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Report - OECD Workshop on Flexible Food-Grade Plastic Packaging

Economic, Regulatory or Technical Barriers to Sustainable Design from a Chemicals Perspective – How Can Policy Makers Help?

Series on Risk Management
No. 76

Two Annex documents prepared as background reports to this workshop are available with the following cotes:

- ENV/CBC/MONO(2023)1/ANN1
- ENV/CBC/MONO(2023)1/ANN2

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Series on Risk Management
No. 76

Report - OECD Workshop on Flexible Food-Grade Plastic Packaging

INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS
A cooperative agreement among FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD

Environment Directorate

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Paris 2023

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Foreword

This report is based on the discussions held at, and background material prepared for, the OECD Workshop on Flexible Food-Grade Packaging – Economic, Regulatory or Technical Barriers to Sustainable Design from a Chemicals Perspective – How Can Policy Makers Help?

Two background papers were developed to support the workshop discussions and are available as Annexes to this report. Annex 1: Background Report - Barriers to sustainable design from a chemicals perspective for flexible food-grade plastic packaging – was developed by Partners for Innovation. Annex 2: Background Report - Government policies and regulations impacting the sustainable design of flexible food-grade packaging – was developed by Stena Circular Consulting.

The reports have been reviewed by workshop participants, the Working Party on Resource Productivity and Waste and the Working Party on Risk Management. The workshop report was endorsed for publication by the Working Party on Risk Management and is published under the responsibility of the Chemicals and Biotechnology Committee.

Executive Summary

In December 2021 the document A Chemicals Perspective on Designing with Sustainable Plastics: Goals, Considerations and Trade-offs was published and seeks to enable the creation of inherently sustainable plastic products by integrating sustainable chemistry thinking in the design process. In follow-up to the report a dialogue was formulated around a workshop theme on Flexible Food-Grade Packaging – Economic, Regulatory or Technical Barriers to Sustainable Design from a Chemicals Perspective – How Can Policy Makers Help? The workshop aimed to understand the barriers the industry faces to more sustainable design of flexible food-grade packaging from a chemicals perspective, discuss policies being put in place by governments, and identify where additional policies could help. Another complementary objective was to understand to what extent the issues discussed are specific to flexible food-grade packaging as opposed to general across different types of plastics or plastic packaging.

Two background reports were developed for this workshop and are included in this document as Annexes. This includes input from industry on barriers to more sustainable design of flexible food-grade packaging from a chemicals perspective and a report outlining government policy approaches that support a shift in more sustainable design.

Although these discussions were focused on flexible plastic food-grade packaging and the sustainable design of plastics from a chemicals perspective, many of the identified barriers to sustainable design and the associated solutions are not unique to this product sector. Due to the complexities of sustainable design from a chemicals perspective that takes a life-cycle approach, there is not one solution that will help to increase sustainability, but policy solutions and support are needed across the life-cycle.

Chemical transparency and chemical safety in the context of mechanisms that support the development of a circular economy remains a key priority.

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1. Introduction

In December 2021 the document A Chemicals Perspective on Designing with Sustainable Plastics: Goals, Considerations and Trade-offs (OECD, 2021)[1] was published and seeks to enable the creation of inherently sustainable plastic products by integrating sustainable chemistry thinking in the design process. By applying a chemical lens during the plastic material selection process, designers and engineers can make informed decisions to incorporate sustainable plastic during the conceptualisation phase of their products. The report provides an integrated approach to sustainable plastic selection from a chemicals perspective, and identifies a set of generalizable sustainable design goals, life cycle considerations and trade-offs. At a more granular level, considerations are identified for each life-cycle phase, which are brought together as a whole-product assessment and optimisation taking the full life cycle into account. The report also considers trade-offs that will need to be carefully balanced in the design phase and reflection on the implications of design choices. Ultimately, the report helps to equip designers and engineers with knowledge of relevant chemical considerations when selecting sustainable plastic, supporting better outcomes and a more transparent process.

Given that the report was geared to industry stakeholders and provides many considerations to account for a more sustainable design of plastics from a chemicals perspective, it was agreed to examine the practical challenges to implement the considerations in the report. In order to narrow the scope of applicability, flexible food-grade plastic packaging was chosen as the scenario to be examined.

A dialogue was formulated around a workshop theme on Flexible Food-grade Packaging – Economic, Regulatory or Technical Barriers to Sustainable Design from a Chemicals Perspective – How Can Policy Makers Help? The workshop was organised under the activities of the Working Party on Risk Management of the OECD's Chemicals and Biotechnology Committee in collaboration with the Working Party on Resource Productivity and Waste of the OECD's Environment Policy Committee (see Table 1). Building on two background reports (Annex 1 and Annex 2), the workshop aimed to understand the barriers the industry faces to more sustainable design of flexible food-grade packaging from a chemicals perspective, discuss policies being put in place by governments, and identify where additional policies could help. Another complementary objective was to understand to what extent the issues discussed are specific to flexible food-grade packaging as opposed to general across different types of plastics or plastic packaging. In addition, discussions around how OECD can further support sustainable plastics design from a chemicals perspective were held to conclude the workshop.

1.1. Background

The use of plastics continues to rise. Except for temporary slowdowns caused by the financial crisis and COVID-19 (except for single-use plastics), the growth has been steady since its introduction (OECD, 2022)[2]. At the same time, several sustainability challenges are becoming increasingly pressing: plastics contribute to climate change, plastics leak into the environment, and plastics contain chemicals and generate microplastics that can pose risks to human health and the environment. As one of the responses to building a circular

[1] OECD (2021), *A Chemicals Perspective on Designing with Sustainable Plastics: Goals, Considerations and Trade-offs*, OECD Publishing, Paris, https://doi.org/10.1787/f2ba8ff3-en.

[2] OECD (2022), *Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options*, OECD Publishing, Paris, https://doi.org/10.1787/de747aef-en.

economy for plastics, recycling has connected the issues of chemical safety and environmental sustainability, particularly for food contact plastics, as recycled plastics – like primary materials – require rigorous control over chemical content. However, the two policy fields are historically different and disconnected: chemical safety regulations act as a constraint on material, whereas recycling regulation is focused on creating markets and building the recycling sector.

Despite some progress in the waste management infrastructure over the last decades, plastics recycling levels remain low, and for flexible plastic food contact materials (FCMs) in particular, very little waste is recycled into useful new materials, let alone new FCMs. However, innovations are on the horizon, which means that the issue may look quite different in the future – for example, by increasing recycling rates through improved technologies. Nevertheless, as reflected in the workshop discussions, this does not negate the need for transformation in other parts of the value chain to enable sustainable plastics use: design, collection, sorting, and use.

Policy development regarding sustainable plastics is increasing (see Annex 2), but much of recent progress is currently being implemented, and the effects are yet to be seen. However, examples of where policy intervention has brought about fast and substantial change exist – such as export bans on mixed plastics and plastics that have not been reprocessed which can stimulate domestic recycling markets.

While focussing on the chemicals perspective, the workshop also highlighted the need to see this activity in the context of a broader suite of plastics management solutions including waste prevention (following the logic of the waste hierarchy), reducing plastics production, increasing reuse, considering material-type selection (i.e. is plastic necessary or the best choice?) and tackling the climate impact of plastics.

1.2. Workshop Participation

The workshop was attended (in person and virtually) by ~100 delegates representing 16 countries and the EU, UN Environment, Business@OECD, companies, expert consultants, academics and non-governmental organisations. The event was chaired by Eeva Leinala and Peter Borkey of the OECD Secretariat.

2. Scene-Setting

The scene setting of the workshop was opened by Toshiaki Yoshioka, Tohoku University, who described Japan's recent "Plastic Resource Circulation Act", aiming to eliminate landfills and reduce energy recovery of plastics waste by scaling up mechanical and chemical recycling. The strategy, named "3Rs + Renewable" emphasises recycling – targeting 60% reuse and recycling of containers and packaging by 2030 – but also has targets to reduce single-use plastics by 25% by 2030, and to introduce 2 Mt of bioplastics by 2030. Integrating bio-refineries is considered essential to manage the future carbon cycle, although biomass sourcing is a key issue to address. Policy areas to drive this change includes guidelines for design, sales/provision to reduce single-use plastics and a focus on collection and recycling capacity.

Jane Muncke from the Food Packaging Forum described plastic pollution as a wicked problem, which is very complex and needs to be addressed in a holistic way. Importantly, most current solutions address symptoms of the larger challenge and may lead to new problems in the future. Robust change can be achieved by identifying responses that shift the entire system of how food packaging is used in the right direction. It is unrealistic to

expect silver bullet solutions. Food packaging has evolved from its original purposes of storage and avoiding spoilage hand-in-hand with the way that foodstuffs are produced and consumed. Therefore, today's requirements for food packaging are much more complex and they are central to enabling the globalised food system. Chemical safety and sustainability of food packaging are related issues, and levels of some hazardous chemicals are higher in recycled plastics (e.g. BPA in rPET) showing that there are conflicting targets. The vision for safe and sustainable food packaging should be that it does not contain hazardous or untested chemicals, and it should not have a negative impact on the environment or human health. This means that environmental and health issues need to be addressed at the same time and not in isolation.

The Food Packaging Forum has developed various databases of over 14 000 chemicals in food contact materials and found that there is only a small overlap between the chemicals that were previously known to be used and the ones that have been measured in food contact materials. Many chemicals in food contact materials likely are non-intentionally added substances (NIAs). It was stated that the scientific consensus is that it cannot be assumed that low levels of chemicals migrating are automatically safe levels – some have no known thresholds, some are too low to enforce, and there is the problem of risk assessment for the toxicity of mixtures which can form. Therefore, some policy initiatives such as the EU's Farm to Fork and Chemicals Strategy for Sustainability are focussing on hazardous properties rather than quantities of migrating chemicals.

Highlights of the recent OECD Plastics Outlook (OECD, 2022)[2] were presented by Maarten Dubois, pointing out that the global use of plastics is growing steadily – historically, only the financial crisis and COVID-19 have created temporary slow-downs in the growth curve. Material flow is still very linear, 9% of plastic waste was recycled in 2019, and leakage is a major issue with over 22 Mt of mismanaged waste. However, OECD's estimates show a smaller role of marine litter than other estimates. Instead, the role of rivers in transporting plastics into marine environments is central. Sustainability improvements are slow, only 1% of innovation around plastics is environmentally relevant, and bioplastics are growing but from a small base and only represent 0,5-1% of plastics today. Levers for improvement were put forward, including design and innovation for circularity, bolstering markets for recycled plastics, scaling-up international financing, and cooperation, and increasing the ambition of domestic policies.

Highlights of the OECD document A Chemicals Perspective on Designing with Sustainable Plastics; Goals, Considerations and Trade-offs (OECD, 2021)[1] were presented by Eeva Leinala. The starting point of this broader work in 2018 was a discussion of the impact of chemical selection at the design stage, and the need to increase awareness of this issue. The report outlines design principles, sustainable design goals, and general considerations in each lifecycle stage from a chemicals perspective, drawing practical learnings from four case studies (OECD, 2021a-d)[3]. The report aims to embed sustainable chemistry thinking

[3] OECD 2021a, *Case Study on Biscuit Wrappers, An example of weighing sustainability criteria for plastic flexible food packaging from a chemicals perspective.* Series on Risk Management No. 64, https://www.oecd.org/chemicalsafety/risk-management/sustainable-plastic-products-biscuit-wrappers.pdf

OECD 2021b, *Case Study on Detergent Bottles, An example of weighing sustainability criteria for rigid plastic non-food packaging.* Series on Risk Management No. 63, https://www.oecd.org/chemicalsafety/risk-management/sustainable-plastic-products-detergent-bottles.pdf

within design teams to increase awareness of the chemical-related environmental and health policy impacts along the life-cycle that need to be considered for sustainable plastics design.

An overview of flexible packaging was provided by CEFLEX, a European consortium of 190+ stakeholders across the flexible plastics value chain, aiming to create a circular economy for flexibles by reaching 80% of flexibles entering a recycling process. They estimate that just below 10 Mt of flexible packaging is put on the market every year in Europe and that 70% of consumer household flexible packaging requires food contact safe materials. Solutions to increase the circularity of flexible plastics include moving more flexible packaging into mono-material, scaling up mechanical recycling by 2-3 times, and establishing various chemical recycling technologies as a way of recycling flexible plastics back into food contact quality and renewing polymers after a few cycles of mechanical recycling.

With regards to food safety and circularity, CEFLEX highlights that the two issues have different characteristics – one is about deep scientific understanding and the other largely about creating markets. Thus, for circularity, they have developed a demand-driven model and see a need to expand collection systems including complements to consumer sorting – as it will not reach high enough collection levels without complementary sorting of the residual stream.

A number of innovations in the field of polymer sustainability were presented; AxiPolymer has developed a barrier resin GrinLoop[4] that can replace a non-PE layer in flexible multilayer plastics, making it recyclable within the PE recycling stream and compatible with existing manufacturing infrastructure. Nextek has developed a process called COtooCLEAN[5] to recycle more PE and PP films back into packaging, using supercritical CO_2 which behaves like an organic solvent removing contaminants and oil while reducing the need for water and drying, and yet does not have the negative attributes (e.g., toxicity, the difficulty of recycling) usually associated with organic solvents. Similar processes are used in the food industry to clean corks for wine usage and decaffeinate coffee beans. RISE Research Institutes of Sweden are undertaking a project named CIRC-PACK[6] aiming to investigate the influence of barriers and adhesives on mono laminate recyclability.

OECD 2021c, *Case Study on Flooring, An example of chemical considerations for sustainable plastics design. Series on Risk Management No. 65,* https://www.oecd.org/chemicalsafety/risk-management/sustainable-plastic-products-flooring.pdf

OECD 2022d, *Case Study on Insulation, An example of chemical considerations for sustainable plastics design. Series on Risk Management No. 66,* https://www.oecd.org/chemicalsafety/risk-management/sustainable-plastic-products%20insulation.pdf

[4] Eudonet. (n.d.). *Axipolymer*. Company Contacts. http://ccm.eudonet.com/xtranet/ecotech/company?i=MerjAdrDGAPXZkcf2qRuoAR1EpL1R1EpL1&lang=En

[5] Packaging Europe. (2022, March 16). Nextek food-grade film recycling project awarded UKRI funding. News. https://packagingeurope.com/news/nextek-food-grade-film-recycling-project-awarded-ukri-funding/7992.article

[6] Circpack. (n.d.). The CIRC-PACK Project. About the Project. https://circpack.eu/about/the-project/

3. Industry Challenges to Sustainable Design of Flexible Food-Grade Plastic Packaging from a Chemicals Perspective

Prior to the workshop several industry representatives agreed to share their challenges to the sustainable design of flexible food-grade plastic packaging from a chemicals perspective. This was through informal small group workshops or individual interviews with the consultant Partners for Innovation. This input was developed into the background paper Barriers to sustainable design from a chemicals perspective for flexible food-grade plastic packaging (see Annex 1) which provides insight into industry challenges. Five main barriers were identified related to chemicals usage: i) food safety of open-loop plastics, ii) low quality of recycled film due to variation in polymers, iii) low quality of recycled film due to additives, iv) insufficient transparency in chemical composition, and v) little to no benefits to biodegradables. More broadly, uncertainty over future regulations and definitions for recycling leads to a lack of demand for recycled material and the risk of misinformation to consumers. Participants commented that there is a lot of harmonisation and improvement work that can be done by industry rather than waiting for policy intervention, such as shifting to inks amenable to recycling. On the other hand, it was highlighted that contrary to what is sometimes thought, the plastics industry is quite fragmented with a plethora of SMEs, which complicates joint action. Another participant noted that transparency with regards to the composition of materials should not be considered a barrier for food-grade packaging as all plastics placed on the market need to comply with regulations, although the regulatory scenarios are different in studied countries (see Annex 2).

At the workshop, additional industry representatives provided perspectives on their challenges. DOW targets diverting 1 Mt of plastics from landfills until 2030 and selling 100% recyclable packaging globally by 2035. DOW provided a North American perspective on plastics' circularity, highlighting the differences in recycling and waste management systems across the globe and even across regions and cities. Such a highly localised system makes it complicated to determine the practical recyclability of plastics. In densely populated areas, new sorting and collection technologies can enable improved sortation (higher yields and more sorted grades) and higher-quality recycled output. For chemical recycling, DOW sees a need for policy-makers to align on common definitions and accounting rules, and to recognise the conversion of plastics into feedstock (often referred to as chemical recycling) as a recycling method.

As a plastic film compounder in the supply chain, St. Johns Packaging has noted several customer and consumer challenges with regard to sustainable design: customers expect a lower price when recycled materials with potentially a lower performance are offered; potential reputational damage to brands is a major concern hampering willingness to test new solutions; availability of recycled high-quality plastics is a challenge; and, the speed-versus-depth trade-off and comparability challenges with regards to life-cycle analysis makes it difficult to assess different solutions. Moreover, it is crucial to design regulations such as the UK plastics tax so that there are no unintended consequences, such as increased use of composite materials or disincentivising reuse solutions.

Qenos is Australia’s only producer of polyethene integrated with ethane feedstock. Strong demand for locally produced products combined with high Australian landfill rates have led to a project in partnership with Plastics Energy aiming to chemically recycle 100,000 tonnes of polyethene back into naphtha-equivalent feedstock for their PE production. Key issues for chemical recycling that were raised include mass balance accounting, clear differentiation between plastics-to-plastics and plastics-to-fuel chemical recycling, and harmonised waste management systems.

French PRO CITEO also highlighted the need for harmonising waste management. The recycling rate for plastic packaging is only 28% in France, and improvement efforts include sorting guidelines, recycling facility projects, incentives for reduction and reuse, and a modulated fee incentivising eco-design. The modulated fee for the Extended Producer Responsibility (EPR) scheme covers weight, the number of elements, and eco-design bonus and malus factors. France currently has four main plastics waste streams: PET bottles, rigid and flexible PE, rigid PP, and three so-called development streams for rigid (PET trays and PS) and flexible PP packaging.

4. Policy Solutions

As a counterpart to the discussion on challenges faced by industry on sustainable design of flexible food-grade packaging from a chemicals selection, the workshop also examined policy solutions that are being implemented or could be implemented.

The OECD Science and Technology Directorate presented the role of policy support for innovation. While firms account for the largest share of R&D expenditures, public support has had an important role in shaping the direction, extent, and nature of innovation, for example by promoting innovations that provide societal value. Tax relief is the most important instrument for innovation support in terms of volume. Before the financial crisis, grants were the main instrument. Except for a boost shortly after, tax relief has taken over since 2010. Large firms benefit from this type of support and have successfully lobbied governments, but it has also grown as a response to trade and competition rules, government state aid rules, and budgetary pressure on bureaucracy favouring such lighter touch incentives.

However, the evidence base on what approach works best is limited, due to lack of critical data, complex chains of policies and contextual factors, etc. Nevertheless, the broad consensus is that tax incentives work well for applications that are to be brought to market sooner, whereas direct support is more well-suited for longer-term and innovation towards specific goals. There is a movement toward governments making more explicit innovation policy choices – there is a need to reinvent and rethink these types of policy, considering the need for new modes of partnership, society engagement, cross-government coherence, international cooperation, and key enablers such as financing etc.

Before the workshop, a background paper on government policies and regulations impacting the sustainable design of flexible food-grade packaging was developed by Stena Circular Consulting (see Annex 2). The background report examined whether there are existing policy initiatives that help incentivise sustainable design from a chemicals perspective for this type of packaging, as well as plastic packaging more generally. Traditionally, chemical safety and end-of-life management have been two separate policy areas, brought together by the need to increase recycling. The main challenge identified in the report is to incentivise resource efficiency and circularity as well as chemical safety. The report found a range of policy approaches underway to incentivise sustainable design, but many are only beginning to be implemented, making it too early to assess their effectiveness. Prioritised actions identified in the report are to facilitate cross-regional alignment, address practical and regulatory challenges with recycled plastics in food packaging, and a robust framework for chemical traceability to align with more sustainable packaging.

Several governments presented innovative approaches to incentivise sustainable design, with a particular focus on flexible food-grade packaging. RISE Research Institutes of

Sweden highlighted the new Site Zero[7] material sorting facility that will have enough capacity to sort all plastic packaging put on the Swedish market, as well as educational efforts by the Swedish EPA on better design, and research projects on sustainable plastics being undertaken by RISE. Japan's Ministry of Environment elaborated on the "3R + Renewable"[8] strategy presented earlier by Toshiaki Yoshioka. The UK Food Standards Agency presented amendments to regulations after the UK exited the EU and described the UK "Plastic Packaging Tax"[9] which applies to domestically produced and imported plastics with less than 30% recycled content.

The European Commission presented the EU "Food Contact Materials (FCMs)"[10] legislation. Initially, the purpose of FCM legislation was to act as a constraint to ensure material safety, rather than to stimulate innovation. More recently, there has been consideration as to how the legislation could directly stimulate the production of more sustainable materials. Only in the last few years has FCM legislation gained broader attention; it has traditionally been a very niche and specialised field, difficult to understand for the public and business operators, resulting in a high risk of misunderstandings. Currently, the legislation is being revised. To highlight a few changes, the new approach includes simplified definitions of materials with broader categories, a shift to a focus on final materials, which alters the responsibility to producers at the end of the value chain, and a tiered approach to i) ban the most hazardous chemicals, ii) have authorities evaluate high exposure uses, and iii) allow benign substances, to focus the evaluation efforts where most needed. Lastly, the new plastic recycling regulation will set up a framework for novel recycling technologies while being food safety driven.

Presenters from National Institute for Public Health and the Environment in the Netherlands wanted to broaden the concept of sustainable and safe plastics by considering also hazardous effects such as inflammatory responses, impairment of energy metabolism, oxidative stress etc., as well as the risks associated with microplastics, and the effects on GHG emissions and climate change on human health.

The USA EPA highlighted that plastics are a very active topic in US regulation and legislation, with the "National Recycling Strategy"[11] aiming to improve markets, enhance policies and programs, and reduce contamination in the recycled materials stream. The established Safer Choice Program is a voluntary labelling scheme to help consumers find products with safer chemical ingredients. Among the requirements for products to display the Safer Choice label are criteria on the packaging, some of which pertain to recycling,

[7] Swedish Plastic Recycling. (n.d.). *We are building Site Zero*. https://www.svenskplastatervinning.se/en/site-zero/

[8] Ministry of the Environment Government of Japan. (n.d.). *The Plastic Resource Circulation Act.* http://www.env.go.jp/en/laws/recycle/14.pdf

[9] UK Government. (2021, June 20). *Policy paper: Introduction of Plastic Packaging Tax from April 2022*. https://www.gov.uk/government/publications/introduction-of-plastic-packaging-tax-from-april-2022/introduction-of-plastic-packaging-tax-2021

[10] European Commission. (n.d.). *Food Safety*. Legislation. https://ec.europa.eu/food/safety/chemical-safety/food-contact-materials/legislation_en#:~:text=It%20sets%20out%20the%20general,odour%20in%20an%20unacceptable%20way

[11] EPA. (2021). *National Recycling Strategy: Part One of a Series on Building a Circular Economy for All*. U.S. EPA Office of Resource https://www.epa.gov/system/files/documents/2021-11/final-national-recycling-strategy.pdf

recovery and resource efficiency. Additionally, the US Food and Drug Administration approves the use of recycled plastics in food contact materials on a case-by-case basis.

5. Remaining Gaps and Overall Observations

The preceding discussion on challenges and policy solutions was considered in a final panel dialogue and round-table discussion. Highlights from this discussion include the following observations:

- The increase of single-use plastics and the circularity gap have shifted the focus on how to step away from single-use and reduce the consumption of resources. Guidance for designing packaging with circularity and optimal resource use in mind is also needed for organisations such as SMEs and procurement units.
- The issues are of high complexity and international, so there is a reason for everyone to take action. To enable this, it might be helpful to understand the different roles of actors along the value chain and to understand and avoid vested interests becoming barriers. For example, resin producers urgently need to reduce emissions, contribute to circular solutions and optimise plastics use; consumer goods producers face a lot of pressure from consumers but need legislation as well as incentives to be able to act; and expectations on consumers must not be too high as results are likely to be disappointing. Progress could be made by working together to reach certain tipping points such as removing known hazardous substances in packaging, harmonising polymer choices in flexibles etc.
- There is a need for applied research and government support in investing in new mechanical and chemical technologies for recycling and clarifying regulations for the technologies. Practically, the EPR model works and should be extended (also combined with the deposit scheme), research needs to be harmonised at least across OECD countries for efficiency, misinformation needs to be avoided, and bio-waste feedstock for use in the most common polymers should be prioritised.
- There is an important role for policymakers in promoting the need for chemical transparency.
- The issues are known but moving on to solutions is difficult. There is a need to identify which solutions are internal to the packaging market, and which are societal. Because the issues can be overwhelming due to their complexity they can lead to inaction. Therefore, an incremental approach is required to make some progress.
- There is a need to embrace and stimulate advanced technology used for improving sorting and different types of recycling while setting standards for carbon and energy use. Standards are also needed for plastic waste, recycled content, design for recyclability as well as standardisation of metrics for monitoring and tracking progress globally.
- A modern example of a dramatic step-change was the introduction of an Australian export ban for mixed plastics and plastics that have not been reprocessed. Companies in the sector saw this as a unique opportunity to invest in the sector, and to date, the ban has led to the fast development of nine plastics recycling plants using a mix of government and private funding.
- A policy that regulates the outcomes rather than the way to get there is powerful, such as the export ban or recycled content targets, as it triggers an effect through

the value chain. The policies should be technology neutral and delineate the limits and rules where needed but at the same time do not define the process to reach the goal.

- Despite the increase in plastics recycling, an important issue is how to adjust policy to reduce constantly increasing production, as the price of plastics needs to internalise environmental externalities.
- There needs to be a balance between consumer safety and circularity – providing sufficient consumer safety while allowing also for circularity.

6. Potential Future Topical Work

The workshop concluded with a discussion on how OECD can further support the sustainable design of plastics from a chemicals perspective. Participants confirmed that policy solutions that keep a focus on safety are a priority, although specific suggestions related to a chemicals focus were limited. Some of the main suggestions from the session and the workshop discussions are outlined below, noting that these could be addressed in initiatives beyond the OECD work on sustainable design of plastics from a chemicals perspective:

- Address the question of where do we really need to have single use plastic packaging? What is an essential use of plastic?
- Understand from a research point of view how much complexity is needed for plastics packaging (i.e., the polymer/chemical combinations), as that is the cause of many of the issues relating to recycling.
- Examine the regulation of chemicals in recycled material.
- Investigate how to advance safety testing for food packaging (in vitro assays, chemical safety and assessments) in order to identify and assess hazards.
- Discuss the broader sustainability issues and solutions for plastics, notably the climate impact but also on how to reduce or limit the growth of the overall plastics consumption and increase reuse (as opposed to single-use plastics packaging) through a life-cycle approach.
- Find opportunities to collaborate with the OECD Best Available Techniques (BAT) expert group in the OECD in terms of value chain and regulations, as well as collaborating with value chains facing similar issues such as textiles.
- Develop an up-to-date summary of the innovations that have happened in mechanical recycling, to understand to what extent mechanical recycling can be a solution.
- Develop an impact analysis of policy interventions and recommendations, with an overview of all measures and their costs, ease of implementation in practice etc. As many policies are new, ex-ante modelling could be used in the near term.

7. Conclusions

Although these discussions were focused on flexible plastic food-grade packaging and the sustainable design of plastics from a chemicals perspective, many of the identified barriers to sustainable design and the associated solutions are not unique to this product sector.

Due to the complexities of sustainable design from a chemicals perspective that takes a life-cycle approach, there is not one solution that will help to increase sustainability but in reality policy solutions and support are needed across the life-cycle spectrum.

Chemical transparency and chemical safety in the context of mechanisms that support the development of a circular economy remains a key priority.

Table 1. Workshop Agenda

Day 1 – 12 May 2022
9h45
Item 1. Welcome, logistics and workshop objectives (OECD)
Scene-Setting
10h00
Item 2. Scene-setting on Plastics, Sustainability and Chemicals
Keynote Speech: **Prof. Toshiaki Yoshioka, Tohoku University** [20 min + 5 min Q&A]
Keynote Speech: **Jane Muncke, Food Packaging Forum** [20 min + 5 min Q&A]
Highlights of OECD Plastics Outlook: **Maarten Dubois, OECD** [10 min]
Highlights of OECD Document - A Chemicals Perspective on Designing with Sustainable Plastics; Goals, Considerations and Trade-offs: **Eeva Leinala, OECD** [10 min]
10 min Q&A for OECD highlights
Scene-Setting of Flexible Food-Grade Plastic Packaging
11h20
Item 3. Introductory Presentation to Flexible Food-Grade Plastic Packaging: What is it, why is it so complex
Graham Houlder, CEFLEX [20 min + 10 min Q&A]
Item 4. Presentations on innovations in the field related to polymers and chemicals and sustainability
• Novel recyclable multi-layer barrier film for food packaging applications. **Ata Zad, AxiPolymer**
• Recycling of food-grade polyolefin films back to food-grade via an innovative process using supercritical CO2 to decontaminate the post consumer materials. **Ed Kosior, Nextek**
• CIRC-PACK project - Increasing circularity of high barrier flexible plastic packaging. **Mattias Anderson and Karin Lindqvist, RISE Research Institute of Sweden**
[7-10 minute highlights each + 15 min Q&A]
Lunch Break 12h35 – 14h00

Industry Challenges

14h00

Item 5. Presentations by industry representatives on challenges to implementing the considerations from the document "A Chemicals Perspective on Designing with Sustainable Plastics" for flexible food-grade packaging

Perspectives of upstream chemical/polymer company Regarding Sustainable Design. **Jennifer Ronk, DOW**

Perspectives of a Plastics Convertor Regarding Sustainable Design. **Adam Bolsover, St. Johns Packaging (UK) Limited**

Advanced Circular Plastics Recycling in Australia: barriers and enablers. **Jeroen Wassenaar, Qenos**

Eco-design, Circularity and Extended Producer Responsibility. **Valentin Fournel, CITEO**

[20 min each + 20 min Q&A]

Coffee Break 15h40 – 16h00

16h00

Item 6. Overall learnings from industry challenges (background paper)

Jannes Nelissen, Partners for Innovation [30 min + 5 min Q&A]

Round-table discussion of participants regarding the challenges identified including identification of themes and priorities. [25 min]

End of Day – 17h00

Day 2 – 13 May 2022

Policy Solutions

9h45

Item 7. Key-note presentation – Policy Support for Innovation

Michael Keenan, OECD Science and Technology Directorate [20 min + 5 min Q&A]

Item 8. Overview presentation on government policies and regulations that impact the sustainable design of flexible food-grade packaging (background paper)

Mats Linder, Stena Circular Consulting [15 min + 10 min Q&A]

Item 9. Presentations from governments on innovative approaches they have implemented or are implementing with the aim of incentivising sustainable design (with a particular focus on those approaches that influence flexible food-grade packaging)

Sweden – Mattias Anderson and Karin Lindqvist, RISE Research Institute of Sweden

Japan – Takaaki Ito, Ministry of Environment

UK - Timothy Chandler, Food Standards Agency

EU – Bastiaan Schupp, European Commission

Netherlands – Susanne Waaijers-van der Loop and Nicole Janssen, RIVM

US – Charlotte Snyder, US EPA

[15 min each + 25 min questions]

Lunch Break 12h30-14h00

14h00

Item 10. Dialogue on further policy solutions for the creation of an enabling environment that reduces technical, economic or regulatory barriers

Panel and then round-table discussion with participants on what other approaches are needed to incentivise sustainable design from a chemicals perspective for flexible food-grade packaging. How to create an enabling environment that reduces the identified barriers?

Panellists:

Lena Stig, Sweden

Adam Bolsover, St. Johns Packaging (UK) Limited

Thor Tummers, Unilever

Ana Dotan, Shenkar College of Engineering and Design, Israel

[5 min each on reflections from the discussions; 20 min panel discussion]

Round-table discussion of participants regarding the identification of policy solutions [45 min]

Future work at the OECD

15h30

Item 11. How can OECD further support the sustainable design of plastics from a chemicals perspective?

- Ideas for additional sectors to analyse using a similar approach? Does the model used for flexible food-grade packaging work?
- Other issues to work on regarding chemicals and sustainable design of plastics?

Item 12. Closure of Meeting

End of Meeting 16h00