All-Atlantic 2021

Connecting, Acting, Cooperating

2-4 June

Ponta Delgada, Azores, Portugal

Welcome everyone!

Marine Debris in the Atlantic Ocean

Session 1 - 11:35-12:05 UTC - Scientific Knowledge and Challenges

5’ Break

Session 2 - 12:10-12:40 UTC - Towards informed policy making

10’ Break

Session 3 - 12:50-13:30 UTC - Building Opportunities with experts and stakeholders

Panel Discussion moderated by Francois Galgani (Ifremer, France)

Attendees, ask your questions in the Q&A Zoom chatbox, and speakers will answer by writing

Marine Debris in the Atlantic Ocean

Challenges and Opportunities in monitoring its sources and pathways

VIRTUAL EVENT
3 June 2021
11:30 – 13:30 UTC

MEET OUR SPEAKERS
Session 1: Scientific Knowledge & Challenges

Dr. José C. Ferreira

FCT NOVA - NOVA University & MARE, Portugal

Dr. Lauren Biermann

(PML/ IOCCG Marine litter Task Force, UK)

Dr. Hans-Peter Plag

IEEE, USA

Implemented by

GEO BLUE PLANET

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IEEE Oceanic Engineering Society OES

All-Atlantic 2021 2-4 June Ponta Delgada, Azores, Portugal — Connecting, Acting, Cooperating

2021 PORTUGAL.EU

Challenges and Opportunities in monitoring the sources and pathways of Marine Debris in the Atlantic Ocean

Societal Impacts of Marine Litter

A transatlantic approach to the impact of marine litter on small coastal communities

José Carlos Ferreira
jcrf@fct.unl.pt

June 3, 2021

With the support

Impacts of marine litter

- **Biodiversity**
- **Economy**
- **Human health**

Wildlife Entanglement

Ingestion

Destruction of Habitats

Decrease in fish stocks

Garbage-strewn beaches

Beach Cleaning Expenses

Damage to vessels

Hazards, risk to humans and the environment

Marine Litter Sources

from marine activity …

originating from
terrestrial activities …

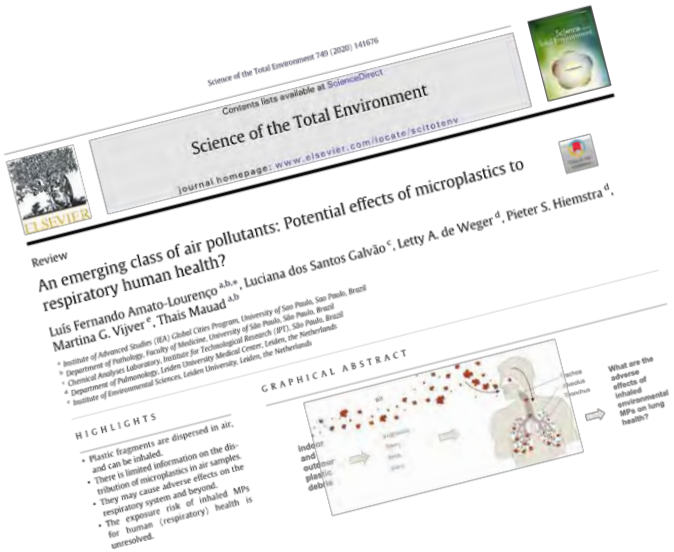
The Impacts?

IS THIS BEACH CLEAN?

Boa Vista Island, Cabo Verde

Micro plastics

<5 mm plastic fragments



Science of the Total Environment 749 (2020) 141676

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Review

An emerging class of air pollutants: Potential effects of microplastics to respiratory human health?

Luís Fernando Amato-Lourenço [a,b,*], Luciana dos Santos Galvão [c], Letty A. de Weger [d], Pieter S. Hiemstra [d], Martina G. Vijver [e], Thais Mauad [a,b]

[a] Institute of Advanced Studies (IEA) Global Cities Program, University of São Paulo, São Paulo, Brazil
[b] Department of Pathology, Faculty of Medicine, University of São Paulo, São Paulo, Brazil
[c] Chemical Analytics Laboratory, Institute for Technological Research (IPT), São Paulo, Brazil
[d] Department of Pulmonology, Leiden University Medical Center, Leiden, the Netherlands
[e] Institute of Environmental Sciences, Leiden University, Leiden, the Netherlands

HIGHLIGHTS

- Plastic fragments are dispersed in air, and can be inhaled.
- There is limited information on the distribution of microplastics in air samples.
- They may cause adverse effects on the respiratory system and beyond.
- The exposure risk of inhaled MPs for human (respiratory) health is unresolved.

GRAPHICAL ABSTRACT

What are the adverse effects of inhaled environmental MPs on lung health?

NATIONAL GEOGRAPHIC

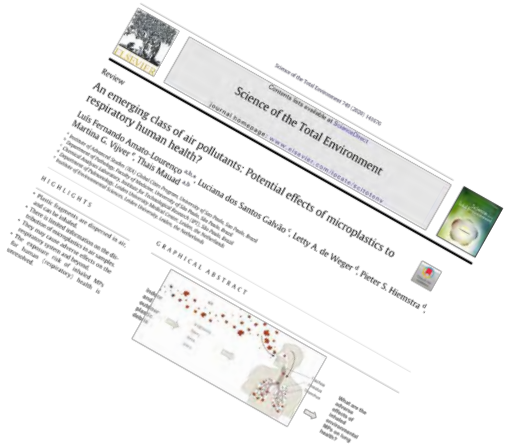
ENVIRONMENT | PLANET OR PLASTIC?

Microplastics are raining down from the sky

Scientists discover large amounts of tiny plastic particles falling out of the air in a remote mountain location.

BY STEPHEN LEAHY

5 MINUTE READ



Review

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Science of the Total Environment

HIGHLIGHTS

GRAPHICAL ABSTRACT

What are the adverse effects of inhaled environmental MPs on lung health?

People eat at least 50,000 plastic particles a year, study finds

Health effects of ingestion of microplastics via food, water and breathing still unknown

Available online at www.sciencedirect.com

ScienceDirect

Current Opinion in Environmental Science & Health

Microplastics in air: Are we breathing it in?

Johnny Gasperi [1,a], Stephanie L. Wright [2,a], Rachid Dris [1], France Collard [1], Corinne Mandin [3], Mohamed Guerrouache [4], Valérie Langlois [4], Frank J. Kelly [2] and Bruno Tassin [1]

Abstract

The annual production of plastic textile fibers has increased by more than 6% per year, reaching 60 million metric tons, about 16% of world plastic production. The degradation of these fibers produces fibrous microplastics (MPs). Such MPs have been observed in atmospheric fallouts, as well as in indoor and outdoor environments. Some fibrous MPs may be inhaled. Most of them are likely to be subjected to mucociliary clearance; however, some may persist in the lung causing localized biological

marine, and more recently, continental environments. Worldwide plastic production increases annually by approximately 3%, and, excluding plastic fiber production, reached 322 million metric tons in 2016 [1]. Whilst the ubiquity of MPs, and especially of fibrous MPs in both marine and freshwater ecosystems has been demonstrated, the dynamics of their sources, pathways and reservoirs are not well documented. Among the sources of microplastics, urban inputs such as waste-

ELSEVIER

Current Opinion in Environmental Science & Health

Volume 1, February 2018, Pages 1-5

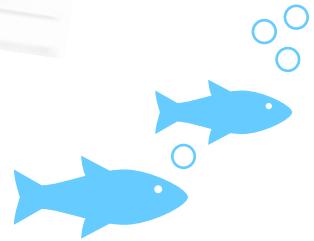
Microplastics in air: Are we breathing it in?

Johnny Gasperi [1,a], Stephanie L. Wright [2,a], Rachid Dris [1], France Collard [1], Corinne Mandin [3], Mohamed Guerrouache [4], Valérie Langlois [4], Frank J. Kelly [2], Bruno Tassin [1]

Show more

https://doi.org/10.1016/j.coesh.2017.10.002

Get rights and content

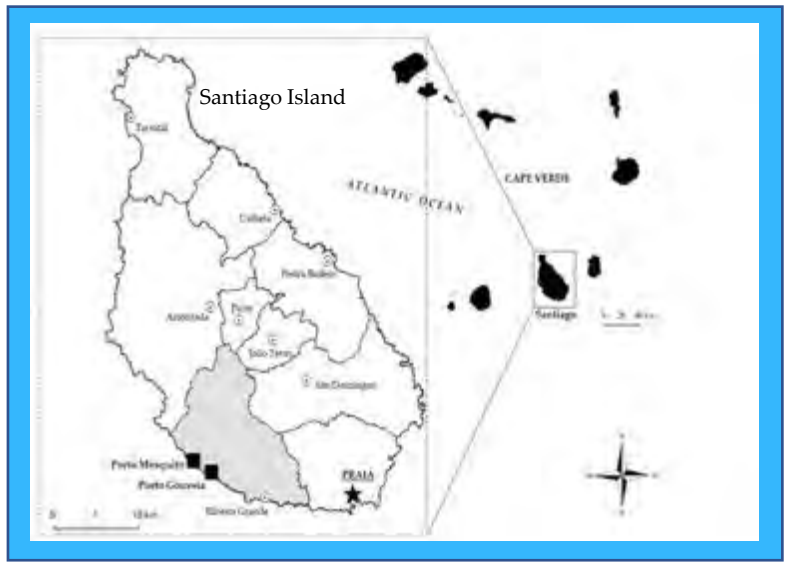


Cape Verde

Tarrafal beach, Santiago Island

A transatlantic approach to the impact of marine litter on small coastal communities

Porto Mosquito and Porto Gouveia Coastal Fishing Communities



The Societal Impacts


Sté


NOSSA
SRA
FATIMA
DE


adidas


Working with
Coastal Island
Communities

Porto Mosquito and Gouveia Public Participation and Community Engagement

Marine litter impacts on low income coastal communities in developing countries

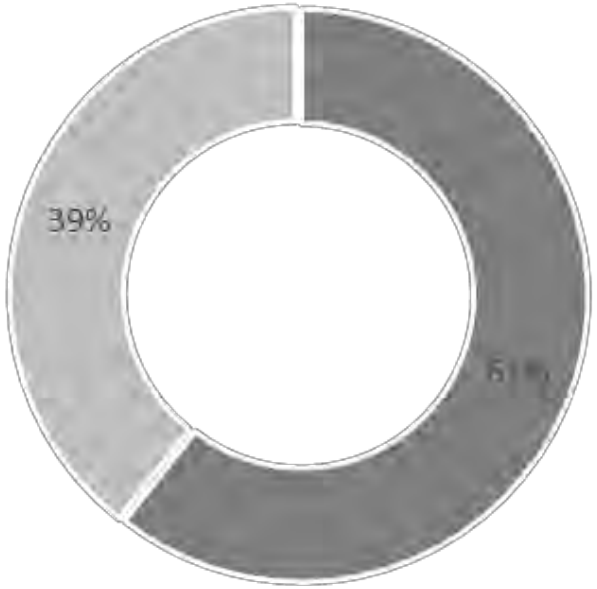
Feedback was given to all participants, in order to create opportunities to update the group

Two coastal communities were selected– Porto Mosquito and Porto Gouveia

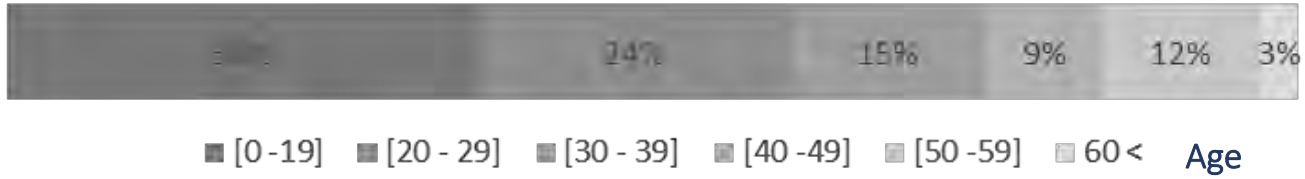
Presentation of scientific information about marine litter followed by training sessions

Non-formal and active participatory methods in two sessions – Brainstorming and active listening

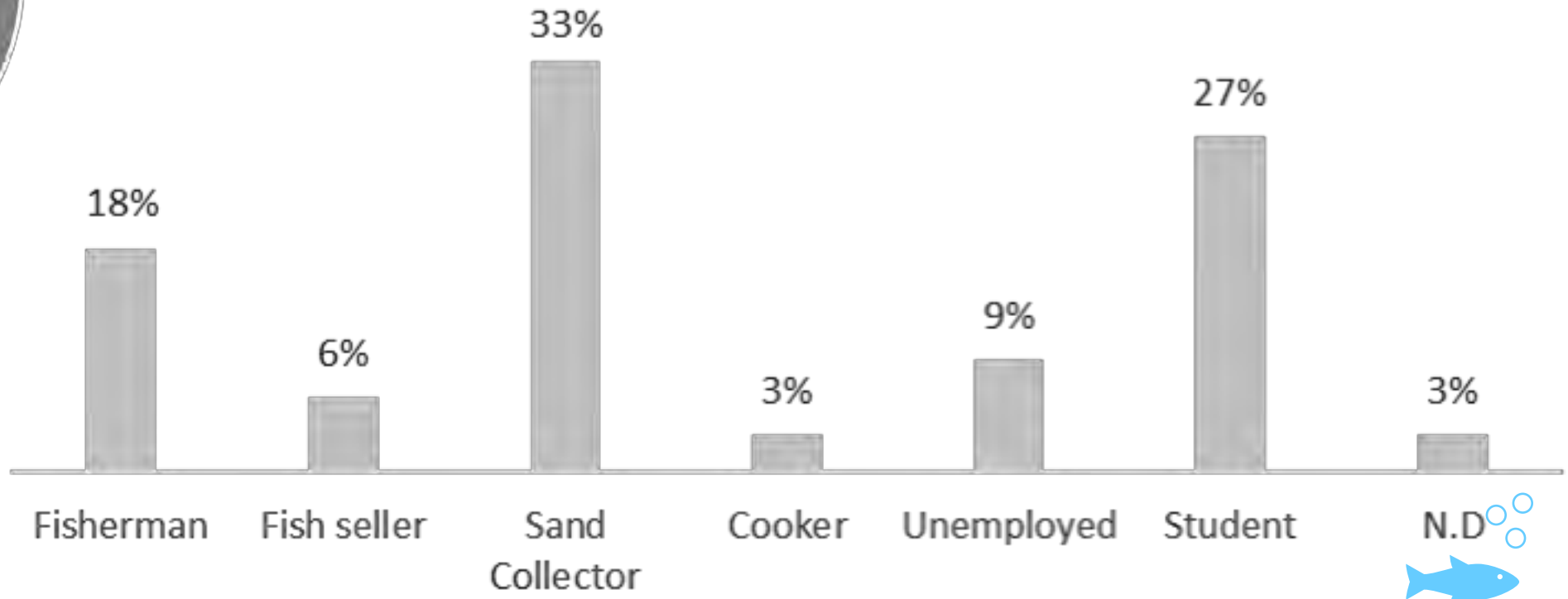
Participants characterization



Participants in the group sessions by gender



Participants in the group sessions by age group



Participants in the group sessions by occupation

Example of poster for publicizing the sessions, posted in public places in both communities prior the participatory sessions

Active listening and brainstorming in the participatory session in Porto Gouveia.

Active listening and brainstorming in the participatory session in Porto Mosquito.

Capacity building regarding marine litter in the participatory session in Porto Gouveia.

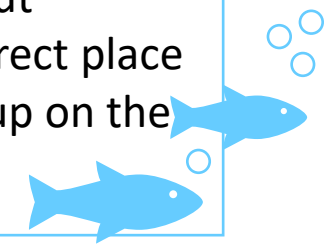
Training of teachers and students at Escola do Salineiro.

Training of sea ambassadors (students, children of fishermen).

Participants perceptions regarding marine litter

Porto Mosquito and Gouveia

Causes		
Waste Management	**Origin of Litter**	**Population Literacy**
The community identified the lack of proper waste management as one of the biggest problems in the island. The lack of trash bins makes people to dispose trash in the hills, which will end up in the sea when it rains	People were fast to refer that it is now allowed to throw litter to the ocean, so the main part of marine litter comes from land	The population admitted that there was not enough information regarding this topic, which explains the lack awareness about marine litter. The community also stated that even when there are trash bins in the street, people usually do not put their residues in the correct place and, the majority, end up on the streets



Participants perceptions regarding marine litter

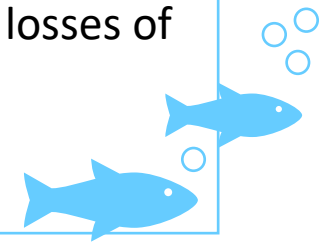
Porto Mosquito and Gouveia

Waste Found
Plastic
In both communities, the population could easily identify plastic (water and oil bottles) as the main component of marine debris. Apart from that, some citizens also stated that clothes and shoes were also common to be found in the beaches

Participants perceptions regarding marine litter

Porto Mosquito and Gouveia

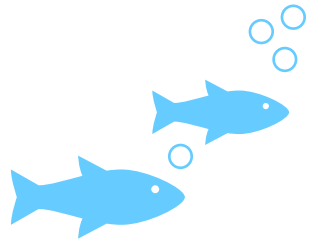
Impacts		
Equipment Damage	**Wildlife at risk**	**Sand Collection**
Some fishermen stated that, sometimes, the fishnets that are abandoned in the sea, can wrap around the boat propeller, which can damage it, resulting in money losses to repair it. This also makes impossible for fishmen and fish sellers to work, which, for some families, is the main source of income	Some participants claimed to have seen some marine species stuck in trash in the ocean and, some of them, even claimed to have found pieces of plastic inside some fish species	The sand collectors referred that the trash can complicate their job, because some areas are so full of litter, that they must clean it first, so they can collect the sand. This, of course, affects their productivity resulting in losses of income



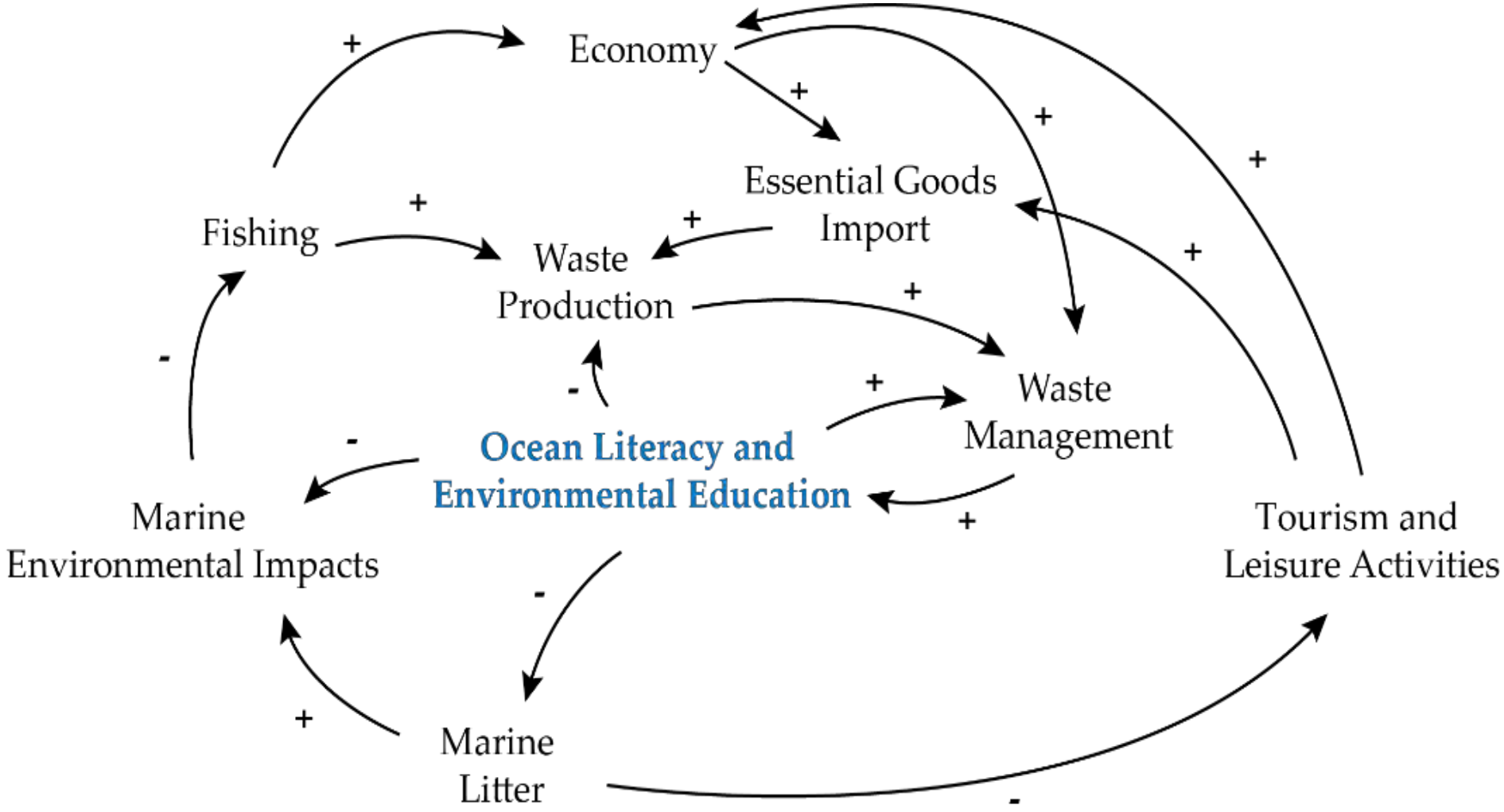
Participants perceptions regarding marine litter

Porto Mosquito and Gouveia

Solutions	
Waste Management	**Educational Campaigns**
The community is aware of the problems regarding waste management and stated that more trash bins in the street and a more efficient trash collection could help prevent the amount of litter that end up in the ocean. Some citizens also pointed out that some materials could be reused as much as possible and recycled to reduce the amount of waste produced	The population also stated that some campaigns about this topic should be done with the involvement of the community, in order to bring awareness about marine litter. Some of the activities suggested were beach cleaning campaigns and training sessions to the professors of local schools



Simplified casual loop diagram of marine litter in fishing island coastal communities in Cape Verde



- Reduce
+ Increase

Source. Ferreira, José C.; Monteiro, Renato; Vasconcelos, Lia; Duarte, Cláudio M.; Ferreira, Filipa; Santos, Euclides. 2021. "Perception of Citizens Regarding Marine Litter Impacts: Collaborative Methodologies in Island Fishing Communities of Cape Verde" *J. Mar. Sci. Eng.* 9, no. 3: 306. https://doi.org/10.3390/jmse9030306

Ocean Literacy and Environmental Education

Awareness

Active community involvement

Co-construction of solutions

Social empowerment

Quality of life and decent work

Fighting poverty

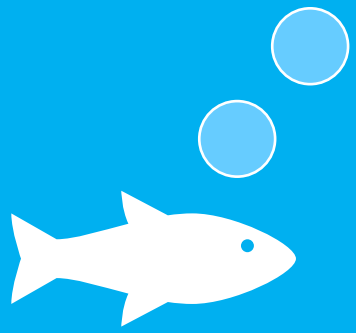
Without this we can have the best laws, the most in-depth studies, the most fantastic solutions BUT the results will not be satisfactory

MARE
Marine and Environmental Sciences Centre

Selection of Marine Litter and microplastics Research Projects in progress at MARE - Marine and Environmental Sciences Center / NOVA School of Science and Technology

ANNEX

Impact on human health - Impact on ecosystems - Public policies –
Active community involvement - circular economy – eco-design and new products …



https://www.mare-centre.pt/en - https://sites.fct.unl.pt/marlab

Challenges and Opportunities in monitoring the sources and pathways of Marine Debris in the Atlantic Ocean

Thank you very much

José Carlos Ferreira
jcrf@fct.unl.pt

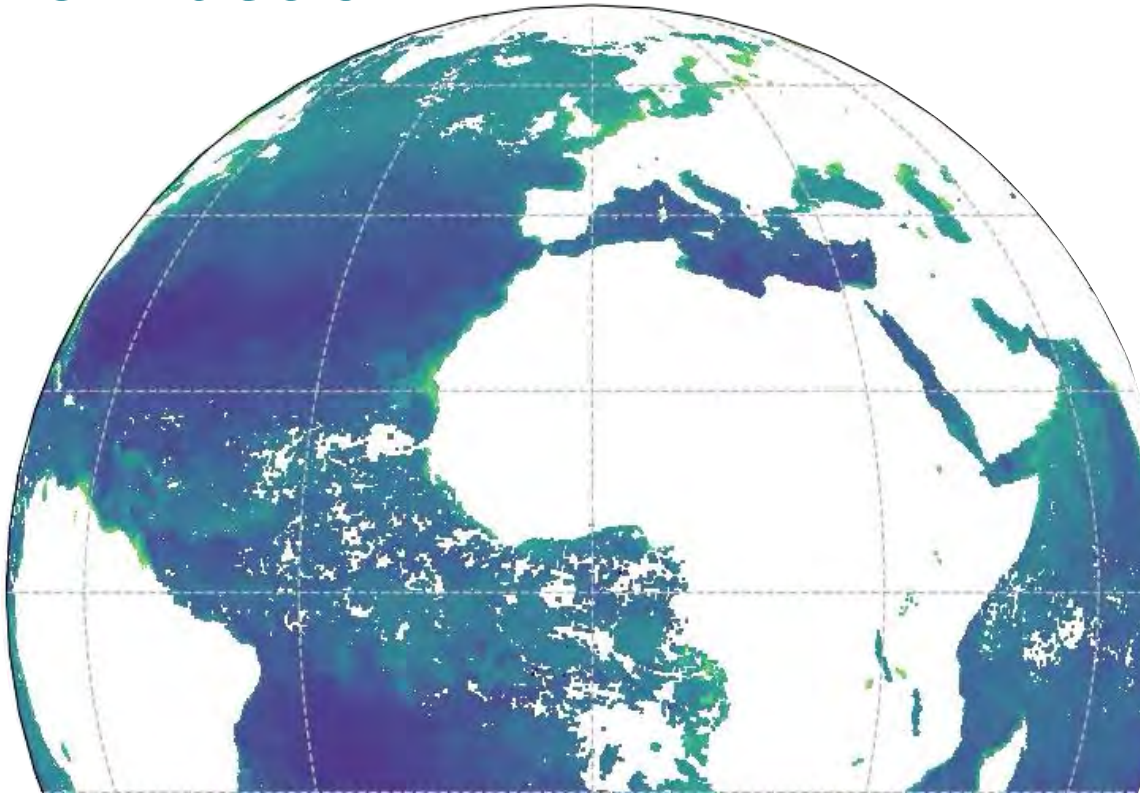
With the support

PML | Plymouth Marine Laboratory

Listen to the ocean

Monitoring (and Forecasting) Marine Plastic Litter using Remote Sensing Datasets & Techniques:

Lauren Biermann, Dan Clewley, Ben O'Driscoll, Aser Mata, Liz Atwood, Victor Martinez Vicente, Tim van Emmerik, Louise Schreyers, Paolo Tasseron, Paolo Corradi, Shungudzumwoyo Garaba, Manuel Arias, Davida Streett, Yangrong Ling, Ellen Ramirez, Juan Valesco, Mary Crowley and Nikolai Maximenko.



Detecting floating plastic patches using high resolution satellite data

Only recently, it was demonstrated that satellites could be used to detect marine macroplastics.

Article | Open Access | Published: 23 April 2020

Finding Plastic Patches in Coastal Waters using Optical Satellite Data

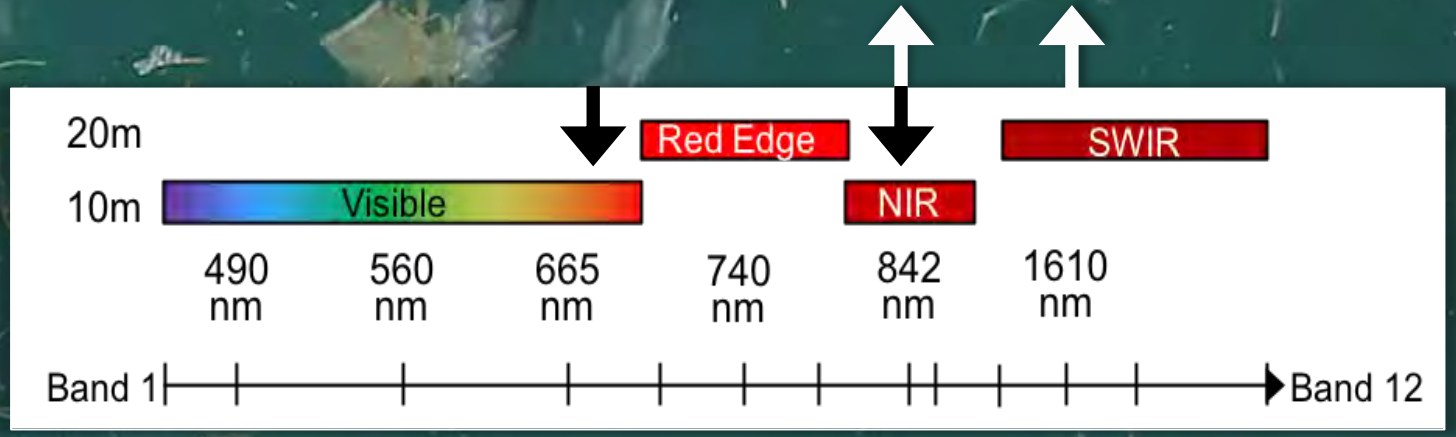
Lauren Biermann ✉, Daniel Clewley, Victor Martinez-Vicente & Konstantinos Topouzelis

Detecting floating plastic patches using high resolution satellite data

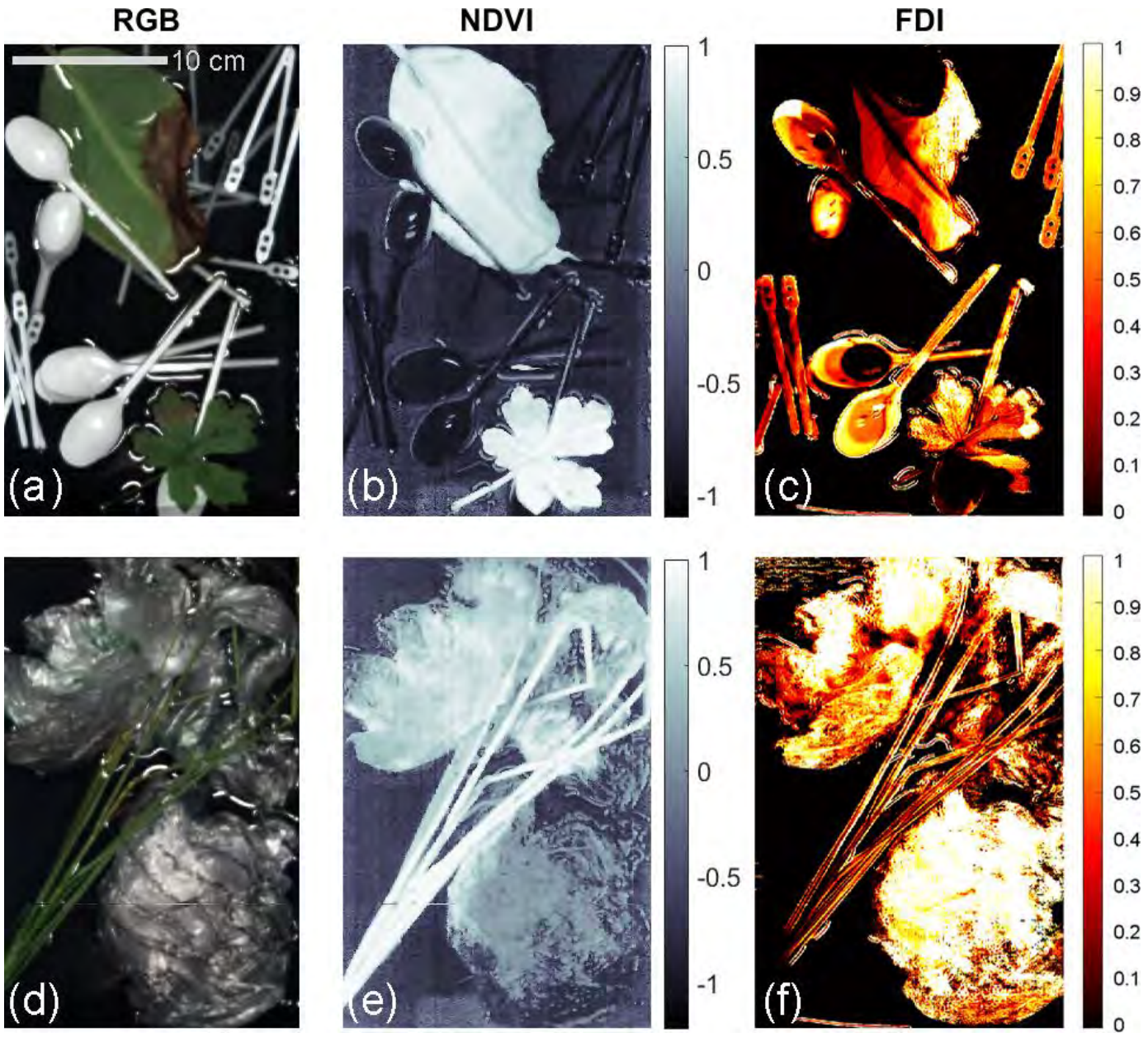
- Sentinel-2A and Sentinel-2B were launched in 2015 and 2017.
- Coverage includes coastal waters every 2 to 5 days at 10 m.
- OPTICAL: Limitations include cloud and wave caps.
- Reliant on **submesoscale features**.

Normalised Difference Vegetation Index (NDVI)

Floating Debris Index (FDI)



Video from
@HFiskJohnson



remote sensing

MDPI

Article

Advancing floating macroplastic detection from space using experimental hyperspectral imagery

Paolo Tasseron [1,*], Tim van Emmerik [1], Joseph Peller [2], Louise Schreyers [1] and Lauren Biermann [3]

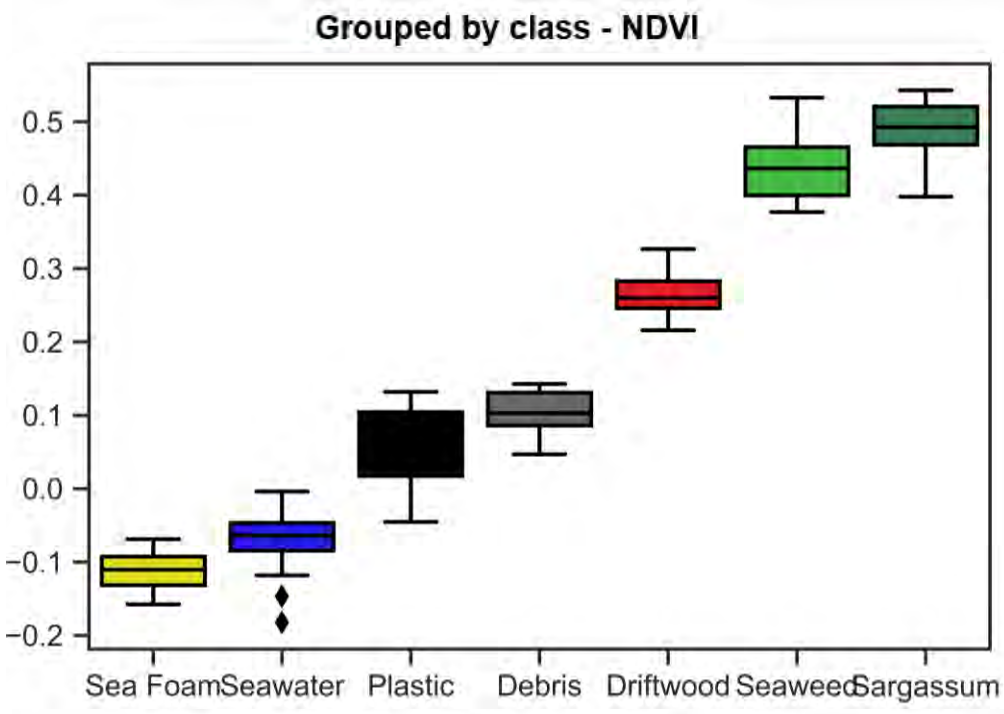
[1] Hydrology and Quantitative Water Management Group, Wageningen University and Research, 6708 PB Wageningen, The Netherlands; tim.vanemmerik@wur.nl (T.v.E.); louise.schreyers@wur.nl (L.S.)
[2] Plant Sciences Group, Wageningen University and Research, 6708 PB Wageningen, The Netherlands; joseph.peller@wur.nl (J.P.)
[3] Plymouth Marine Laboratory (PML), Earth Observation Science and Applications, Plymouth, United Kingdom of Great Britain and Northern Ireland; lbi@pml.ac.uk (L.B.)
* Correspondence: paolo.tasseron@wur.nl

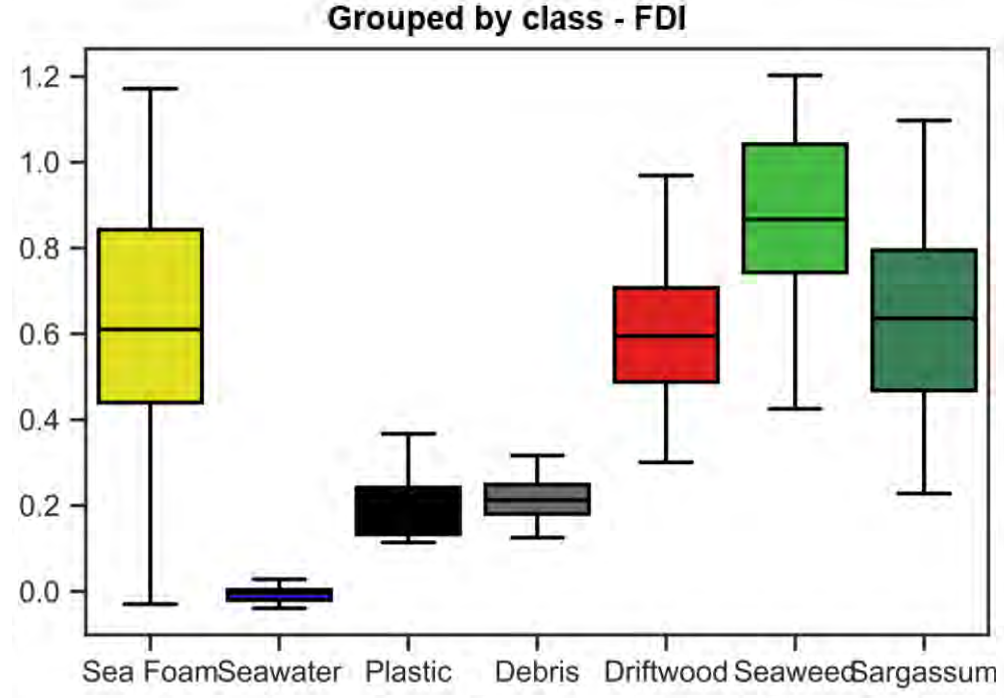
Citation: Tasseron, P.; van Emmerik, T.; Peller, J.; Schreyers, L.; Biermann, L. Advancing floating macroplastic detection from space using hyperspectral imagery. *Remote Sens.* **2021**, *13*, x. https://doi.org/10.3390/xxxxx

Academic Editor: Firstname Lastname

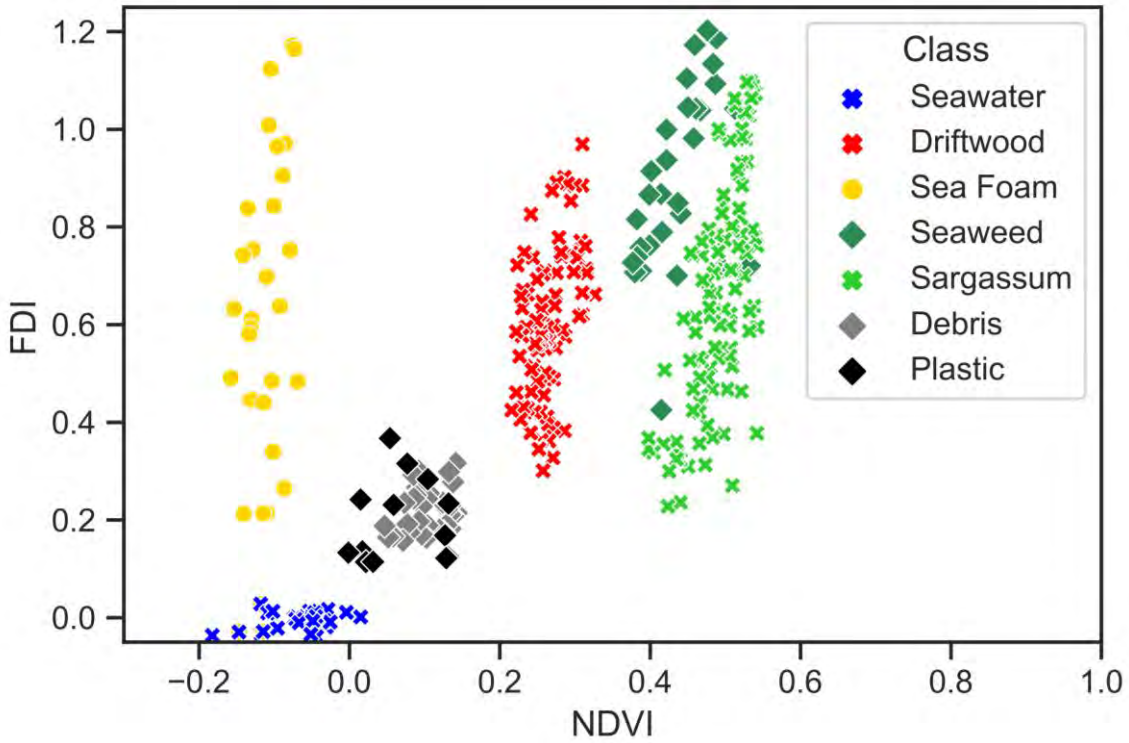
Received: date
Accepted: date
Published: date

Abstract: Airborne and spaceborne remote sensing (RS) collecting hyperspectral imagery provides unprecedented opportunities for the detection and monitoring of floating riverine and marine plastic debris. However, a major challenge in the application of RS techniques is the lack of fundamental understanding of spectral signatures of water-borne plastic debris. Recent work has emphasised the case for open-access hyperspectral reflectance reference libraries of commonly used polymer items. In this paper, we present and analyse a high-resolution hyperspectral image database of a unique mix of 40 virgin macroplastic items and vegetation. Our double camera setup covered the visible to shortwave infrared (VIS-SWIR) range from 400-1700 nm in a dark room experiment with controlled illumination. The cameras scanned the samples floating in water and captured high-resolution images in 336 spectral bands. Using the resulting reflectance spectra of 1.89 million pixels in linear discriminant analyses (LDA), we determined the importance of each spectral band for discriminating between water and mixed floating debris, and vegetation and plastics. The absorption peaks of plastics (1215 nm, 1410 nm) and vegetation (710 nm, 1450 nm) are associated with high LDA weights. We then compared Sentinel-2 and Worldview-3 satellite bands with these outcomes and identified twelve satellite bands to overlap with important wavelengths for discrimination between the classes. Lastly, the Normalised Vegetation Difference Index (NDVI) and Floating Debris Index (FDI) were calculated to determine why they work, and how they could potentially be improved. These findings could be used to enhance existing efforts in monitoring macroplastic pollution, as well as form a baseline for the design of future multispectral RS systems.

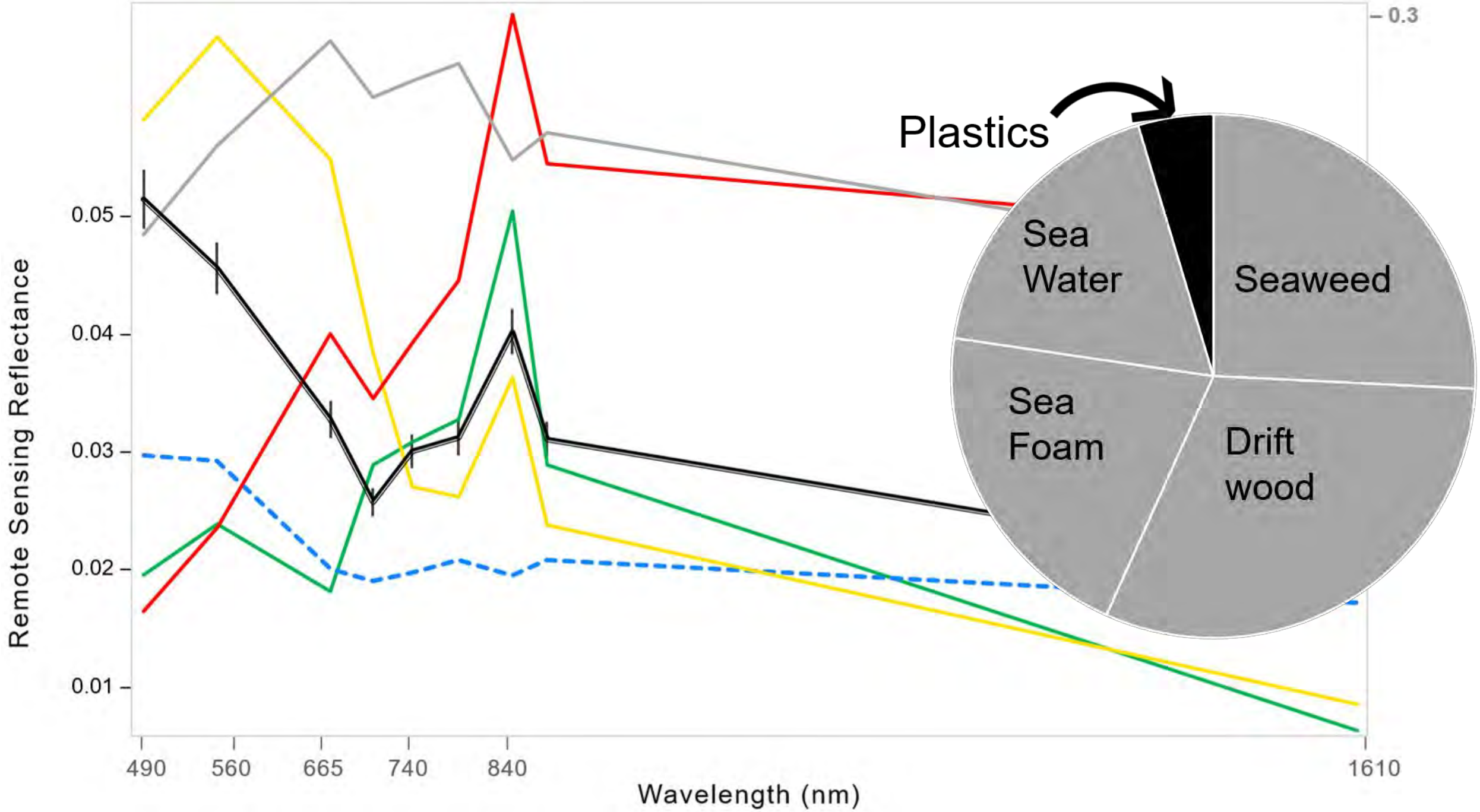




Classification of Marine ‘Floating Materials’



Shown in 2-variable feature space of NDVI and FDI, clustering of materials is evident.


0.3
0.05
0.04
0.03
0.02
0.01
Remote Sensing Reflectance
490
560
665
740
840
1610
Wavelength (nm)
Plastics
Sea Water
Seaweed
Sea Foam
Drift wood

Manual – ongoing process

Stage 1: Exploring

READ Review the literature and social media for new posts and / or publications.

SEARCH Select Sentinel-2 data exhibiting submesoscale features such as fronts, river plumes / eddies.

DATA DOWNLOAD

Manual –
ongoing process

Manual –
half a day per scene…

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DATA DOWNLOAD

Stage 2: Data Processing

CORRECT ACOLITE (20181210.0) atmospherically corrected reflectance.

DETECTION Apply FDI to detect debris on subpixel scales; use of spectral signature to identify plastics.

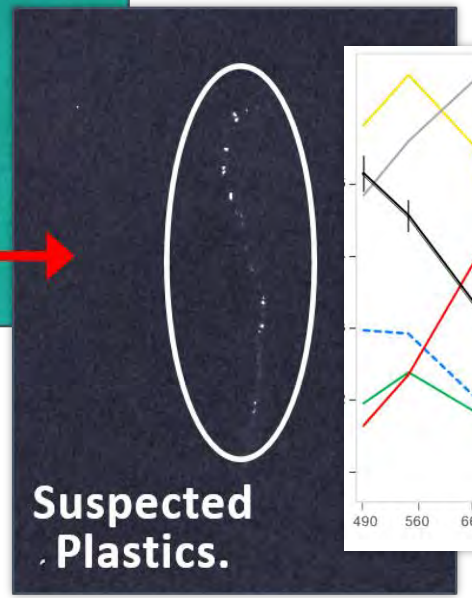
Natural sources of floating materials:
Seaweed, sea foam, timber.

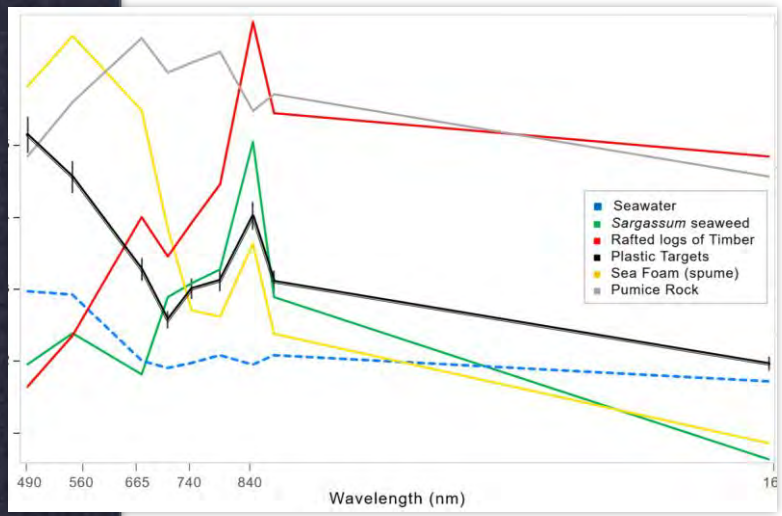
Stage 3: Classification

Naive Bayes Classify detected debris using a trained Naive Bayes model to discriminate macroplastics.

Brightened RGB

FDI detections





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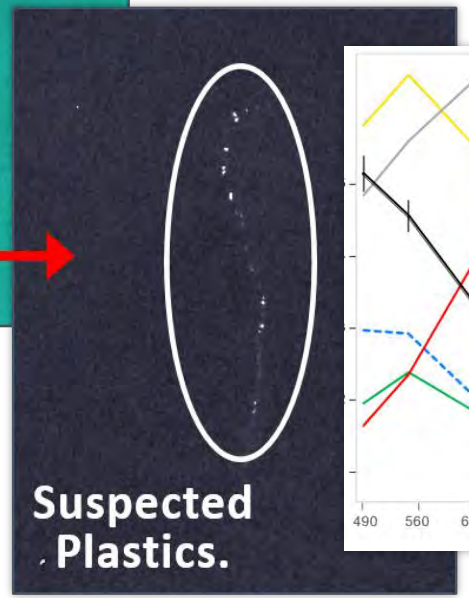

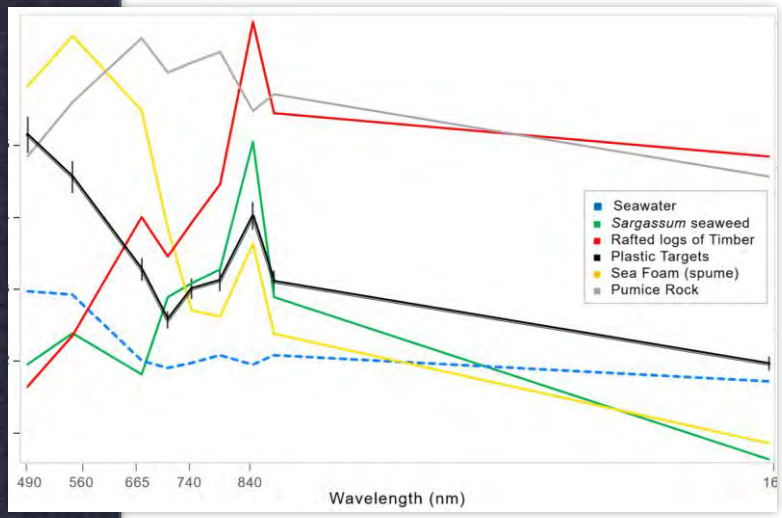

Runs in seconds, took months to make…

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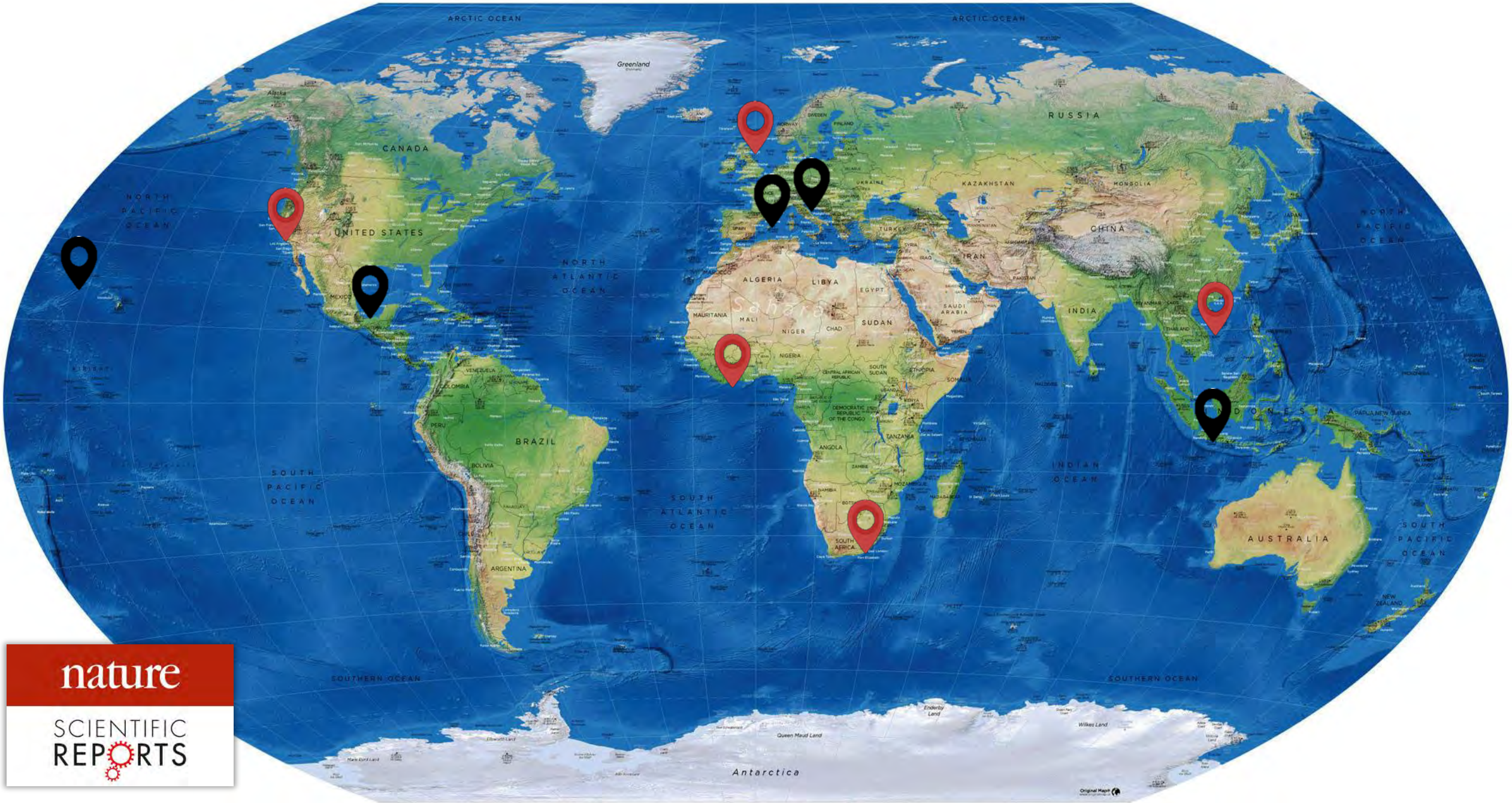

nature

SCIENTIFIC REPORTS

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It takes a Village...

CCG International Ocean Colour Coordinating Group

Listen to the ocean

EARTHRISE ALLIANCE

NEODAAS
NERC Earth Observation Data Acquisition and Analysis Service

esa

SkyfloX

MINDEROO FOUNDATION

data clinic

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

MARINE REMOTE SENSING GROUP
DEPARTMENT OF MARINE SCIENCES
UNIVERSITY OF THE AEGEAN

UNIVERSITY OF HAWAI'I
MĀLAMALAMA
UA MAU KE EA O KA 'ĀINA I KA PONO
1907

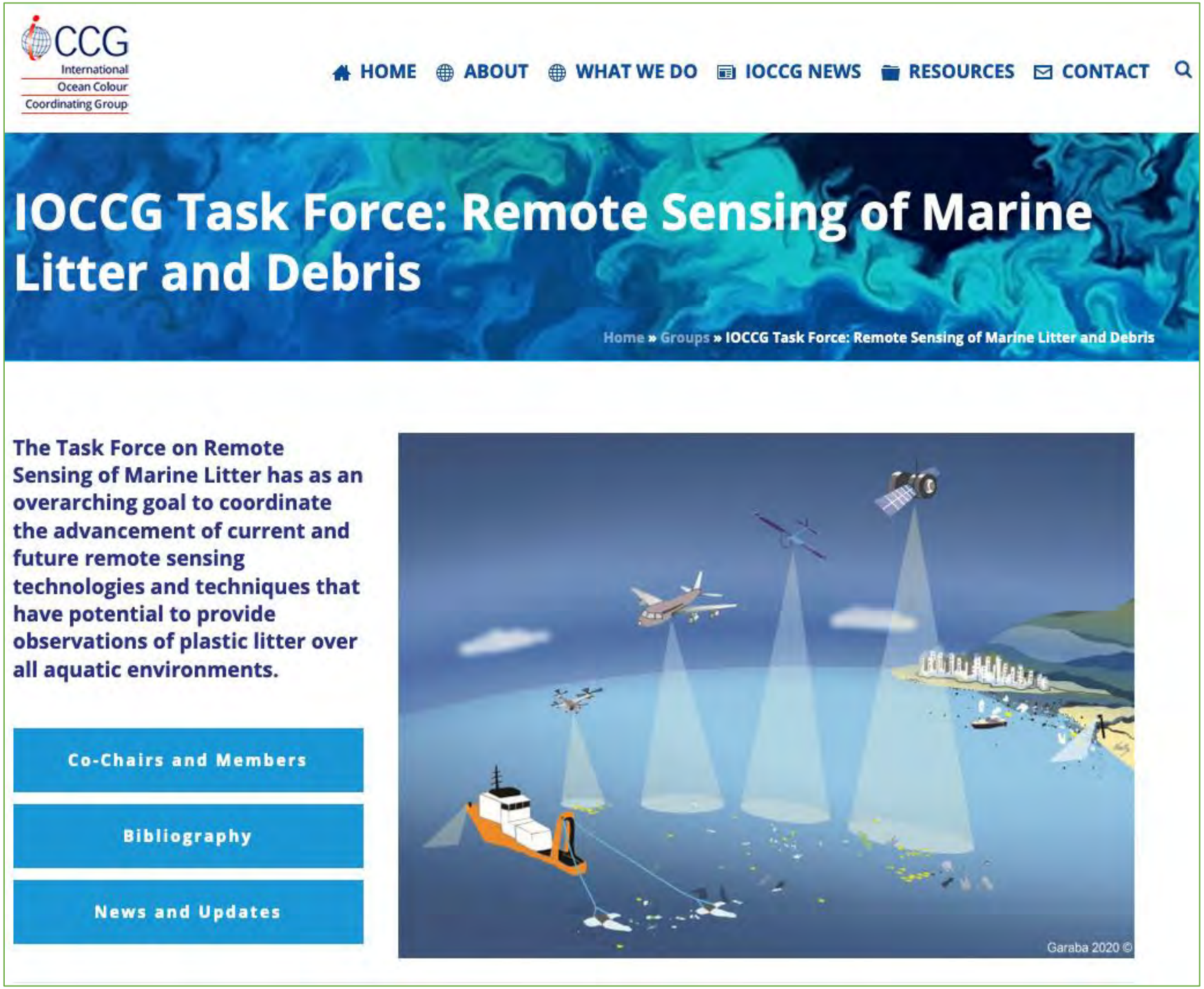
NASA

opernicus
Europe's eyes on Earth

OCEAN VOYAGES INSTITUTE

WAGENINGEN
UNIVERSITY & RESEARCH

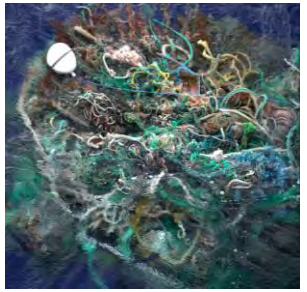
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE



Core Topics:

1. Technologies
2. Algorithms and Applications
3. Datasets
4. Interdisciplinary Aspects

GIANT Ocean



170 tons (340,000 pounds) of ghost nets and plastic debris removed by OVI from the Pacific Gyre in 2020

Extended S-2 Data Collection

- Promote ocean literacy and support the principles and goals prioritised by the UN Decade of Ocean Science for Sustainable Development (2021-2030).
- Validate transport model predictions in known accumulation zones, including ocean gyres.
- Test algorithms for detecting floating debris in known accumulation zones (Case I waters).
- Support plastic removal operations by institutes as Ocean Voyages Institute…!
- Validate satellite-based debris detection and tracking methods with *in situ* data collected beyond coastal zones during, for example, clean-up operations, cruises, and/or deployment of Continuous Plankton Recorders, or through citizen science efforts.

Preliminary Data Acquisition Plan – Proposal

Request to ESA for extended collection of Sentinel-2 imagery over key ocean gyres.

After discussion with the scientific community of the Task Force, this is the proposed Preliminary Data Acquisition Plan for Sentinel-2 over the gyres:

		Sets of AOI	Time period	Rationales
Pacific North Gyre	Scenario 1*	30–35 N, 140–145 W (See Figure 1)	2-3 months (May - July/Aug)	Support removal of plastic debris
	Scenario 2	30–35 N, 145–150 W (See Figure 1)	2-3 months (May - July/Aug)	Support removal of plastic debris
Atlantic North Gyre	Scenario 1			
	Scenario 2			

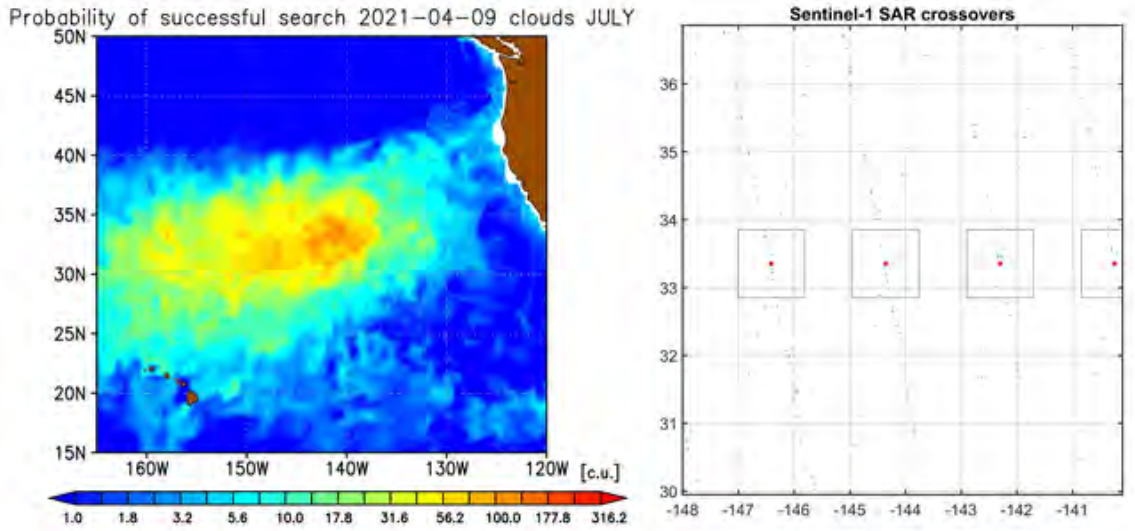


Figure 1: *Area of Interest (AOI) with the highest likelihood for plastic aggregation and cloud-free conditions shown in orange to red (left). Sentinel-1 Wave Mode data are collected within this AOI for detection of aggregating features like slicks and fronts, to further assist with debris detection in optical data (right). Maximum debris concentration estimated around 142W, 33N* which is close to Sentinel-1 WM crossover (142.30W, 33.35N). Figures and data generated by Nikolai Maximenko and Jan Hafner respectively, to support OVI clean-ups and extended ESA Sentinel-2 data collection from 2021 onwards.*

Thank You

PML | Plymouth Marine Laboratory

Listen to the ocean

CCG International Ocean Colour Coordinating Group

EARTHRISE ALLIANCE

NEODAAS
NERC Earth Observation Data Acquisition and Analysis Service

esa

SkyfloX

MINDEROO FOUNDATION

data clinic

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

MARINE REMOTE SENSING GROUP
DEPARTMENT OF MARINE SCIENCES
UNIVERSITY OF THE AEGEAN

UNIVERSITY OF HAWAI'I
MĀLAMALAMA
UA MAU KE EA O KA 'ĀINA I KA PONO
1907

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Europe's eyes on Earth

OCEAN VOYAGES INSTITUTE

WAGENINGEN
UNIVERSITY & RESEARCH

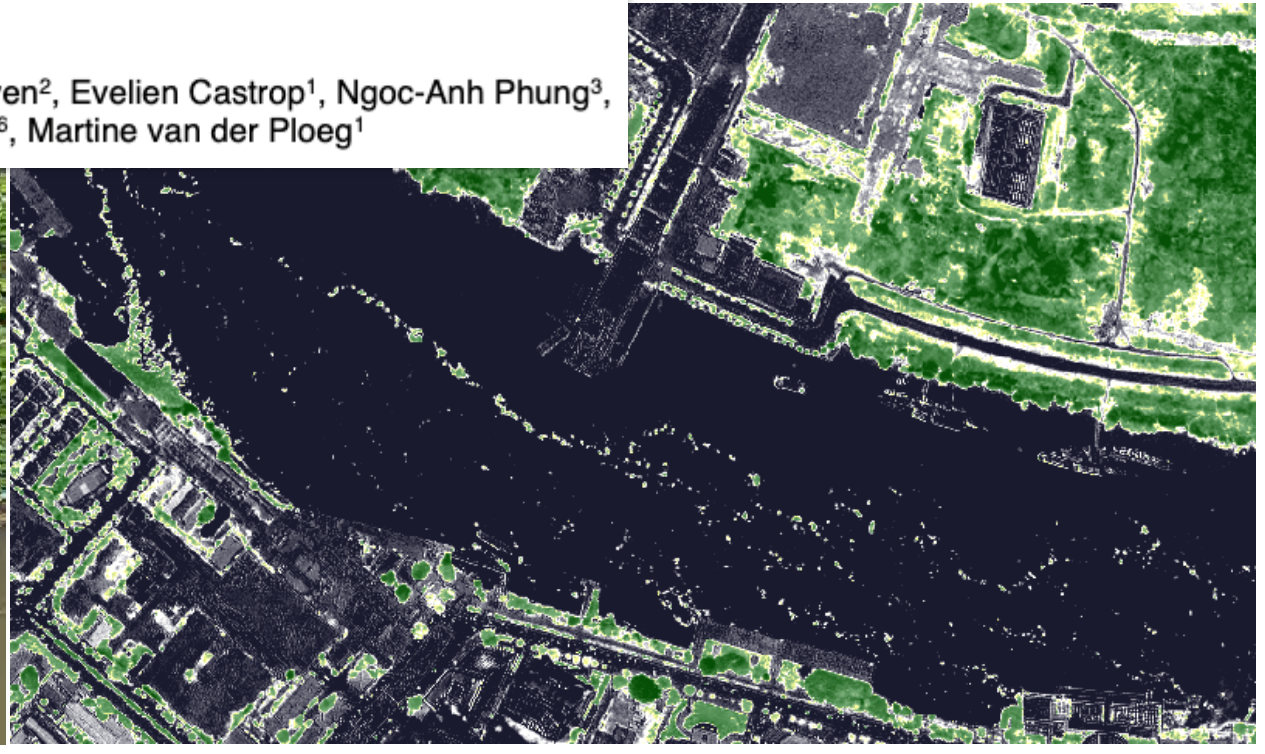
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

Plastic Plants: Saigon River

Plastic plants: Water hyacinths as driver of plastic transport in tropical rivers

Authors

Louise Schreyers[1*], Tim van Emmerik[1], Thanh Luan Nguyen[2], Evelien Castrop[1], Ngoc-Anh Phung[3], Thuy-Chung Kieu-Le[3,4], Emilie Strady[5], Lauren Biermann[6], Martine van der Ploeg[1]



All-Atlantic 2021
Connecting, Acting, Cooperating
2-4 June
Ponta Delgada, Azores, Portugal

We are taking a short break …

We will be back for session 2 in a few minutes

Marine Debris in the Atlantic Ocean

Challenges and Opportunities in monitoring its sources and pathways

VIRTUAL EVENT
3 June 2021
11:30 – 13:30 UTC

MEET OUR SPEAKERS
Session 2: Towards informed policy making

Anga Mbeyiya
African Youth Waste Network
South Africa

Dr. Alexander Turra
UNESCO Chair on Ocean Sustainability

Dr. Denise Mitrano
ETH
Switzerland

Implemented by

BLUE PLANET

Funded by the European Union

EU4Ocean obs

MERCATOR OCEAN INTERNATIONAL

IEEE Oceanic Engineering Society OES

All-Atlantic 2021 2-4 June Ponta Delgada, Azores, Portugal
Connecting, Acting, Cooperating

2021 PORTUGAL.EU

SUSTAINABLE SEAS TRUST

AFRICAN YOUTH WASTE NETWORK

A project of Sustainable Seas Trust's African Marine Waste Network

Informed Communication of Marine Litter

By: Anga Mbeyiya

Africa Youth Waste Network Coordinator

Online Event, 3 June 2021

11:30 - 13:30 UTC/ 13:30 - 15:30 CEST

Towards Zero Plastics to the Seas of Africa

SUSTAINABLE SEAS TRUST

AFRICAN YOUTH WASTE NETWORK

A project of Sustainable Seas Trust's African Marine Waste Network

Education Challenges in Africa

There is no existing curriculum on plastics in Africa

Lack of quality education and educational resources

Teachers with limited capacity

Limited access to education

Poor infrastructure

Why our work is important

- Africa has some of the **most exquisite**, biodiverse and marine **rich coastlines** in the world. We need to **protect them**.

- Our mandate is **to provide** countries of Africa with the **methods to measure** and monitor **plastic waste**, develop management strategies to stop the flow of plastics to the seas, meeting UN requirements and **contributing to Sustainable Development Goal (SDG) achievement.**

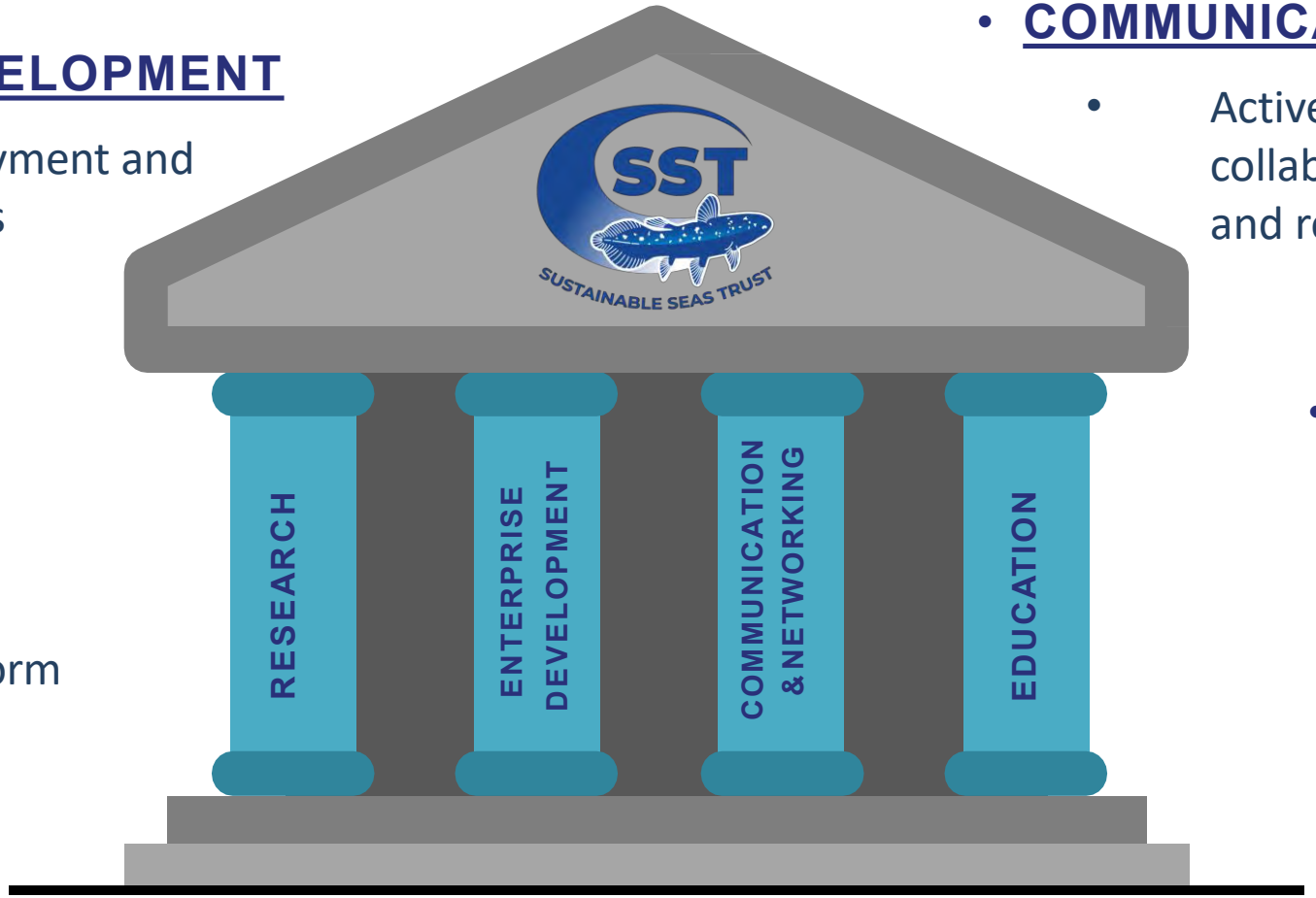
Our Mission is to **generate knowledge** through **research** and **education that inspire actions** that lead to clean**, healthy sustainable seas** and flourishing communities living alongside them.

ENTERPRISE DEVELOPMENT

- Addressing unemployment and poor living conditions

RESEARCH

- Baselines
- Reliable data to inform decisions.



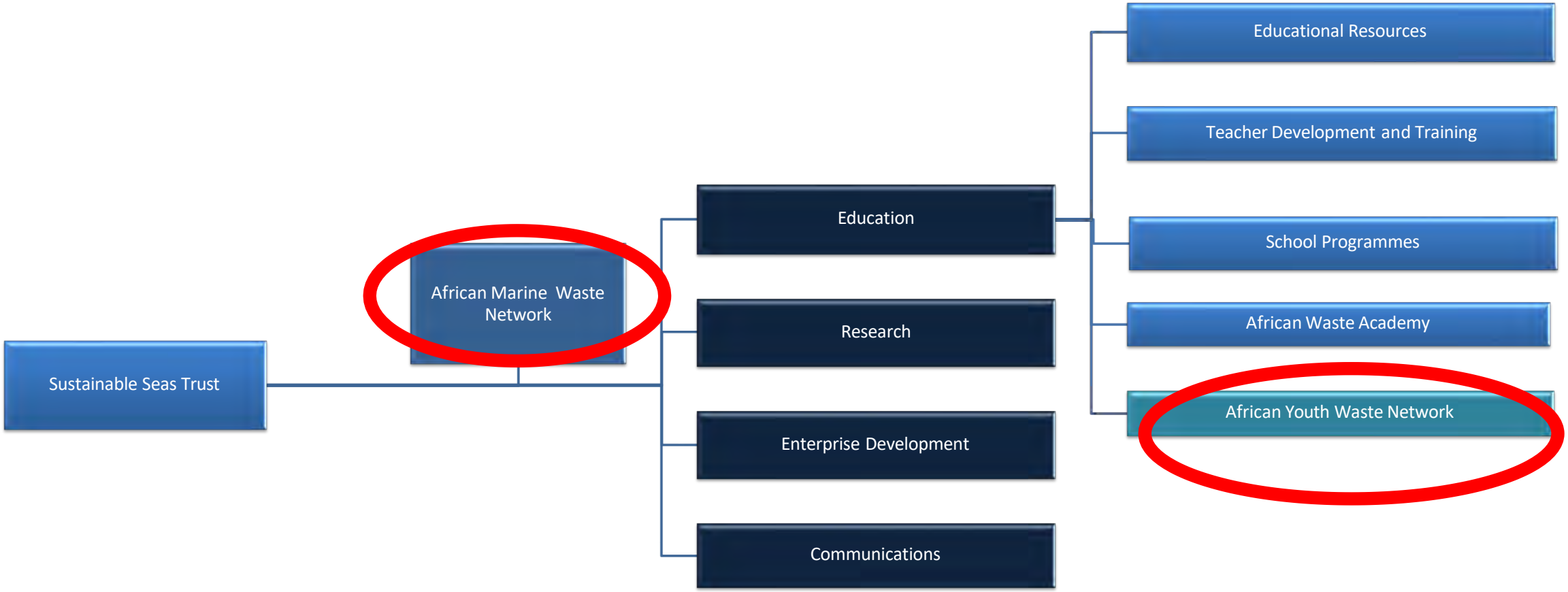
COMMUNICATION & NETWORKING

- Active platform for collaboration, and knowledge and resource sharing

EDUCATION

- Curriculum aligned
- Reference books
- Successful training methodologies
- Train the trainer

Organisation organogram



SST's urgency to educate & grow youth awareness

60%

of Africa's population is under the age of 25 years old.

AFRICA

is the world's youngest and second most polluted continent

19.8 years old

Is the median age in Africa right now.

Education and Capacity Building Programmes:

Schools,

Teach the Teachers,

& Municipalities

Plastics reference book

Education, Capacity Building and Skills Transfer

African Waste Academy

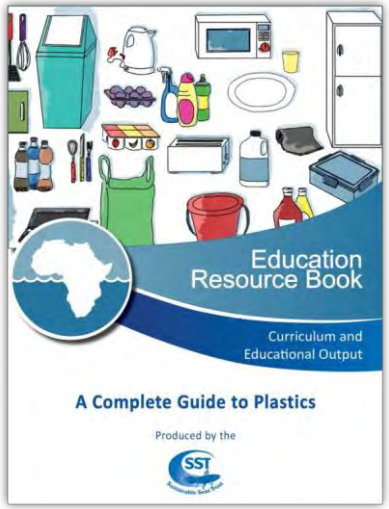
African Youth Waste Network

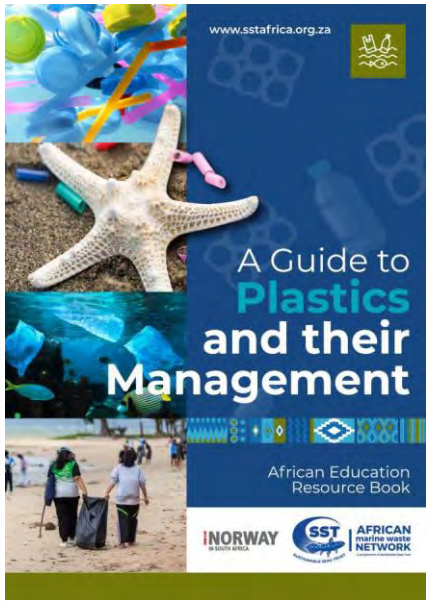
Meeting the Education Challenges

- There is *no* existing curriculum on plastics in Africa
- No definitive African guide to plastics

- **SST is developing – a curriculum for Grade R to Grade 10**
  - plug and play option
  - curriculum aligned for each country.

    - Multiple fonts
    - Translated
    - Online training before having access to materials





Our African Youth Waste Network(AYWN) in Action…









AYWN IS AN ACTIVE PLATFORM

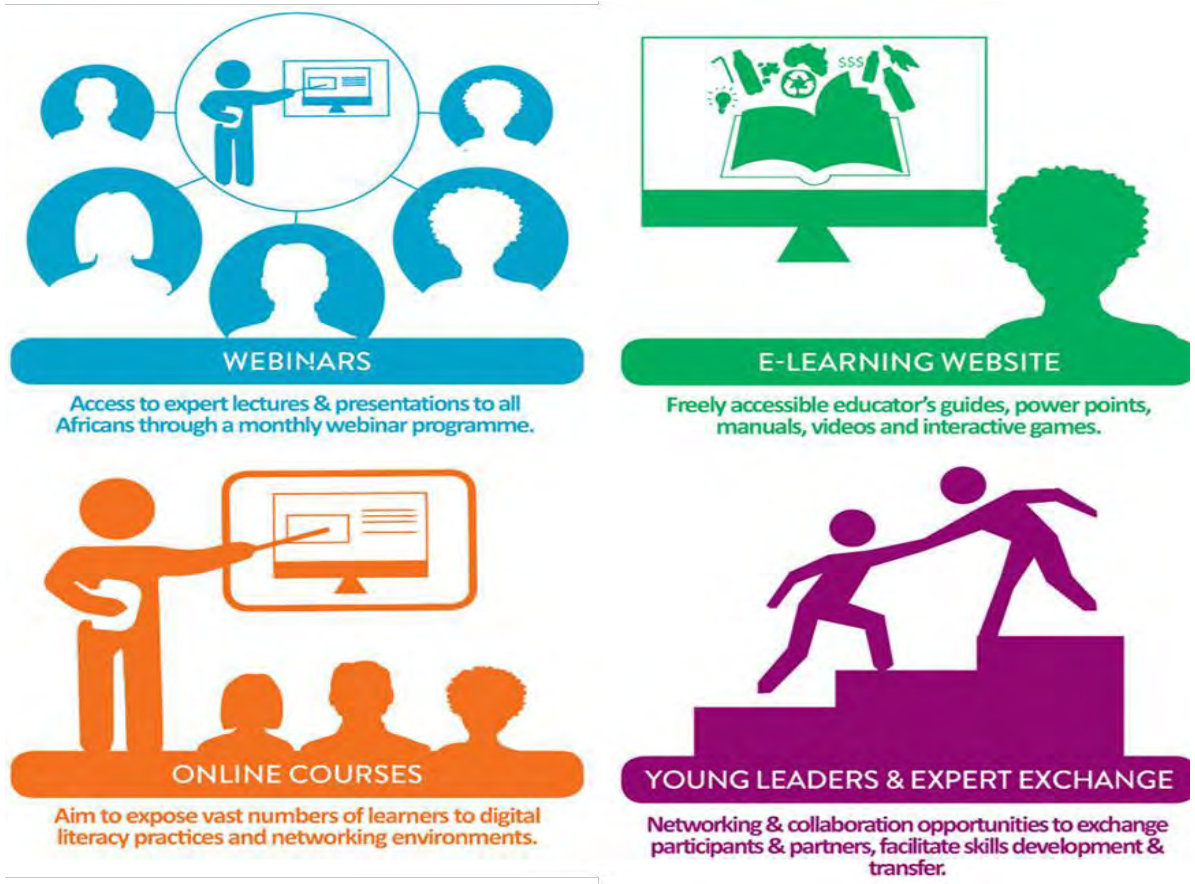
- For collaboration, resource and knowledge sharing.
- Within countries and across borders for the youth of Africa.
- Between the ages of 9 – 35 years old.

Goals and Aims of AYWN

- Provide capacity building educational materials
- Online platform which focuses on the various aspects contributing to plastic pollution

- Knowledge transfer and skills development
- Address educational needs of students and professionals about plastic waste management in Africa

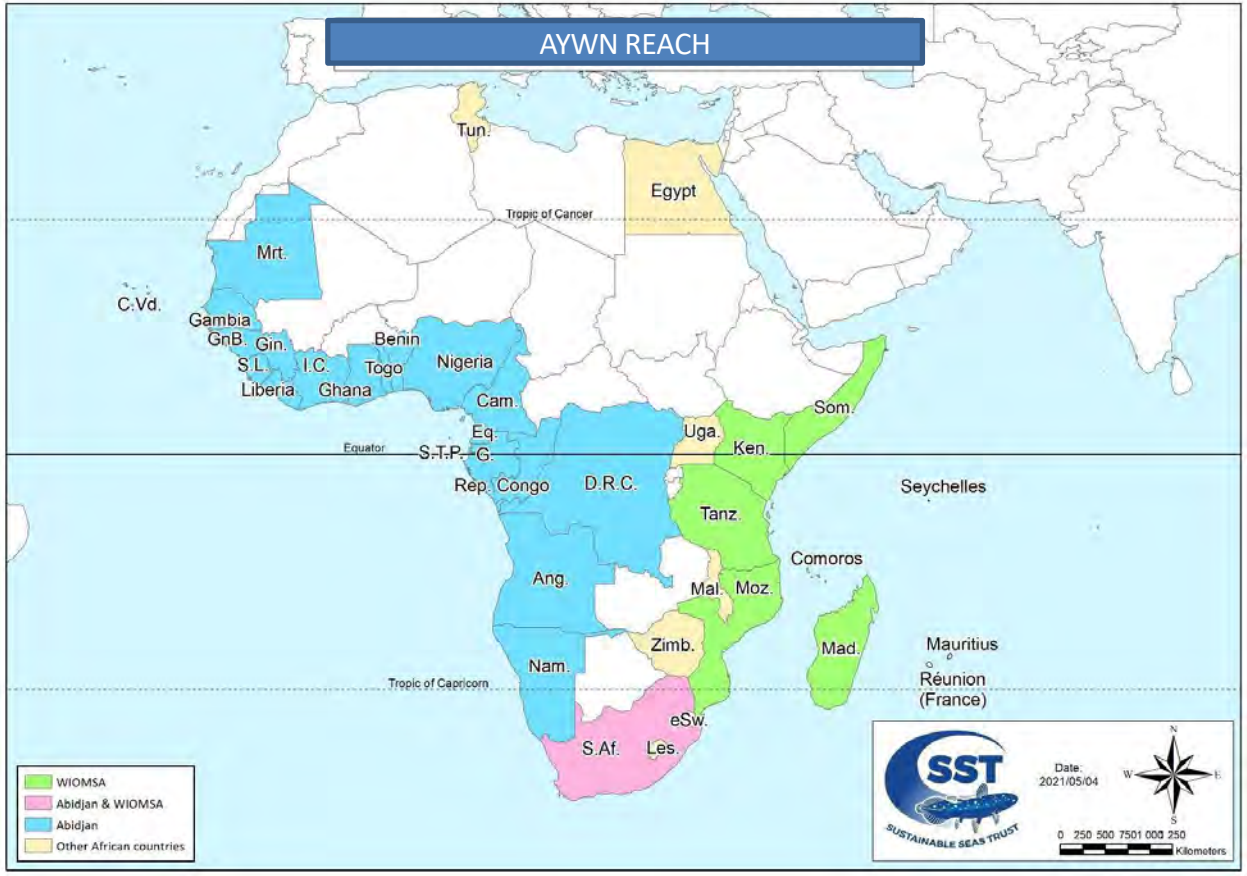
African Waste Academy



1. Free online Education resources
2. Accredited online courses
3. Webinars
4. Young Leaders and Expert Exchange Programme

Our Reach thus far...

- Mapped 3013 organizations.
- Over 40 African countries.
- Waste focused
- Research, Industry, Civil Society, Education and Government.
- Focus on the recycling industry



Overcoming challenges thus far…

- We have substantially **DIFFERENT SOCIO-ECONOMIC DYNAMICS.**
- We **DON'T HAVE** the **STRUCTURES, RESOURCES AND SYSTEMS** of the first world.
- We need to **CHANGE OUR THINKING** to understanding the impacts and outcomes of waste as a resource.
- Need to **CHANGE THE NARRATIVE.**

“Everyone can rise above their circumstances and achieve success if they are dedicated to and passionate about what they do. “

- uTata Nelson Mandela

SST
SUSTAINABLE SEAS TRUST

AFRICAN YOUTH WASTE NETWORK
A project of Sustainable Seas Trust's African Marine Waste Network

Enkosi, Thank you.

Trust Registration: IT 2203/2006 | **NPO Number:** 078-120-NPO | **PBO Number:** PBO 930022444

FOR MORE INFORMATION CONTACT:

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SST

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Department of Environmental Systems Science

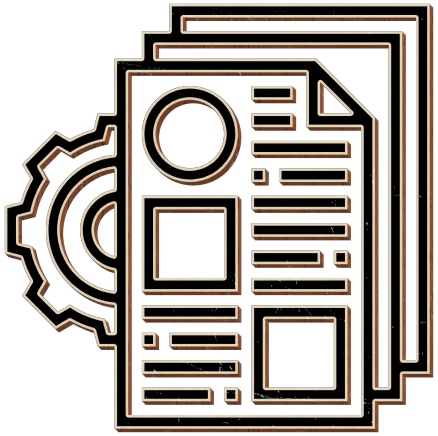
Microplastic regulations need to be precise to incentivize innovation and environmental safety

Professor Denise M. Mitrano
Environmental Chemistry
of Anthropogenic Materials

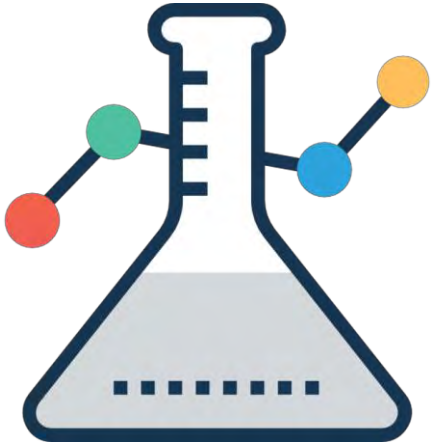
ETH zürich

Microplastic research, regulation and material design

Assess (micro)plastic inputs and implications in the environment

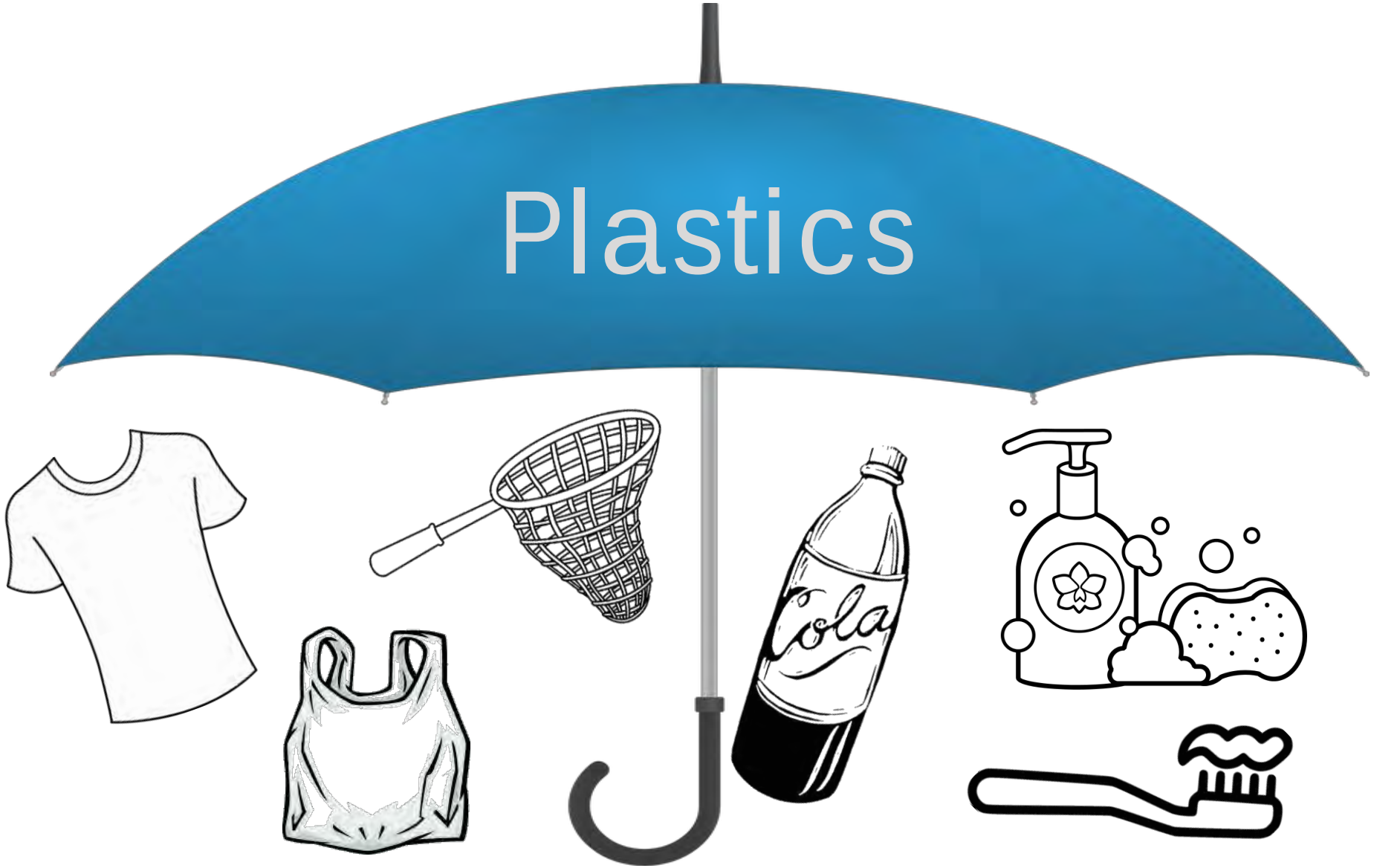


Develop regulation to curtail unnecessary and negative impacts



Design more sustainable and environmentally conscious materials

Plastics (and microplastics) are not all the same

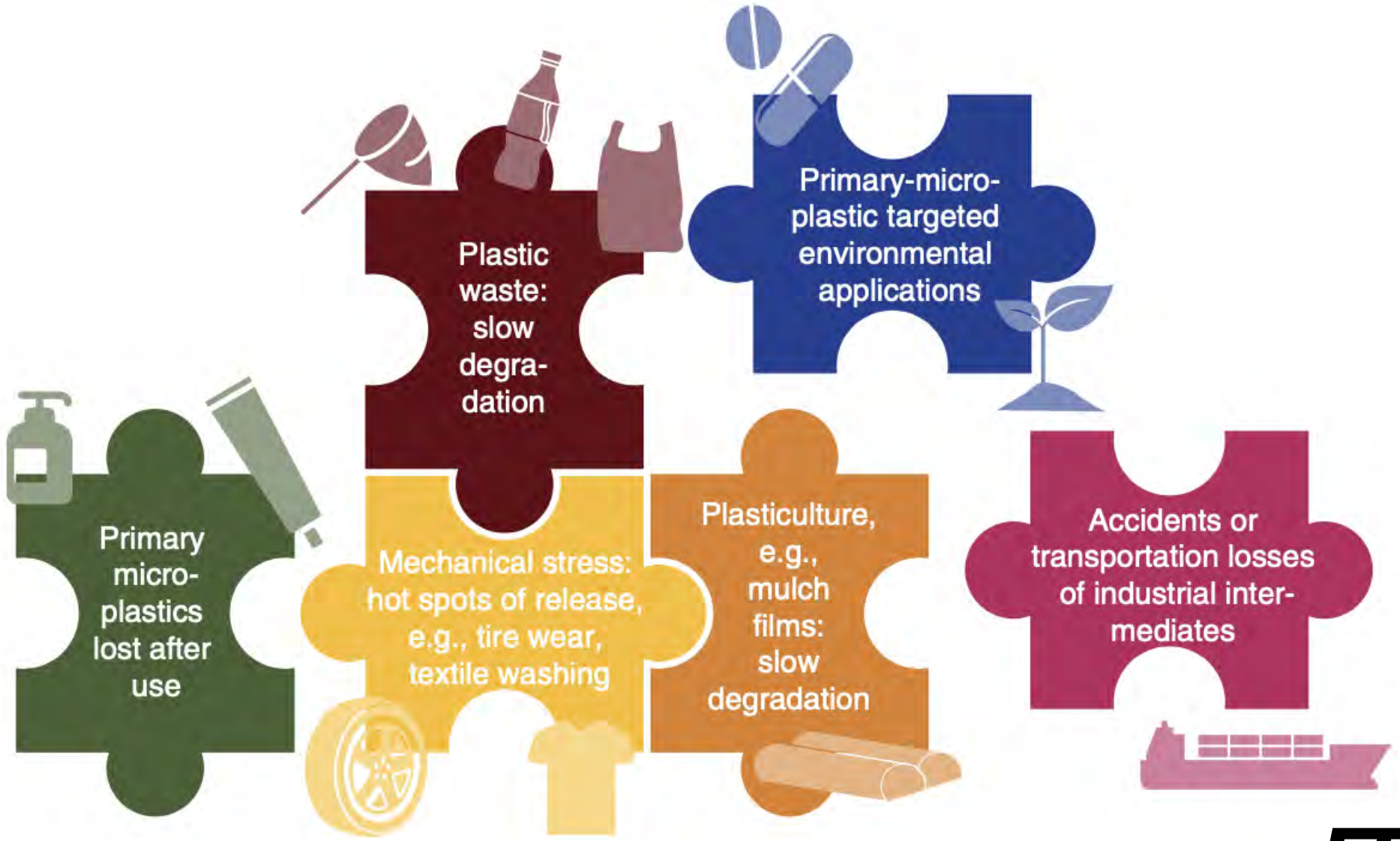


Small(er) plastics... Big(ger) attention

But what is really known/unknown about microplastics?

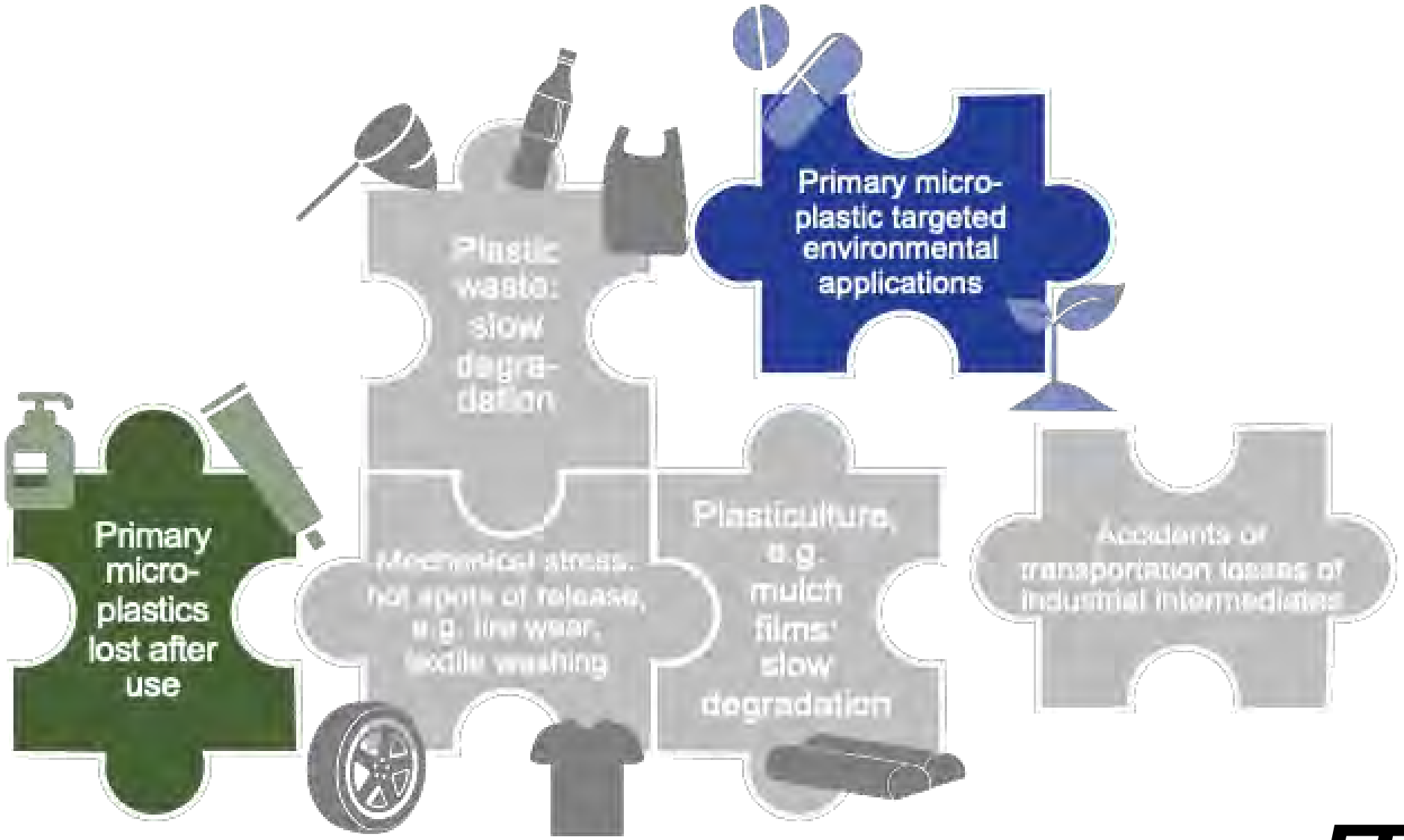
- Eco- and human toxicological effects uncertain
- Concrete information on sources and distribution, transport processes not well defined
- Risk assessment (exposure and hazard) is still subject to large uncertainties
- (Micro)plastic is a persistent material which is widely dispersed in many ecosystems, unknown ecological consequences

Environmental sources of solid microplatics



Mitrano and Wohlleben (Nature Communications, 2020)

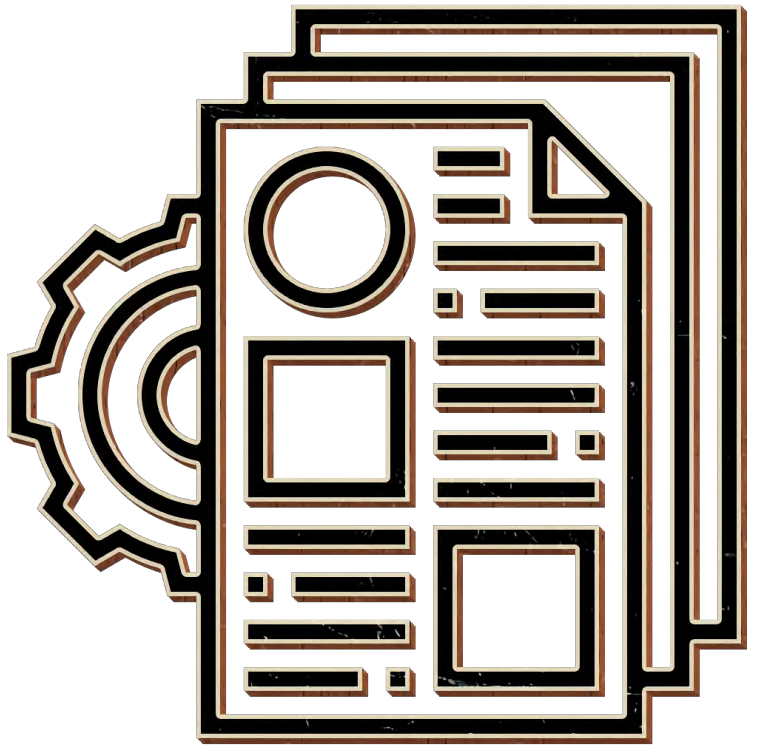
Environmental sources of solid microplatics



Mitrano and Wohlleben (Nature Communications, 2020)

Diversity of polymers and applications complicates policy development

- Normally (REACH) regulations consider singular compounds, but microplastics are considered collectively
- Overarching chemical bans appropriate when there is clear and overwhelming evidence that targeted substances cause harm
- Can all microplastics be regulated the same way? Or be regulated at all?



A recipe for microplastic regulation

Precise definitions needed	Specificity desirable and common language for understanding
Capability to measure MP with current technology	Harmonize sought after results with practical feasibility
Link MPs to specific hazards	Precautionary principal is good, but better to target actual impacts
Enforceable and consistent	Provides clarity for industry and protection for consumers

Snapshot of current (micro)plastic regulations

Precise definitions needed

- In EU, REACH principal of "no data – no market" to ensure safe use of chemicals
- Complex definition of microplastic by ECHA

Measure MPs with current analytical capabilities

- Analytically – VERY challenging!
- If it's not measurable, it's not enforceable

Regulation of polymer

Often exempted, low bioavailability
Sector specific regulations apply

Regulation of additive

EU, REACH, if > 1 ton manufactured
US, chemical substance under TSCA

Regulation of primary solid MPs

Various regulations and reporting in place or proposed regionally

Bridging assessment of microplastics with other particles and chemicals

Link MPs to specific hazards

- Concept of hazard testing challenged: few standardized tests for materials with low solubility or large particles
- Toxicity data don't yet define which properties (size, shape, chemical composition, additives, etc.) induce harm which are specific to microplastics

Enforceable and consistent regulations

- Vague concept of corporate sustainability
  - Without policy restricting certain materials, technologies, additives, etc. and setting-long term sustainability goals – industry likely to favor short terms wins with superficial changes
  - Possibility of companies making false claims – consumers not protected

Relative impacts of using plastic compared to other materials

What must we consider for primary microplastic use?

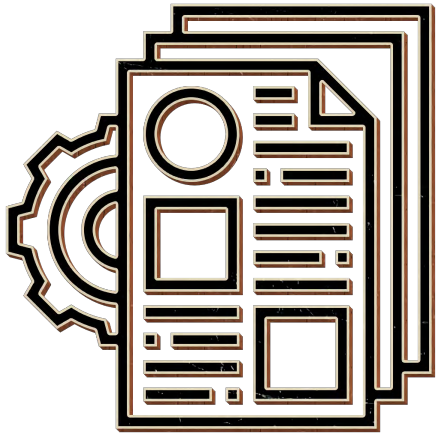
1. What are the environmental heath impacts caused by microplastic use? Can we link specific plastic aspects with hazard?

2. What alternatives currently exist or can be brough to market in the near term, which provide similar functionality?

3. What is the cost of replacement materials (and to whom)?

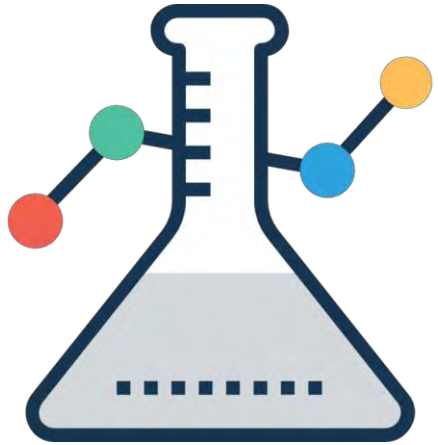
4. Can substitutions be developed that outperform microplastics with few adverse outcomes

Future outlook for MP regulations and material design



- Measurable and enforceable regulations needed
- Current regulations leave little room for development except plastic-free alternatives
- More precise and directed regulations would allow industry to test/screen for most hazardous properties and opt for alternatives

Can't be (micro)plastic regulation alone which solves environmental plastic crisis



- Develop sustainable materials and targeted (micro)plastic use
- Much research into current materials: their physical/chemical properties and costs, are optimized from the point of view of manufactures
- With additional research and development, alternative materials will catch up in terms of both price and performance

Professor Denise M. Mitrano
Environmental Chemistry of Anthropogenic Materials
ETH Zurich
Denise.Mitrano@usys.ethz.ch

www.ecam.ethz.ch

@DeniseMitrano

Funding Source

FONDS NATIONAL SUISSE
SCHWEIZERISCHER NATIONALFONDS
FONDO NAZIONALE SVIZZERO
SWISS NATIONAL SCIENCE FOUNDATION

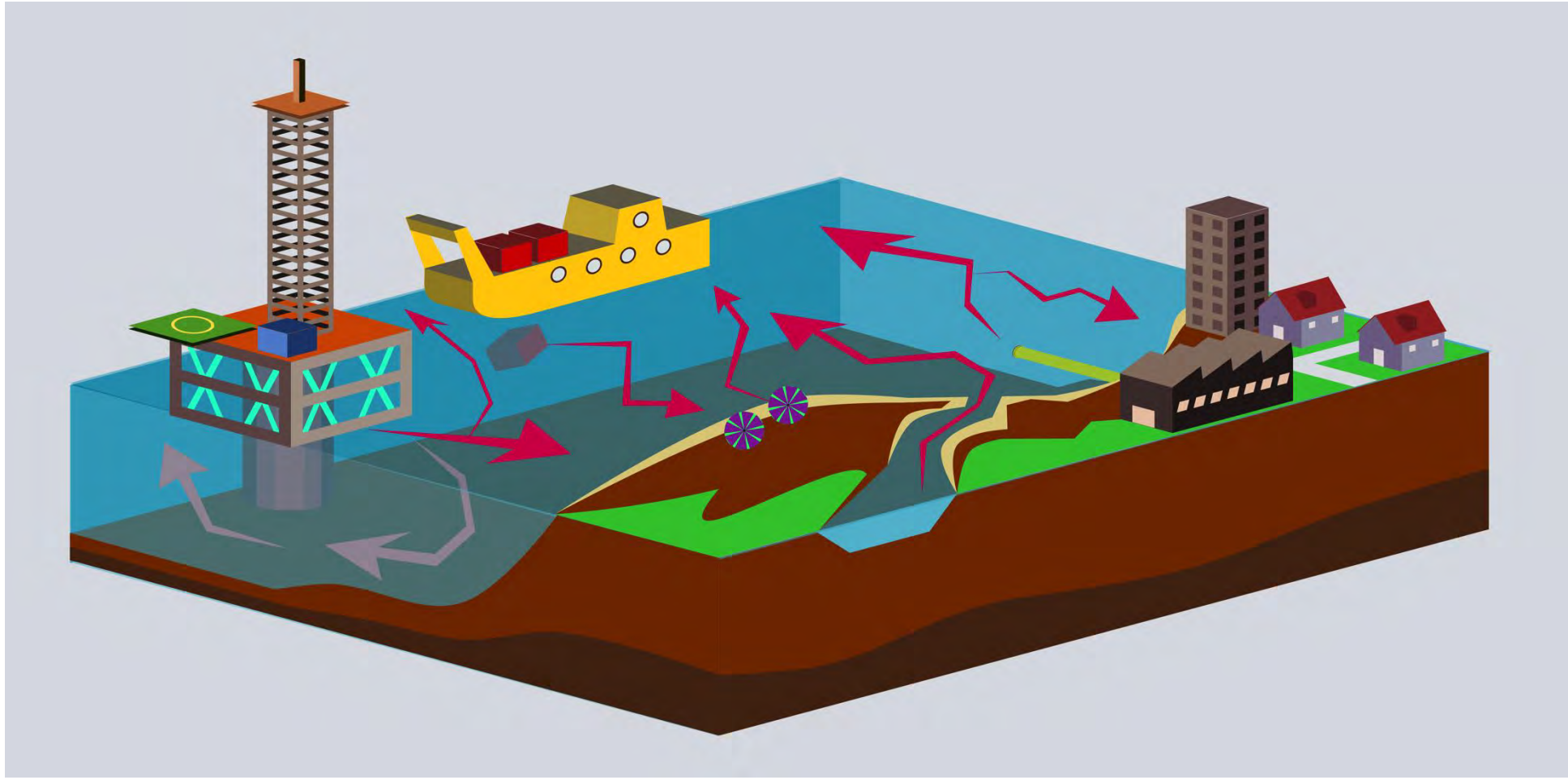
Observation Driven Policy Making

Alexander Turra

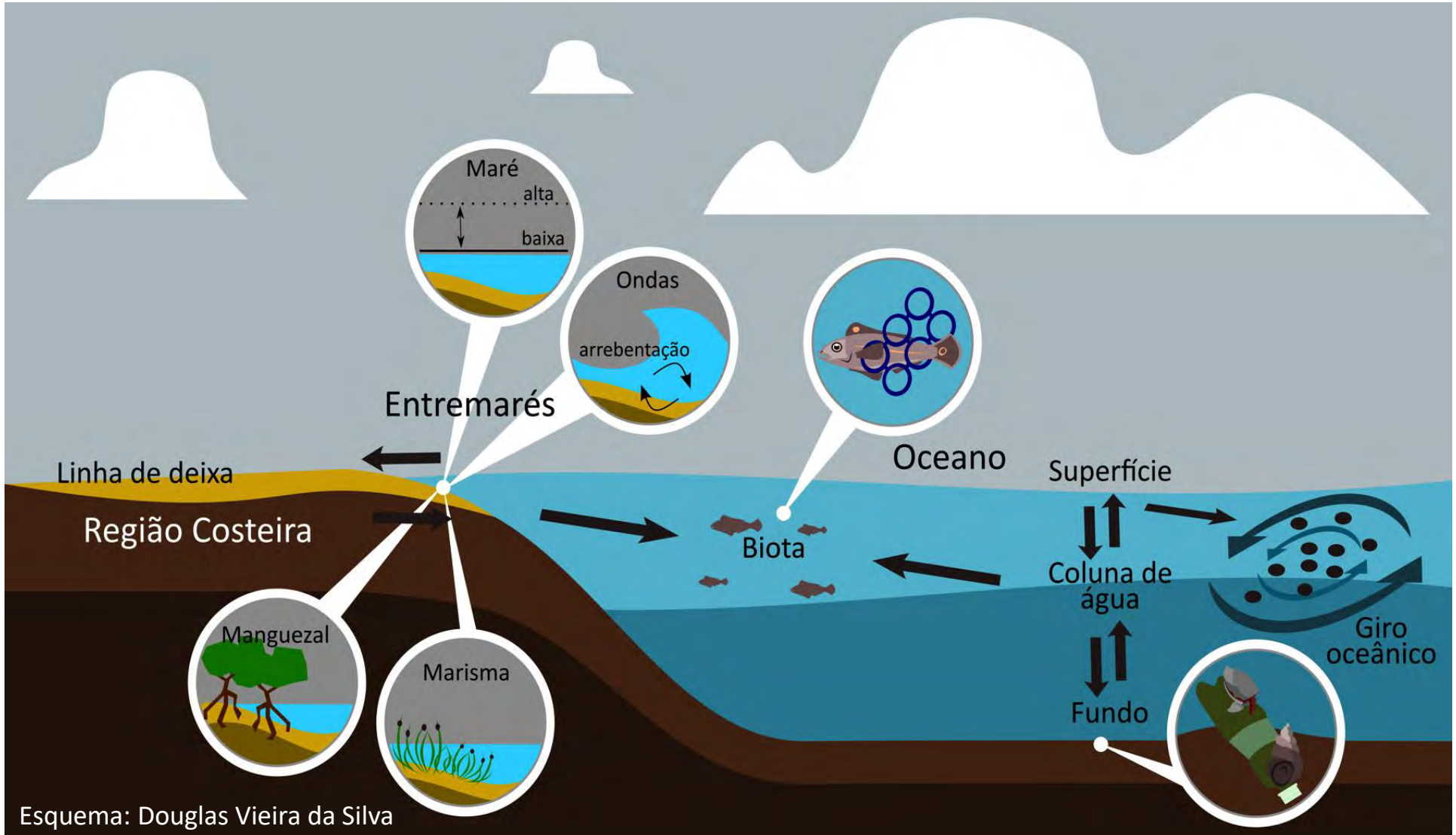
United Nations
Educational, Scientific and
Cultural Organization

UNESCO Chair on Ocean Sustainability
University of São Paulo
Established in 2018

Sources



Sinks



Esquema: Douglas Vieira da Silva

Types of litter, pathways and policies



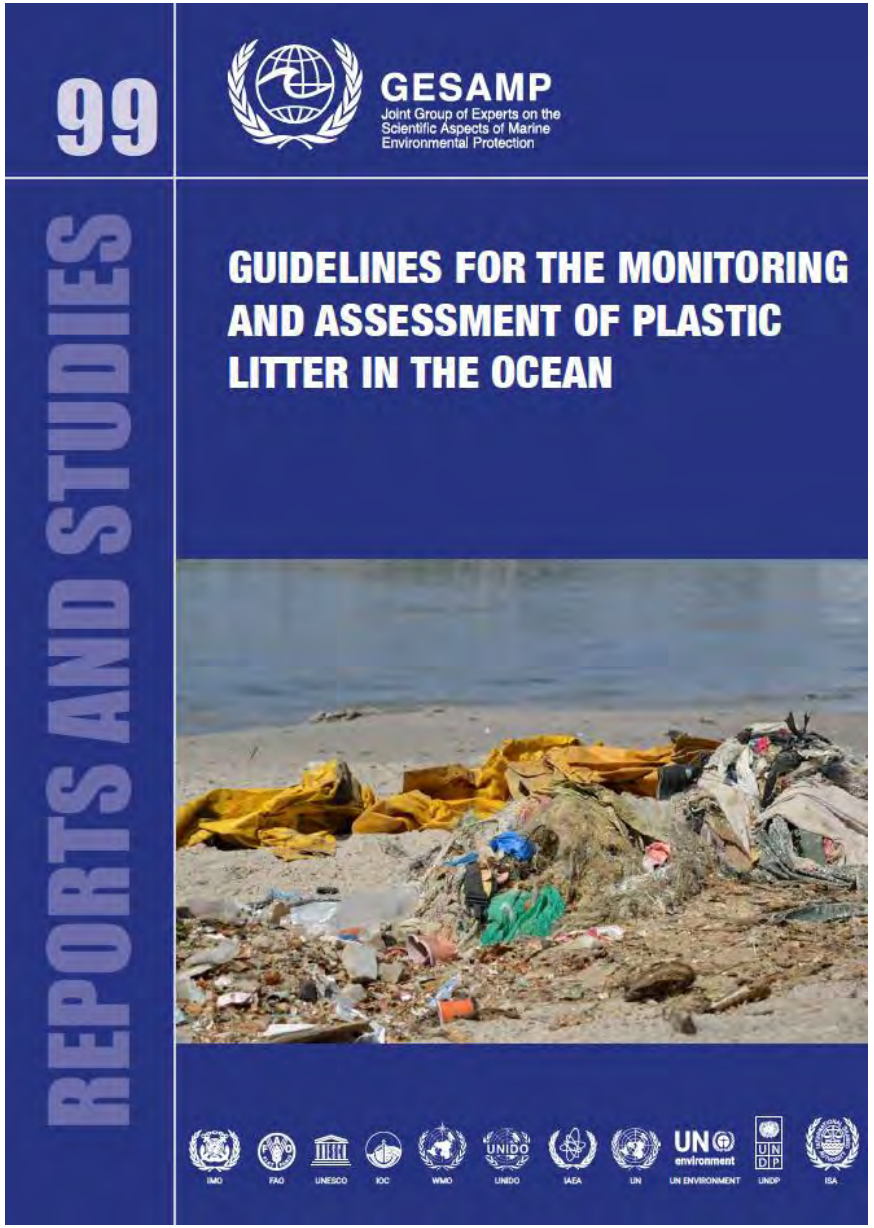


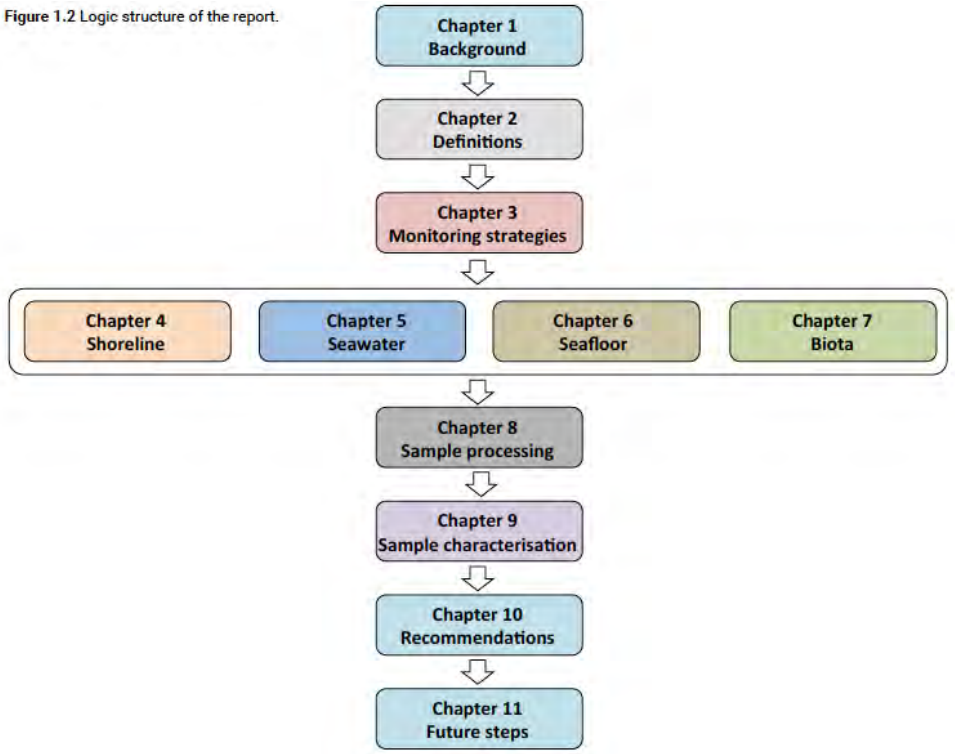





Fonte: Projeto MARPLAST

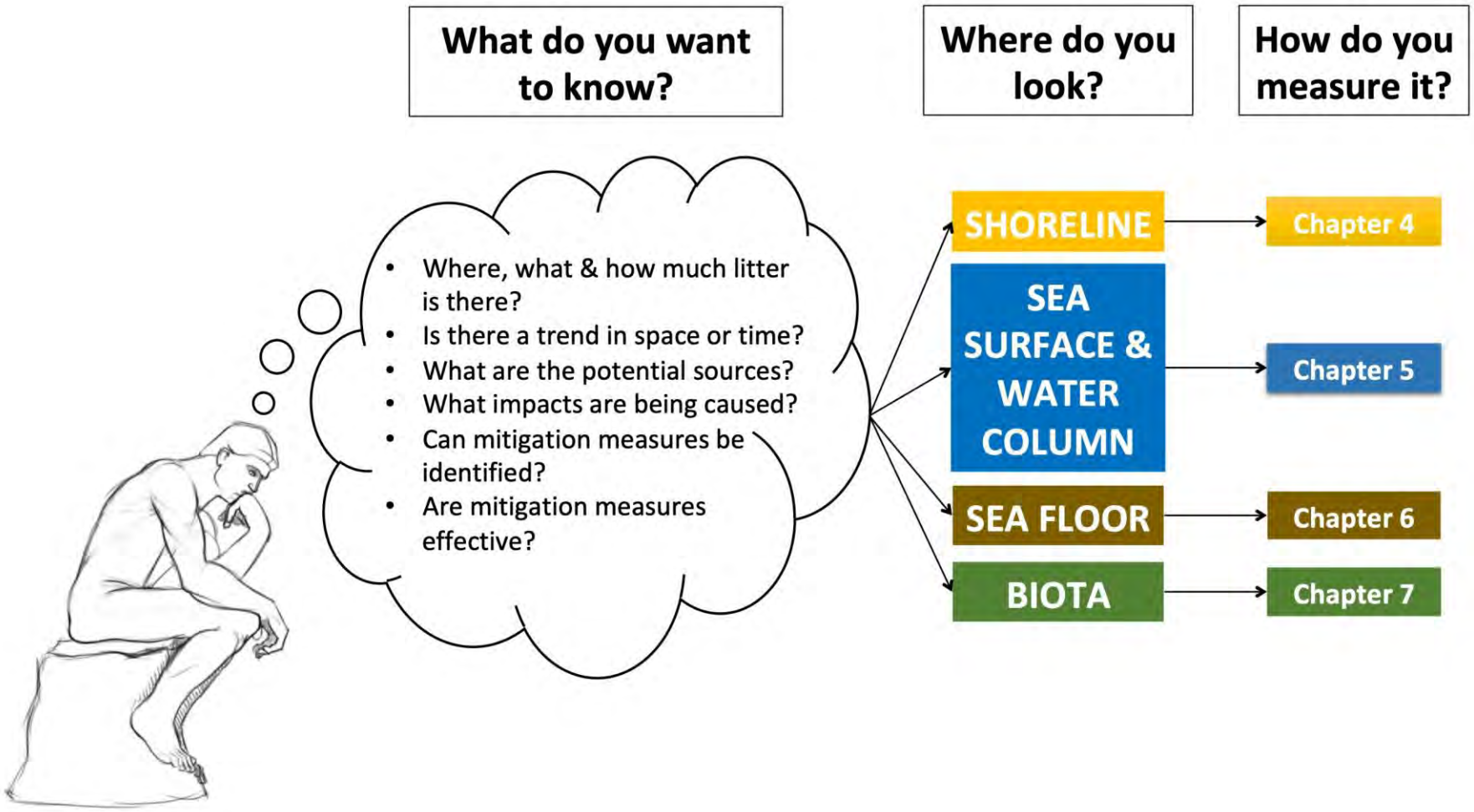
O que é lixo marinho?





(GESAMP, 2019)

Policy concerns



(GESAMP, 2019)

GESAMP (2019) recommendations

	Compartments & plastic size				Examples of policy concerns									
					Distribution & Abundance	Source identification	Impacts on							
Feasibility	Compartment	Sub-compartment	Plastic size	Chapter			Tourism	Seafood safety	Human health and injuries	Navigational hazards	Fisheries & aquaculture	Animal welfare	Biodiversity	Policy relevance index
1	SL	BE	MA	4	R	R	R		R				R	5
2	SL	BE	ME	4	R		R						R	3
3	SF		MA	6	R	R				R	R		R	5
3	SF		MA	6	R	R	R			R	R	R	R	7
4	B	FISH	ME MI	7	R			R			R	R	R	5
4	B	INV	ME MI	7	R			R			R	R	R	5
5	B	SEAB[c]	ME MI	7	R	R						R	R	4
5	B	MEG[c]	MA ME MI	7	R							R	R	3
6	SS		ME MI	5	R						R		R	3
7	SS		MA	5	R					R	R	R	R	5

SL – Shoreline
SF – Seafloor
B – Biota
SS – Sea surface

BE – Beach
FISH
INV – Invertebrate
SEAB – Seabird
MEG – Mega-fauna

MA – Macro-litter
ME – Meso-litter
MI – Micro-litter

(GESAMP, 2019)

Applying the concept…

FUNBIO

Organização das Nações Unidas para a Educação, a Ciência e a Cultura

Cátedra UNESCO para Sustentabilidade do Oceano Universitária de São Paulo
Estabelecida em 2016

uniTwin

USP

ie] Instituto de Estudos Avançados da Universidade de São Paulo

IO Instituto Oceanográfico

SÃO PAULO
GOVERNO DO ESTADO
Secretaria de Infraestrutura e Meio Ambiente

Embaixada da Noruega
Brasilia

Indicators

pemalm

GENERATION

EXPOSURE

EFFECT

Indicators

Table 3. Suggested indicators for monitoring and assessing the generation of marine litter.

Information	Indicator	Collaborator
Information that needs to be monitored	Suggested indicator to be measured	Possible individuals/organizations that may be involved in collecting information
No. people consuming and generating waste	Total population (residents/floating) by municipality	SEADE
Quality, by municipality, of solid waste management, landfills and composting plants	IGR: Solid Waste Management Index	SIMA
Number of households covered by household solid waste collection	ICR: Regular Collection Service Indicator	Municipal government
Number (%) of households covered by selective collection of recyclable solid waste (service coverage)	ICS: Selective Collection Service Indicator	Municipal government (outsourced companies), recycling cooperatives
Quality of sewage collection and treatment	ICTEM: Municipal Sewage Collection and Treatability Indicator	CETESB
Potential for waste to enter the sea through sewage	Quantity (mass or volume) of solid waste retained in the railing and screening of Sewage Treatment Plants (ETEs) and Preconditioning Plants (EPCs)	SABESP, private companies, municipal operators
Informal settlements	Number of homes/area occupied by informal settlements	Municipal government; CDHU; IBGE; academia; third sector
Amount of waste destined for recycling by municipality	Mass or volume of waste destined for recycling/year by municipality	Municipal government (outsourced companies), recycling cooperatives
Population well-being based on income, education and health	HDI: Human Development Index	Municipal government
Income concentration	Gini Index	Municipal government
Potential for waste entering the sea by means of rivers, tidal channels and estuarine channels	Amount of solid waste (mass or volume) in rainwater/urban drainage systems/unprocessed sewage discharge	SNIS, municipal government, third sector
Recovery of solid waste by reverse logistics systems	Amount of solid waste collected by reverse logistics systems by sector	CETESB
Potential for waste to enter the sea due to activities at sea (e.g. ports, navigation, offshore)	Quantity (mass or volume) of waste landed in ports and marinas	Port authorities [São Paulo State Dock Company (CODESP) – Santos Organized Port; São Sebastião Docas Company (CDSS) – São Sebastião Organized Port], marinas
Urban cleaning solid waste (sweeping)	Amount (mass or volume) of waste removed when sweeping and cleaning streets	Municipal government; private sector (companies operating waste collection, dredging and urban cleaning systems)

Table 4. Suggested indicators for monitoring and assessing exposure to marine litter.

	Information	Size	Indicator	Compartment	Collaborating sector	Relation to policy concerns
	Information that needs to be monitored	Micro (<5mm) / Macro and meso (>5mm)	Suggested indicator to be monitored per unit of effort	Shoreline / Surface/water column / Seafloor / Biota	Government agency / Third sector / Private initiative / Academia	Tourism / Food security / Human health / Navigation / Fisheries and aquaculture / Animal welfare / Biodiversity
Physical compartments	Presence of macro- and meso-size solid waste	Macro and meso (>5mm)	No. or mass of items by area, volume or collection time			
			% of characteristics of the items			
	Presence of micro waste	Micro (<5mm)	No. of items by area, volume or collection time			
			% of characteristics of the items			
Relationship with the biota	Ingestion					
	Occurrence of solid waste ingested by organisms (abundance)	Micro (<5mm) / Macro and meso (>5mm)	No. of occurrences of waste ingestion			
			Items or mass by organism (digestive tract or tissues)			
			% of characteristics of the items			
	Entanglement					
	Reports of entanglement in solid waste (prevalence)	Macro and meso (>5mm)	No. of entanglement occurrences (with or without death)			
			% of characteristics of the items			
	Dispersion					
	Presence of exotic species brought by solid waste	Micro (<5mm) / Macro and meso (>5mm)	No. of individuals/exotic species with record of dispersion by marine litter			

Policies

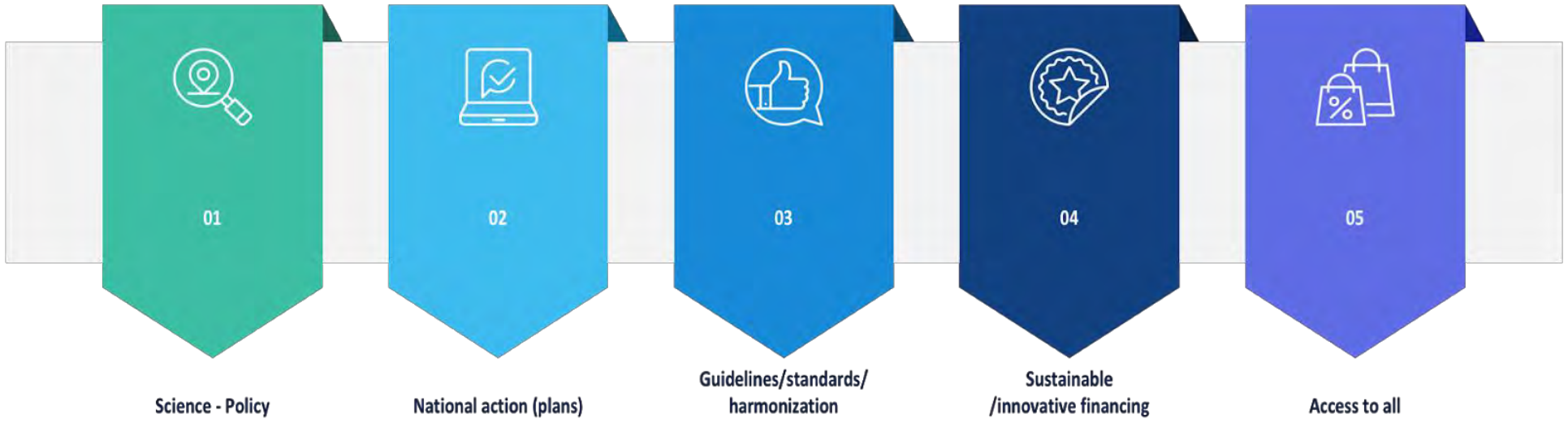
- **Target 7.1**: Abandoned, lost and otherwise discarded fishing gear;
- **Target 7.2**: PEMALM – Collaborative plataforma and indicators;
- **Target 7.3**: Internalization in environmental public policies;
- **Target 7.4**: Marine litter governance strategy;
- **Target 7.5**: Marine litter combat plan.

Approach

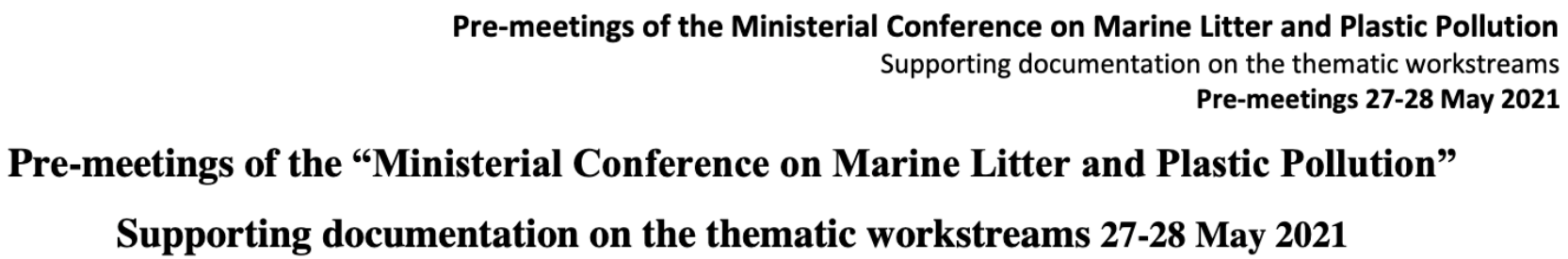
INNOVATION ECOSYSTEM

LINKING SCIENCE AND DECISION-MAKING AT THE LOCAL LEVEL

Strategies


01
02
03
04
05
Science - Policy
National action (plans)
Guidelines/standards/ harmonization
Sustainable /innovative financing
Access to all

Demands



Pre-meetings of the Ministerial Conference on Marine Litter and Plastic Pollution
Supporting documentation on the thematic workstreams
Pre-meetings 27-28 May 2021

Pre-meetings of the "Ministerial Conference on Marine Litter and Plastic Pollution"

Supporting documentation on the thematic workstreams 27-28 May 2021

- Coordination of actions;
- Institutional and legal arrangements;
- Capacity building;
- Data governance.

Up-scalling

CSOs

Academia

Private sector

When estimated and modelled data are used, agencies need to consult and get agreement by national statistical authorities

National Statistical System

International Agencies

UNSD Global SDG Indicators Database

unstats.un.org/sdgs/indicators/database/

Countries have different data flows scenarios

Regional Mechanisms will facilitate the data transmission process from the national to the global level

Regional Mechanism

UNSD Country Data Lab

Source: Guidelines on data flows and global data reporting, 5th Meeting of the IAEG-SDGs, 30-31 March 2017, Ottawa

Alexander Turra
turra@usp.br

United Nations
Educational, Scientific and
Cultural Organization

UNESCO Chair on Ocean Sustainability
University of São Paulo
Established in 2018

Instituto Oceanográfico

All-Atlantic 2021
Connecting, Acting, Cooperating
2-4 June
Ponta Delgada, Azores, Portugal

We are taking a short break …

We will be back for the panel discussion in a few minutes

#All-Atlantic2021 Side Event
Marine debris in the Atlantic Ocean

Meet our panelists joining the discussion with experts from sessions 1 & 2

VIRTUAL EVENT
3 June 2021
11:30 – 13:30 UTC

Dr. François Galgani
Moderator
Ifremer, France

Dr. Alex Turra
GESAMP, USP
Brazil

Heidi Savelli
UNEP Global Partnership on Marine Litter

Dr. Abdoulaye Diagana
UNEP Abidjan Convention

Mareike Erfeling
OSPAR Convention
Netherlands

Michail Papadoyannakis
European Commission

Christopher Corbin
UNEP Cartagena Convention

GEO BLUE PLANET

Funded by the European Union

EU4ocean obs

Implemented by MERCATOR OCEAN INTERNATIONAL

IEEE Oceanic Engineering Society OES

All-Atlantic 2021 Connecting, Acting, Cooperating
2-4 June Ponta Delgada, Azores, Portugal

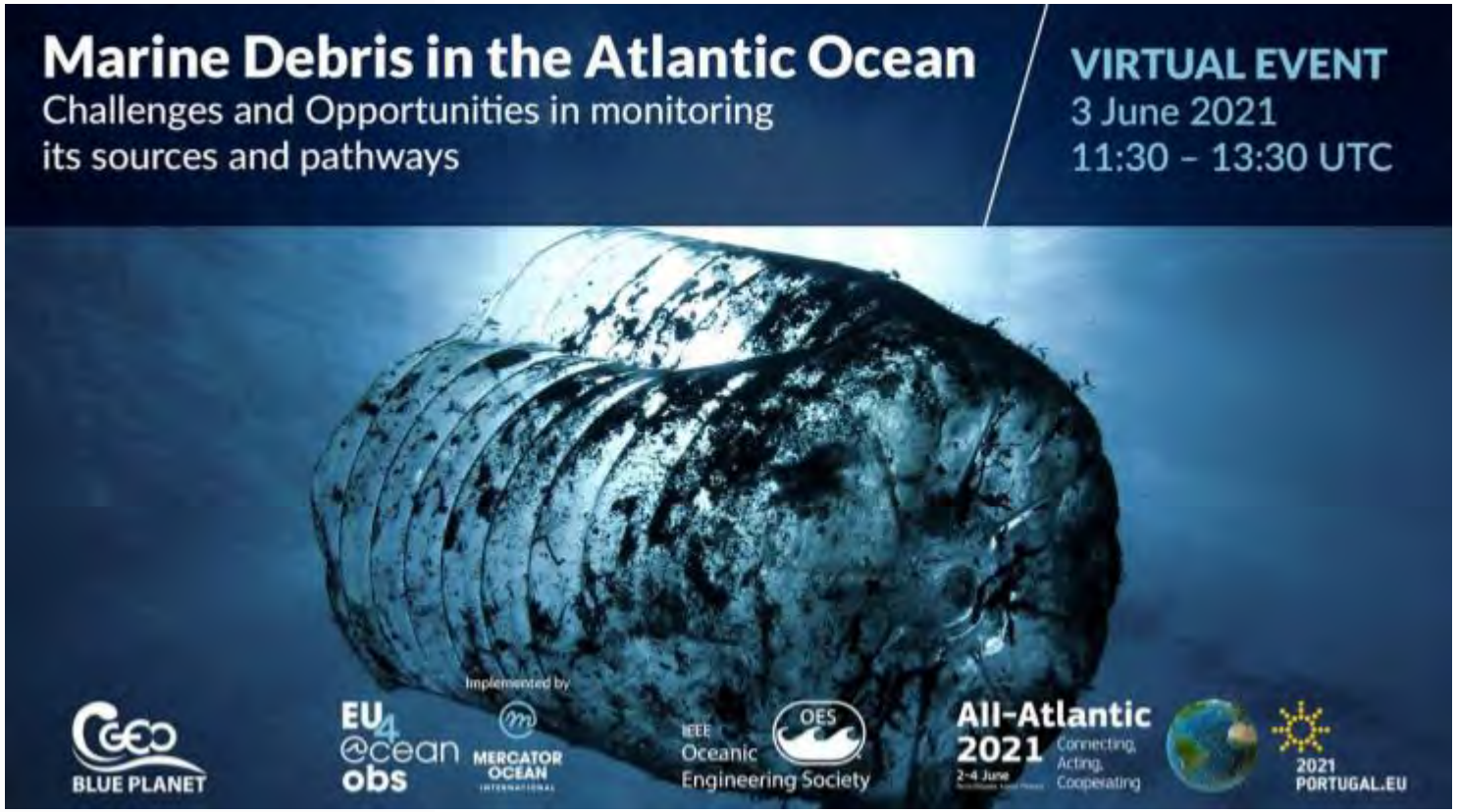
2021 PORTUGAL.EU

With experts from sessions 1 & 2 :

Dr. Lauren Biermann
(PML/ IOCCG Marine litter Task Force, UK)

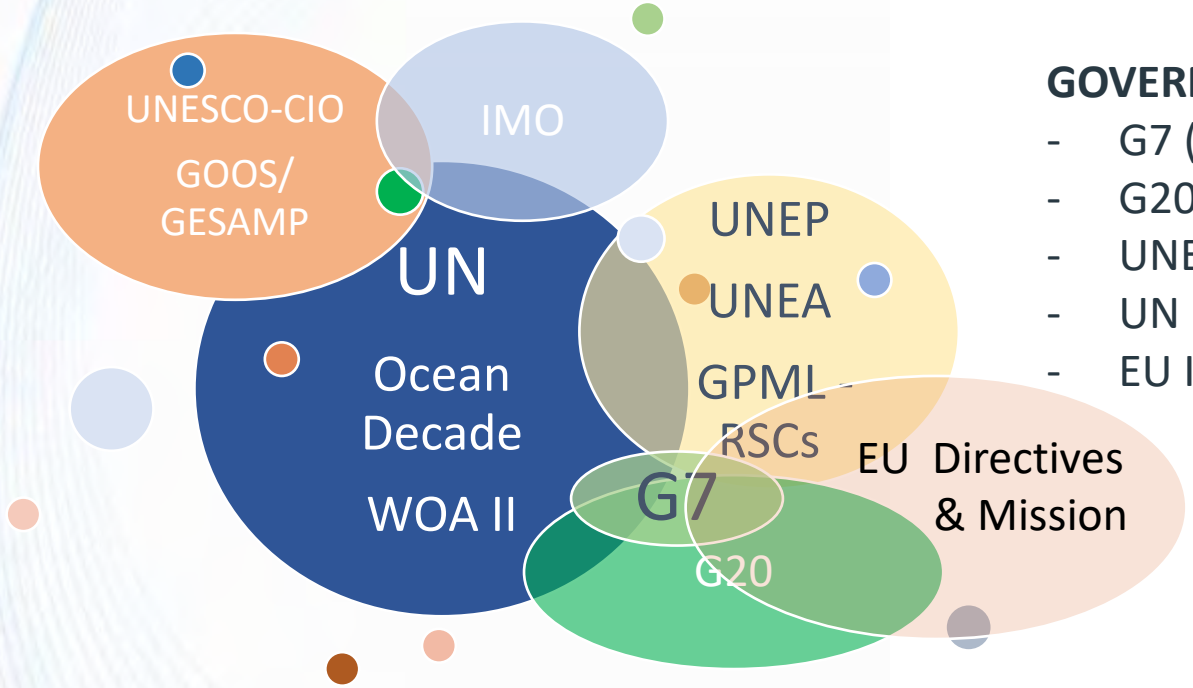
Dr. Denise Mitrano
ETH
Switzerland

Challenges and Opportunities in monitoring the sources and pathways of Marine Debris in the Atlantic Ocean



F. Galgani

Global initiatives on Marine Litter

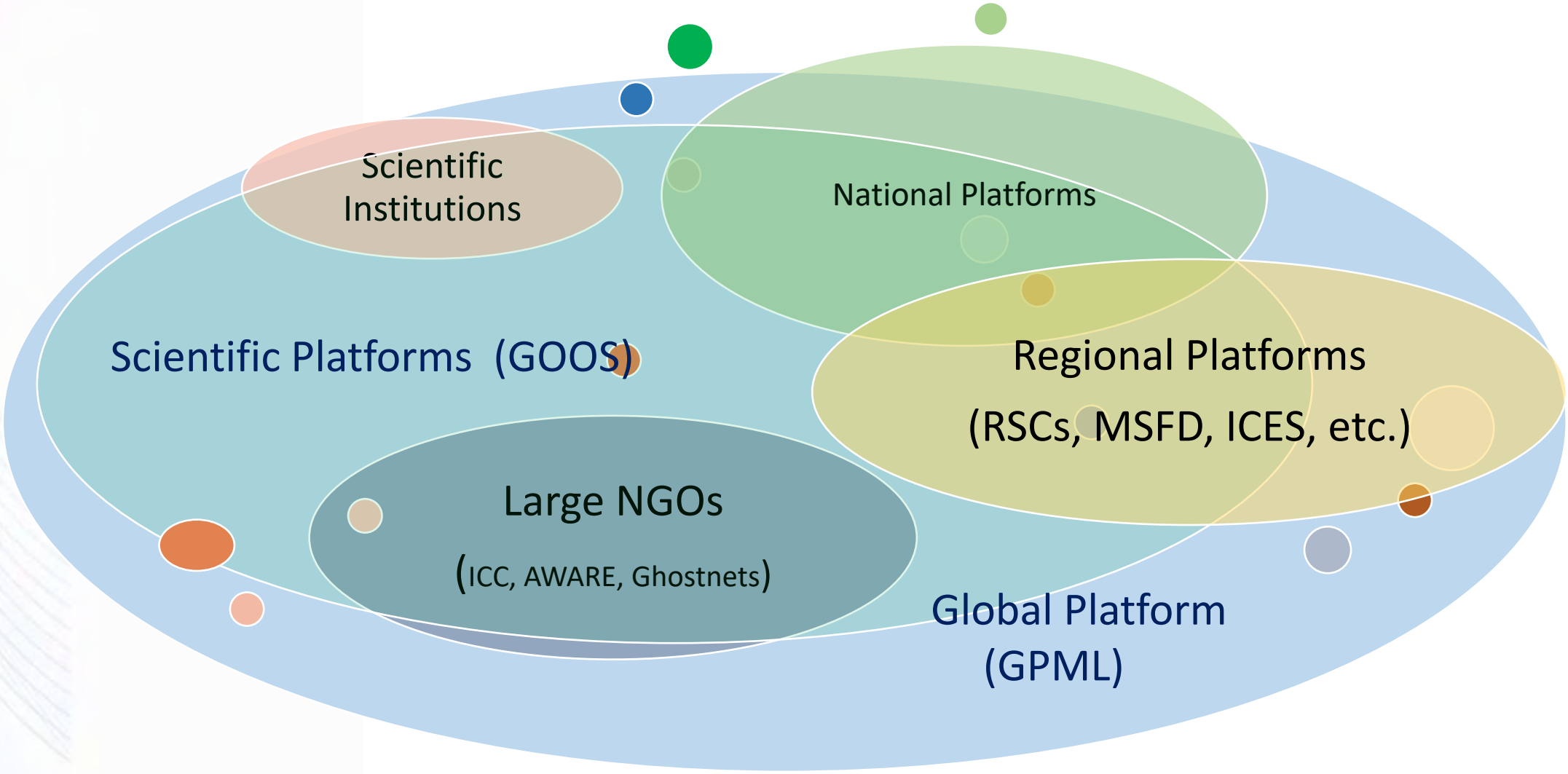


GOVERNANCE

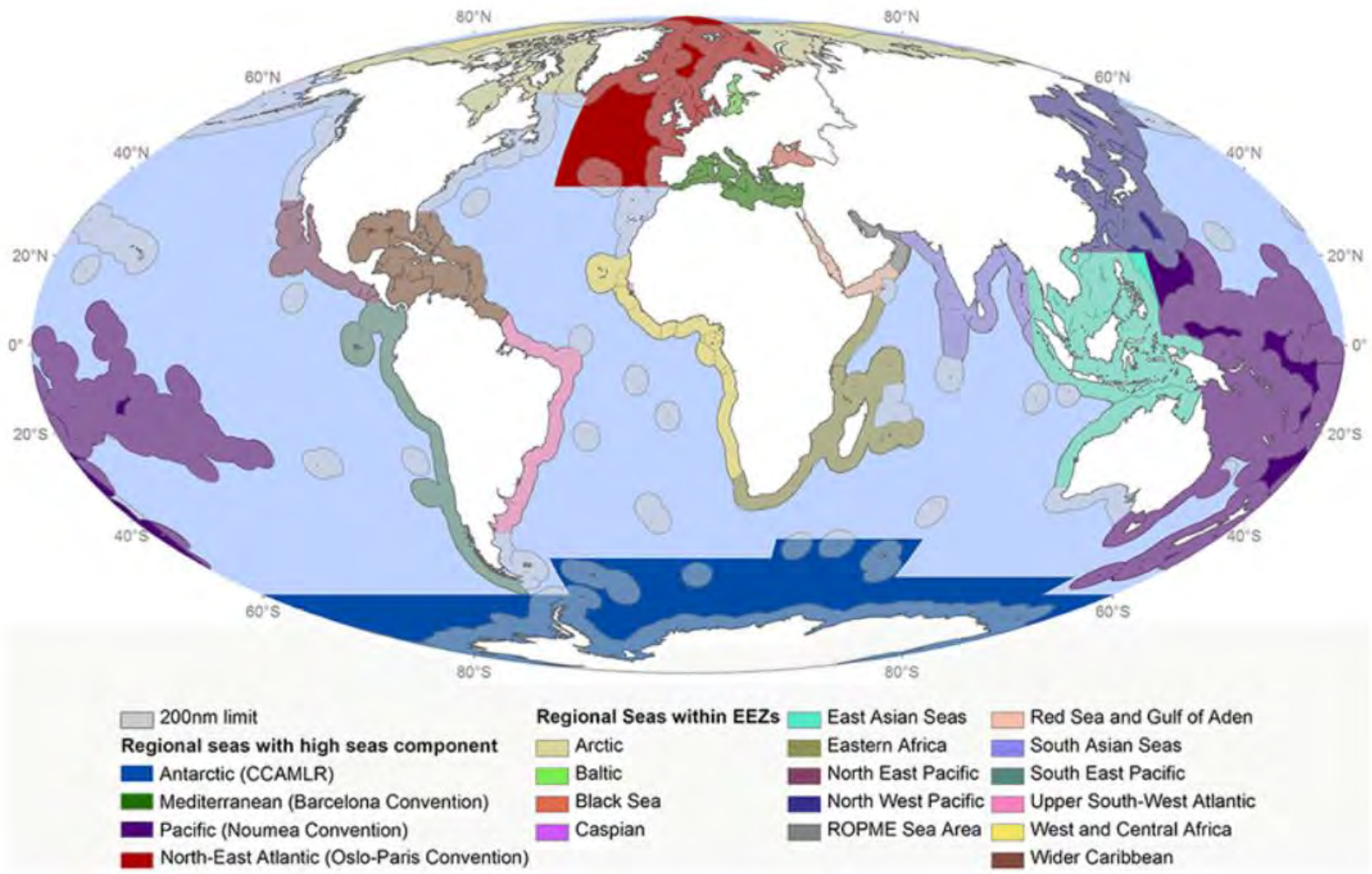
- G7 (2015) Global ML Platform/ coordination UNEP
- G20 (2016) ML platform
- UNEA 2019: global monitoring / global treatee (AHEG/ SAC)
- UN Bodies (IMO, FAO, UNESCO /IOC, CBD, etc.)
- EU Initiatives Mission « STARFISH»:

- **SCIENCE**
- G7 (Japan): Monitoring/ Microplastics
- IEEE/ EOS meetings
- OCEANOBS processes (IMDOS paper, *Maximenko et al., 2019*)
- GEOBLUEPLANET
- IOC/ GESAMP (monitoring)
- OBPS (ML Best practices)

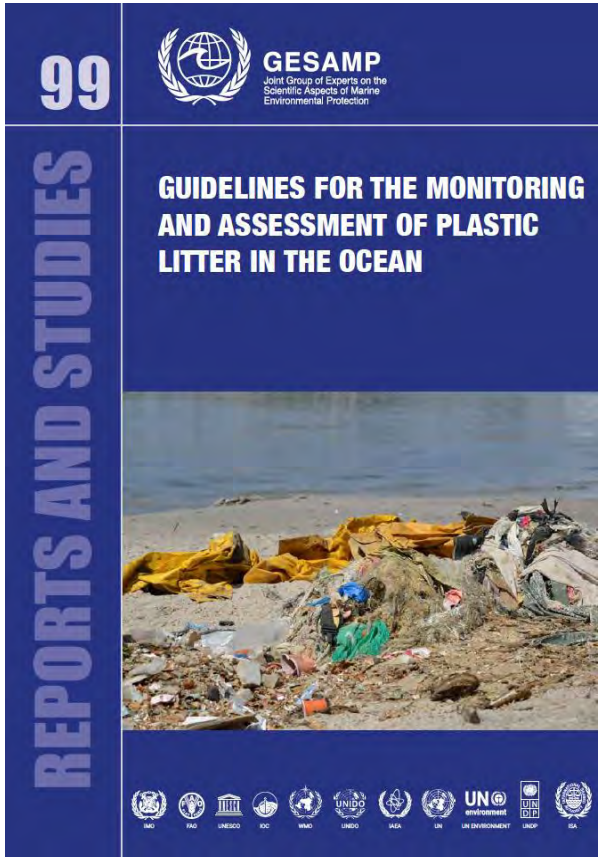
MAIN ACTORS


Scientific Institutions
National Platforms
Scientific Platforms (GOOS)
Regional Platforms
(RSCs, MSFD, ICES, etc.)
Large NGOs
(ICC, AWARE, Ghostnets)
Global Platform
(GPML)

Regional Sea conventions (Cartagena, Abidjan, OSPAR, etc.)

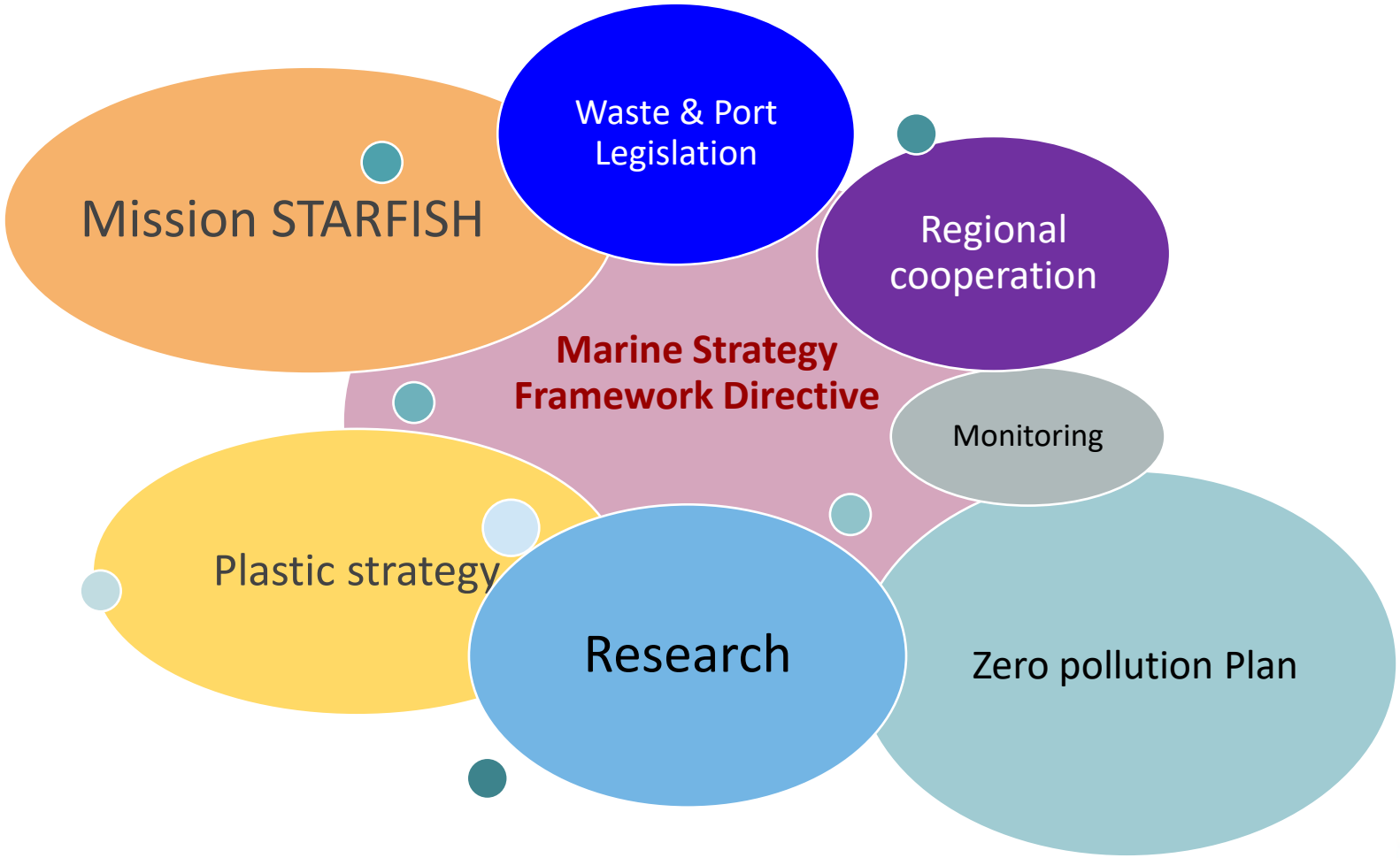


INDICATORS?



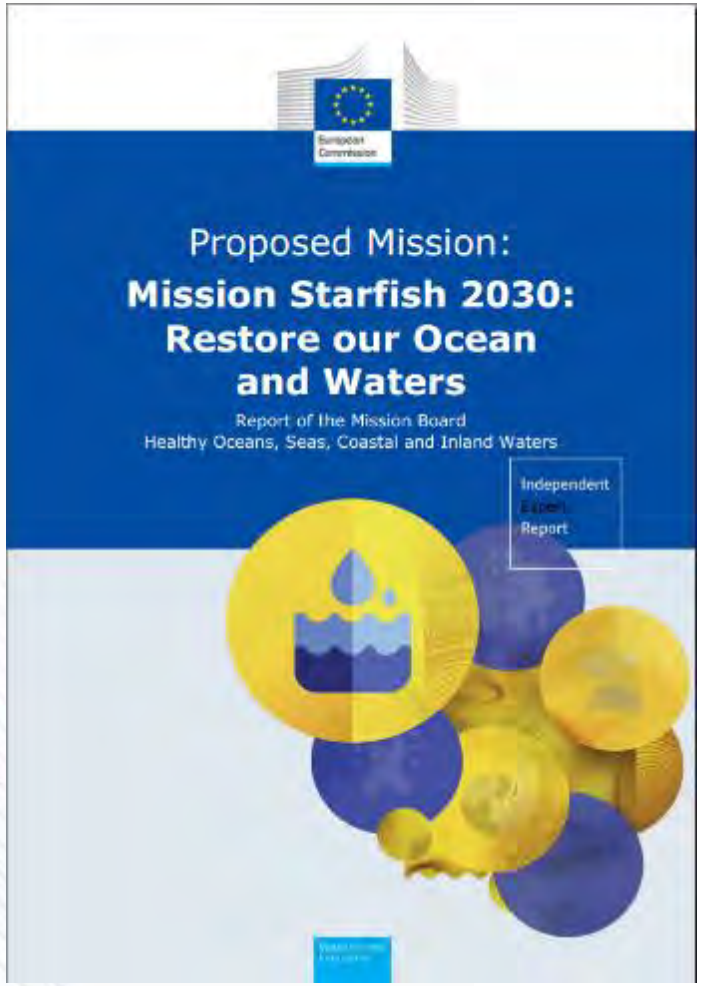
GESAMP

Europe…. Who is doing What?



Zero-Pollution-Action Plan (Green Deal)

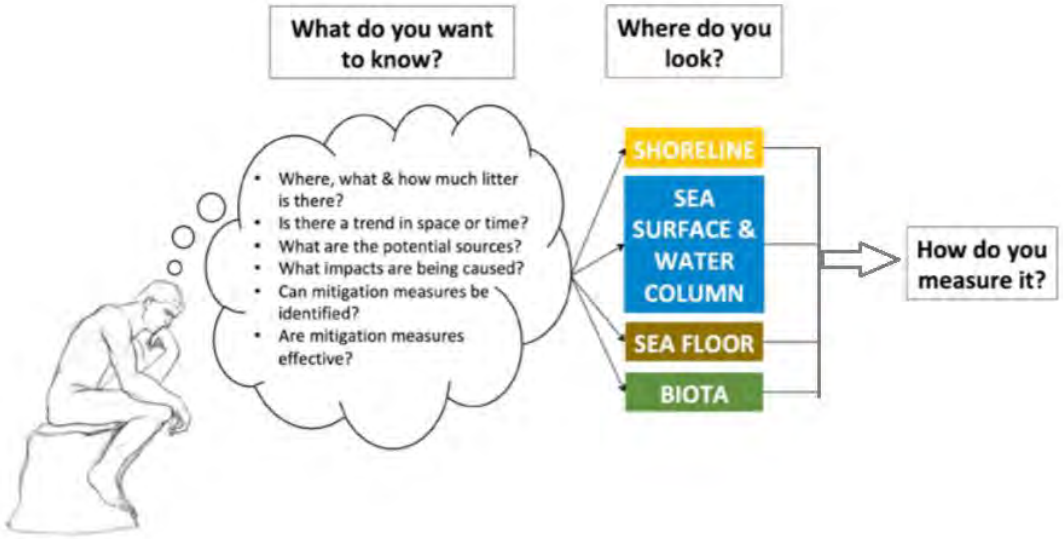
Horizon Europe / Mission STARFISH

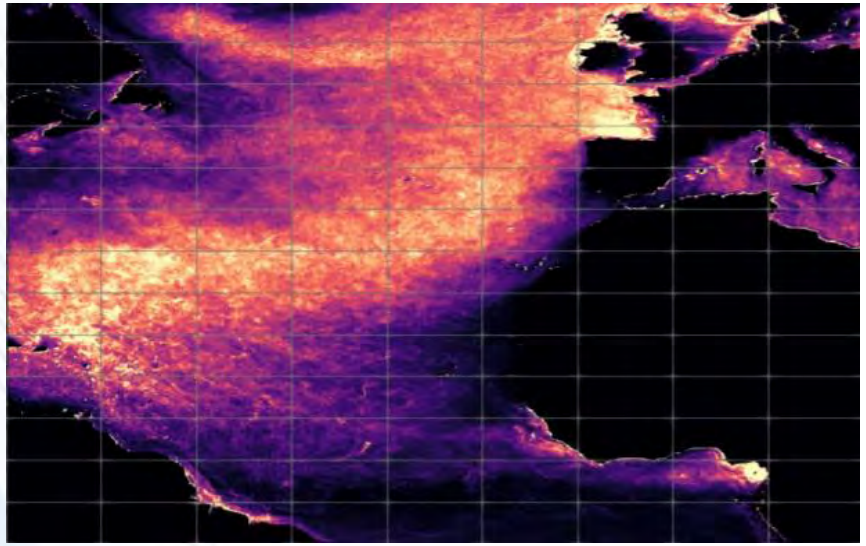


Objective	Target	
Filling the knowledge and emotional gap	1	Each European is a citizen of our ocean and waters
	2	Marine and freshwater observation is streamlined and accessible to all via a digital twin of the ocean and all waters
Regenerating marine and water ecosystems	3	30 percent of EU waters are highly to fully protected
	4	Active regeneration of 20 percent of degraded habitats
	5	Renaturalise rivers and waters
	6	End overfishing
Zero pollution	7	Zero plastic litter generation
	8	Eutrophication of European seas and waters is halted
	9	Zero spill
	10	Underwater noise is regulated and reduced
Decarbonising our ocean, seas and waters	11	Climate-neutral waterborne transport
	12	Support the energy transition through renewable, low-impact ocean energy
	13	Zero-carbon aquaculture
	14	A thriving blue biotech
	15	Climate-neutral blue tourism
Revamping governance	16	An integrated and participatory EU system of ocean and water governance
	17	EU leadership for effective global ocean governance

https://ec.europa.eu/info/publications/mission-starfish-2030-restore-our-ocean-and-waters_en

Monitoring: assessment of differences and trends / efficiency of reduction measures





Ifremer

5 GYRES SCIENCE TO SOLUTIONS

Clean Atlantic

EMODnet

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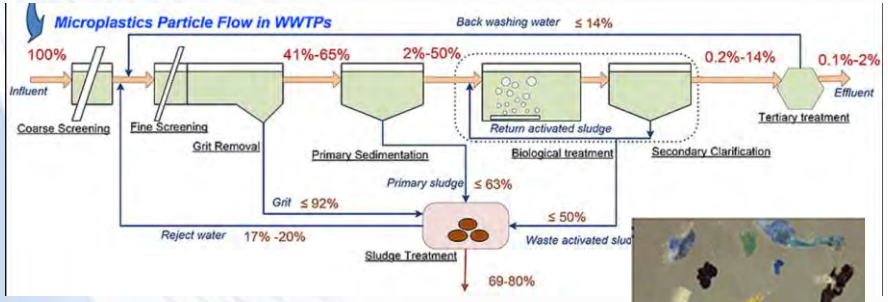
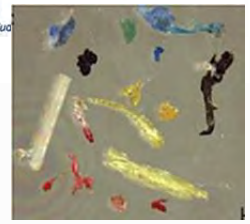
Challenges

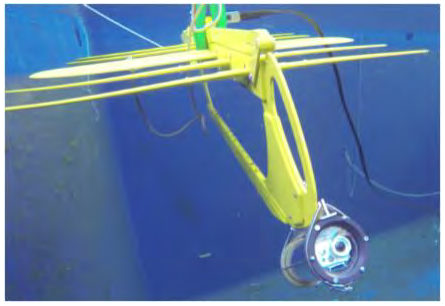
Cost-effective methods





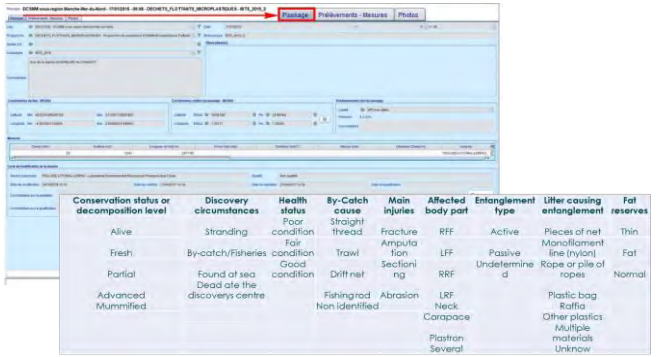
Solutions

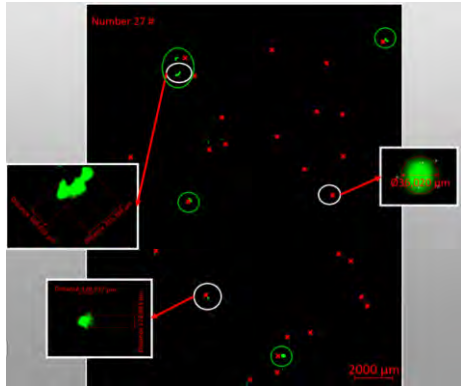
Automated sensors



Satellites

Data management

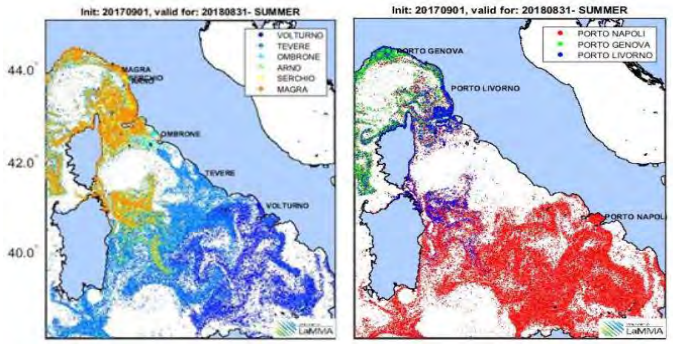




Small sized particles

Risk assessment

Modelling



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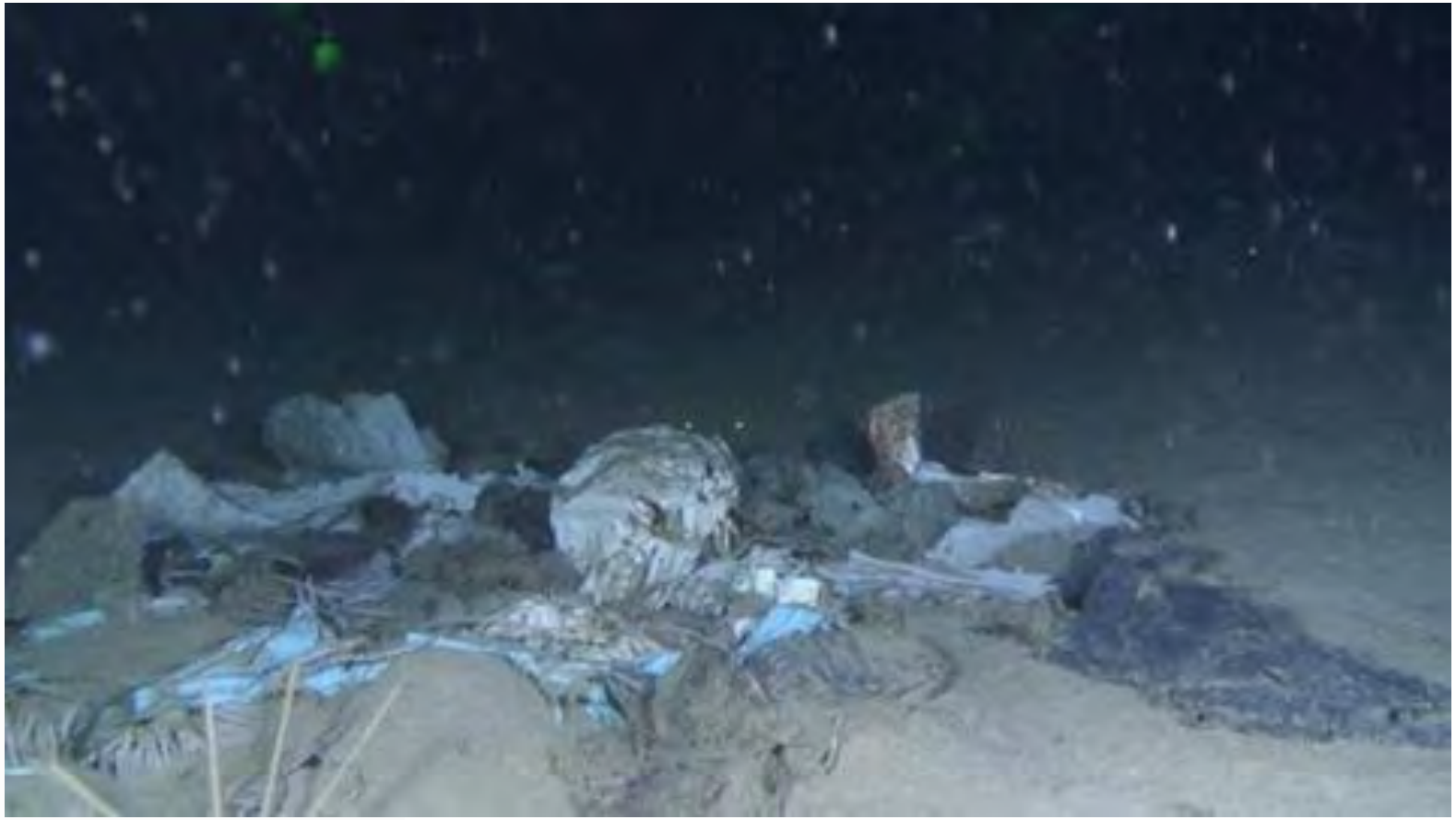

THANK YOU

Ifremer

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Thank you for attending our side event.

We hope you enjoyed it!

You will be able to find more information and a summary of our All Atlantic 2021 side-events on our website **www.eu4oceanobs.eu/all-atlantic-2021/**