for a toxics-free future

IPEN Submission of information and sources to further information on the lifecycle of plastics and human rights

Thank you for the opportunity to submit information related to the toxic lifecycle of plastics, the impacts on human health end the environment and its implications for human rights. We have provided a list of references to peer-reviewed literature at the end of this submission and also hyperlinks in the text for easy access. Many of the reports cited under each section below are relevant for several of the questions but are only added once.

Health and other impacts of uses of plastics, including in consumer products

Every stage of the lifecycle of plastic involves toxic chemicals, which threaten human health, the environment, biodiversity, and the climate. As a consequence, a range of human rights are impacted.

All plastics contain chemical additives that provide sought after properties such as color, flame retardancy, flexibility, etc. These additives are in most cases simply mixed in with the plastic polymer chains and not bound to the material. That means that these additives will leach out of the plastic, with high likelihood of exposing workers, consumers, waste handlers and other people handling these plastics.
An overview of the most common chemicals added to plastics was published by Hahladakis et al in 2018, publicly available here.

Many plastic additives have already known health impacts but health effects of a majority of them are still unknown. In addition, there are unintentional contaminants in plastics from the productions process. Further details of the health impacts of these are provided under the relevant section below.

Toxic additives to plastics and concomitant risks to human rights

While a range of chemicals are used in plastics, the composition of the plastic product is rarely disclosed to consumers, recyclers and waste handlers. Regulatory controls requiring labeling for these chemicals are mostly lacking. While consumers in the EU have the right to know if products contain any identified so-called "substances of very high concern", this information is only shared upon request to the manufacturer. There is very little ability of recyclers and waste handlers to get this information for the massive amounts of plastics entering into their systems.

The fact that chemicals with a range of potential health impacts throughout their lifecycle are added to plastics with very little transparency have high relevance for human rights. For example, it goes against the right to life, health, a healthy environment, safe drinking water and the rights of future generations.

There is increasing evidence about the need to address hazardous chemicals used in plastics. While many reports can be cited, two reports that are useful to illustrate the range of hazardous chemicals used in plastics are

- information from the EU Plastic additives initiative, showing that more than 40% of 418 substances confirmed by industry or registrants to be plastic additives are under regulatory scrutiny (posted here)
- an overview of known plastic packaging-associated chemicals and their hazards published by Groh et al in 2019 (posted here), including 4283 substances identified as likely or possibly associated with plastics. No hazard data was available for 60% of these substances. Of the 906 substances identified as likely associated with plastics, 27% had at least one health hazard classification in CLP (i.e. the EU regulation implementing GHS) and 13% at least one environmental hazard classification in CLP.

E-waste and information of exposure to toxic materials

Electronic products contain a range of toxic substances, including toxic metals such as cadmium in the components and toxic additives to the plastic casing such as brominated flame retardants. Much of the e-waste generated globally is exported to developing countries despite provisions under the Basel Convention restricting this, as well as national and regional regulations (e.g. the WEEE Directive in the EU). E-waste is also exported under the guise of "repair" to developing countries.

The Global E-waste Monitor provide a range of statistics showing the extent of the global problem of e-waste, for example that in 2019, e-waste handling were covered by a policy, legislation, or regulation in less than half of all countries in the world. It shows that in 2019, "the world generated a striking 53.6 Mt of e-waste, an average of 7.3 kg per capita. The global generation of e-waste grew by 9.2 Mt since 2014 and is projected to grow to 74.7 Mt by 2030". Also, it highlights that the fate of 82.6% (44.3 Mt) of e-waste generated in 2019 is uncertain, It also provides examples of the significant health impacts of e-waste handling in Chapter 8.

In receiving countries such as Ghana, the electronics are manually broken apart and metals harvested whereas plastic components are mostly burned in the open generating toxic fumes containing dioxins, PAHs and other POPs. This in turn leads to poisoning of the food chain, see IPEN and BAN report Weak Controls: European E-waste Poisons Africa's Food Chain.

Health and environmental impacts of technologies presented as "solutions" to the plastic pollution problem, such as incineration and plastic-to-fuel technologies

Incineration of plastic waste continues to grow with 25% of global plastic waste incinerated in 2015. With a 0.7% increase in plastic incineration annually since 1980, current trends extrapolated to 2050 suggest that 1 800 million tonnes of plastic will be produced and 900 million tonnes of plastic will be incinerated annually, globally in the year 2050. Incineration of plastic waste results in the creation of unintentionally formed POPs (UPOPs) such as dioxins and furans, brominated dioxins, PCBs and dioxin-like PCBs. Annex C Part II of the Stockholm Convention lists waste incinerators as one of the primary sources of these highly toxic and persistent chemicals. Modern incinerators have not solved the problem of dioxin emissions but have hidden their worst emissions within a regulatory framework that fails to measure them correctly.

Incineration facilities have added more complex flue gas filtering equipment to reduce these emissions but have had the effect of transferring dioxin and other UPOPs into the fly ash and bottom ash residues of the incinerator which can comprise as much as 30% by weight of the waste burned. This results in millions of tonnes of POPs contaminated ash being generated annually around the world. Attempts to find 'beneficial' uses for this ash such as construction material has led to leaching of POPs into the environment contaminating the food chain.

Incinerators also destroy resources that could otherwise be recycled, have a very large carbon footprint, tie up municipal capital, draw down on public subsidies and tax breaks designed for renewable energy. They also stifling waste management innovations due to their 30 year operational life. The pollution issues associated with incinerators have placed them at the centre of environmental justice concerns for decades. Incinerators are mainly sited in locations with low income, low education and among ethnic minorities with reduced ability to leverage political resistance to new incinerator proposals. Cumulative distributive risk patterns are rarely considered in city planning and environmental impact assessments allowing an increased concentration of incinerators in vulnerable communities.

Plastic to fuel technologies have similar risks, toxic emissions and environmental justice problems as incinerators, especially if the fuel is combusted at the processing site. Plastic to fuel technologies are of two main types, solid Refuse Derived Fuel (RDF) and liquid or gas hydrocarbon based fuel.

The first, RDF, consists of pellets or bales created by shredding and compacting municipal waste with a high calorific content based mainly on plastic but also paper, timber and other combustible waste fractions. The output is sold as 'fuel' and not waste. It is burned in cement kilns and incinerators as an 'alternative' to fossil fuels but in reality has a high petrochemical content due to the plastic fraction. Burning of plastic waste high in chlorinated, brominated or fluorinated compounds acts as a promoter of UPOPs formation in emissions. Trading RDF from wealthy to poorer countries avoids the restrictions on 'plastic waste' from the recent Basel convention amendments as RDF is classified as a 'product' and not a 'waste'. In this way the export of waste from wealthy countries to poorer nations can continue as usual.

The second type involves the conversion of plastic waste to hydrocarbon fuel (mostly a diesel like product) or a synthetic gas product (syngas) from processing via pyrolysis or gasification. Pyrolysis and gasification of plastic can create elevated UPOPs emissions, POPs contaminated fuel/syngas and PAH and POP contaminated residue (char). When the fuel product or syngas is combusted the POPs contaminants are released to atmosphere. Some pyrolysis units use a lot of the fuel they create to burn and provide the high levels of heat required by the process. Burning the output fuel onsite creates additional localized pollution issues and raises similar environmental justice considerations as waste incinerators. The high carbon footprint and low quality, contaminated fuel output of these processes prevents them from being considered a 'solution' to plastic waste.

Many 'chemical recycling' techniques currently touted as a solution to plastic waste are based on pyrolysis and suffer from the same problems as plastic to fuel pyrolysis. In an attempt to remove toxic additives from the polymer/monomer stream and purify them for use in new plastic, a large new hazardous waste stream will be created.

Information gaps regarding the lifecycle impacts of plastics

Since chemical additives in plastics are rarely disclosed throughout the lifecycle, this is a big information gap and often an overlooked issue.

A report on Plastic's toxic additives and the circular economy, originally prepared as an INF document for the 2019 Conference of the Parties to the Basel and Stockholm Conventions and later formatted, translated and distributed, goes into depth of many of the lifecycle aspects but also identifies information gaps throughout the lifecycle such as:

- Challenges of the life cycle management of plastics in the circular economy, and the issue of POPs and other toxic chemical additives
- Phase-out and substitution with non-toxic alternatives to avoid regrettable substitution
- Migration and release potential of various additives present in plastic during use
- Difficulty in performing exposure-based risk assessments of products for recycling
- Emission and leaching of potentially toxic substances in plastic waste

IPEN has produced several reports around the issue of so-called toxic recycling, i.e. allowing recycling of plastics containing hazardous chemicals and that can generate new toxic chemicals such as dioxins that then end up in the new products:

- Toxic Loophole: Recycling Hazardous Waste Into New Products
- POPs Recycling Contaminates Children's Toys with Toxic Flame Retardants
- Toxic Industrial Chemical Recommended for Global Prohibition Contaminates Children's Toys
- Toxic Soup: Dioxins in Plastic Toys

The focus has mainly been on brominated flame retardants exempted for recycling under the Stockholm Convention and more information is needed on the fate of other hazardous chemicals in plastics.

The potential health impacts of toxic recycling of brominated flame retardants by Groh et al was published in an Chemosphere article in 2020 on Detection of high PBDD/Fs levels and dioxin-like activity in toys using a combination of GC-HRMS, rat-based and human-based DR CALUX® reporter gene assays.

Plastics impacts on the most vulnerable groups in society, including workers, children and indigenous from toxic exposure to plastics

There is overwhelming evidence that vulnerable groups in society are being exposed to toxic substances as a result of exposure to plastic wastes. There is also evidence that toxic chemical additives in plastic represent a significant health risk to recycling workers. Plastics containing POPs BFRs can generate dangerous exposure for recycling workers, including releases of brominated dioxins at the remelting and extrusion phase (He et al. 2015, Huang et al. 2013, Tang et al. 2014, Labunska et al. 2013). Unless carefully separated from polymers that are not contaminated by POP BFRs, these POPs can leak into the overall polymer recycling chain, ending up in products such as toys and kitchen utensils that increase human exposure, especially among children as well as in food contact materials and household products (Puype et al. 2015).

In some developing countries that have recently been the subject of large imports of plastic waste from developed countries following the China National Sword policy implementation, widespread environmental pollution has been reported. The practice of open burning the unrecyclable plastic waste imports or burning plastic waste as fuel has led to severe POPs contamination of local soil and the food chain. Previous reports by IPEN exposed similar problems of human exposure and food chain impacts in Ghana where a mix of domestic and imported e-waste plastics are burned to access valuable metals in electronics.

It follows that similar contamination occurs wherever plastic waste is open burned. This has health implications for waste pickers in the informal economies of many countries who collect recyclables from landfills sites and open dumps which are often subject to continuous burning and smouldering of plastic wastes.

Effects of endocrine-disrupting chemicals, in plastics, on human health, particularly in women and children

Many plastic additives have endocrine disrupting properties. A recent report on Plastics, EDCs & Health by the Endocrine Society in collaboration with IPEN provides insights into impacts of the most common ones such as phthalates, bisphenols, brominated flame retardants, toxic metals and UV stabilizers. The report also looks into exposure routes to endocrine disrupting chemicals in plastics.

Persistent Organic Pollutants (POPs) in plastics

Several of the POPs listen under the Stockholm Convention are used as additives in plastics (e.g. the brominated flame retardants and SCCPs), and two more are under consideration by the POPs review Committee (UV-328 and Dechlorane Plus).

Plastics that are contaminated with persistent organic pollutants (POPs) because they have been deliberately added to impart a property to the plastic (fire retardancy, etc.), or because they have been inadvertently added because the POP is a trace contaminant of another additive, or because the plastic in its waste form has become contaminated by POPs (as is the case for some marine plastic litter), in most cases need to be considered separately from most other forms of plastic waste. The Stockholm Convention on Persistent Organic Pollutants requires all parties to destroy or irreversibly transform POPs waste (including POPs-contaminated plastic) so that it no longer exhibits POPs characteristics. These characteristics include toxicity in tiny amounts, persistence in the environment, ability to travel long distances, and bioaccumulation in fatty tissues of living organisms causing food chain contamination.

To be defined as POPs waste and subject to Stockholm Convention Article 6 measures, the plastic must contain one or more POPs that for each POP exceeds a prescribed concentration level known as the Low POP Content Level (LPCL). These levels are reviewed periodically, and are sometimes reduced as science demonstrates that POPs are harmful at lower levels than previously understood. So, if a piece of plastic contains a POP or a mixture of POPs at a concentration exceeding the LPCL, it must be destroyed and not recycled, unless the POP can be removed and managed separately (there are some cases where this is possible).

Common plastic uses where POPs have been deliberately added include electronic goods (flame retardants - PBDEs), vehicle and aircraft plastic interiors and upholstery (flame retardants - PBDEs), electrical cable sheaths (plasticisers and flame retardants - SCCP), synthetic textiles in furniture, carpets and other floor coverings (water and grease resistant coatings – PFAS).

All of these uses of plastic and plastic derived synthetic textiles increase human exposure and contribute to the body burden of POPs in vulnerable groups such as pregnant women and children. Most POPs are powerful endocrine disruptors and can have significant development effects on unborn children if the mother is exposed during critical developmental windows for the fetus.

References

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