Ensuring the Significance of 'Do No Significant Harm'

Shortfalls of the DNSH principle and recommendations for improvement

ZOE Institute for Future-fit Economies & New Economics Foundation

Transformation Policy Brief #9 – 6/2022

Imprint

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Please cite as

Miller, C. and Davies, W., Korinek, L., Dastbaz, M. (2022): Ensuring the significance of do no significant harm. ZOE Institute for Future-fit Economies: Cologne.

Transparency

The financial support of the MAVA Foundation is greatly appreciated to make this work possible.

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Table of Contents

Introduction **3**

What is the DNSH principle? **4**

DNSH and the EU Taxonomy *4*

Application of the DNSH principle in EU funds *6*

DNSH application in NRRPs **7**

Insufficient application of DNSH in NRRPs *8*

Vague application of key principles *9*

Reflections on the Technical Guidance for NRRP *8*

European Commission assessment *10*

Common challenges and different structures between Member States *11*

Recommendations for future DNSH application **12**

Content recommendations *12*

Remove allowance of nuclear and gas 12
Add lifecycle assessment 12
A qualitative framework is needed so that potential risks can be identified 13
Mechanisms for non-compliance 13

Procedural recommendations *13*

The DNSH Digital Hub 14
The DNSH Expert Network 14
A DNSH stakeholder learning platform 14
A robust and transparent monitoring system 14

Introduction

The implementation of the do no significant harm (DNSH) principle is a major step forward in efforts to subject investments, and in particular public investments, to closer scrutiny of their contributions to the green transition. In the past, monetary assessment methods for evaluating environmental impacts, such as cost-benefit analysis or cost-effectiveness analysis, have often been criticised for their shortcomings[1] [2] [3], as they focus on concepts that are linked to monetizable costs only. In this logic, other values, such as social values, could not be captured, because they are harder to monetise so these methods often led to making decisions based on only one type of value[4]. Hence, a multi-criteria valuation method is needed to allow for a more flexible approach that considers a variety of objectives, which the DNSH framework represents.

Decisionmakers are often faced with difficult trade-offs, when considering, for example, policy measures that contribute to climate change mitigation but compromise other environmental objectives. **The DNSH is important because it requires a more holistic consideration of the impacts that reforms and investments will have on other policy areas.** This presents an excellent and essential opportunity to prevent harmful trade-offs and improve environmental outcomes. Previously used funding mechanisms did not take a long-sighted approach to investment and did not take all factors into account. As a result, they focused on a specific environmental or social objective without sufficient consideration of other objectives. For example, the targets and metrics used to evaluate investments focused on carbon emissions at the expense of other important environmental data such as clean water, waste, and biodiversity management. With the DNSH principle, there is a holistic approach to investment which takes into account good performance in a given environmental aspect, while also meeting minimum standards in other aspects[5].

However, while the DNSH is an important step towards meeting multiple objectives at a time, **our analysis of Member States' National Recovery and Resilience Plans (NRRPs) under the Recovery and Resilience Facility (RRF), has shown[6] that the application of this principle did not reach its full potential**; there have been significant gaps and inconsistencies. For example, in contrast to the life cycle approach laid out in the EU taxonomy for sustainable investment (EU taxonomy), neither the environmental impact, the acquisition of new equipment, nor a possible increase of energy use was taken into account for digitalisation measures. Additionally, re-use policies were missing across components.

A more robust and coherent application and implementation of this principle is critical, especially as this method will now also be used for future funding instruments at EU level. This policy brief investigates the application of the DNSH assessment in the Member States' (MS) National Recovery and Resilience Plans (NRRPs) as a basis for guidance for a more rigorous and evidence-based application in the future. Based on our analysis of the shortcomings of the DNSH application in the NRRPs, we present proposals for substantive improvements for its application in public financing. In addition, drawing on qualitative interviews with relevant officials, we propose recommendations for procedural improvements, workflows, and governance for how policymakers apply the principle in practice. It is important to reflect on the lessons learned from DNSH application in the NRRPs so that the process can be improved to deliver on the aspirations of this tool to ensure multiple environmental objective, as well as environmental objectives that are embedded within other objectives, are equally considered and met across all sectors.

This brief is structured as follows: First, we explain the background of the DNSH principle, its links to the EU Taxonomy and the Recovery and Resilience Facility as well as its application in future funding instruments at EU level. Next, we provide an analysis of application of the DNSH in Member States' NRRPs, followed by a critical reflection on the substantial and procedural shortfalls of the application of the DNSH principle. Building on this, we conclude with concrete recommendations for the DNSH

application, both on content and procedural aspects, to ensure for a more stringent and robust DNSH assessment in the future.

What is the DNSH principle?

This section gives a background on how the do no significant harm principle was created and how it is applied in EU funds today. This should better contextualise the purpose of the DNSH and how it is presently being used.

DNSH and the EU Taxonomy

The background of the DNSH and the EU taxonomy are interlinked, and therefore this section will explain both, and their relation. The EU taxonomy is a system of classification which defines economic activities that are environmentally sustainable [7]. The Taxonomy Regulation (Regulation (EU) 2020/852)[8], which entered into force on 12 July 2020, establishes six environmental objectives:

1. Climate change mitigation
2. Climate change adaptation
3. The sustainable use and protection of water and marine resources
4. The transition to a circular economy
5. Pollution prevention and control
6. The protection and restoration of biodiversity and ecosystems

To be considered environmentally sustainable, an economic activity must meet four criteria:

a) Contribute to one or more of the above-listed objectives;
b) **Do no significant harm** to any of the above-listed objectives;
c) Be carried out in compliance with minimum safeguards[i]; and
d) Comply with technical screening criteria.

In short, **the DNSH is one of the criteria that an economic activity must meet in order to be considered environmentally sustainable**, by way of causing no significant harm to the six environmental objectives established under the EU taxonomy.

Article 17 of the Regulation sets out very briefly what is considered to be "significant harm" to each of the six environmental objectives, "taking into account the life cycle of the products and services provided by an economic activity, including evidence from existing life cycle assessments" and further explaining that "when assessing an economic activity against the criteria [...], both the environmental impact of the activity itself and the environmental impact of the products and services provided by that activity throughout their lifecycle shall be taken into account, in particular by considering the production, use and end of life of those products and services."

To determine what activities can be considered sustainable for each objective, the Commission had to define technical screening criteria through Delegated Acts. On 9 December 2021, Commission Delegated Regulation (EU) 2021/2139 was published[9] which defined the criteria for the climate change mitigation and climate change adaptation objectives, including whether an activity contributes substantially to these objectives and causes no significant harm to the others. The criteria set out

[i] (1) The minimum safeguards referred to in point (c) of Article 3 shall be procedures implemented by an undertaking that is carrying out an economic activity to ensure the alignment with the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights, including the principles and rights set out in the eight fundamental conventions identified in the Declaration of the International Labour Organisation on Fundamental Principles and Rights at Work and the International Bill of Human Rights.
(2) When implementing the procedures referred to in paragraph 1 of this Article, undertakings shall adhere to the principle of 'do no significant harm' referred to in point (17) of Article 2 of Regulation (EU) 2019/2088.

methods by which the environmental performance of the economic activity will be measured, including defining the boundary for this measurement and the qualitative or quantitative conditions which must be met to enable the performance of the activity in a way that is considered environmentally sustainable.

Box 1: An example of the technical screening criteria

The technical screening criteria for passenger cars include an emission performance threshold of 50g CO2/km until 2025 that should not be exceeded. From 2026 onwards, only vehicles with emission intensity of 0g CO2/km are taxonomy eligible. To avoid significant harm to other environmental objectives, waste management measures must be in place both in the use phase (maintenance) and at the end of the fleet's life, including the reuse and recycling of batteries and electronics. Vehicles must be reusable or recoverable to a minimum of 95 % by weight. In addition, tyres must meet the external rolling noise requirements in the most populated category and the rolling resistance coefficient (which affects the energy efficiency of the vehicle) in the two most populated categories, as set out in Regulation (EU) 2020/740, and ensure compliance with existing EU regulation on hazardous waste and end of life treatment of vehicles (circular economy) and pollution.

While there may be technical criteria for some aspects of the taxonomy (climate change mitigation and climate change adaptation), as of the publication of this policy brief, a delegated act which covers the other four environmental objectives (the sustainable use and protection of water and marine resources; the transition to a circular economy; pollution prevention and control; and the protection and restoration of biodiversity and ecosystems) has not yet been published, thus limiting the guidance available for applying the DNSH to those objectives. According to the European Commission[10], these delegated acts should be adopted in 2022.

Box 2: Nuclear energy and natural gas in the EU taxonomy

On 2 February 2022 the Commission approved in principle a draft complementary Delegated Act[11] that was formally adopted on 9 March 2022[ii]. This Delegated Act sets out technical screening criteria for "economic activities in certain energy sectors", namely nuclear energy and natural gas, in relation to the same two objectives: climate change adaptation and climate change mitigation. This document effectively allows the use of natural gas and nuclear energy as 'transitional' energy sources, stating that:

> "As outlined in the Taxonomy Regulation, the Taxonomy covers more than climate neutral and renewable investments. It also covers economic activities that are clearly not climate neutral or renewable but could, under strict conditions and for a limited time, enable the transition towards a sustainable energy system, such as the economic activities in the natural gas and nuclear sector. They should not hamper the development of renewable resources."

This inclusion was based on feedback from the Technical Expert Group (on natural gas) and the Joint Research Centre (on nuclear). The Delegated Act justifies this inclusion by saying that there is not yet enough energy from renewable sources to meet the needs of the energy market in the EU. However, on 14 June 2022, MEPs objected to the Commission's plan to include nuclear and gas in the taxonomy[12]. The resolution[13] to veto the Commission's proposal to include nuclear and gas is scheduled for a vote during the Parliament's plenary session on 4-7 July 2022.

In the context of the Recovery and Resilience Facility (RRF), Member States needed to provide a DNSH case-by-case assessment for each reform and each investment of their RRP, regulated by Article 18 of the RRF Regulation[14]. The Commission published technical guidance[15] on the application of do no significant harm (DNSH) specifically for this context. This guidance lays out that Member States (MS) should apply the DNSH to all measures in their National Recovery and Resilience Plans

[ii] This is not in force until it is published in the Official Journal

(NRRPs), both reforms and investments. This guidance allows MS to take a simplified form for the assessment in three cases:

(1) if the measure will have little to no impact on all or some of the six environmental objectives in the taxonomy	*MS need only provide a brief justification for the objectives they contend are not significantly impacted and focus the DNSH assessment more substantially on those that are more significantly impacted.*
(2) if the measure is marked as contributing 100% to one of these six objectives	*If a measure is marked as contributing 100% or substantially to an objective, then that measure is considered DNSH compliant for that objective. The MS then must demonstrate that the other objectives are not significantly harmed.*
(3) if the measure contributes substantially to one of the six objectives	

For the substantive assessment, MS must confirm that the measure does not contribute to the factors listed in article 17 of the Taxonomy Regulation[16] and give a justification, providing supporting documents if necessary. If the justification provided is not sufficient, the Commission may decide the measure would possibly entail significant harm to the objective. Annex II[17] provides a list of supporting elements of evidence that MS can optionally refer to for support and annex IV provides worked examples of implementation of the assessment.

As outlined above, the DNSH is one of the criteria for economic activities to meet in order to be environmentally sustainable. However, a clear and consistent definition of what "significant harm" means is still not fully defined by the Commission. The RRF helped define the DNSH for the Taxonomy objectives that didn't already have technical screening criteria through a delegated act, but it was context-specific to support MS in constructing their NRRPs. As the DNSH continues to be applied to other EU funding mechanisms (see next section), more definition and guidance is still needed.

Application of the DNSH principle in EU funds

As set out in the section above, the Commission developed technical guidance for the application of the DNSH principle for its application in the National Recovery and Resilience Plans. In addition to the application of the DNSH principle in the NRRPs, the Commission included the DNSH principle as part of the Common Provisions Regulation[18] from 30 June 2021 to mainstream climate actions across EU funds. The Common Provisions Regulation represents a single rulebook to govern eight EU funds. Together, they represent a third of the EU budget.

The 8 funds covered by this common regulation are:

- European Regional Development Fund (ERDF)
- European Social Fund Plus (ESF+)
- Cohesion Fund
- Just Transition Fund (JTF)
- European Maritime, Fisheries and Aquaculture Fund (EMFAF)
- Asylum and Migration Fund (AMIF)
- Internal Security Fund (ISF)
- Border Management and Visa Instrument (BMVI)

The DNSH principle is presented as a tool to support the Union's commitments to implement the Paris Agreement and the United Nations Sustainable Development Goals. 30% of the EU budget shall contribute to supporting climate objectives. In this context, the funds under the Common Provisions Regulation are intended to support the achievement of this objective and promote activities that meet EU climate and environmental standards and priorities.

However, the Common Provisions Regulation does not set out any details on the concrete application of the DNSH principle in EU funds, nor does it specify how the compliance with the principle will be assessed by the Commission. To date, beyond the application of the DNSH principle in the NRRPs and the delegated act on sustainable activities for climate change adaptation and mitigation objectives there is also not a specific guidance published by the Commission on the application and the assessment of the DNSH principle for its specific context in the EU funds. How exactly the Member States will have to take the DNSH principle into account in the acquisition of EU funds and how the adherence to this principle will be monitored and assessed is therefore still unclear.

Likewise, compliance with the DNSH principle is a criterion for the new Guidelines on State aid for climate, environmental protection, and energy ("CEEAG")[19]. The new guidelines on the State aid rules for projects that support environmental protection were formally adopted in January 2022. They provide a framework for Member States to support activities that are needed to reach the goals of the European Green Deal and aim to help Member States meet their EU energy and climate targets. Here too, the legal text provides little information about the form in which and how rigorously the DNSH principle must be taken into account.

In general, it can be said that the DNSH principle is becoming increasingly important as a criterion for the disbursement of EU funds. This is a positive development as it ensures that the various environmental objectives are considered simultaneously and that measures which at first glance are not related to the environmental objectives do not jeopardise them. The application of the principle in the NRRPs is considered exemplary, as is also made clear in the footnotes of the Commons Provisions Regulation and the Guidelines on State aid for climate, environmental protection, and energy. Against this background, it is even more important that the framework for the application of the principle and the evaluation of compliance with the principle is rigorously and universally comprehensible as well as implementable.

What is still lagging behind, however, are concrete explanations of how the DNSH principle is applied, implemented, and assessed in these funding mechanisms. The European Commission has launched a Taxonomy Compass that aims to *"make the contents of the EU Taxonomy easier to access for a variety of users"*. The matrix displays for taxonomy-eligible activities to which objectives they substantially contribute and what technical screening criteria they must meet. The tool provides an overview of the conditions for economic activities that contribute to climate change mitigation and adaptation to be taxonomy eligible and lists the DNSH criteria. The tool is relatively easy to navigate thanks to the built-in filter option, search function, and the possibility to search for sectors. However, understanding the critical thresholds requires a high level of expertise, notably in waste management, circular economy, and pollution.

In addition, the EU Taxonomy Compass does not give any guidance on a DNSH assessment for activities that are not covered by the EU taxonomy. As the only technical guidance for Member State's DNSH assessments, this is thus insufficient on its own because the DNSH principle must be ensured for all economic activities that are funded under the instruments of the Commons Provisions Regulation.

Limitations of DNSH application in practice

The first testing ground for the use of the DNSH principle was in the NRRPs produced by MS in 2021 through the implementation of the RRF. In their NRRPs, MS were required to place sufficient attention on adherence to the DNSH principle and this therefore provided a good opportunity to observe the application of the principle. In this section, we examine the application of the DNSH principle in practice, and the limitations that this process uncovered.

Insufficient application of DNSH in NRRPs

The limitations of the DNSH assessment for NRRPs outlined above are exemplified in several cases where organisations, including ourselves, have argued the DNSH principle seemed insufficiently applied[20]. The Greens/EFA Group—a coalition of over 70 Green, Pirate, and Independent MEPs—flagged that whilst the EC has provided extensive guidance on the DNSH principle, there are a "large number of measures [in the NRRPs] that do not appear to comply with this guidance"[21]. As part of an ongoing assessment of NRRPs, a network of Civil Society Organisations (including BankWatch Network, Climate Action Network Europe, European Environmental Bureau, and EuroNatur) has similarly **warned of measures that risk non-compliance with the DNSH principle[22]. Generally, areas of concern include fossil-based heating systems & gas boilers, thermal power plants, and irrigation and flood-protection investments.**

Numerous NRRPs include gas boilers and related investments, purportedly solely as a transitional fuel. Examples include Czech Republic, whose NRRP anticipates fossil gas as a potential coal replacement, whilst Poland's NRRP similarly embraces fossil gas and leaves the door ajar for potential lock-in at the systematic level. These do not appear to be "future-proof" investments and could in fact potentially lead to harmful lock-in effects with regards to gas-related investments, contradictory to the EC's DNSH guidance[23]. Romania's plans also include measures reliant on natural gas, although the EC notes that these can "exceptionally be approved, in accordance with Annex III of the DNSH Technical guidance" as Romania supposedly faces "significant challenges in the transition away from carbon-intensive energy sources"[24]. Although Romania's RRP ostensibly seems to anticipate future adaptation to hydrogen or other green gases, campaign groups still warn of the dangers of expanding the existing fossil gas infrastructure, and the risk of locking in a fossil-dependent energy system.

Finally, NGOs have called attention to the 120-million-euro Pisão dam project within Portugal's RRP, also known as the Crato Multipurpose Hydroelectric Plant[25]. Its inclusion in the plan has sparked concern by organisations such as The Study Group on Spatial Planning and Environment (GEOTA), who warned that the construction of the dam could be a "black hole of consequences with no return"[26] as the project could severely affect biodiversity by destroying riparian habitats and cork oak forests, and possibly detrimentally affect a threatened species of steppe birds[27] .The President of Portuguese NGO ZERO, Francisco Ferreira, has called for "the need for a Strategic Environmental Assessment of the RRP, as recommended by several European NGOs, which is already being made in some countries"[28] . The EC emphasises that Portugal "is committed to conduct[ing] full environmental impact assessments relevant to these measures"[29]. However, in terms of compliance measures, the only safeguard mentioned in the EC's assessment is that these commitments are "included in two milestones, ensuring no payment request linked to the fulfilment of these milestones can be approved without DNSH compliance." Considering the scale of potential damage caused through the project, there is a risk these measures are not adequately assessed.

As highlighted above, these examples both point to the potential shortfalls in the assessment of NRRPs, where the binary nature of the rating system precludes room for nuance or extra safeguards to be put in place. This subsequently leaves the door open for potentially harmful measures to be embedded in the NRRP, and yet be awarded the same grade as other MS by the EC's standardised assessment criterion.

Reflections on the Technical Guidance for NRRP

As discussed above, a unique technical guidance document was developed to guide MS in ensuring policy measures in their NRRPs met DNSH principles. This guidance took a simplified form for the specific NRRP context, which presents several challenges. Firstly, within this guidance, some elements are vulnerable to ineffective application of DNSH. The 'simplified form' that is encouraged lends itself to potential shortcuts. For example, after emphasising the importance of the life cycle of an activity, the guidance subsequently states that "*life cycle considerations rather than carrying out a life cycle*

assessment suffices for the purposes of the DNSH assessment in the context of the RRF", which they describe in practice as "*attributional or consequential life cycle analyses (e.g., including the indirect environmental impacts of technological, economic or social changes due to the measure) are not required"*[30]. **Reducing the need for a detailed assessment in this way is likely a strong contributing factor in why discussions around life cycle are significantly vague or insufficient within the NRRPs.**

Second, the guidance does not require clear measurable metrics, stating that the thresholds and metrics found in the Technical Screening Criteria (TSC) are not required[31]. The TSC contains detailed qualitative and quantitative criteria of how to measure activities on the EU taxonomy against the DNSH principles. **The fact the TSC's detailed information and guidance is presented only as *optional* risks ineffective application of DNSH with the possibility that important criteria will not be met.**

Finally, the Commission promotes a flexible approach to application of DNSH criteria in the RRPs, indicating that "flexibility should be granted to allow Member States in limited circumstances and on a case-by-case basis to demonstrate avoidance of adverse lock-in effects by relying on accompanying measures in the RRP"[32]. While the Commission allowed for this flexibility due to the fast nature of the process and the steep learning curve facing MS to embrace DNSH, the approach does not facilitate learning or deep reflection required to fully incorporate its principles. **This flexibility combined with the simplistic scoring approach can, unintentionally, make the DNSH assessment appear more an 'administrative hurdle' MS must get over, or a box to tick, than part of a deeper learning and transformation process.**

Furthermore, such flexibility risks the emergence of loopholes, and potentially harmful actions being approved. The EC notes that "measures related to power and/or heat generation using fossil fuels, as well as related transmission and distribution infrastructure, as a general rule should not be deemed compliant under DNSH for the purposes of the RRF, given the existence of low-carbon alternatives"[33]. Limited exceptions are permitted on a case-by-case basis, "specifically to Member States that face significant challenges in the transition away from more carbon-intensive energy sources, such as coal, lignite or oil, and where a measure or combination of measures can therefore lead to a particularly large and rapid reduction in GHG emissions"[34]. The EC stipulates that these should be compliant with conditions in Annex III of the DNSH guidance to "avoid carbon-intensive lock-in effects". **Yet regardless of the emphasis of the case-by-case nature and 'limited exceptions', there is a risk that allowing such flexibility can lead to DNSH principles being bypassed.**

Vague application of key principles

Certain elements emphasised as important to the DNSH principle are generalised and vague when it comes to application. How 'life cycle' is addressed serves as an exemplar of this. Within the report and annexes related to the Technical Screening Criteria (TSC) process, life cycle is spoken about as a broad concept with little specifics involved. As part of the TSC process, the adoption of a life cycle approach, one that avoids errors such as incorrectly assuming an activity is sustainable that causes harm throughout its life cycle from production to waste, is considered. These documents then cite two example questions to consider regarding life cycle (p33)[35]:

1. What would generate significant harm during the life cycle of the activity?
2. Can this risk be addressed by complying with EU legislation and best practices, international standards, or guidelines?

Beyond this, little else is mentioned about life cycle thinking, especially regarding specifics and measurements. The only explicit mention of a life cycle indicator is found in the Annex report in relation to energy activities, where it references the use of either ISO 14067 or a GHG Protocol Product Lifecycle Standard-compliant Product Carbon Footprint (PCF) assessment to demonstrate the life cycle impacts to produce 1 kWh activity is within a certain threshold.[36]

As another priority of the EU, the digital transition, is addressed through the RRF, a life cycle assessment should be considered along the supply chain and life cycle of electronic goods in addition to policy measures. Likewise, many NRRPs include provisions to produce and promote electric vehicles in order to reduce dependence on fossil fuels. However, the lifecycle of these vehicles is also not required to be assessed, which is crucial considering the negative environmental impact of producing batteries for these vehicles[37].

European Commission assessment

The European Commission's (EC) analysis of NRRPs includes a specific section dedicated to evaluating how suitably the plans address DNSH. These sections tend to be brief, around 1-2 pages of an approximately 80–100-page document, outlining the key aspects and providing a summary conclusion, whereby a grade from A – C is applied. Unlike other aspects of the assessment, adherence to the DNSH principle is graded in binary terms where 'A' means *"no measure does significant harm to environmental objectives (the principle of 'do no significant harm')"* and 'C' means *"one or more measure does significant harm to environmental objectives (the principle of 'do no significant harm')"*[38].

In their assessments, the EC assessed all the NRRPs as a grade A. Given constant back and forth between Member States and the European Commission during the process of developing NRRPs and the explicit requirement for measures to abide by DNSH principles, this is to be expected. However, this presents some challenges. A simplistic scoring system does not fully account for the diversity of NRRPs across Member States, both in the measures they contain and details they provide. **Given the diversity of NRRPs it seems unlikely that all NRRPs would have achieved similar-enough results in applying the DNSH principle to warrant the same grade.** In our assessment of 13 NRRPs we found significant variations[39]. For example, some assessments are straightforwardly positive, such as Croatia and Spain, which are described as having numerous measures that are compliant with DNSH principles from the outset, alongside detailed DNSH assessments for each measure. Others, such as Slovakia and Denmark, are described by the EC as having conducted "adequate" or "broadly adequate" DNSH analyses respectively, whilst still being rated an 'A' on par with all Member States.

A consequence of **a simplistic scoring approach is a lack of differentiation between NRRPs around how well they are implementing the DNSH principle, and crucially, how MS could learn to improve on their approach to DNSH.** With all NRRPs assigned as sufficiently meeting DNSH requirements, examples of potentially harmful measures found within NRRPs, particularly measures offset by the inclusion of flanking (or compensating) measures[40], are more likely to get overlooked. Inclusion of offsetting activities contrasts with advice from the Commission, where they suggested it was not possible to include compensatory measures within a plan. For example, Romania receiving sufficient DNSH adherence despite their plan including significant support for road investments that have the potential to do harm to several environmental objectives - including climate change mitigation, air pollution, and biodiversity - but compensated by "the potential harm of certain mobility investments [such as green taxation] is offset by flanking measures"[41]. Similarly, Lithuania's NRRP supports developing renewable fuels sectors such as biomethane, second generation liquid biofuels, and establishing filling stations for these alternative fuels, all of which could potentially harm several environmental objectives including climate change mitigation, prevention, and control of air pollution and biodiversity, but is ultimately mitigated by including the requirement that biomethane gas or biofuels are exclusively produced from the feedstocks listed in Annex IX to Directive (EU) 2018/2001 of the European Parliament and the Council. These two cases are by no means the only examples across the NRRPs but serve to highlight how differentiation in scoring could have use in encouraging improvement in DNSH adherence.

Ultimately, it may be that a scoring criterion as a graded assessment is not the best way to facilitate improvement and progress towards the goals of the DNSH because scoring is inseparable from the political context: A lower score wouldn't come across as a learning opportunity. The full assessment from the Commission provided a more nuanced picture of the quality of the DNSH assessments from different MS. However, this leaves the open question of whether it was not politically feasible to assess

any country as anything other than an 'A'. **In order for the green transition to be successful, a clear picture of where improvement is needed is necessary and assessing plans as equally addressing DNSH principles does not allow for an understanding of where further effort and more importantly, investment, is needed to make that transition a reality.** Relatedly, if MS don't come to understand where the weaknesses of their assessment are, it limits potential to learn how to improve. In the current context where DNSH is now a part of further funding mechanisms, it is important that MS have the possibility to improve their application of the DNSH assessment for the future.

Common challenges and different structures between Member States

For this analysis, we have conducted targeted interviews with government officials on the application of the DNSH principle in the NRRPs. This allowed us to gain valuable insights into workflows, common challenges and differences in procedural and organisational processes in the DNSH assessment of measures of the NRRPs.

Member States were under considerable time pressure to review their RRPs for compliance with the DNSH criterion. At the time the plans were drawn up, the delegated acts had not yet been transposed into EU law. Neither the Commission nor Member States had the opportunity to use existing processes as a model, because the DNSH was being applied for the first time in the NRRPs. This fact must be taken into account in the analysis of the implementation of the principle.

Moreover, the measures of the NRRPs had to be implemented in a short timeframe and needed to be completed before 2026. This timeframe has pre-selected some measures and led to a prioritisation of measures that have an impact in the short-term rather than the long-term.

Member States had regular exchanges with the RECOVER Task Force in the Commission to clarify in advance the compliance of foreseen measures for the NRRPs with the DNSH principle. Some measures that were initially put forward by Member States were rejected in preliminary bilateral discussions with the Commission that could not withstand the DNSH criteria. However, a public listing of such measures is not available. As we suggest in the next section, a compilation and publication of such a list of excluded measures as well as the arguments for exclusion would be good to generate precedents and learn from application of the DNSH in the NRRPs. Going forward, this would increase transparency regarding the exclusion criteria set by the Commission and improve fairness between Member States.

How Member States have organised themselves varies both internally for the preparation of the plans but especially for the assessment of the included measure with regard to the DNSH principle. In some Member States, such as Germany, the scrutiny of the DNSH compliance of the measures in their plan was decentralised. In this case, the line managers of the respective policy areas were responsible for feeding in their measures and for their DNSH assessment. This was organised differently in Spain, for example, where the Ministry for Ecological Transition and the Demographic Challenge was responsible for scrutinizing the DNSH assessment of all measures within the Spanish RRP. As such, a more coherent DNSH assessment could be guaranteed.

The setting up of a horizontal structure in the case of Spain helped to concentrate the expertise on this topic and to build up the knowledge for this process, but it also doesn't mainstream the capabilities across ministries. While the German approach helps to mainstream understandings but building up technical capabilities to do the assessment in a decentralised way also requires a significant time investment across ministries. It is unclear to what extent some Member States have consulted or commissioned external experts for supporting the DNSH assessment of the measures in the NRRPs.

Recommendations for future DNSH application

The DNSH assessment is an important process for ensuring that the EU makes progress on its goals of the green and just transition while not harming the environment in the process. As we have demonstrated, the way the DNSH is currently used has shortcomings in both the content and criteria of the DNSH assessment itself and the procedure through which MS apply the criteria.

As the EU faces additional crises and political tensions such as the Russian invasion of Ukraine, it is important that the DNSH is robust enough to stand up to these changes in the landscape and is not instead watered down. In order to strengthen the DNSH, we offer several recommendations in the content of the DNSH and for the procedure of its application as ways to create this robustness.

Content recommendations

Remove allowance of nuclear and gas

The inclusion of natural gas and nuclear energy as transitional energy sources in the Taxonomy complementary Delegated Act of the Taxonomy[42] presents a major weakness in the Taxonomy and for the DNSH principle. Some MS included gas and gas-related infrastructure in their NRRPs as bridge to the decarbonisation of their energy supply, especially in conjunction with the use of hydrogen as an energy source. However, not all hydrogen energy is created equal; the source of the hydrogen can come from fossil fuels, including natural gas, which either stored through carbon capture, storage, and utilisation (CCSU) or released into the atmosphere as CO_2, depending on the process used[43]. Some researchers[44] [45] have even found that using blue hydrogen (hydrogen created from natural gas using CCSU) could increase, rather than decrease, dependence on natural gas.

Additionally, as the EU seeks alternatives to Russian energy sources in the context of the invasion of Ukraine, the allowance of natural gas as an acceptable energy source is outdated. The REPowerEU plan from the Commission aims "to make Europe independent from Russian fossil fuels well before 2030". While part of this plan is to seek alternative sources of fossil fuels to meet short-term needs, a bigger focus is on transitioning to clean, renewable energy sources. Thus, the policy objectives set out in the REPowerEU plan are in strong contradiction with the requirements of the taxonomy for dealing with natural gas. Not least because the RRF is providing funding for the implementation of REPowerEU, the taxonomy should be updated as well as the DNSH assessments in the NRRPs to ensure consistency and credibility. Moving forward, **the objectives of REPowerEU also need to be considered in the monitoring of the achievement of the NRRPs' targets and milestones.**

Understanding that energy sources cannot be changed overnight, we recognise that having nuclear and natural gas specified as transitional energy sources is better than allowing them outright. However, the long-term requirement for mitigating climate change and decarbonising our economies should be taken seriously and should have begun more in earnest a long time ago. If we hadn't already planned our economies with so much dependence on natural gas, the current situation with Russia would be very different today. It is also likely that we would be better situated to meet the goals of the Paris Agreement.

Add lifecycle assessment

As mentioned in the last chapter, the importance of 'life cycle' is emphasised in the DNSH principle, however the application feels very generalised and vague in the NRRPs. As explained previously, the RRF calls for a green and digital transition, and many MS included funds in their plans for electric ve-

hicles. However, there was no life cycle assessment required which considered the production of batteries or the e-waste created through these measures. Without this assessment, we cannot fully understand the harm that is or could be caused.

That there is little mention of specifics around life cycle assessment is perhaps unsurprising. Recent academic literature[46] exploring the evolution of life cycle assessment in European policies over the last thirty years points to growing prevalence of the life cycle concept in European policy. However, more often this is only in a generalised manner, such as 'life-cycle thinking'. When it comes to specific methodologies like life-cycle assessment, life cycle costing (LCC), and environmental footprint, these were often only mentioned in relation to future developments. What this study argues is that while development of a system to verify life cycle assessment results is a significant challenge to overcome, **it is necessary if life cycle thinking is to become properly integrated within European policy beyond the vague and generalised. Furthermore, alongside this verification, a set of mandatory life-cycle requirements could be established.** This thinking can lead to clear thresholds and metrics in relation to life-cycle thinking being outlined in the TSC and therefore helping ensure the life cycle aspects of DNSH are more likely to be recognised. Moreover, for life cycle thinking to be implemented, capacity building is needed first and foremost so that the necessary expertise is available in the respective departments.

A qualitative framework is needed so that potential risks can be identified

The measures listed in the NRRPs go far beyond the economic activities defined in the taxonomy. This also applies to reforms for which there are hardly any reference values in the taxonomy. For example, the German RRP includes a reform to reduce barriers to investment. What has not been taken into account is the inclusion of criteria to ensure that the measure does not jeopardise social or environmental standards and thus, potential risks were not specified in their DNSH assessment of this component. **The strength of the DNSH principle lies precisely in its ability to identify potential sources of risk to environmental objectives where the link to sustainability considerations is not immediately clear.** In order for decisionmakers to be able to first identify these potential sources of risk, a comprehensive qualitative framework for the environmental assessment is needed. In other words, with regard to future funding being subject to the DNSH principle, a more comprehensive system is needed, specifying qualitative and quantitative values and guidelines for DNSH.

Mechanisms for non-compliance

As outlined in the procedural observations, a number of measures proposed by MS for their NRRPs were excluded from the outset by the Commission in bilateral discussions because they did not meet the DNSH principle. The fact that there is neither transparent documentation of the excluded measures nor an argumentation as to why they are not DNSH compliant is, in our eyes, lost potential. **Clear and consistent documentation of the excluded measures and the criteria for them would be helpful to serve as a precedent in the design of DNSH-compliant policy measures and would ensure that the DNSH assessment is fair.**

What is also missing is the **definition of mechanisms in case the DNSH principle is violated during implementation.** In the disbursement of RRF funds, which is linked to the achievement of defined milestones and targets, it is unclear to what extent compliance with the DNSH principle is monitored and, in particular, whether a breach of the DNSH principle leads to the withholding of funds. For an effective and robust DNSH principle, we recommend to the Commission that these mechanisms of non-compliance are strengthened and disclosed.

Procedural recommendations

The application of the DNSH requires significant and detailed knowledge about many facets of policy measures in many domains. As such, it is fair to expect that the ministries within MS do not necessarily possess the knowledge necessary to complete a rigorous DNSH assessment without upskilling. We

suggest that in order to facilitate this process, the Commission should provide a space for Member States to access the information they need and build their capacity in order to carry out the assessment. The exact format of this could come in many forms. Our recommendations are as follows:

The DNSH Digital Hub

We recommend establishing a digital hub that contains all relevant information about the application of the principle. It would be dynamic and constantly updated as regulations and delegated acts change and are updated. The Hub should include technical guidance and examples of how DNSH has been applied. This could be similar in content to the technical screening criteria, but the shortfall of the latter is that it is static, and the reader is required to sift through a lot of information to find what they are looking for. This hub should be specifically about the DNSH.

The DNSH Expert Network

A network of experts on different policy areas who can be consulted for specific questions in terms of life cycle, trade-offs, and risks associated with different policy measures, including providing specific training and capacity building. This could be convened by the Commission as a vetted resource bank for policymakers to pull from when applying the DNSH to planned investments and reforms. This could also be a network organised by civil society to support policymakers.

A DNSH stakeholder learning platform

A place to facilitate exchange between Member States, who have a lot they can learn from each other in this process; a support network between MS and EU which ensures the DNSH principle is applied consistently and coherently across different principles and policy areas, Member States, and funding mechanisms. MS should be encouraged to see compliance as a learning process, rather than a politically assessed measure. In this way, learning to mainstream DNSH becomes the priority rather than a stamp of approval.

This could take place in different formats: it could be a regular conference where different actors come together to share learnings; bilateral or multilateral meetings for discussion; an online forum where policymakers can share their learnings as well as their difficulties, where they can seek guidance and recommendations from others.

A robust and transparent monitoring system

Such a system is needed to ensure compliance with DNSH principles and that adequate action is being taken, as other environmental organisations have already called for[47]. This should also be publicly accessible and could involve monitoring committees or similar bodies at MS level—perhaps including CSOs and other key stakeholders—which could function in an advisory or consulting capacity.

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The DNSH is an important opportunity to mainstream the green transition across all economic activities. However, its technical aspects need to be elaborated for it to be more rigorous, and access to resources and support is essential for it to be applied correctly. No MS should be hindered in attempting to apply DNSH principles to policy through lack of sufficient resources; capacity building and easy access to support are essential for the success of the application of the DNSH.

We recommend that communication around and infrastructure of all the above recommendations are integrated at the level of the Secretary General and possible attached to the RECOVER taskforce. Furthermore, these elements need sufficient resources and mandate for implementation. The use of such a platform or process that is created should then be mainstreamed in the EU institutions to ensure that it is widely known and used consistently.

References

[1] Perry, N. & Primrose, D. (2015). *Heterodox economics and the biodiversity crisis.* Journal of Australian Political Economy, 2015(75), 133-152. https://www.ppesydney.net/content/uploads/2020/05/Heterodox-economics-and-the-biodiversity-crisis.pdf

[2] Perry, N. (2010). *The ecological importance of species and the Noah's Ark problem,* Ecological Economics, 69(3), 478-485. https://doi.org/10.1016/j.ecolecon.2009.09.016

[3] Pearce, D. (1998). *Cost benefit analysis and environmental policy*. Oxford Review of Economic Policy, 14(4), 84–100. https://doi.org/10.1093/oxrep/14.4.84

[4] Munda G. (2017). *On the use of Cost-Benefit Analysis and Multi-Criteria Evaluation in ex-ante Impact Assessment*. JRC Technical Reports. European Commission. Joint Research Cetre (JRC).

https://publications.jrc.ec.europa.eu/repository/handle/JRC107900

[5] What does it mean to "Do No Significant Harm"?. (2022, March). bloomberg.com. Retrieved 27 June 2022 from https://www.h2bulletin.com/knowledge/hydrogen-colours-codes/

[6] Dirth, E., Barth, J., Davies, W., Gründahl, M., Hafele, J., Korinek, L., Kiberd, E. & Miller, C. (2021). *A future-fit recovery? A sectoral analysis of practices for promoting systemic change in the NRRPs based on the Recovery Index for Transformative Change (RITC)*. ZOE-Institute for future-fit economies: Bonn. https://zoe-institut.de/en/publication/a-future-fit-recovery/

[7] EU taxonomy for sustainable activities. (2022, June). European Commission. Retrieved 27 June 2022 from https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

[8] Regulation (EU) 2020/852 of the European Parliament and of the Council. *On the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088*. Official Journal of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0852&from=EN

[9] Commission Delegated Regulation (EU) 2021/2139. *Supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives (Text with EEA relevance)*. Official Journal of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R2139&from=EN

[10] Implementing and delegated acts. (2022, June). European Commission. Retrieved 27 June 2022 from https://ec.europa.eu/info/law/sustainable-finance-taxonomy-regulation-eu-2020-852/amending-and-supplementary-acts/implementing-and-delegated-acts_en

[11] C(2022)631. *Commission Delegated Regulation (EU) /... amending Delegated Regulation (EU) 2021/2139 as regards economic activities in certain energy sectors and Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities*. European Commision. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=PI_COM:C(2022)631&from=EN

[12] Taxonomy: MEPs object to Commission's plan to include gas and nuclear activities. (2022, June). European Parliament. Retrieved 27 June 2022 from https://www.europarl.europa.eu/news/en/press-room/20220613IPR32812/taxonomy-meps-object-to-commission-s-plan-to-include-gas-and-nuclear-activities

[13] 2022/2594(DEA). *Draft motion for a resolution pursuant to Rule 111(3) of the Rules of Procedure on Commission delegated regulation of 9 March 2022 amending Delegated Regulation (EU) 2021/2139 as regards economic activities in certain energy sectors and Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities (C(2022)00631 – 2022/2594(DEA)).* Committee on Economic and Monetary Affairs, Committee on the Environment, Public Health and Food Safety. European Parliament. https://www.europarl.europa.eu/meetdocs/2014_2019/plmrep/COMMITTEES/CJ36/RD/2022/06-14/1257367EN.pdf

[14] Regulation (EU) 2021/241 of the European Parliament and of the Council. *Establishing the Recovery and Resilience Facility.* Official Journal of the European Union. https://eur-lex.europa.eu/legal- content/EN/TXT/?uri=CELEX%3A32021R0241

[15] EC(2021) 1054 final. Commission Notice. *Technical guidance on the application of "do no significant harm" under the Recovery and Resilience Facility Regulation*. European Commission. https://ec.europa.eu/info/sites/default/files/c2021_1054_en.pdf

[16] Regulation (EU) 2020/852 of the European Parliament and of the Council. *On the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (Text with EEA relevance).* Official Journal of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0852&from=EN

[17] 2021/C 58/01. Commission Notice. *Technical guidance on the application of 'do no significant harm' under the Recovery and Resilience Facility Regulation*. Official Journal of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021XC0218(01)

[18] Regulation (EU) 2021/1060 of the European Parliament and of the Council. *Laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, the Just Transition Fund and the European*

Maritime, Fisheries and Aquaculture Fund and financial rules for those and for the Asylum, Migration and Integration Fund, the Internal Security Fund and the Instrument for Financial Support for Border Management and Visa Policy. Official Journal of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R1060&from=EN

[19] Public consultation on the revised Climate, Energy and Environmental Aid Guidelines (CEEAG). (2022, June). European Commission. Retrieved 27 June 2022 from https://ec.europa.eu/competition-policy/public-consultations/2021-ceeag_en

[20] Dirth, E., Barth, J., Davies, W., Gründahl, M., Hafele, J., Korinek, L., Kiberd, E. & Miller, C. (2021). *A future-fit recovery? A sectoral analysis of practices for promoting systemic change in the NRRPs based on the Recovery Index for Transformative Change (RITC)*. ZOE-Institute for future-fit economies: Bonn. https://zoe-institut.de/en/publication/a-future-fit-recovery/

[21] Keller S. & Lamberts P. (2021). Open Letter on the ongoing assessment of national Recovery and Resilience Plans by the Commission. The Greens/EFA in the European Parliament. http://extranet.greens-efa-service.eu/public/media/file/1/7058

[22] Bankwatch. (2021). Problematic measures to be addressed during the ongoing assessment of Recovery and Resilience Plans. Bankwatch. Retrieved 27 June 2022 from https://bankwatch.org/wp-content/uploads/2021/06/Recovery-and-Resilience-Plans-Assessment_June2021.pdf

[23] C(2021) 1054 final. Commission Notice. Technical guidance on the application of "do no significant harm" under the Recovery and Resilience Facility Regulation. European Commision. https://ec.europa.eu/info/sites/default/files/c2021_1054_en.pdf

[24] SWD(2021) 276 final. Commission Staff Working Document. *Analysis of the recovery and resilience plan of Romania Accompanying the document Proposal for a COUNCIL IMPLEMENTING DECISION on the approval of the assessment of the recovery and resilience plan for Romania*. European Commission. https://ec.europa.eu/info/sites/default/files/swd2021_276_en.pdf

[25] Gründahl M. (2021). *Assessment of National Recovery and Resilience Plan according to the Recovery Index for Transformative Change (RITC).* ZOE-Institute for future-fit economies. https://zoe-institut.de/wp-content/uploads/2021/08/Portugal_VFinal.pdf.

[26] Group warns Pisão Dam plan "a black hole of consequences with no return". (2021, August). The Portugal News. Retrieved 27 June 2022 from https://www.theportugalnews.com/news/2021-08-30/group-warns-pisao-dam-plan-a-black-hole-of-consequences-with-no-return/62078

[27] Bankwatch. (2021). Problematic measures to be addressed during the ongoing assessment of Recovery and Resilience Plans. Bankwatch. https://bankwatch.org/wp-content/uploads/2021/06/Recovery-and-Resilience-Plans-Assessment_June2021.pdf

28 Problematic measures to be addressed during the ongoing assessment of Recovery and Resilience Plans. (2021, June). Bankwatch. Retrieved 27 June 2022 from https://bankwatch.org/wp-content/uploads/2021/06/Recovery-and-Resilience-Plans-Assessment_June2021.pdf

29 SWD(2021) 146 final. Commission Staff Working Document. Analysis of the recovery and resilience plan of Portugal. European Commission. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021SC0146&from=EN

[30] C(2021) 1054 final. Commission Notice. Technical guidance on the application of "do no significant harm" under the Recovery and Resilience Facility Regulation. European Commision. https://ec.europa.eu/info/sites/default/files/c2021_1054_en.pdf

[31] Ibid.

[32] Ibid.

[33] Ibid.

[34] Ibid.

[35] EU Technical Expert Group on Sustainable Finance. 2020. Taxonomy report: Technical Annex, Updated methodology & Updated Technical Screening Criteria. European Commission. https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy-annexes_en.pdf

[36] Ibid.

[37] Xia, X. & Li, P. (2022). *A review of the life cycle assessment of electric vehicles: Considering the influence of batteries. Science of The Total Environment*. 2022(814). https://doi.org/10.1016/j.scitotenv.2021.152870

[38] Regulation (EU) 2021/241 of the European Parliament and of the Council. *Establishing the Recovery and Resilience Facility.* Official Journal of the European Union. https://eur-lex.europa.eu/legal- content/EN/TXT/?uri=CELEX%3A32021R0241

[39] Dirth, E., Barth, J., Davies, W., Gründahl, M., Hafele, J., Korinek, L., Kiberd, E. & Miller, C. (2021). *A future-fit recovery? A sectoral analysis of practices for promoting systemic change in the NRRPs based on the Recovery Index for Transformative Change (RITC)*. ZOE-Institute for future-fit economies: Bonn. https://zoe-institut.de/en/publication/a-future-fit-recovery/

[40] Dias, C., Grigaitė, K. & Cunha, I. (2022). Country Specific Recommendations and Recovery and Resilience Plans - Thematic overview on climate and green transition related issues. IPOL Economic Governance Support Unit. Accessed at https://www.europarl.europa.eu/RegData/etudes/STUD/2022/689449/IPOL_STU(2022)689449_EN.pdf

[41] COM (2021) 608 final. Commission Staff Working Document. Analysis of the recovery and resilience plan of Romania. European Commission. https://ec.europa.eu/info/sites/default/files/swd2021_276_en.pdf

[42] C(2022)631. Commission Delegated Regulation (EU) /... amending Delegated Regulation (EU) 2021/2139 as regards economic activities in certain energy sectors and Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for

those economic activities. European Commision. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=PI_COM:C(2022)631&from=EN

[43] Hydrogen colours codes. (2022, June). h2bulletin.com. Retrieved 27 June 2022 from https://www.h2bulletin.com/knowledge/hydrogen-colours-codes/

[44] Jaller-Makarewicz, A.M. & Flora, A. (2022, May 22). IEEFA Europe: Blue hydrogen costs 36% higher than UK's 2021 estimate, would increase gas import dependency, The Institute for Energy Economics and Financial Analysis. Retrieved 27 June 2022 from https://ieefa.org/articles/ieefa-europe-blue-hydrogen-costs-36-higher-uks-2021-estimate-would-increase-gas-import?utm_source=Search&utm_medium=p&utm_campaign=all

[45] Howarth, R. W., & Jacobson, M. Z. (2021). How green is blue hydrogen? Energy Science & Engineering, 9(10), 1676– 1687. https://doi.org/10.1002/ese3.956

[46] Sala, S., Amadei, A.M., Beylot, A. & Ardente F. (2021). *The evolution of life cycle assessment in European policies over three decades*. The International Journal of Life Cycle Assessment, 2021(26), 2295–2314. https://doi.org/10.1007/s11367-021-01893-2

[47] Green 10 & Euronatur Stiftung. (2021). Good governance of the EU's national recovery and resilience plans. https://green10.org/wp-content/uploads/2021/10/G10-Statement-on-NRRP-FINAL.pdf