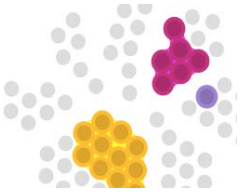
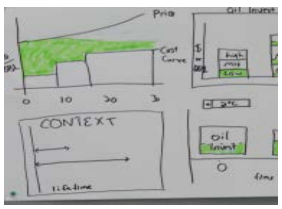
Summary Minutes

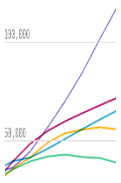
PIK Potsdam

May 30th-31st, 2018

2nd SENSES Co-Production Workshop







The project SENSES is part of the European Research Area for Climate Services (ERA4CS), an ERA-NET initiated by JPI Climate. It is funded by BMBF (DE), BMWFW (AT), NWO (NL), FORMAS (SE) with co-funding by the European Union (Grant 690462). (ERA4CS).

CONTENTS

Attendees ..... **Error! Bookmark not defined.**

Summary 3

DAY 1 4

- Welcome 4
- Revisiting user needs 4
- Stakeholder input: Mutual interviews and persona building 4
  - Policy Panel 5
  - Finance Panel 6
  - Business Panel 6
- Session: Understanding scenarios 7
  - Presentation web-based scenario primer 7
  - Introduction co-production of scenario knowledge 7
  - Overview mitigation and impact scenarios 8
- Session: Scenario navigation 8
  - Results 8
    - Policy Panel 8
    - Business Panel 10
    - Finance Panel 11
  - Feedback in plenary 13

DAY 2 13

- Session: Learning from Scenarios – Visualization workshop 13
  - Results 14
    - Policy & business panel 14
    - Finance panel 15
  - Feedback in plenary 16
- Feedback, Wrap-up 16

SUMMARY

ABOUT THE SENSES PROJECT

The SENSES project aims to develop tools and approaches to make the new generation of climate change scenarios more accessible and comprehensible. This new type of climate change scenarios builds on 3 interconnected pillars:

- Climate change projections
- Climate impact projections
- Mitigation scenarios

Central needs for this step are identified in a co-creation process between scientists and decision makers from policy and business.

THE WORKSHOP

In this workshop, scenario users co-created capacities to find, use and interpret scenarios together with scenario experts. The workshop had a high interaction rate. Accordingly, all sessions were either direct co-production units where stakeholders produced first results together with domain experts or the sessions consisted of intermediate project- results presented by the consortium (developed since the kick-off meeting, Oct 2017).

A joint progress on methodologies and tools was made to empower stakeholders to extract valuable information contained in scenario results and to answer their questions.

Three user panels were addressed

- POLICY: national and international climate policy makers,
- BUSINESS: businesses, particularly those with long term planning horizons,
- FINANCE: financial institutions, with a focus on climate-related risk assets

In the first interactive session the stakeholder panels developed a common *persona* for their respective panel. This persona delivers a user stereotype on whose properties all stakeholders in their panel agree on with all their experience and expertise. It also served as a very dense unit for stakeholders to exchange among each other.

During the session 'Scenario Navigation' participants collectively built a bridge from the world of stakeholders to the world of scenarios via identifying relevant questions and mapping meta-indicators for navigation to the scenario of interest.

In the final visualization session the stakeholders were asked to perform a perspective switch and to take the role of a person wanting to inform about scenario content. Therefore they could pick a question and audience of their choice and co-produce first visualization drafts together with domain experts.

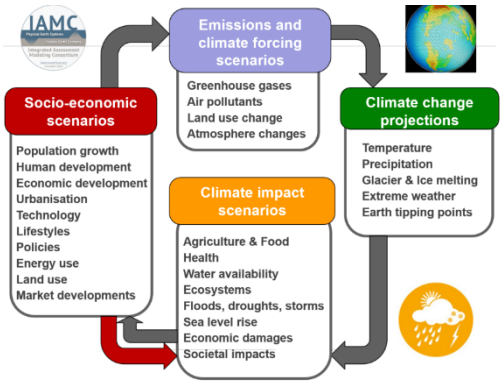
We cordially thank all the stakeholders for their interest, expertise and inspiration which made the SENSES workshop a success!

[Please download the full workshop Agenda here]

DAY 1

WELCOME

Elmar Kriegler (PIK Potsdam) emphasized in his a presentation on climate change scenarios that they are more relevant than ever. They play important roles for achieving the Paris Agreement, in general for climate change assessment, climate-related financial risk, and also for business opportunities. However, he also stresses the fact that we have to keep in mind that scenarios are NOT predictions of the future, but a means for exploring possible futures.



He explained the SENSES aim, namely making climate change scenarios more accessible and usable for policy, businesses, and regions.

At the end of the project a Climate Change Scenario Toolkit will provide scenario users with visualization tools and guidelines on co-production.

[Link to *presentation*]

REVISITING USER NEEDS

Cornelia Auer (PIK Potsdam) summarized the results towards elicitation of user needs that were collected since start of the project in September, 2017. Three main components are pursued for now: 1. Stakeholders have a need for fundamental understanding – "What do scenarios mean, what can they tell us?". This communication has to take place between science and stakeholders. But also stakeholders need to communicate this to their users. 2. There is a demand for orientation in scenario spaces, ideally in form of a typology and expressive characteristics. 3. Indicators are highly valued, as they can be a means connecting the world of stakeholders to the world of scenarios.
Along the following use cases these requirements can be achieved: Link between policies/ pathways and their implications, actor specificity, business / finance perspective, and link between global and local scenarios.

Essentially, SENSES is not about making new scenarios for a specific questions but rather about using the plenty that is there.

[Link to *presentation*]

STAKEHOLDER INPUT: MUTUAL INTERVIEWS AND PERSONA BUILDING

This session had the primary objective for the present stakeholders and consortium members to get to know each other. As a second important goal communication among stakeholders should be promoted and fostered.

Introduction – The stakeholders were asked to team up in pairs. First they interviewed themselves mutually and then presented their partner to the entire audience. The consortium introduced themselves subsequently in a short round to the stakeholders.

Persona building – In order to find out about the needs and motivations of the present stakeholders in a manageable manner and again to foster exchange the stakeholders were asked them to team up in a panel of their choice: either the policy panel, business panel, or finance panel. Each panel created a persona for their group, where a persona can be considered as a stereotype of user, an extreme in order to allow high identification for users, but also for service developers. They help to understand needs, experiences, behaviours and goals. The great advantage is that such a persona is a rather simplified character, but is directly co-created by the stakeholders. Thus, it summarizes properties that the stakeholders would agree on with all their knowledge and experience.

For this purpose the panel groups define for their persona the following attributes: Name, age, and position. Further they answer the following questions for the fictive persona:

1. What are the interests and motivation of …?
2. With whom does … interact?
3. Which information does … need to deliver to this people?
4. What is the main source of information for …?
5. How is success in the world of … measured?
6. What are the challenges and needs for …?

[Link to *presentation*]

RESULTS

POLICY PANEL

Persona: Gaia (40) Head of delegation

1. What are the interests and motivation of …?	2. With whom does … interact?	3. Which information does … need to deliver to this people?
- Reflecting government position and stakeholder interests - Making progress in global diplomacy - Finance	- Other negotiators - Home ministries / associated departments - Interest groups (non-party stakeholders) - Scientists - Constituents - Own advisors - IPCC, UNFCCC, IPBeg	- Government position - GHG inventories, NDC implements - Cost of actions (mitigation/adaptation) - Risks - Implications of particular decisions
4. What is the main source of information for …?	**5. How is success in the world of … measured?**	**6. What are the challenges and needs for …?**
- Adopted text (PA, etc. …) - Advisor/secretariat - Briefings - Media - Google - Executive summaries	- Addressing climate change/Archiving PA goals/SDGs - Reflecting position in text - Fairness in process	- Too much information - Understanding scenarios/access to understandable and relevant information - Understanding uncertainties - Common language - Media/influencers - What action makes biggest difference? - Pressure

FINANCE PANEL

Penny (22, with 26 years work experience) Analyst in an asset management company

1. What are the interests and motivation of …?	2. With whom does … interact?	3. Which information does … need to deliver to this people?
- Maximize return while keeping customers alive minimize down-size risk	- Director - Clients - Rating agencies - Investees	- Scenario analyses - Sector specific information - Regional specific information - Financial analyses
4. What is the main source of information for …?	**5. How is success in the world of … measured?**	**6. What are the challenges and needs for …?**
- Bloomberg - Senses studies - Clients' information - Investees' information	- Money, "Pennies for Penny" - Long-term relationship (clients)	- Understanding of the world to cope with (input) - Regional and temporal scales to factor in - All variables to factor in - Scenarios on future believes

BUSINESS PANEL

Persona: Elona Musk (37) Strategist and doer

1. What are the interests and motivation of …?	2. With whom does … interact?	3. Which information does … need to deliver to this people?
- Change the world - Money from the public sector for funding - Prove business opportunity - Create value - Make money - Long term and short term success of business	- Herself: very self confident, wants to create - Her teams - Action networks (global, wherever worthwhile) - Investors - Policy makers - Leadership team	- Granular detailed visions of future - Risks and opportunities behind scenarios - Assumptions - Credibility - Raw data - Term specific data
4. What is the main source of information for …?	**5. How is success in the world of … measured?**	**6. What are the challenges and needs for …?**
- New business models aligned with local scenarios - Specific media - Relevant business and government sources	- Brand value - Action - $$$ - Values	- Costs: proving the business case - Finding the gold - Understanding the complexity - Hiring the people - Lack of specificity of scenarios - Up to data – new data - Amount of data

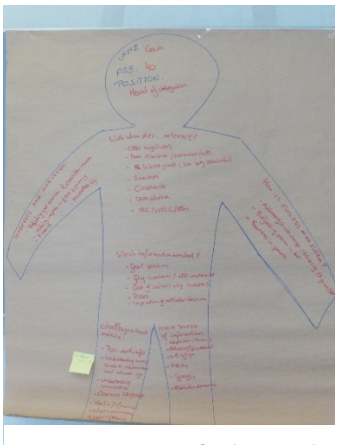


Fig. 1 Gaia, persona of policy panel

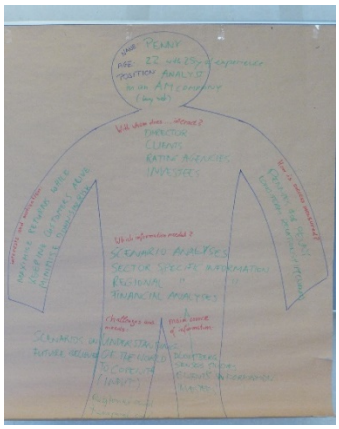


Fig. 2 Penny, persona of finance panel

Fig. 3 Elona Musk, business panel

SESSION: UNDERSTANDING SCENARIOS

PRESENTATION WEB-BASED SCENARIO PRIMER

Fidel Thomet(FH Potsdam) presented the current state of the Primer, developed by FH Potsdam. The primer introduces scenarios to people of diverse knowledge levels and comprises he following chapters:

- Chapter 1 – Climate Community Scenarios
- Chapter 2 – It starts with socioeconomics
- Chapter 3 – The SSP-RCP Scenario Framework
- Chapter 4 – Scenarios and Models
- Chapter 5 – More Scenarios

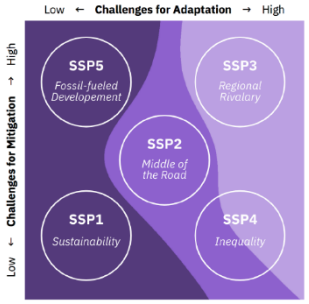


Fig. 4 Role of education in SSPs

During the discussion the variety in the group of stakeholders showed the spread of needs due to different user groups. The stakeholders agreed on the fact that the Primer needs a concrete focus on who is the addressee, what to expect as information, and what is not included. In general, the primer was very well received in terms of a communication and educational tool. Some stakeholders expressed the wish for more modular entry to the individual chapters. Everybody agreed that the topic of uncertainty needs to be addressed.

[Link to snapshots of *presentation*]

INTRODUCTION CO-PRODUCTION OF SCENARIO KNOWLEDGE

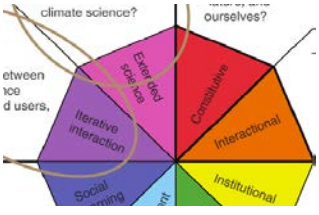


Fig. 5 Different perspectives of co-production in climate change

Kasper Kok (Wageningen University) gave an overview of state of the art in co-production techniques. From the different approaches in literature, he showed their approach to tailor a technique for their needs of regional scenarios.

The audience highlighted the difficulties in finding the right stakeholder for their needs in the regional approach.

[Link to *presentation*]

OVERVIEW MITIGATION AND IMPACT SCENARIOS

Volker Krey (IIASA, Laxenburg) presented the scope of global mitigation scenarios and respective studies that will be relevant for the SENSES project. To allow easier access to these scenarios SENSES will provide fact sheets for each study that answer in a short, concise manner the essential of each study. He also proposed a way to navigate to relevant studies via meta-indicators. These meta-indicators will also be developed in the course of the SENSES project and were topic of the session below.

After that Jan Volkholz (PIK, Potsdam) gave an introduction about impact scenarios incorporated by the ISIMIP project. Impact scenarios can be of high importance, e.g. in identifying physical risk factors.

The Stakeholders were satisfied with the overall structure and articulated that this approach would support them in their daily work.

[Link to *presentations:* Volker Krey, Jan Volkholz]

SESSION: SCENARIO NAVIGATION

Elmar Kriegler (PIK Potsdam) gave an introduction to the general idea of navigating to the scenarios of question via meta-indicators. Theses meta-indicators should serve as a bridge to steer users to the sets of scenario pairs answering their questions. His presentation also summarized the idea how to navigate the future via scenarios and which scenario characteristics are key.

The stakeholders were asked to split into their panels to discuss the following questions:

- What questions would you have if you met scenario experts answering YOUR questions?
- What scenario meta-indicators would you like to have available to select scenario sets to answer your question?

[*Link to presentation*]

RESULTS

POLICY PANEL

Questions

The discussion in the policy panel was very lively and touched upon many topics. One central question was that of timing and time horizons of scenarios. Mostly all stakeholders would desire scenarios looking more into short term developments for the next 5-10 years. Novel categories like energy-growth in non-G20-countries or security would be also of high interest.

Specific question clusters

1. Timing	2. Physical risk / costs	3. Demand side
- What is the timeframe for implementing/deploying a particular policy/technology - What happens until 2030 and how does it impact post-2030?	- What are macroeconomic costs (share of GDP) of climate impacts?	- What can demand side measures contribute?

4. Trade-offs and synergies	5. Sectors	6. Adaptation and mitigation dynamics
- Trade-offs between different mitigation measures and other factors, e.g. the SDGs - What are trade-offs between ambition, impacts and mitigation side-effects? - What are trade-offs between 1.5 and 2 degrees? And between ruling out not ruling out nuclear? Bioenergy? - What policies can reduce trade-offs of mitigation options? - What measures will really count, which ones are desirable but not enough? - Links to SDGs?	- How do others scenarios/pathways compare to ours? Which sectors are they able to cover? - Feasible scale of mitigation in energy sector, co-benefits for society and the environment - Are the lowering costs of renewables included in scenarios? - Options as results of changing technology or costs? - What are my mitigation options if I don't want to employ technology *X*/option *Y*?	- Pricing adaptation needs is a prerequisite for assessing consequences of different mitigation levels. Inability to assess adaptation costs in developing countries will underestimate costs of failed mitigation. - What are the limitations of adaptation? - Role of oceans? Mitigation and adaptation. Loss and damage.

7. Regions
- How do we bring in local and indigenous knowledge in regional scenarios? - How do different pathways affect a country's competitiveness? - What are the most vulnerable regions? - Scenarios relevant for city-level decision making? - Distribution of impacts and side-effects of adaptation

Meta-indicators

The stakeholders emphasized that meta-indicators are required at the different levels: by study, scenario, and model.

Specific meta-indicator clusters

1. Scenario	2. Study
- Rate of change (tech, GHG, other aspects) - Timeframe - Level of policy decision (global/regional/national/local) - Amount of CO2 removal and removal method - Level of water withdrawal	- Additional land requirement for mitigation - Food prices, nutrition requirements, water use - Existing SDG indicators - Impacts indicators for different sectors - Hazard indicators

3. Model	4. Transparency
- Sector (energy, buildings..) - More granular/grid level information. - Transition of carbon intense regions. LULUCF	- Transparency on input assumptions

Business Panel

Questions

The stakeholders discussed the central question when are windows of opportunity closing? How quickly do we need to act to achieve a well-below 2 degree target? Evaluation of current policies and their impact against scenarios is highly desirable. Also trust building by revealing deep knowledge was requested.

Specific questions
- In what year will it be impossible to achieve 2 degree / 2050 targets? - Impact of policy "switch"? - Review pledge plans against scenarios to identify new options (or shortcomings) - Energy policy learning included? - Asset-related metrics of scenario assumptions? - What studies are these scenarios linked with? Where to get it? - How are the SSPs narratives used? How stylised are the scenarios? - Land afforestation scenarios available? (are they believable and thought-through?)

Meta-indicators

The meta-indicator discussion identified two clusters: that of required structural information and indicators about scenario output variables.

Specific meta-indicators clusters

1. Structural information	2. Output
- Price formation (assumptions) in scenarios - Calibration year - Coverage of sectors producing GHGs - Sectoral, spatially detailed information available? - "Politics of adaptation - easier to develop integrated policies (infrastructure, water, afforestation, energy)	- Energy mix developments until 2030 - Peak and neutrality year - Scope of emissions - Evolution of energy /of carbon price until 2030 - Any novel technologies included in new scenarios

Finance Panel

Questions

Generally, financial stakeholders are looking for scenarios that allow
a) aligning companies/financial portfolios with different levels of mitigation and
b) answering risk questions at the physical asset level, financial system level and portfolio level.

Specific question clusters

1. Overarching questions that the finance sector needs answers to	2. Transition risk	3. Cluster physical risk
- Are single investments/portfolios/markets aligned with/contributing to reach climate goals? - Are portfolios/markets taking into account transition risks? - What are the impacts of climate change on portfolios/ markets/ assets/ specific loans? - Is the transformation from brown to green possible without damaging the financial stability? - How to integrate physical and transition risks into Stress Tests?	- What do climate models tell about economic change (not portfolio) - Will fossil fuel assets build today still be competitive to run in 2025/2030? - How does a transition towards a low carbon economy look like (preferably many scenarios and inclusion of a hard and soft landing) - Is the transformation from brown to green possible without damaging the financial stability? How to address brown assets? Is there an accepted green way forward even for brown assets? - What is the impact of climate change on credits? - What costs are allocated to the single developments?	- What are the impacts of climate change on portfolios/markets/assets?
4. Opportunities	**5. Technical questions**	
- What are the impacts of climate change on portfolios/markets/assets? - How much afforestation is cost effective at different long-term targets (e.g. 2°C) and timeframes (e.g. 2050)? - How much new solar, wind, etc. will be built by 2025, 2030/is needed for different temperature targets?	- How do you collect data (point in time or through the cycle)? - How to measure value changes? - How to translate scenarios in relevant metrics? - How can you translate the outcomes of a climate model into economic variables? Which models do you use? - How do you model the transition to a green technology? Which technology is best? Do you consider concentration risks?	

General observations

- Flows are often more relevant than stocks, but get reported less regularly? (e.g. How much new solar, wind, etc. *will be built* by 2025, 2030/is needed for different temperature targets, instead of total capacity in these years)
- Need of a proxy for technology developments to judge which scenarios are realistic
- Analysis should preferably be based on many scenarios (differentiation along many dimensions (socio-economic, technology, policy,…), including scenarios with a hard and soft landing (abrupt or gradual policy phase-in))

Observation by domain expert C. Bertram

- Some of the questions depend on very context-specific details, for which modeling assumptions are crucial (and never will be as sophisticated as country-expert assessment): e.g. will coal power plant x by competitive in country y in 10 years' time -> global scenarios not very useful
- For other questions, individual country policies are not as decisive, as the global total counts: e.g. what is the global market for PV / Wind / electric vehicles in 10 years' time -> global scenarios very useful

For more systemic questions (overall impact of climate change/mitigation policies on financial stability), scenarios offer in principle a comprehensive and consistent tool, but so far translation into relevant metrics not yet achieved.

Meta-indicators

Generally, financial stakeholders are interested in changes in the economy at a rather detailed level and look among other things for shock type scenarios, breakthrough technologies, flows and stocks and feedback into costs. Useful indicators include negative emissions levels, temperature targets, different levels of transition delay, commodity prices without subsidies, technology capital costs, policy measures beyond the carbon price.

Specific meta-indicator clusters

1. Model	2. Scenario assumptions / useful scenario variations	3. Results
- Time-horizon (also short term) - Technology beliefs - Regional granularity - Model version	- Level of ambition/target - Probability of reaching mitigation targets - (Non-CO2 price) policy variables - SSP underlying assumptions (land requirements, diets, etc.) - Policy year	- Price factors excluding subsidies - Speed of the transition - Investment costs by sector (parameters that drive the technology mix) - Commodity prices; producer prices and purchase prices - Capital cost and learning rate assumptions for new technologies (EVs, Solar PV, CCS, Storage) - Flows and stocks (see above) - Negative emission costs-effectiveness

4. Useful scenario variations

- Event based scenarios vs. temperature based scenarios

- Discontinuous/shock scenarios and breakthrough technologies (non-least cost)

- Flows and stocks

Observation by domain expert C. Bertram

- Indicators shall allow use of scenarios in stress tests (here many macro and micro data is used)
- Extreme events (war/crisis) are not explicitly represented in the models. Models rather represent climate impacts/influence on the economy in general.
- Many of the indicators /meta-data are available in principle (if not openly available in database/publication, modeling teams generally willing to provide additional data)

FEEDBACK IN PLENARY

- There is need of **indicators on scenarios**, but also **on models and studies**; they shall be easily identifiable e.g. via tags
- Information on **model version** should be included
- Information on the **short term** (5-10 year time frame) is most relevant for businesses. However, IAMs may not be the best tools for short-term analysis. A possible solution is the use of 'expert judgements' to bring global information down to the user-level.
- The **timeline until 2030** is essential as for policy and paves the way for reaching later targets.

DAY 2

SESSION: LEARNING FROM SCENARIOS – VISUALIZATION WORKSHOP

The overall aim of the visualisation workshop (Boris Mueller, FH Potsdam and team) was to focus on specific insights that can be gained from the scenario space. The stakeholders were given an opportunity to address issues that are directly related to their everyday work - and they should express these issues in a visual way.

The workshop was structured into four sections:

- introduction on data and data visualisation
- concept brainstorm
- visualisation workshop
- presentation

In the introduction, we looked at the available scenario data and at various visualisation techniques. After the introduction, we split the stakeholders in two teams - a policy & business team and a finance team.

The aim of the concept brainstorm was to identify relevant questions and issues than can be answered by the scenario data. Stakeholders from the policy and business panel developed a broad set of questions they wanted to answer by using scenarios. Some questions were highly specific to the needs of the stakeholders who proposed them. But there were also more general questions mostly regarding the relation between scenarios and goals like the SDGs and the Paris Agreements.

In the visualisation workshop, the task was to create a visualisation (static or interactive) of climate scenario data that is a visual representation of the issue discussed in the brainstorm. The participants in the workshop were asked to design the visualisations by just using pens and paper.

RESULTS

POLICY & BUSINESS PANEL

In the policy & business team, two questions were selected for the visualisation part of the session. The first one on trade-offs between mitigation options and SDGs, resulted in a heat table, which showed the relation between different types of pathways and SDGs.

	SDG1	SDG2	SDG3	SDG4	…	
Pathway A	◊	◊	◊	◊		
Pathway B	◊	◊	◊	◊		
Pathway C	◊	◊	◊	◊		
…						

Fig. 6 Connection pathways and SDGs

The matrix would be a tool for assessing which SDGs are fulfilled (green) and which SDGs are not fulfilled (red) by a range of pathways. This is an extremely oversimplified and overarching picture of the relationship between Agenda 2030 and mitigation/adaptation pathways. In reality the SDGs need to be interpreted locally and/or for a sector. The group discussed whether it would be possible still to have a global picture like this, indicating for instance regional differences with bars (longer bars = greater regional differences etc.)

Different spatial scales is one thing, different temporal scales is another thing. The scenarios usually focus on 2050 and beyond, while the SDGs are explicitly about 2030. Several participants were for instance sceptical to use SDG indicators beyond 2050 (uncertainties are to severe).

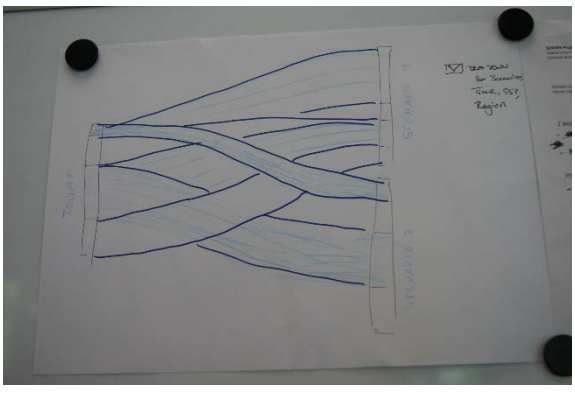


Fig. 7 Sankey diagram bioenergy

The second question we tackled was about the bio energy potential in Africa. This lead to a sankey diagram which visualised changes in land use allocation for multiple scenarios.

FINANCE PANEL

Financial stakeholders brainstormed on relevant topics/ questions for visualization:

- Long term and global mitigation scenarios
- Data on credit risks, impact on different sectors of the economy
- Technology on regional scale
- Costs and risks of the 2°C target, investment flows, financial stability, risk of concentration
- 2 degree investment pathways in OECD countries; e.g. show how total investment and different investment streams change under a 2 degree target (which shows how electrification will change including the difference between coal and green electricity
- Climate effects on the financial system (problem of confidentiality of data, that can only be shown in an aggregated form)

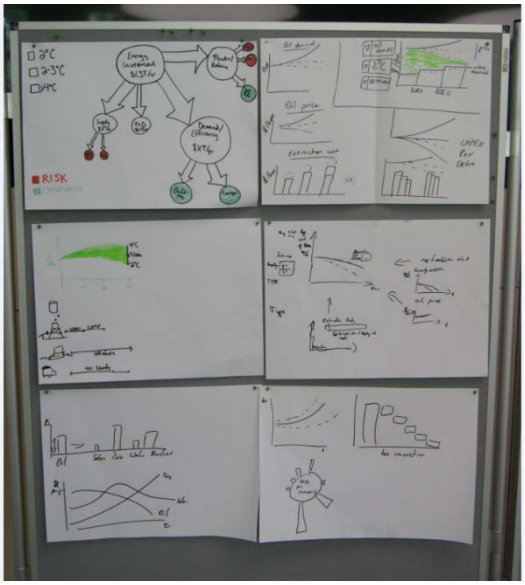


Fig. 8 Impact climate change policies on oil sector

Financial stakeholders agreed to produce first visualizations on the question: **What is the impact of climate change mitigation policies on the oil sector?**

The drawing exercise was accompanied by a discussion on the role of models and the potential of visualization. The REMIND-Magpie models can represent prices, quantities, losses per technology (e.g. oil). Visualization can help showing both risks and opportunities. For instance, if extraction costs rise also prices rise (risk), however, if the price of a technologies rises, another technology may get cheaper (opportunity).

Stakeholders came up with one drawing that brings together best visualization ideas.

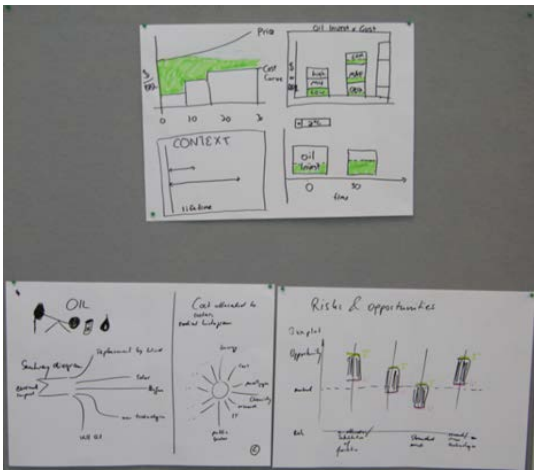


Fig. 9 Summarizing visualizations

1. Lower left: provide context: not all oil investments are created equal: Very different timelines: shale projects anyway have very fast decrease of production -> only very short pay-back period, whereas offshore or tar sand projects are long-term investments (and conventional in between)
2. Upper left: The world market prices for oil increase more slowly with climate policy than without, or might even decrease under strong policies. Therefore profitability (wedge between price and extraction cost will decrease gradually, and especially for projects with higher-than average extraction costs).

3. Right side: Losses in oil sector due to climate policy are unevenly distributed across segments (shale, tar sands, offshore vs conventional), and thus regionally

FEEDBACK IN PLENARY

- **Granularity** is a key issue for all stakeholders
- Early **access to the SENSES Tool** would be very appreciated
- The session was useful to learn about other perspectives, a "**give and take**"
- It would be valuable to have a **cross-stakeholder discussion** at the next workshop
- The main takeaway of the session is the need for **communication, clarity and choice**

The results of the workshop provided several insights. Specifically, we were able to understand and describe the issues and questions the stakeholders are dealing with, when they use climate scenarios. Furthermore, the visualisation sketches provide us with information on the requirements and use cases for the visualisation toolkit.

FEEDBACK, WRAP-UP

Overall the stakeholders found the workshop very valuable. Also the exchange among stakeholders. All presented preliminary results were considered relevant – not equally to everyone, some have high interest in the primer whereas others are strongly interested in the fact-sheets and meta- indicator selector. There is a great curiosity about what the consortium will do with the workshop results and deliver until the next workshop. All stakeholders expressed the wish to be invited again and to be kept updated about intermediate results and prototypes.