ZEP response to consultation on Taxonomy's delegated acts.

The Zero Emissions Platform (ZEP) is a European Technology and Innovation Platform (ETIP) under the Commission's Strategic Energy Technology Plan (SET-Plan), and acts as the EU's technical adviser on the deployment of Carbon Capture and Storage (CCS), and Carbon Capture and Utilisation (CCU) under Horizon2020 R&I programme (grant agreement 826051).

ZEP supports the European Union's commitment to reach climate neutrality by 2050, defined as net-zero greenhouse gas (GHG) emissions by 2050. To this end, carbon capture and storage (CCS) and carbon capture and utilisation (CCU) technologies play a crucial role. These technologies represent a readily available, cost-efficient pathway for the decarbonisation of industrial and energy sectors in the European Union.

ZEP is pleased to provide input to the consultation on the draft delegated acts, outlined as follows:

1. Comments on the principles of the European Taxonomy for Sustainable Finance
2. Hydrogen threshold
3. Electricity threshold
4. CO2 transport
5. Biomass with CCS
6. Waste-to-Energy with CCS
7. Carbon Capture and Utilisation

1. Comments to the principles

1.a. Principles

The principle underpinning the Regulation on a European Taxonomy for Sustainable Activities is clear – any economic activity making 'a significant contribution' to at least one of the six environmental objectives while doing 'no significant harm' to the others can qualify and be labelled as sustainable. After examining the draft delegated acts on climate change mitigation and adaptation, questions regarding this fundamental assumption remain.

Different 'mitigation thresholds' for the same economic activity are used in the delegated acts. For example, in the case of '4.7 Electricity generation from gaseous and liquid fuels', the delegated act on climate change mitigation states that, to qualify under the Taxonomy, "*life-cycle GHG emissions from the generation of electricity using gaseous and liquid fuels are* ***lower than 100gCO_2e/kWh***"). On the other hand, the delegated act on climate change adaptation proposed a different threshold: "*The life-cycle GHG emissions of the activity are* ***lower than 270gCO_2e/kWh****; Life-cycle GHG emissions are calculated based on project-specific data, where available, using Commission*

Recommendation 2013/179/EU or alternatively, using ISO 1067 or ISO 14064-1; Quantified life-cycle GHG emissions are verified by an independent third party".

It is unclear how this would benefit the ultimate objective of the Taxonomy. The two different thresholds risk to undermine the core principles of the Taxonomy when the same economic activity can be evaluated against substantially different thresholds and obtain the same outcome – being defined as sustainable economic activities. There is a risk that some economic activities might choose to apply to the Taxonomy through a more relaxed threshold and qualify, without delivering any climate benefits nor supporting the EU's pathway towards climate neutrality by 2050. This risks to send a wrong signal to the stakeholders that are planning on investing in low-carbon technologies and supporting the decarbonisation – with the danger that 'business as usual' activities continue and that a fragmented policy framework hinders long-term investments in low-carbon technologies such as CCS.

The matter will be all the more complex in 2021, when the four additional delegated acts are expected to be adopted.

1.b. Declining threshold

In the report released by the Technical Expert Group in March 2020, an indication was given that all thresholds would be gradually declining in time and until 2050. This indication was especially important because it stressed that the ultimate goal is reaching net-zero GHG emissions by 2050 in a progressive yet irreversible way. By allowing higher initial thresholds, economic activities can embark on a cost-efficient pathway towards net-zero, steering towards more stringent thresholds decreasing over time. In the current delegated acts, there is no such indication.

1.c. Technology neutrality and science-based approach

The Taxonomy delegated acts must be guided by a science-based approach and remain technology neutral. However, in the draft delegated acts, this is not the case. Electricity production is treated differently depending on the source, regardless of the climate footprint. To deliver on the objective of climate neutrality by 2050, it is essential that all energy sources for electricity production state their carbon footprint clearly and transparently and complete a full and scientific life-cycle analysis. Only by assessing the actual carbon footprint of an energy source can the Commission and the Taxonomy Platform ensure that a technology-neutral, evidence-based approach is adopted.

If the Commission fails to ensure such approach, this might result into an increase in GHG emissions, as ZEP also highlighted this risk in previous input[1], and hinder the Taxonomy's own principles. Furthermore, this would not be fair for those activities that are seriously undertaking a scientific-based and irreversible transition towards emissions reductions.

[1] Zero Emissions Platform, 2020. Input to DG Clima on the Innovation Fund and lack of alignment with European Taxonomy for Sustainable Finance. Available here.

As the thresholds currently stand, ZEP cannot see that a scientific-based and technology-neutral approach has been adopted. This will have negative implications once the Taxonomy is implemented. If the thresholds were to properly reflect the carbon footprint of any energy source for manufacturing activities, all grid-connected hydrogen manufacturing would be disqualified, making it impossible to kickstart grid-connected hydrogen production in the European Union.

2. Hydrogen

The new, proposed threshold makes grid-connected hydrogen manufacturing even more difficult than previously expected, having to comply with the following technical screening criteria:

- *The activity complies with the **life cycle GHG emissions savings requirement of 80% relative to a fossil fuel comparator of 94gCO_2e/MJ** [resulting in 2.256 tCO_2eq/tH2] in analogy to the approach set out in Article 25(2) and Annex V of Directive (EU) 2018/2001 of the European Parliament and of the Council.*

As it currently stands, it is unclear how the proposed threshold of 2.256 tCO_2eq/t has been designed and further clarification is needed regarding how the threshold was developed. The steeply decreased threshold hampers the manufacturing of all types of grid connected hydrogen, including all forms of low-carbon hydrogen production from reformed natural gas with CCS from inclusion under the EU Taxonomy. Moreover, it would not allow for a cost-efficient retrofitting of SMR plants during a transitional period, which are the majority of the plants currently producing hydrogen in Europe.

This amendment was motivated by the need to align the Taxonomy's thresholds with the European Hydrogen strategy. However, there seems to be an error in the EU Hydrogen strategy – where the direct hydrogen production emissions from SMR has been mistakenly reported as full life-cycle emissions and then become the basis for the hydrogen threshold in the Taxonomy delegated act.

For the manufacturing of hydrogen (and aluminium), no grid-connected hydrogen (and aluminium) production will be possible within the EU without Power Purchase Agreements (PPAs). The current discussions underpinning the revision of the REDII delegated act are not yet finished and it is important that alignment between these pieces of legislation is ensured.

If the Taxonomy's intention to be a driver for sustainable investments until 2050, kickstarting a clean hydrogen economy through early, large-scale volumes of hydrogen from reformed natural gas with CCS will be needed. These volumes would be the basis

for the decarbonisation of energy-intensive industrial sectors, paving the way for renewable hydrogen once its production has ramped up[2].

Overall, the proposed threshold for hydrogen (and aluminium) production should decline over time, ultimately leading to climate neutrality by 2050. In the current draft delegated acts, there is no indication that the threshold will decline over time. In addition, and as stated above, the screening criteria for hydrogen manufacturing have been combined into a very challenging, single threshold, which includes the electricity threshold. ZEP would like to reiterate that, if the thresholds were to properly account for the carbon footprint of any energy source, no grid-connected hydrogen could be produced in the European Union.

3. Electricity threshold

Any methodology evaluating a sustainable action or product needs to reflect the current intensity of the grid. Especially for those activities where a connection to the electricity grid is needed, all the emissions connected to the electricity input must be taken into account.

To enable the manufacturing of low-carbon hydrogen and aluminium, ZEP recommends[3] adding Power Purchase Agreements to the electricity threshold and a methodology that ensures that such PPAs have both temporal and geographical correlation between the unit producing the threshold-compliant electricity and the hydrogen (and aluminium) manufacturing unit that is using it, in the same manner as described in the Renewable Energy Directive:

- A temporal correlation – based on when the electricity is produced and when it is consumed in the manufacturing
- A geographical correlation – ensuring that the electricity production purchased is dispatched in the same integrated electricity grid.

4. CO2 transport

ZEP is pleased to see that previously submitted comments were taken into consideration, namely with regards to the technical screening criteria adopted by the Commission: **"The CO_2 is delivered to a permanent CO_2 storage site that meets the criteria for underground geological storage of CO_2 set out in section 5.11 of this Annex; or to other transport modalities, which lead directly to permanent CO_2 storage site that meet those criteria."**

[2] Zero Emissions Platform, 2020. "The crucial role of low-carbon hydrogen production to achieve Europe's climate ambition: A technical assessment". Available here.
[3] Zero Emissions Platform, 2020. Making hydrogen and aluminium manufacturing eligible in the Sustainable Taxonomy. Available here.

ZEP urges the European Commission to clarify this also in the description of the activity – 5.11 Transport of captured CO2 – be updated as follows: "Construction and operation of CO2 pipelines, **ships, trucks, rail and barges,** and retrofit of gas networks where the main purpose is the integration of captured CO2 **for permanent storage**". It is important that this formulation is transposed and included in other pieces of legislation related to CO2 transport, such as the EU ETS Directive and the TEN-E regulation.

5. ZEP input on biomass

Challenge: Biomass is not included in the Taxonomy since the lifecycle for biomass recovery (at least 70 years) is longer than the time left until 2050.

ZEP input

The matter of the lifecycle for the recovery of the biomass prevented the TEG from including it in the Taxonomy, within the activities making a contribution towards 2050 climate neutrality. A simple answer to deal with this matter could be that, regardless of the timeline for the recovery cycle, biomass should be included in the Taxonomy if circularity and sustainability of biomass recovery can be guaranteed and verified and given a solid and scientific life-cycle analysis.

Currently, the delegated act on climate change mitigation defines '4.8 *Electricity generation from bioenergy*' as electricity generated from biomass, biogas and biofuels, the delegated act on climate change mitigation describes the activity as '*Construction and operation of electricity generation installations that produce electricity from biomass, biogas and biofuels'*. The technical screening criteria provided for the activity 4.8 'Electricity generation from bioenergy' define biomass in alignment with REDII: "*Forest biomass used in the activity complies with the criteria laid down in Article 29, paragraphs 6 and 7, of REDII Directive*".

The draft delegated act acknowledges the enabling role of CCS for '*electricity generation installations with a total rated thermal input above 100 MW*'. In this case, CCS should be applied in order for the installation to meet the required threshold. However, there is no acknowledgment of CCS under '4.*20 - Cogeneration of heat/cool and power from bioenergy*' and '*4.24 - Production of heat/cool from bioenergy*'. It is reasonable to think that applications of biomass for heat/cool will be bigger and prioritised over its applications for electricity generation.

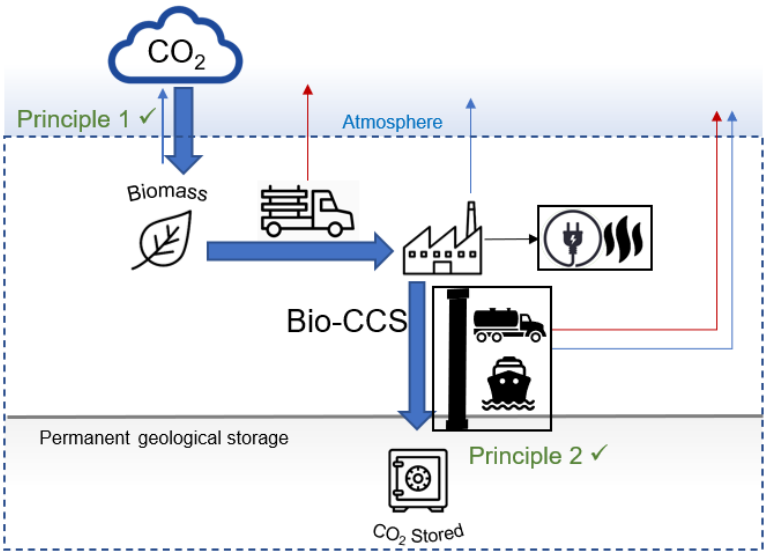
Given the competence and core expertise of ZEP – adviser to the European Commission on the deployment of CCS and CCU, the input hereafter highlights the role of CCS in relation to biomass as an essential prerequisite for all economic activities aiming to use biomass. ZEP acknowledges that upcoming CCS projects will use biomass and aim to

achieve carbon dioxide removals. On this subject, ZEP has released a report in June and a second new one in December 2020[4].

As modelling scenarios show[5], biomass for energy with CCS (BECCS) will play an important role in reaching climate neutrality by 2050 and it will support cost-efficient decarbonisation of energy-intensive industries, such as the cement industry.

The matter of biomass sustainability and lifespan for recovery is complicated and subject to past and ongoing research. The example below provides an illustration of the economic activity.

> *In a Bio-CCS process, CO2 is removed from the atmosphere by photosynthesis and bound as carbon in biomass. The biomass is combusted to generate heat and power. The carbon released is typically in the form of CO2, which is captured and geologically stored. Minor CO2 leakages are likely to occur during the processing and transport of biomass and during the capture and transport of CO2 to the storage site. A CO2 capture rate of 90% is estimated as realistic in CCS projects development. Increasing the capture rate to 95 or even 99% should only lead to a marginal cost increase[6].*



[Figure from report "Europe needs robust accounting for carbon dioxide removals", showing an example of a bioenergy plant with CCS. Biogenic (blue) carbon flows, leakages, heat and power outputs are indicated in the process. Red arrows indicate fossil leakages. For legend, view the ZEP report.]

ZEP's proposal:

[4] Zero Emissions Platform, 2020, Europe needs a definition of Carbon Dioxide Removal ; Zero Emissions Platform, 2020, 'Europe needs robust accounting for carbon dioxide removals'. Available here.
[5] Zero Emissions Platform, 2020, Review of CCS and CCU in future EU decarbonisation scenarios. Available here.
[6] Zero Emissions Platform, 2019. Policy brief on IEAGHG capture rates. Available here.

- CCS is an essential prerequisite for any plants that uses biomass to qualify as neutral or removal.
- A solid and transparent life-cycle analysis and thorough carbon accounting must be implemented throughout the process. The recommendations provided in the ZEP report 'Europe needs robust accounting for carbon dioxide removals' represent the basis to develop such a robust framework[7].
- Biomass generally requires active management. This means that sustainability criteria and forest management should be ensured and strictly monitored. If circularity is guaranteed throughout the process of biomass use, it is important to verify that biomass is allowed to regrow. The technical screening criteria applied to '4.8 electricity generation from bioenergy' represent a basis for this.
- When all the conditions outlined above are verified, the question of timescale will be of secondary importance.

6. Input on Waste-to-Energy with CCS

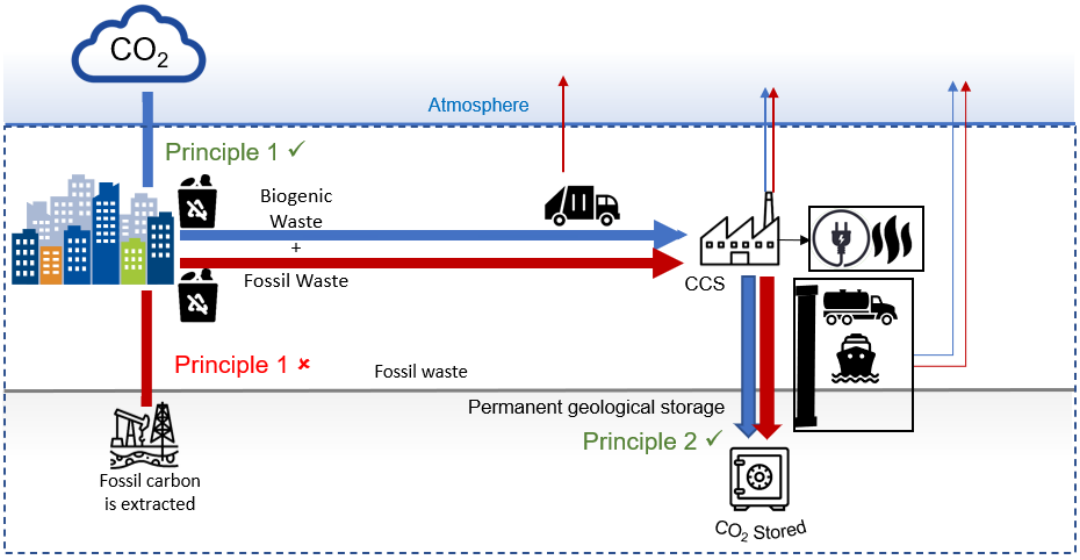
Challenge: to determine what would have happened to waste if not used for Waste-to-Energy and to determine the difference in carbon footprint.

ZEP input

For many cities in Europe, recovering energy through the incineration of residual waste has emerged as a strong climate action to avoid landfilling. Once recycling and reuse has taken place, the residual waste – which is generally half of biogenic and half of fossil origin – is incinerated to recover energy (electricity and heat).

> *Fortum Oslo Värme (FOV) Waste-to-Energy plant in Klemetsrud (Oslo) burns household and industrial waste that cannot or should not be recycled, processing around 400 000 tons of waste per year, and emitting about 450 000 tons of CO2 annually. About 50% of the waste incinerated is of biogenic origin (including food waste, textiles, wood and paper/cardboard), which means that half of the CO_2 emissions from the incineration will be part of the natural CO_2-cycle. Thus, CO_2 capture on energy recovery will in effect remove CO_2 from the atmosphere, delivering carbon dioxide removal.*
>
> *Captured CO2 will be transported and stored permanently under the seabed in the North Sea with the Northern Lights transport and storage infrastructure.*

[7] ZEP recommends adopting a cradle-to-grave life-cycle analysis. The LCA should follow the ISO standards on life cycle assessment (ISO 14040, 14044) and ISO 14067 on the carbon footprints of products.



[Figure from report "Europe needs robust accounting for carbon dioxide removals", showing an example of a waste-to-energy plant with CCS. Biogenic (blue) and fossil (red) carbon flows, leakages, heat and power outputs are indicated in the process. For legend, view the ZEP report.]

ZEP's proposal:

- CCS is an essential prerequisite for any waste-to-energy plants to qualify as neutral or removal.
- Recycling and reuse must occur before proceeding to energy recovery through waste incineration. After recycling and reuse and depending on the share of biogenic CO2 and the carbon intensity of the energy input, the origin of the energy used in the capture process and the amount of CO2 released during CO2 processing and transport, this system has the potential to deliver carbon dioxide removals.
- A solid and transparent life-cycle analysis and thorough carbon accounting must be implemented throughout the process. The recommendations provided in the ZEP report 'Europe needs robust accounting for carbon dioxide removals' represent the basis to develop such a robust framework[8].
- The commercially available C14 method determines the relation of fossil and biogenic waste that are incinerated. This method is further explained in the ZEP report.
- The economic activity of recovering energy through waste incineration complies with the fundamental 'do-no-harm' principle of the European Taxonomy, without hindering any other environmental objective.

[8] ZEP recommends adopting a cradle-to-grave life-cycle analysis. The LCA should follow the ISO standards on life cycle assessment (ISO 14040, 14044) and ISO 14067 on the carbon footprints of products.

7. Input on Carbon Capture and Utilisation

Challenge: Carbon Capture and Utilisation (CCU), Biomass and Waste-to-energy have not been accepted as sustainable economic activities in the TEG report on the EU Taxonomy. The Zero Emissions Platform (ZEP) considers that input on CCU is needed ahead of the future process of (re)assessing the potential inclusion of these activities in the Taxonomy.

ZEP input:
As a basis for the Taxonomy Platform's assessment, input is needed regarding evidence of the climate impact and proposed screening criteria, clarifying under which circumstances the technologies are sustainable according to the criteria of the EU Taxonomy. A Life Cycle Analysis (LCA) needs to be developed for all clean technologies and is a requirement for the EU Taxonomy to evaluate whether a positive effect on climate change mitigation can be delivered/enabled. For most CCU technologies, there is no LCA available to date.

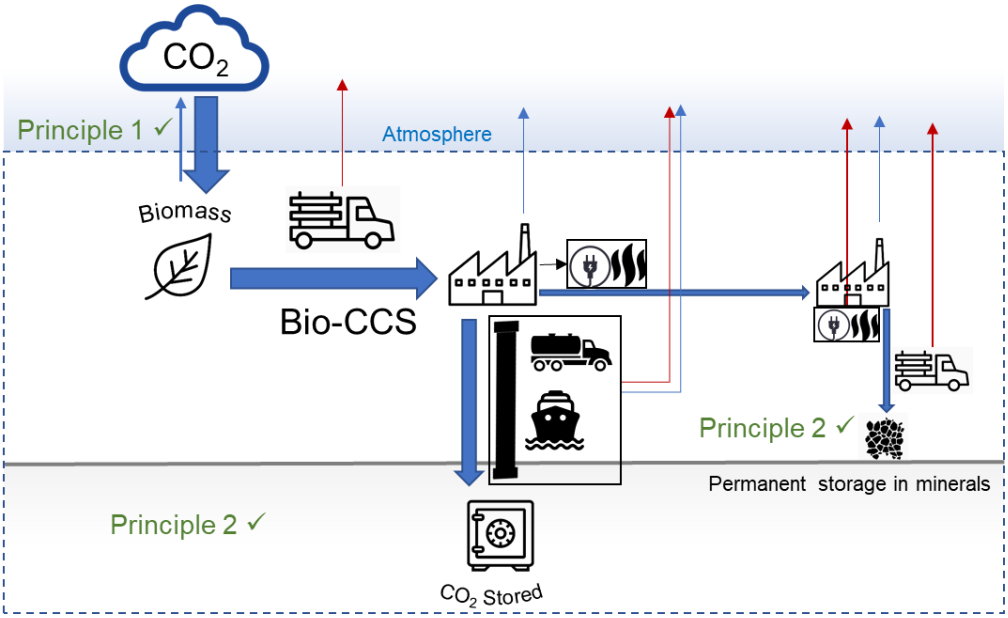
The basis for ZEP's input regarding all activities, is that climate mitigation should be the main driver and that accurate monitoring and carbon accounting must be applied. Below is:

- Proposed definition of capture and utilisation of CO_2 (CCU) and utilisation of CO_2,
- Proposed criteria, and
- The ZEP report "A method to calculate the positive effects of CCS and CCU on climate change".

Proposed definition
Capture and utilisation of CO_2 (CCU) is a process where CO_2 is captured and converted with the input of energy and/or reactant to create a product. Utilisation of CO_2 can also be done without the capture part, using (non-)concentrated CO_2 directly from flue gas.

Proposed criteria

1. ***Origin of the CO_2*** – CO_2 can originate from an **Atmospheric source** (e.g. Direct air capture, Biogenic carbon) and **Geological sources** (e.g. fossil fuels). The origin of the captured CO_2 determines whether the activity will be categorised as mitigation or result in removal of CO_2 from the atmosphere.



[Figure from report "Europe needs robust accounting for carbon dioxide removals", showing an example of a mineralisation. Biogenic (blue) carbon flows are represented together with and fossil (red) leakages, while heat and power outputs are indicated in the process. For legend, view the ZEP report.]

2. ***How the CO_2 is intended to be stored*** – There are two distinct categories: when CO_2 is **'stored in a manner that is intended to be permanent'** or **'not intended for permanent storage'**. The focus of this paper – based on the delegated act on Climate change mitigation to be approved in December 2020 – is on the applications that store CO_2 in a manner that is intended to be permanent. Other applications that are looking at reusing CO_2 with a focus on circularity will be handled when **the delegated act on 'transition to a circular economy'** is to be approved in December 2021.

3. ***Energy use in the capture/conversion of CO_2 and the resulting CO_2 emissions*** – The CO_2 emissions associated with the use of energy in the capture/conversion processes must be accounted for. It should be clearly stated that **the new product, for which CO_2 utilised, should outperform the existing product it is replacing, in respect to the overall climate change effect**. Application of **the Taxonomy's electricity threshold** is expected, with the addition similar to ZEP's recommendation to use **Power Purchase Agreements** (PPAs), and a methodology that ensures both temporal and geographical correlation between the unit producing the threshold-compliant electricity and the unit that is using it, in the same manner as described in the Renewable Energy Directive.

The ZEP report "A method to calculate the positive effects of CCS and CCU on climate change". The report[9] presents a methodology, introducing three fundamental characteristics in the form of KPIs for the classification of technologies for climate change abatement of CCU and CCS projects: 1) Mitigation effect: CO_2 to the Atmosphere, 2) Net energy consumption: Net Energy Factor, 3) Implementation period. The report also includes examples showing the value of this concept.

[9] Zero Emissions Platform, 2020, 'A method to calculate the positive effects of CCS and CCU on climate change'. Available here.