Legacy Plastics

2025 SDG Youth Summer Camp
25.08.20 @ GGGI

ReDi

Contacts:
@responsibledivers
www.responsibledivers.org
responsibledivers@gmail.com

Mermaids Hate Plastic (2016) By Von Wong

ReDi

“We cannot protect something we do not love;

we cannot love what we do not know, and we cannot know what we do not see. Or hear. Or sense.”

- Richard Louv -

Combating Marine Debris

2

ReDi
Responsible Divers

Diving Communities

- Promoting safe & effective Cleanup activities
- Empowering Green diving leaders
- Promoting Eco-Voluntourism

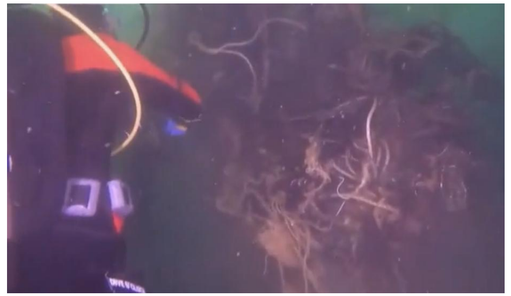
Civil Society

- Solidarity
- Monitoring & suggesting policies

General Public

- Marine Envi. Education
- Raising Awareness

ReDi



SCUBA Diving

Freediving

Coastal

Riverine

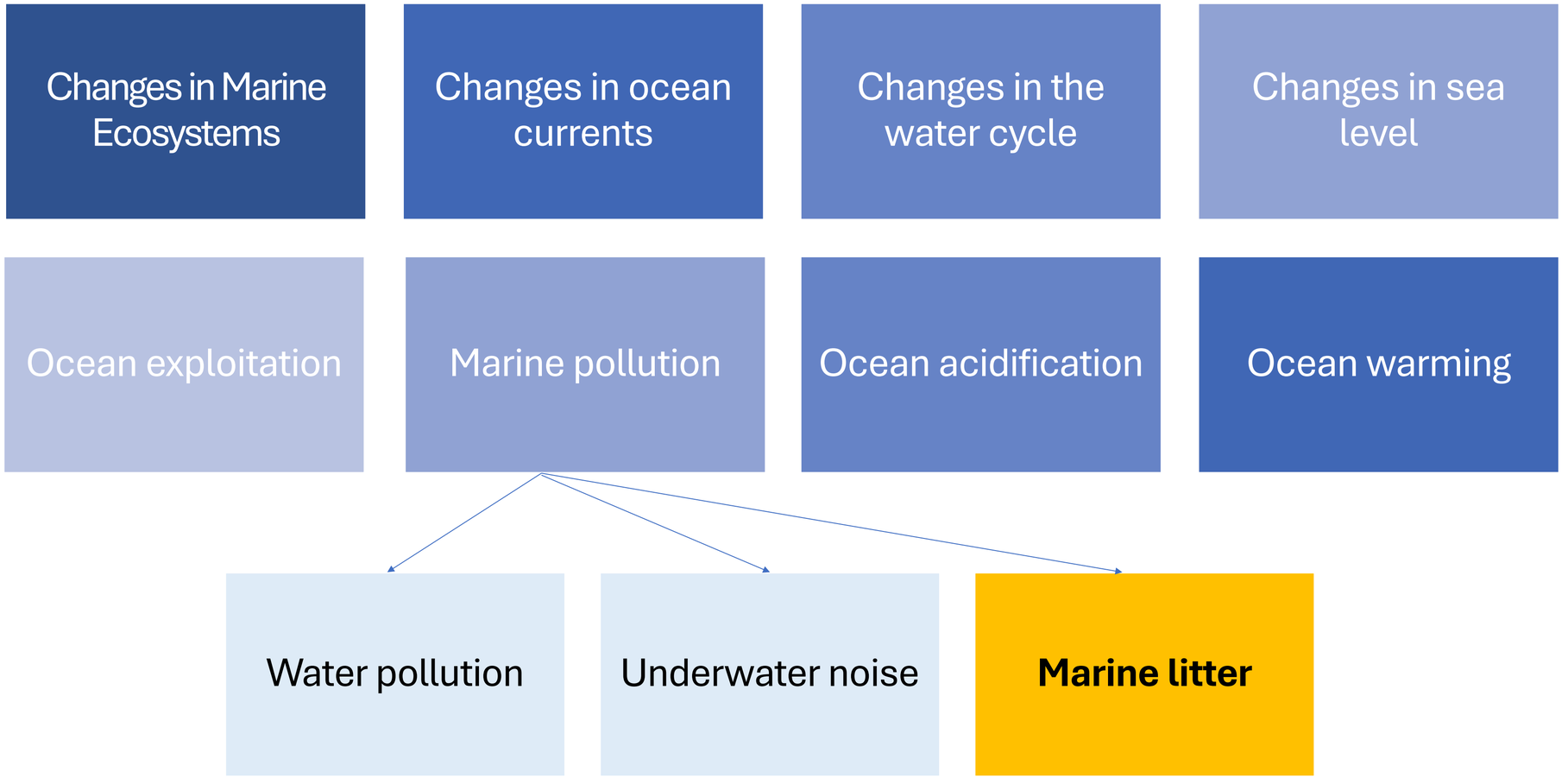
Our cleanup activities go beyond mere cleanups, aiming also
to (1) expand cleanup efforts, (2) raise public awareness, and (3) gather citizen science data.

Table of Contents

1. Marine Debris

Turn off the plastic tap (2021) By Von Wong

Ocean Sustainability Crisis – Pressing issues

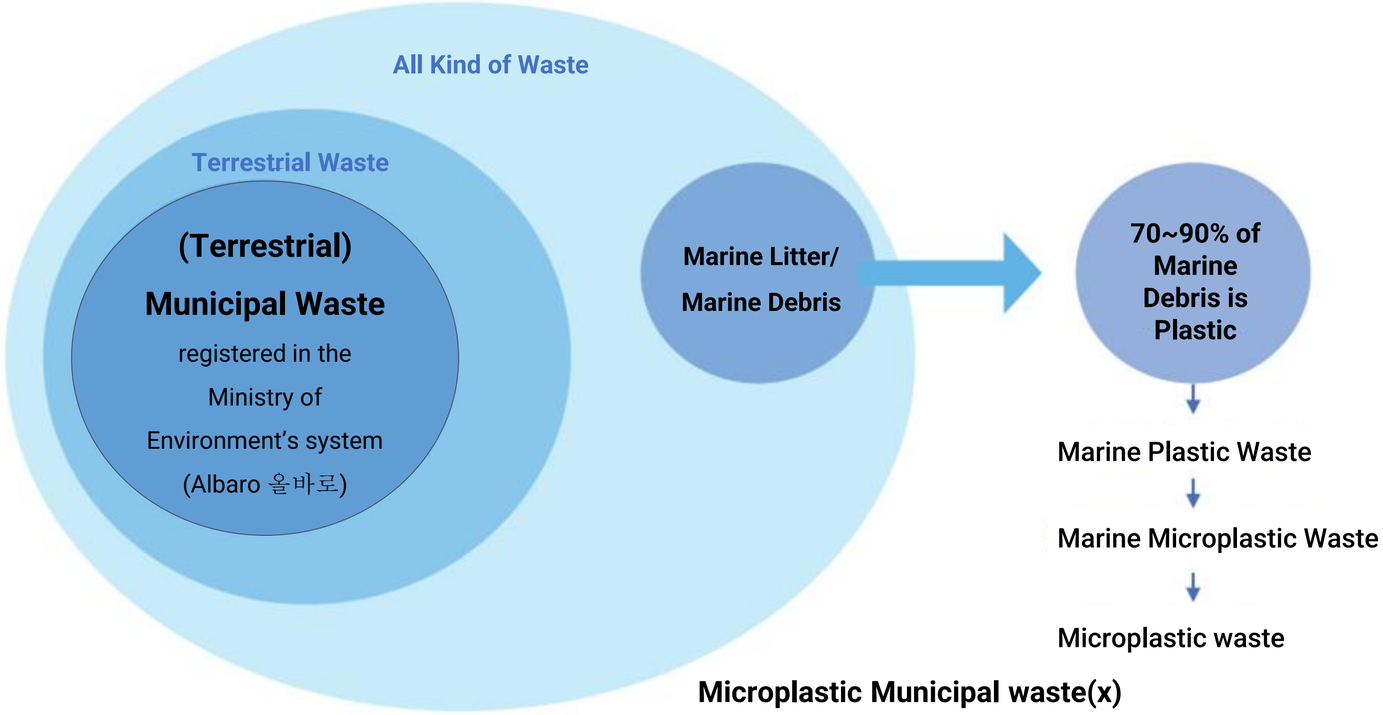


(2018) WORKSHOP ON SDGS IN CARIBBEAN. (n.d .) .https://www.gstss.org/2018_Ocean_SDGs/index.php?file=WS_Report&print=YES&blurb=NO&extent=LONG

1. Marine Debris

Marine Debris is any persistent, manufactured or processed solid material discarded into the sea or rivers or on beaches (UNEP, 2009)

In Korean law, only 'waste' is defined, and litter is not applicable.



Source : OSEAN

*Microplastics are blurring the boundaries between solids and liquids

1. Marine Debris

Classification of marine Litter 1.

Classification by Distribution

Coastal debris
litter in the beach

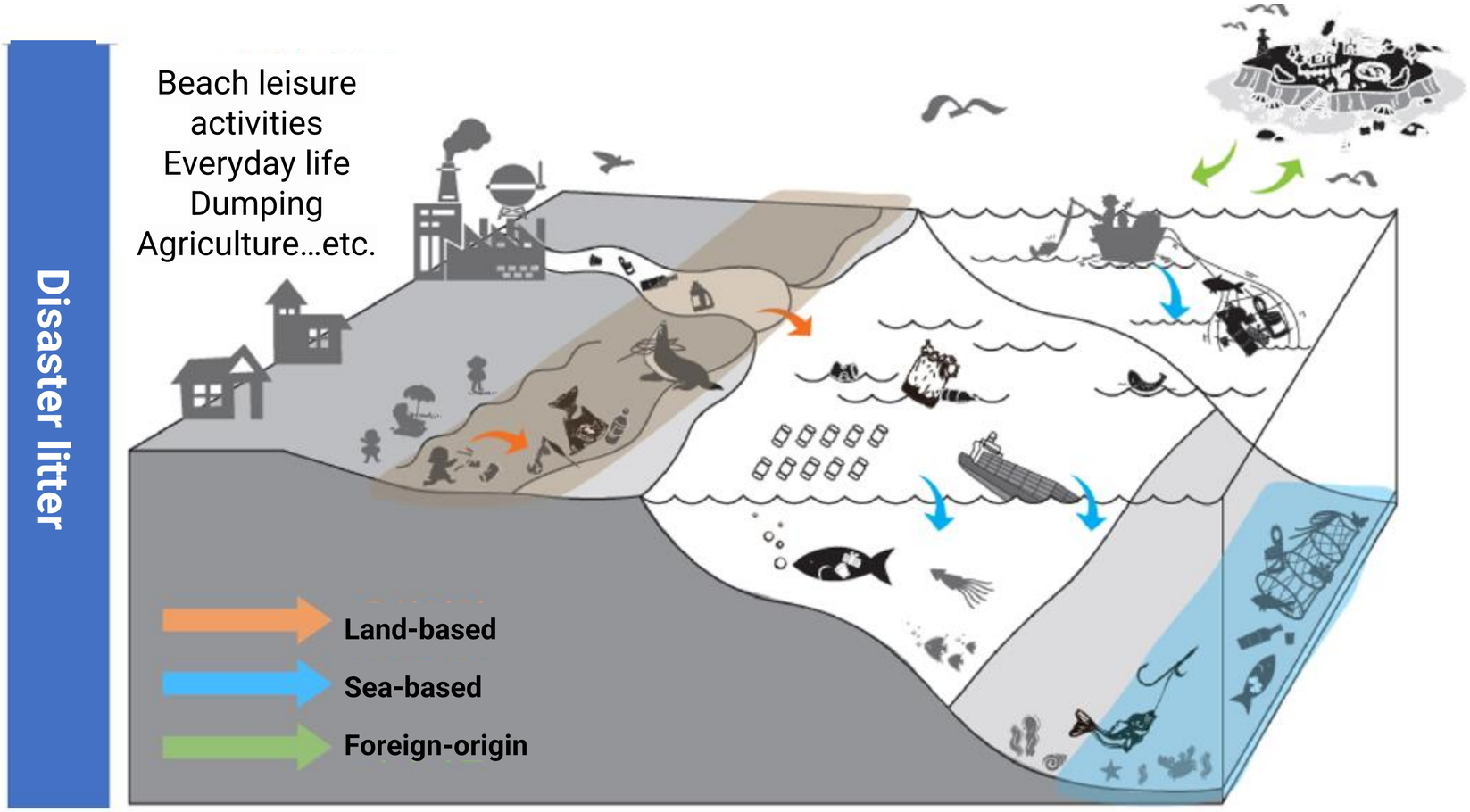
Sunken Marine debris
litter sank to the bottom of the sea

Marine Floating debris
litter on the surface of the sea or in the sea level

1. Marine Debris

Classification of marine Litter 2.

Classification by Source



Everyone is contributing

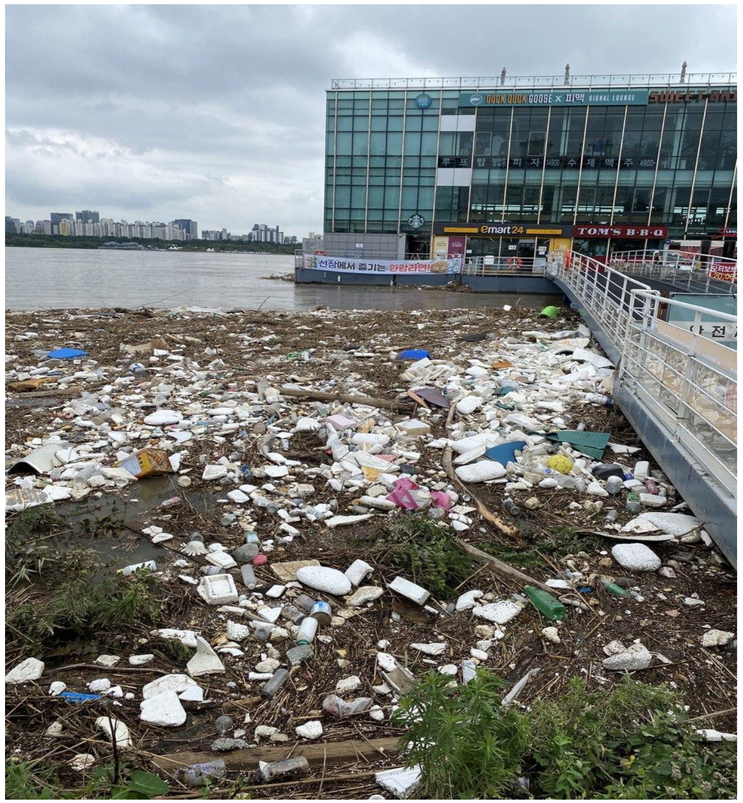
MOF• KIMST• KIOST (2013), Hong et al. (2014)

1. Marine Debris

Classification of marine Litter 2. – classification by source

Daily life vs. disaster debris

Mangwon Han River Park after the Seoul Flood



Source: Photographed by Hwang Sang-cheol
Re-Di instructor (2023.7.18)

2012.7.23 Lantau Island pellet spill in Hong Kong

Source :Plastic Free Seas

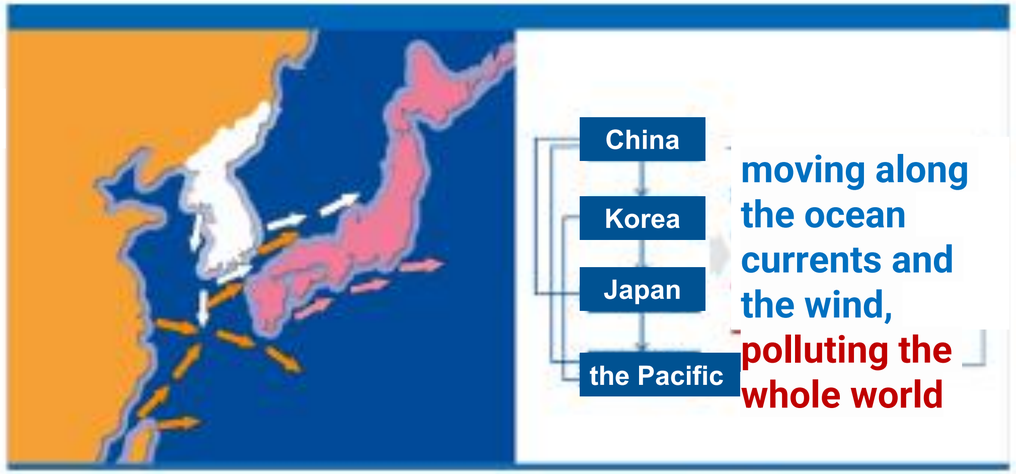
1. Marine Debris

Classification of marine Litter 2. – classification by source

Neighboring countries

경기신문

Incheon Baekyangdo Beach, a national ecotourism site covered with marine debris from China



The JoongAng 사회

Gochujang containers, pesticide containers... "Hangul" trash on the coast of Japan

KBS NEWS

Korean garbage also accumulates on the 'North Pacific Garbage Island'

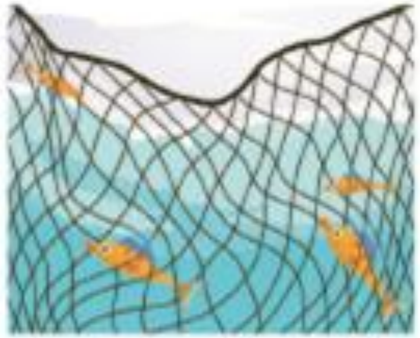
Surfrider Project Aims to Reduce Plastic Pollution, Protect Hawaiian Monk Seals

1. Marine Debris

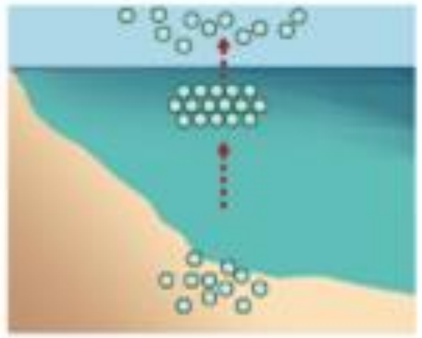
Impact and Damage of Marine litter

The amount of marine litter in Korea accounts for only 0.76% of the total land litter
But the damage caused by this is huge

Harm to marine life and ecosystems

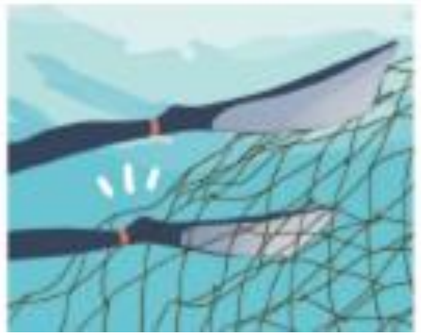


Economic Losses to the fishing industry



Reduced ocean carbon sequestration capacity

Risks to maritime safety

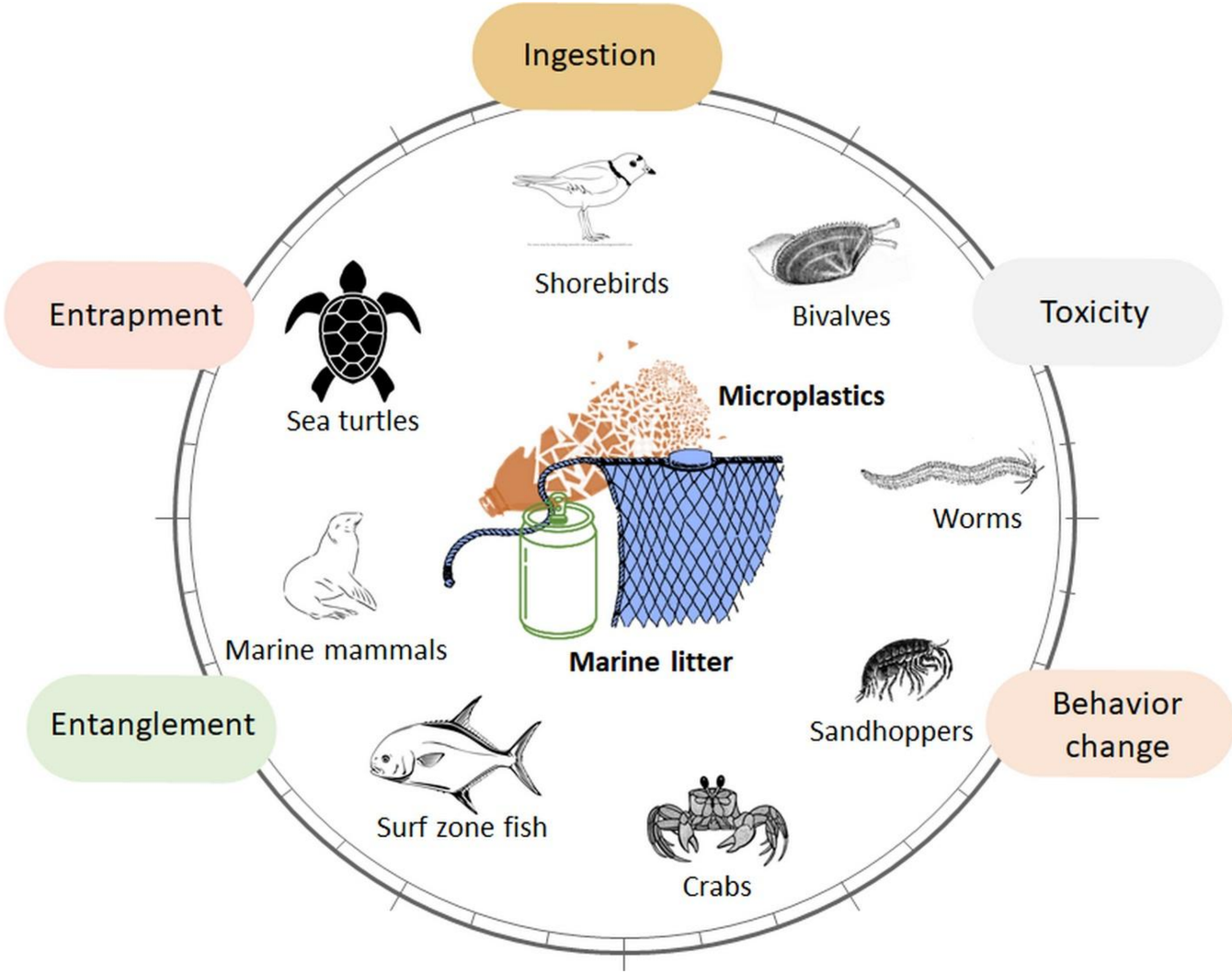


Risks to diver safety

Aesthetic degradation and losses to tourism

1. Marine Debris

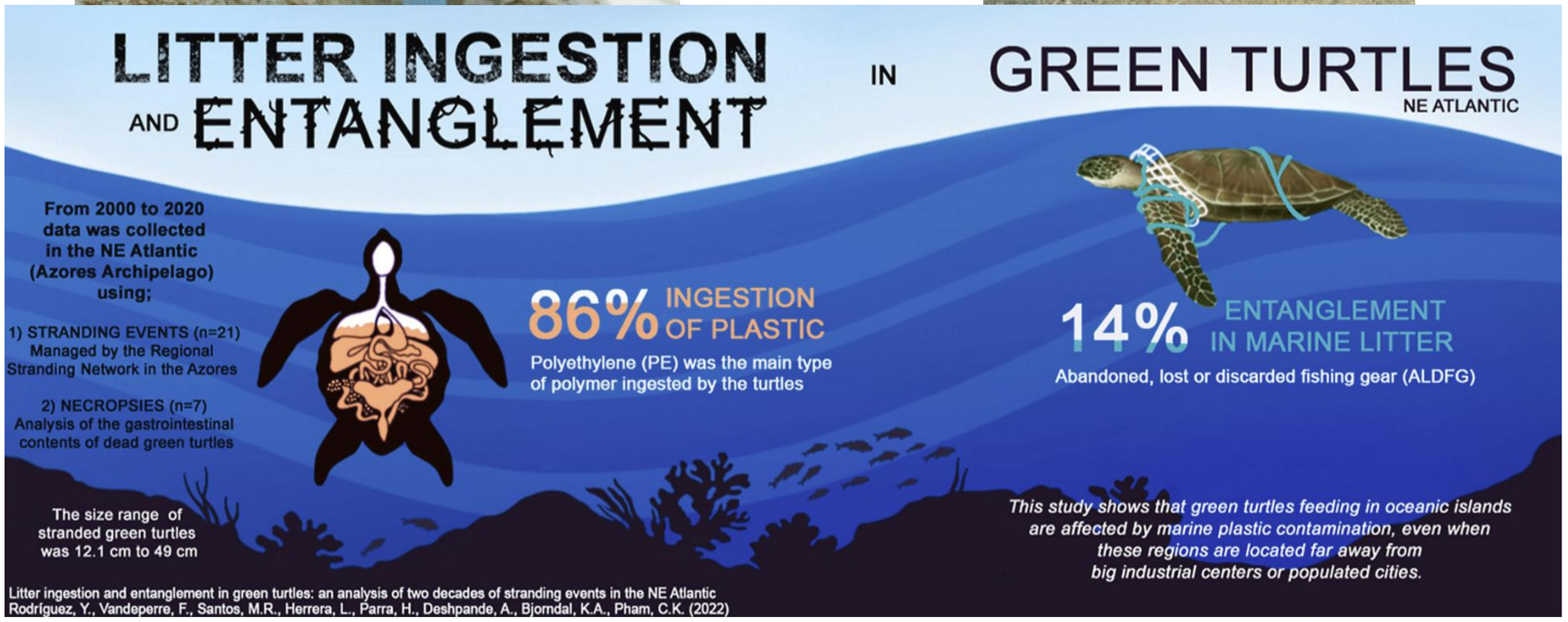
Impact and Damage of Marine litter – Marine Species



Source: Costa, L.L.; Fanini, L.; Ben-Haddad, M.; Pinna, M.; Zalmon, I.R. Marine Litter Impact on Sandy Beach Fauna: A Review to Obtain an Indication of Where Research Should Contribute More. *Microplastics* **2022**, *1*, 554-571. https://doi.org/10.3390/microplastics1030039

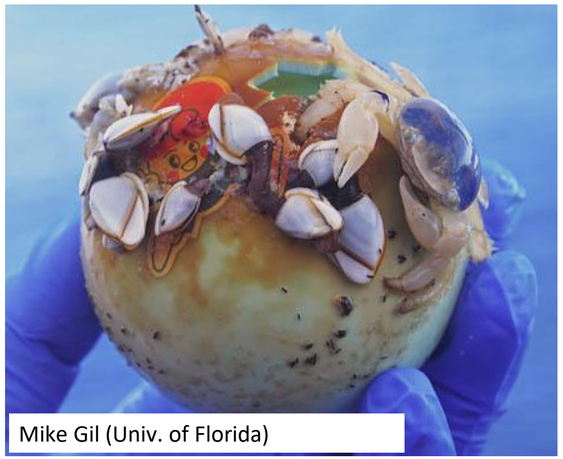
1. Marine Debris

Impact and Damage of Marine litter – Marine Species



1. Marine Debris

Impact and Damage of Marine litter – Marine ecosystems



Raft for non-indigenous species

Pathogenic vector

Blocking oxygen, nutrient flow and light

Damages to Benthic environment

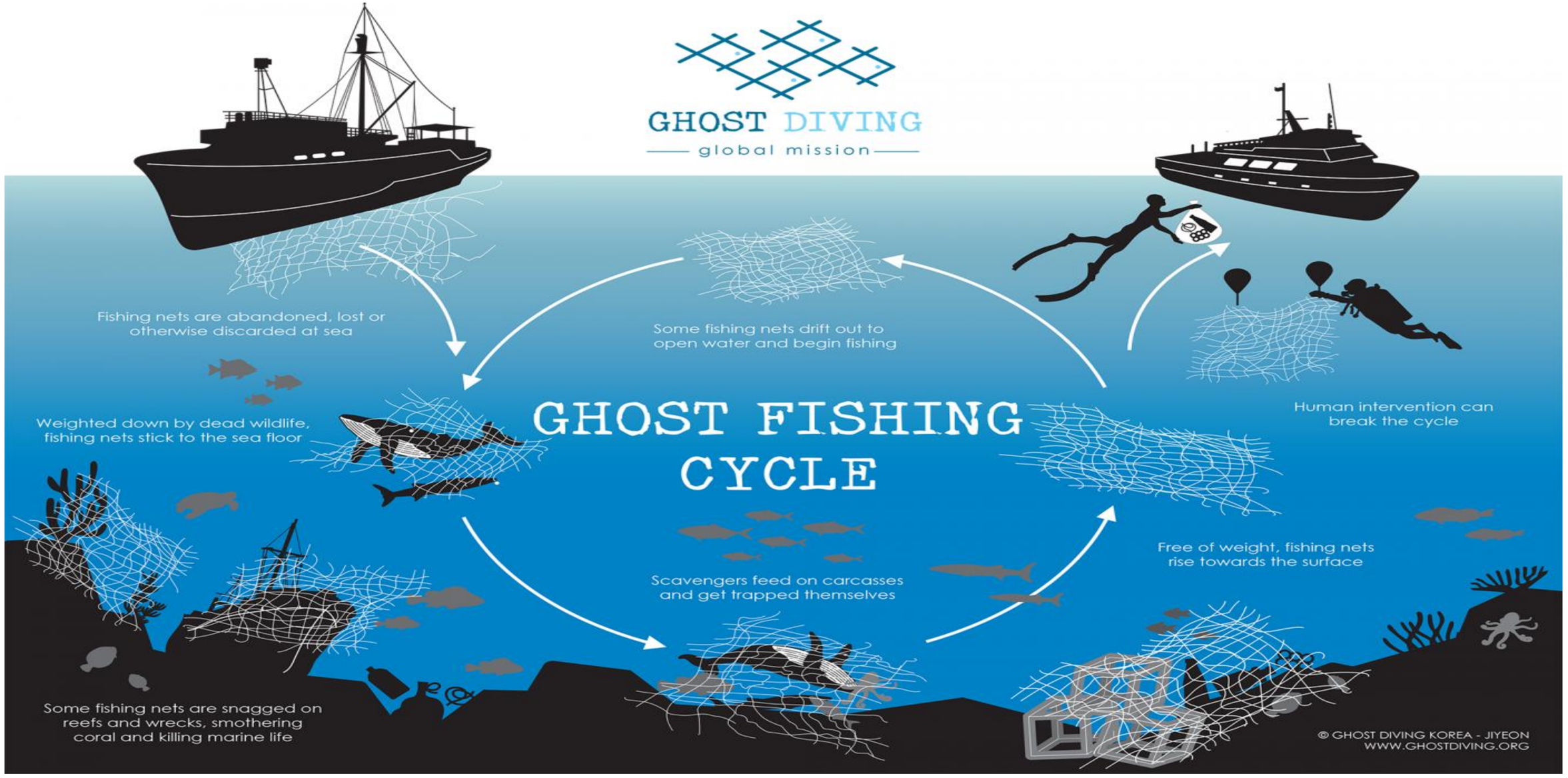
Damages to coral reefs

Leaching and sorbing toxic chemicals

Source: UNEP(2021) Drowning in Plastics p.33, (Edited by ReDi)

1. Marine Debris

Impact and Damage of Marine litter – Ghost fishing



2. Marine PLASTICS

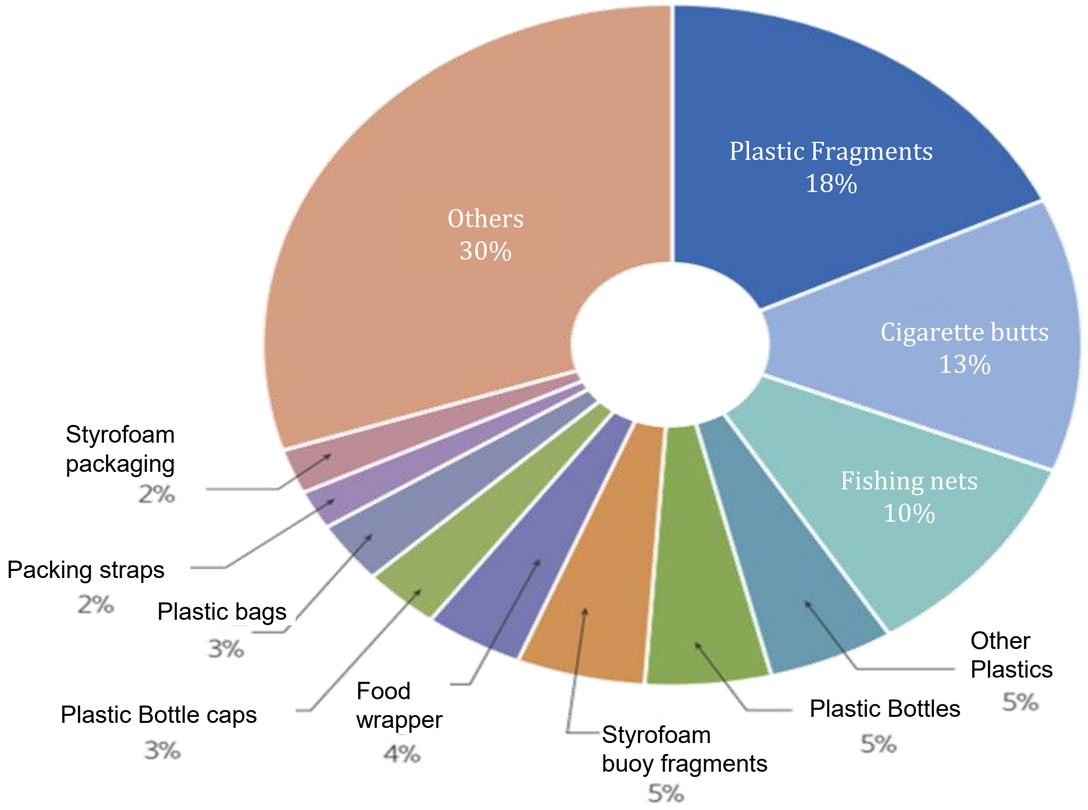
Turn off the plastic tap (2021) By Von Wong

2. Marine PLASTICS

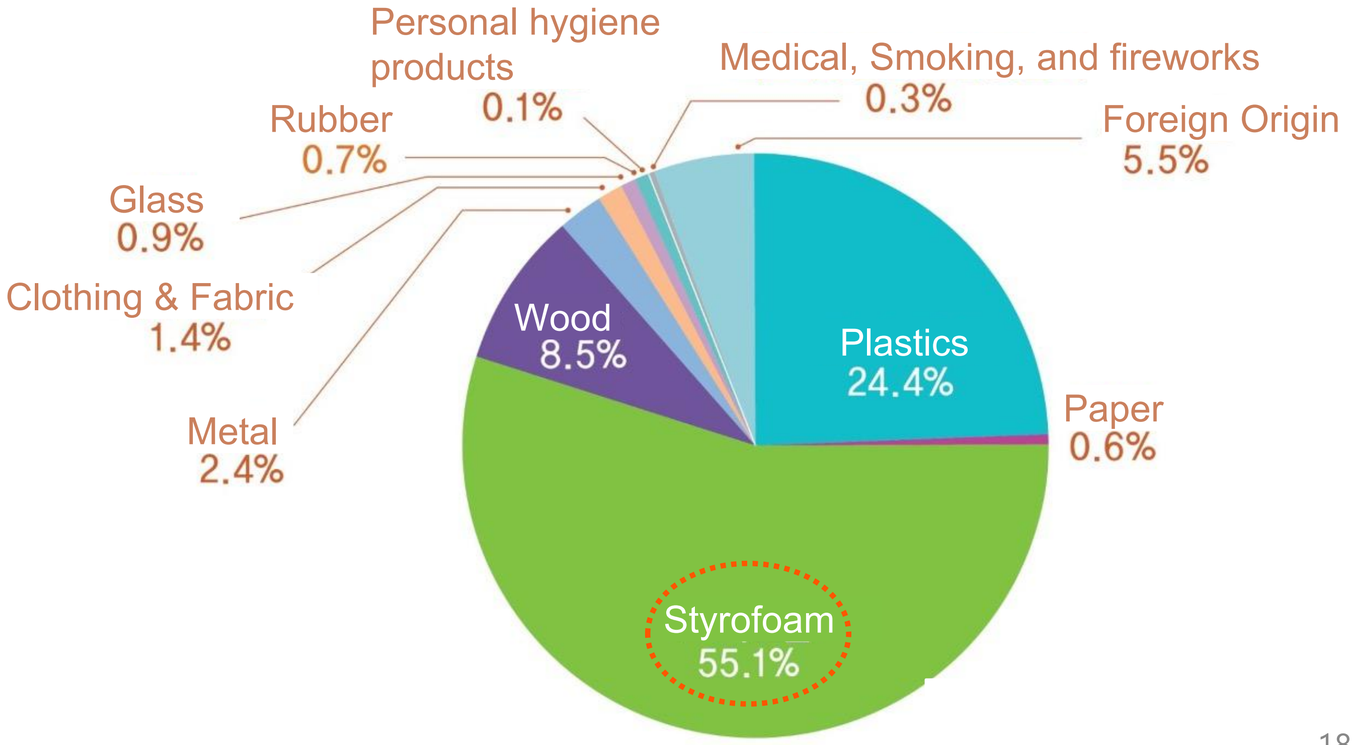
"Plastic debris is currently the most abundant type of litter in the ocean, making up *80% of all marine debris* found from surface waters to deep-sea sediments."

- IUCN (Nov 2023) Marine Plastic Pollution, Issues Brief

Composition of marine debris from Korean National Coastal Beach Litter Monitoring, *by count* (2022)



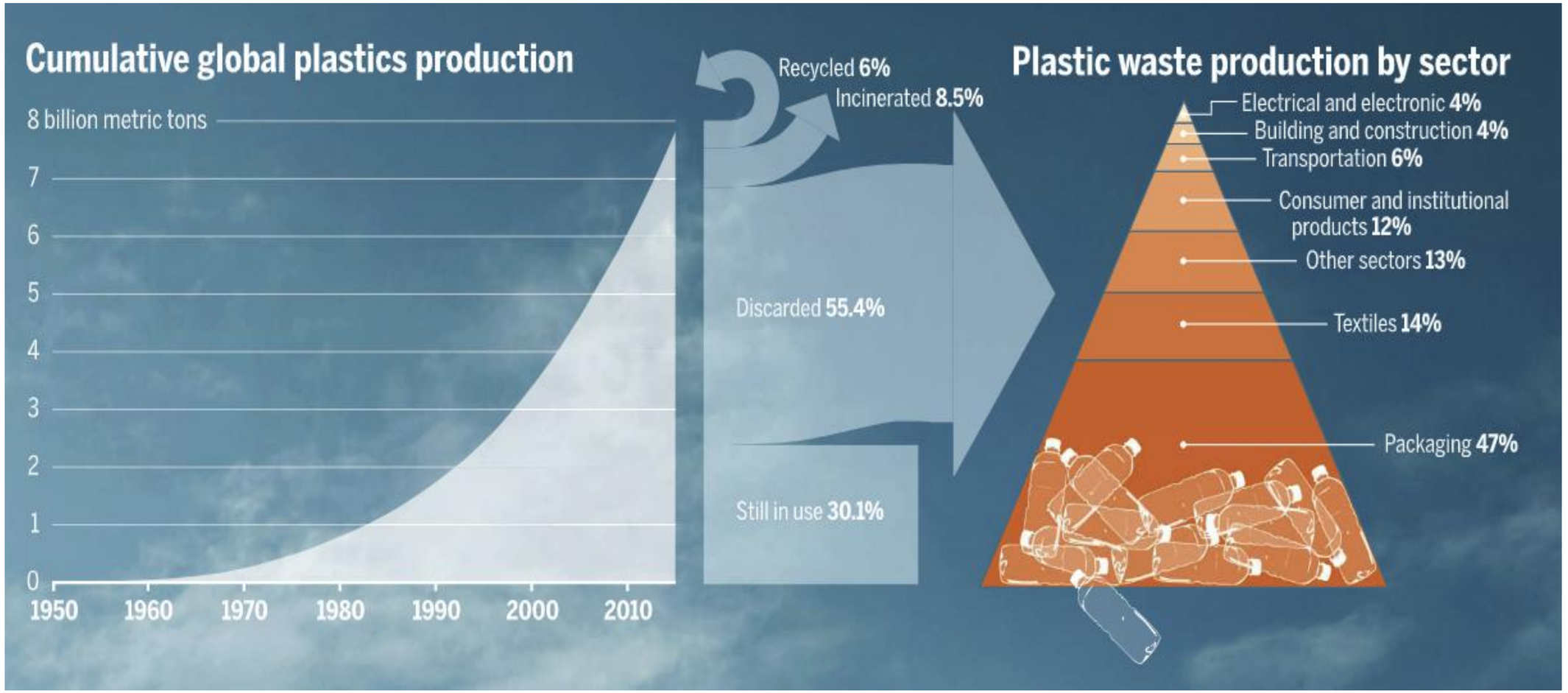
Composition of marine debris from Korean National Coastal Beach Litter Monitoring, *by volume* (2015)



Source: OSEAN (2023)

2. Marine PLASTICS

An estimated 79% of all plastic waste ever produced continues to persist somewhere on Earth. Annually, 3% of plastic debris ends up in our oceans. Including rivers and lakes, 11% of plastics are dumped into the aquatic environment, estimated to be up to 23M tons in 2016.



Source: Our Plastic Dilemma, Science Vol 373, issue 6550, 2 Jul 2021

1. Marine Debris

Global Marine Litter Generation

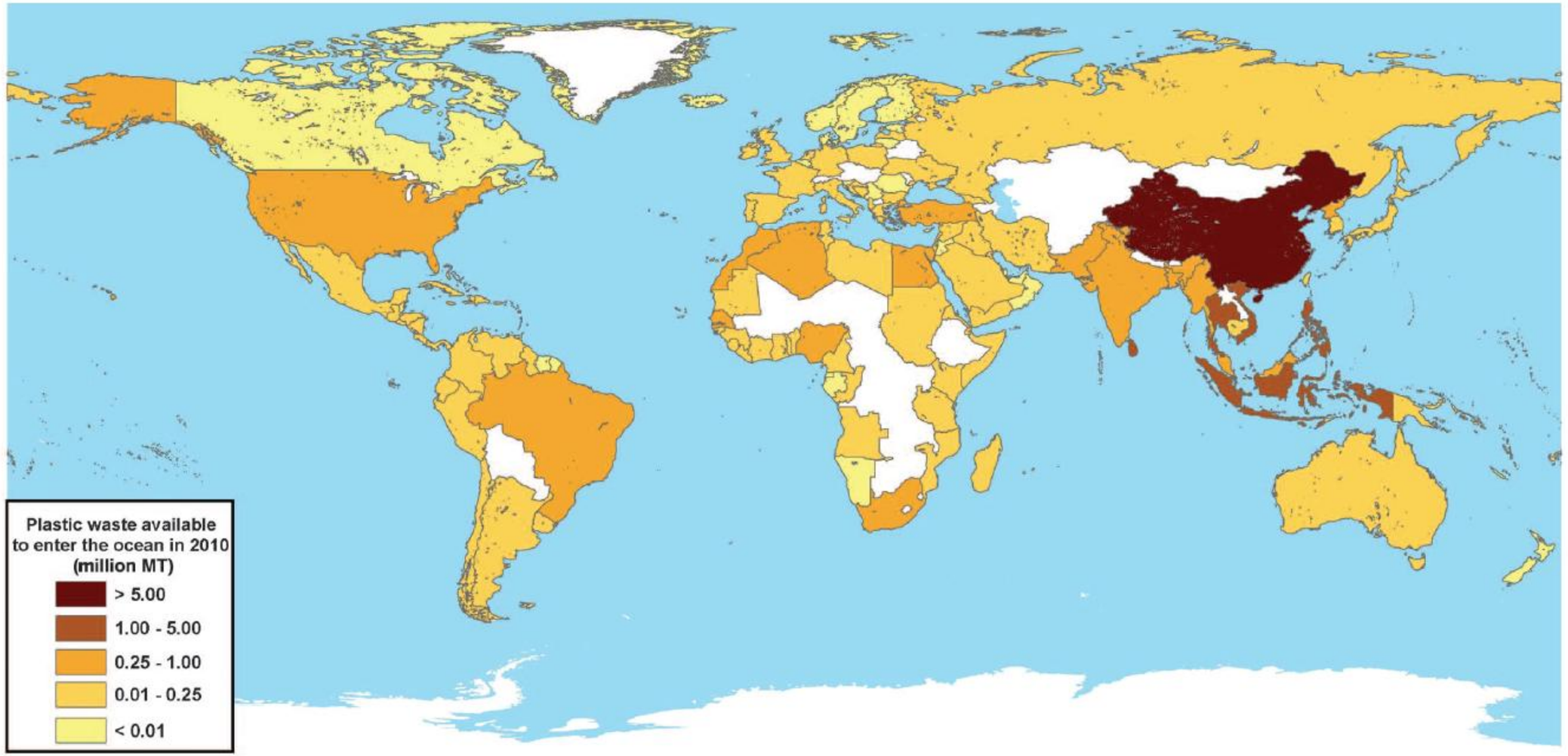
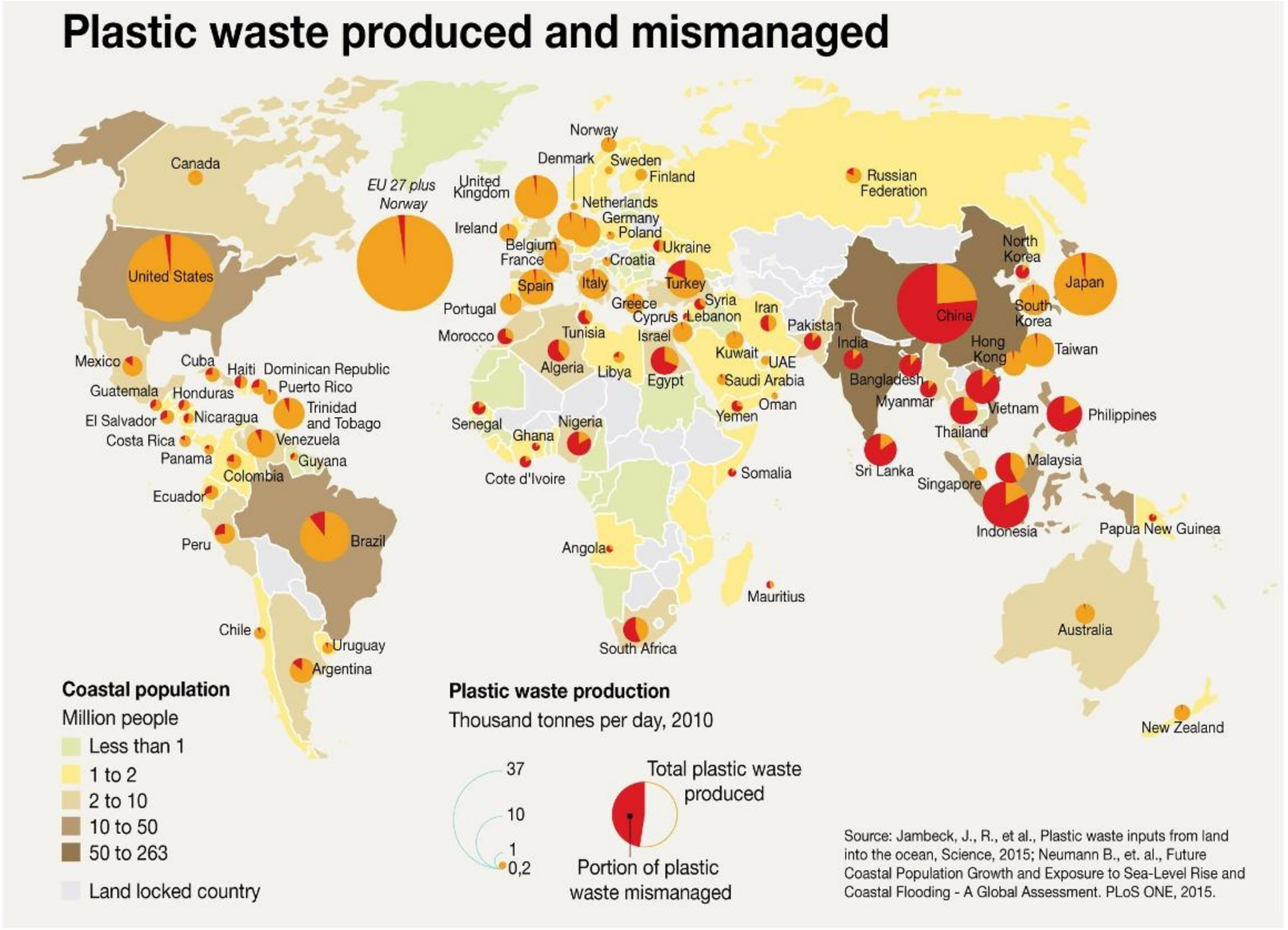


Fig. 1. Global map with each country shaded according to the estimated mass of mismanaged plastic waste [millions of metric tons (MT)] generated in 2010 by populations living within 50 km of the coast. We considered 192 countries. Countries not included in the study are shaded white.

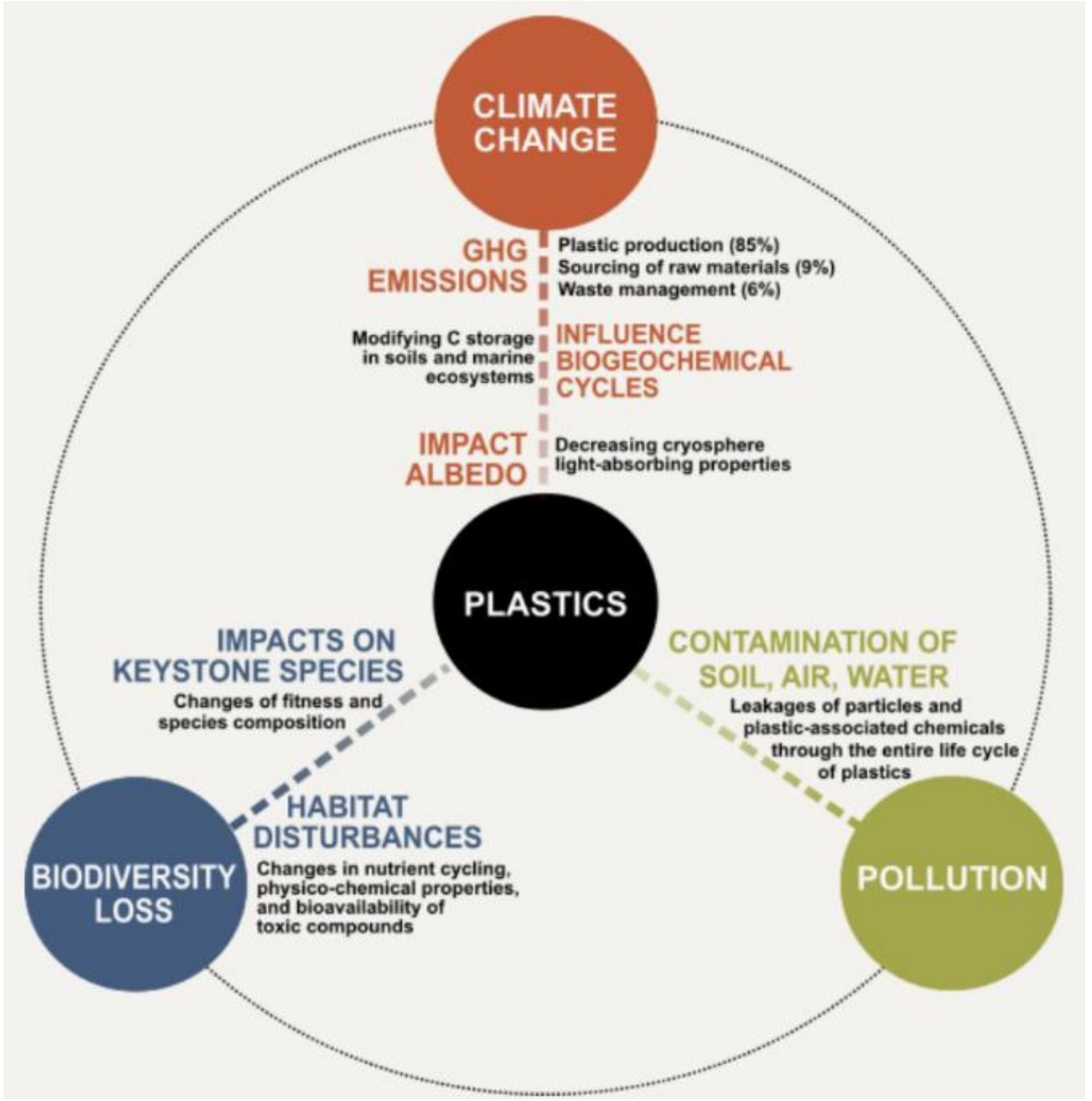
2. Marine PLASTICS

Global Marine Litter Generation



2. Marine PLASTICS

Plastics finds its place at the center of the Triple Planetary Crisis



Source: Scientists' Coalition for an Effective Plastics Treaty (2024), Plastics and the Triple Planetary Crisis, DOI:10.5281/zenodo.10880588

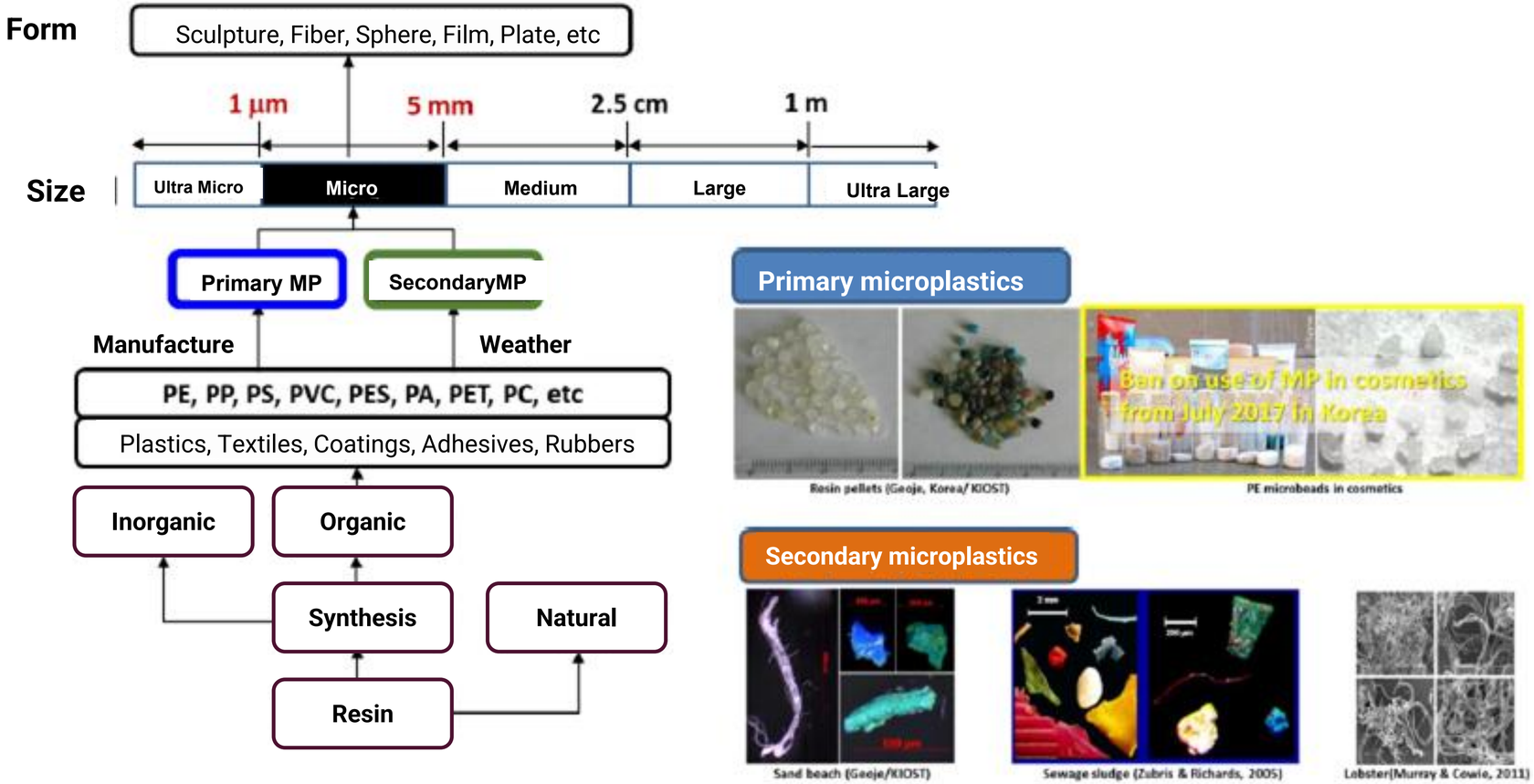
3. Microplastics

Turn off the plastic tap (2021) By Von Wong

3. Microplastics

Classification of Microplastics

a solid synthetic polymer compound with a size of 5 mm or less that is manufactured, or existing products are fragmented or fine



Shim et al. (2018) *Marine Microplastics: Abundance, Distribution and Composition*
In: Microplastic Contamination in Aquatic Environments, Elsevier

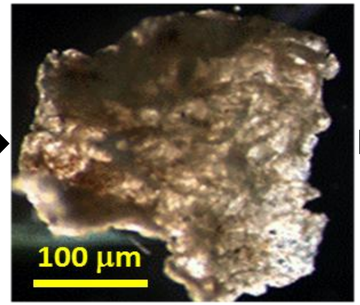
3. Microplastics

Paradigm Shift in Marine Plastic Pollution

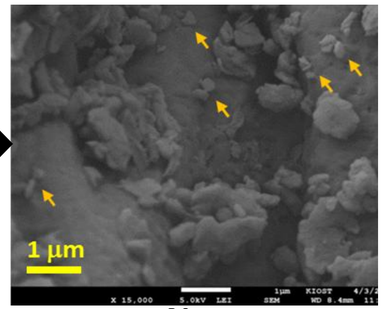

Mega


Macro

Meso



Micro



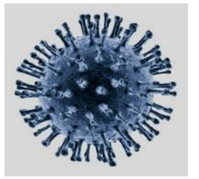
Nano


Hippo


Dog


Ant


Flea


Virus

Increase

Decrease

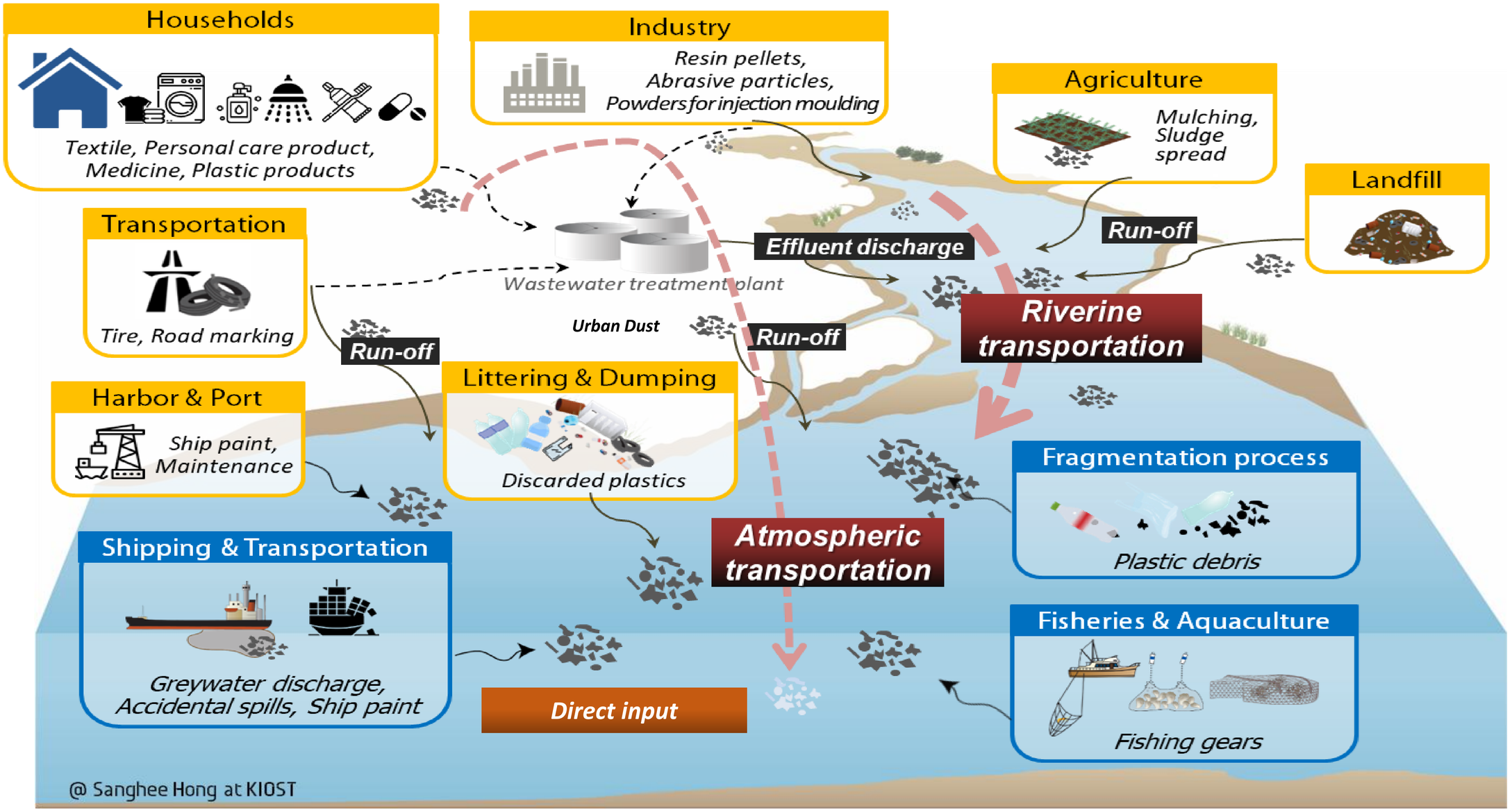
- Volume
- Entanglements
- Deposition velocity

- Numbers
- Bioavailability
- Target Organisms
- Human Exposure
- Toxicity
- Detection difficulty
- Cleanup difficulty

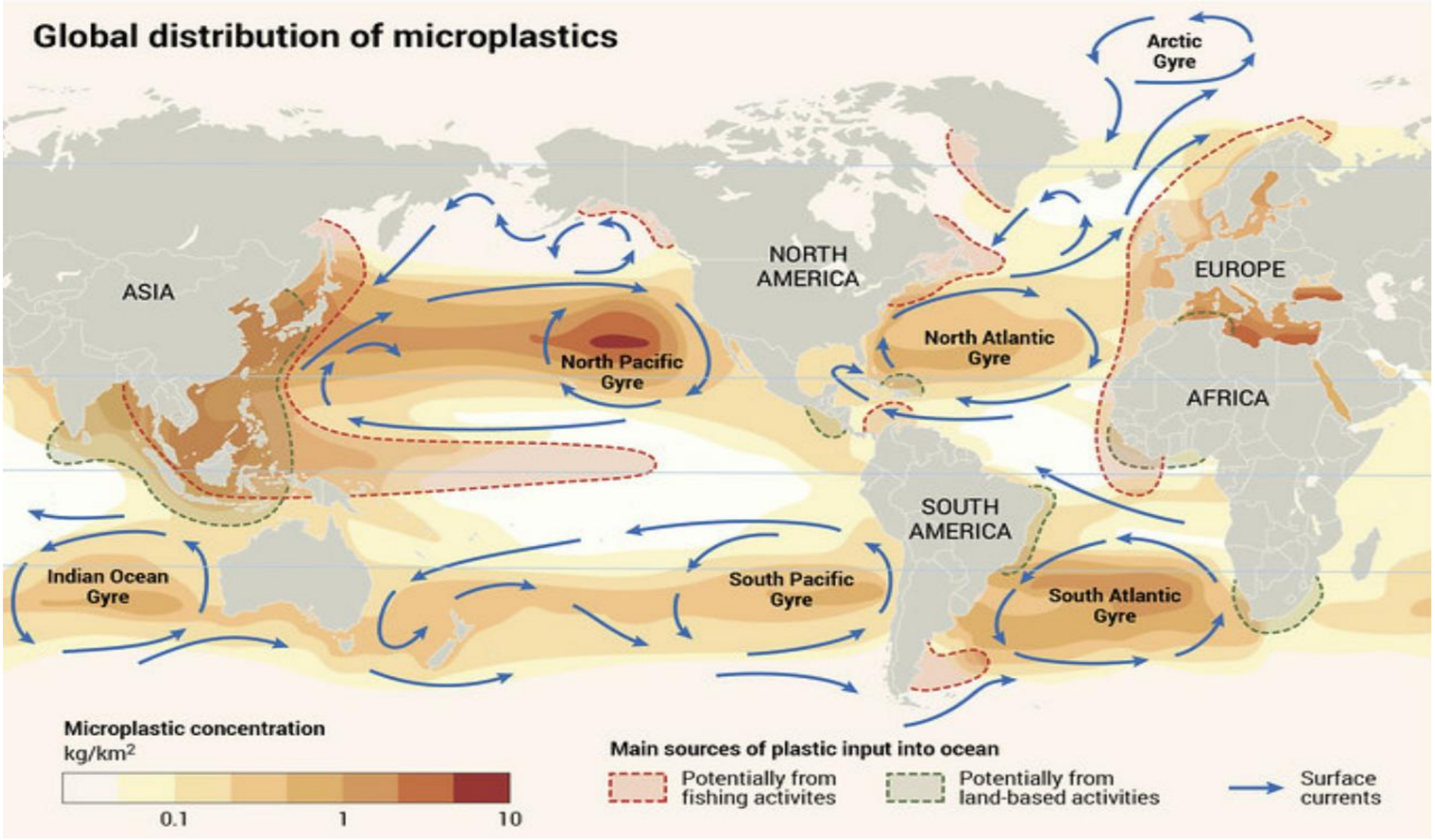
Source: Shim. WJ (2023) Plastic Ocean: Microplastics (ppt)

3. Microplastics

Sources and pathways of microplastics



3. Microplastics

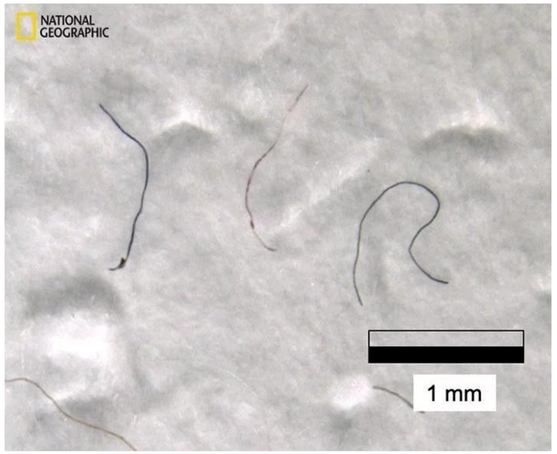


Source: Riccardo Pravettoni and Philippe Rekacewicz (2019) https://www.grida.no/resources/13339

3. Microplastics

Across the planet

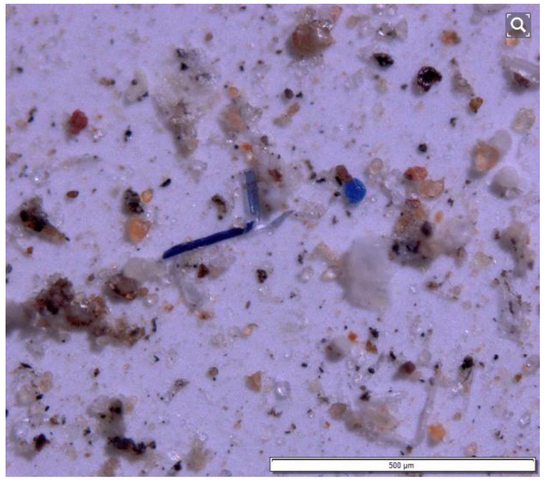
8,440 meters of Mt. Everest



▲ 8,440m 높이에서 수집된 눈 샘플에 미세플라스틱이 들어 있다.
© Imogen Napper / 내셔널 지오그래픽, NatGeo.com/Everest

Microplastic pollution along the water circulation system into the atmosphere

Raindrops and snowflakes
(Estimated to be approx. 1,000 tons in U.S. Western National Park, Wildlife Sanctuary)



▲ 대기 중에서 비와 함께 섞여 내린 미세플라스틱 (사진=유타대학 연구진)

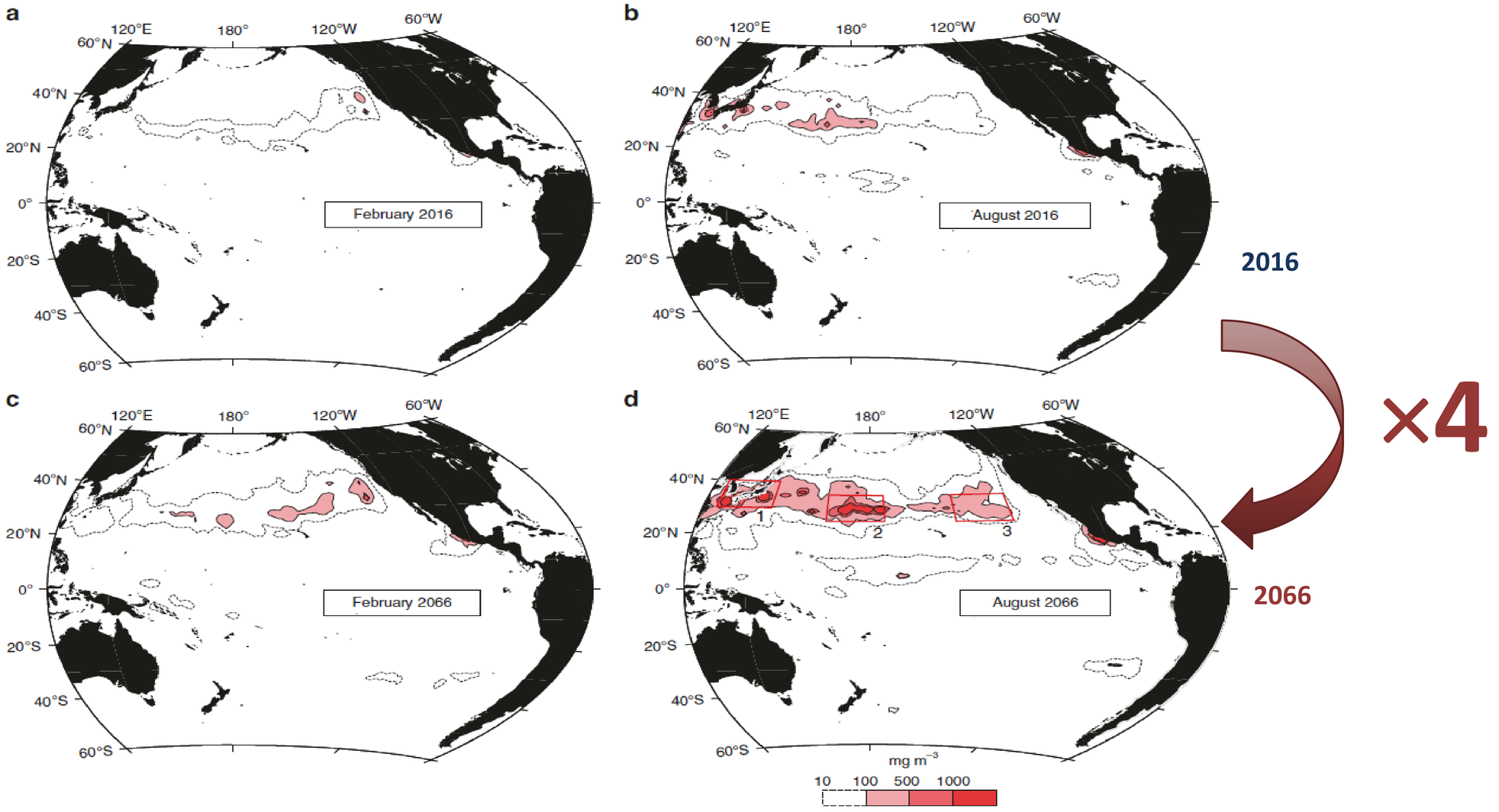
Underground water
(6.4 per liter detected in 16 out of 17 locations in the United States)

피아주엘로 박사가 미주리 주의 한 동굴 입구에서 지하수를 채취하고 있다. ©Teresa Baraza Piazuelo

Even in the deepest Mariana Trench

3. Microplastics

Trends of Microplastic pollution – production-based estimation



Source: Isobe et al. (2019) *Nat Comm*. *10*: 417, from Shim. WJ (2023) Plastic Ocean: Microplastics (ppt)

3. Microplastics

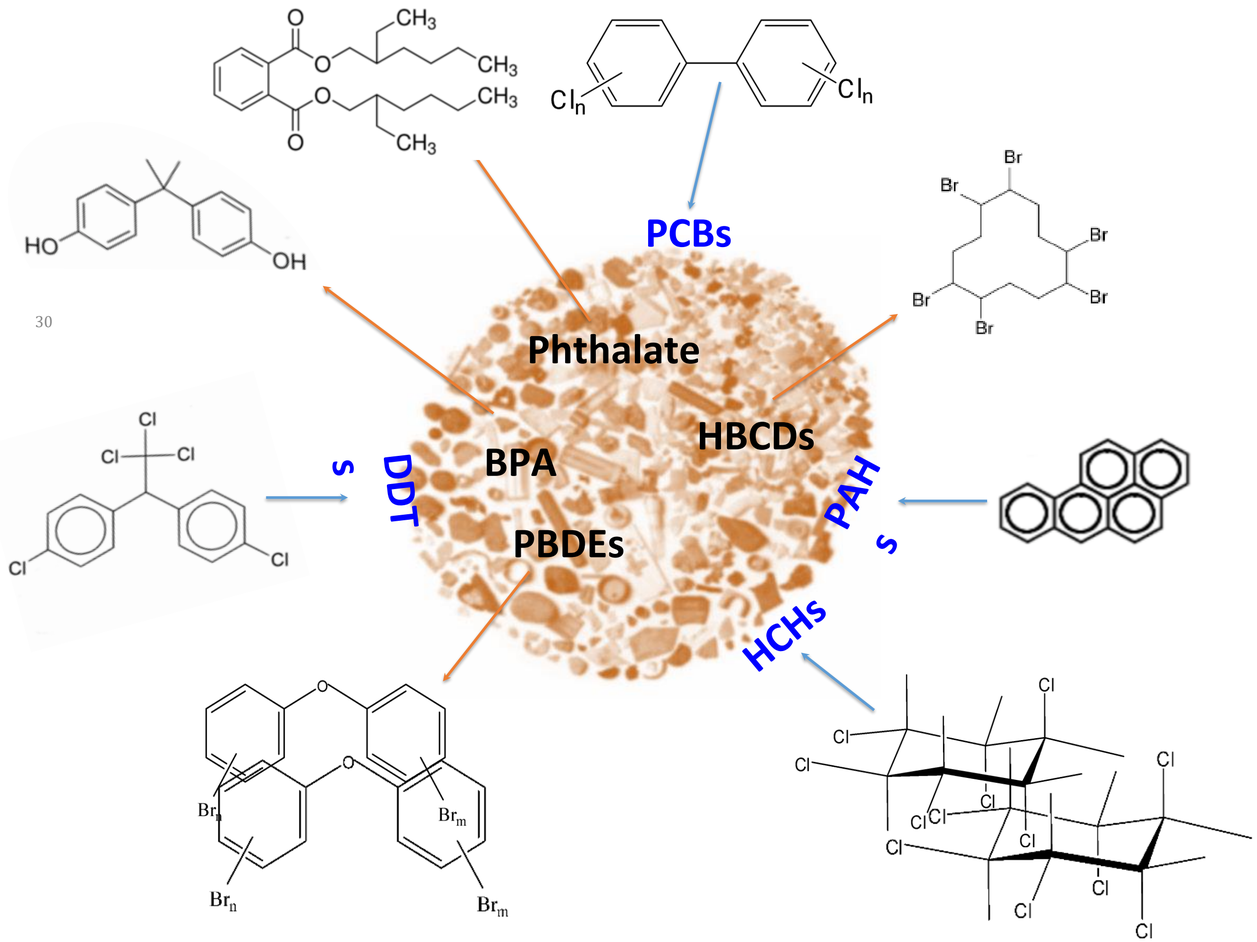
Risks – Rafts for Toxins

1. Adsorbed chemicals

2. Additive chemicals

More than 16,000 types of chemicals are used in plastic manufacturing, of which 25% are hazardous substances such as carcinogens and endocrine disruptors. Yet only about 6% are regulated worldwide, raising concerns over widespread health risks including reproductive disorders, cancer, and cardiovascular diseases.

(Source: Scientist's Coalition (2024) Policy Brief : Human Health in the Global Plastic Treaty)

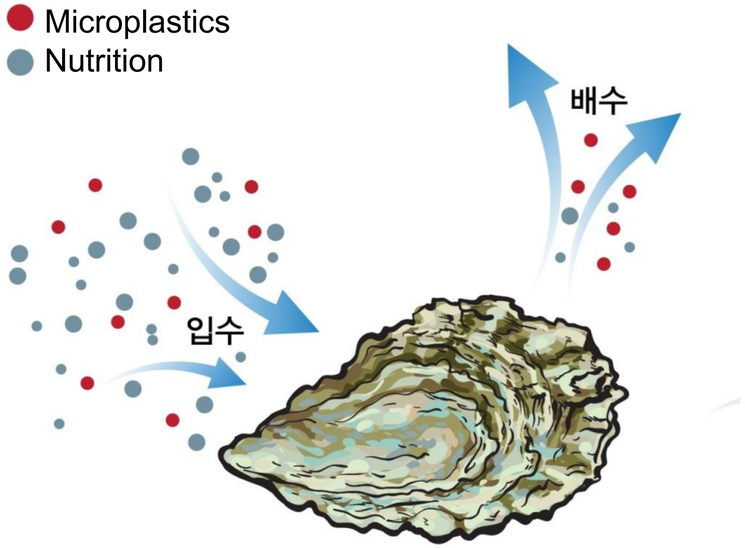


Source: Shim. WJ (2023) Plastic Ocean: Microplastics (ppt)

3. Microplastics

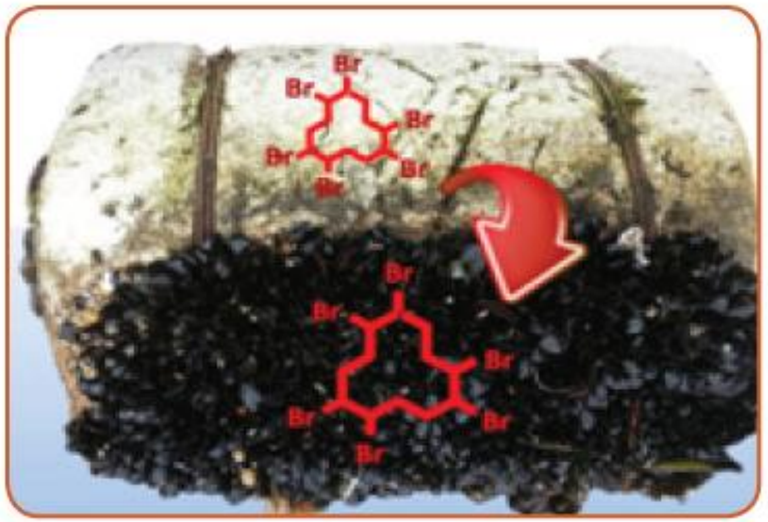
Risks – Ecological impacts (1)

Ingest **Micro-Styrofoam** through water



Oysters and mussels ingest microscopic Styrofoam particles along with water and nutrients, and these particles remain in the bodies.

Flame Retardant Residues in Buoys Transfer to Oysters



Conventional buoys contain flame retardants* that can leach into the marine environment and accumulate in oysters

*Flame retardants are toxic substances added during buoy manufacturing to prevent burning

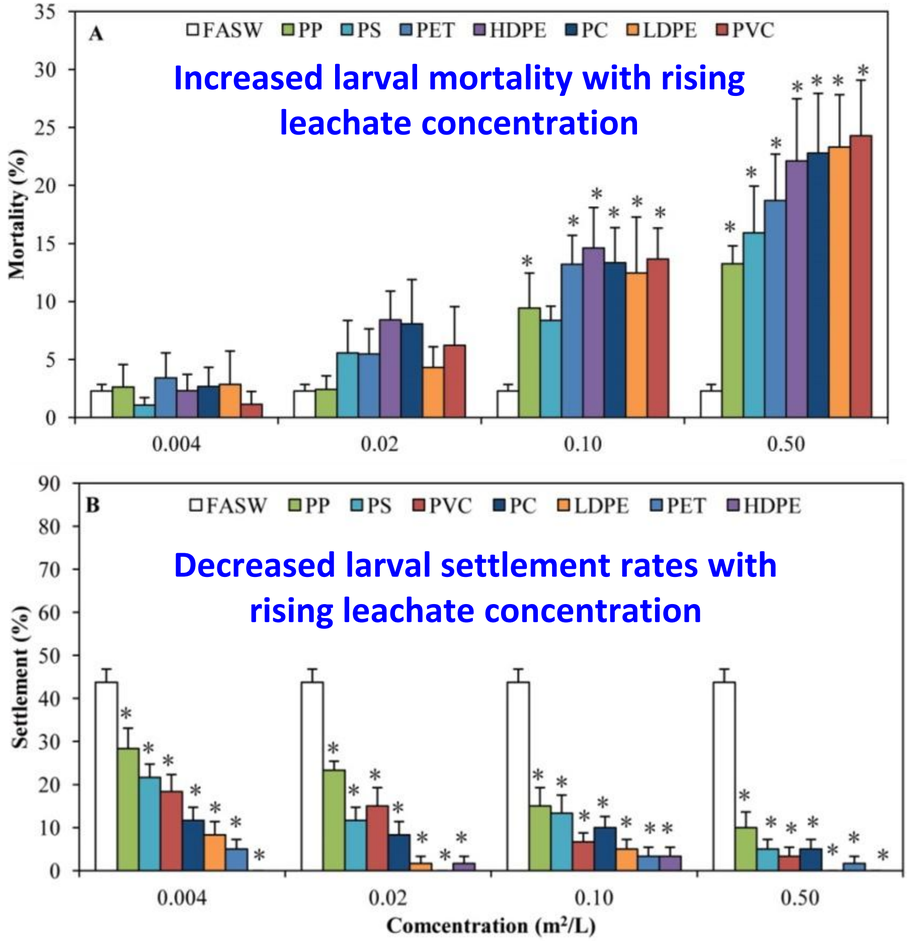
Source: Ministry of Maritime Affairs and Fisheries(2017)

3. Microplastics

Risks – Ecological impacts (2)

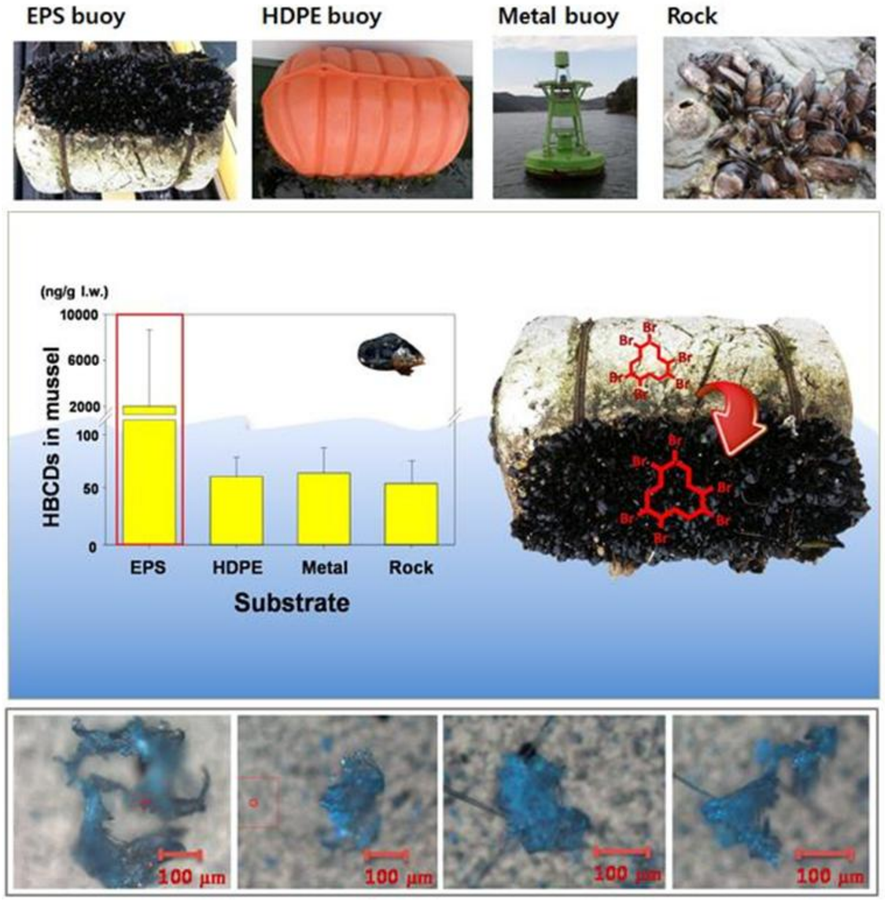
Biological effects of plastic leachates

Li et al. (2016) *Environ. Sci. Technol.* 50:924



Chemical Transfer from plastics to biota

Jang et al. (2016*) Environ. Sci. Technol.* 50: 4951

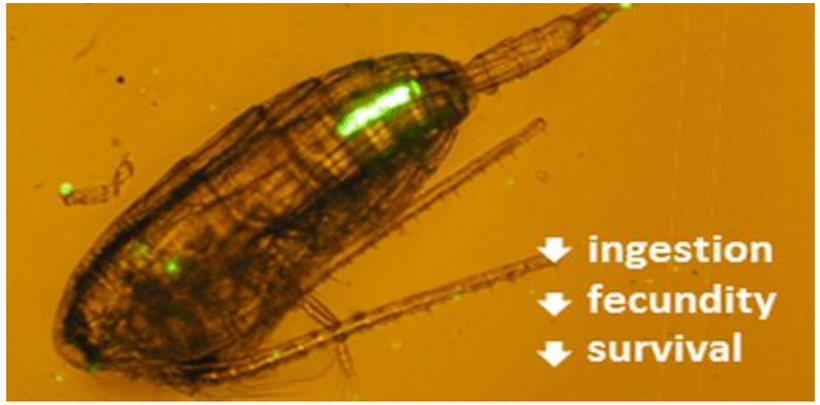


Source: Shim. WJ (2023) Plastic Ocean: Microplastics (ppt)

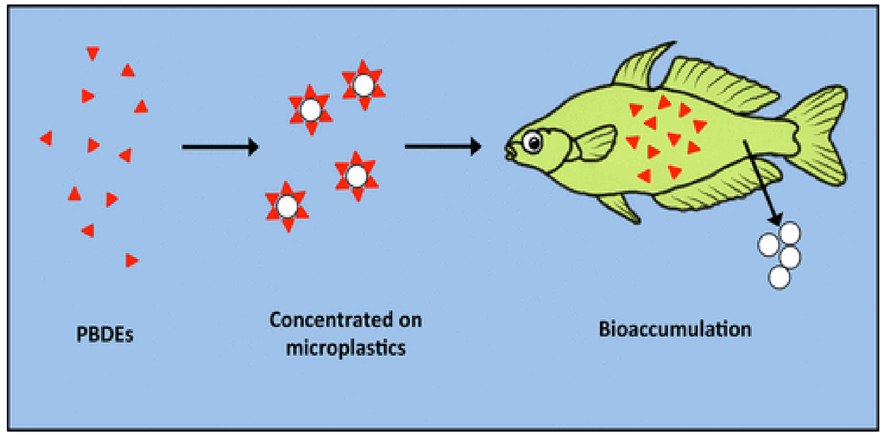
3. Microplastics

Risks – Ecological impacts (3)

The physical effects of particles Cole et al., 2015

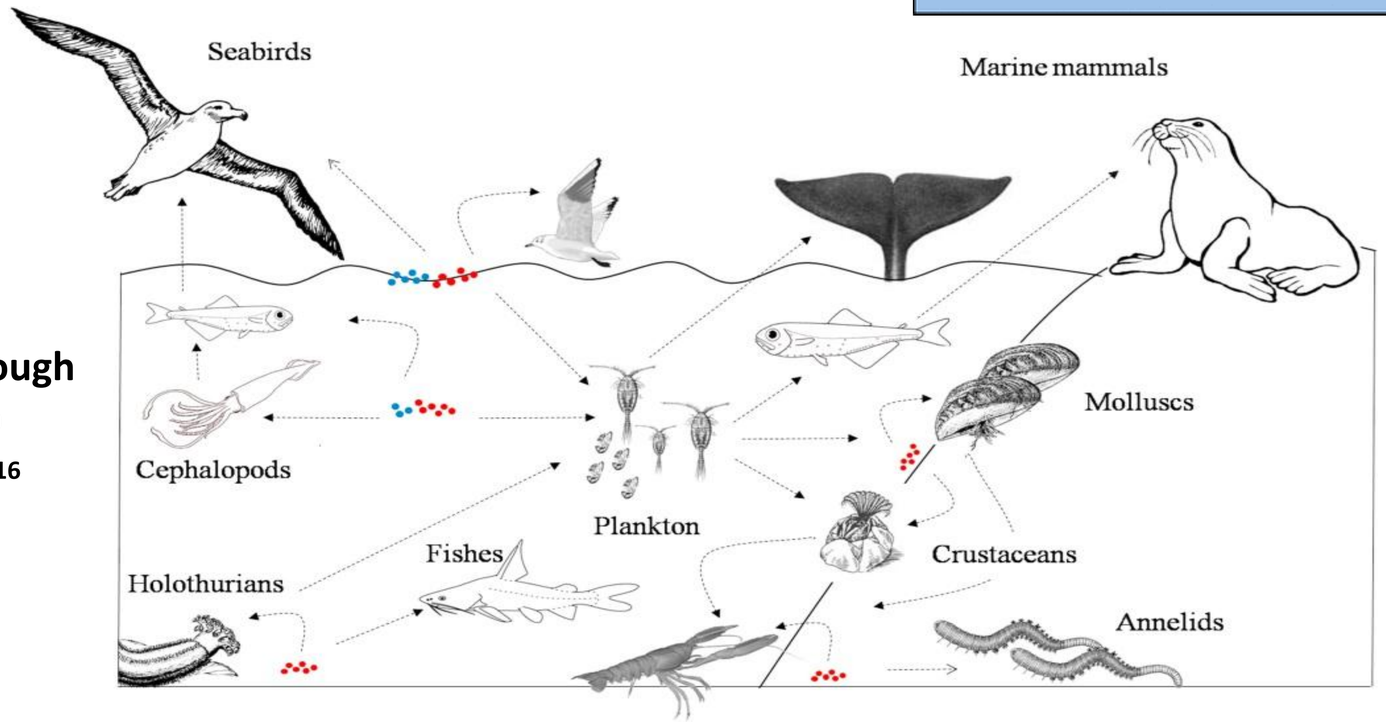


Toxic Effects of Chemical Substances Wardrop et al., 2016



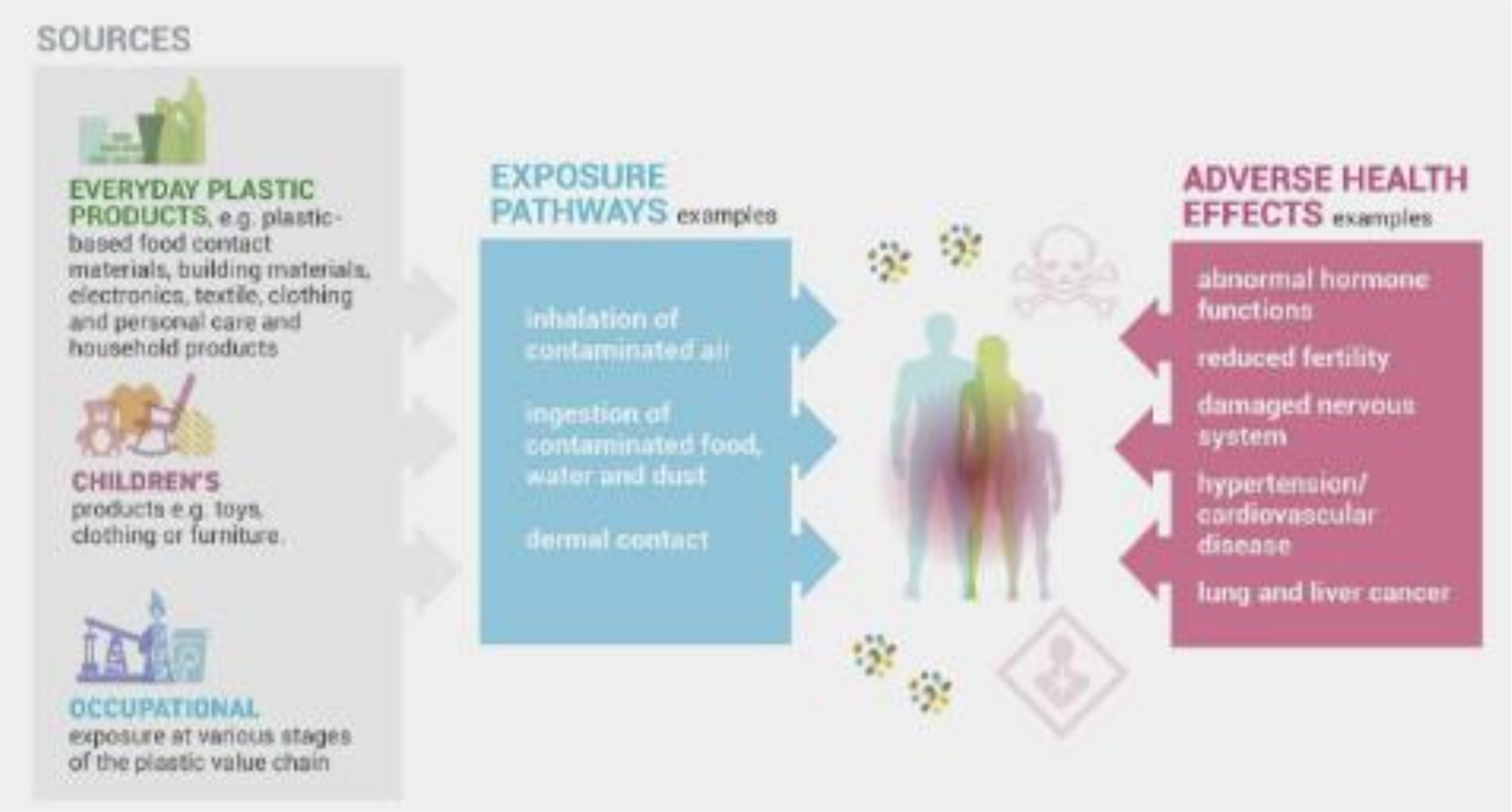
Transmission through the food web

Ival do Sul & Costa, 2016



3. Microplastics

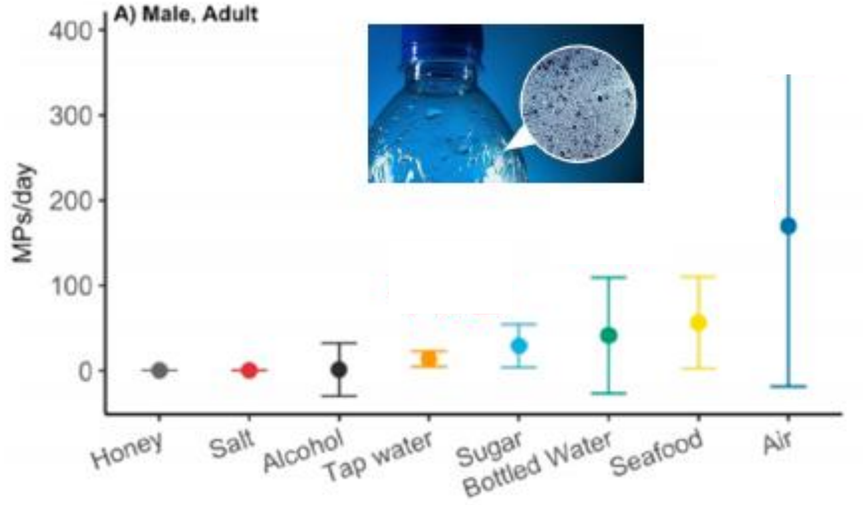
Risks – Human exposure

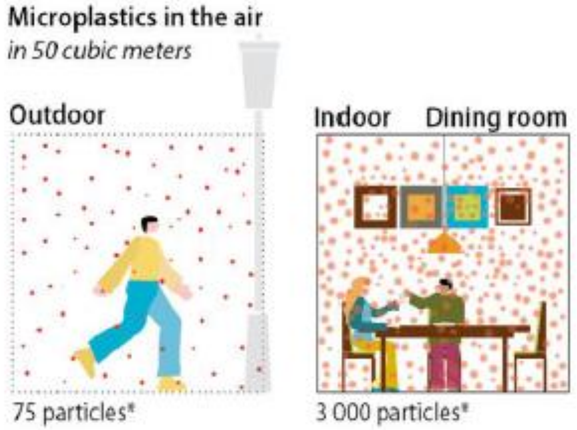


Source: United Nations Environment Programme and Secretariat of the Basel, Rotterdam and Stockholm Conventions (2023). Chemicals in plastics: A Summary and Key Findings. Geneva.

3. Microplastics

Risks – Human Exposure to microplastics and additives





- Concentrations in infants' and toddlers' feces up to 10 higher than in adults

Cox et al. (2019) *Environ. Sci. Technol. 53*: 7068; UNEP (2022)

3. Microplastics

Risks – Human exposure

Discovered 'microplastics' in all organs and tissues of the human body

Microplastics detected in 47 organs and tissues of donated bodies
(Charles Rolsky, Arizona State University)

©The BioDigital Human

3. Microplastics

Examples of Microplastic-related Damage to the Human Body

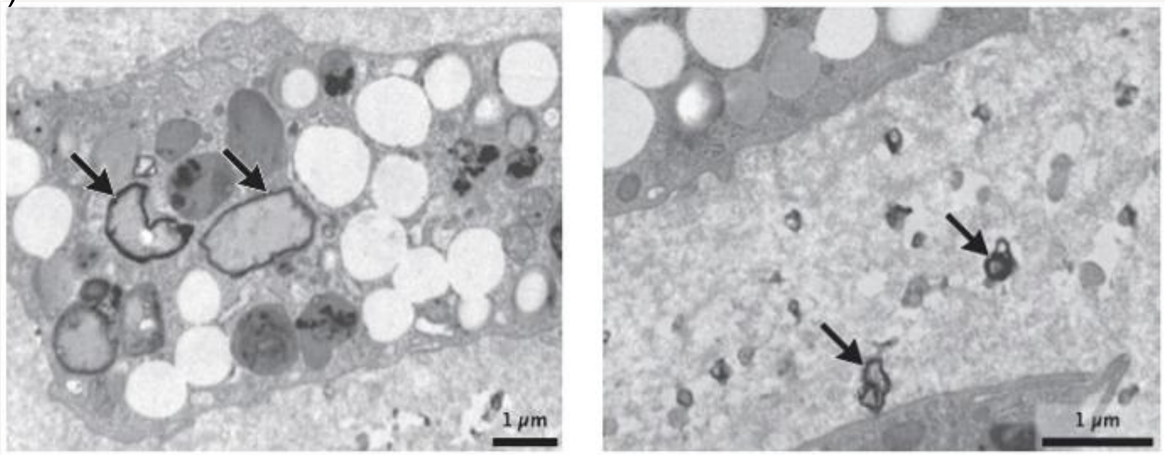
Chemical leaching from plastics interferes with the endocrine system -> well known

Recent studies have revealed that the *physical* presence of microplastic particles themselves can also be harmful

The first study examining the direct effects of the particles on human health

(Marfella, R. et al. (2024.03) Microplastics and Nanoplastics in Atheromas and Cardiovascular Events, *The New England Journal of Medicine*, Vol. 390 No.10, DOI: 10.1056/NEJMoa2309822)

- Investigated 300 patients with atherosclerosis, a condition that increases risk of stroke, angina, and heart attack
- Microplastics were detected in carotid plaque (atherosclerotic lesions composed of blood proteins and lipids)
- Patients with plastic-containing plaques were found to be more than four times as likely to die within the following three years

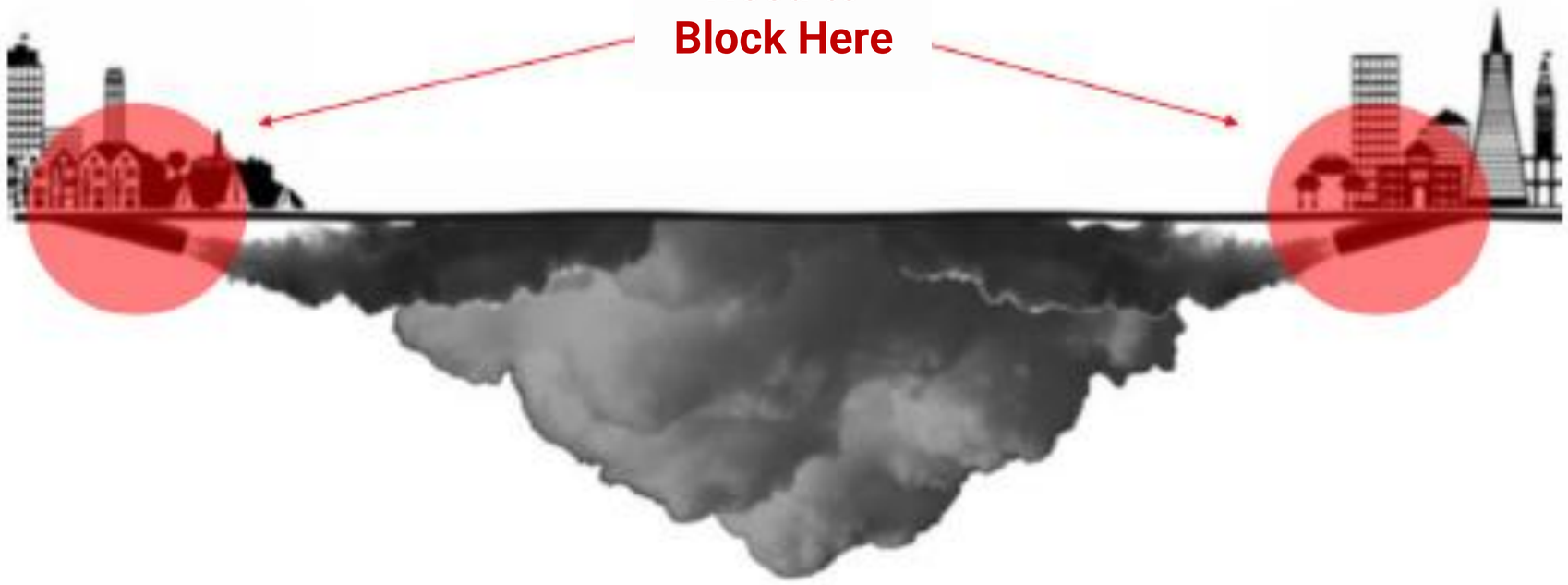


The arrows in these microscope images point at microplastic particles—characterized by jagged edges—that were detected inside a macrophage cell (left) and free floating in plaque removed from patients' carotid arteries (right).

MICROGRAPH BY MARFELLA, ET AL., 2024 (LEFT) AND MICROGRAPH BY MARFELLA, ET AL., 2024 (RIGHT)

3. Microplastics

Much like smog, Microplastics are impossible to clean up once dispersed

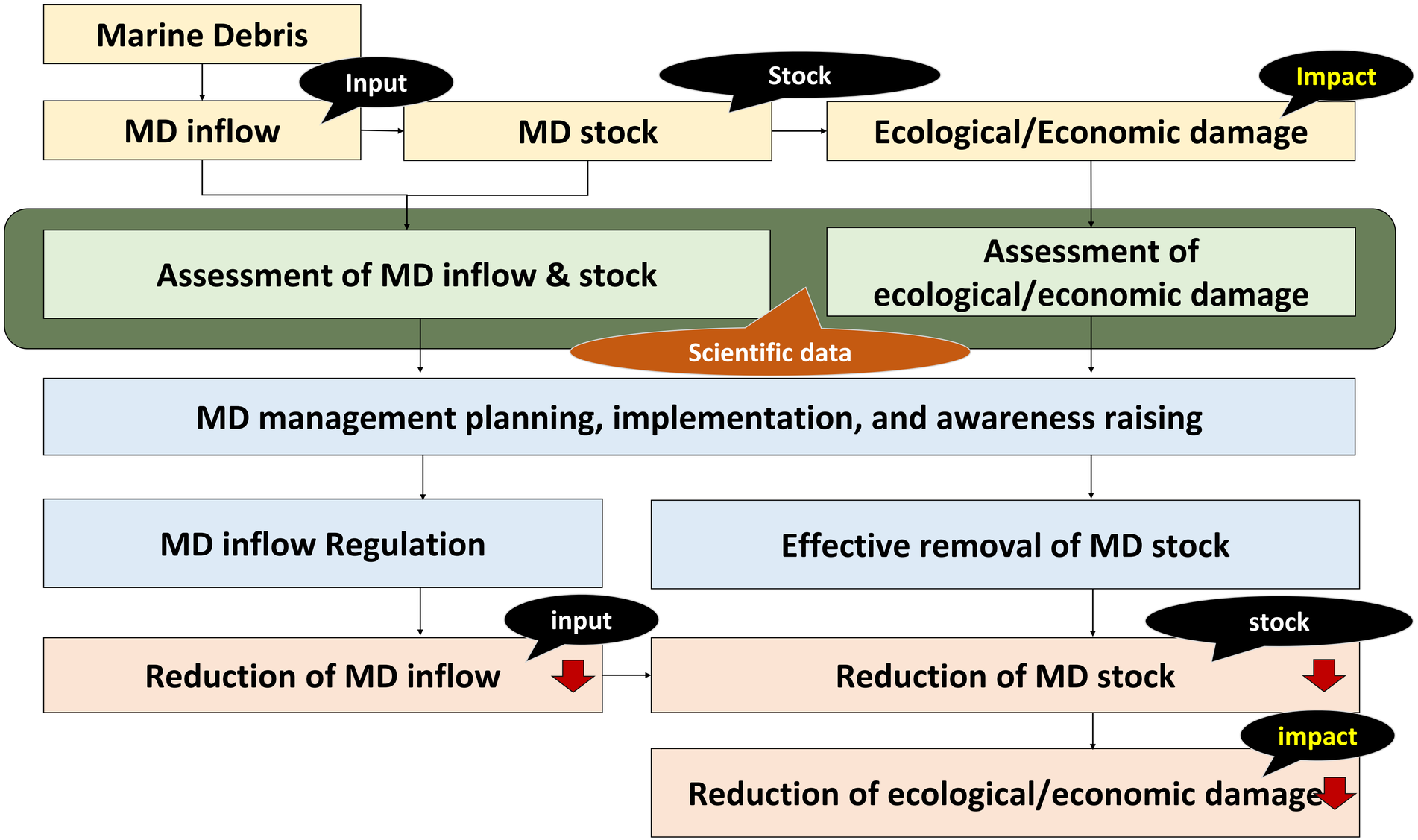


©5Gyres

4. Combating Marine Debris

Turn off the plastic tap (2021) By Von Wong

4. Combating Marine Debris



4. Combating Marine Debris

(Korean Case) MD Response system – Acts and Statutory Plans

Marine Environment Management Act (enacted ‘07)
1st Basic Plan for Marine Debris Management (‘09–’13)
2nd Basic Plan for Marine Debris Management (‘14–’18)
3rd Basic Plan for Marine Debris Management (‘19–’23)

Marine Debris and Marine Contaminated Sediment Management Act (effective Dec. 4, ‘20)
1st Basic Plan for the Management of Marine Debris and Marine Contaminated Sediment (’21-’30)

Objective : Strengthen the management system for marine debris and contaminated sediments to ensure a healthy marine environment.

- By 2030: Reduce marine plastic debris generation by 60%, achieve zero by 2050
  (Current: 67,000 tons → 27,000 tons by 2030 → 0 by 2050)
- By 2030: Halve the volume of contaminated marine sediments
  (Current: 11.8 million m^3 → 5.9 million m^3 by 2030)

4. Combating Marine Debris

(Korean Case) MD Response system – Current Statutory Plan

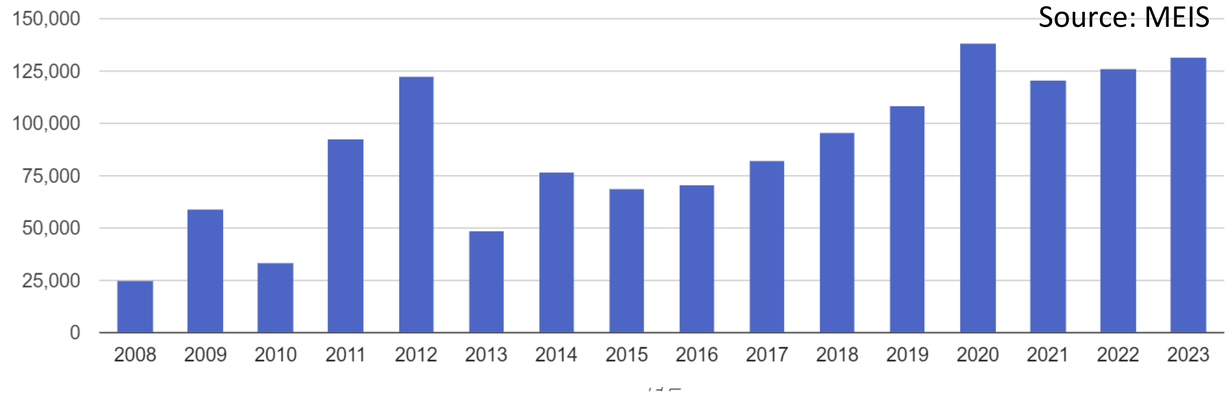
[Part 1] Marine Debris Management				
1-1 Prevention	**1-2 Collection/Transport**	**1-3 Treatment/Recycling**	**1-4 Management Capacity**	**1-5 Awareness**
Control marine, land, and foreign sources	Close blind spots, boost local cooperation, improve efficiency	Expand infrastructure, promote recycling	Strengthen governance, smart systems, plastic/discharge control, intl. cooperation, secure funds	Expand participation, tailored education
[Part 2] Contaminated Sediment Management				
2-1 Prevention	**2-2 Management**	**2-3 Technology/Markets**	**2-4 Awareness**	**2-5 Governance**
Build prevention systems, manage coastal sources, trace pollution pathways	Improve evaluation, internalize investigation, lifecycle control, close gaps	Develop remediation tech, train experts, expand markets	Strengthen education, outreach, cooperation bodies	Integrated management, secure resources

4. Combating Marine Debris

(Korean Case) MD Collection

Korea's Marine Debris Collection Efforts

Among the highest collection levels worldwide



Policy Shift

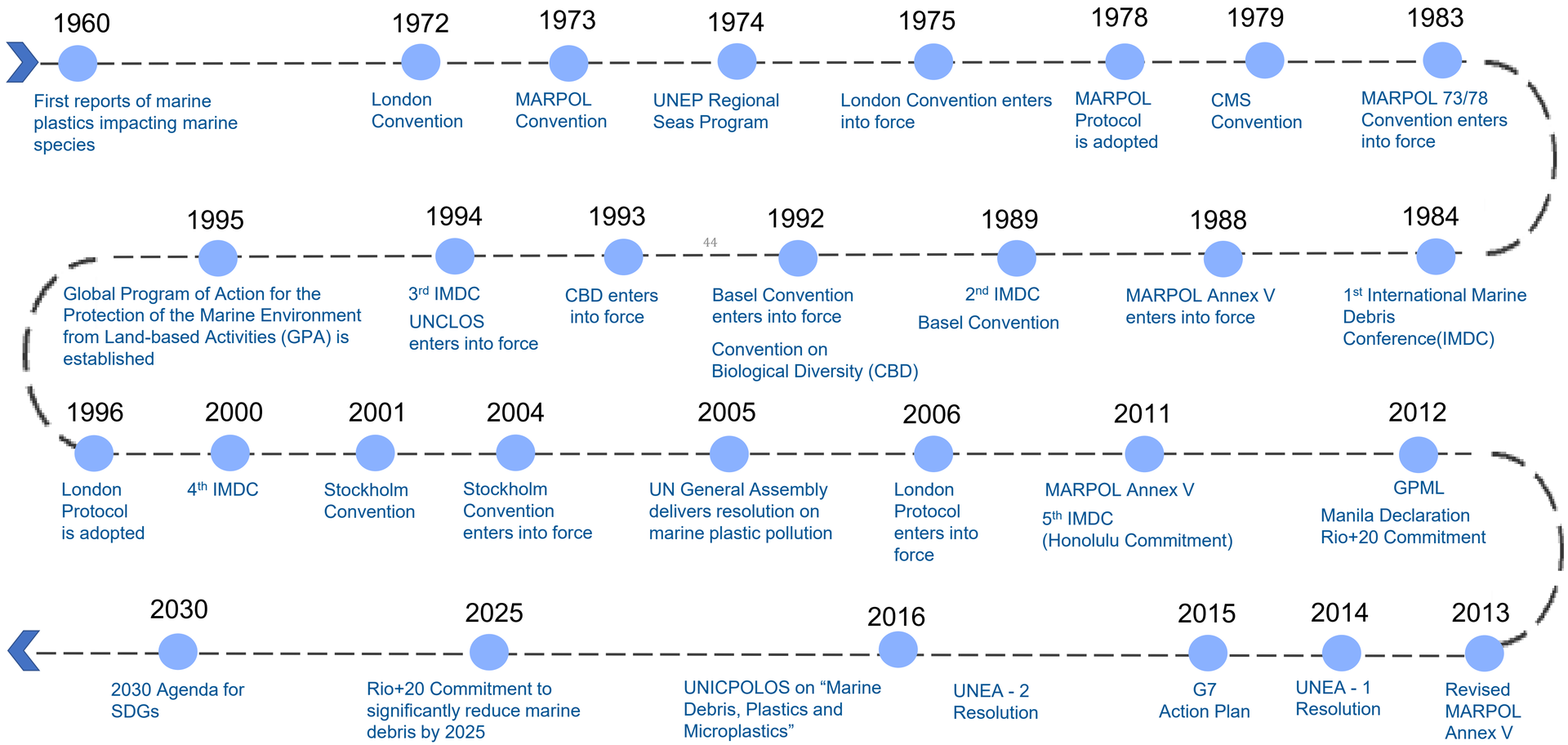
- from collection-centered measures → to inflow reduction.
- Once debris enters the ocean, collection costs are over 4 times higher

i.e. Budget allocation for MD collection
('09–'13) Under 1st Plan : 80% of budget, avg. KRW 60B annually.
('14–'18) Under 2nd Plan: 70% of budget, avg. KRW 66B annually
(10x of the U.S.)
('21-'30) Under Current Plan : 63% of annual budget of 2024. KRW 92.7B

4. Combating Marine Debris

The evolution of Int'l MD Governance

Slow transition from voluntary soft law to biding hard law conventions



Adapted from Mapphoto/Riccardo Pravettoni, 2018

4. Combating Marine Debris

Global Commitments : SDG 14.1

SDG 14. Conserve and sustainably use the oceans, seas and marine

14.1 by 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution

4. Combating Marine Debris

Major Multilateral Environmental conventions

Conventions	Objectives	Plastic-related
London Convention	Prevent Marine Pollution caused by the dumping of litter and other matter	Prohibits the direct dumping and disposal of plastic waste into the ocean
Int'l Convention for the Prevention of Pollution from Ships (MARPOL)	Protect human health and the environment from the adverse impacts of hazardous litter generated by int'l shipping and dumping	Prohibits the disposal of plastic litter from ships into the ocean
Basel Convention	Protect human health and the environment from the adverse impacts of the transboundary movement and disposal of hazardous litter	Regulates the transboundary movement of plastic waste, preventing illegal trade and requiring environmentally sound management
Rotterdam Convention	Protect human health and the environment by regulating the Prior Informed Consent (PIC) procedure for certain hazardous chemicals and pesticides in int'l trade	Implements measures to reduce emissions of organic pollutants, including plastic additives and by-products
Stockholm Convention	Protect human health and the environment from Persistent Organic Pollutants (POPs)	Regulates or exempts POPs contained in plastics
Minamata Convention	Protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds	Regulates certain substances such as residual mercury and methylmercury found in some plastics (e.g. PVC) and by-products generated during production process

4. Combating Marine Debris

Key int’l actors addressing in MD Plastics

Classification	Name	Major Trend
International Organization	United Nations Environment Assembly(UNEA)	• Adopting a resolution calling for an integrated approach to plastic and litter management
	Sustainable Development Goals(SDG)	• Including reducing marine debris in the goal of marine ecosystem protection
	Global Partnership on Marine Litter (GPML)	• Establishing a network of international organizations, governments, NGOs, researchers, businesses, and civil society organizations
	UN Clean Seas: A Campaign for Ocean Trash-Free Seas	• Promoting campaigns to reduce the use of disposable items, microplastics, and excessive packaging
	Convention on Biological Diversity(CBD)	• Adopting a resolution to reduce the impact of marine debris on biodiversity
	Convention on the Conservation of Migratory Species of Wild Animals(CMS)	• Adopting a resolution to reduce the impact of marine debris on migratory species
	Basel Convention	• Regulating the import and export of plastic waste
	International Maritime Organization(IMO)	• Strengthening the management of ship-generated plastic and revising lost fishing gear reporting regulations
Local Conference	Regional Seas Programme	• Advancing action plans for marine debris in the Northwest Pacific (NOWPAP) and East Asia (COBSEA) regions
	G20	• Setting target of zero additional marine plastic pollution by 2050
	APEC	• Announcing a marine debris roadmap
Industry		• Promoting self-rescue efforts through initiatives such as the "New Plastics Economy Global Declaration"

4. Combating Marine Debris

- From UNEA-1 to UNEA-5.2, evidence consistently showed that marine debris stems from plastic overproduction, overuse, and mismanagement—driving the call for a global plastics treaty, which aimed to cover ALL lifecycle of plastics
- Despite the stated objective of concluding a legally binding international agreement on plastic pollution by 2024, the fifth session of the Intergovernmental Negotiating Committee (INC-5) in December 2024 ended without agreement.
- The resumed session, INC-5.2, which adjourned last week in Switzerland, also produced no concrete outcome. As a result, the negotiation process now faces heightened uncertainty regarding its direction and prospects.

Answer:
Close the Tap

Humanity can no longer sustain its way of life.

Amid many complex solutions, one truth is clear - we must cut the excessive waste we produce.

Turn off the plastic tap (2021) By Von Wong

Thank you

ReDi instagram