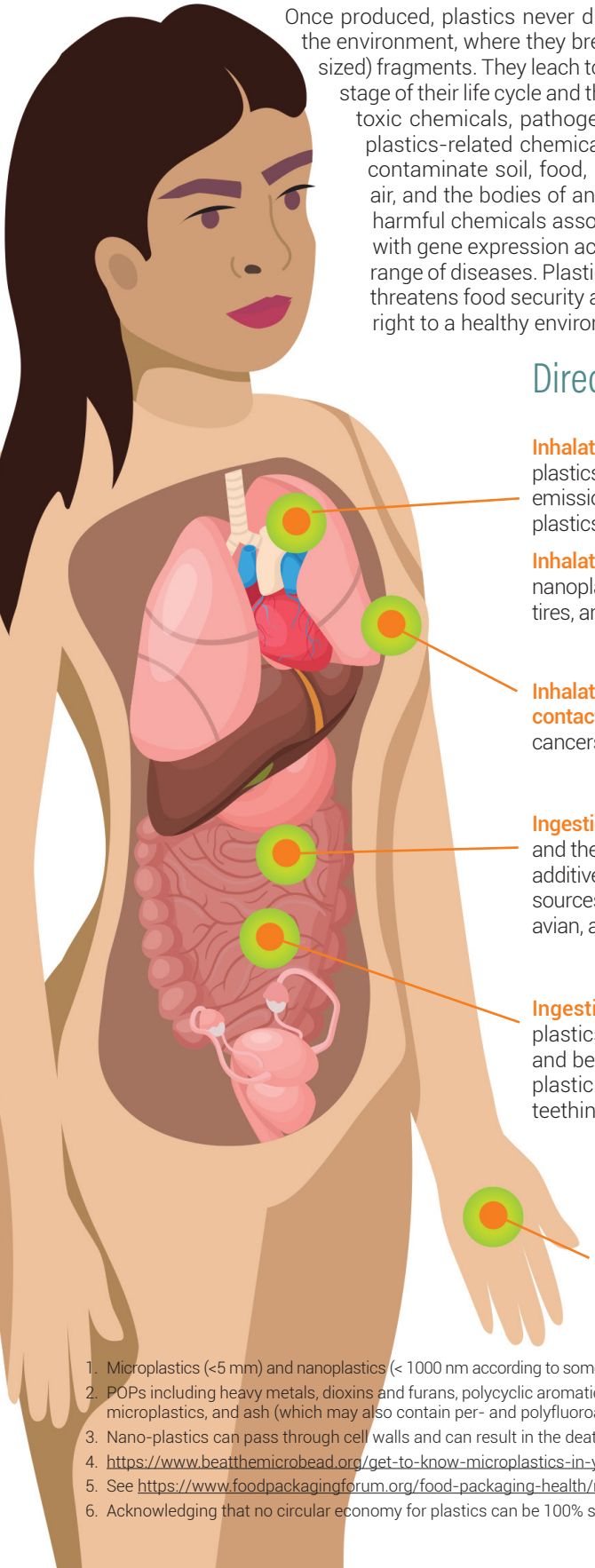
Plastics Impacts on Human Health in the Pacific Region

Once produced, plastics never disappear. They are released into the environment, where they break up into tiny (micro and nano-sized) fragments. They leach toxic chemicals and gases at every stage of their life cycle and they attract and transfer additional toxic chemicals, pathogens, and invasive species. Toxic plastics-related chemicals and nano- and microplastics contaminate soil, food, marine and freshwater sources, air, and the bodies of animals and humans.[1] Many of the harmful chemicals associated with plastics can interfere with gene expression across generations, causing a wide range of diseases. Plastic pollution, including marine litter, threatens food security and safety, human health, and the right to a healthy environment.



Direct health impacts

Inhalation of micro/nano plastics and toxic and hazardous emissions particularly when plastics are burned.[2]

Inhalation of airborne micro/nanoplastics from, among others, tires, and synthetic fabrics.

Inhalation, ingestion, and skin contact: EDCs increase risk of cancers and other diseases

Ingestion of micro/nanoplastics and their associated chemical additives in all exposed food sources (marine, freshwater, avian, and agricultural).

Ingestion of toxins leached from plastics packaging into food and beverages and from other plastic products such as plastic teething toys.

Skin contact when using cosmetics, and other products containing EDCs, micro/nano plastics and acrylates copolymer.[3]

Indirect and direct health hazards from plastics pollution include

Inhalation and ingestion of, and skin contact with, microplastics, nanoplastics, acrylates copolymer,[4] monomers, additives, and contaminant sorption (including persistent organic pollutants (POPS), endocrine disrupting chemicals (EDCs), carcinogens, and heavy metals, and Non-Intentionally Added Substances (NIAS).[5]

Human organ systems affected

- Cardiovascular
- Renal
- Gastrointestinal
- Neurological
- Reproductive
- Respiratory

Resultant diseases and developmental disorders include

- Cancers
- Diabetes
- Neuro-, reproductive and developmental toxicity

The genetic effects of EDCs and POPS can can pass on from parent to child for several generations.

Recommendation

A policy framework supporting a safe(r) circular economy for plastics in the Pacific region would help protect its peoples from the indirect and direct hazards posed by marine litter and plastics pollution.[6]

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1. Microplastics (<5 mm) and nanoplastics (< 1000 nm according to some authors or < 100 nm according to others).
2. POPs including heavy metals, dioxins and furans, polycyclic aromatic hydrocarbons (PAHs), carcinogens, EDCs, microplastics, and ash (which may also contain per- and polyfluoroalkyl substances [PFAS]).
3. Nano-plastics can pass through cell walls and can result in the death of cells.
4. https://www.beatthemicrobead.org/get-to-know-microplastics-in-your-cosmetics-2/
5. See https://www.foodpackagingforum.org/food-packaging-health/non-intentionally-added-substances-nias
6. Acknowledging that no circular economy for plastics can be 100% safe.

Indirect Human Health Hazards From Plastics Pollution

Threats to marine and freshwater food sources

Pacific communities depend on a safe and abundant supply of seafood as their main protein source. Plastics pollution, including marine litter, threatens safe, clean, healthy, and sustainable ecosystems and, therefore, human food safety and food security in the following ways:

- Strangulation, entanglement, and ingestion of wildlife from plastic litter (e.g., from abandoned, lost or otherwise discarded fishing gear).
- Rafting[7] of POPS on litter and microplastics and entry into human food chains (contaminant sorption).
- Rafting of invasive species and pathogens on marine and freshwater litter and microplastics across territories (biofouling).
- Leaching of toxic plastic monomers[8] and additives[9] from marine and freshwater litter and microplastics into marine organisms.
- Bioaccumulation and biomagnification[10] (trophic transfer) of microplastics and associated chemical additives in the marine food web.
- Plastic litter, microplastics, and toxic leachate from landfill failure, flooding, transboundary tidal flows, or waste management/circular system failure.

Climate change

Globally, 8% of fossil fuels are used for plastics production yet plastics are not produced in the region.The Pacific region is disproportionately impacted by climate change impacts all along the global plastics supply chain as well as the transboundary flows of plastics into the region exacerbate climate change impacts. Plastics exacerbate climate change impacts, and ozone depleting chemicals found in some plastics compromise access to a safe, clean, healthy, and sustainable environment.

Agricultural impacts

- Agricultural plastics (including microplastics in controlled release fertilizers and degraded or mulched plastic films) degrade soil health and contaminate produce.
- Leachate and plastic fragments from poorly lined and failing landfills can contaminate arable soils and water supplies.

Manufacturing and recycling

- Manufacturing and recycling of plastics expose waste workers and nearby communities to plastics pollution.
- Toxic NIAS[11] are introduced in the manufacturing and recycling of plastic products.

Mosquito-borne diseases

Discarded plastics offer ideal breeding conditions for mosquitos which can act as vectors for diseases such as dengue fever.

7. When organisms attach themselves to litter, particularly marine litter, and travel.
8. The building blocks of plastic polymers.
9. Additives in plastics can include plasticizers, flame retardants, antioxidants, acid scavengers, light and heat stabilizers, lubricants, pigments, antistatic agents, slip compounds and thermal stabilizers.
10. Bioaccumulation takes place in a single organism over its lifetime, resulting in a higher concentration in older individuals. Biomagnification takes place as chemicals transfer from lower trophic levels to higher trophic levels within a food web, resulting in a higher concentration in apex predators.
11. See https://www.foodpackagingforum.org/food-packaging-health/non-intentionally-added-substances-nias

Further reading

Plastic and Human Health: A Lifecycle Approach to Plastic Pollution

Plastic Ingestion by Fish in the South Pacific

A Comparison of Microplastic in Fish from Australia and Fiji

Non-intentionally added substances (NIAS)

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