Comments on the Plastic Waste Technical Guidelines

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Comments on the Draft Updated Technical Guidelines on the Environmentally Sound Management of Plastic Wastes and for their Disposal

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I. Overview

We recognize the significant work of the SIWG since 2019, and the welcome emphasis on waste prevention. However, it is much too early for to adopt these draft guidelines, for the following reasons:

1. The draft guidelines **provide more confusion, rather than clarity, on the plastic amendments:**
    - by failing to clearly identify plastic waste streams that fall under the plastic amendments, including by failing to address multiple Basel Annex IX entries that could overlap with Y48;
    - by failing to clarify the difference between ESM R3 operations, and non-ESM R3 operations;
    - by offering vague language on the issue of contamination.

2. The draft guidelines **lack emphasis on plastic waste prevention**, and in particular on reduction, reuse, and repair.

3. The draft guidelines **fail to provide a clear definition of R3 plastic recycling as plastic-to-plastic processes,** including chemical processes that yield substances that are highly likely to be hazardous and have no track record of displacing virgin plastics in the economy.

4. The draft guidelines **fail to provide guidance on ESM or distinguish between ESM and non-ESM plastic waste-management operations**. This is in spite of the clear mention of ESM in the title of the guidelines, which should be discarded if the guidelines are not significantly amended in this regard. Instead, the guidelines list many non-ESM operations, particularly chemical recycling, with a bias towards these unproven technology concepts.

5. The draft guidelines **fail to address the real, practical, difficulties of plastic waste management** which make ESM so important, including:
    - hazardous gaseous emissions during plastic waste-management operations, including harm to workers' health during the sorting, recycling and downcycling of plastic waste;
    - hazardous and microplastic-rich effluent flows from the washing of plastic waste;
    - hazardous effluent flows from the chemical treatment of plastic waste;
    - microplastics in incinerator ash;
    - challenges with the management of residual plastics from recycling processes;
    - circular economy challenges with plastics, due to low material efficiencies of recycling processes, and the resulting lack of genuine closed-loop recycling (virgin plastic is still required in recycled products; downcycling);
    - climate metrics of plastic waste-management operations;

6. The draft guidelines also **don't address ESM in relation to microplastics releases from waste**, including:
    - the ESM of wastewater and sewage sludge containing microplastics;
    - the ESM of plastic textile wastes despite associated secondary microplastics releases;

    They also **lack a reference to microplastics in incinerator bottom and fly ash**, a new, important, finding must also be reflected in the draft D10/R1 guidelines on incineration before they are adopted at COP.

7. The draft guidelines **fail to cover pneumatic tires**, despite their high content in plastics, and despite the fact that tires are a major source of terrestrial and marine microplastics.

8. The draft guidelines **undermine the Basel Convention** in their approach to end of waste criteria.

In addition, UN Environment Assembly (UNEA) resolution 5/14 was adopted in March 2022. This is significant, and is alone sufficient reason to reconsider the draft technical guidelines.

Firstly, given the explicit reference to ESM in the new international legally binding instrument and its larger remit to end plastic pollution, the Basel Convention should play a supportive role and ensure any technical guidelines on ESM for plastic waste are aligned with the new international legally binding instrument's objectives. As a result, consultation with the INC and a clear indication on how it seeks to address ESM for plastic waste should predate the adoption of any technical guidelines on the same topic at the Basel Convention.

Secondly, the specific reference to ESM being achieved through "resource efficiency and circular economy approaches" calls into question whether the draft technical guidelines, as currently drafted, are fit for purpose. For example, the technical guidelines identify chemical recycling and energy recovery as ESM approaches when, considering resource efficiency and circular economy, those approaches would likely not be considered ESM except for in very narrow circumstances.

For these reasons, Parties should defer consideration and adoption of the draft technical guidelines to COP-16 after consultation with INC and revision to ensure compatibility with resource efficiency and circular economy approaches as well as alignment with the new international legally binding instrument on plastic pollution.

Critical work is needed to address these issues, and can only be accomplished by delaying adoption of these guidelines to the 16th COP of the Basel Convention in May 2023. Adoption at the 16th COP, rather than at the 15th COP, will also ensure better synergy and alignment with the new international legally binding instrument to address plastics across their lifecycle, including plastic pollution.

II. Textual changes with supporting explanations and evidence

Key: *Black italics* refer to text in the draft guidelines at the end of the 2022 Basel Convention OEWG (CRP 23), with suggested deletions in ~~red strikethrough~~ and additions in **bold red**.

§ 2 (p.7): Scope includes all plastic wastes and all plastic fractions from other waste streams

Suggested changes:

*2. Plastic wastes, in the context of these guidelines, covers plastic wastes classified by entries Y48 in Annex II, A3210 in Annex VIII and B3011 in Annex IX to the Basel Convention. Furthermore, the guidelines cover plastic wastes extracted and/or separated from other waste streams that have plastic components or consist partially or fully of plastic (e.g., wastes collected from households (Y46), waste electrical and electronic equipment (WEEE), waste vehicles****, ships, aircraft and spacecraft****, ~~[waste pneumatic tyres]~~* ***waste pneumatic tyres****, waste cables, waste lead-acid batteries****,** ~~and~~ waste textiles* ***and paper waste, in particular paper-plastic and paper-plastic-aluminium laminates,*** *for which there are separate related entries in Annexes VIII and IX).*

Explanation and evidence:

Decision BC-14/13 created a mandate to update the 2002 Technical guidelines for the identification and environmentally sound management of plastic wastes and for their disposal. Decision BC-14/13 did not create a mandate to restrict the scope of these guidelines. The scope of the 2002 guidelines included "all polymer and plastic types" (p. 7 of the guidelines). This clearly includes rubber, natural and synthetic (also known as 'elastomers', one of the main classes of plastic polymers).

Ships, aircraft and spacecraft

> The term vehicle is open to different interpretations, a comprehensive interpretation that includes all transportation devices, and a more restrictive interpretation limited to ground transportation devices. Like other vehicles, ships, aircraft and spacecraft all have plastic components and can generate plastic waste streams during disassembly at end of life. For this reason, it is important for the guidelines to explicitly recognize plastics from ships, aircraft and spacecraft within its scope, as well as plastic from waste vehicles in general.

Waste tyres

> The Basel Convention Revised technical guidelines for the environmentally sound management of used and waste pneumatic tyres state that (Basel Convention 2011, Table 2 p. 8):

- all tyres have plastic reinforcement fabrics made from polyester, rayon or nylon;
- car tyre rubber is made mostly from synthetic rubber (60–70%);
- truck tyre rubber is made with a significant portion of synthetic rubber (20-40%).

Tyres are composed of only about 20% natural rubber, with ca. 15% steel. The balance is synthetic rubber plastics (elastomers) such as SBR (styrene butadiene rubber), polybutadiene (PBD); and oil; with heavy metals (such as zinc) and synthetic vulcanising agents, accelerators, retardants (benzoic acid), pigments, fillers, reinforcing agents, anti-degradants, softeners, antioxidants, extenders and accelerators (sulphonamides, thiazoles) and desiccants (Kole et al. 2017, Bockstal et al. 2019). In sum, waste pneumatic tyres consist largely of synthetic rubber and plastic reinforcement fabrics, and are therefore irrefutably a plastic waste stream that should be covered in the guidelines.

In addition, synthetic polymers from tyres are a major source of microplastics in oceans. Tire rubber fragments are considered as a subset of microplastics (Armada et al. 2022, Hartmann et al. 2019). Kole et al. (2017) estimated their contribution as 10 percent of overall microplastic waste in the world's oceans. Another study by the International Union for Conservation of Nature estimated that two thirds of all microplastics in the oceans are from textiles and car tyres, with the quantity from synthetic plastics in car tyres at 6.4 million tonnes per annum, or 28 percent of all microplastics released to oceans (Boucher and Friot, 2017). Vehicle tire wear is regarded as one of the most important sources of environmental microplastic due to the rapid global increase in the number of vehicles (An et al, 2020).

Failing to address synthetic rubber under provisions controlling plastic waste would greatly diminish the Basel Convention's relevance and legitimacy among other global efforts to address plastic pollution.

Paper wastes (plastic laminates and contaminants)

Paper waste shipments can include up to 30% of mixed plastic waste that is not recyclable in practice, and ends up being burnt (Sochat & Lavigne 2022, Petrlik et al. 2019). A court case is currently underway in Brazil concerning mixed plastic waste including used diapers and PPE illegally shipped from the USA in paper waste shipments (Dalla Stella et al. 2022). In addition, paper waste streams can include high amounts of plastic waste due to the inclusion of plastic-paper laminates such as Tetrapak-style packaging. Indeed, Table 8 recognizes the relevance of B3026 waste from the pre-treatment of composite packaging for liquids, including non-separable plastic fraction and non-separable plastic-aluminium fraction. For these reasons, it is important for the guidelines to explicitly address plastics from paper waste streams in this scope paragraph.

References:

- An, L., Liu, Q., Deng, Y., Wu, W., Gao, Y., & Ling, W. (2020). Sources of microplastic in the environment. *Microplastics in Terrestrial Environments*, 143-159.
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- Wik and Dave, 2009, Occurrence and effects of tire wear particles in the environment – a critical review, Environmental pollution, 157, pp. 1-11.

§4, 5, 10 (p.7-8): Describing and defining plastics

Suggested changes:

*4. **Plastics started being made over 100 years ago from cellulose (Bakelite). They are now almost exclusively made from fossil fuels – crude oil or shale gas.** Plastics started to come into wider use in the 1950s and within a few years production had risen to a high rate. Global production of plastic increased from 1.5 million tonnes in 1950 (Plastics Europe, 2008) to 368 million tonnes in 2019 (Plastics Europe,2020).*

*5. Plastics are lightweight with varying degrees of strength, can be both thermal and electrical insulators, can be moulded in various ways, and can offer a large range of characteristics and colours achieved through additives**, which can be toxic and impact ESM**. Plastics are most commonly used for packaging, food containers, building and construction, transportation, electrical and electronic equipment, agriculture, healthcare, sport, and energy generation.*

[...]

*9. The leakage of plastic into the environment can occur from a variety of land-based and ocean-based sources in the form of macroplastics and microplastics (small plastic particulates below 5 mm in size). The sources include, but are not limited to, the uncontrolled dumping of waste, littering, wastewater, storm water run-off and sewers, microplastics intentionally added to products, loss of fishing gear, **incinerator ash (Yang et al. 2021, Shen et al. 2021, Pienkoß et al. 2022), the fragmentation of oxo-degradable plastics and failed dissolution of water-soluble plastics (e.g. PVA, see Rolsky and Kelkar 2021)** [rubber granulate from turf pitches and] pellets from plastic production as well as wear from the use of a variety of plastic products such as [tyres,] paints and synthetic textiles and unintentional releases from plastic materials in production processes and equipment. Leakages may inter alia be caused by insufficient and inefficient waste collection, transport and disposal systems, unsustainable private consumer behaviour as well as unsustainable business practices. **Microplastic pollution is further compounded by the use of wastewater and sewage sludges that contain microplastics on land (Koutnik et al. 2021).***

Explanation and evidence:

The draft should refer to microplastics being present in incinerator bottom and fly ash. This is a new, important, finding which comes after the D10/R1 guidlelines on incineration was completed. The D10/R1 guidelines should be revised accordingly at the COP. Their presence is partly due to the ubiquity of flame retardants in plastic waste and lack of incinerator temperature control even when operating at steady state BAT.

The first study to identify this was by Yang et al. (2021) who found up to 102,000 microplastic particles in bottom ash per metric ton of waste incinerated. This was subsequently supported by Shen et al. (2021) who found between 23 and 171 particles per kg dry weight of bottom and fly ash. Microplastics particles were from fragment, fibre, film, and foam and they also accrued heavy metals Cr, Cu, Zn, Pb. The authors also did leachate tests and found that the microplastics 'significantly dissolved' out of bottom ash and into the environment. It was further corroborated by a European study using bottom ash from modern incinerators in Germany and Sweden (Pienkoß et al. 2022). The microplastics were a mixture of PET, PP and PE, with minimum concentrations of 0.12g per 25.9kg.

A common practice is to use wastewater and sewage sludge residues for deposition on land. But this transfers microplastics to the environment. A study from the U.S found that 785–1080 trillion microplastics are released annually to the environment as a consequence of sewage sludge deposition (Koutnik et al. 2021). Another recent study, also from the U.S., analysed polyvinyl alcohol (PVA) from laundry and dish washer detergent pods (estimated to be ca. 17,000 metric tons per annum used in the U.S.) 61% of the PVA from these pods ends up in the environment as a result of sewage sludge use on land (Rolsky and Kelkar, 2021).

References:

- Koutnik, V.S., Alkidim, S., Leonard, J., DePrima, F., Cao, S., Hoek, E.M.V., Mohanty, S.K. 2021. Unaccounted microplastics in wastewater sludge: Where do they go? American Chemical Society EST Water, 1 (5), pp. 1086-1097.
- Pienkoß, F., Abis, M., Bruno, M., Grönholm, R., Hoppe, M., Kuchta, K., Fiore, S., Simon, F-G. 2022. Heavy metal recovery from the fine fraction of solid waste incineration bottom ash by wet density separation, Journal of Material Cycles and Waste Management, 22, pp. 364-377
- Rolsky, C., Kelkar, V. 2021. Degradation of polyvinyl alcohol in US wastewater treatment plants and subsequent nationwide emission estimate, Environmental Research and Public Health, 18 (11), https://doi.org/10.3390/ijerph18116027
- Shen, M., Hu, T., Huang, W., Song, B., Qin, M., Yi, H., Zeng., Zhang. 2021. Can incineration completely eliminate plastic wastes? An investigation of microplastics and heavy metals in the bottom ash and fly ash from an incineration plant, Science of the Total Environment, 779, 146528.
- Yang, Z., Fan, L., Zhang, H., Wang, W., Shao, L., Ye, J., He, P. 2021. Is incineration the terminator of plastics and microplastics?, Journal of Hazardous Materials, 401, 123429.

§15 (p. 9): Oxo-degradation, water dissolution of plastics are non-ESM

Suggested changes:

15. Compostable plastics are considered those plastics which have been tested and adhere to international standards, such as American Society for Testing and Materials ASTM D6400-21 (ASTM, 2021) (in the U.S.) or European Standard EN 13432:2001 (European Standard, 2021) (in Europe), for biodegradation in an industrial composting facility: in addition, this may be certified by a third party. For compostable plastics to be fully composted, disposal must happen under specific conditions of temperature, moisture, oxygen level and microbial activity, normally found in controlled composting. Oxo-degradable plastic is made by blending a pro-degradant additive into the plastic during the extrusion process, which accelerates the fragmentation of plastics into plastic fragments under certain conditions. Once the product is buried in the soil and loses light, the degradation process stops and residual small plastic particles remain intact, causing the release of microplastics. ***For this reason, oxo-degradation of plastics is not an ESM operation.***

15bis. Water-soluble plastics such as polyvinyl alcohol and its blends are used as protective films for laundry and dish detergents; sizing and finishing agents in the textile industry, and as thickening or coating agents for paints, glues, meat packaging, and pharmaceuticals in paper and food industries. While water-soluble plastics may dissolve in water under specific circumstances, these are not met in waste-water treatment plants, leading to significant water pollution with PVA microplastics, which concentrate environmental pollutants and amplify their uptake in the food chain. The discharge of PVA into water also triggers foaming and disrupts the oxygen exchange, harming aquatic life. Even when water-soluble plastics like PVA dissolve, their constituents (such as ethylene in the case of PVA) can remain intact in water, and harm aquatic fauna and flora. For these reasons, the disposal or dissolution of water-soluble plastic PVA and its blends into municipal water or water bodies is not an ESM operation (Rolsky and Kelkar 2021).

Evidence:

- Rolsky, C., Kelkar, V. 2021. Degradation of polyvinyl alcohol in US wastewater treatment plants and subsequent nationwide emission estimate, Environmental Research and Public Health, 18 (11), https://doi.org/10.3390/ijerph18116027

Table 8 (p. 19-20): Existing Basel listings likely to be also identified with plastic wastes (B3011, Y48, A3210)

Suggested changes (see explanations and evidence in the right column and below the table):

38bis. Some existing waste listings are impacted or superseded by the new Plastic listings adopted at COP14. The table below provides Parties greater guidance on what existing listings are likely to be also considered as A3210, Y48 or B3011. Where multiple listings may apply, the precautionary approach demands that the listing requiring the greatest level of control should be the one for which leads the waste characterization and control procedure.

Entries with direct reference to plastic wastes		Plastic waste entry most likely to apply [1]	Explanation
Y13	*Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Contaminated with hazardous constituents***
A1190	*Waste metal cables coated or insulated with plastics containing or contaminated with coal tar, polychlorinated biphenyls (PCB), lead, cadmium, other organohalogen compounds or other Annex I constituents to an extent that they exhibit Annex III characteristics*	***A3210 (hazardous)***	
A3050	*Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives excluding such wastes specified on list B (note the related entry on list B B4020*	***A3210 (hazardous)***	
B1115	*Waste metal cables coated or insulated with plastics, not included in list A A1190, excluding those destined for Annex IVA operations or any other disposal operations involving, at any stage, uncontrolled thermal processes, such as open burning.*	***Y48 (special consideration) if mixed, contaminated, halogenated, or lack an ESM R3 destination.***	***Plastics used for cable insulation are often PVC (halogenated plastic) and have no ESM R3 destinations.***
~~[B3010~~	*~~Solid plastic waste]~~*		
B3026	*The following waste from the pre-treatment of composite packaging for liquids, not containing Annex I materials in concentrations sufficient to exhibit Annex III characteristics:* *• Non-separable plastic fraction* *• Non-separable plastic-aluminium fraction*	***Y48 (special consideration)***	***These non-separable fractions do not meet B3011 requirements for almost exclusively consisting of single polymers almost free from contamination.***
B3040	***Rubber wastes***	***Y48 (special consideration) for synthetic rubber.***	***Most rubber streams today are synthetic or majority-synthetic.*** ***Synthetic rubber is plastic and has no ESM recycling destinations, and is therefore unable to comply with B3011, therefore Y48 applies.***
B3080	***Waste parings and scraps of rubber***	***Y48 (special consideration) for synthetic rubber scraps and parings.***	***See above. Most rubber streams today are synthetic. Synthetic rubber is plastic and has Synthetic rubber has no ESM recycling destinations, and is therefore unable to comply with B3011, therefore Y48 applies.***
B3140	***Waste pneumatic tyres, excluding those destined for Annex IVA operations***	***Y48 (special consideration)***	***Tyres are made from a mix of polymers and other***

			materials, and therefore do not meet B3011 requirements "almost free from contamination" and consisting "almost exclusively of" a single, non-halogenated polymer - therefore Y48 applies.
B4020	*Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives, not listed on list A, free of solvents and other contaminants to an extent that they do not exhibit Annex III characteristics, e.g., water-based, or glues based on casein starch, dextrin, cellulose ethers, polyvinyl alcohols (note the related entry on list A A3050)*	***Y48 (special consideration)***	***These wastes are likely to be mixed and contaminated and in any case are likely to have no ESM R3 destinations, so they cannot meet B3011 requirements and therefore Y48 applies.***
Other entries relevant to plastic waste			
Y1	*Clinical wastes from medical care in hospitals, medical centres and clinics*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Mixed and highly likely to be contaminated with hazardous constituents***
Y3	*Waste pharmaceuticals, drugs and medicines*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Mixed and highly likely to be contaminated with hazardous constituents***
Y10	*Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs)*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Contaminated with hazardous constituents***
Y12	*Wastes from production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Contaminated with hazardous constituents***
Y24	*Arsenic; arsenic compounds*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Contaminated with hazardous constituents, including in the form of plastic additives***
Y26	*Cadmium; cadmium compounds*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Contaminated with hazardous constituents, including in the form of plastic additives***
Y27	*Antimony, antimony compounds*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Contaminated with hazardous constituents, including in the form of plastic additives***
Y29	*Mercury; mercury compounds*	***A3210 (hazardous) unless they don't exhibit an Annex***	***Contaminated with hazardous constituents,***

		III hazardous characteristic	***including in the form of plastic additives.***
Y31	*Lead; lead compounds*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Contaminated with hazardous constituents, including in the form of plastic additives***
Y41	*Organic solvents*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Organic solvents in plastic waste streams are contaminants***
Y42	*Halogenated organic solvents*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Halogenated organic solvents in plastic waste streams are contaminants***
Y45	*Organohalogen compounds other than substances referred to in this Annex (e.g., Y39, Y41, Y42, Y43, Y44)*	***A3210 (hazardous) unless they don't exhibit an Annex III hazardous characteristic***	***Organohalogen compounds in plastic waste streams can be contaminants, including halogenated additives, or halogenated polymers***
Y46	*Wastes collected from households*	***Y48 (special consideration)***	***Plastic wastes separated from mixed household wastes and not separated at source are unlikely to meet B3011 criteria "almost free from contamination" and consisting "almost exclusively of" a single, non-halogenated polymer - therefore Y48 applies. Y46 is also the entry covering refuse-derived fuel (RDF), which often has a significant mixed and contaminated plastic fraction***
A1160	*Waste lead-acid batteries, whole or crushed*	***A3210 (hazardous)***	***The battery housings will be contaminated with lead and acid residue, motor oil. Even if plastic housings are separated they are likely to be hazardous***
A1170	*Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous*	***A3210 (hazardous) if predominantly plastic***	***Contaminated with hazardous constituents***
A1180	*Waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with Annex I constituents (e.g., cadmium, mercury, lead,*	***A3210 (hazardous), if predominantly plastic***	***Contaminated with hazardous constituents***

	polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on list B B1110)19		
A3120	*Fluff - light fraction from shredding*	***A3210 (hazardous), even if predominately plastic***	***Contaminated with hazardous constituents.***
A3140	*Waste non-halogenated organic solvents but excluding such wastes specified on list B*	***A3210 (hazardous), even if predominately plastic***	***Contaminated with hazardous constituents***
A3150	*Waste halogenated organic solvents*	***A3210 (hazardous), even if predominately plastic***	***Contaminated with hazardous constituents***
A3180	*Wastes, substances and articles containing, consisting of or contaminated with polychlorinated biphenyl (PCB) polychlorinated terphenyl (PCT), polychlorinated naphthalene (PCN) or polybrominated biphenyl (PBB), or any other polybrominated analogues of these compounds, at a concentration level of 50 mg/kg or more*	***A3210 (hazardous), even if predominately plastic***	***Contaminated with hazardous constituents***
A4020	*Clinical and related wastes; that is wastes arising from medical, nursing, dental, veterinary, or similar practices, and wastes generated in hospitals or other facilities during the investigation or treatment of patients, or research projects*	***A3210 (hazardous) even if predominately plastic***	***Contaminated with toxic compounds/elements.***
A4070	*Wastes from the production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish excluding any such waste specified on list B (note the related entry on list B B4010)*	***A3210 (hazardous) even if predominately plastic***	***Contaminated with toxic compounds/elements.***
A4110	*Wastes that contain, consist of or are contaminated with any of the following:* *• Any congenor of polychlorinated dibenzo-furan* *• Any congenor of polychlorinated dibenzo-p-dioxin*	***A3210 (hazardous) even if predominately plastic or derived from the burning of plastic***	***Contaminated with hazardous constituents***
A4130	*Waste packages and containers containing Annex I substances in concentrations sufficient to exhibit Annex III hazard characteristics*	***A3210 (hazardous) even if predominately plastic***	***Contaminated with hazardous constituents***
B1090	*Waste batteries conforming to a specification, excluding those made with lead, cadmium or mercury*	***Y48 (special consideration) if containing plastics***	***Inevitably mixed or contaminated.***
B1110	*Electrical and electronic assemblies:* *• Electronic assemblies consisting only of metals or alloys*	***Y48 (special consideration) if containing plastics***	***Inevitably mixed or contaminated.***

	• *Waste electrical and electronic assemblies or scrap (including printed circuit boards) not containing components such as accumulators and other batteries included on list A, mercury switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or not contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Annex III (note the related entry on list A A1180)* • *Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct reuse, and not for recycling or final disposal*		
B1250	*Waste end-of-life motor vehicles, containing neither liquids nor other hazardous components*	***Y48 (special consideration) if containing plastics***	***Inevitably contaminated and likely mixedv***
B3020	***Paper, paperboard and paper product wastes***	***Y48 (special consideration) if containing plastics***	***Paper waste shipments have been shown to include up to 30% contamination with Y48 mixed plastic wastes (Petrlik et al. 2019).***
B3030	*Textile wastes*	***Y48 (special consideration) if the textiles contain plastics (e.g. nylon, polyester, elastane).*** ***Note: Many textiles are treated or contaminated with PFAS, or contain PVC, both Y45 hazardous constituents (organolahogens). Shipments containing such textiles should not be listed under B3030 but assumed to be A3210 hazardous, unless they don't display a hazardous characteristic.***	***Textiles themselves are often mixtures of plastics and natural fibers. As such they are not pure polymers so the likelihood of these being Y48 is very high.***
B3035	*Waste textile floor coverings, carpets*	***Y48 (special consideration) if containing plastics (e.g. nylon, polyester, polypropylene, polyethylene).*** ***Note: Many textile floor coverings and carpets are treated or contaminated with PFAS, or contain PVC (vinyl), both Y45 hazardous constituents (organolahogens). Shipments***	***Most likely mixed or contaminated, likely to include PFAS-treated textiles.***

		containing such textiles should not be listed under B3035 but assumed to be A3210 hazardous, unless they don't display a hazardous characteristic.	
~~[B3140~~	*~~Waste pneumatic tyres, excluding those destined for Annex IVA operations]~~*		
B4010	*Wastes consisting mainly of water-based/latex paints, inks and hardened varnishes not containing organic solvents, heavy metals or biocides to an extent to render them hazardous (note the related entry on list A A4070)*	***Y48 (special consideration)***	***These wastes are likely to be mixed and contaminated. Further, they have no ESM R3 destinations, so they cannot meet B3011 requirements and therefore Y48 applies.***
B4030	*Used single-use cameras, with batteries not included on list A*	***Y48 (special consideration)***	***Single-use cameras are made from a mix of plastic polymers and additives and other materials, and therefore do not meet B3011 requirements "almost free from contamination" and consisting "almost exclusively of" a single, non-halogenated polymer - therefore Y48 applies.***

38 ter. According to Article 1 paragraph 1(a) of the Convention, plastic waste that matches any Annex I entry is to be considered hazardous waste, unless it does not possess any of the hazardous characteristics contained in Annex III. Therefore, hazardousness is assumed, and has to be disproven, rather than the reverse (see also paragraph 101).

[1] Plastic waste entry most likely to apply to this waste stream due to significant plastic fraction within the waste stream, or because this constituent can be found as an additive or contaminant in plastic wastes.

Explanation and evidence:

New column: Plastic waste entry most likely to apply

> One of the main objectives for these TGs is to help Member States correctly identify plastic wastes in relation to the plastic waste amendments, in order to comply adequately with their new obligations under the Convention. This requires not only highlighting which existing Basel listings may be relevant - but indicating which is the likely corresponding plastic entry. It is also essential for the guidelines to clearly state that where plastic wastes were previously listed only on a B entry in Annex IX now fall under Y48, the stronger controls associated with Annex II prevail. Arguments justifying the likely listings are included in a fourth column.

Paper waste

> Paper waste shipments can include up to 30% of mixed plastic waste that is not recyclable in practice, and ends up being burnt (Sochat & Lavigne 2022, Petrlik et al. 2019). A court case is currently underway in Brazil concerning mixed plastic waste including used diapers and PPE illegally shipped from the USA in paper waste shipments (Dalla Stella et al. 2022). In addition, paper waste streams can include high amounts of plastic waste due to the inclusion of plastic-paper laminates such as Tetrapack-style packaging. For these reasons, it is useful to highlight the relevance of entry B3020, including to alert Member States and their customs and enforcement agencies to check paper waste shipments for contamination with plastic wastes.

Rubber and tyre waste

Much of the rubber currently used in the global economy is synthetic rubber, which covers a wide range of synthetic polymers made from fossil fuels. Synthetic rubber is among the top sources of microplastic pollution. Failing to address it under provisions controlling plastic waste would greatly diminish the Basel Convention's relevance and legitimacy among other global efforts to address plastic pollution. For these reasons, it is important to include entries B3040, B3080 and B3140, to ensure that Member States address microplastic pollution, including pollution arising from elastomer (rubber) plastic wastes.

Refuse-derived fuel

The guidelines should also clarify that RDF shipments, which contain a significant fraction of mixed post-consumer plastic waste, must be controlled under Annex II, as Y48, or otherwise as Y46 household waste, or as hazardous waste if they contain Annex I constituents and display Annex III characteristics (Bremmer 2022).

References:

- Bremmer, J. (2022) *Australian Refuse-Derived Fuel: Fuel product or plastic waste export in disguise?*, IPEN and National Toxics Network
- Dalla Stella, M., Berg Utzon, M., Wall, S., Segnini, G. (2022) *Fabricante de papel trouxe ilegalmente lixo dos EUA para Brasil, diz Ibama*, Columbia Journalism Investigations and UOL
- Petrlik, J., Ismawati, Y., DiGangi, J., Arisandi, P., Bell, L. and Beeler, B. (2019) *Plastic waste flooding Indonesia leads to toxic chemical contamination of the food chain* Arnika, Nexus3 Foundation, IPEN and Ecoton
- Shochat, G., Lavigne, C. (2022) *How Canadian recycling could be fuelling pollution in India: Bales of recyclable paper with high rates of plastic contamination still making their way overseas*, Canadian Broadcasting Corporation

§60-62 (p.25): Guidance on ESM

Suggested changes and explanations:

60. As presented in paragraph 32 of this document, Article 4 of the Basel Convention contains provisions related to the ESM of hazardous wastes and other wastes. ESM is also the subject of the following declarations:

(a) [...]

*(b) The 2011 Cartagena Declaration on the Prevention, Minimization and Recovery of Hazardous Wastes and Other Wastes, which was adopted at the tenth meeting of the Conference of the Parties to the Basel Convention, reaffirms that the Basel Convention is the primary global legal instrument for guiding the ESM of hazardous wastes and other wastes and their disposal**, including efforts to prevent and minimize their generation, and efficiently and safely manage that which cannot be avoided**.*

It is appropriate to emphasize prevention as these guidelines focus on ESM.

*61. The waste management hierarchy **which establishes a priority for actions that prevent and avoid waste,** is a guiding **policy** principle for the ESM of waste**. The hierarchy includes, in order of preference,** ~~and covers~~ prevention, minimization, reuse, recycling, other recovery including energy recovery, and finally, final disposal. ~~In doing so, the hierarchy encourages treatment options that deliver the best overall environmental outcome, taking into account lifecycle thinking~~[1]~~.~~ The waste management hierarchy has also been recognised by the Strategic Framework (adopted by decision BC-10/2), the ESM framework (see its paras. 11, 14, 18, 26 and 43) and in the Guidance to assist Parties in developing efficient strategies for achieving the prevention and minimization of the generation of hazardous and other wastes and their disposal (UNEP, 2017d). UNEA-2 resolution 11 on marine plastic litter and microplastics also called on countries to establish and implement necessary policies, regulatory frameworks and measures consistent with the waste hierarchy.[2] The waste hierarchy was also defined and described in UNEP's Global Waste Management Outlook (UNEP, 2015b).*

This paragraph as drafted is not a correct description of the waste management hierarchy as it does not really describe how a hierarchy works (ie. emphasis on priority and order of preference). Life cycle thinking is actually distinct from the hierarchy but is important, and is better addressed in the following paragraph (see suggestions below).

*62. Parties should consider a systemic **life-cycle** approach to harmonizing and developing policy frameworks related to plastic **products before they become** wastes. Such an approach may address the **need for such products, their lifespan before becoming wastes, and whether or not their function can be substituted with alternative materials which are more inherently circular or reusable. This kind of life-cycle approach examines the** root causes of the problem and take**s** a long**er**-term perspective that considers the long-lasting consequences of **introducing** plastic in the environment, **and its eventual fate,** including in the marine environment.*

§73-74 (p. 25-26): End of waste criteria

Suggested changes:

*73. **The Convention does not clarify when a waste ceases to be a waste. However, some countries have adopted in their national legislation** End of waste criteria **that** can determine the point at which a material need no longer be classified as waste. **In some cases, end-of-waste criteria in national legislation breach the Basel Convention (European Commission 2020).** The Glossary of Terms of the Basel Convention provides explanatory notes in this regard (UNEP, 2016b). **Possibilities for waste to cease to be waste referenced in the Glossary of terms include when:***

(i) It has been prepared for reuse:

(ii) It has undergone a recycling operation and that operation is completed

(iii) It has otherwise gained end-of-waste status as a result of a recovery operation

~~*For example, it could be after the waste has undergone a recovery (including recycling) operation and complies with specific criteria to be developed in accordance with the following conditions:*~~

~~*(a) The substance or object is commonly used for specific purposes;*~~

~~*(b) A market or demand exists for such a substance or object;*~~

~~*(c) The substance or object fulfills the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products;*~~

~~*(d) The use of the substance or object will not lead to overall adverse environmental or human health impacts.*~~

*74. **In order to be consistent with ESM, end-of-waste criteria must not lead to adverse outcomes for the environment or human health. A specific challenge for end-of-waste criteria for plastic wastes is the presence of toxic chemicals in recycled plastic pellets, including brominated flame-retardants, bisphenol A and benzotriazole UV stabilizers (Brosché et al. 2021). The same challenge applies to plastic waste pyrolysis oil (Rollinson & Oladejo 2020; Kusenberg et al. 2022).***

~~*One of the used points in the reprocessing system at which recycled plastics become eligible for passing end-of-waste criteria, is the thermal melt compounding stage used to make homogenous resin pellets that closely resemble virgin plastic compounds. However, there are many cases where high-purity, washed flakes or chips of a single-polymer type can also be directly incorporated into new plastic products during the manufacturing conversion stages, avoiding the need for energy intensive extrusion melt compounding to create a pellet format (e.g., PET drink-bottle flakes being directly extruded and thermoformed to make PET packaging trays). [An example for end-of-waste criteria is the non-packaging plastics framework in England (English Environment Agency, 2016).]*~~

Explanations and evidence:

As noted in the Basel Convention Glossary of Terms, the Convention does not clarify when a waste ceases to be a waste. It is important to remind readers of this in these paragraphs on end-of-waste criteria, since they depart significantly from the Convention, and can create dangerous loopholes that allow materials to fall outside of the Convention's control procedures, causing harm to the environment and public health, and to the authority of the Basel Convention.

The current text includes language on end-of-waste criteria that departs from the Glossary of Notes and devoid of supporting references. This text is not part of the glossary even though this is implied. We recommend that this section be cleaned up to not presume ideas which are not part of the current adopted glossary on the subject.

The draft completely omits the fact that many existing end-of-waste laws at the national level among Parties to the Basel Convention directly breach the Convention by reclassifying controlled wastes as products (e.g. incineration ash), facilitating harm to human health and the environment, as well as environmental injustice at the global scale. This issue has been documented and recognized by the European Commission (European Commission 2020).

In fact, the EU has also not been able to adopt end-of-waste criteria for recycled plastics to date, as recycled plastics often fail to meet quality and chemical safety requirements for new plastic products. Paragraph 74 omits this reality and alleges, without basis, that recycled plastics "become eligible for passing end-of-waste criteria" from the moment that recycled pellets are made.

Furthermore, the draft fails to mention that the challenges with plastic wastes have prevented the adoption of end of waste criteria for plastics in the EU, as opposed to other waste streams that allow for toxic-free and closed-loop recycling, and where end of waste criteria are therefore more appropriate. In this sense, this section completely disregards how end of waste criteria impact ESM and outcomes for the environment and human health.

The presence of toxic chemicals in plastic pellets and recycled plastics has been abundantly documented by IPEN (Brosché et al. 2021). The same challenge has been documented for plastic waste pyrolysis oils (Rollinson & Oladejo 2020; Kusenberg et al. 2022), despite attempts by industry players to get end-of-waste criteria for pyrolysis oil in EU countries (European Commission 2020).

References:

- European Commission (2020) Study To Assess Member States (Ms) Practices On By-Product (Bp) And End-Of Waste (Eow)
- Brosché, S., Strakova, J., Bell, L. and Karlsson, T. (2021) Widespread chemical contamination of recycled plastic pellets globally. International Pollutants Elimination Network (IPEN)
- Rollinson, A.N., Oladejo, J.M. (2020) Chemical Recycling: Status, sustainability and environmental impacts, Global Alliance for Incinerator Alternatives, DOI: 10.46556/ONLS4535
- Kusenberg, M., Eschenbacher, A., Djokic, M.R., Zayoud, A., Rageart, K., De Meester, S., Van Geem, K.M. (2022). Opportunities and challenges for the application of post-consumer plastic waste pyrolysis oils as steam cracker feedstocks: To decontaminate or not to decontaminate? Waste Management, 138, pp.83-115.

§80 bis-septies (p. 27-28): "Almost free from contamination", "almost exclusively consisting of"

Suggested changes, explanations and evidence:

80 bis. In the entries Y48 and B3011 the terms "almost free from contamination and other types of wastes" and "almost exclusively consisting of" appear. The purpose of these terms is to distinguish between entries Y48 and B3011. A ~~pragmatic and~~ clear interpretation of these terms should ensure that plastic wastes or mixtures of plastic wastes, consisting of PE, PP and PET, ***that are contaminated above a minimal threshold*** *~~of a lower quality~~ are not classified under entry B3011.*

> "Pragmatism" cannot be invoked as grounds for weakening obligations provided for in Basel Convention text.
>
> "Of a lower quality" is language that is even more vague and loose than "Almost free from contamination" and "almost exclusively consisting of". It adds confusion instead of clarity

80 ter. Consignments of plastic wastes which have been subject to sorting or processing prior to shipment may ***or may not be contaminated above minimal thresholds, depending on the level of manual segregation at source, among other factors.*** *~~have fewer negative impacts on the environment during their transport and recycling. Such consignments may be suitable for classification as B3011.~~*

> This statement is factually inaccurate: many countries including the USA fail to produce plastic waste bales with low contamination despite sorting and processing (for example, a 2016 study by California's environmental agency CalRecycle found above 14% contamination in PET plastic bales, above 11% in

coloured HDPE plastic bales, but under 5% for non-coloured HDPE plastic bales). In addition, transport is not the issue that the plastic amendments seek to address, but rather fate in importing countries.

80 quarter. Conversely, the entry Y48 may be applied to shipments of ~~highly contaminated~~ plastic wastes ***contaminated above a minimal threshold*** *which may pose a greater risk of negative impacts on the environment* ***and human health****. This risk is related to the greater likelihood that Y48 wastes may be subject to mismanagement during transport and recycling, such as the improper disposal or dumping of contaminated plastic wastes or non-target waste materials. As Y48 plastic wastes pose a greater risk of negative impacts on the environment, transboundary movements of waste classified under entry Y48 are subject to the Convention's prior written consent procedure.*

It is unclear on what grounds this text interprets Y48 as only applicable to "highly-contaminated" plastic waste shipments. This amounts to a severe weakening of the plastic amendments. In addition, impacts from plastic waste trade that have triggered the amendments include harm to human health in addition to environmental pollution (Petrlik et al. 2019).

80 quinquies. When implementing at the domestic level, Parties may interpret the terms "almost free from contamination and other types of wastes" and "almost exclusively consisting of" used in entries B3011 and Y48 in different ways (other approaches to interpreting these terms may exist):

(a) Parties may use a quantitative approach is to interpret these terms using quantitative criteria. For example, for the first indent of entry B3011, the content of contamination, other types of wastes or non-halogenated polymers, cured resins or condensation products, or fluorinated polymers other than the principal non-halogenated polymer, cured resin or condensation product, or fluorinated polymer that makes up the bulk of the plastic waste could be specified, that it should, for example, not exceed a total maximum percentage of the weight of the consignment of ***0% (Brunei Darussalam, The Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Waste 2020), 0.5% (Government of the Hong Kong Special Administrative Region, 2020), 1% (Turkey) or*** *2 %* ***(Republic of Indonesia, 2020; European Commission, 2021).*** *~~Regional guidance following this approach has been issued in "Correspondents' guidelines No 12 on classification of plastic waste" in the European Union (European Commission, 2021)~~;*

It seems arbitrary to only quote the EU's limit percentage when other countries have passed legislation in this regard, including before the EU. Alternative language is provided and ideally, this text can be substituted with a table from the Plastic Waste Partnership working group on this issue. A strict and consistent global contamination limit is the best way forward, following the example of China before its ban, and of Hong Kong currently (0.5%).

(b) Another approach is to use a combination of both quantitative and qualitative criteria. For example, under current UK case law it has been established that a consignment of non-hazardous wastes destined for recycling may be classified under an entry in Annex IX of the Convention, such as B3011, if the presence of contamination or non-target wastes can be considered to be so small as to be minimal. In making this assessment, UK regulators must first consider the quantity of any contaminants observed during an inspection ***[more technical information needed]****. If contaminants or non-target wastes can be observed throughout the consignment, it is unlikely that the contamination or presence of non-targets wastes could be considered to be so small as to be minimal and therefore the consignment cannot be classified under entry B3011. If the quantity of contamination is considered to be minimal, the UK regulator must then consider the quality and nature of the contamination and non-target wastes present. Having considered all three criteria together (quantity, quality, and nature) it is possible to determine whether the contamination remains so small as to be minimal and suitable for classification as B3011. The Scottish Environment Protection Agency has issued guidance which follows this approach.*

This language needs more detail on the process of "observation" as contaminants can be buried deep inside bales such that superficial visual inspection of container contents is insufficient and extracting and studying samples from deep inside the container at the center of the bales is necessary. If contaminants are visible to the naked eye they are likely above de minimis levels.

(c) Another approach to the term "almost exclusively consisting of" a single polymer is to consider intentional and non-intentional additives in plastics, especially those additives that interfere with the environmentally-sound recycling of plastic wastes.

References:

- CalRecycle (2016) Bale Rate Study: Public & Industry Workshop – February 17, 2016

- The Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Waste (2020), Discussion of the previous workshops on plastic wastes and results of the questionnaire
- Government of the Hong Kong Special Administrative Region, Environmental Protection Department (2020) Waste Plastics Import and Export Control
- Republic of Indonesia (2020) Decree of the Minister of Trade, the Minister of Environment and Forestry, Minister of Industry, and Head of State Policy of the Republic of Indonesia NOMOR 482, S.235/MENLHK/PSLB3/PLB.3/5/2020, 715, KB/1/V/2020 TAHUN 2020 About Implementation of Import of Non Hazardous and Toxic Material Waste As Raw Material Industry [unofficial translation]
- Petrlik, J., Ismawati, Y., DiGangi, J., Arisandi, P., Bell, L. and Beeler, B. (2019) *Plastic waste flooding Indonesia leads to toxic chemical contamination of the food chain* Arnika, Nexus3 Foundation, IPEN and Ecoton

Table 9, §91-97bis (p. 29-30): Preventive measures

Suggested changes (see explanations in the column on the right, and below):

Table 9: Examples of policy instruments and measures on waste prevention and minimization[1]

Note: the order of measures has been changed to follow the logic of the plastics lifecycle.

Policy	*Waste prevention and minimization measures*	Explanations
Regulatory	*- ~~Landfill ban/incineration ban~~* ***- Caps on virgin plastic resin production.*** *- Ban**s** on single-used plastics, such as single-use plastic bags or cutlery [2],* ***- Bans on plastic polymers that are toxic (e.g. PVC), that are hard to recycle, that fragment easily (e.g. EPS)*** ***- Bans on plastic products or applications that are particularly harmful, e.g. sachets, plastic diapers.*** ***- Bans on intentionally-added microplastics and small macroplastics that litter easily (e.g. plastic confetti)*** *- Ban**s** on oxo-degradable ~~and oxo-biodegradable~~ plastics* *- Consumption reduction measures[3]* *- Green procurement criteria* *- Restrictions on hazardous substances in plastics* *- ~~Sustainability product aspects / design requirements~~ **Design for reuse, durability and repairability*** *- Extended Producer Responsibility (EPR), e.g., including fee modulation with respect to **reuse, design aspects or** recycled content* ***- Right to repair legislation*** *- Deposit return schemes* *~~- Labelling and identification of products~~* *~~- Targets on recycled content~~* ***- Incineration bans*** ***- Trade restrictions***	Recycled content targets support recycling but not necessarily prevention. They are typically set low levels – between 15 to 25%, meaning 75% to 85% of virgin plastic in products. Landfill bans can increase waste incineration (Zero Waste Europe 2020) and lead to overseas dumping of plastic waste that has no domestic recycling market. Incineration bans are a safer measure to support prevention without adverse externalities.
Market-based	*- Pay-as-you-throw schemes (PAYT)* *~~- Landfill tax/incineration tax~~* *- Taxes on products (packaging, plastic bags)* *- **Economic incentives for reusable products and packaging, packaging-free businesses*** *- Deposit return schemes* *- Extended producer responsibility (EPR)* *- **Incineration tax***	Landfill tax can lead to increased incineration and lead to overseas dumping of plastic waste that has no domestic recycling market. Incineration taxes are a safer measure to support

		prevention without adverse externalities. Market-based policies can include supportive approaches (incentives) as well as punitive approaches (taxes).
Information-based	*- Labelling and identification of products* ***and their additives*** *- Awareness campaigns/school education* ***and citizen science*** *- Procurement guidelines* *- Information exchange platforms* ***for businesses and consumers*** *- Environmental certification schemes* ***- Plastic footprint calculators for businesses and consumers***	
Voluntary	*- Product standards (e.g., eco design) and specifications* *- Extended producer responsibility (EPR)*	

~~91. Waste prevention and minimization involves both upstream alterations in product design, includingreduction of plastic materials in the production phase including in packaging, reduction of primary microplastics. product redesign to avoid hazardous substances, incorporation of recycled plastics. use of alternative materials and increasing durability, reusability and recyclability of plastic products, as well as alterations in consumer habits The choices made at the design stage will also influence the sorting and recycling process and the options available for recycling. Design strategies that emphasize durability, reusability and recyclability serve two useful objectives – the process produces less waste and by using constituents that are less hazardous, generates waste that is less hazardous.~~

~~92. Eco-design principles that contribute to increased recyclability and reduced contamination should be as follows:~~

~~(a) design for minimal resource use.~~

~~(b) design for sustainable sourcing.~~

~~(c) design for environmentally sound use.~~

~~(d) design for repair, reuse, disassembly, and/or recycling.~~

~~93. Businesses, including manufactures, suppliers and retailers should implement product design communicating information through claims and labels, e.g., for clear and well-designed recyclability labels. Principles such as reliability, relevance, clarity, transparency and accessibility should serve as the main guiding principles of claims and labels (UNEP, 2020d).~~

~~94. Retailers and brand owners should control excess packaging and labelling, reduce packaging, remove difficult-to-recycle materials and difficult to detect black plastic as well as ensure and encourage use of recyclable packaging and packaging that was made from recycled plastics.~~

We support Norway's suggested deletion of paragraphs 91-94 for the following reasons:

- §91 reiterates what is in Table 9, but also exceeds the focus of this section on prevention by going into recycling. The EU's proposed changes to this paragraph are redundant with Table 9.
- §92 considers design for recycling instead of design for prevention, which is the focus of this section.
- §93 focuses on information about recycling instead of prevention, which is the focus of this section.
- §94 mixes prevention and recycling interventions, without regard for the focus of this section which is on prevention.

94 bis. Design requirements for products are a central feature in successful waste prevention and minimization policy. It has been shown that eco-design determines almost 80 percent of a product's environmental impact (European Commission, 2012).

94 ter. An evident design feature is to reduce the amount of plastic waste generated by limiting the use of plastics in new products. This requires that sustainable alternatives can be found, either by using alternative materials with

less environmental impact or by reducing the size of the products. The volume of plastic packaging could for instance be reduced in many cases, in order to prevent excess packaging that are not actually needed.

94 quater. Such measures are especially applicable to single-use products and other products that are known to cause plastic littering, such as plastic bags, disposable cutlery and products made of EPS. Consumption reduction measures could be a relevant initiative for these articles, leading to a substantial reversal of increasing consumption trends. Alternatively, a total ban could be formulated. The use of oxo-degradable plastics should for instance be eliminated since this plastic type leads to the release of microplastics.

94 quinquies. For other plastic products, the most relevant design feature would be to focus on an extended lifespan, thereby postponing and reducing waste generation. This can be achieved through integrating aspects of durability, reusability, repairability and upgradability in the design process. Centres for reuse and repair of plastic products can provide a crucial service in this setting. Operation of these centres could be strengthened by facilitating their access to plastic waste that are held by collection schemes or facilities, and that can be reused or repaired, but are not destined for such treatment by those schemes or facilities.

94 sexies. Products should be designed to ensure that dangerous additives in plastics are avoided as much as possible. Furthermore, it is important to restrict the use of intentionally added microplastics in products, such as cosmetics and paint.

94 septies. The choices made at the design stage will also influence the options available for recycling, once the product has become waste. Using materials that lead to hard-to-recycle waste should be avoided as much as possible. This especially applies to composite products where the individual parts or layers are difficult to separate, typically consisting of a combination of plastics and other material types or of different plastic polymers. The use of black plastic that is difficult to detect by automatic sensor sorting should also be avoided.

94 octies. Setting specific targets for recycled content in plastic products will have a positive impact on the demand for secondary raw materials and strengthen their market position, thereby stimulating recycling activities. In addition, the implementation of deposit return schemes for plastic products, such as PET beverage bottles, typically leads to high levels of collection and provides a clean stream of plastics for the reuse or the recycling industry.

94 novies. Businesses, including manufactures, suppliers and retailers should disseminate product design information through claims, labels and identification schemes regarding plastic products, e.g., for clear and well-designed recyclability labels. This will enable consumers to make informed choices when buying products, leading to waste prevention and minimization. Such schemes could also enable waste operators to access information about the content of dangerous additives in the plastic waste, in order to avoid these additives spreading through subsequent recycling and manufacturing processes. Emerging techniques in this field, such as digital passports, tagging and watermarks, should be explored.

94 decies. Principles such as reliability, relevance, clarity, transparency and accessibility should serve as the main guiding principles of claims, labels and identification schemes (UNEP, 2020b). The schemes could be regulatory or voluntary.

94 undecies. EPR systems aim to shift a large part of the costs of waste management back to producers, thereby stimulating investment in eco-design, leading to waste prevention and increased recycling. In order to be effective, the EPR systems should implement incentives for waste prevention and recycling for each individual producer, for instance through modulating the fees that producers pay according to certain criteria, such as recycled content or other design aspects. EPR schemes could be regulatory or voluntary.

94 duodecies. Green public procurement criteria may be developed to facilitate the inclusion of green requirements in public tender documents, including specific requirements on waste prevention and recycling. Since the public sector's purchasing accounts for a large proportion of the economic activity in society, such criteria could have an important influence on services and works within the marketplace. The criteria could be either regulatory or voluntary.

94 terdecies. Marked-based measures may be used to incentivize actions towards waste prevention and minimization. Taxes can be levied on certain plastic products, such as plastic bags, or on plastic products that do not comply to a certain environmental standard, such as a minimum content of recycled material. In addition, taxes can be levied on energy recovery or landfilling of plastics. Tax exemptions can also be applied, for instance for reuse and repair activities. Another option is to introduce pay-as-you-throw (PAYT) schemes with variable pricing for waste collection by weight or volume, which works as an incentive for consumers to generate less waste. The highest fee would typically be imposed on mixed residual waste.

94 quaterdecies. Introducing a ban on landfilling of plastics could be considered, although banning landfilling while allowing plastic waste incineration can increase waste generation and incineration (Zero Waste Europe 2015). For this reason, it is useful to consider banning all plastic waste incineration (with or without energy recovery) ~~It could also be relevant to ban energy recovery of recyclable plastics,~~ except in cases where hazardous waste incineration represents the best available technique to destroy hazardous plastic wastes~~in cases where certain plastic types or additives represent a particular health risk or environmental hazard and require destruction~~. This increases recycling and stimulates waste prevention.

94 quindecies. Actions for the prevention and minimization of plastic waste would benefit from a change of public awareness relating to production and consumption. Creating awareness amongst the general public as well as the business community can be achieved through targeted campaigns and education. Sharing practical information and guiding tools about how individuals and companies can prevent and reduce plastic waste in their daily lives, is also a useful step.

94 sexdecies. Additionally, local authorities should promote waste prevention-based community building through communication where local commerce and industries, as well as consumers, are visible. For further information, see section III.J.

[...]

We support Norway's suggested additions (in black bold), with some suggested changes with respect to landfill bans, due to their impacts on plastic waste management. Specifically, a 2015 study by Zero Waste Europe shows that landfill bans alone (without a ban on incineration) can increase waste generation and waste incineration. Similarly, a 2020 Zero Waste Europe analysis shows the same issues with landfill targets: *"The evidence shows that meeting the 10% threshold is extremely challenging and may push decision makers to invest in waste incineration so as to minimise landfilling. This may create a lock-in situation, with waste compelled to go to incineration, contravening the principles and strategic goals of the Circular Economy Package. Moreover, the threshold defined as a percentage could also discourage waste reduction measures as it wouldn't matter how much waste we generate, it only matters that we landfill 10% of it."* (Zero Waste Europe, 2020).

References:

- Zero Waste Europe (2020), The new 10% landfill target may work against the circular economy, Policy Briefing
- Zero Waste Europe (2015) Zero waste to landfill and/or landfill bans: false paths to a Circular Economy, Policy Paper

Figure 2 and Table 10 (p.36): Sources and examples of plastic waste

Suggested changes:

Figure 2 and Table 10 should both include references to:

- plastic wastes from hospitals, health and safety, and laboratories (including single-use plastic packaging, medical and laboratory supplies and personal protective equipment);
- plastic wastes from pneumatic tires (see comment, explanations and evidence on paragraph 2 above).

§101-101bis (p.37-38): Identification of PVC and other hazardous plastic wastes

Suggested changes:

Identification of hazardous and non-hazardous plastic wastes

101. [According to Article 1 paragraph 1(a) of the Convention, plastic waste that belongs to any category contained in Annex I is to be considered hazardous waste, unless it does not possess any of the hazardous characteristics contained in Annex III. The following plastic wastes should therefore be presumed to be hazardous waste unless it can be shown that it does not possess or exhibit a hazardous characteristic specified in Annex III of the Convention, such as:

(a) Resins of plastic wastes and wastes coming from use of these resins fall under the category Y13 ("wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives") contained in Annex I and entry A3050 in Annex VIII of the Convention. For example, wastes of formaldehyde resins may exhibit the hazardous characteristics H6.1, H11 and H12;

(b) Plastic wastes containing or contaminated with heavy metals covered under the Annex I categories Y24 (arsenic; arsenic compounds), Y26 (cadmium; cadmium compounds), Y29 ("Mercury; mercury compounds") and Y31 (lead; lead compounds). For example, rigid PVC containing cadmium and lead stabilizers, may possess Annex III characteristics H6.1, H11, H12 and H13, in which case they would fall under entry A3210;

(b)bis Waste of polyvinyl chloride (PVC) plastics. PVC is a halogenated polymer (Annex I category Y45 "organohalogen compounds other than substances referred to" elsewhere in Annex I) that displays the Annex III H13 hazardous characteristic due to de novo generation of polychlorinated dibenzo-furans and/or polychlorinated dibenzo-p-dioxins during thermal degradation.

(c) Plastic wastes containing or contaminated with brominated flame retardants (BFRs), in particular BFRs that are POPs according to the Stockholm Convention, may in some cases fall under entry A3210. In general, wastes containing BFRs also fall under Annex I category Y45 ("organohalogen compounds other than substances referred to" elsewhere in Annex I) and, if antimony compounds are used as synergists of the BFRs, under category Y27 ("Antimony, antimony compounds"). Depending on the concentration and the chemical properties of the BFRs and their synergists, plastic wastes containing or contaminated with BFRs may possess the hazardous characteristics H6.1, H11, H12 and H13.

(d) Textile wastes made of plastic that is treated with PFAS compounds for waterproofing that are persistent and toxic. PFAS compounds such as PFOS and PFOA that are listed as POPs under the Stockholm Convention, may possess the hazardous characteristics H6.1, H11, H12 and H13.

(e) Plastic wastes contaminated with hazardous materials such as solvents covered under the Annex I categories Y41 (organic solvents) and Y42 (halogenated organic solvents), and entry A3140 and A3150 in Annex VIII of the Convention. For example, a waste solvent plastic tank may possess the hazardous characteristics H11 and H12.

(f) Plastic wastes from medical care in hospitals, medical centres and clinics under the Annex I category Y1 and Annex VIII entry A4020, plastic wastes contaminated with waste pharmaceuticals, drugs and medicines under the Annex I category Y3. For example, waste syringes may possess the hazardous characteristics H6.1, H6.2, H11 and H12.

(g) Plastic wastes containing certain additives such as some phthalates may possess hazardous characteristics contained in Annex III of the Convention.

(h) plastic wastes from metal cables ("waste metal cables coated or insulated with plastics contaminated with coal tar, polychlorinated biphenyls, lead, cadmium, other organohalogen compounds or other Annex I constituents to an extent that they exhibit Annex III characteristics") under the Annex I category Y45 and the Annex VIII entry A1190, which may exhibit the hazardous characteristics H6.1, H11, H12 and H13.

(i) Plastic wastes from waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs) fall under the Annex I category Y10 and the Annex VIII A3180, in some case, may fall under the Annex VIII A1160, A1170, A1180, A3120 and A4130. PCBs, PCTs and PBBs are listed as POPs under the Stockholm Convention and waste contains these chemicals may possess the hazardous characteristics H6.1, H11, H12 and H13, depending on their concentration levels in a waste.

(j) Plastic wastes from production, formulation and use of inks, dyes, pigments, paints, lacquers and varnish fall under the Annex I category Y12 and the Annex VIII A4070. For example, wastes of azo dyes may exhibit the hazardous characteristics H11, H12 and H13;

(k) Plastic wastes that contain, consist of or are contaminated with any congenor of polychlorinated dibenzo-furan and/or any congenor of polychlorinated dibenzo-p-dioxin under the Annex VIII entry A4110, may exhibit the hazardous characteristics H11 and H12.

101bis. Annex II to the Basel Convention lists category Y46 which may contain or be contaminated with certain plastic wastes referred to in paragraph 101.]

Identification of ~~non-hazardous~~ contaminants

102. Contaminants are unwanted materials present in plastic wastes., including non-hazardous contaminants ***and contaminants that are hazardous or require special consideration under the Convention.*** *The composition of plastic wastes depend not only on the intrinsic composition of the different plastics but may also contain certain ~~non-hazardous~~ contaminants which derive from the production, use or waste phases of the plastic lifecycle.*

[...]

104. Mixed polymer waste streams may be more difficult to recycle. For instance, small amounts of PVC mixed with other polymers (PE, PP or PET) can prevent effective recycling. Clear PET and PVC (i.e., from packaging) have a particular problem with cross-contamination as their visual appearance is very similar. ***In addition, even in the event that PVC contaminants could be removed from mixed polymer waste streams to improve recycling of other plastics, PVC wastes are challenging to dispose of without triggering de-novo formation of polychlorinated dibenzo-furans and/or polychlorinated dibenzo-p-dioxins (H13 hazard characteristic under Annex III).*** *Film types such as PP, PET and multi-layer laminates are considered contaminants in a mixed LDPE stream (Mepex Consult AS, 2017).*

Explanation and evidence:

The guidelines do not only fail to clarify the Basel status of PVC waste, they also wrongfully characterize PVC contaminants in other plastic waste streams as "non-hazardous", in violation of Convention (Sections III.D.3 and 4). In fact, PVC satisfies the Basel Convention definition of hazardous waste (Annex I component - organohalogen - and Annex III characteristic - H.13). Indeed, the EU is considering options for PVC phaseout or restriction to essential use given the threat that PVC poses to the objective of a non-toxic environment (European Commission 2022).

Many Basel Convention Parties are illegally trading PVC as an Annex II, or even Annex IX plastic waste (e.g.: Japan violating Basel within OECD with PVC exports, non-party US exporting PVC waste to Basel members, see Basel Action Network 2022) and confusion in the guidelines will make this worse.

References:

- Basel Action Network (2022) Basel Plastic Waste Trade Violations Rampant One Year After Amendments Entry into Force
- European Commission, Directorate-General for Environment (2022) The use of PVC (poly vinyl chloride) in the context of a non-toxic environment : final report, https://data.europa.eu/doi/10.2779/375357
- Healthcare Without Harm et al. (2021) Why PVC remains a problematic material

§169, 170 (p. 47): Storage

Suggested changes and explanations:

169. Plastic wastes in shredded or baled form should be stored on clean concrete floors. If plastic wastes are stored indoors, a fire-prevention system should be available to prevent fires and ease firefighting. If plastic wastes are stored outdoors, it should be protected from contamination and weather damage by means of tarpaulins ~~or appropriate plastic film~~. This will also help prevent wastes from entering the environment, e.g., through wind drift. Protection against fire should also be in place. Contamination of plastic wastes from dust and dirt can be avoided by the use of pallets.

These guidelines should not be advocating the increased use of single-use plastics, such as plastic film, for purposes of plastic waste storage, but rather should focus on reusable options, such as tarpaulins.

170. Polymers degrade with prolonged exposure to UV light, resulting in the deterioration of the physicochemical properties of the plastic. Plastic wastes stored outside should therefore be covered with a UV-protective material ***[technical ESM information needed]****.*

This paragraph lacks critical information on environmentally-sound UV-protective materials that may be used during the outdoor storage of plastic wastes. This must be addressed during further work on the guidelines.

__§176-235; 249-284 (p. 48-57): Mechanical and chemical recycling__

This section on plastic waste recovery is still weak and fails to address ESM. It includes a biased, rose-tinted view of chemical treatment of plastic wastes without any consideration given to ESM. It gives no attention to the management of hazardous waste outputs from chemical recycling processes, nor to copious quantities of fossil fuels consumed by chemical recycling processes, and their climate impacts. **Sections on chemical treatment ("chemical recycling", "solvent-based purification" and "plastic-to-fuel") must be either removed, or significantly shortened and referenced very clearly as non-ESM operations.**

This section also repeatedly fails to address very real challenges of plastic recycling. For instance, it merely states that toxic by-products of plastic recycling or other recovery must be "appropriately" dealt with instead of detailing ESM approaches, or recognizing the absence of ESM for such processes.

There is scant information on guidelines for effluent flows from the washing of plastic waste and chemical recycling effluent. These are major hazardous streams. Not only should the guidelines address this in detail, but it is relevant because managing such high volumes of toxic waste has been the cause of failure for attempts at commercial scale up of chemical recycling (Sherwood 2020).

In addition, this section is built upon a flawed and incoherent conceptual framework that includes the processing of plastic wastes ultimately into non-plastic products as recycling. Instead, recycling, whether mechanical or otherwise, must be strictly restricted to plastic-to-plastic processes.

Other conceptual challenges include the use of the non-standard term "physical recycling", often used in the literature to mean mechanical recycling or downcycling, to describe solvent-based purification, more commonly considered as chemical recycling among chemical engineers.

Finally, this section needs clear identification of what constitutes ESM R3 operations, and what does not constitute ESM R3 operations, for purposes of implementation of and compliance with the Basel plastic amendments. No such information is included in the current draft.

The same issues are apparent in the section titled 'Specific aspects related to recycling of certain types of plastic wastes'. This section is entirely lacking ESM assessments of different recycling techniques for specific polymers, including climate metrics.

As a result, these guidelines require more work than can be completed before COP15, and the suggestions below represent only what was possible to formulate during the comment period, and are only a fraction of what is needed.

Suggested changes and explanations:

176. Plastic waste recycling (operation R3) can be categorized as follows:

(a) Mechanical recycling, with the processing of waste plastic through physical sorting, size reduction, cleaning and drying, thermal melt-extrusion and pelletizing, and compounding;

(b) Chemical recycling, including:

> ***i)*** *~~(b)~~ ~~Physical recycling~~* ***Solvent-based purification****, with the removal of* ***additives or other contaminants*** *~~constituents~~ (e.g., flame-retardants) from plastic waste while keeping the plastic polymer molecules chain largely intact ~~(solvent-based purification)~~;*
>
> ***ii) Thermal (e.g. pyrolysis) or chemical (e.g. glycolysis) decomposition of plastic wastes including their constituent polymers, and further decontamination and filtration in order to recover monomers that are used as feedstock for plastic manufacture.***

~~(c) Chemical recycling, where the plastic polymer molecules chains are broken down (recovery of chemical constituents that have been de-polymerized) and used as base chemicals, including feedstock for plastic manufacture (feedstock recycling).~~

> It is unusual to group solvent based chemical recycling as 'physical recycling', and also causes confusion with mechanical recycling. Furthermore, solvent-based purification does not target the removal of any constituents, but specifically of additives or contaminants.
>
> Equating chemical recycling with simple "depolymerization" is also factually wrong. When plastics are made

to thermally decompose, hydrocarbon fragmentation produces molecules which are different to their component monomers. For example, from relatively simple PP a high content of benzene, xylene, toluene, plus polycyclic aromatic hydrocarbons (PAHs) is formed (Williams and Williams, 1999). Similarly, with PVC, as chlorine is progressively removed new carbon bonds are formed creating aromatics such as indene, naphthalene, and alkylated naphthalenes (Schiers and Karminsky, 2006). These components, along with many plastic additives, are highly hazardous to human health, meaning facilities would have to be regulated and managed to avoid potentially high risk situations both on and off site. Any amount of plastic that is profitable to process at a single facility would be likely have these chemicals in significant quantities during processing and storage (Rollinson and Oladejo, 2020).

The term recycling does not apply when the process output is not used to make new plastics. Therefore, the term chemical recycling does not apply when the outputs are used as chemicals for applications other than plastics (fuel or other chemical applications). This is also consistent with paragraph 178 that restricts recycling to processes where outputs are used in plastic applications.

Finally, the term “feedstock” makes no sense when used specifically in relation to chemical recycling. ‘Feedstock’ is an unspecific engineering term for all input material fed to any process, so applicable to mechanical recycling and incineration as well.

[...]

*178. The recycling of plastic wastes can be challenging because of the wide variety of uses, additives, and blends that are used in a multitude of products. Recycling can be either reprocessing into the original product application with equivalent properties ~~(closed-loop recycling)~~ or a different plastic application with similar material properties (~~open-loop recycling~~ **downcycling**).*

The term closed-loop recycling is misleading here as a plastic recycled product cannot be made with 100% recyclate, unlike with other waste streams such as metal and glass - virgin plastic must be incorporated.

[...]

*210. Hydro-cyclones are based on the principle of centrifugal acceleration to separate plastic waste mixtures **by density, but not by polymer type**. A hydro-cyclone transfers fluid pressure energy into high-speed rotational fluid motion (see figure 665). This rotational motion creates a strong centripetal force within the spinning liquid chamber (i.e., a G-force of multiple times gravity) causing a rapid and strong relative movement of solid particles suspended in the fluid in relation to the particle and fluid density, thus permitting rapid density separation of materials from one another. Hydro-cyclones have a very high throughput rate and result in highly accurate density separation if plastic particle size is small (<6mm nominal size) and of a regular shape. **Hydro-cyclones produce high volumes of plastic-rich liquid wastes requiring treatment before their disposal in an environmentally sound manner.***

[...]

*218. The cleaning liquid should be collected, assessed for contamination and treated **[technical ESM information needed]** before release to the environment ~~or recycled within the recycling unit~~.*

This paragraph lacks critical information on how the cleaning liquid should be treated. This must be addressed during further work on the guidelines. In addition, the cleaning liquid should <u>not</u> be recycled within the unit as this concentrates toxins and creates a less effective capture medium.

[...]

221. Commonly used plastic waste drying technologies include centrifugal spin-drying, air-blast drying, fluidized bed drying, infra-red drying and these often include heated airflow to increase the drying rate. ~~Care should be taken to use low-energy consumption drying equipment~~.

Use of low-energy consumption drying equipment cannot be achieved. Whatever the moisture level of the waste, there will be the same requirement for energy independent of technology type.

[...]

*223. The gas produced by drying of plastic wastes should be treated appropriately **[technical ESM information needed]** before being released to the atmosphere in particular if it is odorous or it contains harmful volatile contaminants.*

This paragraph lacks critical information on how this gas should be treated. This must be addressed during further work on the guidelines.

[...]

~~Physical recycling (R3)~~ Chemical recycling (R3)

225bis. The technologies described below have not been proven at a commercial scale. They require highly sorted and clean inputs, rivaling mechanical recycling. Energy demands are typically high, as well as hazardous waste outputs. These technologies are not ESM (Sherwood, 2020; Rollinson and Oladejo, 2020; Hann et al., 2020).

226. ~~Physical recycling refers to~~ solvent-based purification ~~which~~ dissolves the solid plastic's physical macro-structure but preserves the original molecular structure of the individual polymer chains. This method can be used to separate and remove additive chemicals and fillers bound within the waste polymer compound. The resulting cleaned polymer molecules can then be recovered (e.g., by precipitation), dried and re-formed into the original plastic material. ~~at close to 100% product purity and mass yield~~.

See Sherwood, J. 2020. Closed-loop recycling of polymers using solvents, Johnson Matthey Technology Review, 64, pp. 4-15.

~~227. Based on the similar compatibility between solvent and solute molecules, solvent-based recycling separates the plastic resin from various additives and fillers. Solvent-based recycling is a novel technology allowing the recycling of, among others, complex polymer compounds like multilayer packaging or contaminated polystyrene using selective dissolution.~~

This paragraph is entirely redundant with paragraph 226. The draft would be less confused if it showed more consistency in the use of clear technical terms (solvent-based purification), instead of ambiguous terms such as physical recycling. Furthermore, the allegation in this paragraph about multilayer packaging is baseless - in fact, the literature points to the failure of chemical recycling attempts targeting multilayer packaging, see Rollinson and Oladejo (2020).

~~Chemical recycling (R3)~~

There is no valid conceptual basis for separating solvent-based purification and solvolysis from other methods of chemical recycling.

~~228. Chemical recycling, a rapidly evolving field, may be a complementary technology to mechanical recycling for certain plastic waste types or applications.~~

The mandate of these guidelines is the ESM of plastic waste, not the advertisement of immature technologies that create hazardous waste by-products and harm the climate.

~~229. Certain types of plastic wastes are not suitable for mechanical recycling. This can be due to the complexity of the physical structure of the wastes and the way different polymer types and other materials have been combined within the original product design. Examples include thermosetting plastic composites, where the plastic resin cannot be thermally re-formed and the fibres are very difficult to remove, and thin-walled, multi-layer packaging films made with various plastic and metallic layers bonded together.~~

It is factually incorrect and highly misleading to present chemical recycling technologies as a solution for mixed plastic waste and multimaterial wastes containing plastics. The shortcomings of mechanical recycling should be addressed in the section on mechanical recycling and certainly not in this section.

Chemical recycling was formerly touted as an option for plastics which were dirty and mixed (even though it was technically immature and had failed at scale up over four previous decades). This weak argument is invalid because chemical recycling has the same, or worse, problems: it also requires high purity, often reagent grade, 'waste plastics'. The problem of sending dirty or contaminated and mixed plastics to a different technology because mechanical recycling cannot handle such waste was blind optimism now accepted to be false.

The only experimental examples of chemical recycling which have worked have relied on highly sorted and pure inputs that are a far cry from the wastes described in this paragraph (see Rollinson and Oladejo 2020, Hann et al. 2020 p. 2). The inclusion of this paragraph will induce Member States to adopt non-ESM practices, with irreversible pollution and human health impacts, wasting precious financial resources in the process.

References:

- Rollinson, A.N., Oladejo, J.M. (2020) Chemical Recycling: Status, sustainability and environmental impacts, Global Alliance for Incinerator Alternatives, DOI: 10.46556/ONLS4535
- Hann, S. & Connock, T. (2020). Chemical Recycling: State of Play. Eunomia Research & Consulting for CHEM Trust.

~~*230. The term 'chemical recycling' describes a broad range of non-mechanical/physical recycling methods, which have significantly different outputs arising from the applied process techniques. The various methods can be classified into three categories:*~~

~~*(a) Solvolysis (monomer recycling);*~~

~~*(b) Pyrolysis (falls under chemical recycling in case the output is used as material for base chemicals);*~~

~~*(c) Gasification (falls under chemical recycling in case the output is used as material for base chemicals).*~~

This paragraph is redundant with paragraph 176. Also, recycling applies to plastic-to-plastic processes, not processes which generate chemicals that have no demonstrated application in the economy, and which may in any case be too contaminated with hazardous constituents to be usable in the economy.

See also comments on gasification at paragraph 233 below.

231. Chemical recycling methods where solid plastic is dissolved into a liquid phase solvent and the polymer molecules then further break-down into smaller components parts, include various methods named as 'solvolysis'. This technique can be used for condensation polymers, such as PET, where the original polycondensation reaction is reversed in the liquid solvent phase and the resulting monomer building-blocks, or intermediates, can be purified (i.e., to remove dyestuffs), prior to being fed-back into the original polymerization process. This approach preserves the useful chemical components of the waste polymer molecules, and these can be re-used back into full-scale industrial reactors, as direct replacement for primary ~~feedstock~~ raw materials. In the process of purification, hazardous wastes may be generated which should be treated appropriately. The term 'solvolysis' (sometimes called 'monomer recycling') is the collective term used for various types of solvent-specific methods, these include 'glycolysis', 'methanolysis' etc. The mass of output polymer material recovered by this method can be classified as 'recycled plastic'.

The term feedstock here is redundant with raw material.

232. Chemical recycling methods where the plastic wastes are subjected to intense heat and/or chemical break-down during a thermal reaction process normally result in output streams that are a mixture of gases, liquids and waxes, plus a residual carbonaceous char. Often the lightest gaseous output fractions are incinerated within the process to generate heat energy for the chemical break-down. In most cases this is carried out in the absence of oxygen or moisture. Such sealed-reactor thermal processes are named 'pyrolysis' and may be used for addition polymers such as the olefinic and styrenic polymer types ~~(the term 'feedstock recycling' is also used)~~. Some of the resulting output mass fractions can be used ~~as chemical feedstock~~ to replace prime (e.g., oil-derived) naphtha materials, as part of the cracking and polymerization reaction stages that make-up large-scale petrochemical process plants. However, the tracking and tracing of the exact end-destination for the waste-derived monomer and short-chain fractions is difficult, so mass-balance approaches and chain of custody are needed to estimate the actual mass-flow from input plastic waste into the polymer end-products. There are various measurement schemes to certify mass-balance processes, which vary in their definitions of recycling and recycled content (Edwards,2021). ISO 22095 (Chain of custody — General terminology and models) can be used as the basis for the definition and description of chain of custody models. Out of the Chain of Custody models according to the terminology described in ISO 22095, book and claim removes all physical links between inputs and outputs and therefore is not considered a valid approach for chemical recycling of plastic wastes. [For example, some allow allocation of non-polymer outputs to be claimed as recycled content in plastic products.]

The term "feedstock" makes no sense when used specifically in relation to chemical recycling. 'Feedstock' is an unspecific engineering term for all input material fed to any process, so applicable to mechanical recycling and incineration as well.

233. ~~Gasification involves plastic wastes being subjected to high temperatures in the presence of an oxidizing agent to break down the polymer to a 'syngas' containing carbon dioxide, monoxide, water and hydrogen. This can, in some cases, be converted into ethanol and then used to make new hydrocarbons (e.g., polyethylene).~~

Gasification cannot function with plastic waste at large scale. This has been known for over a century. The problem is due to how plastic melts inside a gasifier which is in turn due to plastic's internal structure lacking a fixed carbon framework. Only small lab-scale gasification of plastic can be achieved.

Temperature and gas circulation for optimum reaction kinetics must be maintained while also moderating temperature to avoid secondary and tertiary synthesis of unwanted molecules. If the process operates at low temperature (and cost), then some lighter monomers will form but incomplete depolymerisation will occur. If the process operates at a higher temperature (and cost) to increase primary depolymerisation, it will increase the formation of heavier, contaminant aromatic molecules.

The tarry gas is a consequence of gasifiers being unable to cope with plastic feedstock. Gasification tar gas clean up systems are highly unique and challenging. No post gasifier treatment system can cope with cleaning up the gas from a gasifier fed with plastic waste so that the gas is clean enough to be used as a precursor for new plastic. Such gas can only be burned directly.

Gasifiers cannot function with plastic waste above lab-scale. There are no credible references showing the use of plastic waste gasification outputs in the petrochemicals industry.

234. Various examples of chemical recycling methods for plastic wastes are ~~available~~ ***being experimented*** *at the pilot-plant stage and* ***in very few cases*** *also at close to full-scale operating throughput, but most are yet to demonstrate long-term commercial maturity at the full industrial scale. There is a lack of evidence to generate conclusions around the viability of many technologies, and a lack of understanding of the lifecycle impacts (Hann et al., 2020).*

235. For further information refer for example to the report "Chemical Recycling of Polymeric Materials from Waste in the Circular Economy" (European Chemicals Agency, 2021).

[...]

259. Recycled PP can be mixed with virgin PP in any ratio for the production of new products such as clothes hangers, playground equipment, compost bins and kerbside recycling crates. However, there are many recent examples of high-quality PP recyclates being used ~~at 100% levels~~ for the production of car-parts, pipes, drainage goods and electrical product casings, as well as for non-food contact packaging items.

No references are given to support the allegations that PP products can be made out of 100% recycled content, which goes against established wisdom in plastic recycling whereby virgin resin is often required to create new products due to issues with polymer degradation and contamination, and virgin additives are usually added to recycled products. A product made from 100% recyclate may be too contaminated to pass chemicals standards for products, and the recycling process leading to it is therefore non-ESM.

The calculation methodology for accounting for recycled content in products is important and requires disclosure, given the loose and deceptive use of mass balance calculations by some companies to make overstated claims about recycled content in their products. No percentages of recycled content should be given without disclosing the calculation methodology. The fact that recycled PP is not used in food-contact packaging applications speaks to chemical contamination issues in recyclates. See:

Zero Waste Europe (2021) Recycled content in plastics – the mass balance approach.

[...]

264. ABS regenerated material can sometimes be blended with other similar types of compatible plastic waste (e.g., HIPS), and, by adding various functional additives, modified ABS blended materials with good toughness, corrosion resistance, oil resistance, cold resistance, weatherability and anti-aging properties can be produced. When recycled, ABS from plastic wastes can be used either in a mixture with virgin material, or as ~~100%~~ ***mostly*** *recyclate, to produce products.*

No reference is provided to support the 100% figure, neither is the calculation method disclosed, nor any explanation for how toxic contamination is addressed. For further explanations and evidence, see above.

[...]

266. Blow-moulded PET from bottles is one of the plastic wastes that are easiest to recycle and have the highest recycling rate of any common plastic. ~~Closed loop recycling (e.g., bottle to bottle) is possible.~~ This is because it is relatively easy to wash, separate out coloured flakes and then upgrade the intrinsic viscosity (polymer chain length) *during the recycling process to near-virgin quality using polycondensation reactions.* ~~*Food-contact approval certification has been given to advanced recycling processes that can demonstrate very high purity and tight quality control of the closed-loop recycled PET (r-PET), with usage levels of up to 100% r-PET to make new consumer drinks bottles.*~~ ***However, a recent review study points to the presence of bisphenol A in recycled PET, due to contamination. The study also notes the migration of this bisphenol A into beverages, as well as greater migration of antimony into beverages from recycled PET as compared to virgin PET, calling into question the safety of recycled PET bottles and other food-contact materials (Gerassimidou et al. 2022).***

No reference is provided to support the 100% figure, neither is the calculation method disclosed, nor any explanation for how toxic contamination is addressed. For further explanations and evidence, see above.

In addition, "Food-contact approval certification" from an undetermined origin has no value from an ESM perspective. Its inclusion lulls readers of these guidelines into a false sense of safety, when indeed in light of the most recent science on chemical contamination of recycled PET, this certification may have been granted on shaky grounds.

Indeed, the latest scientific findings indicate that recycled PET can be an unsafe food-contact material, and possibly even less safe than virgin PET. See:

Gerassimidou, S., Lanska, P., Hahladakis, J. N., Lovat, E., Vanzetto, S., Geueke, B., Groh, K. J., Muncke, J., Maffini, M., Martin, O. V., & Iacovidou, E. (2022). Unpacking the complexity of the PET drink bottles value chain: A chemicals perspective. Journal of Hazardous Materials, 430, 128410. https://doi.org/10.1016/j.jhazmat.2022.128410

267. The process of recycling PET bottles (or other rigid PET packaging wastes) for use in fibres is generally to sort, granulate, float sink, wash and dry. The fibres are made by adding colouring (as required), extrusion melting, filtering, and spinning into fibres. The output quality of the fibres depends upon the input quality of the PET flakes and the capability of the recycling process. ~~*The most demanding woven applications with very fine denier yarns can be successfully made from 100% recycled PET.*~~

Again, this hyperbolic claim ("most demanding", "very fine", "successfully", "100%") is unreferenced, and the calculation methodology to account for the recycled content is undisclosed, and potentially compromised by a deceptive use of mass balance instead of batch-level calculations (Zero Waste Europe 2021). It contradicts the previous sentence that refers to the variable quality of recycled PET, depending on the quality of inputs. It is also unlikely to be accurate given the quality challenges with recycled plastic, PET being no exception, and recycled PET's greater propensity for shedding compared to virgin fiber (Özkan and Gündoğdu. 2021).

268. PET textiles and fibres can be recycled by thorough washing and re-melting. Recycled PET can be used for carpets, garments and non-woven applications. ***However, recycled PET sheds more microfibers than virgin PET during washing (Özkan and Gündoğdu 2021).***

See Özkan, İ., & Gündoğdu, S. (2021). Investigation on the microfiber release under controlled washings from the knitted fabrics produced by recycled and virgin polyester yarns. The Journal of The Textile Institute, 112(2), 264–272. https://doi.org/10.1080/00405000.2020.1741760

§238-239 (p. 57-59): Energy recovery

Suggested changes with explanations and evidence:

238. Most plastics are hydrocarbon polymer compounds that can burn and have a high calorific value (see Table 17). ***These should not be mixed with low calorific value waste in order to avoid lowering the furnace temperature, resulting in incomplete combustion, higher toxic and uPOPs emissions in gaseous and solid phases, and higher transfer of microplastics to the bottom ash.***

Mixing plastic waste with low calorific value feedstock will lower the furnace temperature and may cause incomplete combustion, which in turn will result in higher than normal toxic emissions in gaseous and solid phase, plus the transfer of microplastics to the bottom ash. The current language of paragraph 238 goes against ESM as it would increase adverse impacts on the environment and human health.

238bis. Although most plastics have high calorific value, the presence of flame-retardant additives can interfere with their complete combustion, resulting in microplastics in incinerator ash. Incomplete combustion of plastic

waste in incinerators also occurs due to the lack of incinerator temperature control even when operating at steady state best available technique (BAT) (Yang et al. 2021, Shen et al. 2021, Pienkoß et al. 2022). ~~*Because of the high calorific value, plastic waste should be mixed with other compatible waste fractions with a low calorific value in order to achieve a preferably constant calorific value of the mixture.*~~

The draft should refer to microplastics being present in incinerator bottom and fly ash. This is a new, important, finding which comes after the D10/R1 guidelines on incineration was completed. The D10/R1 guidelines should be revised accordingly at the COP.

The first study to identify microplastics in incinerator ash was by Yang et al. (2021) who found up to 102,000 microplastic particles in bottom ash per metric ton of waste incinerated:

This was subsequently supported by Shen et al. (2021) who found between 23 and 171 particles per kg dry weight of bottom and fly ash. Microplastics particles were from fragment, fibre, film, and foam and they also accrued heavy metals Cr, Cu, Zn, Pb. The authors also did leachate tests and found that the microplastics 'significantly dissolved' out of bottom ash and into the environment:

It was further corroborated by a European study using bottom ash from modern incinerators in Germany and Sweden (Pienkoß et al. 2022). The microplastics were a mixture of PET, PP and PE, with minimum concentrations of 0.12g per 25.9kg.

References:

- Yang, Z., Fan, L., Zhang, H., Wang, W., Shao, L., Ye, J., He, P. 2021. Is incineration the terminator of plastics and microplastics?, *Journal of Hazardous Materials*, **401**, 123429.
- Shen, M., Hu, T., Huang, W., Song, B., Qin, M., Yi, H., Zeng., Zhang. 2021. Can incineration completely eliminate plastic wastes? An investigation of microplastics and heavy metals in the bottom ash and fly ash from an incineration plant, *Science of the Total Environment*, **779**, 146528.
- Pienkoß, F., Abis, M., Bruno, M., Grönholm, R., Hoppe, M., Kuchta, K., Fiore, S., Simon, F-G. 2022. Heavy metal recovery from the fine fraction of solid waste incineration bottom ash by wet density separation, *Journal of Material Cycles and Waste Management*, **22**, pp. 364-377.

Table 17: Energy values of plastic wastes, including mixed plastic wastes, in comparison with other waste and fuels.

References are needed for this table. Some of the values are wrong, e.g. coal which is almost half its actual CV.

239. Plastic wastes can be part of fuels derived from waste such as Solid Recovered Fuel (SRF) in accordance with the European standard (EN 15359) and RDF. ~~*SRF has a higher calorific value than RDF.*~~ *RDF is produced by removing* ***some of*** ~~*all*~~ *the non-combustible components such as metals, glass and putrescible materials from MSW and then pelletizing the combustible material. As this is processed MSW, RDF has a higher concentration of plastic waste than MSW and consequently a higher energy value,* ***but only because significant energy has been expended in making RDF. In whole process energy balance terms, burning RDF is no better than burning raw MSW.***

The statement that SRF has higher calorific value than RDF is incorrect and has no supporting evidence. SRF is a title given by the EU to RDF in an attempt to bring some standardization. The calorific value could be higher or lower.

The statement that all non-combustible components are removed is incorrect and has no supporting evidence. Some non-combustible components remain in RDF.

Burning RDF is no better in whole process energy balance terms than burning raw MSW, in fact it it reduces the overall amount of energy recovered. Climate metrics should be considered here, since the production of RDF/SRF is highly energy intensive.

References:

- Consonni, S., Giugliano, M., & Grosso, M. (2005). Alternative strategies for energy recovery from municipal solid waste: Part A: Mass and energy balances. Waste Management, 25(2), 123–135. https://doi.org/10.1016/j.wasman.2004.09.007

§285-289 (p. 63): Health and safety

285. Both the supplier and receiver of the materials should ensure that the following information is available, ~~when required~~:

Health and safety information should be made available systematically, it should not be optional.

288. When plastic waste is contaminated with larger quantities of food residues problems with micro-organisms, odour and attraction of pests may occur. Measures should be taken to reduce odour and pests around the workplace. ***[Technical information needed].***

Explaining these kinds of measures, and in particular ESM measures, is precisely the role of these guidelines. Air pollution and pests in plastic waste collection, sorting and recycling facilities puts the health of workers and local communities at risk.

289. ~~Plastic containers used to supply hospitals with sterile water and other aqueous solutions may safely be recycled provided they have been kept separated from medical/clinical wastes (e.g., RECOMED UK).~~ Plastic wastes may become contaminated with water, insect pests and dirt during transport and storage if not properly protected.

This is not a credible reference, from a technology provider website. There is no evidence of how much plastic has been recycled nor how environmentally sound the process is.

Editorial changes

Suggested changes and explanations:

16. There are a wide range of polymers used in common plastics and they each have different properties which make them ~~appropriate~~ ***lend themselves to*** *~~for~~ different applications. Properties and typical applications of common polymer types, including those listed in entries Y48 and B3011 in Annex II and IX to the Basel Convention respectively, are shown in Table 1.*

The term "appropriate" is not fitting in these guidelines which should not prescribe use of plastics, but rather focus on their prevention and management as waste in an ESM manner. More neutral language is suggested instead.

274. [The recycling of waste fluorinated polymers is ~~partly~~ not well established (Schlipf et al., 2014) as they may contain additives to an extent to render the waste hazardous or problematic. However, fluorinated polymers applied to metal articles (e.g., non-stick frying pans) might end up in metal recycling streams.]

Poorly-phrased, unclear language.