origin debris which had been the most abundant items in domestic debris.
- Model case as cooperation between government and NPOs

- More efforts to cooperate with neighboring countries
- Categories should be amended and plastic-focused monitoring is needed. Macro-, meso-, and microplastic surveys can be harmonized in terms of classification frame for further study.

➡ The 2nd stage of monitoring just started on January 2018.

Acknowledgement

We express our sincere thanks to the non-profit organizations and volunteers who have contributed to the marine debris monitoring program for 10 years.

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Thank you for listening

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