The background image is a photograph of a dry, arid landscape. In the center, a large, thick, brown tree trunk stands prominently, its branches reaching upwards. The ground is rocky and uneven, with patches of dry, yellowish-brown grass. In the foreground, several animals are visible: a small brown dog on the left, a larger brown dog in the middle, and a black and white dog on the right. In the background, more trees and a clear blue sky with some clouds are visible.

Monitoring freshwater ecosystem health

Lis Mullin Bernhardt, Freshwater Ecosystems Unit
25 March 2019

SDG 6

“Ensure availability and sustainable management of water and sanitation for all”



Integrated management – across sectors and regions – balancing competing needs

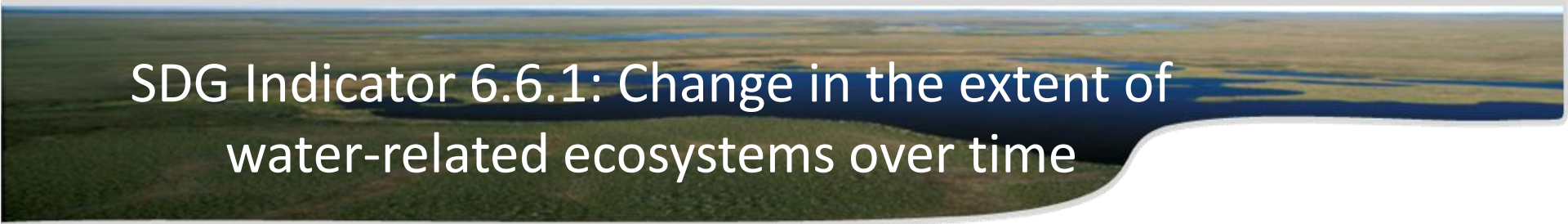


6.3.2 – N, P, EC, Ph, Turbidity / TSS

6.6.1 – Changes to FWE – spatial extent, quantity, quality

SDG target 6.6. By 2020, Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes



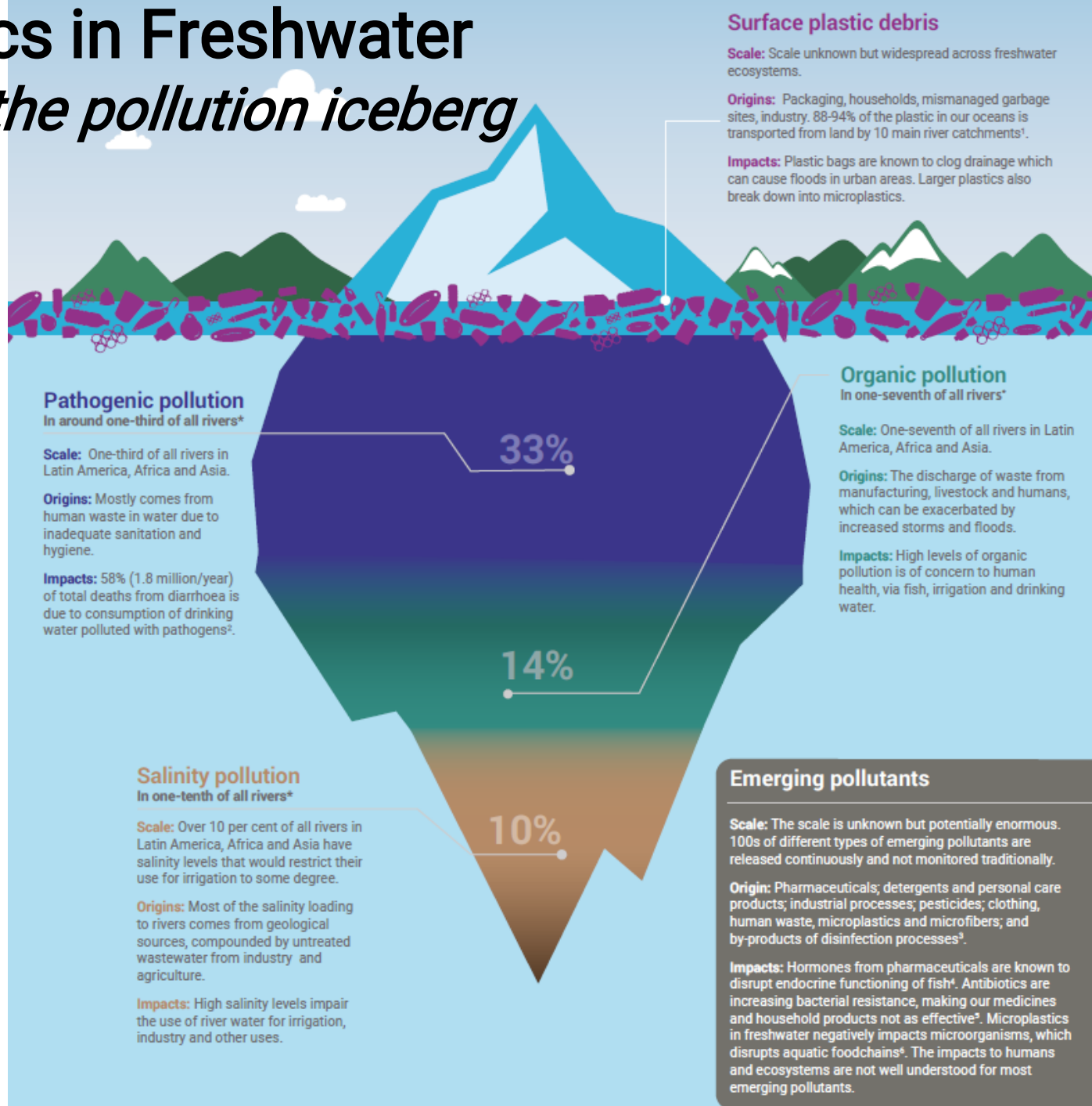


SDG Indicator 6.6.1: Change in the extent of water-related ecosystems over time

Ecosystem types	Extent/Volume/Flow sub-indicators	Ecosystem Health sub-indicators
Vegetated Wetlands (water dominated ecosystems such as swamps, marshes and peatlands)	Spatial extent/area	Wetland health indices
Inland open waters (lakes and reservoirs)	Spatial extent/area Quantity (volume)	Lake health indices Water quality (6.3.2)
Rivers and estuaries	Quantity (streamflow)	River health indices Water quality (6.3.2)
Groundwater aquifers	Quantity (depth to groundwater table)	Groundwater interaction with surface water

Plastics in Freshwater

Tip of the pollution iceberg



Recent findings and estimates ...

About 8 million tonnes of plastic enters the sea every year. If business as usual ... our oceans could contain **1 kg of plastic for every 3 kg of fish** by 2025, and **more plastic than fish by 2050**

10 river systems carry more than **90% of the global output of plastics** that ends up in the ocean. Two are in Africa (the Nile and the Niger) and the other eight are in Asia (the Ganges, Indus, Yellow, Yangtze, Haihe, Pearl, Mekong and Amur)

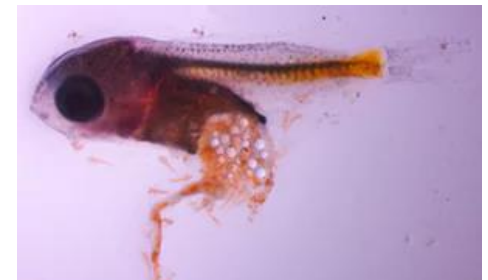
The **plastic debris floating** on the ocean surface accounts for **only 5%** of all the plastic trash dumped into the sea; the other 95% is submerged beneath the surface

Plastic trash has been found in both the Arctic and the Antarctic, **virtually nowhere in the Ocean is plastic free**

12 brands of **beer**, and 12 brands of **commercial sea salt** all contained plastic particles. More than 80% of **tap water** samples collected from over 5 continents tested positive for plastic

Are Microplastics dangerous?

- They are **indigestible and non-biodegradable** and **often contaminated** with heavy metals such as cadmium, chromium, and lead.
- Once released into the aquatic environment, plastics **attract and concentrates toxins**
- They are **mistaken for food by marine animals** and ingested.
- They **block the digestive system** of animals.
- Some plastics are so tiny that they **embed in the animal tissues**.
- They are **passed across the food chain**, and some find their way to humans.
- **Impacts of plastics in freshwater bodies differ** from those of ocean plastics because of the way we use freshwater ecosystems - we use it **directly for drinking, food production, industrial processes** among other uses.
- **Fate and effect of microplastics is still unknown.**



Recently started / ongoing work from UNEP on plastics in freshwater

1. Harmonizing monitoring methodologies using GESAMP for FWE (rivers)
2. Wastewater monitoring
3. Project / case study – one river (Nairobi / Athi)

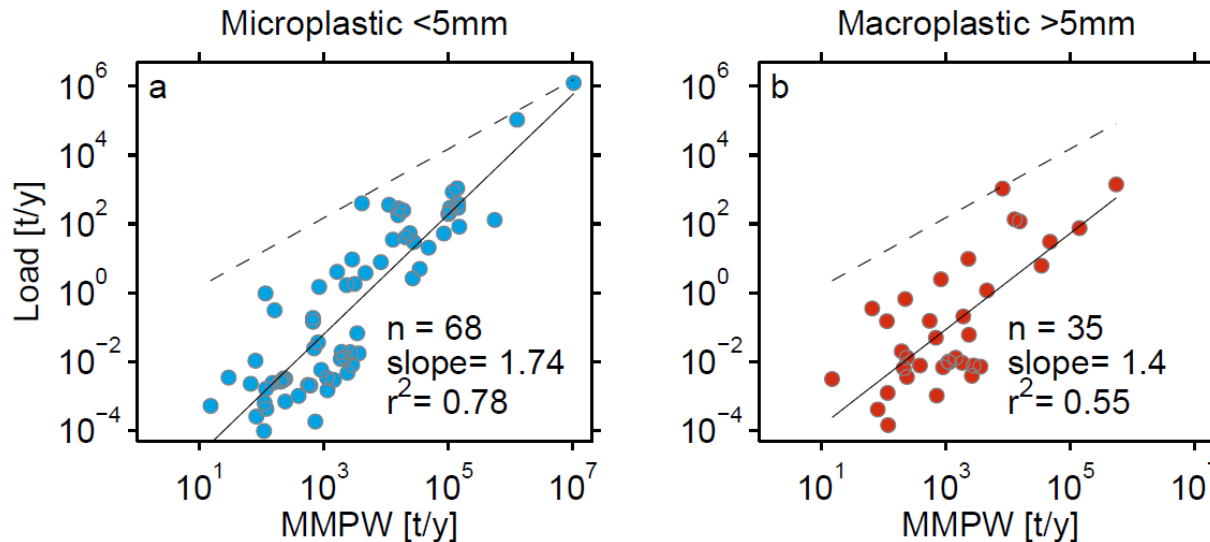
Harmonizing monitoring methodologies using GESAMP for FWE (rivers

World Water Quality Alliance – led by GEMS/Water

- Development of guidelines covering terminology and methodologies for the sampling and analysis (size and shape definitions, sampling protocols, physical and chemical identification methods, requirements for monitoring, etc
- Intervention and policy recommendations
- Final consultations (workshop, final recommendations – GESAMP)

UFZ – Helmholtz Center for Environmental Research, Germany
UNU-FLORES, Integrated Management of Material Fluxes and Resources

Plastic in rivers

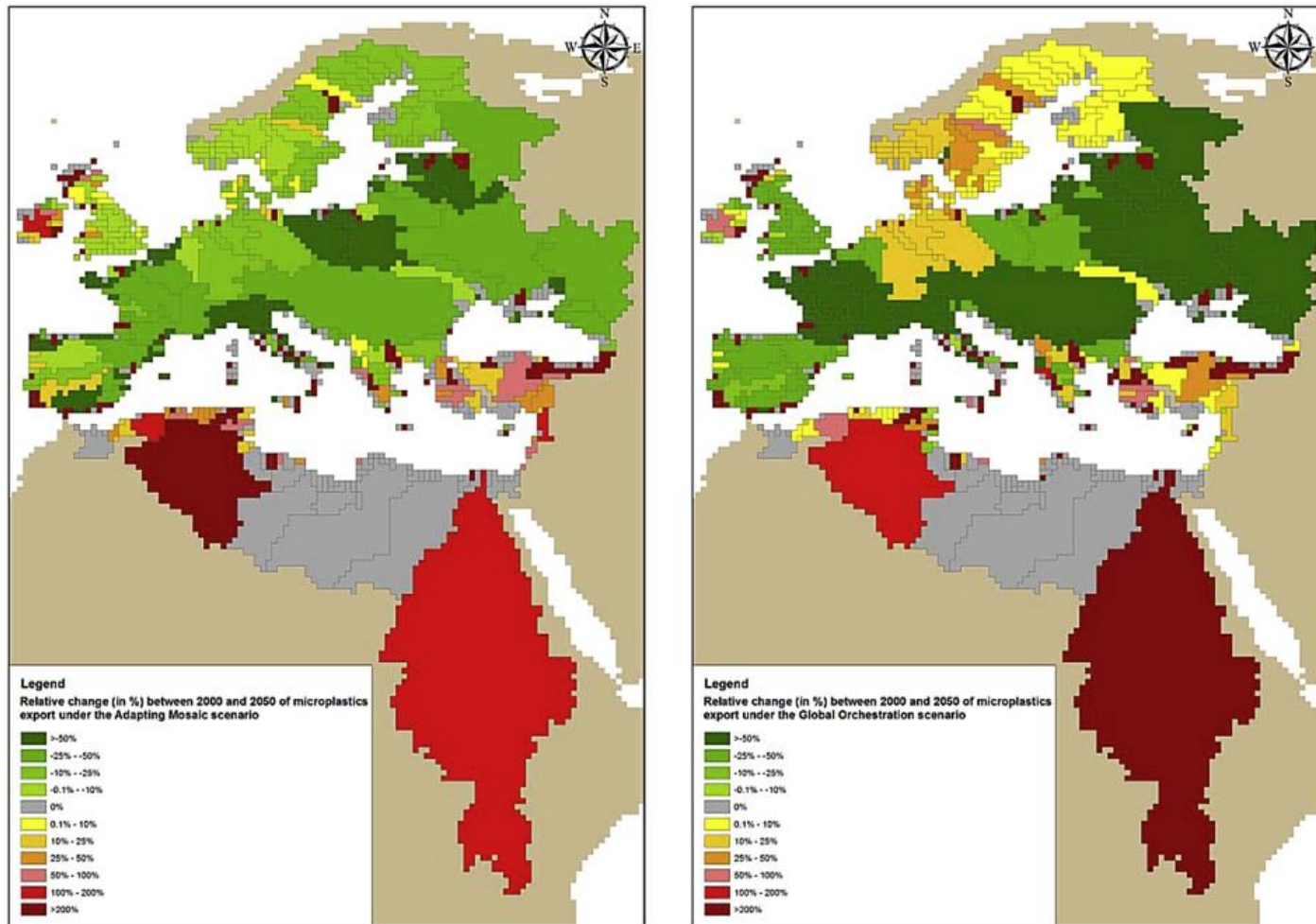


Relationship between Mismanaged Plastic Waste (MMPW) generated in the river catchments and observed plastic loads in rivers

Monitoring Proxies: sewerage/treatment/population density/GDP/transport

Schmidt et al. (2017)

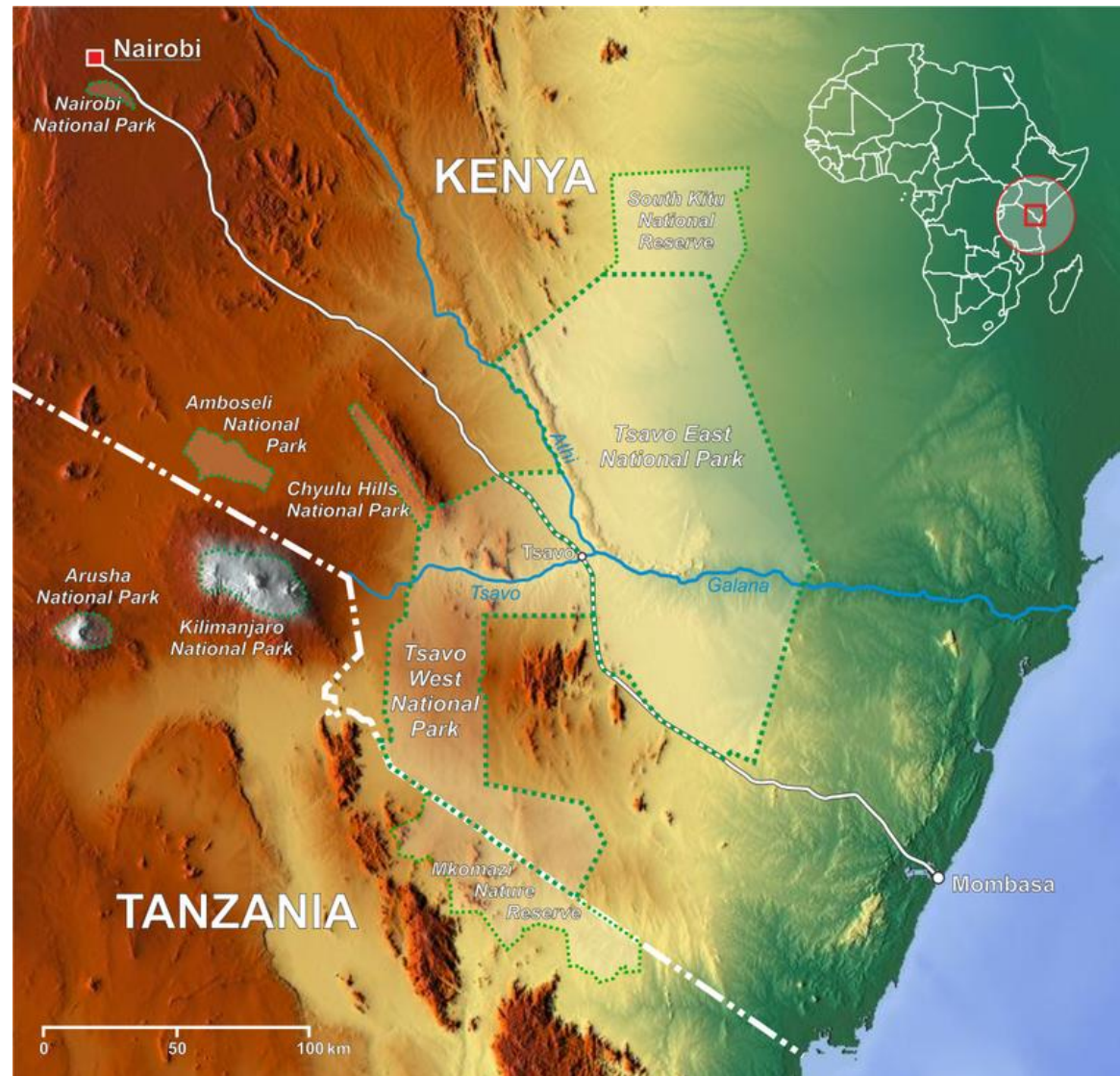
Projected Plastic load change between 2000 and 2050 (model estimate)



relative change (in %) between 2000 and 2050 in microplastics river export (load) for two scenarios, Adapting Mosaic (proactive env. management; achievable technology; left) and the Global Orchestration (rapid GDP increase – low population – sewerage connection & treatment higher; right). Green colours indicate that river export of microplastics in 2050 is lower than in 2000, yellow to red colours indicate increase.

3. Athi/Nairobi Athi River

- Citizen science expedition
- 9 March Media trip sand harvesting
- 16 March Rotary cleanup Fourteen Falls – matrix of actions, Rotary clubs, CSIRO river transect

















Questions

- Where – river – 3 different spots? NBO, Tsavo, coast?
- Waste management/solutions side
- Point/non-point entryways
- Model?



**SUSTAINABLE
DEVELOPMENT GOALS**

Thank you!

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<https://www.unenvironment.org/water>

