



# Summary Minutes

# 3<sup>rd</sup> SENSES Co-Production Workshop

SEI, Stockholm Sweden

**May 21<sup>st</sup>-22<sup>nd</sup>, 2019**

## ATTENDEES

### Stakeholders

Eric Fee, UBA  
Joanna Post, UNFCCC (remote)  
Seth Monteith, Climate Works  
Chris Weber, WWF  
Elbers Christian, BaFin  
Philipp Haenle, Deutsche Bundesbank  
Alban Pyanet, Oliver Wyman  
Daan Koopman, 2° Investing Initiative  
Michael Hayne, 2° Investing Initiative  
Sini Matikainen, Bank of England  
Jessica Andrews, UNEP FI  
Stein Peer, IFC  
Anna Grochkowska, European Commission FISMA  
Ged Davis, World Energy Council  
Yannick Motz, GIZ  
Martin Rokitzki, Plan Adapt

### Observer

Hannah Helmke, Right. Based  
Timothy Carter, Finnish Environment Institute (SYKE) Finland  
Magnus Frumerie, SSFC

### Consortium

Cornelia Auer, PIK Potsdam, Scientific coordination, global mitigation scenarios, coproduction  
Nico Bauer, PIK Potsdam, Global mitigation scenarios, finance, global mitigation scenarios  
Henrik Carlsen, SEI Stockholm, Regional scenario studies, coproduction  
Daniel Huppmann, IIASA Laxenburg, Global mitigation scenarios, scenario exploration  
Kasper Kok, Wageningen University, Regional scenario studies, coproduction  
Volker Krey, IIASA Laxenburg, Global mitigation scenarios  
Elmar Kriegler, PIK Potsdam, Global mitigation scenarios, coproduction  
Boris Müller, Potsdam University of Applied Science, Visualization  
Jonas Parnow, Potsdam University of Applied Science, Visualization  
Sara Talebian, SEI Stockholm, Future Studies, Regional scenario studies  
Fidel Thomet, Potsdam University of Applied Science, Visualization  
Jan Volkholtz, PIK Potsdam, Global impact projections  
Nadia Zeissig, Potsdam University of Applied Science, Visualization

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### 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 were presented a range of communication modules (under development), asked for their feedback and included in further co-creation of these communication modules. 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

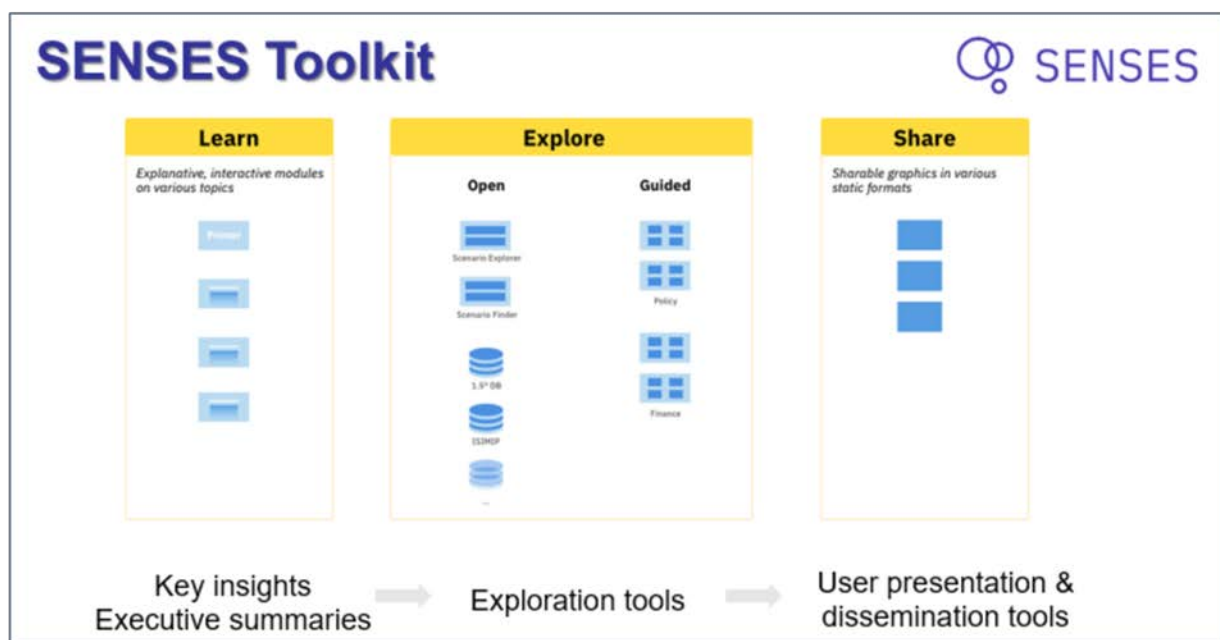
- POLICY: national and international climate policy makers,
- BUSINESS: businesses, particularly those with long term planning horizons,
- FINANCE: financial institutions, with a focus on climate-related risk assets

*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](#)]

## VISION AND CENTRAL TOPICS

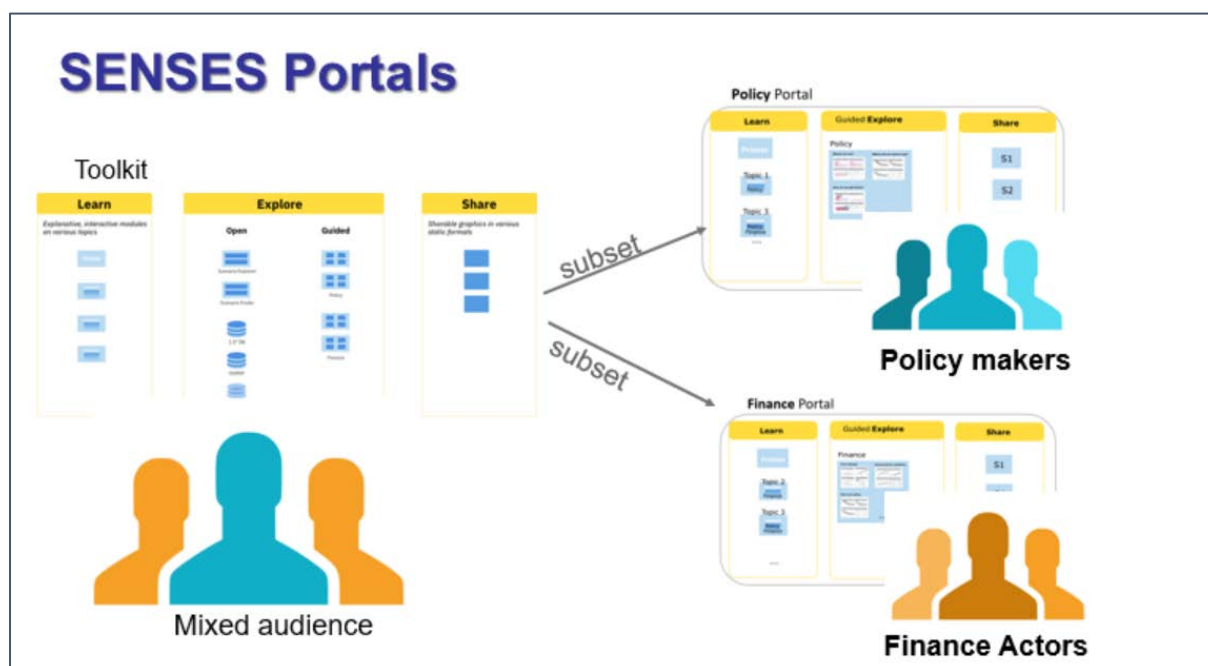
Elmar Kriegler (PIK Potsdam) introduces the central vision of the SENSES toolkit and portals, which will be described in detail below. As decisive key factor for successful scenario communication he emphasizes the need of stakeholders to contextualize climate change scenarios, i.e. how are they related to the world of the stakeholders and how can they answer *their* questions. He fosters again that essentially, SENSES is not about making new scenarios for a specific questions but rather about using the plenty that is there and make it available to the public.



The SENSES Toolkit is structured into three segments: learn – explore – share. All elements in the toolkit are called tools. This collection contains local, but also linked tools. It is a rather open collection with no restrictions, only that the tools should be categorizable into the three columns.

- Learn column: all tools within are called learn modules. The goal of learn modules is to provide insights and context on a certain topic. This can include tutorial material (e.g. the scenario primer) or information-telling (possibly including infographics) of key insights from selected scenario sets.
- Open explore column: will contain tools 'Open explore modules' for more advanced users, like the scenario finder or a link to the scenario explorer
- Guided explore column: contains 'Guided explore modules' (GEMs), which are collections of workspaces from the IIASA scenario explorer. The workspaces are constrained to a specific question – the set of scenarios and variables is fixed. However, the user has the possibility to go from there directly to the scenario explorer. The complexity from the learn modules to the guided explore modules is slightly increased. GEMs relate to a learn module, and allow users to explore a pre-selected set of scenarios and variables to deepen their understanding about the scenario outcomes and their associated uncertainties and contingencies.
- Share column: Share components can be individual modules that help the user to share her insights with a third person (e.g. via slides, figures or movies) or components that allow the user to export figures etc. from the learn modules and potentially also from the guided explore modules.

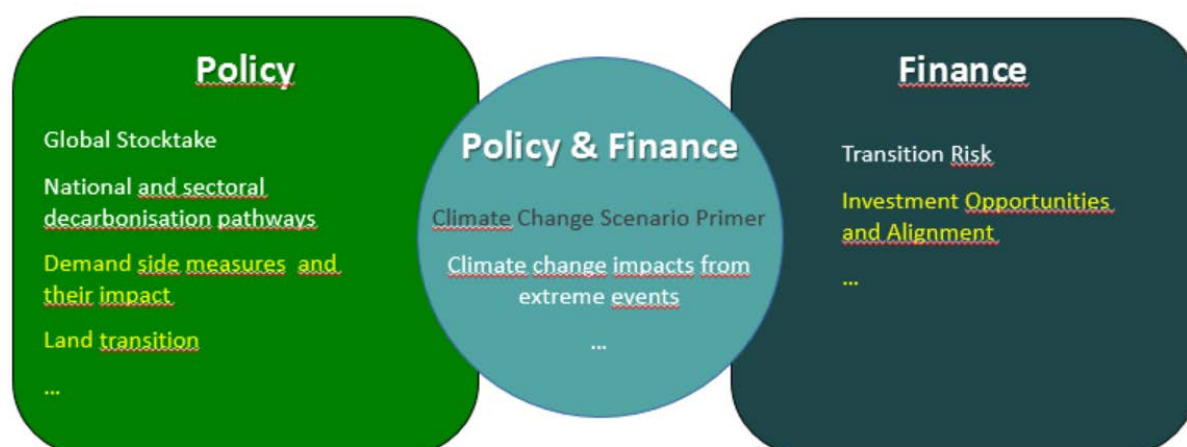
The content of the three columns is connected. For example, learn modules link to Guided Explore Modules (GEMs) and to shareable media files.



The portals are a collection of selected learn modules, GEMs and share components structured by the needs of a certain user-groups. The focus of SENSES will be on portals for the **policy** and **business & finance community**. The aim of the portals is to provide users holistic access to understand, explore and share key assessments in their domain that are informed by scenarios. Thus, they will pursue the idea of providing a scenario service in a more focussed manner.

To provide such holistic assessment, modules from all three columns will be selected and combined in meaningful ways. The substructure by the three functions columns - learn, guided explore, share - remains. For each column there will be a subset of tools according to the user-group. Please note – the ‘open explore modules’ from the toolkit will not be part of the portals as they don’t provide enough guidance.

## Candidate topics for learn modules to establish comprehensive policy and finance portals



Based on the co-production insights achieved before, the SENSES consortium has identified several central topics for the policy and finance stakeholder groups that will be pursued. Please note, some of these topics can certainly be of interest to both groups.

For the policy stakeholder group the following topics are of relevance

- Global stocktake - Are we doing enough? What are alternatives? What is the collective outcome of the NDCs in terms of global emissions in 2030? What strengthening of action after 2030 would be required to reach the 1.5°C and 2°C goals after targeting the NDCs by 2030?
- National and sectoral decarbonisation pathways - What are global and national sector transition roadmaps until 2050 consistent with the Paris climate goals?
- Demand side measures and their impact - What is the potential of behavioural changes, energy and food demand, etc?
- Land transition - What is the role of land use change for reaching the Paris climate goals (reducing agricultural emissions, eliminating deforestation and enhancing terrestrial carbon sink)? How can demands on the land be reduced and balanced?

For the finance stakeholder group the two following topics are considered:

- Transition risk - Under which conditions are specific sectors (e.g., oil and gas industry) exposed to greater/lower financial risks? Under which conditions can shocks occur? What is the role of aspects like delayed action, stringent policies, availability of CDR?
- Investment opportunities and alignment – Which investments need to be made to achieve stringent climate abatement? How can the transition be shaped in a positive way? In which sectors and for which technologies occur actual opportunities?

A joint and very important topic for both stakeholder groups is that of physical risk.

- Physical risk - What is the risk induced by permanent changes in weather patterns and extreme events? How much land area is affected by extreme events? How many people are exposed to those?

[Link to [presentation](#)]

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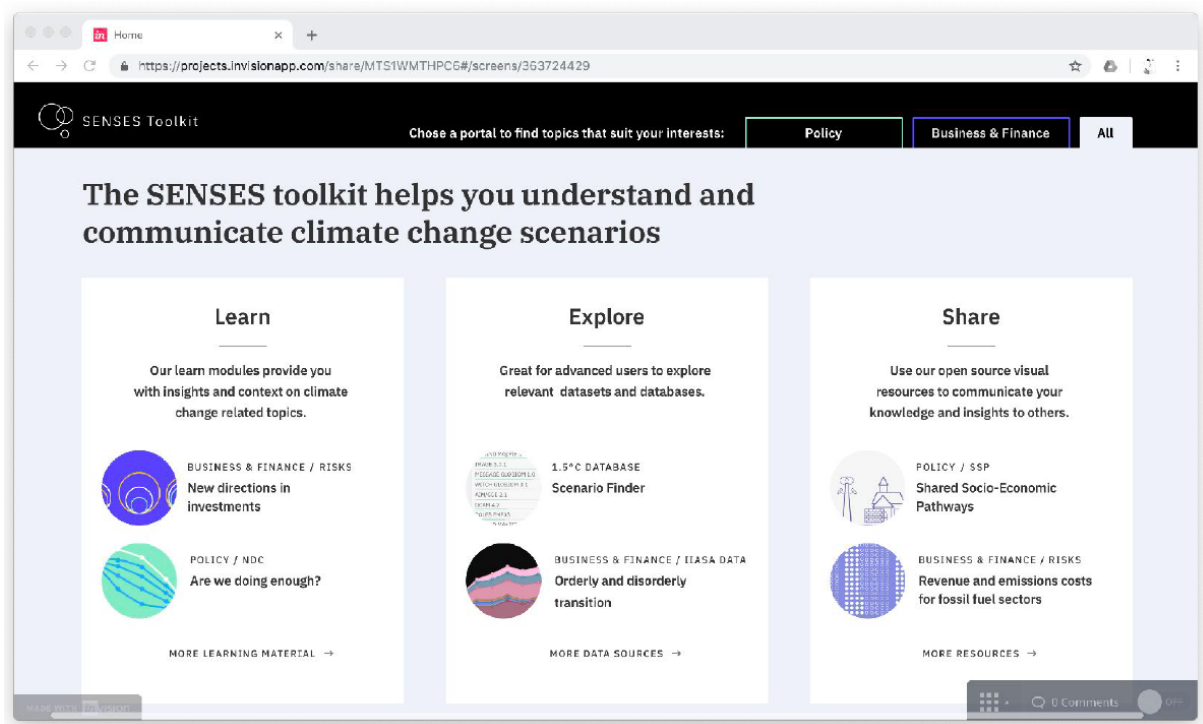
## IMPLEMENTATION AND DESIGN

Boris Mueller (FH Potsdam) gives a tour on the implementation and design of the SENSES toolkit and portals. He points out that within SENSES we want to equip stakeholders and users with expertise, tools and visualisations on climate scenarios. To produce trust and credibility he proposes the following key ingredients: visualization + explanation + data access + re-usable content.

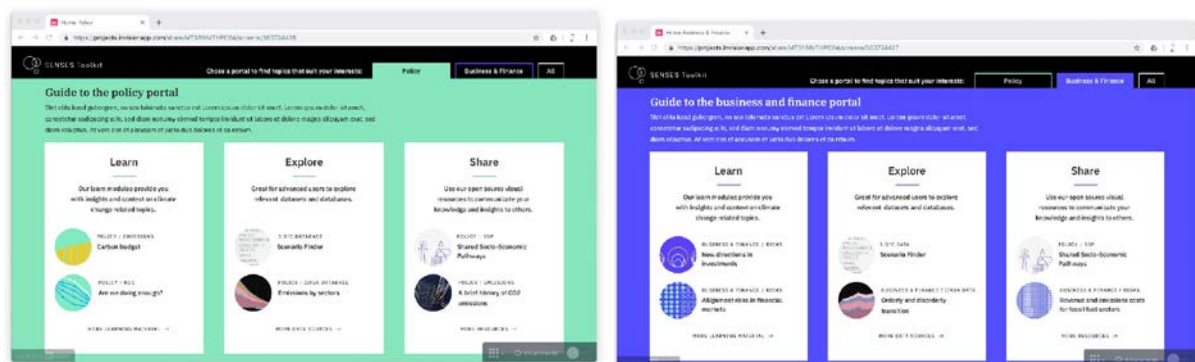
Boris Mueller also explains the idea of conducting continuous co-production with stakeholders outside the workshops, as well. Therefore he proposes working groups, 'tridems', consisting of a visualization expert, a domain expert and a stakeholder expert working on learn and explore modules for one of the topics mentioned above.

Finally, the stakeholders are presented the vision of the SENSES toolkit and portals' design.

Design SENSES toolkit:



Design SENSES portals:



[Link to [presentation](#)]

## DISCUSSION

After these presentations a lively discussion emerged. Below we summarized the central wishes that arose by the stakeholders.

**Interfacing the ‘outside world’** - A central question was, how SENSES can inform and interface to other groups. For other scenario building teams SENSES should convey that climate change *is* a central topic. Here the communication of scenarios like the SSPs and links to the [sustainable development goals](#) (SDGs) can be a lever. They are designed to integrate socio-economic and other dimensions into mitigation/adaption assessment. Current work is already bringing the scenarios into the SDG space. For the finance community the question is how the interface for a scenario “handover” should be shaped? How would banks use these scenarios? The project with Oliver Wyman of risk-factor pathways is a good example how this can work. SENSES will focus on providing tools and infrastructure.



**Physical risk** – Many of the stakeholders emphasized the great value of also gaining insight to the link of climate change impacts as physical risk to people but also to economy. Being able to quantify the potential damages and to prepare for appropriate adaptation measures has become even higher. SENSES is already working to provide an module on physical impact (see below).

**Scenario uncertainty** – For the sake of transparency it is important to convey the difference of scenario uncertainty versus statistical/model/parameter uncertainty. This could be topic of a basic learn module.

**Short-term disorderly scenarios** – The finance community is still very interested in what they call ‘shock scenarios’ from a transition risk perspective but also from an acute physical risk perspective. Here, SENSES will look into scenarios inspecting the consequences of climate regimes following the nationally determined contributions (NDCs) versus immediate stringent climate action. This focusses on the implications of orderly versus disorderly transition, but physical-risk-disorder approaches are not yet available.

## SESSION: PRESENTATIONS

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### SCENARIO ASSESSMENTS IN IPCC SR 1.5°C

Elmar Kriegler (PIK Potsdam) presents the central insights from the IPCC special report on global warming of 1.5°C (SR 1.5) to put the stakeholders on top of current research. In the context of mitigation the SR 1.5 states that pathways consistent with 1.5°C global warming with no or limited overshoot require immediate action, while high overshoot would allow for stabilised emissions until 2030. If mitigation is not strengthened compared to current NDCs 1.5° will be breached. Early action will reduce the need for carbon dioxide removal (CDR) technologies.

[Link to [presentation](#)]

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### SCENARIO EXPLORER

Daniel Huppmann (IIASA Laxenburg) gives a brief introduction on the [IAMC 1.5°C scenario explorer](#), which is a tool aiming to increase transparency and reproducibility of the SR 1.5. It is designed to get from the charts in the report to data behind them. Using a guest account one can get started immediately and will be guided by interface explanations in tooltips as well as predefined workspaces based on charts in the SR 1.5. Besides viewing and downloading figures and data the explorer also allows to modify, create, and share workspaces and gives direct access to documentation, bibliography, licensing information, release notes & corrections, contributing studies, and attribution.

[Link to [presentation](#)]

In the discussion the complexity of the explorer was pointed out, but SENSES learn modules and explore modules will give a soft landing (see below).

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### SCENARIO FINDER AND INDICATORS

Volker Krey (IIASA Laxenburg) and Jonas Parnow (FH Potsdam) present the scenario finder, which helps to quickly identify relevant scenarios and is designed based on use cases identified in the second stakeholder workshop. It allows to filter scenarios by qualitative metadata, results, and input assumptions. The first prototype is online and allows filtering by qualitative data, but will soon be updated to integrate value-based filtering and to enable to inspect a selection of the scenarios into the scenario explorer.

[Link to [presentation](#)]

## TOOLKIT AND PORTALS PROTOTYPE

Boris Mueller (FH Potsdam) presents the [prototype](#) of the SENSES Toolkit. He explains how it gives access to modules that allow you to learn about scenarios, explore them and to download and share insights. Specific finance and policy portals will give access to a subset of modules which are considered especially relevant for these sectors. The toolkit can be navigated vertically following the three columns *learn*, *explore* & *share*, as well as horizontally through links within the modules.

[Link to [presentation](#)]

## SESSION: INTRODUCTION TO LEARN MODULES

Nadia Zeissig (FH Potsdam) and Jonas Parnow (FH Potsdam) give an introduction to a policy and a finance module. The [policy learn module](#) is centred around the topic of global stocktake and explores how current decarbonization plans until 2030 relate to the long-term targets of the Paris Agreement. The [finance learn module](#) focusses on transition risk through climate change policies and explains the determinants of dynamics in the energy sector.

[Link to [presentation of JP](#) and [presentation of NZ](#)]



Figure: Snapshot Policy Learn Module

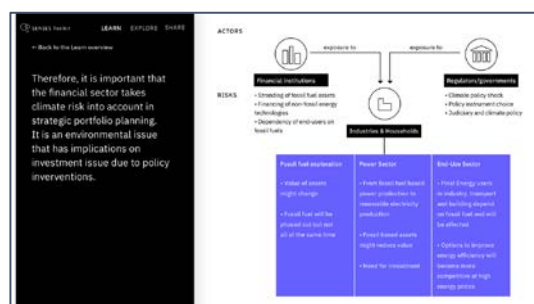


Figure: Snapshot Finance Learn Module

## RESULTS

### POLICY PANEL

#### General feedback points

- Step-by-step from simple to complex is good.
- Time horizon: 2050 of more interest, however showing the whole data until 2100 tells the whole story, e.g. about costs.
- The stakeholders need a baseline/reference. What are investments now? Always relative numbers should be provided that the user can better estimate the impact.
- Showing the implications of investments and costs would be desirable. What does that mean for other quantifiable indicators?
- Modules don't convey the associated risk – impacts, tipping points and possible thresholds should be shown together with the graphs. Examples would be large-scale impacts such as the loss of the Greenland ice sheet, or coral reefs disappearing. Ideally all reasons for concern should be shown.

- Temperature response/ trajectory should be added.
- National level is becoming more important, higher granularity here is very desirable.
- Should the scenario set be limited to 1.5 degree scenarios in the IAMC database? What about combining with more high-end scenarios to give reference?

### Direct feedback on learn module

- Show the disruptiveness of the graph, it should be pointed out that there needs to be a strong transition. The underlying paper uses 'disruptiveness indicators', but they might be difficult to communicate. A list of indicators on disruptiveness would provide valuable insight.
- Visualization of cumulative versus yearly bar graphs is not clear. It is unclear how it is presented.
- Text on graphs too small, it should not be buried in the notes.
- Unclear investment visualization: we need to use 'capacity addition', the investment indicator is causing confusion. Stakeholders struggle with the overall message: 'it is better to postpone action?'.

### Further topics

- Insights to land use change and impact: the assumptions on land use change for carbon dioxide removal (CDR) come with strong impacts. Insights to land use change and impact is critically important.
- SDGs: another learning module on the sustainable development goals would be very good. A link of mitigation scenarios with SDGs is good topic for a learning module.
- Real world data: a critical question is how much coal capacity is still in the pipeline? We should look in part of the energy system and include historical and current detail.
- Basic learn modules: conveying information on basic concepts, e.g. on the net versus gross CO2 accounting (CDR, biofuels, non-CO2). Another example are the given ranges: fossil fuel ranges of e.g. oil by scenario would be helpful.
- Demand side options: the stakeholders want more on what the individual can do. This should be framed as a choice rather than as uncertainty.

### Life after SENSES

Another topic that emerged, was that the stakeholders were already discussing how SENSES could live on after its project lifetime (August 2020). JPI Climate is planning 'Knowledge Hubs' to bring together information, data, and initiatives such as SENSES. The stakeholders emphasize we would need an editor for such an undertaking. It is a real activity that needs funding. Minimum would be a 'standing committee' taking care of its curation.

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## FINANCE PANEL

### General feedback

- Step-by-step guidance is good. Learn modules should take the intended user at the hand and explicitly work through an example.
  - Time frame: the stakeholders state that for them going beyond a 10 years time-frame is becoming problematic. One reason is also that things are getting too uncertain.
  - Resolution: the stakeholders are in strong favour of breaking down scenario data by country and sector. For the sectoral detail the global automotive industry, or mining industry could be a very good example.
- Specific use cases like the following could be tackled: When do our financial institutions stop financing

coal extractions? For this question regional or country specific data is interesting. This use case could then be expanded to e.g. when will industry stop investing in a certain type of engine.

- Reference scenarios: stakeholders need orientation, depicting reference scenarios can help here.
- Orientation: Orientation is helpful, which could be to start with concrete questions when selecting modules; 'If I have this question, which module should I use?'

#### **Direct feedback on learn module**

- Describe better the scope of variables that are used. Also time perspectives and geographical scales.

#### **Further topics**

- Physical risk: It would be good to have a learning module on physical risk. A lot of emphasis is on transition risks in the financial sector, but also physical risk play a role. More generally, how do different risk categories translate into each other, e.g. physical risks to financial risks? Would it be possible to articulate trade-offs between transition risks and physical risks? This would be very interesting, and especially comparing time-scales.
- Long discussion on uncertainties: A module about uncertainty, a pure one is highly desirable. Financial risk management is 100% about uncertainty management. It should be clear that scenarios are one tool for understanding one type of uncertainties.  
Two ways of talking about uncertainty are mentioned: i) what is likely to happen and what is the variance, and ii) what is not going to happen, i.e. what can be excluded.
- Model assumptions: Stakeholders need answers to the following questions - What are the underlying assumptions of the models used? What assumptions are scenarios having on land use, etc. ?
- Model characteristics: Also there is a need for model comparison, e.g. a quick snapchat on how a model works. What other model could I use if I don't agree with this model's assumptions? What is shared among models under a certain scenario and what are the differences?
- Business opportunities: How could business opportunities be identified using scenarios? This would also show a different perspective than the focus on the downside of things.

#### **General remarks**

- Translation of languages: There should be a translation of climate data into data finance people are using in their existing risk calculation frameworks. This includes the question on how to translate climate variables to financial variables. This is a demanding task and the questions arises who should take this role, the climate change community or the finance community? Or someone in between, consultants?
- Clarification of terms like 'plausibility', 'uncertainty', 'consistency': the stakeholders struggle to make sense of the slight differences in these terms. Here clarification would be highly appreciated.
- Clarification of term 'disordered transition': For financial institutions one definition is that this is a scenario that is not expected by most institutions. The currently presented scenarios don't seem to match this definition.
- Drawing from existing experience: Would it be possible to collect and show, how different user groups (TBD) have used scenarios? This would be potentially useful, but needs to be anonymous of course.
- Use of scenarios to assess interdependencies: The interdependencies between sectors, or risk types is important for the reverse engineering scenario planning. Assessing the input variable multidimensional space for a given output level.
- Usability: the stakeholders advice the consortium to invite people from the financial sector *before* they release the next version. In order to secure it being usable for these people.

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## FEEDBACK IN PLENARY

### Report back from policy

It can be stated that at least 3-5 extra modules are desirable:

- SDGs
- Land use
- Demand versus supply
- Impacts
- Fundamentals

The issue of continuity after end of SENSES was raised and encouraged to continue the work.

### Report back from finance:

The proposed work was in principle well received. Central users would be risk managers, not CEOs (who would be in policy group).

A mapping and translation to traditional categories is needed that speak to finance. The notion 'transition risk' should not be used.

The following extra modules would be of help:

- Uncertainty
- Physical risk by climate change impacts

The trade-off between granularity and robustness is an issue: whereas going down to the level of firms, sectors, and nations would be desirable it remains that this increases uncertainty. The higher granularity would be especially helpful for 'near term realism', i.e. the next 10 years.

There is the wish of modelling "disorderly transition scenarios", however this is not the scope of SENSES.

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## DAY 2

### SESSION: INTRODUCTION TO GUIDED EXPLORE MODULES

Cornelia Auer (PIK Potsdam) gives a presentation on the guided explore modules. They are connected to learn modules and provide more detailed information on the presented content. Variations in terms of scenarios and variables allow the user to explore a specific topic in more depth.

[[Link to presentation](#)]

### Connection learn ↔ explore module: example policy

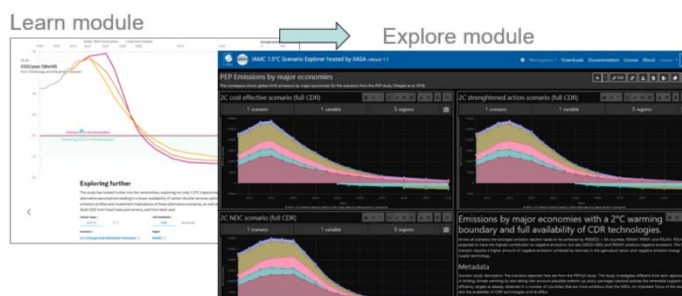


Figure: Snapshot - Connection between learn and explore module

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## RESULTS

### POLICY PANEL

The policy panel conducted an open discussion on the use of scenarios, focusing on the IAMC database, with much focus on the content of scenarios, rather than on the way it should be visualised.

#### **Feedback to the approach:**

- Benchmarking: the first issue that came up, was how GEMs could serve for benchmarking the data in the IAMC 1.5 database.
- Complexity and target audience: a lot of the discussion centred around the question how much complexity can be digested by the target audience and that users would potentially even need knowledge brokers to access the meaning of GEMs. Explicit feedback was, that e.g. users from the ministry would not be able to use GEMs without further guidance.
- Guidance: Related to the complexity issue all agreed that the users need good guidance to make sense of scenarios. Text panels with information and meta-data could be helpful, however not all are convinced if that is sufficient.
- Model background: the transmission of the basic idea of a model would be helpful.
- Critical assumptions: critical assumptions on population, GDP, etc. are needed to contextualise and evaluate scenario information. However their impact has to be made clear and should not be mixed up with effects by the inner logic of a model.
- Classification: to reduce the complexity a tree with scenario families could be a solution. Also marker scenarios would be very helpful, where the full information is provided.

#### **Direct feedback to the module:**

- Reference: to connect the content of a specific GEM and to give orientation always reference scenarios should be shown. E.g. a link with IPCC reports is needed (archetypes P1-P4). Also the spread of full variation is helpful. Finally the notion of 'conventional wisdom' was mentioned – the GEMs should allow to reference back to common facts.
- Context: Always knowing what can be seen in a GEM is a necessity: the information what model, what scenario, what resolution, what variable should be easily accessible.
- Interactive information would be helpful (e.g. displayed when hovering over a line).
- Visual representation better than text: e.g. for the given world regions a depiction on a map would be more helpful than providing this information via text. KNMI Climate Atlas might have good examples of how to visualise.
- Highlighting specific areas in a GEM-panel could help for orientation: e.g. crucial moment of turning point (when do scenarios peak?) is of high interest.
- Cryptic scenario abbreviations should be replaced by complete scenario names.

#### **General remarks:**

- Granularity: the usefulness of this information has a strong relation with granularity - higher thematic and regional (e.g. country specific) granularity would enhance the usability. Connecting with key policy makers is addressing big policy questions such as pollution in cities, security, costs, etc.
- Feedback: it would be optimal if the GEMs provided a feedback box for users to give suggestions for what they are missing.

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## **FINANCE PANEL**

#### **General feedback to the approach:**

- Model background: instantly a long discussion on comparing models emerges, and how to understand them. However, stakeholders don't have a single opinion here. Some argue for more understanding is needed in order to base decisions on these tools ('You need to know what the models are!'). Others argue that black boxes are more or less ok. Fact sheets about the underlying driving forces of scenarios would be useful. This would make it possible to assemble a set of scenarios for a specific use

case. Also including model characteristics.

Further, specific issues arise, about calibrating the data, which revision years are used or what principal modelling approach which is used.

- Orientation: a principle discussion about ‘finding the scenario that fits my purpose’ takes place. A ‘scenario choice wizard’ is also discussed - based on basic questions the wizard would filter the scenarios. Searching for the appropriate scenarios is a topic that has shown up in all co-production workshops and is pursued with the scenario finder tool and will not be accomplished by the GEMs. GEMs focus on a specific set of scenarios and variables to illustrate specific details to one topic.
- Simplification: some stakeholders argue that a holistic but simplified view on the real risks should be given, as this supports their communication. Thus, it is the task of the scientific community to communicate what the real risks are in a very condensed, simplified manner. Other stakeholders mention the counter argument that they need details, they need to communicate how complex the question is. It is the role of the intermediates to translate. Here, the common visualization mantra applies ‘Overview first, details on demand’.

#### Direct feedback to the module:

- Time-scale: due to huge inertia decisions today have an implication in 2050. The issue is to look at short term measures for long term consequences. Thus, a view only on the upcoming 10 years is not enough.

#### General feedback:

- Potential misuse: the stakeholders are strongly concerned with potential misuse if users are left alone with the choice of the right scenario(s). In this sense managers could find scenarios that give argument to continue as today. An investor could ask: ‘show me some scientific evidence that gas will still be en vogue in 2050’. Given the range of scenarios available in the database, in many cases it is possible to find isolated scenarios that could support specific business interests and empower ‘bad investors’ with stamps like IPCC and SENSES.  
For the concept of GEMs the danger is rather low, as they are designed to show a specific choice of scenarios in one panel and to give a comprehensive view on a topic.
- The scenarios can be used in context where they could be of legal importance. The courts just now start to learn about causality (of CC impacts) etc.

## SESSION: IMPACT SCENARIOS

Jan Volkholz (PIK Potsdam) and Fidel Thomet (FH Potsdam) give a presentation on impact scenarios and first visualization products. Jan Volkholz introduces impact models as major tool for climate impact research. They are quantitative computer model projections that simulate the important processes leading to climate change impacts.

Hereby, ISIMIP - the Inter-Sectoral Impact Model Intercomparison Project - offers a framework for consistently projecting the impacts of climate change across sectors and spatial scales. ISIMIP has focus topics that are chosen in consultation with relevant groups and stakeholders. ISIMIP started in 2012 and is currently in the 3rd round with a focus on “Climate impacts after Paris.” The next focus topic is “Impact



Figure: Snapshot Impact Module

attribution and adaptation". ISlpedia is an open climate-impacts encyclopedia with the main aim to communicate results from ISIMIP. ISlpedia is the SENSES sister project and SENSES will make curated results of ISIMIP accessible to its stakeholders.

Fidel Thomet shows first visualizations of an ISIMIP example analysis. The key questions is: How much of the Earth's surface faces heat waves, droughts, crop failure and floods in a 1.5°C warmer world? A scatterplot illustrates the land area affected by crop failure (per country). A further visualization result, [SENSES-Earth](#), shows the frequency of droughts at a 2° global warming level in Central America, the comparison of the frequency of extreme events (river floods, wildfires) at a 2° global warming level between two different climate models. In the future more contextual information will be given. The idea is to provide a learn module on this topic.

[Link to [presentation](#)]

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## DISCUSSION

### Feedback on further topics

- Vulnerability: there is a recurrent request is for vulnerability information and whether it is possible to turn this impact information into vulnerability information and to what extent? This will be the focus for the next ISIMIP round, but cannot be informed as easily now.
- Adaptation: The link to adaptation would be helpful. Ex-ante effectiveness evaluation of adaptation measures and policies, the inclusion of adaptive capacities, interdependency with other risks as well (multi-risk assessment) would enhance the usability of climate impact data. However, most of the activities for adaptation happen on regional scale. There is a limit to what can be done at global scale. Identifying hot spot areas that might be worthy of additional emphasis can be done. Also, from the perspective of transnational impacts the global data can give important insights. Adaptation will be covered in the next simulation round of ISIMIP, as well.
- Interactions between the sectors are critical. In agriculture certain yield changes dependent on irrigation processes. This information is in general covered by ISIMIP data. However, not all models cover all parameters.
- Overlaying with biophysical maps: Most of the interesting work that is going on in the finance community is overlaying the biophysical maps with information on asset bases of real estate, power plants, etc. However, most of this data is commercial data and expensive to get. Thus, making maps as usable as possible for users, like the insurance companies to download them and overlay them themselves would be a good use case.
- Reduction of data: It is important to not say only what is the most likely outcome but also what outcomes can be excluded. It could be a valuable to condense and provide the information for what is likely to happen but in which areas, in which sectors we may not be expecting things to remain constant.
- Link to SDGs: On the mitigation side there is more analysis coming up that is trying not to look at mitigation in isolation but to look at which potential impacts arise by mitigation policies on food security, access to water, etc. This would be also desirable for impact data.

### Feedback on the learn module

- It would be useful to have a video that shows changes over time rather than showing static images.
- The scatterplot might be misleading, it looks like you have less crop failure for 4 degree but it is actually that there are just fewer models. The largest potential for crop failure looks like it would be with 1.5°C.



## General feedback

- Quality control: Quality of model outputs is critical. At the upcoming ISIpedia kick-off there will be an assessment of the models, assigning models a grade. However, the grading will not be part of the first release.
- SSPs: The SSPs play a major role for ISIMIP and are of high interest to the stakeholders. ISIMIP uses SSP2, SSP1 and SSP5 in the next round. There should be transparency why e.g. not SSP3 is used. Further, there are a lot of studies that show us that it is the social economic conditions that make climate and material risk rise. It should be considered whether this could also be incorporated more into the transition risks assessments.

## FEEDBACK, WRAP-UP

### WRAP-UP

At the end Elmar Kriegler (PIK Potsdam) gives a short wrap-up from what he found most important during the workshop. We understand that granularity is a key issue for all stakeholders. We should make an effort to bring in available data on the country level. Uncertainties were especially for finance an important aspect. However, there is a tension between getting to granular and not being robust enough with statements.

An important question is how to reduce the number of scenarios. We need to qualify them and provide a set of scenarios for specific cases to alleviate the access for new users.

We had an inspiring discussion that went directly into the content, the main idea of SENSES is to think of how to communicate our insights but it is hard to separate it from how to develop insights. In some areas this insights are not sufficient the question are going way beyond.

The feedback from stakeholders that we should already think of how we can use the project results beyond the project lifetime is very encouraging.

Finally, Elmar announces the next stakeholder co-production workshop which will be approximately in February 2020.

### FEEDBACK

Overall the stakeholders found the workshop very valuable and gave positive feedback. They liked the concept of the learn, explore and share columns and showed great interest in the presented preliminary results. An early access to the SENSES tools would be very appreciated.

- GEMs: The stakeholder were really interested in the GEMs but asked for more guidance for specific use cases. There is a wide gap between the basic user and people that know how to use the explorer. Trying to bridge this chasm is a huge challenge. The explore modules have also a few risks involved. It might be (ab-)used for different purposes and taken out of context to justify undesirable action. These risks should be considered.
- Stakeholders as mediators and multipliers: Several stakeholders can think of a lot of people in their area that have similar roles and would like to involve them for using the modules.
- The role of the scientist: A lot of information is communicated in the language of science so far, so sciences plays a key role in the transformation of our financial system. Scientist might want to reconsider there mandate and role. They can do this by not only providing conclusion but to involve the target groups throughout the whole project and have the “handshake” already in mind.
- Notion of errors: The notion of errors was mentioned during the discussions but maybe a bit too limited. We have to think about how we do represent the errors.

- The discussion made it very evident how many potentially conflicts in use we have, how large the knowledge gap still is, and that it is important to find a consistent and harmonized approach now.
- Useful entry points for people: it would be useful to think of the levels of detail in the different modules and how they might be linked to external users, like national communicators, who also have portals. E.g. there are many portals on national-level on climate change. What aspects of SENSES portals might they link too? Where will be useful entry points for people? It should also be made clear within the portals why someone should work with this and for which reasons it could be useful.
- A taxonomy for the multitude of scenarios would be helpful and reference points on how the possible relates to the desirable.
- Relation between impact and mitigation aspects: We looked at both but somehow in isolation, cross referencing might be important in some of the visualization and tools.
- Terminology: The harmonization regarding the terminology being used across different disciplines is very important. It should be compatible with the usage of a broad community and SENSES should try to make it as universally acceptable as possible.
- It was suggested to get more feedback and do more testing of the modules with stakeholders. NGFS and Sustainable Banking Network were mentioned as potential great stakeholder groups. SENSES should have the “handshake” in mind and think about different practitioner groups. We should make sure that we involve the target groups throughout the whole project. E.g. provide beta courses before launching it, having another feedback round in a larger stakeholder group, organizing a webinar.