OCEAN POLLUTION: MESSAGE FROM A PLASTIC WHALE

Marte Haave[1], Dorothy J. Dankel[2], Anders Goksøyr[2]
[1]Uni Research, Bergen, Norway & [2]University of Bergen
marte.haave@uni.no, dorothy.dankel@uib.no, anders.goksoyr@uib.no

The Norwegian press was quickly on site to cover the beached whale

PROBLEM

The Ocean in the Anthropocene is becoming more and more defined by plastic pollution. The goosebeak whale that stranded outside Bergen, Norway January 2017 caught the attention of the world. Its stomach was blocked by plastics, making it starve. This was not the first animal to suffer from plastics, and will not be the last. The message from the whale was clear; waste is killing the Ocean. The public, politicians, scientists and the industry sectors responded, and plastic pollution is now high on the agenda. The **UN´s SDG 14.1** reflects this need to prevent and significantly reduce marine littering. **How can this be done**? And how do plastics really affect the Ocean? We must look into this. The graphic below addresses some of the knowns and unknowns.


Christoph Noever, University of Bergen

A scientist lays out the plastic content of the whale´s stomach: over 30 single use plastic bags

PLAN

To fully understand the implications of plastics, and to mitigate the detrimental effects, we need to approach plastic pollution the same way as other persistent environmental contaminants (PCB, DDT, Dioxins, lead etc).

A range of existing methods developed in toxicology can be adapted to plastic research:
- quantitative environmental analyses from macro- to nano-scale
- microplastic tolerance and toxicity thresholds

In addition we need to map:
- sources, dispersal and fate in the environment
- global monitoring of efficiency of mitigation

POLICY

Anthropogenic activities cause plastic materials to be ubiquitous in the environment. By defining plastics as a Persistent Organic Pollutant, and by **applying existing legislation and international systems, the production, trade and use of plastics can be controlled**, and the environmental dispersal limited.

The 3R´s Reduce, Refine, Replace can be applied for plastics:

Reduce
- Ban single-use household plastics
- Stimulate a strong circular economy and recycling

Refine
- Limit use of plastics to essential needs (medical, construction, sports)

Replace
- Stimulate innovation of sustainable and fully biodegradable material

FACTS

MACROplastics

- Global presence
- Entanglement, drowning
- Ingestion of macroplastics
- Blocking the stomach
- Damage to the ecosystem

Research Questions
- How much is there?
- Where is it?
- Where does it end up?
- Can invasive species hitch-hike?
- Who is affected?

MICROplastics

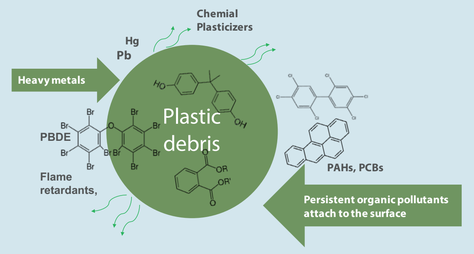
- Global presence
- Ingested by small animals
- Obstruction of the stomach
- Higher energy use
- Lower reproduction

Research Questions
- Environmental distribution and fate?
- Carrying bacteria and virus?
- Large scale uptake by Ocean plankton?
- Long term ecosystem effects?

Toxicity of plastics

- Plastics are persistent
- Foreign substances
- Plastics leak toxic chemicals
- Pollutants stick to plastic surfaces

Research Questions
- Leakage of plastic additives after ingestion?
- Increasing total chemical exposure?
- Cocktail effects?



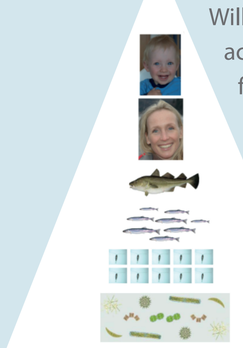
A **cocktail of chemicals** in the environment **sticks to the plastic surface.**

Chemicals added during production **leak out** from the plastic.

Food web threats

- Ingested by small animals
- May enter the tissue and "blood" in crabs
- Causes irritation in tissues

Research Questions
- Long term health effects of ingestion?
- Point of entry in the food web?
- Bioaccumulation with age?
- Biomagnification up the food chain?
- Who is at risk? Babies or elderly?



Will microplastic accumulate up the food chain like other pollutants?

At which trophic level will plastics enter the food web?

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SUSTAINABLE DEVELOPMENT GOALS