TECHNICAL EXPERT WORKSHOP ON MODELLING APPROACHES FOR PLASTICS USE PROJECTIONS

22-23 June 2020

2PM-6PM (Central European Summer Time)

Virtual Meeting, via Zoom

Draft AGENDA

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Background

Plastics are one of the most commonplace materials on the planet. In 2015, global plastics production reached 407 million tonnes per annum (Mtpa), more than that of paper (400 Mtpa)[1] or aluminium (57 Mtpa).[2] The rapid growth of plastics use is due to unique properties: high strength-to-weight ratio, high plasticity, impermeability to liquids and resistance to physical and chemical degradation, lost costs. Thus, plastics substitute for other materials (glass, metal, wood, natural fibres…) in many applications.

Mounting evidence shows that plastics production, use and waste generation will continue to rise to unprecedented levels in the coming decades in the absence of new policy action. The future increase of plastics production and waste may increase the leakage into the environment, both terrestrial and marine. The supply of the materials required for plastics production, including oil extraction and refining, as well as the use and disposal of plastic products are creating significant environmental pressures and health issues (related to micro plastic uses). These pressures may have serious consequences for ecosystems and human well-being. In particular, plastic pollution has become ubiquitous: in all the world's ocean basins, including around remote islands, the poles and in the deep seas. An additional 5 to 13 million tonnes are estimated to be introduced every year to the oceans.[3] This material will only decompose over the course of hundreds, if not thousands, of years.

An emerging literature studies the future of plastic production, plastic waste management and litter

One of the most recurrent policy questions, is how plastics use will evolve in the coming years and decades and to what extent policies can limit its use. A new empirical literature has set up innovative methodologies to address this question by linking plastics use to economic growth projections. Four main papers address this issue: Jambeck et al. (2015), Geyer et al. (2017), Lebreton and Andrady (2019), as well as Ryberg et al. (2019).

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[1] WWF (2018), Pulp and paper, http://wwf.panda.org/about_our_earth/deforestation/forest_sector_transformation/pulp_and_paper.
[2] USGS (2016), Aluminum Legislation and Government Programs, https://minerals.usgs.gov/minerals/pubs/commodity/aluminum/myb1-2015-alumi.pdf.
[3] Jambeck, J. et al. (2015), "Plastic waste inputs from land into the ocean", Science, http://dx.doi.org/10.1126/science.1260352.

These papers mainly focus on quantifying plastics waste generation and possible leakage into the environment. All of the studies have a global scope, and local estimates are given in some cases. Jambeck et al. (2015) mainly deals with leakage of plastic waste from coastal zones into the ocean, Lebreton and Andrady (2019), in a similar vein, provides a more granular view of the plastic waste generation and mismanagement at global level. Geyer et al. (2017) gives a macro-view of plastics waste generation derived from production data.

Authors employ different methodologies. While Jambeck et al. (2015) and Lebreton and Andrady (2019) utilise country-level waste and other socio-economic data to derive estimates, Geyer et al. (2017) estimate plastic waste from global production data. In the case of Ryberg et al. (2019), they aggregate all possible sources and use various estimates to quantify plastic losses to the environment along the value chain. As for estimates and projections, Jambeck et al. (2015) provides a baseline estimation of 2010, with projections to 2020 and 2025, Geyer et al. (2017) gives projections to 2050, Lebreton and Andrady (2019) provide projections to 2060, while Ryberg et al. (2019) estimates 2015 values only.

According to the projections in this empirical literature, if growth persists at similar rates, plastics production is expected to reach 1 600 Mtpa in 2050.[4] This represents a fourfold increase compared to 2015, with the potential to proportionally impact plastic pollution.

In this empirical literature, the projected volumes of plastic follow aggregate economic growth and/or population growth. These projections are then used to follow the corresponding amount of plastic wastes and plastic pollutions. To develop a policy agenda on plastics use and waste generation, governments would need to consider the underlying economic and structural drivers both at the aggregate and sectoral level. Indeed, plastics is not a homogenous product, but instead refers to different plastics and uses. These various plastic flows have different lifetimes, waste management rates, recycling rates, which justifies the need for a sectoral perspective for plastics projections.

[4] EMF (2017), Rethinking the future of plastics and catalysing action, https://www.ellenmacarthurfoundation.org/assets/downloads/publications/NPEC-Hybrid_English_22-11-17_Digital.pdf.

Another promising and complementary approach is conducted by the International Institute for Applied Systems Analysis (IIASA), relying on the Greenhouse gas and Air pollution Interactions and Synergies (GAINS) model. The GAINS model has a resolution of 180 countries and regions with global coverage and spanning the period 1990-2050 in five-year intervals. The model structure allows for deriving estimates of the generation of both municipal and industrial waste by category, including plastic waste, and with attribution of different waste categories to disposal and treatment streams[5]. Future projections of waste generation are input of the model, driven by macroeconomic and population trends using elasticities estimated econometrically on historical data. But the GAINS model provides a framework for assessing strategies that reduce emissions of air pollutants, greenhouse gases as well as waste pollution. The model identifies concrete measures for different pollutants, sectors, and countries/regions that achieve reduction targets at least cost.

Structural economic modelling can offer complementary insights, particularly on drivers of plastic use and waste, trade implications and on the impact of policies

Structural models, such as Computable General Equilibrium (CGE) models, could provide an integrated and coherent framework for understanding the economic drivers of plastics. In particular, such models could assess how economic growth and economic trends (like structural change) determine plastic use. CGE models have been used extensively for climate change analysis (*The Economic Consequences of Climate Change*, OECD 2015), as well as air pollution (*The economic consequences of outdoor air pollution*, OECD 2016) and material resources (*Global Material Resources Outlook to 2060*, OECD 2019). However, they have not yet been used in the context of developing scenarios of plastic use.

In turn, these models could examine policies that curb these underlying drivers. One key advantage of this methodology is that its multi-sectoral structure allows for sector-based plastics projections. Moreover, as CGE models are based on a full economic accounting (through Input-Output tables), tracking the entire value chain of plastic use and production is possible.

Therefore, combining the empirical approach and structural economic modelling could be beneficial for providing a comprehensive toolkit to analyse plastics production and waste, as well as evaluate alternative policy responses. In particular, the suggested toolkit would help analyse the socio-economic drivers of plastics use and waste at the aggregate and sectoral level, and provide alternative projections of plastic

[5] Gomez-Sanabria, A., Höglund-Isaksson, L., Rafaj, P. & Schöpp, W. Carbon in global waste and wastewater flows –its potential as energy source under alternative future waste management regimes. Advances in Geosciences 45, 105–113 (2018).

production and plastic waste, under different scenarios, about future global socio-economic trends, connecting them to their impact on marine plastic pollution.

Most importantly, a tentative modelling of the implementation of plastic policies would provide reference materials for policymakers to conceptualize and assess both the benefits and unintended consequences of policy action to lessen the negative environmental spillovers resulting from unabated plastics production and plastics waste generation. For example, it would allow examining the role of multilateral and co-ordinated action in achieving environmental objectives, as plastic feedstocks, polymers, and to a lesser extent, waste are internationally traded commodities. Although the benefits of combining the empirical and structural approaches are clear, this exercise faces a lot of challenges, in terms of data compatibility and the underlying economic assumptions among others.

Aim and objectives of the workshop

This OECD technical workshop will convene leading experts for the quantification of plastics production and plastic waste generation, as well as experts in economic modelling. The workshop will to take stock of methodologies and databases to design projections of plastics use, production and waste. The aim is to consult with the experts to design a framework that allows for the evaluation of different policies, relying on structural economical drivers. The use of diverse methodologies and often disjointed data sources may present challenges in developing plastic projections and policy recommendations.

The workshop aims at addressing the following questions:

- What will be the likely increase in plastic use, production and disposal in the coming decades according to recent methodologies?
- How can these current methodologies be improved or combined to create improved projections? What data and information is missing?
- What are the pros and cons of modelling different types of plastic goods, technologies (e.g. recycled and biodegradable plastics) and different substitutes to plastic (biomass, glass, metals, etc.)?
- What are the possible impacts on plastics of potential long run changes in behaviours implied by COVID-19 crisis?
- What policy options should be included in modelling analyses to support policy makers?

The workshop will consist of 4 sessions. **Session 1** will set the scene surrounding plastic policies. Furthermore, it will take stock of what initiatives and policies already exist to tackle this problem (Osaka Blue Ocean Vision, single use plastic bans…). This session will also examine how modelling analysis and projections can contribute to assess the issue and the effectiveness of policies. **Session 2** will look at the state-of-the-art empirical approaches for baseline plastics projections, review the results and underlying techniques, and discuss their strengths while identifying potential areas for improvements. **Session 3** will look at how to integrate empirical studies within structural economic modelling. **Session 4** will first deal with plastic leakages in the environment and plastic footprints, and second take into account the existing international commitments (e.g. Osaka) and explore possible coverage of policies, including scenarios of international cooperation and partial commitments. Finally, the concluding session will bring together the key takeaways of the workshop, and explore potential synergies and collaborations among groups.

The outcomes of the workshop will inform the development of an OECD's Global Plastics Outlook.

Preliminary Workshop Agenda
(Central European Summer Time)

22 June 2020	
14:00-14:15	**Opening Remarks: aims, expectations and structure of workshop** Jean Chateau (OECD)
14:15-15:00	**Plastic Waste Generation Policies – Current Challenges** • Perspectives from recent OECD work, Shardul Agrawala (OECD) • The role of modelling and projections to assess the issue and the effectiveness of policies, Jenna Jambeck (University of Georgia)
15:00-16:25	**Plastic Production and Waste Generation – empirical models: an overview of the latest approaches (Part I)** • Supply side models, Roland Geyer (University of California at Santa Barbara, USA) • Plastics across their Value chains, Morten Ryberg (Technical University of Denmark)
16:25-16:35	Coffee Break
16:35-18:00	**Plastic Production and Waste Generation – empirical models: an overview of the latest approaches (Part II)** • Plastics and petrochemicals in energy modelling, Tae-Yoon KIM (IEA) • Breaking the Plastic Wave, Yoni Shiran (SystemIQ)

23 June 2020	
14:00-15:45	**Integrating empirical studies within structural economic modelling** • An overview of the plastic waste sector in the IIASA GAINS Model, Adriana Gomez-Sanabria (IIASA) • Modelling plastics in ENV-Linkages, Ruben Bibas (OECD) • Policies on plastics production and disposal in Exiomod, Olga Ivanova (PBL)
15:45-16:00	Coffee Break
16:00 – 17:30	**Environmental consequences and Scenarios of international cooperation and partial commitments** • Modelling Plastic Leakage in the Environment : state of the art and open questions, Julien Boucher (EA - Shaping Environmental Action) • Private sector expectancies about plastic projection and policies, Maarten Dubois (Ernst and Young) • EU strategy for plastics in Circular Economy, Paulo Da-Silva Lemos (DG Environment, European Commission)
17:30-17:45	**Closing Remarks**