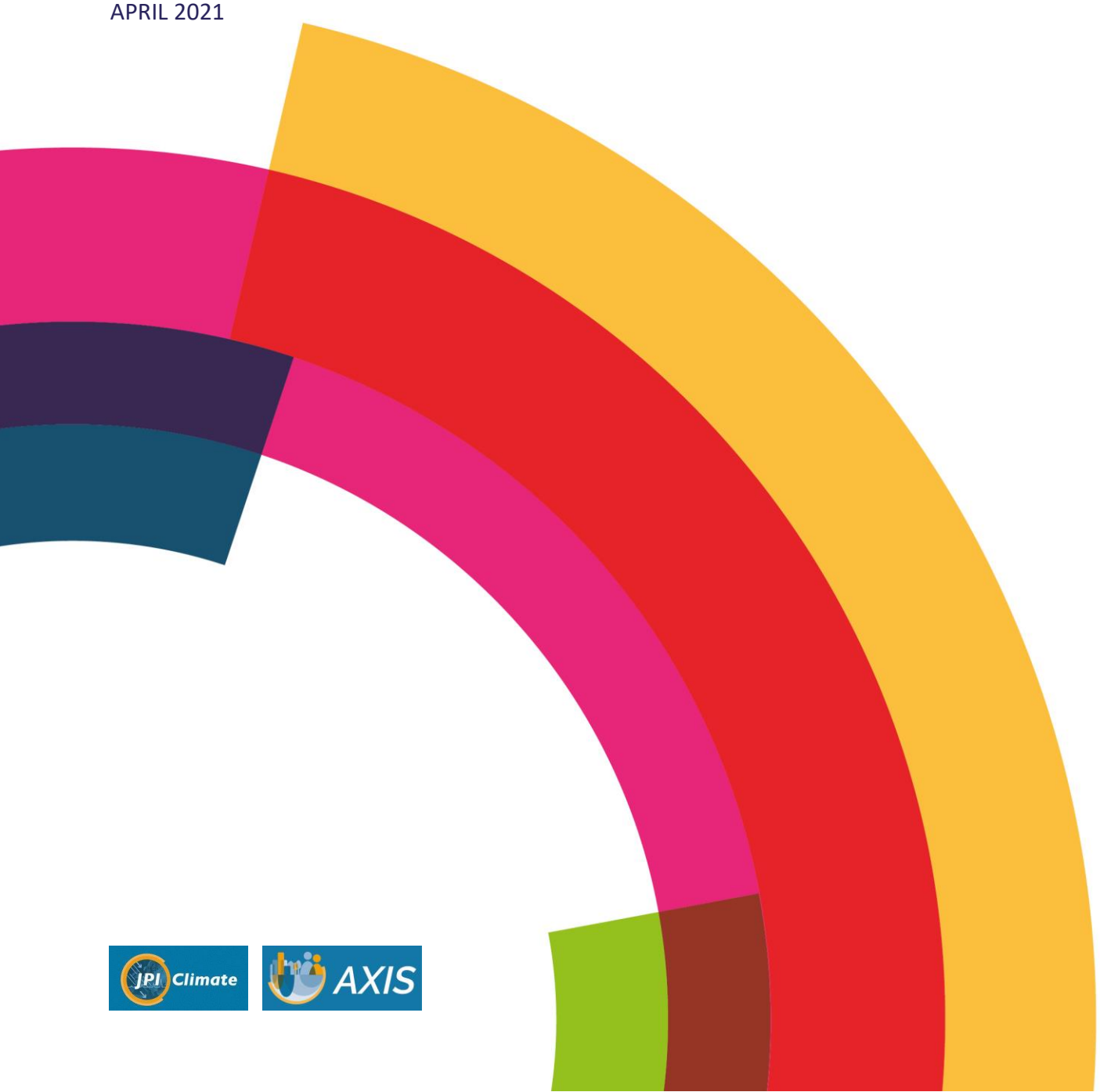
SHAPE

Sustainable development pathways achieving Human well-being while safeguarding the climate And Planet Earth

Report on the first phase of the Multi-Stakeholder Dialogue

June-October 2020

APRIL 2021



JPI Climate AXIS

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June-October 2020

Dialogue organizers:
Institute for Advanced Sustainability Studies (IASS)
Stockholm Resilience Centre (SRC)

Consortium partners:
German Development Institute – Deutsches Institut für Entwicklungspolitik (DIE)
International Institute for Applied Systems Analysis (IIASA)
Norwegian University of Science and Technology (NTNU)
Potsdam Institute for Climate Impact Research (PIK; SHAPE project coordinator)
University Utrecht (UU)

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We are grateful to the stakeholders (and their organizations) for their invaluable contribution and time dedicated to the SHAPE project.

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Summary and key messages

The first SHAPE multi-stakeholder dialogue elicited inputs and views on possible narratives for a new set of target-seeking scenarios, the Sustainable Development Pathways.

The dialogue consisted of a comprehensive online questionnaire and an interactive online workshop. 40 participants took part in the workshop events held from 20-22 October 2020. The participants were invited from a mix of academic, government, civil society and business sectors involved in international discussions about global sustainability and the 2030 Agenda. It was aimed for a group who could speak to all 17 SDGs and to all our dimensions. It was also attempted to include representatives from every continent. All thematic sessions were open to all stakeholders.

The online workshop modes worked well. Benefits include international participation, self-documenting processes, and the possibility for catching up and checking on unclear aspects (for parts that were recorded).

SHAPE's overall scenario approach based on branching points in a selected set of dimensions was well-understood and appreciated by the stakeholders. In general, there were more suggestions for improvement of selected dimensions and branches, than explicit suggestions for new branches or dimensions. The main exceptions were related to the need to address oceans and coasts, to take a more integrated perspective on food systems, and to treat some of the aspects currently included in the Future of Work dimension separately (for instance inequality). Stakeholders also called for more attention to interactions across domains (nature, land, water and energy in particular).

Stakeholders highlighted the need to clarify and improve the treatment of the convergences of the different options across countries and regions. The discussion of scenario combination 5 "Local Solutions" raised many interesting issues of cross-scale connection and interaction.

Several "alternative" scenario combinations were considered interesting and worth pursuing further in SHAPE's analyses. For example, "Green and social market economy" was highlighted as a non-standard but overall plausible combination, a "pleasant future to live in" taking "the best of multiple worlds with strong corporate responsibility, social cohesion, and proactive environmental management".

However, the discussions about scenario combinations also indicated that the current suite of dimensions and branches present some inconsistencies and interdependencies. In particular, stakeholders pointed out that some dimensions are more encompassing than others and that there is a lack of clarity in the boundaries between dimensions ("system boundaries"). In response, the SHAPE consortium will analyse how to organize dimensions in the overall space of sustainable development dimensions and create some hierarchy between dimensions, highlighting more fundamental ones, and avoiding excessive interdependence. Such a hierarchical approach would lead to more distinct and internally consistent scenarios.

Finally, stakeholders raised many questions related to the real-world implementation of the pathways: How can societies get to the outcomes described in the dimensions? And what events may need to be put in place to get societies on track? Do societies share the same values in the first place, and why? We will continue to address these kinds of questions with our stakeholders in the next phases of the project because they help ensure the broad relevance of the Sustainable Development Pathways to the widest possible application contexts.

Structure of this report

This report is divided into three parts.

Part one introduces the project and the dialogue process. Links to the summary report of the initial SHAPE webinar and a synthesis of the questionnaire results are provided.

Part two of the report covers a synthesis of the recommendations made by the stakeholders about the dimensions and scenarios. The synthesis is based on the input that we received through the workshops and also the questionnaire. For transparency, the exact transcription of the workshop results as they were written on the Miro online workboards can be found in the annex.

Part three of the report provides a discussion of the workshop results and stakeholders' recommendations about key changes to be made for the narrative development. It also addresses open issues for further stakeholder discussions and reflects on the participatory process at this stage of the SHAPE project.

The report concludes with key messages for the team members of the SHAPE project, from our stakeholders and for the bigger SDG picture.

1. INTRODUCTION: the SHAPE Multi-Stakeholder Dialogue

Context and purpose

The international consortium project *Sustainable development pathways achieving Human well-being while safeguarding the climate And Planet Earth* (SHAPE) is developing quantitative target-seeking scenarios, the Sustainable Development Pathways (SDPs), that simultaneously achieve the Sustainable Development Goals in 2030, maintain sustainable development thereafter, and meet the climate targets set out in the Paris agreement.

The first phase of SHAPE's multi-stakeholder dialogue was conducted between June and October 2020. The main aim of this first phase was to provide an opportunity for in-depth discussion of the underlying narratives of the SDPs".

The SHAPE project is developing and analysing SDPs in order:

- to understand crucial interactions between climate action and other SDGs related to land and water, consumption and production, and economic development and inequalities;
- to explain system transformations to overcome trade-offs and enhance synergies to achieve this broad range of sustainable development objectives simultaneously, and;
- to investigate effective means of governance facilitating deep transformations on regional and global levels.

The SDPs can be effective and impactful resources for informing public debate on the implementation of the 2030 Agenda. Given the expertise and international prominence of project partners, the SDPs are expected to become useful references for decision-makers in both the public and private sector. For instance, SHAPE already has well-established links with the UN Sustainable Development Solutions Network (SDSN), with project partners IASS, DIE and PIK involved in SDSN Germany. Project partners provide important knowledge to international efforts such as the UN High-level Political Forum on Sustainable Development and maintain partnerships with local and regional SDG initiatives as well as with policymakers. In addition, the Intergovernmental Panel on Climate Change (IPCC) is another important recipient of the project's research. For example, early results from the project will be useful for the upcoming 6th Assessment Report, and in the longer term for analysis of SDG effects of climate impacts vs. mitigation.

At the same time, the project is making many new integrative developments, for instance, on modelling of the water-energy-land-climate nexus, coupling industrial ecology to IAMs (Integrated Assessment Models), inequalities and governance to address the challenges of providing science support for the Sustainable Development Goals. The SHAPE consortium employs a co-creative approach for the development of this new set of scenarios, both to benefit the research approach and scenario design, and also to maximise the usefulness of the analyses and findings for a diverse audience. Dialogue is a means for clear communication and mutual learning about the strengths, limitations and open opportunities of the project's analytic approaches.

More information on the SHAPE project in general can be found on our website: http://shape-project.org.

The Dialogue Organisers

The SHAPE Multi-Stakeholder Dialogue is organised by the Institute for Advanced Sustainability Studies (IASS) and the Stockholm Resilience Centre (SRC). The information webinar and the workshop were co-convened in collaboration with all SHAPE project partners (Potsdam Institute for Climate Impact Research (PIK), International Institute for Applied Systems Analysis (IIASA), University Utrecht (UU), German Development Institute (DIE), Norwegian University of Science and Technology (NTNU)). Colleagues from all other SHAPE project partner institutions also contributed to the questionnaire synthesis, informing the thematic design of the workshop.

The Stockholm Resilience Centre (SRC) is an international centre that advances transdisciplinary research on governance of social-ecological systems with a special emphasis on resilience. The Institute for Advanced Sustainability Studies (IASS) conducts research with the goal of identifying, advancing, and guiding transformation processes towards sustainable societies using a transdisciplinary, transformative, and co-creative research practice.

The Dialogue Structure

SHAPE's multi-stakeholder dialogue began with an information webinar in June 2020, which introduced the project's branching-points approach to scenario construction (Box 1). Throughout the summer, targeted stakeholders were invited to respond to a comprehensive questionnaire providing comments on the proposed set of dimensions, branches and their combination into scenario narratives (see appendix A of this report for more information). In October 2020, a three-day multi-stakeholder workshop was convened online to provide in-depth discussion of these components of the SDPs, taking the questionnaire answers as a starting point. In this report, we focus on the multi-stakeholder workshop, however taking into account both, the results of the multi-stakeholder workshop and also the feedback that we received through the questionnaire. Both are expected to be used as input to finalize the new scenario narratives (Figure 1). Based on the final narratives, the scenarios will be quantified (Box 2). A second multi-stakeholder workshop is planned for the fall of 2021 to discuss the quantitative results. Refer to the Stakeholder engagement Concept Note for a full description of the process.

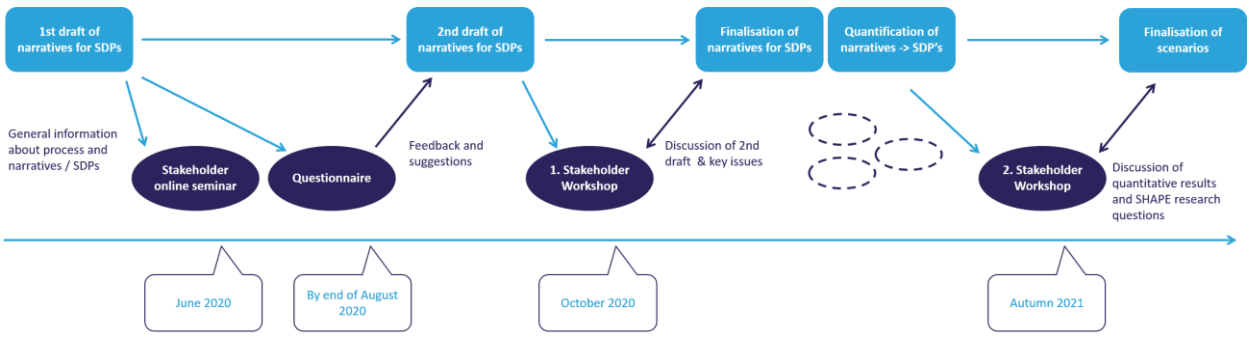


Figure 1 – SHAPE's scenario building process and stakeholder engagement timeline. This report documents the first phase of the multi-stakeholder dialogue from June-October 2020 with a focus on the 1st stakeholder workshop from 20-22 October 2020.

The Workshop 20-22 October 2020

The main objective of the workshop was to develop a joint understanding among SHAPE's stakeholders about the core branching points and how to combine them into multidimensional SDP narratives. The project team also provided an overview of current capacities of Integrated Assessment Models and what SHAPE will enable through integration with other models and research insights.

Due to the Covid-19 pandemic, the workshop was held in a series of online events on 20-22 October 2020 instead of an in-person two-day meeting that was initially planned to take place in Potsdam. The workshop event used the meeting software Zoom and the online collaboration tool Miro. This allowed the discussions to be recorded and self-documented, for sharing among participants for easy later access. Appendix B shows the workshop agenda.

Colleagues from all other SHAPE project partner institutions supported the realisation of this first major event of the multi-stakeholder dialogue in their roles as project respondents, facilitators and note-takers during the break-out groups and the plenary sessions.

Participants

40 participants from 17 countries took part in the workshop of the SHAPE Multi-Stakeholder Dialogue. Participants included diverse stakeholders, including international negotiators and national experts in policy, business and NGOs as well as transdisciplinary research experts from academia. Among others, representatives from diverse organizations such as FAO, ILO, ICLEI, the World Energy Council, SEforAll, Citi group, WWF South Africa, Fridays for Future Namibia, the Swedish Baha'i Community, and several universities participated in the workshop. A complete list of participants and institutions can be found in appendix C (also including the respondents to the questionnaire).

The criteria for selecting the participants were that they provided expertise and experience relevant to the SDGs; and understanding and influence over related policy processes in sustainable development. It was aimed for a group that could speak to all 17 SDGs and to all our dimensions with stakeholders coming from the broad sectors governance, civil society and business as well as experts from academia. For the selection of academic experts, it was moreover intended to cover various research disciplines contributing different perspectives on sustainable development (economics, energy, environment, public policy).

Our main targets in this first workshop were organizations with global reach. A balanced representation of all world regions (here understood as continents) was not our core goal. Nevertheless, we attempted to include representatives of all continents. In the end, the majority of participants came from Europe and North America (32 participants; 80%), next to participants from Africa (2; 5%), Asia (3; 7,5%) and Latin America (3; 7,5%). In the selection of stakeholders, we strived for gender ratio. In this first workshop, the ratio was 17 women : 23 men (42% : 58%).

Following applicable data protection rules, the workshop and questionnaire results are summarized without attributing them to specific persons or organizations.

The Methodology

Background – Our stakeholders were introduced to the SHAPE project, its aims and its new approach to scenario building via an introductory webinar held in June 2020. Following that event, a questionnaire was circulated from July until

September 2020 to targeted stakeholders. The questionnaire responses provided the focal topics for discussion and a basis for the grouping and sequencing of the thematic sessions during the workshop. Moreover, conversation starters (called "highlights" in the following) were derived from the received questionnaire responses. For instance, these were points of strong convergence or divergence in the respondents' positions.

Plenaries – The workshop started and ended with plenary sessions. The first plenary introduced our stakeholder group to the aims, purpose and procedure of the workshop. It dealt with the relation between the SDGs and the SHAPE dimensions (Box 1), next to the question of what we can expect from Integrated Assessment Models (IAM) (and to some extent industrial ecology modelling) (Box 2), giving extensive room to questions from our stakeholders. In the last plenary session, two days later, the results of the last thematic session (Thematic Session 4) were discussed along with next steps in the SHAPE project and the way forward of the stakeholder engagement in 2021. The plenaries and the thematic sessions were each scheduled for 90 minutes.

Thematic sessions for knowledge sharing and ideation – Over the course of the three days four thematic sessions took place. Three of the sessions focused on the branching points and dimensions, while the fourth thematic session focused on the scenario combination. The workshop started with the "foundational" dimensions in thematic session 1, followed by dimensions in session 2 and 3 that build on these. The workshop concluded with a session which synthesized the feedback from previous sessions and focused on the scenario combinations to evaluate and discuss the coherence of the dimensions and alternative possibilities.

Thematic session 1-3 on the branching points and dimensions were structured identically. In part I the facilitators gave an overview of the dimensions to be discussed during the respective session. Selected questionnaire responses were shown, so-called "highlights" that would subsequently be used as conversation starters during the break-out groups. Part II, the main part of each thematic session, comprised discussions in break-out groups to which the participants were pre-assigned by the facilitators (based on a survey about their preferred dimensions). Each group dealt with one specific dimension. Following part II, all participants and the facilitators reconvened again during part III of the session to present a summary of each discussion to everybody, thereby highlighting open issues, divergences and convergences.

Thematic session 4 dealt with the combination of individual branches to specific narrative / scenario combinations. It was therefore structured differently, starting with (1) an introduction on how the initial scenario combinations were chosen, giving (2) an overview of six scenario combinations as proposed by the SHAPE consortium and related questionnaire responses ("highlights"), (3) recapping highlights from the thematic sessions 1-3, and (4) outlining the creative work task for this session. Next, our stakeholders worked in break-out groups again, presenting their results during the final plenary that followed.

Self-documenting break-out groups – Miro online workboards (see Figure 2) were used for the discussion of the specific dimensions (thematic sessions 1-3) and the narrative combinations (thematic session 4). The participants were encouraged to write down their contributions to the discussion as part of the self-documenting process. They could see all workboards, and move among them in their own time, if they had information to add beyond the topics of their own break-out group.

For Thematic Session 1-3, the discussions and the Miro online workboards were structured around the two questions:

1) Do you consider it necessary to create new branches or break dimensions?

2) Would you change something about the existing branches? (Are their differences clear?)

It was further possible to post comments applicable to other dimensions as well. For thematic session 1-3 each break-out group involved one project respondent from the SHAPE consortium answering questions and one facilitator from SRC or IASS guiding through the discussion with the stakeholders. Other SHAPE consortium members could join as observers but not as active participants in the discussions. Instructions on how to use the Miro online workboards were provided beforehand, and also in each session.

Thematic Session 4 on final narratives - To gather feedback on the final narrative/scenario combinations, a creative approach was chosen for the break-out groups of thematic session 4. After having discussed the dimensions and branching points separately in thematic sessions 1-3, the stakeholder group was now invited to provide feedback on the *combinations* of the dimensions and their individual branching points. Using the Miro online workboards, the compatibility of the branches in the respective narrative combination was to be discussed in a first step. The second step foresaw to create a vision of 2050 based on these branches in the form of a letter, a news article, hashtags, a story, tweets, etc. This task intended to help ensure the coherence of the narrative combination or to detect potential flaws by working (and thinking) in a more creative way compared to a "classic" discussion. The creative task could also help foster ownership of the process. For this the facilitators left the break-out rooms to leave the room entirely to the stakeholders who worked independently and thus more freely during this phase.

The self-documenting process in the break-out groups was backed up by the recording of the sessions. The recordings were only accessible by the consortium members for the possibility of catching up and checking on unclear aspects throughout the analysis of the workshop results.

Rules of engagement – Openness, shared resources on online documents. Using the colour coding as indicated in the instructions, participants could add sticky notes to the Miro workboards, move them around, however, not delete any of them. They were free to move to the other break-out rooms, get engaged in the ongoing discussion and add sticky notes to the workboards there. Yet, the facilitators encouraged everyone to stay in each group for at least 10 minutes in order to enable the start of a conversation.

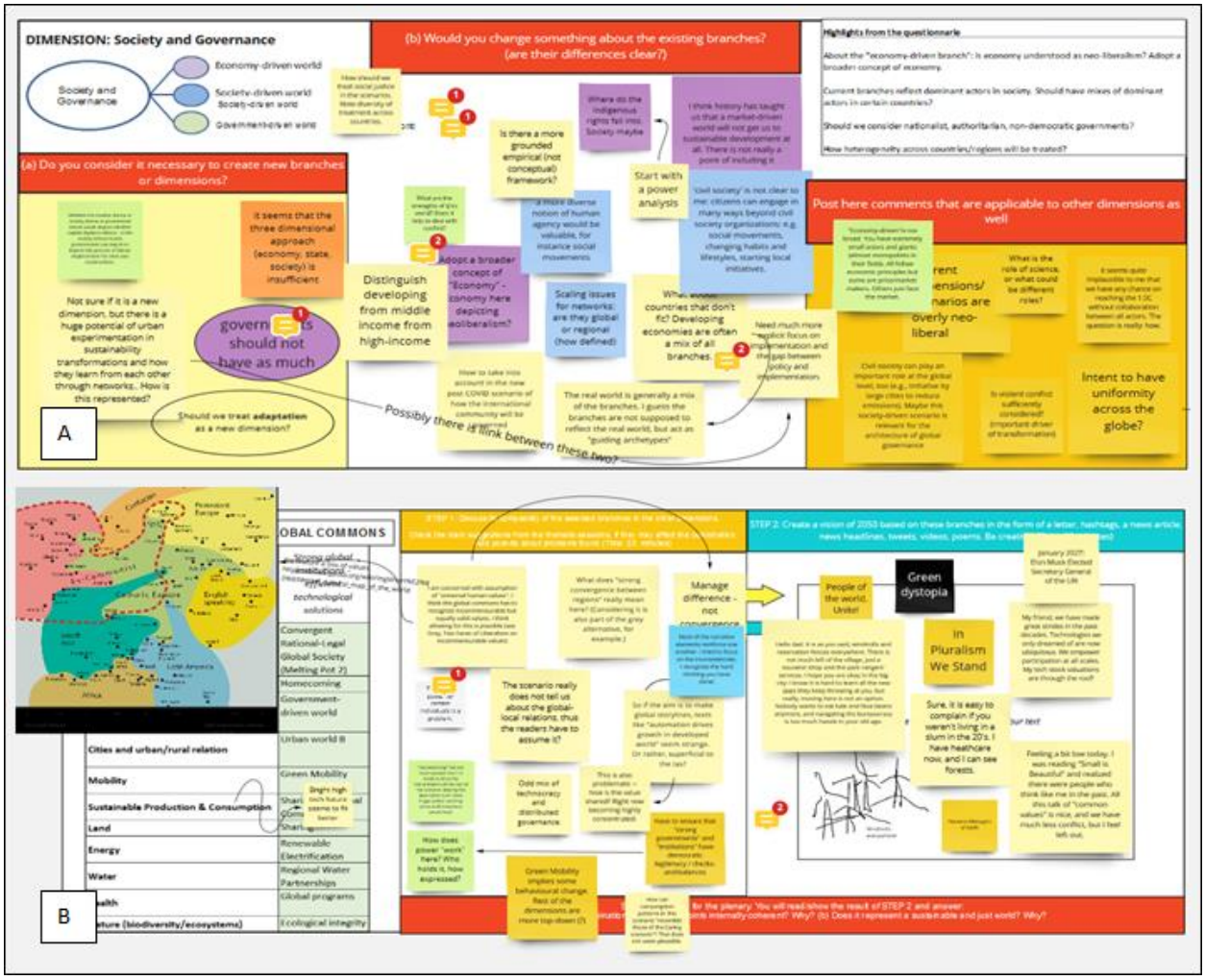
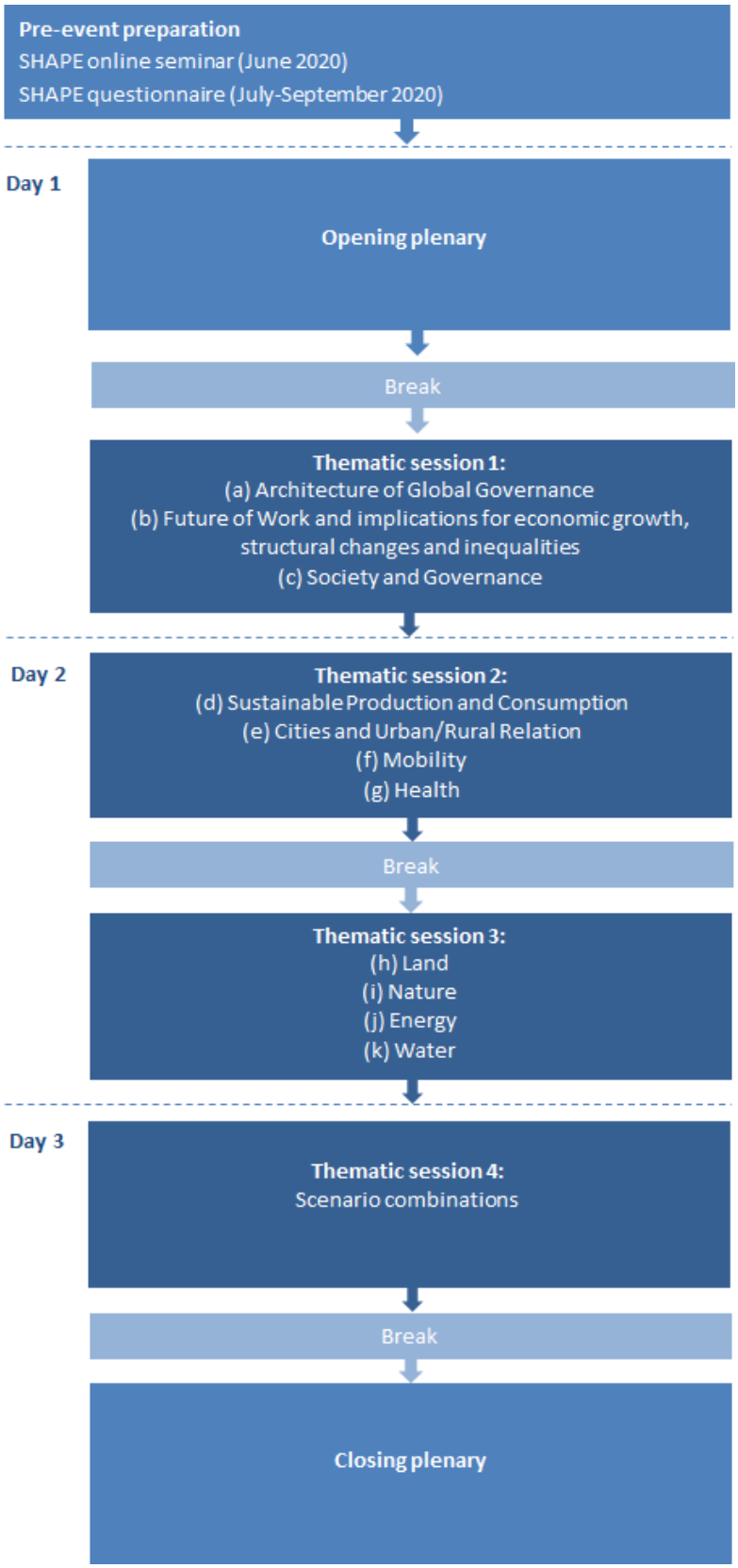


Figure 2 – Examples of a Miro workboard of thematic session 1-3 (A) and thematic session 4 (B)

The Workshop Plan



Box 1:

The scenario building process: the concept of dimensions and branching points

The SHAPE team has identified 11 dimensions that provide leverage towards achievement of the SDGs, and which the SDPs should therefore cover. They represent key societal subsystems or sectors, and reflect domains of literature on transformations and their current (and sometimes divergent) understandings about pathways to reach sustainable futures. This ensures that the insights obtained from SHAPE's stakeholder dialogue can be translated into alternative model-based scenario analyses and quantified pathways.

The 11 dimensions address economic, socio-political and technological / lifestyle aspects of a sustainable future, along with environmental aspects affecting resource provision and nature:

(1) Future of work (digitalization, growth, inequality), (2) Architecture of Global Governance, (3) Society & Governance, (4) Cities and Urban-Rural Relations, (5) Mobility, (6) Sustainable Production & Consumption, (7) Energy, (8) Land, (9) Water, (10) Health, (11) Nature (biodiversity, ecosystems)

The SDGs and the 11 dimensions

The SHAPE dimensions cover the 17 SDGs and many interactions among them (see Table Box 1.1 below). They are not framed directly in terms of individual goals or targets themselves. Instead, they capture key levers to influence the goals. The SHAPE dimensions can be mapped to the five categories of the 2030 Agenda (Planet, Prosperity, People, Peace & Partnership) and the six transformations for The World In 2050 presented by Sachs et al. (2019).

Table Box 1.1 - Shape dimensions and the SDGs

SDG's/Dimensions of the narratives	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Architecture of Global Governance																	X
Future of work & implications for economic growth, structural changes and inequalities	X			X	X			X	X	X							
Society and Governance				X	X											X	
Cities and urban-rural relation											X						
Mobility											X						
Sustainable Production & Consumption									X		X	X					
Land		X											X		X		
Energy							X						X				
Water						X									X		
Health		X	X														
Nature (biodiversity, ecosystems)														X	X		

These multiple dimensions enable a branching point approach to be used[1]. For each dimension, societies can (and do) hold greatly divergent views on how to act and how to structure themselves to achieve a given goal. The branching point approach articulates these divergences and allows for different branches to be combined into a scenario narrative, as Figure Box 1.1 illustrates. This approach intends to capture some of the real-world richness and complexity of perspectives on how to best pursue sustainable development.

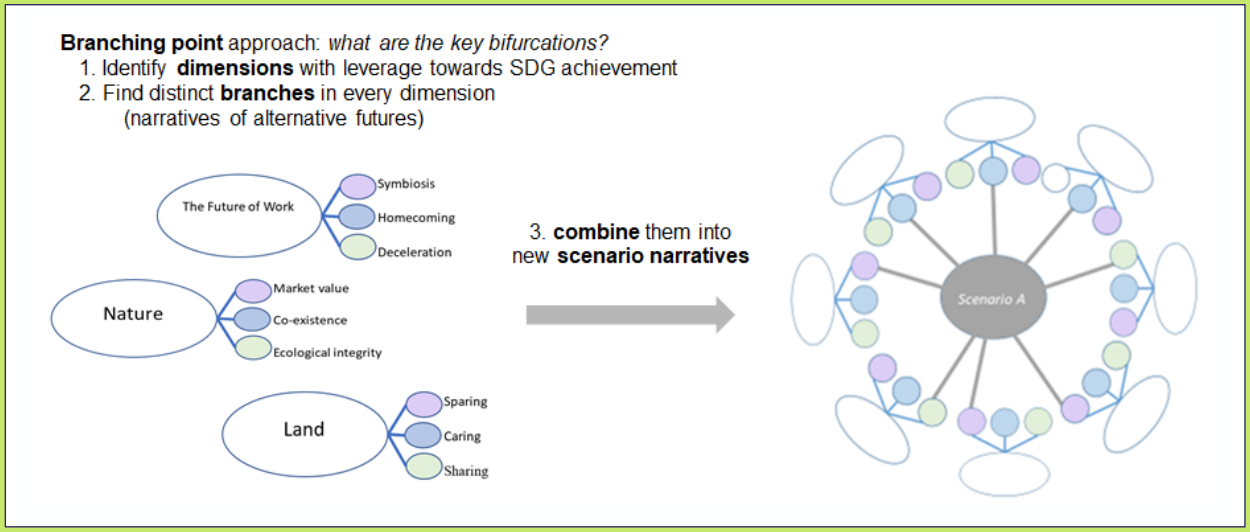


Figure Box 1.1 - Scenario narratives created by combining the branching options of the 11 dimensions in different ways.

Of course, individual people or interest groups will have their own views on desirable societal actions and structures. Some branches may be seen as too idealistic to be feasible. Equally, restricting discussions to today's social trends and structures may be seen as too limiting for the ambition of achieving the SDGS. In the workshop discussions, the guiding principle for spelling out dimensions was: "Let the utopian views stand (at least for now)."

[1]Ana Paula D. Aguiar, David Collste, Zuzana V. Harmáčková, Laura Pereira, Odirilwe Selomane, Diego Galafassi, Detlef Van Vuuren, Sander Van Der Leeuw, Co-designing global target-seeking scenarios: A cross-scale participatory process for capturing multiple perspectives on pathways to sustainability, *Global Environmental Change*, Volume 65, 2020, 102198, ISSN 0959-3780, https://doi.org/10.1016/j.gloenvcha.2020.102198. (http://www.sciencedirect.com/science/article/pii/S0959378020307810)

Box 2:

What can we expect from SHAPE's models?

In SHAPE, three leading integrated assessment models will be used to quantify the Sustainable Development Pathways: IMAGE (developed by Utrecht University), MESSAGE (IIASA), and REMIND-MAgPIE (PIK). Together with other IAMs, these models have already played an important role in informing policy and societal action on climate change and related global change issues such as energy systems and land use. The 2030 Agenda highlights the need to ensure that analysis of policy options for SDG implementation can align with and can benefit from the quantified insights that IAMs provide on these issues.

IAMs inform discourse by evaluating a set of transition scenarios tied to different courses of action. Quantitative scenarios are useful for many contexts where the effects of physical and technological changes can be tracked or determined with confidence. For example, "traditional" IAMs have been applied to energy system transformations for climate mitigation. In such studies, the optimization of a societal welfare function is constrained by an emission budget. Demographics, GDP, and demands for energy and food are the main drivers. Uncertainty about the future trends in these drivers is captured by different narratives, which are translated into quantitative scenarios.

IAMs are increasingly applied to situations where physical and technical systems interface with contexts of social and ecological change, where system responses are intrinsically complex and context specific. In some cases, these processes are brought into the models themselves rather than being represented as narratives. For instance, some IAMs include representations of the dynamic interactions of land cover (vegetation types) with climate and the water cycle, enabling the quantitative exploration of policy options that link climate, energy and land use.

One of the challenges in applying IAMs for analysing sustainable development questions is their sectoral and regional aggregation, as well as their limited ability to fully represent the multi-dimensional SDG space. However, the suite of different models in SHAPE (IMAGE, MESSAGE, REMIND-MAgPIE and industrial ecology models) provides a broader coverage of SDGs than any single model can address alone, and importantly it allows for different mixes of SDG-related issues to be modelled quantitatively, showing different perspectives on the different dimensions being analysed.

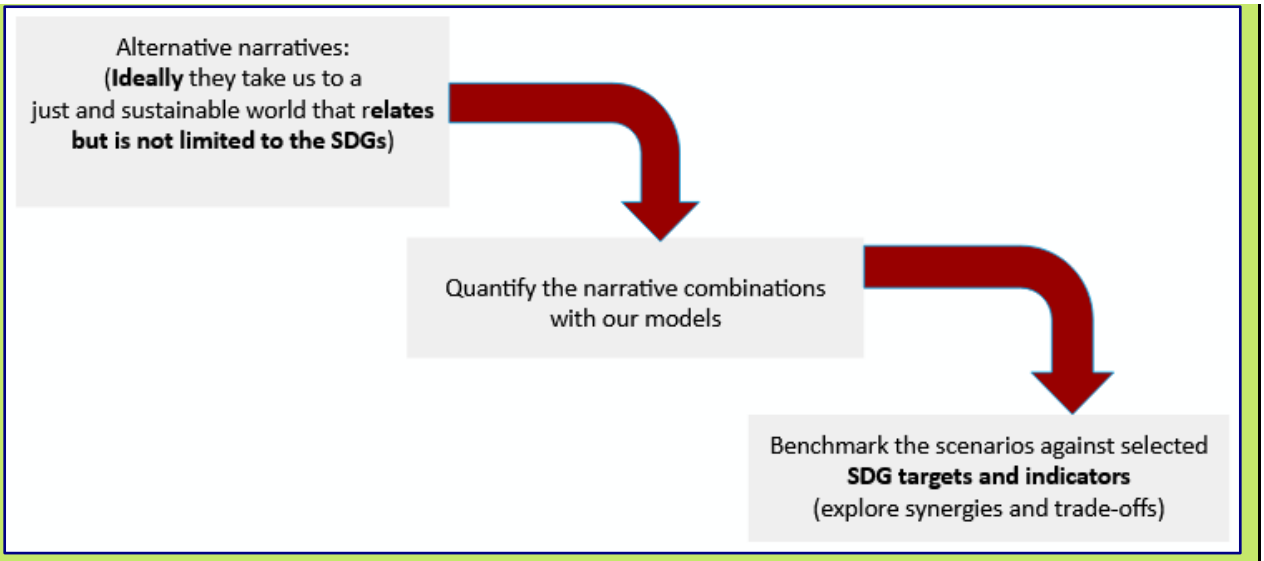


Figure Box 2.1 – Benchmarking the scenarios against selected SDG targets and indicators.

In Shape, the alternative narrative combinations will subsequently be quantified with the models (see Figure Box 2.1). This means that qualitative storylines are translated into quantitative model inputs such as *drivers* (population, GDP, inequality, etc.) and for instance *available policy options*. After running the models, the scenario results will then be benchmarked against selected SDG targets and indicators. If the targets are not met, the assumptions on the model inputs reflecting the alternative narratives will be revised. The aim is to explore synergies and trade-offs in the trajectories of the different Sustainable Development Pathways (SDPs) to reach the 2030 Agenda's SDGs.

2. RESULTS: Synthesis of the stakeholder recommendations about the dimensions and scenarios

The following sections are based on the workshop results (including the question and answer session during the first plenary of the stakeholder workshop) as well as the questionnaire results (see appendix A.1 and A.2). The exact transcription of the workshop results as they were written on the Miro workboards and a curated chat history from thematic session 4 can be found in appendix D.

2.1 Dimensions and branching options

2.1.1 Overarching issues (including new dimensions)

This section addresses overarching issues that were raised in multiple contexts and that do not apply to any specific dimension alone, including also suggestions on new dimensions. In general, there were less suggestions for new dimensions and more suggestions for the improvement and extension of *existing* dimensions and branches. These are addressed in chapter 2.1.2 "Specific comments about existing dimensions".

"Super-dimensions": Society and Governance was referred to as a "super-dimension" because the assumptions made in this context influence all other dimensions. Although not explicitly referred to like that, the overall comments on Architecture of Global Governance and Nature also emphasize their importance as a basis for all other dimensions. In particular the fundamental significance of the Nature dimension for our societal and economic systems (well-being and resource extraction as two examples) was highlighted. It was strongly suggested to add a new dimension on oceans and coasts as both are vital for climate mitigation and adaptation. Explicit suggestions on how to integrate oceans and coasts were made for many dimensions (see Appendix D).

The interconnectedness of the dimensions was highlighted by the stakeholders and became in particular clear in the way that consumption and demand is (not) included in certain dimensions. For example, the energy dimension rather focuses on supply whereas energy demand is rather included in the dimension on sustainable production and consumption. With regard to a holistic approach, it was suggested to add a new dimension on food systems which includes the supply chain and the infrastructure of food provision instead of only addressing "food". The interconnectedness of the dimensions however also raises the question of "system boundaries" of the individual dimensions: which aspects need to be included in which dimension without too much repetition?

A need to review the fundamental assumptions on human nature was brought up in connection with the role of consumption and linked to behavioural and lifestyle changes that underlie all the other dimensions (humans are more than only consumers). A more human-centred component and an extended view on values was missed, addressing how a changing understanding of human relation to nature and to each other might not only shape consumer behaviour but also governance ("build back better and greener"; the three spheres of transformation (practical, political, personal) by Karen O'Brien). A need for greater awareness of indigenous lifestyles, traditional knowledge and practices was emphasized.

The transitions should really be seen as vehicles of social justice. Raised in relation to multiple dimensions, explicit examples for a just transition include intragenerational energy justice, the enforcement of indigenous rights and the integration of the well-being concept in the dimensions. It also needs to be asked whether people actually

have the capabilities to change their lifestyle. Education, as one example to support human agency and adaptive learning, was suggested to be included as a new dimension. Closely related to social justice, it was suggested multiple times to treat inequality (and economic growth) as dimensions on their own, separating them from the dimension of the Future of Work. It was further remarked that societies might become less inclusive if new technologies (especially small-scale decentralized technologies) increase the gap between rich and poor.

It was overall suggested to adopt a broader concept of "economy" in the dimensions. Related to this, stakeholders asked how constraints in technological innovation and resource availability are addressed in the different scenarios. Although some technologies are not yet ready to be used, they will be included in the models - how will people be convinced that achieving the SDGs and climate goals is possible based on such technology assumptions? Stakeholders emphasised the need to consider absolute decoupling from energy and material throughput, not only relative decoupling.[2] These issues will further be elaborated in section 2.1.2 in the dimensions *Sustainable Production and Consumption, and to some extent in the dimension Future of Work and Energy.*

Regional convergence and divergence: mentioned as an explicit example, individual branches of the Future of Work should be able to coexist in some parts of the world. Different points of departure have to be taken into account. It was asked for instance how the different energy requirements of developing and developed countries are addressed. It was however also remarked that although governance systems might diverge in their nature, they can choose similar technology options. How is this aspect of regional divergence on the one hand and convergence on the other hand addressed in the scenarios?

Further, the impact of the Covid-19 pandemic should be taken into account. Concrete examples include for instance that less commuting and more working from home might have a lasting effect on mobility and the future of work. This might also concern governance ("[...] take into account in the new post-COVID scenario of how the international community will be governed?"). But also strategies like building back better, the concepts of resilience and adaptation might be taken more into account for the SDPs. Lastly, there were several suggestions to complement the positive outlooks for pathways towards sustainability with less optimistic, but potentially more realistic branches.

Following from the reflections about future sustainable development pathways, a major overarching issue concerns the implementation and capacity for the implementation of the branches. By raising the questions "How do we get to these sustainable worlds and to social cohesion?" and "How do we get everyone to work together?" the following aspects were addressed:

1. Policy reforms and their enforcement: The significance of policy reforms and their enforcement were explicitly stressed with regard to the Nature dimension. It was viewed as important to not only advance positive outcomes for nature but also to safeguard these achievements. Moreover, the important inclusion of indigenous rights was emphasized (which were perceived as most likely to be included in a society-driven world?). On a global level, policy imple-

[2] In relative decoupling, as the economy grows. Material use also grows, but at a slower rate than the economy. In absolute decoupling, the economy grows, but material use decreases. The concept of "sufficient absolute decoupling" also is relevant: the economy grows, but material use decreases quickly enough to meet a given target (e.g. a planetary boundary).

mentation also touches upon the question of how to measure the *effectiveness* of global governance and whether the (70-year-old) UN system can deliver adequate action. Also, the passing of laws may not be enough as this does not automatically imply their implementation too. Corruption is a big problem and it was argued that governments should not be given as much power as they have today (raised in Society & Governance). Overall, it was said that it is difficult to identify where change can start but governance in the public and private sphere are key. Strengthening national and local institutional capacity and finding a balance between global norms and local realities is important. "Institutional strength" or "organisational capacity" were also suggested to be separate dimensions.

2. The actors to implement sustainable development: All levels of organisation are crucial for the transformations and universal participation is essential. While a vision for sustainable development and the understanding of how the world works needs to be shared, national politics will yet likely prioritize different SDGs over others - and participants often asked how this reality is (or could be) addressed in the models? Regionalisation, the views from different stakeholder and societal areas, and different institutional perspectives (also political levels: local, regional, national, etc.) might be helpful. In particular cities can be important actors not just because of their role in public procurement but also because of their increased interconnectedness in networks that enhance learning processes and knowledge exchange. In this regard their role in the transitions towards sustainable development could be further highlighted. Behavioural change was seen by some as the key to operationalize the SDPs. With regard to actors of the transformation to sustainability, it was further suggested to add geopolitics as a dimension as well as "the grassroots".

3. The time horizon: it is necessary to be explicit about the events that need to be put in place in the next one or two decades to achieve a sustainable world in 2050: This also includes the assumptions on innovation and the role of high-tech vis-à-vis behavioural and lifestyle change. Adding to this, it was said that technology with a human face will be needed, not technology for its own sake.

4. The financing of the transitions and an assessment of the investments needed to go along one branch or the other: "Finance" was suggested to be added as a separate dimension. Moreover, a better valuation of externalities like ecosystems and CO_2 amongst other things is needed (CO_2 pricing is already included in the models).

5. A better understanding of the trade-offs for countries, commodities and economies is considered necessary to implement the SDPs.

The role of historic trends was mentioned a few times to evaluate the feasibility of the assumptions in the narratives of the SDPs - did for example efficiency improvements lead to less resource usage in the past? Formulating narratives with qualitative elements and quantifiable indicators was one way found necessary to operationalize the SDPs. The strong need to include more drivers of transition that are not readily available in parameters for the models (governance issues, demographics or urbanization) was recognized on the one hand as was the challenge to do so on the other hand.

2.1.2 Specific comments about existing dimensions

In this section we present a synthesis of the stakeholder suggestions about each dimension and its branches (Table 1). To facilitate the understanding and analysis of the suggestions, we included a comprehensive description of each dimension and its branches (as was also presented to the stakeholders).

Table 1 – Suggestions and comments about the original dimensions and branching options. To put the stakeholders' suggestions (light blue boxes) in context, the original description for every dimension and its branching options is given. There, current dependencies across dimensions are highlighted in red (Shape work package 1 analysis).

(1) ARCHITECTURE OF GLOBAL GOVERNANCE	
Original description of the dimension and its branches	*This dimension refers to the architecture of collective decision-making, in particular the spatial aspects of how decisions are made (global to local relations). Initially, three possible branching options were proposed. The **convergent cosmopolitan society (melting pot 1)** is where the architecture foresees a global society where standards, norms and principles converge to create a homogenous "cosmopolitan" identity. Its key characteristic is the strategic interplay between state and non-state actors, which defines strong horizontal global governance. The **convergent rational-legal global society (melting pot 2)** foresees a decision-making architecture that is defined by constant (multilateral) political negotiations. Its key characteristic is that national governments are dependent on international agreements and global regimes to pursue sustainability goals. The **divergent glocality (salad bowl)** pertains to "glocalized" frameworks where differences mix but each of which remains relatively autonomous. With a divergent glocality, problems are resolved through indigenous approaches.*
Stakeholder suggestions	For this dimension it was suggested to **clarify the concepts of cosmopolitan, globalization, local, polycentric, and universal values:** The combination of convergent, melting pot and efficiency with cosmopolitan could be reviewed as "cosmopolitan" is rather a concept of embracing difference based on a shared understanding of humanity. Moreover, what part of globalization is weak? A globally embedded polycentric decision-making structure might have an effective but loose global governance structure where redundancy occurs. This can however be a resilient structure and some issues are best managed at different scales (global/local action). It was recommended to review the assumptions about "efficiency as a guiding principle" leading to global action and "effectiveness as guiding principle" leading to local action. **Power imbalances and reforms of institutions** (World Bank, IMF, etc.) need to be addressed. Further the difference between "top" and "bottom" power was not entirely clear. It was further suggested to include **regional block scenarios** with a group of leaders or one leader country (e.g. melting pot 2 with regional economic blocks?). It was unclear how the different weights that individual countries have, are reflected in the current pathways and how differences in "character" of the states will be accounted for. In the **glocality branch**, it was not clear what is local. Are municipalities the decision-makers at the local level? Or nation-states? There was a suggestion to include a "local" branch with local action by the municipalities, given the strong role they are currently playing in taking action. It was suggested that the branch on "Melting Pot 2" should address historic carbon debt. Although digitalization is focused on in the dimension Future of Work and implications for economic growth, structural changes and inequalities, the governance of digitalization should be made explicit by addressing the systemic inequities that are amplified by digitaliza-

	tion (developed countries operating at 5G while developing countries operate at 2G), making sure that the voices of least developed countries are heard. Examples for less positive branches in this dimension are a branch that includes violent conflict (which can be an important driver for transformation; see also Society & Governance) or nationalistic tendencies (based on bilateral interaction and power) or that generally addresses negative developments without corresponding global governance.
(2) FUTURE OF WORK AND IMPLICATIONS FOR ECONOMIC GROWTH, STRUCTURAL CHANGES AND INEQUALITIES	
Original description of the dimension and its branches	*This dimension addresses how societies will evolve their values and institutions to keep up with and shape technological developments (digitalization, automation, computing, machine learning and genetic engineering). This will largely be defined by how concepts of human-to-human and **human-to-machine relationships** will evolve against this backdrop. We imagine three different developments aligned with a sustainable development paradigm: a world in which human and machines develop a highly symbiotic relationship to meet human needs **(Symbiosis)**, a world in which humans set themselves apart from machines to focus on human development **(Homecoming)**, and a world which decelerates technological progress by institutions in a drive to keep technology overreach in check **(Deceleration)**. In relation to the **economy**, in the Symbiosis branching option, there is high GDP growth in all regions, with strong convergence between regions. In Deceleration, there is low GDP growth in developed countries, medium convergence between regions, and high growth in public infrastructure, public services and social welfare programmes. Focus on human well-being. Finally, in Homecoming, GDP is replaced by broader human well-being as an indicator of progress. Automation drives moderate growth in developed countries, with the additional wealth generation channelled to public ownership. Strong convergence between regions.*
Stakeholder suggestions	In this dimension, both labour (regulations) and (digital) technology – 4th industrial revolution – are considered important drivers for the future of work. It was commented that more weight should be put on the power of labour (unions) and labour (de-)regulations (gig economy) while also emphasizing the transition from labour to a capital economy. Questions on welfare and inequality were raised: (1) What are the **impacts of job and climate migration**, and is there a role for **universal basic income**? Questions were raised (and largely covered by the dimension already) on a different meaning of work, whether there will be enough jobs and on the role of education and retraining? (2) **The connection of the welfare state and environmental policy** could be more explicit, relating this dimension to Architecture of Global Governance, Society and Governance and Nature. Environmental taxes could feed redistribution, and environmental damages may need new transfers and insurance mechanisms. (3) **The assumptions on access to digital technology are very optimistic**: Deceleration might not be a choice aspect in some world regions but rather a problem of access, although global technological leap-frogging is assumed. Deceleration was in fact appreciated as a desirable regulatory environment and it was pointed out that reducing the influence of big tech companies and restricting the usage of big data does not necessarily translate into a slower rate of digitalization nor does a focus on human wellbeing necessarily leads to slower growth. Yet, the (near) zero marginal cost of digitalization could also lead to wealth concentration in some regions and poverty in others. Especially if high education as assumed is not attained throughout the general population and inequalities increase, rapid digitalization could also lead to slow growth. **It was asked whether we are thinking about growth in the right way** and if a transition from

	labour to capital economy can imply lower energy and material use? It was asked whether digitalization will reduce material and energy throughput while it was also said that digitalization is speeding up production and consumption and with it **material and energy throughput** if levels of GDP growth remain high. Even if GDP is replaced by a better indicator for wellbeing in the Homecoming branch, this **rebound effect of improved efficiency** needs to be handled. Related to this it was suggested in the *SCP dimension* to add a branch with absolute decoupling as a strategy to reduce resource extraction. For this dimension, it was remarked that the growth paradigm is present in all the branches albeit at varying degrees. The concepts of degrowth or post-growth were brought forward as another strategy to reduce material and energy throughput (with a differentiation between industrialized countries and developing countries). It was said that macroeconomic assumptions (prosperity and social wellbeing) do not cover the degrowth/post-growth narrative, which is an important part of the debate, while behavioural and lifestyle assumptions fit well with such a narrative. In general, it was remarked that maintaining quality of life through more sustainable forms of consumption might be an alternative to traditional GDP. Consumption in the digital age might also rather focus on services instead of materials, food and resources (hedonistic consumption). Nevertheless, it was remarked that also services imply the consumption of materials and energy. **It was pointed towards the advantage of digitalization and Big Data to facilitate the understanding of tele-coupling and to improve environmental awareness** for instance by informing consumers about the origins of a certain product. As examples for less positive branches in this dimension a fourth branch could be included where the benefits of accelerated digitalization concentrate in the hands of a few without a welfare state to share the benefits or a scenario with extreme inequality.

(3) SOCIETY AND GOVERNANCE

Original description of the dimension and its branches	*This dimension encompasses three alternatives in relation to actors leading the transformation. The **economy-driven** branch refers to a cluster of countries where policies are oriented towards improving efficiency and maximizing value added. This cluster is driven by the main logic that networks of private sector plus other state and non-state actors (and not primarily the state) can best provide solutions. The **government-driven** branch pertains to a cluster of countries where a 'strong' central authority drives the transformation to sustainability. By strengthening state capabilities, the state can effectively facilitate the 'sharing' not only of the benefits but also the costs/risks of sustainable development. The **society-driven** branch is, in theory, positioned between the other two where networks of civil society, state and private sector jointly drive the transformation. It is driven by an 'enlightened self-interest'. In this branching option, sustainability policies are driven by guiding norms and principles that are deliberated as the social transformation unfolds.*
Stakeholder suggestions	As mentioned in 2.1.1, this dimension was perceived as a **"super-dimension"** exerting influence on all others. The clear distinction into the three alternative actors for the transformation leaves however open **how heterogeneity across regions and countries that don't neatly fit into these "buckets"** will be treated (developing economies often have a mix of all three). It was remarked that in comparison with the economy-driven branch, the distinguishing features of the society-driven branch, its emphasis on solidarity, wellbeing and the greenness of innovation, might be highlighted more than its network character. From a socio-technological regimes perspective, networks always drive transformation. It was suggested

	to review the section on lobbying (currently very little on lobbying per se) and the definition of *civil society*: citizens can get engaged beyond civil society organisations, for instance in the form of social movements. Civil society networks (e.g. city networks) can play a role on a global level and might therefore also be considered more in Architecture of Global Governance. Indigenous rights were best seen represented in a society-driven world. The economic assumptions in this dimension (and also in SCP and Future of Work) could be refined, considering that from a historic perspective a purely market-driven world does not lead to sustainable development and that a strong state is required. **"Economy-driven" might be too broad** in the sense that there are very big actors who are price and market makers and small actors that are simply market followers. Although both groups follow economic principles, there is a strong imbalance in power. Democratizing economic decision-making is therefore key, in particular in business corporations, and it makes a large difference in this regard whether a world is society- or market-driven. The advantages of a government-driven world were not clear to everyone. Will this approach help to deal with conflicts and what does "good governance" mean? Reservation was expressed about a government-driven world due to prevailing corruption. From this point of view a society-driven world was rather seen as the way forward. It was further asked why governance is treated in two dimensions while the focus could be shifted more to the role of the state (as distinct from the government) in the different pathways. Examples for less positive branches in this dimension are branches incorporating for example nationalist, authoritarian, non-democratic governments or branches that include monopolistic or oligopolistic structures. It was further asked whether violent conflict is sufficiently considered as an important driver of transformation (see also Architecture of Global Governance).

(4) CITIES AND URBAN-RURAL RELATIONS

Original description of the dimension and its branches	*This dimension considers three alternative and aligned futures for urban areas. In all of them there is universal access to adequate, safe and affordable housing and basic services, and no one lives in slums (SDG11). In **Urban World A**, the large majority of its population lives in urban areas, in a balance of megacities, medium, and small cities, with compact urban forms dominated by mid- and high-rise buildings. New constructions prevail on renovations, and there is a diffusion of smart materials and technologies for energy efficient buildings. Landscapes outside cities are largely dominated by nature, rewilding and clusters of hyper-efficient corporate-led food production sites close to urban areas. In the **Urban-Rural World**, the urban-rural relation is blurred, and the landscapes are heterogeneously shared by humans and nature. There is a dominance of small and medium cities, and strong peri-urban rural communities producing food through cooperatives. Cities have an "archipelago", polycentric design, and low- to mid- rise buildings dominate, allowing biodiversity to thrive. Sprawling is avoided by means of reduced housing size, and diffusion of co-housing and house sharing. There is a dominance of local low-energy materials and nature-based technologies dominate. Cities and services are remodeled in a way to allow the dominance of walking and biking. The **Urban World B** can be placed in between the previous two. There is a primary role of local institutions and governance in driving urban development. Similar to the first vision, the urbanization rate is high, with a balance of mega-cities, medium and smaller cities. However, urban density is lower, for improved access to communal spaces, services and nature. Co-housing, house sharing, and reduced housing size are promoted to avoid urban sprawls. A high degree of digitization accelerates the adoption of smart cities and smart homes, as well*

	as the diffusion of new construction technologies.
Stakeholder suggestions	Issues that were suggested to be reviewed in this dimension include: (1) the **connection between wellbeing and nature**: more urban green spaces (in particular in Urban World A), adding the aspects of health and vulnerability to infectious diseases, creating climate resilient cities (Urban world A is potentially less prepared for natural disasters or influx of people from rural areas); (2) the **linkages between food and city networks** (waste, water, urban agriculture etc.); (3) a **clearer differentiation between the Urban-rural world and Urban World B**. It was also suggested to define suburban areas more in detail: especially in Urban World A urban sprawling is not well defined. It was further proposed to include co-housing in all branches. Generally, this dimension has major interlinkages with Mobility, Sustainable Production and Consumption, the Future of Work (e.g. job creation in rural areas avoids job migration to cities; high urbanization rates depend on level of manufacturing and high income) and Energy (cities where people live in small flats rather than large houses safe energy and produce less emissions. Megacities might thus support a green and energy efficient society). The importance of this dimension was perceived quite differently ("in general less essential" and "glad these are represented").

(5) MOBILITY

Original description of the dimension and its branches	*This dimension covers three branching options roughly aligned with the overarching themes of "Market Driven Innovation", "Resilient Communities", and "Managing the Global Commons" along the mobility dimension.* ***SciFi Mobility*** *aligns to a highly globalized and technologically advanced world with a strong reliance on market forces (Market Driven Innovation). The* ***Sustainable Lifestyles*** *branching option is embedded in a world where holistically-minded people live in medium-size cities (Resilient communities). The* ***Green Mobility*** *aligns to the Managing the Global Commons narrative. Reflecting this, different mobility models prevail for short and long-distance. The* ***SciFi Mobility*** *branching option relies on autonomous vehicles with low-footprint and drivetrains (high degrees of individual mobility). High-speed intercity travel (Hyper-Loop, Transrapid). Demand for long-distance passenger transport stalls in high income regions due to high digital interconnectivity. Autonomous freight transport with direct and indirect electrification. The* ***Sustainable Lifestyles*** *focus on public transport and increases in non-motorized/hybrid electric modal shares. Cars with mainly electric drivetrains are shared among communities. Reduced long-distance travel in wealthy regions. Decreasing demand for long-distance freight transport due to localized markets. Finally, the* ***Green Mobility*** *option relies on full (direct) electrification in all sectors. Individuals: Car sharing, shared autonomous vehicles and public transport. Lifestyles and policies adjust for less long-distance travel in wealthy regions.*
Stakeholder suggestions	It was found that the mobility dimension needs to be more inclusive and further aspects of mobility should be added more explicitly: **(1) be more specific about freight and transportation of goods and services** (heavy goods vehicles, rail, aviation, marine mobility etc.; right now there is a focus on people), **(2) include fleet sizes** as this has important implications for the organization of spaces and landscapes. Concrete suggestions for **maritime mobility** include novel maritime transportation (SciFi mobility), traditional boats and navigation (Sustainable Lifestyle), innovation for clean maritime transport (Green Mobility). Due to its technological assumptions (Hyper-Loop, autonomous vehicles), **Sci-Fi mobility might be less credible for short-term scenarios** and thus not relevant for the 2030 SDGs. It was also un-

	clear why long-distance passenger travel stalls in the Sci-Fi mobility branch. It was highlighted that **mobility is a means to an end with many implications for society** and strong linkages with the other dimensions (a.o. Cities and urban-rural relation, Future of Work). It is **relevant for social cohesion** (transportation systems often are a result of social engineering; how can **inequality** be addressed? What about low-density areas? What about health issues through bad air quality?). **Commuting** to and from work is essential in many people's lives (how does this change in the long-term by the Covid-19 pandemic? Are digitalization and smart technologies drivers of change?). Finally, there is **a need to address increased tourism**. Overall, the assumed broad electrification of the mobility sector raises the **question on the origin of raw materials and mineral extraction**, linking this dimension directly to Sustainable Production and Consumption as well as the Energy dimension.
(6) SUSTAINABLE PRODUCTION & CONSUMPTION	
Original description of the dimension and its branches	*In this dimension, we envisioned three alternative futures.* ***Caring for the World*** *is a world with strong social cohesion. Goods and services are shared among local communities. Material consumption becomes less important and is partly replaced by increased demand for services, even at the expense of economic growth. The new lifestyle therefore poses a smaller burden on natural resources. People favour locally produced products, with local markets being protected from global ones and strong regulation for global players.* ***Sharing the Global Commons*** *envision a world where strong regional and global institutions (through regulations and price tags) are the main drivers of a sustainable transformation. This presents a strong incentive to the sharing economy but also to communal sharing initiatives. Overall, consumption stalls in the wealthy regions due to steering policies until sustainable products are available. In developing countries, policies have to be shaped to allow convergence of lifestyles.* ***A bright High-Tech Future*** *is a "Green growth" extrapolation of current trends. New technologies lead to efficiency gains for the production of materials and food which outweigh the scale effects of the economy. Consumption is convenient and sustainable. In the industry sector, factories make heavy use of robotics to build and recycle goods, whose design is governed by Cradle-To-Cradle directives. During the rise of this Green economy, care is taken to not add burdens related to material extraction and waste disposal to developing economies. For the transition phase, sharing might also be part of this scenario to meet the SDGs. Lifestyles converge fast via borderless markets and digital networks.* ***Digitalization*** *plays a distinct role in the branching options. While in a* ***bright High-Tech Future****, digital technologies will be used as a means to implement the SDGs, in the other two branches it supports human interaction, local information exchange and enables the sharing economy.*
Stakeholder suggestions	**Sustainable production and consumption is a cross-cutting theme** as it has links with many of the other dimensions and overarching issues. On the one hand it was stressed that all three branches are complementary to each other. It was remarked that **the three branches emphasize different dimensions of sustainable production and consumption**: production (High Tech Future), consumption (very little, but in Caring for the World) and distribution (of global commons in Sharing the Global Commons) and there is need for tight cooperation and consultation between the individual level, the community, the institutions / governance that are addressed to differing degrees in the branches. On the other hand, it was remarked that the three branches conflict with each other and it was suggested to **review the branches with regard to the underlying vision of the world**. Answering questions like "how many people are supported?", "What is their standard of living?", "What energy sources are used?", "How much recycling?" might help to get coherence by clarifying the physical bounds to production and consumption. It was also asked whether the focus is too Euro-centric

("How does China fit into any of these pathways?", "How to ethically integrate the global south in terms of economic growth and human rights")?

The branches could be reframed with regard to the decoupling debate. Efficiency improvements imply relative decoupling but do not automatically lead to absolute decoupling. It was suggested to add a branch with absolute decoupling. It further remains to be asked **where the resources come from** for high-tech innovation (e.g. requirements of precious metal for batteries?). What is considered "high-tech" and what are generally the **assumptions on innovations** in the models (some technological developments might take longer to be realised than others and the **time horizons** in the branches are different)? **High-tech is perceived by some as "scary" due to the related resource extractions**. From this point of view the Caring for the World branch is preferred. It was remarked that sustainable production is not only about greener technology but also about the inclusion of people in the production process. Related to the decoupling debate, it was further suggested to highlight **the role of consumption** on the consumer level more (mentioned as an overarching issue in 2.1.1). This touches on **the fundamental assumptions on human nature to be more than a consumer**. It links to the role of education (also suggested as a new dimension) for making informed decisions and is a central part of the overarching issues of behavioural and lifestyle change. It was emphasized that **a shift is needed away from the consumption paradigm**. Instead of referring to "convergence of consumption lifestyles", it should just be referred to "consumption lifestyles" as it is unclear whether convergence and divergence is bad, good or value neutral in this context. Convergence and divergence can both be beneficial depending on the branch.

There were **divergent views on the integration of food** in this dimension: acknowledging the importance of food in the context of sustainable production and consumption ("how and where we produce food is an important factor") vs. leaving out food as it is covered elsewhere (for example as a separate ***food systems* dimension**). With regard to production and emissions reduction, it might be worth looking into material usage to lock in carbon (this idea was marked with a question mark in the Miro workboard). But also, to clarify **how much will be produced in each of the branches** and to account for different methods of production (for example **merge traditional/indigenous methods with modern technology**). It was recognized that the Caring branch seems to be particularly suited for local differentiation in production decisions and for a decentralized production. In this branch, there is also a close link to cities that are able to support sustainable production through their implications on the construction sectors. With specific regard to the branch Bright High-Tech Future, it was remarked that "Green growth" through new technologies would rather be an example of technological regime change than an extrapolation of current trends as productivity growth has been slowing in technologically advanced economies. It was also asked whether negative externalities surrounding heavy usage of digital technologies such as i.e. e-waste, digital trust and responsibility issues were considered in a High-Tech branch.

As mentioned before, sustainable production and consumption links with many of the other dimensions. These include not only the Future of Work (jobs), but also Cities and urban-rural relation, Mobility, and the central link with resource provision (explicit mentioning of Eco reforestation, permaculture, clarity on use of alternative/bio feedstocks, protection of water sources). It was asked how the clear link between sustainable production and consumption with water and energy is taken up in the narratives?

As an example for a less positive branch in this dimension, it was suggested to also focus on unsustainable practices that ultimately need to be reduced.

(7) ENERGY	
Original description of the dimension and its branches	*The branches of the energy system narratives roughly fall in line with the concepts of "Green growth", "Sharing-and-caring", and "Sparing". These in turn differ across specific branching options relevant for the energy system. Common elements across all branches include rapid and universal electrification and the use of low or zero emission technologies (potentially including carbon capture and storage/use). The **Market Supply** has a focus on increasing the supply of clean energy, through well managed markets. Infrastructure focuses on large energy production facilities taking advantage of economies of scale, globalized markets, public-private partnerships and centralized distribution networks. Typical energy production technologies would include hydropower, offshore-wind, concentrated solar power, nuclear power, combined heat and power, and bioenergy with CCS. In the **Energy Communities** there is reduced energy demand through behavioural change. It relies on a bottom-up transformation, overcoming producer/consumer split ("prosumers"). **Small scale decentralized production** technologies including rooftop photovoltaic, micro-grids, onshore wind (community owned), biomass for heat, and solar water heating. Regional energy systems differ. Finally, the **Renewable Electrification** world relies on strong institutions and governance which promote systemic transformation approaches for optimizing supply and demand. High electrification and focus on efficiency and flexibility, managed through high levels of digitalization. Combination of small- and large-scale production combining self-sufficiency of buildings and large-scale distributed renewables (offshore wind, solar farms) for other energy services (transport, industry).*
Stakeholder suggestions	The energy transition is **a key challenge for sustainable development**. Similar to sustainable production and consumption, the role and assumptions of innovations and high-tech play a huge role, as the **energy transition is only realistic if technology delivers too**. Some of the assumed technologies to reduce emissions will however only be available after 2030 (after the core focus period of the SHAPE project). It was therefore suggested to further **clarify the role of negative emissions** in the energy pathways. It was remarked that **electrification seemed to be a little overemphasized** and that the branches should also consider other energy sources more prominently like power-to-x or gas. It was asked what role nuclear power is playing (an existing controversy)? Clarification was asked on whether some technologies are limited to certain branches (e.g. BECCS, DACCS)? With reference to Gruebler's LED scenario, which assumes huge energy efficiency improvements but very little activity reduction, it was suggested to use the **reduction of activity** as another way to construct the scenarios (by assuming decreased energy demand this aspect is currently reflected in the Energy Communities branch). Specific comments were made about Energy Communities ("interesting but very unlikely in major developing countries where most people live in large urbanized areas"), Renewable Electrification ("electrification of heavy industries challenges available sources of renewable energy"; "most likely [branch]") and Market Supply ("biomass is not a clean energy"). Three overarching issues were raised in relation to the energy dimension (compare section 2.1.1): (1) **Implementation:** A better understanding of the political economy and fruitful mechanisms for the energy transition is needed (Geopolitics sending the wrong signals for instance in energy pricing as fossil lifestyles need to be more costly; "We should really look at alternatives of how one can save energy"). The main question is also about centralisation and decentralisation both of which have very different implications. (2) **Role of demand and consumption:** Add more explicit assumptions on the demand side in the energy dimension which is largely covered implicitly in the other dimensions. (3) **Regional differentiation:** Co-existence of the three branches in different regions? Or different time frames in the same

	regions? Different governance systems might also choose similar technology options and a mix of technologies/branches might be more significant (also see section 2.1.1). For instance, Market Supply and Energy Communities should not be mutually exclusive.
(8) LAND	
Original description of the dimension and its branches	*Different narratives of a transformation to sustainability in the land system differ with respect to the **perception of the sustainability challenge**, the **option space of potential solutions**, the weight they give to **technological versus societal innovation** and to **demand- versus supply-side approaches**, as well as the **main actors** of the change process. The narrative of **Sparing** follows the paradigm of efficiency and intensification to reduce resource use and pollution, and emphasizes the role of technological innovation and market-based solutions. Political actors define framework conditions and policy instruments that set economic incentives. The transformation process is supported by large actors in the private sector interfacing agro-industry, digital solutions, bio-, health and food technology, and logistics. Food production and processing is mostly concentrated in large corporations. The technology-oriented approach does not only induce considerable changes on the supply side (highly efficient and automized agricultural production systems as well as landless food production), but also on the demand side via personalized dietary recommendations, novel foods and technical means to reduce waste and losses. Behavioural change aiming at self-restriction and moderation is not widely supported.* *The **Caring** narrative focuses on individual choices and a modest lifestyle to reduce environmental degradation. Behavioural change is motivated by strong ethical values under the paradigm of "caring for people, animals and nature" and facilitated by a large range of actors of the civil society. The societal change process is initialized and driven by consumers, communities, families, farmers and social networks, both on- and offline, as well as nongovernmental organisations (NGOs) and the civil society in general. Access to land and other resources is controlled by communities and local institutions, farm sizes are rather small. The main area of innovation lies in the socio-economic domain, the development of societies with a low material footprint. Diets are based on plant-based and unprocessed ingredients and food waste and losses are low, also due to short food supply chains. Demand-side preferences have repercussions on the supply side, favouring agro-ecological and organic practices with low input, high animal welfare and maintenance of ecosystem services.* *The third narrative follows the paradigm of **Sharing** resources, time and space for reconciling human well-being and ecosystem health. Acknowledging the need to manage local and global commons within environmental boundaries, a broad range of actors including the domains of politics, economy and civil society engage in dialogue and experiment with new ways of living and economic activity within reliable boundary conditions set by strong political institutions. Different societal groups as well as individuals have access to land and natural resources and use them in multi-purpose systems. Fostering innovation is understood as a transdisciplinary endeavour, drawing from multiple sources of knowledge including traditional and technology-oriented perspectives. Efficiency of the whole system is deemed more important than of individual processes. The dichotomy of managed versus natural land is in general overcome by inclusive approaches where food production is transformed from input-based to biodiversity-based practises.*
Stakeholder suggestions	The branches of this dimension are on the one hand well-known categories "that are fine" and where "all scenarios seem likely possible". On the other hand, the current interconnections to other dimensions could be made more explicit in this dimension. It could also be **expanded beyond human agricultural land use** (or otherwise be renamed to just "agricul-

	tural land use"). Non-anthropogenic areas, agroforestry and the use of timber (bioeconomy in general), parks and protected areas could be included. Silvopasture and agroforestry (if added to the "Sharing" branch) can protect and enhance ecosystems, produce food and sequester carbon. There was concern that the dimension reflects right now a **very northern view on land use** which could be refined by including other concepts of land based livelihoods that are more inclusive of indigenous lifestyles and culture (Example of Chief Seattle: land cannot be possessed by anyone). Several trade-offs were highlighted for this dimension: (1) bio-economy approaches might sacrifice some concerns on biodiversity as plantations are scaled, (2) **rebound effects** of efficiency improvements can occur (more yield per area can incentivize more area in cultivation if there are no strong laws and monitoring), (3) assumptions on land use and bioenergy demand/energy systems might be problematic. It was **suggested to transfer the concepts of "sparing", "caring" and "sharing" to oceans too**: coastal sparing; waste reduction, fish discards reduction (caring branch); conservation areas, efficient marine protected areas (sharing branch). It was further suggested to create **a new dimension on food systems** (also see section 2.1.1), where related supply chains (global, local, mixed?) and their links with mobility and energy use are defined.
(9) WATER	
Original description of the dimension and its branches	*The water dimension has branching options concerning the scale of supply and its resource base, but also addressing its interaction with energy, industrial and agricultural usage.* ***The Water Innovation*** *narrative is based upon high levels of technological development in water production, distribution, and sanitation, as well as liberal market structures. This is aided by a well-regulated marketplace with strong oversight ensuring environmental and social goals are met. Water resources are extended through technological improvement, including desalination as recycling of treated water. Strong digitization ensures efficient water use in commercial and agricultural uses, lowering overall demand. There is a remedial approach to wastewater where treatment is the primary method to combat pollution. In the* ***Low tech*** *narrative, water supply is based on community-based structures with smaller scale infrastructure exploiting readily available local resources. A key element of this narrative is the overall lower water demand due to greater consumer sensitivity towards wastefulness. This reduces consumer water demand which is further supplemented by limited agricultural irrigation. Strong resource oversight ensures that withdrawals are sustainable and within safe yields. Small scale local water treatment facilities ensure that water returned to natural bodies is free of fouling or may be reused. There is a precautionary approach towards wastewater, where water pollution is avoided. In the* ***Regional Water Partnerships*** *water resources are managed at the basin level by strong international public institutions ensuring that the flows and stocks of water resources are collected, treated and supplied in an efficient and sustainable manner. Supply of water is ensured through water infrastructure including piping, small-scale damming and channeling water resources. Reductions in water demand are motivated by shared understanding of water management, leading to demand sufficiency and behavioral change. This is supplemented by cleaning and recycling of wastewater. Water resources are used synergistically with other systems via the use of water bodies for energy storage or agricultural production/development. There is a precautionary approach towards wastewater, where water pollution is avoided.*
Stakeholder suggestions	*DISCLAIMER: This dimension was not discussed by stakeholders in the workshop as no one joined the breakout group on the water dimension. The suggestions are therefore only based*

	on the questionnaire responses and on a discussion between consortium members. *From the questionnaire responses:* **This dimension is of different importance as it is "impact-related" following from others.** The Low tech branch is very unlikely in major developing countries where most people live in large urbanized areas. It was commented for the specific case of Namibia that a Water Innovation branch would not make sense there. It was further commented that this branch is linked to high-tech agriculture. *From the consortium members:* All three branches of the water dimension **need to be spelled out further** as they are yet incomplete. It should in particular be considered that **water is a requirement for many of the other dimensions**, for example energy and agriculture, and that tele-connections need to be taken into account.
(10) HEALTH	
Original description of the dimension and its branches	*This dimension covers three branching options roughly aligned with the overarching themes of "Market Driven Innovation", "Resilient Communities", and "Managing the Global Commons" along the health dimension.* ***Market-driven innovation****: The health system is advanced by market driven innovations in robotics and IT aided medicine (long distance surgery, AI robots aided elderly care). Expertise is concentrated in large centralized hospitals. Personalized medicine (using (epi)genetic information). Apps, wearables and implanted chips measuring body functions enable tailored health advice. Private health insurance. Functional foods (nutrichemicals).* ***Holistic approach****: The health system is focused on prevention (food, exercise, meditation), education and local knowledge to ensure healthy bodies and minds. Community-based health centers with strong outreach activities, non-hierarchical care teams (like Buurtzorg in NL) and Multi-generation homes for elderly care. Tax-based public insurance system.* ***Global programs****: Focus on combating major global health problems (based on global burden of disease) and the transfer of technology, knowledge and personnel. Strong global organizations (WHO). Vaccination & education programs. Shared access to patents. Universal Health Coverage through a global public health insurance. Pandemic monitoring.*
Stakeholder suggestions	Although it was found that it is time to investigate health in relation to sustainable development pathways, the branches were found not yet built out. Not only was it suggested to **increase the focus on mental health** but also to **expand the branches beyond the health care system**, highlighting the importance of food, food production and nutrition on health, next to other preventative measures such as sanitation and infrastructure, including ways to deal with demographic change and exploding health care costs, and also addressing scientific knowledge and breakthroughs. The issue of financing the transitions was raised as an overarching issue for several (all?) dimensions. *(Some of these aspects are already addressed in the original dimension description by the consortium.)* Explicit reference was made to the energy dimension in particular for developing countries, where the availability of clinics and medicine storage depend on power sources. **The three branches of this dimension were considered not to be exclusive,** and it could in fact be a **good idea to pursue them jointly**. It was remarked that certain geographies might pursue the holistic approach additionally to the others. The holistic approach was also commented to be "the way forward" in contrast to the other two branches. It was further suggested to put the individual at the centre of health care, and to consider the interplay between individuals, communities and institutions.

(11) NATURE (BIODIVERSITY, ECOSYSTEMS)	
Original description of the dimension and its branches	*This dimension covers three branching options roughly aligned with the overarching themes of "Market Driven Innovation", "Resilient Communities", and "Managing the Global Commons" along the nature dimension.* ***Market value****: Recognizing the value of biodiversity and intact ecosystems for tourism, agriculture and as a source for innovation ensures protection. Technological innovation facilitates tailoring of protected areas to species' needs. Sustainable management. Bioeconomy.* ***Co-existence****: Coexistence of humans and natural ecosystems. Focus on local safeguarding of habitats. Community-based management. Supporting identities.* ***Ecological integrity****: Accepting that nature needs protection from human influence. International conservation policies are efficiently implemented and protecting areas expanded to ensure representation of species especially in global biodiversity hot spots. Focus on wilderness and rewilding.*
Stakeholder suggestions	**The fundamental significance of the nature dimension** was stressed several times ("Nature needs to be put into account at all times"). Nature could therefore be considered as a "super-dimension" next to the governance dimensions Architecture of Global Governance and Society and Governance (see section 2.1.1). However, while "more details regarding this dimension and how it speaks to the other dimensions" was desired, a diverging perspective also suggested to integrate this dimension in the land use dimension. The **Nature dimension might be further extended** to address **cultural and non-monetary benefits** as well as the sustainable use of wild species, the restoration and recovery of populations, to elaborate more on nature-based solutions and to address trade-offs in demand for future land. **A new branch was suggested for this dimension called "symbiosis"** where economy and society operate within nature. There was strong approval with the Co-existence branch while it was at the same time cautioned that nature might be at risk here from economic activity. For Ecological integrity it was suggested to address the question of population size and to add that production should be placed where it is best suited (example of tomato production in Italy and not in Holland). The branch Market value was met with scepticism: it was questioned whether this can work, arguing that payments are unclear because many people benefit a little and "there is not one owner of the supply". It was also asked whether traditional or modern technology will be integrated in Market value. Overall, policy reforms with regard to nature (and the efficiency of such reforms) were regarded as essential. Concrete suggestions were made for **integrating the ocean perspective**: bioeconomy, sustainable fisheries & aquaculture (Market value), traditional, community-based management of coastal areas (Co-existence), and international global targets (Ecological integrity).

2.2 Scenarios

This section will give recommendations on which narrative/scenario combinations to implement in general and reflect the feedback received on each individual combination.

2.2.1 Overarching issues

Although there was general consensus to implement the three "basic" scenario combinations as they are "standard and well thought out" along the lines of technological, behavioural and policy solution, there was a desire for more unusual scenario combinations. Potential was seen to use the dimension and branching point approach to create narratives that are less business-as-usual while at the same time providing consistent storylines ("What about we love money AND we love nature?"). As such in particular narrative/scenario combination 6 "Green and social market economy" was highlighted as a non-standard but overall plausible combination, a "pleasant future to live in" taking "the best of multiple worlds with strong corporate responsibility, social cohesion, and proactive environmental management". Similarly, narrative/scenario combination 5 "Local Solutions" was suggested to be pursued further.

Again, the question of real-world implementation and how to get on to these tracks in time (until 2030) was raised in the overall discussion of the narrative/scenario combinations. Therefore, more investment on the local level was suggested to avoid the recreation of a top-heavy, bottom-light global governance architecture. It was also remarked that the scenarios are narrow precisely due to the orientation towards the Agenda 2030.

2.2.2 Specific comments about the initial scenario combinations

In this section we present a synthesis of our stakeholders' suggestions about each scenario (Table 2). To facilitate the understanding and analysis of the suggestions, we included the short description of the branches composing each scenario. According to Appendix D.3, the preferred scenarios for quantification would be[3]:

- Green and social market economy (6 "votes")
- Local solutions (possibly with addition of some market elements) (6 "votes")
- The basic combinations: Market-driven innovation (4 "votes"); Resilient communities (3 "votes"); Managing the global commons (2 "votes")

[3] During the workshop we asked participants to select and write in the chat the scenario combinations which they would like to see quantified. "Votes" reflects how many times a specific combination was named.

Table 2 – Suggestions and comments about the scenario narratives. To put the stakeholders' suggestions (light blue boxes) in context, the original description for every scenario narrative is given. There, current dependencies across dimensions are highlighted in red (Shape work package 1 analysis).

(1) MARKET-DRIVEN INNOVATION (basic): **Overview: Technology and market driven - globalized world - high-growth**		
Original scenario narrative (combining branching options)	***Convergent Cosmopolitan Global Society (Melting Pot 1)***	*Strong social globalization, multilateralism. Efficiency as the guiding principle for political actions ("Together we can achieve our goals better").*
	Symbiosis	*Rapid digitalization is fully embraced and drives future development of the economy. Welfare state redistributes part of the gains. High GDP growth in all regions, with strong convergence between regions.*
	Economy-driven world	*Market actors drive transformation, market solutions are key to transformation, focus on efficient market economy, maximizing value-added.*
	Urban world A	*High urbanization, predominance of mega and large cities, compact urban form. Diffusion of smart technologies and energy-efficient buildings and infrastructures.*
	SciFi Mobility	*Autonomous vehicles with low-footprint drivetrains enable high degrees of individual mobility. High-speed intercity travel (Hyper-Loop, Transrapid). Demand for long-distance passenger transport stalls in high income regions due to high digital interconnectivity. Autonomous freight transport with direct and indirect electrification.*
	A bright High-Tech Future	*"Green growth" extrapolation of current trends. Large efficiency gains, cradle-to-cradle material usage. Heavy use of digital technologies.*
	(Land) Sparing	*Efficiency & intensification, largely privately driven, automated production, landless food production. Genetic engineering for increased efficiency.*
	Market Supply	*Well managed markets increase supply of clean energy from diverse resources (incl. biomass, synthetic fuels, and possibly fossil resources with CCS). Benefits from economies of scale, globalized markets and centralized distribution networks. Large scale supply and storage benefit from public-private partnerships.*
	Water Innovation	*A well-regulated marketplace ensures that resources are sustainably used. Resources are extended through technological improvement, including desalination. Demand is largely based on price signals, and strong digitization ensures efficient water and de-foulement use in commercial and agricultural uses.*
	Market-driven innovations	*Robotics and IT aided medicine. (Long distance surgery, AI robots aided elderly care). Centralized large hospitals. Personalized medicine (using (epi)genetic information). Apps enable tailored health advice. Wearable and implanted chips measure body functions. Private*

		health insurance. Functional foods (nutrichemicals).
	(Nature) Market value	*Recognizing the value of biodiversity and intact ecosystems for tourism, agriculture and as a source for innovation ensures protection. Technological innovation facilitates tailoring of protected areas to species' needs. Sustainable management. Bioeconomy.*
Stakeholder suggestions	Despite the critique that this combination is too "business as usual" and at the same time too far-fetched for an SDP due to ongoing civil society attention (school strikes, Black Lives Matter, etc.), it was also described as the most coherent combination. Yet, it was argued to soften the scenario a bit. Its market-driven focus with unprecedented technological development and record-speed adaptation of technologies, might miss poor people in its equation. People living in poverty do not have the power to shape marketplaces and drive demand. An absence of human behaviour and lifestyle in this combination was remarked as was that seeing "a world [...] through a globalized lens doesn't see the behaviour of "little" people and local communities".	

(2) RESILIENT COMMUNITIES (basic):

Overview: Human well-being - behavioural change - local & less tech-driven

Original scenario narrative (combining branching options)	***Divergent Glocality (Salad Bowl)***	*Weak globalization, polycentric decision-making. Effectiveness as guiding principle for political actions ("Because problems are local, actions should primarily be local").*
	Deceleration	*New digital scepticism. Institutions try to control and steer development of digitalization. Low GDP growth in developed countries, medium convergence between regions. High growth in public infrastructure, public services and social welfare programmes. Focus on human well-being.*
	Society-driven world	*Networks (civil society, private sector and government actors jointly) drive transformation, focus on solidarity & well-being, social cohesion, and green innovation.*
	Urban-rural world	*Reversal of urban-rural migration trend, strong peri-urban communities. Small to medium cities thrive (polycentric cities), remodelled to allow for walking & biking. Co-housing, house sharing and reduced housing size to avoid urban sprawls.*
	Sustainable Lifestyles	*Focus on public transport and increases in non-motorized/hybrid electric modal shares. Cars with mainly electric drivetrains are shared among communities. Reduced long-distance travel in wealthy regions. Decreasing demand for long-distance freight transport due to localized markets.*
	Caring for the World	*Strong social cohesion. Resilient communities provide cosy social environments and a high degree of self-sufficiency. People value personal interaction and social participation over comfort and status symbols. Goods and services are shared among local communities.*
	(Land) Caring	*Strong behavioural change, shift to plant-based and unprocessed diets, low waste. Focus on local & organic agriculture.*
	Energy	*Reduced energy demand through behavioural change. Bottom-up*

	Communities	*transformation, overcoming producer/consumer split, decentralized energy system.*
	Low tech	*Community-based and decentralized water supply and sanitation infrastructure. Reduced demand based on sufficiency, reuse and behavioural change.*
	Holistic approach	*A holistic approach tapping into local knowledge to ensure healthy bodies and minds. Focus on prevention (food, exercise, meditation). Health education in schools. Community-based health centres with strong outreach activities. Non-hierarchical care teams (like Buurtzorg in NL). Multi-generation homes for elderly care. Tax-based public insurance system.*
	Coexistence	*Coexistence of humans and natural ecosystems. Focus on local safeguarding of habitats. Community-based management. Supporting identities.*
Stakeholder suggestions	Responding positively to this narrative/scenario combination, two potential discrepancies were also remarked: • The deceleration branch of Future of Work and implications for economy growth and inequality relies on strong governmental regulation of digitalization. Yet Resilient communities is a society-driven world where government regulations might play less a role. Digitalization is at the same time a very important enabler for a return to rural areas as assumed in this combination (e.g. to allow for teleworking). The importance of basic universal income in this scenario was reinforced as was urban agriculture. • The compatibility between "Divergent Glocality" and "Society-driven" branches was questioned, as Divergent Glocality assumed decisions made at national level (there were questions about the need for a really local, e.g., municipality branch, see Table 1). The discussion illustrated how both branches need clarification. The creative piece they wrote, the "Wakanda story", for example, does not reflect lack of global coordination and local solutions implied in the Divergent Glocality: *Dear EU, I imagine Africa as a carbon neutral that sufficiently produces its own food, fibre building construction and textiles. Imagine a world where poverty is non-existent because of equitable distribution of resources on a global scale, better protection of indigenous communities and of their knowledge and practices, and less plunder of resources. I Imagine a paradise like Wakanda in 2050.*	

(3) MANAGING THE GLOBAL COMMONS (basic):

Overview: Strong global institutions - efficient technological solutions

Original scenario narrative (combining branching options)	***Convergent Rational-Legal Global Society (Melting Pot 2)***	*Strong social globalization based on universal human values, multilateralism, solidarity as a strong and effective principle to mobilize actions ("We are together because we share the same aspirations/values").*
	Homecoming	*Re-focus on importance of human dimension, machines used to automate routine tasks. GDP as indicator of progress replaced by broader human well-being. Nonetheless automation drives moderate growth in developed countries, with the additional wealth generation*

		channelled to public ownership. Strong convergence between regions.
	Government-driven world	*Governments drive transformation, strong statehood & good governance*
	Urban world B	*Urban development driven by local institutions and governance. High urbanization, balance of mega-cities, medium and smaller cities. Improved access to communal spaces, services and nature. Co-housing, house sharing and reduced housing size to avoid urban sprawls.*
	Green Mobility	*Full (direct) electrification in all sectors. Individuals: Car sharing, shared autonomous vehicles & public transport. Lifestyles & policies adjust for less long-distance travel in wealthy regions.*
	Sharing the Global Commons	*Strong regional and global institutions are the main drivers of a sustainable transformation. Although the driving force is different, consumption patterns in the short-to-medium term resemble those of the "Caring" scenario.*
	(Land) Sharing	*Mixing managed/natural land, biodiversity-based practices, strong institutions, focus on whole-system efficiency.*
	Renewable Electrification	*Technocratic approach optimizing supply & demand. High electrification and focus on efficiency and flexibility.*
	Regional Water Partnerships	*Water resources management at the basin level, including infrastructure such as damming. Transboundary water institutions. Reduced demand based on sufficiency, recycling and behavioural change. Motivated by shared understanding/information of resource challenges. Integrated approaches to managing aquatic ecosystems.*
	Global programs	*Global programs to combat major health problems (based on global burden of disease) and transfer of technology, knowledge and personnel. Strong global organizations (WHO). Vaccination & education programs. Shared access to patents. Universal Health Coverage through a global public health insurance. Pandemic monitoring.*
	Ecological integrity	*Accepting that nature needs protection from human influence. International conservation policies are efficiently implemented and protecting areas expanded to ensure representation of species especially in global biodiversity hot spots. Focus on wilderness and rewilding.*
Stakeholder suggestions	Although this combination is part of the basic narrative/scenario combinations recommended to be further implemented, it was met with scepticism ("green dystopia"). The combination was described as being distant from ground realities, needing more emphasis on implementation. The global-local relationship was not entirely clear in particular with regard to convergence among regions. Global convergence was not necessarily seen as something desirable and it was suggested to rather manage differences than achieve complete convergence between regions. The global commons was suggested to recognize incommensurable but equally valid values, featuring a mix of values ("In Pluralism We Stand"), instead of universal human values: "Small is Beautiful [...] [a]ll this talk of "common values" is nice, and we have much less conflict, but I feel left out." This combination also does not seem to be an option where corruption prevails, power needs to be legiti-	

	mized democratically with working checks-and-balances. It was further remarked that the branch Bright High-Tech Future (SCP dimension) might fit better and that Green Mobility (Mobility dimension) implies at least some behavioural, bottom-up change in an otherwise top-down narrative/scenario combination. One comment remarked an odd mix of technocracy and distributed governance in this combination.	
(4) HUMAN DEVELOPMENT (alternative): **Overview: Human well-being - societal cohesion - behavioural changes - tech-optimistic**		
Original scenario narrative (combining branching options)	***Convergent Rational-Legal Global Society (Melting Pot 2)***	*Strong social globalization based on universal human values, multilateralism, solidarity as a strong and effective principle to mobilize actions ("We are together because we share the same aspirations/values").*
	Homecoming	*Re-focus on importance of human dimension, machines used to automate routine tasks. GDP as indicator of progress replaced by broader human well-being. Nonetheless automation drives moderate growth in developed countries, with the additional wealth generation channelled to public ownership. Strong convergence between regions.*
	Society-driven world	*Networks (civil society, private sector and government actors jointly) drive transformation, focus on solidarity & well-being, social cohesion, and green innovation.*
	Urban-rural world	*Reversal of urban-rural migration trend, strong peri-urban communities. Small to medium cities thrive (polycentric cities), remodelled to allow for walking & biking. Co-housing, house sharing and reduced housing size to avoid urban sprawls.*
	Green Mobility	*Full (direct) electrification in all sectors. Individuals: Car sharing, shared autonomous vehicles & public transport. Lifestyles & policies adjust for less long-distance travel in wealthy regions.*
	Sharing the Global Commons	*Strong regional and global institutions are the main drivers of a sustainable transformation. Although the driving force is different, consumption patterns in the short-to-medium term resemble those of the "Caring" scenario.*
	(Land) Caring	*Strong behavioural change, shift to plant-based and unprocessed diets, low waste. Focus on local & organic agriculture.*
	Energy Communities	*Reduced energy demand through behavioural change. Bottom-up transformation, overcoming producer/consumer split, decentralized energy system.*
	Regional Water Partnerships	*Water resources management at the basin level, including infrastructure such as damming. Transboundary water institutions. Reduced demand based on sufficiency, recycling and behavioural change. Motivated by shared understanding/information of resource challenges. Integrated approaches to managing aquatic ecosystems.*

	Global programs	*Global programs to combat major health problems (based on global burden of disease) and transfer of technology, knowledge and personnel. Strong global organizations (WHO). Vaccination & education programs. Shared access to patents. Universal Health Coverage through a global public health insurance. Pandemic monitoring.*
	Ecological integrity	*Accepting that nature needs protection from human influence. International conservation policies are efficiently implemented and protecting areas expanded to ensure representation of species especially in global biodiversity hot spots. Focus on wilderness and rewilding.*
Stakeholder suggestions	This narrative/scenario combination was the only combination that was not explicitly recommended for further model implementation. It was met with scepticism regarding its name: development models are diverse, implying different values, world conceptions and social goals for different societies. A bigger point of critique concerned the assumption of universal human values as it remains unexplained why we are together in the first place? There needs to be a powerful reason why the world is brought together in order to work towards sustainability (for instance: #Conclusive research - NoHabitablePlanetB!!!). How do global institutions deliver on the ground and how is ownership at the local level ensured? It was further suggested to replace "Ecological integrity" with "Coexistence" in the Nature dimension to better fit with "Sharing the global commons" in the dimension Sustainable Production and Consumption.	

(5) LOCAL SOLUTIONS (alternative):

Overview: Regional approaches - strong local institutions - well-regulated technologies

Original scenario narrative (combining branching options)	***Divergent Glocality (Salad Bowl)***	*Weak globalization, polycentric decision-making. Effectiveness as guiding principle for political actions ("Because problems are local, actions should primarily be local").*
	Deceleration	*New digital scepticism. Institutions try to control and steer development of digitalization. Low GDP growth in developed countries, medium convergence between regions. High growth in public infrastructure, public services and social welfare programmes. Focus on human well-being.*
	Government-driven world	*Governments drive transformation, strong statehood & good governance.*
	Urban world B	*Urban development driven by local institutions and governance. High urbanization, balance of mega-cities, medium and smaller cities. Improved access to communal spaces, services and nature. Co-housing, house sharing and reduced housing size to avoid urban sprawls.*
	Sustainable Lifestyles	*Focus on public transport and increases in non-motorized/hybrid electric modal shares. Cars with mainly electric drivetrains are shared among communities. Reduced long-distance travel in wealthy regions. Decreasing demand for long-distance freight transport due to localized markets.*
	Caring for the World	*Strong social cohesion. Resilient communities provide cosy social environments and a high degree of self-sufficiency. People value personal interaction and social participation over comfort and status*

		symbols. Goods and services are shared among local communities.
	(Land) Sharing	*Mixing managed/natural land, biodiversity-based practices, strong institutions, focus on whole-system efficiency.*
	Renewable Electrification	*Technocratic approach optimizing supply & demand. High electrification and focus on efficiency and flexibility.*
	Low tech	*Community-based and decentralized water supply and sanitation infrastructure. Reduced demand based on sufficiency, reuse and behavioural change.*
	Holistic approach	*A holistic approach tapping into local knowledge to ensure healthy bodies and minds. Focus on prevention (food, exercise, meditation). Health education in schools. Community-based health centres with strong outreach activities. Non-hierarchical care teams (like Buurtzorg in NL). Multi-generation homes for elderly care. Tax-based public insurance system.*
	Coexistence	*Coexistence of humans and natural ecosystems. Focus on local safeguarding of habitats. Community-based management. Supporting identities.*
Stakeholder suggestions	This narrative/scenario combination was perceived positively despite the fact that in such a scenario global pacts like the Paris Agreement might fail in favour of local, regional or bilateral agreements. It was positively noted that this combination reflects taking up responsibility for local problems in an institutionalized manner, allowing for geographical diversity and heterogeneity (buildings constructed with local materials and styles, grocery stores with local food only, higher biodiversity on managed land due to diverse agricultural production where new technology and traditional knowledge is combined, train travel within countries instead of flying). There were however a few suggestions for alternative branches to be included: It was questioned whether the branches "Caring for the world" (SCP dimension) and "Low-tech" (Water dimension) are the (only) fits in this combination. The focus on local solutions quickly diverts the debate to exclusively traditional practices and away from technological innovation. However, high-tech solutions should probably also be included in a local narrative, yet with clear management put in place and without being entirely market driven. Local approaches towards circular economy might for instance require high-tech solutions to decrease inputs, and the integration of some market elements could distinguish this combination better from *Resilient communities*. Moreover, the branch "Caring for the world" (SCP dimension) might not fit with the branches "Renewable Electrification" in the energy dimension or "Sharing" in the land dimension. It was further proposed that if a food *systems* branch was developed, it could focus on the local level with smaller supply chains controlled by the government. The health dimension might also feature a local health program rather than a holistic one.	

(6) GREEN AND SOCIAL MARKET ECONOMY (alternative):

Overview: Market & tech friendly - strong institutional rules

Original scenario narrative (combining	***Convergent Cosmopolitan Global Society (Melting Pot 1)***	*Strong social globalization, multilateralism. Efficiency as the guiding principle for political actions ("Together we can achieve our goals better").*

branching options)	***Homecoming***	*Re-focus on importance of human dimension, machines used to automate routine tasks. GDP as an indicator of progress replaced by broader human well-being. Nonetheless automation drives moderate growth in developed countries, with the additional wealth generation channelled to public ownership. Strong convergence between regions.*
	Society-driven world	*Networks (civil society, private sector and government actors jointly) drive transformation, focus on solidarity & well-being, social cohesion, and green innovation.*
	Urban world A	*High urbanization, predominance of mega and large cities, compact urban form. Diffusion of smart technologies and energy-efficient buildings and infrastructures.*
	SciFi Mobility	*Autonomous vehicles with low-footprint drivetrains enable high degrees of individual mobility. High-speed intercity travel (Hyper-Loop, Transrapid). Demand for long-distance passenger transport stalls in high income regions due to high digital interconnectivity. Autonomous freight transport with direct and indirect electrification.*
	A bright High-Tech Future	*"Green growth" extrapolation of current trends. Large efficiency gains, cradle-to-cradle material usage. Heavy use of digital technologies.*
	(Land) Sparing	*Efficiency & intensification, largely privately driven, automated production, landless food production.*
	Renewable Electrification	*Technocratic approach optimizing supply & demand. High electrification and focus on efficiency and flexibility.*
	Water Innovation	*A well-regulated marketplace ensures that resources are sustainably used. Resources are extended through technological improvement, including desalination. Demand is largely based on price signals, and strong digitization ensures efficient water and de-foulement use in commercial and agricultural uses.*
	Market-driven innovations	*Robotics and IT aided medicine. (Long distance surgery, AI robots aided elderly care). Centralized large hospitals. Personalized medicine (using (epi-)genetic information). Apps enable tailored health advice. Wearable and implanted chips measure body functions. Private health insurance. Functional foods (nutrichemicals).*
	(Nature) Market value	*Recognizing the value of biodiversity and intact ecosystems for tourism, agriculture and as a source for innovation ensures protection. Technological innovation facilitates tailoring of protected areas to species' needs. Sustainable management. Bioeconomy.*
Stakeholder suggestions	As mentioned above this narrative/scenario was in particular highlighted as an example for an innovative and overall consistent combination. Yet it was also subject to discrepancy. Despite its overall very positive perception, it was quite strongly argued that in such a market- and tech-friendly narrative, the intended strong institutional regulations are at great risk of being used to green-wash unsustainable practices. Opposing this view, it was pointed to the (initially surprising) fact that this scenario is society-driven. This novel and yet imaginable approach would avoid green-washing tactics as (all) actors appear sincere	

about a truly sustainable world. It was however acknowledged that tensions might arise from natural capital pressures (nature and water) and also between a society-driven future and the potentially large role of high-tech solutions in this combination. Market driven innovations (health dimension) as symbolized by private health insurances might also be too far-fetched in a society-driven world. These tensions could be difficult to overcome and might need some reworking in order for the narrative to be completely consistent.

Starting from Green and social market economy, another combination was suggested by switching the branches of the dimensions Water, Health and Nature of this combination to “Regional Water partnerships”, “Global programs” and “Ecological integrity”, and potentially also the branch of the Energy dimension to “Energy Communities”. This could result in a very different (but appealing?) world compared to the current market economy.

3. NEXT STEPS: Analysis of the results and lessons learned

In this section, the workshop organizers present an analysis of the way forward based on the stakeholder input summarized in Section 2. The workshop discussions and the feedback received through the questionnaires added rich input across diverse topics to the SDP narratives. The input will be taken up by the consortium for restructuring the dimensions/branches, as discussed in Section 3.1. Some of the issues arising in the stakeholder recommendations go beyond what can be incorporated in the narratives and/or later modelled. We identified some of those issues as critical themes for future stakeholder engagement (Section 3.2). We close this section with our reflections on the lessons learned about the participatory process itself (Section 3.3).

3.1 Dimensions, branches and scenarios: key changes

SHAPE's overall scenario approach was, in general, reasonably well-understood and appreciated by the stakeholders. However, our choice of dimensions and our choices and combinations of branching options caused some misunderstandings among the stakeholders, and the discussions also exposed some inconsistencies in the current design of the project dimensions and branches. The dimensions were seen as having repetitions, redundancies and interdependencies.

Based on the synthesis presented above, we consider that prior to fixing specific details about the existing branches, the SHAPE project team would benefit from stepping back and reviewing the dependencies among branches and dimensions, and then recombining the scenarios:

- A key problem identified in both the questionnaire and during the workshop is the lack of clarity about the 'system boundaries' of the dimensions, and the interdependencies among the branches across dimensions - and even in relation to the scenario narrative (confusingly called the "overarching narrative" in some cases). This lack of clarity and distinctiveness complicates the possibility of recombinations. The organizers' suggestion is therefore:
    - to reorganize and create some hierarchy between the dimensions, highlighting the most fundamental ones, and avoiding excessive interdependence;
    - in the new design, carefully address the recommendations for existing dimensions / branches (Table 2). The changes should then be explained and discussed in future stakeholder events (e.g. a webinar).
- Terminology also caused some confusion among stakeholders, compounded by the length and lack of uniformity in the dimension documents about the terms and nomenclature relating to the scenario development process.[4]

[4] For example, some dimensions refer to their branches as "branching options" (in accordance with the concept note), others as "narratives" and others yet as "scenarios". Some explicitly attach the branching options to the "overarching narratives" (i.e., scenario narratives), limiting the possibility of recombination. Some dimensions introduce some additional terminology (e.g., Future of Work), like "domain" (for dimension). It also classifies the features of the branches as: "core" (central to narratives to be reflected in the overarching narrative across all domains), "aspects" (other domain narratives may be more central to this category, but those aspects in the narratives

In future reporting of the project, the various components of the scenarios need to be explained clearly and described consistently.

3.2 Open issues - Future stakeholder engagement

Themes for future discussions:

From the workshop discussions, we derived a number of issues for future discussions:

1. A major issue is related to the real-world implementation of the branches, addressing the questions “How do we get to these sustainable worlds, to social cohesion, etc.?” and “How do we get everyone to work together?”. It needs to be investigated what type of events and what timing of events bring the world closer to its sustainability goals and lower emissions, and in how far such events and induced changes might act in symbiosis.

2. There were some questions about how we will measure effectiveness of the transformation in different scenarios.

3. The mutual learning process about modelling and real-world needs can still be deepened addressing questions such as what are key policy needs and specific key questions that are helpful to be modelled? What are the opportunities, challenges and limitations of modelling?

4. The importance of including grounded empirical frameworks and power analyses when reflecting about the future of society was also raised. This topic reinforces the key role of the social sciences in the next SHAPE phases, and in the scenario and modelling processes in general.

These aspects will be taken up in the planning of the next steps of the SHAPE multi-stakeholder dialogue.

3.3 About the participatory process

The first phase of the SHAPE Multi-Stakeholder Dialogue and in particular the workshop in October have shown that online work settings can enable effective interaction among diverse stakeholders. A participatory process ideally involves learning by all participants - including the organisers - and the next section will discuss strengths and weaknesses that were encountered during the SHAPE stakeholder engagement process so far.

Lessons learnt concerning the organisational aspects of the whole stakeholder dialogue include that the integration of a “pre-event phase” to the workshop in October was very helpful, given the complexity of IAMs and the number of topics that were discussed. The information webinar three months prior to the workshop provided the opportunity to approach and inform a larger group of people before entering into a phase where more commitment from the side of the stakeholders was required. The webinar and in particular the questionnaire gave people insight into the work of the SHAPE project and the chance to decide whether they wanted to join. Like this people who actually

should be adapted to be consistent with the dominant domain narratives and then also be reflected), and “tangential” (can be adapted, adopted, or overruled by the dominant domain narratives).

participated in the workshop were more dedicated and the engagement process became more binding. This might be proved by participants joining us back over the three days while some even attended workshop sessions that they had not signed up for initially.

Further lessons learnt concerning the participatory scenario process are that despite the aforementioned "pre-event phase" and the extremely rich and important input to the final narratives, the project could potentially have benefited from an (even) earlier and more frequent interaction with stakeholders and experts. For example, before the full narratives for the branching points were created and combined into scenarios.

Lessons learnt concerning the organisational aspects of the online workshop include for once that online group working requires *at least* as many active team-members as would be necessary in face-to-face events. It was good to have project respondents in the discussions to directly clarify questions and it was very helpful to have additional project colleagues join not only to observe the discussions but also to keep an eye on the Miro workboards. This helped make sure that the discussions were well reflected by the sticky-notes while the facilitator could concentrate on guiding the conversation. An idea for improvement in this regard might be to use the online sticky-notes next time to cluster ideas directly during the discussion to help structure the conversation along these ideas.

Lessons learnt about the technical aspects of conducting an online workshop include that it is possible to introduce new online tools (Miro workboards) and simultaneous work modes (discussion and self-documentation). It is however essential to explain the processes very well (multiple times; including additional formats like videos), keep the explanations as simple as possible and give participants enough "practice time" to familiarize themselves with the online tools. With regard to the Miro workboards, the anonymous work mode is advantageous in the sense that it allows participants to create ideas and to comment more freely. At the same time the anonymity naturally makes it impossible to follow up with any particular "sticky-note author". Moreover, it is very helpful to assign a separate role to a session host responsible for technical issues and questions. It might be remarked on a side note that we could certainly benefit from the fact that our participants (and us) got used to online work modes over the course of this year.

Lessons learnt about the creative exercise in the workshop: During thematic session 4, we proposed an exercise in which participants would analyse the consistency of the scenario combination, through a creative process to connect the different branches (like writing a letter, creating hashtags, newspaper headlines, etc.). Although the task was at first met with scepticism (it was asked why we did not use well-established scenario methods such as Morphological analysis, Scenario Diversity Analysis (SDA), which we may apply in future opportunities) the goal of the exercise was not a full formal analysis of the consistency and internal logic of the scenarios, but to also promote ownership. Such an exercise could also have been useful at the beginning of the workshop for the different branches.

Lessons learnt with regard to the diversity of stakeholders include that balancing inputs from transdisciplinary academics and stakeholders in the governmental, business and civil society sectors is challenging. The discussions during the workshops showed that both groups have different levels of interest and prior knowledge which steered the discussions at times into a more research-oriented direction rather than reflecting on 'real' world issues. Clearly, both are very valuable, but it might be helpful to separate more academic discussions from other discussions to gain a clearer understanding of

the experiences from decision-makers in governmental, business and civil society sectors.

The online work mode might have made the workshop more inclusive than a face-to-face event that was originally planned to take place in Potsdam. It is easier to reach out to different world regions without travel costs and travel time being involved. Although stakeholders joined us from Africa, Asia and South America, most participants in this first phase of the Multi-Stakeholder Dialogue were from Europe or North America. From this perspective, the potential of online workshops within SHAPE could be further expanded to include more voices from distant world regions and especially the Global South. Challenges arising from such a setting include consciousness about the coordination of different time zones and diverging access to digital infrastructure. With regard to broadening the diversity of perspectives, future stakeholder events could include more perspectives from the business sector but also from civil society.

4. FINAL REMARKS

The report concludes with final remarks containing key messages each for the team members of the SHAPE project, from our stakeholders and for the bigger SDG picture.

For the organisational process: Online workshop modes can work well. Benefits include for instance international participation and self-documenting processes.

For the construction of the narratives: Overall the scenario approach based on branching points was well-understood and appreciated by the stakeholders. In general, there were more suggestions for improvement of existing dimensions and branches, than explicit suggestions for new branches or dimensions. The *interdependencies* among branches and dimensions need reviewing (clarification on hierarchies and more fundamental dimensions; 'system boundaries' of the dimensions).

From our stakeholders: Next to further pursuing the basic scenario combinations, there was encouragement for *bolder and more unusual* combinations. The *real-world implementation* of the pathways is also an important aspect (How can societies get to the outcomes described in the dimensions? And what events may need to be put in place to get societies on track? Do societies share the same values in the first place, and why?).

For the bigger SDG picture: We will continue to address these kinds of questions with our stakeholders in the next phases of the project because they help ensure the broad relevance of the Sustainable Development Pathways to the widest possible application contexts.

APPENDICES

Appendix A - Questionnaire: overview and summary of results

The questionnaire aimed at getting a first round of external feedback on the narrative development as proposed by the SHAPE consortium. The received responses provided the focal topics for discussion during the workshop from 20-22 October 2020 and a basis for the grouping and sequencing of the workshop's thematic sessions.

Structured into three parts, our stakeholders were asked to comment on each of the individual dimensions, branches and narrative combinations which are part of the SHAPE methodology to integrate different options for pathways towards sustainable development. Moreover, the recipients were asked to suggest new aspects that are not yet covered in the narratives for the SDPs.

Released directly after the online seminar in early July 2020, 76 questionnaires were sent out over the period from July until the end of September. 25 questionnaires were sent back of which 19 were returned complete. Figure A.1 summarizes the distribution of answers by dimension. The results were evaluated throughout September and October 2020 and built an important basis for our stakeholder workshop.

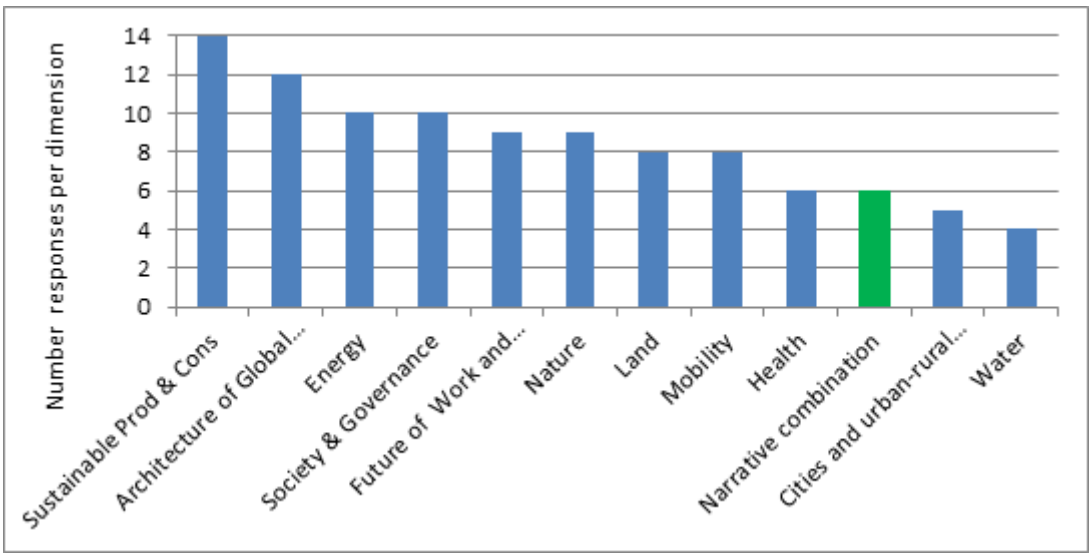


Figure A.1 – Number of responses received per dimension and on the narrative combination

A.1 Overarching issues

A number of overarching issues were derived from the questionnaire responses. These included (1) questions of convergence and divergence across the globe and allowing for mixes for example of economic integration, (2) the consideration of the dimensions *Society & Governance* and *Architecture of Global Governance* as "super-dimensions" resulting from their influence on all other dimensions. It was further criticized that (3) currently popular narrative elements such as the role of digitalization and the neoliberal conception of the market were too easily accepted. These narrative elements could be built out. We received contrasting opinions on the narrative combination whereby (4) more unusual combinations were encouraged instead of well-known storylines on the one hand, while it was also suggested to sim-

plify the combinations along the lines of “technological solution”, “behavioural solution”, “policy solution” on the other hand.

A.2 Synthesis of specific answers about the dimensions and combinations

Please refer to our synthesis of the questionnaire results.

Appendix B

B.1 Agenda of the workshop

Day 1, Tuesday 20 October 2020:	
2:00-3:30 pm CEST	**Plenary session 1** Zoom access: please see below the agenda
4:00-5:30 pm CEST	**Thematic session 1** covering (a) Architecture of Global Governance (b) Future of Work and implications for economic growth, structural changes and inequalities (c) Society and Governance Zoom access: please see below the agenda Access to our white boards on Miro: will be provided during each session
Day 2, Wednesday 21 October 2020:	
2:00-3:30 pm CEST	**Thematic session 2** covering (d) Sustainable Production and Consumption (e) Cities and Urban/Rural Relation (f) Mobility (g) Health Zoom access: please see below the agenda Access to our white boards on Miro: will be provided during each session
4:00-5:30 pm CEST	**Thematic session 3** covering (h) Land (i) Nature (j) Energy (k) Water Zoom access: please see below the agenda Access to our white boards on Miro: will be provided during each session
Day 3, Thursday 22 October 2020:	
2:00-3:30 pm CEST	**Thematic session 4** covering The scenario combination Zoom access: please see below the agenda Access to our white boards on Miro: will be provided during each session
4:00-5:30 pm CEST	**Plenary session 2** Zoom access: please see below the agenda

B.2 Project team roles in supporting stakeholder discussions

Breakout group discussions:	**Thematic session 1** (a) Architecture of Global Governance; (b) Future of Work and implications for economic growth, structural changes and inequalities; (c) Society and Governance	**Thematic session 2** (d) Sustainable Production and Consumption; (e) Cities and Urban / Rural Relation; (f) Mobility; (g) Health	**Thematic session 3** (h) Land; (i) Nature; (j) Energy; (k) Water	**Thematic session 4** Scenario combination
Host	Anil Singh[1]	Anil Singh[1]	Anil Singh[1]	Anil Singh[1]
Facilitators	(a) Ana Paula Aguiar[1] (b) Merle Remy[2] (c) Sarah Cornell[1]	(d) Sarah Cornell[1] (e) Ana Paula Aguiar[1] (f) Merle Remy[2] (g) Falk Schmidt[2]	(h) Ana Paula Aguiar[1] (i) Sarah Cornell[1] (j) Merle Remy[2] (k) Falk Schmidt[2]	Ana Paula Aguiar[1] Sarah Cornell[1] Merle Remy[2] Falk Schmidt[2] Sebastian Rauner[3] Bjoern Soergel[3]
Project respondents	(a) Ariel Hernandez[4] (b) Elmar Kriegler[3] (c) Ines Dombrowsky[4]	(d) Alois Dirnaicher[3] (e) Alessio Mastrucci[5] (f) Bas van Ruijven[5] (g) Sebastian Rauner[3]	(h) Isabelle Weindl[3] (i) Sebastian Rauner[3] (j) Vassilis Daioglou[6] (k) Ines Dombrowsky[4]	

[1] SRC, [2]IASS, [3]Potsdam Institute for Climate Impact Research, [4]German Development Institute (DIE), [5]International Institute for Applied Systems Analysis (IIASA), [6]Utrecht University

Appendix C – List of participants (workshop and questionnaire)

Workshop			
	Name	**Organisation**	**Place**
1	Adolf Kloke-Lesch	Sustainable Development Solutions Network (SDSN) Germany	Bonn, Germany
2	Aljoša Slameršak	Institut de Ciència i Tecnologia Ambientals (ICTA-UAB)	Barcelona, Spain
3	Amanda Silvino	Brazilian Institute for Space Research (INPE)	São José dos Campos, Brazil
4	Arlind Xhelili	Collaborating Centre on Sustainable Consumption and Production (CSCP)	Wuppertal, Germany
5	Camila Chabar	ICLEI - Local Governments for Sustainability	São Paulo, Brazil
6	Charisse Johnson-Singh	Swedish Baha'i Community	Stockholm, Sweden
7	Charlotte Oja	Swedish Baha'i Community	Stockholm, Sweden
8	Christopher Wingens	German Development Institute (DIE)	Bonn, Germany
9	Clotilde Rossi di Schio	Sustainable Energy for All (SEforALL)	Vienna, Austria
10	David Carlin	UNEP-FI	Geneva, Switzerland
11	Dominic Kranholdt	Sustainable Development Solutions Network (SDSN) Germany	Bonn, Germany
12	Emi Mizuno	Sustainable Energy for All (SEforALL)	Vienna, Austria
13	Eric Kemp-Benedict	Stockholm Environment Institute (SEI-US)	Somerville, MA, USA
14	Felix Meyerhoff	German Council for Sustainable Development	Berlin, Germany
15	Fred Stolle	World Resources Institute (WRI)	Washington DC, USA
16	Ged Davis	World Energy Council	London, UK
17	Hannah Sinaie	Swedish Baha'i Community	Stockholm, Sweden
18	Hui Wen Chan	Citi (formerly)	New York City, USA
19	Ina-Maria Shikongo	Fridays for Future	Windhoek, Namibia
20	Ingeborg Niestroy	SDG Watch Europe	Brussels, Belgium
21	Jeremy Schlicken-rieder	Food and Agriculture Organization (FAO)	Rome, Italy
22	Jussi T. Eronen	BIOS Research Unit & Helsinki University	Helsinki, Finland
23	Kasper Kok	Wageningen University	Wageningen, The Netherlands
24	Lorenzo Giovanni	Food and Agriculture Organization (FAO)	Rome, Italy

	Bellù		
25	Manish Kumar Shrivastava	TERI School of Advanced Studies	New Delhi, India
26	Marc Fleurbaey	Princeton University	Princeton, NJ, USA
27	Mary Gasalla	University Sao Paulo/IEA	Sao Paulo, Brazil
28	Matteo Pedercini	Millennium Institute	Washington DC, USA
29	Naoko Ishii	Tokyo University	Tokyo, Japan
30	Natalia Alekseeva	Food and Agriculture Organization (FAO)	Rome, Italy
31	Nora Bergsmo	Swedish Baha'i Community	Stockholm, Sweden
32	Paavo Järvensivu	BIOS Research Unit	Helsinki, Finland
33	Pardis Pirzadeh	Swedish Baha'i Community	Stockholm, Sweden
34	Prabhat Upadhyaya	WWF South Africa	Cape Town, South Africa
35	Seth Monteith	ClimateWorks Foundation	San Francisco, USA
36	Vic van Vuuren	International Labour Organization (ILO)	Geneva, Switzerland
37	Ville Lähde	BIOS Research Unit	Helsinki, Finland
SHAPE Advisory Board			
38	Jale Tosun	University of Heidelberg	Heidelberg, Germany
39	Vaibhav Chaturvedi	Council on Energy, Environment and Water (CEEW)	New Delhi, India
40	Zoi Vrontisi	E3Modelling	Athens, Greece
Respondents who completed the SHAPE questionnaire but could/did not participate in the work-shop			
Name		Organisation	Place
Eva Söbbeke and Philipp Haenle		German Central Bank/Network for greening the financial system	Frankfurt am Main, Germany
Jason Hickel		University of London	London, UK
Jörg Mayer-Ries		German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU)	Berlin, Germany
Kaoru Inoue		Global Enabling Sustainability Initiative (GeSI)	Brussels, Belgium
Roberto Schaeffer		CENERGIA/COPPE/UFRJ	Rio de Janeiro, Brazil
Stéphane Hallegatte		World Bank	Washington DC, USA

Appendix D – Workshop: Miro Board transcriptions, links, curated chat history

This annex summarizes the exact transcriptions of the Miro online workboards that were used to self-document the discussions in the break-out sessions. It also contains the curated chat history from the last plenary session where the participants had been asked to write down their opinion about which narrative/scenario combinations should be further pursued.

D.1 The transcription tables

For Thematic Session 1-3, the tables reflect the three sections of the Miro workboards (on (i) new branches or dimensions, (ii) changes on the existing branches, (iii) overarching aspects applicable to other dimensions as well). For Thematic Session 4, the tables contain the results of the two Miro workboard sections: (i) discussion of compatibility of branches and (ii) the creative task.

Colour coding:
Different colouring of some aspects means that they were connected by a connection line in the original Miro workboards. The same colour means these specific aspects are all connected.
Underlaid with grey colour are aspects that were added to the Miro workboards by the facilitators prior to the sessions. These aspects were taken from the questionnaire responses and served as conversation starters in the break-out sessions.

Table D.1.1 – Dimension: Architecture of Global Governance (Thematic Session 1/Breakout group 1)

Miro Board (post-its)		
(a) Do you consider it necessary to create new branches or dimensions?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post here comments that are applicable to other dimensions as well**
Could it be relevant to branch between a scenario where a (group of) countries becomes the leader a scenario in which no world "leader" emerges? It is not clear whether having such a leader helps or not for achieving the goals.	I do not see how to reflect in this framework the weight that different countries have. We have some who seat in the driving seat and many others that are followers. Scenarios around governance should take these differences into account.	How is social justice/inequality is treated in the different scenarios?
What about regional 'leaders'?	In which branch do I insert a scenario where global Human-made phenomena increasingly occur (climate change, international trade and related scocial and environmental dumping. big-data gathering...) with no corresponding global governance?	Make sure that we are addressing what is needed, which are quite fundamental transformations
Regional 'leaders' could be authoritarian governments	How do we account for the fact that globally states vary in their character, they represent different sides of political economic interests?	Focus on aspects that cannot be modelled
Add a more nationalistic branch, based on bilateral interaction and power	The green branch should address the issue of historic carbon debt.	Are these branches going to be used as building blocks for scenario narratives?
What about violent conflict	It is unclear what is the difference in power "top" versus "bottom"	On social justice: We have a serious framing problem in climate governance. It is overtly technological and economic transition but we need to see these transitions as a vehicle of social justice instead of minimizing social injustice

		impacts
What does regional would mean?	We should layout global institutional developments for each scenario.	Why is governance being treated in two dimensions?
Not a clear distinction from Melting Pot 1; replace by regional economic blocks.	Are we sure that the UN model which is now a 70 year old system can ensure delivery of various goals for the next 30 years? *(this post-it was commented -> see comment section)*	
Local divergence	While developing scenarios for the future re governance, I believe that it is fruitful to detect 'weak' (or not so weak) signals in the current societies and build alternative scenarios by exacerbating some of these weak signals. THe weakening of National States vis-a vis big corporations is one of these signals woth exploring. THis is probably a branch per se	
	In terms of digitization, how would the global governance architecture address the systemic inequities that digitization amplifies? How will it safeguard the voice of least developed countries if some countries operate on 5G whereas others operate on 2G?some countries operate on 5G whereas others operate on 2G?	
	How do we measure the effectiveness of global governance?	
Miro Board comments:		
https://www.nature.com/articles/nclimate2774 *(on "Are we sure that the UN model which is now a 70 year old system can ensure delivery of various goals for the next 30 years?")*		

Table D.1.2 – Dimension: Society and Governance(Thematic Session 1/Breakout group 2)

Miro Board (post-its)		
(a) Do you consider it necessary to create new branches or dimensions?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post here comments that are applicable to other dimensions as well**
A more diverse notion of human agency would be valuable, for instance social movements	I think history has taught us that a market-driven world will not get us to sustainable development at all. There is not really a point of including it	How should we treat social justice in the scenarios. Note diversity of treatment across countries.
'civil society' is not clear to me: citizens can engage in many ways beyond civil society organizations: e.g. social movements, changing habits and lifestyles, starting local initiatives.	Whether it is market driven or society driven or government driven would impact whether capital displaces labour. In the society driven model, governments can step in to impede the process of labour displacement for votes and social welfare.	Adopt a broader concept of "Economy" - Economy here depicting neoliberalism?
It seems that the three dimensional approach (economy, state, society) is insufficient	"Economy-driven" is too broad. You have extremely small actors and giants (almost monopolists in their fields. All follow economic principles but some are price/market makers. Others just face the market.	It seems quite implausible to me that we have any chance on reaching the 1.5C without collaboration between all actors. The question is really: how.
What is the role of science, or what could be different roles?	Is there a more grounded empirical (not conceptual) framework?	Governments should not have as much power as they have today.
Not sure if it is a new dimension, but there is a huge potential of urban experimentation in sustainability transformations and how they learn from each other through networks.. How is this represented? *(this post-it was addtionally connected & labelled with another one*	Start with a power analysis	Scaling issues for networks: are they global or regional (how defined)

-> see comment section)		
Current dimensions/ scenarios are overly neo-liberal	Distinguish by ideas of the role of the state *(this post-it is no longer on the Miro Board)*	The real world is generally a mix of the branches. I guess the branches are not supposed to reflect the real world, but act as "guiding archetypes"
Is violent conflict sufficiently considered? (important driver of transformation)	Where do the indigenous rights fall into. Society maybe	How to take into account in the new post COVID scenario of how the international community will be governed
Need much more explicit focus on implementation and the gap between policy and implementation.	What are the strengths of this government-led world? Does it help to deal with conflict?	Civil society can play an important role at the global level, too (e.g., initiative by large cities to reduce emissions). Maybe this society-driven scenario is relevant for the architecture of global governance
Should we treat adaptation as a new dimension?	What about countries that don't fit? Developing economies are often a mix of all branches. *(this post-it was commented -> see comment section)*	Intent to have uniformity across the globe? *(connected to "Convergence among world regions? Technological leapfrogging for many countries?" in Future of Work)*
	Distinguish developing from middle income from high-income *(this post-it was commented -> see comment section)*	
Miro Board comments:		
De facto, national government are loosing power w.r.t. other private global entities which are really running the business *(on "governments should not have as much power as they have today.")*		
I'd caution against country categories based on income oder politically set ones like dev'ind or dev'ed countries. Differences within these groups are bigger than similarities. *(on: "Distinguish developing from middle income from high-income")* Reply to this comment: That is fine with me. But I mean that there distinct constraints and experiences for what are termed the "emerging" economies vis-a-vis both the historically industrialized countries/OECD and the "LDCs".		
I would say that applies to all countries *(on: What about countries that don't fit? Developing economies are often a mix of all branches.)* Reply: Indeed.		
Plehwe and Mirowski argue that neoliberal theory requires a strong state. They argue that is the "neo" that separates it from classical laissez-faire liberalism. More generally, Pryor offers this definition: "An economic system comprises the totality of institutions and organizations that specify property relations within a given society and that channel and influence the distribution of goods and services."		
Starting with the state, then, perhaps: State as regulator (or State as protector of the market?) State as leader State as partner		
Miro Board labelled connection lines:		
Possibly there is link between these two? *(Connection line between "Not sure if it is a new dimension, but there is a huge potential of urban experimentation in sustainability transformations and how they learn from each other through networks.. How is this represented?" and "Need much more explicit focus on implementation and the gap between policy and implementation.")*		

Table D.1.3 – Future of Work and implications for economic growth, structural changes and inequalities (Thematic session 1/Breakout group 3)

Miro Board (post-its)		
(a) Do you consider it necessary to create new branches or dimensions?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post here comments that are applicable to other dimensions as well**
Transition from labour to a capital economy	Macroeconomic assumptions (prosperity and social well-being) do not cover the post-growth/degrowth narrative, which is an important part of the debate, while behavioural/life-style assumptions fit well with the degrowth narrative. It would be important to address this inconsistency by also producing 0-growth or negative growth scenarios.	will there be enough jobs? is there a role for universal basic income? also, what is the role of retraining or even migration? are we thinking about growth in the right way? May not be about traditional GDP but maintaining quality of life through more sustainable forms of consumption
Disentangle digitalization, economic growth and inequality as separate dimensions	What about a different meaning of work?	Universal Basic Income

I do not find a scenario where digitalization is speeding up but there is no 'welfare state' to share the benefits and , in fact, the benefits concentrate in the hands of few entities. There is no skepticism so this is not the second branch and also the third does not match. Probably we need a fourth more 'dystopic" but probably closer to a possible future reality	How the welfare state is connected to environmental policy (e.g., recycling the carbon tax) should appear perhaps more clearly somewhere?	Hedonistic consumption of what? In a digitalized economy the consumption might just be on services instead of consumption of materials, food, resources in general.
	Is it possible to have slower digitization but still have high economic growth?	Will digitalization reduce material and energy throughtput? *(this post-it was additionally connected & labelled with another one -> see comment section)*
	Mature handling of digitalization is desirable future	How about implications of COVID-19: more working from home could be quite influential
	If thinking about post/de-growth scenarios, need to distinguish between industrialized an developing countries. also: currently income (affordability) is a key driver in many models, how to deal with this?	Consider the bargaining power of workers vis-a-vis employers (approved by other participant -> "heart emoji")
	Use the comparative of the branch/narrative with historical trends, so experts can judge the feasibility of the branches.	A key issue appearing in current research is the power of labor (unions) and labor regulation (gig economy)
		How do these relate to urbanization or a return to rural?
		Will the related GDP outputs from these supersede those from SSPs or other exogenous sources?
		How will a replacement of GDP be in the Homecoming scenario flow throughout models structure including sectors?
		Review assumptions about role of digitalization on economic growth and inequalities
		Is it possible for differentiation across geographies so that some take up homecoming while others take on another?
		Convergence among world regions? Technological leapfrogging for many countries? *(connected to "Intent to have uniformity across the globe?" in Society & Governance)*
		Digitalization and Big Data facilitating telecoupling and improved environmental awareness.
		These are good points. I think think the branches should illustrate out the wedges between the assumptions and historical trends. The wedges can be used to judge the feasibility of a given assumption.
Comments (from breakout group facilitator):		
-regulation/deregulation with regard to labour as an important driver next to technological innovation (4th industrial revolution)		
-for regulation/deregulation both civil society pressure and government legislation are important		
-shift from labour to capital and automation links to energy: lower energy pathways are off from historical trends -> how to approach this?		
-implications on the future of work are different in a government- or market driven world		
-in relation to "disentangling the welfare state": targeted social policy vs. a more universal approach		

-in relation to degrowth/post-growth: differentiate between developed and developing countries
Miro Board labelled connection lines:
More capital at a lower energy/material use? (Connection line between “Will digitalization reduce material and energy throughtput?” and “Transition from labour to a capital economy”)

Table D.1.4 – Sustainable Production & Consumption (Thematic session 2/Breakout group 1)

Miro Board (post-its)		
(a) Do you consider it necessary to create new branches or dimensions?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post here comments that are applicable to other dimensions as well**
Need for sustainability education. *(this post-it is no longer on the Miro Board)*	Enabling traditional communities, Indigenous people to maintain lifeways is at heart of "caring for world"	Can we start sections with a brief description of history. For example if scenarios cover the period to 2050 then describe period 1990-2020. (this post-it was commented -> see comment section)
Education to empower youth to be agents of change.	Merge traditional/indigenous methods with modern technology	We must ask what are the dimensions that perpetuate and globalize unsustainable production and consumption patterns and then move on to discus how to dilute them.
SCP linked to jobs, education	Branches complementary. Need of tight cooperation and consultation between the individual level, the community, institutions and governments. Universal participation essential.	As noted yesterday, these dimensions are all positivist, advocating certain perspectives which may not be consistent with each other. a high tech future may not be caring for the world (e.g. AI automation debates). I think it would be important to focus on the 'unsustainable dimensions' that need to be reduced
Use of materials to aid with climate mitigation? (Circular) bio-economy. Locking carbon into material stocks?	Conflict between these branches - technologies and aspirations are tightly linked and globalised at different dimensions to effective local sust solutions etc.	If there is only relative decoupling of production from resource use, how do we get to sustainable world. Given that at the moment we are living unsustainably?
Clear link with water and energy use. How do the narratives link there?	The 3 branches do not make up 3 distinct worlds	How does China fit into any of these pathways? Are these too Euro-centric?
Food might be left out here as it is covered elsewhere (but might have large potential)	These [branches] capture some important and divergent narratives	How to ethically integrate the global south in terms of economic growth and human rights
Consider "food systems" instead of "food"	The caring and sharing resemble each other in the short term but what is the differentiation in the long term	Need for a global economic system that is based on sustainability
How and where we produce food is an important factor	The caring scenario seems a local driven mindset which might imply local driven decisions as opposed to universal, how will you differ geographic choices?	Review underlying visions of the world
Decoupling relative but not absolute in all branches. Add one with absolute decoupling?	Different methods of production have to be taken into question	The need of a vision of sustainability across the levels of organisation individual, institution and government.
I completely agree with absolute decoupling	Eco reforestation	Important to consider if people have capabilities to change lifestyles (a question that Amartya Sen would ask)
Strong link with (changing) lifestyles and behaviour	Permaculture	
Maybe just highlight a bit more the role of consumption on the consumer level within the broader sustainable consumption and production concept. Then to also see how could one move/scale up from individual to community to broader societal change (inc. system change).	Cities are able to support production *(this post-it is no longer on the Miro Board)*	

One could also see how behavioural insights can support this aim.		
	Need to re-evaluate the nature of a human being to more than a consumer.	
	Reframe branches with regards to the decoupling debate *(this post-it was additionally connected & labelled with another one -> see comment section)*	
	Unclear whether "Caring for the World" assumes absolute decoupling *(-> this post-it was commented, see comment section)*	
	Cities/urbanization: Bulding construction, demand of cement/steel/wood, life-times/size of buildings	
	Transport and mobility. Construction of vehicles, requirement of precious metals for batteries, etc.	
	Link to urban/rural splits in how and where people live and how they transport goods	
	How do we protect water sources in potential mining areas for the marginalized communities	
	Clarity on use of alt/bio feedstocks with regard to production	
	Unclear how much is produced in the branches (how they differ in GDP)	
	decentralize production	
	Temporal dimension: some branching points are on a shorter time horizon than others	
	High tech scares me because I think of more extractions of materials	
	I agree with high-tech scare. We need to think about frugal ways in terms of technology as well as governance and lifestyle for sust. Prod. and Consumption.	
	What technologies or production methods are considered "high-tech." Does this imply all carbon zero methods? A hydrogen, bio, nuclear, CCS driven economy or purely RE?	
	Move away from fossil fuels products, Textiles/food	
Miro Board comments:		
Can we be more explicit about the dynamics of change--for example what are the events we need to have in place to achieve a 'sustainable world' by 2050? *(on "Unclear whether "Caring for the World" assumes absolute decoupling")*		
Agree. *(on "Can we start sections with a brief description of history. For example if scenarios cover the period to 2050 then describe period 1990-2020.")*		
Miro Board labelled connection lines:		
Yes. *(connection line between "Reframe branches with regards to the decoupling debate" and "Decoupling relative but not absolute in all branches. Add one with absolute decoupling?")*		

Table D.1.5 – Cities and Urban/Rural Relations (Thematic session 2/Breakout group 2)

Miro Board (post-its)		
(a) Do you consider it necessary to create new branches or dimensions?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post here comments that are applicable to other dimensions as well**

	Difference between B and C?	Relation to future of work: job migration to cities; jobs should be created in rural areas
	Citizen awareness is going to be critical for changing the behavior across countries in terms of preferring lower floor-space even though income is increasing.	Relation to the energy sector: cities save energy
	Traditional communities livelihoods	City food network is important to take into account, specially related to vulnerable groups
	How is well-being realised in the branches? Is this an issue in this dimension?	Sustainable food systems (aquatic resources? fisheries)
	Wellbeing and nature connection seems not that contrasting in B and C	Research has shown that a high urbanisation rate is dependent on the level of manufacturing as well as high income level. So a larger point is that urbanisation growth and rate should ideally be consistent with underlying assumptions related to economic structure.
	Urban and peri-urban forests and green spaces	
	Health and especially vulnerability to infectious diseases might also be a critical dimension	
	Missing consideration of urban -rural linkages (food, agriculture, food system)	
	Food loss and waste (food and water waste management)	
	Urban agriculture - potential food production capacity	
	Central importance of food provision (including urban production)	
	Issue of sprawling	
	Climate resilient cities need to be an important element, given that it is likely that climate change will cross the thresholds	
	Address coastal cities	
	Urban world A:	
	Urban world A potentially less prepared for influx of people from rural areas	
	Urban world A potentially less prepared for natural disasters	
	How would it be the realtion with nature and well-being of people in branch 1 (A)?	
	Urban world B:	
	Coudn't things like co-housing etc. also happen in the other worlds? And would-net't it be good or even necessary in each case? it a good differentation aspect?	
Miro Board comments:		
Need to include some city examples that best characterise the three scenarios (aproved by others -> "thumbs up")		

Table D.1.6 – Mobility (Thematic session 2/Breakout group 3)

Miro Board (post-its)		
(a) Do you consider it necessary to create new branches or break dimension?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post here comments that are applicable to other dimensions as well**
What about less positive outlooks?	SciFi: less credible for short-term scenarios & not relevant for 2030 SDGs	Strong correlation with future of work

I thought we are looking for positive futures, this is why...	Differentiation between megacities and shrinking cities	Strong correlation with urbanisation
What about maritime mobility?	Low density areas?	Financing of sustainable transport/mobility through which financial instruments, relation to governance
Need to be comprehensive on mobility, include HGVs, rail, aviation, marine,....	In some countries like Indonesia or the Philippines, you see rapid urbanization in few cities or conglomerate of cities, compared to shrinking rural areas	
	Where do the raw materials come from?	
	Technological contraints, also batteries or lack of resources	
	Digitalization, smart technologies as drivers of changes in transportation?	
	Disruptive technologies leading for example to less need for commuting	
	Flexibility in work	
	The big elephant in the room: COVID 19, the effects of changes in labor practices such as home office to transportatiion?	
	Will improved transport system leads to more emissions, e.g., due to cheaper travel costs for tourism?	
	Also increase of income in emerging countries can lead to more leisure travels	
	How is tourism addressed?	
	Does mobility only encompass passenger transportation, how about goods and services?	
	Freight not considered	
	Consideration of fleet size missing	
	Sharing options?	
	Local creative innovation in mobility	
	Transportation systems are often results of social engineering, how can inequality/inequities be addressed?	
	Mobility is also relevant to social cohesion	
Comments (from BOG facilitator):		
-relation with air quality		

Table D.1.7 – Health (Thematic session 2/Breakout group 4)

Miro Board (post-its)		
(a) Do you consider it is necessary to create new branches or break dimension?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post here comments that are applicable to other dimensions as well**
Mental health is fundamental to all other aspects of health and all other dimensions. WHO definition: ""Mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community." - (This definition also has assumptions about human nature and the purpose of life.)	Recognition of holistic methods	Consideration of justice, equaity of access, and universal participation (interpreted broadly) in all dimensions.
Check the WHO definition for mental health.	Certain geographies might pursue the holistic approach additionally to the others	Consider relationships/interaction between three protagonists: the individual, communities (narrowly or broadly defined), and institutions as well as their respective roles.

How to deal with demographic change and the exploding health cost.	Holistic approach: the way forward compared to the other two	Consider the interplay between individuals, institution and community All are involed in all any question
missing importance of food, food production, nutrition for health	Covid as an example.	Be explicit about the underlying assumptions of human nature in each scenario. (eg. some prominent economic and psychological theories assume humans are inherently self-interested, which has implications for how we've structured economy).
	In universal life situation such as Death of an individual and care of the elderly, infants and funcially impared our assumputions of human nature define what is done. The Health care systems have a high focus on techology and doing where as individuals often which to be heard and their nobility respected.	Food production? Diets?
	As a Clinical doctor: The outcome of the doctors effort is realy very dependent on the motivation of the individual patient to accept the changes and efforts needed to recreate helath in the indivudial. The strongest source of motivation in an individual is a strong sence of oneself being capable and noble. (see definition of Mental Health)	Consider nexus with energy (access and use), land use, population density
	Health is mostly created by individuals, in their own Environment. Sometimes the indiviuals need assistance from Health Care Professionals	Mental health includes assumptions on the nature of human nature which has interlinkages to other dimensions
		Changes in health/demography/lifespans will have major impacts on economies, sustainability, and climate. How are the changing dynamics of society (brought about by health advances in developing nations) integrated into models?
		Health is a system. Healthcare is more focused on acute interventions, but good health depends on infrastructure and sanitation throughout society. How are those things protected and enhanced in a changing world?
		How do changing healthcare costs and se of the healthcare system impact ustainability in a society?

Table D.1.8 – Land (Thematic session 3/Breakout group 1)

Miro Board (post-its)		
(a) Do you consider it necessary to create new branches or dimensions?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post here comments that are applicable to other dimensions as well**
This only seems to focus on agricultural human-use of land but what of other uses and non-anthropogenic areas? Timber? Parks/protected areas?	Chief Seattle	Food systems link: define the supply chains for these... Global, Local, Mixed? Linked to mobility scenario aspects and energy use
Possibly expand beyond agricultural land use	Northern view of land management	Lots of links to energy systems and use of bioenergy
Transfer “sparing”, “caring”, “sharing” to oceans too	What view on the cultural role of food production and land-based livelihoods do you find in Africa, South and Southeast Asia, etc.?	Timber use in construction and how it compares across scenarios with regard to materials switching for cement and steel
Issues of protected areas and economic	All likely need to define convergence	Food systems approach

interests	theory on land intensification. All to the same productivity levels or something differentiated?	
Add agroforestry	Land, urban and poverty	Convergences across regions, different starting points (e.g., productivity technologies, but also institutional problems)
No need for additional branches just clarity on interconnections	Land ownership hetereneity needs to be taken into consideration	
	Bioeconomy	
	As a matter of fact, the different branches could be more or less effectibve in achieving sustainable land use	
	Well known categories that are fine	
Additional from the chat:		
-Also about water: foreign companies are poisoning our water sources in the name of economic development which only benefits the rich countries again. -Would agroforestry be under the "sharing" scenario (but it is also quite community based mostly, - or?) -The 'sharing' scenario emphasises strong governance. However - the two others also require rather strong governance -In the scenarios where behaviour change is central: Is it assumed that this comes about 'by itself', or would it also include that you need/have regulation?		

Table D.1.9 – Nature (Thematic session 3/Breakout group 2)

Miro Board (post-its)		
(a) Do you consider it necessary to create new branches or dimensions?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post here comments that are applicable to other dimensions as well**
Oceans and coastal dimensions	Policy reform for nature is essential	Fundamental basis of nature for our existence.
Coastal dimensions lacking - but vital for both climate mitigation and adaptioan.	Sustainable use of wild species	Nature needs to be put into account at all times
Safeguarding achievements.	Zoonotic pandemics	Nature is not parallel - it is fundamental to the dimensions
Efficient implementation of policies.	Trade-offs in demand for finite land - food, fuels, etc, and also vulnerability of plans to different climate scenarios	Nature issues dimention should be integrated at all others dimentions in the sense that we are nature and there is no separation
Policy reform issues.	ENCORE' tool - how dependent are people on nature's inputs?	Climate change mitigation and adaptation needs
Policy reforms?	More details regarding this dimension and how it speaks to the other dimensions	Oceans and coastal dimensions seem to be missing in the narratives
Restoration and recovery of population.	Could be included in the land dimension	"Building back better" - link to market value, but also social structures, etc.
Sustainable use of wild species.	Coexistence:	How resilient are policies and the gains achieved under existing policy?
Climate change mitigation and adaptation needs	Deforestation zero	
Nature-based solutions	Nature at risk here -> Economy always wins from ecology	
Symbiosis branch - economy and society within nature?	Ecological integrity:	
	Needs to address the question of population size	
	The local production and consumption. does this not disregard the need to produce where it is best suited. e.g. tomatoes in italy not in Holland ?	
	What does restoration mean in these narratives?*	
	Cultural and non-monetary benefits	
	Agroforestry , multiple bioenergy sources, and their place in the mix	

	** = not entirely clear whether author of this sticky-note referred to "Energy Communities" or all branches in general*	
Comments (from BOG facilitator):		
on "Sustainable use of wild species": Clarify this as a way to distinguish between the branches.		

Table D.1.10 – Energy (Thematic session 3/Breakout group 3)

Miro Board (post-its)		
(a) Do you consider it necessary to create new branches or break dimension?	**(b) Would you change something about the existing branches? (are their differences clear?)**	**Post-its related to other/all dimensions**
There are many possibilities related to supply, demand, policy, speed of change, etc. Difficult to assess if these three are the most essential ones	Market supply and energy communities should not be mutually exclusive	I understand that the end point of all the three branches aim at achieving sustainable energy use (zero net GHGs?). This is probably the idea of all the branches in the shape exercise. But where trade offs are addressed?
How do we ensure that carbon pricing reflects true social cost of carbon and not just a token amount?	Branches are very focused on electricity, should be broader	Somebody already raised the issue of political economy of energy. Transition out of oil has implications for transnational companies, but not only. Nigeria, for instance, without oil royalties may blow up!
See Gruebler's LED scenario, which assumes huge energy efficiency improvements, but very little activity reduction. Reduction of activity can be another way to construct the scenarios.	Main question really relates to centralisation/ decentralisation	How do branches apply to different regions?
	I complete agree that decentralisation is the crucial aspect	Collective rights of indigenous communities affected by energy projects such as wind energy in Oaxaca in Mexico
	A decentralised energy system evrsus a centralised energy system could be interesting and have very different implications.	Eventually, you will have to assess the different amount of investment needed to to go along one branch or the other
	Make assumptions on demand side more explicit	Governance
	If you are talking about energy beyond power sector, you need to think demand sides more too, Industry and transport energy suage . I cannot imagine these three dimentsion can cover transport and industry which need more diverse energy carriers beyond electricity. But these three dimentsion only covers power. for exmaple, maybe need to tell more about power-to-X as well.?	Would really like to see greater emphasis on the challenges arising from transition. How can a developing country minimize trade-offs while shifting away from fossils? *(this post-it was additionally connected & labelled with another one -> see comment section)*
	Political economy of energy transitions is critical. ad needs to be better understood.	Something missing in your discussion: new technologies (especially small-scale decentralized technologies) make rich people less dependent on poor people, and therefore make it possible for societies to become less inclusive.
	Geopolitics of moving away from oil	Geopolitics sending wrong signals e.g. in energy prices
	What about nuclear? (scenarios should reflect existing controversies)	Energy justice, incl. intragenerational justice
	Should gas play any role? If so, what role?	Take water prerequites for energy options into account!
	Do you consider the coexistance of these three dimensions simultanously in different regions or different time frames in	**Additional from the chat:**

	the same regions?	
	Different governance systems can end up / choose similar technolgy options. all dimensions need flexibility and renewables. it is a matter of technology mix.	Land rights and mining is very closely inter-related
	Speed of transition matters *(this post-it was connected & labelled with another one -> see comment section)*	
	How will branches engage with limits to fast energy transitions like carbon debt/energy debt, rare mineral limits, EROI cliff...	
	I have hard time to separate three dimentsion. They can co exist in different regions or same regions/ countries. .	
	Unclear if some technologies are limited to only certain branches (e.g., BECCS/DACCS)	
	Each of the three scenarios seem partial in nature.	
	Market-Supply:	
	"Market Supply" emphasizes the role of energy supply technologies that may only become available after 2030. This is out of the SDG time-perspective and incompatible with the precautionary principle. I suggest that you clarify the role of negative emissions. For example... by saying that market supply assumes a temporary overshoot of temperature goals, which will be reversed with large-scale carbon removal after 2050...	
	Add off-shore clean energy	
	Renewable Electrification:	
	Electrification of heavy industries challenges available sources of renewable energy	
	Energy Communities:	
	Behavioural change via prices	
	We should really look at alternatives of how one can save energy	
	Over emphasis on electrification. Needs to consider other energy carriers.*	
	Need to include regulation, carbon tax or pricing in the scenarios. These incentives for energy transition are needed for the coming decade.*	
	** = not entirely clear whether author of this sticky-note referred to "Energy Communities" or all branches in general*	
Miro Board labelled connection lines:		
Factors other than the speed of transition *(connecting "speed of transition" and "Would really like to see greater emphasis on the challenges arising from transition. How can a developing country minimize trade-offs while shifting away from fossils?"/"Governance")*		

Table D.1.11 – Water (Thematic session 3/Breakout group 4**)

**** In this thematic session no stakeholders participated and the aspects highlighted here are exclusively from consortium members**

Miro Board (post-its)		
(a) Do you consider it is necessary to	**(b) Would you change something about**	**Post here comments that are applicable**

create new branches or break dimension?	the existing branches? (are their differences clear?)	to other dimensions as well
Three branches not yet systematically spelled out / incomplete	Low Tech:	Link to sustainable production & consumption: (high-tech) agriculture
	Very unlikely in major developing countries where most people live in large urbanized areas	Water needs to be considered as constraint in modelling! (see Thirsty energy report)
	Low tech has to be seen vis-a-vis dominant economic paradigms (if it should be more than a "niche" phononenon)	Water is a prerequisite for many of the other dimensions! Take it into account.
	Water Innovation:	Think across the three branches and the dimensions in an integrated manner
	Heavily depends on progress in other dimensions	
	Is market approach likely to work and to be sustainable? We hardly have any empirical evidence that it works	
	Regional Water Partnerships:	
	Sytematically consider water implications for Major (Technology) developments (e.g. H2)	
	Water is central for many key issues, such as "negative emissions" (BECCS) & green hydrogen	
	Regional Approach - don't Forget tele-Connections!	

Table D.1.12 – SCENARIO 1: Market-driven innovation (Thematic session 4/Breakout group 1)

Miro Board (post-its)	
STEP 1: Discuss the compatibility of the branches in this scenario combination	**STEP 2: Creative task - create a vision of 2050 based on the branches in this scenario combination**
I think that internally this is the most consistent scenario. Main assumptions: a) unprecedented technological development and record-speed adoption of technologies worldwide and in all social practices; b) Ubiquitous presence of market economy: global marketization of nature and effective pricing of externalities; textbook neoclassical framing of environmental economics.	#bail-out-cycle along the lines of business cycles a market-driven world recurrently requires bail-out packages. This scenario is possible if we institutionalize bail-out packages to deal with the 'sustainability bubbles' created by market forces (similar to sub-prime lending crisis initially providing housing to ppl)
Absence of human behaviour/ lifestyle assumptions?	#TextbookEconomics
What is possible in terms of change in the coming decade?	Resurgence of the techno-expert! Science in high demand - but this time round with learning from the 'Two Cultures' failures of the 20th century.
Real change needs to take place on all fronts PEOPLE need to express through various channels what they want to see achieved – SDGs by 2030, net-zero emissions by 2050 etc Lateral learning is happening, but the world needs to do better than that because of the scale of required change.	#ExpectingTheWorst #HopingForTheBest
Market driven = demand-driven, so there needs to be enough demand to make goods and services available.	#PhilanthropyFor ThePlanet #WealthForTheWin
Poor people don't have the power to shape market-places, drive demand. So this does mode not actually work for nature (biodiversity / ecosystem services)	"Successful SDG scenarios in a world where failure is likely"
Will health services be made accessible to everyone or is the focus rather on healthy environment, lifestyles, livelihoods?	Climate Change is not a Problem but an an Opportunity.
Moving to megacities could results in challenges in reaching SDGs - adaptations	#NoLimitsScenario
A world seen through a globalised lens doesn't see the behaviour of "little" people and local communities...	BUT ALL THE TRADE-OFFS!!
Cosmopolitanism - people feel that they are global citizens, nations seek multilateral agreement on issues.	#RecycledIs TheNewNew
Thinking about the links between these dimensions - pollution, cities, health, wellbeing....	Effective outcomes are not always fair outcomes!

More awareness needed in terms of Production consumption	Strong regulations on market operations could bring in synergies. If societies demand it, markets become adjunct to society
	More realistically, I think this scenario would lead to a situation where some of the SDGs will be achieved e.g. on energy, infrastructure and others would not especially the people centric SDGs. As a result, in 2050 the conception of SDG itself would get revisited and revised. What worries most is the failure on peace...and whether the threat of an explosive conflict would force market to value 'needs' instead of 'demands (this post-it was commented -> see comment section)
	Interview with Samantha Patel, co-leader of xxx Mega city Q. What surprises you most about change in the last 30 years. A. Perhaps most has been the extraordinary change in our behaviour and the acceptance and integration of new technologies that manage a significant part of welfare needs. Following the deep recession of the twenties we found new policies that framed and shaped the market. This led to universal support with a guaranteed minimum digital credit and the right of every person to health care, education. The fight to achieve this was monumental. The new, cheaper technological options helped but most of all was building cross-community support for change. Most surprising was public acceptance of a fundamental revamp of the tax system with the digital and carbon taxes central to our new budget. Not everything was perfect. The greening of the city with vertical farms and new parks moved more slowly than I would have wished, but we did change planning rules and have done a great job protecting and expanding our “green ring”. We are well on track to meet all energy needs through electricity. Hyperlinks are emerging, connecting us to the other “megas”. Q. Could you illustrate by an example? What new technologies have managed what welfare needs? A. Nutrition capsules is a good example. It has released so much of land to meet the requirement for housing to the 15 bn plus population. Mass production of capsules through AI has brought down the cost so much that we can have a universal public distribution system. (Q. that sounds so fictitious) Yes, it does. But fiction is stranger than truth. Sometimes. Q: How does the city itself differ from 2020? A. We have learned so much from other megacities about how to protect and restore nature. You’ll see we have neo-wilded our building walls and roofs (and some of the plants are edible too, not just oil-rich). The global heating means we have to value and manage water in entirely new ways - the good old fashioned buying-offsets approach just didn’t work so well for water. We faced being sued by a couple of our neighbour megacities for interrupting their moisture recycling regimes, so now all our land and water uses are monitored locally with citizen-apps and also from the Tesla Space Eye.
Comments (by BOG facilitator):	
I agree - and worse, the idea that "peace" itself gets redefined, rather as some people see "security" extending its meaning and scope *(on: "More realistically, I think this scenario would lead to a situation where some of the SDGs will be achieved e.g. on energy, infrastructure and others would not especially the people centric SDGs. As a result, in 2050 the conception of SDG itself would get revisited and revised. What worries most is the failure on peace...and whether the threat of an explosive conflict would force market to value 'needs' instead of 'demands")*	

Table D.1.13 – SCENARIO 2: Resilient Communities (Thematic session 4/Breakout group 2)

Miro Board (post-its)	
STEP 1: Discuss the compatibility of the branches in this scenario combination	**STEP 2: Creative task - create a vision of 2050 based on the branches in this scenario combination**
Are there two distinct scenarios here: a national top down scenario and a scenario where the focus of change is the community, city and sub-regions?	#OneWithNature

Deceleration relies in government to control digitalization, and society-driven is a mix of all sectors	#Imagine
Deceleration does not really address jobs, job creation	#resilientcitiesaresmartcities
Self governance	Dear EU, I imagine Africa as a carbon neutral that sufficiently produces its own food, fibre building construction and textiles. Imagine a world where poverty is non-existent because of equitable distributionl of resources on a global scale, better protection of indigenous communities and of their knowledge and practices, and less plunder of resources. I Imagine a paradise like Wakanda in 2050
Caring: strong behavioural change, shift to plant-based and unprocessed diets, low waste. Focus on local & organic agriculture	
High growth in public infrastructure, public services and social welfare programmes. Focus on human well-being	
Low GDP growth, what does it mean to developing countries?	
Rural-urban rural disparity, education is key	
BUI	
Urban agruiculture	
Technology combining indigenoues knowledge	
Resilience means self-autonomy, less need to travel	
Digitalization needed for moving back to rural and teleworking	
No mass production	
Caring for the World: strong social cohesion. Resilient communities provide cozy social environments and a high degree of self-sufficiency. People value personal interaction and social participation over comfort and status symbols. Goods and services are shared among local communities.	

Table D.1.14 – SCENARIO 3: Managing the Global Commons (Thematic session 4/Breakout group 3)

Miro Board (post-its)	
STEP 1: Discuss the compatibility of the branches in this scenario combination	**STEP 2: Creative task - create a vision of 2050 based on the branches in this scenario combination**
How can consumption patterns in this scenario "resemble those of the Caring scenario"? That does not seem plausible.	Green dystopia
Green Mobility implies some behavioural change. Rest of the dimensions are more top-down (?)	People of the world, Unite!
Have to ensure that "strong governments" and "institutions" have democratic legitimacy / checks-and-balances *(connection line to "How does power work here? Who holds it, how expressed?)*	January 2027: Elon Musk Elected Secretary General of the UN
How does power "work" here? Who holds it, how expressed?	My friend, we have made great strides in the past decades. Technologies we only dreamed of are now ubiquitous. We empower participation at all scales. My tech stock valuations are through the roof!
"Homecoming" has too much packed into it. It tends to drive the interpretation of the rest of the scenario. Making the description a bit more frugal and/or splitting some stuff elsewhere would help?	Feeling a bit low today. I was reading "Small is Beautiful" and realized there were people who think like me in the past. All this talk of "common values" is nice, and we have much less conflict, but I feel left out.
Odd mix of technocracy and distributed governance	Humans=Managers of Earth
The scenario really does not tell us about the global-local relations, thus the readers have to assume it?	Sure, it is easy to complain if you weren't living in a slum in the 20's. I have heathcare now, and I can see forests.
What does "strong convergence between regions" really mean here? (Considering it is also part of the grey alternative, for example.)	Hello dad. It is as you said, windmills and reservation fences everywhere. There is not much left of the village, just a souvenir shop and the park rangers' services. I hope you are okay in the big city: I know it is hard to learn all the new apps they keep throwing at you, but really, moving here is not an option. Nobody wants to eat kale and fava beans anymore, and navigating the bureaucracy is too much hassle in your old age.
Too much power for certain individuals is a problem.	Windmills everywhere! *(illustrated by a drawing)*
Most of the narrative elements reinforce one another. I tried to focus on the inconsistencies. I recognize the hard thinking	In Pluralism We Stand

you have done!	
I am concerned with assumption of "universal human values". I think the global commons has to recognize incommensurable but equally valid values. I think allowing for this is possible (see Gray, Two Faces of Liberalism on incommensurable values) *(connection line to "Manage difference - not convergence")*	
Manage difference - not convergence	
So if the aim is to make global storylines, texts like "automation drives growth in developed world" seem strange. Or rather, superficial to the tas? (connection line to "This is also problematic -- how is the value shared? Right now becoming highly concentrated.")	
This is also problematic -- how is the value shared? Right now becoming highly concentrated.	
Bright high tech future seems to fit better	
We feature a mix of values https://en.wikipedia.org/wiki/Inglehart%E2%80%93Welzel_cultural_map_of_the_world (see map)	
Miro Board comments:	
Needs some rewriting how is global convergence happening. Is global convergence possible or even desirable? Probably not.	
Is this on the wrong board? It wasn't added by the BOG. (*on "Too much power for certain individuals is a problem.")*	

Table D.1.15 – SCENARIO 4: Human Development (Thematic session 4/Breakout group 4)

Miro Board (post-its)	
STEP 1: Discuss the compatibility of the branches in this scenario combination	**STEP 2: Creative task - create a vision of 2050 based on the branches in this scenario combination**
Need clarity on why in the first place are we together? And then how come we share the same values? This assumption need to be problematized. *(Connection line to post-it "#Conclusive research - NoHabitablePlanetB!!!" labeled "Only reason this is achievable")*	#Conclusive research - NoHabitablePlanetB!!! *(connection line to #ONE-WORLD-OR-NONE)*
On the scenario as a whole: Development models are diverse and mean different things to different societies (values, world conceptions, social goals)	#ONE-WORLD-OR-NONE *(connection line to #GreenUtopia)*
Integration and recognition of indigenous rights and lands	#GreenUtopia *(connection line to #NoGrowth-Is-TheReal Growth)*
How do the strong global organizations actually deliver on ground?	#NoGrowth-Is-TheRealGrowth
Decentralized production on a global level	18th March 2050: One World Headquarters. Solution to Covid-49 found and delivered within 4 months of the first case.
Behavioral change through accepting reproducing sustainable local lifestyles that do not reflect on economic growth indicators but represent human development for sharing the commons and maintaining ecological integrity	22nd Oct 2050: One World Headquarters, The agreement to have one world for all successfully implemented, all key goals achieved!
Suggestion: In the Dimension Nature, replace Ecological integrity with Coexistence *(connection line to "Sharing the global commons may be contradictory with ecological integrity")*	
Sharing the global commons may be contradictory with ecological integrity	

Table D.1.16 – SCENARIO 5: Local Solutions (Thematic session 4/Breakout group 5)

Miro Board (post-its)	
STEP 1: Discuss the compatibility of the branches in this scenario combination	**STEP 2: Creative task - create a vision of 2050 based on the branches in this scenario combination**
Rural-urban could also be an interesting option for the cities dimension	Headline: Highspeed rail finally gets sufficient funding in NE and West Coast
Dimension "Sustainable Production and consumption" is not consistent with land and energy	Headline: WHO disbanded as more countries pull funding in favor of health local systems
Concern that "high-tech" solutions should still exist here without focus on market driven solutions... maybe highly managed	WHO disbanded as funding dries up in favor of focus on local health systems

production using technological solutions	
If food systems branch was developed it could focus on local level with smaller supply chains with government input/control	Headline: UN Headquarters sold to urban vertical farming conglomerate
Water: low-tech fitting? SustC&P: Caring fitting?	Headline: Architecture competitions focusing on local built local sourced wooden skyscrapers
Health: maybe better local health programs instead of "holistic"?	Headline: Oceans declared cleaned as recycling at local levels reach highest levels in history
New richness of forms and materials: Architecture is part of central arts	Headline: British Columbian company wins West Coast annual Cider competition
High-tech solutions possible together with low-growth pathways?	Lower levels of non-communicable diseases due to higher physical activity and diets containing less processed food,
This scenario has the potential to be geographically very diverse and heterogeneous.	Taking responsibility for local problems,in an institutionalized manner
Local approaches towards circular economy may require high-tech solutions, not with the aim to maximize output, but to decrease inputs	Higher biodiversity on managed land: local varieties, and diverse agricultural production systems. combining new technologies with traditional knowledge
	Global pacts fail as more countries drop out of Paris Agreement and instead focus on local/regional/bilateral planning agreements
	Grocery stores packed with local food and only specialized stores have products from elsewhere. Cooking shows on how to cook for you regions' seasons.
	Homes and residential buildings constructed with local materials and styles... higher level of divergence of how the built environment looks across regions
	Train travel within countries as airfare prices are cost prohibitive

Table D.1.17 – SCENARIO 6: Green & Social Market Economy (Thematic session 4/Breakout group 6)

Miro Board (post-its)	
STEP 1: Discuss the compatibility of the branches in this scenario combination	**STEP 2: Creative task - create a vision of 2050 based on the branches in this scenario combination**
Tension between society-driven and high-tech future (social capital)	This could be a very pleasant future to live in with market actors taking responsibility for "green" and for society
What is the role of institutions in a heavily tech-driven society? (mentioned in the title)-> privacy etc.	It takes the best of multiple worlds with strong corporate responsibility, social cohesion, and proactive environmental management
Just world -> universal basic income: is it just? how would it work?	Possible tensions with natural capital pressures (water, nature)
Overall very interesting (non-standard) scenario, no obvious inconsistencies	People life with in the luxury of high-tech developments that make life easier, without giving up income growth
Initially surprising that it is society driven	
Ideally, start from market for each dimension and see how it needs to twisted to be green & social	
Could be "energy communities" instead of "renewable electrification" (better reflecting the social aspect)	
Switch water to regional partnership? also health & nature?	
Suggestion: change last 4 dimensions to "renewable electr.", 3x green (like in Human Development) -> very different world from current market economy	
Possible to switch to urban-rural in the cities branch?	

D.2 Links to originals and synthesis tables

We also provide the links to the original Miro board and synthesis spreadsheets, for reference:

Links to the MIRO boards:	
Thematic Session 1:	https://miro.com/app/board/o9J_lIWPih0=/
Thematic Session 2:	https://miro.com/app/board/o9J_lIWfaGY=/
Thematic Session 3:	https://miro.com/app/board/o9J_lIWEUQY=/
Thematic Session 4:	https://miro.com/app/board/o9J_lIVh2ZI=/
Plenary 1 (training):	https://miro.com/app/board/o9J_lIWaPFQ=/
Links to synthesis table (organized post-its transcriptions):	
Home spreadsheet:	https://docs.google.com/spreadsheets/d/1-nvDWwlfq9iBGdrQNAY1pt1y2-MTwLmi87ybB1jgN9g/edit#gid=1256714151
Thematic session 1:	https://docs.google.com/spreadsheets/d/1-nvDWwlfq9iBGdrQNAY1pt1y2-MTwLmi87ybB1jgN9g/edit#gid=1495310650
Thematic session 2:	https://docs.google.com/spreadsheets/d/1-nvDWwlfq9iBGdrQNAY1pt1y2-MTwLmi87ybB1jgN9g/edit#gid=687564890
Thematic session 3:	https://docs.google.com/spreadsheets/d/1-nvDWwlfq9iBGdrQNAY1pt1y2-MTwLmi87ybB1jgN9g/edit#gid=910971353
Thematic session 4:	https://docs.google.com/spreadsheets/d/1-nvDWwlfq9iBGdrQNAY1pt1y2-MTwLmi87ybB1jgN9g/edit#gid=456129714

D.3 Curated chat on the model implementation of the scenario combination

Participant A: Green and social market economy. Interesting, unusual, but also a realistic given today's trends.
Participant B: Green and social market- This scenario has elements of markets, society and sustainability that no other scenario has. [...]
Participant C: Green & social market economy
Participant C: Reason same as above
Participant D: Local solutions: as it may help get more clarity on how efforts across different levels can be aligned or may not align. However, with addition of some market elements
Participant E: ”Local Solutions”, since it combines national coordination and local action, making context-tailored solutions plausible.
Participant F: 1-3 seem standard well thought out and should be quantified and as to the 4-6 I would focus on Local and Green/Social Market as the most interesting.
Participant A: My second choice is also "local solutions", although this might be somewhat close to the "old" IPCC SRES B2
Participant G: Local green and social market
Participant G: both
Participant H: Resilient communities because the survival of our people is dependant on it. If the plundering continues I am afraid that we might end up being classified as a troubled region and all because of

the plunder and corruption. Our 50% of our population is not educated, but we have skilled people and why not develop that skill.

Participant I: Green & social market economy (and market driven innovation)

Participant H: S1-Market driven in my view compliments my vision if somehow one could include the skilled “uneducated” people as they could also contribute to the global economy if given a fair chance

Participant J: I would also opt for scenario 5 'local solutions' - besides 1, 2 and 3

Summary:

- Green and social market economy (6 “votes”)
- Local solutions (possibly with addition of some market elements) (6 “votes”)
- The basic combinations: Market-driven innovation (4 “votes”); Resilient communities (3 “votes”); Managing the global commons (2 “votes”)

Appendix E - Links to presentations of the workshop

Plenary 1:	https://docs.google.com/presentation/d/1KER8jnO9Vz1K8xQMoGA9PElaDm659UGvSdPZMPcoOc/edit#slide=id.g9b8d02444f_0_
Thematic Session 1:	https://docs.google.com/presentation/d/1bx4Q2W0TOnAmvJfPeUF5p6CKKGfNOVLuiMzKPu1SE/edit#slide=id.p1
Thematic Session 2:	https://docs.google.com/presentation/d/15AY19R1prKGkVE3bZKmHf_bYOKgdakpGtWUSvlMY/edit#slide=id.g9e74bd8acf_2_133
Thematic Session 3:	https://docs.google.com/presentation/d/15IQlo37dWyGlSQrJacqQcGp6P56gL6IJwKWMJkYmk/edit#slide=id.g9e76cfbcec_0_88
Thematic Session 4 & plenary 2:	https://docs.google.com/presentation/d/1JBO1zKDs-HVj2HMaSQuSDS-UxJgufNjaWn-6ScIKgrE/edit#slide=id.ga485396afe_2_73

Appendix F - Literature suggested by stakeholders

Alessandro et al., (2020). EUROGREEN

Carlsen, H., Eriksson, E. A., Dreborg, K. H., Johansson, B. and Bodin, Ö. (2016). Systematic exploration of scenario spaces. Foresight, 18(1). 59–75. DOI: 10.1108/FS-02-2015-0011

Matthews, H. Quantifying historical carbon and climate debts among nations. *Nature Clim Change* 6, 60–64 (2016). https://www.nature.com/articles/nclimate2774

Rajan, R (2019). The Third Pillar: How Markets and the State Leave the Community Behind

Ritchey, T. (2011). Modeling alternative futures with general morphological analysis. World Futures Review, 3(1). 83–94. DOI: 10.1177/194675671100300105

Rozenberg, J. and Fay, M. (2019). Beyond the Gap: How Countries Can Afford the Infrastructure They Need while Protecting the Planet. Sustainable Infrastructure. Washington, DC: World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/31291 *(last chapter)*

Schweizer, V. J. and Kriegler, E. (2012). Improving environmental change research with systematic techniques for qualitative scenarios. Environmental Research Letters, 7(4). 044011. DOI: 10.1088/1748-9326/7/4/044011

Weimer-Jehle, W. (2006). Cross-Impact Balances: A system-theoretical approach to cross-impact analysis. Technological Forecasting and Social Change, 73. 334–61.

WWF (2020). Enhancing NDCs through Nature-Based Solutions. https://www.worldwildlife.org/publications/enhancing-ndcs-through-nature-based-solutions

WWF (2020). Nature-Based Solutions for climate change. https://wwfeu.awsassets.panda.org/downloads/wwf_nature_based_solutions_for_climate_change__july_2020_final.pdf