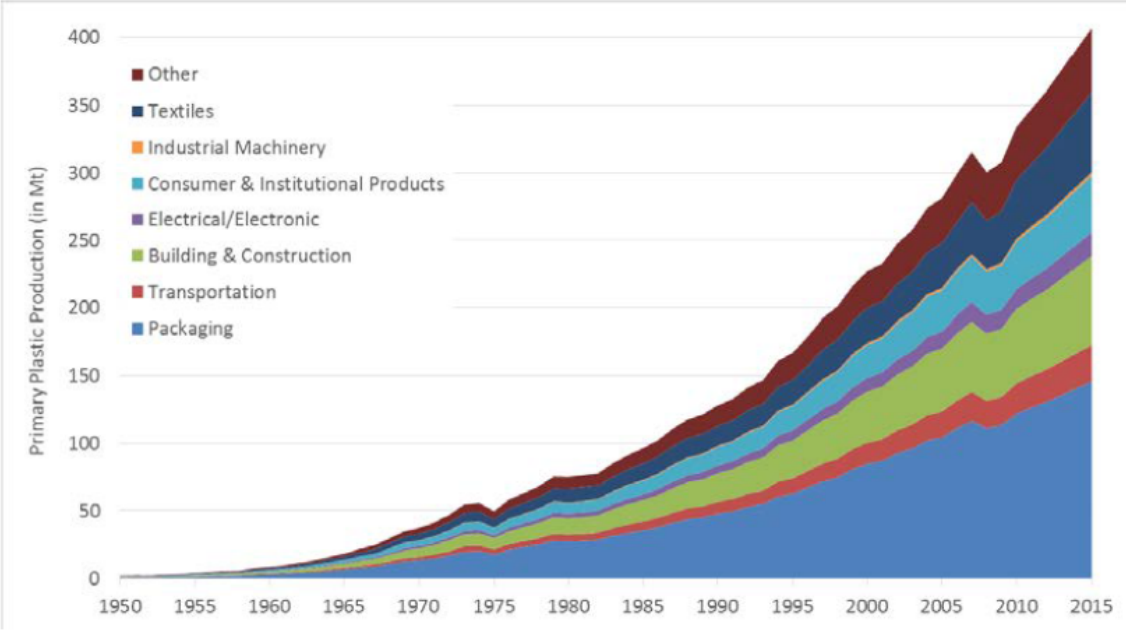
Plastics in the Interface between Chemicals, Products and Waste

Since 1950 plastics have rapidly become one of the most commonplace materials on the planet. In 2015, global plastics production reached 407 million tonnes per year, making it more than the production of paper (400 Mtpa), fish (200 Mtpa), and aluminium (57 Mtpa).

Figure 1. Global plastics production: 1950 to 2015



Source: Geyer, R., J. Jambeck and K. Law (2017), "Production, use, and fate of all plastics ever made", *Science Advances*, Vol. 3/7, p. e1700782, http://dx.doi.org/10.1126/sciadv.1700782.

overconsumption of plastic is feeding the ever growing petrochemical industry and plastic's production is expected to continue to grow by 40% until 2030. If production continues to grow at similar rates, plastics production will reach 1 600 million tonnes in 2050. Today, plastics are one of the most commonplace materials on the planet.

The fact that plastic is very cheap is certainly contributing to a massive global expansion. If present trends continue, there will be more plastics in the ocean than fish by weight[1].

The proliferation of plastics use, in combination with poor end-of-life waste management, has resulted in widespread, persistent plastics pollution. Around 6 300 million tonnes of plastics waste are thought to have

[1] According to a report by the World Economic Forum and the Ellen MacArthur Foundation,

been generated between 1950 and 2015, of which only 9% were recycled, and 12% incinerated, leaving nearly 80% to accumulate in landfills or the natural environment. Plastic pollution is present in all the world's major ocean basins, including remote islands, the poles and the deep seas, and an additional 5 to 13 million tonnes are introduced every year. Plastics can be considered as the new persistent organic pollutants (POPs).

There is strong evidence that plastics are **persistent**. The **longevity of plastics** that accumulate in the natural environment is very problematic since they will only decompose over hundreds, or even thousands of years, during which time they fragment into smaller microplastics and nanoplastics.

Plastics undergo **long-range transport**, as documented by their widespread presence in remote oceans.

The concept of **bioaccumulation and biomagnification is also met by some plastics:** there is evidence that microplastics are present in top predators and are transferred up the food chain. Marine wildlife is harmed through ingestion of plastics or entanglement, with negative implications for ecosystem health and the overall sustainability of fisheries.

Plastics pollution also poses **risks for wildlife and human health**. According to UN figures, plastic debris causes the death of more than a million seabirds every year, as well as more than 100,000 marine mammals. Adding a further layer to the problem, the UN says the plastic in the oceans is "loading the human food chain with potentially cancer-causing toxins". High levels of bisphenol A (BPA), chlorinated flame retardants, parabens, lead and polychlorinated biphenyls (PCBs), some of which have been banned or restricted in Europe for many years, have been found in marine wildlife in the region, showing how long some plastics have been in the seas.

Other economic costs for cleaning up the beaches known to have high concentrations of plastics litter. Taken together, the economic cost of these impacts has been estimated at USD 13 billion per year.

Another issue of great concern is that toxic (even banned) chemicals are increasingly being found in consumer products made of plastic recycled materials such as Octa and Deca BDE in children's toys made of recycled plastic from electronic products, PBDE in plastic food contact materials or PAHs in rubber playgrounds made of recycled tyres.

As an attempt to address this unsustainable rhythm and findings, the European Commission has proposed a Plastic Strategy which actually mostly addressed the problem of plastic recycling. It needed to be completed by a broader approach in the matter, such as the one discussed under the Interface between chemicals products and waste legislations. The debate currently framed by the Commission not only proposes an appropriate horizontal angle, but also identifies the relevant challenges to be addressed. Rethink Plastic Alliance welcomes that:

> "The results of the interface analysis, which are relevant to all waste streams and recycled materials, will feed into the future EU strategy for a non-toxic environment and will also inform the implementation of the plastics strategy[2]".

As the Commission has pledged to make all plastics recyclable by 2030, the EU must take a stand either for quality-and-safety-watched recycling, and solely for all-recyclability. This is a unique opportunity for the EU to respond to an existing reality where at the moment, safety of the materials used in an economy destined to be circular cannot be guaranteed, and where their low price, poor collection rate, disincentivise for the use of alternatives. This is despite now well documented evidence of widespread ocean pollution, impacts of plastics and their additives on health and the environment, single-use based consumption models,

The interface is particularly fitted to tackle the deadlocks of short life-duration products that currently do not guarantee safety and are the exact opposite of a sustainable practices. With regard to plastics, the rationale

[2] European Commission, Staff working document accompanying the Communication on the implementation of the circular economy package: options to address the interface between chemical, product and waste legislation, SWD(2018) 20 final , 16 January 2018, available at: https://ec.europa.eu/docsroom/documents/27321

must focus around preventing unnecessary uses of a material with heavy life-cycle impact, with very short-life applications given the life-cycle assessment of the material.

How to define substances of concern?

Defining a "substance of concern" is of particular importance in this case as plastics and its additives are now detected in (almost) all population: an adult accumulation of plastic is constant in consumers, in workers but also in the environment, in the food chain. An infinite quantity of consumer items is made from plastic and exposure to the substance is now constant from the embryonic life to the end of life. However, exposure to plastics and related chemicals has been linked to a number of serious health effects including cancer, birth defects, dysfunctional immune and reproductive systems, and damages to the central and peripheral nervous system.

Plastics contain a number (up to thousands) of substances which are added given their properties of plasticiser, flame retardant, solvent, stabiliser, lubricant, biocide, etc. Various of these chemicals have been identified on different lists for their hazardous properties such as decaBDE, styrene, bisphenols, phthalates. Some of those chemicals should be identified as substances of concern given their harmful properties on health or the environment: some are endocrine disruptors; carcinogenic, mutagenic of toxic for reproduction (CMRs); etc.

For these reasons, Rethink Plastic Alliance believes that a comprehensive definition of a "substance of concern" is most appropriate to tackle the related challenges of plastic and identify the substances which literally, "give rise to a concern". Among them should be:

- All substances meeting the properties referred to in Article 57 of REACH Regulation (EC) No 1907/2006; this would consequently cover substances identified as category 1A and 1B carcinogenic, mutagenic, toxic for reproduction – referred as "CMRs"[3], very persistent and very bioaccumulative substances, persistent bioaccumulative and toxic substances, endocrine disruptors, neurotoxins and sensitisers. As an example of good practice, the EU Ecolabel scheme has adopted cut-off criteria, prohibiting the use of substances meeting the properties of Article 57 in Ecolabelled products[4].
- substances listed in Annex VI of the CLP Regulation for classification of a chronic effect as referred into the Commission's proposal, but also substances of concern for the environment;
- substances regulated under the Stockholm Convention (POPs);
- specific restricted substances listed in Annex XVII to REACH;
- specific substances regulated under specific sectorial/product legislation such as the mercury regulation, the toys regulation, the restriction of hazardous substances in electrical and electronic equipment regulation, etc.…
- other substances of equivalent level of concern;

As the composition of plastic is constantly evolving, we believe that grouping chemicals with similar properties such as bisphenols, phthalates, brominated flame retardants, is a relevant regulatory approach.

[3] It must be highlighted that the 2018 REACH REFIT evaluation recognised that the regulation still fails to properly apprehend and regulate CMRs category 1A and 1B manufactured or imported in quantities lower than 10 tonnes per year, implying that more regulatory actions are required to properly regulate these substances; having these substances identified as substances of concern could be a way to bypass this shortcoming;

[4] European Commission Joint Research Centre, Findings of the EU Ecolabel Chemicals Horizontal Task Force, Proposed approach to hazardous substance criteria development, specifically Appendix 2, 24th February 2014, available at: http://ec.europa.eu/environment/ecolabel/documents/Chemicals%20HTF_Approach%20paper.pdf

Design non-toxic plastics

Product design legislations must ensure considerations for chemicals of concern from the design stage, along the whole life-cycle of the products and materials.

A fundamental step to contribute to that objective is to improve chemicals management. EU and national policymakers must:

- Ensure compliance with chemicals legislations, which includes stricter and harmonised enforcement actions;
- Make use of the grouping technique to identify and control more strictly and quickly chemicals, which incidentally contributes to ease the identification of substances of very high concern;
- Improve information on substances, including by ensuring full traceability of chemical composition;

But as substances of concern are included into articles and end up in waste, it is equally important to create real harmonisation amongst the different frameworks in order to guarantee safe manufacture, use, reuse, recycling and disposal of the plastics.
Specific product legislations must urgently include sustainability, systemic life-cycle approach and chemicals risks considerations.

In the case of plastics, the recyclability of the material should not be, as it currently is, the only factor considered to assess the sustainability of the material. Instead, the life-cycle assessment of plastics should consider:

- The fossil and petrochemical feedstock of the material;
- The health and environmental risks of the polymers and their additives (their chemical risks and toxicity impacts) as well as the risks arising from plastics and its additives during the use, re-use of the product;
- The exposure to plastic additives from workers operating in recycling facilities;
- The shortcomings of the current plastic recycling system: separation of mixed plastics is often not possible, contaminations occur, cycle of mechanical recycling (the most frequent option so far), legacy chemicals are often not identified, polymer immiscibility and mixed plastics, the necessity to add additives for polymers recycling, the limited times a material can undergo a recycling process;
- Whether the disposal of the material would be a safer solution than recycling a plastic containing substances of concern;
- The inefficient collection leading to discards in the environment of a persistent material with additives of potential concern;
- The possibility to ensure that recycled plastics from specific sources is kept in controlled and closed loops, with full traceability.

Product legislations must regulate the presence of SoC from the design stage. To that end, product design legislations must provide extended producer responsibility schemes to address the use of chemicals of concern in products and penalise the use of hazardous substances to prevent toxic materials and achieve substitution.

Track chemicals of concern in plastics

Chemicals are used and released during production, use, end of life and dismantling and recycling of plastics. As recognised in the SWD[5], there is a great lack of information on chemicals in plastic products and waste leading to uncertainties about the safety of recycled plastics for sensitive applications. But without sufficient

[5] European Commission, Staff working document accompanying the Communication on the implementation of the circular economy package: options to address the interface between chemical, product and waste legislation, SWD(2018) 20 final , 16 January 2018, available at: https://ec.europa.eu/docsroom/documents/27321, P.8

information on the additives contained in plastics, the risks due to exposure to substances of concern cannot be properly managed. However, the ubiquity of plastics, the circularity objectives increase the risks of exposure to unknown and untraced substances.

Rethink Plastic Alliance believes that the presence of chemicals of concern in products must be tracked as soon as 2025. It should be tracked under a harmonised framework, to avoid duplication of obligations. For practicability reasons, some sectors could be prioritised given the urgency to address chemicals of concern in their content (such as textiles, food contact materials, toys, furniture) or given their impact on the environment (construction material).

We also support a system tracking all chemicals in articles by 2030; this system would be facilitated by a prior voluntary scheme to disclose the full content of an article, which would then become compulsory by 2030. That system would contribute to mitigate the legacy chemicals problems by enabling the identification of all substances in products, including of those later identified as of concern. It would also contribute to enforce the citizen's right to know, facilitate enforcement competence of authorities and enable companies to adopt appropriate chemicals management measures and comply with regulatory requirements.

Towards safer plastics streams

To achieve safer plastic requires proper measures to avoid and substitute substances of concern in the first place and to avoid contaminating secondary streams. Circularity of plastic cannot justify toxic recycling. The interface discussion is the proper framework for policy makers to address the presence of potentially harmful chemicals with design solutions, chemicals regulations and prevention practices. Rethink Plastic Alliance strongly supports establishing same requirements for virgin and recycled materials as a basic principle of a circular economy.

We believe that allowing substances of concern in secondary plastic streams must not be identified as a sustainable solution: instead of contributing to circularity, this only perpetuates contamination of plastic streams for decades. However, in very specific occasions and under rules adopted by European legislators, case by case assessments of the different end-of-life options (including removal, destruction, landfilling, incineration, etc.) might allow the presence of substances of concern in re-use or recycle streams under strict conditions that are:

1. To prohibit the presence of substances of concern for certain consumer applications such as packaging, toys, textiles, furniture and food contact materials;
2. To exclude the presence of substances for which safe exposure thresholds cannot be established along the whole life-cycle: among these are persistent organic pollutants (POPs), PBTs and vPvBs, endocrine disruptors; CMRs should equally not be allowed in plastic streams.
3. Specifically designed impact assessments should ensure the protection of health and the environment and the uptake of the resulting secondary plastics. They should assess whether decontamination is a preferred option, the impacts of the presence of substances of concern in the plastic, the number of recovery phases the plastic can undergo before becoming unsuitable for recycling, etc.;
4. The use of recycled plastic must be kept in guaranteed closed and controlled loops;
5. The chemical content must be fully traceable throughout the life cycle of the plastic;
6. Appropriate labelling must indicate the presence, the name, the location and the quantity and specific safety information of the substance of concern, thanks to tools such as for instance barcodes, QR codes, numbers;

Imported articles

The EU must conduct enforcement measures to prevent the presence of substances of concern in imported articles as well as compliance checks on safety data sheets and control of imports in Member States. Goods

imported to the Union must be effectively subject to the same rules as EU-produced goods. This is of particular importance for plastics, given their globalised supply chains.

The suitability of the REACH Authorisation procedures must be assessed to address this issue. Restriction procedures under REACH must be used to monitor substances subject to Authorisations under REACH: those substances must be efficiently restricted in imported goods.

End-of-waste criteria for plastics

Efficient end-of-waste criteria depend on the quality of the material to be subject to that status. Here again, it requires a holistic understanding of the interface challenges. We insist that plastic streams need to be cleaned up from the start, not solely at the end-of-waste phase (with design and EPR schemes, removal solutions for instance). This would contribute to remove components reducing the quality and safety of the end-of-waste, thus making criteria applying more easily.

We believe that the criteria should be harmonised at EU level to avoid inconsistencies amongst Member States. They should ensure a high level of protection of health and the environment and must not permit the presence of substances not allowed in virgin materials.

Classifying plastic waste

The classification of waste should reflect intrinsic hazard properties of substances contained in plastic waste, aligned with the CLP Regulation. However, updates in current existing legislations are necessary to respond the challenges of the interface. The European List of Waste (LoW) classification should be revised and updated and the Classification, labelling and Packaging (CLP) Regulation must better reflect endpoints and properties such as high persistence, bioaccumulation, endocrine disruption, neurotoxicity; it must also address mixture toxicity and non-threshold substances.

Bioavailability and bioaccessibility cannot guarantee sufficient health and environmental safety as plastic streams are constantly contaminated with substances not yet apprehended by those biotests. In fact, biotests should be use as last sort, when no conclusions have been reached with conventional chemicals analysis.