Global Minimum Transparency Standard (GMTS) for hazardous chemicals in products

A missing but essential tool for the protection of biodiversity

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groundWork

Health and Environment Justice Support
Olga Speranskaya, Alexandra Caterbow
www.hej-support.org, info@hej-support.org

SSNC
Andreas Prevodnik
andreas.prevodnik@naturskyddforeningen.se
www. naturskyddforeningen.se

groundWork
Rico Euripidou, rico@groundwork.org.za
Mafoko Phomane, mafoko@groundwork.org.za
www.groundwork.org.za

For more information about GMTS please visit:
www.globalchemicaltransparency.org

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Biodiversity loss is happening at an unprecedented rate, with pollution from chemicals and wastes being among the fundamental causes. While Aichi Biodiversity Target 8 calls to curb pollution to levels that are not detrimental to ecosystem function and biodiversity, this target has not been achieved[1]. Moreover, the recent publication in Environmental Science &Technology emphasizes that annual production and releases of novel entities, including chemicals," are increasing at a pace that outstrips the global capacity for assessment and monitoring"[2] . International chemical treaties, including the Stockholm, Rotterdam, Basel, and Minamata Conventions, significantly contribute to addressing chemicals and waste pollution. However, their effective enforcement at the national level is often still lacking. With few exceptions, the chemical conventions do not have formal transparency requirements for the regulated chemicals in materials and products. Such an information gap may complicate the compliance work. The suggested approach to develop a Global Minimum Transparency Standard for Hazardous Chemicals in products (GMTS) will help address the problem along the whole product life-cycles. The overarching purpose of a GMTS is to achieve equal access to information about the presence of the most hazardous chemicals in products irrespective of country and within and outside the supply chains. It will help make informed decisions for how the products are handled throughout their life cycles and ensure the global safety of human health and the environment.

Introduction to the role chemical pollution plays in biodiversity loss

Biodiversity ensures the sustainability of ecosystems and the biosphere by driving biogeochemical cycles, producing oxygen, absorbing pollution, regulating precipitation and stabilizing the climate, producing food and buffer against diseases, and, thus, providing livable conditions. Biodiversity also has spiritual and cultural significance to humanity. No matter how insignificant it may seem, each species contributes to the sustainability of the local ecosystem and the biosphere as a whole.

However, many factors negatively impact biodiversity, and pollution is among the five key pressures on biodiversity as identified by the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services). The IPBES Summary for policymakers documents that air, water, and soil pollution have increased, with marine plastic pollution as much as tenfold since 1980. The report emphasizes that many types of pollution have significant adverse effects on nature, Including "greenhouse gas emissions, untreated urban and rural waste, pollutants from industrial, mining and agricultural activities, oil spills and toxic dumping"[3].

The Global Chemicals Outlook - Towards Sound Management of Chemicals highlights that "the biodiversity costs of inaction on chemicals are high"[4]. It further notes that the regular use of consumer products can also discharge chemicals that contaminate the environmental media. Moreover, chemicals leach from products disposed of in landfills and are released into the air during open burning or incineration. They contaminate the recycling stream and remain in recycled material stock.

Today's products often contain hundreds of toxic chemicals with hazardous properties, including heavy metals, endocrine-disrupting chemicals, persistent organic pollutants, and volatile organic compounds. These chemicals harm the wildlife's reproduction, immune, hormonal and neurological systems, making "entire ecosystems **more vulnerable and less resilient** in a context where they are also affected by many other external stressors such as climate change or habitat loss"[5].

Intentionally and unintentionally added chemicals, including from recycled materials, are found in various products, including toys. According to the Global Chemicals Outlook II: summary for policymakers, the complexity of global supply chains, cross-border trade in chemicals and products, and recycling pose particular problems. The report further notes that "Full material disclosure of products, sound recycling, and waste management, and sustainable product design are important actions to minimize potential future releases from material stocks and products, and to generate secondary raw materials in a circular economy that are safe and sustainable"[6].

This information paper clarifies how chemicals, directly and indirectly, impact biodiversity, focusing solely on materials, products, and associated waste as an essential source of exposure to toxic chemicals. It explains how a Global Minimum Transparency Standard for toxic chemicals in products may contribute to biodiversity protection by forming a foundation for a safe circular economy, resource-efficient material flows, and sustainable production and consumption models.

Direct impacts of hazardous chemicals from the life cycle of materials/products on biodiversity

All stages of the life cycles of materials and products contribute to chemical emissions and releases into the environment. Pollutants may arise from processing chemicals for raw material production, extraction, refining, manufacturing, or be by-products from chemical reactions in these processes or energy production. They can also leak from materials and products in use or their waste.

High, prolonged, or recurrent exposure to individual chemicals, or mixtures, may cause reproductive, immunological, neurological, and metabolic damage, etc., or even death, in wildlife. For example, a Europe-wide study gave strong evidence that chemicals threaten the ecological integrity and biodiversity of almost half the continent's water bodies. This study, which tested for some 223 chemicals across 4,000 monitoring sites, found that organic chemicals were likely to have acute lethal effects on sensitive fish, invertebrates, or algae species at 14% of sites and chronic long-term effects at 42%[7]. Another European field study of real-time measurements showed the existence of frequent, recurrent exposure peaks that exceeded environmental quality standards for some chemicals, a situation that may push organisms to levels of stress where recovery is compromised[8].

However, biological effects are very complex and manifest at several organizational levels from cells to individuals and populations, and over different timescales. Furthermore, many emitted chemicals remain unmonitored in the environment. Their ecotoxicological effects and their breakdown products have often not been evaluated, or only for limited numbers of species. Consequently, under field conditions, it is generally hard to establish clear cause-effect relationships for specific chemicals – let alone for mixtures – so the direct negative impacts of chemical pollution on biodiversity are likely to be underestimated[9].

Indirect impacts of chemicals from the life cycle of materials and products on biodiversity

It is important to emphasize that the production of chemicals requires the extraction of natural resources. In turn, such extraction requires technological chemicals. Approximately half of greenhouse gas emissions and over 90% of biodiversity loss and water stress come from natural resource extraction and processing[10]. Global consumption of materials, like biomass, fossil fuels, metals, and minerals is expected to double over the next four decades, with annual waste generation projected to increase 70% by 2050[11].

The link between chemical industry and other drivers of biodiversity loss

Overall, the growing production of materials and products and waste generation, depend on the chemical industry that performs a key function in the global economic system by supplying chemicals for production and extraction of raw materials and for processing raw materials into products. It is, therefore, one of the drivers behind natural resource extraction, together with chemical-intensive sectors, such as various manufacturing industries.

Furthermore, oil, gas, and coal are still the primary feedstocks for basic chemicals and the fuel for the large amounts of energy needed to produce chemical products. The chemical industry is increasingly looking at how to transit more to renewable organic feedstocks. This is a necessary development, but wrongly managed could be harmful. For example, subsidies promoting biofuel use contributed to a four-fold increase in bioethanol production and a tenfold increase in biodiesel production in the past decade, with significant negative impacts on biodiversity[12] [13] [14]. Waste from existing agriculture and forestry, sewage, and cultured algae or bacteria may be alternatives to organic feedstocks that do not necessarily imply claiming virgin land and forest resources or creating large-scale monocultures.

The chemical industry alone is also the 'world's largest industrial energy consumer. It accounts for approximately 10 percent of global energy demand or 30 percent of total industrial energy demand[15]. It is the third largest industrial emitter of CO_2 and contributor to climate change, which is considered another principal driver behind biodiversity loss[16] [17]. Add to this, emissions of greenhouse gases from the manufacturing of materials and products.
However, the current global production and consumption systems drive climate change by consuming energy as well as degrading the carbon storage potential of various ecosystems, thereby draining the buffer and mitigation functions that we rely upon. According to the University of Southern Denmark, "There are several ecosystems on Earth that efficiently store carbon. In principle, all living organisms like animals, plants, algae, and bacteria, consist of carbon and thus function as a carbon sink as long as they live"[18]. Thus, harming ecosystems and causing biomass and biodiversity loss inevitably result in limitations of carbon storage potential.
Habitat loss and degradation are considered the

most important immediate cause of biodiversity loss[19]. In terrestrial environments, agriculture, forestry, and mining are key operations causing this situation and supply raw materials to fuel production and consumption systems for materials and products. Extractive, production, manufacturing operations in terrestrial environments may also cause negative impacts on downstream aquatic ecosystems, e.g., through chemical pollutants and releases of excessive amounts of organic matter and sediments. In addition, recently, there has been an increased interest in seabed, and lakebed mining[20], with direct habitat destruction in aquatic environments.

Waste as a threat to wildlife

Another factor behind habitat loss and degradation is waste. In the current linear economic system, accumulated waste needs to be disposed of at the end of the material and product life cycle, which claims land and may cause destruction of it. Physical waste may spread in uncontrolled manners from disposal sites. For example, plastic waste accumulating in the oceans is a well-known issue, with severe impacts on marine ecosystems, while in other ecosystems, plastic waste has largely unknown implications[21]. Plastic waste can be hazardous to wildlife because plastics block the feeding apparatuses and the guts of organisms and may also carry in or absorb onto their surface hazardous chemicals[22 23 24].

To add on the issues of physical contamination with waste, uncontrolled and diffuse releases of toxic chemicals from waste or upon incineration of waste, may spread in an uncontrolled manner in the environment.

An often highly toxic waste category is electric and electronic waste ("e-waste")[25]. Electronic devices are comprised of hundreds of chemicals, including highly toxic to human health and the environment. These chemicals include heavy metals, brominated flame retardants, and polybrominated diphenylethers. Artisanal e-waste recycling includes open burning, acid bath heating, and uncontrolled use of process chemicals, causing severe contamination of soil, water, and the food chain[26 27]. Nevertheless, the global market for electronic components is projected to grow at a compound annual growth rate of about 4.8% from 2020 to 2025[28]. The high consumption rate, short life cycle, and limited options for repair of electrical and electronic equipment result in the increase of e-waste generation that is "projected to grow to 74.7 Mt by 2030 – almost doubling in only 16 years"[29].

Toxic releases from waste bring us back to the discussion on the direct impacts of hazardous chemicals from the life cycle of materials/products on biodiversity.

An often overlooked but important piece of the solution to the biodiversity crisis

Chemicals, waste and the link to Sustainable Development Goals and Aichi Targets

With some generalization, but mindful of the fact that certain individuals and communities have considerably less impact than others, it is clear that large sections of the global society exist beyond the carrying capacity of the natural resources and ecosystems. The overshoot in use increased by 20% only between 2002 and 2010[30]. To meet the world's urgent environmental, political and economic challenges, in 2015, the Sustainable Development Goals (SDGs) were agreed upon "to end poverty and protect the planet"[31].

There is a clear link between nearly all SDGs and the sound chemicals and waste management. However, SDG 12, "*Ensure sustainable consumption and production patterns*", reflects explicitly the insight that chemicals and waste management are inextricably linked to the broader quest for resource efficiency. It highlights the importance of waste reduction and the need to decouple more of the economy from virgin natural resource use and environmental impacts. If fulfilled, conditions for meeting many additional SGDs would automatically improve. Moreover, four of the identified five principal drivers behind biodiversity loss (habitat destruction and degradation, climate change, chemical pollution, and over-exploitation or unsustainable use of natural resources) could be indirectly or directly addressed.

SDG target 12.4 states that "By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment". Its fulfillment requires the systematic identification of hazardous chemicals and restriction, phase-out, or substitution of the most toxic. This, in turn, requires transparency for chemicals in materials and products. According to article 22 of the Dubai Declaration, underlying the UN Chemicals Strategy Strategic Approach to International Chemicals Management (SAICM), "… information relating to the health and safety of human health and the environment should not be regarded as confidential"[32].

SDG target 12.5 states that "By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse". If fulfilled, the economy could increasingly decouple from the need for virgin raw materials while the issue of waste management would improve. This necessitates a systemic change that creates favorable market conditions for secondary raw materials. Products that by design can be maintained to extend their life cycles as long as possible must simultaneously be promoted. When their life span is over, they should be easily dismantled, and the materials reused or recycled. However, transparency for hazardous chemicals in materials and products will be necessary to ensure that secondary raw materials are safe for human health and the environment.
Safe handling of terminal waste that cannot become secondary raw materials also requires transparency for their chemical composition.

Another systemic change necessary to meet this target is to reduce the overall need for materials and products in society, e.g., new ownership models, such as collaborative consumption, where communities share products for collective consumption. Such consumption models can help the poor and disadvantaged access primary products and services[33].

In turn, the fulfillment of SDG 12 will promote the realization of several Aichi targets, notably no. 4, 5, 6, 7, 8, and 19[34].

Global Minimum Transparency Standard (GMTS) for toxics-free transformation of the economy

A transition to safe chemicals and products by design and using non-hazardous chemicals throughout the lifecycle offers significant opportunities to reduce chemical pollution and improve circularity that minimizes the need for virgin raw materials, energy, process water, and chemicals in production and manufacturing. At the same time, it will foster more sustainable innovation. Combined with the shared ownership models mentioned above, this will help address four of the five principal drivers behind biodiversity loss.

However, the lack of globally agreed requirements to ensure the availability and accessibility of information on hazardous chemicals in products throughout the product life cycle leads to continued contamination of the supply chain. Noting that supply chains for many materials and products nowadays are multi-national, the spread of chemicals of concern is hard to address until harmonized global disclosure actions are adopted. Thus, transparency of information on hazardous chemicals in materials and products throughout the lifecycle provides a solid contribution to the transformation of the economy that helps respond to the systemic challenges of biodiversity loss. The suggested Global Minimum Transparency Standard (GMTS) for hazardous chemicals would be a keystone tool to support the necessary economic transition since it creates conditions for informed decisions concerning chemicals for all life stages of materials and products. A dedicated webpage to the GMTS idea provides more information, including the rationale for the standard and suggestions for putting it in place[35].

A GMTS is a globally harmonized transparency standard for hazardous chemicals in products and defines the minimum level of information disclosure. Countries or companies that wish to disclose more information on hazardous chemicals for their own specific purposes are encouraged to do so.

Circular economy is gaining increasing recognition as an important model for the necessary transformation of the economy. A number of resolutions from UNEA 4 confirm the importance of the circular economy[36] [37] [38], and new resolutions affirming this are expected from UNEA 5. The European Union was a forerunner with its Circular Economy Action Plan first launched in 2015 and updated in 2020[39], but there are now several additional regional initiatives emerging, such as the African Circular Economy Alliance[40] and the Latin American and Caribbean Circular Economy Coalition[41].

The EU Chemicals Strategy for Sustainability points to the need for mainstreaming the transition to a toxic-free circular economy, as "essential cross-cutting elements for sustainable development and taking into account policy coherence for development"[42].

A GMTS will form a crucial foundation – a keystone – for a toxic-free circular economy, thus supporting the UNEA 4 resolution that calls for a circular economy and to keep hazardous substances out of the material cycles[43]. In turn, achieving a toxic-free circular economy will help "not only to slow and eventually halt biodiversity loss, but also reverse its decline, by establishing conditions for rebuilding natural capital and restoring ecosystems"[44], which

is in line with the Aichi targets aimed to protect and conserve the biodiversity.

However, the Aichi targets cannot be met unless the World's three priority and intertwined crises, namely climate change, biodiversity loss, and pollution, are addressed in a concerted way. This requires that the parties of the Convention on Biological Diversity coordinate and seek synergies with the work of other existing multilateral environmental agreements (MEAs), including chemical conventions and the Strategic Approach to International Chemicals Management (SAICM). Nevertheless, a GMTS should simultaneously be recognized as an essential but missing tool in the toolbox of multi-lateral environmental agreements to help countries disclose hazardous chemicals in materials and products along the whole lifecycles, which supports improved conditions for the establishment of the necessary synergies between the MEAs.

The standard should ideally be binding from the very beginning to be efficient. The voluntary UNEP Chemicals in Products Programme[45] has proven slow and ineffective. Though the Programme represents a tool for information disclosure for hazardous chemicals, with full ingredient disclosure for materials and products as the ultimate goal, there is no impetus for companies to join it because of its non-binding nature. The GMTS offers a more realistic approach than the UNEP Chemicals in Products Programme in short to medium term. However, the UNEP Chemicals in Products Programme should continue in parallel with the GMTS initiative, as they are mutually supportive.

Call on the stakeholders of the Convention on Biological Diversity

With reference to the facts and arguments presented above, we call upon the parties to the Convention:

- to send clear and strong signals to UNEP or the UNGA of the importance of the GMTS idea as a keystone tool for the transformation of the economy, necessary to meet the systemic challenges causing loss of biodiversity;

- to propose resolutions to the UNEA with a call for the development of a binding GMTS, either as part of an existing convention, if possible, to enhance synergies and take advantage of existing administrative or budgetary arrangements, or if necessary, as a new stand-alone multilateral instrument;

- The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to the Convention on Biological Diversity should repeatedly highlight the benefits of the GMTS idea for addressing the systemic challenges behind biodiversity loss so that the concept is mainstreamed at the intergovernmental and national levels;

- All stakeholders, including progressive and responsible companies and industry associations involved in the development and implementation of the work with the Convention should repeatedly highlight the benefits of the GMTS for addressing the systemic challenges behind biodiversity loss so that the idea is mainstreamed at all levels in society.

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