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**Global Forum on Environment: Plastics in a Circular Economy - Design of Sustainable Plastics from a Chemicals Perspective** 

Series on Risk Management

No. 49

The Global Forum on Environment took place 29-31 May 2018 in Copenhagen, Denmark.

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### OECD Environment, Health and Safety Publications Series on Risk Management No. 49

Global Forum on Environment: Plastics in a Circular Economy - Design of Sustainable Plastics from a Chemicals Perspective

29-31 May 2018, Copenhagen, Denmark



A cooperative agreement among FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD

### **Environment Directorate ORGANISATION FOR ECONOMIC COOPERATION AND DEVELOPMENT Paris 2018**

GLOBAL FORUM ON ENVIRONMENT: PLASTICS IN A CIRCULAR ECONOMY - DESIGN OF SUSTAINABLE PLASTICS FROM A CHEMICALS PERSPECTIVE

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### Foreword

This report provides a summary of the discussions at the "Global Forum on Environment: Plastics in a Circular Economy – Design of Sustainable Plastics from a Chemicals Perspective" that took place on 29-31 May 2018 in Copenhagen, Denmark.

The workshop was organised in co-operation between the OECD Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology (Joint Meeting) and Working Party on Resource Productivity and Waste (WPRPW), and was hosted by the Danish Government, with funding from the European Commission, Nordic Council of Ministers, Austria (Federal Ministry for Sustainability and Tourism), Germany (Federal Ministry of Environment, Nature Conservation and Nuclear Safety) and Belgium (Public Waste Management Agency of Flanders).

An expert group was formed from delegates nominated by the Joint Meeting and the WPRPW to inform the organising of the workshop in collaboration with the OECD secretariat and representatives within the Danish Government. The report takes into account feedback received from Delegates after the workshop, and comments received from the Joint Meeting and WPRPW by written procedure.

### 1. Introduction

The OECD Global Forum on Environment: Plastics in a Circular Economy - Design of Sustainable Plastics from a Chemicals Perspective was held in Copenhagen, Denmark from the 29<sup>th</sup> to 31<sup>st</sup> May, 2018. The workshop was organised by the OECD (under the auspices of the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology together with Working Party on Resource Productivity and Waste) in conjunction with the Danish Ministry of Environment and Food.

The main focus of the Global Forum was the design stage of plastic products, and how chemical selection decisions influence environmental and health outcomes at various stages of the product lifecycle. Better design decisions can help to minimise these impacts, and improve the 'circularity' of a product by facilitating material recovery at the end of life. Annex A provides the full agenda of the workshop.

The workshop brought together around 100 participants from 25 countries, with representation from a range of OECD and partner countries (including Argentina, Brazil, People's Republic of China, and South Africa). The majority of participants were government representatives, but there was also significant participation from the private sector and a range of civil society organisations. Annex B provides a full list of participants.

Three background papers were prepared to support the discussion at the workshop:

- Considerations and Criteria for Sustainable Plastics from a Chemical Perspective (Northwest Green Chemistry)
- Technical Tools and Approaches in the Design of Sustainable Plastics (ABT Associates)
- Policy Approaches to Incentivise Sustainable Plastic Design (Instituted for European Policy)

The discussions from the workshop will be used to further update the documents which will be published as OECD documents.

### 2. Outcomes from the Global Forum

### 2.1. Welcome and opening remarks

The Global Forum was opened by speeches from four high level speakers: Henrik Studsgaard (Permanent Secretary, Ministry of Environment of Denmark), Daniel Calleja-Crespo (Director-General for DG Environment, European Commission), Mark Gordon (Deputy Director-General of the Department of Environmental Affairs, South Africa), and Shardul Agrawala (Head of Environment and Economy Integration Division, OECD Environment Directorate).

The message from the opening speeches was clear: plastics are important materials that provide significant economic and environmental benefits, but there is a need to improve the sustainability of plastics through chemical redesign and make them more circular. Also widespread leakage into the natural environment is creating damage that cannot be ignored. Plastics are now high on the political agenda with governments in many countries looking to implement measures that can effectively address these challenges. After the Green Paper on a strategy on plastic waste in the environment in 2013, the EU launched a plastics strategy in January 2018 which includes additional financing for the development of smarter and more recyclable plastics materials, making recycling processes more efficient, and tracing and removing hazardous substances and contaminants from recycled plastics. The Danish Government is working on a national plastics strategy, while South Africa is considering ways to reduce leakage and increase recycling, while taking account of the particular challenges that arise in an emerging market context. The design of plastic materials and products is perceived to be central, as about 80% of the environmental impacts of products are determined at the design stage. OECD is well placed to support efforts in this field, due to its ability to work across sectoral divides, as the issues sit at the interface of chemicals and waste management policies.

### 2.2. Session 1: Scene setting

The opening was followed by a scene setting session that was intended to provide a common knowledge base with which to frame the discussions during the workshop. The key topics covered included, (i) the key polymers and additives currently in use, (ii) the role that plastics play in sustainable development, and (iii) the key challenges that occur at the design stage from a sustainability point of view and that affect different life-cycle stages, including end-of-life.

The discussions in this session illustrated the broad diversity of plastics as a class of materials. Plastics are used in a wide range of applications, from long lived durable goods like infrastructure, buildings, and vehicles to shorter lived products such as packaging and other single use plastics. Many types of polymer exist, and various additives are used to improve their performance characteristics. Sources of feedstock also vary, from traditional fossil fuel inputs to bio-based or recycled inputs. In some cases, plastics are also marketed as being biodegradable, even if the precise definition of this term (time required, under what conditions, to what final product) is not always clear. This diversity often serves to complicate end of life recovery processes.

The lifecycle environmental and health damages associated with plastics and their constituent additives were a key focus of the session. Estimates of environmental damages in the order of USD 140 billion were presented. At the same time, the environmental benefits resulting from the unique properties of plastics were also emphasised. It was noted that switching to alternative materials such as metal or wood may, in many cases, increase the overall environmental impact of production and consumption.

Finally, improved plastics design was identified as a key means of reducing the negative side effects of plastics while, at the same time, harnessing their positive performance attributes. Plastics that are designed with end of life treatment in mind, or that contain fewer toxic additives, are likely to have a relatively smaller environmental and health footprint. That said, several trade-offs between plastics performance and end of life-cycle management were mentioned:

- The structure of thermoset plastics makes them strong and light, but also renders them unrecyclable, except through more limited chemical recycling
- Additives improve the performance of plastics and the resulting products, but can introduce health risks and render recycling difficult
- Bio-based plastics like PLA avoid the extraction of new fossil carbon, but can lead to land use change. Also biodegradable plastics can hinder the recycling process

The role of China in the recycled plastics value chain was also discussed, including the recent import restrictions that also affect recovered plastics. These policies are leading to some restructuring and consolidation in the Chinese plastics recycling sector, as well as providing incentives for better collection and sorting of domestic household waste in order to mobilise local resources which were not sufficiently used so far. A recycled plastic content label is also being developed for the Chinese market.

### 2.3. Session 2: Sustainable plastics design in practice

The objective of this session was to highlight concrete examples of companies that have attempted to reduce the environmental and health impacts of plastics by targeting the design stage.

Six presentations were given by actors operating in different parts of the value chain, from petrochemical production through to the recycling of end of life plastics. Some cross-cutting theme to emerge from this session were the importance of research and innovation in the development of additives and polymers that are less hazardous or have lower risk profiles and that are relatively easy to treat at the end of their life; development of recycling technologies that lower the cost of material recovery; and the need for collaboration along the whole value chain for change to occur.

Specific design approaches that were mentioned included:

• The design of plastics that contain fewer and less harmful additives. This would reduce human health and environmental impacts during use, incentivise the recovery of end of life plastics, and stimulate their re-introduction across a broad range of economic sectors. In situations where the use of hazardous additives cannot be easily reduced (either because of the desirable performance characteristics resulting from their use, or because few suitable substitutes are

available), the emphasis should be on reducing exposure and ensuring information on additive content is available through the value chain.

- The design of plastics that incorporate, or blend, alternative feedstock (bio-based or recycled), or that are biodegradable. Although the environmental benefits of bio-based and biodegradable plastics were highlighted, several participants also touched upon potential risks. For example, increased demand for bio-based feedstock could modify land use patterns, and generate additional pressure on biodiversity. Similarly, increased use of biodegradable plastics could become problematic for recyclers if they cannot be easily identified and separated. Even if biodegradable plastics are well labelled, this degradation will only occur under specific industrial composting conditions and will not occur in typical land or marine conditions.
- The design of plastics that do not incorporate multiple polymers or other materials. Multi-layer plastics are widely used, particularly in food related applications where they serve to provide different functions, such as mechanical properties, oxygen or water barriers. This involves the use of different polymers and materials. When these plastics reach their end of life recycling is generally prohibitively expensive. An early stage innovation involving the use of chemically identical but structurally distinct layers of plastic was discussed as a potential solution.
- Finally, recycling using chemical processing (chemical recycling) was identified as having the potential to address many of the consequences of "unsustainable" plastics design. In particular, because chemical recycling transforms waste plastics back into a feedstock of its constituent molecules as a secondary raw material, it can allow the removal of the additives that hinder the use of recycled plastics and in some cases, it can reduce the use of chemical substances such as additives by imparting functions to the resin itself. It was suggested that through constructing a recycling system, it is possible to secure adequate feedstock, and that the commercial feasibility of feedstock recycling has the potential to increase.

# **2.4.** Session **3**: Criteria for defining sustainable plastics from a chemicals perspective

The objective of this session was to discuss the various types of criteria that could define "sustainable" plastics from the perspective of chemical selection and material composition. The background paper on Considerations and Criteria for Sustainable Plastics from a Chemical Perspective (Northwest Green Chemistry) served as a discussion starter. Participants were separated into six parallel breakout groups and asked to consider three questions:

#### How to define sustainable plastics from a chemicals perspective?

The participants largely agreed with the criteria that were outlined in the background paper. These included the following steps:

- 1. Establish design goals using life cycle thinking
- 2. Gather information for considerations and criteria related to:
  - Feedstock selection

- Production and manufacturing
- Product use
- Disposal/recovery plan and options
- 3. Assess considerations and criteria at each independent life cycle stage
- 4. Look at the product as a whole and benchmark it against products that provide the same service
- 5. Evaluate and optimize for continual product improvement

The comparative chemical hazard and exposure assessment and a life-cycle chemical inventory, outlined in the background document, are supporting elements of the steps.

A number of aspects were emphasised by the break-out groups including the importance of taking a holistic approach to plastics design: considerations relating to feedstock selection and other design criteria should be taken into account in addition to chemical selection. The need to take a lifecycle approach was also raised several times. The environmental and health implications of design decisions – including those associated with feedstock production, plastics use, and waste management – should be considered.

Several break out groups noted that there may be a need to consider sustainability differently across different plastics or product categories. Distinctions could be made between short lived packaging products and more long lived durable plastics for example. It was also suggested that the definition of sustainability could vary across countries according to the available waste management infrastructure. For example, promoting the use of biodegradable PLA as a sustainable solution would only be desirable in countries that can collect and separately recycle or compost this material.

The importance of taking a forward looking approach was also emphasised: the emergence of new materials and chemicals, or advances in waste treatment technologies could modify what is, and is not, considered to be sustainable. Similarly, it was suggested that resource requirements to carry-out sustainability analysis in the framework of product and material design is an important consideration.

Also, in developing criteria, all stakeholders should be involved in the process including producers, brand owners, companies involved in end of life management, workers, consumers, non-governmental organisations, occupational health and safety practitioners among others.

## How should trade-offs between different sustainability criteria be taken into account?

Taking a holistic approach to sustainable plastics design implies the need to consider trade-offs between different criteria. For example, additives improve the performance of plastics and the resulting products, but can introduce health risks, and can render recycling problematic. It was noted that there are existing tools that are available to assess these trade-offs (hazard assessments and life-cycle analysis for example), but that in some cases data availability hinders their full application. It was raised that when assessing sustainability there is a need to clarify, keep track and be transparent about data gaps.

In the context of considering trade-offs, several groups noted the need for harmonised definitions of key sustainability criteria such as: bio-sourced, bio-degradable, compostable, and recyclable.

## What role could the OECD play in helping to define these criteria or address knowledge gaps?

Three main issues were highlighted for further OECD work in this area:

- Further develop criteria and guidance. In particular, work could differentiate potential sustainability criteria across different plastics or product categories
- Focus on specific criteria where further advancement is needed (the issues surrounding bio-based feedstock, biodegradability, and recyclability for example).
- Identify best practices for considering trade-offs (methods, benchmarks, costs, or optimisation). Further elaborate how critical thresholds could be used for specific criteria

# **2.5.** Session 4: Technical tools and approaches related to polymer and chemical selection at the design stage of the plastic product

The objective of this session was to discuss the tools and approaches that are available to assess the sustainability criteria identified in the Session 3. The background paper on Technical Tools and Approaches in the Design of Sustainable Plastics (ABT Associates) supported discussions during this session. Six presentations were given by organisations involved in the development or use of these types of tools.

A wide range of technical tools, check lists, and consultative approaches were identified during the session. There was a general consensus that these tools represent a valuable source of information for plastic and product designers, and for consumers. That said, the extent to which they help to influence design decisions remains unclear.

A number of the tools that were presented aim to design-out 'hot spots' in the life-cycle in terms of hazard, pollution or waste in order to move to safer and more circular products that can be 'cycled'. It was noted that there is need for collaborative design and holistic approaches to sustainability that aim for continuous improvement. The design phase needs to be supported with common definitions and defined standards.

Several gaps were identified which, if addressed, could help to improve the effectiveness of these tools:

- Shortage of readily available interactive tools (which are particularly useful given that they allow users to receive custom recommendations based on their criteria and inputs). Only a handful of interactive tools are currently available, and the majority are proprietary or fee-based.
- Most tools address plastics generally rather than focusing on specific polymers or product categories. Designers could benefit from tools that provide more targeted information for specific polymers.
- The majority of design tools tend to focus on environmental and health implications of plastics during their use and end of life phases. The implications associated with feedstock selection and processing are under-represented. That said, one participant cautioned against exhaustive assessments, pointing out that "not everything that can be measured is important, and not everything that is important can be measured".

One cross-cutting message to emerge from this session was the importance of context when assessing the sustainability of different types of polymers and additives including differences in chemical vs material evaluation. For example, the presence of a certain additive may create risks to human health at the end of life, but exposure may be negligible if waste materials are treated using appropriate methods. Similarly, biodegradable or compostable plastics may help to reduce environmental burdens, but only in situations where appropriate collection and treatment infrastructure exists.

### 2.6. Session 5: Policy approaches to incentivise sustainable plastic design

The objective of the final session was to discuss the policy mixes that could be used to promote the design of more sustainable plastics. Two panel discussions – the first on voluntary approaches, and the second on more traditional economic and regulatory instruments – took place. This discussion was supported by the background paper Policy Approaches to Incentivise Sustainable Plastic Design (Instituted for European Policy). It is clear that a suite of policy instruments are necessary – voluntary, market-based, regulatory, financing and investment – and that each have advantages and disadvantages, some of which were highlighted in the session.

Several interesting insights emerged from the panel discussion on voluntary approaches. First, the Global Automotive Declarable Substance List (GADSL) – a global harmonised list of the substances contained in vehicles and vehicle parts at the time of sale – was provided as an example of a successful voluntary initiative. GADSL demonstrates that transparency regarding chemical content is possible, even in product categories with supply chains as complex as those in the automobile industry. Second, several examples of voluntary standards, certifications, and labelling schemes were discussed. Government and third party sponsored standards and eco-labels exist in a number of countries, and have the potential to improve product design while also driving demand for relatively environmentally friendly products. That said, voluntary certifications and labels have only recently begun to emerge in the plastics domain.

Extended producer responsibility (EPR) schemes were the main focus of the second panel on economic and regulatory instruments. Particular attention was given to fee eco-modulation, which was highlighted as a potentially effective means of incentivising the design of sustainable plastics. The French bonus-malus eco-modulation system – which was reported to have helped to reduce the use of aluminium in PET production – was provided as an example of one such approach.

Several other noteworthy interventions were made during the session:

- Claims about the recyclability of plastics should be carefully assessed when setting policy. All thermoplastics are technically recyclable, it is the business case for recycling that is currently lacking.
- The methodologies used to calculate recycling rates differ significantly across countries. With many countries or industry associations setting recycling targets to incentivise design of more circular products, collection and improved recycling technologies, these calculation differences can influence their rate of success. Reported rates may overstate the actual volume of material recycled if, (i) all exported waste plastics are assumed to be recycled, and (ii) collection rather than diversion rates are reported. In terms of potential policy solutions, it was suggested by one participant that the definition of recycling should reflect the actual volume of material that is re-introduced back into the economy, in the

sense that in a circular economy context, only what substitutes virgin material should be counted as recycled.

- Regulatory approaches to chemical and material content should not differentiate between primary and secondary plastics and should also be material neutral. Less stringent rules for secondary plastics could negatively influence the public perception of these materials, and lead to less demand for them.
- Policy approaches to more sustainable plastics design need to recognise the importance of international cooperation. Plastics production and value chains span international borders: policies relating to plastics design are therefore more likely to be effective when they are implemented in multiple jurisdictions.

### 3. Opportunities for future OECD work on sustainable plastics design

### 3.1. General areas for possible future work

The meeting concluded with a wrap-up session that brought together some of the key messages heard during the event. It also established a menu of ideas for possible future work at the OECD.

Work at the interface of chemicals and waste management was identified as an area where the OECD could usefully undertake additional work. This could include a focus on plastics sustainability criteria, tools to assess these criteria, and policies to stimulate better design more generally.

Participants also saw opportunities for the OECD to work on the economics of plastics waste management, including through a value chain approach and a focus on economic instruments (e.g. extended producer responsibility). Finally, the meeting also suggested the OECD could develop a "Declaration on Plastics", possibly in the form of a Council Recommendation, the content of which was not discussed at the meeting.

### **3.2. Specific areas for possible future work**

### 3.2.1. Criteria for defining sustainability from a chemicals perspective

- Further develop criteria and guidance that define sustainable plastics. In particular, work could differentiate potential sustainability criteria across different plastics (e.g. composites) or product categories (e.g. short- and long-lived, simple and complex products).
- Focus on specific criteria where further advancement is needed (the issues surrounding bio-based feedstock, biodegradability, and recyclability for example)

# *3.2.2. Technical tools and approaches related to polymer and chemical selection*

- Further map and disseminate existing tools, possibly through the promotion of existing platforms (such as the OECD SAA Toolbox);
- Identify good practices in knowledge exchange and value chain communication, such as through the use of product passports, in order to better link information along the supply chain;
- Facilitate the development of internationally harmonised databases and information systems to ensure disclosure of chemicals content in plastic materials and provide accessible information along the value chain, including on safer alternatives;
- Identify best practices for considering trade-offs (methods, benchmarks, costs, or optimisation).

#### 3.2.3. Policy approaches to incentivise sustainable plastic design

- Assess economic instruments that can support sustainable plastics design in order to develop recommendations on their design and to analyse their economic costs and benefits
- Improve incentives for sustainable plastics design in the framework of EPR
- Take stock of voluntary approaches that support sustainable plastics design and the assessment of their effectiveness.

### 3.2.4. Other issues

- Improve understanding of the costs and benefits of different types of plastics and plastics pollution
- Analyse issues relevant for emerging materials (e.g. composites)
- Analyse chemicals related barriers to plastics material recovery
- Ensure testing, hazard and risk assessment approaches are available for final materials
- Improve hazard information on polymers, additives and non-intentionally added substances
- Analyse value chains for specific polymers and opportunities to improve markets for recycled material; accounting for geographical differences
- Improve understanding of linkages between chemicals and waste management legislation
- Encourage awareness and education measures

## Annex A. Agenda

	DAY 1 - 29 May, 2018	
8:30-9:00	Registration	
9:00-10:30	Introductory High Level Session	
	<b>Chair:</b> Jakob Møller, Assistant Permanent Secretary - Ministry of Environment and Food - Denmark	
	<ul> <li>Opening keynote presentations on sustainability and plastics</li> <li>Henrik Studsgaard - Permanent Secretary - Ministry of Environment and Food - Denmark</li> <li>Daniel Calleja Crespo - Director General Environment - European Union</li> <li>Mark Gordon - Deputy Director General: Chemicals and Waste Management - Department of Environmental Affairs - South Africa</li> <li>Shardul Agrawala - Head of Division - Environment and Economy Integration Division - OECD</li> </ul>	
	(15 min presentations followed by discussion with participants)	
10:30-11:00	BREAK	
11:00-13:00	Session 1: Setting the Scene	
	<b>Chair:</b> Shardul Agrawala, Head of Environment and Economy Integration Division, Environment Directorate, OECD	
	<b>Objective:</b> The objective of this session is to provide a common knowledge base over which to frame the discussions during the workshop. It aims to provide an overview of the role of plastics for sustainable development, of the key polymers and additives that are currently in use, as well as the key challenges that occur at the design stage from a sustainability point of view and that affect different life-cycle stages, including end-of-life.	
	Presentations:         ▶ Anders Daugaard - Technical University of Denmark         Plastics 101 - main types of polymers and additives; for which uses; key hazards/risks         ▶ Ramani Narayan - Michigan State University/ISO Technical Group Conveyor         Challenges to achieveing more sustainable plastics design from feedstock to end of life         ▶ Libby Bernick - Trucost         Costs and Benefits of More Sustainable Plastic Use         ▶ Keli Yu - China National Resources Recycling Association         Perspective of Chinese recyclers on the topic of sustainable plastics design	
	(4 x 20 min presentations followed by Panel Discussion and Q&A)	
13:00 - 14:00	LUNCH	
14:00 - 15:30	Session 2: Sustainable Plastics Design in Practice	
	<b>Chair:</b> Anne Elisabeth Kamstrup, Head of Department, Circular Economy and Waste, Danish Environmental Protection Agency	

	<b>Objective:</b> The objective of this session is to highlight examples from companies who have addressed a particular challenge with respect to chemicals/polymers and plastics by targeting the design stage. The examples will highlight how chemical/polymer choice at the design stage influences aspects along the life-cycle and what solution was found or is being worked on. The presenters will also share their definition of 'sustainability' from a chemicals perspective as well as the criteria that they use to inform decision-making at the design stage.
	<ul> <li>Presentations:</li> <li>➢ Jean Viallefont - Total         Different types of polymer feedstock - biopolymers, recycled polymers, conventional feedstock     </li> <li>➢ Tom Mallen - Valspar Corporation         Safety by design process for packaging coatings     </li> <li>➢ Arthur Fong – Apple         Integrating Green Chemistry into a Closed-loop Plastics Supply Chain     </li> </ul>
	(3 x 20 min presentations followed by 30 min discussion)
15:30-16:00	BREAK
16:00-17:30	Session 2 continued: Sustainable Plastics Design in Practice
	<ul> <li>Presentations:         <ul> <li>➢ Eric Beckman - University of Pittsburg Multi-layered packaging</li> <li>➢ Erik Moerman - Indaver - Plastics2Chemicals Recycled polymeric material to fulfil design requirements of customer</li> <li>➢ Toshiaki Yoshioka- Tohoku University Linking of recycled EEE waste to design; incentives to use secondary materials; bioplastics</li> <li>(3x20 min presentations followed by 30 min discussion)</li> </ul> </li> </ul>
~18:30	Conference Dinner

DAY 2 - 30 May, 2018		
9:00-12:15	Session 3: Criteria for Defining 'Sustainability' From a Chemicals Perspective	
	<b>Chair:</b> Peter Börkey, Principal Administrator, Environment and Economy Integration Division, Environment Directorate, OECD	
<b>Objective:</b> The objective of this session will be to discuss what it means to be "sustainar from the lens of chemical selection and material composition and how to evaluate the claims of sustainability. What are the various types of criteria that could define "sustainar plastics when considering chemical (polymer and additive) selection.		
Presentation: Lauren Heine - Northwest Green Chemistry Introduction of Background Paper / 20 min + 10 min Q&A		
	Breakout groups / 45 min / 20 min break / 40 min	

<ul> <li>Reporting back from breakout groups / 45 min</li> <li>➢ Including discussion on: what are the gaps, research or guidance needs and what could be done at OECD?</li> </ul>
<ul> <li>Soren Bowadt - European Commission - DG Research &amp; Innovation</li> <li>Reflection on the outcomes of the criteria discussion and alignment with design of new EU research programmes on sustainable plastics / 10 min</li> </ul>

12:15-13:30	LUNCH	
13:30 - 15:00	Session 4: Technical Tools and Approaches Related to Polymer and Chemical Selection at the Design Stage of the Plastic Product	
	<b>Chair:</b> Eeva Leinala, Principal Administrator, Environment, Health, Safety Division, Environment Directorate, OECD	
	<b>Objective:</b> This session aims to identify some of the key tools and approaches that can support sustainable plastics design and are already available, as well as important gaps that would need to be addressed. This includes technical tools, check-lists, as well as consultation mechanisms that aim to support product designers in their decision making about the selection of substances and material composition.	
	<ul> <li>Presentations:</li> <li>➤ Emily Conner - ABT Associates</li> <li>Presentation of background paper / 20 min + 10 min Q&amp;A</li> <li>➤ Mats Linder - Circular Economy Expert</li> <li>Tools for innovation and material selection: Definitions and Circular Design Guide</li> <li>➤ Justin Bours - Cradle to Cradle Products Innovation Institute</li> <li>Product Standard for designers and manufacturers</li> </ul>	
	(2 x 15 min presentations + 30 min Q&A/discussion)	
15:00-15:30	BREAK	
15:30-17:00	Session 4 continued: Technical Tools and Approaches Related to Polymer and Chemical Selection at the Design Stage of the Plastic Product	
	<ul> <li>Presentations:</li> <li>➢ Peter Saling - BASF ProScale Project Relative potential toxicological performances of products</li> <li>➢ Shari Franjevic - Clean Production Action Plastic Scorecard and GreenScreen for Safer Chemicals</li> <li>➢ Eric Bischolf - Covestro - Chair of ISO Technical Committee 61/SC 41 - Plastics and the Environment ISO standards</li> </ul>	
	(3 x 15 min presentations + 30 min Q&A/discussion)	
	In comparison to criteria identified in session 3, where are the gaps for tools & approaches to evaluate the criteria? What can be done at the OECD? / 30 minutes	

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9:00-10:40	Session 5: Policy Approaches to Incentivise Sustainable Plastic Design	
	<ul> <li>Chair: Henrik Søren Larsen, Head of Department, Chemicals - Ministry of Environment and Food - Denmark</li> <li>Objective: This session aims to discuss the policy approaches and instruments that are already in place or could be developed to incentivise a shift in sustainable chemistry thinking at the product design stage - 'benign by design'. It includes perspectives from government, the private sector and civil society about the most promising policy initiatives.</li> </ul>	
	Presentation: > Emma Watkins - Institute for European Environmental Policy Presentation of background paper / 20 min + 10 min Q&A	
	<ul> <li>Panel 1: Voluntary Approaches (5 min highlights from each speaker)</li> <li>George A. Racine – ExxonMobil Chemical and representing Global Automotive Industry Declarable Substances List Initiative</li> <li>Brandon Bray - USEPA Resource Conservation and Sustainability Division</li> <li>Kim Christiansen - Plastics Europe</li> <li>Susanne Stark - Austrian Consumer Association</li> <li>Hisao Ida - Plastic Waste Management Institute, Japan</li> </ul>	
	(40 min - Panel discussion then open discussion on approaches and needs, including what can be done at the OECD)	
10:40-11:00	BREAK	
11:00-12:15	Session 5 continued: Policy Approaches to Incentivise Sustainable Plastic Design	
	<ul> <li>Panel 2: Regulatory and economic instruments (5 min highlights from each speaker)</li> <li>Arnoud Passenier - Ministry of Infrastructure and the Environment, Netherlands</li> <li>Carlos de Los Llanos - CITEO - France</li> <li>Stephane Arditi - European Environmental Bureau</li> <li>Helmut Maurer - European Commission</li> <li>Keith Christman - American Chemistry Council</li> </ul>	
	(45 min - Panel discussion then open discussion on approaches and needs, including what can be done at the OECD)	
12:15 - 13:15	Opportunities for Potential Further Work at the OECD	
	<b>Chair:</b> Henrik Søren Larsen, Head of Department, Chemicals - Ministry of Environment and Food - Denmark	
	Summary of knowledge, tools and policy gaps, research and guidance needs identified through sessions 3-5. Identification of additional needs and recommandations for possible future work at the OECD.	
13:30	Close of Meeting	

## Annex B. List of Participants

Australia/Australie	<b>Mr. Andrew MCNEE</b> Assistant Secretary, Chemicals and Waster Branch Environment Standards Division (ESD) Department of the Environment
Austria/Autriche	Ms. Renate PAUMANN Federal Ministry of Sustainability and Tourism
Belgium/Belgique	<b>Mr. Yorg AERTS</b> Policy Advisor International Policy Unit Public Waste Agency of Flanders (OVAM)
	<b>Ms. Christa HUYGH</b> Risk Management of Chemical Substances FPS Health, Food Chain Safety and Environment
Canada	Mr. Guy GAGNÉ Section Head, Plastics and Chemicals Unit Chemical Production Division Environment and Climate Change Canada Environmental Protection Branch
	Ms. Chantal QUESNEL Project Engineer, Plastic Task Force Waste Reduction and Management Division Environment and Climate Change Canada Environmental Protection Branch
Denmark/Danemark	<b>Ms. Anne Elizabeth KAMSTRUP</b> Deputy Head of Division Environmental Protection Agency Ministry of Environment and Food
	Mr. Jakob MOLLER NIELSEN Director Climate change adaption, water sector and groundwater Ministry of the Environment and Food, Danish Environmental Protection Agency
	<b>Mr. Henrik STUDSGAARD</b> Permanent Secretary Ministry of the Environment and Food

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	<b>Ms. Katrine BOM</b> Advisor Environmental Protection Agency Ministry of Environment and Food
	<b>Mr. Andreas Hastrup CLEMMENSEN</b> Head of Section Ministry of Environment and Food
	<b>Dr. Flemming INGERSLEV</b> Chemical engineer, Ph.D. Chemicals Division Danish Environment Protection Agency Ministry of the Environment
	<b>Mr. Henrik Søren LARSEN</b> Head of Department, Chemicals Ministry of Environment and Food
Estonia/Estonie	Mr. Mihkel KRUSBERG Adviser Estonian Ministry of the Environment Environmental Management Department
Finland/Finlande	<b>Dr. Hinni PAPPONEN</b> Senior Specialist Environmental Protection Department Ministry of the Environment
	<b>Dr. Kati VAAJASAARI</b> Senior Specialist Environmental Protection Department Ministry of the Environment
Germany/Allemagne	<b>Dr. Sandra WAGENER</b> Federal Institute for Risk Assessment (BfR)
	<b>Dr. Claus –Gerhard BANNICK</b> Head of Unit Wastewater Technology Research German Environment Agency
	<b>Dr. Franziska KRÜGER</b> Product Responsibility German Environment Agency
Hungary/Hongrie	<b>Ms. Tunde HARSANYI</b> Environmental technologies officer Department of Waste Management Ministry of Agriculture and Rural Development

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Israel/Israël	<b>Dan BETH-DIN</b> Ministry of Environmental Protection
	<b>Professor Ana DOTAN</b> Head of Shenkar's Branch Israel Plastics and Rubber Center Shenkar College of Engineering and Design
Italy/Italie	<b>Ms. Federica TOMMASI</b> Environment & Primary Prevention Dept. Istituto Superiore di Sanità
Japan/Japon	<b>Dr. Erwin LEPOUDRE</b> Business Manager Green Polymer Division
	<b>Dr. Masahiro OGUCHI</b> Senior Researcher Center for Material Cycles and Waste Management Research National Institute for Environmental Studies
Korea/Corée	Mr. Wooil KIM Senior Researcher Environmental Resources Research National Institute of Environmental Research
Latvia/Lettonie	<b>Dr. Judite DIPANE</b> Senior expert Environmental Protection Department Ministry of Environmental Protection and Regional Development
Netherlands/Pays-Bas	<b>Ms. Nicole JANSSEN</b> National Institute for Public Health and the Environment (RIVM)

Mr. Arnoud PASSENIER Senior Programme Manager Circular Economy Ministry of Infrastructure & the Environment Environment Directorate

	<b>Ms. Manon ZWART</b> National Institute of Public Health and the Environment (RIVM)
Slovak Republic/République slovaque	<b>Ms. Maria TROSANOVA</b> Waste Management Department Ministry of Environment
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	<b>Ms. Åsa STENMARCK</b> Inquiry Chair Climate and sustainable cities - Waste IVL Swedish Environmental Research Institute
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EU/UE	<b>M. Daniel CALLEJA-CRESPO</b> Director General Directorate-General for Environment European Commission
	<b>Mr. Soren BOWADT</b> Head of unit DG Research & Innovation European Union Unit of Advanced Materials and Nanotechnology
	<b>Ms. Elina KARHU</b> Head of Unit Classification and prioritisation ECHA (European Chemicals Agency)
	<b>Prof. Dr. Jur. Helmut MAURER</b> DG Environment European Commission

Brazil/Brésil	Mr. Flávio DE MIRANDA RIBEIRO Dept. Public policies of solid waste and resource efficiency Companhia Ambiental do Estado de São Paulo CETESB
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South Africa/Afrique du Sud	Mr. Mark GORDON Deputy Director General, Chemicals & Waste Management Department of Environmental Affairs, South Africa Ms. Mamogala J. MUSEKENE Chief Directorate - Integrated Waste Management & Strategic Support
	Department of Environmental Affairs
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Business and Industry Advisory Committee (BIAC)/Comité consultatif économique et industriel (BIAC)	<b>Ms. Adina Renee ADLER</b> Senior Director of International Affairs Government Relations & International Affairs Institute of Scrap Recycling Industries (ISRI)
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European Environmental Bureau/Bureau européen de l'environnement	<b>Mr. Stephane ARDITI</b> Product & Waste Policy Manager European Environmental Bureau (EEB)

**Ms. Dolores ROMANO** Chemicals policy advisor European Environmental Bureau / Bureau Européen de l'Environnement

UN Development Programme (UNDP)/Programme des Nations Unies pour le développement (PNUD)	Mr. Kasper KOEFOED Chemicals and Waste team UNDP Dr. Guillermo ROMÁN Waste Management Expert U.N. Development Programme (UNDP)
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Apple	<b>Dr. Arthur FONG</b> Apple
Austrian Consumer Association	Susanne STARK Austrian Consumer Association
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	Ms. Eeva LEINALA Principal administrator ENV/EHS OECD
	Mr. Andrew MCCARTHY Junior Environmental Economist ENV/EEI OECD
	<b>Mr. Tobias UDSHOLT</b> Young Associate ENV/EEI OECD