COBSEA - NUS Project 2021

Regional research inventory update and expansion, online data visualisation platform and recommendations to support the development of the GPML regional node

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    a. Maintaining the online platform for data visualisation and analytics
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Part 1: Project Activities and Deliverables

	Activity	Deliverables
A	Create the foundation for a regional research network of academic and research institutions on marine litter	➔ Concept note for the development of a research network with a draft skeleton ToR ➔ Summary of recommendations from pilot activities (4 webinar series)
B	Create, populate, expand and update online database of marine litter research in the EAS region	➔ Concept note for the development of the database ➔ Populated database (online) ➔ Online platform with visualisation of key data and findings (including on sources, pathways and impacts of plastic pollution and marine litter)
C	Support development of knowledge management and networking services linked to the EAS Regional Node of the GPML.	➔ Concept note on development of a catalogue of experts and of capacity building resources ➔ Initial catalogues of expert individuals and institutions as well as capacity building resources

Focus of this presentation

Part 2: Regional team members

Coordinated by the National University of Singapore (NUS) with the lead of Centre for International Law (CIL), and critical support of the Tropical Marine Science Institute (TMSI) on the marine scientific data extraction.

The outcome is a joint effort of the entire regional team, made up of more than 30 members across various countries:

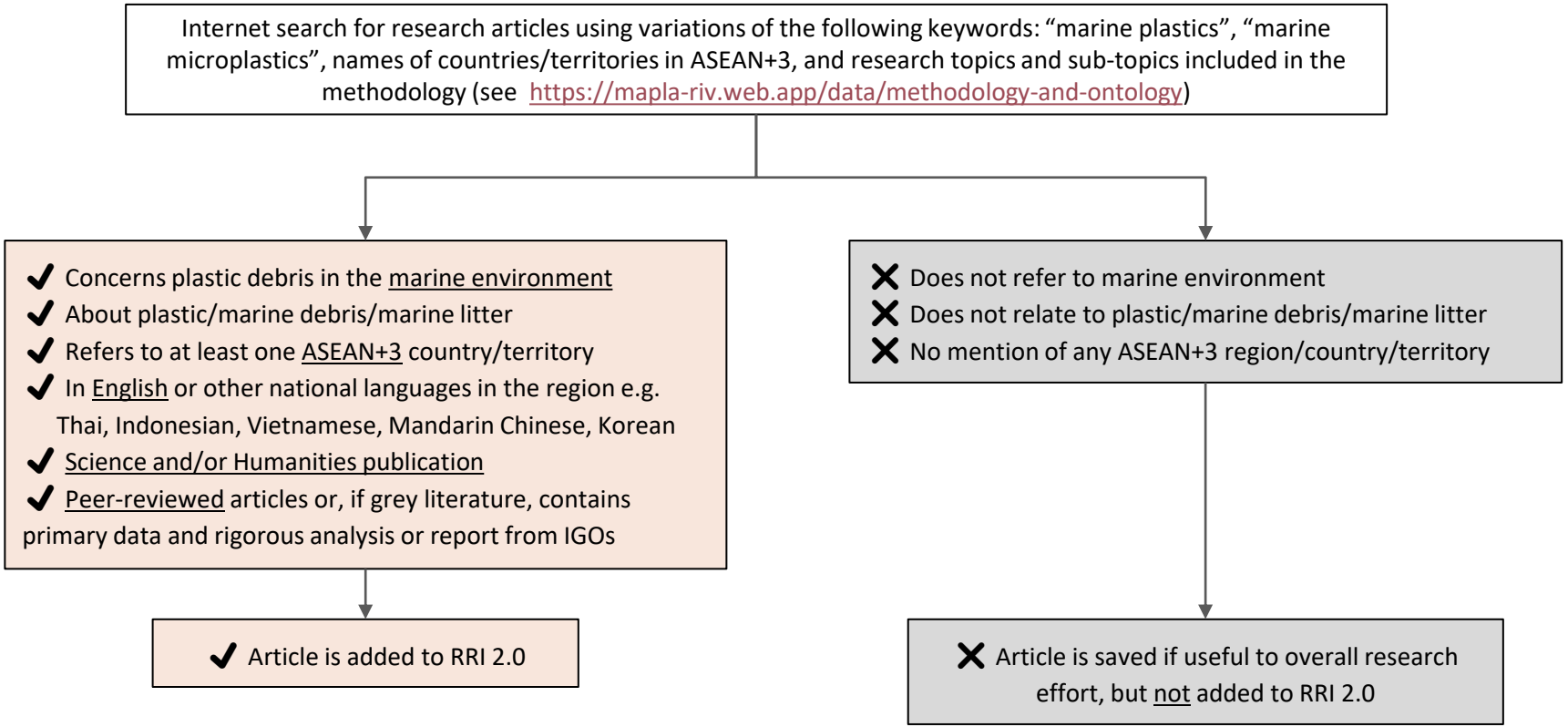
- NUS-CIL, **Singapore**: Youna Lyons, Cheng Ling Lim, 刘雨露 (Yulu Liu), Bùi Quang Huy (Bui Quang Huy), Dennis Tan, Dita Liliansa, 정다운 (Dawoon Jung), Sng Wen Xin, Vũ Hải Đăng (Vu Hai Dang)

  NUS-TMSI, **Singapore**: Mei Lin Neo, Jenny Fong, Lee Hsien Rong Samuel and Theresa Su

- Universiti Sains Malaysia, **Malaysia**: Japareng Lalung and his team
- Swinburne Sarawak, **Malaysia**: Changi Wong and Moritz Mueller
- Can Tho University, **Vietnam**: Văn Phạm Đăng Trí (Van Pham Dang Tri) and Lê Hoàng Hải Anh (Le Hoang Hai Anh)
- University of the Philippines-Mindanao, the **Philippines**: Neil Angelo S. Abreo
- Marine Science Institute, the **Philippines**: Ronan Baculi and Deo Onda
- Chulalongkorn University, **Thailand**: ชวลิต เจริญพงษ์ (Chawalit Net Charoenpong), ปิ่นมนัส บูชา (Pinamas Bucha), เพ็ญใจ สมพงษ์ชัยกุล (Penjai Sompongchaiyakul) and ราฮุล เมโรทรา (Rahul Mehrotra)
- Indonesian Institute of Science (LIPI), **Indonesia**: Sulistiowati and Muhammad Reza Cordova
- Myanmar Ocean Project, **Myanmar**: သန္ဓာကိုကြီး (Thanda Ko Gyi)
- East China Normal University, **China**: 李道季 (Li Daoji) and 朱礼鑫 (Zhu Lixin) and their team

Part 3: The Regional Research Inventory 2.0 (RRI 2.0)

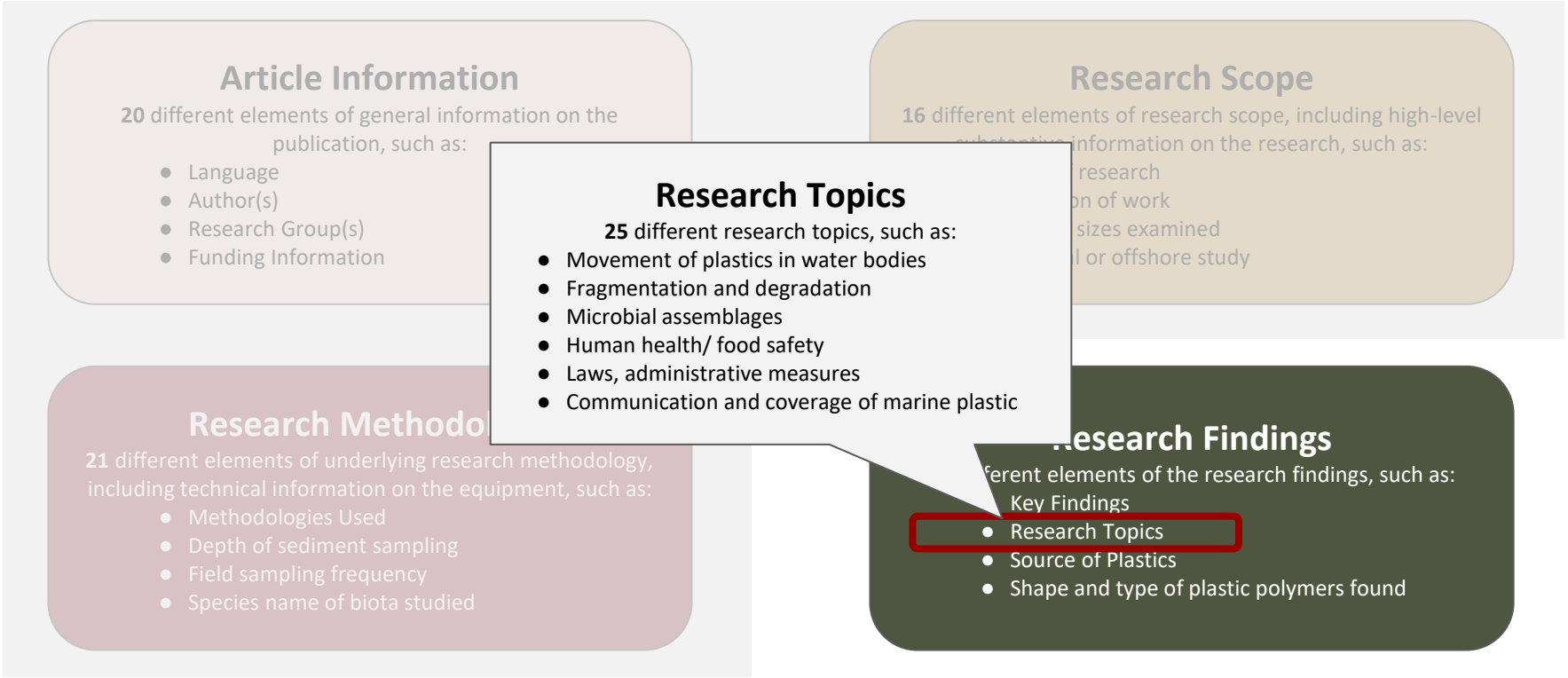
a - Scope and selection process for inclusion of publications in RRI 2.0



Part 3: The Regional Research Inventory 2.0 (RRI 2.0)

b - Metadata: Information extracted from publications included in the Inventory

(see https://mapla-riv.web.app/data/methodology-and-ontology)



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(see https://mapla-riv.web.app/data/methodology-and-ontology)

Methodology and Database Ontology

This section provides information on the development of RRI 2.0 and this website. The inventory and metadata can be found here.

Overall Methodology

Identification of relevant publications and data extraction

The identification of relevant publications and data extraction has been carried out by the Singapore-based core team and the extended regional team, according to the area of expertise of each researcher. Target publications for inclusions are those that relate to any aspect of pollution from marine plastics in Southeast and East Asia until July 2021; not including publications that would relate solely to the production of plastic material and products or the upstream management of waste. The RRI 2.0 builds on the publications already captured in the previous version of the inventory here.

In RRI 2.0, the inventory was updated to include more recent publications, and publications in non-English languages. The search for publications was limited to contents which could be found online (even if only the abstract). Various keywords were used in numerous search engines, including Google Scholar, ScienceDirect, Scopus, and ProQuest (see guidance below). Domestic academic collections accessible to the regional team were also consulted - this enabled the inclusion of relevant research (such as dissertations) conducted in the
researcher in the regional team. It is hoped that the regional team can
make it more representative and improve the accessibility of the papers

RRI 2.0 includes non peer-reviewed publications provided that they c
metadata fields could be filled reliably. In countries where there has b
useful substitutes. Furthermore, not all sampling reports lend themselv
database. Of note in this context, most of the non-English papers that c

Website Development

This website is developed using two open-source libraries: React.js and

All the data is queried directly from the database inventory on Google
the website. This approach simplifies the development and maintenan
platform. The website content is dynamic and is refreshed everyday.

The website codebase is readily available publicly on Github.

Guidance to the Research Inventory metadata fields

The metadata input fields are grouped into 4 broad categories, as shown below.
The detailed metadata, including the instructions on filling in the inventory, can be found here.

Article Information

This first category of input fields capture general information on the publication. This includes basic information such as the language of the publication, the names of authors, and funding information.

- ID
- Geographical Scale
- Link to source
- Title
- First Author
- Editor(s)
- Country/territory of Research Institution
- Academic type
- Country/territory studied
- Language
- Translated title
- Corresponding author
- Book Title
- Funding Information
- Year Published
- Type
- Citation
- Author(s)
- Journal
- Research Group(s)

Research Scope

This second category of input fields captures the different elements of research scope. It includes high-level substantive information on the research and publication. This enables a better understanding of the research, such as whether it is a coastal or offshore study, whether it has social/cultural elements, or whether the research examined contaminants.

- Aim of research
- Location of work
- Coastal or offshore study
- Microplastic size
- Legal/regulatory study
- Policy study
- Period of study
- Relevant water body_Detailed
- Plastic sizes examined
- Contaminants examined
- Social/cultural study
- Period of study_Year
- Relevant water body_General
- Adopted GESAMP size
- Fishing gear examined
- Economic/management study

Research Findings

This fourth category starts with a summary of key findings for each publication. Plastic sources (whether implied or traced), counts and/or weights are recorded. Where ever possible, the reported average values and standard deviations are recorded verbatim.

- Key Findings
- Research Topics
- Plastic Characterisation_Colours Found
- Plastic Characterisation_Polymer
- Macro_Mean Abundance_Count
- Water_Mean Abundance_Weight
- Seabed Sediment_Mean Abundance_Count
- Mangrove_Mean Abundance_Weight
- Degradation indicated
- Source of Plastics
- Plastic Characterisation_Conducted
- Plastic Characterisation_Shape
- Plastic Characterisation_Polymers Found
- Macro_Mean Abundance_Weight
- Shoreline Sediment_Mean Abundance_Count
- Seabed Sediment_Mean Abundance_Weight
- Biota_Mean Abundance_Count
- Source of Plastics_General
- Plastic Characterisation_Colour
- Plastic Characterisation_Shapes Found
- Macro_Uses
- Water_Mean Abundance_Count
- Shoreline Sediment_Mean Abundance_Weight
- Mangrove_Mean Abundance_Count
- Biota_Mean Abundance_Weight

Within the input field **Research Topics**, the values for input as stated below:

- Survey and monitoring/pollution status
- Contribution from rivers
- Contribution from fisheries/ALDFG
- Discharge from offshore infrastructures and shipping
- Port reception facilities
- Fibreglass-reinforced plastic vessels
- Hull scraping and marine coating
- Land-based/upstream research/waste management
- Differentiation between plastic sources
- Movement of plastics in water bodies
- Fragmentation and degradation
- Accumulation zones and hotspots
- Ingestion of plastic in the wild
- Branchial uptake of plastic in the wild
- Entanglement by plastic in the wild
- Microbial assemblages
- Experimental studies of physicochemical impacts
- Impact on endangered species
- Trophic transfer of plastic
- Marine plastics as pathways for introduction of
- Methodologies and technologies for research on marine microplastic
- New' or 'emerging' technologies for marine plastic
- Methodologies and technologies for marine plastic

Research Methodology

This third category of input fields describes the underlying research methodology, approach. Where ever possible, technical information on the equipment and technology used. This is particularly useful to understand capacity needs and elements of data comparability.

- Methodologies Used
- Field sampling_Frequency
- Biota_Species
- Common names
- Desktop/deductive analysis
- Water sampling_Depth
- Mangrove/mudflat sediment Sampling_Depth
- Field sampling_Conducted
- Survey/Interview_Conducted
- Biota_Phyllum
- Literature review_Conducted
- Modeling_Conducted
- Shoreline sediment sampling_ Depth
- Control/blanks
- Field sampling_Compartment
- Other sampling_Type
- Biota_Applied
- Literature review_Volume
- Modeling_Type Plankton net_Mesh size
- Seabed sediment sampling_Depth

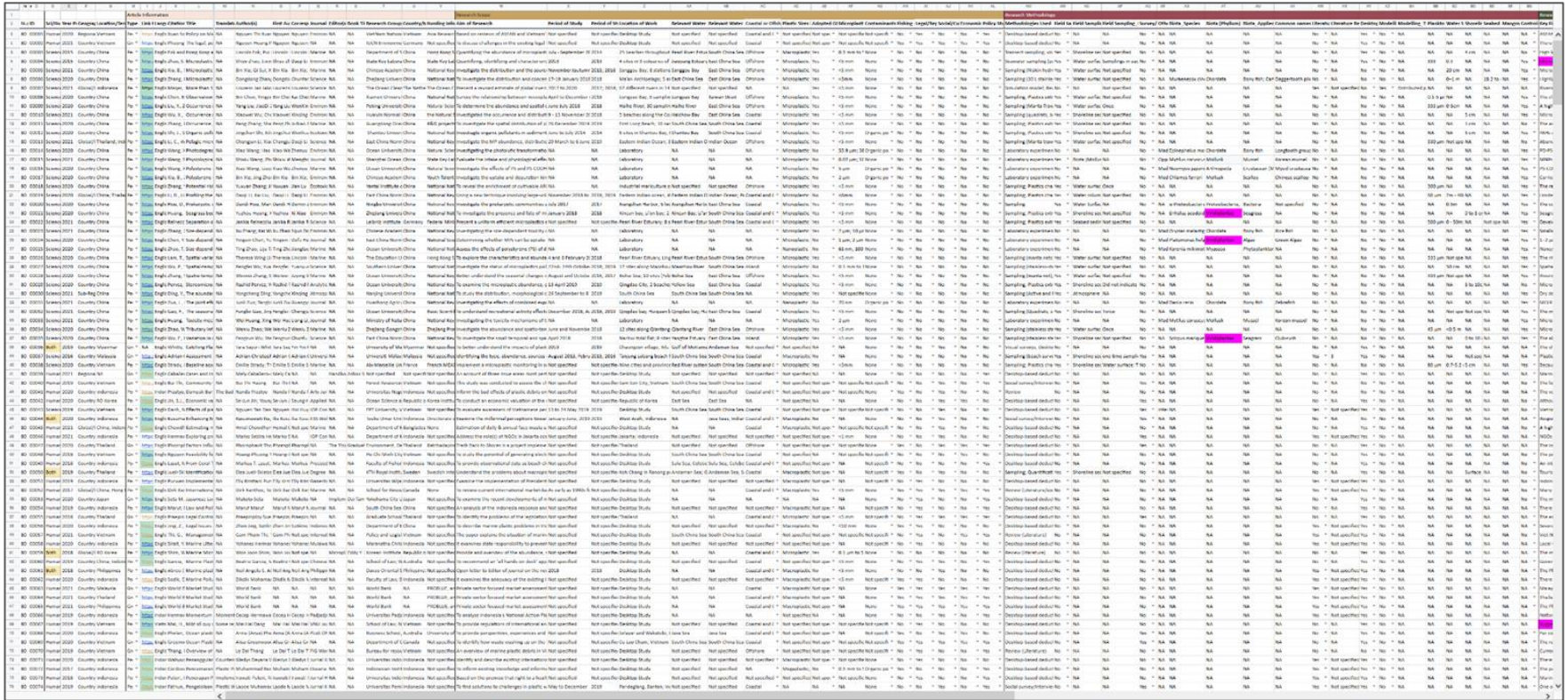
Under the input field **Methodologies Used**, the values for input are stated below:

- Review (literature or social)
- Identification
- In-situ experimental work
- Laboratory experimental work (Heavy metal analysis)
- Remote imagery and analysis
- Desktop quantitative analysis
- Monitoring
- Sampling
- Laboratory experimental work (Sorption of pollutants/chemicals)
- Plastics extraction/preparation
- Field study (Socio/economic)
- Desktop qualitative analysis
- Quantification
- Simulation model
- Laboratory experimental work (Toxicity of plastic on development in marine biota life stages)
- Plastics characterisation, identification, quantification
- Social survey/Interview/Questionnaire

Part 3: The Regional Research Inventory 2.0 (RRI 2.0)

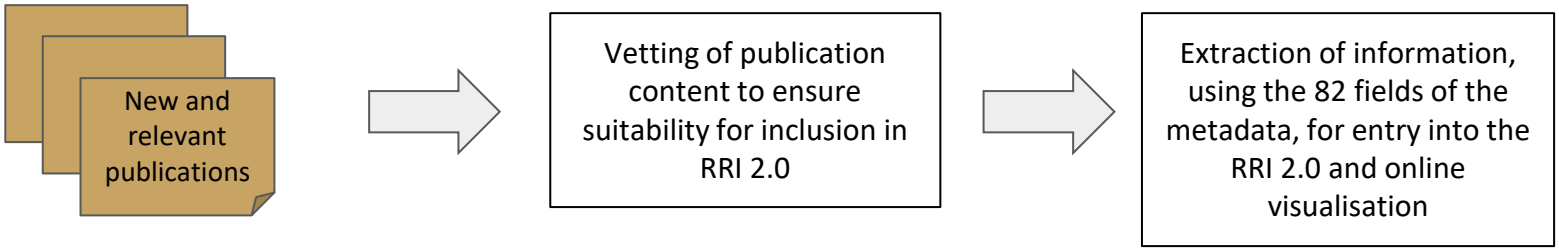
c - A snapshot of RRI 2.0

Table containing 82 columns and 702 rows, of organised data



Part 3: The Regional Research Inventory 2.0 (RRI 2.0)

d - Updating of RRI 2.0

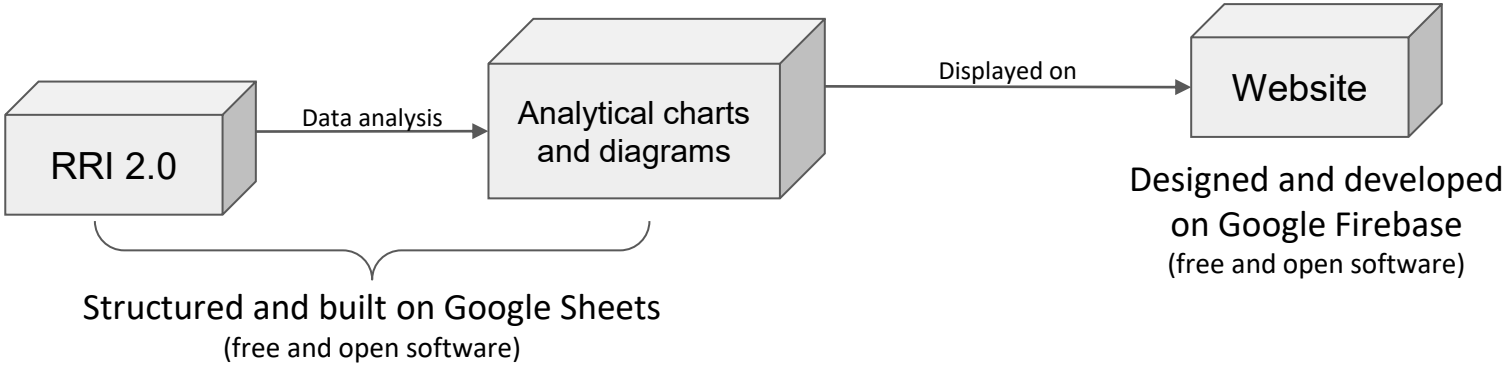


- Updating of the RRI 2.0 is necessary for the information to remain relevant and current
- Expertise in data organisation, a familiarity with the metadata & utilizing the RRI 2.0 and technical understanding of relevant fields of research on marine plastics are necessary
- The publication may also be in non-english language and require fluency in ASEAN +3 languages and access to local databases
- Publications are commonly behind paywall and require subscriptions, such as through academic institutions, to access

Part 4: Online Data & Visualisation Platform

a - Approach chosen for the development

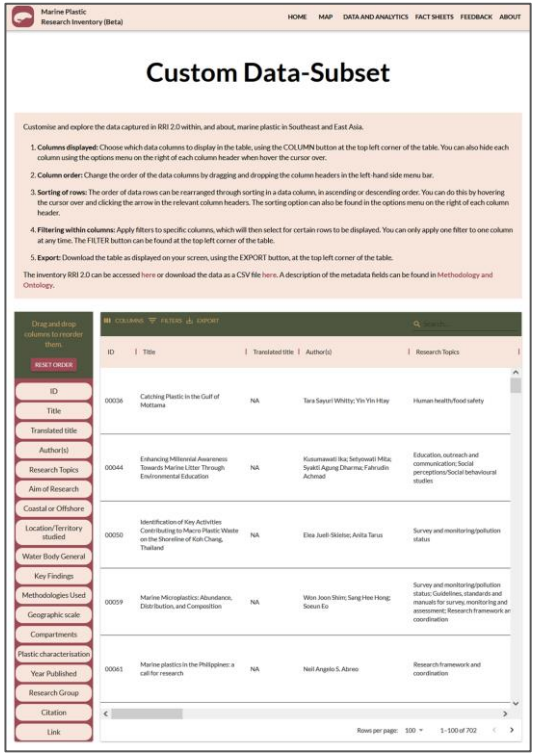
- Key concern was to create content that could easily be imported to other platforms
- The overall architecture of the RRI 2.0 and of the visualisation platform are like that of Lego© blocks - the parts can exist on their own and are also able to connect with other similar pieces
- Information on publications are extracted and stored on the RRI 2.0, which is set up within a Google Sheet (therefore easily exportable on any other repository)
- Data within the Google Sheet are analysed to create charts and diagrams
- Online data analytics and visualisation platform is designed and developed, separately, on Google Firebase
- Data, charts and diagrams from Google Sheet are communicated to Google Firebase and displayed on the online platform

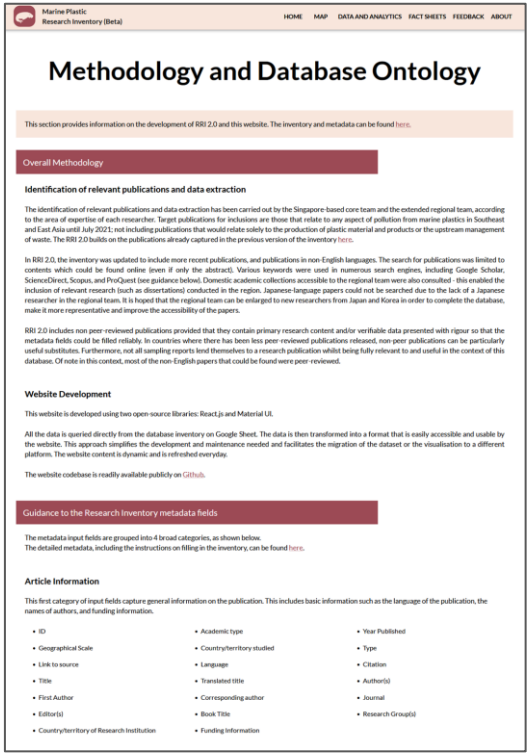


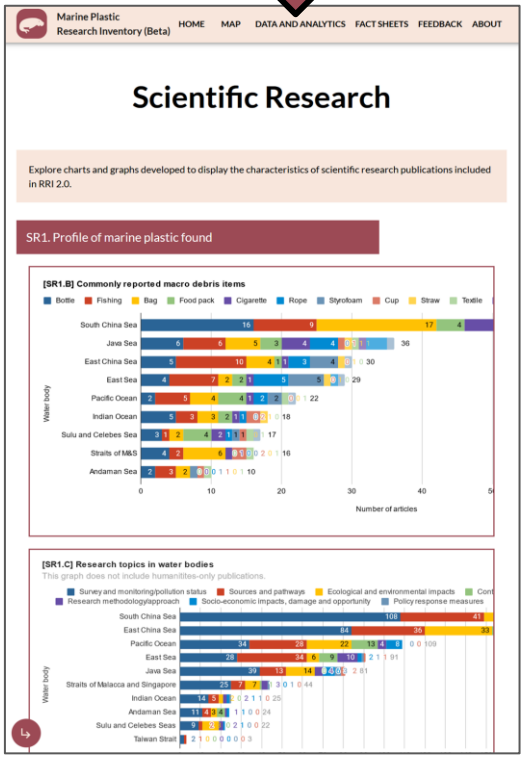
Part 4: Online Data Visualisation Platform

b - The online platform - beta version (*https://mapla-riv.web.app/data*)

Data and Analytics







Part 4: Online Data Visualisation Platform

b - The online platform - beta version (*https://mapla-riv.web.app/data*)

Map

This interactive map provides a visual representation of the geographic extent of RRI 2.0 as well as an extract of data analysis. When clicking on a country/territory, the following information is provided in relation to that country/territory:

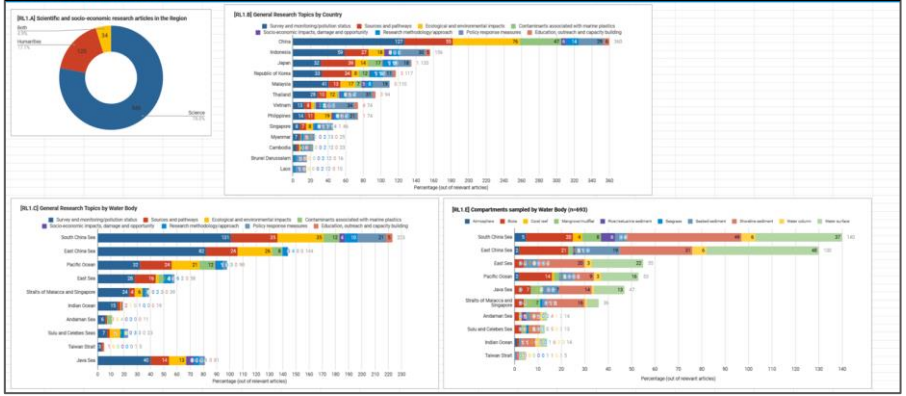
First, the total number of publications in RRI 2.0; Second, the number of publications on sub-topics is included: Science-only, Humanities-only, Both (i.e. Science and Humanities), Laboratory-based, Desktop-based, Field sampling, Microplastic, Macroplastic, Fishing gear, Legal/Regulatory, Social/Cultural, Economic/Management, Policy Study.

The RRI 2.0 can be accessed here.

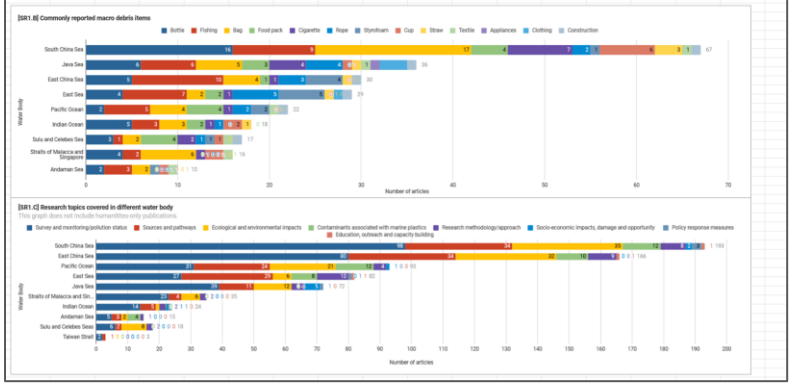
Part 3: The Regional Research Inventory 2.0 (RRI 2.0)

c - Examples of information available

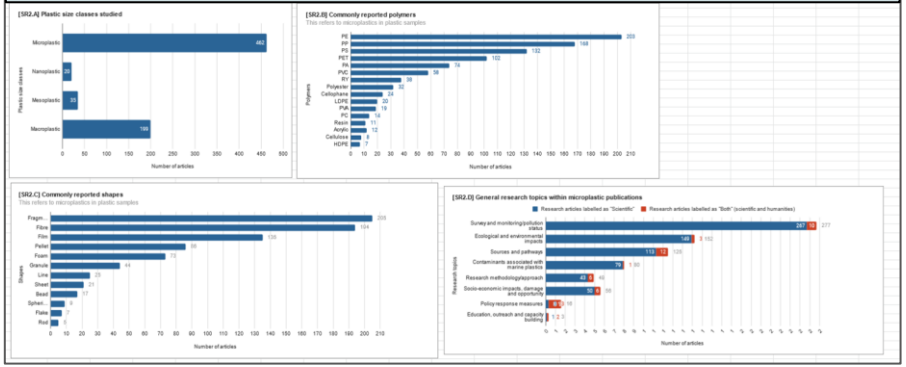
RESEARCH PROFILE



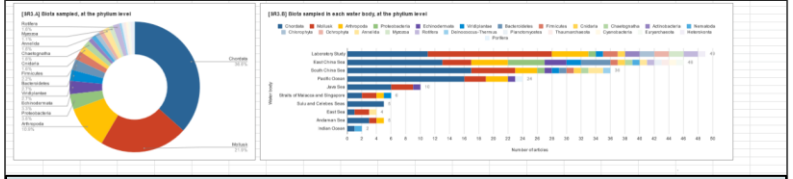
SR1 . Profile of marine plastics found



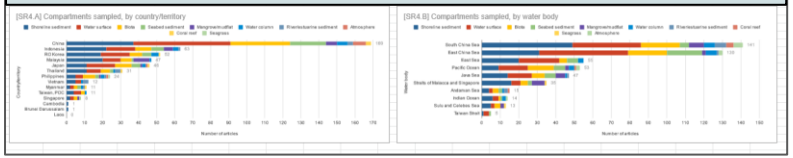
SR2 . Dive into Microplastics



SR3 . Biota



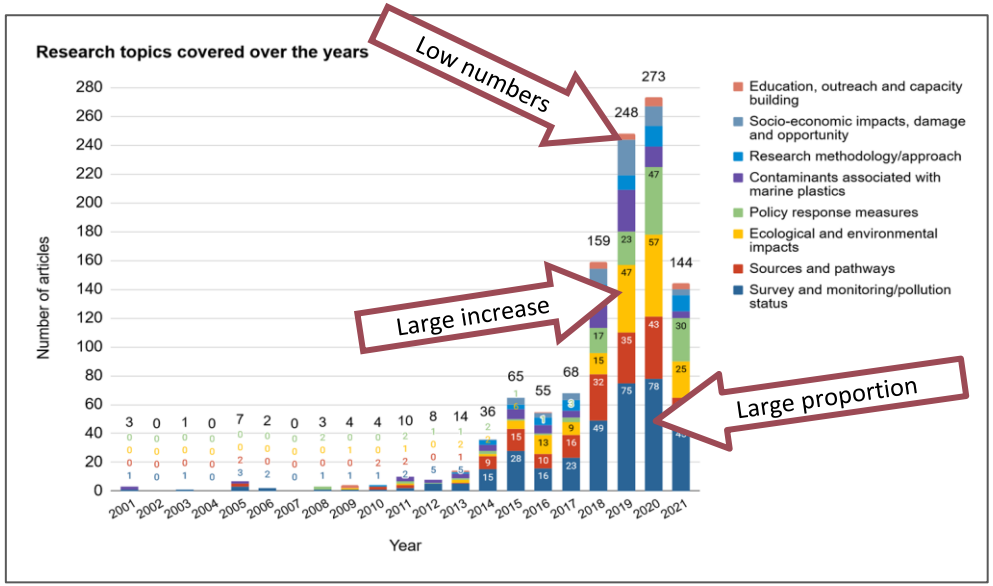
SR4 . Compartment sampled



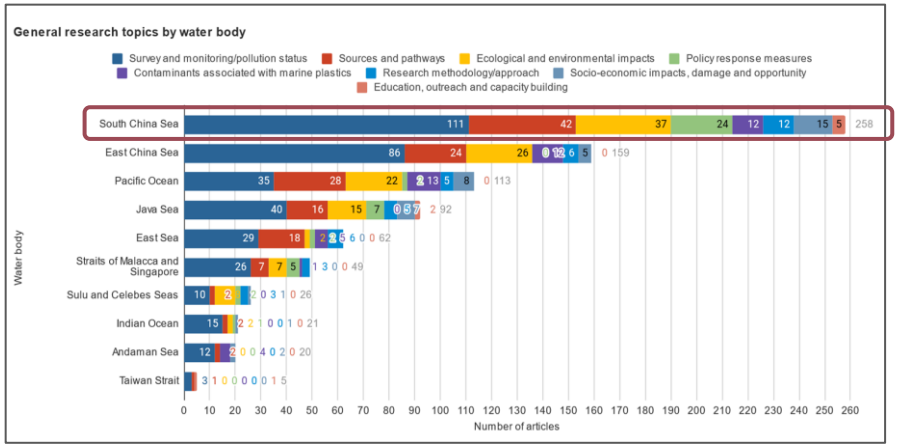
Part 4: Online Data & Visualisation Platform

d - Using the online platform: some examples

Research topics covered over time



Research topics in different water bodies



⚠ Note that this perspective is based on publicly-available online research published between 2001 and June 2021, that the research team has found, successfully accessed and documented. Studies that did not lead to accessible online publications could not be included.

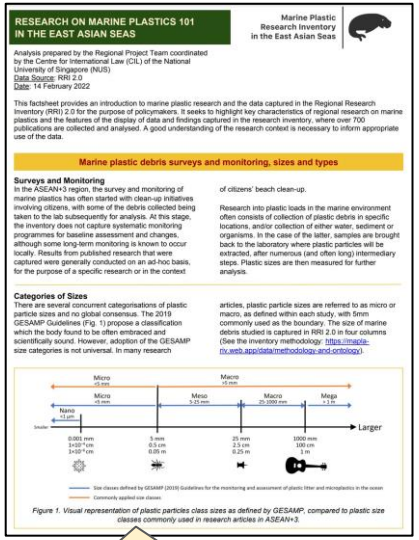
Part 4: Online Data & Visualisation Platform

e- Factsheets (https://mapla-riv.web.app/factsheets)

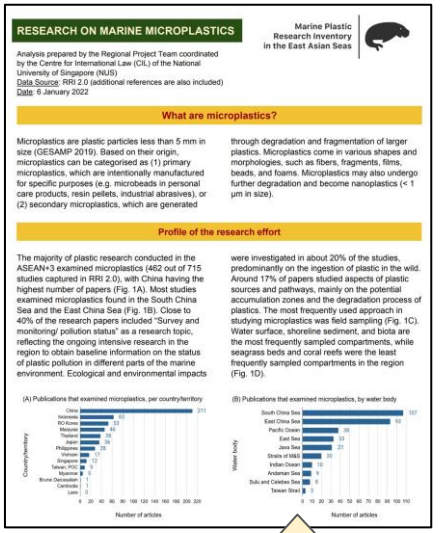
- Two factsheets are available on the (beta) data visualisation online platform
- They are based on data from the inventory
- They were prepared to demonstrate the way in which data included in the inventory can be used for different applications, especially policy-making purposes
- Our vision is that many more factsheets will be added to answer specific questions in the context of the region or parts of the region. We have several in the work and hope that others from the region will join.

Examples include:

- ➔ ***Single-use plastic and consumer plastics***
- ➔ ***Contaminants associated to marine plastics and the micro-plastisphere***
- ➔ *Social and cultural factors in pollution from marine plastics*
- ➔ *Economic costs, risks and hotspots*
- ➔ *Fisheries and aquaculture*
- ➔ *Marine plastics and biota*
- ➔ *Regional features: tropical climate condition, extreme events and hazards*



- Marine plastic debris surveys and monitoring, sizes and types
- Research topics
- Evolution of the research focus
- Understanding sources and pathways
- Understanding impacts
- Responses and interventions
- Limitations and opportunities for policy-making



- What are microplastics
- Profile of the research effort
- Sampling methods and challenges
- Findings on abundance and distribution
- Societal concerns and response
- Unanswered research questions

Part 5: Platform maintenance and integration with GPML

a- Maintaining the online platform for data visualisation and analytics

Examples of maintenance tasks:

1. Edits to textual content on the platform, as required
2. Review of the platform to ensure any changes to the RRI 2.0 are reflected in the data analytics
3. Update all softwares involved and their compatibility as needed
4. Ensure the components written by code are functional
5. Ensure security/cyber-security

Part 5: Platform maintenance and integration with GPML

b- Means of integration with GPML or other online platforms on marine litter

Several avenues can be explored, including:

1. Importing of inventory dataset onto GPML-hosted website
    a. The issue of updating of the inventory to be handled
2. Importing of visualisation and analytics onto the GPML-hosted website that would pull data from inventory
    a. Inventory will still be hosted and maintained by regional team and academia
3. Link to data hosted on current beta-temporary online platform

We are looking forward to this regional research network and joint-effort on the research inventory and data extraction to develop further

If you have any feedback, please share them here - https://tinyurl.com/cobsea-nus

Please contact us for any clarification or further discussion at younalyons@nus.edu.sg