



HOW MUCH OF A PROBLEM IS WASTE IN OCEANS?

FOCUS ON MICROPLASTICS



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2. Key facts
3. What are Microplastics?
4. Impacts
 1. Environmental
 2. Health
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7. Discussion



PRESENT

8 MILLION
TONS

PRESENT



822 000
TIMES

PRESENT



1 TRUCK
EVERY
MIN

FUTURE

2014

FORECAST

2050

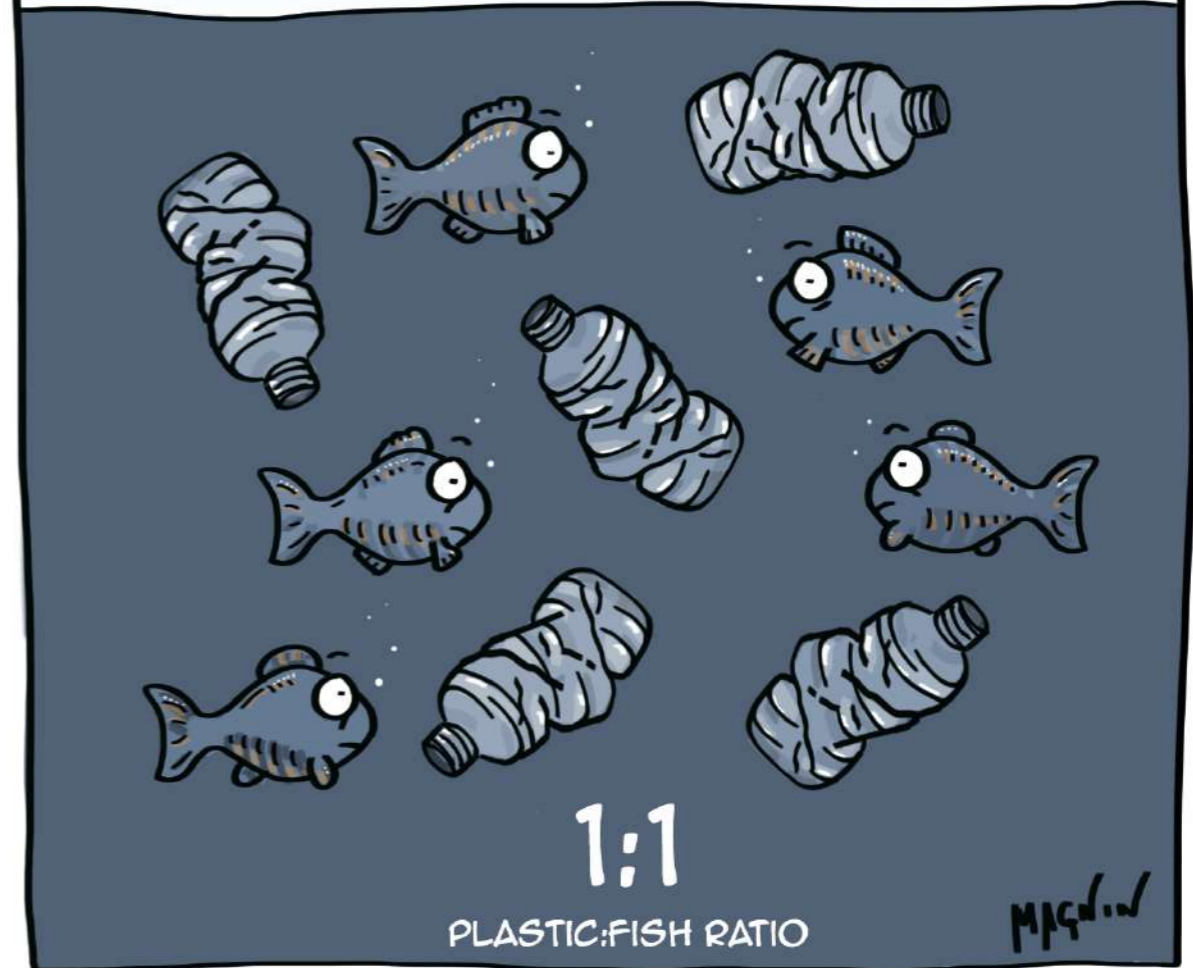
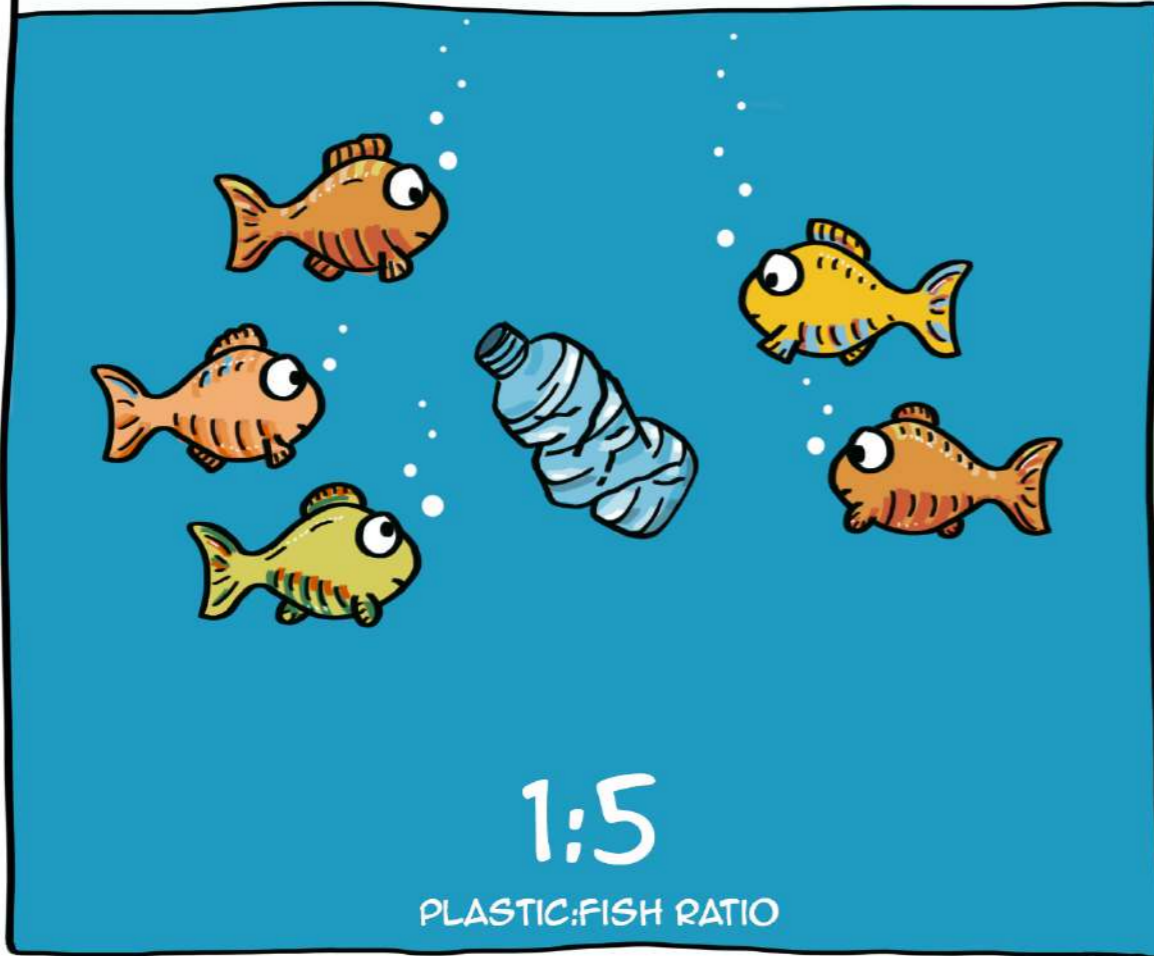
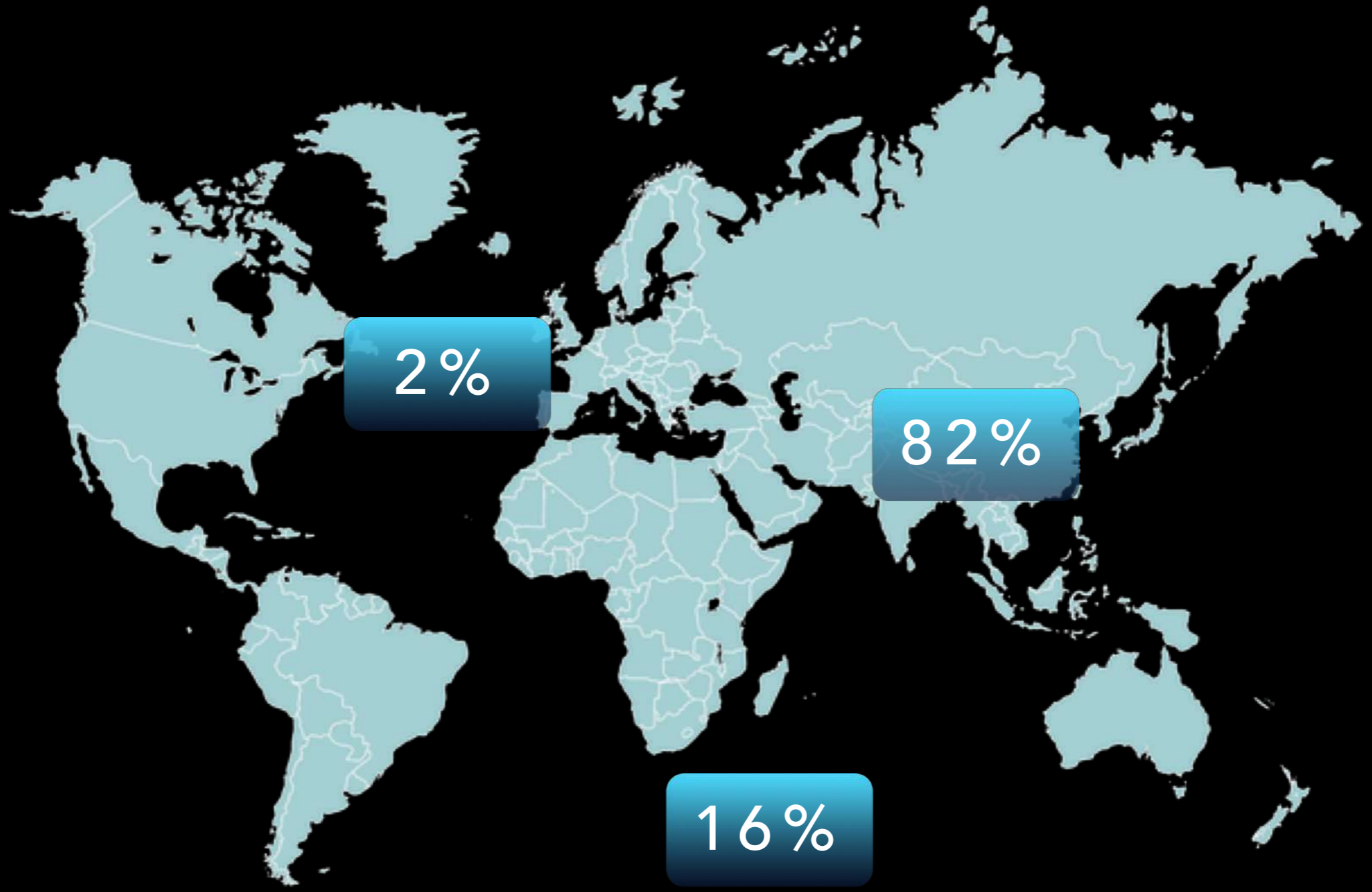


Illustration by Alexandre Magnin - Sustainabilityillustrated.com

<https://sustainabilityillustrated.com/en/2018/06/12/more-plastic-than-fish-in-2050/>

PLASTIC

ORIGIN



<http://www.ultimate-packaging.co.uk/statement-from-ultimate-packaging-regarding-recent-communications-and-legislative-interventions-relating-to-plastic-packaging/>

PLASTIC

GYRES



<http://teded.tumblr.com/post/134857415063/how-nurdles-are-invading-our-oceans>

MICROPLASTIC

DEFINITION



<http://blogs.ifas.ufl.edu/lakeco/2017/09/17/microplastics-whats-big-deal/>

“small plastic pieces less than five millimeters long which can be harmful to our ocean and aquatic life.”

National Oceanic and Atmospheric Administration U.S. Department of Commerce, 2018



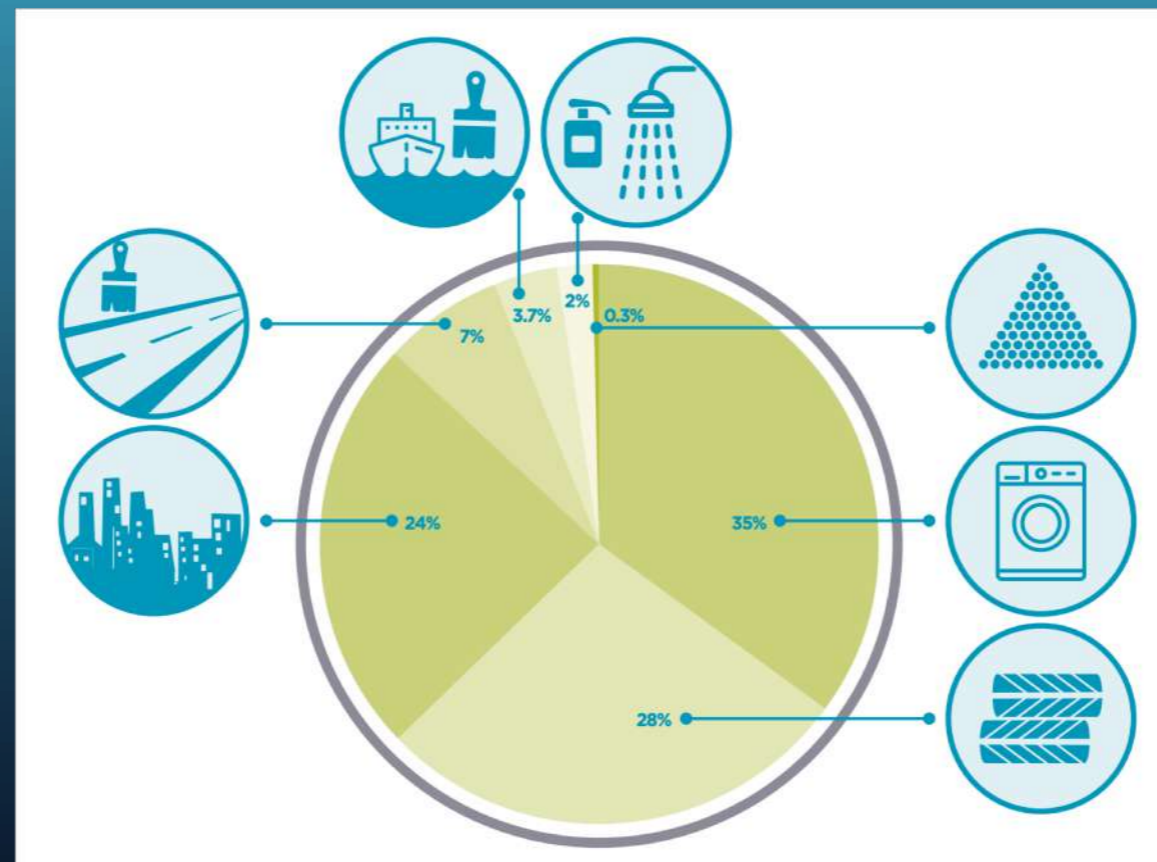
<http://jpi-oceans.eu/news-events/news/results-%E2%82%AC75-million-call-microplastics-published>

MICROPLASTIC

CATEGORIES

PRIMARY

« are plastics directly released into the environment in the form of small particulates »



MICROPLASTIC

CATEGORIES

SECONDARY

« are plastics originating mostly from the degradation of large plastic waste into smaller plastic fragments once exposed to the marine environment »

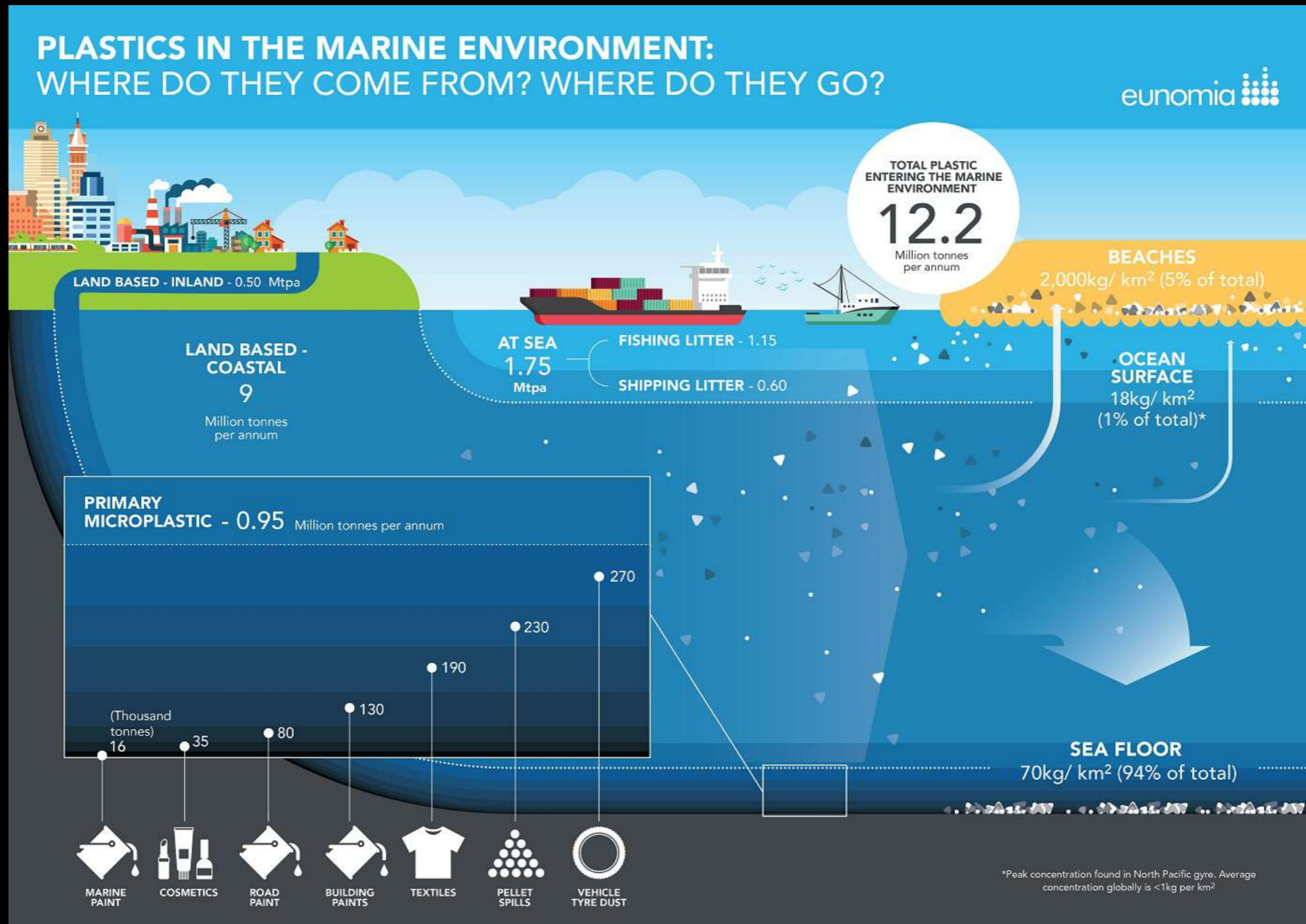
Julien Boucher, 2017



<http://blog.nationalgeographic.org/wp-content/uploads/2016/04/Archi-official-09.jpg?fbclid=IwAR0HHoz3MSBQajLsEuCY10pthwiGX2Q2-ufmm0H3YVGZJFhThybkLMTKZ7w>

MICROPLASTIC

PATHWAYS



<http://www.eunomia.co.uk/marine-plastics-we-should-fight-them-on-the-beaches/>

MICROPLASTIC

ORIGIN

PRIMARY

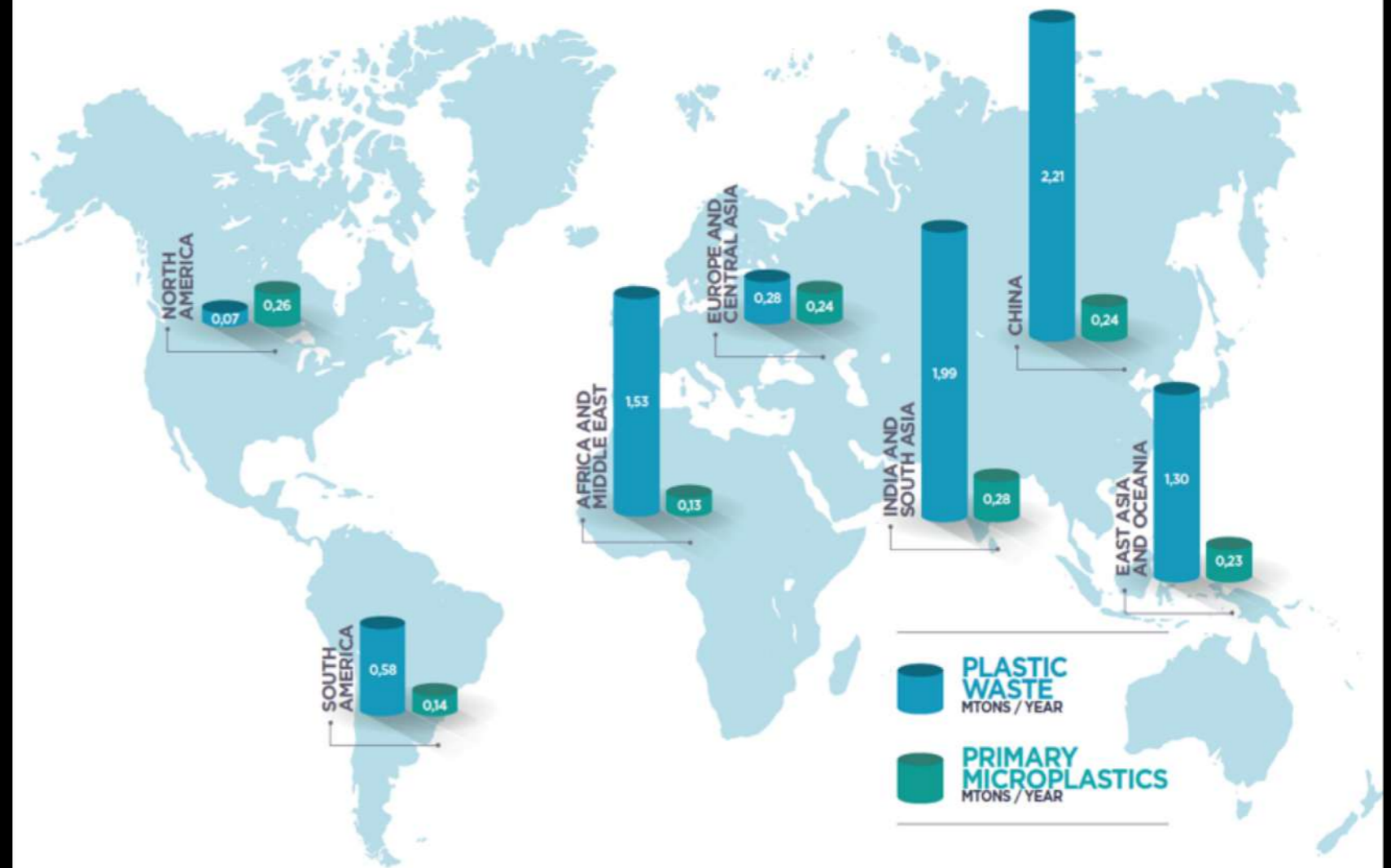
WESTERN
COUNTRIES

SECONDARY

EMERGING
ECONOMIES

GLOBAL RELEASES TO THE WORLD OCEANS:

COMPARISON WITH PLASTICS ORIGINATING FROM MISMANAGED WASTES

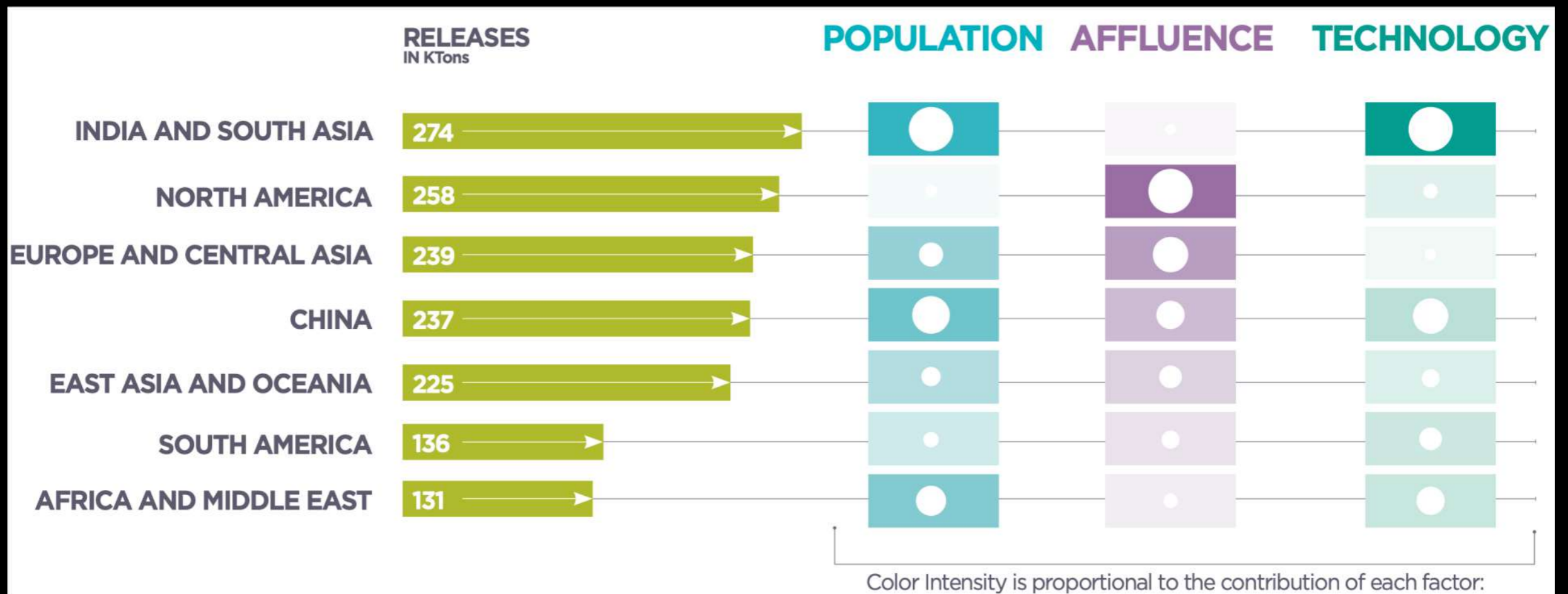


<https://storyofstuff.org/wp-content/uploads/2017/02/IUCN-report-Primary-microplastics-in-the-oceans.pdf>

MICROPLASTIC

IMPACT OF COUNTRIES

$$\text{IMPACT} = \text{Population (habitants)} * \text{Affluence (US\$ GDP/habitant)} * \text{Technology efficiency (Release / US\$ GDP)}$$



<https://storyofstuff.org/wp-content/uploads/2017/02/IUCN-report-Primary-microplastics-in-the-oceans.pdf>

ENVIRONMENTAL IMPACTS

IMPACT ON ECOSYSTEMS

- ▶ Microplastics can transport invasive species, including:

- ▶ Algal blooms



- ▶ Pathogens



- ▶ Threat to biodiversity: Increasing likelihood of diseases of coral reefs



- ▶ Found in remotest places of earth: deep sea sediments



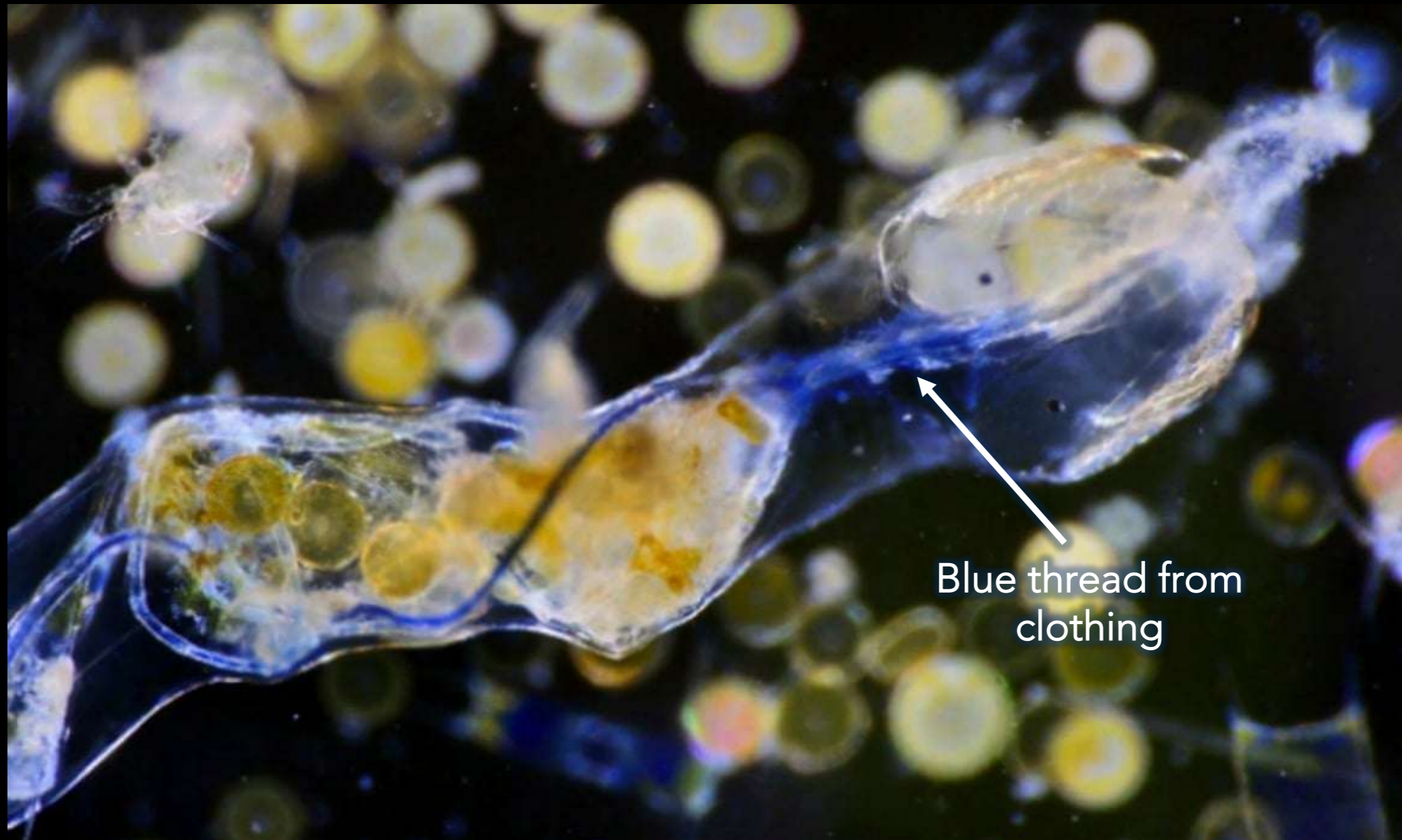
<https://www.fromthegrapevine.com/nature/these-colorful-coral-reefs-shocked-scientists>



<https://phys.org/news/2018-09-polluted-groundwater-contaminated-south-pacific.html>

ENVIRONMENTAL IMPACTS

IMPACT ON ECOSYSTEMS



<https://www.theguardian.com/environment/2017/nov/15/plastics-found-in-stomachs-of-deepest-sea-creatures>

ENVIRONMENTAL IMPACTS

IMPACT ON INDIVIDUAL ANIMALS

PHYSICAL EFFECTS

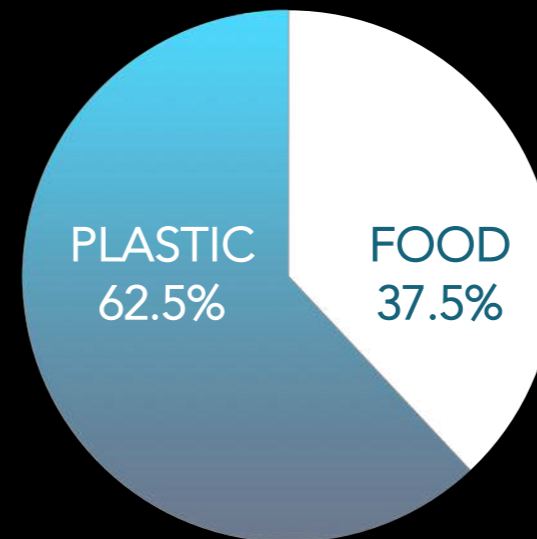
- ▶ Obstruction preventing uptake of food



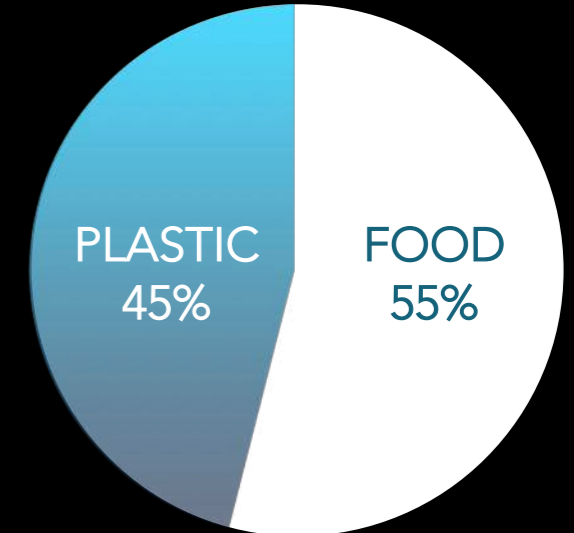
- ▶ Damage to digestion track



SEATURTLE



ALBATROSS



<http://www.earthday.org/wp-content/uploads/Earth-Day-Network-Plastic-Pollution-Primer-and-Action-Toolkit-updated-2.20.2018.pdf>

ENVIRONMENTAL IMPACTS

IMPACT ON INDIVIDUAL ANIMALS

CHEMICAL EFFECTS

▶ Chemical toxicity



▶ Heavy metals



▶ Impaired Health



<https://www.nrdc.org/onearth/palate-plastic>

ENVIRONMENTAL IMPACTS

IMPACT ON INDIVIDUAL ANIMALS

TAKEN UP ACROSS THE
GILLS THROUGH
VENTILATION

ADHERE TO THE BODY
OF ORGANISMS

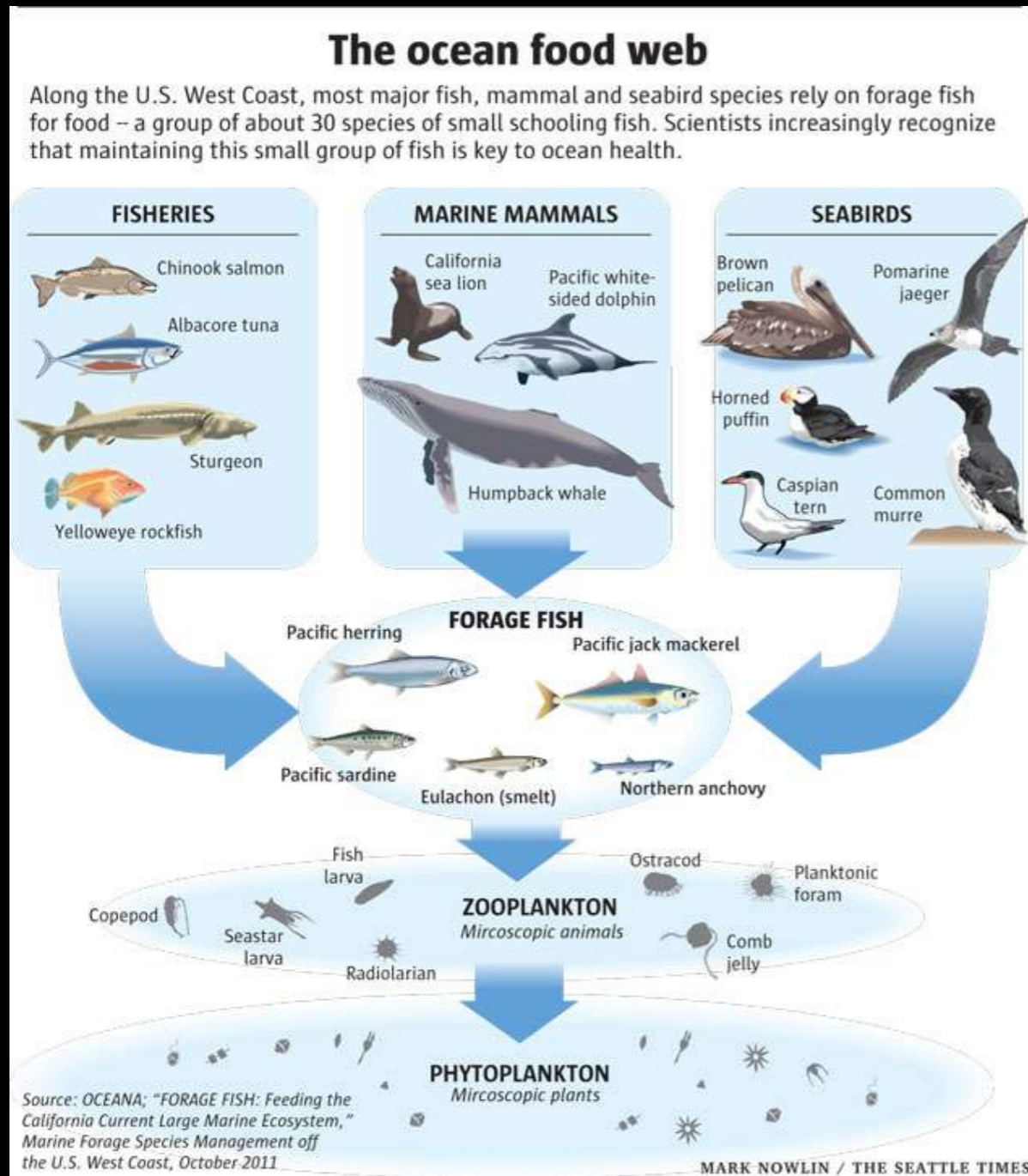
HOW?

INGESTED
(DIRECTLY OR
INDIRECTLY)

ABSORBED INTO THE
ORGANISM

ENVIRONMENTAL IMPACTS

OCEAN FOOD WEB



http://o.seattletimes.nwsourc.com/html/localnews/2017762147_littlefish16m.html



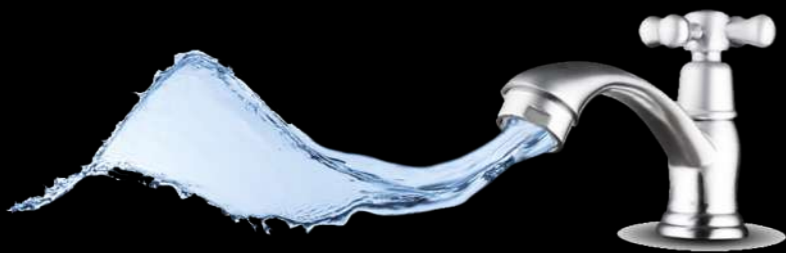
https://cdn4.dogonews.com/images/4bcc2151-cfb8-45c6-8a2f-ca3b53ba5688/fc5badc4-2942-11e6-b3b6-bdf44ca17c9d_1280x720.jpg



<https://www.seaturtlecamp.com/plastic-paradise/>

HEALTH IMPACTS

DO WE EAT PLASTIC?



HEALTH IMPACTS

HUMAN HEALTH

FACTS

- ▶ Ingested & Digested
- ▶ "more than 50% of the world population might have microplastics in their stools"
UEG, 2018
- ▶ Made out of chemicals

EXAMPLES

- ▶ Polyethylene Terephthalate (PET): nausea, vomiting, diarrhea
- ▶ Polyvinyl Chloride (PVC): 'endocrine disruptors' interfere with the production of hormones

ECONOMIC IMPACTS

FISHERY AND AQUACULTURE

“10% to 12% of the global population relies on fisheries and aquaculture for their livelihood.”

FAO, 2014

IMPACT

- ▶ Damaged fishing vessels
- ▶ Reduced catches due to abundance of debris
- ▶ Microplastic contamination in marine species can affect the local consumption of seafood



<https://www.pinterest.com/pin/500884789785115864/>

ECONOMIC IMPACTS

TOURISM

IMPACT

- ▶ Reduces aesthetic value
- ▶ Affects recreational opportunities
- ▶ Example: Kamilo Beach, Hawaii



https://www.huffingtonpost.com/entry/kamilo-beach-hawaii-dirtiest-beach-america_us_58e99a38e4b05413bfe3792d

SOLUTIONS

STOP PUTTING PLASTIC IN THE OCEAN

PRODUCERS



CONSUMERS



GOVERNMENTS



<https://www.worldatlas.com/r/w728/upload/8d/00/66/plastic-bag-infographic.jpg>

ORGANIZATIONS



The Honolulu Strategy

SOLUTIONS

TAKING THE PLASTIC OUT OF THE OCEAN

INITIATIVES

International Coastal
Clean Up

The Pacific Ocean
Clean Up



<https://oceanconservancy.org/wp-content/uploads/2018/07/Building-A-Clean-Swell.pdf>



<https://www.digitaltrends.com/cool-tech/ocean-clean-up-garbage-patch/>

SOLUTIONS

THE NEW PLASTICS ECONOMY

- ▶ Circular Economy Principles
- ▶ Lost opportunity
- ▶ Improve waste management and recycling systems



<https://footwearnews.com/2016/focus/athletic-outdoor/adidas-parley-for-the-ocean-prototype-sneakers-instagram-contest-227860/>



<https://www.remarkablecoating.com/california/san-francisco-whiteboard-paint/>

KEY TAKEAWAYS

150 Million Tons
1:1 by 2050

Huge importance
of primary
micro plastics

Contamination
of the food chain

DISCUSSION

- ▶ What do you think about the way media communicates this issue?
- ▶ Do you know any other solution to fight against ocean waste (microplastics)?
- ▶ Do you think governments are doing enough to limit or ban the use of plastics?

REFERENCES

Avio C.G. et al. (2016). Plastics and microplastics in the oceans: From emerging pollutants to emerged threat, *Marine Environmental Research*. Elsevier, 1-3.

Carrington, D. (2017). Plastic fibres found in tap water around the world, study reveals, *The Guardian*.
<https://www.theguardian.com/environment/2017/sep/06/plastic-fibres-found-tap-water-around-world-study-reveals>

Coral Reef Alliance. (n.d.) *Coral Reel Biodiversity*. Retrieved November 07, 2018 from <https://coral.org/coral-reefs-101/coral-reef-ecology/coral-reef-biodiversity/>

Eumonia. (2016). Marine Plastics: we should fight them on the beaches. <http://www.eunomia.co.uk/marine-plastics-we-should-fight-them-on-the-beaches/>

FAO (2014) *The State of World Fisheries and Aquaculture: Opportunities and Challenges*.
<http://www.fao.org/3/a-i3720e.pdf>

Gall, S.C., & Thompson, R.C., (2015). The impact of debris on marine life. *Marine Pollution Bulletin*, Vol. 92, 170-179.

Glenza, J. (2017). Sea salt around the world is contaminated by plastic, studies show.
<https://www.theguardian.com/environment/2017/sep/08/sea-salt-around-world-contaminated-by-plastic-studies>

Good, K. (2015). Do You Eat Fish? You Could be Eating Plastic.
<http://www.onegreenplanet.org/environment/how-plastic-from-our-clothing-is-ending-up-in-fish/>

REFERENCES

Greenfacts. (2018). What are Microplastics and how do they enter the environment.

<https://www.greenfacts.org/en/marine-litter/1-2/3-micro-plastics.htm>

Herreria, C. (2017). The Islands Of Hawaii Hold One Of The Dirtiest Places In The World.

https://www.huffingtonpost.com/entry/kamilo-beach-hawaii-dirtiest-beach-america_us_58e99a38e4b05413bfe3792d

Julien Boucher, D. F. (2017). Primary Microplastics in the Oceans: a Global Evaluation of Sources. International Union for Conservation of Nature.

Kershaw, P.J., & Rochman, C.M. , GESAMP (2016). "Sources, fate and effects of microplastics in the marine environment: part two of a global Assessment" p.74-89.

<http://www.gesamp.org/site/assets/files/1275/sources-fate-and-effects-of-microplastics-in-the-marine-environment-part-2-of-a-global-assessment-en.pdf>

Lamb, J.B., Willis, B.L., Fiorenza, E.A., Couch, C.S., Howard, R., Rader, D.N., (...) Harvell, C.D. (2018). Plastic waste associated with disease on coral reefs. *Science*, Vol. 359(6374), 460-462. Retrieved from

<http://science.sciencemag.org/content/359/6374/460>

Liebezeit, G., & Liebezeit, E. (2014). Synthetic particles as contaminants in German beers: Food.

<https://www.tandfonline.com/doi/abs/10.1080/19440049.2014.945099>

Liebezeit, G., & Liebezeit, E.(2015). Origin of synthetic particles in honeys.

<http://agro.icm.edu.pl/agro/element/bwmeta1.element.agro-953d4b4d-549a-4bc6-9d95-2b10030b7552>

Lin, C. (2018). Nanoplastics in marine life can threaten human health. <https://www.scmp.com/tech/science-research/article/2148792/nanoplastics-can-accumulate-marine-life-and-threaten-human>

REFERENCES

Lin, C. (2018). Nanoplastics in marine life can threaten human health. <https://www.scmp.com/tech/science-research/article/2148792/nanoplastics-can-accumulate-marine-life-and-threaten-human>

Magnusson, K. (2017). Swedish sources and pathways for microplastics to the marine environment. Swedish Environmental Protection Agency.

Marcus Eriksen. (2014). Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111913>

Murar, K. (2017). Hawaii tourism industry sets records for sixth consecutive year. <https://www.bizjournals.com/pacific/news/2018/01/31/hawaii-tourism-industry-sets-records-for-sixth.html>

National Oceanic and Atmospheric Administration U.S. Department of Commerce (2018) What are Microplastics? <https://oceanservice.noaa.gov/facts/microplastics.html>

Rozalia Project (n.d.) A human scale solution to the biggest pollution problem facing our ocean: microfibers. <http://rozaliaproject.org/stop-microfiber-pollution/>

Taylor, M. (2017). *Plastic found in stomachs of deepest sea creatures*. Retrieved November 06, 2018 from <https://www.theguardian.com/environment/2017/nov/15/plastics-found-in-stomachs-of-deepest-sea-creatures>

Tyree, C., & Morrison, D. (2017) Invisibles. https://orbmedia.org/stories/Invisibles_plastics

UEG (2018) Microplastics discovered in human stools across the globe in 'first study of its kind', UEG Week. <https://www.ueg.eu/press/releases/ueg-press-release/article/ueg-week-microplastics-discovered-in-human-stools-across-the-globe-in-first-study-of-its-kind/>

Van Cauwenberghe, L., Vanreusel, A., Mees, J., & Janssen, C.R. (2013). Microplastic pollution in deep-sea sediments. *Environmental Pollution*, Vol. 182, 495-499.