



THE WORLD IN 2050
ANNUAL REPORT
2017

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I. Introduction and Background

On 25 September 2015, the United Nations General Assembly unanimously adopted a resolution on *Transforming our world: the 2030 Agenda for Sustainable Development*, based on 17 Sustainable Development Goals (SDGs) with 169 associated targets. Together, these SDGs set the international agenda on the social, economic and environmental dimensions for sustainable development. In September 2014, preceding the adoption of the SDGs, the International Institute for Applied Systems Analysis (IIASA), the Stockholm Resilience Centre (SRC) and the Sustainable Development Solutions Network (SDSN) announced a new global scientific initiative – *The World in 2050* (TWI2050) – to provide fact-based pathways to assist in the implementation and achievement of all 17 SDGs.

Today, no science-based pathways exist for successfully achieving all SDGs simultaneously. The global transformations necessary to achieve the SDGs urgently need a robust scientific foundation and fact-based way forward. TWI2050 is a global multi-year, multi-stakeholder, interdisciplinary research initiative designed to contribute knowledge to support national and international policy and implementation efforts. TWI2050 is a partnership between science and policy that aims to develop pathways toward sustainable development within planetary boundaries (for a list of TWI2050 partners and network see Appendix 1). Using an integrated and systemic approach, TWI2050 addresses the full spectrum of transformational challenges related to achieving the 17 Sustainable Development Goals (SDGs), to avoid potential conflicts among them, and reap the benefits of potential synergies, and reach the desired just and safe target space for people and planet by 2050 and beyond. This approach is the first goal-based, multi-model quantitative and qualitative integrated analysis that encompasses the full set of SDGs.

The year 2017 was one of consolidation and building momentum for the TWI2050 initiative. The major activities for the year included:

- Finalizing the scientific framing of the initiative
- Defining target spaces and developing indicators for 2030 and 2050
- Elucidating alternative sustainable development narratives based on achievement of the 17 SDGs by 2030
- TWI2050 3rd Annual Meeting
- Establishing working groups and work plans around the major TWI2050 themes
- Participating in relevant events and meetings such as the HLPF and STIF
- Developing a funding strategy
- Drafting scientific papers
- Establishing the TWI2050 Website
- Planning for the 4th Annual Meeting 2018

II. TWI2050 Framing

The SDGs set out to eradicate social inequalities, achieve world development for a population that will probably exceed 8 billion by 2030 and a world economy expected to double by 2030 and triple by 2050, on an environmentally stable planet. The scientific, fact-based analyses are lacking for how this transformation to global sustainable future for all within planetary boundaries is to occur.

A starting point to analyse pathways towards goals is to establish an agreed framework that fulfils these goals. TWI2050 proposes a framing narrative and quantitative and time-bound target spaces of indicators that set the outer boundary conditions for the transformation of the world between now and 2050 through the SDGs and the Paris Agreement. The objective is to thereby mobilize the international research community to explore multiple sustainable development pathways (SDPs) by applying back-casting analyses of how to achieve the goals in the framing narrative at multiple scales. At an overarching level the objective is to achieve all SDGs by 2030, and by 2050 continue meeting all SDGs in an evolving prosperous and just world for all while stabilising the Earth system within planetary boundaries and remaining cognisant of Earth and human systems dynamics on longer time horizons out to 2100.

The TWI2050 Framework (Figure 1) includes qualitative and quantitative elements and consists of the following: (i) a broad transformational narrative, (ii) target spaces of indicators for the 2030 and 2050, timeframes, and (iii) specific sustainable development pathways (SDPs) that include quantitative elements based on modelling approaches and complementary storylines. There can be many such alternative pathways that explore branching points, lock-ins, resilience, inclusiveness, cooperation and differing transformational dynamics. The TWI2050 framework is designed to allow modelling and analytical groups (Integrated Assessment Modellers, Earth system modellers and others) to identify and explore a portfolio of measures needed to achieve all SDGs jointly accounting for synergies and trade-off. With such common goals and in some cases agreed common assumptions the framework facilitates intercomparison of results.

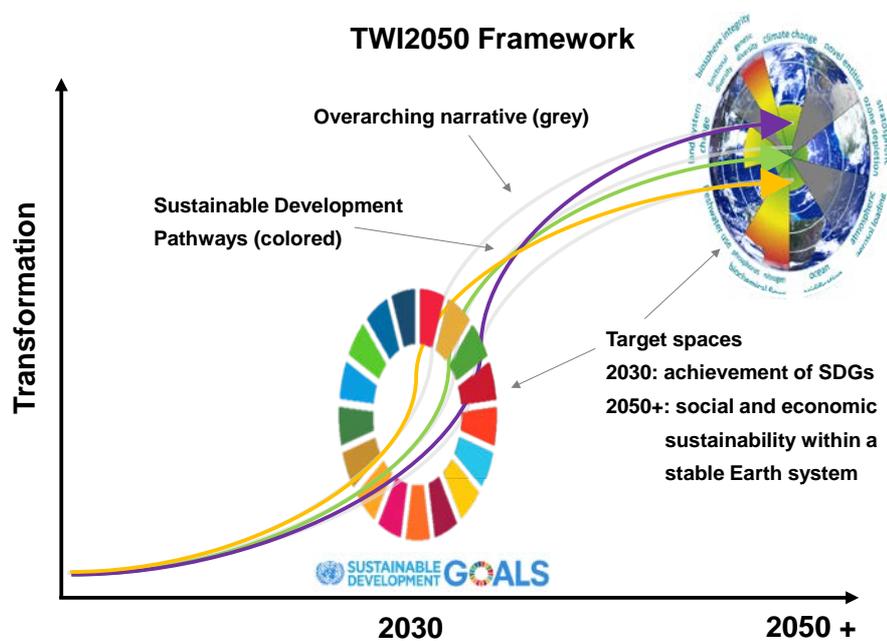


Figure 1: TWI2050 Framework: The illustrative graphic shows alternative sustainable development pathways (SDPs) that reach the two defined target spaces: all 17 SDGs and the transformation toward sustainability within planetary boundaries beyond 2050. An overarching narrative (grey) on sustainability transformation motivates the TWI2050 framework.

Development and enhancement of the TWI2050 framework has been a major activity over the past 12 months. The work of the four working groups (see below) established at the 2017 TWI2050 meeting will facilitate the ongoing refinement of this framework.

Overarching sustainable development narrative

At the centre of the framework, alongside the target spaces, is the ‘framing narrative’. This provides largely qualitative boundary conditions to be met within which sustainable development pathways can be explored. The boundary conditions defined by the TWI2050 narrative translates to a set of quantitative and qualitative (multidimensional, science-based) target spaces that further specify the overall boundaries:

The overarching narrative states that: *the world embarks on a development roadmap for a transformation to global sustainable development: It sets out to achieve the SDGs by 2030, and by 2050 continues meeting all SDGs in an evolving prosperous and just world for all, stabilising the Earth system within planetary boundaries.* Given system dynamics and latency, the narrative extends to 2100.

TWI2050 will offer one broad narrative that includes some variants, with the possibility for sub-narratives for individual pathways and regional and national perspectives. For example, what are the narratives in Africa, Asia, North and South America, Asia and Europe that might be combined to form a coherent global narrative?

Target spaces and indicators

TWI2050 identifies two multidimensional, science-based targets, one for 2030 and the other for 2050 and beyond in terms of quantitative and qualitative characteristics consisting of boundary conditions applying to every major region of the world. In the 2030 Agenda, nations agreed on 169 targets to be reached by 2030. However, the full set of SDG targets (and related indicators) cannot be directly used in a scientific assessment. First, some targets are not meaningful to explore using quantitative scenario analysis. Second, a more concise set of targets is needed to focus model analysis and comparison of results across models and to facilitate better communication to policymakers. In the end, a wide array of analytical approaches, and different sets of indicators (tier-based system) at varying degrees of granularity is needed. While the 2030 targets can be informed strongly by the SDGs, the 2050 values would need to maintain this ambition level or further progress and ensure developments stay within planetary boundaries. This may include additional indicators and adaptations as science advances. Accounting for dynamics post 2030 warrants a longer-term view and greater flexibility in sustainability implementation.

Using experts and stakeholders from relevant fields, TWI2050 undertook a selection process based on a consistent set of selection criteria (see Appendix 2) to reduce the number of targets and indicators, while still ensuring that the targets represent the most crucial aspects of the SDGs. This process allowed TWI2050 to reduce the full set of targets and indicators for the SDGs to a list of “essential targets” for each SDG. Reducing complexity while limiting information loss helps both modellers as well as communication with policy makers. The main objective was to specify targets as quantitative information to complement the narrative for developing TWI2050 pathways. For illustrative purposes, exemplary targets from the current target spaces are shown in Table 1. The complete set of targets are expected to be published late 2018 including further refinement at national and regional levels.

Table 1 shows three very different types of indicators and related research challenges and knowledge gaps, representing the human dimension (SDG 1 on poverty), the technology dimension (SDG 7 on energy) and the Earth-system dimension (SDG 13 on climate). For each SDG, indicators and associated ambition levels for 2030 and 2050 were selected to evaluate the achievement. Where appropriate, ambition levels are provided with a minimum that needs to be achieved (e.g. absolute poverty line)

and a related aspirational benchmark range linked to human development advances (e.g. energy services including electronic consumer goods or mobility).

To assist in the development of indicators but also for other purposes, such as the assessment of sustainable development pathways, it may be desirable to cluster the SDGs into (inter)related groupings. TWI2050 has extensively discussed various alternative clustering methods and schemes (see Appendix 2) and has reached the conclusion that (i) the SDGs are universal, holistic and inter-dependent and thereby indivisible, and (ii) any clustering method is context specific, being dependent on the question being addressed, modelling approach, or regional context, etc.

Sustainable Development Pathways (SDPs)

The SDPs will consist of quantitative and qualitative components that support the operationalization of multiple routes to arrive at the designated targets across all domains and sectors, for example, lifestyles, energy, urbanization, technology, governance, education and land-use including food security.

Pathways development will require Earth system modellers, integrated assessment modellers and other modelling and analytical communities to agree on a common qualitative and quantitative narrative, common goals and in some cases common standards and approaches to allow inter-comparison.

The SDPs represent the myriad routes from the present to 2050 and beyond, across domains and sectors, for example, energy, urbanization, technology, governance, education and food security. The objective is for the framing narrative to function as a common set of generic boundary conditions to allow modelling groups to develop and analyse multiple SDPs that explore transformations within this narrative and associated target spaces. The SDPs will consist of quantifications and qualitative storylines which support operationalization of multiple pathways to meet the target spaces. The pathways may differ along branching points describing different development characteristics, such as technological vs. behaviour change in the energy system; or dynamics of transnational governance vs. unilateral political power politics in the global political system. The pathways encompass at relevant scales, for example, population, technological, economic, and environmental dynamics. Their storylines include, for example, the quality of institutions and governance, shifting values and norms, the levels of corruption or equity. The assessment of possible branching points and differing characteristics across the pathways can be a tool for determining important trade-offs among the achievement of SDGs and human development within planetary boundaries. The TWI2050 framework will facilitate analysis of essential conditions and options for flexibility within the SDPs in line with the overarching narrative.

As a potential starting point TWI2050 could adopt one of the Shared Socio-Economic Pathways (SSPs) developed by the scientific communities for the IPCC. However, SSPs (and other pathways currently used in environmental research) fail to provide the breadth in scope as necessary to guide the UN 2030 Agenda and evaluate progress in SDG implementation. SSP1 is one such pathway that in principle leads to a development in the direction of sustainability even though the emphasis is more on climate adaptation and mitigation. Ideally, TWI2050 could take this particular SSP1 and generalize it to all 17 SDGs by integrating through modelling results and narratives the achievement of those SDGs missing right now from SSP1, going beyond climate-only or development only.

Table 1: Three exemplary targets showing initial boundary conditions, quantifiable 2030 targets and indicators based on expert judgment and quantifiable targets and indicators in 2050

SDG	TWI2050 normative goal	Initial Condition	Indicator	Metric	Threshold 2030	Threshold 2050	Research Questions
	End absolute poverty	890 million (13%) under absolute poverty line (UN 2016)	International absolute daily per capita poverty line	2016 US\$/cap	2	2	<i>How can poverty outcomes resulting from economic activities be better reflected in models?</i>
	Decrease relative poverty	>1.8 billion (~26%) living at risk of relative poverty (own estimations)	Relative daily per capita poverty threshold	2016 US\$/cap	benchmark: 6 (Q1), 16 (mean), 24 (Q3) 60% of median national daily disposable income	benchmark: 14 (Q1), 26 (mean), 37 (Q3)	<i>What is the optimal range of acceptable level of inequality?</i>
	Universal modern energy services for all	2.4 billion (42%) without access to clean cooking (UN 2016) 1.1 billion (15%) without access to electricity (UN 2016)	Final energy demand for consumer goods	GJ/cap/year	benchmark: 11 (North), 3 (South) minimum: 1 GJ/hh/year	benchmark: 8.2 (North), 3.7 (South)	<i>What is the appropriate level of energy consumption to fulfill decent living needs in different countries and economic settings accounting for technological change?</i>
			Final energy demand for thermal comfort	GJ/cap/year	benchmark: 15 (North), 5 (South) minimum per hh: 2.5 (South), 1 GJ LPG	benchmark: 5 (North), 1 (South)	
			Final energy demand mobility	GJ/cap/year	benchmark: 17 (North), 4 (South)	benchmark: 10 (North), 2 (South)	
	Limit global warming	Global CO ₂ e emissions in 2016: ~40 GtCO ₂ e (Le Quéré 2017)	Cumulative carbon emissions	GtCO ₂ e	High ambition benchmark: Cumulative carbon budget 2015-2030: 460 [423-503]	High ambition benchmark: Cumulative carbon budget 2030-2050: 212 [143-319]	<i>What are the GHG emission budget and trajectories consistent with limiting global warming to 2 °C and at the same time achieving all SDGs?</i>
					Lower ambition benchmark: Cumulative carbon budget 2015-2030: 508 [477-550]	Lower ambition benchmark: Cumulative carbon budget 2030-2050: 491 [301-547]	

This calls for model development and methodological advances such as better integration of modelling and other approaches, *e.g.*, qualitative assessments on dynamics of social change in order to guide SDG implementation scientifically. In many cases, this will not be possible via quantitative indicators. Instead, narratives can be used to cover rather qualitative elements such as governance, cooperation, or behaviours.

III. TWI2050 initiative process

The TWI2050 workplan consists of four phases. In phase one, the aim is to build the research community and produce an agreed global narrative and exemplary target spaces, though acknowledging these will be refined over time (Figure 2).

The TWI2050 Annual Meetings build the core of the community building. These are complemented by regular teleconferences of the organizations contributing to the scientific steering of the initiative. In parallel, working groups (see below) conduct their own meetings (both in person or virtual).

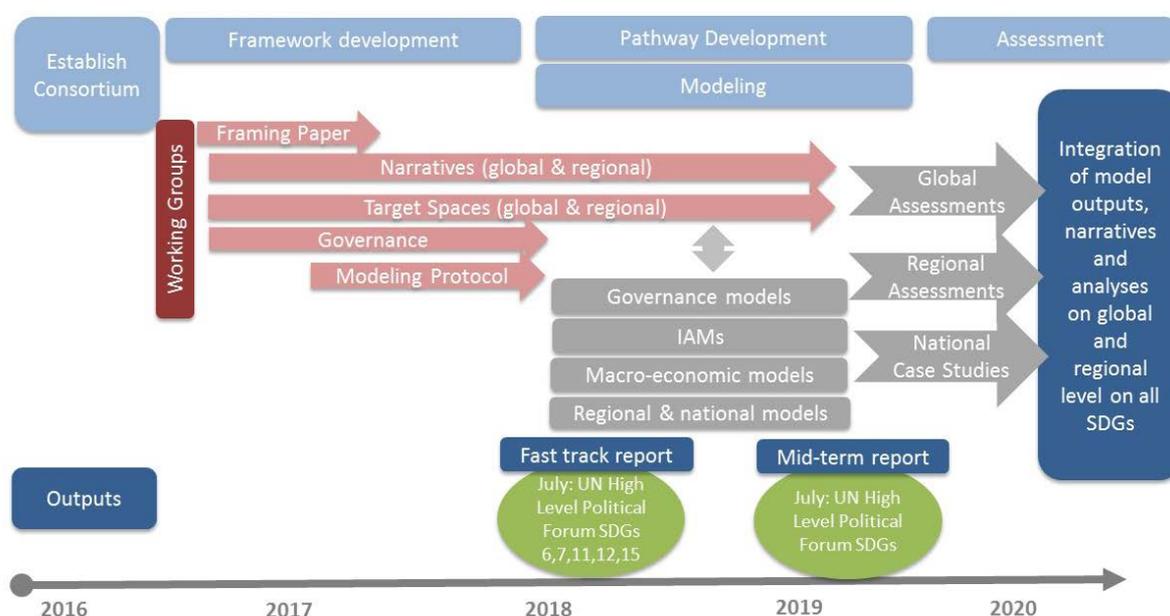


Figure 2: TWI2050 framework consists of four phases: (1) establishing consortium of modelling groups and partners, (2) developing the framework for operation, (3) pathway development and modelling at all scales, (4) integration of model outputs, model intercomparison, analysis and results at all scales. To facilitate this process parallel working groups have been established relating to narratives, target spaces, governance and modelling protocol. In addition, there will be a series of “fast-track” products aligned with the international SDG process, *e.g.*, the annual Science-Technology-and-Innovation Forum and High-Level Political Forum.

IV. Summary of the TWI2050 3rd Annual Meeting 2017

Building on the two previous TWI2050 annual meetings, which established the scientific and organizational foundations for the initiative, the objectives of the third annual meeting were to: (i) consolidate the TWI2050 community; (ii) advance the scientific framing of TWI2050; (iii) establish specific working groups, and (iv) establish short- and longer-term priorities and work plans. Over 130 participants from more than 50 different organizations participated in the meeting held from 3-5 April 2017 at IIASA, Laxenburg, Austria (for meeting Agenda and List of Participants see Appendix 4).

As input to the meeting, the TWI2050 community jointly developed a draft framing paper describing the concept for developing pathways to 2050 and beyond by ‘back-casting’ from a ‘target space’ (sustainability for people and the planet) to achieve all SDGs by 2030, with some exemplary cases of how this could be achieved with quantitative and qualitative methods.

Participants worked with exemplary indicators of the target spaces and refined them by additional indicators, keeping in mind possible interdependencies and relationship to other SDGs. Discussions included the following topics:

- Key indicators for target spaces for all SDGs in 2030 and 2050+
- Possible key linkages and knowledge gaps within the SDG cluster
- Methods to develop pathways (models, narratives, other tools)

Participants also discussed, from a systems analysis perspective, backcasting approaches for sustainable development pathways informed by the target space for the SDGs. The following areas were covered:

- Key systems, their characteristics and relationships to the SDGs (*e.g.*, energy system: related to climate, human health, and water and land-use);
- Possible trade-offs and synergies among main system indicators with other SDGs;
- Identification of possible branching points in alternative sustainable development pathways.

Outcomes from the meeting included:

- **Elucidation of the overarching narrative.** Based on discussions of the draft TWI2050 framing paper, participants discussed elements for a transformational narrative and other key considerations for advancing TWI2050 assessment.
- **Delineation of SDG target space.** Based on existing work on transformational pathways, participants discussed how to qualitatively and quantitatively define the target spaces of desirable future social, economic and environmental development to 2030 and beyond, towards a just and safe space for people and the planet.
- **Establishment of Working Groups.** Working Groups were established for the following topics: Narratives, Target Spaces, Modelling Protocol, and Governance, each with specific objectives and outputs. These Working Groups are the primary operating units of TWI2050.
- **Prioritization of next steps and outlining a work plan.** Participants agreed on a short-term work plan and a longer-term strategy for the initiative, including targeted outcomes and contributions towards important events and initiatives to achieve SDGs.

Short Term

- Produce a Policy Report for UN High Level Political Forum (July 2018)
- Establish the TWI2050 Framework
- Define the target space 2030 and 2050+;
- Where are we today?
- Look into pathways and governance

Longer Term

- Develop governance & policy instruments
- Define narratives: From global to regional
- Interdisciplinary integration (Earth Preservation & Resource SDGs, Human Development, Economic Opportunity & Reducing inequality, Governance)
- Find new pathways

Continued stocktaking of the research in the literature and across different scientific communities participating in TWI2050 will be undertaken to support the work, and help crystalize key research questions, methods, tools, and joint activities of the working groups.

V. TWI2050 Working Groups

Four TWI2050 Working Groups have been established as the principal operational units of the initiative. Working Groups focus on individual themes or methodological challenges and will operate until they have answered their research question. The objectives of the individual working groups will be refined over the period of their operation. In addition, as the need arises, more working groups may be established, groups may change their focus, or cease.

Working Group on Narratives

TWI2050 seeks to frame the solution space for sustainable development pathways, based on comprehensively achieving the Sustainable Development Goals (SDGs) by 2030 and sustaining progress to 2050 and beyond within planetary boundaries. The current TWI2050 narrative, and to a lesser extent the SDG's, are derived from a very 'western', globalizing perspective on the future of our planet. If the project is to be successful and its results are to be widely adopted globally, it needs to develop narratives that mobilize those parts of the world's population that have different perspectives on the future of the planet, or different approaches to defining or achieving sustainability. As part of this effort, pathways and narratives need to be defined that can integrate unforeseen societal dynamics into the TWI2050 goals.

Objectives

- Development of a meta narrative that describes a development of the world in the spirit of the SDGs and that is flexible enough to accommodate a set of sub- or regional narratives
- Develop a wider band of potential futures for the project by taking into account unanticipated dynamics that might occur
- Increase global interest in the project through contributions to it from different cultures and different perspectives

Outputs

- Publication of an overarching meta narrative for TWI2050
- Publication of a selected range of narratives from different cultures
- Publication of a 'futuring' paper on societal changes that might affect the SDG goals

Convening Lead: Sander van Leeuw (Arizona State University)

Working Group on Target Spaces

TWI2050 seeks to provide scientific guidance to help policy makers implement the SDGs successfully. To this end, the SDGs provide the basis. However, the majority of the SDGs have 2030 as their running period, some even 2025 or 2020. The SDGs, their targets and suggested indicators and values are not always suitable for modelling purposes and need to be interpreted in many cases to make them operational for research. Furthermore, the SDGs are very comprehensive. Research groups need to arrive at a concise set of indicators for the target spaces representing sustainable development in 2030 and 2050 and beyond in their work. This will require reducing the complexity of the full set of SDG targets, while minimizing information loss so that the assessment can be considered representative of all SDGs. This will facilitate intercomparison of results and communication thereof

with policymakers. The identification of suitable indicators should follow an internally consistent framework. TWI2050 is involving domain experts and stakeholders of the relevant fields to identify crucial indicators that can reflect as much information as possible, ideally across several SDGs. The target spaces should reflect what models need and can do. To make them usable for a wide array of models, different sets of indicators are likely needed.

Objectives

- To frame the target space for TWI2050, which fulfils the criteria of (i) meeting the SDGs by 2030, (ii) sustaining progress towards 2050 and (iii) respecting global environmental constraints
- To propose representative indicators and associated target values which will inform the modelling protocol and guide the integrated assessment of TWI2050

Outputs

- Indicator list: Data base with explanatory note
- Working paper or scientific publication presenting the TWI2050 indicators for the target space and the rationale for their selection

Convening Lead: Detlef van Vuuren (PBL)

Working Group on Modelling Protocol

The modelling protocol provides guidance and instructions along the full modelling ‘value chain’ in order to provide for consistency, interpretability and comparability of outcomes. This comprises several sequential steps and hierarchical decisions. Starting with the narratives produced by the corresponding working group these need to be operationalized coherent pathways and branching points need to be identified. These branching points need to be reflected in a set of diverging input tables or possibly even model formulation. It moreover has to be assured, that the key input parameters to the models – where applicable -are harmonized (e.g. GDP, population, cost assumptions). In a similar manner, key output variables that should be reported by the models will have to be decided. This of course strongly relates to the target space developed in the corresponding working group.

In TWI2050 different types of models will be used given the broad and ambitious scope of the initiative, whereby Integrated Assessment Models will be the workhorses when it comes to scenario analyses. The modelling protocol establishes how these models ‘talk’ to each other. In some cases, outputs from one model will be inputs to another model and vice versa. In such cases the modelling protocol will provide guidance on model linkages. When models overlap in terms of their underlying systems they can either be run in parallel to explore the sensitivity of outcomes or hierarchical orders are established, where one model produces results that have to be replicated by other models. The modelling protocol will provide guidance on the most suitable approach depending on the defined pathway and need for convergence.

Objectives

- To provide guidance to modelling teams for the implementation of TWI2050 pathways, describe main pathways set-up and assumptions (flexibility vs consistency)
- To assure minimum degree of consistency (and thus integration)
- To provide basic definitions for regions, sectors, reporting standards and data templates

Outputs

- Database on SSPs including terms of reference
- First modelling protocol prototype by Spring 2018, full modelling protocol in the years ahead under continued refinement
- Definition on branching points and integration of the transformation process

Convening Leads: Elmar Kriegler (Potsdam Institute for Climate Impact Research) and Keywan Riahi (IIASA)

Working Group on Governance

Next to technological innovations, transformations to sustainability require societal, political and institutional change. SDGs 16 and 17 address these innovations. In other words, peace, inclusive governance and institutions for cooperation are not only an objective but shall also enable the achievement of other SDGs. Although all SDGs reinforce or counteract each other in one or the other way, SDGs 16 and 17 differ from other goals: SDG 16 and 17 address structural change, which usually takes a long time, up to decades. In addition, SDG 16 refers to a type of change that can be abrupt and disruptive. For instance, societal conflict can easily and abruptly turn into war in societies under stress. The nature of SDG 16 and 17 thus comprises three challenges for scenario-building. First, building sound and robust theories must reflect political and societal change, which is often hard to predict. Second, building representative indicators is a challenge due to the complex nature of social and political phenomena. Third, it will be challenging to avoid problems of endogeneity. Given the limits of predicting societal and political change on a large scale, the Working Group will elaborate how case studies and qualitative methods can inform scenarios for the TWI2050. Finally, the Working Group aims at informing policy-making by looking at institutional preconditions for an integrated implementation of the SDGs (nexus thinking; polycentric governance).

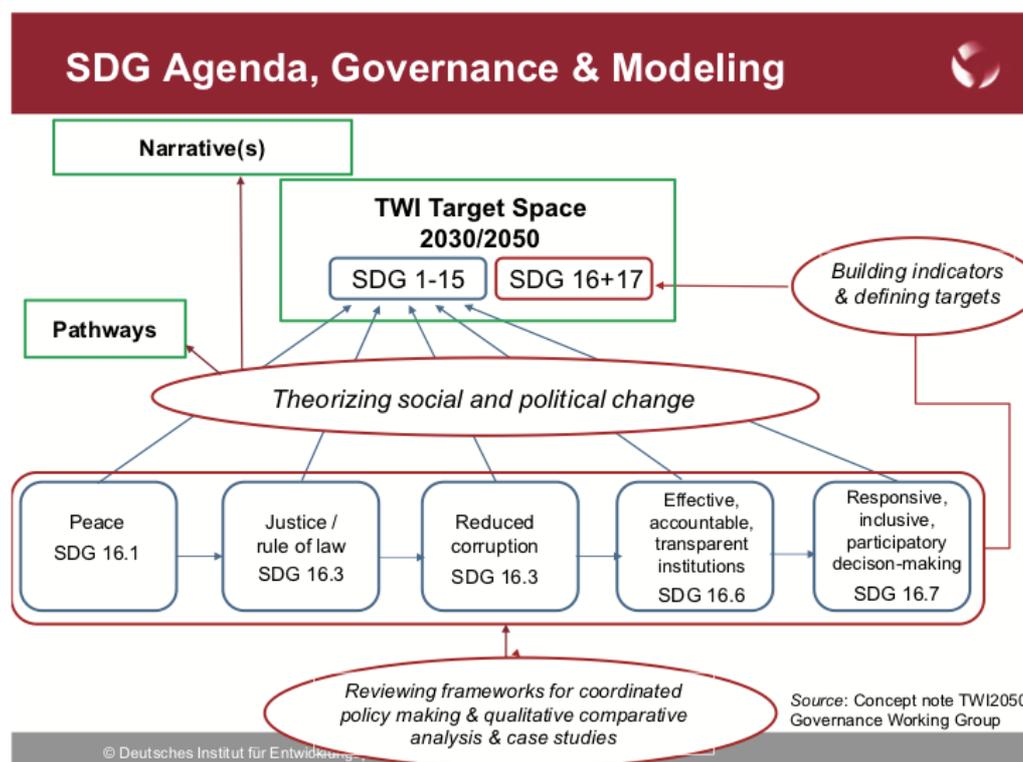


Figure 3. Conceptual framework being considered by Working Group on Governance

Objectives

- Consolidating various theories of societal change into a concept of transformative change to be applied in TWI2050 project
- *Narrative*: To contribute to narrative-building
- *Modelling*: To integrate theories of societal and political change in modelling scenarios and integrated assessment of TWI2050
- *Target space*: To propose representative indicators and associated target values with regard to peace, governance and societal change, social cohesion (“safe space for societies”)
- *Policy-making*: To generate knowledge about integrated implementation of the Agenda 2030.

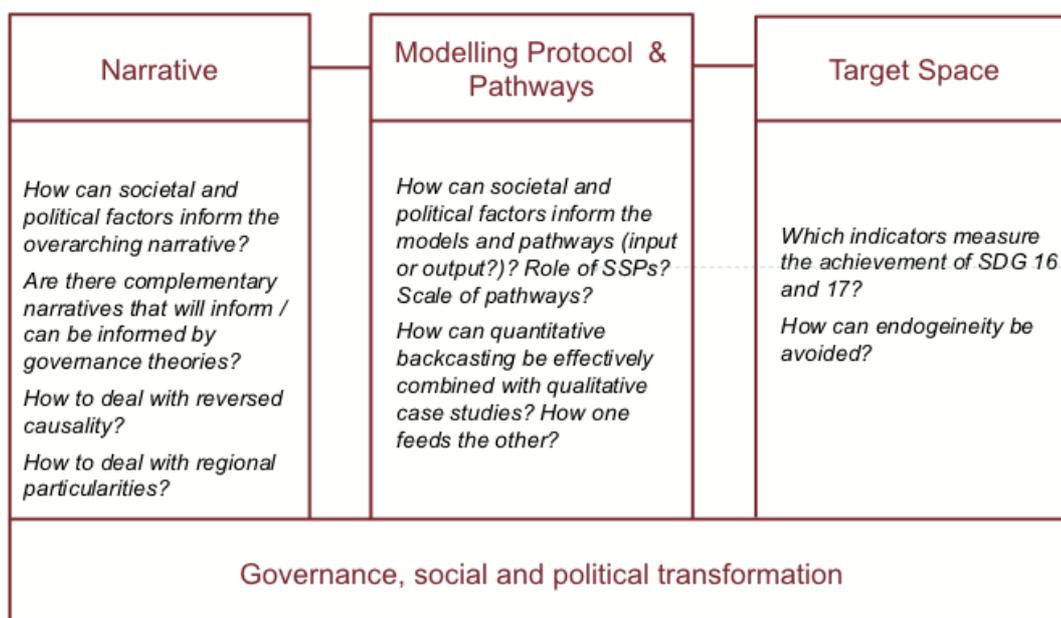


Figure 4. Questions under consideration by the Working Group on Governance and their relationship to the other Working Groups

Outputs

- Two interdisciplinary workshops on Governance, theories of social change and modelling
- Contribution to theory-building, narratives and indicator list for target space
- Publications on theoretical and methodological challenges of integrating social and political factors in modelling and case studies on governance of SDGs
- Policy advice on integrated implementation of 2030 Agenda

Convening Leads: Ines Dombrowsky, Julia Leininger and Dirk Messner (DIE)

VI. Outreach and Communications

2017 saw an increased focus on promoting the TWI2050 initiative among stakeholders with participation at multiple national and international meetings, scientific publications, production of the TWI2050 [Concept Note](#) and [Brochure](#), and establishment of the [TWI2050 website](#).

Significant Events and Meetings

In 2017, TWI2050 participated in a number of key events related to the implementation of the SDG and Paris Agreement agendas. Of particular note are the following:

UN Science Technology and Innovation Forum, New York, 15-18 May

TWI2050 was represented by Nebojsa Nakicenovic at a series of meetings in New York related to amplifying the role science, technology and innovation (STI) can play in implementing the UN 2030 Agenda on Sustainable Development. There he emphasized the need for support for integrated analytical approaches when assessing the SDGs.

He also organized a [side event](#) that aimed to support the international dialogue on linking Science, Technology and Innovation (STI) policies and road maps to human development, in particular SDGs 1, 2, and 3, which was the focus of the forum. This included the paradox connected with STI, with STI both representing solutions to the sustainable development challenge as well as adverse impacts which hamper sustainable development. STI policies have to encompass human development and planetary boundaries to assure stable and safe future for all in the long-run.

UN High-Level Political Forum, New York, 17-19 July

The High-level Political Forum is the United Nations' central platform for follow-up and review of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals and provides for the full and effective participation of all States Members of the United Nations and State members of specialized agencies. Convened under the auspices of the UN Economic and Social Council, the meeting is being organized to conduct an in-depth review of a number of sustainable development goals, including Goal 17 - Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

TWI2050 researchers shared their research and expertise in two sessions of the meeting:

- *A guide to SDG interactions: From science to implementation.* This session saw the launch of a new report which contained a number of contributions from TWI2050 associated researchers
- *SDG 17 - Advancing science, technology, and innovation for the SDGs.* The session explored policies and actions for advancing science, technology and innovation (STI) for achieving the SDGs.

The African Dialogue on The World In 2050, Kigali, 28-29 August

The African Dialogue on *The World In 2050* brought together representatives of governments, the private sector, academic institutes, civil society, UN and other international organizations and other policy-influencers to explore sustainable development pathways under the theme: *How can agriculture contribute to meeting the UN Sustainable Development Goals (SDGs) in the context of social-ecological resilience and the conservation and sustainable use of agro-biodiversity in Africa?* The theme contextualizes agro-biodiversity and farming systems in Africa for transformations to sustainable development.

The Dialogue provided TWI2050 with sketches for narratives for sustainable pathways that embed African perspectives, concerns and recommendations and also presented TWI2050 a valuable method

for future stakeholder involvement and offered guidelines for how to include different actors' visions in the elaboration of sustainable development pathways.

UNFCC Conference of the Parties 23, Bonn, 6-17 November

TWI2050 organised three side events at the annual COP meeting designed to increase the visibility of the TWI2050 initiative among key decision makers. The panellists discussed how the initiative aims to address a broad spectrum of transformational challenges related to these two agreements.

Topics discussed included:

- How do we meet the hunger, poverty, energy, growth goals while meeting the environmental and climate goals?
- What are the synergies and trade-offs?
- How do we strengthen the climate and development linkages for greater impact?
- What are the costs of pursuing social goals without meeting sustainability goals and the other way around?
- What do we need to do to achieve the targets of the Agenda 2030 and Paris Agreement?

Other selected events with TWI2050 involvement:

2017

- Vienna Energy Forum, Vienna, 9-12 May
- UN Science Technology and Innovation Forum, New York, 15-18 May
- International Association of Energy Economics Conference, Vienna, 3-5 September
- International Conference on Sustainable Development, New York, 18-19 September
- Sustainable Development Solutions Network Meeting, New York, 21-22 September
- Global Science, Technology and Innovation Conference, Brussels, 25-26 October
- [Crossroads](#), Bonn, 4-5 November

2016

- Alternative Pathways towards Sustainable Development Symposium, Tokyo, 10 February
- [TWI2050 Annual Meeting](#) at IIASA, Vienna, March 2016
- National Renewable Energy Laboratory, Denver, 29 March
- JNIF, Tokyo, 10-12 April 2016
- Sustainable Development Goals Europe Business, Brussels, 31 May
- UN Science Technology and Innovation Forum, New York City, 5-7 June
- UN High-Level Political Forum, New York City, 19-21 July
- Energy Modelling Forum Workshop, Snowmass, 23-17 August
- IPCC Special Report 1.5°C Scoping Meeting, Geneva, 15-17 August
- ISW IPCC, Stockholm, 30 August
- IUCN, WCC, Honolulu, 1-10 September
- 1.5°C Conference, Oxford University, 20 September
- 3rd Climate and Energy Conference, Seoul, 30 November

Scientific Papers

As a primarily science-based initiative, it is critical that TWI2050 contribute high-quality scientific articles to international peer-reviewed scientific journals. Acknowledging that TWI2050 is a decentralised multi-partner initiative, it is to be expected that such articles will be multi-authored

from different institutions. However, wherever possible the association to the TWI2050 initiative should be made explicit. This will not only promote TWI2050 within the scientific community but also add to the overall integrity and cohesion of the initiative and TWI2050 community.

Core TWI2050 publications

- Nakicenovic, N., Roskström, J., Sachs, J., Gaffney, O., Zimm, C., Kriegler, E., Messner, D., Riahi, K., van Vuuren, D., *et al.* (2018). The world in 2050: towards pathways for global sustainable development. *Nature* (submitted)
- Target spaces (in prep).

Selected publications with TWI2050 input:

- McCollum, D., Gomez Echeverri, L., Busch, S., Pachauri, S., Parkinson, S., Rogelj, J., Krey, V., Riahi, K., *et al.* (2017). Connecting the Sustainable Development Goals by their energy inter-linkages. IIASA Working Paper. IIASA, Laxenburg, Austria: WP-17-006 (submitted to ERL Reviews)
- Nakicenovic, N., and Zimm, C. (2017). New technological solutions for the Sustainable Development Goals and beyond. *Environmental Scientist* **26**: 68-73
- Zimm, C., Sperling, F., and Busch, S. (2018). Identifying Sustainability and Knowledge Gaps in Socio-economic Scenarios vis-à-vis the Sustainable Development Goals, in: Selected Papers from the International Conference on Sustainable Development 2017, September 18-20, 2017 New York, USA. *Economies* (in review)

As TWI2050 aims to be a scientific partner to the implementation of the SDGs, it is also important that TWI2050 produces documents relevant and useful to decision makers and other key stakeholders, such as the UN High-Level Political Forum.

TWI2050 Website

The [TWI2050 website](#) was established in 2017 and is currently undergoing development. The aim of the site is to not only provide a public ‘face’ to the TWI2050 initiative but also to act as both a single point of access for TWI2050 consortium partners and collaborators for TWI2050 resource materials (documents, events, *etc.*) and a dialogue forum.

VII. Funding Strategy

At present TWI2050 is funded primarily as in-kind contributions from participating institutions. This is clearly unsustainable in the medium- to long-term if TWI2050 is to meet its objectives, and a strategy to secure substantial long-term guaranteed core funding will be required. As obtaining such funds from conventional national or regional science-based funding agencies can be problematic for these types of initiatives, alternatives need to be sought elsewhere, such as international funding initiatives or private foundations.

To this end TWI2050 has submitted a proposal for a Collaborative Research Action (CRA) to the Belmont Forum for consideration. The Belmont Forum is an international partnership of funding organizations, international science councils, and regional consortia that mobilizes funding of environmental change research and accelerates its delivery to remove critical barriers to sustainability. The CRA on integrated science for the SDGs was agreed upon at the Belmont Forum meeting in fall 2017 and is expected to be launched in early 2018.

Additional funding proposals to a number of foundations are currently being developed.

VIII. 4th Annual Meeting 2018

The main objective of the Annual Meeting is to review and finalize the Working Group drafts for the first TWI2050 report to be presented at the High-Level Political Forum and other relevant events in 2018, and to define the strategy for TWI2050 for the next two years including the preparation of derivative products such as White Papers, Policy Briefs, Thematic Papers, *etc.*, and to generate material for the Website.

IX. Appendices

Appendix 1: List of TWI2050 Partners and Network

Partners (those groups that have **formally** expressed an interest in collaborating on the project)

Centre for Integrated Studies on Climate Change and the Environment (CIRED)
 Climate Center Service Germany (GERICS)
 Earth Institute, Columbia University
 European Commission, Joint Research Centre (JRC)
 Energy Planning Program, COPPE, Federal University of Rio de Janeiro
 Environmental Change Institute (ECI) at the University of Oxford
 Fondazione Eni Enrico Mattei (FEEM)
 Future Ocean
 German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE)
 International Institute for Applied System Analysis (IIASA)
 Millennium Institute
 MIT Joint Program on the Science and Policy of Global Change
 National Institute for Environmental Studies (NIES)
 National Renewable Energy Laboratory (NREL)
 Organisation for Economic Co-operation and Development (OECD)
 Potsdam Institute for Climate Impact Research (PIK)
 Stockholm Resilience Centre
 Sustainable Development Solutions Network (SDSN)

Network (those groups that have **informally** expressed an interest in collaborating on the project)

Alpen-Adria University (AAU)
 Analysis, Integration and Modelling of the Earth System (AIMES)
 Austrian Research Promotion Agency
 Australian National University (ANU)
 Arizona State University (ASU)
 University of Natural Resources and Life Sciences (BOKU)
 Brazilian Federal Agency for the Support and Evaluation of Graduate Education (CAPES)
 Centro Nacional de Monitoramento e Alertas de Desastres Naturals (CEMADEN)
 Centre for Global Sustainability Studies (CGSS)
 Commonwealth Scientific and Industrial Research Organization (CSIRO)
 Conservation International
 Earth League, whole Earth system modelling initiative
 Empresa Brasileira de Pesquisa Agropecuária (Embrapa)
 Forestry and Forest Products Research Institute (FFPRI)
 Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP)
 Fundação Oswaldo Cruz
 Future Earth
 Global Environment Facility (GEF)
 Imperial College
 Indian Institute of Technology (IIT)
 Institute for Advanced Sustainability Studies (IASS)
 Institute for Global Environmental Strategies (IGES)
 International Energy Agency (IEA)

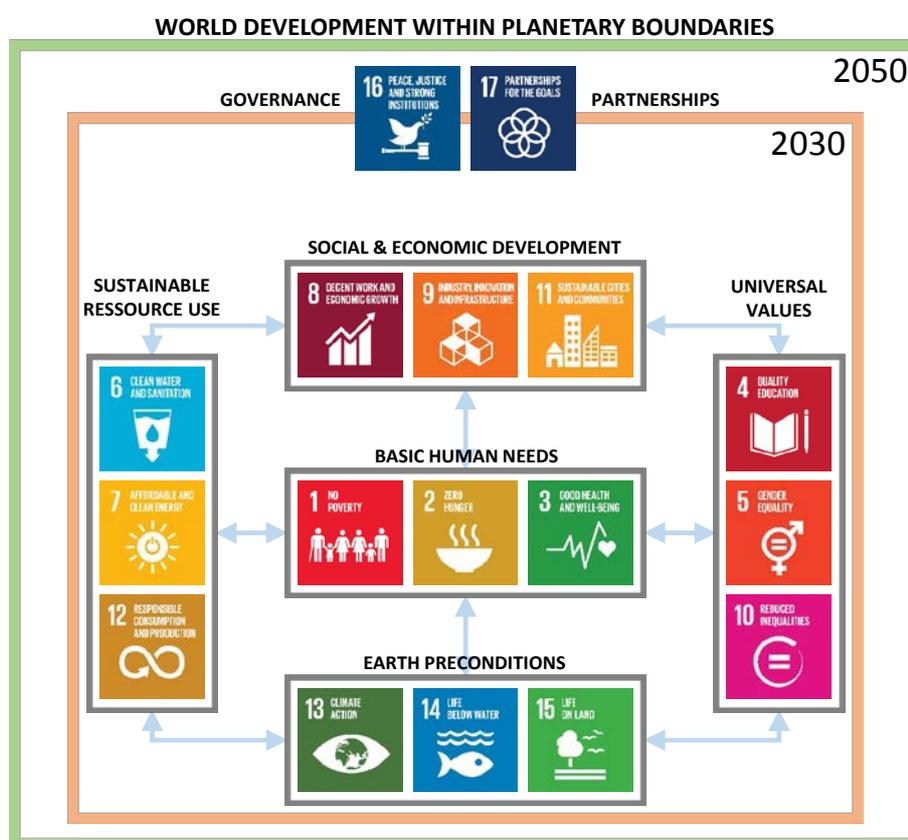
International Food Policy Research Institute (IFPRI)
International Monetary Fund (IMF)
Intergovernmental Panel on Climate Change (IPCC)
Korea University (KU)
London School of Hygiene & Tropical Medicine
Mercator Research Institute on Global Commons and Climate Change (MCC)
National Center for Atmospheric Research (NCAR)
National Science Foundation (NSF)
Pacific Northwest National Laboratory (PNNL)
Netherlands Environmental Assessment Agency (PBL)
Research Institute of Innovative Technology for the Earth (RITE)
Rheinisch-Westfälische Technische Hochschule Aachen (RWTH)
Stakeholder Forum
Swedish Research Council for Sustainable Development (FORMAS)
Tsinghua University
UNDESA
UNEP
Université Catholique de Louvain
University of Sussex
US National Academy of Sciences (NAS)
World Bank
World Wildlife Fund (WWF)

Appendix 2: Alternative Approaches to Clustering of SDGs

Clustering is done for pragmatic reasons to structure the debate about the SDGs as a whole and to assist with modelling approaches. No hierarchy exists or is implied between the SDGs in terms of how fundamental they are. Also, links between SDGs in different clusters can be as strong or even stronger as between SDGs within a cluster. The clustering should follow a logical principle. As different logical foundations exist, there can be multiple logical ways to cluster the SDGs. Settling on one clustering will be a pragmatic decision on what appears to be a compelling and most suitable logic for the purpose of TWI50. However, it must be stressed that for the SDG agenda (and TWI2050) to be successful all SDGs must be addressed in unison.

Examples of the different clustering approaches considered by TWI2050 are given below.

Example 1



Example 2:

The clustering illustrated in the wedding cake is an attempt to distinguish the different characters of the goals. All aspects of human well-being “rests on biosphere capacity and the interplay with the Earth system”. There is an intimate interdependence, societies’ development is intertwined with the ecological system, which is also being increasingly recognized. In the Wedding Cake, the biosphere is represented by SDGs 6, 13, 14 and 15. A well-functioning biosphere is the precondition for society’s development, represented by SDGs 1, 2, 3, 4, 7, 11 and 16. Furthermore, the economy is seen as a subsector of society and is represented by SDGs 8, 9, 10 and 12. Finally we have the overarching goal 17 on implementation and partnerships.



Example 3:

The proposal aims to cluster the SDGs in four different spheres:

1. **Environmental needs** focusing on environmental integrity of a system without making the human use of environmental services the direct subject of the SDG: SDG13 (climate action), SDG14 (life below water), SDG15 (life on land)
2. **Human development needs** which focus on individual human needs that affect an individual's basic condition to subsist as a member of society. Two subcategories may be identified – **human development needs relating to environmental services and resources** (SDG2: Zero Hunger; SDG6: Clean Water and Sanitation, SDG7: Affordable and Clean Energy), and **other human development needs** (SDG1: No poverty, SDG3: Good health and wellbeing, SDG4: Quality Education, SDG5: Gender Equality).
3. **Economic development needs** which focus on the economic condition of humans to progress and successfully participate in society: SDG8 (decent work and economic growth), SDG9 (Industry, Innovation and Infrastructure), SDG10 (Reduced inequalities), SDG12 (Responsible consumption and production)
4. **Social and institutional needs** which relate to building and administering societies and communities: SDG11: Sustainable cities and communities, SDG16: Peace, justice, and strong institutions, SDG17: Partnership for the goals.

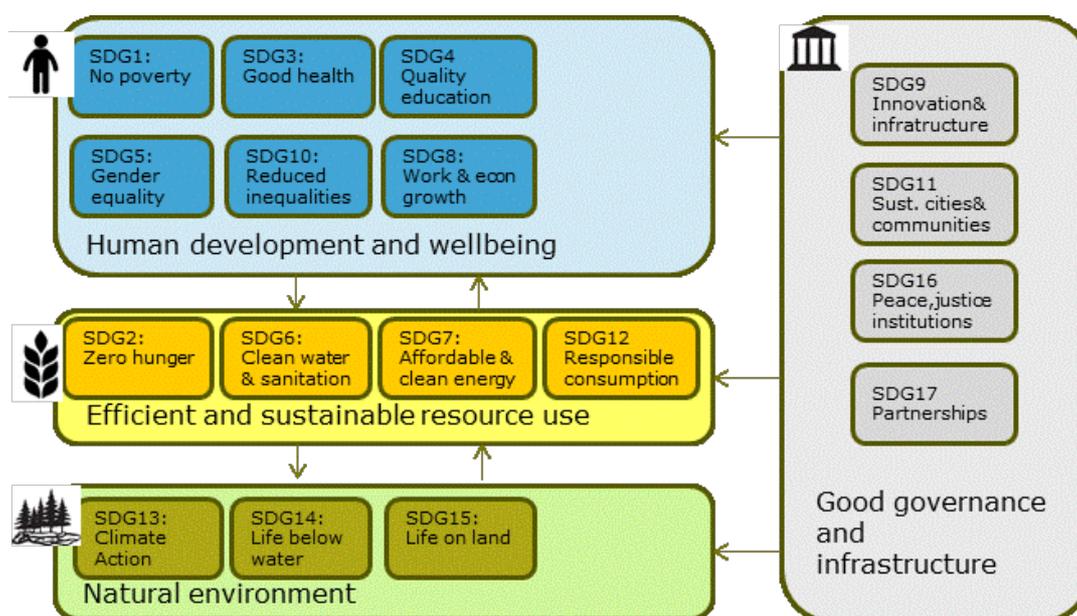
Example 4

An essential part of the sustainability discussion is about human development, the interaction between human development and the environment, environmental integrity and the institutions that ensure that these interactions take place in a sustainable way.

This example to cluster the SDGs in four different spheres:

1. **Human development** which focus on individual human needs that affect an individual's basic condition to subsist as a member of society and the objective to reduce inequality. While clearly the next category also relates to human development, the difference is that the next category has a strong focus on resource use.

2. **Resource use** which focus those human development goals that are directly based on human resources. The rationale of recognizing this group is that it shows the symmetry between them (full access in 2030; sustainable extraction; clean) and emphasizes their connection (nexus)
3. **Environmental integrity** focusing on environmental integrity of a system: SDG13 (climate action), SDG14 (life below water), SDG15 (life on land)
4. **Social and institutional needs** which relate to building and administering societies and communities:



Example 5:

This example focuses on human-biophysical “systems” that address the key issues of integration from a biophysical as well as an implementation perspective. In some cases, this requires dividing SDGs across several issues

- **Social services:** health, nutrition interventions provided through the health sector, education (this includes most dimensions of demography and might include social protection schemes)
- **Energy transformation** (i.e. decarbonizing energy systems and ensuring universal access). This cluster is framed around the power grid, which is a natural system and will be the cornerstone of any decarbonization effort. It also has the advantage of lending itself to cross-country analyses where power systems are integrated.
- **Sustainable land use transformation**, i.e. sustainable agriculture, food security, forests, terrestrial biodiversity, green water & blue water for agriculture (it strikes me as very important not to separate agriculture from forests/terrestrial biodiversity)
- **Sustainable cities transformation** (this is a complex one since it overlaps significantly with “sustainable energy” and covers additional water uses, but it seems possible to clarify this cluster clearly enough).

- **Sustainable industry transformation (“circular economy”?):** SCP excluding GHG emissions & biomass; labor policies
- **Sustainable oceans**
- **Governance & norms**

In addition, an economic module is needed that combines these different issues or transformation. It needs to be coupled with an adding-up constraint for planetary boundaries and local resource use constraints.

Example 6:

For developing the narrative of a sustainable development pathway (SDP), it is suggested to (i) concentrate first on those SDGs that are central to universal achievement of basic human needs and environmental sustainability and (ii) focus on the complete and timely achievement of the associated quantitative targets. The underlying rationale: Basic human needs is an existential requirement and needs to be realized in the context of projected population growth, while staying within biophysical limits (planetary boundaries but also regional limits) is a prerequisite for sustaining life support systems, underpinning human systems. SDGs focused on human welfare, institutions and governance could then be explored in their modulating influence on overcoming barriers to development and environmental sustainability through varying assumptions and quantitative specifications.

Proposed Clusters:

Cluster 1: Basic Human Needs	Remarks on selected targets
SDG1: No Poverty	Complete achievement of quantitative and time bound targets
SDG2: Zero Hunger	
SDG6: Clean Water and Sanitation	
SDG7: Affordable and clean energy	
Cluster 2: Biophysical limits & environmental sustainability	Remarks on selected targets
SDG13: Climate Action (further informed by Paris Agreement)	Complete achievement of quantitative and time bound targets
SDG14: Life below water	
SDG15: Life on Land	
Cluster 3: Societal characteristics & transformation	Remarks on selected targets
SDG3: Good Health and Well Being	Targets are selected and further specified through additional quantitative and qualitative assumptions to explore the relative influence on the complete achievement of clusters 1&2 through impacts on cooperation, skills & innovation, access to practices and technologies and associated implications of supply and demand for resources
SDG4: Quality Education	
SDG5: Gender Equality	
SDG8: Decent Work and Economic Growth	
SDG9: Industry, Innovation and Infrastructure	
SDG10: Reduced Inequalities	
SDG11: Sustainable Cities and Communities	
SDG12: Responsible Consumption	
SDG16: Peace and Justice, Strong Institutions	
SDG17: Partnership for the Goals	

Appendix 3: TWI2050 3rd Annual Meeting Agenda and List of Participants

Monday, 3 April

09:00	<i>Transportation from Hotel (Albertinaplatz) to Laxenburg Conference Center</i>
09:30-10:00	<i>Arrival and Registration</i>
10:00-10:20	Welcome , Pavel Kabat, IIASA (10 min)
Venue:	SDSN and Agenda 2030 , Jeffrey Sachs, SDSN (10 min)
Theater	
10:30-11:00	Introduction and TWI2050 Updates Moderators: <i>Nebojsa Nakicenovic, IIASA and Johan Rockström, SRC</i> <ul style="list-style-type: none"> Update of activities and discussion on future initiatives Discussion
11:00-12:30	Plenary Session I: Discussion on TWI2050 framework and science policy interface Chair: <i>Elmar Kriegler, Potsdam Institute for Climate Impact Research</i> The TWI2050 community has jointly developed a draft science paper describing the concept for developing pathways to 2050 and beyond by “back-casting” from a “target space” (sustainability for people and the planet) to achievement of all SDGs by 2030 with some exemplary cases of how this could be achieved with quantitative and qualitative methods. First part of the session will present the draft paper and the second how to define the target space indicators that would be used for backcasting in the pathways. TWI2050 draft science paper and objectives for the meeting <i>Nebojsa Nakicenovic, IIASA and Johan Rockström, SRC (20 min)</i> Discussion (60 min) Group Photo
12:30-13:30	<i>Lunch in the Conference Center – Oval Room</i>
13:30-16:00	Plenary Session II: Stocktaking of TWI2050 related activities with brief presentations Moderator: <i>Nebojsa Nakicenovic, IIASA and Johan Rockström, SRC</i> Activities related to TWI2050 <ul style="list-style-type: none"> Update on the G20 and T20, Dirk Messner, DIE (5 min) Global Sustainable Development Report 2019, Wolfgang Lutz, IIASA (5 min) ICSU SDGs, Anne Sophie Stevance, ICSU (5 min) Future Earth, Wendy Broadgate, FE (5 min) Belmont Forum, Maria Uhle, NSF and Erica Key, Belmont Forum (5 min) Contributions from participants and presentation of related activities (30 min) <ul style="list-style-type: none"> UNDESA SDG Activities, Alex Roehrl, UNDESA (10 min) CD-LINKS, Keywan Riahi, IIASA (10 min) Update on the SSP work, Detlef van Vuuren, PBL (10 min) TWI2050 Stocktaking, Matthias Berger, IIASA (5 min) Setting the stage for Parallel Working Sessions <ul style="list-style-type: none"> Overall Objectives and Guidance, Elmar Kriegler, Potsdam Institute for Climate Impact Research (15 min) Discussion (45 min)
16:00-16:30	<i>Coffee break</i>
16:30-18:30	Parallel Working Sessions “A” (Cluster Target Spaces): Each parallel group will start work with exemplary indicators of the target spaces and refine them by other indicators while keeping in mind possible interdependencies and relationship to other SDGs. Discussions should include the following topics: <ul style="list-style-type: none"> Key indicators for target spaces for all SDGs in 2030 and 2050+ Possible key linkages and knowledge gaps within the SDG cluster

	<ul style="list-style-type: none"> • Methods to develop pathways (models, narratives, other tools)
Venue:	Session A1: Social and Economic Development - SDGs 8, 9 and 11
Theater	Chair: <i>Valentina Bosetti, FEEM</i>
	Rapporteurs: <i>Lorenza Campagnolo, FEEM (Lead) and Sebastian Busch, IIASA</i>
Venue:	Session A2: Basic Human Needs - SDGs 1, 2 & 3
Marschall	Chair: <i>Sander van der Leeuw, ASU</i>
Room I	Rapporteurs: <i>Heleen van Soest, PBL (Lead) and Raya Muttarak, IIASA</i>
Venue:	Session A3: Earth Preconditions - SDGs 13, 14 & 15
Marschall	Chair: <i>Carlos Nobre, CEMADEN</i>
Room II	Rapporteurs: <i>Jörn Schmidt, CAU (Lead) and Frank Sperling, IIASA</i>
Venue:	Session A4: Sustainable Resource Use - SDGs 6, 7 & 12
Franz Josef	Chair: <i>Jae Edmonds, JGRCI</i>
Room	Rapporteurs: <i>Alexander Popp, Potsdam Institute for Climate Impact Research (Lead) and Apollonia Miola, JRC</i>
Venue:	Session A5: Universal Values - SDGs 4, 5 & 10
Kaminzimmer	Chair: <i>Guido Schmidt-Traub, SDSN</i>
	Rapporteurs: <i>Eric Zusman, IGES (Lead) and Kathryn Smith, CSIRO</i>
Venue:	Session A6: Governance and Partnerships - SDGs 16 & 17
Kronprinz	Chair: <i>Dirk Messner, DIE</i>
Rudolf Room	Rapporteurs: <i>Caroline Zimm, IIASA (Lead) and Julia Leininger, DIE</i>
18:30-21:00	<i>Social Event at the Laxenburg Conference Center</i>
21:00-21:30	<i>Transportation to Hotel (Albertinaplatz) in Vienna</i>

Tuesday, 4 April

08:00	<i>Transportation from Hotel (Albertinaplatz) to Laxenburg Conference Center</i>
09:00-12:00	<p>Plenary Session III: Brief Reports of Parallel Sessions “A” Moderator: <i>Detlef van Vuuren, PBL</i></p> <p>Parallel Session Chairs and Rapporteurs</p> <ul style="list-style-type: none"> • Session A1: Social and Economic Development - SDGs 8, 9 & 11 (10 min) <i>Valentina Bosetti, FEEM, Lorenza Campagnolo, FEEM and Sebastian Busch, IIASA</i> • Session A2: Basic Human Needs - SDGs 1, 2 & 3 (10 min) <i>Sander van der Leeuw, ASU, Heleen van Soest, PBL and Raya Muttarak, IIASA</i> • Session A3: Earth Preconditions - SDGs 13, 14 & 15 (10 min) <i>Carlos Nobre, CEMADEN, Jörn Schmidt, CAU and Frank Sperling, IIASA</i> • Session A4: Sustainable Resource Use - SDGs 6, 7 & 12 (10 min) <i>Jae Edmonds, JGRCI, Alexander Popp, Potsdam Institute for Climate Impact Research and Apollonia Miola, JRC</i> • Session A5: Universal Values - SDGs 4, 5 & 10 (10 min) <i>Guido Schmidt-Traub, SDSN, Eric Zusman, IGES and Kathryn Smith, CSIRO</i> • Session A6: Governance and Partnerships - SDGs 16 & 17 (10 min) <i>Dirk Messner, DIE, Caroline Zimm, IIASA and Julia Leininger, DIE</i> <p>Feedback: <i>Jeffrey Sachs, SDSN</i> (5 min)</p> <p>Discussion</p> <p>Setting the stage for Parallel Working Sessions</p> <ul style="list-style-type: none"> • Overall Objectives and Guidance, Detlef van Vuuren, PBL (10 min)
12:00-13:00	<i>Lunch in the Conference Center – Oval Room</i>
13:00-15:00	<p><u>Parallel Working Sessions “B” (Systems Perspectives)</u> Parallel sessions to discuss from a systems analysis perspective backcasting approaches for sustainable development pathways; the analysis should be informed by the target space for the SDGs. The following areas should be covered:</p> <ul style="list-style-type: none"> • Key systems, their characteristics and relationships to the SDGs (e.g., energy system: related to climate, human health, and water and land-use); • Possible trade-offs and synergies among main system indicators with other SDGs; • Branching points in alternative sustainable development pathways.
Venue:	Session B1: Water and Aquatic Systems, SDGs 6 & 14
Kaminzimmer	Chair: <i>Belay Begashaw, SDGC/A</i>
	Rapporteurs: <i>Peter Burek, IIASA (Lead) and Jörn Schmidt, CAU</i>
Venue:	Session B2: Agriculture, Food and Terrestrial Systems, SDGs 2 & 15
Marschall	Chair: <i>Michael Obersteiner, IIASA</i>
Room I	Rapporteurs: <i>Frank Sperling, IIASA (Lead) and Heleen van Soest, PBL</i>
Venue:	Session B3: Human Capacity, Health and Institutional Systems, SDGs 3, 4, 16 & 17
Marschall	Chair: <i>Thomas Hale, Oxford</i>
Room II	Rapporteurs: <i>Kathryn Smith, CSIRO (Lead) and Julia Leininger, DIE</i>

Venue:	Session B4: Energy and Climate Systems, SDGs 7 & 13
Theater	Chair: <i>Roberto Schaeffer, COPPE</i> Rapporteurs: <i>Apollonia Miola, JRC (Lead) and Caroline Zimm, IIASA</i>
Venue:	Session B5: Cities, Infrastructure and Consumption Systems, SDGs 9,11 &12
Franz Josef	Chair: <i>Jerry Miller, NAS</i> Rapporteurs: <i>Tomoko Hasegawa, NIES (Lead) and Owen Gaffney, SRC</i>
Room	
Venue:	Session B6: Economic Development and Equity, SDGs 1, 5, 8 & 10
Kronprinz	Chair: <i>Jean-Pascal van Ypersele, UCLouvain</i> Rapporteurs: <i>Sebastian Busch, IIASA (Lead) and Lorenza Campagnolo, FEEM</i>
Rudolf Room	
15:00-15:30	<i>Coffee break</i>
15:30-18:30	Plenary Session IV: Brief Reports of Parallel Sessions “B”
Venue:	Moderator: <i>Keywan Riahi, IIASA</i>
Theater	Parallel Session Chairs and Rapporteurs
	<ul style="list-style-type: none"> • Session B1: Water and Aquatic Systems, SDGs 6 & 14 (10 min) <i>Belay Begashaw, SDGC/A, Peter Burek, IIASA and Jörn Schmidt</i> • Session B2: Agriculture, Food and Terrestrial Systems, SDGs 2 & 15 (10 min) <i>Michael Obersteiner, Frank Sperling, IIASA and Heleen van Soest, PBL</i> • Session B3: Human Capacity, Health and Institutional Systems, SDGs 3, 4, 16 & 17 (10 min) <i>Thomas Hale, Oxford, Kathryn Smith, CSIRO and Julia Leininger, DIE</i> • Session B4: Energy and Climate Systems, SDGs 7 & 13 (10 min) <i>Roberto Schaeffer, COPPE, Apollonia Miola, JRC and Caroline Zimm, IIASA</i> • Session B5: Cities, Infrastructure and Consumption Systems, SDGs 9, 11&12 (10 min) <i>Jerry Miller, NAS, Tomoko Hasegawa, NIES and Owen Gaffney, SRC</i> • Session B6: Economic Development and Equity, SDGs 1, 5, 8 & 10 (10 min) <i>Jean-Pascal van Ypersele, UCLouvain, Sebastian Busch, IIASA and Lorenza Campagnolo, FEEM</i>
	Feedback: <i>Veerle Vandeweerd, G-STIC</i> (5 min)
	Discussion
18:30	<i>Adjourn and transportation to Hotel (Albertinaplatz) in Vienna</i>

Wednesday, 5 April

08:00	<i>Transportation from Hotel (Albertinaplatz) to Laxenburg Conference Center</i>
09:00-12:00	Plenary Session V: Way forward
Venue:	Chairs: <i>Elmar Kriegler, Potsdam Institute for Climate Impact Research, Keywan Riahi,</i>
Theater	<i>IIASA, Detlef van Vuuren, PBL</i>
	Feedback and Contributions from participants
	Global Environment Facility, Naoko Ishii, GEF (5 min)
	<ul style="list-style-type: none">• Summary of the conceptual framework• Integration and how to improve the target space• Dynamics of backcasting from target space to SDGs• Quantifications and storylines to be used for pathways• Alternative pathways, trade-offs and synergies• Development of protocols for tools to be used in TWI2050• Formation of Working Groups• Community building, Dissemination and Outreach• Work plan and process• Conclusion
12:00-13:00	<i>Adjourn and Sandwich lunch</i>
13:00	<i>Transportation to Hotel (Albertinaplatz) in Vienna</i> <i>Transportation to Airport (upon request)</i>

List of Participants

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Thomas Hale University of Oxford UK
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Tomoko Hasegawa National Institute for Environmental Studies (NIES) and International Institute for Applied Systems Analysis (IIASA) Japan
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Matthias Jonas International Institute for Applied Systems Analysis (IIASA) Austria
Pavel Kabat International Institute for Applied Systems Analysis (IIASA) Austria
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Erica Key Belmont Forum France

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