The European Commission's science and knowledge service

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JRC work on plastic Life Cycle Assessment (LCA) including alternative feedstock to produce bioplastics – state of play

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Ispra/Brussels, November 21, 2018

European Commission

Suggested agenda

- Introduction, objectives, and overview of tasks
- Update on Tasks
  - Update on Task 2: meta-analysis of selected existing studies
    - Update on call for information and data
  - Update on Task 3: draft methodology for LCA of plastics
  - Update on Task 4: inclusion of indirect effects of the use of biomass for plastics
  - Update on Task 5: selection of articles for LCA
  - Update on Task 6: 5 screening LCAs
  - Update on Task 7: stakeholder consultation
- Discussion

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Overall project objective

- Elaborate a consistent and appropriate **LCA-based methodology** to evaluate potential environmental impacts of the use of alternative feedstocks (biomass, recycled plastics, CO_2) for plastic articles production in comparison to using current feedstock
- Apply the methodology to a number of **LCA case studies**, assessing a range of impact categories, various End of life (EoL) scenarios (recycling, biodegradation), and the indirect effects of using alternative feedstock for plastic production.
- This is an Administrative Arrangement (AA) between DG GROW and JRC.

JRC Directorates and units involved

Space, Security and Migration

Health, Consumers & Reference Materials

Nuclear Safety & Security

Growth and Innovation (B)

Energy, Transport & Climate (C)

Sustainable Resources (D)

B5

C2

D1

Involved in the JRC plastics LCA

European Commission

Project plan (total duration 24 months from September 2017)

- Task 1) Kick-off meeting
- Task 2) Meta-analysis of selected existing studies
- Task 3) Draft methodology for LCA of (bio-)plastics
- Task 4) Include indirect effects of the use of biomass for plastics
- Task 5) Selection of relevant plastic articles for LCA
- Task 6) Five screening LCAs
- Task 7) Technical consultation
- Task 8) Final methodology for LCA of (bio-)plastics
- Task 9) Detailed LCAs of further 10 articles, and final report
- Task 10) Dissemination activities

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Task 2: meta-analysis of selected existing studies

- **Status:**
  - Nearly **170 documents** (papers, reports) were collected through relevant keywords via scientific and conventional search engines
  - Collected documents were screened against several criteria useful for (i) classification and (ii) selection of relevant studies for a more detailed analysis (based on respective level of quality and detail)
  - **32 documents** were selected for an in-depth assessment of performed methodological choices and lifecycle aspects included in the assessment

Task 2: meta-analysis of selected existing studies

- **Main evidence:**
  - iLUC is addressed only in a few studies (7/32), applying different emission factors and approaches (no common methods available)
  - The use of waste/residual bio-based feedstock is addressed with different methods (different types of allocation/substitution), potentially leading to different results
  - Additives are only included, limited to production impacts, in a couple of studies, by means emission (impact) ranges for similar class of substances
  - Biodegradation rates of materials during biological treatment/in-situ degradation frequently vary in a wide range across case studies
  - Littering is semi-quantitatively addressed only in one case study, through the introduction of an indicator attempting to capture the aesthetic impact of littered product (area*time spent in the environment before degradation)

Call for data and information

- Call for data and information (signed by both JRC D.1 and GROW D.2 HoU) sent out on July 11 (>450 addresses)
- Deadline for providing input: July 31, then extended to August 24
- Content:
  - purpose of the call
  - use of collected data/information
  - instructions to provide data/information
  - contact details
  - detailed annex listing the type of data/information requested, dividing by type of plastic feedstock/type (fossil-based, bio-based/biodegradable, recycled-based, CO_2-based)

Call for data and information

- Received feedback: from ~60 stakeholders, including:
  - Industry/companies: 23
  - Consultancy: 7
  - Industry associations: 7
  - Academia: 7
  - Research institutes: 7
  - National agencies/bodies: 2
  - Other: 2

  The input received in the call for information has not been taken into account in the 5 screening LCAs – while some of the references mentioned in the material submitted by the Starch industry have been analysed within the in depth evaluation.

  Input received will be taken into account in the final method and the 10 full LCAs.

Task 3: draft methodology for LCA of plastics

- **From the text of the AA**:
  - Building upon the evaluation of existing work in this area, DG JRC will further specify a consistent methodology to perform LCA of alternative scenarios for plastics production, including all relevant life cycle stages, i.e. cradle–to-grave/cradle.
  - The methodology will be developed based on the recommendations of ISO 14040 and 14044 standards, taking into account the learnings from the DG JRC work on the Product Environmental Footprint (Recommendation 2013/179/EU) and on lessons learned from the extensive literature and discussion on biofuels/bioenergy sustainability assessment.

Task 3: draft methodology for LCA of plastics

- Main methodological aspects relevant to plastics covered in the document include:
  - Proper definition of functional unit and system boundaries;
  - Recommended impact categories and related assessment methods
  - Modelling of agricultural production and animal husbandry
  - Modelling of GHG emissions and removals
  - Modelling of dLUC and iLUC (see also task 4)
  - Modelling of EoL options including degradability during treatment/in-situ degradation
  - Initial suggestions for accounting of littering formation at the inventory level

Task 4: inclusion of indirect effects

- **From the text of the AA**:
  - expand the analysis to highlight and, when possible, quantify the indirect effects of the use of biomass for bio-based plastics on other biomass uses (e.g. food and feed, wood industry, biofuel/bioenergy etc.).
  - The methodology will take into account as far as relevant ongoing JRC work on "Biomass supply and demand", wider sources produced for the Commission in the recent years such as the results of the S2Biom project, and state-of-the art scientific literature.
  - The methodology and scenarios assessed will take into account as much as possible different policy and regulatory scenarios.

Task 4: inclusion of indirect effects

- **Status**
  - Review/Collection of iLUC approaches/factors mainly distinguished between biophysical and economic modelling
  - Main sources identified: Valin et al. (2015), Biospri (2018), Schmidt et al. (2015), S2biom, Tonini et al. (2016), earlier JRC reports on biofuels.
  - Comparison of these iLUC (CO_2) figures with iLUC (CO_2) factors given in EU 2015/1513

Task 5: selection of articles for the LCA

- **From the text of the AA**:
  - Criteria for the selection of relevant plastic articles to be investigated will be defined.
  - This selection may consider factors such as: *the market importance of different virgin polymers and plastic articles; EU import dependency of required feedstock base for materials, economic sectors where polymers and articles are encountered; article intended lifetime and durability; use of flexible packaging versus rigid packaging; availability, properties and composition of different recovered waste plastics; technology readiness levels of article manufacturing with mechanically or chemically recovered polymers or non-oil based polymer sources; availability and quality of techno-scientific data needed for LCA analysis*; etc.

JRC will make a preselection of ~15 articles, ranked in order of relevance for further study, of which 10 will be selected for further LCA studies after the stakeholders' consultation. This list can include articles selected for the screening LCAs.

Task 5: selection of articles for the LCA

- **Selected for the screening LCAs**:
  - ***Flexible packaging film (food)***
  - ***Bottles***
  - ***Mulching film***
  - ***Insulation material***
  - ***Car interior panel***

TASK 6: 5 screening case studies

- **From the text of the AA**:
  - Five screening LCAs will be undertaken, addressing 5 different polymers obtained from alternatives to fossil feedstocks and used in specific applications (articles), comparing them with equivalent fossil-based plastics.
  - The screening LCAs have the main objective to apply, evaluate and refine the draft methodology, e.g. regarding identification of relevant impact categories and aspects of feasibility, data availability and data quality, and indirect effects to be assessed.

TASK 6: 5 screening case studies

- Screening LCAs for the following articles:
  - *Bottles*
  - *Flexible food packaging film*
  - *Mulching film*
  - *Insulation panels*
  - *Car interior panels*

TASK 7– Technical consultation

- **Start: November 20, 2018;**
- **End: December 19, 2018**
- **Stakeholder workshop: November 29-30, 2018 - Brussels, Berlaymont**
- **Documents under consultation :**
  - Draft methodology (covering both “normal” and indirect effects/ILUC, incl. results from the meta analysis)
  - Reports on 5 screening LCAs (incl. selection criteria for case studies and suggested draft list for articles for 10 full LCAs)
- **Documents distributed via email and accessible online via the website of the European Platform on Life Cycle Assessment (EPLCA)**
- **Any consultation input is welcome to:**

JRC-LCA4PLASTICS@ec.europa.eu

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Any questions?

Your thoughts and input is welcome!

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