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Quantifying and Deploying Responsible Negative Emissions in Climate Resilient Pathways

Stakeholder views on the business case for NETPs

Horizon 2020, Grant Agreement no. 869192

Number of the Deliverable	Due date	Actual submission date
5.2	**30.05.2022**	**30.05.2022**

Work Package (WP): 5 – Public and Stakeholder Assessment

Task: 5.2 – Stakeholder views on the business case for NETPs

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Dissemination level: Public

Call identifier: H2020-LC-CLA-02-2019 - Negative emissions and land-use based mitigation assessment

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869192

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Document history

V	Date	Beneficiary	Author/Reviewer
1.0	2022-05-17	UCAM	David Reiner, Lucrezia Nava, Celina Scott-Buechler/ Mark Preston (BELLONA), Cat Reynolds (DRAX)
1.1	2022-05-30	UCAM	David Reiner, Lucrezia Nava, Celina Scott-Buechler

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Executive Summary

The development and scalability of negative emission technologies and practices (NETPs) are dependent on the engagement of different stakeholders. Actors in the private sector and NGOs are especially important, as they are called upon to invest in or deploy the different NETPs and to legitimize projects and policies on carbon removal. Therefore, in order to shed light on the business case for NETPs, it is important to understand the perceptions of different stakeholders and highlight the barriers that emerge to their deployment and use.

To understand stakeholder views on the business case for NETPs, and its potential barriers, we conducted 46 interviews with 20 leading European environmental NGOs, 3 government agencies, and 23 companies in industries such as energy, CDR development, and agroforestry. These interviews totalled 55 hours—each interview was 72 minutes on average. Interview-based analysis allow researchers to interrogate not just interviewees' overall opinions but also the motivation and reasoning that undergird their opinions (Shrum et al., 2020; O'Beirne et al., 2020; Buck, 2018). In this way, they lend themselves to more in-depth consideration of how opinions form and what contingencies those opinions rest on. They are thus especially useful for understanding the potential roles of policies in earning a social license to operate (SLO) (Mabon et al., 2013; O'Beirne et al., 2020). In line with our aim, we focused interview questions on stakeholders' perceptions of the relative pros and cons of various NETPs as well as the regulatory framework within which they are either enabled or hampered.

Our interviews elucidated several trends. Most importantly, they reveal the barriers that stakeholders face in their engagement with NETPs, which affect both the legitimacy of NETPs-related projects and policies and the stakeholders' efforts in their development and deployment. First, we found a set of barriers faced by stakeholders interested in buying NETP credits, developing or deploying NETPs, or supporting NETPs-related initiatives. Stakeholders highlighted uncertainties in the present and future policies and markets and, relatedly, current and future business cases for NETPs as some of the main reasons for continuing business as usual and thus not engaging with NETPs. There was a strong indication that one helpful role for policy would be to reduce uncertainty and encourage industrial clusters of technology-based NETPs to promote synergies between different stages of industrial carbon removal, i.e. CO_2 capture, transportation, and storage. If policies do not address the sources of uncertainty, the risk is that organisations (in particular in the private sector) will only engage in NETP projects that are aligned with and/or similar to their current operations and business models. These "familiar" solutions, however, are not necessarily the most effective or efficient ones to reduce or remove CO_2, and therefore focusing exclusively on them might represent a cost not only for the organisation but for the society as a whole.

Second, we found that issue framing and interaction with existing value-sets are crucial to hindering or catalysing engagement with NETPs. In particular, stakeholders differ on their perceptions about nature- and technology-based solutions, also due to historical differences in the use and understanding of forests and nature. These differences can also be ascribed to different frames – in particular whether NETPs are evaluated in comparison with existing alternatives or in absolute terms. Taking a relative perspective involves accepting some risks and developing and using a mix of NETPs. This approach assumes that the alternative of not capturing enough CO_2 in the required timeframe is worse. By contrast, stakeholders taking a more absolutist view are more inclined to separately consider the risks associated with each NETP and adopt the precautionary principle to avoid the negative and potentially irreversible consequences that some NETPs might entail. The problem is that these two perspectives, both based on sound moral and scientific

arguments, are not compatible, and the presence of such different assumptions and frames prevents the constructive dialogue among stakeholders that is essential for policy formulation (de Bakker et al., 2019; Mena & Palazzo, 2012; Rasche, 2012).

Finally, we identified tensions between social and ecological objectives, as well as across different ecological objectives such as CO_2 removal and biodiversity. These trade-offs between objectives and priorities further damage the dialogue among stakeholders, who tend to prioritize opposite poles of each tension. In addition, setting targets and measures that take into consideration only one dimension (e.g., carbon sequestration) emerges as problematic. Given the intricate interrelationships among the elements of social-ecological systems, focusing on a single dimension carries the risk of worsening the status of other dimensions, such as biodiversity or food security.

Based on our findings, we arrive at several policy recommendations. First, there is an urgent need for clarity and long-term certainty in regulatory frameworks, both at the level of the EU and within governments of individual member states. In particular, policies that support the establishment of industrial clusters will be important for the success of technology-based approaches like direct air capture (DAC) and bioenergy with carbon capture and storage (BECCS). Supporting policies around storage and monitoring, reporting, and verification (MRV) can help fill gaps in private investment by establishing minimum standards and providing greater confidence to the actors in such industrial clusters. We also find that stakeholders are sensitive to how NETPs are framed, indicating that messaging should be tailored to specific stakeholder worldviews and geographies. Finally, we find that a systemic policy approach, rather than one focused on specific aspects of NETPs, will be useful to help clarify policymakers' broader vision and allay worries about the future investment environment and NETP viability. As such, policies that address multiple objectives and that can create connections between components of climate action and social and ecological welfare are critical.

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Introduction

Negative emissions technologies and practices (NETPs), which remove CO_2 from the atmosphere in ways that are intended to be permanent (Tanzer & Ramirez, 2019), are increasingly seen as essential tools in the global pursuit of the Paris Agreement goals of keeping global warming well below 2°C (preferably 1.5 °C) (Fuss et al., 2018; IPCC, 2022). Although many traditional climate solutions like renewable energy and adaptation have became less contested over time, the debate around NETPs has recently emerged and many of these solutions are internationally contested among stakeholders (see Deliverable D5.1). It is thus uncertain whether NETPs (either individually or as a class) will secure a social license to operate (SLO), defined as ongoing public acceptance of a technology or practice (see Deliverable D5.1). Without some certainty of SLO, investments in NETPs take on additional risks (O'Beirne et al., 2020). The private sector, which has been a central driver of innovation in NETPs, is often especially wary of assuming high risk given companies' profit motives and responsibilities to shareholders (Honegger et al., 2021). Literature focused on enablers for NETP development and deployment has thus emphasized the dual role of innovation and supportive policies (Peters & Geden, 2017; Carton et al., 2021; Honegger et al., 2021). Supportive policies, including tax benefits, emissions trading schemes, direct government procurement, and carbon removal obligations can help to de-risk investments and assure future demand for removals (Bednar et al., 2021), but also run the risk of undermining other social or environmental efforts if done incorrectly.

For NETPs to be deployed at scale and contribute to reaching net-zero targets by 2050, there needs to be a clear business case for the development and deployment of NETPs that can only be sustained with clear incentives and regulations (Carton et al, 2020), which, in turn, are tied to the specific views of a wide variety of stakeholders. Stakeholders are relevant not only to advance the research and development and the implementation of NETP-related projects but also to legitimize policies and initiatives from other stakeholders. However, each stakeholder's views of NETPs (as a whole as well as individual NETPs, i.e. afforestation/reforestation, direct air capture, bioenergy with carbon capture and storage) are bound to be different. Even so, research reveals trends in opinion among stakeholder groups (see Deliverables D5.1 and D5.3). For example, companies tend to be broadly supportive of NETPs as a climate strategy, and especially so of NETPs like bioenergy with carbon capture and storage (BECCS) that have industrial co-benefits (Deliverable D5.3). NGOs, on the other hand, tend to be more sceptical of including NETPs in climate goals and tend to favour land- over technology-based options (Deliverable D5.3). Many of the concerns raised about NETPs' role in climate policy centres on the potential for so-called moral hazard: the possibility that society's ability to remove emissions from the atmosphere will dissuade actors from ambitious decarbonization (Carton et al., 2020). To address this moral hazard, researchers have proposed that policies play a coordinating role between decarbonization and negative emissions by separating targets for each to avoid blurring the two goals (Deliverable D6.2; McLaren et al., 2019; Reiner et al 2021). In sum, to understand the business case for NETPs and the potential barriers to their development and deployment, we need to shape policies that best address stakeholders' needs and concerns and create incentives for different types of stakeholders to engage with these solutions in an effective way.

The purpose of this study is to investigate the perceptions of different stakeholders in order to outline the barriers that can impede the business case for NETPs development and scalability, as well as to propose policy recommendations that can curb these barriers. The rest of the deliverable is organised as follows: In the next section, we describe the method used for data collection and analysis, which is based on qualitative data from 46 interviews with different stakeholders (55 hours of recording). We then report the results, centred on the three most prominent barriers that emerge: (i) uncertainty about the development of market

mechanisms and policies regarding NETPs, (ii) the coexistence of different perceptions and framings among stakeholders, and (iii) tensions between the goal of removing CO_2 and other equally prioritized social or environmental goals. Finally, we propose some policy recommendations to reduce and address these barriers and promote the informed development of NETPs.

1. Methods

To shed light on the business case for NETPs, and the potential barriers to it, we implement a qualitative analysis based on semi-structured interviews with various stakeholders, including members of environmental NGOs and representatives of government agencies and companies. This type of analysis allows us to delve into the barriers related to each NETPs' business case in greater depth compared to a quantitative analysis. Such a detailed study allows us to develop policy recommendations that can help inform decision-makers.

We started by identifying the set of relevant stakeholders. Through an extensive internet search process, we compiled a database that included individuals from 298 environmental NGOs and 279 private sector organisations (used also to identify the relevant stakeholders for the analyses reported in Deliverables 5.1 and 5.3). Inclusion criteria were a substantive presence in Europe (even in the case of organisations with headquarters located on other continents) and an interest in European Union policies for climate change mitigation, either because of the sector, as in the case of climate organisations or companies in the energy sector, or because of a declared interest of the organisation in the deployment of NETPs, expressed through reports, public comments, or media statements (their analysis is the object of Deliverable 5.1 on social license to operate). A few relevant members from each organisation were selected based on their expected knowledge and expertise, interest, and decision-making power within the organisation they represented (e.g. senior policy officers for NGOs, senior executives for NETP developers, or relevant experts and project managers/sustainability managers in larger companies). The final database included a total of over 1000 stakeholder members' contacts.

Out of this larger sample, we selected 150 stakeholders to invite for an interview on a rolling basis (about 20-25 per month). We employed multiple criteria when selecting interviewees. First, we set out to interview stakeholders who have key roles in the debate over negative emissions and for whom NETPs are (or will be) central to their organisation's future strategy or where individuals have displayed expertise, as evidenced by the publication of reports or other organisational documents on the topic. This is the case, for example, with the main environmental NGOs active in Europe, as well as some companies in the energy or agroforestry sectors. Indeed, in this type of analysis, the quality of the information provided is more important than the representativeness, and informants must be knowledgeable about the topic. Another criterion was to invite some of the participants to the series of workshops we organised (the results of which are analysed in Deliverable 5.3). The discussion that constituted part of the workshop allowed us to select from the participants some stakeholders who presented relevant viewpoints and insights and elaborate on them through the interviews. Finally, we tried to maintain at least some representation of the different sectors involved, including sectors such as aviation and automotive, as well as geographic representation, to capture the differences in these dimensions that also emerged from the analyses included in Deliverables 5.1 and 5.3.

Interviews began in May 2021 and ended in April 2022, with approximately one interview carried out per week. We conducted a total of 46 semi-structured interviews lasting an average of 72 minutes (between 60 and 90 minutes) for a total of 55 hours of recording time. The interviews were held virtually via video call on the Zoom platform (thus facilitating access to stakeholders in different geographic areas while facilitating

nonverbal communication between interviewer and interviewee through video). Interviews were conducted in English, recorded, and transcribed. The transcripts were saved anonymously (retaining only sector and geographic area). Figures 1 and 2 show the geographical and sectoral distribution of the sample. Regarding sectors, we focus on representatives of the private sector and NGOs. Twenty respondents work at NGOs, while 23 were from the private sector (10 representatives of the utilities or oil & gas sector, 3 from the agroforestry sector, 3 developers of NETPs, and the remaining respondents were from other sectors such as finance, automotive, or aviation). Moreover, despite not being the primary focus of our data collection, we interviewed three government agency representatives, given their knowledge about the evolution of the debate among stakeholders. Regarding geographical distribution, 18 informants are part of organisations with an international scope (10 who work at the European level based in Brussels and 8 with a worldwide remit), 8 are based in the UK, 3 in France, 3 in Germany, 3 in Finland, and the others in other countries such as Italy, Hungary, or Estonia. The interview protocol included questions regarding opinions on European Union or governments policies, pros and cons of each NETPs, and interaction with other stakeholders (it is important to notice that semi-structured interviews do not have the same script for every interview but only themes to be discussed and it is the interviewer who, based on the conversation, decides what questions to ask).

We analysed the verbatim transcripts from the interviews following Gioia's inductive coding (Gioia et al., 2013). We started by familiarizing ourselves with the data collected, translating and reading all the documents various times and annotating the emerging themes. In the second stage, we used NVivo to code inductively each interview, in an exploratory coding procedure to find the main topics emerging from producers' statements (Strauss & Corbin, 1998), adhering faithfully to informant terms. In the third stage, we followed the Gioia method to move from first-order concepts to second-order themes to final aggregate dimensions. We looked for similarities and differences among the original first-order concepts, and we grouped them into second-order categories. We finally conducted a 2nd-order analysis to further aggregate the emerging categories into three overarching dimensions that represent the three main barriers to the business case for NETPs, discussed in the next section.

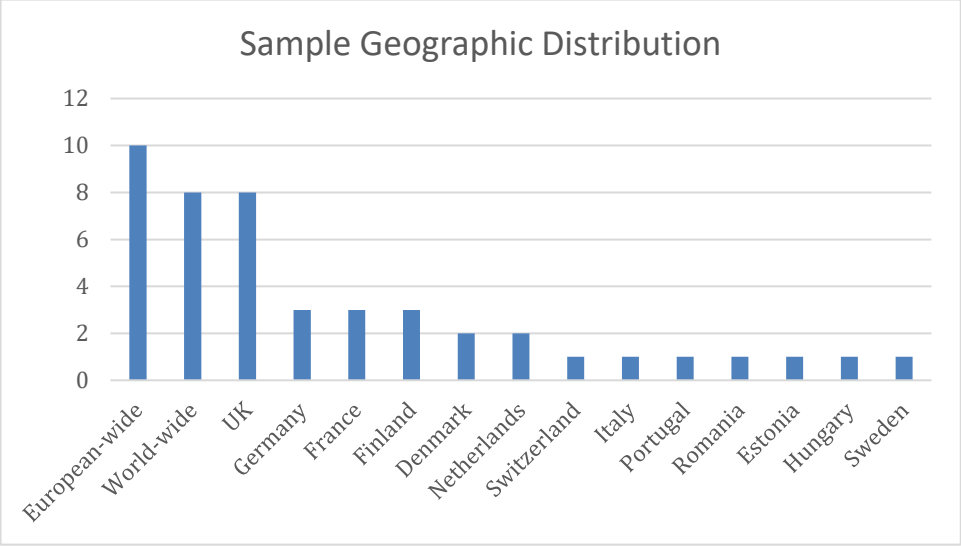

Figure 1 - Geographic Distribution of Informant

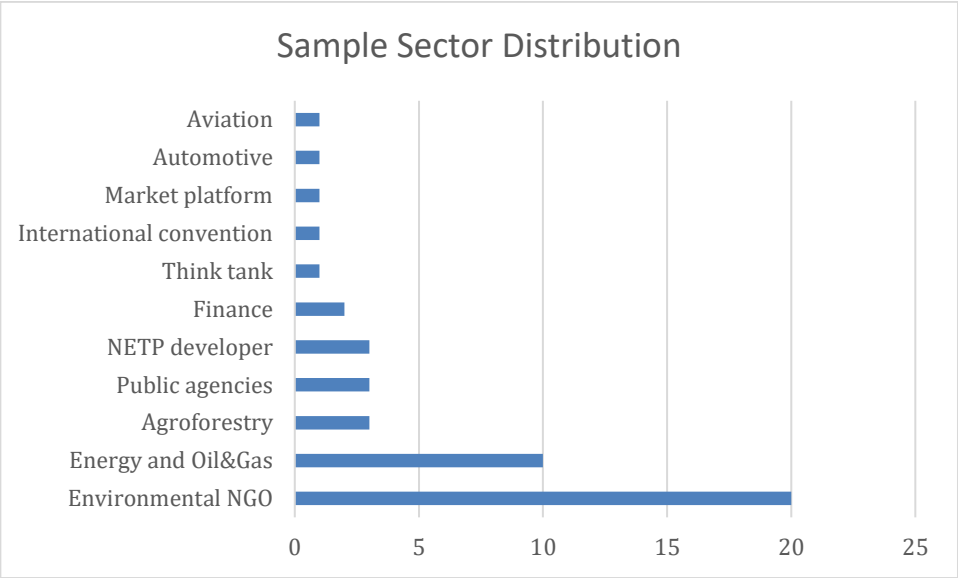

Figure 2 – Sector Distribution of Informants

2. Key findings

As our results indicate, most stakeholders believe that the use of NETPs is necessary in order to achieve net-zero, although there is variation in the perception of which NETPs are most promising and in what quantity they should be deployed, depending on differing perceptions of the costs, timing, and risks of each NETPs. However, the business case for many NETPs remains unclear. Indeed, stakeholders have highlighted important barriers that undermine their development and scaling. In particular, we discuss three main barriers in this section: 1) uncertainty about the development of market mechanisms and policies regarding NETPs, 2) coexistence of different perceptions and framings among stakeholders, and 3) tensions between the goal of carbon removal and other high-priority social or environmental goals. The next lines explore each of these barriers in more detail.

2.1 Barrier 1: Uncertainty about the development of market mechanisms and policies regarding NETPs

Uncertainty, especially regarding the regulatory environment, emerged as a major barrier to the development of NETPs.

Many stakeholders, especially in the private sector, point out how they are unable to justify investing in deployment or even research and development of NETPs because the relevant legislative frameworks are unclear. There is a lack of certainty about what the incentives will be for this type of investment and which NETPs will be part of it, whether there is a commitment to developing a market for carbon dioxide removals, who is accountable for the emissions captured (the organisation who captures them or the one who pays for them), and what future prices for capturing carbon will look like. In addition, the legislative framework should be clear and credible not only for the next 5 or 10 years but for the next 20 or 30 years, because this is the timeframe that many companies adopt when considering such investments. This uncertainty makes it particularly difficult to incorporate investment in NETPs into organisational models and routines. Several organisations point out that, in this context, it is difficult to estimate the financial returns on investment in removals and thus to get key decision-makers within the organisation to discuss and approve the investment. Although most energy companies have routines to address and model energy price uncertainty, assessing and including regulatory/market uncertainty regarding NETPs into their models and decision-

making process is for them more challenging, as evidenced by the following quote from an energy company representative:

> *"What is someone willing to pay to get rid of the carbon dioxide? How? We don't know how much they are, we are calculating on the investment cost and, but we are not finished there. We don't know what the investment costs will be… We have the uncertainties that we are used to have, like 'what is the electricity price in 10 years' or 'what is the value of the district heating in 10 years, those questions also have a great impact but we're used to that kind of questions. We have routines for how to estimate it. But for this market for carbon, and also the cost of the transport and storage, there are a lot of very large uncertainties"* (Energy sector representative)

This limitation is particularly crippling for NETPs such as BECCS and DACCS, which require a large initial capital investment. As suggested by a representative of an energy company, investing in CCS requires a large commitment in terms of initial investment since, unlike other NETPs such as biochar, it is not possible to invest in small scale and relatively cheap projects to be scaled up in the future (Honegger & Reiner, 2018).

> *"Those projects [biochar investment] are much lighter to start in a small scale, but this BECCS is such a huge project, we can't start in a small scale and there is no infrastructure, that [the infrastructure] needs to come, because we can't start in a small scale. And those who are [implementing] the transport and storage part, they can't start in a small scale either, it needs to be big to grow. It's not like the biochar, you can make some biochar and use it. It's not this, it [BECCS] requires big scale, new infrastructure investment with a lot of stakeholders."*
> (Energy sector representative)

As can be seen, many of these investments require companies to go "all in," and the risk is simply too high without a clear commitment from governments and regulators to ensure support, continuity, and stability over the next 30 years. Indeed, many companies are concerned about investing in solutions that might not later emerge as impactful. To avoid taking on this responsibility, they would like policy-makers to guide and support these choices and if the commitment is credible and long-term, they declare themselves to be willing to adapt and embrace any choice. This can also avoid risks related to internal and external legitimacy in case the chosen solutions prove ineffective.

In short, to overcome this uncertainty, many companies require greater regulatory clarity and initial support in the form of subsidies and public funds along with a mandate for polluters to pay for removals in order to be able to establish a market, which, however, must be "fair", as indicated by one energy sector representative, i.e., not only affect certain jurisdictions or companies so as not to unbalance the competition.

Another major source of uncertainty is that many NETPs will need to develop the entire "business ecosystem" (i.e., the network of organisations -including suppliers, distributors, customers, competitors, government agencies, and so on- involved in the delivery of NETPs), as it is the case for CCS, where different organisations are involved as clients and providers of either capture technologies or CO_2 transport and storage. Individual organisations therefore cannot invest without the certainty that other organisations along the chain will come on board and that complementary services, such as infrastructure and marketplace platforms, will be available, as reported by an energy sector representative in the quote below:

"There needs to be political or EU funding or something because there are so many that need to work in the same direction at the same time. Because we could build this capturing, carbon capture and liquefaction, but we can't build the storage…And that is it's also a huge investment that someone else has to do. So I think that is one reason for the need for some regulations or some "substitutes"[1]. Because there are such huge investments that are to be made by different parts" (Energy sector representative)

The regulator should therefore coordinate different organisations to develop a cluster that makes investment in NETPs more attractive.

Reducing this uncertainty must be a priority. To avoid uncertainty, companies are often driven to invest exclusively in projects that are better aligned with the organisation's routines, operations, business model, and expertise, to take advantage of synergies with existing markets and reduce uncertainty, as suggested by the following quote from an energy industry representative:

"Our district heating market is rather stable. It's quite safe, at least in the short term. But it's not possible to grow very much in that market, so that is exciting with this BECCS, that it will be adding a market to our existing market… it's always nice to find another business in connection to your old business." (Energy sector representative)

However, this narrower and more familiar approach breeds resistance to change and promotes the continuation of business as usual or the adoption of relatively timid measures that are suboptimal not only for the organisation but also for society as a whole. The risk is that, for example, even when investment in NETPs is more costly and has greater externalities than mitigation, companies may still pursue the former path because of the similarity to existing routines, business models, and competencies. As evidenced by the following quote from an NGO representative:

"Once people have picked their lane, they continue to sort of go into it and see if they can fit into the existing policy framework without having to change too much." (Environmental NGO representative)

The bias towards familiar solutions represents a possible explanation for why the risk of moral hazard is perpetuated: although mitigation is less costly and risky for companies and society as a whole, investment in NETPs is chosen because of the similarity to existing routines. Similar mechanisms are also found in choosing NETPs to invest in, explaining for instance why oil & gas companies are more likely to invest in the broad concept of "decarbonized gas", as many informants from this sector mentioned, than in renewables. This choice would allow incumbent firms to takie advantage of synergies with existing organisational routines and capabilities, including employees' skills and expertise, even if it is highly contested by other stakeholders who call for more radical changes in the energy sources. However, as the management literature points out, developing new capabilities and changing organisational routines is extremely difficult and costly (Ashforth & Fried, 1988; Gersick & Hackman, 1990; Hannan & Freeman, 1983; Weiss & Ilgen,1985). Therefore, policies must focus on creating better incentives for the development of those NETPs that, though desirable, offer fewer synergies with existing industry practices. Indeed, as our analysis reveals, the primary motivations for investing in NETPs by the private sector are external (anticipation of regulatory or other stakeholders' pressure). Policymakers can therefore play a key role in overcoming resistance to the more radical change in routine that may be needed in many sectors, such as energy.

[1] *Based on the context of the sentence, the authors believe the informant meant complements, and not substitutes.*

2.2 Barrier 2: Coexistence of different perceptions and framings among stakeholders

The second barrier is related to the differences in stakeholder perceptions and framings. Stakeholder perceptions and the related social license to operate were the subjects of the study described in Deliverable 5.1, where it emerges that stakeholders' perceptions of NETPs have profound sectoral and geographic differences, but also differ between the so-called technology-based NETPs and nature-based NETPs (Deliverable 2.2). Similarly, the framing used by stakeholders was discussed in Deliverable 5.3, where it was found that the framing adopted in the discussion, whether moral/emotional or logical/scientific, affects the process and outcome of multistakeholder deliberation. Reinforcing these findings, our analysis of stakeholder interviews reveals that perceptions and framing are potential hindrances and catalysts of the development and scaling of NETPs: depending on the value-sets in which perceptions are rooted, stakeholders might favour or contrast an engagement with NETPs.

We found that there are differences in how nature-based and technology-based solutions are perceived. In general (and especially among NGO representatives), there is a preference for nature-based solutions because they produce additional co-benefits for the ecosystem beyond carbon sequestration, but also because they have less complex processes. The more complex the process and supply chain, the higher the chances that NETPs will be opposed, especially if they conflict with natural cycles.

Interestingly, however, there is geographical variation in the way land-based solutions are perceived. In some countries, such as those in Scandinavia, where forested areas are more abundant, solutions that require active forest and land management, including BECCS production, are perceived positively. In these contexts, where there is a long tradition of managed forests and the use of biomass for heating and energy, the prevailing view is that forest management is the way to preserve forest functioning and services, even though abundance often brings up the perception that natural resources are infinite and everywhere, as the following quote from a Scandinavian-based energy industry representative reveals:

> *"Sweden is covered with forests. It has always been. You have always been cutting trees to warm your houses…There is acceptance [for using wood] for building houses and for keeping the houses warm, or for selling wood to other countries for paper. But it's part of the tradition in Sweden, so it's not so much in question as it is in the rest of Europe."* (Energy sector representative)

There is also often a lack of consideration of the opportunity cost of land use, which is "locked-in" for even hundreds of years and cannot be redeveloped, as mentioned by a public agency representative:

> *"I think it's it's seen as cheap because you just grow a tree and you leave it there and it grows and it absorbs CO2 but you have, once you take into account sort of the cost of the land and the fact that you're not going to be able to use that land for anything for the next 100 years until, well, forever. So, once you build that cost in then it becomes more expensive"* (Public agency representative)

Framing also emerges as important. Two types of framing in particular appear to be prevalent, suggesting different philosophical approaches among stakeholders. A first approach is consequentialist and is generally (but not exclusively) adopted by private sector representatives. Stakeholders who adopt this framing evaluate each option in relative terms, that is, in comparison with other available alternatives, as suggested by this quote from a representative of the forestry sector:

"The public discourse also prevents that we find solutions and means because, of course, some people say to leave the forest totally alone, that's the best solution, but that does not respond to where the timber is coming from. And then the alternative is 'okay, we don't touch the forest here, but we import timber from elsewhere', where it's much less sustainably produced" (Forestry sector representative)

From this perspective, even if a solution is not perfect and creates externalities, it is still desirable if it is among the best available alternatives, while also considering the risks of inaction. For the stakeholders adopting this framing, taking some risks and starting to invest in some NETPs is necessary despite the risks, as inaction carries worse risks and harms. They often, therefore, suggest investing in all solutions, as time will tell which ones work and which ones create problems, given the lack of time and the urgency to deal with climate change. Trust in regulatory effectiveness in solving eventual problems or reducing risks also distinguishes these stakeholders. However, this approach can be misleading if future scenarios are considered as a baseline for evaluating alternatives, as described by an NGO representative:

"It's all this history of sort of counterfactual forward-looking baselines where you can say something's going to happen, that you're going to deforest half of your forest, and then you only deforest 25% of your forest and, 'woop, you've done great'." (Environmental NGO representative)

The second type of framing, on the other hand, is normative, which is common among many NGOs though not unique to this sector. This framing seeks to evaluate each solution separately and to use the precautionary principle under which it is important to assess the risks of each NETP or policy before it is implemented, as some harms may be irreversible, as testified by this quote from one NGO:

"The way that we've constructed futures is incredibly oversimplified and this gets to the heart of the discussion about the integrated assessment models, and what we decided to choose as the handful of technologies…about, you know, what the future technological landscape looks like…land-use change on the scale of the size of China, is the land that will be converted to be used for bioenergy with carbon capture and storage. And so, you know, this type of model that's really just a socio-economic model…completely avoid the discussion about food impacts, about social acceptability, about sustainability from a lot of other different perspectives." (Environmental NGO representative)

There is also less confidence in the ability of institutions to limit risks once projects are undertaken (e.g., the risk of biomass used for BECCS not being waste biomass but the product of deforestation). The risk with this approach is that it might slow down the transition to net-zero by narrowing the number of solutions available, since the solutions that can guarantee permanence (like those involving CCS) present generally higher costs or risks while those that have fewer negative externalities on the socio-ecological system tend to have a lower permanence of captured CO_2. In sum, all scalable solutions present some major drawback, which is compounded by how differently the stakeholders perceive these drawbacks.

These different perspectives, rooted in profound value-set differences, hinder stakeholder dialogue defined as a "two-way interactive process of stakeholder engagement that involves breaking down existing assumptions and developing new ways of learning" (Burchell & Cook, 2006, p. 213). However, the measures needed to implement climate solutions and comply with international climate agreements necessarily involve multiple actors and require engagement in multistakeholder initiatives that involve both businesses and NGOs in their development and governance (de Bakker et al., 2019; Mena & Palazzo, 2012; Rasche, 2012). Stakeholder dialogue is therefore critical to addressing current environmental challenges (as detailed in Deliverable 5.3). However, stakeholder dialogue is hindered by the co-existence of these two views that

are very difficult to reconcile, despite both can be supported from a moral and scientific point of view. The risk is that the dialogue stagnates and evolves around circular arguments that do not help to reach the shared solutions needed to implement the steps necessary to achieve net-zero. It is also interesting to note that both perspectives are informed by scientific arguments although they often lead to opposing views about whether or not to support a policy or NETP. Science, therefore, cannot by itself lead to a convergence of views when philosophical perspectives diverge. Understanding and deepening the perspectives and value-sets of the stakeholders involved is necessary before specific policies can be discussed.

2.3 Barrier 3: Tensions between the goal of carbon removal and other equally prioritized social or environmental goals

Finally, the third but no less important barrier concerns the tensions and trade-offs that emerge between different goals. Tensions and trade-offs exist between the goal of CO2 removal and other equally high-priority social or environmental goals-and no available NETP seems exempt from having potential negative externalities on other goals. A first tension emerges between social and environmental goals. This tension is not only tied to fairness issues in the geographic distribution of targets across countries, discussed in Deliverable 4.3, but also to land use (and its opportunity cost). For example, NETPs involving high land-use requirements could undermine social goals such as food security, but also autonomy, development, and survival of rural and indigenous communities, as highlighted in the following quote from an NGO member:

> *"They speak of afforestation, reforestation, and blah, blah, blah, but is not with native indigenous species, it's with plantations, so they need land. And they usually take, you know, displaced communities out of their lands, and then they restrict the access to the land where they are going to establish the plantation."* (Environmental NGO representative)

There are also important trade-offs between environmental goals, and some practices that maximize CO_2 sequestration can have devastating effects on water cycles and biodiversity (especially in the case of afforestation or reforestation that does not follow restoration logic) (Madhu et al, 2021). Scholars have recognized the existence of tensions and paradoxes among the often disparate social, environmental, and economic goals (Hahn et al., 2015; Van der Byl et al., 2020) and the difficulties experienced by decision-makers in balancing these goals (Hahn et al., 2018). As social and ecological goals are "inextricably connected and internally interdependent" (Bansal 2002, p. 123), progressing on one sustainability issue (e.g.., CO_2 emission reduction) is likely to have detrimental effects on other sustainability or social goals. As pointed out in an NGO member's quote below, forests (as well as wetlands) are multifunctional, and their multifunctionality must be recognized beyond their ability to absorb CO_2:

> *"The forestry sector is much more difficult than industrial decarbonisation, because we're talking about so many different objectives of sustainable land use and finding biodiversity and producing food and producing wood."* (Environmental NGO representative)

This is why important risks emerge in setting a target that includes only one dimension, such as CO_2 absorption. Given the tensions between different targets and the intricate interrelationships between different elements of social-ecological systems, incentivizing a single dimension with targeted policies necessarily carries a risk of aggravating other dimensions, such as biodiversity or social goals. The tensions between different objectives are experienced by stakeholders as well, as suggested by an NGO representative in the quote below:

> *"So, we've seen that the area of forests have grown dramatically over the last 20 years or so, and this has sort of maintained the overall carbon sink that has happened over time. And yet, we're not seeing these improvements in biodiversity…In a nutshell, you know, everyone seems on board with the concept of multifunctionality. But in our view, we've seen an optimization for the economic output and for carbon sequestration. So the other elements can't, cannot at this stage be proven in terms of what's required for reporting"* (Environmental NGO representative)

The risk of associating nature exclusively with carbon sequestration is so high that many stakeholders do not want forests and wetlands to be part of discussions related to carbon removal.

Many stakeholders, however, recognize that focusing on a single, relatively simple goal is necessary to drive action. Indeed, trying to maximize multiple conflicting goals is often beyond the capacity of individual organisations. The complexity that emerges from these tensions is indeed too difficult to manage, and the tendency is to engage in wishful thinking and hope for "easy fix" targets or measures and to ignore trade-offs, as reported by one policymaker in the quote below:

> *"But I think that it comes from wishful thinking, that there is going to be some kind of fix, that we just have to do X and we will get Y, and we can avoid the pain and the difficulties, because they really are difficulties, in actually decarbonizing."* (Government representative)

The policymaker goes on to bring up the example of BECCS, which at first seemed to her to offer a panacea solution that could solve the energy transition, and only after policies to encourage these investments were implemented did she realize the risks associated with massive deployment of this technology in terms of land displacement. By the same token, some stakeholders report that this is why, for example, there is more hype about mitigation than adaptation (and also why solving crises is more political than preventing them).

In sum, many stakeholders recognize that while governments have so far been able to achieve "low-hanging fruit" such as coal phase-outs, more difficult decisions must now be made that may involve lifestyle changes and could have significant costs on other social-ecological goals. Resolving these tensions is difficult, exacerbated by the paradoxes that often emerge (e.g., carbon removals are necessary to achieve net-zero, but the fact that removals exist deters us from achieving the goals because of moral hazard). Stakeholder dialogue is also undermined by the fact that stakeholders are situated at different poles of these tensions (i.e. they prioritise one or the other of the goals that are in conflict with each other but both are legitimate or at least possible to legitimize). For example, oil and gas companies argue that their business should continue in order to retain jobs and meet social goals, albeit in conflict with ecological ones. Because the field is characterized by many right vs. right dilemmas (Kidder 1995), moral arguments can be used to justify any course of action. For example, in the aviation industry, one respondent points out that to achieve net-zero, biofuels will have to be used as a trade-off between fossil fuels and a total shutdown of flight activity, which would have negative effects on society. Similar examples also emerge from respondents in the agriculture sector: climate change policies are too rigid for small-scale farmers, but preserving their business and income is essential for their livelihoods and the food security of society. Here again, the tensions and paradoxes impose greater difficulty in dialogue among stakeholders and in defining the most effective solutions.

3. Key policy recommendations

Our findings point to a clear need for long-term policies that support and complement ongoing stakeholder efforts in developing, deploying, and governing NETPs. Three main issues arose in interviews and were

brought up by both civil society and private sector representatives across several countries: 1) uncertainty in regulatory frameworks and future policy support, 2) lack of sensitivity to geographic and framing diversity, and 3) piecemeal objectives as opposed to systemic planning. While significant progress has already been made by stakeholders to advance these goals, policies can act to coordinate stakeholders' efforts to both benefit stakeholders and advance more ambitious NETP capacity in the short and long terms. In so doing, policymakers should communicate NETPs in diverse ways to diverse stakeholders, drawing on their existing expertise and value-sets, in order to remove barriers to a constructive debate among stakeholders and arrive at collaborative answers.

3.1 Certainty in regulatory framework and set up a cluster and give incentives for radical changes

One of the primary themes that emerged in our interviews was the need for long-term certainty in the regulatory structure. Stakeholders pointed to the risk of engaging in a relatively new industry without the necessary enabling policies. Such policies, from clarifying underground storage permitting to committing to the purchase of removal credits to help meet net-zero and net-negative emissions targets, are essential for businesses to make financial investments, reassure shareholders, and establish secure business models. When pressed on what they meant by "long term" policymaking, many stakeholders emphasized the need to look beyond the five to ten-year horizon toward the 20 to 30 year-range. While policymaking on such long timescales can be challenging politically and procedurally, there is an emergent need for clarity at least to provide broad policy frameworks, as opposed to the uncertain and/or myopic policies that often characterise many nascent regulatory regimes. For instance, stakeholders underline the need for separate targets to complement existing long-term net-zero targets (which in many cases also need to be clarified). They call for a clearer picture of how any residual emissions will need to be balanced out with NETPs by 2050 in order to achieve net-zero emissions. Following the recommendations from the most recent IPCC report (2022), which outlines the three sequential roles of net reductions, net-zero, and net-negative, stakeholders require more certainty around when and how these goals will be achieved.

Stakeholders involved with NETPs requiring significant infrastructure build-out, especially BECCS and DACCS, underscored a particular need for policies to coordinate industries (ideally within geographical regions) at various stages of the process. This is because different organisations are often responsible as clients or providers for capture, storage, and any transportation needed between the two (e.g., carbon dioxide pipelines). One way of coordinating between these stages that came up in multiple interviews was the need for incentives for and/or direct creation of industrial clusters to optimize energy production and technology sharing while minimizing the distance between capture and storage sites. Additional investment and construction hurdles pose moral hazards for companies, which without the support of policy fall back on existing routines, business models, and competencies, thus entrenching them in business as usual. Creating more attractive opportunities to diversify and invest in otherwise risky NETPs encourages firms to move away from their traditional business models and respond to anticipatory policy requirements for sustainability.

In addition to facilitating industrial clusters for technology-based NETPs, policies are critical to filling in some of the gaps in the supply chain. Most importantly, strong government support for monitoring, reporting, and verification (MRV) is an essential first step that needs to become credible and routinised before any sort of effective regulatory regime can be implemented and can provide additional certainty, even if it is less financially attractive for the private sector (and therefore often overlooked). As NETPs are

incorporated into net-zero and net-negative goals at the firm, national, and international scales, reliable MRV will enable accurate carbon accounting and minimise reversals. Government-backed MRV is also attractive as such arrangements provide additional assurances against double-counting, leakage, or lack of additionality. Establishing a robust structure for MRV at a national or, perhaps more desirably, at a European or international level could serve both to encourage stakeholders to participate in NETPs development and deployment as well as ensure that removals are both permanent and of high quality.

3.2 Sensitivity to diversity

The second set of policy recommendations reflects the diversity of stakeholders involved in the NETP arena. Our previous work (see Deliverable 5.1) indicated significant differences in opinion of NETPs across geography and sector. We also found that the frames used to discuss NETPs can influence stakeholders' overall perceptions of NETPs (see Deliverable 5.3). In the work described in this report, we confirm that these differences occur not just at the organisational level, but also at the individual level. Together, these results may be interpreted as guidance not only for wide-reaching communications (i.e. policy reports, press conferences) but also in interpersonal communications (i.e. negotiations with representatives of certain organisations). For the most part, NGOs were found to respond more favourably to nature-based NETPs and to be more sceptical of technology-based NETPs which are perceived as less systemic (i.e., only focused on a single target, CO_2 removal). Companies also tended to favour nature-based options when planning their net-zero strategies but did not show the same level of scepticism toward technology-based options compared with NGOs. Given these findings, policymakers should develop multiple strategies for communicating NETPs, drawing on the strategies that are most likely to resonate with stakeholders depending on their location and sector. For example, organisations in the Nordic countries were found to respond more positively to the whole to NETPs premised on managed forestry, including BECCS, given their history with successful production of bioenergy from forests. Policymakers in other regions of Europe, however, might be warier of raising the prospect of BECCS, particularly with most NGOs.

One important aspect of tailoring messaging by geography and sector is the framing used to discuss NETPs. Previous work shows that approaching NETPs from moral/emotional and rational/scientific frames can make a message resonate more or less with stakeholders depending on their characteristics, in particular geography and sector (see Deliverable 5.3). NGOs were found to respond better to framings of NETP-related issues that emphasized their moral and emotional dimensions, such as intergenerational or international justice. Companies, on the other hand, responded better when presented with more scientific descriptions of NETPs and the need for them in climate policy grounded more in logic than emotion. In previous stakeholder workshops (described in Deliverable 5.3), we explored these dynamics in the inter-group context whereas here we explore the interpersonal context. We found that framing the use of NETPs in terms of the alternative—i.e. overshooting the Paris Agreement's 1.5°C target—was more compelling for certain stakeholders, while others tend to discuss NETPs on their own merits. Especially where difficult tradeoffs arose for individual NETPs, such as BECCS' large land and water footprint, framing the discussion in terms of alternatives helped to reach solutions-oriented opinions, while the second approach takes a precautionary approach and avoids the deployment of NETPs, which are perceived as leading to potentially irreversible negative externalities. Ultimately, policymakers will need to find a balance and mediate between these opposing approaches to enable a fruitful dialogue among stakeholders.

3.3 Multi-criteria objectives and systemic perspective

Across stakeholder groups, regardless of sector or geography, we found one marked similarity: a clear desire for the conversation about NETPs to be more holistic but also action-oriented. Often, political and industrial silos focus policy discussions on single aspects of solution-building—in this case, NETPs' ability to remove carbon from the atmosphere. But what we found in our interviews, and indeed in workshops (Deliverable 5.3) and organisational documents (Deliverable 5.1) as well, was an emphasis on the tensions and trade-offs between NETPs being employed solely as mechanisms for carbon removal and their ability to promote environmental and social co-benefits. Stakeholders were cognizant of these tensions and trade-offs and resolved them according to their own pre-defined values to determine their support for individual NETPs. In many cases, weighing social and environmental good leads to so-called 'right versus right' dilemmas, in which one stakeholder might favour a course of action based on its ability to maximize social and/or economic good while another stakeholder might favour the opposite decision in order to maximize environmental good. The role of policy is to mediate, balance, and find a sustainable, effective compromise among these goals. For instance, policies should focus on ensuring a robust MRV system that ensures the quality and permanence of the CO_2 captured while avoiding a situation whereby the incentives focus solely on optimising for CO_2. Developing evaluation systems that assess each initiative based on its effects (positive and negative) on different goals – like the Sustainable Development Goals (e.g. biodiversity, food security, human rights…) is important to ensure that co-benefits and trade-offs among goals are considered and handled by decision-makers and reduce the risks associated with single measures and targets (i.e. net-zero emissions).

Moreover, recognising which sets of values stakeholders weigh more than others will be important for policy discussions. Further, securing multi-benefit outcomes (i.e. ecosystem services in addition to carbon sequestration) will require policy mechanisms that enable often contentious or uncertainty-laden trade-offs to be explored further and eventually resolved. As policymakers engage with diverse stakeholders, the ability to bridge competing objectives to arrive at a compromise will be critical. The fora in which these stakeholder discussions take place will also be important, with a clear need for fair, inclusive, and diverse stakeholder participation. While bringing together stakeholders that often mistrust each other (per Deliverable 5.3) may seem counterintuitive, our work suggests that weighing trade-offs is best accomplished when opposing value sets can find common ground.

4. Conclusions and further steps

In conclusion, our analysis reveals that stakeholder perceptions of the business case for NETPs are affected by some important barriers that impede the diffusion and development of NETPs. In particular, these barriers impact the risk stakeholders are willing to take, and especially the resistance to change organisational routines to invest in NETPs that are more dissimilar to current operations. Similarly, these barriers undermine the constitutive dialogue among stakeholders involved in the policy arena, which is essential to ensure the legitimacy and feasibility of policies regarding NETPs. In addition, stakeholders are aware that CO_2 removal cannot be the only objective, and that trade-offs must be made between a climate goal and other relevant social and environmental objectives. European policies seeking to foster the development and deployment of NETPs must therefore focus on reducing regulatory uncertainty,

committing to robust policy frameworks for the coming decades despite inevitable policy changes, and coordinating the development of the fully-fledged business ecosystems that investing in many NETPs will require. Similarly, understanding the different perceptions and framing of the various stakeholders involved can lead to improved dialogue among stakeholders, reducing the gridlock and circular arguments that often impede the debate. Finally, climate policies aimed at NETPs must be reconciled with those related to other social and environmental goals so that trade-offs and tensions between different goals are resolved without one target prevailing at the expense of others.

In preparing this report, the following deliverable/s have been taken into consideration:

D#	Deliverable title	Lead Beneficiary	Type	Dissemination level	Due date (in MM)
2.2	Interactions and trade-offs between nature-based and engineered climate change solutions	UOXF	R	Public	17
4.3	Identify Member state targets for CDR	ICL	R	Public	17
5.1	Measuring Social License to Operate for Different NETPs	UCAM	R	Public	18
5.3	Stakeholder Perceptions of NETPs Governance	UCAM	R	Public	18
6.2	Principles for carbon negative accounting	CMW	R	Public	18

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