

GenOA week 2022

Citizen Science e Sport al servizio dell'ambiente marino: il progetto MicroPlastic Hunters



Francesca Garaventa
(and a lot of cool people)

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**CNR
IAS**
INSTITUTE OF ANTHROPIC
IMPACTS AND SUSTAINABILITY
IN THE MARINE ENVIRONMENT





Sonda Cassini 19 Luglio 2013
distanza approssimativa di 1.445858
miliardi di chilometri dalla terra.

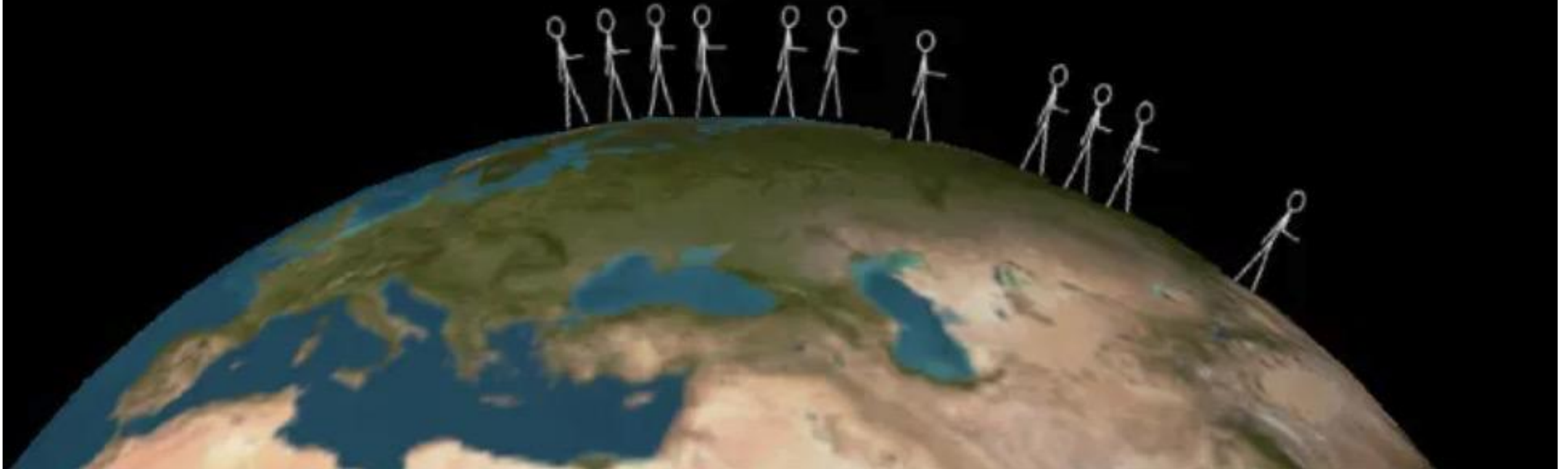
↑
Quel tenue
puntino azzurro è
noi (Carl Sagan)



7 billion guests



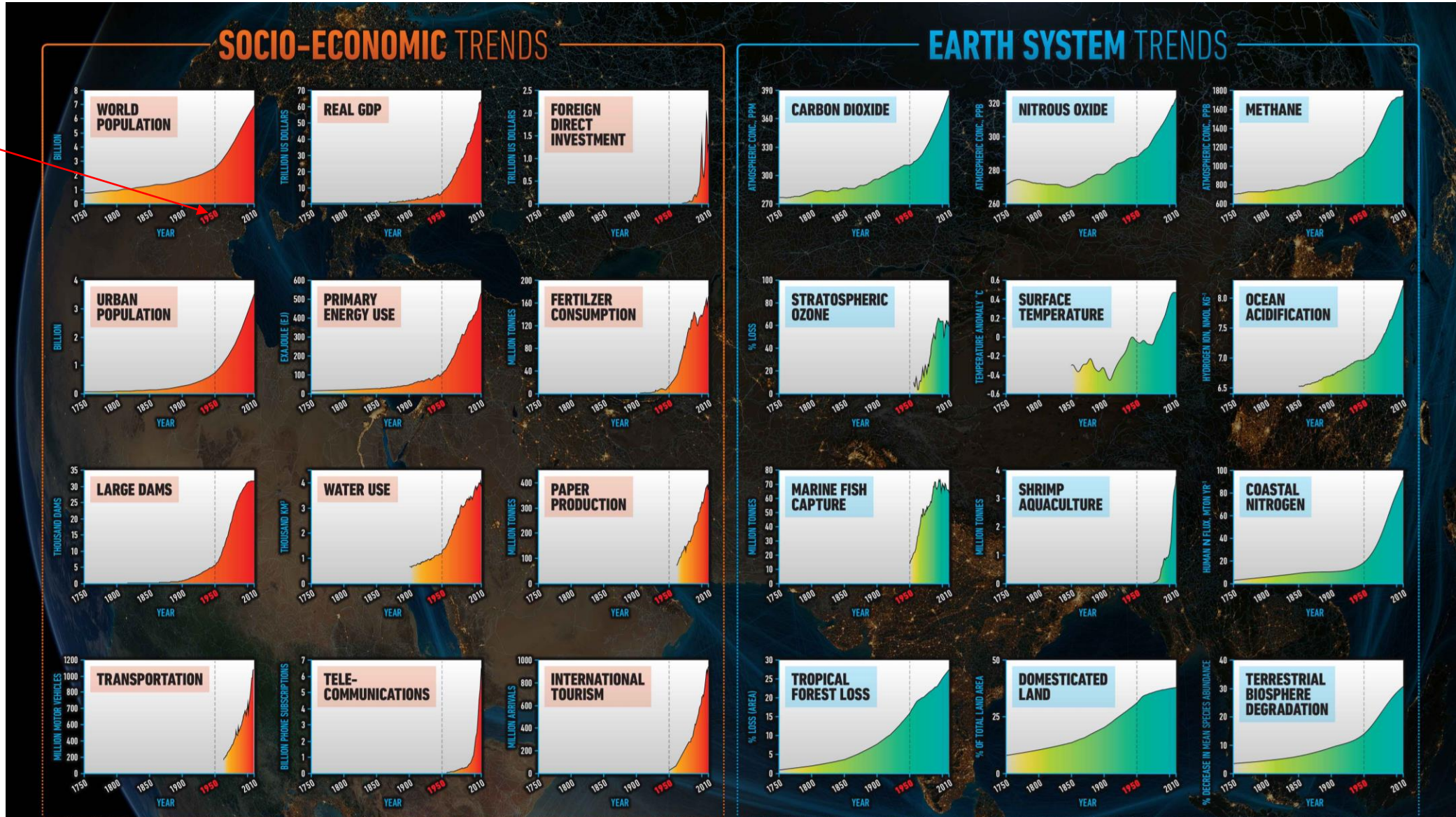
+75 million/year anno > 8 billion in 2025





Great Acceleration Era

1950





2020



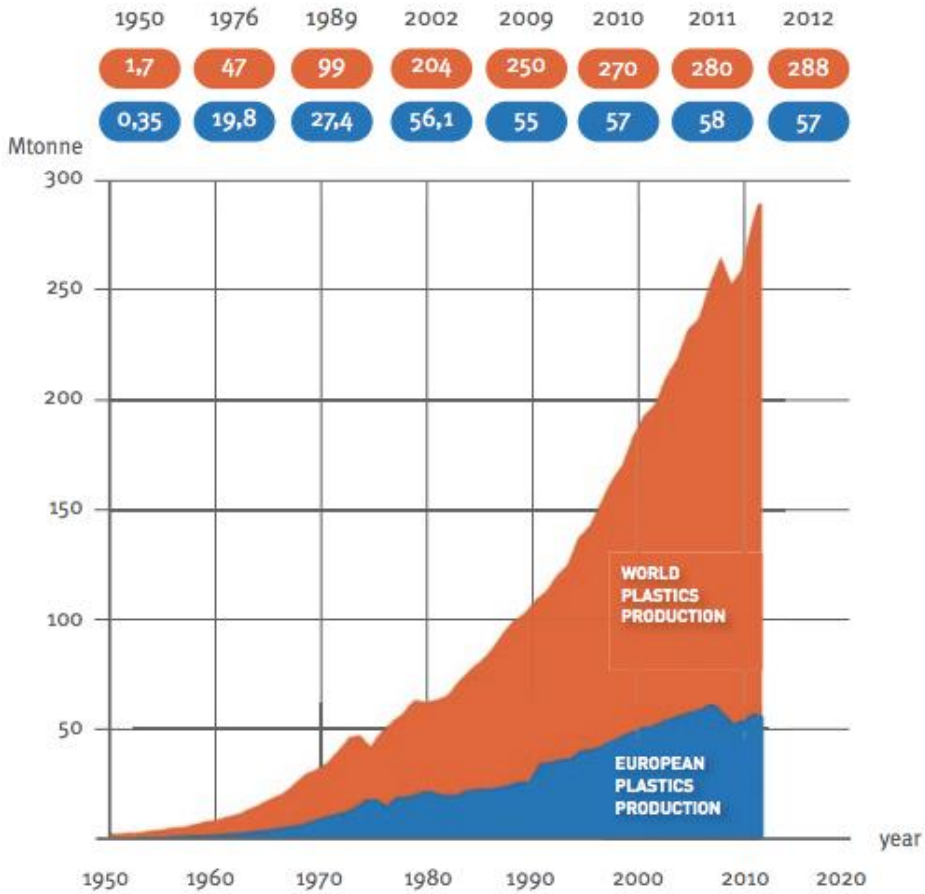
The anthropogenic mass (which has recently doubled roughly every 20 years) surpassed all global living biomass.

Elhacham et al. 2020, Nature





Plastic production



World



Europe (EU28+NO/CH)



Includes Thermoplastics, Polyurethanes, Thermosets, Elastomers, Adhesives, Coatings and Sealants and PP-Fibers. Not included: PET-fibers, PA-fibers and Polyacryl-fibers.





Plastics demand by product sector

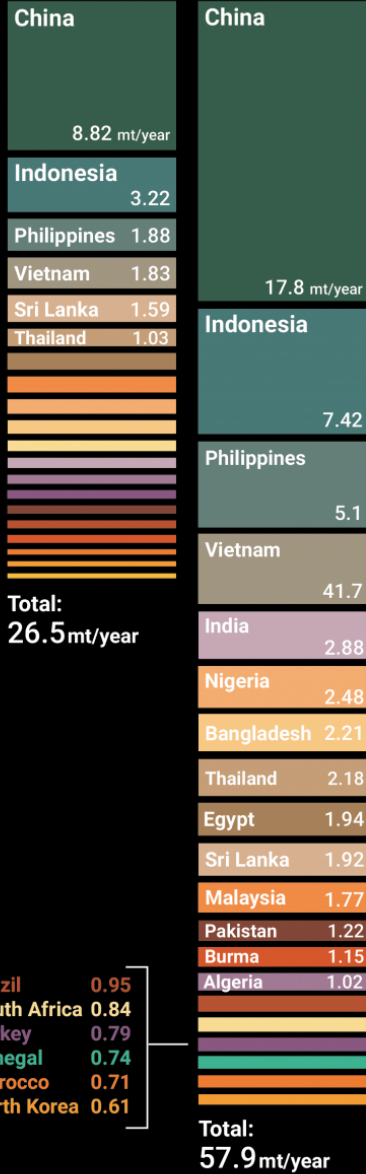




TOP 20 COUNTRIES RANKED BY MASS OF MISMANAGED PLASTIC WASTE IN 2010 AND 2025

Egypt	0.97
Malaysia	0.94
Nigeria	0.85
Bangladesh	0.79
South Africa	0.63
India	0.6
Algeria	0.52
Turkey	0.49
Pakistan	0.48
Brazil	0.47
Burma	0.46
Morocco	0.31
North Korea	0.3
United States	0.28

2010 **2025**



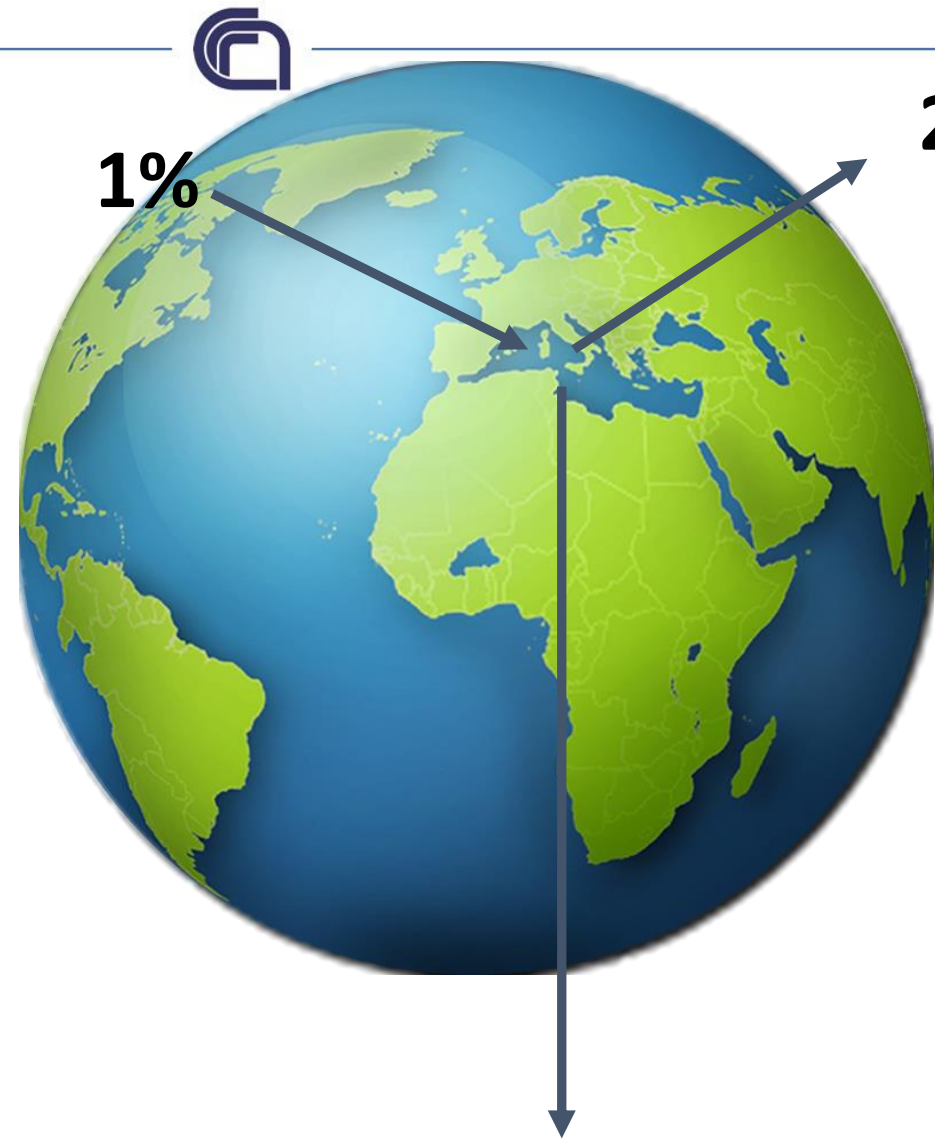
Total: 26.5 mt/year

Total: 57.9 mt/year

"Plastic waste inputs from land into the ocean",
Science February 2015
International Business Times/Hanna Sender

The Plastic destiny





1%

20% GMP

Overall asset of the
Mediterranean Sea (2016)

US\$ 5600 billion

10% WMB

(World Marine Biodiversity)

229.000 tonnes of plastic is leaking
into the Mediterranean Sea **every**
year

500 shipping containers each day

Unless significant measures are
taken to address mismanaged
waste, the main source of the
leakage, **this will at least double**
by 2040

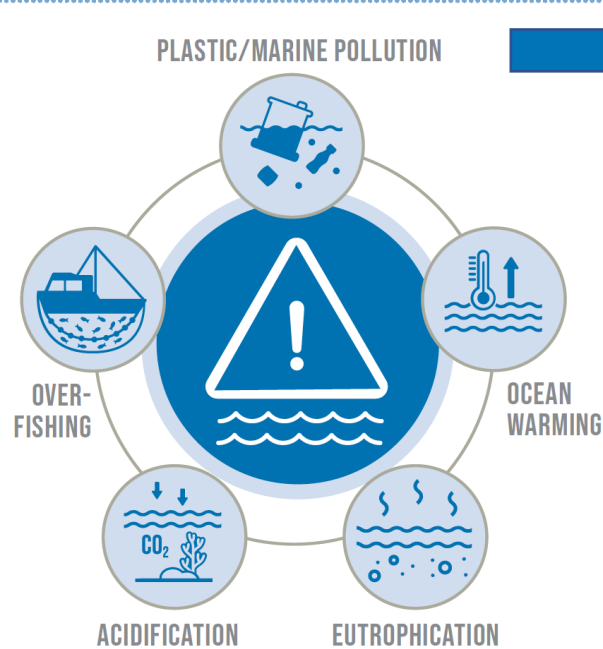




CONSERVE AND SUSTAINABLY USE THE OCEANS, SEA AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

OUR OCEAN

THE PLANET'S LARGEST ECOSYSTEM
IS ENDANGERED



**PLASTIC POLLUTION
IS CHOKING THE OCEAN**

**17+ MILLION METRIC TONS
OF PLASTIC ENTERED
THE OCEAN IN 2021**

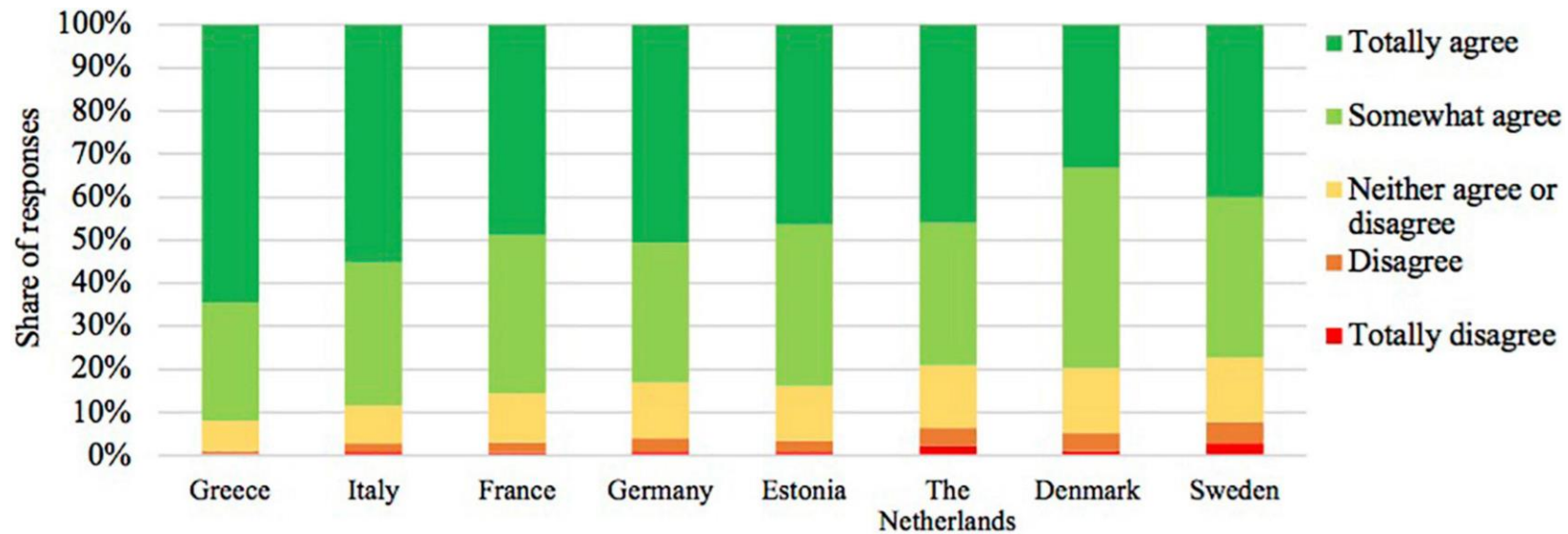
**PROJECTED TO DOUBLE OR
TRIPLE BY 2040**





Concern and Consequences of Marine Plastic Litter

“I am very worried about plastic pollution in seas and oceans”

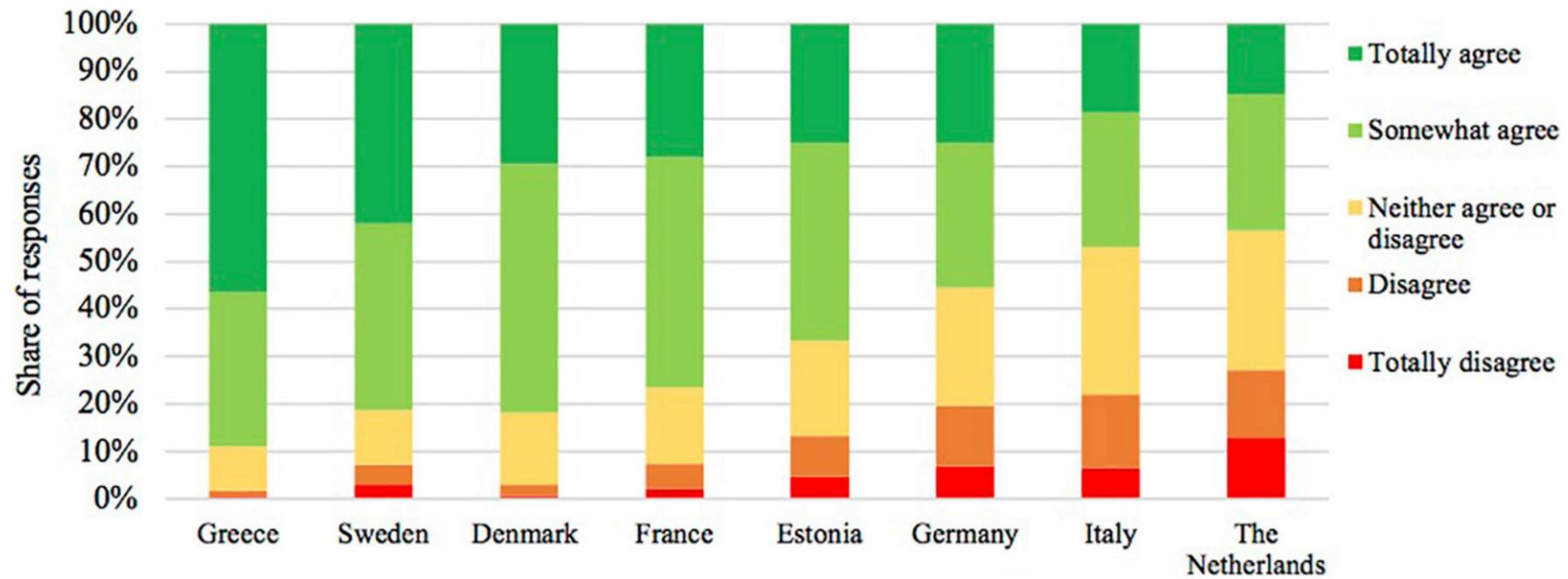


Van Oosterhout 2022 Front. Mar. Sci., Sec. Marine Pollution



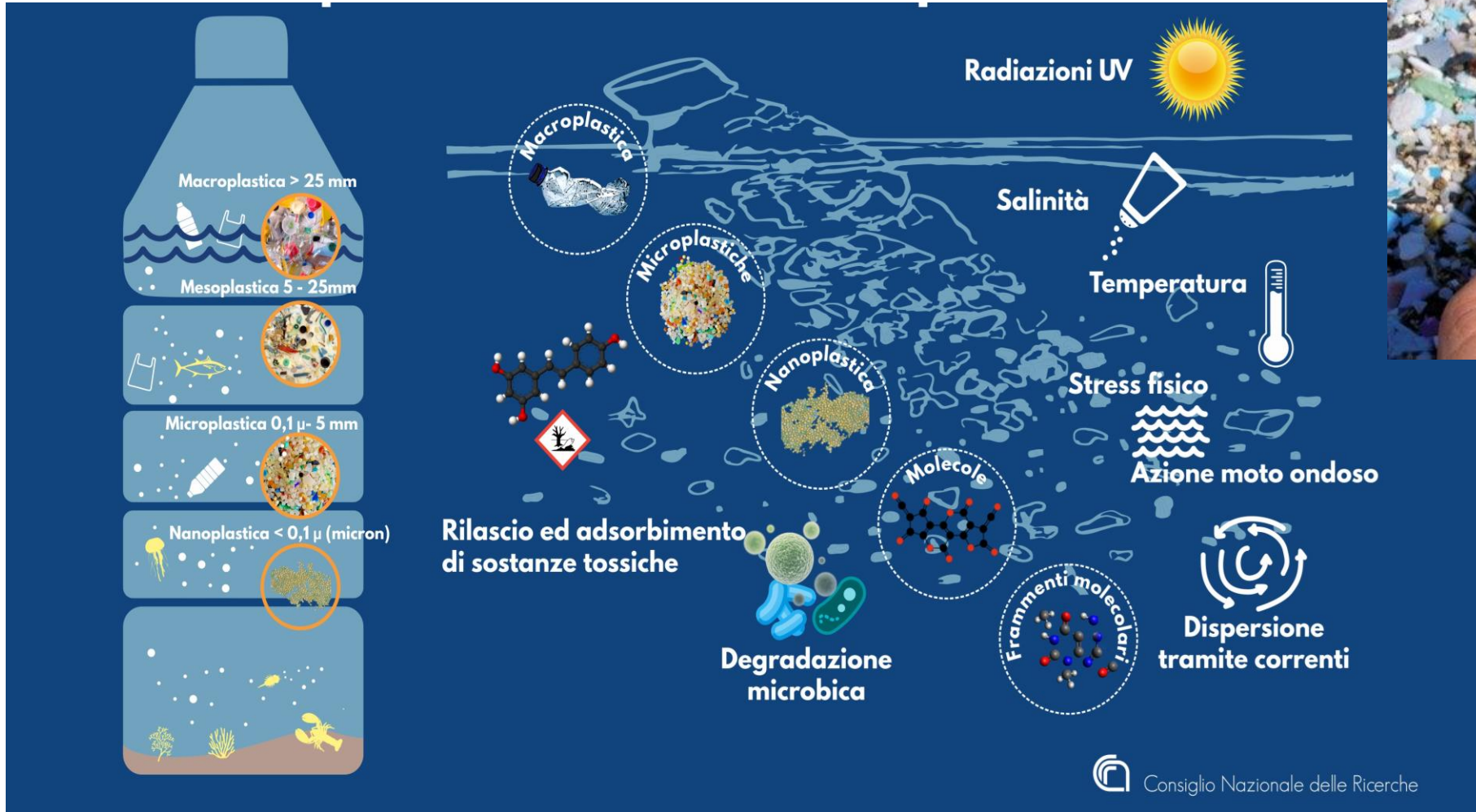


“I feel a personal responsibility to try to reduce plastic pollution”





Microplastics





MACRO → MICRO → nano Plastic

SOURCE-PRESENCE-DYNAMIC-DESTINY

THRESHOLD

Where? How long? How much?
What are they made of?
Where do they come from?
Where do they go?

**WHAT'S THE BASELINE LEVEL OF
CONTAMINATION?**



PRESENCE – EFFECTS

THRESHOLD

What's their effect?

Do they enter in the food chain?

Do they interact with other
contaminants?

AWARNESS-OUTREACH-
TECHNOLOGICAL DEVELOPMENT

Are we a part of the problem?

What can we, industry and
Governments can do?





Where? How much?

2015

TUNU

WATER ←

9 Stations

Northeast Greenland - TUNU-VI Expedition (5-17 August 2015)

FISH samples (DEMERSAL)

Triglops nybelini
71 specimens

Mallotus villosus
50 specimens

Boreogadus saida
35 specimens

2017

October 2017: Microplastic monitoring in Guadeloupe

Water, Sediment and Fish

July 2017: Microplastic monitoring along Italian Coast

Water, fish and zooplankton

19 Sampling Stations

2019

May-June 2019: Micro/Nano Plastic Monitoring in Central Tyrrhenian Sea

Water, sediment and Biota
Oceanographic dynamic

18.05 08.06

PRIN - EMME

2020

July 2020: Micro/Nano Plastic Monitoring in Central Tyrrhenian Sea

Water, sediment and Biota

DIFENDIAMO IL MARE TOUR
15 - 31 LUGLIO 2020
MAR TIRRENO

RESPONSE

2021

Dal 21 giugno al 10 luglio

DIFENDIAMO IL MARE TOUR
Adriatico 2021

TAPPE

- Ancona
- Pescara
- Isole Tremiti
- Molfetta
- Bari
- Torre Guaceto
- Brindisi

H2020 EU Project



Evolution of the distribution and dynamic of microplastic in water and biota: a study case from the Gulf of Gabes (Southern Mediterranean Sea)

Sana Ben Ismail¹, Elisa Costa¹, Jaziri Hela¹, Silvia Morgana¹, Mohamed A. Ben Ismail¹, Roberta Minetti², Alessio Montarsolo¹, Sammarì, Marco Faimali¹ and Francesca Garaventa¹

Microplastics in the Mediterranean: Variability From Observations and Model Analysis

Kostas Tsiaras^{1*}, Elisa Costa², Silvia Morgana², Chiara Gambardella², Veronica Piazza², Marco Faimali², Roberta Minetti², Christina Zeri¹, Melilotus Thyssen³, Sana Ben Ismail⁴, Yannis Hatzonikolakis^{1,5}, Sofia Kalaroni¹ and Francesca Garaventa²

Distribution Patterns of Floating Microplastics in Open and Coastal Waters of the Eastern Mediterranean Sea (Ionian, Aegean, and Levantine Seas)

Argyro Adamopoulou¹, Christina Zeri^{1*}, Francesca Garaventa², Chiara Gambardella², Christos Ioakeimidis³ and Elli Pitta¹

Averaged abundance:

2017 – GREENPEACE: 0,52 items/m³ → Adriatic – Tyrrhenian – Ionian Seas

2018-19 – CLAIM: 146.592,71 ± 78080,35 items/km² → Ligurian Sea

2019 – GREENPEACE: 94.737,30 ± 84064,83 items/km² → Central Tyrrhenian

2020 – GREENPEACE: 275.738,68 ± 398525,29 items/km² → TIRRENO CENTRO-SETTENTRIONALE

Hot Spots:

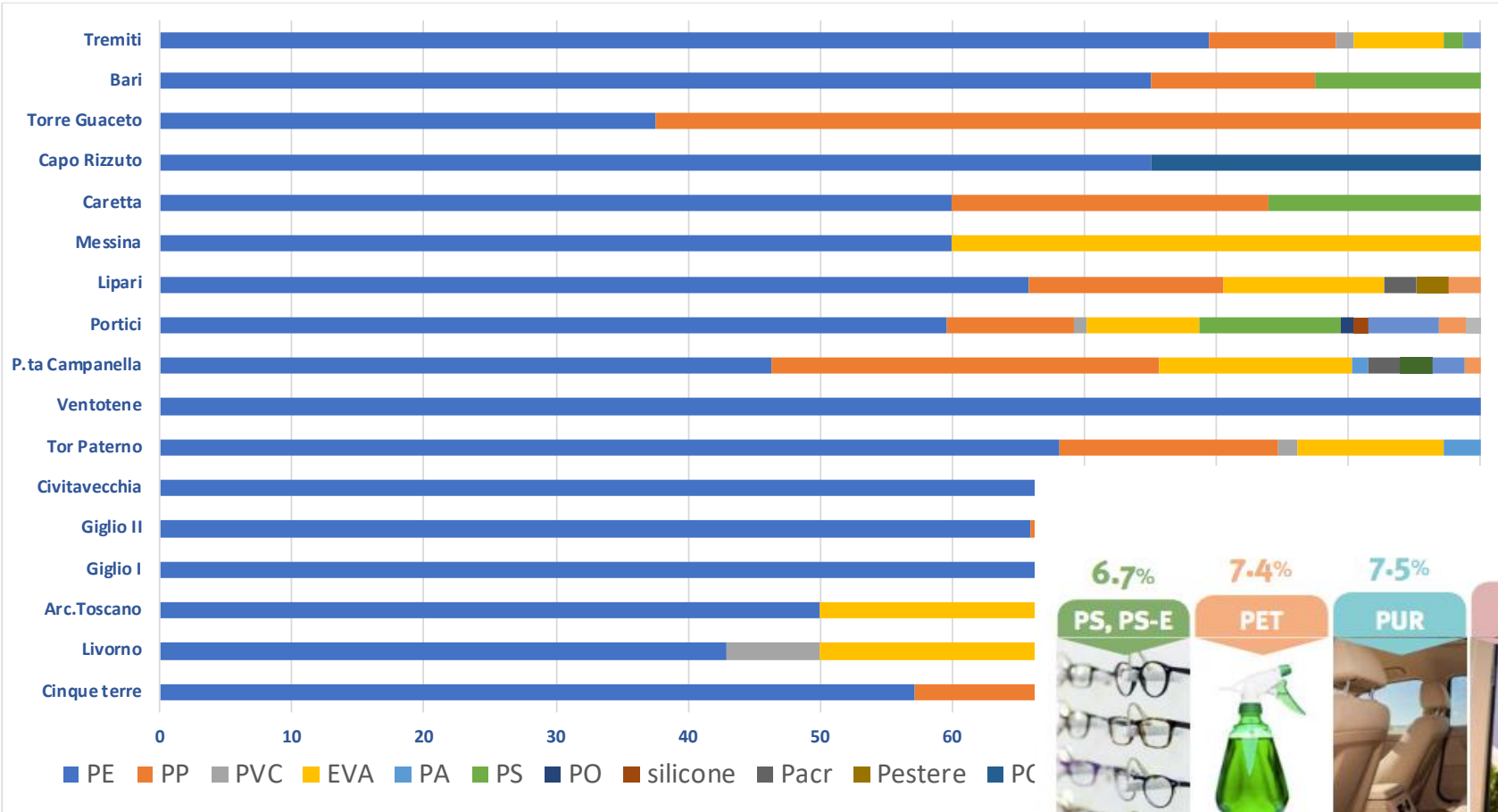
Gulf of Naples: 1.230.000 items/ km²

Corsica Channel: 1.653.061,22 items/km²

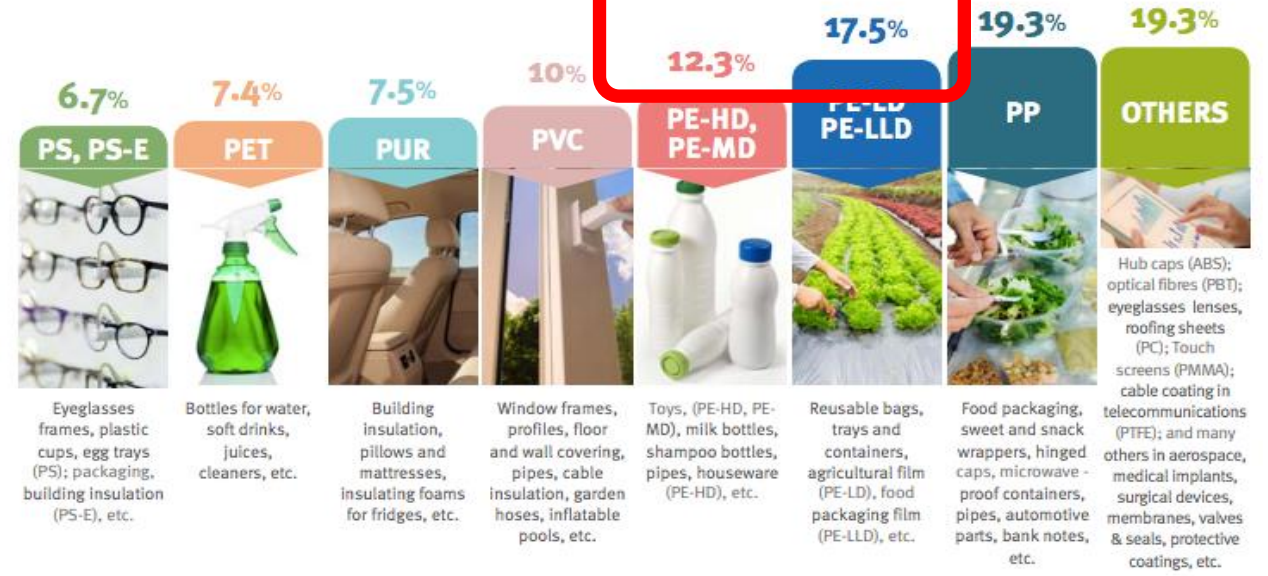




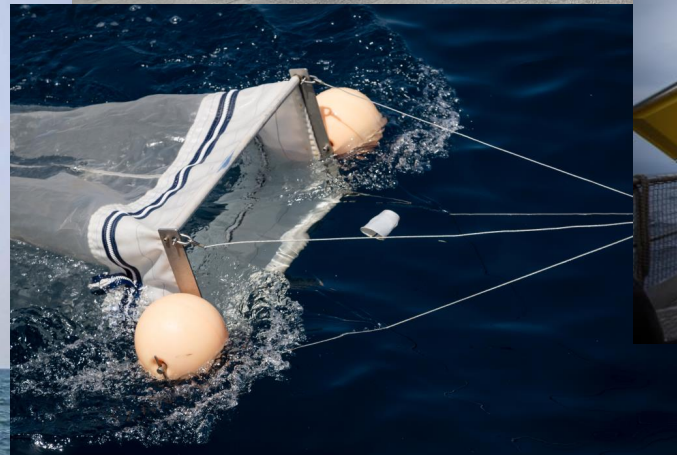
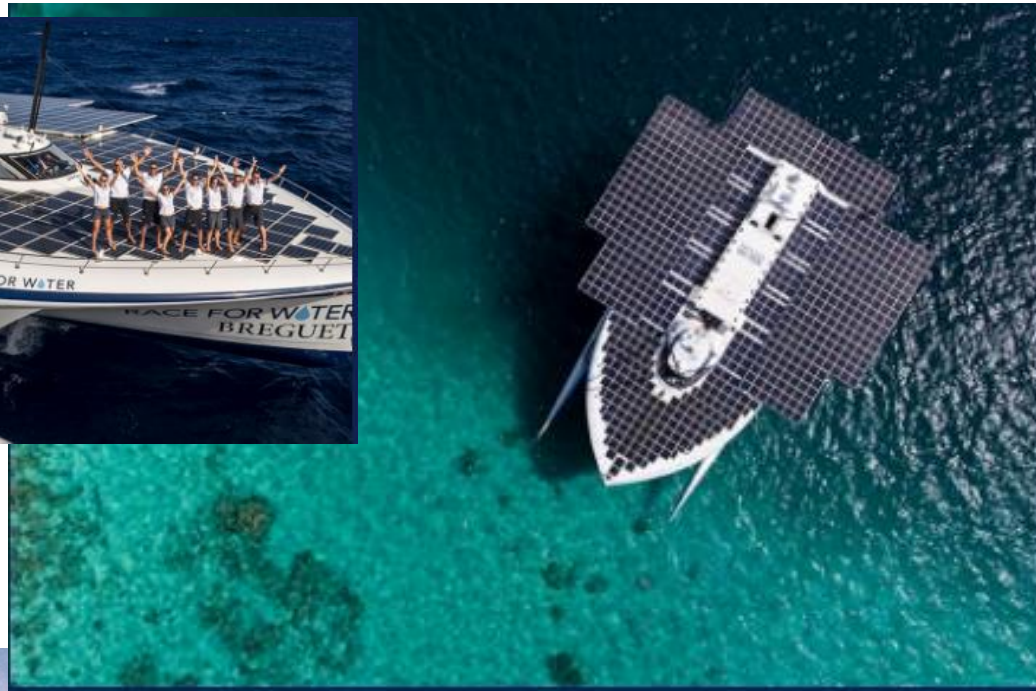
Polymers type



European plastic demand by Polymer (2017)

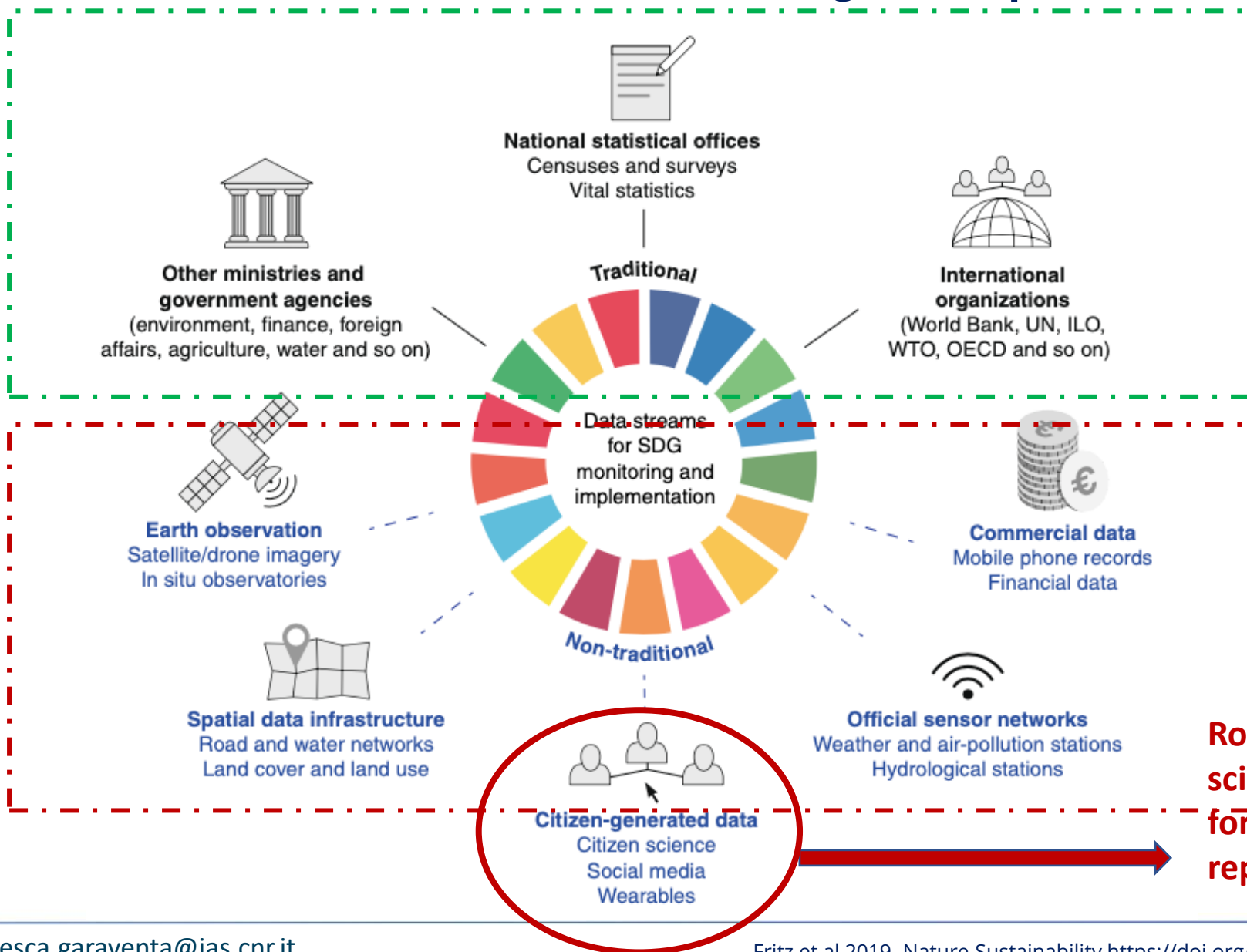


How was the data collected?





Traditional and non-traditional data sources available for SDG monitoring and implementation.



SUSTAINABLE DEVELOPMENT GOALS



Roadmap that outlines how citizen science can be integrated into the formal Sustainable Development Goals reporting mechanisms.





Citizen Science Projects on Plastic Pollution



2minutebeachclean
<https://beachclean.net/>
Monitors: Beach litter
Activity: Beach cleaning
Tools: App, beach clean boards
Outcome: Awareness raising, cleaner beaches!



Community Beach Clean (UK)
<https://www.sas.org.uk/our-work/beach-cleans/>
Monitors: Beach macro-litter
Activity: Beach cleaning
Tools: Beach Clean Box
Outcome: Communities coming together to clean beaches



International Coastal Clean Up
<https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/>
Monitors: Beach litter
Activity: Beach cleaning on specified dates
Tools: "how-to" kit, CleanSwell app
Outcome: long-term global data on plastic to inform action

International Pellet Watch

International Pellet Watch
<http://www.pelletwatch.org/>
Monitors: Plastic resin pellets ("nurdles")
Activity: collecting nurdles and sending them to a lab for analysis
Tools:
Outcome: Global mapping of pellet pollution and better understanding of the persistent organic pollutants (POPs) associated with them



OSPAR Marine Litter Monitoring
<https://www.ospar.org/work-areas/eiha/marine-litter>
Monitors: Beach litter
Activity: Monitor all litter on 100m of beach, and all macro litter on 1km of beach 4 times a year
Tools: "How-to" guide and beach questionnaire
Outcome: Marine litter composition by type for North-East Atlantic

Marine LitterWatch

Marine Litter Watch (Europe)
<https://www.eea.europa.eu/themes/water/europes-seas-and-coasts/marine-litterwatch>
Monitors: Beach litter
Activity: Beach cleaning
Tools: App
Outcome: Contribute to a public database, support European policy making





Citizen Science Projects on Plastic Pollution



Marine LitterWatch

Marine Litter Watch (Europe)
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EU Single use Plastic Directive



12.6.2019 EN Official Journal of the European Union L 155/1

I
 (Legislative acts)
 DIRECTIVES

DIRECTIVE (EU) 2019/904 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
 of 5 June 2019
 on the reduction of the impact of certain plastic products on the environment
 (Text with EEA relevance)





MACRO → MICRO → nano Plastic

SOURCE-PRESENCE-DYNAMIC-DESTINY

THRESHOLD

Where? How long? How much?
What are they made of?
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WHAT'S THE BASELINE LEVEL OF
CONTAMINATION?



AWARNESS-OUTREACH-
TECHNOLOGICAL DEVELOPMENT

Are we a part of the problem?

What can we, industry and
Governments can do?





1 OUTDOOR sport

A COOL CREW



SEA KAYAKING



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2 Projects



BLU DI GENOVA

Scoprire, studiare e proteggere il mare della città



Discover, study and protect the City Sea

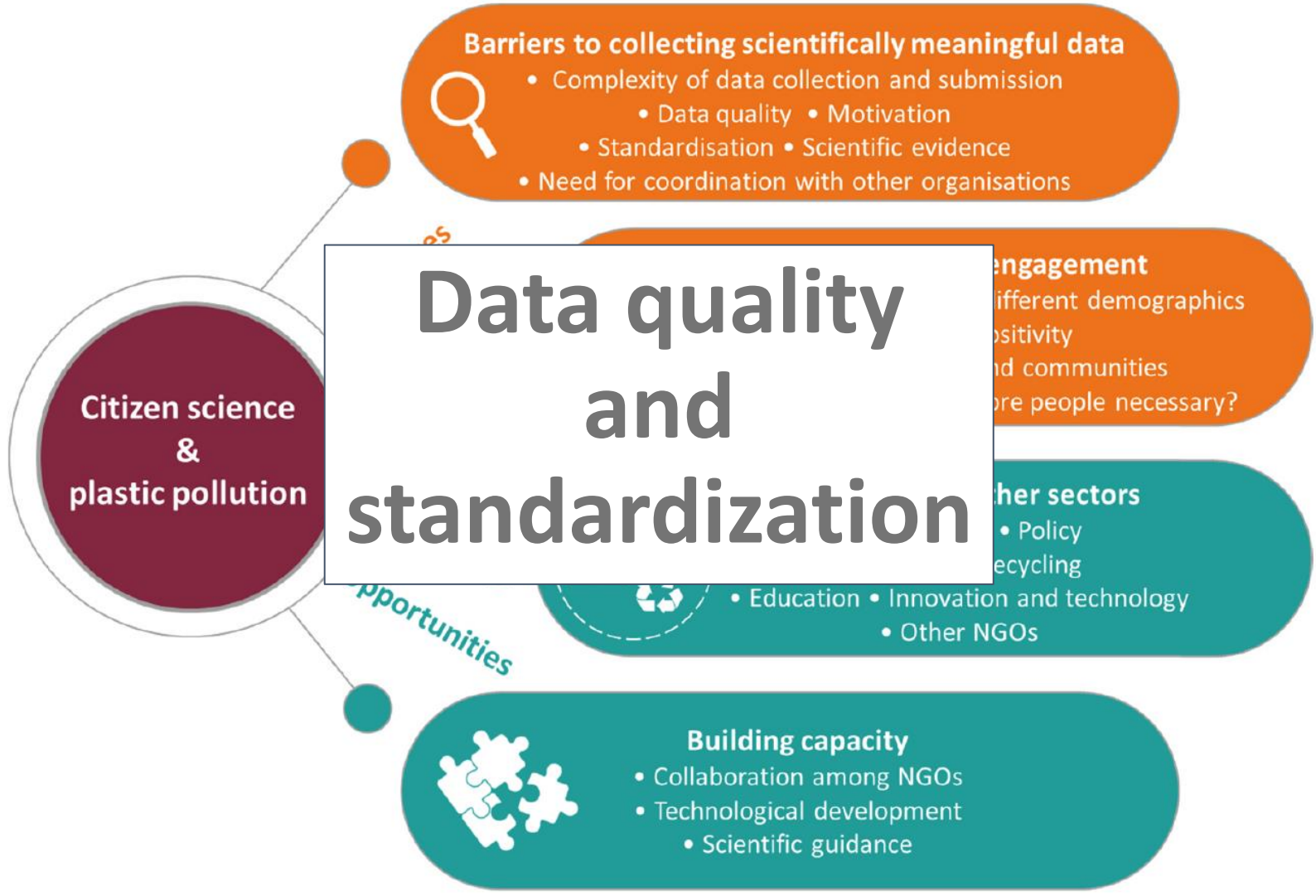


COMUNE DI GENOVA









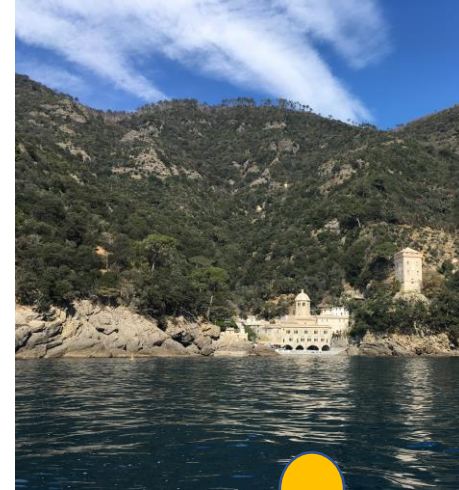
Nelms S.E. et al. 2022 Environmental Science and Policy 128: 14–23



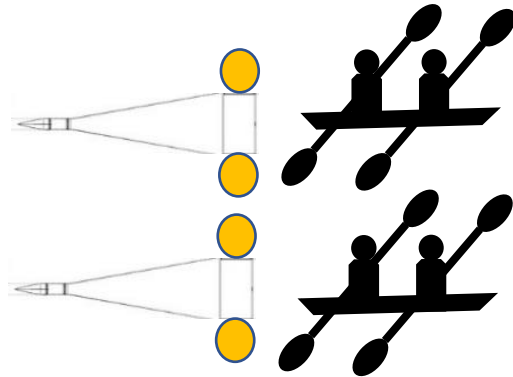
Method validation



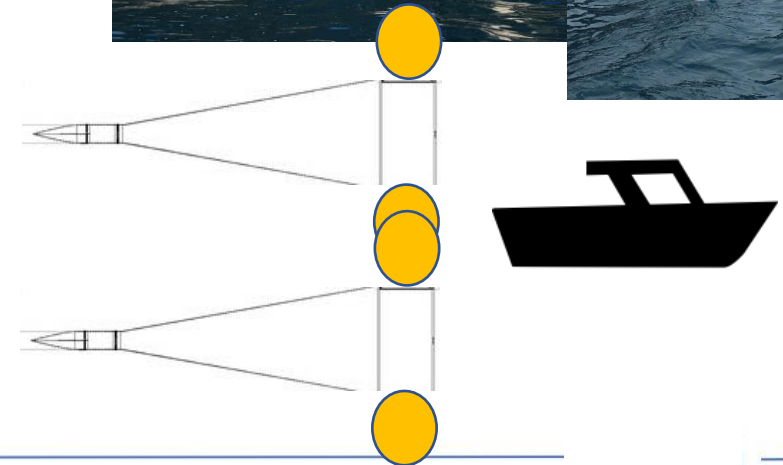
PORTOFINO MPA



GENOA CITY - ROCKY SHORES

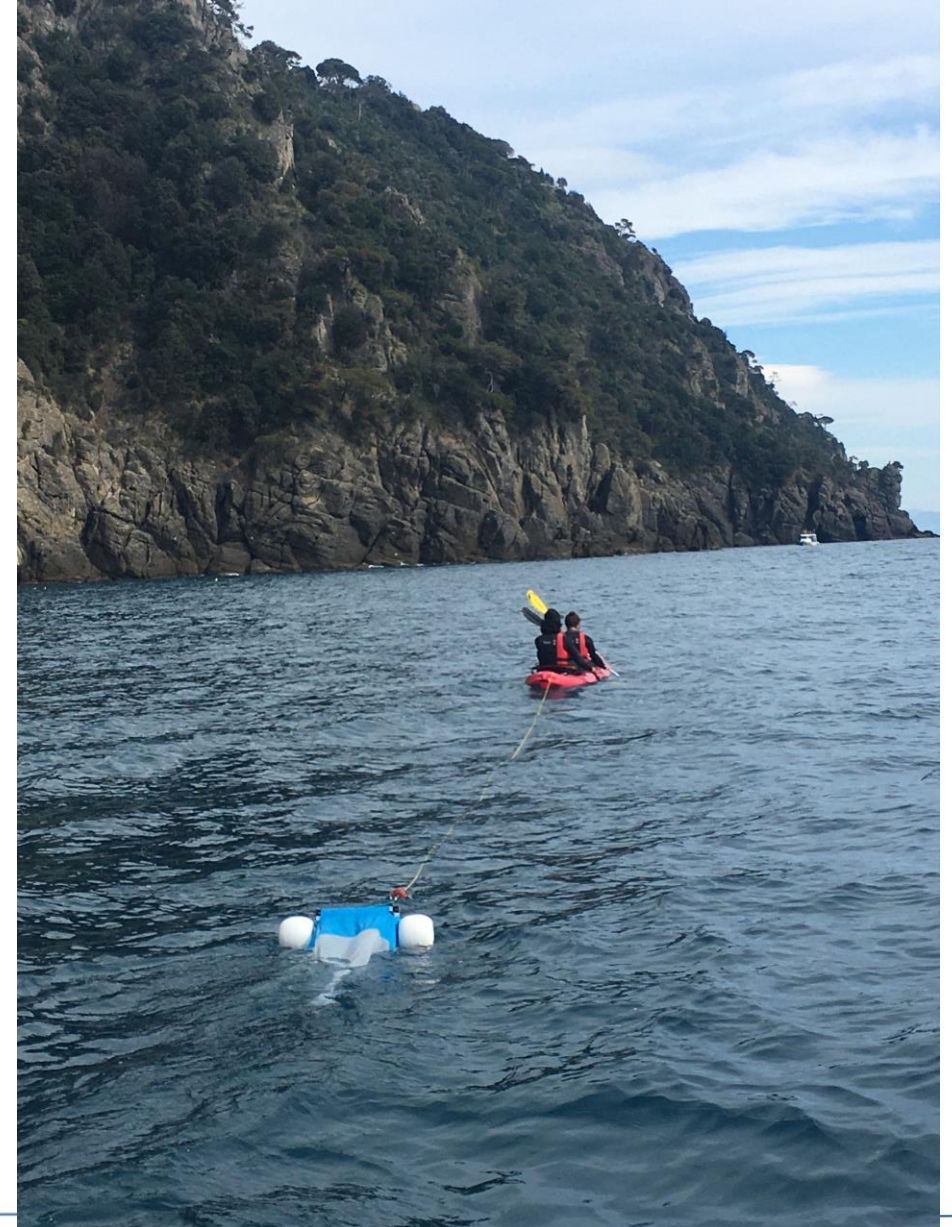


Vs





VS.



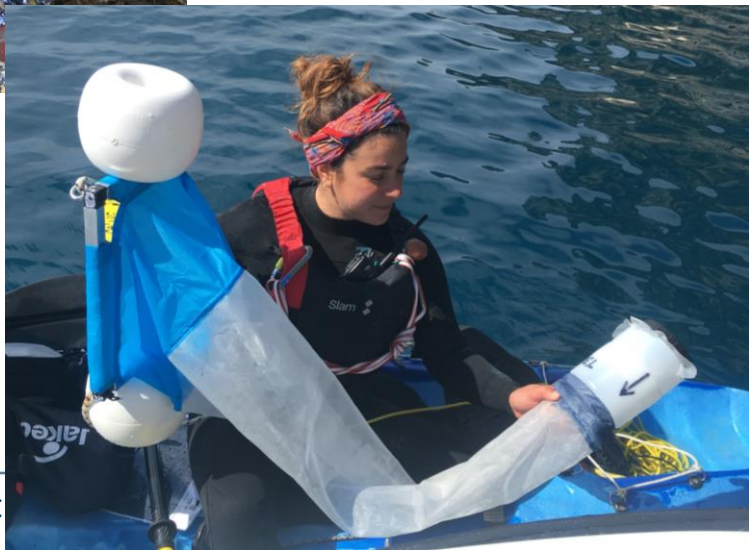
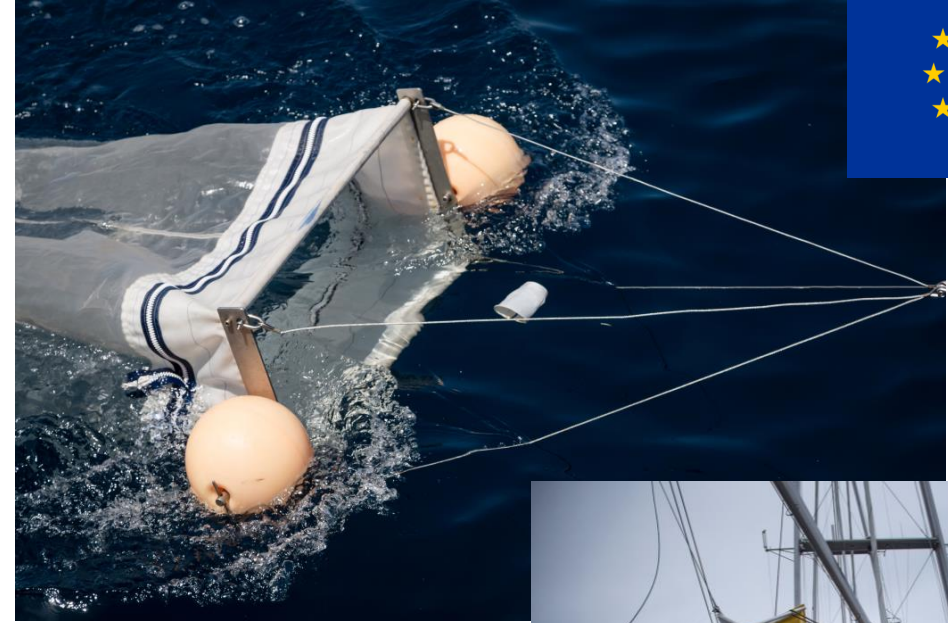


MINIMANTA

VS.

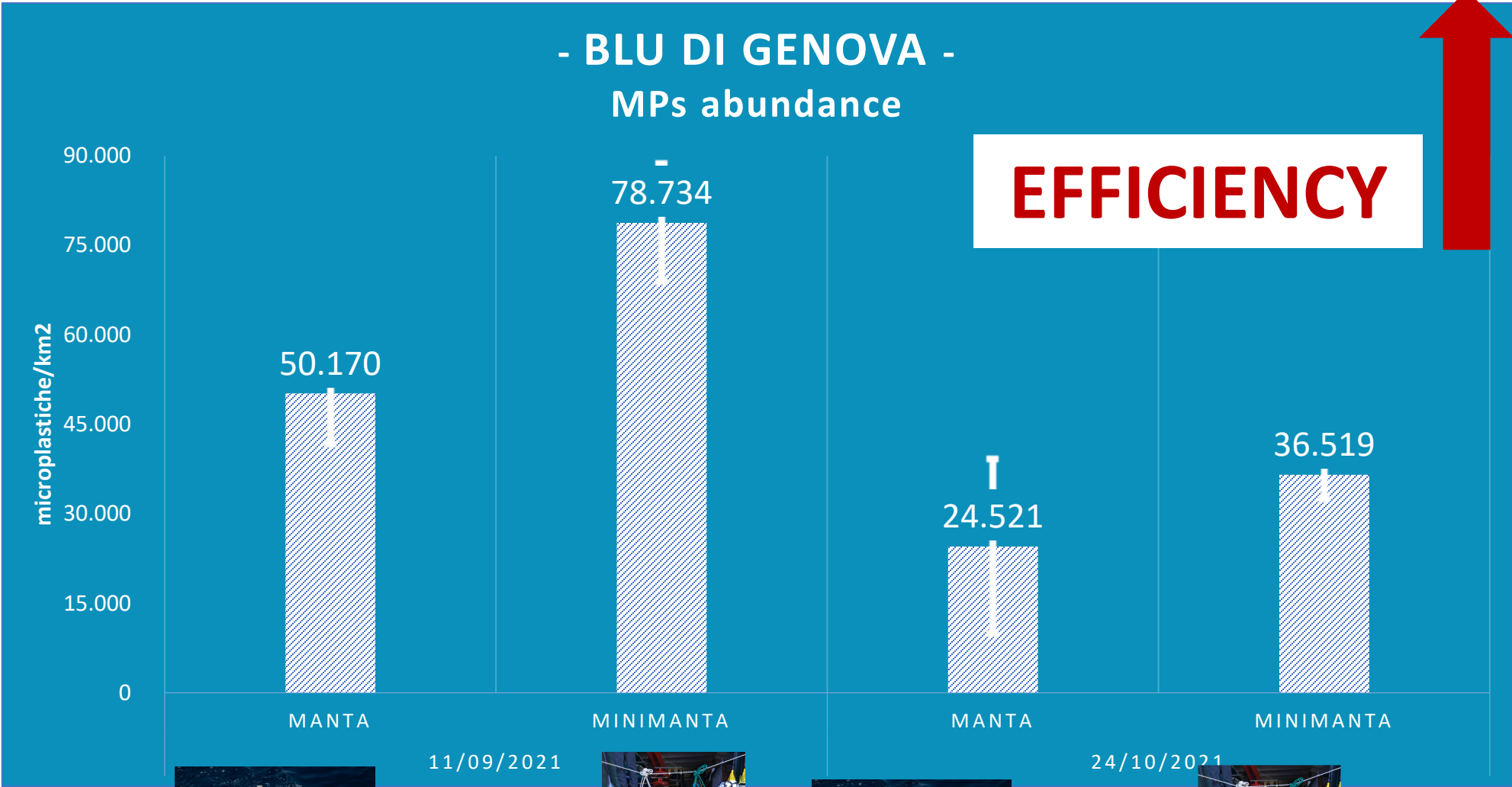
MANTA

MSFD





Results: how many are there?



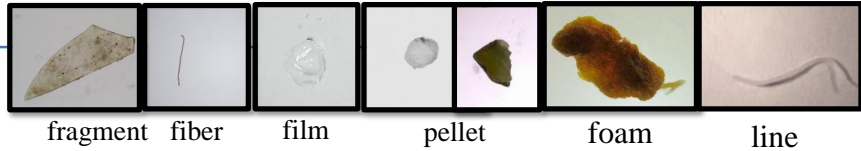
11/09/2021



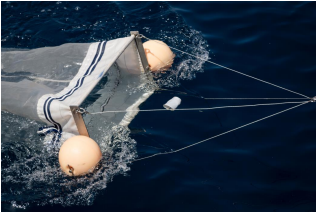
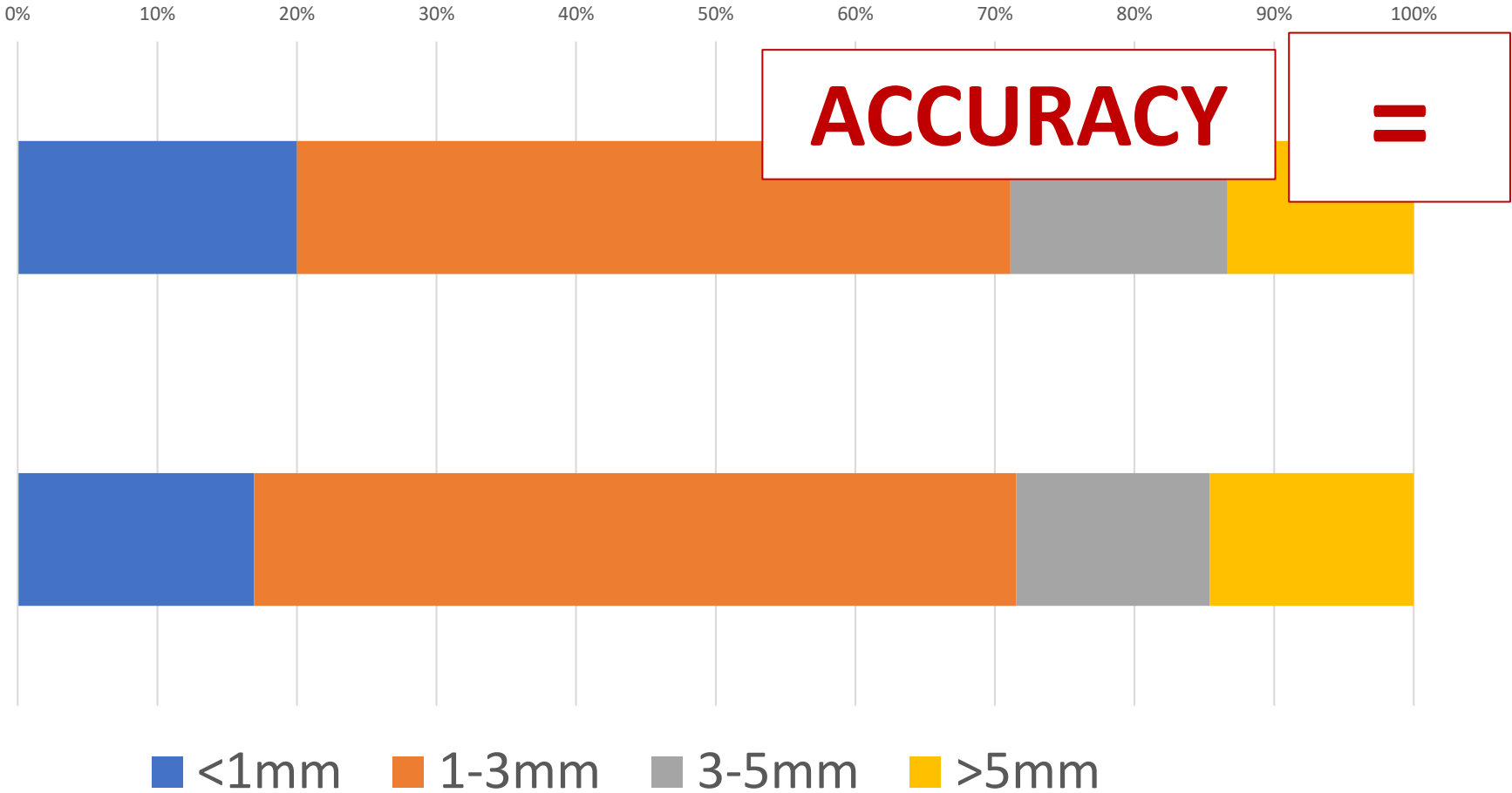
24/10/2021



Results: what's the size?



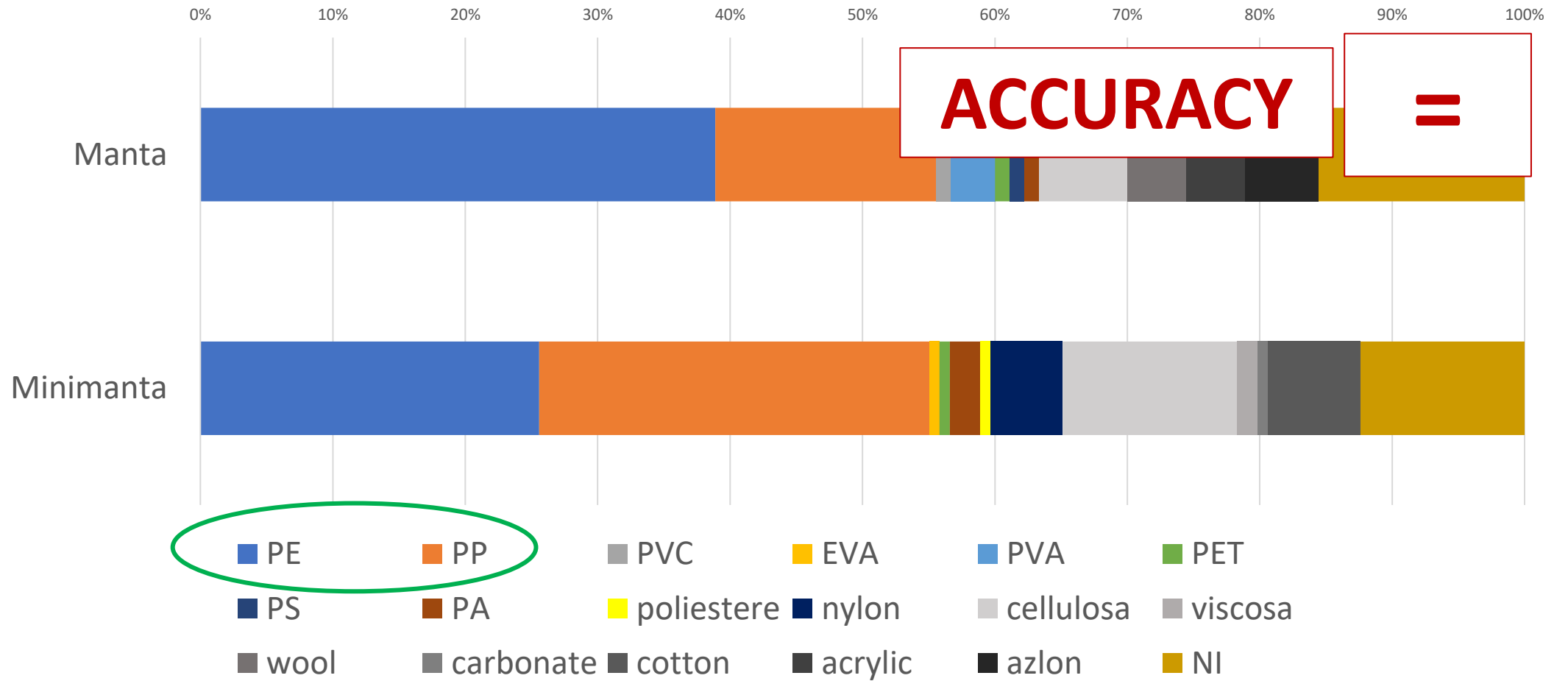
- BLU DI GENOVA -
Diminisional classes distribution



Results: what are they made of?



- BLU DI GENOVA -
Polymer type





MINIMANTA

VS.

MANTA

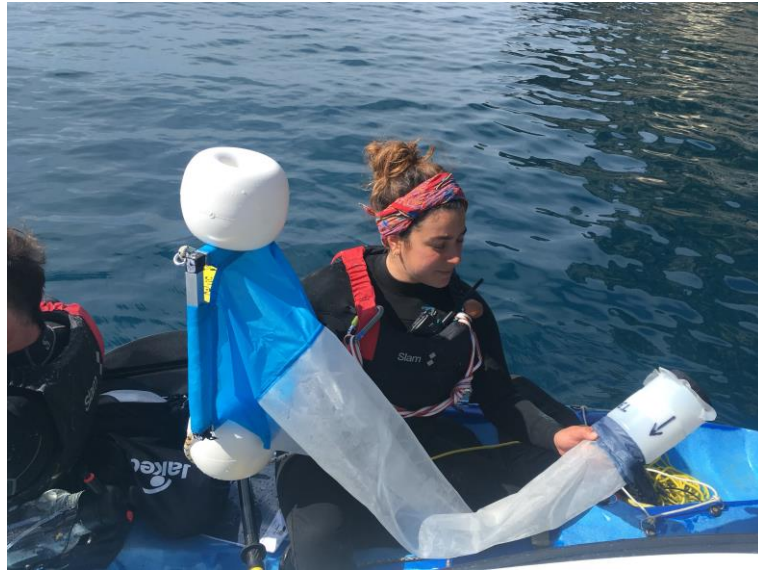




Citizen scientist

VS.

Scientist



Se adeguatamente addestrati e invitati a svolgere compiti ben definiti, la qualità dei dati registrati dai cittadini scienziati può essere paragonabile ai dati raccolti da scienziati qualificati





Dedicated non-profit organizations

Public CSs

Successful CS projects require collaboration between multiple stakeholders

Local governments

Experienced volunteer coordinators



COMUNE DI GENOVA

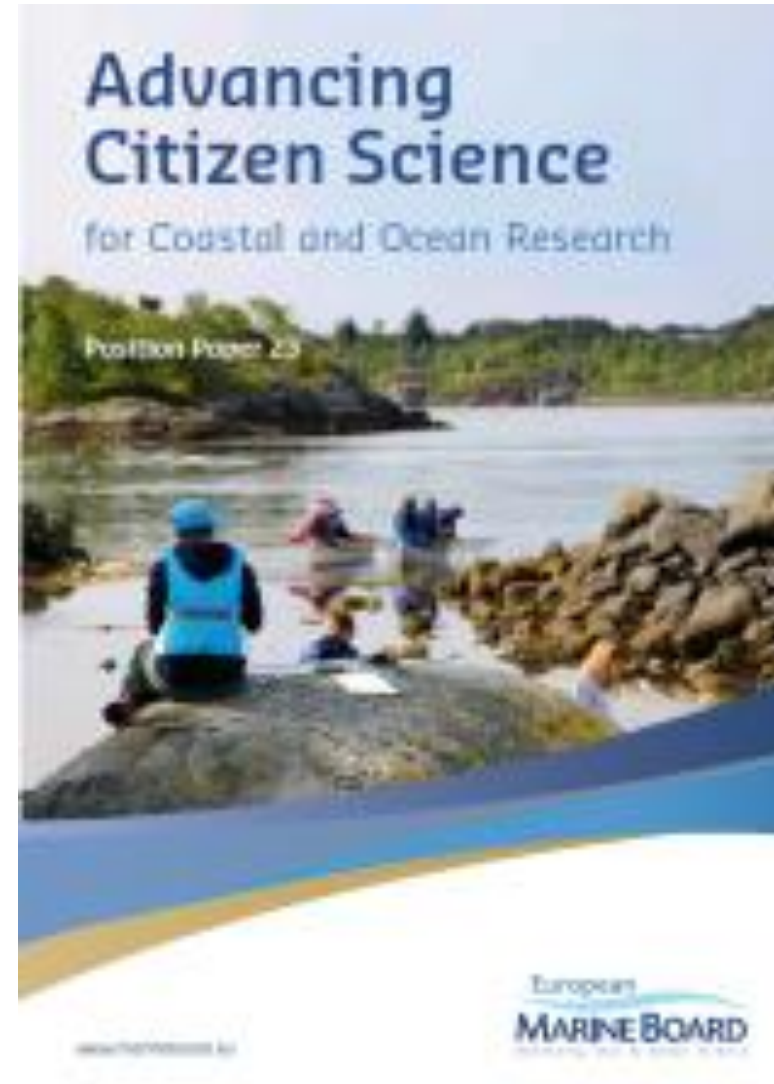


Professional research scientists





**Position paper - mira a
fornire nuove idee e
indicazioni per stimolare
l'ulteriore avanzamento
della Marine Citizen
Science**



Garcia-Soto et al 2017. Advancing Citizen Science for Coastal and Ocean Research. DOI:10.31230/osf.io/kreh3

francesca.garaventa@ias.cnr.it





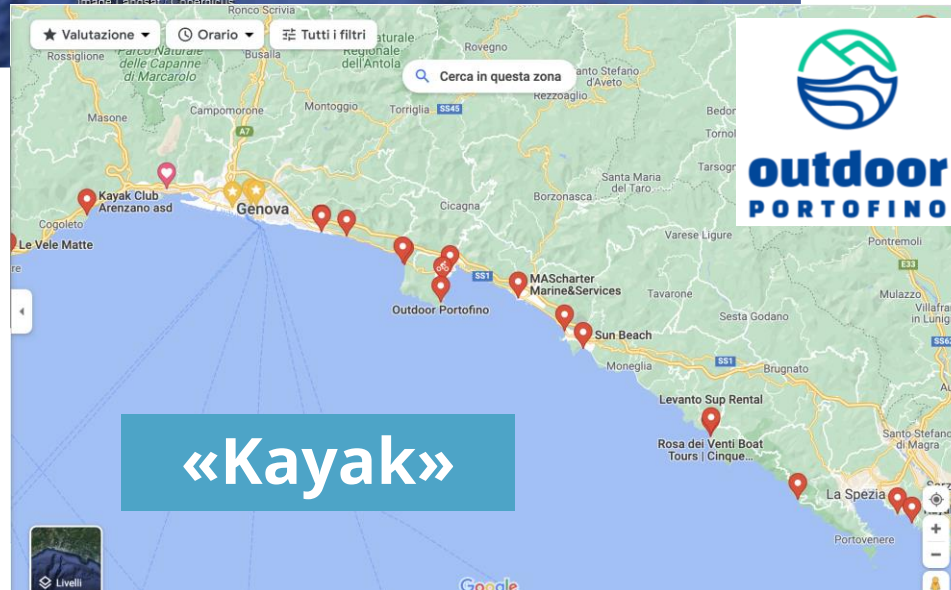
La vastità degli ambienti costieri e oceanici implica che gli scienziati impiegherebbero diverse vite per studiarli da soli. Collaborando con i cittadini, è possibile:

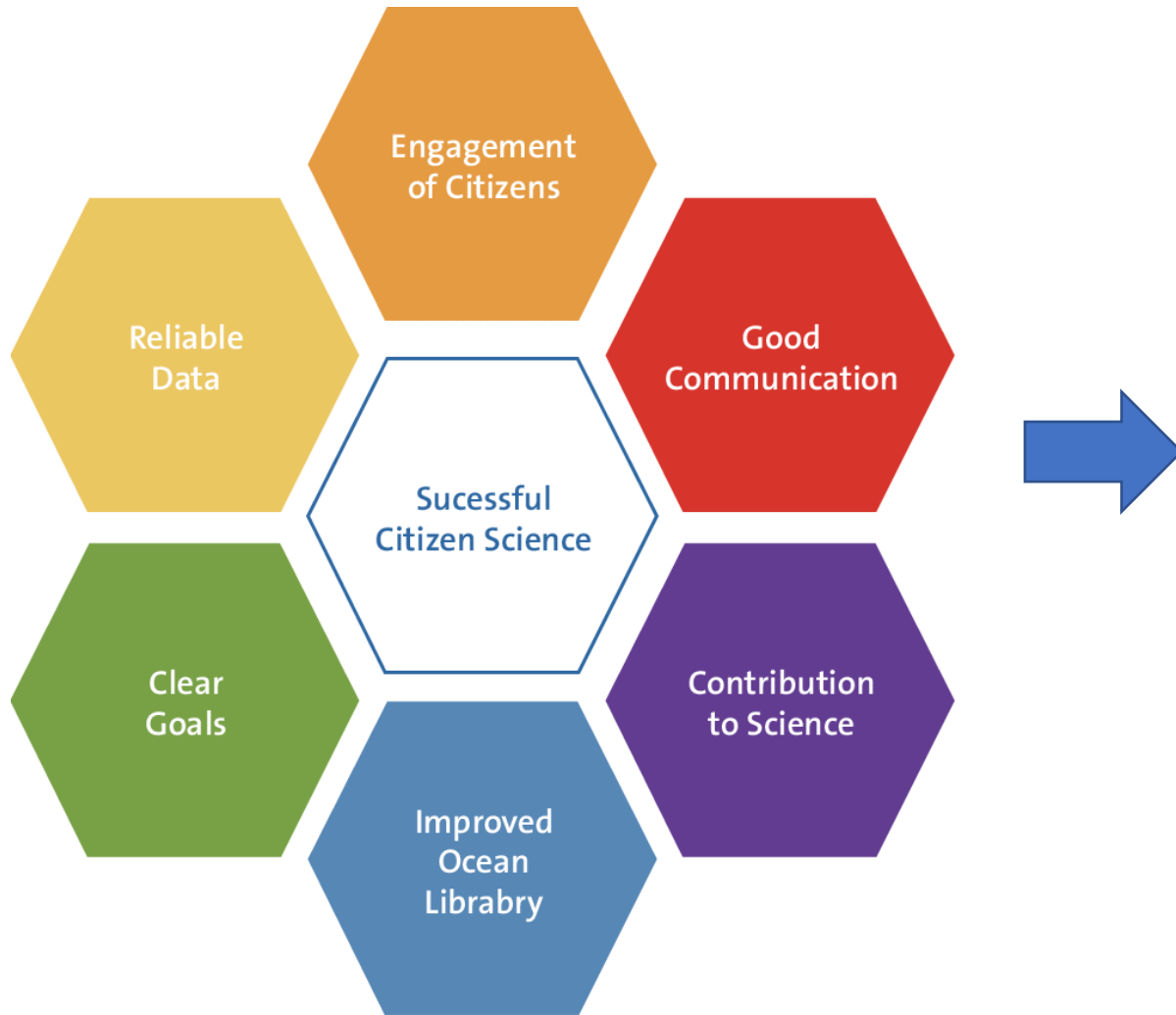
- abbattere le barriere tra scienziati e cittadini in un'era post-verità;
- dare ai cittadini la possibilità di partecipare all'elaborazione della politica marittima;
- utilizzare la scienza dei cittadini come strumento per la marine Ocean Literacy;
- mobilitare un gran numero di persone per raccogliere dati e sviluppare nuove conoscenze scientifiche e consapevolezza;
- acquisire una comprensione delle questioni marine su scale spaziali e temporali molto più ampie;
- rendere l'oceano più rilevante per la società





What's next?





Migliora la qualità della ricerca, rendendola più rilevante per la società e offrendo vantaggi significativi per coloro che vi partecipano.





Strategic action areas for progressing Marine Citizen Science in Europe



Per realizzare appieno il potenziale di Marine Citizen Science in Europa sarà necessaria un'azione concertata da parte delle organizzazioni di ricerca e dei responsabili della ricerca, non solo delle scienze marine, ma anche di diversi settori, tra cui l'informatica, il diritto e l'economia.

Garcia-Soto et al 2017. Advancing Citizen Science for Coastal and Ocean Research. DOI:10.31230/osf.io/kreh3





Festival della Scienza





Grazie per l'attenzione

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