

**Survey report on regulatory obstacles and drivers  
for boosting a sustainable and circular urban biobased economy**

**SURVEY REPORT**



2020

*In cooperation with:*



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## Table of Contents

GLOSSARY .....	3
INTRODUCTION.....	4
Policy background.....	4
Aim of this report .....	4
Methodology .....	5
RESPONDENTS INFORMATION.....	6
Respondent numbering.....	6
DISCLAIMER.....	7
STOCKTAKING AND ANALYSIS .....	8
Legend.....	9
I. Landfill Directive.....	10
II. Animal by-products Regulation .....	17
III. Nitrates Directive.....	22
IV. Fertilisers Regulation.....	26
V. Proposal for a Regulation laying down rules on the making available on the market of CE marked fertilising products .....	29
VI. REACH Regulation.....	33
VII. Waste Framework Directive .....	38
VIII. Sewage Sludge Directive .....	47
IX. Urban Waste Water Treatment Directive .....	50
X. Renewable Energy Directive.....	53
XI. EU ETS-Innovation Fund .....	61
XII. Effort Sharing Decision & Regulation .....	62
XIII. A Bio-economy for Europe .....	66
XIV. Council Regulation on Organic Farming .....	71
XV. Directive to reduce indirect land use change for biofuels and bioliquids.....	73
XVI. Fuel Quality Directive .....	74
XVII. The Gas Directive.....	75
XIX. Regulation on Detergents.....	76
XX. Packaging Waste Directive .....	77
XXI. Cosmetic Regulation.....	78
XXII. CMO Regulation .....	79
XXIII. Regulation on the placing on the market and use of feed .....	80
XXIV. Plastics Regulation.....	81
XXV. Regulation on recycled plastics in food contact.....	82
XXVI. Water Framework Directive .....	83
XXVII. A European Strategy for Plastics in a Circular Economy.....	84
XXVIII. Closing the loop - An EU action plan for the Circular Economy .....	90
XXIX. Towards a circular economy – A zero waste programme for Europe.....	91
ANNEXES .....	93
Questionnaire.....	93

# GLOSSARY

## Bioeconomy

‘The bioeconomy covers all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste), their functions and principles. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, biobased products, energy and services. [Biomedicines and health biotechnology are excluded]. To be successful, the European bioeconomy needs to have sustainability and circularity at its heart. This will drive the renewal of our industries, the modernisation of our primary production systems, the protection of the environment and will enhance biodiversity’.<sup>1</sup>

## Biobased economy

A biobased economy includes all economic and industrial sectors that use biological resources and processes to produce food, feed, biobased products, energy and services.

## Circular Economy

In a circular economy the value of products, materials and resources is maintained for as long as possible, and the generation of waste minimised (Closing the loop – An EU action plan for the Circular Economy. COM(2015)614 (Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions)).

## Circular biobased economy

The circular biobased economy is about the application of circularity principles to the biobased economy. It can include, for example, the management of biological residues and waste flows in urban areas and their recycling into safe, sustainable and valuable biobased products.

## Urban circular biobased economy

In this context, it refers to the processes valorising urban biowaste resources through the production of urban biowaste-based products (using as feedstock urban biowaste and wastewater sludge).

## Bio-based products from biowaste and urban wastewater sludge (UWWS)

E.g. organic fertilisers, biogas and bio-methane, bioethanol and biomethanol, biobased chemicals (e.g. esters, alcohols, alkanes, carboxylic acids (e.g. lactic acid, succinic acid), surfactants, etc.), biobased plastics (e.g. Polyhydroxyalkanoates (PHAs)), biobased feed ingredients, etc.

## Urban biowaste

Biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants’.<sup>2</sup>

## Urban Wastewater Sludge (UWWS)

Here defined as: sludge from urban wastewater treatment plants.

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<sup>1</sup> [https://ec.europa.eu/research/bioeconomy/pdf/ec\\_bioeconomy\\_strategy\\_2018.pdf#view=fit&pagemode=none](https://ec.europa.eu/research/bioeconomy/pdf/ec_bioeconomy_strategy_2018.pdf#view=fit&pagemode=none)

<sup>2</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2018:150:FULL&from=EN>

# INTRODUCTION

## Policy background

Cities are geographical and economic areas with major concentration of waste generation and flows. Currently cities generate 1.3 billion tonnes of solid waste annually, a figure expected to almost double by 2025. Roughly half of these waste resources is organic<sup>3</sup>. Urban biowaste<sup>4</sup> and wastewater sludge<sup>5</sup> are precious feedstocks for producing valuable and safe biobased products such as fertilisers, chemicals and plastics. The 2018 Updated Bioeconomy Strategy considers that ‘biodegradable waste (or biowaste) can be an important source of biomass’ for biorefining and ‘cities should become major circular bioeconomy hubs. Circular urban development plans could translate into very significant economic and environmental gains’.<sup>6</sup>

However, today, urban biowaste and wastewater flows are perceived as issues for cities from an economic and environmental point of view: their management is costly and they are still too often landfilled causing GHG emissions and potential hazards to the human health and the environment. Moreover, their value is only partially captured through the production of compost and/or biogas only or through energy recovery.

Nevertheless, urban circular biobased economy models and emerging biobased technologies can enable the recycling and valorisation of urban biowaste and wastewater flows into higher-value and safe biobased products, thereby generating significant economic, social and environmental benefits such as:

- Generating local jobs;
- Improving the sustainability of local waste management schemes (e.g. reducing landfilling and waste of precious feedstock for biorefining);
- Urban biowaste and wastewater sludge are a secondary feedstock available all-year round in significant quantities. They can be used for biorefining without creating a conflict with food production or land use change;
- The extraction/production of valuable substances from local organic waste resources - including critical materials like phosphorus - contributes to reduce their imports from outside the EU;
- Supporting industrial symbiosis between the waste and wastewater management sectors and the biobased industries producing chemicals, fertilisers, plastics, etc.;
- Providing significant local contributions to achieve EU targets in specific policy fields such as: circular economy, bioeconomy, sustainable growth and reindustrialisation, GHG emissions reduction (e.g. by reducing landfilling and keeping stored in new products the carbon contained in biobased feedstock), urban-rural cooperation and production of renewable energy.

## Aim of this report

In a sustainable and circular urban biobased economy, processes and products have positive economic, social and environmental outcomes. In particular, the biobased products produced from urban biowaste and wastewater sludge must respect specific safety criteria in order to avoid negative impacts

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<sup>3</sup> World Economic Forum (2017), Project MainStream – Urban Biocycles, *System Innovative on Environmental and Natural Resource Security*, p.6

<sup>4</sup> Here defined as: biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants.

<sup>5</sup> Here defined as: sludge from urban wastewater treatment plants.

<sup>6</sup> Updated Bioeconomy Strategy, p.6 and 50.

on human and animal health and on the environment. Innovative technologies and processes aim at demonstrating the possibility to extract more value from these feedstocks. However, how do the EU legislation on waste, climate mitigation, renewable energy, water resources, etc. influence their TRL upgrade and their development? How can the EU legislations support innovative value chains and processes and at the same time assuring their safety and sustainability?

This report presents a preliminary analysis of the EU regulatory obstacles and drivers influencing the production of biobased products from urban biowaste and wastewater. This analysis is based on a survey carried out in 2018 by the EU Urban Agenda's Partnership on Circular Economy.<sup>7</sup> The aim of this report is indeed to present to EU legislators the direct feedback from experts on how specific EU legislations are influencing the current production of biobased products from urban biowaste and wastewater. Moreover, this report can provide useful information to local policymakers interested in valorising urban organic resources through the production of biobased products by reporting direct experiences.

Considering the heterogeneous EU legislations analysed, the Partnership opted for specific analysis and conclusions per each legislation instead of an overall conclusion for the entire report.

## Methodology

This report is based on a survey launched and managed by the Partnership on Circular Economy of the EU Urban Agenda – see the respective questionnaire in the Annex.

In 2017Q4, the Partnership identified a sample of experts from research centres, cities, utilities and biobased industries to be involved in the survey.

The survey was launched in 2018Q1 and the replies were collected in 2018Q2. The analysis was carried out by EU law and policy institute *Europa Decentraal*<sup>8</sup> during 2018Q3/Q4.

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<sup>7</sup> <https://ec.europa.eu/futurium/en/circular-economy>

<sup>8</sup> <https://europadecentraal.nl/>

## RESPONDENTS INFORMATION

### Respondent numbering

More information about the respondents of this questionnaire can be found here. In the questionnaire the respondents can be identified through their corresponding number from this table:

Number	Organisation	Type
1	Attero	Waste management company
2	BIR	Waste management company
3	VLAKWA: Flanders Knowledge Center Water	Knowledge centre
4	ECN	Lobby group bio-waste companies
5	Energem	Bio-waste/Bio-fuel company
6	Greece - Ministry of env & energy	Government authority
7	Paques	Waste water management company
8	DAFIA	EU project (H2020)
9	EMBRACED	EU project
10	ReNEW	EU project (H2020)
11	RES URBIS/SMART Plant	EU project (H2020)
12	ROUTES	EU project
13	URBIOFIN	EU project
14	VOLATILE	EU project
15	University of Valencia	University
16	Wetsus	Knowledge centre
17	Wageningen University	University

## **DISCLAIMER**

The information and data included in this report are based on a survey carried out by the Partnership on Circular Economy of the EU Urban Agenda. The survey report is based on the position of the respondents to the survey that was launched and managed by the Partnership in 2018. Additionally the Partnership has provided an elementary contextualisation of the survey results in the survey report. The information and views contained in the present document are those of the Partnership and/or respondents to the survey and do not reflect the official opinion of the European Commission nor that of the Partners. The Commission and the Partners do not guarantee the accuracy of the information contained therein. Neither the Commission or the Partners nor any person acting on the Commission's behalf or on the Partners' may be held responsible for the content and the use which may be made of the information contained therein.



## **STOCKTAKING AND ANALYSIS**

## Legend

### Legislation

The input received has been compiled per legislative act into legislative frameworks (tables).

### Product categories

For every legislative act the input received has been subdivided into different product categories, namely:

1. Fertilisers (organic/inorganic)
2. Biogas and bio-methane
3. Bioethanol and biomethanol
4. Biobased chemicals
5. Bioplastics
6. Bio-based food & feed ingredients
7. Recovered cellulose

### Classification system of bottlenecks and drivers

**I.** All EU legislations/policy documents are numbered with roman numbers.

**I.1.** Product categories are numbered secondly. It is possible that a certain bottleneck/driver is mentioned in different product categories, then multiple numbers are mentioned here divided by a / (e.g. I.1/3).

**I.1.1** The final number indicates the chronological order of the bottlenecks/drivers belonging to the specific legislation.

#### *Clarification on similar bottlenecks:*

Similar bottlenecks or drivers regarding the same legislation, but for different products or product categories that were submitted by respondents were also included in the legislative frameworks. However these similar bottlenecks or drivers are visualised in the framework with a *blue and cursive* layout.

#### *Clarification on 'new' and 'old' legislation:*

Several of the legislative acts discussed in this analysis were still in decision-making phase of the legislative process. For these legislative acts (e.g. the Waste Framework Directive) respondents provided feedback both on the existing legislation and the Commission proposal. The provided input on the proposals and existing legislation has been merged into single legislative frameworks. The connotation (old legislation) or (new legislation) has been added to bottleneck/driver titles to distinguish between feedback provided on the new and old legislation.

## I. Landfill Directive

The feedback of the responders on both the ‘old’ Landfill Directive [1999/31/EC](#) and the feedback on the proposal to change the Landfill Directive ([2015/0274/COD](#)). As the proposal has resulted in a newly adopted Directive [2018/850/EU](#) amending the Landfill Directive, this Directive will be used to analyze the feedback provided. The new consolidated Landfill directive can be found [here](#).

### Overall Conclusion

The feedback was separately collected for the Landfill Directive and the proposal to amend the Landfill Directive. In the overall feedback some general trends came to the forefront:

- Multiple respondents in different product categories considered the addition of a stricter maximum percentage of municipal waste that is allowed to be landfilled (10%) in the amended Landfill Directive as a positive development. Some argued for an even stricter limit (5%).
- Various bottlenecks suggest that stricter measures against, and even prohibiting, the landfilling of biodegradable waste should be considered in the Landfill Directive. It follows from our analysis of the revised Landfill Directive in combination with the revised Waste Framework Directive that the revised waste legislation adheres to the wishes of the respondents (at least in relation to the organic fraction of municipal waste (**See bottleneck I.3.3**). However, there are still issues with the current definition of ‘biodegradable waste’ in the Landfill Directive, several respondents argue for a less restrictive and clearer definition. For example, sludge is not clearly included in the definition of biodegradable waste in the Landfill Directive.

### 1. Fertilisers (organic/inorganic)

Biobased product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Organic Fertiliser (compost or digestate)	<p><b>Bottleneck I.1.1 (new legislation)</b> One of the respondents (4) representing waste management companies argued for an addition of the term ‘non-recyclable’ in article 5(5) of the new Landfill Directive:</p> <ul style="list-style-type: none"> <li>• <i>Member States shall take the necessary measures to ensure that by 2030 the amount of <b>non-recyclable</b> municipal waste landfilled is reduced to 10% of the total amount of municipal waste generated.</i></li> </ul> <p>To make sure that only non-recyclable residual waste is sent to a landfill.</p>	<p><b>Driver I.1.1 (old legislation)</b> A regulatory driver in the old Landfill Directive in relation to organic fertilisers mentioned by one of the respondents (6) was that article 5 (that sets up a national strategy for the implementation of the reduction of biodegradable waste going to landfills), also encourages the separate collection of biodegradable waste, sorting in general, recovery and recycling.</p> <p><b>Driver I.1.2 (old legislation)</b> This government authority (6) also found it useful that (sewage) sludges used for soil fertilization or improvement are excluded from the scope of this directive.</p> <p><b>Driver I.1.3 (new legislation)</b> Furthermore this respondent (6) stated that stricter measures shall be taken in order to achieve the landfill</p>	<p><b>Bottleneck I.1.1 (new legislation) and I.1.2 (new legislation):</b> Both these bottlenecks refer to article 5(5) in the newly adopted Landfill Directive and are directed at reducing the amount of (recyclable) municipal waste that is being landfilled, especially when there are more desirable alternatives (see the waste hierarchy in article 4 of the Waste Framework Directive).</p> <p>In relation to <b>bottleneck I.1.1</b>, the new Directive has a new paragraph added into article 5:</p> <ul style="list-style-type: none"> <li>- <i>5.3a: Member States shall endeavour to ensure that as of 2030, all waste suitable for recycling or other recovery, in particular in municipal waste, shall not be accepted in a landfill with the exception of waste for which landfilling delivers the best environmental outcome in accordance with Article 4 of Directive 2008/98/EC.</i></li> </ul> <p>This paragraph seems to have the same goal as what the respondent suggested. However, “<i>shall endeavour</i>” is less strict than for example, “<i>shall take measures</i>” (used in article 5(3)(f)). This implies an intention</p>

		targets, according to the amended Article 5, aiming at the further reduction of biodegradable waste going to landfills.	to achieve and not an obligation.  For specific forms of waste (see article 11(1) and article 22(1) of the Waste Framework Directive) there are obligations for separate collection. E.g. paper, metal, plastic, glass, textiles and bio-waste. These separately collected waste streams cannot be landfilled after the implementation of the new landfill directive (see article 5(3)(f)). However, this does not exclude the possible landfilling of other recyclable wastes.
Hydrochar (HTC biochar)	<b>Bottleneck I.1.2 (new legislation)</b> A respondent (15) belonging to a research institute argues that the defined maximum percentage of landfilled municipal waste in the proposal (10%) should be lower. They suggest a target of 5% with a possible five year derogation for some countries (Estonia, Greece, Croatia, Latvia, Malta, Romania and Slovakia). This could function as a strong driver in the development of a new OFMSW valorization strategy. Reducing the amount of landfilled material has a direct impact on the development of new EoW products.		With regard to <b>Bottleneck I.1.2</b> it is clear that the suggested 10% maximum target of landfilled municipal waste is maintained in the new directive (article 5(5)). The 5 year derogation period for Member States that landfill a large percentage of their waste (article 5(6)) is also present. It is logical that a lower maximum would positively affect the valorization of OFMSW. However, one can wonder whether this is achievable politically.
Mixed concentrated liquid fertiliser (inorganic)		<b>Driver I.1.4 (old legislation)</b> A responder (10) from an EU funded project also considered the fact that landfilling is not allowed for sludge and organic waste a driver for the use of organic fertiliser. They mention the forbidding of landfilling for sludge and organic waste.	<b>Driver I.1.1 (old legislation) &amp; Driver I.1.3 (new legislation)</b> The regulatory driver I.1.1 is related to the old directive and encourages the implementation of a national strategy that also encourages the separate collection of biodegradable waste (article 5(1)). This article is still present in the new Landfill Directive, however, as suggested in driver I.1.3, the new Directive has taken further steps against the landfilling of biodegradable waste (article 5(3)(f)). See the analysis of bottleneck I.3.3 below.  <b>Driver I.1.2 (old legislation) &amp; Driver I.1.4 (old legislation)</b> Both these drivers relate to sludge. According to driver I.1.2 the fact that sludges used for soil fertilization or improvement are excluded from the scope of the directive (article 3(2) first indent), is positive. This means that when sludges are used for these goals, this will not be treated as landfilling. However, driver I.1.4 is less clear. In the new or revised directive there is no mention of a ban on landfilling sludge or organic waste. The new directive does however provide a prohibition of landfilling bio-waste. See the analysis of <b>bottleneck I.3.3</b> below.

### 3. Bioethanol and biomethanol

Biobased product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethanol/(Bio)ethanol	<p><b>Bottleneck I.3.3 (new &amp; old legislation)</b>            A respondent (13) from an EU funded project considered that both the new and the old directive lack prohibitions in relation to landfilling biodegradable waste. It only sets targets for reduction.</p> <p>They suggest further restrictions on the landfilling of biodegradable waste by prohibiting the landfilling of biodegradable waste that has been separately collected.</p>	<p><b>Driver I.3.5 (old legislation)</b>            The responder (13) found it positive that the directive (article 5(2)c) obliges Member States to reduce the amount of biodegradable municipal waste that they landfill to 35% of 1995 levels by 2016 (for some countries by 2020).            As producing bioethanol from OFMSW helps to reduce the amount of bio-waste sent to landfill.</p>	<p><b>Bottleneck I.3.3 (new &amp; old legislation)</b>            In the new directive a couple of new subparagraphs are included in article 5:</p> <ul style="list-style-type: none"> <li>- 5.3. <i>Member States shall take measures in order that the following wastes are not accepted in a landfill:</i> <ul style="list-style-type: none"> <li>(f) <i>waste that has been separately collected for preparing for re-use and recycling pursuant to Article 11(1) of Directive 2008/98/EC and Article 22 of that Directive, with the exception of waste resulting from subsequent treatment operations of the separately collected waste for which landfilling delivers the best environmental outcome in accordance with Article 4 of that Directive.</i></li> </ul> </li> </ul> <p>Following article 22 (1) on bio-waste of the recently altered Waste Framework Directive (<a href="#">Directive 2008/98/EC</a>), bio-waste must be collected separately or separated and recycled at source before 2024. Resultantly in combination with article 5(3)(f) of the new Landfill Directive, it is prohibited to landfill bio-waste after 2024. Thereby seemingly resolving the bottleneck with regard to biodegradable waste. However, the definitions of bio-waste and biodegradable waste do not completely match. It seems that waste can be biodegradable waste but not fall within the category bio-waste.</p> <p>Article 3(4) of the WFD:  <i>'bio-waste' means biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants'</i></p> <p>Article 2(m) of the Landfill Directive:  <i>'biodegradable waste' means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard;</i></p>

			<p><b>Driver I.3.5 (old legislation)</b> This driver is no longer relevant as the new limits on the landfilling of biodegradable waste are more strict (see text above). However, these newly formed prohibitions/limits should/could stimulate the production of bioethanol even further.</p>
<b>4. Biobased chemicals</b>			
Biobased product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Adipic acid, Muconic acid / 1,5-pentanedia mine	<p><b>Bottleneck I.4/5.4 (old &amp; new legislation)</b> A respondent (8) representing EU funded projects stated that waste prevention policy could reduce available feedstocks for the creation of these products.</p> <p><b>Bottleneck I.4/5.5 (old &amp; new legislation)</b> Furthermore, they (8) suggest to carry out a global assessment of the initial waste reduction versus the efficiency of the product obtained.</p>	<p><b>Driver I.4/5.6 (old &amp; new legislation)</b> The interviewee (8) also states that the Landfill Directive should promote the use of waste as raw material for the production of byproducts or other products and should include rewards for these good practices.</p>	<p><b>Bottleneck I.4/5.4 (old &amp; new legislation)</b> Respondents seem to suggest that when waste prevention policy is functioning effectively that this could reduce available feedstocks for the creation of mentioned products.</p> <p><b>Bottleneck I.4/5.5 (old &amp; new legislation)</b> Not really a regulatory bottleneck, they seem to want to carry out an global enquiry to assess how effective the production of these products is (waste reduction vs. the efficiency of the product). Better knowledge action.</p>
Biosurfactant	<p><b>Bottleneck I.4/5.6 (old legislation)</b> One of the EU funded projects that responded (13) stated that the amount of waste devoted to landfills should be reduced.</p>	<p><b>Driver I.4/5.6 (old &amp; new legislation)</b> <i>This driver was also mentioned by another EU funded project (13) in relation to this product.</i></p>	<p><b>Bottleneck I.4/5.6 (old legislation)</b> Article 5(5) of the new directive clearly states a new maximum percentage (10%) of municipal waste that is allowed to be landfilled. So the amount of waste devoted to landfills is going to be reduced substantially.</p>
(Poly) lactic acid	<p><b>Bottleneck I.4/5.4 (old &amp; new legislation)</b> <i>This bottleneck was also mentioned by another EU funded project (13) in relation to this product.</i></p> <p><b>Bottleneck I.4/5.5 (old &amp; new)</b> <i>This bottleneck was also mentioned by the respondent (13).</i></p>	<p><b>Driver I.4/5.6 (old &amp; new legislation)</b> <i>This driver was also mentioned by EU funded project (13) in relation to this product.</i></p>	<p><b>Bottleneck I.4/5.6.7 (old legislation) &amp; Driver I.4/5.6.9 (new legislation)</b> The definition of biodegradable waste in the Landfill Directive has not changed in the revised directive. Article 2(m): <i>Biodegradable waste means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard.</i> The European Parliament did suggest a different definition. See</p>
Single Cell Oil for oleochemical industry	<p><b>Bottleneck I.4/5.6.7 (old legislation)</b> A respondent belonging to an EU research funded project (14) argued that the OECD definition of biological waste should be taken into account to fully cover the input scope of the VFAP (Volatile Fatty Acid Platform) value chain.</p>	<p><b>Driver I.4/5.7 (old legislation)</b> The responder (8) found it positive that the (old) directive (article 5(2)) sets mandatory targets for the reduction of biodegradable waste and organic components that is allowed to be landfilled.</p>	

<p>produced by yeasts</p>	<p><b>Bottleneck I.4/5/6.8 (old legislation)</b> The definition of biodegradable waste does not explicitly mention sludges (respondent 14).</p> <p><b>Bottleneck I.4/5/6.9 (new legislation)</b> The respondent (14) further suggested that to promote the value chain of bio-based products, a more detailed description of recycling by means of VFAP (volatile fatty acid platform) in anaerobic digestion would be helpful. Currently the revised WFD defines recycling but the Art. 11a(4) text "... or other output with a similar quantity of recycled content in relation to input..." restricts the validity for VFAP and the evidenced fact that this method leads to high-level added-value output in comparison with traditional output compost and digestate.</p>	<p>Another respondent (9) belonging to an EU project also considered these binding targets a good driver. Especially in relation to AHP (Absorbent Hygiene Products) waste.</p> <p><b>Driver I.4/5/6.8 (new legislation)</b> Another interviewee (14) belonging to an EU funded project states that the further restrictions on the landfilling of waste is positive for this value chain. Especially, the prohibition of separately collected biodegradable waste in landfills.</p> <p><b>Driver I.4/5/6.9 (new legislation)</b> The respondent (14) stated that the European Parliament have suggested amendments of the Commission proposal (COM/2015/594) that would alter the proposal towards the objectives of the VFAP value chain (amendments 1, 2, 8, 9, 25, 27, 29 and 51).</p>	<p>amendment 25: <i>(m) 'biodegradable waste' means food and garden waste, paper, paperboard, wood and any other waste that can undergo anaerobic or aerobic decomposition.</i> The <a href="#">OECD definition</a> is: <i>Biological waste is waste containing mostly natural organic materials (remains of plants, animal excrement, biological sludge from wastewater treatment plants and so forth).</i></p> <p><b>Bottleneck I.4/5/6.8 (old legislation)</b> The definition of biodegradable waste does indeed not explicitly include sludges, neither in the old or the revised Directive. See the definition above and also notice that the OECD definition does include sludges (<b>bottleneck I.4.7</b>).</p> <p><b>Bottleneck I.4/5/6.9 (new legislation)</b> In the old directive no definition of recycling is given. In the revised Directive reference is made to the definition described in article 2 of the Waste Framework Directive: <i>17. 'recycling' means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations;</i></p> <p>Furthermore, in paragraph 4 of article 11a of the WFD further clarification is given when biodegradable waste that enters anaerobic treatment counts as being recycled. It does not specifically mention VFAP or fatty acids or bioplastics, while compost and digestate are mentioned.</p> <p>The respondent (14) further states that as from 01-01-2027 municipal bio-waste treated in AD is considered as recycled only if separately collected or separated at source (WFD, Art. 11a (4)). That means, considered as recycled only if separately collected or separated at source (WFD, Art. 11a (4)). That means, VFA generated from the <u>biological fraction of MSW</u> is not considered a recycling product.</p>
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			<p><b>Driver I.4/5.6 (old &amp; new legislation)</b>  The use of waste as raw material for the production of byproducts or other products and rewards for good practices are not mentioned in either the old or new Landfill Directive. The Directive does mention: “<i>waste suitable for recycling or other recovery</i>”, it seems that according to the definitions given by article 3 of the Waste Framework Directive, the use of waste for the production of byproducts is covered by this definition.</p> <p>There are no rewards available for the usage of waste for the production of byproducts. However, a new paragraph is added in article 15, namely</p> <p><b>Driver I.4/5.7 (old &amp; new legislation)</b>  This driver is similar to <b>driver I.3.5</b>. The limits/targets set by the newly adopted Landfill Directive are even stricter. So this should have an even greater effect.</p> <p><b>Driver I.4/5/6.8 (new legislation)</b>  This driver is certainly valid. See analysis <b>bottleneck I.3.3</b>.</p>
<b>5. Biobased plastics</b>			
<b>Biobased product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>



<p>Biobased plastics</p> <p>Bio-Polyamide 56 / Long chain Bio-Polyamides / Polyhydroxyalkanoate (PHA)</p>	<p><b>Bottleneck I.4/5.4 (old &amp; new legislation)</b> Same feedback as bio-based chemicals.</p> <p><b>Bottleneck I.4/5.5 (old &amp; new legislation)</b> Same feedback as bio-based chemicals.</p> <p><b>Bottleneck I.4/5/6.7 (old legislation)</b> Same feedback as bio-based chemicals. Same feedback as bio-based chemicals.</p> <p><b>Bottleneck I.4/5/6.8 (old legislation)</b> Same feedback as bio-based chemicals.</p> <p><b>Bottleneck I.4/5/6.9 (new legislation)</b> Same feedback as bio-based chemicals.</p>	<p><b>Driver I.4/5.6 (old &amp; new legislation)</b> Same feedback as bio-based chemicals.</p> <p><b>Driver I.4/5.7 (old legislation)</b> Same feedback as bio-based chemicals.</p> <p><b>Driver I.4/5/6.8 (new legislation)</b> Same feedback as bio-based chemicals.</p> <p><b>Driver I.5.10 (new legislation)</b> Respondent (9) also mentions the binding maximum target of 10% municipal waste that is allowed to be landfilled as a driver for the diversion of AHP waste from landfilling, prompting its separate collection and recycling.</p>	<p><b>Driver I.5.10 (new legislation)</b> The newly adopted Landfill Directive indeed has a stricter maximum of 10% of municipal waste that is allowed to be landfilled, in place (article 5(5)). Which could lead to a need for further separate collection of municipal waste to recycle/re-use it effectively. However, so far no mention of the separate collection of AHP waste in either the WFD or the Landfill Directive.</p>
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**6. Bio-based food & feed ingredients**

Biobased product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Omega-3 fatty acids	<p><b>Bottleneck I.4/5/6.7 (old legislation)</b> Same feedback as bio-based chemicals.</p> <p><b>Bottleneck I.4/5/6.8 (old legislation)</b> Same feedback as bio-based chemicals.</p> <p><b>Bottleneck I.4/5/6.9 (new legislation)</b> Same feedback as bio-based chemicals.</p>	<p><b>Driver I.4/5/6.8 (new legislation)</b> Same feedback as bio-based chemicals.</p>	

## II. Animal by-products Regulation

The feedback of the respondents was directed at the Animal by-products Regulation ([Regulation 1069/2009/EC](#)). Furthermore, the Regulation ([Regulation EU/142/2011](#)) implementing the ABP regulation is also discussed.

### Overall Conclusion

In the feedback on the Animal by-products Regulation and its implementing regulation some general trends came to the forefront:

- Many respondents gave feedback related to technical (treatment) requirements in the implementation regulation of the ABPR.
- The ABPR lays down public health and animal health rules for animal by-products and derived products, these rules are seen by some as too strict and should be developed further to better suit specific products and processes.
- Much of the feedback is directed at expanding the processing options, uses and kinds of bio-based products from animal by-products. It is acknowledged however, that the complexity of the processes and variety of new bio-based products makes it very difficult to provide general requirements and guidelines.

### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Organic Fertiliser (compost or digestate)	<p><b>Bottleneck II.1.1</b> A respondent belonging to a waste management company (1) argued that there are very strict time-temperature profiles/criteria for use of compost (category 3) in comparison to animal manures (category 2).</p> <p><b>Bottleneck II.1.2</b> A respondent belonging to relevant industry (4) argued that the required time-temperature profiles (70 °C/1h) with a particle size of 12 mm is not suitable for the treatment of catering waste, which includes bio-waste collected from household for producing compost. National regulations exempt catering waste or allow alternative time-temperature profiles. They recommend to implement EU wide alternative time-temperature profiles suitable for producing compost from source separated bio-waste.</p> <p><b>Bottleneck II.1/4.3</b> A bottleneck identified by a respondent belonging to a EU project (13) is that bio-based fertilisers derived from OFMSW</p>	<p><b>Driver II.1.1</b> A respondent belonging to a waste management company (1) finds the presence of time-temperature profiles for sanitation in the legislation to be an important driver.</p>	<p><b>Bottleneck II.1.1</b> Based on article 9(a) of the ABPR animal manure falls into category 2 and is allowed to be applied to the land without processing by the competent authority (article 13(f)). While there are more requirements for composting category 3 materials (Annex V chapter 3 section 1 of the implementing <a href="#">Regulation EU/142/2011</a>). There does indeed seem to be additional requirements for processing of category 3 materials into compost in comparison to animal manures.</p> <p><b>Bottleneck II.1.2</b> ABPR applies to catering waste destined for composting. It is a category 3 materials (article 10(p) ABPR). Annex V chapter 3 section 1 of the implementing <a href="#">Regulation EU/142/2011</a> also applies here. Section 2 provides for alternative transformation parameters for composting plants. However, dependent on the competent authority (no EU-wide alternative).</p> <p><b>Bottleneck II.1/4.3</b> This bottleneck voices a general concern with the ABPR and its implementing regulation: the complexity of the processes and variety of new bio-based products makes it very difficult to provide general</p>

	<p>are submitted to the ABPR because of the unavoidable content of animal by products in fresh organic fertiliser. ABPs restrictions have a temporary character but they last for a decade, creating a bubble of non-compliance in OFMSW derived products in general and specifically to future bio-based fertilisers.</p> <p>Therefore revision of ABPR is necessary regarding OFMSW processes and derived products. The complexity of the processes and variety of new bio-based fertilisers makes it very difficult to give a simplified guideline.</p>		<p>requirements and guidelines. Bottleneck II.1.2 can be seen as an example of this problem.</p> <p><b>Driver II.1.1</b> Self-explanatory</p>
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**4. Bio-based chemicals**

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biosurfactant	<p><b>Bottleneck II.4/5.4</b> One respondent (13) of an EU-project argued for the inclusion of bio-surfactants as byproducts in the ABPR (article 33, 34, and 35)). If chemical products are included it may foster the use of wastes for the production of a wide variety of products, such as bio-plastics and surfactants. (including the option of using waste for the production of byproducts for the agrifood, chemical and packaging markets).</p>		<p><b>Bottleneck II.4/5.4</b> Article 33, 34, 35 and 36 are concern with products (derived from animal by-products) that may be placed on the market. Chemical products are indeed not included here. However, if chemical products would (in article 33), it is important to consider how this relates to the legislation governing chemical products (such as REACH). The second respondent (14) further stated that chemicals are not exhaustively included in the ABPR, only cosmetics which are commonly based on chemical substances and directly applied in health and body care is mentioned. Furthermore, the use of omega-3 FA and single cell oils derived from VFAP process should be defined in the ABPR according to the respondent.</p>
(Poly) lactic acid	<p><b>Bottleneck II.4/5.4</b> <i>Respondent (13) also mentioned this bottleneck in relation to (poly) lactic acid. The respondent however, includes that the products should comply with requirements safety requirements (article 37, 38, 39).</i></p> <p><b>Bottleneck II.1/4.3</b> <i>Respondent (13) also mentioned this bottleneck in relation to (poly) lactic acid.</i></p>		<p><b>Bottleneck II.4/5.5</b> This bottleneck suggests that the requirements of category 3 materials under which it is allowed to treat these materials to produce compost or digesters should also be extended for the creation of adipic/muconic acid and PHA. Thus, extending the procedures for category 3 feedstock described in Regulation <a href="#">EU/142/2011</a> to allow for the use of animal by-</p>

<p>Adipic acid Muconic acid</p>	<p><b>Bottleneck II.4/5.5</b> The requirements (for category 3 materials) mentioned in the ABPR and implementing regulation should be extended to the product discussed here according to the respondent (11) belonging to an EU project. The ABPR allows for the treatment of some animal by-products and describes procedures required to allow solid outputs from composting plants and anaerobic digesters onto land.</p>		<p>products for other products or technologies. This seems to be in line with <b>Bottleneck II.1/4.3</b></p> <p><b>Bottleneck II.4/5/6.6</b> Expansion of the processing options, uses and number of bio-based products in the regulation. Is closely related to <b>Bottleneck II.1/4.3</b>. Specifically for the inclusion of VFAs processing options and products the respondent wants to amend:</p> <ul style="list-style-type: none"> <li>- Article 13(e) and 14 (f): “composted, <b>treated in a VFAP (volatile fatty acids platform)</b> or transformed into biogas”</li> <li>- Art. 32(1)(d): In addition, digestion residues from transformation into <b>VFA</b>, biogas or compost may be placed on the market and used as organic fertilisers or soil improvers.</li> </ul>
<p>Single Cell Oil</p>	<p><b>Bottleneck II.4/5/6.6</b> A respondent (14) belonging to an EU project considered the ABPR too restrictive in relation to the end-use of processed animal by-products. The Regulation categorizes three classes of animal by-products of which class two and three are allowed for anaerobic digestion. With regard to Omega-3 fatty acids: applications of derived products in feed and medicinal areas are mentioned e.g. in Art. 33-36. With regard to Single Cell Oil: end uses (e.g. in cosmetic), as targeted by the oleochemical industry are very restricted as well (Art. 33).  VFAP output (acids and acid compounds) and its downstream products differ significantly from their waste origin. <b>If safety criteria are fulfilled</b>, the ABPR needs to include new applications for derived products in the food/feed and chemicals area.  <i>Bottleneck II.4/5.4</i> <i>Respondent (14) also mentioned this bottleneck.</i></p>		
<p><b>5. Bio-based plastics</b></p>			
<p><b>Bio-based product</b></p>	<p><b>Bottlenecks (&amp; recommendations)</b></p>	<p><b>Regulatory drivers</b></p>	<p><b>Analysis</b></p>
<p>Bio-based plastics</p>	<p><i>Bottleneck II.4/5.4</i> <i>Respondent (14) mentioned this bottleneck.</i></p>		

	<p><b>Bottleneck II.4/5.5</b> Respondent (11) gave the same feedback for bio-based plastics.</p> <p><b>Bottleneck II.4/5/6.6</b> Respondent (14) also mentioned this bottleneck in relation to bio-based plastics.</p>		
<b>6. Bio-based food &amp; feed ingredients</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Omega-3 fatty acids	<p><b>Bottleneck II.4/5/6.6</b> Respondent (14) also mentioned this bottleneck in relation to Omega-3 fatty acids.</p>		
Insect-protein	<p><b>Bottleneck II.6.7</b> One respondent (2) belonging to a waste management company states that dead insects are mostly regarded as the feed material “processed animal protein”. At the moment it is not allowed to use processed animal protein for agricultural animals, swine, ruminants and poultry. It is allowed to use the feed material “rendered fat” of insects to all animal species including insects. Dependent on the feedstock on which insect protein is produced it can be used for:</p> <ul style="list-style-type: none"> <li>- Feedstock vegetable waste: fish feed and pet food</li> <li>- Mixed vegetable, meat and fish waste: only pet food</li> <li>- Organic fraction of commercial solid waste: only pet food</li> </ul> <p>The respondent argues for further research on insect protein, to determine risks and appropriate measures. Specifically, research is needed to determine whether insect protein can transmit BSE.</p> <p><b>Bottleneck II.6.8</b> Another respondent belonging to a research institute (16) argued that the list of allowed production insects in the EU is too narrow and should be extended to other invertebrate species.</p>	<p><b>Driver II.6.2</b> One respondent (2) belonging to a waste management company considers it positive that the ABPR lays down public health and animal health rules for animal by-products and derived products, in order to prevent and minimise risks to public and animal health arising from those products, and in particular to protect the safety of the food and feed chain.</p>	<p><b>Bottleneck II.6.7</b> If the requirements laid down in article 31 of the ABPR have been fulfilled, it seems that insect protein based on vegetable waste could be used to feed agricultural animals. However, when it is not purely vegetable based, <a href="#">Regulation 999/2001/EC</a>, does not permit the use of insect protein.</p> <p>The respondent concludes that there is a need for more research. This could lead to revisions in the legislation to better cater to the use insect protein as feed material.</p> <p><b>Bottleneck II.6.8</b> Article 21 of regulation 142/2011/EC sets the requirements for processing and placing on the market animal by-products for feeding to farm animals. This article refers to Annex X chapter II. In sub 2 of section 1 of this chapter the list of insects for production is mentioned, this consists of three species.</p> <p><b>Bottleneck II.6.9</b> This bottleneck is not directed at urban waste water sludge but specifically sludge and waste water streams from food industries.</p>

	<p><b>Bottleneck II.6.9</b></p> <p>The respondent (16) further argued that the allowed list of feed substrates should be extended to safe sludges produced on sludges and water streams from food industries. They argue that the feed materials that the insects can be grown on are limited to what is also fed to 'regular' farmed animals like poultry, pigs etc.</p>		<p><b>Driver II.6.2</b></p> <p>The protection of public and animal health that results from the rules in the ABPR is seen as a positive as well. This contradicts to some extent <b>Bottleneck II.2.4.</b></p>
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### III. Nitrates Directive

The responders provided feedback on the Nitrates Directive ([Directive 91/676/EEC](#)). [The consolidated version can be found here.](#)

#### Overall Conclusion

The feedback on the Nitrates Directive is mainly focused on two points:

- There is a lack of harmonization resulting in differences between MS in the way limits set in the directive are applied.
- The conditions set in the directive do not consider the specific characteristics of bio-based fertilisers other than manure.

#### 1. Fertilisers (organic/inorganic)

Biobased product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Compost & digestate	<p><b>Bottleneck III.1.1</b> One of the respondents (4) belonging to waste management industry argued that differences in implementation exist on the national/regional level, with regard to the limit on nitrogen in manure applied to the land each year. The limit of the amount of nitrogen in manure is set at 170 kg N.</p> <p><b>Bottleneck III.1.2</b> According to a respondent belonging to a research institute (17) the many derogations of MS with regard to the conditions of the Directive lead to many differences between MS. This bottleneck is closely related to bottleneck III.1.1 mentioned above.</p> <p><b>Bottleneck III.1.3</b> According to two respondents representing different categories (4 &amp; 17), there is a problem in relation to the low availability (or effectivity) of nitrogen of digestate/compost when compared to inorganic fertilisers. The limits set in the Nitrates Directive with regard to nitrogen content of fertilisers do not take this into consideration. Both respondents have a different solution for this problem however:</p> <ul style="list-style-type: none"> <li>- The first respondent (4) argued that compost as an organic soil improver should be exempted from the Nitrates Directive.</li> </ul>		<p><b>Bottleneck III.1.1 &amp; III.1.2</b> The problem identified here is a lack of harmonization. According to the respondents the ways in which nitrogen is taken into account varies in the MS, moreover the many derogations leads to even greater differences between and within MS.</p> <p><b>Bottleneck III.1.3 &amp; III.1.4</b> These bottleneck relates to the effectivity/availability of the nitrogen in compost/digestate and other characteristics of bio-based fertilisers. The availability of nitrogen for crops in compost is low as most of the nitrogen (95%) is fixed in organic matter and thus not available. The limits in the Nitrates Directive do not take this into consideration. Moreover, the specific characteristics of bio-based fertilisers are not taken aboard. The different solutions provided:</p> <ul style="list-style-type: none"> <li>- To exempt compost from the Nitrates Directive based on the fact that it is an organic soil improver could be a solution.</li> <li>- The inclusion of the effectivity of nitrogen in compost/digestate in the mandatory Action Plans (article 5(4)(a) in conjunction with Annex III). The respondents comment is based on the national (Dutch) context in which the effective amount of nitrogen is calculated using the “fertiliser equivalent” or “fertiliser replacement value”. It seems that the nitrogen fertiliser equivalent is used to calculate the right amount of organic fertilisers needed for a particular crop. However, this systematic does not seem to change the calculation of the total use of nitrogen. This would imply that more organic fertiliser is needed with a higher count of nitrogen because of the lower effectiveness in comparison to mineral</li> </ul>

	<ul style="list-style-type: none"> <li>- The second respondent (17) argued that the effectivity of nitrogen in compost/digestate has to be included in the obligatory fertilizing plan. They suggest to distinguish availability of nitrogen (mineralisation) from solubility of phosphorus (chemical equilibria). Focus on nitrogen fertilising products from animal manure. If these products have a similar action as chemical nitrogen fertilisers, they can be set free of use requirement of animal manure. JRC is working on criterions (SAFEMANURE).</li> </ul> <p><b>Bottleneck III.1.4</b> A respondent belonging to an EU funded project (13) explicitly highlighted the problem that the Directive does not differentiate the time release profile and other characteristics or properties of organic and/or biobased fertilisers. They argue for revisions of the Nitrates Directive with regard to OFMSW and new bio-based fertilisers with low solubility or improved time release profile of N and P.</p> <p><b>Bottleneck III.1.5</b> The origin (feedstock) of the product (compost) determines its regulatory position, this was mentioned by a research institute (17).</p>		<p>fertilisers. Resulting in an advantage for mineral fertilisers.</p> <ul style="list-style-type: none"> <li>- The revision of the Nitrates Directive specifically directed at bio-based fertilisers with low solubility or improved time release profile of N and P. The goal is to promote the use of new advanced bio-based fertilisers.</li> </ul> <p><b>Bottleneck III.1.5</b> The respondent provided the example of compost from sewage sludge. In this case the rules on quality and use of sewage sludge are in force. These regulations are based on the Sewage Sludge Directive 86/278/EEC. This problem of the feedstock determining the regulatory position of products is also mentioned in relation to other products (phosphates and ammonium sulphate).</p> <p>For ammonium sulphate the research institute considers the problem to originate from the definition of 'livestock manure' in the Nitrates Directive (article 2(g)). (see also <b>bottleneck IV.1.3</b>). The respondent stated that JRC's project SAFEMANURE will propose criterions to solve this issue.</p> <p>These bottlenecks result partly from an interconnection issue, which entails that the bottleneck arises from the counterproductive interplay of EU legislation.</p>
Recovered phosphates	<p><b>Bottleneck III.1.2</b> <i>The respondent (17) belonging to a research institute provided the same bottlenecks for this product.</i></p> <p><b>Bottleneck III.1.3</b> <i>The respondent (17) belonging to a research institute provided the same bottlenecks for this product.</i></p> <p><b>Bottleneck III.1.5</b> <i>The respondent (17) belonging to a research institute provided the same bottlenecks for this product.</i></p>		



Ammonium Sulphate	<p><b>Bottleneck III.1.2</b> The respondent (17) belonging to a research institute provided the same bottlenecks for this product.</p> <p><b>Bottleneck III.1.3</b> The respondent (17) belonging to a research institute provided the same bottlenecks for this product.</p> <p><b>Bottleneck III.1.5 (see also bottleneck IV.1.3)</b> The respondent (17) belonging to a research institute provided the same bottlenecks for this product.</p> <p>With regard to ammonium sulphate, the respondent gave a specific example of the bottleneck: Ammonium Sulphate has a dual status depending on its feedstock. When animal manure is not the feedstock, it is a designated chemical fertilizing product. If animal manure is the feedstock it is designated as animal manure and thus the rules on the use of animal manure apply.</p>		
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**4. Biobased chemicals**

Biobased product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Single Cell Oil & Omega-3 fatty acids	<p><b>Bottleneck III.4/5/6.6</b> This bottleneck was provided by a respondent belonging to a EU funded project (14). The action programmes to be established following the Nitrates Directive includes an annual application limit for nitrogen from manure (170 Kg/ha N). It does not consider fertilisers other than manure. Rules for other fertilisers (e.g. sewage sludge, digestate of non-animal origin, compost) would need to be included. The Directive sets a fixed limit of 170kg p.a. for application of nitrogen, one of the most</p>		<p><b>Bottleneck III.4/5/6.6</b> This bottleneck seems to be closely related to <b>bottlenecks III.1.3 &amp; III.1.4</b>. Their solution is the introduction of specific rules directed at fertilisers other than manure in the Nitrates Directive.</p>

	important plant nutrients, but mentions only one example for a nutrient source, the organic fertiliser <i>manure</i> . Currently, there are individual national solutions on this issue. <b>Hence, the list of organic nitrogen sources would need to be expanded by inclusions or exclusions (e.g. for digestate from VFA)</b> , with view on applications for VFAP process residues.		
<b>5. Biobased plastics</b>			
<b>Biobased product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Biobased plastics	<i>Bottleneck III.4/5/6.6</i> <i>The respondent (14) provided the same bottleneck for this product.</i>		
<b>6. Bio-based food &amp; feed ingredients</b>			
<b>Biobased product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Omega-3 fatty acids	<i>Bottleneck III.4/5/6.6</i> <i>The respondent (14) provided the same bottleneck for this product.</i>		

## IV. Fertilisers Regulation

The responders provided feedback on the Fertilisers Regulation ([Regulation 2003/2003/EC](#)). The consolidated version of the Regulation can be found [here](#).

### Overall Conclusion

The majority of the feedback provided by the respondents concerns **bottleneck IV.1/4/5.1**. The problem identified here is that organic fertilisers are not covered in the scope of this regulation. The European Commission has taken action in relation to this issue by introducing a new proposal for a Regulation laying down rules on the making available on the market of CE marked fertilising products, this proposal is discussed in another framework (V).

### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Organic Fertiliser (compost or digestate)	<p><b>Bottleneck IV.1/4/5/6.1</b> Three respondents (4, 13 &amp; 14) representing different types of organizations, namely relevant industry and an EU funded projects consider the fact that organic fertilisers and organic soil improvers are not covered in the scope of this regulation the main issue in relation to this product category. Because this leads to the exclusion of recycled bio-waste materials from being placed as EU fertilising products on the EU market. They suggest a revision of the Regulation to cover these products as well.</p> <p><b>Bottleneck IV.1.2</b> A respondent (6) belonging to a government authority considered the lack of standards for digestate an issue. These standards could function as an important driver for this product.</p>		<p><b>Bottleneck IV.1/4/5/6.1</b> The Fertilisers Regulation in its current form only applies to inorganic mineral fertilisers. This is considered to be the main issue with this regulation in relation to bringing to the market the biobased products in this framework (compost/digestate/ammonium sulphate/hydrochar/phosphates/omega-3 fatty acids/biobased plastics). The respondents belong to different categories, namely relevant industry, EU funded project, government authorities, and research institutes. Therefore it seems that this is a widely shared problem.</p> <p>The European Commission has taken action on this issue with the introduction of a new proposal to extend rules to non-harmonized fertiliser products and to improve the workings of the EU fertilisers market (<a href="#">2016/084/COD</a>). The respondents were also asked to provide feedback on this proposal. Consult framework V on the proposal for more information.</p>
Ammonium Sulphate	<p><b>Bottleneck IV.1.3</b> A respondent (17) from a research institute states that the issue with ammonium sulphate is that if the feedstock is animal manure, it is defined as animal manure. Therefore the rules in on the use of animal manure apply. They argue that the origin of this problem stems from the definition of animal manure in the Nitrates Directive.</p>		<p><b>Bottleneck IV.1.2</b> This bottleneck is closely related to bottleneck VI.1.1 because it argues for standards for digestate within the Fertilisers Regulation. This would be a logical consequence of the inclusion of bio-based fertilisers to the scope regulation.</p>

Hydrochar (HTC biochar)	<b>Bottleneck IV.1/4/5/6.1</b> <i>An interviewee (15) belonging to a research institute provided the same bottleneck for this product.</i>		<b>Bottleneck IV.1.3</b> This is partly an interconnection issue, which entails that the bottleneck arises from the counterproductive interplay of EU legislation. The respondent argues that due to the definition of animal manure in the Nitrates Directive, ammonium sulphate does not fall within the scope of the Fertilisers Regulation (see <b>bottleneck III.1.5</b> ).  Furthermore, the respondent indicated that the Joint Research Centre is commissioned by DG ENVI to formulate criterions for reaching an end-of-manure status of these type of fertiliser products (the JRC project SAFEMURE for adaption of the Nitrates Directive). Furthermore, the JRC installed a working group <a href="#">STRUBIAS</a> (JRC project for the new EU regulation on fertilisers).
Recovered phosphate	<b>Bottleneck IV.1/4/5/6.1</b> <i>A respondent (17) belonging to a research institute provided the same bottleneck for this product.</i> <i>If the feedstock for phosphate is animal manure or other organic material, there is still organic carbon present which is not allowed.</i>		
<b>4. Bio-based chemicals</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Single Cell Oil for oleochemical industry produced by yeasts	<b>Bottleneck IV.1/4/5/6.1</b> <i>An interviewee (14) belonging to an EU funded project provided the same bottleneck for this product.</i>		
<b>5. Bio-based plastics</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Bio-based plastics	<b>Bottleneck IV.1/4/5/6.1</b> <i>An interviewee (14) belonging to an EU funded project provided the same bottleneck for this product.</i>	<b>Driver IV.5.1</b> A respondent (11) belonging to an EU funded project considers the fact that the Fertilisers Regulation clearly	<b>Driver IV.5.1</b> It seems that the respondent refers to the possibility to add fertilizing products to the list of EC fertilisers (annex I) if it fulfills the requirements

		states EoW criteria from products derived from sewage sludge to be used as fertilisers. So this would apply for chemicals/materials derived from processing of sewage sludge when they are used as fertilisers. Possible applications for PHA in this sense are slow release fertiliser matrixes. The respondent further states that PHA can be used as a coating to obtain controlled release fertilizers. They could replace polyurethane coatings that under the new Fertilizer ordinance will need to be replaced by biodegradable polymers. It should be possible to use PHA derived from sewage sludge for this application.	of article 14. Following the procedure of article 31. However, there is no mention of PHA as a fertilizing product
<b>6. Bio-based food &amp; feed ingredients</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Omega-3 fatty acids	<i><b>Bottleneck IV.1/4/5/6.1</b> An interviewee (14) belonging to an EU funded project provided the same bottleneck for this product.</i>		

## V. Proposal for a Regulation laying down rules on the making available on the market of CE marked fertilising products

The proposal for a regulation laying down rules on the making available on the market of CE marked fertilising products ([2016/084 \(COD\)](#)) was introduced in 2016 and is currently in trilogue negotiations. It amends regulations EC/1069/2009 and EC/ 1107/2009.

### Overall Conclusion

There are some general remarks that can be disseminated from the feedback provided:

- Multiple respondents argued for amending the technical requirements for organic fertilisers in the proposal to better suit the placement on the market of compost and digestate as a fertilising product.
- Furthermore, expansion of the scope of the proposal to include more products, source materials and techniques was also mentioned by several respondents.

### 1. Fertilisers (organic/inorganic)

Biobased product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Organic Fertiliser (compost or digestate)	<p><b>Bottleneck V.1.1</b> One of the respondents (1) belonging to a waste management company argues that a clear definition and distinction between organic fertiliser and organic soil improver is needed based on their function.</p> <p><b>Bottleneck V.1.2</b> One of the respondents (4) belonging to relevant industry stated that compost and digestate (solid or liquid) do not comply with the nutrient content requirements for organic fertilisers set in the proposal. Compost does, however, comply with the requirements for organic soil improver and solid digestate could comply with the requirements for organic soil improver. This will influence the marketing of compost and digestate as it is today declared as an organic fertiliser. It might be more difficult for compost/digestate to act as an alternative to mineral fertilisers for farmers. They therefore recommend to set the minimum content for organic fertilisers and organic matter on dry matter basis. This should for compost and digestate be based on <a href="#">the JRC report</a> 'End of waste criteria for biodegradable waste subjected to biological treatment (compost &amp; digestate).</p> <p><b>Bottleneck V.1.3</b> A respondent (4) stated further that hygiene requirements in the proposal hinder the placement of compost and digestate on the market as a CE fertilising product. The hygienic requirements for E.coli and Enterococcaceae cannot be fulfilled in fertilising products based on organic materials as these</p>	<p><b>Driver V.1.1</b> A respondent belonging to relevant industry (4) finds that the inclusion of organic fertilisers and soil improvers will provide the possibility of marketing compost as CE fertilising product in the EU.</p> <p><b>Driver V.1.2</b> A respondent (6) belonging to a government authority and one belonging to an EU project (13) considers the proposal a driver as it aims to establish a regulatory framework enabling production and making available on the market of fertilisers from recycled bio-wastes, contributing to a better implementation of the waste hierarchy, by minimizing landfilling or energy recovery of bio-wastes. More specifically, it is proposed that a CE marked fertilising product may contain, among others, compost or digestate obtained through aerobic composting or anaerobic</p>	<p><b>Bottleneck V.1.1</b> The proposal does include product requirements and a distinction between organic fertilisers and soil improvers based on their function (article 4 conjunction with <a href="#">Annex I</a>).</p> <p>However, the respondent wants to include different parameters that better reflect the difference between the two:</p> <ul style="list-style-type: none"> <li>- Look at effective organic matter content (EOM) using the humification coefficient (HC)</li> <li>- Look at the mineral nitrogen content (N-mineral)</li> <li>- The total phosphate content (P2O5)</li> </ul> <p>Classification:</p> <ul style="list-style-type: none"> <li>- Hereby organic soil improver should contain a high level of EOM and be low in nutrients.</li> <li>- Organic fertiliser should be high in nutrients and low in EOM.</li> </ul> <p><b>Bottleneck V.1.2, Bottleneck V.1.3 and Bottleneck V.1.4</b> All these bottlenecks deal with the requirements for organic fertilisers in the proposal and how these requirements are not conducive for placing compost and digestate on the market as a fertiliser product. All bottlenecks look at different kind of requirements:</p> <ul style="list-style-type: none"> <li>- <b>Bottleneck V.1.2:</b> Product function requirements (nutrient content) The nutrient content requirements for organic fertilisers to be placed on the market as such can be found in Annex I part II</li> </ul>

	<p>pathogens are re-growing in biological viable organic materials.</p> <p><b>Bottleneck V.1.4</b> The same respondent (4) states that the treatment requirements for aerobic treatment in the proposal is outdated. The proposed time-temperature profiles for aerobic treatment are outdated and not in line with common practices in member states.</p> <p><b>Bottleneck V.1.5</b> The respondent (17) also argued for the inclusion of compost from source separated biomass. .</p> <p><b>Bottleneck V.1.6</b> A respondent belonging to an EU project (13) stated that the component material categories (CMCs) for bio-based fertilisers are to specifically defined. Thereby limiting the use of diverse bio residues and bio products from biotechnological fermentation of OFMSW. It should be more inclusive.</p>	<p>digestion, respectively, of bio-waste within the meaning of Directive 2008/98/EC resulting from separate bio-waste collection at source. It will thereby drive separate collection of OFSMW.</p>	<p>PFC 1(a) paragraph 2 on organic fertilisers. The requirements for organic soil improver can be found in Annex I part II PFC 3(a) paragraph 2.</p> <ul style="list-style-type: none"> <li>- <b>Bottleneck V.1.3:</b> Hygiene requirements The hygiene requirements with regard to E.coli and Enterococcaceae can be found in Annex I part II: PFC 1(A) paragraph 4, and PFC 3(A) paragraph 3(b) and paragraph 4.</li> <li>- <b>Bottleneck V.1.4:</b> Treatment requirements The aerobic treatment requirements for compost can be found in <a href="#">Annex II</a> part II CMC 3 paragraph 3. The respondent (4) argues for a more flexible approach: producers should be allowed an to apply alternative time temperature profiles for which he can demonstrate equivalent effectiveness for hygienisation. (see <a href="#">position paper ECN</a> for further precise amendments)</li> </ul> <p><b>Bottleneck V.1.5</b> <a href="#">Annex II</a> part II CMC 3 paragraph 1(a) does include source separated bio-waste as one of the component materials for compost.</p>
<p>recovered phosphates (struvite, magnesium phosphate, calcium phosphate)</p>	<p><b>Bottleneck V.1.7</b> Ammonium sulphate should be included in the new proposal.</p>		<p><b>Bottleneck V.1.6</b> The proposal identifies three different input materials for aerobic composting (CMC 3 par. 1 and CMC 5 par. 1):</p> <ol style="list-style-type: none"> <li>a. Source separated bio-waste</li> <li>b. Animal by-products category 2 &amp; 3 (ABP Regulation 1069/2009/EC)</li> <li>c. Living or dead organisms under certain conditions (except for the organic fraction of mixed municipal household waste, sewage/industrial or dredging sludge and ABP of category 1).</li> <li>d. Composting additives</li> </ol> <p>According to the respondent, this could be more inclusively formulated to allow for a more diverse use of bio-input materials for compost.</p>
<p>Hydrochar ( HTC biochar)</p>	<p><b>Bottleneck V.1.8</b> A respondent belonging to a research institute (15) finds that the proposal should not only focus on compost and digestate as End of Waste organic soil conditioners. Hydrochar represents a more attractive solution in terms of market potential and quality control. Therefore the recommendation is to include other technologies able to transform bio-waste and sewage sludge in carbon-rich material able to replace peat and lignite (e.g. pyrolysis and hydrothermal carbonization) among the mentioned technologies for EoW products.</p>		<p><b>Bottleneck V.1.7</b> Ammonium sulphate is indeed not mentioned in the product function categories (PFCs) or Component material categories (CMCs).</p> <p><b>Bottleneck V.1.8</b> This bottleneck refers to article 18 of the proposal which states that a CE market fertilising product that has undergone a recovery operation and</p>

			<p>complies with the requirements laid down in this regulation shall cease to be waste. These requirements do indeed not extent to the technologies mentioned by the respondent (pyrolysis and hydrothermal carbonization).</p> <p><b>Driver V.1.1</b> Self-explanatory</p> <p><b>Driver V.1.2</b> This proposal is seen as a driver towards bringing recycled bio-wastes on the market as fertilisers. The part specifically related to compost and digestate in this regard is the same as <b>bottleneck V.1.6</b>.</p>
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**4. Bio-based chemicals**

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Single Cell Oil	<p><b>Bottleneck V.4/5/6.9</b> One representative of a EU project (14) found that the proposal should include the use of the technique: VFAP (volatile fatty acids platform) in anaerobic digestion. The use of the remaining materials from this process (using VFAP in AD processing to get single-cell oil/Omega-3 fatty acids) for fertilising purposes would boost the bio-based products discussed here (also bioplastics).</p>	<p><b>Driver V.4/5/6.3</b> Anaerobic digested OFMSW and UWWS are considered as appropriate input materials for fertilisers under certain conditions. Animal by-products category 2 and 3 are listed as well.</p>	<p><b>Bottleneck V.4/5/6.9</b> The respondent argues for the inclusion of VFAP in the proposal. Specifically, the inclusion of this text is suggested: <i>“Every organic and inorganic substance, compound and matter which results from a treatment in a VFAP within an anaerobic digestion plant can be considered for the production of CE marked fertilizing products as far as the requirements of this Regulation are fulfilled.”</i> (Annex II part II: in CMC3 on compost as paragraph 7, in CMC4 on energy crop digestate as paragraph 5, in CMC5 on other digestate as paragraph 8) Related to bottleneck V.1.9 in the sense that they argue for the expansion of proposal to include (innovative) new techniques and products.</p>

**5. Biobased plastics**

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis



Bio-based plastics (PHA)	<p><b>Bottleneck V.4/5/6.9</b>  <i>This bottleneck was also mentioned by a representative of an EU project (14) in relation to bio-plastics.</i></p>	<p><b>Driver V.4/5/6.3</b>  <i>This driver was also mentioned by a representative of an EU project (14) in relation to bio-plastics.</i></p> <p><b>Driver V.5.4</b>  A respondent representing EU projects (11) argued that the harmonization of the market for digestate as a result of the proposal, could have a positive effect on the PHA value chain. Because it is a by-product of PHA. It may also have an effect on end-of-waste criteria for digestate.</p>	<p><b>Driver V.5.4</b>  Article 18 of the proposal could affect the end-of-waste status of digestate and the harmonization of the market could have a positive effect on the PHA value chain.</p>
<b>6. Bio-based food &amp; feed ingredients</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Omega-3 fatty acids	<p><b>Bottleneck V.4/5/6.9</b>  <i>This bottleneck was also mentioned by a representative of an EU project (14) in relation to Omega-3 fatty acids .</i></p>	<p><b>Driver V.4/5/6.3</b>  <i>This driver was also mentioned by a representative of an EU project (14) in relation to Omega-3 fatty acids.</i></p>	

## VI. REACH Regulation

The respondents provided feedback on the REACH Regulation ([1907/2006/EC](#)).

### Overall Conclusion

In the feedback given on the REACH regulation, some general bottlenecks came to the forefront:

- Multiple respondents stated that the costs to register (new) biobased products are an administrative burden to bring biobased products on the market. Especially for SMEs the costs to register their biobased products are too high. One of the respondents proposed to take costs influencing factors into account, for example the registered product potential contribution to EU climate targets.
- For some respondents it is not clear which information exactly has to be provided to exempt substances from the REACH regulation. Also, two respondents argued that digestate should be exempted from REACH as is the case for biogas and compost.
- Various bottlenecks suggest that biobased polymers are *de facto* not exempted from registration requirements under REACH, as is usually the case for polymers. Therefore, one of the respondent argued that there should be a better definition for biobased polymers that are not totally pure.

### 1. Fertilisers (organic/inorganic)

Biobased product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Organic Fertiliser (compost or digestate)	<p><b>Bottleneck VI.1.1</b> One of the respondents belonging to industry (4) stated that it is not clear which information has to be provided to fulfill the requirements of Article 2(7)(b) of the REACH regulation.</p> <p><b>Bottleneck VI.1.2</b> One of the respondents belonging to EU projects (11) argued that registration of new products to the market, such as UVCB (Substance of Unknown of Variable Composition) including biological materials, entails so high costs that it is impossible for SME's to register its biobased products. According to this respondent all materials recovered from waste which will not be in direct contact with persons during their use should be exempted from REACH registration.</p> <p><b>Bottleneck VI.1.3</b> One of the respondents belonging to EU projects (13) argued that the required REACH registration could be a barrier for new biobased products as they will need to be registered for the first time. This is a barrier to develop new biobased products. This bottleneck is closely</p>	<p><b>Driver VI.1.1</b> According to one of the respondents belonging to industry (4) one of the drivers of REACH is that compost is exempted from REACH registration.</p>	<p><b>Bottleneck VI.1.1. &amp; VI.1.4</b> Article 2(7)(b) of the REACH-regulations sets out criteria for exempting substances covered by Annex V from the registration, downstream user and evaluation requirements.</p> <p>The problem identified here is that the criteria for exempting substances covered by Annex V of the REACH-regulations are formulated in a general way. Entry 12 of the document <i>Guidance for Annex V</i> prescribes that the exemption for compost covers compost when it is no longer waste according to Directive 2008/98/CE, and is understood as being applicable to substances consisting of solid particulate material that has been sanitized and stabilized through the action of micro-organisms and that result for the composting treatment. However, Entry 12 of the document <i>Guidance for Annex V</i> states that the explanation about biogas is without prejudice to discussions under Community waste legislation on the status, nature, characteristics and potential definition of compost, and may be updated in the future.</p> <p><b>Bottleneck VI.1.2 &amp; VI.1.3 &amp; VI.1.5</b> These bottlenecks relate to the registration costs of (new) biobased</p>

	related to bottleneck VI.1.2. <b>Bottleneck VI.1.4</b> One respondent belonging to industry (4) and one respondent belonging to a research institute (17) stated that digestate is not exempted from REACH and should be exempted from this regulation as is the case for compost and biogas.		products. This is an administrative burden, especially to bring new biobased products on the market. The cost to register a product are a barrier for SME's.
Hydrochar (HTC biochar)	<b>Bottleneck VI.1.5</b> One of the respondents belonging to research institutes (15) argued that the registration costs for new products under REACH are (too) high. This bottleneck is closely related to bottleneck VI.1.2 and bottleneck VI.1.3. The respondent argues that the cost influencing costs should be taken into account, for example the registered product potential contribution to EU climate targets.		

#### 4. Biobased chemicals

Biobased product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biosurfactant	<b>Bottleneck VI.4.6</b> One of the respondents belonging to an EU project (13) argued that biosurfactant should be characterized as a chemical reagent.		<b>Bottleneck VI.4.6</b> The respondent seems to suggest that biosurfactants are treated differently than (chemical) surfactants.
(Poly) lactic acid	<b>Bottleneck VI.4.7</b> One of the respondents belonging to an EU project (13) stated that it is hard to fulfill all the requirements of Article 2.7. (d) of the REACH-regulation.		Article 2(7)(b) of the REACH-regulations sets out criteria for exempting substances covered by Annex V from the registration, downstream user and evaluation requirements.  The document <a href="#">Guidance for Annex V</a> describes the exemptions from the obligations to register in accordance with Article 2(7)(b) of the REACH Regulation.
Adipic acid Muconic acid / 1,5-pentanediamine	<b>Bottleneck VI.4.8</b> One of the respondents belonging to an EU project (8) argued that the monomers (Adipic acid and 1,5-pentanediamine) only are exempted from REACH registration if Article 2.7 (d) can be fulfilled.		Surfactants are exempted from registration in so far a chemical reaction takes place with a substance in the context of its use as surfactant. Thus, only the products derived from the surfactant as a result of its reaction with another substance are exempted from the registration provision. The

			<p>manufacture or import of a surfactant itself is subject to the registration provisions. (see entry 4 of the Guidance for Annex V).</p> <p><b>Bottleneck VI.4.7 &amp; VI.4.8</b> The respondents seem to suggest that the requirements to apply Article 2.7.(d) are too strict.</p> <p>The exemption from registration for recovered substances in Article 2.7.(d) of REACH relies on the condition that the same substance has been registered before. The recovered substance must be the same as the substance already registered.</p> <p>Although the registration provision under REACH does not apply to polymers, an importer of polymer is required to register the monomers and other substances used to manufacture the polymer. For recovered polymers, the monomers and other substances have to be registered in order to be able to rely on the exemption of Article 2.7(d). The impurities in the monomer need to be identified and to establish the hazard profile as well as the classification and labelling of the recovered monomer.</p>
<b>5. Biobased plastics</b>			
<b>Biobased product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>

**Bottleneck VI.5.9**

One of the respondents belonging to EU project (8) argued that in some cases biobased polymers need to be registered, although polymers are in principle exempted from registration.

**Bottleneck VI.5.10**

One of the respondents belonging to industry (7) stated that the rules for non-pure biobased products, such as PHA polymers with low purity, are not clear and the respondent argues that a better definition for biobased products that are not totally pure should be included.

**Bottleneck VI.5.11**

Poly-hydroxy-alkanoates are falling under the category of polymers according to REACH and thus exempted from registration.

However, if the PHA has a level of impurities of 2% and whose composition is not known, it would be identified as an UVCB and not be exempted from registration, stated one of the respondents belonging to an EU project (11).

**Driver VI.5.2**

A respondent belonging to an EU project (11) PHA (and PHA precursors) fall within the definition of polymer and are exempted from REACH registration.

**Bottleneck VI.5.9 & VI.5.10 & VI.5.11 and Driver VI.5.2**

Respondents seem to argue that although polymers are exempted from registration, this is not the case for biobased polymers as the monomers are subject to registration or because of the impurity of these polymers.

Polymers are exempted from registration under REACH. According to Article 6(3), the manufacturer of a polymer must however submit a registration for the monomer substance(s) that have been not already been registered, if:

(a) the polymer consists of 2% weight by weight (w/w) or more of such monomer substance(s) or other substance(s) in the form of monomeric units and chemically bound substance(s);

(b) the total quantity of such monomer substance(s) or other substance(s) makes up 1 tonne or more per year (the total quantity in this context is the total quantity of monomer or other substance ending up chemically bound to the polymer).

Whenever it is not scientifically possible to establish 1) whether the substance falls under the definition of a polymer or ii) the chemical structure of the monomer unit(s), the substance can be regarded as a UVCB substance. In this case the registration for the substance itself can be submitted.

A respondent further states that in the case of PHA production from fermented waste the monomers are the volatile fatty acids (VFA's) in the fermented waste. There can be many different types of VFA's that are used by the bacteria to product the PHA. The PHA product can be made such that it has more than 98% purity. In this case it is not clear whether they are exempted or the monomer has to be registered. In that case: the PHA polymer and the repeating chains in the polymer can be well defined, but the feed composition is much more difficult to define and may vary, while the bacteria still make a similar polymer. Here bio-based production differs from classical polymer production. Therefore, the REACH regulation should provide clarity on how to interpret "monomer" in this case. We propose that the regulation should look at the repeating chains in the PHA and define this as the "monomer".



## VII. Waste Framework Directive

The feedback of the responders on both the ‘old’ Waste Framework Directive [2008/98/EC](#) and the feedback on the proposal to change the WFD ([2015/0274/COD](#)). As the proposal has resulted in the newly adopted [Directive 2018/851/EU](#) amending the WFD, this Directive will be used to analyze the feedback provided. The new consolidated WFD can be found [here](#).

### Overall Conclusion

The feedback was separately collected for the Waste Framework Directive and the proposal to amend the WFD. In the overall feedback some general trends came to the forefront:

- With regard to both the regulatory drivers and bottlenecks there is broad support for the new measures on bio-waste related to separate collection and recycling targets in the revised WFD.
- Furthermore, also the municipal waste recycling targets and the elaboration on the incentives for the application of the waste hierarchy in the revised WFD are seen as positive developments.
- There are however several respondents that find that there is still a lack of EoW criteria for bio-waste to support products from bio-waste based feedstocks. (With regard to compost and digestate this could be resolved by the adoption of the proposal for a regulation on CE marked fertilising products). The process of reaching EoW status is still seen as difficult and as lacking harmonization.
- Multiple respondents also found that the WFD lacks clear reference to treatment of bio-waste outside of composting and digestion and should include other treatment possibilities and techniques.

### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Compost or digestate	<p><b>Bottleneck VII.1.1 (old legislation)</b> A respondent representing a waste management company (1) stated that the distinction between source separated and not source separated OFMSW should be clear (in relation to the old WFD). E.g. compost from mixed MSW and sewage sludge cannot be used in agriculture (risks are too high). They recommend a definition of bio-waste that is source separated.</p> <p><b>Bottleneck VII.1/4/6.2 (old legislation)</b> A respondent (4) belonging to relevant industry argued that the old WFD does not stimulate the implementation of the separate collection of bio-waste. The separate collection of bio-waste should become mandatory without exemptions.</p> <p><b>Bottleneck VII.1.3 (old &amp; new legislation)</b> The respondent (4) considered that there is a lack of specific recycling targets for separately collected bio-</p>	<p><b>Driver VII.1.1 (new legislation)</b> An interviewee (4) belonging to relevant industry found the mandatory separate collection of bio-waste by 2024 and the fact that by 2027 only separately collected bio-waste can be counted as recycled, important drivers in the new WFD.</p> <p><b>Driver VII.1/5.2 (new legislation)</b> This interviewee (4) further stated that the fact that rules are included on the use of measures by Member States to provide incentives for the application of the waste hierarchy, can be seen as a driver.</p> <p><b>Driver VII.1/4/5.3 (old &amp; new legislation)</b> A respondent (6) representing a government authority stated that the separate collection of bio-waste with a view to the digestion and</p>	<p><b>Bottlenecks VII.1.1 (old legislation) ,VII.1/4/6.2 (old legislation) and Driver VII.1.1 (new legislation)</b> These bottlenecks and driver are based on the unrevised WFD. In the new WFD, the definition of bio-waste does not include reference to separate collection in either the old or new WFD (article 3 paragraph 4). However, article 22 on the treatment of bio-waste has changed substantially. From January 2024 onwards bio-waste has to be either separated and recycled at source, or be collected separately and not be mixed with other types of waste. It seems that the new WFD resolves the bottlenecks identified here. There is a clear focus and mandatory commitment on source separated bio-waste in the new article 22. There are however possible exemptions on the separate collection of bio-waste. E.g. waste with similar biodegradability and compostable properties as bio-waste may be collected together with bio-waste Furthermore, according to the newly added article 11a paragraph 4 municipal bio-waste entering aerobic or anaerobic treatment may only count as recycled if it is separately collected or separated at source.</p> <p><b>Bottleneck VII.1.3 (old &amp; new legislation)</b> The new WFD does mention that the Commission shall consider setting reuse and recycling targets for municipal bio-waste by 31 December 2024. This means that</p>

	<p>waste. Including targets for industrial bio-waste.</p> <p><b>Bottleneck VII.1.4 (old legislation)</b> A respondent (4) representing relevant industry argued that there was/is a lack of incentives to:</p> <ul style="list-style-type: none"> <li>- support the implementation of separate collection and management of bio-waste.</li> <li>- Encourage the use of recycled organic materials</li> </ul> <p><b>Bottleneck VII.1.5 (old &amp; new legislation)</b> Two interviewees belonging to relevant industry (4) and government authority (6) argued that both the old and the new WFD lack End-of-Waste criteria for biodegradable waste at EU level.</p> <p><b>Bottleneck VII.1.6 (new legislation)</b> An interviewee (4) belonging to relevant industry further argued that no specific waste codes for municipal and industrial bio-waste are included.</p> <p><b>Bottleneck VII.1.7 (new legislation)</b> The respondent (4) also found the inclusion of the TEEP clause in the new proposal to be counterproductive.</p>	<p>composting of bio-waste according to article 22, contributes to the production of high quality organic fertilisers.</p> <p><b>Driver VII.1.4 (new legislation)</b> A representative from an EU project (13) argues that the combination of the conditions for OFMSW of the new WFD (separate collection), and the possible EoW criteria for bio-based fertilisers according to the new proposed Regulation (<a href="#">2016/084/COD</a>) form an important driver for bio-based fertiliser products.</p>	<p>additional legislation is needed to set these targets. Furthermore, industrial bio-waste is not mentioned.</p> <p>There are however other indirect ways in which recycling and preparation for recovery for separately collected bio-waste is ensured (by excluding less desirable options with reference to the waste hierarchy):</p> <ul style="list-style-type: none"> <li>- Article 10(4) WFD does state that MS shall take measures to ensure that waste that has been separately collected for reuse and recycling pursuant of article 22 (on bio-waste) is not incinerated.</li> <li>- Article 5(3)(f) of the new Landfill Directive ensures that it is not allowed to landfill bio-waste.</li> </ul> <p><b>Bottleneck VII.1.4 (old legislation) and Driver VII.1/5.2 (new legislation)</b> In the revised WFD a new paragraph is added to article 4 in which is stated that MS shall make use of economic instruments and other measures to provide incentives for the application of the waste hierarchy. Reference is made to Annex IVa which include measures to support separate collection of waste and encourage the use of recycled materials. E.g. Annex IVa paragraph 7: <i>sustainable public procurement to encourage better waste management and the use of recycled products and materials.</i></p> <p>With this addition it seems that MS are activated to provide more incentives towards the goals mentioned in the bottleneck.</p> <p><b>Bottleneck VII.1.5 (old &amp; new legislation)</b> There has been no mention in the new Article 6 or the new WFD in general with regard to EoW criteria for bio-waste. However, following <b>Recital 19</b> (2018/851/EU) that states that EoW rules can be established in product-specific legislation, the new Proposal for a Regulation laying down rules on the making available on the market of CE marked fertilising products <a href="#">2016/084 (COD)</a> does provide for EoW criteria for bio-waste for fertilizing products (article 18). Thereby, providing possible EoW criteria for compost and digestate.</p> <p><b>Bottleneck VII.1.6 (new legislation)</b> <b>Recital 10</b> of <a href="#">Directive 2018/851/EU</a> does mention codes for municipal waste based on <a href="#">Commission Decision 2014/955/EU</a>. Chapter 20 of this Decision deals with municipal wastes, here are several codes deal with different forms of bio-waste. E.g. 200108: biodegradable kitchen and canteen waste and 200201 biodegradable waste).</p> <p><b>Bottleneck VII.1.7 (new legislation)</b></p>
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			<p>The TEEP clause is: Technically, Environmentally and Economically practicable. This clause relates to separate collection of waste and can be found in article 10 and 11 of both the old and the revised WFD and could result in exemptions on the separate collection of waste. In the proposal to amend the WFD this clause was also added to article 22 on bio-waste (<a href="#">2015/0275(COD)</a>).</p> <p><b>Driver VII.1/4/5.3 (old &amp; new legislation)</b> The text mentioned as a driver is restructured in the revised WFD however, its content remains the same. (article 22(2)(a))</p> <p><b>Driver VII.1.4 (new legislation)</b> Combination of:</p> <ul style="list-style-type: none"> <li>- conditions for separately collected OFMSW (see analysis bottlenecks VII.1.1 (old), VII.1.2 (old) and VII.1.3 (old &amp; new)) and</li> <li>- EoW criteria of biobased fertilisers under the new proposal for CE marked fertilising products (see analysis Bottleneck VII.1.5 (old &amp; new))</li> </ul> <p>Could indeed function as a driver for bio-based fertiliser products.</p>
<p>Hydrochar (HTC biochar)</p>	<p><b>Bottleneck VII.1.8 (old legislation)</b> A representative (15) of a research institute argued that there are differences in Member State treatment of End-of-Waste criteria because of a lack of harmonization. As MS are responsible and have the final decision for the End-of-Waste certification of products, this creates different approaches in different countries.</p> <p><b>Bottleneck VII.1.9 (old legislation)</b> The respondent (15) also found the non-mentioning of HTC (hydrothermal carbonization technology) as relevant alternative technology (next to composting and digestion) for treatment of bio waste an omission in Article 22 of the old WFD.</p> <p><b>Bottleneck VII.1.10 (old legislation)</b> The respondent (15) also argued that the concept of “urban mining” should be included in EoW product</p>		<p><b>Bottleneck VII.1.8 (old legislation)</b> According to article 6(3) of the new WFD MS can still set EoW criteria if they are not set at the Union level. Furthermore, when the Commission deems it necessary they can set EU-wide criteria (art. 6(2)). This was also possible under the old article 6(2). Recital 19 of the directive amending the WFD (2018/851/EU), also states that EoW rules can be established in product-specific legislation. With regard to fertiliser products these EoW rules are proposed in the new Proposal for a Regulation laying down rules on the making available on the market of CE marked fertilising products (<a href="#">2016/084/COD article 18</a>) see <a href="#">bottleneck VII.1.5 (old &amp; new)</a>. However, hydrochar is not mentioned in this proposal (see framework V for further information).</p> <p><b>Bottleneck VII.1.9 (old legislation)</b> Article 22 paragraph 3 of the revised WFD also only mentions the creation of European standards for bio-waste intended for composting and digestion. Other products are not mentioned. However, article 22 paragraph 2(a) does mention: “recycling of bio-waste, including composting and digestion”. Thereby not limiting it to composting and digestion alone.</p>

	certification criteria.		<b>Bottleneck VII.1.10 (old legislation)</b> No mention of urban mining as a form of recovery operation (neither in the new or old WFD Annex II). It is however, a non-exhaustive list. Therefore the question remains how to incorporate this in legislation (e.g. as recovery or recycling technique).
<b>2. Biogas and bio-methane</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Bio-methane	<b>Bottleneck VII.2.11 (old legislation)</b> A representative (6) of a government authority stated that permitting difficulties arise when a bio-methane plant is characterized as waste treatment facility.		<b>Bottleneck VII.2.11 (old legislation)</b> It does not seem that any changes have been made in the WFD with regard to the permitting process described in this bottleneck. According to article 23 of the WFD, MS have to require any establishment or undertaking who carries out waste treatment to obtain a permit from the competent authority with specific requirements. The issuing of a permit is also connected to article 13 on the protection of human health and the environment. If the treatment is not in line with this article, a permit will not be issued.
<b>3. Bioethanol and biomethanol</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Bio-methanol/Bio-ethanol	<b>Bottleneck VII.3.12 (old &amp; new legislation)</b> A respondent belonging to relevant industry (5) argued that the waste conversion for advanced biofuels should be higher in the waste hierarchy. As biofuel production is currently at the same level in the hierarchy as incineration with energy recovery. While there is a higher economic value in reprocessing waste for the biofuel sectors than simply incinerating the waste for stationary energy production according to the respondent. The respondent states that the Commission services should fine-tune the waste hierarchy by making a distinction between the use of waste for		<b>Bottleneck VII.3.12 (old &amp; new legislation)</b> In the new WFD the waste hierarchy (article 4) stays the same and annex II does not change in relation to this bottleneck. According to Annex II (R1) the use of waste for fuel is indeed regarded as equal to waste used for incineration with high levels of energy recovery. See also: <a href="#">the role of waste-to-energy</a> (European Commission).  <b>Bottleneck VII.3.13 (new legislation)</b> The measures already mentioned in Annex IV of the original WFD has been expanded in the revised WFD (Annex IVa). It could be possible for MS to provide incentives based on Annex IV (for example based on paragraph 11). However, there is no specific mention of waste-to-chemicals in the WFD or EU-wide harmonization of incentives for waste-to-chemicals.

	<p>energy (incineration) purpose ONLY and the use of the waste for chemicals, biofuel and/or bioplastics. This sort of processing should be equal to recycling.</p> <p><b>Bottleneck VII.3.13 (new legislation)</b> The respondent (5) also stated that the WFD lack mechanisms to encourage price premiums for chemicals produced from wastes. Chemicals from waste receive the same price as chemicals from virgin material. The production of products from wastes requires the use innovative technologies and costs are typically higher than production of virgin fossil sources</p> <p><b>Bottleneck VII.3.14 (new legislation)</b> The respondent (5) further argued that more guidance on landfill and incineration charges should be offered, ensuring that recovery of wastes for conversion to fuels and chemicals is not subjected to these charges.</p> <p><b>Bottleneck VII.3/5.15 (old &amp; new legislation)</b> A representative (13) of an EU project argued that end-of-waste status needs to be developed for bio-products and by-products on an EU level. Thereby promoting the production of bio-products from bio-waste beyond only compost and digestate.</p> <p><b>Bottleneck VII.3.16 (old legislation)</b> The representative (13) also argued that the WFD lacks a suggestion to production of bio-products from waste or an obligation to produce a percentage of bio-products from OFMSW. There should be a broader focus then only compost and digestate.</p>		<p><b>Bottleneck VII.3.14 (new legislation)</b> Paragraph 1 of the annex IVa of the new WFD states that charges and restrictions for the landfilling and incineration of waste are examples of economic measures to provide incentives for the implementation of the waste hierarchy. No further guidance is given. The Commission could be advised to provide guidance documents on how to implement landfill and incineration charges while ensuring that recovery of wastes for conversion to fuels and chemicals is not subjected to these charges.</p> <p><b>Bottleneck VII.3/5.15 (old legislation)</b> As stated in <b>Bottleneck VII.1.5 (old &amp; new)</b>, the Commission could introduce EU-wide EoW criteria for bio-products based on the WFD. In relation to organic fertiliser products these EoW criteria are included in product specific legislation (<a href="#">2016/084/COD</a>). It seems that this is not the case for the product discussed here (bio-ethanol) or bio-plastics (this bottleneck is also mentioned in relation to this product). According to a respondent this leads to lack of clarity and homogeneity among MS. Greater harmonization and simplification of the legal framework on by-products and end-of-waste status could help. Introduction of an obligation for the Commission to act where divergent EoW/by-product criteria exist among member states (as suggested by a respondent (9)) could be an interesting approach.</p> <p><b>Bottleneck VII.3.16 (old legislation)</b> The respondent argues for the inclusion of bio-products production in the WFD. E.g. by changing article 22(2)(a) of the revised WFD, the paragraph now states that MS shall take measures to encourage the recycling of bio-waste, including composting and digestion. The inclusion of bio-product production to composting and digestion would stimulate bio-product production in their view. It is important to note that the article does not exclude other forms of recycling than composting and digestion. Furthermore, paragraph 2(c) of article 22 is specifically directed at promoting the use of materials produced from bio-waste.</p>
<b>4. Bio-based chemicals</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>

<p>Single Cell Oil</p>	<p><b>Bottleneck VII.1/4/6.2 (old legislation)</b> A representative of an EU project (14) also mentioned this bottleneck in relation to this product.</p> <p><b>Bottleneck VII.4/5/6.17 (old &amp; new legislation)</b> A representative of an EU project (14) stated that the definition of bio-waste in the WFD should be changed to the OECD's definition. It should include UWWS.</p> <p><b>Bottleneck VII.4/5/6.18 (new legislation)</b> The representative (14) further argued that specific rules for remaining bio-fractions of MSW should be included in the WFD.</p> <p><b>Bottleneck VII.4/5/6.19 (old &amp; new legislation)</b> The respondent (14) further argued for the inclusion of biodegradable plastics in the WFD. Moreover, the respondent wants to include priority options for extracting substances from the bio-waste.</p>	<p><b>Driver VII.1/4/5.3 (old &amp; new legislation)</b> This driver was also mentioned by a representative of an EU project (14).</p>	<p><b>Bottleneck VII.4/5/6.17 (old &amp; new legislation)</b> The definition of bio-waste in the revised WFD has been expanded to include some forms of biodegradable waste (article 3(4)). However, UWWS is excluded. The definition provided by the OECD does include sludge and while the directive 2018/851/EU does emphasize the importance of the definition of municipal waste to be in line with the OECD (recital 10), this is not stated for bio-waste. For undertakings that use both UWWS and OFMSW feedstock it is difficult if these waste streams are treated/defined differently in the relevant EU legislation. See also the framework on Sewage Sludge directive (VIII). The respondent states that if the same OECD definition on biological waste would apply in the WFD, the Landfill directive and the Sewage sludge directive, a more coherent waste legislation could be achieved and waste stream management with VFAP could be facilitated.</p> <p><b>Bottleneck VII.4/5/6.18 (old &amp; new legislation)</b> The respondent argues that further rules are needed for the bio-fractions of the MSW that remain after compliance with the mandatory separate collection and treatment of bio-waste from municipal waste. Hereafter, there might still be remaining bio-fractions in MSW due to e.g. waste misthrow and mixed bio-waste (with meat). These remaining bio-fractions could be considered for <a href="#">volatile fatty acids platform</a> treatment (VFAP). <a href="#">In the revised WFD</a>, OFMSW treatment in AD is no more considered as recycling from 2027, <a href="#">due to separate collection requirements in article 11a (4) WFD</a>.</p>
<p>Medium chain fatty acids and Volatile fatty acids (VFA)</p>	<p><b>Bottleneck VII.4.20 (old &amp; new legislation)</b> A respondent (7) belonging to relevant industry stated that the EoW process for by-products is unclear and complex. Hereby limiting the development of promising recovery technologies.</p>		<p><b>Bottleneck VII.4/5/6.19 (old &amp; new legislation)</b> This bottleneck is related to Bottleneck VII.3.15 (old), the respondent also wants to include more products and techniques to the WFD to stimulate the value chain of the discussed products. E.g. volatile fatty acids platform (VFAP) and bio-plastics.</p>
<p>(Poly) lactic acid and Adipic acid/Muconic acid</p>	<p><b>Bottleneck VII.4/5.21 (old &amp; new legislation)</b> Two respondents (8 and 13) belonging to EU projects argue that the transport and treatment of waste in this value chain (polylactic/adipic/muconic acid) itself is more impressive than the result and therefore it is not a recovery (this is related to the efficiency of the process and the logistics). They suggest improving the logistics of the system and efficiency of the processes. Furthermore, they suggest to carry out a global assessment of the initial waste reduction versus the efficiency of the product obtained.</p>	<p><b>Driver VII.4/5.5 (new &amp; old legislation)</b> According to two respondents (8 and 13) belonging to EU projects, the waste hierarchy benefits the innovative product generation from waste.</p>	<p><b>Bottleneck VII.4/5.20 (old &amp; new legislation)</b> In the revised WFD the EoW requirements for by-products have not changed (article 5(1)(a-d)). However, similar as with EoW requirements in article 6, the MS have a more direct responsibility to take appropriate measures (article 5(1) and (3)). Moreover, the rules for EU-wide requirements for by-products are also explained in more detail (article 5(2)). This does however, not result in compulsory harmonization.</p> <p><b>Bottleneck VII.4/5.21 (old &amp; new legislation)</b> This is not a better regulation action but rather better knowledge. Global assessment is required and further development of the process and logistics.</p>

			<p><b>Driver VII.4/5.5 (old &amp; new legislation)</b> The correct application of the waste hierarchy stimulates the reuse and recycling of waste above other alternatives such as incineration and dumping. As the conversion of waste into chemicals can be seen as recycling this helps the value chain of the product discussed here.</p>
<b>5. Bio-based plastics</b>			
Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Bio-based plastics (PHA)	<p><b>Bottleneck VII.3/5.15 (old &amp; new legislation)</b> <i>This bottleneck is also mentioned by a representative of an EU project (9) in relation to bio-based plastics.</i></p> <p><b>Bottleneck VII.4/5/6.17 (old &amp; new legislation)</b> <i>This bottleneck was also mentioned in relation to bio-based plastics by the same respondent belonging to an EU project (14) and by another (11).</i></p> <p><b>Bottleneck VII.4/5/6.18 (old &amp; new legislation)</b> <i>This bottleneck was also mentioned in relation to bio-based plastics by the same respondent belonging to an EU project (14).</i></p> <p><b>Bottleneck VII.4/5/6.19 (old &amp; new legislation)</b> <i>This bottleneck was also mentioned in relation to bio-based plastics by the same respondent belonging to an EU project (14).</i></p> <p><b>Bottleneck VII.4/5.20 (old &amp; new legislation)</b> <i>This bottleneck was also mentioned in relation to PHA by the same respondent belonging to relevant industry (7).</i></p> <p><b>Bottleneck VII.5.22 (old legislation)</b></p>	<p><b>Driver VII.1/5.2 (new legislation)</b> <i>This driver was also mentioned by a representative of an EU project (9).</i></p> <p><b>Driver VII.1/4/5.3 (old &amp; new legislation)</b> <i>This driver was also mentioned by a representative of an EU project (11).</i></p> <p><b>Driver VII.5.6 (new legislation)</b> A representative of an EU project (9) considered the binding targets for recycling of municipal waste a driver in the WFD.</p>	<p><b>Bottleneck VII.5.22 (old &amp; new legislation)</b> Article 13 of the old WFD states that waste management must be carried out without endangering human health and the environment. This article and its application has not change in the revised WFD. The specific product and hygiene conditions for the use of waste streams as a feedstock for products can be found in product specific or hygiene legislation and therefore that specific legislation would have to be revised to solve this bottleneck.</p> <p><b>Bottleneck VII.5.23 (old legislation)</b> The bottleneck was made in regard to the old WFD, however, it is also relevant with regard to the revised WFD. The example given by the respondent illustrates their point clearly: the EoW criteria, formulated by the Joint Research Centre, for biodegradable waste subject to biological treatment to produce compost and/or digestate, excludes digestate and compost materials derived from the organic fraction of mixed municipal waste and sewage sludge because of their impurities. This while the techniques used in the creation of e.g. bi-polymers consists of a much more extensive biological and chemical treatment of the waste feedstock resulting in higher removal of impurities and contaminants. <a href="#">However, as another respondent (14) stated, the proposal for CE marked fertilisers (2016/084/COD: annex II part II CMC 3&amp;5)</a> mentions OFMSW and UWWS as ingredients for CE marked fertilisers if treated by AD and not exceeding a certain limit of contaminants (pp.27-29).</p> <p><b>Driver VII.5.6 (new legislation)</b> The revised article 11(2) WFD sets binding targets for the preparing for re-use and</p>

	<p>A representative from an EU project (13) mentioned that there is a lack of consistency in product and hygiene legislation in relation to waste as a feedstock. Many uses of PHAs produced from waste feedstocks are suspect or prohibited.</p> <p><b>Bottleneck VII.5.23 (old legislation)</b>  A respondent belonging to an EU project (11) argued that new technologies and new bio-products require a reframing/re-construction of the principles of the present regulations for waste valorization. Especially as these new technologies can offer much higher protection against contamination but do not fit the current legislative frame.</p>		recycling of municipal waste.
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**6. Bio-based food & feed ingredients**

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Omega-3 fatty acids	<p><b><i>Bottleneck VII.1/4/6.2 (old legislation)</i></b>  <i>A representative of an EU project (14) also mentioned this bottleneck in relation to this product.</i></p> <p><b><i>Bottleneck VII.4/5/6.17 (old &amp; new legislation)</i></b>  <i>This bottleneck was also mentioned in relation to this product by the same respondent belonging to an EU project (14)</i></p> <p><b><i>Bottleneck VII.4/5/6.18 (old &amp; new legislation)</i></b>  <i>This bottleneck was also mentioned in relation to this product by the same respondent belonging to an EU project (14).</i></p> <p><b><i>Bottleneck VII.4/5/6.19 (old &amp; new legislation)</i></b>  <i>This bottleneck was also mentioned in relation to this product by the same respondent belonging to an</i></p>		

	<i>EU project (14).</i>		
<b>7. Recovered Cellulose</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
<b>Cellulose</b>	<p><b>Bottleneck VII.8.24 (old legislation)</b>  A respondent from an EU project (11) found that the procedures to let a product derived from waste loose its waste status (EoW criteria) are complex in the old WFD.</p>		<p><b>Bottleneck VII.8.24 (old legislation)</b>  As can be read above, there have been several changes with regard to EoW criteria in the revised WFD (see <b>Bottleneck VII.1.7 (old)</b>). However, it does not seem that the process has become simpler for the product discussed here (cellulose).</p>

## VIII. Sewage Sludge Directive

the responders provided feedback on the Sewage Sludge Directive ([Directive 86 / 278 /EEC](#))

### Overall Conclusion

There are some general remarks that can be disseminated from the feedback provided:

- The sewage sludge directive is considered outdated which results in regulatory divergence between member states laying down different (stricter) limits to heavy metals in the application of sewage sludge for agricultural use
- The sewage sludge directive does not take into account sufficiently new technologies that make reuse of sewage sludge possible for the production of bio-based products
- Revision of the sewage sludge directive is therefore recommended to harmonize standards and limits between member states and facilitate the valorization of new technologies for the reuse of sewage sludge.

### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Hydrochar (HTC biochar)	<p><b>Bottleneck VIII.1.1</b> A research institute indicated (15) that there is a lack of common interpretation between member states of sewage sludge derived products applicability in agriculture. Therefore it is recommended to include advanced sewage sludge upgrading technologies, such as HTC or pyrolysis, among the treatment technologies considered viable solution for the production of sewage sludge end of waste product in all member states.</p>	<p><b>Driver VIII.1.1</b> A research institute (15) indicated that the limits to heavy metal concentration in the sewage sludge directive is an important driver for the application of hydrochar derived from sludge in agriculture. This is due to the fact that the HTC process, in comparison to raw dried sludge, concentrates carbon nutrients but also some other heavy metals.</p>	<p><b>Bottleneck VIII.1.1</b> indicates a regulatory divergence between member states regarding allowed sewage sludge upgrading technologies and limit values of heavy metals.</p> <p>Regulatory divergence in general regarding the sewage sludge directive was also mentioned in the 2014 ‘<a href="#">ex-post evaluation of Five Waste Stream Directives</a>’ by the European Commission. This divergence is due the fact that the directive has not been updated for many years and therefore most member states have implemented stricter limits to heavy metals the application of sewage sludge for agricultural purposes in national regulations.</p> <p><b>Driver VIII.1.1.</b> however indicated that the sewage sludge directive in general can be a driver for the Hydrochar production since the heavy metal limits set by the directive stimulates the use of new innovative techniques in sewage sludge treatment.</p>

### 4. Bio-based chemicals



Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Single Cell Oil for oleochemical industry produced by yeasts	<p><b>Bottleneck VIII.4/5/6.2</b></p> <p>A respondent belonging to a EU project (14) indicated that to stimulate the use of Volatile Fatty Acids Platform within Anaerobe Digestion to bio-based products would need to be regulated or documented as a preferable application of sewage sludge instead of other methods, such as direct application in agriculture ( which is mentioned in the sewage sludge directive).</p>		<p><b>Bottleneck VIII.4/5/6.2</b> indicated that the EU regulatory framework regarding sewage sludge application should promote new treatment technologies, such as Volatile Fatty Acids Platform, by giving preference to these technologies instead of direct application of sewage sludge in agriculture.</p> <p>However, since the sewage sludge directive is intended to promote the use of (treated) sewage sludge in agriculture, it would require changing and extending the current scope and objective of the sewage sludge directive.</p>
<b>5. Bio-based plastics</b>			
Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Polyhydroxy alkanate (PHA)	<p><b>Bottleneck VIII.5.3</b></p> <p>A respondent belonging to a EU project (11) indicated that the sludge directive is outdated and would need a comprehensive evaluation and reformulation to be aligned with the Circular Economy Package.</p>		<p><b>Bottleneck VIII.5.3</b> Indicated a need for the directive to be reformulated and aligned with the Circular Economy package. The directive has been earmarked for revision for several years but so far no new EU action regarding this directive has been announced.</p>

Biobased plastics	<p><i>Bottleneck VIII.4/5/6.2</i>  <i>A respondent belonging to an EU project (14) provided the same bottleneck for this product</i></p>		
<b>6. Bio-based food &amp; feed ingredients</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Omega-3 fatty acids	<p><i>Bottleneck VIII.4/5/6.2</i>  <i>A respondent belonging to an EU project (14) provided the same bottleneck for this product</i></p>		

## IX. Urban Waste Water Treatment Directive

The responders provided feedback on the Urban Waste Water Treatment Directive (UWWTD) ([Directive 91/271/EEC](#))

### Overall Conclusion

There are some general remarks that can be disseminated from the feedback provided:

- There are no clear end-of-waste criteria for the reuse of sludge in the UWWTD, however such criteria can play an important role in promoting reuse of sewage sludge
- The UWWTD should include a framework of preferred solutions for the reuse of wastewater in order to encourage reuse of waste water
- For the reuse of waste water as a raw material for byproducts, end-of waste criteria are considered necessary

### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
compost or digestate	<p><b>Bottleneck IX.1.1</b> A governmental authority (6) indicated that water treatment should be encouraged and disposal of sludge to surface waters should be phased out.</p>		<p><b>Bottleneck IX.1.3</b> Currently there are criteria for reuse of sewage sludge in farming (very limited use) in the <a href="#">Directive 86/278/EEC</a>. However, as the respondent states there are no further EoW criteria with regard to products obtained from sewage sludge in the UWWTD or other product specific legislation. It is suggested in <b>Bottleneck IX.1.3</b> that the same or similar criteria of Directive 86/278/EEC is incorporated in the UWWTD.</p> <p>On the basis of the revised Waste Framework Directive (WFD) it can be concluded that such criteria can be formulated by the EU in new waste stream/resource specific regulations, by the member states or in product specific legislation.</p>
Hydrochar (HTC biochar)	<p><b>Bottleneck IX.1.2</b> A research institute (15) indicated that the Urban Waste Water Directive (UWWTD) does not take into account the available Sludge valorization and recycling strategies technologies available.</p> <p><b>Bottleneck IX.1.3</b> A research institute (15) indicated that there is mention to End of Waste Criteria available for products obtained from sewage sludge (referencing the sewage sludge directive (86/278/EEC)).</p>		

### 4. Bio-based chemicals

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis

<p>Volatile fatty acids (VFA) (acetic, propionic, butyric and valeric acids)</p>	<p><b>Bottleneck IX.4/5.4</b> A responder from the industry (7) indicated that the UWWTD highlights that sludge should be disposed but that the UWWTD does not provide a framework for preferred solutions for the treatment or re-use of sludge. According to the responder this results that sludge ends up being incinerated because it is the easiest way.</p> <p>The responder suggests the UWTD should ensure that sludge is not disposed unnecessarily and should promote more focus on adding value to sludge produced by wastewater treatment plants.</p>		<p><b>Bottleneck IX.4/5.4 and IX.4/5/6.5</b> indicate that a framework for preferred solutions for the reuse of wastewater is necessary to encourage reuse. The UWTD stipulates in the 7<sup>th</sup> recital that indeed reuse of sludge should be encouraged, however it does not provide a framework/guidelines how this could be accomplished nor does UWTD not set targets to encourage more reuse of sludge. Including such a framework and/or reuse targets would mean an extension of the legal objective of the UWTD.</p> <p><b>Bottleneck IX.4.6</b> indicates that reusing wastewater as raw material for new byproducts should be promoted. For the reuse of waste water as a raw material for byproducts, end-of waste criteria are necessary. On the basis of the revised Waste Framework Directive (WFD) it can be concluded that such criteria can only be formulated by the EU in new waste stream specific regulations, by the member states or in product specific legislation. Inclusion of such criteria in the UWTD itself would therefore not seem appropriate.</p>
<p>Single Cell Oil</p>	<p><b>Bottleneck IX.4/5/6.5</b> A responder from an EU project (14) indicated that the listing of preferable treatment by Volatile Fatty Acids Platform and produced materials needs to be added to the UWWTD to enhance support of this value chain.</p>		
<p>Biosurfactant</p>	<p><b>Bottleneck IX.4.6</b> A responder from an EU project (13) indicated that the amount of wastewater produced should be promoted by reusing wastewater as a raw material for new byproducts. Such reuse practices should therefore be rewarded.</p>		
<p><b>5. Bio-based plastics</b></p>			
<p><b>Bio-based product</b></p>	<p><b>Bottlenecks (&amp; recommendations)</b></p>	<p><b>Regulatory drivers</b></p>	<p><b>Analysis</b></p>
<p>Biobased plastics</p>	<p><b>Bottleneck IX.4/5/6.5</b> <i>This bottleneck is also mentioned by a responder of an EU project (14) in relation to Omega-3 fatty acids / Single Cell Oil</i></p>		
<p>Polyhydroxy alkanates (PHA)</p>	<p><b>Bottleneck IX.4/5.4</b> <i>This bottleneck is also mentioned by a responder from the industry (7) in relation to Volatile fatty acids (VFA)</i></p>		

	<b>Bottleneck VIII.5.3</b> <i>a responder from an EU project (11) mentioned that a bottleneck in relation to Hydrochar (HTC biochar) and the Sewage Sludge Directive also has implications for the Urban Waste Water Treatment Directive.</i>		
<b>6. Bio-based food &amp; feed ingredients</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Omega-3 fatty acids	<b>Bottleneck IX.4/5/6.5</b> <i>This bottleneck is also mentioned by a responder of an EU project (14) in relation to bioplastics and/ Single Cell Oil</i>		

## X. Renewable Energy Directive

The feedback of the respondents was directed at the Commission proposal for a revised Renewable Energy Directive (RED II, [2016/0382\(COD\)](#)). As this proposal has been amended by Parliament and Council and later adopted in Parliament after the conclusion of the trilogue negotiations, the [compromise text](#) of RED II has been used to analyse the provided feedback. RED II has been published in the Official Journal of the European Union and can be found [here](#).

### Overall Conclusion

The input gathered on both RED and REDII shows that REDII can be seen as a step forward as it addresses a number of bottlenecks in the original Directive. Respondents see the increased target of originally 27% of renewable energy in the final consumption as a driver for innovation. This will be the case even more so as the target has been increased to 32%. The inclusion of advanced biofuels is also a welcome addition according to respondents.

### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Compost/Digestat	<p><b>Bottleneck X.1.1 (new legislation)</b> A representative of a group of bio-waste companies (4) said that support schemes for energy from bio-waste are not in line with EU waste hierarchy.</p> <p>This respondent (4) pointed out that public financial support for energy generation that undermines the waste hierarchy should be phased out in order to achieve higher separate collection and recycling rates.</p>		<p><b>Bottleneck X.1.1 (new legislation)</b> This bottleneck is based on RED II prior to trilogue negotiations. It appears that the compromise text of RED II addresses this bottleneck by including a new Article 3(1) which urges Member States to design their national policies, based on Article 25, with due regard to the waste hierarchy.</p> <p>Furthermore, the recitals of the compromise text (in particular recitals 20 and 36) emphasize the principles of the waste hierarchy. Support schemes for renewables sources of energy should consider these principles.</p>
Hydrochar (HTC biochar)	<p><b>Bottleneck X.1.2 (new legislation)</b> A representative of a University (15) states that there is no structured pathway for individual Member States towards renewable energy.</p> <p><b>Bottleneck X.1.3 (new legislation)</b> The representative of the University (15) also stated that there is no support for development of new industrial projects (production and use of RE).</p> <p><b>Bottleneck X.1.4 (new legislation)</b> The representative from the University (15) stated, furthermore, that targets are needed for biofuels derived from</p>	<p><b>Driver X.1.1 (new legislation)</b> A representative of a University (15) categorised the taking aboard of and use in the new proposal as a driver.</p>	<p><b>Bottleneck X.1.2 (new legislation)</b> The final compromise text does contain a number of provisions instructing the Member States on how to calculate the share of energy from renewable sources or to ensure that consumers are entitled to become self-consumers.</p> <p>Article 27 and, more specifically, Annex 1a to the Governance Regulation (<a href="#">2016/0375(COD)</a>) does provide guidelines for individual targets for Member States by proposing an indicative formula. This formula determines the share per Member State by utilising the following four criteria to divide the difference between the Union's targets for 2030 and 2020:</p>

	bio-waste (ILUC-free products)		<ol style="list-style-type: none"> <li>1. a flat rate contribution, the same for each Member State (30%)</li> <li>2. a GDP per-capita based contribution, capped at 150% of the Union's average (30%)</li> <li>3. a potential based contribution (30%)</li> <li>4. a contribution reflecting the interconnection level of the Member State, capped at 150% of the Union's average. (10%)</li> </ol> <p>These criteria should be sufficient for individual Member States to determine their individual annual targets until 2030.</p> <p><b>Bottleneck X.1.3 (new legislation)</b>          No explicit mention is made of new industrial projects. There is, however, ample mention of support schemes. Article 4, for instance, stipulates that Member States may apply support schemes for electricity from renewable sources in order to reach or exceed the Union's target. This support can take place in the form of direct price support schemes granted in the form of a market premium. Furthermore, Member States have more leeway for supporting small-scale installations and demonstration projects.</p> <p><b>Bottleneck X.1.4 (new legislation)</b>          Targets for biofuels derived from bio-waste (ILUC-free products) are included in Article 25 of RED II.</p> <p><b>Driver X.1.1 (new legislation)</b>          A respondent (15) is of the opinion that the increased focus on ILUC effects of biofuels in RED II compared to RED I is positive.</p> <p>Article 25 of RED II puts emphasis on limiting the use of high indirect land-use change risk food or feed crop-based biofuels, bioliquids and biomass fuels produced from food or feed crops for which a significant expansion of the production area into land with high carbon stock is observed.</p>
	<b>2. Biogas and bio-methane</b>		

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biogas		<p><b>Driver X.2.2 (old legislation)</b> A respondent from an EU-funded project (13) categorised the explicit mention of biogas production as a technology which can significantly contribute to sustainable development as positive.</p>	<p><b>Driver X.2.2 (old legislation)</b> The old directive mentioned biogas explicitly as a form of energy from a renewable source. This categorisation is not changed in the new Directive.</p>
<b>3. Bioethanol and biomethanol</b>			
Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethanol /Bio-ethanol	<p><b>Bottleneck X.3.5 (old legislation)</b> A respondent (5) from a bio-waste/bio-fuel company said that the RED has only been marginally successful in expanding use of advanced biofuels due to mandates for technologically advanced biofuels being not specific enough. Double counting under the RED has led to a substantial increase in the production of biodiesel from used cooking oil and animal fats, but has not led to any significant investment in cellulosic biofuels. Furthermore, the addition of an advanced biofuels sub-target in the 2015 revision of RED came much too late to drive investments in advanced biofuels in Europe.</p> <p><b>Bottleneck X.3.6 (old legislation)</b> A respondent (13) from an EU-funded project states that RED does not differentiate between advanced (based on non-food biomass feedstocks, residues and wastes) and 1<sup>st</sup> generation (from crops, plants) biofuels.</p> <p><b>Bottleneck X.3.7 (new legislation)</b> A respondent, representing a bio-waste/biofuel company (5) said that there is no mandate/target set for the use of advanced biofuels</p>	<p><b>Driver X.3.3 (old legislation)</b> A respondent (5) stated that the RED has driven innovation, but this innovation was hampered by the financial crisis and the resulting decrease in public spending.</p> <p><b>Driver X.3.4 (old legislation)</b> A respondent (13) from an EU funded project categorised the target of 20% of energy consumption from renewable sources as a driver.</p> <p><b>Driver X.3.5 (old legislation)</b> A respondent (13) from an EU funded project stated that the 10% target for the use of renewable energy in transport fuels will contribute to the 20% of renewable energy.</p> <p><b>Driver X.3.6 (new legislation)</b> Respondent (5) categorised the strong proposed sub-target for advanced biofuels that will gradually increase over time as a driver.</p> <p><b>Driver X.3.7 (new legislation)</b></p>	<p><b>Bottleneck X.3.5 (old legislation)</b> This bottleneck has largely been solved by REDII as it limits the use of used cooking oil and animal fats. However, the respondent argues that Member States may modify this limit. The cap of 1.7% of part B of Annex IX (used cooking oil and animal fats) feedstock can be increased upon request of Member States provided the Commission agrees to this. In some MS the use of this feedstock now is already twice the cap of 1.7%. Moreover, the fact that it is at the discretion of the Member States to apply double counting (again) on this type of feedstock could lead to unintended effects (fraud by deliberately producing used cooking oils). And finally: the instrument of double counting is used differently depending on the feedstock: the 3.5% advanced biofuel target is in fact only 1.75%.</p> <p>The second part of this bottleneck, the addition of a sub-target for advanced biofuels coming too late for the 2020 targets, is not relevant for the 2030 targets. The higher targets for 2030 should drive investments in advanced biofuels in Europe.</p> <p><b>Bottleneck X.3.6 (old legislation)</b> In contrast to REDI, REDII does differentiate between advanced biofuels (based on non-food biomass feedstocks) and 1<sup>st</sup> generation (from crops, plants) biofuels. Part A of Annex IX to REDII lists the feedstocks for the</p>



	<p><b>Bottleneck X.3.8 (new legislation)</b> Respondent (5) points out that due to the new WFD construction and demolition waste (C&amp;D waste) no longer is considered MSW. If the biogenic part of C&amp;D waste is used for the production of biofuels it is not clear under what category of Annex IX part A of the RED this would fall. Possibly industrial waste but it depends on the Member States how to classify this type of waste.</p> <p><b>Bottleneck X.3.9 (new legislation)</b> Respondent (5) also highlighted the need for support schemes for commercial-scale deployment of advanced biofuels.</p> <p><b>Bottleneck X.3.10 (new legislation)</b> A respondent from an EU-funded project (13) wrote that the target for renewables for transport fuels is maintained.</p>	<p>Respondent (13), representing an EU-funded project that at least 27% of renewables in the final energy consumption in the EU is met.</p>	<p>production of advanced biofuels. This list does not include crops or plants.</p> <p><b>Bottleneck X.3.7 (new legislation)</b> Whereas RED I stipulated a single target of 0,5% in 2020 (Article 3(4)(e), RED II stipulates a path to a target for biofuels and biogas of at least 3,5% in 2030 (0,2% in 2022 and 1% in 2025).</p> <p><b>Bottleneck X.3.8 (new legislation)</b> Coherent classification of C&amp;D waste in Annex IX part A lowers the bureaucratic burden for those processors that use C&amp;D waste for biofuel production – no coherency means seeking approval in every MS to process this waste into biofuel – and avoids internal market fragmentation. It is advised that the European Commission through a Delegated Act adds C&amp;D waste to Annex IX part A as a separate category.</p> <p><b>Bottleneck X.3.9 (new legislation)</b> RED II does not contain specific provisions regarding support schemes for (commercial-scale deployment of) advanced biofuels. Based on the recitals it can be concluded that the creation and design of support schemes are to be determined by the Member States.</p> <p><b>Bottleneck X.3.10 (new legislation)</b> In the compromise text, the target for renewables for transport fuels has been increased to 14% in 2030(Article 25(1) RED II) , up from 10% in 2020 (Article 3(4) RED I). Therefore, the bottleneck pointed out by this respondent has been partly solved. However, a respondent (5) further commented that Member States can reduce the 14% by 50% (because of the double count of advanced biofuels and certain other biofuels) and the support of conventional biofuels (capped at 7%) is no longer supported. This means in energy terms a step back compared to the 2020 target of 10% RES-T.</p> <p><b>Driver X.3.3 (old legislation)</b></p>
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		<p>The increased targets in REDII will further drive innovation. The international commitments to reduce emissions and limit the use of energy from fossil sources should drive public spending in order for it not to be hampered by possible crises.</p> <p><b>Driver X.3.4 (old legislation)</b> The increased target in REDII of 32% shall further drive innovation.</p> <p><b>Driver X.3.5 (old legislation)</b> The target of 10% for the use of renewable energy in transport fuels has been increased to 14% in REDII. This will further contribute to the overall target of 32% in 2030.</p> <p><b>Driver X.3.6 (new legislation)</b> Article 25(1) of the compromise text mandates a minimum share of advanced biofuels in the transport sector (as listed in part A of Annex IX) of at least equal to 0,2% in 2022, 1% in 2025 and, 3,5% by 2030. This will likely drive additional investment and innovation.</p> <p><b>Driver X.3.7 (new legislation)</b> The target of 27% from the proposed RED II has been increased in the compromise text of RED II. Recital 8 of the compromise text, in light of the Paris Agreement, explains that it is appropriate to establish a Union binding target of at least 32%. Article 3(1) sets out this target.</p> <p>Furthermore, Article 3(1) of RED II stipulates that the European Commission “shall assess this target, with a view to submit a legislative proposal by 2023 where there are substantial costs reductions in renewable energy production, or where needed to meet the Union’s international commitments for decarbonisation or where a significant decrease in energy consumption in the Union justifies this.”</p> <p>This means that the set target of 32% is intended as a minimum target and that meeting international commitments is first priority.</p>
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4. Bio-based chemicals			
Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Single Cell Oil	<p><b>Bottleneck X.4/5/6.11 (old legislation)</b> A respondent (14) from an EU-funded project mentioned the national targets concerning the shares of renewable resources for energy production in general and specifically for the transport sector.</p> <p>To increase the material production from renewable (waste) resources, priority targets for this purpose would need to be defined within this context.</p>		<p><b>Bottleneck X.4/5/6.11 (old legislation)</b> This is considered a bottleneck for the priority of gaining materials from resources as exploitation must be decided between material and energy use. According to the respondent VFAP directly competes with gaining energy from biogas and as such, a priority target for materials is requested against energy uses to boost the circular economy and reduce primary raw material consumption.</p>
Medium chain fatty acids / Volatile fatty acids (VFA) (acetic, propionic, butyric and valeric acids)	<p><b>Bottleneck X.4.12 (old legislation)</b> A respondent from a waste water management company (7) said that the directive states that significant financial resources should be applied into the development and support of renewable energy (recital 22, REDI). However, for byproducts production from organic waste (such as MCFA), this acts against since more financial support exists for biogas production than for other new by-products which add more value to waste.</p>		<p>Providing financial support for the development for renewable energy can have negative effect on the production of non-energy related by-products from organic waste.</p>
Biosurfactant	<p><b>Bottleneck X.4.13(old &amp; new legislation)</b> According to a respondent from an EU-funded project (13), REDI and REDII establish sustainability and greenhouse gas emissions saving criteria for biofuels, and bioliquids and biomass fuels. Not for other bio-based products such as biosurfactants.</p>		<p><b>Bottleneck X.4.13 (new legislation)</b> The respondent is correct in pointing out that sustainability and greenhouse gas emissions saving criteria are not included in RED II with respect to biosurfactants.</p> <p><b>Bottleneck X.4/5/6.14 (new legislation) &amp; driver X.4/5/6.8 (new legislation)</b> Of the Council amendments referred to by respondent (14) two (18 and 321) have been included in the compromise text agreed by the institutions. Amendment 18 as new recital 20 and amendment 321 as</p>

			Article 3(3). Member States are thus instructed to design support schemes with due regard to the waste hierarchy. Waste prevention and recycling should be the priority option.
Single Cell Oil for oleochemical industry produced by yeasts	<p><b>Bottleneck X.4/5/6.14 (new legislation)</b> A representative from an EU-funded project (14) stated that the [original] Proposal establishes a target of 27% for the share of renewables in the total EU energy consumption of 2030 and limits sources from food and feed production to 3,8% in 2030. It sets minimum targets for the share of various waste feedstocks in advanced biofuels, other biofuels and biogas (Art. 7 and Art. 25; Annexes 9 and 10).</p> <p>“To strengthen the benefits of secondary resources from waste as well as energy recovery, the VFAP VC models – as combining material and energy - would need to be considered as a preferable concept in the Proposal. Furthermore, the amendments mentioned in ST53512018 INIT would need to be taken into account within this legal act.”</p>	<p><b>Driver X.4/5/6.8 (new legislation)</b> According to a representative from an EU-funded project (14), following the proposal, the waste hierarchy has to be considered (Art.7.1.(c)). The ST5351 2018 INIT amends the Proposal and relates clearly to the circular economy as well as to the waste hierarchy of the WFD 2008/98/EC (e.g. amendments 18, 30, 143, 287, 321, 323) and stresses waste prevention and recycling as being the priority option in case of developing support schemes (18).</p>	
<b>5. Bio-based plastics</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Biobased plastics	<p><b><i>Bottleneck X.4/5/6.11 (old)</i></b> <i>The same bottleneck was mentioned by a respondent from an EU-funded project (14)</i></p> <p><b><i>Bottleneck X.4/5/6.14 (new legislation)</i></b> <i>A respondent from an EU-funded project (14) also mentioned this bottleneck in relation to Single Cell Oil for oleochemical industry produced by yeasts &amp; Omega-3 fatty acids.</i></p>	<p><b><i>Driver X.4/5/6.8 (new legislation)</i></b> <i>A respondent (14) also mentioned this driver in relation to Single Cell Oil for oleochemical industry produced by yeasts &amp; Omega-3 fatty acids.</i></p>	
Polyhydroxyalkanoates (PHA)	<p><b><i>Bottleneck X.4/5.12 (old legislation)</i></b> <i>This respondent (7) also mention this bottleneck in relation to Volatile fatty acids (VFA) (acetic, propionic, butyric and</i></p>		

	valeric acids).		
<b>6. Bio-based food &amp; feed ingredients</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Omega-3 fatty acids	<p><b>Bottleneck X.4/5/6.11 (old)</b> The same bottleneck was mentioned by a respondent from an EU-funded project (14)</p> <p><b>Bottleneck X.4/5/6.14 (new legislation)</b> A respondent from an EU-funded project (14) also mentioned this bottleneck in relation to Single Cell Oil for oleochemical industry produced by yeasts and bioplastics.</p>	<p><b>Driver X.4/5/6.8 (new legislation)</b> A respondent (14) also mentioned this driver in relation to Single Cell Oil for oleochemical industry produced by yeasts &amp; bioplastics.</p>	

## XI. EU ETS-Innovation Fund

[[Directive \(EU\) 2018/410](#) amending [Directive 2003/87/EC](#) establishes an Innovation Fund in which Greenhouse gas emission allowances will be used to support innovation in low-carbon and renewable technologies.]

### Overall conclusion

The respondents welcome the Innovation Fund as it has the potential to contribute to the deployment of renewable energy. One respondent wanted the inclusion of saved greenhouse gas emissions by the deployment of renewable energy in the Emission Trading System.

### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Hydrochar (HTC biochar)		<b>Driver XI.1.1</b> A representative of a University (15) said that the strategy is a support for bio-based fuels like Hydrochar, produced from residual materials, as they represent competitive alternatives to the fossil materials.	<b>Driver XI.1.1</b> The allowances put in the innovation fund (Article 8(14)(h)) will incentivise the development and deployment of renewable energy.

### 4. Bio-based chemicals

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biosurfactant (Poly) lactic acid	<b>Bottleneck XI.4.1</b> A respondent from an EU-funded project (13) said that the saved GHG-emission from the use of wastes for bio-based (or byproducts) should be included in the Emission Trading System.		<b>Bottleneck XI.4.1</b> The Emission Trading System has the aim of reducing Greenhouse gasses by limiting allowances and therefore increasing the price. More research would be needed on how to include saved Greenhouse gasses in this system.

## XII. Effort Sharing Decision & Regulation

The respondents provided feedback on both the Effort Sharing Decision ([406/2009/EC](#)) and the proposal for a Effort Sharing Regulation ([2016/0231/COD](#)). As the proposal has been adopted, the new regulation ([2018/842/EU](#)) will be used to analyze the feedback provided.

### Overall conclusion

The binding nature of the targets set by the Effort Sharing Regulation is welcomed by the respondent. This will drive limiting greenhouse gas emissions. A number of respondents would like to see additional incentives or the establishment of a credits-based system. The Regulation does not provide for either.

### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Digestate	<p><b>Bottleneck XII.1.1 (old legislation)</b> A respondent belonging to a research institute (17) considered it a bottleneck that the Effort Sharing Decision was not effectively enforced as a regulation.</p>		<p><b>Bottleneck XII.1.1 (old legislation)</b> The Effort Sharing Decision applied for the period 2013-2020. For the period 2021-2030 an Effort Sharing Regulation has been adopted, effectively resolving the bottleneck.</p>
Hydrochar (HTC biochar)	<p><b>Bottleneck XII.1.2 (new legislation)</b> An interviewee representing a research institute (15) stated that the CO2 emission calculation in the regulation should be considered in all sectors. Instead of only direct emission of energy sector (e.g. the plastic and fertiliser sector).</p> <p><b>Bottleneck XII.1.3 (new legislation)</b> The interviewee (15) further argued that CO2 credits should be developed instead of CO2 taxes, to support the use of biological and also End-of-Waste material replacing virgin fossil substrates.</p>	<p><b>Driver XII.1.1 (new legislation)</b> A respondent representing a research institute (15) stated that the articles concerning a new system for CO2 control and reduction programmes development in all Member States functions as a driver for this product.</p>	<p><b>Bottleneck XII.1.2 (new legislation)</b> The respondent argues that the CO2 emission calculation should be considered for all sectors and not only the direct emission of the energy sector. Based on article 2(1) it seems that the Regulation also covers GHG emissions from industrial processes and agriculture.</p> <p><b>Bottleneck XII.1.3 (new legislation)</b> The Regulation does, indeed, not establish a credit system. That does, however, not mean it will not be effective in achieving the targets for a reduction of greenhouse gas emissions as these targets are binding upon the Member States.</p> <p><b>Driver XII.1.1 (new legislation)</b> The Regulation does indeed assign the Commission the possibility to adopt implementation legislation to determine further annual emission allocations in Member States. Furthermore, corrective action has to be taken by Member States not achieving their obligations under this Regulation (article 8).</p>

2. Biogas and bio-methane			
Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethane	<p><b>Bottleneck XII.2.4 (old &amp; new legislation)</b> A respondent from a national governmental authority (6) said that there is no price for non-ETS emissions, only legally binding targets.</p> <p><b>Bottleneck XII.2.5 (old legislation)</b> A respondent from a national governmental authority (6) mentioned the lack of legally binding targets for the transport sector in the Decision. Including such targets would help reducing emissions.</p>		<p><b>Bottleneck XII.2.4 (old &amp; new legislation)</b> Annex I to the Regulation contains a list with the individual reduction targets for Member States. The Effort Sharing Regulation does, indeed, not contain a pricing system for greenhouse gasses. This Regulation, combined with Directive 2003/87/EC which established a trading system for greenhouse gasses, should lead to savings in the emissions of greenhouse gasses.</p> <p><b>Bottleneck XII.2.5 (old legislation)</b> Both the Decision and the Regulation do not contain specific targets for the transport sector. The Regulation does, however, provide ample mention of the importance of the transport sector. Recital 12 notes that the “transport sector represents almost a quarter of the Union’s greenhouse gas emissions.” Furthermore, this recital calls for “a comprehensive approach for the promotion of greenhouse gas emission reductions and energy efficiency in transport, for electric transportation, for a shift of transport modes, where more sustainable, and for sustainable renewable energy sources in transport also after 2020.” Moreover, the Renewable Energy Directive and its recently adopted successor (REDII) do include renewable targets for transport fuels (10% in 2020 and 14% 2030). See framework X (Bottleneck X.3.10).</p>
3. Bioethanol and biomethanol			
Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis



Biomethanol /(Bio)ethanol		<b>Driver XII.3.2 (new legislation)</b> A respondent (13) mentioned the reduction of EU Member States emissions of greenhouse gases in the order of 30 % by 2020 compared to 1990. Bioethanol production from OFMSW reduces GHG emissions compared to alternative waste management options.	<b>Driver XII.3.2 (new legislation)</b> Recital 1 of the new Regulation states that the Council has endorsed a binding target of a 40% reduction of greenhouse gasses in 2030 compared to 1990. This will likely result in a higher demand for advanced biofuels.
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#### 4. Bio-based chemicals

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
(Poly) lactic acid & Biosurfactant	<b>Bottleneck XII.4.6 (old &amp; new legislation)</b> A respondent (13) noted that the use of wastes to produce bio-based products may reduce GHG emissions due to the substitution of the fossil-based equivalents. The Decision and the Regulation do not reward this bio-based value chain. The respondent suggests a GHG quantification and comparison with fossil-equivalent products by creating a common framework for GHG emissions saving calculation.		<b>Bottleneck XII.4.6 (old &amp; new legislation)</b> Article 4 of the new Regulation stipulates that Member States shall limit its greenhouse gas emissions at least by the percentage set for that Member State in Annex I in relation to its greenhouse gas emissions in 2005. The use of wastes to produce bio-based products may well contribute to achieving the targets set. However, the suggested framework for GHG emissions saving calculation is not incorporated in either the Decision or the Regulation.
Single Cell Oil for oleochemical industry produced by yeasts		<b>Driver XII.4/5/6.3 (old &amp; new legislation)</b> A representative from an EU-funded project (14) said that the Decision stipulates legally-binding targets for national emission reduction for the period from 2013-2020. (EU target for 2020: 30% in comparison to 1990). It includes solid waste and wastewater treatment sectors as detailed in Annex I of Decision 2005/166/EC.	<b>Driver XII.4/5/6.3 (old &amp; new legislation)</b> Self-explanatory. Annex II to the Decision (and Annex I to the new Regulation for 2021-2030) contains the list of individual targets for the Member States.

#### 5. Bio-based plastics

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
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Biobased plastics	<p><b>Bottleneck XII.5.7 (old legislation)</b> A representative from an EU project (14) said that the merits related to emissions and achievement of emission targets would need to be further verified and incentivised, in order to foster bio-based products resulting from waste and waste-water recycling.</p>	<p><b>Driver XII.5.4 (old &amp; new legislation)</b> A respondent from an EU-funded project (9) said that setting targets on the effort of Member States to reduce their greenhouse gas emissions fosters also the increase of material recovery from waste, especially when the recycling process becomes carbon neutral as in the case of AHP recycling.</p> <p><i>Driver XII.4/5/6.3 (old legislation)</i> <i>The same bottleneck was mentioned by a respondent from an EU-funded project (14)</i></p>	<p><b>Bottleneck XII.5.7 (old legislation)</b> Although there are no dedicated incentives for achieving the targets set by the Regulation, the binding nature of these targets should be sufficient in order to achieve them. Related to bottleneck XII.4.6 (old &amp; new).</p> <p><b>Driver XII.5.4 (old &amp; new legislation)</b> A carbon neutral recycling process would benefit from the obligation imposed by Article 3 and Annex I to reduce greenhouse gas emissions.</p>
<b>6. Bio-based food &amp; feed ingredients</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Omega-3 fatty acids		<p><i>Driver XII.4/5/6.3 (old legislation)</i> <i>The same bottleneck was mentioned by a respondent from an EU-funded project (14)</i></p>	

### XIII. A Bio-economy for Europe

The communication: [A bioeconomy for Europe](#) was published in 2012 and has been reviewed in 2017. This has resulted in an updated bioeconomy strategy: [a sustainable bioeconomy for Europe](#) (11 October 2018). All the feedback was given on the old communication. In this analysis the bottlenecks/drivers are compared to the new communication to see whether they remain relevant.

The Updated Bioeconomy Strategy (2018) includes significant improvements: a strong focus on circular bioeconomy, the role of cities as bioeconomy hubs, the valorisation of biowaste through the production of safe and sustainable bio-based products. In particular:

- Focus on cities and urban circular bioeconomy: ‘Cities should become major circular bioeconomy hubs. Circular urban development plans could translate into very significant economic and environmental gains. Moreover ‘The Urban bioeconomies pilot will enable 10 European cities to turn organic waste from a societal problem into a valuable resource for the production of bio-based products. Furthermore, the rehabilitation of brownfields and application of circular bioeconomy processes and technologies within urban areas should be further developed to diversify the sustainable sourcing of biomass and to create new business opportunities.’ (p.9)
- Stress on circularity and sustainability and reference to organic waste in the definition of ‘bioeconomy’: ‘Sustainable & Circular: Bioeconomy the European way. The bioeconomy covers all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste), their functions and principles. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services. To be successful, the European bioeconomy needs to have sustainability and circularity at its heart. This will drive the renewal of our industries, the modernisation of our primary production systems, the protection of the environment and will enhance biodiversity.’ (p.1).

More references: [https://ec.europa.eu/research/bioeconomy/pdf/ec\\_bioeconomy\\_strategy\\_2018.pdf#view=fit&pagemode=none](https://ec.europa.eu/research/bioeconomy/pdf/ec_bioeconomy_strategy_2018.pdf#view=fit&pagemode=none)

#### Overall conclusion

Many respondents praised the strategy, including mobilising stakeholders and the creation of a bio-economy investment platform. A number of respondents said that the Communication lacks specific targets as it sets general objectives. This is, of course, the purpose of a Communication of this kind.

#### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Organic Fertiliser (compost or digestate)		<b>Driver XIII.1.1</b> According to a representative from a government authority (6) the strategy promotes mitigation and adaptation to climate change, investment in knowledge, innovation and skills.	<b>Bottleneck XIII.1.1</b> The 2018 Communication from the Commission takes additional steps compared to the communication from 2012. For instance, the EU will create a fund of EUR 100 million, the Circular Bioeconomy Thematic Investment Platform. The aim of this fund is to de-risk (and thus stimulating) private investments in sustainable solutions.
Hydrochar (HTC biochar)	<b>Bottleneck XIII.1.1</b> According to a representative from a research institute (15) the 2012 strategy lacks specific solutions for the promotion of a bioeconomy.  <b>Bottleneck XIII.1.2</b> The representative (15) also missed a strict connection of support for the bio-economy with bio-waste valorisation in the	<b>Driver XIII.1.2</b> A driver identified by a respondent belonging to a research institute (15) stated that some supporting measures are positively influencing the HTC value chain.	<b>Bottleneck XIII.1.2</b> A strict connection of support for the bio-economy with bio-waste valorization is not mentioned in the 2018 Communication. The accompanying Staff Working Document does, however, place a strong emphasis on the value of biowaste. This paragraph (2.2) refers to obligations included in the Circular Economy Package (including higher recycling targets and mandatory separate collection of biowaste by the

	2012 strategy.		<p>end of 2023), but does not mention support schemes.</p> <p><b>Driver XIII.1.1</b> The 2018 Communication follows up on the 2012 Communication by introducing a number of actions that will address the aims as mentioned by the respondent. These actions include, among others, the launch of a EUR 100 million Circular Bioeconomy Thematic Investment Platform, facilitating the development of new sustainable biorefineries and research and innovation investments for the development of substitutes to fossil based materials that are bio-based, recyclable and marine-biodegradable. Further actions include mobilising public and private shareholders and pilot actions to support local bioeconomy development via Commission instruments and programmes. Mitigating and adapting to climate change is the fourth objective of the Communication.</p> <p><b>Driver XIII.1.2</b> In the 2018 Communication, the fifth objective, ‘strengthening European competitiveness and creating jobs, pursues the aims of the original Communication. Among the items of the fifth objectives are the creation of standards, renewable energy policies and carbon pricing. These objectives will positively influence the HTC value chain.</p>
<b>2. Biogas and bio-methane</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Biomethane	<p><b>Bottleneck XIII.2.3</b> A government authority (6) pointed out a disparity between technical possibilities the current technology allows, the cleansing of the biogas through the use of membranes that enables the production of methane of similar quality to the one of the natural gas. However, the current regulatory legal framework (at least in the Member State of the government authority (6)) does not allow its use by injecting it into the natural gas network or its use as transport fuel.</p>	<p><b>Driver XIII.2.3</b> The respondent from a governmental authority (6) said that promoting biomethane would not only contribute to reducing greenhouse gas emissions and reducing gas imports but would also solve the problem of organic waste management from agriculture or the domestic sector (including hotels and expired food).</p>	<p><b>Driver XIII.2.3</b> These advanced biofuels, as defined in Annex IX of the revised <a href="#">Renewable Energy Directive</a>, can indeed be produced from waste deemed not fit for use in the food or feed chain. Promotion of biomethane would contribute to achieving the targets set by this Directive.</p>

### 3. Bioethanol and biomethanol

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethanol /(Bio)ethanol 1	<p><b>Bottleneck XIII.3.4</b> A representative from a bio-waste/bio-fuel company (5) said there is a need for commercial deployment of clean technologies for circular economy</p> <p><b>Bottleneck XIII.3.5</b> The representative from the bio-waste/bio-fuel company (5) pointed out that current policy offers no mechanism to encourage a price premium for chemicals produced from renewable sources and bio-based wastes.</p> <p><b>Bottleneck XIII 3.6</b> While referring to increased awareness of renewable and low-carbon chemicals production in the private sector, the representative from the bio-waste/bio-fuel company (5) said that price signals need to be created by legislation to increase the share of bio-based products significantly.</p> <p><b>Bottleneck XIII.3.7</b> A representative from an EU-funded project (13) said that the Communication sets general objectives, but no specific targets for bio-waste conversion into bio-products.</p>	<p><b>Driver XIII.3.4</b> A representative from an EU-funded project (13) categorised the shift towards a new bio-economy as a driver.</p>	<p><b>Bottleneck XIII.3.4</b> Paragraph 4.2 of the 2018 Communication states that the European Commission will develop a Strategic Deployment Agenda which will provide a long-term vision on pathways to deploy and scale up the bio-economy in a sustainable and circular manner.</p> <p><b>Bottleneck XII.3.5</b> The Communication does not mention schemes of this type.</p> <p><b>Bottleneck XIII.3.6</b> The Communication does not contain measures that will directly result in price differentiation. It does, however, list a number of actions that will stimulate research, demonstration and deployment of bio-based solutions. Other measures resulting from other pieces of legislation (e.g. the Renewable Energy Directive II and the Effort Sharing Regulation may result in national policies aimed at cutting emissions and stimulating bio-based solutions.</p> <p><b>Bottleneck XIII.3.7</b> It is the nature of documents like this Commission Communication to present a vision and provide guidelines for stakeholders. The objectives in this Communication will be followed-up by more specific targets in dedicated legislation such as the Renewable Energy Directive.</p> <p><b>Driver XIII.3.4</b> The driver in the Commission Communication as identified by the respondent forms the core of the Communication.</p>

4. Bio-based chemicals			
Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Single Cell Oil		<p><b>Driver XIII.4/5/6.5</b> A respondent from an EU-funded project (14) pointed out that the Communication emphasises the use of waste for added-value generation of bio-based products and points out public funding (e.g. for research under Horizon 2020).</p>	<p><b>Bottleneck XIII.4.8</b> The nature of this Commission document is to present a vision and proposals that will be implemented at a later stage. This document gives stakeholder the opportunity to deliver their input.</p> <p><b>Driver XIII.4/5/6.5</b> The Communication mentions that Circular urban development plans could translate into very significant economic gains. The city of Amsterdam is used as an example as it estimates that the better recycling of high value organic residue streams could generate EUR 150 million in added value per year, create new 1.200 job in the long run and save 600.000 tonnes of carbon dioxide annually. The Commission proposals for the next MFF (2021-2027) intend to give a significant boost for funding for research and innovation in the bioeconomy sector.</p>
Biosurfactant & (Poly) lactic acid	<p><b>Bottleneck XIII.4.8</b> A respondent from an EU-funded project (13) noted that it would be highly recommended for the contents of this Communication to become mandatory for all Member States.</p>	<p><b>Driver XIII.4.6</b> A respondent (13) said that the Communication would benefit the market for bioproducts by reducing dependence on fossil fuel derived products, managing natural resources sustainably, while creating new jobs and promoting European competitiveness.</p>	<p><b>Driver XIII.4.6</b> The driver in the Commission Communication as identified by the respondent forms the core of the Communication.</p>
Medium chain fatty acids & Volatile fatty acids (VFA) (acetic, propionic, butyric and valeric acids)		<p><b>Driver XIII.4/5.7</b> A respondent from a waste-water management company (7) said that the Communication distinguishes clearly the biobased products using feedstocks that increase pressure in the ecosystems and food supply from the feedstocks that are more sustainable, mostly nowadays considered waste streams.</p> <p><b>Driver XIII.4/5.8</b> A respondent from a waste-water management company (7) pointed out that the Communication acknowledges the need for investment in demonstration and scale-up of these technologies which is crucial for emerging biobased technologies such as MCFA which are unique substances that are hard to produce from oil.</p>	<p><b>Driver XIII.4/5.7</b> The Communication makes multiple mentions of pressure on ecosystems and, in the staff working document, indirect land use change (ILUC). Furthermore, part A of Annex IX to the <a href="#">revised Renewable Energy Directive</a> contains a list of ILUC-free feedstocks for advanced biofuels.</p> <p><b>Driver XIII.4/5.8</b> Among the actions the Commission proposes in the Communication are the launch of a EUR 100 million Circular Bioeconomy Thematic Investment Platform and the mobilization of public and private stakeholders, in research, demonstration and deployment of sustainable, inclusive and circular bio-based solutions.</p>

<b>5. Bio-based plastics</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Biobased plastics		<p><b>Driver XIII.4/5/6.5</b>  <i>The same driver was mentioned by a respondent from an EU-funded project (14).</i></p>	
Polyhydroxy alkanates (PHA)		<p><b>Driver XIII.4/5.7</b>  <i>The same driver was mentioned by a respondent from a waste-water management company (7).</i></p> <p><b>Driver XIII.4/5.8</b>  <i>The same driver was mentioned by a respondent from a waste-water management company (7).</i></p>	
<b>6. Bio-based food &amp; feed ingredients</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Omega-3 fatty acids		<p><b>Driver XIII.4/5/6.5</b>  <i>The same driver was mentioned by a respondent from an EU-funded project (14).</i></p>	

## XIV. Council Regulation on Organic Farming

The feedback of the respondents was directed at the Regulation on organic production and labelling of organic products ([Regulation 834/2007/EC](#) and its regulation laying down detailed rules ([Regulation 889/2008/EC](#)). The Regulation on Organic Farming and the Regulation 889/2008/EC have recently been replaced by the Regulation on organic production and labelling of organic products ([Regulation 2018/848/EU](#)). The feedback has been analyzed with this new Regulation in mind (that will enter into force from 1 January 2021).

### 1. Fertilisers (organic/inorganic)

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Organic fertiliser (compost or digestate)	<p><b>Bottleneck XIV.1.1</b> A respondent belonging to a EU project (13) argued that the main obstacles were the limitations in raw materials that could be integrated into fertilisers for organic farming</p>	<p><b>Driver XVI.1.1</b> The respondent (15) found the heavy metals content and the original resources that are considered for the production of organic soil conditioners to be the main drivers in the Commission Regulation.</p>	<p><b>Bottleneck XIV.1.1</b> Annex I of the Commission Regulation 889/2008/EC regulates which materials can be used for fertilisers (organic production methods only). This regulation is going to be replaced by Regulation 2018/848/EU. Article 24(1)(b) of the new regulation states that the Commission may authorize the use of certain products and substances for use in organic production (restrictive lists) for fertilisers. However, it seems that such a list is not yet provided and it is unclear whether it will diverge in relation to Annex I of Regulation 889/2008/EC.</p> <p><b>Bottleneck XIV.1.2</b> The respondent suggests the Commission Regulation 889/2008/EC (annex I) does include composting and anaerobic digestion as technologies for bio-waste valorization into fertilisers and hydrochar or hydrothermal carbonization is not mentioned. The revised Regulation does also not mention this product or technique.</p> <p><b>Driver XVI.1.1</b> Annex I of Regulation 889/2008/EC includes maximum concentrations of different heavy metals that may be present in e.g. composted</p>



<p>Hydrochar (HTC biochar)</p>	<p><b>Bottleneck XIV.1.2</b>          Another respondent (15) belonging to a research institute mentioned the Commission Regulation 889/2008/EC, detailing the rules of the original Regulation, and noted that one bottleneck they had experienced was that hydrothermal carbonisation is not considered among the technologies applicable for biowaste valorization into biofertilisers.</p>	<p><b>Driver XVI.1.1</b>          The respondent (15) found the heavy metals content and the original resources that are considered for the production of organic soil conditioners to be the main drivers in the Commission Regulation.</p>	<p>household waste to be used as fertilisers. For the new regulation these limits are not (yet) set.</p>
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## XV. Directive to reduce indirect land use change for biofuels and bioliquids

The feedback of the respondents was directed at the Directive to reduce indirect land use change for biofuels and bioliquids ([Directive 2015/1513/EU](#)), which in turn amends several pre-existing Directives: the Fuel Quality Directive ([98/70/EC](#)) and the Renewable Energy [Directive \(2009/28/EC\)](#).

### 3. Bioethanol and biomethanol

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethanol /(Bio)ethanol		<p><b>Driver XV.3.1</b> A respondent belonging to an EU project (13) mentioned several drivers. The first is that the use of conventional biofuels derived from crop plants was limited to 7%. The second was that Member States needed to implement a target for biofuels from non-food feedstock, so that they would make up at least 0,5% of transport energy in 2020. The third was the fact that the regulation allowed for the double counting of the energy contents of advanced biofuels towards the renewable energy target of 10%.</p>	<p><b>Driver XV.3.1</b> The Directive amends several other Directives (<a href="#">Directive 98/70/EC</a> and <a href="#">Directive 2009/28/EC</a>). These amendments stimulate the production of biomethane/ethanol from OFSMW in several ways:</p> <ul style="list-style-type: none"> <li>- The 7 % limitation of the use of conventional biofuels derived from crop plants can be found in the Renewable Energy Directive (article 3(4d)). This Directive is going to be replaced by REDII (<a href="#">2016/0382(COD)</a>), which is currently in the final stage of the trilogue). In the compromise text the 7 % limit is upheld, it even seems that the limit will decrease to 0 % from 2024-2030 (article 25(1)).</li> <li>- The 0,5 % target for biofuels from non-food feedstock in the transport sector can be found in article 3(4e) of RED I, this is an indicative target. In the compromise text on REDII the targets can be found in article 25(1) as well: <i>Within this total share, the contribution of biofuels and biogas produced from feedstock listed in part A of Annex IX shall be at least equal to 0,2 % in 2022, 1 % in 2025 and, increasing up to at least 3,5 % by 2030.</i> It seems that the target is low for 2022 when compared to the 0,5 % goal for 2020 in REDI. However, that was an indicative target and this seems to be a binding target.</li> <li>- The double counting of the energy contents of advanced biofuels for the renewable energy target of 10% can be found in article 3(4f) RED I. In the compromise text on REDII this has remained the same (article 25(1)).</li> </ul> <p>Furthermore, the Commission has adopted a <a href="#">delegated act</a> (based on REDII) setting out the criteria for determining high ILUC-risk feedstock for biofuels and criteria for certifying low ILUC-risk biofuels, bioliquids and biomass fuels.</p>

## XVI. Fuel Quality Directive

The feedback of the respondents was directed at [Directive 2009/30/EC](#), which amends several pre-existing Directives such as the Fuel Quality Directive ([98/70/EC](#)). The feedback received was related to the amendments in the FQD.

### 2. Biogas and bio-methane

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethane	<p><b>Bottleneck XVI.2.1</b></p> <p>One respondent belonging to a government ministry overseeing energy and environment (6) mentioned a lack of clear specifications being a bottleneck in this Directive.</p>		<p><b>Bottleneck XVI.2.1</b></p> <p>The Directive 2009/30/EC amends the Fuel Quality Directive. When examining the FQD it does set environmental specifications for biofuels. Furthermore, consideration 24 of the Directive it is stated that there should be periodic reviews of the fuel specifications (see also article 9(1)), which could lead to new implementation legislation setting further specifications.</p>

### 3. Bioethanol and biomethanol

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethanol /(Bio)ethanol		<p><b>Driver XVI.3.1</b></p> <p>Although the respondent (13) in this case, who belongs to a EU project, did not provide a bottleneck, they did mention the driver as being the reduction goal of at least 6% of greenhouse gas in the use of fuel for vehicles in 2020, compared to 2010.</p>	<p><b>Driver XVI.3.1</b></p> <p>Even though 2020 is approaching, the Fuel Quality Directive is not getting updated, since the Commission proposes using REDII alone to regulate the uptake of low-emission and renewable fuels for the period 2021-2030 and not extending the GHG reduction target under the FQD beyond 2020 (see the 2017 <a href="#">Commission report</a>).</p>

## XVII. The Gas Directive

The feedback of the respondents was directed at the Gas Directive ([Directive 2009/73/EC](#)).

### 2. Biogas and bio-methane

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethane	<p><b>Bottleneck XVII.2.1</b> One respondent belonging to a government authority (9) mentioned a need for reduced taxation in order to account the renewable nature of green gas.</p>		<p><b>Bottleneck XVII.2.1</b> It is hard for the Commission to deal with this bottleneck. Taxes are after all the domain of the Member States, as it is stated not to be within the jurisdiction of the European Union in article 3, 4 and 6 of the Treaty on the Functioning of the European Union.</p> <p>However, The compromise text of the new Renewable Energy Directive (<a href="#">REDII</a>) does does mention tax exemptions as an instrument that the Member States can apply to promote the use of energy from renewable sources. (article 2(j)). Important to note that these measures do have to be in line with the Waste hierarchy (article 3(3)).</p>

### 3. Bioethanol and biomethanol

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethanol /(Bio)ethanol		<p><b>Driver XVII.3.1</b> One respondent (13) said that a driver in this Directive was the explicit specification that biogas is granted non-discriminatory access to the gas system.</p>	<p><b>Driver XVII.3.1</b> The non-discriminatory access rule for biogas that the respondent mentioned is based on article 1 paragraph 2 of the Directive.</p>

## XIX. Regulation on Detergents

The feedback of the respondents was directed at the Regulation on Detergents ([Regulation 648/2004/EC](#)).

### 3. Bioethanol and biomethanol

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biosurfactant	<p><b>Bottleneck XIX.3.1</b> The respondent (13), belonging to an EU project, mentioned that one bottleneck was that biosurfactants are not explicitly included.</p>		<p><b>Bottleneck XXIX.3.1</b> The regulation does set limitations based on the biodegradability of surfactants (article 4). Biosurfactants as a specific group of surfactants is not mentioned.</p> <p>It might be worth considering for the Commission whether biosurfactants need a special ruleset, considering biosurfactants undergo the process of biodegradation <a href="#">easier</a>, so as to promote their use.</p>

### 4. Bio-based chemicals

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Single Cell Oil for oleochemical industry produced by yeasts	<p><b>Bottleneck XIX.4.2</b> A respondent representing an EU project (14) argues for the inclusion of reference to the origin (feedstock) of the detergents and surfactants (e.g. waste-based/bio-based) in the Regulation.</p>	<p><b>Driver XIX.4.1</b> The respondent (14) mentioned they considered the minimum requirements for biodegradability of surfactants for the oleochemical industry to be a driver, as well as the rules about low phosphorus contents in detergents.</p>	<p><b>Bottleneck XIX.4.2</b> Currently the Regulation does indeed not take aboard the feedstock of the detergents and surfactants. This bottleneck is related to bottleneck XIX.3.1 in that it is directed at specific rules for biosurfactants produced from bio-waste.</p> <p><b>Driver XIX.4.1</b> As stated above article 4 sets the minimum requirements for biodegradability of surfactants. Furthermore, the limitations on the content of phosphorus can be found in article 4a.</p>

## XX. Packaging Waste Directive

The feedback of the respondents was directed at the Packaging and Packaging Waste Directive ([Directive 94/62/EC](#)). This Directive was amended recently by [Directive 2018/852/EU](#).

### 4. Bio-based chemicals

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Polylactic acid (PLA)	<p><b>Bottleneck XX.4.1</b></p> <p>The respondent (13), belonging to an EU-project, noted that one bottleneck they had encountered was that the presence of heavy metals in waste was not taken in account in the production process of lactic acid (purification), resulting in a final product that may not be suitable for use in packaging. The respondent suggests initial control of waste to reduce the possible heavy metal content that preclude their use in packaging applications.</p>		<p><b>Bottleneck XX.4.1</b></p> <p>Article 11 of the Packaging Waste Directive regulates the amount of metals that packaging can contain. The bottleneck mentioned by the respondent seems to be more with their own production process rather than a problem with the limits set in the directive.</p> <p>However, the suggestion made related to initial control of waste to reduce the possible heavy metal content would be something that could be addressed in EU legislation. This is however, not something that should be addressed in the Packaging Waste Directive but is directed at the feedstock for the production of Polylactic acid. This is the OFMSW and norms for municipal waste are more likely to be included in the Waste Framework Directive.</p>

### 5. Bio-based plastics

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biobased plastics	<p><b>Bottleneck XX.5.2</b></p> <p>The respondent (14), belonging to a EU project considered the fact that, the practice of recycling biowaste into bioplastics is not covered in the target definition of direct material recycling to plastics, a bottleneck.</p>		<p><b>Bottleneck XX.5.2</b></p> <p>Article 6 sets the recycling and recovery targets for packaging waste. Furthermore, annex II of the Directive sets requirements on the composition and reusability and recoverability of package. However, It does indeed not discuss the feedstock (bio-waste) for packaging materials. Therefore the practice of recycling bio-waste into bioplastics is also not mentioned.</p>

## XXI. Cosmetic Regulation

The feedback of the respondents was directed at the Cosmetic Regulation ([Regulation 1223/2009/EC](#))

### 4. Bio-based chemicals

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Single Cell Oil for oleochemical industry produced by yeasts	<p><b>Bottleneck XXI.4.1</b> One respondent (14), belonging to an EU project, found that one bottleneck to be the fact that sustainability criteria and indications of the origin of raw materials are not mentioned in the Regulation. The respondent thought this necessary to hasten the introduction of bio-based products on the market. The Regulation defines rules for manufacturing and distribution of cosmetic products being an important end use for oleochemicals. While it considers restrictions on animal testing, sustainability criteria and indication of raw material origin (e.g. bio-based) are not included in this legal source.</p> <p>To accelerate the placement on the market of bio-based products like single cell oils from VFAP downstream fermentation, significant information and/or stipulations on the bio-based origin of these products would need to be introduced.</p>	<p><b>Driver XXI.4.1</b> The respondent noted that restrictions on animals testing are included in the Regulation and mentioned that as a good aspect.</p>	<p><b>Bottleneck XXI.4.1</b> The primary goal of the Cosmetic Regulation is to ensure a high level of protection of human health and is not directed at promoting sustainable origin of raw materials. Therefore there is no mention of sustainability or the environment. However, the respondent argues that a high level protection of human health does not contradict the inclusion of sustainability criteria. It is evidenced by studies that consumers more and more value sustainability, and thus it is logical that this argumentation is important to be legally defined and bio-based raw materials as ingredients need to be labelled on the cosmetic packaging.</p> <p><b>Driver XXI 4.1</b> This driver is related to animal testing and not a driver towards for the value chain of bio-based products from bio-waste.</p>

### 5. Bio-based plastics

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
PHA	<p><b>Bottleneck XXI.5.2</b> One respondent (13), belonging to a EU project found a bottleneck to be the fact that article 17 of the Regulation, which implies producers have to make sure there is no prohibited substance in the packaging, only applies to the packaging.</p>		<p><b>Bottleneck XXI.5.2</b> Article 17 of the Regulation refers to article 3 of the Regulation regarding safety of cosmetics in general. Therefore, it seems that the same rules apply for both cosmetics as well as packaging.</p>

## XXII. CMO Regulation

The feedback of the respondents was directed at the Regulation establishing a common organization of the markets in agricultural products ([Regulation 1308/2013/EU](#)).

### 4. Bio-based chemicals

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Single Cell Oil for oleochemical industry produced by yeasts	<b>Bottleneck XXII.4/5/6.1.</b> One bottleneck mentioned by a respondent belonging to a EU project (14) was that there was not enough support in the Regulation for the competitiveness of waste-based input materials for processes triggering bio-based products such as PHA.		<b>Bottleneck XXII.4/5/6.1</b> In the Regulation no mention is made of support for waste-based input materials although support for sustainable production processes is mentioned for several markets. The respondent suggests that the integration of financial incentives for waste and by-products from crop harvest and food/feed processing if used for bio-based products in the CMO would improve their position against those derived from the crops themselves. Furthermore, it debilitates ethical concerns on the use of food crops for non-food purposes e.g. for PHA) and refutes environmental arguments, such as land use for bio-based products.

### 5. Bio-based plastics

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
	<i>Bottleneck XXII.4/5/6.1</i> <i>The same respondent (14) mentioned this bottleneck in relation to plastics.</i>		

### 6. Bio-based food & feed ingredients

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Omega-3 fatty acids	<i>Bottleneck XXII.4/5/6.1</i> <i>The same respondent (14) mentioned this bottleneck in relation to Omega-3 fatty acids.</i>		



## XXIII. Regulation on the placing on the market and use of feed

The feedback of the respondents was directed at the Regulation on the placing on the market and use of feed ([Regulation 767/2009/EC](#)).

### 6. Bio-based food & feed ingredients

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Omega-3 fatty acids	<p><b>Bottleneck XXIII.6.1</b> A respondent belonging to an EU project (14) considers the safety and health criteria for feedstuffs a bottleneck. As it prohibits the feed production from UWWs waste or household waste. The Regulation should be reviewed with novel technologies in mind, to upscale volatile fatty acids from waste.</p>		<p><b>Bottleneck XXIII.6.1</b> Article 6 refers to restricted and prohibited materials for the use of feed. In the article is referred to Annex III which includes a list of these materials. Chapter 1 Sub 5 and 6 state that waste water and urban waste are prohibited materials for feed. The respondent mentioned that it might be necessary to review new technologies to see if it is possible to get volatile fatty acids from underground waste systems or household waste for the purpose of feed ingredients. Considering the prohibition of using this waste was not lifted in the recent revision of this Regulation, it can be assumed that not enough has changed regarding these technologies for the Regulation to changed..</p>

## XXIV. Plastics Regulation

The feedback of the respondents was directed at the Regulation on plastic materials and articles intended to come into contact with food ([Regulation 10/2011/EU](#)).

### 5. Bio-based plastics

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biobased plastics	<b>Bottleneck XXIV.5.1</b> The respondent belonging to a EU-project (14) mentioned the small amount and variety of registered types of biodegradable and bio-based plastics such as PHA to be a bottleneck. The respondent recommended the amount of registered types to be increased.		<b>Bottleneck XXIV.5.1</b> While there are some aliphatic, bio-degradable substances mentioned in Annex I of the Regulation, the amount of registered types of biodegradable and bio-based plastics is small. To work better towards the Commission's environmental goals, it might be worth it to research whether more bio-degradable substances can be placed on the list of allowed substances.

## XXV. Regulation on recycled plastics in food contact

The feedback of the respondents was directed at the Regulation on recycled plastics in food contact ([Regulation EC/282/2008](#)). This regulation amends Regulation [EC/2023/2006](#) on good manufacturing practice (GMP) for materials and articles intended to come into contact with food. Regulation EC/2023/2006 lays down the rules on GMP for materials listed in Annex I to Regulation [EC/1935/2004](#) the food contacts materials regulation. (see article 1 EC/2023/2006).

### 5. Bio-based plastics

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biobased plastics	<p><b>Bottleneck XXV.5.1</b> The respondent belonging to an EU project (14) did not specify a bottleneck, but did specify that they recommended that the Regulation be reviewed concerning possibilities of integrating bio-recycling.</p>		<p><b>Bottleneck XXV.5.1.</b> If the Commission would want to raise awareness on bio-recycling and biopolymer production from waste, it might be worth reviewing the Regulation to see if use of these processes might be stimulated through regulation, as far as this has not come up in the <a href="#">evaluation</a> of the Regulation, that was due to be published in the first quarter of 2018.</p> <p>Furthermore, it is worth noting that bio-recycling and other stated points were not mentioned in the Better Regulation <a href="#">report</a> of the EC-JRC.</p>

## XXVI. Water Framework Directive

The feedback of the respondents was directed at the Water Framework Directive ([Directive 2000/60/EC](#)).

### 7. General remarks

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
General	<b>Bottleneck XXVI.7.1</b> The respondent (3), who belongs to a research institute, did not mention any bottlenecks on their own, but instead referred to the <a href="#">Fitness Check</a> that the Commission organized for this Directive. The respondent did echo the feedback of multiple stakeholders, who complained the reuse of water was not possible.		<b>Bottleneck XXVI.7.1</b> In relation to the reuse of water the Commission has already introduced a proposal for a Regulation setting minimum requirements for water reuse ( <a href="#">2018/0169/COD</a> ), thus addressing the issue of water reuse. The question remains however if the bottleneck would be completely addressed by this Regulation or not.

## XXVII. A European Strategy for Plastics in a Circular Economy

The European Strategy for Plastics in a Circular Economy ([COM/2018/028 final](#)) strives towards a higher amount of separate waste collection and aims at a higher usage of recyclable and compostable plastics.

### Overall conclusion

Many of the Commission's proposals are welcomed by the respondents. Respondents welcome additional stimulating measures to make bioplastics more attractive in the market compared to traditional plastics.

### 3. Bioethanol and biomethanol

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biomethanol /(Bio)ethanol 1	<p><b>Bottleneck XXVII.3.1</b> A representative from a bio-waste/biofuel company (5) said that the Communication does not contain measures to find better waste management solutions for non-recycle wastes, such as conversion into fuels and chemicals.</p> <p><b>Bottleneck XXVII .3.2</b> A representative from a bio-waste/biofuel company (5) said that action is needed at all levels of the waste hierarchy in order to keep more plastic waste out of disposal.</p> <p><b>Bottleneck XXVII .3.3</b> A representative from a bio-waste/biofuel company (5) pointed out that the current policy does not offer a mechanism to encourage a price premium for chemicals produced from wastes (which is recycling in the EU waste hierarchy). Chemicals from waste receive the same price (the commodity price) for the chemical, discouraging investment in this important sector for the circular economy. This is in stark contrast with biofuels which command a higher price due to the compliance value created by regulation.</p> <p><b>Bottleneck XXVII .3.4</b> The representative from a bio-waste/biofuel company (5) mentioned that the production of products from wastes requires the use innovative technologies and costs are typically</p>		<p><b>Bottleneck XXVII.3.1</b> In the Communication (para. 4.1) the Commission refers to proposed rules on waste-management. “ 23These include clearer obligations for national authorities to step up separate collection, targets to encourage investment in recycling capacity and avoid infrastructural overcapacity for processing mixed waste (e.g. incineration), and more closely harmonised rules on the use of extended producer responsibility.” ( COM (2015) 593, COM (2015) 594, COM (2015) 595, COM (2015) 596.) No references to non-recyclable waste are included in the Strategy.</p> <p><b>Bottleneck XXVII.3.2</b> The Communication does provide for action at multiple levels. 1. Improving the economics and quality of plastics recycling, 2. Curbing plastic waste and littering, 3. Driving innovation and investment towards circular solutions and 4. Harnessing global solutions.</p> <p><b>Bottleneck XXVII.3.3</b> The Communication does indeed not provide for a mechanism that encourages a price premium.</p> <p><b>Bottleneck XXVII.3.4</b> In paragraph 4.3 the Commission mentions that The cost of alternative feedstocks, including bio-based feedstocks and gaseous effluents “can be</p>

	higher than production of products using conventional virgin fossil sources.		an obstacle to wider use; in the case of bio-based plastics it is also important to ensure that they result in genuine environmental benefits compared to the non-renewable alternatives. To that effect, the Commission has started work on understanding the lifecycle impacts of alternative feedstock used in plastics production, including biomass. Based on the available scientific information, the Commission will look into the opportunities to support the development of alternative feedstocks in plastic production.” Furthermore, to further innovation the Commission pledges to provide direct financial support through the European fund for strategic Investment and other EU funding instruments (e.g. structural funds and smart specialization strategies, Horizon 2020). The commission is also in the process of developing a Strategic Research Innovation Agenda on plastics to guide future funding decisions. Through this support the costs of production of products from waste can be, in some cases, diminished. However, this does not solve the problem as this funding will only affect certain funded projects (unless innovative cost efficient ways of using waste as a resource are found). The price of conventional virgin materials will have to rise or other ways would have to be found to negate the difference in costs (e.g. taking aboard CO2 costs of virgin materials).
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**4. Bio-based chemicals**

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biosurfactant	<p><b>Bottleneck XXVII.4.5</b> A representative from an EU-funded project (13) said that it was highly recommended for the Communication to become mandatory in all Member States as soon as possible, thus categorising the non-binding nature of the document as a bottleneck.</p> <p><b>Bottleneck XXVII.4.6</b> The representative from the EU-funded project (13) said that promotion (by an action plan) of the transition from plastics to bioplastics in the EU from production to the market would be</p>	<p><b>Driver XXVII.4.1</b> The representative from the EU-funded project (13) said that the Strategy would tackle the market bio-products and bioplastics.</p>	<p><b>Bottleneck XXVII.4.5</b> The Strategy from the Commission presents a vision and provides guidelines for stakeholders, and therefore, the possibility for those stakeholders to present their input. <a href="#">Annex I</a> to the Communication contains a list of future EU measures to implement the Strategy. Among these actions are revisions of Directives and Regulations. These actions will be binding upon the Member States.</p> <p><b>Bottleneck XXVII.4.6</b> In its Strategy, the Commission announced a number of actions on compostable and biodegradable plastics. These include the start of work to develop harmonized rules on defining and labelling compostable and</p>

	beneficial.		biodegradable plastics and to conduct a lifecycle assessment to identify conditions where their use if beneficial, and criteria for such application. Besides this, the Commission is working on starting the process to restrict the use of oxo-plastics via reach.
(Poly) lactic Acid		<p><b>Driver XXVII.4.2</b> The representative from an EU-funded project (13) said that the Strategy acknowledges that bio-based feedstock for plastic packaging as well as compostable plastics for separate bio-waste collection contribute to more efficient waste management and help to reduce the impacts of plastic packaging on the environment.</p> <p><b>Driver XXVII.4.3</b> The representative from an EU-funded project (13) said that the revised Waste Framework Directive allows biodegradable and compostable packaging to be collected together with the bio-waste and recycled in industrial composting and anaerobic digestion, which has already successfully been implemented in several Member States.</p> <p><b>Driver XXVII.4.4</b> The representative from an EU-funded project (13) said that by 2023, separate collection of bio-waste is set to be mandatory throughout Europe. Biodegradable plastics verifiably help to collect more bio-waste and ultimately contribute to reaching the new recycling targets. Relevant European standards, such as the harmonized standard EN 13432 for industrially compostable plastic packaging can serve as basis for future standards for composting outlined in the agreed revision. According to the representative it can be assumed from that perspective that biopolymers (including the partly biotechnological production of the required monomers) will play a major role in order to meet the before mentioned aspects. If we could foresee</p>	<p><b>Bottleneck XXVII.4/5.7</b> The various actions announced by the Commission in <a href="#">Annex I</a> can help to optimise the current biotechnical processes.</p> <p><b>Driver XXVII.4.1</b> The actions announced by the Commission in its Strategy (see Bottleneck XXVII.4.6), combined with an increased focus on decreasing the dependence on fossil-fuel based plastics will lead to a stronger demand for bioplastics.</p> <p><b>Driver XXVII.4.2</b> In paragraph 2 it is mentioned that these types of plastics currently represent a small part of the market, in the future they can help reducing dependency on fossil fuels.</p> <p><b>Driver XXVII.4.3</b> Self-explanatory, no direct link to the Strategy.</p> <p><b>Driver XXVII.4.4</b> Self-explanatory, no direct link to the Strategy.</p>

		OFMSW as a possible feedstock for such fermentation processes the further composition and behaviour of MSW (e.g. food waste together with packaging materials) will probably influence the pre-treatment and subsequent processing, respectively.	
Adipic acid & Muconic acid & 1,5-pentanediamine	<b>Bottleneck XXVII.4/5.7</b> A respondent from an EU project (H2020) (8) said that the Strategy is aimed at process efficiency, while current biotechnological processes are not yet optimized. This can result in products having a greater impact than that they would have at an industrial-scale production. It can lead to a rejection of the materials/products.		
<b>5. Bio-based plastics</b>			
<b>Bio-based product</b>	<b>Bottlenecks (&amp; recommendations)</b>	<b>Regulatory drivers</b>	<b>Analysis</b>
Biobased plastics	<b>Bottleneck XXVII.5.8</b> A representative from an EU-project (14) said that the Communication requires more plastics recycling in terms of quality and quantity and that the Communication stresses the need of a regulatory framework for biodegradable plastic. Specific references to bio-based plastics and measures thereto could not be found.	<b>Driver XXVII.5.5</b> Representatives from an EU-funded project (9) mentioned that start of work to develop harmonized rules on defining and labelling compostable and biodegradable plastics.  <b>Driver XXVII.5.6</b> Respondent (9) mentioned the to be conducted lifecycle assessment to identify conditions where the use of bioplastics is beneficial, and the criteria for such application.  <b>Driver XXVII.5.7</b> Respondent (9) described the Commission's proposed action to pursue work on life-cycle impacts of alternative feedstocks for plastics production as a	<b>Bottleneck XXVII.5.8</b> The Commission Strategy does contain a number of actions regarding bioplastics. These actions can be found in <a href="#">Annex I</a> . These actions are mentioned in the analysis for Bottleneck XXVII.4.6. However, according to a respondent it is overlooked that there are various technical applications where biodegradable plastics have a technical function (for instance biodegradable mulch films, fertilizer coatings) and standards and targets for a minimum biodegradability still have to be developed.  <b>Bottleneck XXVII.5.9</b> Among the actions included in the Strategy are actions to promote investment and innovation in the value chain (see <a href="#">Annex I</a> ). These actions include examining the feasibility of a private-led investment fund to finance investments in innovative solutions and new technologies aimed at reducing the environmental impact of primary plastic production, and direct financial support for infrastructure and innovation through the European Fund for Strategic Investment and other EU



		<p>driver.</p> <p><b>Driver XXVII.5.8</b> Respondent (9) praised the Commission’s proposed action to make better use of economic instruments, especially to raise the costs of landfilling and incineration.</p>	<p>funding instruments (e.g. structural funds and smart specialisation strategies, Horizon 2020).</p> <p>This funding could lead to a smaller disparity between subsidies for biogas produced with the same feedstocks as PHA and subsidies for PHA production. However, as a respondent states, the analysis above relates to reducing the required funding of investment. However biogas production subsidies are often production/operation related (per m3 of biogas). Such operational subsidies are not available for bio-based products, thus leading to an unlevel playing field.</p>
<p>Polyhydroxy alkanates (PHA)</p>	<p><b>Bottleneck XXVII.5.9</b> A representative from an EU-funded project (13) pointed out that there is a disparity between subsidies for biogas produced with the same feedstocks as PHA and subsidies for PHA production.</p>	<p><b>Driver XXVII.5.9</b> A representative from a waste-water management company (7) mentioned that having a better definition of biodegradable or composting will ensure that truly biodegradable plastics in different conditions, such as PHA, will gain more relevance.</p> <p><b>Driver XXVII.5.10</b> The representative from the waste-water management company (7) furthermore said that the Strategy reinforces the importance of using their own resources (carbon) to produce plastics.</p> <p><b>Driver XXVII.5.11</b> A representative from an EU-funded project (13) mentioned that establishment of a clear regulatory framework for plastics with biodegradable properties</p> <p><b>Driver XXVII.5.12</b> A representative from an EU-funded project (13) pointed out that the Commission will propose harmonised rules for defining and labelling compostable and biodegradable plastics.</p> <p><b>Driver XXVII.5.13</b> The representative from an EU-funded project (13) said that the Commission will also develop lifecycle assessment to identify the conditions under which the</p>	<p><b>Bottleneck XXVII.5.10</b> This bottleneck is recognised in paragraph 4.2: “most currently available plastics labelled as biodegradable generally degrade under specific conditions which may not always be easy to find in the natural environment, and can thus still cause harm to ecosystems” To address this the Commission will take the action to start work to develop harmonised rules on defining and labelling compostable and biodegradable plastics, see <a href="#">Annex I</a>.</p> <p><b>Driver XXVII.5.5 till XXVII.5.15</b> Self-explanatory, see <a href="#">Annex I</a>.</p> <p><b>Driver XXVII.5.16</b> In paragraph 4.3 of the Strategy the Commission highlights that alternative feedstocks can be developed to avoid using fossil resources. Furthermore, the Commission mentions that, so far, Horizon 2020 has provided over EUR 250 million to finance R&amp;D in areas of direct relevance to the strategy.</p> <p>Furthermore, in paragraph 4.3, the Commission calls on public authorities to invest in extended and improved separate collection.</p>

		<p>use of biodegradable or compostable plastics is beneficial, and the criteria for such applications.</p>	
<p>Bio-Polyamide 56 / Long chain Bio-Polyamides / Polyhydroxy alkananoate (PHA)</p>	<p><b>Bottleneck XXVII.5.10</b>  A representative from an EU-project (11) said that it is recognised that most currently available plastics labelled as biodegradable generally degrade under specific conditions which may not always be easy to find in the natural environment, and can thus still cause harm to ecosystems. In addition, plastics that are labelled 'compostable' are not necessarily suitable for home composting. If compostable and conventional plastics are mixed in the recycling process, it may affect the quality of the resulting recyclates.</p>	<p><b>Driver XXVII.5.14</b>  A representative from an EU project (H2020) (8) said that biochemical recycling is applied to recover materials and reintroduce them into the production cycle, which significantly reduces resource consumption and waste generation. Waste are thus converted into resources, which is among the main objectives of this circular strategy</p> <p><b>Driver XXVII.5.15</b>  A representative from an EU-project (11) said that the Strategy recognises that targeted applications, such as using compostable plastic bags to collect organic waste separately, have shown positive results; and standards exist or are being developed for specific applications.</p> <p><b>Driver XXVII.5.16</b>  In addition, the representative from an EU-project (11) said that new feedstocks such as food waste for the production of plastics are a recognized priority to improve the carbon footprint of plastics and to move away from fossil fuels. It is recognized this is still experimental.  For consumer applications, the existence of a well-functioning separate collection system for organic waste is essential.</p>	

## XXVIII. Closing the loop - An EU action plan for the Circular Economy

The respondents provided feedback on the communication of the European Commission: Closing the loop – An EU action plan for the Circular Economy ([COM/2015/0614 final](#)).

### 6. Bio-based chemicals

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
PLA for hot melt adhesives.	<b>Bottleneck XXVIII.4.1</b> A respondent belonging to an EU project (13) argued that further clarification is needed of aspects of biodegradation of the media for the materials, establishing real conditions and their behavior.		<b>Bottleneck XXVIII.4.1</b> Bio-based materials are addressed in the Action Plan (e.g. chapter 5.5). Here the Commission also addresses the need for attention for lifecycle environmental impacts in relation to bio-based materials.
Single Cell Oil for oleochemical industry produced by yeasts	<b>Bottleneck XXVIII.4/5/6.2</b> A respondent belonging to an EU project (14) argued for the full integration of product life cycles into waste prevention and management programmes by adaption of the current legislation along all the stages of activities.		<b>Bottleneck XXVIII.4/5/6.2</b> The bottleneck stated here, is directed at changing EU legislation along the whole product cycle. The Action Plan does suggest measures along the whole product cycle, from eco-design, production processes to waste management. This seems to support the recommendation by the respondent.

### 7. Bio-based plastics

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biobased plastics	<b>Bottleneck XXVIII.4/5/6.2</b> <i>This bottleneck was also mentioned by the same respondent (14) in relation to biobased plastics.</i>		

### 7. Bio-based food & feed ingredients

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Omega-3 fatty acids	<b>Bottleneck XXVIII.4/5/6.2</b> <i>This bottleneck was also mentioned by the same respondent (14) in relation to Omega-3 fatty acids.</i>		

## XXIX. Towards a circular economy – A zero waste programme for Europe

The respondents gave feedback on the Commission communication: Towards a circular economy – A zero waste programme for Europe ([COM\(2014\)398](#))

### 8. Bio-based chemicals

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Single Cell Oil for oleochemical industry produced by yeasts	<p><b>Bottleneck XXIX.4/5/6.1</b> A respondent belonging to an EU-project (14) considered that the strategy lacked a clear focus on the potential of biowaste recycling towards generation of resources and bio-based products.</p>	<p><b>Driver XXIX.4/5/6.1</b> A respondent belonging to an EU-project (14) found it a driver that the Strategy promotes the transformation of waste into resources and presents measures to strengthen the advantages of a better waste management.</p>	<p><b>Bottleneck XXIX.4/5/6.1</b> Although the Strategy is directed at transforming waste into a resource. There is indeed not a very clear link made between bio-waste recycling with the goal of creating bio-based products such as volatile fatty acids. However, this might be too specific for a communication. The strategy does mention the promotion of markets for high quality secondary materials and boosting recycling and reuse in general.</p> <p><b>Driver XXIX.4/5/6.1</b> The strategy is explicitly directed at modernizing waste policy (see chapter 3). Thereby transforming waste into a resource. In chapter 3 the Commission also outlines the proposed measures for better waste management of municipal waste (page 9). E.g. boost reuse and recycling of municipal waste to a minimum of 70% by 2030 and clarify the calculation method for recycled materials, etc.</p>

### 9. Bio-based plastics

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Biobased plastics	<p><b>Bottleneck XXIX.4/5/6.1</b> <i>The respondent (14) also mentioned this bottleneck in relation to biobased plastics.</i></p>	<p><b>Driver XXIX.4/5/6.1</b> <i>The respondent (14) also mentioned this driver in relation to biobased plastics.</i></p>	

### 4. Bio-based food & feed ingredients

Bio-based product	Bottlenecks (& recommendations)	Regulatory drivers	Analysis
Omega-3 fatty acids	<p><i><b>Bottleneck XXIX.4/5/6.1</b></i></p> <p><i>The respondent (14) also mentioned this bottleneck in relation to Omega-3 fatty acids.</i></p>	<p><i><b>Driver XXIX.4/5/6.1</b></i></p> <p><i>The respondent (14) also mentioned this driver in relation to Omega-3 fatty acids.</i></p>	

# ANNEXES

## Questionnaire

**PLEASE INCLUDE IN EACH TABLE THE INFORMATION RELATED TO ONLY ONE BIOBASED PRODUCT**  
**PLEASE ADD ADDITIONAL TABLES FOR EACH BIOBASED PRODUCT**

**Biobased product:** [ \_\_\_\_\_ ]

**Feedstock:** [ \_\_\_\_\_ ]

*[TIP: please indicate if the feedstock is made of the organic fraction of municipal solid waste (OFMSW) and/or urban wastewater sludge (UWWS), or a mixture between one of these feedstock with other biobased feedstock (e.g. food-processing waste, animal waste such as manure, forestry and agricultural residues, etc.)]*

**Technology readiness Level (TRL):** [ \_\_\_\_\_ ]

*[TIP: Technology readiness levels (TRL): [https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014\\_2015/annexes/h2020-wp1415-annex-g-trl\\_en.pdf](https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf)]*

**Safety aspects:** [ \_\_\_\_\_ ]

*[TIP: "If possible, please summarise or send us information on safety aspects (e.g. human health risk assessment, etc.) related to the product and its process".]*

<b>Legislation</b> <i>[TIP: This is an incomplete list of EU legislation applicable to or influencing the production of OFMSW/UWWS-based products – please indicate in the space 'other EU legislations' any additional EU legislation and add rows if needed. Please feel free to add in the spaces 'national', 'regional' and 'local legislations/policies' additional legislation at the national, regional and local level].</i>	<b>Regulatory obstacles</b> <i>[TIP: Please report in details if specific aspects of these legislations contain regulatory obstacles for this value chain].</i>	<b>Regulatory drivers</b> <i>[TIP: Please report in details if specific aspects of these legislations contain regulatory drivers for this value chain].</i>	<b>Possible recommendations to address regulatory obstacles and, support regulatory drivers</b> <i>[TIP: if you have any proposal for how to address these obstacles, please explain here].</i>
<b>EU legislations directly applicable to this value chain</b>			
<i>Animal by-Products <a href="#">Regulation 1069/2009/EC</a></i>			

<i>Fertilisers Regulation</i> <a href="#">Regulation 2003/2003/EC</a>			
<i>Proposal for a Regulation laying down rules on the making available on the market of CE marked fertilising products</i> <a href="#">2016/084 (COD)</a>			
<i>Nitrates Directive</i> <a href="#">Directive 91/676/EEC</a>			
<i>REACH</i> <a href="#">Regulation 1907/2006/EC</a>			
<i>Waste Framework Directive</i> <a href="#">Directive 2008/98/EC</a>			
<i>Proposal revised Waste Framework Directive</i> <a href="#">2015/0275 (COD)</a>			
<b>Other EU legislations</b> <i>[TIP: please add any other EU legislation or policy influencing the development of this value chain - add rows if needed]</i>			
<b>EU legislations and policies influencing this value chain</b>			
<i>Effort Sharing Decision</i> <a href="#">Decision 406/2009/EC</a>			
<i>Proposal Effort Sharing Regulation</i> <a href="#">2016/0231/COD</a>			
<i>EU Emission Trading System – Innovation Fund</i> <a href="#">2015/148/COD</a>			

Renewable Energy Directive (RED) <a href="#">Directive 2009/28/EC</a>			
<i>Proposal RED II</i> <a href="#">2016/0382/COD</a>			
Urban Wastewater Directive <a href="#">Directive 91/271/EEC</a>			
Landfill Directive <a href="#">Directive 1999/31/EC</a>			
<i>Proposal Landfill Directive</i> <a href="#">2015/0274/COD</a>			
A European Strategy for Plastics in a Circular Economy <a href="#">COM/2018/028 final</a>			
A bioeconomy for Europe <a href="#">COM_2012_0060_FIN</a>			
<b>Other EU legislations and policies</b> <i>[TIP: please add any other EU legislation or policy influencing the development of this value chain - add rows if needed]</i>			
<b>National legislations/policies</b> <i>[TIP: please add national legislations or policies influencing the development of this value chain – add rows if needed]</i>			
<b>Regional legislations/policies</b> <i>[TIP: please add regional legislations or policies influencing the development of this value chain – add rows if needed]</i>			
<b>Local legislations/policies</b> <i>[TIP: please add local legislations or policies influencing the development of this value chain – add rows if needed]</i>			



**PLEASE ADD ADDITIONAL TABLES FOR EACH BIOBASED PRODUCT**