Agency for the Assessment and Application of Technology

North Pacific Marine Science Organization

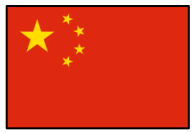
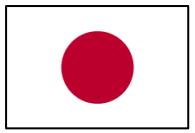
Ministry of Agriculture, Forestry and Fisheries-Japan

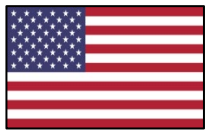
Ministry of Fisheries and Marine Affair

Indonesian Research Institute

Capacity building in Indonesian fishing communities using smartphone technology to monitor the environment and fisheries: The FishGIS project

M Makino, Mark L. Wells, Suhendar I. Sachoemar, Naoki Tojo, Shion Takemura, Shigeharu Kogushi, Vladimir Kulik, Joo-Soo Lee, Charles Trick, Chang-an Xu and Alexander Bychkov

Background of the project

- Marine environment is changing
  -> Sustainable fisheries and stable seafood supply are at risk.
- How to reduce and anticipate the risk?
  -> You have to understand the changes.
- How to understand the changes?
  -> Monitoring over time is important.

FishGIS is a new technology to monitor the changes

(Funded by MAFF Japan for FY2017-2019)

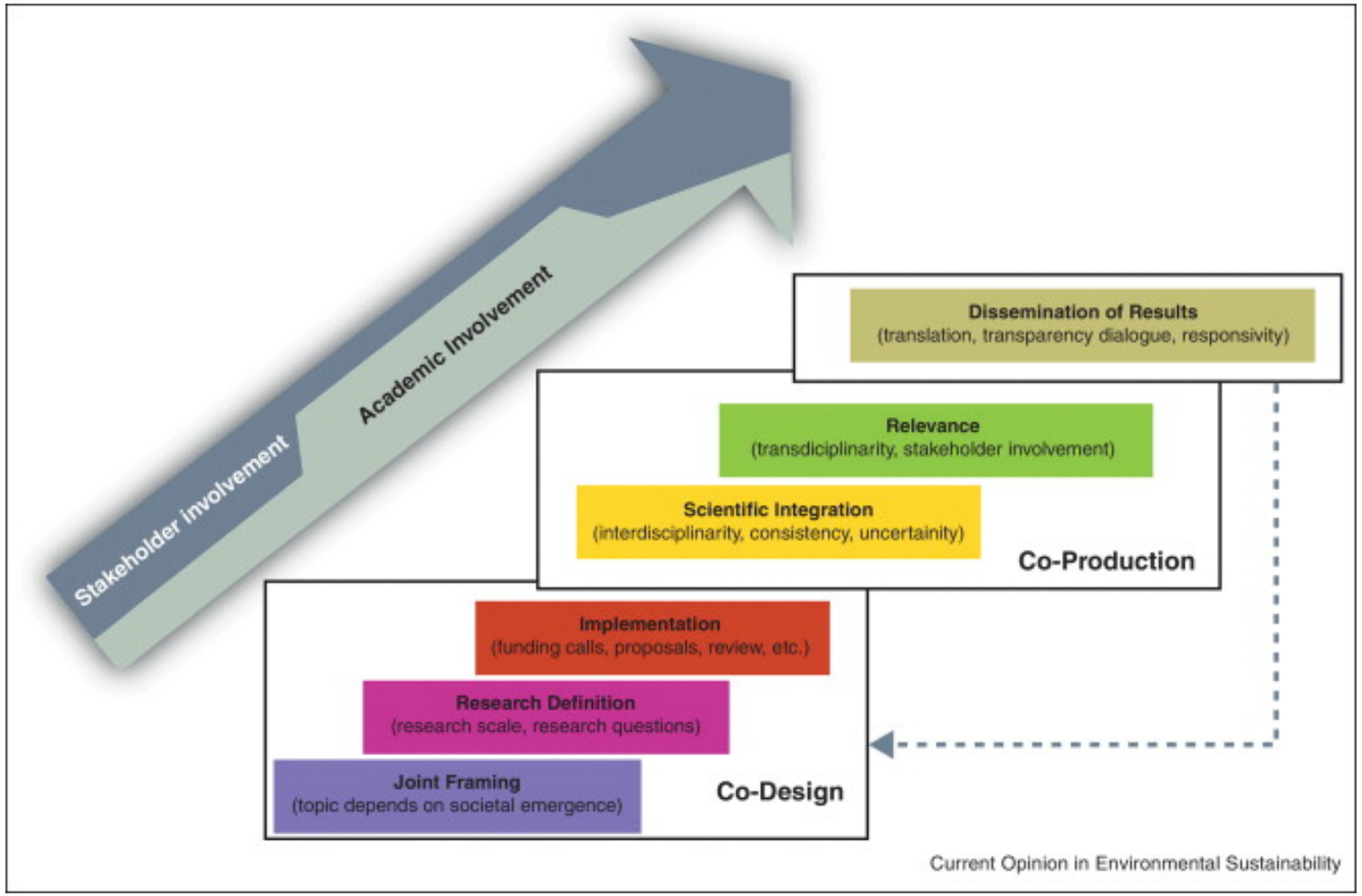
Project Objective

To build capacity to monitor coastal ecosystems and fisheries management by local small-scale fishers by the **Mobile Phone Technology** in Indonesia.

Project Key questions

a. How do global changes in climate and economy affect coastal ecosystems? and
b. How may enhanced capacity for monitoring activities by local fishers help to improve fisheries management in coastal areas?

Transdisciplinary approach of Future Earth



Mauser et al. (2013)

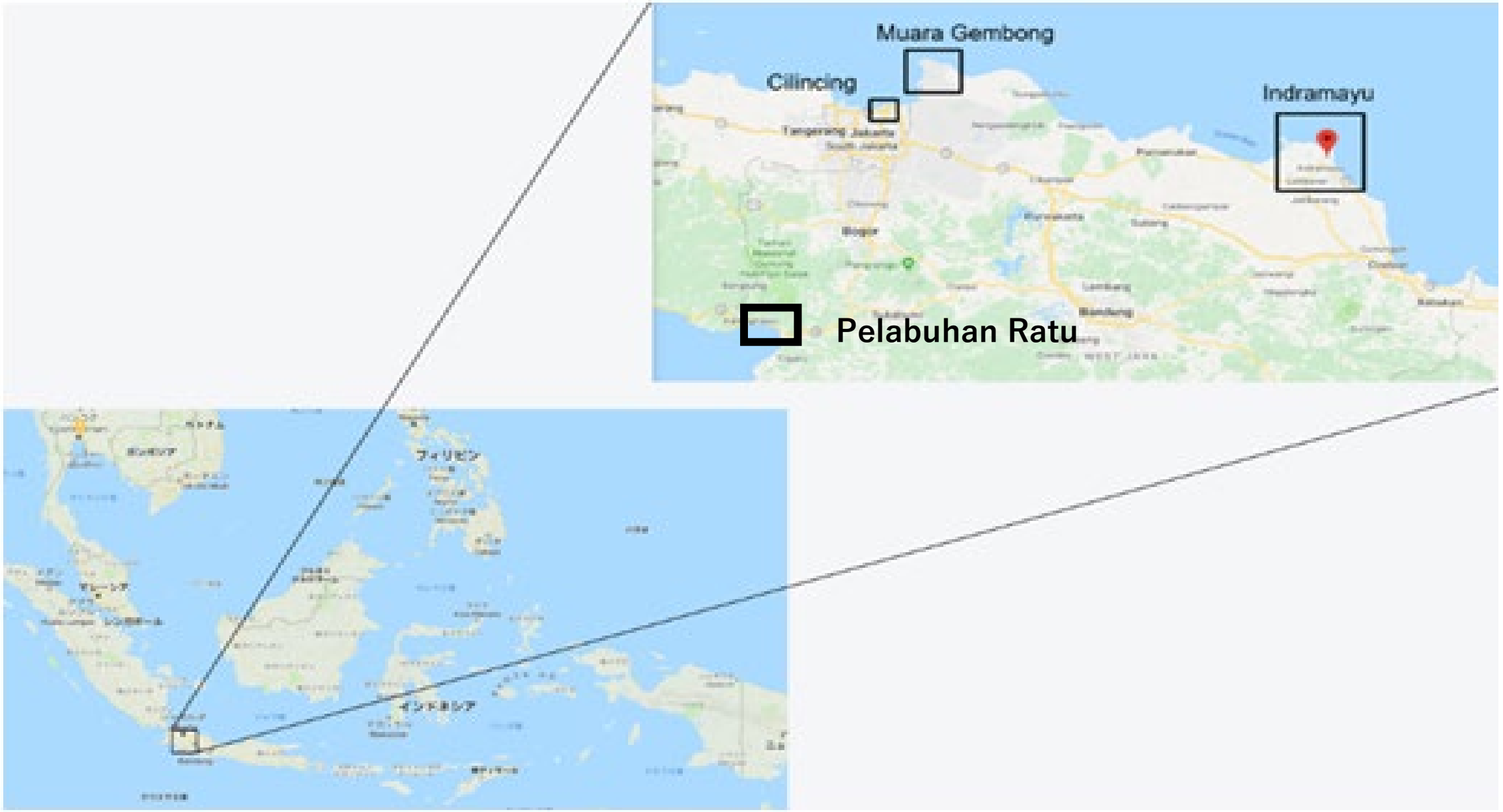
Co-design,
Co-production,
and Co-delivery
with
local people,
local researchers,
and
local government

The Project Science Team (PST)

- Local Lead: Prof. Suhendar Sachoemar (**BPPT, Indonesia**)
- Mitsutaku MAKINO (**Japan**: Co-Chairman) **HD**
- Mark Wells (**USA**: Co-Chairman) **S-HAB**
- Vladimir Kulik (**Russia**) **MONITOR**
- Joon-Soo Lee (**Korea**) **TCODE**
- Shion Takemura (**Japan**) **HD**
- Naoki Tojo (**Japan**) **FIS**
- Charles Trick (**Canada**) **S-HAB**
- Chang-an Xu (**China**) **SG-PICES-NPFC**
- Alexander Bychkov (**PICES Secretariat**)

・GIS technology specialist : Shigeharu Kogushi

Since the beginning of the project,
we have organized workshops/meetings
in local communities in Indonesia
to understand communities' needs for this
project


Muara Gembong
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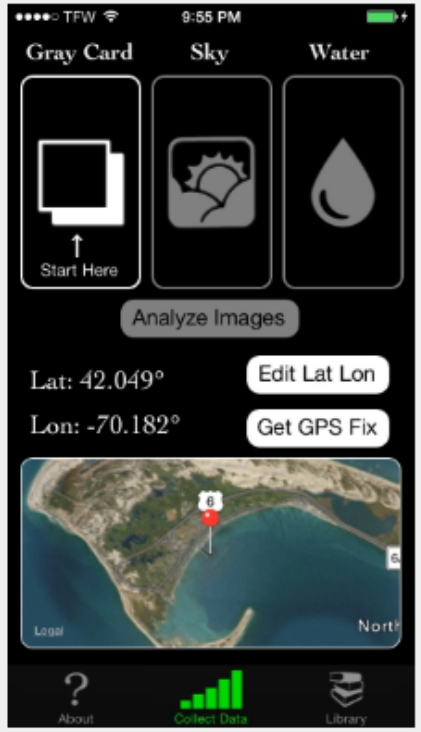
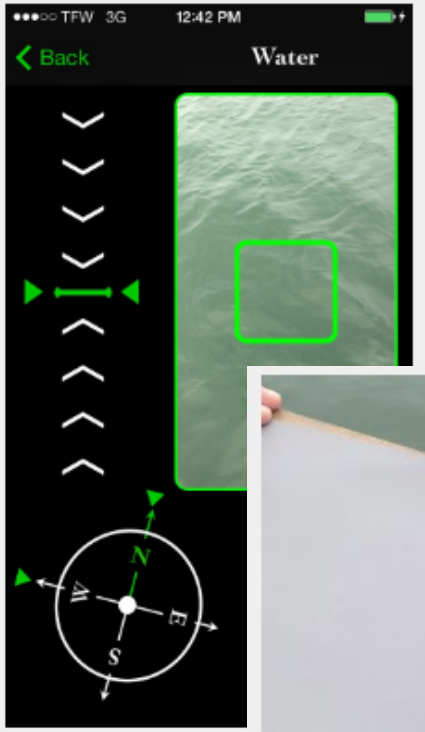
Pelabuhan Ratu
Tangerang
Bogor
Bandung
インドネシア

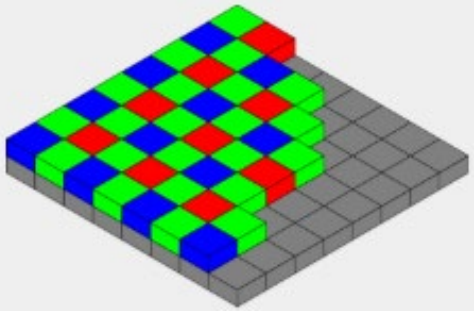
based on the results
from these community meetings,
we identified **5 monitoring items**
important for local communities

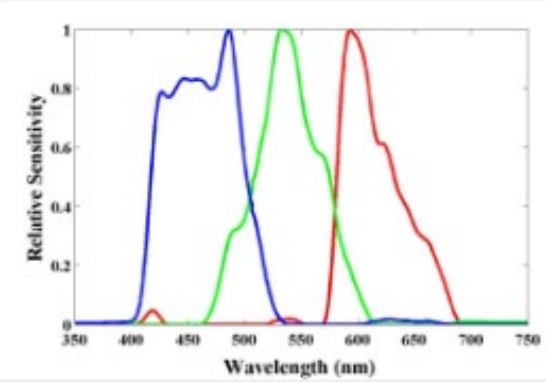
They are all to be monitored by local people
using the Mobile phone

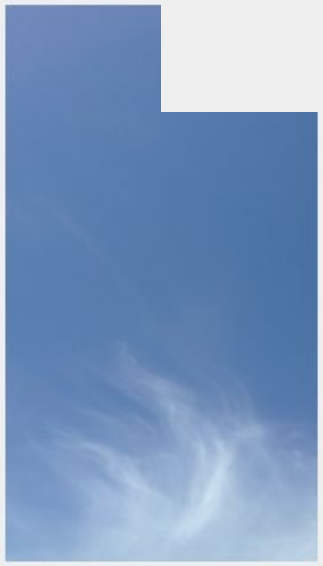
Monitoring Item No. 1/5:
Coastal Water Quality by mobile phone App.







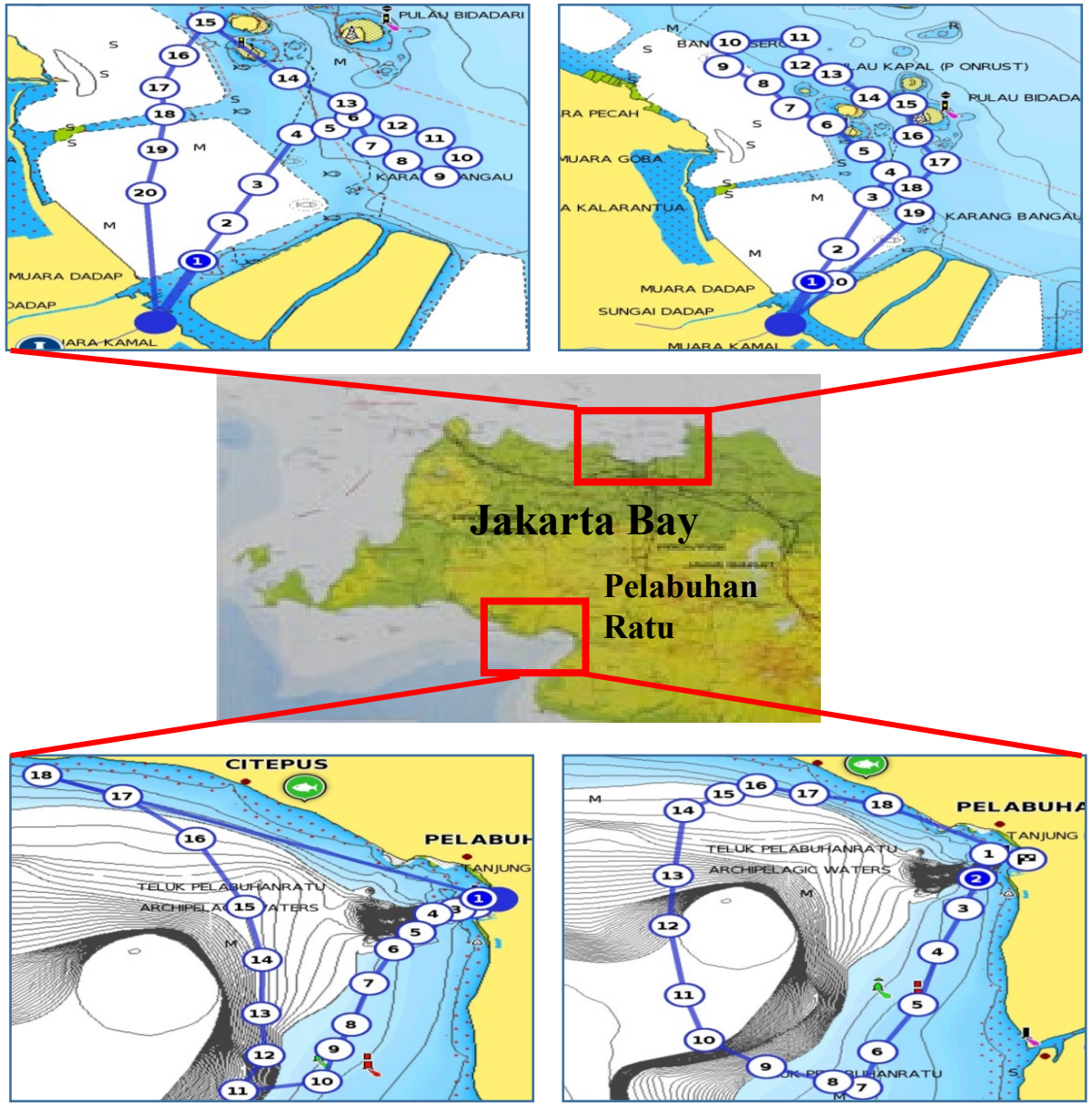




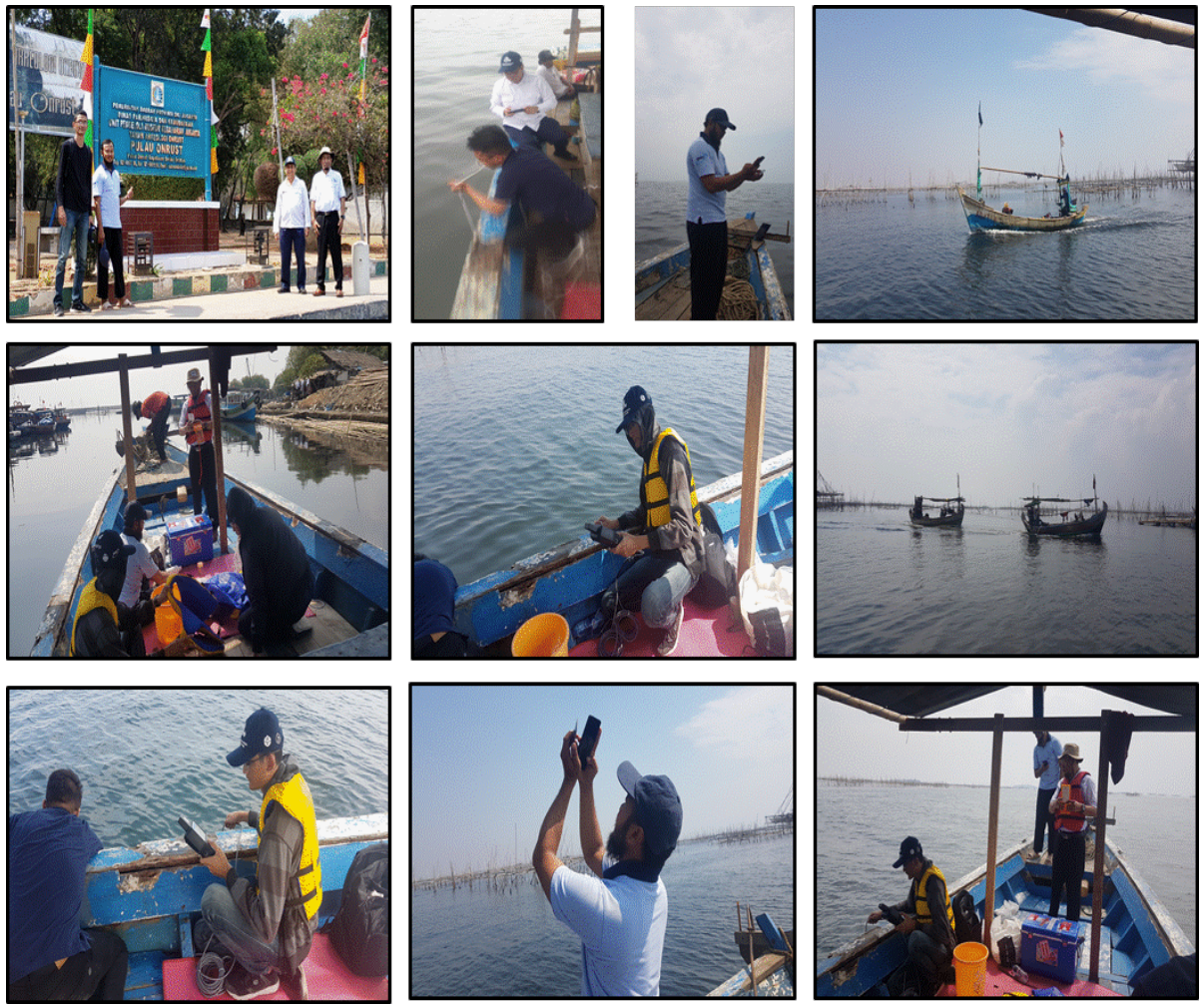
- Water turbidity (TNU), suspended particulate matter (g/cm3), chlorophyll concentrations, etc.

Remote sensing group in Indonesia are now using this data to improve coastal chlorophyll algorithms

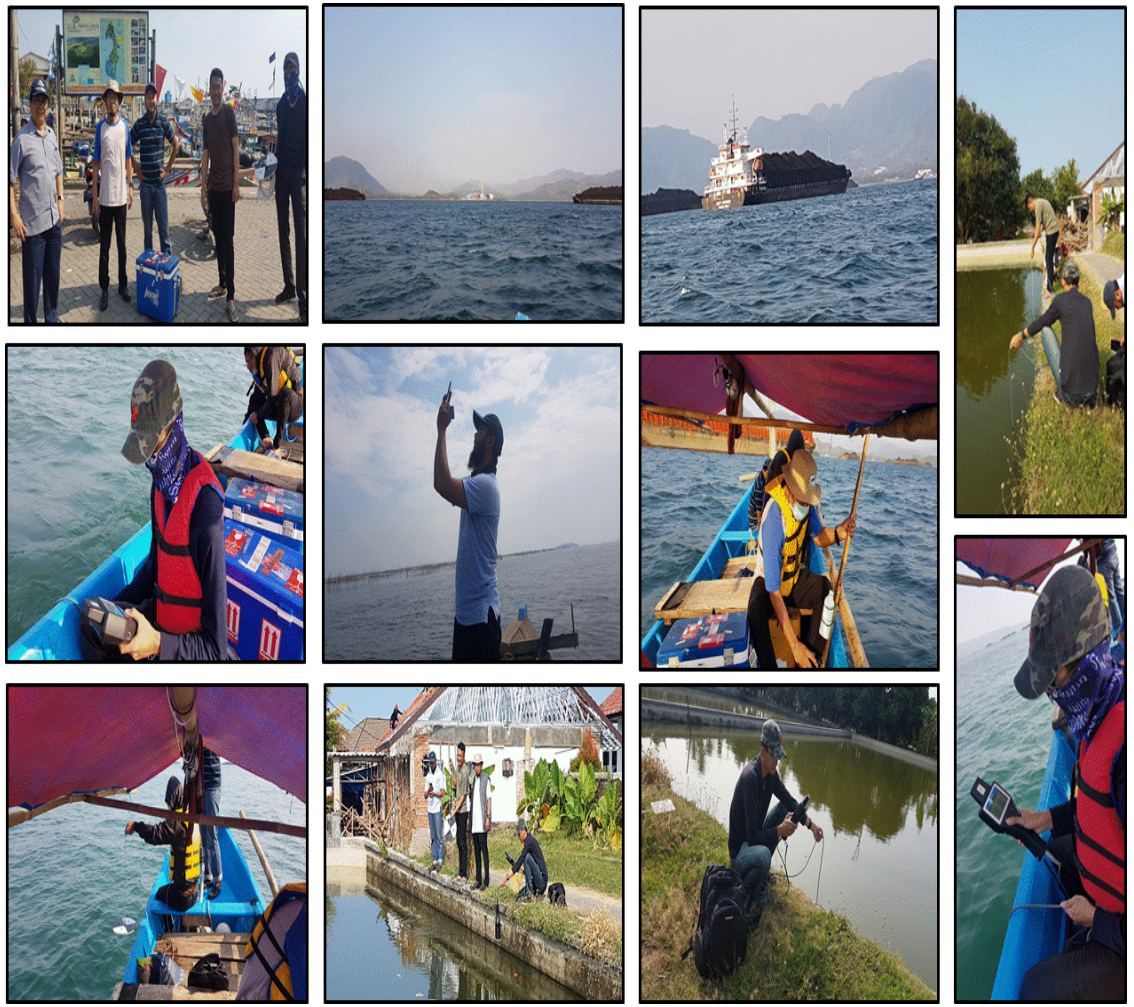
- 80 sampling points
- Jakarta Bay
  (August 14 and September 4, 2019)
- Pelabuhan Ratu
  (August 17 and September 7, 2019)



By Prof. Suhendar Sachoemar, BPPT

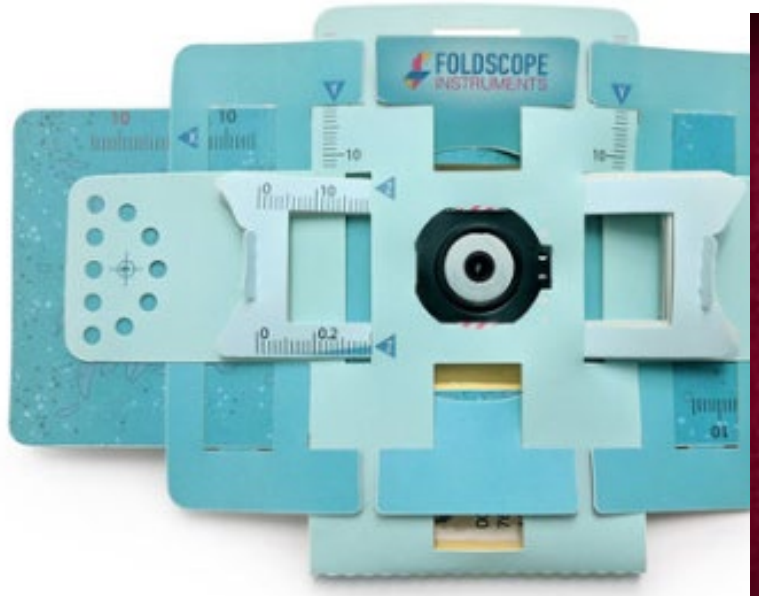


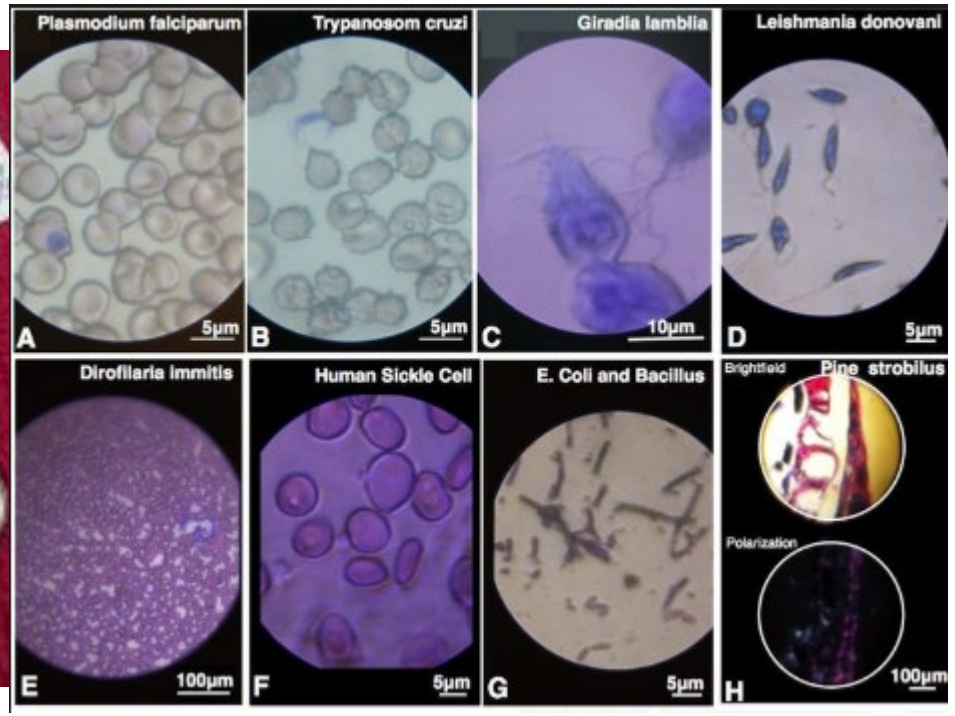
Jakarta Bay



Pelabuhan Ratu Bay

Monitoring Item No. 2/5: **phytoplankton** by mobile phone Foldscope



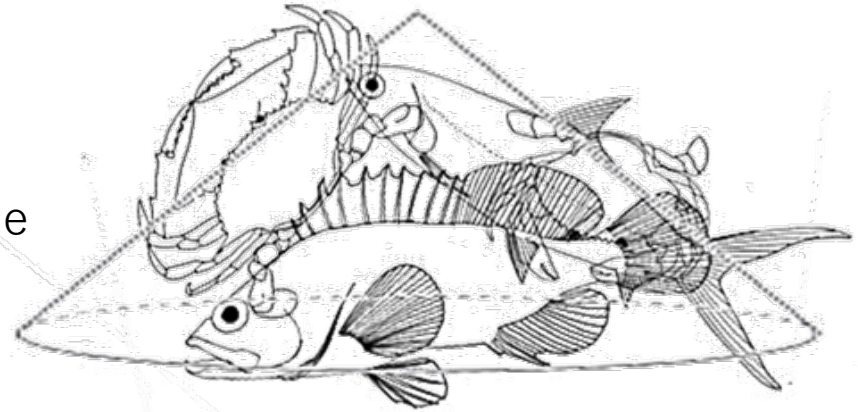


- Magnification of 140x, resolution of 2 microns
- Photos by local people are used to predict the HAB (Harmful Algal Broom) by the Indonesian researchers.

Monitoring Item No. 3/5 : Fish landing by your Mobile Phone Camera

- The photo of landed fish is important for assessing the sustainability of resources.
- Also, when you find new/unknown species, please take photo and share among us! (Climate change)

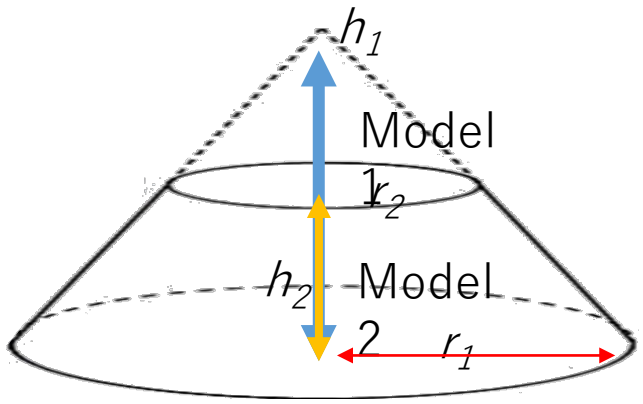
Assuming conical shape for the pile



“Can we quantify catch on board in small scale fishing?”

(with minimum efforts by fishers,

such as photos with mobile phone in this project)



Total 50 patterns of a pile with same fishes (8 species)

Methodology for the quantification of catch from photos

By Dr. Naoki Tojo

$$W_{est} = \frac{1}{3}\pi h_1 {r_1}^2 \times d$$

$$W_{est} = \frac{1}{3}\pi h_2 ({r_1}^2 + r_1 r_2 + {r_2}^2) \times d$$

d=Density of fish body: 1.065-1.09997 (Red snapper, TSUCHIMOTO et al 1992)
Bootstrapping (1000 times, uniform distribution)

Comparing the estimated weight and true weight

Monitoring Item No. 4/5:
Fisheries monitoring by your Mobile Phone Camera

- Your community has many regulations and local rules for fisheries management.

- If you find any suspicious or illegal vessels that violate your regulations/rules, take photos, and share with government and neighbors.

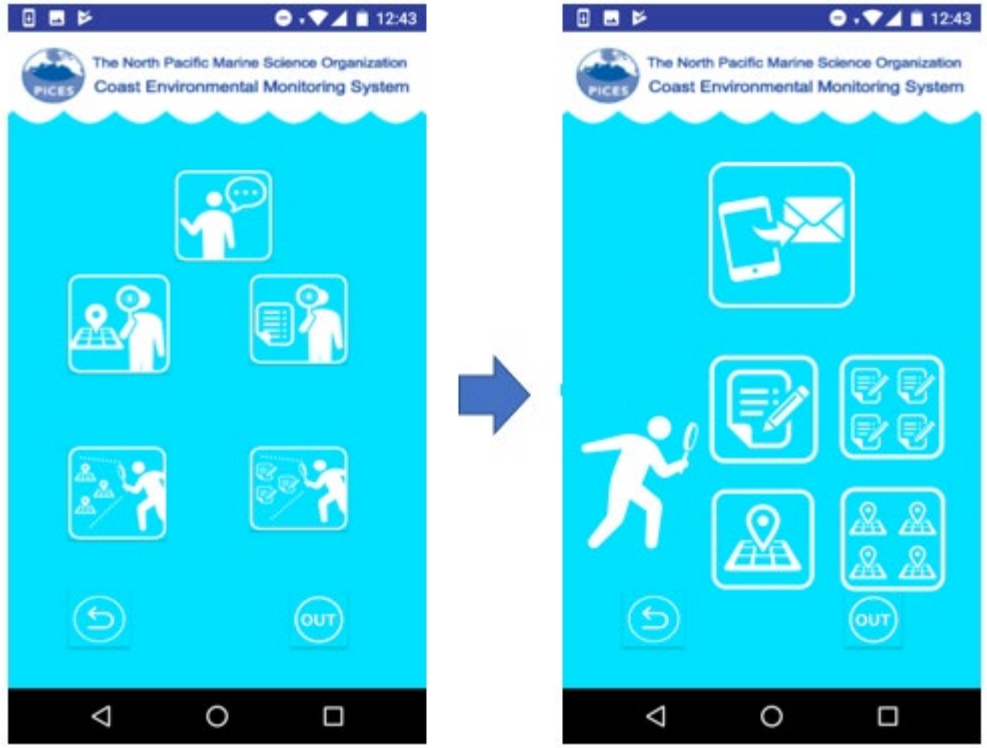
Monitoring Item No. 5/5:
Floating garbage by your Mobile Phone Camera

- The photo of floating garbage is useful for gov. to design effective clean-up activities

- Share with government to let them know the real situation.

We developed a Mobile Phone GIS app. to share all information gathered by local people

By Dr.Shigeharu Kogushi

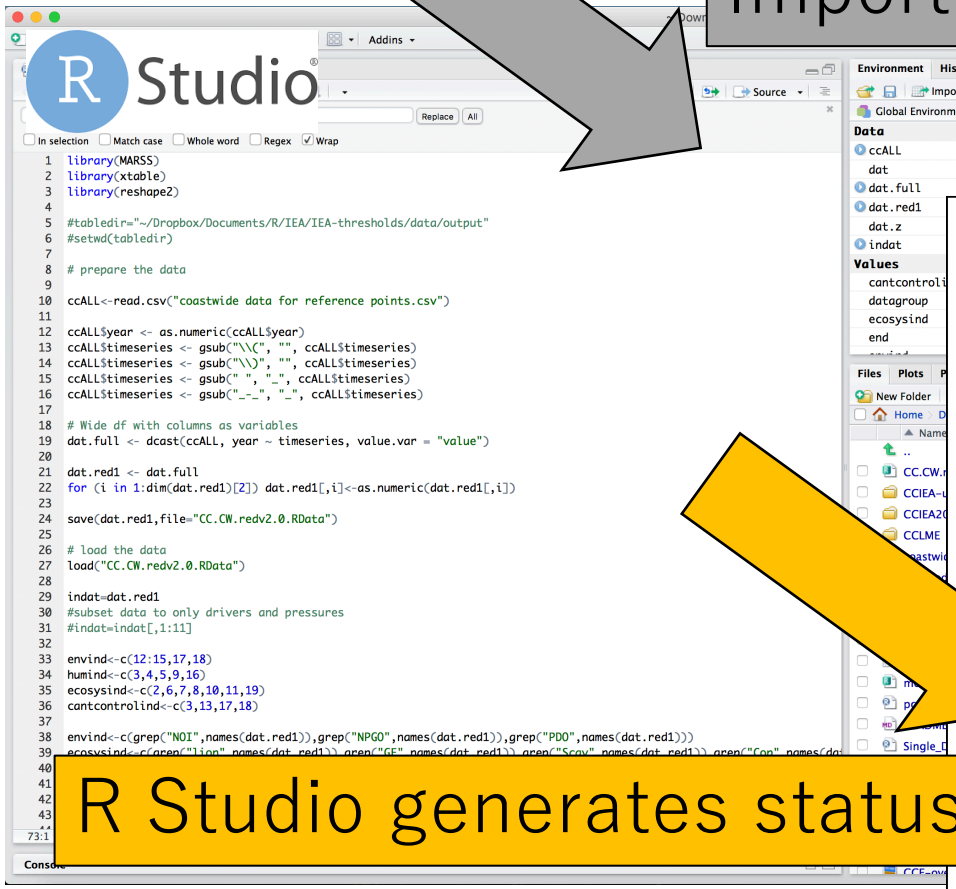


We are developing Rscript for generating Status Reports for local communities, government, and researchers.

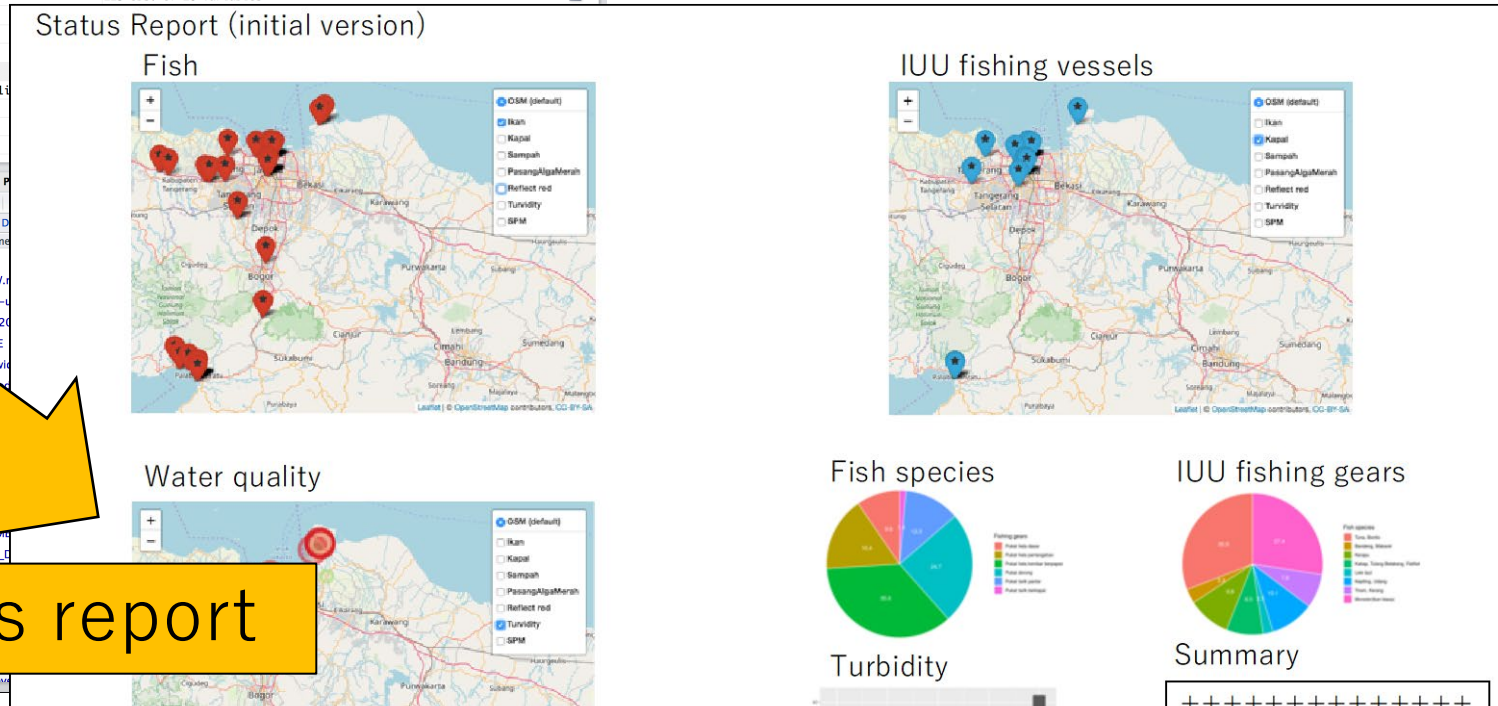
Monitoring results are stored on the indonesian server.

Import data from cloud server by RStudio

By Dr. Shion Takemura



R Studio generates status report



The Indonesian Government is supporting us to organize capacity building workshops

- The data will be stored in the Indonesian National Ocean Data Center
- Legitimacy of the activities.

Capacity building is the Key

- Strong supports from the communities – fishers are teaching fishers

  -> **Sense of ownership, pride and sustainability of the activity**

What we have done so far in FishGIS project

1. Sep 21, 2017: Preparatory meeting at Vladivostok .
2. Oct 5-6, 2017: Jakarta **Workshop**,
3. Jan 17-19, 2018: the 1st PST meeting in Yokohama
4. March 19-25, 2018: the Signing ceremony of LoI with BPPT/PICES and the Feasibility Trip in Indonesia.
5. July 10-12, 2018: the 1st Training **Workshop** in Indonesia.
6. Nov 2, 2018: the 2nd PST meeting in Yokohama
7. Dec 2018: Follow up visit
8. March 2019: 2nd Training **Workshop**
9. July 2019: 3rd Training **Workshop**
10. Oct 2019: 3rd PST meeting in Victoria
11. Feb 2020: Final **Workshop** and the assessment meeting

3 PICES PRESS Articles
26(2), 27(1), 27(2)

Expected output/outcome from this project

<Better understandings by the local people and researchers >

- Water quality and the basic productivity of the area
- The risk of the HAB occurrences
- Fish resource sustainability
- Climate change effects (longer term changes)
- Ideas for better fisheries management, etc.

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- Ideas for better fisheries management, etc.

<Better information for government policy measures>

- Policy effectiveness information
- Information of coastal governance and conservation
- Climate change effects
- Close interaction with community, etc.,etc.

In February, we organize the final workshop, and conduct the assessment of our project impacts to local people and government

Co-creating the vision for the future

Thank you very much