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

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Executive summary

We recommend that the SIWG and the consultants supporting its work focus on improving these draft guidelines in the following ways:

- A more accurate definition of plastics that includes processed natural polymers obtained from significant chemical treatment, given their contributions to plastic waste and pollution;

- Clearer identification of which plastic wastes are B3011, Y48 or A3210 according to the Basel plastic amendments;

- More emphasis on plastic waste prevention, including through reuse and repair;

- A more rigorous definition of R3 recycling that excludes processes that do not minimize emissions that harm human health and the environment, and that do not reliably and efficiently produce functional recyclate at commercial scale;

- More content on the different emissions (sorting residues including outthrows and contaminants, greenhouse gasses, microplastics, toxic chemicals) from plastic recycling and other forms of plastic waste-management, and in particular:
    - Microplastics emissions from textile waste and undissolved polyvinyl alcohol in wastewater and sewage sludge;
    - Microplastics emissions in incinerator bottom and fly ash;

- Greater emphasis on Best Available Technique (BAT) and Best Environmental Practice (BEP) and environmentally-sound management (ESM) in recycling, to minimize abovementioned emissions and help guideline users distinguish high quality plastic recycling from other forms of plastic recycling;

- Exclusion of non-ESM waste-management operations in line with the title of the guidelines, including technologies commonly marketed as "chemical recycling" or "advanced recycling" (solvolysis, pyrolysis, gasification);

- And finally, more emphasis on consistency with the Basel Convention in sections on end-of-waste criteria.

Textual changes with supporting rationales and evidence

Black italics represent text in the current draft guidelines, with GAIA and BAN's suggested deletions in ~~*red italic strikethrough*~~ and additions in ***bold italic red***.

Describing and defining plastics (§4-16)

In paragraph 4 it is useful to highlight the that the first plastics were bio-based, in order to dispel the notion that biobased plastics are necessarily innovative or better for the environment - in particular given the confusion between feedstock origin and end-of-life behaviour (biobased vs. biodegradable or compostable)..

> *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).*

As these guidelines are about environmentally-sound management, the toxic and ESM risks triggered by additives merit mention in paragraph 5. The second sentence of paragraph 5 deserves more clarity, as plastics are not used in "energy generation" per se but rather in infrastructure, similarly they are not intrinsic to human movement (sports) but often used as equipment towards that end, and so forth.

> *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,* ***textiles, vehicles*** ~~*transportation*~~*, electrical and electronic equipment,* ***film and piping used in*** *agriculture, healthcare* ***equipment****, sport****s equipment****, and energy generation* ***infrastructure****.*

The proposed edit to the first sentence of paragraph 6 makes the sentence more clear and concise. Brackets should be removed from the second sentence as these guidelines are on environmentally-sound management, so mention of health and environmental impacts need to be more than cursory. Additives can pose a variety of challenges from hazardousness to recycling and more.

> *6. However, plastic wastes can* ***have*** ~~*also pose challenges related to*~~ ***negative*** *impacts on human health and the environment.* ~~*[*~~*Such impacts are for example caused by certain additives and processing aids that may render the waste hazardous****, difficult to recycle, or otherwise*** *problematic.*~~*]*~~ *Attention to such impacts has increased recently particularly, amongst other issues, due to the ubiquity of plastics and microplastics in the marine environment (UNEP, 2021a). This is a consequence of the leakage of plastic into the environment at every stage of its lifecycle, particularly if plastic wastes are not managed in an environmentally sound manner. The plastics lifecycle includes a full range of activities from extracting raw materials, production, distribution, use and disposal as waste. Environmental problems may be caused at any stage in the lifecycle of plastics, inter alia from point source emissions to air, water and soil from production processes as*

well as from plastic wastes not managed in an environmentally sound manner. The majority of plastics degrade very slowly in the environment.

In paragraph 8, the term impacts is neutral - it could be a beneficial or harmful impact. However, the concept of ESM is explicitly defined as minimizing harm - this is therefore the term that should be used in this paragraph. Furthermore, microplastics can be emitted but cannot leach - neither can macroplastics, while air-blown dispersal and airborne emissions must also be covered as a form of pollution. The term "can" already expresses that harm is potential, so there is no need for additional mentions of "potential", otherwise the paragraph may end up minimizing scientific evidence on such harms, which is not desirable for guidelines on ESM. Finally, the term "items" in particular is awkward, and the accurate term is "macroplastic".

*8. Landfilling of plastic wastes can have **harmful** impacts on human health and the environment, in particular in non-engineered landfills or open dumpsites**,** such as the ~~potential~~ leaching of plastics additives, **as well as emissions of microplastics and macroplastics** ~~particles and items~~ into the wider environment. Gasification, pyrolysis and combustion, in particular open burning, of plastic wastes, can also ~~have impacts on~~ **harm** human health and the environment due to emissions and releases of greenhouse gases; and pollutants, such as unintentionally produced POPs and mercury.*

The presence of microplastics in incinerator bottom and fly ash is an important finding that needs to be reflected in paragraph 9 and taken into account in the storage and use of incineration ash in an ESM context. These finding are also absent from the D10/R1 guidelines on incineration as they were published after the SIWG's work was completed, so it is all the more important to reflect them in these plastic waste guidelines.

The presence of microplastics in incinerator ash 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, fiber, 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 found that 785–1080 trillion microplastics are released annually to the environment as a consequence of sewage sludge deposition (Koutnik et al. 2021). Another study analyzed 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).

Finally, the term "unsustainable" repeated in the second to last paragraph is redundant and brings no value.

9. The leakage of plastic and plastic wastes into the environment can occur from a variety of land-based and ocean-based sources in the form of macroplastics and microplastics and nano-size plastic particles. The sources include, but are not limited to, the uncontrolled dumping of waste, litter, wastewater, storm water run-off and sewers, microplastics intentionally added to products, loss of fishing gear, spillage of plastic pellets from plastic production as well as wear from the use of a variety of products containing plastics such as artificial turf, paints and synthetic textiles ~~and~~ unintentional releases from plastic materials in production processes and equipment, ***microplastic releases from incinerator ash, and the fragmentation of oxo-degradable plastics and failed dissolution of water-soluble plastics.*** *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.***

The following elements should be clear in the definition of plastics in paragraph 10: not all plastics are made from synthetic polymers; some plastics are made from natural polymers that have been processed with the aid of chemicals (e.g. cellophane, cellulose acetate, viscose, bio-based rubber) or fermentation (polyhydroxyalkanoates or PHA) - as argued by Hartmann et al. (2019) for a definition of microplastics, as captured in the table below.

Criterion	Recommendation	Examples
I: Chemical composition		
Ia: Polymers	All synthetic polymers:	
✓ Include	▪ Thermoplastics	All commodity plastics
	▪ Thermosets	Polyurethanes, melamine
	▪ Elastomers	Synthetic rubber
	▪ Inorganic/hybrid	Silicone
✓ Include	Heavily modified natural polymers (semi-synthetic)	Vulcanized natural rubber, regenerated cellulose
× Exclude	Slightly modified natural polymers	Dyed natural fibers
Ib: Additives		
✓ Include	All polymers included in Ia disregarding their additive content	Plasticized PVC with >50 % additives
Ic: Copolymers		
✓ Include	All copolymers	ABS, EVA, SBR
Id: Composites		
✓ Include	All composites containing synthetic polymer as essential ingredient	Reinforced polyester and epoxy
✓ Include	All surface coatings containing polymers as essential ingredient	Paints containing polyester, PUR, alkyd, acrylic, epoxy resin
✓ Include	Tire wear (and road) particles	-
? Open question	Is it necessary to define a minimum polymer content?	
II: Solid state		
✓ Include	All polymers with a T_m or T_g >20 °C	See examples in Ia
× Exclude	Polymer gels	PVA, PEG
? Open question	Should wax-like polymers (T_g <20 °C) be included?	

10. Plastic is a synthetic ***or heavily-modified natural*** *material, either a polymer or combination of polymers of high molecular mass modified or compounded with additives such as fillers, plasticizers, stabilizers, lubricants, pigments. According to the International Organization for Standardization (ISO) "plastic is a material which contains as an essential ingredient a high polymer and which, at some stage in its processing into finished products, can be shaped by flow" (ISO, 2013).*

The decomposition of biodegradable plastics involves the release of both water and carbon dioxide.

14. [[Plastics can also be classified [distinguished] [considered][categorized] into biodegradable and non-biodegradable.] Biodegradable plastics are broadly understood to refer to plastics that can be degraded under certain conditions, such as temperature, [UV,] humidity, oxygen content and pH, by microorganisms in nature, such as bacteria, mould, and algae, and turn into water ~~or~~ ***and*** *carbon dioxide and other small molecules. [The timeframe, the level of biodegradation, and the environment condition required for biodegradation need to be provided, along with claim of biodegradability of plastics (European Bioplastics, 2018). Standard specifications or protocols are required for biodegradability of plastics. Some of the available standard protocols for assessment of biodegradation of plastics include ISO/17556 for aerobic biodegradability of plastic materials in soil, ISO/15985 for anaerobic biodegradation under high-solids anaerobic-digestion conditions.] Both fossil-based plastic and bio-based plastic can be biodegradable or non-biodegradable under certain conditions. [An example of] The classification of plastics based on material and biodegradability is shown in Figure 1, where examples of some types of plastics are indicated.]*

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, 2001) (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 plastics are intrinsically very different from compostable plastics. They should be addressed in separate paragraphs to avoid any confusion between the two. The ESM aspects relevant to oxo-degradation must be highlighted, given these guidelines are about ESM of plastic waste.

15. Bis *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 out of sunlight, 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.***

An additional paragraph is needed to cover microplastic pollution from water-soluble plastic polymers and their wastes. See Rolsky et al. (2021) for detailed evidence.

15ter. 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.

Basel Convention listings governing plastic waste (§38bis, Table 8)

The original Table 8 simply lists existing Basel Convention listings that refer to plastic wastes, without clarifying which new listings would apply, and therefore how Parties should control their transboundary movement. This is a significant gap in these guidelines.

Indeed, one of the main objectives for these guidelines as defined at COP 14 is to help Parties correctly apply the plastic waste amendments and comply 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 reiterate the principle from Article 1 paragraph 1(a) of the Convention, according to which 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: the burden of proof respects the precautionary principle (see also paragraph 101). Likewise, 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. The policy regarding overlapping Basel Convention listings should always give precedence to entries with the highest level of control. Proposed paragraph 38 bis in this regard is modeled on a similar paragraph (49) from the Basel Convention e-waste guidelines (*Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention*).

For this reason, GAIA and BAN propose the following changes to Table 8 in order to clearly identify which existing Basel Convention listings overlap with which of the new listings from the Basel Convention plastic amendments, with corresponding explanations. This kind of clarification has been done previously in the e-waste guidelines, in text form (paragraph 49) rather than in a table.

This amended Table 8 considers waste streams with significant plastic fractions as well as hazardous constituents that are used as additives or found as contaminants in plastic wastes.

38bis. Plastic waste with hazardous constituents or from waste streams with hazardous constituents should be presumed to be hazardous waste unless it can be shown either that it does not exhibit hazardous characteristics or that it does not contain hazardous components or substances.

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***	***Likely to be contaminated with hazardous constituents. Some plasticizers e.g. DEHP satisfy the Basel***

		hazardous characteristic	**Convention definition of hazardous waste.**
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.**
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		**Plastic waste entry most likely to apply [1]**	**Explanation**
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 III hazardous characteristic***	***Contaminated with hazardous constituents, 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***	***Organohalogen compounds in plastic waste streams can be contaminants, including halogenated additives, or halogenated polymers***

		hazardous characteristic	
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, 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*	**_A3210 (hazardous), if predominantly plastic_**	**_Contaminated with hazardous constituents_**
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* *• Waste electrical and electronic assemblies or scrap (including printed circuit boards) not containing components such as accumulators*	***Y48 (special consideration) if containing plastics***	***Inevitably mixed or contaminated.***

	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 mixed***
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.***	***Most likely mixed or contaminated, likely to include PFAS-treated textiles.***

		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 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.***

[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.

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).

Evidence:

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).

General considerations on environmentally-sound management (§60(b)-62)

*60(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.***

> GAIA and BAN witnessed the inclusion of this sentence with support from a Party (Canada) during the 10 June 2022 contact group negotiation during the Basel Convention COP15 and are concerned to see that this contact group addition was not reflected in the updated guidelines draft.

*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 reusable, reparable or circular. 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.*

End of waste status (§73-74)

Paragraph 73bis should focus on end-of-waste national regulations that address plastics, as end-of-waste issues may be very different for other material streams. The EU has not successfully adopted end-of-waste status for plastics in the past precisely due to the specific challenge of toxics amplified in plastic recyclate that interfere with product quality and safety, and is currently re-examining the issue.

> *73bis. Some Parties have adopted conditions in their national legislation that can determine the point at which ~~a material~~* ***plastics*** *need no longer be classified as waste[, such as ~~the European Union (European Union, 2008) and~~ the UK (English Environment Agency, 2016).*

End-of-waste legislation can often open loopholes that result in breaches of Parties' obligations under the Basel Convention and increased harm to the environment and human health. These risks must be highlighted in these guidelines about ESM and to support Parties in compliance with the Basel Convention, and deserve an additional paragraph for that purpose.

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 (Umweltbundesamt GmbH et al., 2020).

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 (Umweltbundesamt GmbH et al., 2020).

> ***73ter. End-of-waste status for plastic wastes and by produdcts of its management (e.g. pyrolysis oil, incineration ash) can result in greater circulation of toxics in the economy, particularly when the full chemical content of plastic waste, including intentional and non-intentional additives, contaminants, and leachable fluids is not known. There is mounting evidence of toxics in recyclate from mechanical recycling operations, oils from the pyrolysis of plastic waste, and ash from the incineration of mixed waste containing plastics. End-of-waste status for plastic wastes could also lead to breaches of Basel Convention controls on Y48 and A3210 plastic wastes.***

"Almost free from contamination" and "almost exclusively consisting of" (§80ter)

While we are not aware of a Party that has explicitly included intentional and non-intentional additives into account in contamination rates, this approach is worth mentioning because:

- It is the most faithful interpretation of entry B3011 that distinguishes polymers from contaminants and
- The amount and nature of additives (intentional or not) significantly impacts whether a plastic waste can be recycled in an ESM manner.

> *80 ter. (old 80 quinquies.) When implementing the entries B3011 and Y48 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 these entries in different ways. Examples of approaches to interpreting these terms are the following :*
>
> *A quantitative approach [...]*
>
> *An approach drawing on an assessment of quantitative elements and qualitative criteria [...]*
>
> ***An approach not applied by any Parties yet but proposed by several environmental non-governmental organizations is the inclusion within abovementioned quantitative limits of all additives and contaminants, including coatings, paints, inks, fillers and non-intentional additive substances (NIAS).***

Preventive measures (Table 9)

Include prevention targets and don't confuse prevention with recycling

So far, waste prevention has often been confused with waste minimization - the downstream reduction of existing waste, rather than any upstream attempt to reduce the volume of materials that become waste in the first place. A 2018 assessment showed that most EU member states who had passed waste prevention policies only included binding measures on waste recycling and management of existing waste, and did not focus on prevention proper (Johansson & Corvellec, 2018).

Recycling can play a role in circularity but does not automatically prevent primary material use - it only delays final disposal. Furthermore, 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 - so the manufacturing of new products with recycled content involves further virgin material use and overall further waste generation, as compared with measures that truly impact prevention such as reuse. In this sense, it is incorrect to include measures related to recycling such as recycling targets and recycled content mandates in this section on prevention (Zink et al., 2018).

In contrast, genuine prevention policies include binding prevention targets on producers, and reuse targets (replacing disposables by reusables), and other approaches to reduce primary material production and use. Such prevention targets already exist for some streams such as food waste and provide robust policy examples, with mandatory targets that include both percentages and absolute amounts (Johansson & Corvellec, 2018; ECOS et al., 2022). Municipal waste-prevention targets also exist in Flanders, the Netherlands, Spain, Italy and Sweden (ECOS et al., 2022).

Countries can pass plastic waste prevention targets, or count plastic waste prevention towards broader municipal solid waste prevention targets, as environmental groups are currently advocating in the EU in the context of the Waste Framework Directive revision (ECOS et al., 2022). Some plastic prevention targets already exist. For example, the 2020 Afvalpreventieprogramma Nederland (Waste prevention programme Netherlands) provides that by 2024, 20 % less plastic shall be used than in 2017.

Plastic prevention can also be achieved through market-based measures such as taxes on virgin plastics used for single-use plastic production. Examples of virgin single-use plastic taxes include:
- Italy 450EUR/tonne tax adopted in the Budgetary Act 2019, Art 1, paragraphs 634-658
- Spain 450EUR/tonne: (copied from Italian regulation)
- UK 200GBP/tonne tax for plastic packaging made with 70% or more virgin plastic adopted in the 2021 Plastic Packaging Tax

Likewise, reuse targets directly cause plastic waste prevention. Sweden has adopted targets to increase the ration of reusable packaging in its policy Att göra mer med mindre – nationell avfallsplan och avfallsförebyggande program 2018-2023 (To do more with less – national waste management plan and waste prevention programme 2018-2023).

Examples of economic incentives supporting reuse and packaging reduction also include:
- Municipality of Capannori, Italy (2008): As part of a comprehensive zero waste policy, the municipal administration introduced a 20% discount on the fixed part of the waste tax for all businesses that sell food and other products without packaging. Shops that want to take advantage of the discount must show the municipality that they have introduced packaging-free products in their shops.
- Municipality of Talamone, Italy (2017): 30% to 70% reduction of the variable part of the waste tax for small shops (maximum 150 square metres in size) that sell unpackaged products or products in reusable containers. Those who sell only refill products are entitled to a discount of 70%, while those offering refills alongside a more traditional model will benefit from a 30% tax reduction.

These and many other examples are detailed in Seas At Risk (2021).

Preventive measures on primary and secondary microplastics

Microplastics fall under the scope of these technical guidelines and their prevention cannot be disregarded. GAIA and BAN advocate the inclusion of additional measures to prevent microplastic waste and pollution including:

- Bans on intentionally-added microplastics other than those found in products, such as Resolution 69 (2021) of the city of Palm Beach Gardens (Florida, USA) prohibiting glitter on city property.
- Bans on small macroplastics that litter easily, such as Resolution 69 (2021) of the city of Palm Beach Gardens (Florida, USA) prohibiting confetti on city property.
- Bans on water-soluble plastics that cause microplastic water pollution (see See Rolsky et al., 2021) ;
- Bans on plastics that fragment easily into microplastics, for example bans on polystyrene foams (including extruded polystyrene (XPS) and expanded polystyrene (EPS)), such as Iceland's 2021 Amendment to the Hygiene and Pollution Prevention Act banning plastic foam food and beverage containers.

Landfill bans can increase incineration; incineration bans can stimulate prevention

Landfill bans can increase waste incineration (Zero Waste Europe, 2020) and increase the pressure to export plastic waste that has no domestic recycling market. Incineration bans are a safer measure to support prevention without adverse toxics and carbon impacts.

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

Policy instruments	*Waste prevention and minimization measures*
Regulatory	*- Design requirements* ***- Plastic waste prevention targets*** ***- Reuse/refill targets*** *[- Ban on single-use plastics, such as single-use plastic bags or cutlery]* *[- Ban on oxo-degradable plastics]* *- ~~Restrictions~~ **Bans** on hazardous substances in plastics and of microplastics in products **or other primary microplastics (e.g. glitter)*** ***- Bans on small macroplastics that litter easily (e.g. plastic confetti)*** ***- Bans on plastics that fragment easily into microplastics (e.g. polystyrene foams)*** ***- Bans on water-soluble plastics that dissolve incompletely, forming microplastics (e.g. polyvinyl alcohol)*** *- **Production and** Consumption reduction measures* *- ~~Targets on recovery/recycling~~* *~~- Targets on recycled content~~*

	- *Deposit return schemes to increase reuse ~~and recycling~~* - *Labelling and identification of products* - *Extended Producer Responsibility (EPR), e.g., including fee modulation with respect to recycled content or other design aspects* - *Green procurement criteria* ~~[- Landfill ban/~~*incineration ban*~~]~~ ~~[~~*Reduce the use of hard to recycle plastics*~~]~~
Market-based	- *Taxes on products (e.g. packaging, plastic bags[, virgin plastic~~]~~)* - *Tax exemptions (e.g. for reuse and repair)* - *Pay-as-you-throw schemes (PAYT)* - *Deposit return schemes* - *Extended producer responsibility (EPR)* - *Landfill tax/incineration tax* *[- Tax on virgin plastic]* *[- Economic incentives for reusable and repairable products and packaging, packaging-free businesses]*
Information-based	- *Awareness campaigns/school education* - *Labelling and identification of products* - *Procurement guidelines* - *Providing practical information, e.g., via information exchange platforms, to businesses and consumers* - *Environmental certification schemes*
Voluntary	- *Product standards (e.g., eco design) and specifications* - *Labelling and identification of products* - *Extended producer responsibility (EPR)* *[- Green procurement criteria]* *[- Sustainable procurement]*

Identification of PVC and other hazardous plastic wastes (§101-103)

Additional paragraph 101(b)bis is needed to correctly identify PVC waste. PVC satisfies the Basel Convention definition of hazardous waste (Annex I component - organohalogen - and Annex III characteristic - H.13) (Healthcare Without Harm, 2021). 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).

> ***101 (b)bis Further, as PVC is a halogenated polymer (Annex I category Y45 "organohalogen compounds other than substances referred to" elsewhere in Annex I) that may exhibit the Annex III H13 hazardous characteristic due to new generation of polychlorinated dibenzo-furans and/or polychlorinated dibenzo-p-dioxins during thermal degradation, and due to the off-gassing of vinyl chloride in landfills, PVC waste should be considered as a hazardous waste.***

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). At the very least, it should be controlled under Y48 as a halogenated plastic.

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.

> ***Identification of ~~non-hazardous~~ contaminants***
>
> *102. Contaminants are unwanted materials present in plastic wastes.* ***They can be hazardous or non-hazardous****~~, including non-hazardous contaminants~~***.** *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.*
>
> *103. Mixed polymer waste streams may are 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).*

Industry specifications (§107)

It is important to emphasize that so no government is under the illusion that the existence of industry standards can be a substitute for national regulation on contamination limits in plastic waste imports and exports. These specifications were already in existence before the global plastic waste crisis from 2018 onwards and were not effective in preventing the crisis.

> *107. Specifications (see the footnotes related to "almost free from contamination and other types of waste" and "plastic waste almost exclusively consisting of" in entries B3011 and Y48 that refer to international and national specifications that may offer a point of reference) can be sourced from industry-wide standards, regional and national quality standards at different stages linked to the plastic waste trade. Specifications are often used to characterize waste destined for recycling and to specify the quality of the outcome of the recycling process. Some documents relevant for specifications have been developed by private sectors including industrial associations such as Institute of Scrap Recycling Industries (ISRI, 2020), Plastics Recyclers Europe and European Recycling Industry Confederation (EuRIC).* ***They are not legally binding and are often based on economic and not environmental considerations.***

Storage (§169-170)

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.

> **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.

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.

> ***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].***

Mechanical and chemical recycling (§175-235; §249-284)

This section, as well as the sections on specific types of plastics, need 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.

Instead, the current guidelines fail to address very real challenges of plastic recycling and other recovery. For instance, the draft 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.

In addition, the guidelines give insufficient attention to the management of hazardous waste outputs from chemical recycling processes, and make no mention of the copious quantities of fossil fuels consumed by chemical recycling processes, and their climate impacts.

Furthermore, these guidelines must define recycling consistently with the Basel Convention Glossary of Terms, and the outcome of work to revise Annex IV to the Convention. The Basel Convention Glossary of Terms states that:

> *"Recycling operations usually involves [sic] the reprocessing of waste into products, materials or substances, though not necessarily for the original purpose. Resources are saved by recovering material benefits from the waste. Recycling is to be distinguished from operations that recover energy from the waste. In some countries, where material is used once merely for its physical properties e.g. for backfilling, this does not amount to recycling. An example is used lubricating oil*

re-refined which could result in high grade oil which is valuable for its chemical properties and hence that would be a recycling operation. Used oil could also simply be used as a fuel so that the recovery operation would be energy recovery and not recycling."

Neither solvolysis, pyrolysis or gasification have reliable outputs that allow us to consistently define these operations as recycling ("plastic-to-plastic" or "plastic-to-chemicals") in a manner that is consistent with the Basel Convention Glossary of Terms since at times their main outputs are fuels, or even hazardous waste. The outputs from solvolysis, pyrolysis, and gasification of plastic waste are unpredictable and depend on different additives/contaminants in the feedstock, as demonstrated in GAIA's case study of the Agylix pyrolysis facility in Tigard, Oregon, USA, that claimed to recycle plastic waste when it fact it turned plastic waste into pyrolysis oil which ended up being hazardous waste requiring disposal in cement kilns (Patel et al., 2020). Therefore, it is not possible to determine from the outset whether a so-called "chemical recycling" process constitutes recycling or other recovery, or even final disposal (in the case that the main output is hazardous waste).

The way in which these processes are described will be determined by current work to review Annex IV to the Convention, and work on these technical guidelines should not prejudge or constrain Annex IV discussions. In GAIA and BAN's views, the best listings to capture those operation would be as follows, and should be ultimately referenced in the guidelines once the work on Annex 4 to the Convention has concluded:

- R3. Mechanical recycling
- R3bis. Chemical recovery e.g. solvolysis [and solvent-based purification]
- R1. Thermal recovery e.g. pyrolysis / gasification / incineration w energy recovery

We suggest the use of the term "recovery" and not "recycling" for solvolysis, pyrolysis and gasification not to prejudge of the outcome of Annex 4 work. **Sections on chemical treatment (solvolysis, pyrolysis and gasification) must be either removed, or significantly shortened and referenced very clearly as non-ESM operations.**

Furthermore, 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 (McNeill et al., 1995; Zhou et al., 2016). 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.

As solvolysis, pyrolysis and gasification cannot be reliably categorized as recycling processes, they should not be mentioned in paragraph 175. Text on those technologies should be preferably deleted, or consolidated in paragraphs 226 onwards.

> ***175*** *[Formerly 176]. Plastic waste recycling (operation R3)* ***is*** ~~*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) Physical recycling, with the removal of constituents (e.g., flame-retardants) from plastic waste while keeping the plastic polymer molecules chain largely intact (solvent-based purification);*~~
> ~~*(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 describe solvent based purification 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.

> ***New paragraph for section in paragraphs 226 onwards. Forms of chemical recovery include*** ~~*(b) Physical recycling, with*~~ *the removal of* ~~*constituents*~~ ***additives and contaminants*** *(e.g., flame-retardants) from plastic waste while keeping the plastic polymer molecules chain largely intact (solvent-based purification);*

> ***New paragraph for section in paragraphs 226 onwards / OR DELETION. Further forms or recovery include 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, other chemical applications, or fuels. In some cases, the outputs of these processes are too contaminated for it to make economic sense to decontaminate them, and they must be disposed of as hazardous waste.***

In the first sentence of paragraph 177, "uses… that are used" makes no sense. In the second sentence, for the sake of clarity it is important to highlight that even so-called "closed-loop" recycling is usually not fully circular since it requires the incorporation of primary plastic material, and perhaps even more so than in open-loop applications, as the functionality and quality requirements for closed-loop applications are usually higher.

> ***177*** *[Formerly 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)* ***with the addition of virgin material*** *or a different plastic application with similar material properties (open-loop recycling).*

178 *[Formerly 179]**.** As noted above, closed-loop recycling refers to a recycling method in which recycled plastic wastes are processed and returned to their original use. A well-established example of closed-loop recycling is bottle-to-bottle recycling.* ***It should be noted that virgin plastic must be incorporated, and recyled products are not made of 100% recyclate.*** *Open-loop recycling refers to the recycling process whereby plastics wastes are converted into new use. An example of open-loop recycling is the recycling of waste PET bottles into polyester staple fibre, polyester filament, film, etc. When choosing closed-loop recycling or open-loop recycling, inter alia the physical properties, and the environmental benefits should be considered. Improving the quality of the recycled materials, as well as supporting and improving markets for secondary materials, should be promoted.*

The mandate of these technical guidelines includes bringing clarity to Parties for their effective compliance with and implementation of the Basel Convention plastic amendments. Without guidance, there is a risk that thermoset plastic waste is subjected to transboundary movements without controls, as it is cited in listing B3011 as "cured resins". However, current technology allows no ESM recycling of thermoset wastes, therefore "cured resins" cannot satisfy the requirements of entry B3011 at present. Proposed paragraph 188bis is essential to bring clarity on this issue and should be unbracketed.

~~[~~**188bis.** 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.~~]~~

Paragraph 188quater makes an important contribution on the challenge of toxic contaminants in recycled plastics and how this can interfere with their use as food-contact materials. This should be unbracketed.

~~[~~**188quater.** In case recycled plastic, for example PET or HDPE, is used in food contact materials, strict national legislation for using recycled plastics in food contact materials should be in place to minimize migration of substances into food.~~]~~

The description of hydro-cyclones in paragraph 209 needs further clarification to make it clear that hydro-cyclones do not resolve the issue of contamination with non-target polymers. In addition, as these guidelines are about ESM, the environmental implications of using hydro-cyclones must be made clear, as per our suggested addition.

209 *[Formerly 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.

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 not be recycled within the unit as this concentrates toxins and creates a less effective capture medium.

> ***217*** *[Formerly 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 this gas should be treated. This must be addressed during further work on the guidelines.

> ***222*** *[Formerly 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.*

Our preference is that solvolysis, pyrolysis and gasification of plastic wastes are excluded altogether from these guidelines as they are not ESM. If this is not possible, we suggest the use of the term "recovery" and not "recycling" for solvolysis, pyrolysis and gasification not to prejudge of the outcome of Annex 4 work. Sherwood, 2020; Rollinson and Oladejo, 2020; Hann et al., 2020 provide ample evidence of the high energy needs and hazardous waste outputs from these processes, that are not ESM.

> *[EDIT HEADING]* ***~~Physical recycling (R3)~~ Chemical and thermal recovery (solvolysis, pyrolysis, gasification)***

> ***224bis. 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.***

Solvent based purification does not yield 100% product purity due to the carryover of residual additives and solvent, and it cannot be considered as a perpetual recycling method for plastics because the polymers degrade with each cycle (Crippa et al., 2019).

> ***225*** *[Formerly 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* **or with the use of an anti-solvent***), dried and re-formed into the original plastic material. ~~at close to 100% product purity and mass yield.~~*

This paragraph is entirely redundant with paragraph 225. 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 Crippa et al. (2019).

> ***226*** *[Formerly 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.*~~

There is no valid conceptual basis for separating solvent-based purification and solvolysis from other methods of chemical recovery. The immature technologies described in the following paragraphs create hazardous waste by-products and harm the climate and are not ESM. These paragraphs should therefore be deleted.

It is furthermore highly misleading to have paragraph 228 describing the shortcomings of mechanical recycling in the chemical recovery section, because it suggests that solvolysis, pyrolysis or gasification of plastic wastes are appropriate for mixed plastic waste and multimaterial wastes containing plastics. This paragraph should be moved to the mechanical recycling section.

Solvolysis, pyrolysis or gasification of plastic wastes, marketed as "chemical recycling", were 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 (see Crippa et al., 2019, 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.

> ***[DELETE HEADING]*** ~~***Chemical recycling (R3)***~~
>
> ***227*** *[Formerly 228].* ~~*Chemical recycling, a rapidly evolving field, may be a complementary technology to mechanical recycling for certain plastic waste types or applications.*~~
>
> ***228*** *[Formerly 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.*~~
>
> ***229*** *[Formerly 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).*~~

Chemical recovery includes the removal of additives and contaminants (e.g., flame-retardants) from plastic waste while keeping the plastic polymer molecules chain largely intact (solvent-based purification). Further forms or recovery include 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, other chemical applications, or fuels.

229bis [Formerly 230]. The type of outputs from these operations (chemicals for plastic manufacture; other chemicals; fuels; or hazardous waste) is highly unpredictable, depending in part on contaminants present in the plastic wastes.

230 *[Formerly 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'.*~~

231 *[Formerly 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. 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.]~~

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.

232 *[Formerly 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).~~*

It is not accurate that chemical recycling facilities are available at "close to full-scale operating throughput". This is speculation and those technologies have not got any nearer to operating at 'full-scale throughput' in fifty years of experimentation. This paragraph also misses the crucial information on ESM. The Rollinson and Oledejo, 2020 report was the first assessment of environmental impacts and it shows that the technology has multiple routes to environmental harm.

233 *[Formerly 234]. [Chemical recycling, a rapidly evolving field, may be a complementary technology to mechanical recycling for certain plastic waste types or applications.]* *~~Various examples of chemical recycling methods for plastic wastes are available at the pilot-plant stage and also at close to full-scale operating throughput [but~~* *most are yet to demonstrate 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 life-cycle impacts (Hann et al., 2020)].* ***Environmental impacts of pyrolysis and gasification include toxic emissions of phthalates, bisphenols, toxic brominated compounds, CO and hydrogen cyanide, PAHs, and dioxins, many of which are potent carcinogens). Solvolysis can concentrate toxics in recyclate, or transfer toxics from plastics into solvents (such as phthalate esters) while solvents used are often toxic and hazardous themselves such as n-hexane, cyclohexane and chloroform. Plastic depolymerization is also highly energy and carbon-intensive, worsening climate change, in addition to similarly high energy and carbon requirements for repolymerization. Environmental***

__impacts also arise from the necessary treatment of hazardous outputs from these processes, such as spent solvents, tars, char, oils and gasses (Rollison and Oladejo, 2020).__ [However, to date, only a few chemical recycling plants are in continuous operation, and further scientific evidence for the ecological and economic benefits is still necessary for final evaluation. These technologies are a developing area,] for further information refer to the report "Chemical Recycling of Polymeric Materials from Waste in the Circular Economy" (European Chemicals Agency, 2021), "Chemical recycling: A critical assessment of potential process approaches (Quicker et al, 2022)", "Chemical Recycling of Plastic Waste: Comparative Evaluation of Environmental and Economic Performances of Gasification- and Incineration-based Treatment for Lightweight Packaging Waste (Voss et al, 2022)" and "Chemical Recycling: State of Play" (Hann et al, 2020).

(Co-)incineration of plastic waste with energy recovery (§236-238)

Use of plastic waste as a fuel constitutes energy recovery, and this was included in the original paragraph and should be reinstated despite a deletion during the last COP contact group.

__236__ [Formerly 237]. For energy recovery, plastic wastes can inter alia be thermally treated __or used as a fuel__ through incineration with energy recovery with other kinds of waste, e.g., MSW and industrial wastes, or [through co-incineration] in blast furnaces and power plants, and through co-processing in cement kilns.

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.

The draft should also 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.

__237__ [Formerly 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. The presence of flame-retardant additives can interfere with the complete combustion of plastics, 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).*** *~~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.~~*

References are needed for Table 17. Some of the values are wrong, e.g. coal which is almost half its actual calorific value.

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

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 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 (Consonni et al., 2005). Climate metrics should be considered here, since the production of RDF/SRF is highly energy intensive.

> ***238*** *[Formerly 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 usually has a higher calorific value than RDF.~~ RDF is produced by removing* ***some of*** *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.***

Recycling of specific plastics (§265-267)

No evidence has been given to support the claim that "certification" has been given to outputs from pyrolysis, gasification or solvolysis of PET waste being used at 100% levels for food-contact materials and the sentence should be removed unless such evidence is presented. In the EU, only mechanical recycling is approved for FCM applications at present. The latest scientific findings indicate that recycled PET can be an unsafe food-contact material, and possibly even less safe than virgin PET (Gerassimidou et al., 2022).

> ***265*** *[Formerly 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.***

The guidelines must highlight the environmental implications of using plastic recyclate in products, both positive and negative. In particular, recycled PET used in textiles has been shown to have a greater propensity for microfiber shedding compared to virgin fiber (Özkan and Gündoğdu, 2021).

267** [Formerly 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.

Health and safety (§285-289)

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

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

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. We recommend further work on this point intersessionally before final adoption of these guidelines.

287** [Formerly 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].

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.

***288** [Formerly 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.*

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GAIA is a global network of more than 800 grassroots groups, NGOs, and individuals. We envision a just, zero waste world built on respect for ecological limits and community rights, where people are free from the burden of toxic pollution, and resources are sustainably conserved, not burned or dumped. We work to catalyze a global shift towards environmental justice by strengthening grassroots social movements that advance solutions to waste and pollution. For more information, see www.no-burn.org

Founded in 1997, the Basel Action Network is a 501(c)3 charitable organization of the United States, based in Seattle, WA. BAN is the world's only organization focused on confronting the global environmental justice and economic inefficiency of toxic trade and its devastating impacts. Today, BAN serves as the information clearinghouse on the subject of waste trade for journalists, academics, and the general public. Through its investigations, BAN uncovered the tragedy of hazardous electronic waste dumping in developing countries. For more information, see www.BAN.org