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RAINFOREST PROJECT SUMMARY

Co-produced transformative knowledge to accelerate change for biodiversity

Food and biomass production systems are among the most prominent drivers of biodiversity loss worldwide. Halting and reversing the loss of biodiversity therefore requires transformative change of food and biomass systems, addressing the nexus of agricultural production, processing and transport, retailing, consumer preferences and diets, as well as investment, climate action and ecosystem conservation and restoration. The RAINFOREST project will contribute to enabling, upscaling and accelerating transformative change to reduce biodiversity impacts of major food and biomass value chains. Together with stakeholders, we will co-develop and evaluate just and viable transformative change pathways and interventions. We will identify stakeholder preferences for a range of policy and technology-based solutions, as well as governance enablers, for more sustainable food and biomass value chains. We will then evaluate these pathways and solutions using a novel combination of integrated assessment modeling, input-output modeling and life cycle assessment, based on case studies in various stages of the nexus, at different spatial scales and organizational levels. This coproduction approach enables the identification and evaluation of just and viable transformative change leverage points, levers and their impacts for conserving biodiversity (SDGs 12, 14-15) that minimize trade-offs with targets related to climate (SDG13) and socioeconomic developments (SDGs 1-3). We will elucidate leverage points, impacts, and obstacles for transformative change and provide concrete and actionable recommendations for transformative change for consumers, producers, investors, and policymakers.

EXECUTIVE SUMMARY

Stakeholder engagement is key to the success of the RAINFOEST project as it seeks to co-produce effective and just pathways to meet EU and global biodiversity targets through the transformation of the food and biomass sector. To this end, a stakeholder reference group was created with representatives from government institutions, academia, civil society, and industry. Our first stakeholder engagement was held on consecutive afternoons on the 11th and 12th of May, 2023. The workshop included 7 sessions to cover key parts of the pathway design.

The 1st session was an introduction to the design and objectives of the project and the discussion focused on relationships with other relevant projects to create the most relevant an up-to-date output.

The 2nd session introduced the pathway design process and objectives and the discussion focused on applied topics to explore, how to cover alternative economic paradigms and equity issues, the dimensions of sustainability covered by the selected targets, and relevant scenario frameworks. The inputs from stakeholders on applied questions and dimensions of equity, the need for transparency about different dimensions of wellbeing and limits of what can be modeled, and the relationship to existing scenario frameworks will be considered in the draft of the pathway narratives due later this year.

The 3rd session introduced the model toolbox to the stakeholders and identified areas for developing the model toolbox. The discussion focused on the need for comprehensive coverage and completeness over increasing resolutions. And will be followed up by looking at the integration of models, target indicators, and case-studies to look at completeness.

The 4th session presented global and European policy and scientific frameworks used to compile targets for nature, climate, and people and an explanation for the selection of the subset to be used in the project. There was agreement over the comprehensiveness of the reviewed frameworks and a useful discussion over the inclusion of social boundaries such as Earth commission report on safe and just earth system boundaries. The input will be used to update and refine target compilation and selection.

The 5th session focused on how to include different values and ethical systems into the design of transformative pathways. There was a useful discussion over the current ambiguity in the IPBES illustrative narratives and equity principles and how the creation of clear definitions is a key task for the project. The input will also be used to further develop the other dimensions of justice beyond distributive ones.

The 6th session used a hypothetical, quantitative example to discuss how global targets can be downsized to national-level contributions while considering questions of justice. The discussion focused on the complexity in downscaling targets and the feedback will support efforts to identify target groupings with logical links and compile available data and methods to approach the downscaling of selected targets.

The 7th Session focused on our approach to identifying feasible policy interventions that can create biodiversity friendly value chains in the European food and biomass sector. The feedback suggested taking an holistic approach to different interventions that interact in a synergistic and coherent way but also discussed the difficulty in assessing the effectiveness of interventions due to them being context dependent. The stakeholder input supports focusing on value chain actors, in particular consumers, and societal acceptance as a key criterion.

At the end of the session, the closing remarks reflected upon the high level of discussions over the two days and the success of the first stakeholder engagement. Next steps were also explained that there will be two further engagements with the stakeholder reference group in May 2024 and July 2025.

SCHEDULE

Time schedule	Session title	Brief description of content
Thu. 11th May		
13:00-13:20	Introductions and Objectives	This session will set out the goals for the day including different roles and a short round of introductions.
13:20-14:05	Introduction to the RAINFOREST project	What are the main objectives, approach, and expected outcomes of the project? Who are the partners and how is the project structured?
14:05-14:50	Introduction to the draft pathways	How do we understand pathways? What are building blocks and how are they combined? What applied questions are we targeting?
14:50-15:05	Break	Short break
15:05-15:50	Introduction to the toolbox	What is the model toolbox? What is its goal and what are its components?
15:50-16:00	Check out	Recap and summarize insights day 1
Fri. 12th May		
13:00-13:10	Check-in	Introduce goals for the second day
13:10-13:45	Aggregated targets considered in the pathways	Which policy frameworks did we consider? Why and how did we select and group targets?
13:45-14:20	Plural Values and Justice Principles	Exploring why worldviews and justice are key to creating transformative pathways. And how to align equity principles with value systems.
14:20-14:35	Break	Short break
14:35-15:10	Downscaling targets based on worldviews and justice principles	Using a hypothetical, quantitative example, how can a global target be broken down to national-level contributions?
15:10-15:45	Interventions and feasibility aspects	What kind of policy instruments and initiatives are needed to embark on desirable pathways? Present and discuss policy feasibility criteria and identify gaps in the evidence on policy effectiveness
15:45-16:00	Check out	Recap insights day 2

Participant list

Stakeholders:

Frank Wugt-Larsen	EEA
Alexandra Marques	PBL, The Netherlands
Wellington Lourenco de Almeida	Director of the Center for Advanced Study in Government and Administration (CEAG/UnB)
Adrian Leip	European Commission - DG Research & Innovation, Bioeconomy and Food Systems Unit (RTD.B2) - Head of Sector Bioeconomy
Fabrice DeClerck	Science Director, EAT and Senior Scientist, Alliance of Bioversity & CIAT of the CGIAR
Anna Chilton	Nestle

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Thomas Schinko	IIASA
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Daniel Braun	UBO
Larissa Nowak	SGN
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Chrisopher Wong (day 2)	IIASA
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Jochen Dürr	UBO
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Marion Lebrun	NTNU
Konstantin Stadler (day 2)	NTNU
Ramshid Rashidpour (day 2)	UBO

0. WORKSHOP PREPARATION

In preparation for the stakeholder engagement, a range of prominent scientists and civil society, policy and industry representatives were invited to join the stakeholder reference group with six selected. The selected stakeholders were then informed about the purpose of the workshop through a briefing note provided on the 4th of May 2023 (See attachment 1).

1. DAY 1

1.1 Project objectives and set-up

Presentation: Stakeholder workshop – Pathways and toolbox, Francesca Verones (Presenter)

The introductory session gave the project team a chance to introduce the stakeholder group to the project and give them an opportunity to ask questions and comment on the project objectives and design. The comments, mainly, focused on how the project related to sister projects, with which some of the stakeholders are involved. It was noted that keeping open channels of communication and continued interaction would be beneficial.

1.2 Introduction to pathways

Presentation: Introduction to pathways, David Leclère (Presenter)

The presentation focused on introducing to, and discussing with, the stakeholder reference group the pathways to be developed in the RAINFOREST project. The session covered;

- the need for transformative change to meet ambitious global goals for people, climate and nature,
- the identified gap from already existing pathways (including the lack of details on EU biomass supply chains and lack of consideration of equity

questions),

- the type and characteristics of pathways developed and the questions they should enable us to explore,
- the process to co-develop and explore them in RAINFOREST,
- as well as a brief introduction to key ingredients of the pathways (targets, human agency, interventions, equity) that were to be covered in more detail on day 2.

Key discussion points:

- **What are relevant applied topics to explore in the articulation of EU and global policy frameworks?** Several elements were mentioned, such as i) looking at how EU ambition emerging from the Green Deal is compatible with the Global Biodiversity Framework (F DeClerck & F W Larsen pointed to a broad alignment, except perhaps for a need to step up EU ambition on restoration), ii) exploring to what extent meeting the action targets for 2030 are sufficient for achieving the 2050 goals, and if not what else is needed, iii) exploring how both regional variations in pressures and various alternative considerations of effort sharing could imply different levels of ambition for EU contribution to global targets (as compared to other countries, and as compared to current ambition of the EU – D Leclere mentioned it could be a key targeted application). In relation to the latter, F DeClerck also mentioned that land use conversions could be a topic upon which equity narratives could be built, for example rights to land conversion in relation to historical impact of nations (e.g., could lead to the idea that regions like Europe would be committed to restoration as historically converted beyond what would be agreed as a threshold). W Lourenco de Almeida also pointed to the potential value of understanding the terms of the public debate outside the EU on the EU green deal, and design dissemination activities in relation to that. This topic could be a specific target for both research (as covered in WP3 and WP4) and dissemination activities (e.g., within WP5, communicating on lessons learned).
- **Distributive justice and downscaling of targets**. It was mentioned as

something valuable to explore, including in methodological choices. F W Larsen referred to an earlier work on the topic. He pointed to the need to consider alternative technical choices to be able to provide robust baskets of contributions (with some uncertainty range). The need to make targets more specific to the EU food and biomass supply chains was mentioned by A Marques, pointing to the fact that many global targets concern all sectors, and the specific expectations for the food and biomass supply chains need to be explicated. The EU policy framework already offers more specific targets for the food and biomass sector and could be a starting point.

- **What are key narrative elements, how do they cover issues such as alternative economic paradigms (e.g., green growth vs post growth), or equity issues (e.g., not only cross-country but also within-country inequality, and impacts of interventions), and to what extent can the models explore this?** The idea to explore differences in green growth vs post-growth futures was noted as important to A Marques. Although models are not necessarily well equipped to endogenously picture related macro-economic dynamics, it is feasible and of high interest to at least capture likely implications for hierarchies of interventions (e.g., higher focus on technology and market instruments for green growth, vs higher focus on decreasing material consumption beyond basic needs) and explore how to link pathways to economic paradigms via the projected economic indicators rather than by explicit scenario assumptions (e.g., there is evidence that pathways like bending the curve entail decreasing trends in value added for the agricultural sector). While inequalities across countries could be considered more directly in the models, heterogeneity within countries, either as object targeted by interventions to achieve the goals or as a feature of distributional impacts of interventions, might be more difficult to model endogenously, at least for some actors (e.g., consumers often represented by an average consumers at country or regional level, little detail in intermediate actors of supply chains). There are however ways to take exogenous but explicit assumptions about within-country inequalities, for example in relation to the calculation of food security outcomes (so we may be able to picture different approaches on how reducing within-country inequality can be a means to achieving the goals),

and we will also try to leverage ongoing model developments to increase the granularity with which consumers or supply chain actors are modeled within countries (so that we can maybe talk a little more about the within-country distribution of the impacts of interventions). D Leclere also mentioned that we should allow ourselves to consider in the pathway narrative aspects we cannot model. T Schinko also mentions that intergenerational justice (i.e., across generations) issues is increasingly visible in the discourse of various actors and could be important to look at, for example as an aspect of transformative change related to the short-term costs for various actors, and how transformation narratives and interventions can address those or not.

- **What dimensions of sustainability are implied by the selected targets and their values to depict the future?** Following a question from A Marques and A Leip, D Leclere clarified we do not necessarily envisage that the broader sustainability agenda (all 17 SDGs) will be considered as met in the future depicted by the pathways, which might at first focus on biodiversity, climate and a few selected human wellbeing goals, among which health and food security aspects related to food consumption. A Leip noted that there are several aspects of human wellbeing beyond food consumption-related outcomes: some (including health, cultural and spiritual aspects) that can hardly be modeled, while some others can be modeled only in a coarse way (e.g., poverty or food security outcomes in relation to within country inequality is difficult to model when considering average consumers). While it can be understandable that many of those would not be considered for practical reasons, it should be transparent, and the resulting bias should be acknowledged. F DeClerck also mentioned that it is important to clarify which biodiversity dimensions we'd like to cover, between the area of natural ecosystems, the integrity of both natural and managed ecosystems, including from a functional integrity perspective, and extinctions. D Leclere pointed to the following day's session on targets, we would seek to keep track of three main dimensions covered in Global Biodiversity Framework, GBF (extent of natural ecosystems, integrity of local community assemblages and extinction risks), and possibly also consider various nature contributions to people (including biomass provision, carbon removal, and to the extent possible

additional ecosystem services like pollination, pest control or erosion control).

- **How to approach interventions?** Fabrice DeClerck mentioned that considering intervention portfolios was a promising idea and could be a practical way to consider options for harnessing synergies and navigating trade-offs – as A Leip mentioned, these are important aspects of policy integration to consider. To answer a question from F DeClerck, D Leclere clarified that interventions pictured in the pathways will be first sourced from scientific community and literature but will in a second step be revised with input from WP3 and WP4, where direct engagement with stakeholder for specific case studies will strive to elicit stakeholder preferences on intervention portfolios. A Leip mentioned that within the EU policy framework, resource efficiency and cascading principles will be important interventions to account for in the narrative and modeling. Reacting to a point from W Lourenco de Almeida on the potential interest of understanding how EU green deal interventions are perceived in the public debate in countries outside the EU, J Boerner also mentioned that from a justice perspective, interventions are almost as important as targets in shaping perceptions and outcomes of policies and should be incorporated into the narratives.
- **What scenario frameworks will you draw upon?** A Leip mentioned that several scenario frameworks, like the SSPs, have already been developed and could be helpful for the goal, while we might decide to go beyond SSPs and focus on the next generation of scenario frameworks. IIASA clarified that the SSPs have been very useful but also have limitations: e.g., the bending the curve modeling exercise was based on it but needed to expand it in several dimensions such as ambitious dietary shifts or conservation and restoration. They also are being criticized for their lack of explicit consideration of values, and this was one of the main reasons for IPBES to suggest a new scenario framework (the Nature Futures framework(Durán et al., 2023; “Sustainable agriculture and food systems,” 2022)) to promote the development of a novel generation of value-explicit scenarios. RAINFOREST will inevitably rely on elements developed within the SSP (Shared Socioeconomic Pathways) scenario framework and seek to harvest further the richness of SSP developments (the EUR-AGRI SSPs could for example be relevant) but will start from the novel

Nature Futures scenario framework.

Next steps:

- Several elements of discussion were explored further in the following sessions on day 2.
- The inputs from stakeholders on various applied questions and dimensions of equity will be relevant to consider, the need to be transparent about different dimensions of wellbeing covered as well as limits of what can be modeled, and the positioning as compared to existing scenario frameworks will be considered in the draft of the pathway narratives, to be delivered later this year.

1.3 Introduction to the toolbox

Presentation: Introduction to the model toolbox, Koen Kuipers (Presenter).

Summary of session:

The session focused on 1) introducing the model toolbox to the stakeholders present in the workshop and 2) identifying areas of focus for developing and improving the model toolbox. This introduction involved a description of the different models in the toolbox, required inputs to the model toolbox, the environmental indicators that the toolbox can quantify (output), and the identification of (potential) links between models in the toolbox. The subsequent discussion involved highlighting elements to be addressed in the model toolbox development.

Key discussion points:

- Holistic perspective: focus on trying to approach the model development from a holistic perspective. That is, try to be comprehensive in country, target indicator, and sectorial coverage and prioritize completeness over increasing (spatial, sectoral, or species) resolutions.
- The identification of target indicators:
    - Comprehensive sustainability assessments should consider

environmental, social, and economic indicators.

- An important environmental indicator is vegetation intactness. Because autotrophs provide the basis for other life (e.g., animal species groups) it can be used as a proxy for biodiversity impacts. The ecosystem integrity index (Hill et al., 2022) considering human modification (HM) of natural habitat, the biodiversity intactness index (BII), and the net primary productivity (NPP) as a proportion of potential natural NPP.
- Another environmental indicator mentioned by the Global Biodiversity Framework (GBF), Sustainable Development Goals (SDGs), and EU Green Deal is reduction of food waste.
- When considering environmental indicators, it is relevant to differentiate between different land use practices (e.g., applying organic vs. chemical fertilizers), but it is also challenging, so always consider the 'costs' related to increasing the resolution of impacts on sustainability indicators.

- The integration of models, target indicators, and case-studies:
  - It is important to reflect on model developments in relation to linkages with other models in the model toolbox. For example, if one of the (economic) models is improved to differentiate between the use of organic and chemical fertilizers, but the (environmental) models are not able to differentiate between impacts of organic and chemical fertilizers, the model improvements may not have the desired effect. Model integration (improvements in model a should be able to be picked up by model b, otherwise no point). Hence, it is recommended to harmonize model developments within the model toolbox.
  - Like harmonizing model developments, the target indicator identification as well as the target downscaling should ideally be reconciled with the model toolbox developments and with the case studies.
  - Data availability for target indicators: company disclosures increasingly include GHG (greenhouse gas) emissions, and the scope of these

environmental disclosures is expanding towards biodiversity (e.g., stimulated by the EU taxonomy for sustainable activities). Hence, evaluating these disclosures can help identify target indicators as well as the quantification of company footprints.

- Case-studies: the PBL Netherlands Environmental Assessment Agency is working on similar case-studies as some in RAINFOREST (environmental consequences of national dietary shifts and environmental footprints of investment portfolios), so there is potential for collaboration for these case-studies.

Next steps:

- Evaluate comprehensiveness of the target indicators and the country and sectoral coverage of the model toolbox.
- Consider the suggestions raised in the workshop regarding the target indicator selection in the target indicator selection.
- Contact the PBL Netherlands Environmental Assessment Agency for potential collaboration regarding some of the RAINFOREST case-studies.

2. DAY 2

2.1 Aggregated Targets Considered in the Pathways

Presentation: Aggregated Targets Considered in the Pathways, Larissa Nowak (Presenter)

Summary of session:

In this session, we presented which global and European policy and scientific frameworks we considered to compile targets for nature, climate, and people and why and how we selected a subset for our further work. On the one hand, this target subset will inform pathways of transformative change in the nexus between biomass production and consumption, biodiversity, and climate action. On the other hand,

selected targets will be downscaled to explore justice principles. We collected feedback on our choice of frameworks and focal topics that defined our target selection.

Key discussion points:

- There was a general agreement on the comprehensiveness of the selection of frameworks, the set of focal topics and the decision to include some targets quantitatively and others qualitatively in the pathways; some further frameworks, references and relevant topics mentioned are listed below.
- It was appreciated that we aim at including pollination. A challenge might be how to account for the multitude of production practices, e.g., one surrogate measure suggests 10-25% embedded habitat per km2 agricultural land to secure pollination and pest control;
- Three metrics for production lands that might be useful are: (1) functional integrity (>10% habitat per km2 in production lands); (2) crop/land-use diversity (>5-10 crops land uses per 5-10 km2; still rather unrefined), (3) connectivity in agricultural lands; organic might be too specific, and not well associated with many of the outcome measures (except pesticide pollution) that we are interested in.
- Since many of the targets in global and European policy frameworks are dated until 2030, but the pathways will likely be developed until the midcentury, it will be interesting to also look at the goals in the policy frameworks that are often dated until 2050.
- It will be important, in some context, to consider local communities and indigenous peoples.
- An additional interesting concept to consider might be the concept of Doughnut economics, which can give information on social boundaries, not necessarily to quantify them, but to observe them and make sure to stay within them.
- An Earth Commission paper will be published soon; it uses the planetary boundaries framework and explores not only a safe space but also a just space, i.e., it assesses under each safe limit, whether too many people are harmed. This paper might be of interest for our work. Planetary boundaries

version 3.0 (Rockström et al., 2023).

- Another relevant reference might be the Chatham House article on sustainable agriculture and food systems("Sustainable agriculture and food systems," 2022).
- The corporate sustainability reporting directive (EU) will come out soon and is being discussed a lot in the corporate environment.

Next steps

- Update and refine target compilation and selection according to the feedback
- Feed target selection into the pathways and the downscaling

2.2 Distributive justice principles

Presentation: Biodiversity, worldviews and justice. Christopher Wong (Presenter)

Summary of Session:

The session focused on how to include different values and ethical systems that exist in society in the design of transformative pathways as the interventions needed to protect biodiversity have wide ranging social consequences. It involved elaborating key distributive justice principles from the climate justice literature and discussing how these could be utilized for just biodiversity policies. It addressed how these could be aligned to the six illustrative narratives that are part of the Nature Futures Framework (NFF).

Key Discussion Points:

- The NFF (see image below) is conceptualized as a boundary tool showing nature's limits, the space within the triangle which can be incorporate different values. This means that in the rainforest it is necessary to show that the illustrative narratives we are using show the range of options, that these can be balanced, and different narratives can exist simultaneously in different regions.

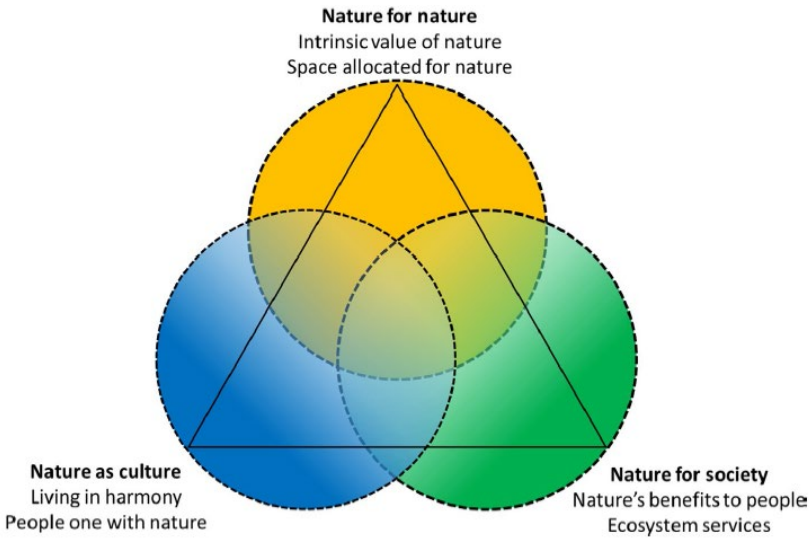

Fig. 1, Pluralistic Nature Futures Framework, IPBES

- The importance of transparency in values and ethics that are being used in the development of the pathways was seen as key.
- There was a discussion on the clarity of the illustrative narratives as narratives such as "Half Earth" are very different if you mean 50% protected are or 50% intact area. This is part of a wider issue that the land use and protected area narratives are much more interchangeable and ambiguous than the economic ones.
- The EEA has, previously, looked at how to downscale planetary boundaries with a baseline of "Equal Per Capita" against five other principles (Lager et al., 2023). They found that operationalizing each one can be done in different ways and that they need to be utilized in baskets of principles. Many of the principles are non-exclusive but some are so this needs to be clarified to form coherent sets of principles.
- In previous work done by Unilever, they found the selection of the downscaling principle had the greatest impact on whether the overall target was met so it is important that when creating multiple scenarios that we show how these will work together to meet the overall target.
- Highlighted principles for further reflection:

  - Ecological debt: There is a difference between carbon accounting and biodiversity accounting. Biodiversity depends more acutely on the measure used such as species conservation or biodiversity's contribution to society. We need to work on how this would impact responsibility and allocation.
  - Subsistence: Distinguishing between luxury and need based utilization of nature was seen as highly relevant. This could be coupled with donut economics to see what level of human need nature has the capacity to provide and sustain. This can then support the allocation of resources and consumption.

- It was, also, reflected upon that when talking about traditional or indigenous communities and equality, it is not just about income and monetary equality. One must reflect on the inequality in political and social representation.

Next Steps:

- To take into account the current ambiguity in the illustrative narratives and equity principles, the creation of clear definitions of each of the illustrative narratives and ethical principles that are to be used in the project is a key task to complete.
- This needs to be coupled with a clear explanation of how the value and ethical based pathways can be utilized to show balanced and coupled options that meet the global targets.
- The justice principles need to be further developed to include the other dimensions of justice, beyond distributive ones, such as recognitional.

2.3 Downscaling targets based on worldviews and justice principles

Presentation: Downscaling targets based on worldviews and distributive justice

principles. Thomas Kastner (Presenter)

Summary of session:
This session used a hypothetical, quantitative example to discuss how a global target can be broken down to national-level contributions, while considering world views and questions of justice. We focused on the global target of protecting at least 30% of terrestrial areas by 2030 (Kunming-Montreal global biodiversity framework, target 3). We introduced three hypothetical countries that differ in their area, population density, GDP per capita, percentage of natural area, species richness, and area already protected. It was then discussed with the stakeholders, how those countries could contribute to achieving the global target and how that would link to agricultural production and consumption in these countries.

Key discussion points

- Key points discussed in this session were the complexity of the downscaling, the importance of considering links between targets, the role of financial mechanisms and policy instruments, and some considerations specific to the example of the 30 by 30 target.
- This example illustrates how complex breaking a target down can be. It shows that even if there is already a lot of information/ data available, it might still not be sufficient to capture all relevant details. Tackling this complexity with the available data in the downscaling and coherently aligning this with the pathway narratives will be essential.
- Among the available targets going from consumption and production to area protection and restoration, there are logical links that might help to navigate through the targets. Identifying these links might help us to tackle the complexity. Such links exist, e.g., between protection and restoration or between consumption, production, protection, and restoration.
- How to share burdens and benefits will be an essential question; this question is relevant at different levels: between countries, within countries; to explore different scenarios of distributing burdens/ costs and benefits it might be relevant to think about financial mechanisms and policy instruments that could be applied to make a desired change happen, e.g., positive/ negative incentives, regulations. So, we might need to consider a

portfolio of national and international policies.

- In the given example, there are two distributional aspects: how to distribute protected areas and how to distribute cost; from a green growth paradigm, a question could be: how much does it cost to protect here compared to somewhere else? One way to approach this would be to start with the (ecologically sound) placement of protected areas and then think about how the burden of this can be distributed.
- How to distribute protected areas is also an ecological question. Areas to be protected can be identified from an ecological perspective, e.g., aiming at protecting species richness, ecosystems, carbon sinks etc. This then determines the share of protected areas in different countries, and we can see how much space is left e.g., for production and how this can be distributed from the consumer or producer perspective.
- The link between consumption and protection was discussed. E.g., it was suggested to differentiate between human needs and luxury consumption; optimizing that might free up area for protection. I.e., starting from reducing consumption, what will be the outcome?

Next steps

- Identify target groups with logical links
- Literature review on and compilation of available data and methods to approach the downscaling of selected targets

2.4 Interventions and feasibility aspects

Presentation: Interventions and feasibility, Daniel Braun and Jan Börner (Presenters)

Summary of Session:

This session focused on our approach to identifying feasible (policy) interventions that can serve as measures towards more biodiversity friendly value chains in the European food and biomass sector. We considered interventions targeting certain actor groups along a simplified supply chain from producers to consumers, as well as systemic interventions that potentially affect whole value chains. Moreover, specific

instruments and instrument mixes, feasibility criteria and associated knowledge gaps to assess such interventions in economic, technological, and societal terms were discussed.

Key Discussion Points:

- Looking at political interventions in Europe, there is a clear focus on production-oriented interventions. Interventions focusing on supply chains as a whole are often voluntary and less strict, while interventions on the consumer side are mostly information based. This circumstance does not reflect the potential leverage some interventions beyond the production sector can have. However, the strongest agency for change may lie in value chain interventions since they can control production practices. Consumers on the other hand, who are usually subject to informative interventions, often lack the monetary and time resources to make informed decisions. Although more transparency is needed, it just affects a minor target group that has enough resources to adapt its behaviour in a more biodiversity friendly way.
- Policy mixes are important and most effective since they can enable one another. The positive effects of single instruments are often regressive, meaning they can be unfair or unjust for certain stakeholder groups. Other instruments can be put in place to compensate for these effects. However, a coherent concept should be developed ex ante, which considers how different instruments influence certain stakeholder groups and how instrument interactions can best be used to generate synergies and compensate for undesired effects. E.g., combining informative consumer interventions with stricter financial policies.
- Investors are an important actor group that should also be considered in the model. They are subject to systemic interventions and have an influence on most other actors in the value chain.
- Regarding the implementation of effective interventions there is currently a huge gap for manufacturers, distributors, and retailers in terms of transparency regarding the origin of commodities along the supply chain. This makes it difficult for these actors to reach their commitment to the EU deforestation regulation and provides opportunities for implementing more

effective policies that require companies to disclose the origin of their commodities.

- It is difficult to assess policy effectiveness because whether policies are successful or not often depends on the specific context in which they are implemented. Also, understanding the interactions between different interventions and setting priorities in an "ecosystem of options" that can quickly evolve is challenging. One promising method is the Food Systems Dashboard developed by Fanzo and Haddad (https://www.foodsystemsdashboard.org/), which can be used to track food patterns and different indicators to identify effective policies via an AI tool.
- Interventions targeting consumers are important and can be effective measures to induce change when they are implemented together with conversion control instruments (either incentivizing or restricting measures). A method that presents toolboxes of options rather than prescribing one particular option is suggested.
- One topic that is often discussed in the industry is integrity of measures and targets. The reason for that is the assumed relationships between targets, measures, and outcomes, that are depicted and assumed in policies, are difficult to align with and often do not reflect the reality of companies.
- Another difficulty is associated with the fact that some companies tend not to have strongly vertically integrated value chains, meaning that they cannot directly influence all parts of the supply chain, but rely on the cooperation of other actors. Another factor adding complexity for companies is the high granularity of data required by certain interventions. Companies also face technological challenges, e.g., when it comes to segregation in supply chains and the application of appropriate tracking techniques.
- One problem regarding missing knowledge about the effectiveness of interventions is the lack of knowledge exchange between academia and politics in terms of decision making. Communication and the identification of alliances between strategic actors is important.
- Shifting to a more plant-based diet is the critical aspect of moving toward a society that is in harmony with biodiversity. There is an intention gap within society: people want to protect nature but are not willing to accept

restrictions such as reduced meat consumption. Effective interventions need to address this, but the challenge is finding measures accepted by society.

- Bioenergy is another major issue since there have been contradicting signals from policy makers in recent years so that some people adopted unsustainable practices like heating with pellets.
- Regarding technological solutions there have been some major innovations with immense potential for biodiversity, but they come with trade-offs and are still discussed in society, e.g., new green techniques, precision fermentation, or CRISPR-Cas9. It is necessary that they are used in the right way and that there is acceptance within society to make use of their potential. Coherent narratives and cost incentives might lead to a shift in social norms, accelerating the adoption of such technologies when reaching a tipping point.
- Agricultural taking place at the landscape level must be considered. It can be useful to break down the agricultural and food landscape into key topics that affect a particular landscape. One major factor for the agricultural sector is yield and yield optimization, in which environmental aspects and an improvement in livelihood are key aspects. It can be helpful to first take a historical perspective to identify potential challenges and obstacles (e.g., unsustainable practices that are rooted in farming traditions) and then develop scenarios for future development.
- Regarding eating habits, it is also important to consider trends outside of Europe. While in some regions the consumption of meat rises, it is decreasing in other regions. For dietary changes to happen, people must have access to healthy and sustainable food options, regardless of income or societal status ("Food Apartheid"). Interventions should be implemented that make it easier for all societal groups to access healthy food.

Next Steps:

- Considerations for a holistic concept of different interventions that interact in a synergistic and coherent way and even out negative consequences of individual instruments need to be made. However, limited knowledge about interactions and feasibility aspects make it challenging to produce reliable solutions.

- Since the focus of interventions has been primarily on producers, special attention should be given to interventions targeting other value chain actors, in particular consumers, which play a major role in making a biodiversity friendly transition possible via dietary changes and consumption choices.
- Societal acceptance should be considered a key criterion for evaluating intervention feasibility.

3. CLOSING REMARKS AND NEXT STEPS

In the closing remarks from presenters and participants, there was overall positive feedback and the workshop was seen as successful with a high level of discussion and engagement from the stakeholder reference group. A question was asked about next steps and future engagements with the stakeholder reference group in the project. It was explained that there would be two further engagements at key point in the project's development in May 2024 and July 2025.

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APPENDIX

Attached documents:

Briefing for stakeholder workshop 1

Presentation 1.1 – Stakeholder workshop

Presentation 1.2 – Pathway design

Presentation 1.3 – Model toolbox

Presentation 2.1 – Aggregated targets

Presentation 2.2 – Biodiversity, world views, justice

Presentation 2.3 – Downscaling targets

Presentation 2.4 – Interventions and feasibility

May 4th, 2023

BRIEFING FOR STAKEHOLDER WORKSHOP #1

Authors : David Leclère, Christopher Wong, Thomas Schinko, Marta Kozicka (IIASA); Larissa Nowak, Thomas Kastner (SGN); Daniel Braun, Jan Börner (UBO); Francesca Verones, Isabelle Richter (NTNU), Koen Kuipers (RU)

RAIN FOREST

Co-produced transformative knowledge to accelerate change for biodiversity

Grant agreement number: 101081744

Funded by the European Union

OBJECTIVES FOR THE WORKSHOP

The RAINFOREST project will contribute to enabling, upscaling and accelerating transformative change to reduce biodiversity loss due to EU food and biomass value chains by creating co-produced value-laden and just pathways. As part of the co-design process, we will engage with a range of stakeholders at all governance levels. This first workshop is intended as an introduction for the stakeholder reference group on:

- An early draft of new, just, viable and actionable targets and pathways able to reverse the ongoing global biodiversity decline through transformative change in the EU food and biomass nexus between climate action, production, trade, consumption, and human behaviour. We are interested in views and preferences from the reference stakeholder group on our preliminary thinking on:

i) the transformation expected for EU food and biomass supply chains towards goals for nature, climate and people,
ii) why equity issues matter for enabling such a transformation,
iii) the type of pathways we intend to use to explore these issues,
iv) the basic components of such pathways and how we plan to combine them, and
v) how we can operationalise equity principles in downscaling global targets to different geographies and sectors.

- Conceptual considerations in two additional areas:

a) interventions that should be mobilised to enact transformative change in EU food and biomass supply chains, and how we frame the feasibility of such interventions,

b) what type of methods and tools do we envisage to use and further develop within RAINFOREST (e.g., for the quantification of pathways, and case studies).

This document provides introductory material for the workshop, with a focus on the draft of the RAINFOREST pathways.

THE TRANSFORMATION AHEAD

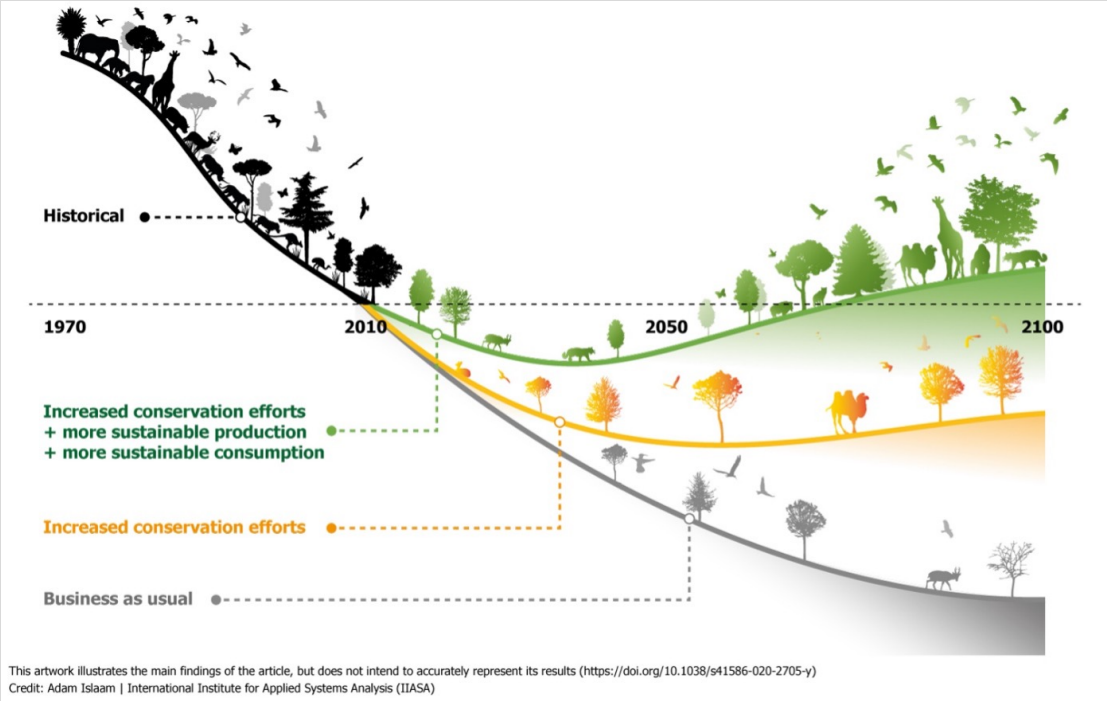

Figure 1: Example of pathways towards biodiversity goals, illustrating the need for transformative change to reach ambitious biodiversity goals. Credit: Adam Islaam (IIASA), after Leclère et al 2020.

As illustrated in Figure 1, reaching, even rudimentary, climate and biodiversity goals will necessitate transformative changes. According to the 2019 IPBES Global Assessment Report Biodiversity and Ecosystems Services a "fundamental, system-wide reorganisation across technological, economic and social factors, including paradigms, goals and values".

This principle lies at the heart of the Paris Agreement on climate change, the recently adopted Kunming-Montreal Global Biodiversity Framework and the EU Green Deal. Moving towards the targets contained in these global multilateral treaties and in EU policy frameworks mean that the following developments for EU food and biomass supply chains are expected in the coming decades:

- A decrease in the material footprint of global and EU food and biomass consumption in terms of biodiversity and climate impacts, with globally conflicting views on what an equitable contribution from the EU to global goals might be. In the EU, efforts are expected to focus on reducing waste and over-consumption, as well as encouraging a shift in consumption choices towards healthier and more sustainably produced products (including plant-based and organically produced/certified products).

- A decrease in the land use and pollution associated to both domestically produced and imported food and biomass products, through the promotion of more sustainable production practices (including sustainable intensification and agroecological practices) throughout supply chains. In the EU, efforts are expected to focus on less intensive production practices (reduction in pesticide and fertilizer application, promotion of organic and agroecological practices), as well as efforts to reduce the deforestation embedded in the imports of key food and biomass products, and to incentivize more sustainable production methods in exporting countries.

- An integrated conservation approach towards an increase in the extent and integrity of all ecosystems, combining a pervasive use of biodiversity-inclusive spatial planning methods with an increase

in the extent, management effectiveness, connectivity and diversity of protected and restoration areas, respecting the rights of indigenous peoples and local communities. In the EU, efforts are expected to focus on a moderate increase in the extent and connectivity of protected areas, a limited conversion of intensive and semi-natural land to natural ecosystems, and a large effort to improve the condition of all ecosystems, including all intensively managed landscapes through reduced input, use and increased shares of semi-natural elements in such landscapes, as well as promotion of biodiversity-friendly forestry practices and uses.

- An effort to align action towards climate and biodiversity goals, through harnessing the climate mitigation and adaptation potential of conservation and restoration actions and avoiding climate mitigation measures with adverse biodiversity impacts. In the EU, efforts are expected to focus on promoting restoration and protection efforts with large climate mitigation and adaptation co-benefits and limiting the reliance of the energy system transition on unsustainable levels of biomass or water use.

- A change in the allocation of financial resources, including an increase in the level of financial resources dedicated to the implementation of national biodiversity strategies and plans, a phasing out of subsidies harmful to biodiversity and an increase in international financial transfers. In the EU, efforts might focus on revising incentives and subsidies in policies such as the Common Agricultural Policy or the EU taxonomy on sustainable activities, increasing funding dedicated to the Green Deal implementation and to international biodiversity and climate action, and promoting innovative finance tools, such as green bonds and ESG disclosure.

WHY DOES EQUITY MATTER?

The transformative changes outlined in the previous section will have far-reaching social and economic consequences for wide-ranging stakeholder groups with diverging interests, worldviews and risk perceptions. This forms a significant challenge to collective action: conflicts across groups can hamper the adoption and implementation of policies, thereby effectively deterring the transformative change required to resolve such crises. Overcoming such challenges requires understanding the underlying reasons for these conflicts and then to co-produce equitable and workable policy solutions by finding values, framings and relationships which are the least contentious. This inevitably requires us to ask questions such as how society should value the environment and how resources should be shared and allocated. Recognizing this, the IPBES seeks to develop new types of scenarios based on the Nature Futures scenario framework, explicitly focusing on incorporating multiple views of nature as a central element of the scenario design.

Two interlinked concepts are often mobilized to frame equity in the thinking about enabling and accelerating transformative change:

- Worldviews: these are the very way in which individuals divine meaning from and about the world, with important effects on actions and behaviours by providing interpretations of why events occur and how we should respond to them.

- Justice: these are applied equity questions (actions and processes to be undertaken) often being the source of the tension across groups of diverging worldviews and interests. These include questions such as how costs and benefits should be shared (distributive justice) that often have been traditionally considered in the climate and conservation literature, but also additional forms of justice, such as recognition, restorative and procedural justice (see Table 1).

Table 1: Dimensions of Justice (Amended table from N Dawson, B Coolsaet and A Martin, 2018)

Dimensions of Justice	Applied equity questions
Procedural	How are decisions made and by whom? How are unequal power relations and differential abilities to assert or oppose different claims handled? What processes should be followed?
Recognition	What is the status afforded to different social and cultural values or identities and to the social groups who hold them?
Restorative	How can previous injustices or harms be rectified? And how can future harms or injustices be prevented?
Distributional	Who realises benefits or incurs costs and risks (whether material or non-material, objective or subjective)?

Discussions of distributive justice, such as fair shares of GHG emission reductions or contribution to global financial instruments between nations, have been central to the negotiations of multilateral climate and biodiversity agreements and are expected to remain so in their implementation. Similarly, the EU Green Deal raises tensions for various actors over decision making processes, overall ambition, means of implementation and burden sharing.

In RAINFOREST, we plan to operationalise equity in two ways:

- First, we focus the pathway design on multiple ways of valuing nature, with a focus on justice questions. We first review worldview groupings from the current literature and identify key related assumptions on specific justice questions, to then create coherent pathways to transformative change that are acceptable and align with the groupings. While all justice dimensions are to be included in the narrative of each pathway, the quantification of pathways may focus more heavily on distributive justice issues. Each pathway will be characterised not only by alternative variations of global and EU targets, but also by alternative distributions of targets among geographies and sectors, in relation to narratives on distributive justice.

- Second, we will investigate, through case studies, the local, context-specific acceptability of various interventions and policies, based on their adherence or inconsistency with pre-existing worldviews. This represents a bottom-up, inductive approach to producing a viable set of local goals and targets for agreed interventions and may help characterizing the pathways in terms of feasibility.

DESIGNING NEW PATWHAYS

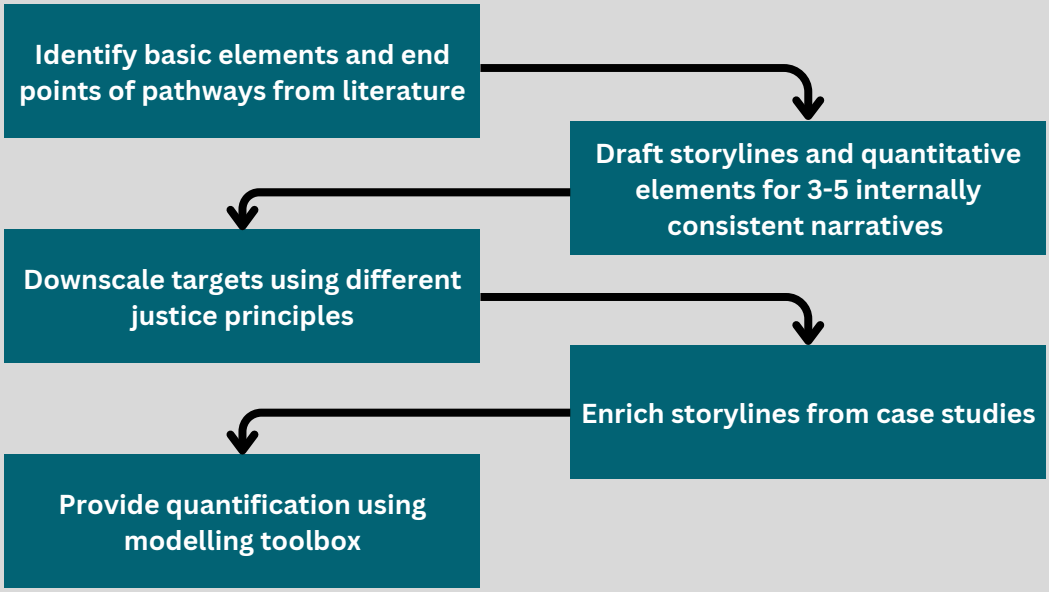

Figure 2: Pathway Design Process (Adapted from Kok, 2009))

We understand pathways as a broad set of contrasted and internally consistent scenarios about the future, deliberately designed to explore alternative visions about both the state of specific dimensions at a given point in time (e.g., biodiversity, climate, or poverty) and the trajectories leading to these. They consist of internally consistent narrative elements (sometimes called storylines) related to elements of the dimensions of interest, often complemented with quantitative aspects for selected elements, that can then be more extensively quantified through quantitative modeling methods. Among other examples, the scenario matrix developed to support coordinated research on climate combines pathways on future socioeconomic development and related drivers of climate change (Shared Socioecomic Pathways SSPs) and pathways on actual levels of perturbation to the climate system (Representative Concentration Pathways RCPs). As summarized in the IPBES Global Assessment report on biodiversity and ecosystem services, variations of the latter scenario matrix allowed a better understanding of what futures might unfold for not only climate but also biodiversity. But they were not designed to support the exploration of value-laden scenarios about the future, that could enable transformative change positive futures for nature, climate and people, which are the target of the Nature Futures scenario framework.

The new pathways developed in RAINFOREST intend to contribute to filling such a gap, with a focus on equity and environmental justice questions, in the context of futures in which the transformative change in the EU food and biomass nexus between climate action, production, trade, consumption, and human behaviour contributes to reaching ambitious goals for nature, climate and people. Following the Nature Futures framework, such pathways would focus primarily on futures in which biodiversity, climate and human wellbeing goals are met, and would differ by value-explicit assumptions about specific environmental justice framings arising from the transition to such a future state. We intend to proceed in 4 steps:

1) Review literature on the basic elements that may characterise the end-points and transitions of such pathways, such as targets from global and EU policy frameworks relevant to the EU food and biomass supply chains for biodiversity and climate, expected transformative change interventions required to achieve them, concerned sectors within and outside the EU, and values, worldview grouping and pathways emerging from the

Nature Futures framework and environmental justice aspects that might be relevant to EU food and biomass supply chains. These together will contribute the key elements of the storylines and selected quantitative elements of the pathways.

2) Draft storylines and selected quantitative elements of a set of 3-5 contrasted pathways that would provide internally consistent narratives on equity issues associated with how transformative change in the EU food and biomass nexus between climate action, production, trade, consumption, and human behavior contributes to reaching ambitious goals for nature, climate and people. This stage is expected to put particular emphasis on outcome and action targets at an aggregated level (e.g., EU vs global, all biomass value chains aggregated), the values, worldview grouping and archetypal pathways from the Nature Futures scenario framework, and aspects of distributive justice (to be used for downscaling the targets at a more disaggregated level) altogether providing a first foundation of the pathways.

3) Develop a set of targets downscaled to a level relevant for value chain segments (e.g., producers, consumers, and intermediate actors), sectors (e.g., crop, livestock, forest) and geographies (e.g., EU members States, major world regions outside the EU) that would rely on alternative distributive justice principles, and include additional insights emerging from the case studies on the feasibility of different interventions. This stage is expected to enrich the pathways with more details about targets and interventions specific to the context of a variety of actors.

4) Provide a more extensive quantification of the pathways using the RAINFOREST modelling toolbox.

This first workshop will occur at early developments of steps 1 and 2, with interest to collect feedback from the stakeholder reference group on the goal of the pathways and our initial understanding of specific topics (as illustrated in Figure 3) such as: the values, worldview grouping and archetypal pathways from the Nature Futures framework and their relation to specific environmental justice dimensions to be included, as well as the aggregated outcome and action targets to be included, or the distributive justice principles and the value chain segments, sectors and geographies relevant to the downscaling of targets.

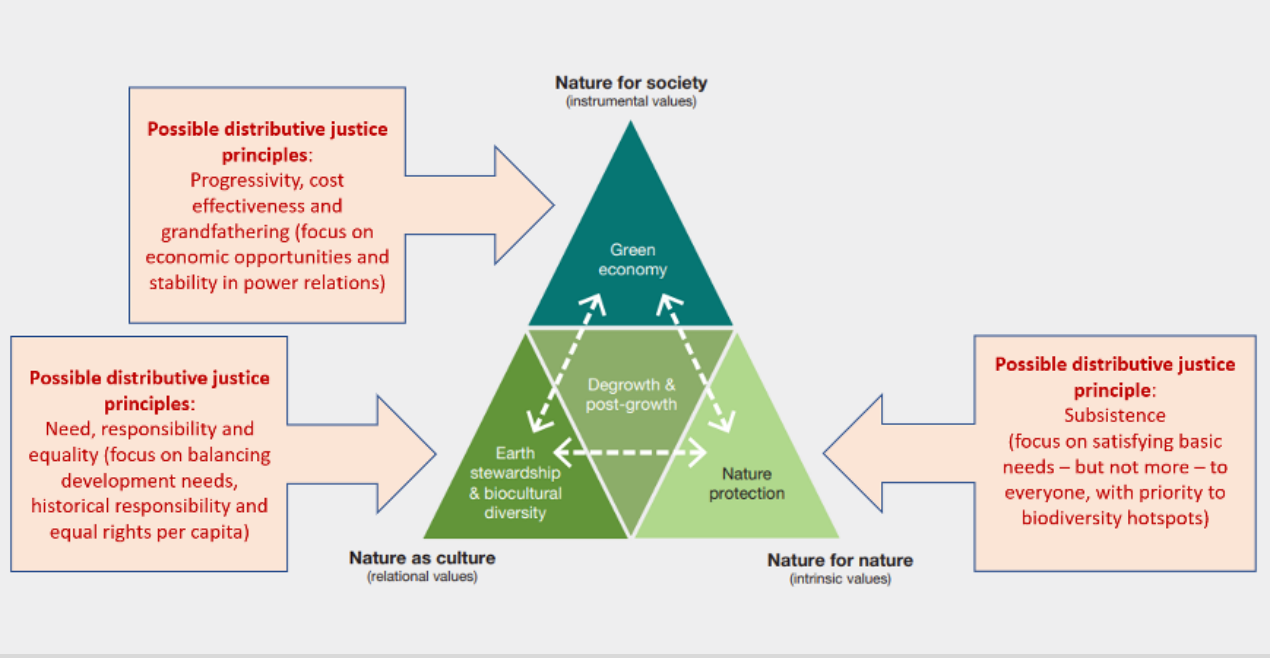

Figure 3: Apex values (nature for nature, focused on intrinsic values; nature for society, focused on instrumental values; and nature as culture, focused on relational values), and archetypal pathways (Green Economy, Earth Stewardship & biocultural diversity, Green economy, Post-growth and degrowth, and Nature protection) emerging from the Nature Future framework, as well as tentative assumption about the distributive justice principles that could be attached to them. Adapted from Figure 5-16 from the IPBES Methodological Assesssment Report on the diverse values and valuation of nature.

Programme and Session Guide

The workshop will take place in two 3 hour slots (13:00-16:00 CET) on Thursday, 11th May and Friday, 12th May. As detailed below, each day will be split into multiple sessions focusing on specific topics. The format for each session will be a short presentation to support a guided discussion that follows. This will give participants an opportunity to provide feedback on what they have heard and formulate recommendations for next steps.

Day 1: Thursday, 11th May

13:00-13:20
Introductions and Objectives
This session will set out the goals for the day including different roles, membership of the Stakeholder Reference Group and a short round of instructions.

13:20-14:05
The RAINFOREST project
What are the main objectives, approach, and expected outcomes of the project? Who are the partners and how is the project structured?

14:05-14:50
Introduction to the draft pathways
How do we understand pathways? What are building blocks and how are they combined? What applied questions are we targeting?

14:50-15:00
Break

15:00-15:45
Introduction to the toolbox
What is the model toolbox? What are its components? And what are our goals for it?

15:45-16:00
Summary and Reflections
A brief recap of the day and a chance for final thoughts and questions.

Day 2: Friday, 12th May

13:00-13:10
Objectives and Check-in
This session will set out the goals for the day and a quick check-in.

13:10-13:45
Aggregated targets considered in the pathways
Which policy frameworks did we consider? Why and how did we select and group targets?

13:45-14:20
Plural Values and Justice Principles
Exploring why worldviews and justice are key to creating transformative pathways. And how to align equity principles with value systems.

14:20-14:35
Break

14:35-15:10
Downscaling targets based on worldviews and justice principles
Using a hypothetical, quantitative example, how can a global target be broken down to national-level contributions?

15:10-15:45
Interventions and feasibility aspects
What policy instruments and initiatives are required for desirable pathways? Present and discuss policy feasibility criteria and identify gaps in the evidence on policy effectiveness.

15:45-16:00
Summary and Reflections
A brief recap of the day and a chance for final thoughts and questions.

STAKEHOLDER WORKSHOP

Pathways and tool box

Francesca Verones

11 and 12 May 2023

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

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This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

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3

Agenda Day 1

13:00-13:20	Introductions and Objectives
13:20 - 14:05	Introduction to RAINFOREST
14:05 - 14:50	Introduction to the draft pathways
14:50 - 15:00	BREAK
15:00 – 15:45	Introduction to the toolbox
15:45 – 16:00	Summary and Reflections

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

4

Agenda Day 2

13:00-13:10	Objectives and Check-in
13:10 - 13:45	Aggregated targets considered in thepathways
13:45 - 14:20	Plural Values and Justice Principles
14:20 - 14:35	BREAK
14:35 - 15:10	Downscaling targets based onworldviews and justice principles
15:10 – 15:45	Interventions and feasibility aspects
15:45 – 16:00	Summary, Reflections and outlook

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

5

Rules in online workshop

- Please have your cameras turned on
- Please mute yourself
- Please do not use the chat for side discussions
- Please raise your hand for questions and comments

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

6

Objectives of the workshop

- Help us understand the relevant decision-making context related to biodiversity
- Identify and discuss relevant targets, transformative pathways and indicators
- Shape conceptual and methodological choices
  - For pathways of transformative change and targets
  - For the modelling toolbox
- Input is crucial for shaping the course of the project

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

7

Goals of Day 1

- Get to know each other
- Get feedback and input for the development of the pathways
- Get feedback and input for the development of the toolbox

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

8

Introduction to RAINFOREST

COPRODUCED TRANSFORMATIVE KNOWLEDGE TO ACCELERATE CHANGE FOR BIODIVERSITY

Start: 1 December 2022

End: 30 November 2025

NTNU Norwegian University of Science and Technology, IIASA, Radboud Universiteit, UNIVERSITÄT BONN, SENCKENBERG world of biodiversity, PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ, The Cyprus Institute, Unilever, ROBECO, bonn realeis

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

9

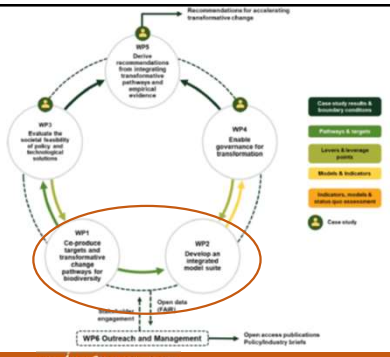
Main objectives

- contribute to enabling, upscaling and accelerating **transformative change** in Europe towards **reducing biodiversity impacts** of major **food and biomass** value chains
  - co-develop and investigate **just and viable pathways for transformative change** and policies for their **implementation** with stakeholders
  - enhance **assessment models** to allow for the quantification of **biodiversity impacts** at different spatial and organizational levels (e.g. company, national and global scales
  - highlight and exemplify the **application of the investigated pathways** for transformative change in case studies
  - investigate and co-generate **governance and financial reforms**, including public sector procurement, at all scales
  - **explain, visualize and communicate** our results and tools to a **diverse audience**

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

10

Organization



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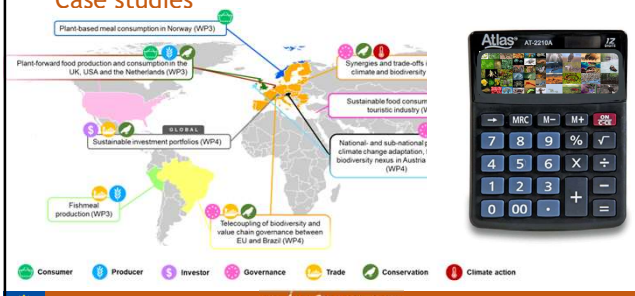
11

Case studies



This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

12

Why do we need RAINFOREST?

- Human consumption, production, and trade of food and biomass are the main underlying causes of biodiversity loss
- We have ambitious goals, but transformation of socio-economic, political, and technological aspects is required

13

Expected outcomes of the project

- Better assessments for biodiversity impacts
- Pathways and suggested actions for mitigating and reversing biodiversity loss
- Proof of methods in case studies
- Tool(s) that allow others to calculate their impacts

14

Cluster

BAMBOO, BIONEXT, BIOTraCes, CLEVER, BioValue, Transformative Pathways, PLANET4B PROJECT, TC-BE, BIOTRAILS, SUSTAIN

15

RAIN FOREST

NTNU, IIASA, SENCKENBERG world of biodiversity, Radboud Universiteit, The Cyprus Institute, UNIVERSITÄT BONN, Unilever, bonn realais, ROBECO

Thank you!

Visit https://rainforest-horizon.eu/

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INTRODUCTION TO PATHWAY DESIGN

David Leclère, Christopher Wong, Thomas Schinko, Marta Kozicka (IIASA); Larissa Nowak, Thomas Kastner (SGN); Daniel Braun, Jan Börner (UBO); Francesca Verones, Isabelle Richter (NTNU), Koen Kuipers (RU)

11th May 2023

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

1

What is our ambition for this session?

1. To understand the rationale, characteristics, potential use and design process of the new pathways to be generated in RAINFOREST
2. To discuss of what interest these pathways could be to you, and what elements might be important to capture in it

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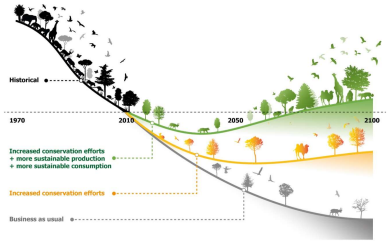
2

Transformative change for nature, climate and people



Desirable future

Transformative change
"fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values" IPBES (2019)

Business as usual

Source: own compilation, based on Adam Islaam (IIASA), after Leclère et al 2020

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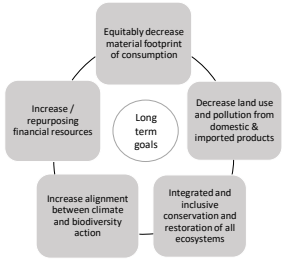
3

Gap 1: implications for EU food & biomass value chains?



Source: own interpretation of international and EU policy frameworks

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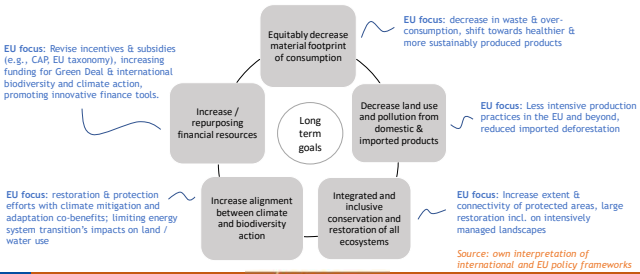
4

Gap 1: implications for EU food & biomass value chains?



EU focus: Revise incentives & subsidies (e.g., CAP, EU taxonomy), increasing funding for Green Deal & international biodiversity and climate action, promoting innovative finance tools.

EU focus: decrease in waste & over-consumption, shift towards healthier & more sustainably produced products

EU focus: Less intensive production practices in the EU and beyond, reduced imported deforestation

EU focus: restoration & protection efforts with climate mitigation and adaptation co-benefits; limiting energy system transition's impacts on land / water use

EU focus: Increase extent & connectivity of protected areas, large restoration incl. on intensively managed landscapes

Source: own interpretation of international and EU policy frameworks

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5

Gap 2: a lack of consideration for equity questions?

- Transformative change = large social & economic consequences for many groups of diverging interests & worldviews.
- A challenge to collective action, that requires engaging in value & equity discussions
- Entry points to equity:
  - **Worldviews** are useful to understand value groupings
  - Tensions often materialize on **environmental justice topics**

Dimensions of Justice	Applied equity questions
Procedural	How are decisions made and by whom? How are unequal power relations and differential abilities to assert or oppose different claims handled? What processes should be followed?
Recognition	What is the status afforded to different social and cultural values or identities and to the social groups who hold them?
Restorative	How can previous injustices or harms be rectified? And how can future harms or injustices be prevented?
Distributional	Who realises benefits or incurs costs and risks (whether material or non-material, objective or subjective)?

Source: Adapted from Dawson et al 2018

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6

Our hypothesis

Activity: Co-produce and explore new, just, viable and actionable targets and pathways able to halt or reverse the ongoing global biodiversity decline through transformative change in the EU food and biomass nexus between climate action, production, trade, consumption, and human behavior

Outcomes:

- address the identified research gap
- generate knowledge supporting the acceleration of transformative change

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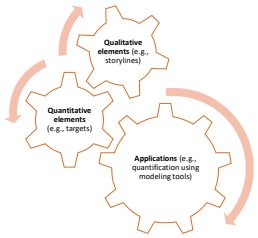
7

How we understand *pathways*

Pathways:

- Contrasted & internally consistent scenarios about the future
- Exploring alternative visions about end points (e.g., future biodiversity, climate, or human well-being states), and the trajectories leading to these

Example: Representative Concentration Pathways (RCP, perturbation of the climate system) and Shared Socio-economic Pathways (socio-economic development) linking population, GDP, energy and land use sectors and climate system



Source: own design

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8

What should the RAINFOREST pathways allow exploring?

Questions

- What actor-level contributions might be compatible with EU and global goals for biodiversity & climate ?
- What might be alternative distribution of efforts towards global targets based on different equity viewpoints?
- What could be impacts on various parts of EU food and biomass value chains?
- What viable & feasible interventions might allow reaching the desired end point?

Applications

- Produce actor-level targets (e.g., biodiversity state in countries X and Y, consumption in country X for commodity group C, trade between country X and Y in commodity) for each pathway
- Use the RAINFOREST modeling toolbox to quantitavely assess the pathways

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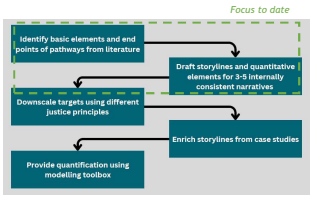
9

What type of pathways? How to build them?

Based on IPBES' **Nature Futures framework:**

- **Time horizon**: ca mid-21st century
- **Common end point**: biodiversity, climate and human wellbeing goals are met
- **Narratives**: value-explicit assumptions about specific environmental justice framings arising from variations in / transition to such a future end point
- **Targets**: from indirect drivers to outcomes, from aggregated levels to value chain segments/sectors/countries



Source: Adapted from Kok et al 2009

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10

Basic elements of pathways: aggregated targets

What aggregated targets?

- Outcomes: biodiversity, climate, human wellbeing
- Action: Direct (e.g., land use, pollution) & indirect drivers (e.g., conservation, consumption, production, trade, finance, education, etc.)
- At global and EU levels
- As contained in both scientific & policy frameworks

Use in pathways

- Used to characterize end points & how to get there
- Integrated as a mix of quantitative (e.g., outcome, action on some drivers) and qualitative (e.g., action on some other drivers) elements

NB: Also supports/refined through downscaling of pathways as actor-level targets, assessment with toolbox

More in tomorrow's session on aggregated targets (13:10-13:45): review, database, selection

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11

Basic elements of pathways: human agency

What human agency?

Broad categories of interest:

- Value chain segments
  Consumers, Producers & Intermediates
- Sectors
  Agriculture and forestry, conservation, energy, finance
- Institutions
  Markets, governments, ?IPLC?
- Geographical division:
  EU, Major world regions, ?EU-MS?

Use in pathways

- Narratives for each pathway should be differentiated about interventions for specific groups of actors
- Integrated primarily as qualitative elements

NB: Further refined in downscaling of pathways as actor-level targets & assessment with toolbox (with higher level of detail on sectors – e.g., specific commodity groups – and geographies)

Some additional elements in tomorrow's session on target downscaling (14:35-15:10)

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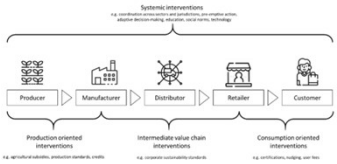
12

Basic elements of pathways: interventions

What interventions?



Use in pathways

- Narratives for each pathway should be differentiated about interventions for specific groups of actors
- Integrated primarily as qualitative elements

NB: Pathway drafts (to be produced this year) will only have a limited focus on interventions, to be enriched later in the project based on insights from case studies

Some additional elements in tomorrow's session on Interventions and feasibility aspects (15:10-15:45)

13

Basic elements of pathways: equity

Key questions on values & equity

- What are the main value groupings (e.g., nature for nature vs. nature for society) and themes (e.g., green-growth vs post-growth, half-earth vs whole earth) characterizing alternative worldviews about transformative change?
- How can these align to specific assumptions about environmental justice dimensions? (e.g., where do we restore & protect? Who its reduces consumption?)
- How can these link to contextual aspects of technological, economic and political feasibility of various interventions?

Use in pathways

- Narratives for each pathway will be based on pre-existing value groupings & themes from literature and declined in terms of environmental justice
- Integrated primarily as qualitative elements

More in tomorrow's sessions on plural values and justice principles (13:45-14:20), target downscaling (14:35-15:10) and interventions and feasibility (15:10-15:45)

14

Discussion starter

- Do you agree with the hypothesis?
  (the need for equity-focused trasnformative change pathways)
- How does the environmental justice framing resonnates with you?
- What applied questions would be of interest to explore (e.g., effort-sharing towards green deal / GBF, feasibility of specific intervention portfolios)?
- Are we missing some important basic elements?

15

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16

STAKEHOLDER WORKSHOP

Introduction to the toolbox

Koen Kuipers

11 May 2023

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1

Model toolbox

- Set of economic and environmental impact models
  - GLOBIOM (partial equilibrium model)
  - EXIOBASE (hybrid MRIO model)
  - GLOBIO (global biodiversity model)
  - LC-IMPACT / ReCiPe (LCIA models)
- Quantify **climate**, **biodiversity**, and **socioeconomic** impacts of
  - Transformative pathways
  - Case studies (e.g., national consumption and production footprints, or production processes)
- Enhance models to quantify impact indicators relevant for measuring transformative change
  - Consider transformative change in the economic models
  - Improve representation of biodiversity indicators

LD0

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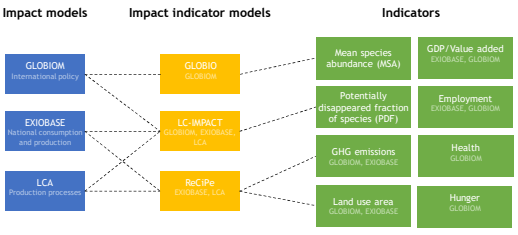
2

Models and indicators in the toolbox



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3

GLOBIOM

- Dynamic model: partial equilibrium model (PEM) of land use sectors (37 regions, 58 products)
- Application: quantify RAINFOREST pathways in terms of economic and environmental outcomes
- Output:
  - Land use maps, biodiversity indicators (extinction risk, BII), GHG emissions
  - Production, consumption, trade, prices, value added, risk of hunger, health
- Potential toolbox links
  - GLOBIO (MSA)
  - LC-IMPACT (PDF) / ReCiPe (GHG and land use footprints, health)
  - EXIOBASE (Employment)

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4

EXIOBASE

- Static model: multi-regional input-output model (MRIO) of national supply-use tables (44 countries, 200 products)
- Application: what-if scenarios of national consumption and production patterns
- Output:
  - GHG emissions
  - Land use
  - Socioeconomic indicators (e.g., GDP or employment)
- Toolbox links:
  - ReCiPe (land use and GHG footprints)
  - LC-IMPACT (PDF)
  - GLOBIO (MSA)

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5

LCA

- Life cycle assessment (LCA) model of specific production processes (region-specific)
- Application: (prospective) production processes
- Output:
  - GHG emissions
  - Land use
- Toolbox links:
  - LC-IMPACT (PDF)
  - ReCiPe (GHG and land use footprints)

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6

GLOBIO

- Model global biodiversity responses to human pressures for **plants** and **vertebrates** (birds and mammals)
- Input: maps of human pressures (e.g., land use or temperature change)
- Output: maps of mean species abundance (MSA)
- Toolbox links:
  - GLOBIOM
  - EXIOBASE

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7

LC-IMPACT & ReCiPe

- Life cycle impact assessment (LCIA) methodologies (190 countries/825 ecoregions, several impact indicators)
- Input: environmental flows (e.g., GHG emissions or land use)
- Output:
  - LC-IMPACT: Potentially disappeared fraction of species (PDF; for plants, birds, amphibians, mammals, and reptiles)
  - ReCiPe: Global warming potential (GWP)
  - ReCiPe: Land use area
- Toolbox links:
  - GLOBIOM
  - EXIOBASE
  - LCA

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8

Model toolbox application in case studies

- Peru fishmeal production footprints (LCA)
- Food consumption scenario footprints in NL, UK, and USA (MRIO, GLOBIOM)
- Investment portfolio footprints (LCA-MRIO hybrid)

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9

Model toolbox improvement?

What is important to you? Some examples:

- The actors considered (e.g., all countries)
- The resolution of the sectors considered (e.g., conventional and organice agriculture)
- The impact indicators considered (e.g., additional indicators to GWP, land use, MSA, PDF, GDP and employment)
- The transformative change interventions (e.g., dietary changes, climate and biodiversity action alignment, trade and supply chain regulations)
- The species groups covered by the biodiversity indicators (currently plants, birds, mammals, amphibians, and reptiles)
- The spatial resolution of the indicators

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10

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11

AGGREGATED TARGETS CONSIDERED IN THE PATHWAYS

Larissa Nowak

12.05.2023

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1

Agenda

1. Frameworks
2. Target selection
3. Summary
4. Questions

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2

1. Frameworks

a) Policy frameworks

- Global
  - Kunming-Montreal Global Biodiversity Framework (biodiversity)
  - Paris agreement and COP27 cover agreement (climate)
  - Sustainable development goals

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3

1. Frameworks

a) Policy frameworks

- Global
  - Kunming-Montreal Global Biodiversity Framework (biodiversity)
  - Paris agreement and COP27 cover agreement (climate)
  - Sustainable development goals
- European
  - EU Green Deal and related frameworks (e.g., biodiversity, farm to fork strategies)

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4

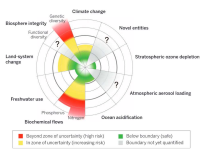
1. Frameworks

a) Policy frameworks

- Global
  - Kunming-Montreal Global Biodiversity Framework (biodiversity)
  - Paris agreement and COP27 cover agreement (climate)
  - Sustainable development goals
- European
  - EU Green Deal and related frameworks (e.g., biodiversity, farm to fork strategies)

b) Scientific frameworks

- Planetary boundaries framework
- Nature Futures scenario framework



Steffen et al. 2015

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5

1. Frameworks

Database

- Compilation of goals and targets from these documents (global and EU scale)
- Additional information, e.g.,:
  - Outcome/direct driver/indirect driver
  - Topic (biodiversity, climate, land use, pollution,…)
  - Target grouping

Body	Identifier	Target text	Direct driver/ indirect driver/ outcome	Topic	Grouping (1) SL quant./ (2) SL qual./ (3) NSL qual./ (4) NSL
GBF	GBF target 3 protect 30 by 30	Ensure and enable that by 2030 at least 30 per cent of terrestrial and inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognising and respecting the rights of indigenous peoples and local communities, including over their traditional territories.	direct driver	land/ sea use	1

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6

2. Target selection

Purpose of selected targets

(a) Informing pathways of transformative change
- Quantitatively and qualitatively

(b) Downscaling of specific targets
- To different geographies and sectors
- Exploring justice and allocation principles

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7

2. Target selection

Focal topics (for pathways and downscaling)
- Consumption, production, trade of biomass products
- Pollution (excess nutrients, pesticides)
- Area protection, restoration
- Greenhouse gas emissions from the AFOLU sector (agriculture, forestry and other land use)
- Extent (and intactness) of natural ecosystems
- Extinction risk
- Potentially pollination (example for nature's contribution to people)

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8

2. Target selection

1. Shortlisted (focal topics), quantitative
- Part of pathways, quantified, downscaled
- Targets addressing focal topics, e.g., GBF targets 1-3, 7, 10 and 16

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9

2. Target selection

1. Shortlisted (focal topics), quantitative
- Part of pathways, quantified, downscaled
- Targets addressing focal topics, e.g., GBF targets 1-3, 7, 10 and 16

2. Shortlisted (focal topics), qualitative
- Part of pathways, but not quantified (potentially not enough data)
- E.g., targets on pesticide use

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10

2. Target selection

1. Shortlisted (focal topics), quantitative
- Part of pathways, quantified, downscaled
- Targets addressing focal topics, e.g., GBF targets 1-3, 7, 10 and 16

2. Shortlisted (focal topics), qualitative
- Part of pathways, but not quantified (potentially not enough data)
- E.g., targets on pesticide use

3. Not shortlisted, qualitative
- Not main focus but important for pathway development, included qualitatively
- Mostly targets related to indirect drivers

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11

2. Target selection

4. Not included (out of scope)
- Genetic resources and benefit sharing
- Biosafety
- Use of wild species, wildlife trafficking, fishing
- Pollution other than from excess nutrients or pesticides
- Invasive species
- Climate change in general, adaption, loss and damage
- Urban greening
- EU-GD: mobility, building and renovating, circular economy

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3. Summary

- Global and European policy and scientific frameworks
- Target selection for (a) pathways and (b) downscaling
- Some topics will be the focus of pathways and downscaling
- Some topics are out of scope
- Four groups of targets (accordingly)

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13

4. Questions

- Is there a policy (or scientific) framework that we have overlooked?
- Is our selection of focal topics meaningful?
- Is it okay to exclude the topics/ targets we exclude?
- Which of the selected topics/ targets are particularly relevant to quantify?

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14

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15

Sentences for five pager

Which policy and scientific frameworks did we consider? Why and how did we select and group targets?

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16

BIODIVERSITY, WORLDVIEWS AND JUSTICE

Day 2, Session 2

Christopher Wong

12th May 2023

This project is funded by the European Union's Horizon Europe research and innovation programme under grant agreement no. 101081744.

1

What is our ambition for this session?

1. To understand why worldviews and justice are key to transformative pathways for biodiversity.
2. To discuss what are the key equity principles and how we can align them to different value systems.

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2

How will we get there?

1. Explain what worldviews and justice are.
2. Explain equity principles from climate justice literature and how they can be translated to biodiversity.
3. Show our proposed alignment of illustrative pathways and equity principles.
4. Discuss the relative importance of different equity principles and our proposed alignment.

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3

Why talk about worldviews and justice?

Rittel and Webber (1973):

"the search for scientific bases for confronting problems of social policy is bound to fail, because of the nature of these problems"

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4

Wicked Problems

- Climate Change and Biodiversity are archetypal "wicked problems".
- Contested meaning, magnitude and responses.
- Opens up questions about how society should be managed.
- Scientific communities' response has been to create more accurate and compelling evidence.

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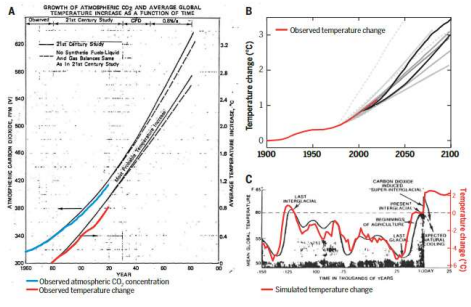
5

Historically observed temperature change (red) and atmospheric carbon dioxide concentration (blue) over time, compared against global warming projections reported by ExxonMobil scientists. (**A**) "Proprietary" 1982 Exxon-modeled projections. (**B**) Summary of projections in seven internal company memos and five peer-reviewed publications between 1977 and 2003 (gray lines). (**C**) A 1977 internally reported graph of the global warming "effect of CO_2 on an interglacial scale." (A) and (B) display averaged historical temperature observations, whereas the historical temperature record in (C) is a smoothed Earth system model simulation of the last 150,000 years.



Taken from Supran et al., 2023

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6

Wicked Problems

Plutynski and Fujita-Lagerqvist (2016, p282) state,

"Biodiversity is at the intersection of a host of political and economic conflicts over land, resources, and power."

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7

Plural Value in the Nature Futures Framework

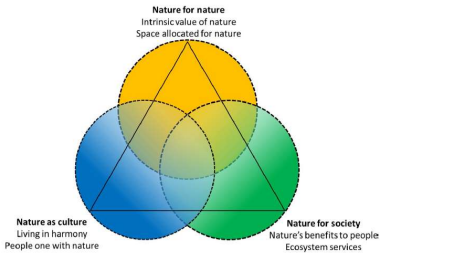

Fig. 3, Pluralistic Nature Futures Framework, IPBES

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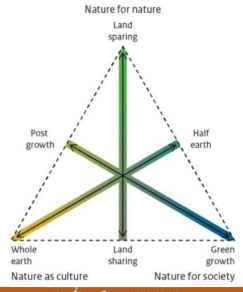
8

Six Illustrative Narratives for Biodiversity



(Part of Figure 3 from Durán et al., 2023)

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9

What are the Dimensions of Justice?

Dimensions of Justice	Explanation
Procedural	Procedural justice refers to how decisions are made and by whom, whether formal rules and processes or informal interactions, necessitating attention to unequal power relations and differential ability to assert or oppose different claims.
Recognition	Recognition revolves around the status afforded to different social and cultural values or identities and to the social groups who hold them
Restorative	Restorative justice seeks processes to rectify previous injustices or harms caused and to prevent future harm or injustices being perpetrated.
Distributional	Distribution concerns who realises benefits or incurs costs and risks, whether material or non-material, objective or subjective.

(Amended table from N Dawson, B Coolsaet and A Martin, 2018)

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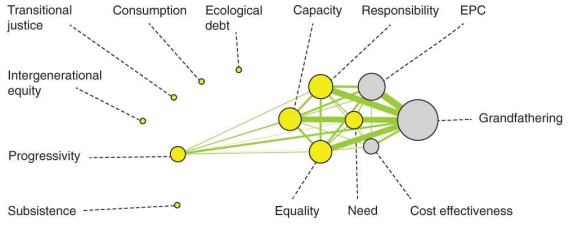
10

Equity Principles for Distributional Justice



(Dooley et al., 2021)

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11

Equity Principles for Distributional Justice

Overarching Principle	Climate allocation approach	Definition	Application to Biodiversity Loss
Sovereignty / Status Quo	Grandfathering	Grandfathering is based on a sovereignty principle where current resource use is seen as an acquired or 'status quo right'. This approach allocates costs or budgets based on a country's current share in global environmental pressure.	Current relative levels of biodiversity loss between countries is maintained and all countries are expected to reduce from that level.
Economic	Cost Effectiveness	Cost Effectiveness prioritises environmental protection schemes that have the least economic costs.	Areas where there is the least economic activity and most species richness are protected.
Economic	Progressivity	Prioritizes economic and social progress in mitigation plans for carbon reduction based on technological advances.	Minimalist interpretation of biodiversity protection through sustainable intensification.
Responsibility	Responsibility	Responsibility approach is where those responsible for environmental harm bear the burden of reduction and restoration such as polluter pays.	1.Producer focus
			2.Consumer focus

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Equity Principles for Distributional Justice

Overarching Principle	Climate allocation approach	Definition	Application to Biodiversity Loss
Capability	**Need**	Need takes account of the social requirements of alleviating poverty so exempting the poorest from contributing to environmental action because meeting their basic needs has moral priority.	1.Low-income countries excluded from cost allocations for nature protection and restoration. 2.Or the least developed countries are allowed to increase biodiversity loss in order to reduce poverty.
Capability	**Capacity**	The capacity or ability to pay approach is based on the capability principle where allocation of costs or budgets is based on a country's GDP per capita.	1.The costs of nature protection and restoration would be based on GDP per capita. 2.Countries with the greatest natural capital should protect the most.
Capability	**Subsistence**	Distinguishes between subsistence emissions and luxury emissions and suggests that they should be treated differently in reduction schemes.	Would distinguish between necessary biodiversity loss for maintaining basic needs and biodiversity loss that is caused by excessive consumption.
Equality	**EPC**	Equal per capita allocation is based on the equality principle where a country's share in the global population designates their allocation of budgets or costs.	1.Each country should have the same level of nature protection. 2.Cost of nature protection and restoration is done per capita.
Equality	**Egalitarian**	Actions that reduce inequality are prioritised .	1. Inequality in access to nature and its benefits 2. Monetary inequality

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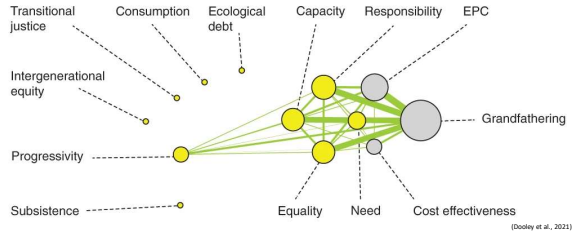
Question 1: Which principle is most important for you?



(Dooley et al., 2021)

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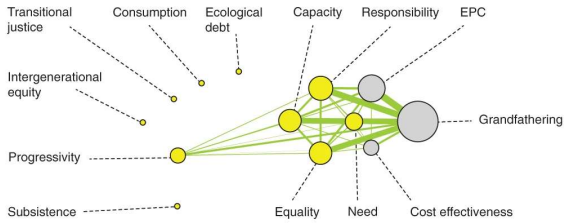
Question 2: Are we missing any equity principles?



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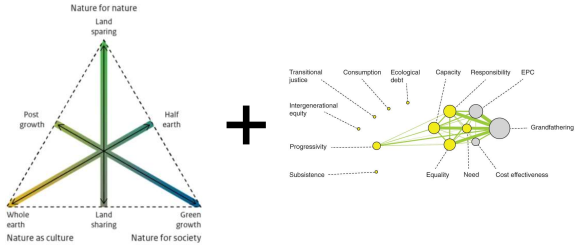
Aligning Narratives with Justice Principles



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Question 3: Is this the correct alignment?

Narratives	Allocation Principle
Green Growth	Progressivity, cost effectiveness, capacity and grandfathering
Post-growth	Responsibility, egalitarian and Subsistence
Whole Earth	Need, capacity and egalitarian
Half Earth	Progressivity, cost effectiveness and need
Land Sparing	Capacity
Land Sharing	Progressivity and egalitarian

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DOWNSCALING TARGETS BASED ON WORLDVIEWS AND DISTRIBUTIVE JUSTICE PRINCIPLES

Thomas Kastner

12th of May 2023

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1

What is our ambition for this session?

- Using considerations on worldviews and distributive justice to quantitaively break down global targets:
  - How are different outcomes motivated by different worldviews and justice principles?
  - How do they differ in regards to burden and benefit sharing?
  - What is the value of implementing such an approach with real-world data for selceted targets?

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2

How will we get there?

- Introduce and discusss hypothetical example relating to the 30 by 30 target
- Collect suggestions how to distribute contributions to reach the target in the example
- Reflect on the approach and on the focus target groups within RAINFOREST

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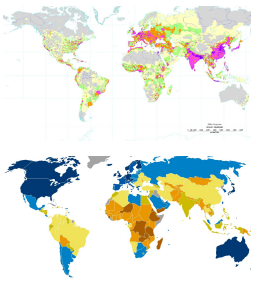
3

Three countries: Hypothetical differences

	Country A	Country B	Country C
Country area	150	100	50
Population	150	300	450
GDP	300	1800	450
Population density	1	3	9
GDP per capita	2	6	1



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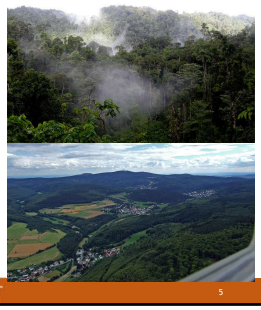
4

Indicators relevant to the 30 by 30 target

	Country A	Country B	Country C
Natural area	50	5	0
Protected area	**15**	**35**	**5**
Natural area (%)	*33%*	*5%*	*0%*
Protected area (%)	***10%***	***35%***	***10%***

	Country A	Country B	Country C
Country area	150	100	50



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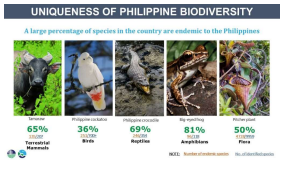
5

Indicators relevant to the target

	Country A	Country B	Country C
Natural area	50	5	0
Protected area	**15**	**35**	**5**
Natural area (%)	*33%*	*5%*	*0%*
Protected area (%)	***10%***	***35%***	***10%***
Species number	100	60	50
Unique species	50	1	15



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6

Indicators relating to agricultural production, trade and consumption



	Country A	Country B	Country C
Agricultural production	150	100	50
Nitrogen surplus	0	20	20
Physical trade balance (import - export)	-100	70	30
Plant-based food	20	50	60
Livestock feed	30	120	20

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7

The 30 by 30 target

- At least **30 per cent of areas**, *especially areas of particular importance for biodiversity and ecosystem functions and services*, **are effectively conserved and managed through** *ecologically representative, well-connected and equitably governed systems of* **protected areas** and other effective area-based conservation measures**.**

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8

The 30 by 30 target in our example

- Global area: 300
- 30% target -> 90 of protected area needed to meet the target
- Currently 55 protected area
- **At least 35 additional protected area**

	Country A	Country B	Country C
Country area	150	100	50
Population	150	300	450
GDP	300	1800	450
Population density	1	3	9
GDP per capita	2	6	1
	Country A	Country B	Country C
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Nitrogen surplus	0	20	20
Trade balance	-100	70	30
Plant-based food	20	50	60
Livestock feed	30	120	20

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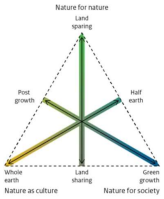
How should the three countries contribute to meeting the target? And why?



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Plant-based food	20	50	60
Livestock feed	30	120	20

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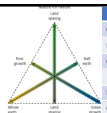
10

Worldview / Narrative: **XX**
Distributive Justice Principle: **YY**



Additional area (at least 35)
Country A: *XX* Country B: *YY* Country C: *ZZ*

Motivation for the distribution
AAA

Financial mechanisms
BBB

Implications for production, trade and consumption of biomass products
CCC

	Country A	Country B	Country C
Country area	150	100	50
Population	150	300	450
GDP	300	1800	450
Population density	1	3	9
GDP per capita	2	6	1
	Country A	Country B	Country C
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Nitrogen surplus	0	20	20
Trade balance	-100	70	30
Plant-based food	20	50	60
Livestock feed	30	120	20

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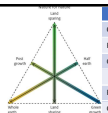
11

Worldview / Narrative: **XX**
Distributive Justice Principle: **YY**



Additional area (at least 35)
Country A: *XX* Country B: *YY* Country C: *ZZ*

Motivation for the distribution
AAA

Financial mechanisms
BBB

Implications for production, trade and consumption of biomass products
CCC

	Country A	Country B	Country C
Country area	150	100	50
Population	150	300	450
GDP	300	1800	450
Population density	1	3	9
GDP per capita	2	6	1
	Country A	Country B	Country C
Natural area	50	5	0
Protected area	**15**	**35**	**5**
Natural area (%)	*33%*	*5%*	*0%*
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Unique species	50	1	15
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Agricultural production	150	100	50
Nitrogen surplus	0	20	20
Trade balance	-100	70	30
Plant-based food	20	50	60
Livestock feed	30	120	20

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12

Some considerations

- Different motivations how to "downscale" one target → we suggest to make underlying worldviews and justice principles explicit
- Wide range of targets have been formulated
- Quantitatively explore different sets of related targets / targets that might trade off:
  - Protection / Restoration / Ecosystem integrity / Nutrient balances
  - Production (e.g., N surplus, pesticides) / Trade (e.g., deforestation free products) / Consumption (footprints)

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Questions

1. What are potential challenges and pitfalls of such an approach?
2. Are there targets you think would be especially interesting to explore?
3. Are you aware of related ongoing discussions / strands of literature / relevant data sources?

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Worldview: **Nature for Nature**
Distributive Justice Principle: **Capacity**

Additional area
Country A: *+45* Country B: *-10* Country C: *+10*

Motivation for the distribution
Protection focusses on areas with highest global biodiversity value; Conservation is understood as joint global challenge where countries contribute funding according to their capacity; renaturation / restoration of protected areas that are currently under any form of use

Financial mechanisms
Country B as supports the establishment of PAs in remaining natural areas and areas of high global conservation value

Implications for production, trade and consumption of biomass products
Exports from A might decline, more imports needed in C, Production in B might have to increase to compensate, reduction of AP consumption might give options for exports

	Country A	Country B	Country C
Country area	150	100	50
Population	150	300	450
GDP	300	1800	450
Population density	1	3	9
GDP per capita	2	6	1
	Country A	Country B	Country C
Natural area	50	5	0
Protected area	15	35	5
Natural area (%)	*33%*	*5%*	*0%*
Protected area (%)	*10%*	*35%*	*10%*
Species number	100	60	50
Unique species	50	1	15
	Country A	Country B	Country C
Agricultural production	150	100	50
Nitrogen surplus	0	20	20
Trade balance	-100	70	30
Plant-based food	20	50	60
Livestock feed	30	120	20
Human trophic level	2.23	2.32	2.06

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Worldview: **Nature for Culture**
Distributive Justice Principle: **Subsistence & Egalitarian**

Additional area
Country A: *+50* Country B: *+15* Country C: *+10*

Motivation for the distribution
Protected areas are often areas where certain uses and local biodiversity coexist. Each country meets at least the 30% target. Access for all societal groups to semi-natural areas is prioritized.

Financial mechanisms
Support and innovations for integrative land management is mainstreamed. Value of biodiversity is shared throughout society.

Implications for production, trade and consumption of biomass products
Reductions in resource intensive consumption to lower pressure on land. Focus on balanced nutrient budgets. Trade regimes focus on sufficiency and resilience.

	Country A	Country B	Country C
Country area	150	100	50
Population	150	300	450
GDP	300	1800	450
Population density	1	3	9
GDP per capita	2	6	1
	Country A	Country B	Country C
Natural area	50	5	0
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Plant-based food	20	50	60
Livestock feed	30	120	20
Human trophic level	2.23	2.32	2.06

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17

Worldview: **XX**
Distributive Justice Principle: **YY**

Additional area
Country A: *XX* Country B: *YY* Country C: *ZZ*

Motivation for the distribution
AAA

Financial mechanisms
BBB

Implications for production, trade and consumption of biomass products
CCC

	Country A	Country B	Country C
Country area	150	100	50
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STAKEHOLDER WORKSHOP

Interventions and Feasibilibity

Jan Börner and Daniel Braun

12 May 2023

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1

Definitions

- We define **interventions** as:
  All types of actions targeting biodiversity conservation (special attention is given to policy instruments and initiatives)
- **Feasibility** refers to:
  - Economic feasibility
    (e.g., cost effectiveness)
  - Technological feasibility
    (e.g., availability of technological tools)
  - Social and political acceptability
    (e.g., approval of social groups and political decision-makers)

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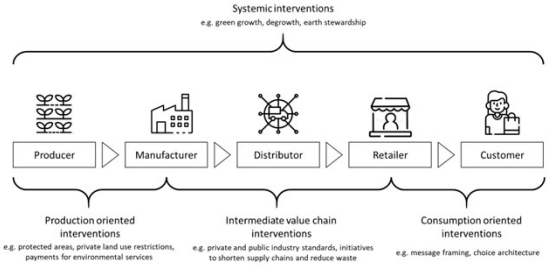
2

Categories of Interventions



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3

Challenges

Assessing and evaluating the feasibility of interventions is challenging because:

- they affect a wide range of actors, commodities, supply chains, geographies, and sometimes nations (e.g., EU regulations)
- they are diverse in their wording, scope, timelines for implementation and level of transparency
- there is limited evidence on their effectiveness
- they often interact in synergistic or antagonistic ways with other interventions

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4

Our Questions

- Which interventions are most needed for more biodiversity-friendly food and biomass value chains?
- What criteria are needed to assess the feasibility of these interventions?
- What knowledge gaps are in the way of making these interventions more effective?

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