Workshop Minutes

4th SENSES
Co-Production Workshop

University of applied science, Potsdam, Germany
March 04-05, 2020

Stakeholders

Peer Stein, International Finance Corporation (hindered due to Corona)
Michael Hayne, 2° Investing Initiative
Alban Pyanet, Principal, Oliver Wyman
Martin Rokitzki, PlanAdapt
Ged Davis, World Energy Council
Philipp Haenle, Deutsche Bundesbank
Christian Elbers, LL.M. BaFin
Davide Lombardo, European Commission DG FISMA
Jesica Andrews, United Nations Environment Programme - Finance Initiative
Yannick Motz, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (hindered due to Corona)
Aditi Maheshwari, IFC (hindered due to Corona)
Andres Chang, Science Based Targets initiative / CDP
Paul Langeveld, WUR
David Carlin, UNEP-FI
Quyen Nguyen, IFC (hindered due to Corona)

Observer

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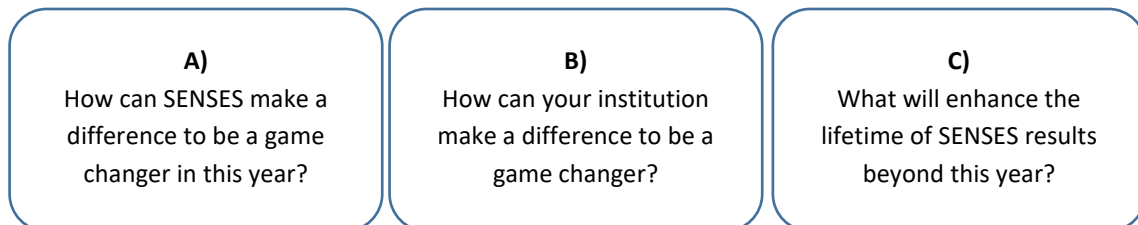Timothy Carter, Finnish Environment Institute (SYKE) Finland

Consortium

Cornelia Auer, PIK Potsdam, Scientific coordination, global mitigation scenarios, coproduction, communication
Christoph Bertram, PIK Potsdam, Global mitigation scenarios, financial risk assessment
Henrik Carlsen, SEI Stockholm, Regional scenario studies, coproduction (hindered due to Corona)
Lotte de Jong, Wageningen University, Regional scenario studies, coproduction
Jerome Hilaire, PIK Potsdam, Global mitigation scenarios, financial risk assessment
Florian Humenoeder, PIK Potsdam, Global land use scenarios
Kasper Kok, Wageningen University, Regional scenario studies, coproduction
Volker Krey, IIASA Laxenburg, Global mitigation scenarios
Elmar Kriegler, PIK Potsdam, Project leader, global mitigation scenarios, financial risk assessment, communication
Prof. Boris Müller, Potsdam University of Applied Science, Lead visualization
Jonas Parnow, Potsdam University of Applied Science, Visualization
Simona Pedde, Wageningen University, Regional scenario studies, coproduction
Bas van Ruijven, IIASA Laxenburg, Global mitigation scenarios, financial risk assessment
Sara Talebian, SEI Stockholm, Future Studies, Regional scenario studies (hindered due to Corona)
Fidel Thomet, Potsdam University of Applied Science, Visualization
Jan Volkholz, PIK Potsdam, Global impact projections
Nadia Zeissig, Potsdam University of Applied Science, Visualization

CONTENTS

OPENER: GAME CHANGER YEAR 2020 – HOW CAN WE MAKE A DIFFERENCE?

As opener of the workshop the stakeholders were asked to think about how 2020 is considered in the climate community as "the game changer year" and to answer the following questions

A) How can SENSES make a difference to be a game changer in this year?	**B)** How can your institution make a difference to be a game changer?	**C)** What will enhance the lifetime of SENSES results beyond this year?

The following answers were given:

A)   By far the most mentioned word was '**relevance'**. If SENSES continued to create this bridge of mutual understanding between users und science this increase the relevance of the outcome to a great it extent. And relevant information is the key to stakeholder uptake - this would make a real difference. Further, **nearterm realism** and credibility had a strong focus, especially to finance stakeholders (they even hope for a 5 year horizon).
Accessibility of the scenario knowledge is important in two ways: make content well understandable (e.g. through visualization, factsheets, translation of terminology etc) and **sharpening** conclusions by the information content that can be deduced from scenario data. But on a higher level for finance stakeholders to also link the content to industry standards: simple example would be to have values not as EJ but in Mbarrels, a more complex example would then be to have an interface to link scenario output directly to stress-testing.
Making the **scenario variability** understandable was also mentioned, e.g. grouping scenario characteristics and showing what is due to uncertainty and what is scenario specific would be very helpful.

B)   On the highest level stakeholders want to make a difference in enabling heightened climate ambition and accountability. They are willing to produce a **common understanding** of what it means, e.g. for corporate actors to reach 'net-zero' and near-term steps to get there.
Stakeholders are very willing to contribute to the SENSES communication effort in **promoting the tools** and products in their **networks** (multiple mentions). Stakeholders from Finance want to advise their clients to manage & **measure climate risks**, capture opportunities and **steer** their **business towards sustainability**.
On a practical level they want to help us increase the usability of our tools by highlighting us to their specific needs or difficulties.

C)   Most important was for the stakeholders that the modules get **updated** on a regular basis. Have a living data basis, bibliography and support.
Multiple stakeholders asked that SENSES tools should be used for **capacity building** trainings to interested institutions.
There was a very explicit wish to keep the SENSES stakeholder **community** alive.
SENSES tools should also be put into context of the broader academic landscape, but also industry models. Especially a good **integration with ISIpedia** is very desirable.

GOAL OF MEETING, STATUS SENSES (ELMAR KRIEGLER)

Elmar Kriegler (PIK Potsdam) introduces the central vision of the SENSES toolkit and portals, which will be described in detail below. The goal is to make climate change scenarios more accessible and usable to selected user groups by effective means to communicate key insights and empowering users to explore scenario information. 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.
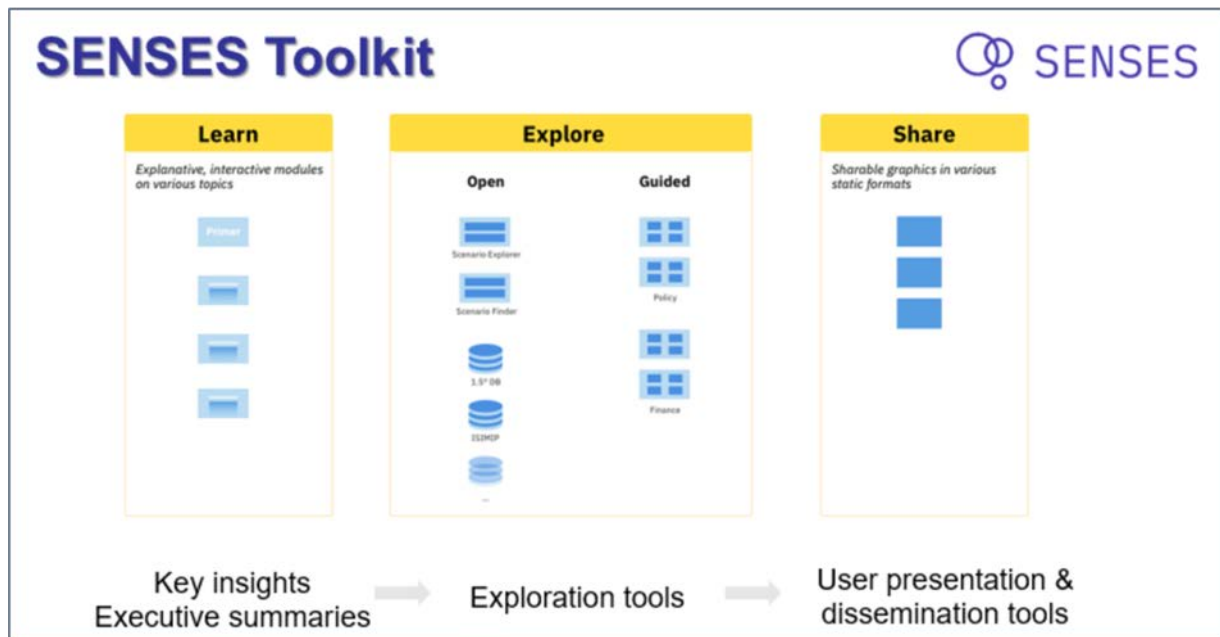

The SENSES Toolkit is structured into three conceptual segments: learn – explore – share. The in the toolkit are called modules. This collection contains local, but also linked modules. It is a rather open collection with no restrictions, only that the modules should be categorizable into the three types.

- 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 modules: will contain 'Open explore modules' for more advanced users, like the scenario finder or a link to the scenario explorer
- Guided explore modules (GEMs): 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 mostly 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 elements: can be individual elements 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.

Welcome to the Senses Policy Portal.

Here you can explore a curated sets of learning modules regarding Policy related aspects of Climate Change. You can scroll three different chapters: Budgets, Transitions and Extreme Events.
If you are interested in all the Senses Project material refer to the Toolkit.

In the Budgets chapter you will be introduced to the near and long-term plans to reach Net Zero emissions in the next century. The Transitions section is dedicated to different kind of transitions that might occur. From energetic to land transitions, you will be provided with a complete overview of how our future will look like. The Extreme Events chapter is dedicated to the extent and impact of Climate Change according to the predictions.

↓
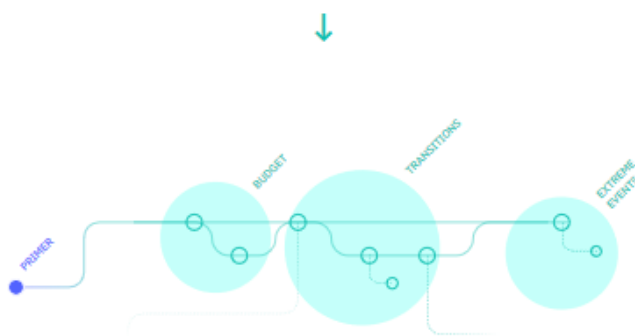
The SENSES portals

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.

Topics addressed in the toolkit (esp. learn modules)

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.

SENSES learn modules   SENSES

Shared topics
Climate change scenario primer
Climate impacts of extreme events

Policy topics
Emissions gap and how to bridge it (Global Stocktake)
Linking to national transitions (tbd)
Towards an electric future
Solving variability challenge of wind and solar power
Land use transitions
Co-producing adaptation strategies

Finance topics
Investment Needs and Alignment
Transition Risk – Fossil fuel phase-out
Transition Risk – Power sector transition
Transition Risk – Risk Factor Pathways (tbd)

He also introduced the regional case studies. The Netherlands case study on de Overijsselse Vecht on robust adaptation strategies and the Kenya case study on transnational climate change impacts.

SENSES Regional Stakeholder Interaction 🔗 SENSES

Netherlands Case Study
(Lead: Wageningen)

De Overijsselse Vecht

Kenya Case Study
(Lead: SEI)

KENYA VISION 2030
Towards a globally competitive and prosperous nation.

DISCUSSION

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

Granularity – Despite not being the focus of SENSES, stakeholders keep wishing for information of higher granularity. The linking of regional to global scenarios will be one important step. Higher sectoral information would clearly be desirable.

Interfacing the 'outside world' - A central question was, how SENSES can inform and interface to other groups. A central link to the outside world be price, trade and jobs information. Macroeconomic information is of high relevance.

Scenario uncertainty – For the sake of transparency it is important to convey the difference of scenario uncertainty versus statistical/model/parameter uncertainty.

Solutions – SENSES should focus on depicting a solution perspective, e.g. how to get from a NDCs to a 1.5°C pathways.

QUESTIONNAIRE

Boris Mueller (FH Potsdam) briefly presented the current status of the SENSES toolkit, portals and modules. The evaluation test itself was based on a questionnaire prepared by the FHP to evaluate the SENSES Toolkit, the portals and modules.

The aim of the survey was primarily to obtain feedback on the general usefulness of the toolkit as well as to get an insight into whether it is easy for the user to become familiar with the user interface and easy for users to achieve their objective through using the toolkit.

The survey was conducted as follows: Each stakeholder was interviewed individually by a member of the FHP team or a substitute student. The survey lasted one hour in total with 15 minutes for free exploration of the toolkit, 30 minutes to go through and answer the prepared questionnaire and 15 minutes for general feedback.

The toolkit was mostly very well received and the stakeholder enjoyed exploring the website. The toolkit was perceived as a highly innovative way to present complex information that allows the user to intuitively use and play around with the modules. The presented learn modules were particularly well received, as was the scenario finder. The toolkit was found to be suitable to "take complex datasets and making them broadly accessible in a visually pleasing way". It was said to be very informative and trustworthy by providing sources and authors for each module. One stakeholder stated that "it makes models come alive" and stakeholder agreed with the statement that it "presents the scenarios in a comprehensive way".

Furthermore the evaluation showed that the majority of the questions that tested the usability e.g. calling certain modules, extracting specific information from a graphic or navigating through modules, could be solved without the need of assistance.

FEEDBACK

The stakeholders consider the toolkit as a phenomenal resource for education. Especially the primer is a big favorite of the stakeholders.

The following points were mentioned they should be improved:

- **Terminology** > needs of consistency
- **Interface**
    - **Navigation** > Scrolling behaviour not obvious, some devices are not obvious or self-explanatory, Toolkit is confusing. The multitude of elements seems to overwhelm the users.
    - Hover over things could be useful (popup that explain functions)
    - Basic functions of the toolkit should be explained.
- **Granularity / High Level (Data)**
    - The connection between learn modules and GEMs seems not be obvious.
    - Numbers are very much science oriented (Fossil Fuel Risks)
        - Units not graspable - Easier units to make numbers more approachable. **Focus on the unit the reader cares about.**
        - Language should be aimed at audience.

- **Storylines** appear to not be clear to many of them. Ideally users want to create their own story, but this is out of scope for the project.

- **Gamification / interactivity**
  Playing around with variables, orientation to gamification could be helpful. Explore shortcut - more exploratory views where models and scenarios can be toggled on and off, these views should have an easier entry point so that they are easily reachable.

- **Bias**
  The toolkit must take care that trustworthiness is guaranteed. It should not take an activist view (e.g. Fossil fuels, why you should not invest in them) or give guidance outside the expert scope (investment advice).

- **References**
  Some graphs seemed not correct, this does not help the trust process. More clear sources might help, more context around graphs and how the visualizations are shown.

The following points represent a summary of wishes by the stakeholders

- **Navigation**
  - Clean up might help
  - Glossary for abbreviations (e.g. with tooltips)
- **Model finder** in addition to Scenario Finder → learn more about models
  - Extension of the current scenario finder, it could be integrated in there
  - Based on reference cards, however this is already in the primer, and the data is too limited and not really useful
- **Link back to scenario finder** from learn modules: a stakeholder finds a scenario in a learn or explore module and would like to find scenarios with a similar set of characteristics.
- Provide **more details** on the models and scenarios in learn modules
- **Download option**: It would be useful to have a download option for the data next to the visualization, either allow us to download the chart and the image conveying the data so I can use it.
- Make code available? **Open sourcing** code of modules and even contributing by external partners, have pull requests.
- "Set the world in which you want to **play**" - you should be able to select a model to build assumptions and look at the visualizations in a certain light, instead of building knowledge from zero

General comments to content:

Showing the big picture would be very valuable, e.g. dilemma between cheap energy versus physical losses. Focussing on relevant big potential impacts? Energy not a big industry anymore in US, so how would I be interesting to a stakeholder from the US?
Comment from Elmar Kriegler – not every question can be answered by the scenarios produced. But maybe future scenarios will be able to.

FURTHER LEARN MODULES (WORK IN PROGRESS)

INVESTMENT OPPORTUNITIES

Part of the finance portal, deals with investments. It shows how to make finance flows consistent with a pathway toward low GHG emissions and climate resilient development.

Main goal: Depict → todays investments determine emissions tomorrow

Visual ideas are inherited from a McCollum paper, the visualizations are interactive versions of the ones available on the paper.

FEEDBACK

The higher the level of granularity of the data shown the more interesting. Also looking at models / juxtaposing them is really interesting.

LAND USE 🌿

The story is based on the recent special IPCC report on climate change and land (last year). The module is structured in three parts: first, why land is under pressure? Second, why is land the solution to the climate problem? Last part, how can we use land in a sustainable way?

First it shows how the land is used, then why land is under pressure / how the total demand increase / prices for agricultural products / how the increase in production is achieved.
Then land is presented as part of the solution, key characteristics of negative emissions technologies. How does land cover change in the mitigation case. Contrasting scenarios (both compatible with 1.5) show individual consequences on land.

FEEDBACK

Having some indicators or variables showing crop yields variations would be valuable.
Technological and impact aspects should be both covered.

DAY 2 – THURSDAY, MARCH 05, 2020

SESSION: PRESENTATION & EVALUATION OF GUIDED EXPLORE MODULES (GEMS)

Cornelia Auer (PIK Potsdam) gives a presentation on the guided explore modules (GEMs). They are connected to learn modules on mitigation scenarios and provide more detailed information on the presented content, i.e. the data basis of the information in the learn modules. Variations in terms of scenarios and variables allow the user to explore a specific topic in more depth and to become familiar with the questions that can be answered by mitigation scenarios. After the presentation the stakeholders are sent to breakout groups to give feedback on the user interface, but also if relevant questions and topics are addressed in the GEMs.
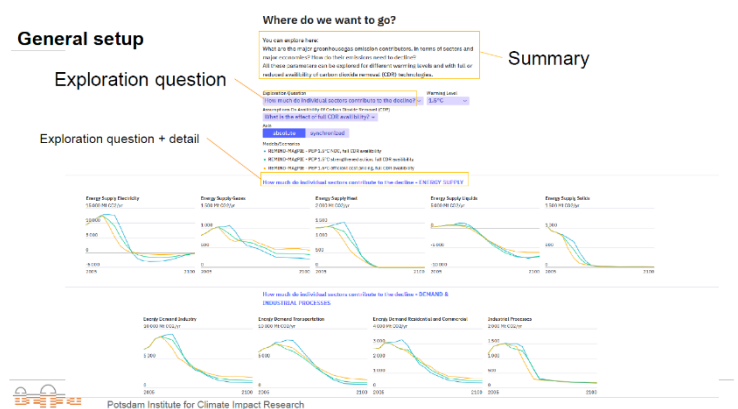

Figure: Screenshot of example GEM with descriptive elements

POLICY PANEL - FEEDBACK

1. More context and explanation needed to interpret the figures, especially for non-experienced users.

- Especially explanations for non-linear changes and turning points would be very helpful.
- Further desirable would be more context, also outside of IAMs and about uncertainty beyond the model spread.
- Add historical data to compare to model output in base year and see trend breaks
- Model input (technology costs and performance, underlying assumptions (e.g. GDP))
- Link to literature

2. Questions that we raise to provide the information are crucial

- What is the range of challenges?
- What are major contributors?
- Food production and link to bioenergy
- Not sufficient detail on energy demand side, add relevant available metrics (e.g. emission per energy vs. energy per value added), ideally also cover behaviour, lifestyle
- Combine with novel datasets, e.g. link electrification in transport to battery and lithium production data
- Explore implications of demand vs. supply investment, e.g. via slider that illustrates implications of 1 billion dollars of investment on demand vs. supply side
- Range of peaking of emissions at global level that is consistent with 1.5 or 2 C and link to country-level action (for large economies)
- Break-down of numbers shown
- Focus on 2030/2050 time horizon instead of 2100
- Spatial resolution: add country data if possible- jobs in energy industry and surrounding businesses - which sectors, e.g. lithium

3. Feedback on UI

- Icons to visualize some headlines instead of words
- Mouseover with pop-up to provide more context for figures
- Uncertainty not well defined - what is the shaded area about? address via mouseover?
- Add data download and link to Scenario Explorer options to allow further exploration

FEEDBACK - FINANCE PANEL

1. Feedback on UI

Synchronising axes is very useful, this should be default.
The resolution is rather small, could it be increased. Or have a possibility to click on a panel it and see it enlarged.
The users would prefer more the possibility to switch axes instead of having more views/subpages. Axis could then be distinguished by various colours.
They also wish a clean interface with detail on demand, e.g. mouse overs, question-mark or info buttons (?, i).
Add download button to get underlying data as (csv, xlsx)

Change scenario names to make them more understandable.
Link to IIASA database is very good.

! The big picture should always be clear. It should not be possible that users pick the information aspects of a scenario that they like and ignore consequences tied to these aspects (high oil consumption & correlated negative emissions).

2. Feedback on questions/ topics

The following topics were repeatedly mentioned:
- How to solve the electricity and electrification challenge
- What are the different approaches with (reduced) energy demand. Supply side well covered, but end use is poorly covered. What are the implications of different policies to end use.
- Show totals and what are the CDR, CCS strategies: Need to say how much CO2 is removed from CCS and other CDR technologies
- Feasibility of individual scenarios should be perceivable, e.g via second layer that would help the user to better understand the "feasibility" of

- Carbon intensity in 2020 and 2050
- Land-use CO2 emissions (sink or emitter)
- CDR levels
- Non-CO2 emissions (CH4)

- What exactly are Wyman indicators and what is their setup (background). Clarify if you want to work absolute or relative to baseline. Second layer: where is the risk?
Example what are direct emission costs? Add emissions from burning of these three energy carriers + CO2 prices. Show how the input data relates to direct emission costs or other indicators. Make it *more explicit* in the interface.

Scenario/ model setup and narratives
Further the individual behaviour of the models seems to be unclear to the users and this diffusivity decreases trust and usability. Having a dedicated explore module (ideally even a learn module) on IAM model narratives is considered as extremely helpful. It can even fascinate people and trigger important discussion. (SSPs very good).
At minimum seeing the key assumptions would already be helpful (GDP, population). The more the scenario setup can be clarified the more trust is there to really employ them.
Examples:
* Coal phase out strategies along the different IAMs
* What are the socio-economic drivers that relate to energy/power sector? What are the key drivers? Why is it different? Start with the story, present the context

Feedback on content:
As in every session the stakeholder wish for higher granularity, especially country level information.
Another very interesting option to see would be the variation 'what if I allocate investment here or there, now or later'. This data is unfortunately not yet available, but might come in the future.
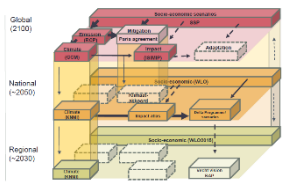
Outlook:
What are the trillion dollar questions?
Question/ GEM of the month
People are happy to contribute to questions.

Important to make plausibility checks

Kasper Kok, Lotte de Jong (Wageningen University)
4th SENSES Co-Production Workshop, Potsdam

Kasper Kok gives an introduction to the idea of linking global and regional scenarios, a top down and bottom up process at the same time. In this session he would like to conduct a learning by doing experience: developing 'extended scenarios' and adaptation options for the finance sector. Adaptation scenarios would be given by the local adaptation context and the identified risk structure (here climate impact scenarios). The afternoon session will cover two topics: a) developing qualitative scenarios: sectoral extensions for the finance sector and b) the development of adaption options for the finance sector (from the view point of two different SSPs).

There is a workshop upcoming with Bas van Ruijven (IIASA) where he and other modelling experts will work on extensions of the SSPs for the finance sector.

## FEEDBACK, WRAP-UP WITH STAKEHOLDERS (ELMAR KRIEGLER)

WRAP UP ELMAR KRIEGLER

Follow-up

Elmar Kriegler explains the follow up process. The toolkit will be launched in May with a subset of elements. Before the stakeholders will receive a googledoc where they can put their comments and feedback to. The results should be treated confidential within the SENSES group. Once the rework has taken place it can be shared with larger circles.

Further, there will be a tutorial workshop with finance in the second half of year after official launch.

Outlook
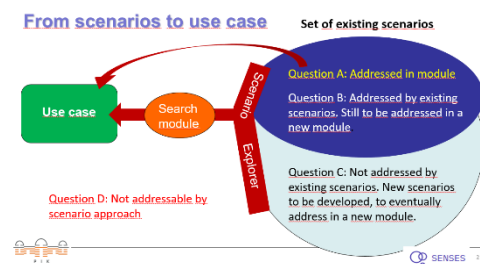
Given the situation we have a use case, that needs communication, there are several options:
a) It is addressed by an existing module
b) It is addressed by existing scenarios but no module exists
c) Not addressed by existing scenarios, but may be addressed by upcoming scearnios / will be developed

→ All can be covered by the scenario explorer and SENSES will build the bridge.

The SENSES Toolkit will stand in the centre and other projects will center around and will kind in a fractal way generate new content (in visualization and in scenario data). If everything continues this way it would be very desirable to have a haven for all those products and the SENSES toolkit extended to a living ecosystem and an institution to curate such a toolkit. The climate change scenario hub would be an excellent place for this.

Dissemination
Elmar Kriegler invites the stakeholder to be the multipliers of SENSES. Currently there are two option as types of dissemination to which they will be invited:

1) Presentation of communication concept: the learn, the explore, the share and the search modules
2) Tutorial for finance actors (primer, transition & physical risk, investment)

The consortium will follow up with concrete plans and dates on these events.

STAKEHOLDER FEEDBACK (TOUR DE TABLE)

Overall the stakeholders found the workshop very valuable, they will take a lot of insights with them. The presented results were considered relevant and they are looking forward to see more. The following points were mentioned in detail:

Workshop
The workshop was perceived as great and exciting. Stakeholders thanked the organizers for the high level exchange. This workshop put the exchange on a new level.
The product development (or rather co-production development) was lean and very engaging.

Evaluation
The one-by-one evaluation at the workshop with the questionnaire/ quiz was perceived as extremely good. Demanding, but also good to see what is there, to be forced to understand the toolkit.

Usability The usability of the toolkit and products is already very impressive. One stakeholder mentions the learn modules are exactly what he needs. Please see below the suggestions and critique for further enhanced usability.

Connection SSPs with finance
The multiscale approach to connect global SSPs with sectoral extension narratives for the finance sector triggered interest and people are clearly interested in more.

Content: The content that is chosen in the SENSES toolkit is indeed interesting. Data at disaggregated level would be of even higher interest (national ..)

The following points were mentioned to the consortium to be cautious about or as aspects of improvement:

Misinterpretation: Multiple stakeholders mention the danger that the power of the developed tools must be used cautious. The SENSES products have to make sure, that a user is always forced to see the whole picture the scenario information is providing. It is important that users cannot take away the information they like without considering the linked aspects. Here we have to take care to give a comprehensive picture in the modules (e.g. high use of fossil fuels *MUST* be comprehensively linked to the associated high negative emissions).

Brokerage/ Workshops/ Certificates: Du to the misinterpretation risk, it would be great if the toolkit was used to support a knowledge broker to deliver the information to an external audience. Another option would be to employ a possibility of making some kind of certificate in the toolkit that reassures the user that the most important concepts are understood ('Sense making in SENSES'). Capacity building trainings are also a good way of making sure the right content is taken away.

Assumptions: Assumptions of climate change scenario are still not perfectly clear to the stakeholders and this lack of transparency needs to be removed for increased uptake in economy and finance.

Improvements - technical:
The frontpage should still be easier to navigate and contain more structure and orientation. The option to extract or download the data and graphs from the toolkit is a highly desirable feature.
The stakeholders believe that more interaction and the option to play more with the data would enhance the toolkit. There seems to be a great desire for more autonomous playing with the given tools.
A glossary for the terminology of climate scenarios would be simple but very helpful.
A video instruction, going through a set of exemplary modules, could be a good way to help people get an idea what is there.

Improvements - content:
Working with narratives is very helpful for understanding complex content, this should also be applied even for the data centric GEMs (guided explore modules). This will make them a great asset.

Also connecting the presented data to the outside world will drastically increase the relevance of the provided tools. Connection to outside information, other data will boost usability.

<u>Impact projections</u>
Translating the progress of impact research is often not done for the broader public and SENSES takes a first step to do so. This is very good and of course more of this would be even better.

<u>Outlook</u>
The stakeholders agreed that continuation and expansion of the SENSES approach should be pursued. They see a bright future for the tools. But also the network is highly valued by the stakeholders, they explicitly asked the SENSES team to keep this network alive and continue co-production and exchange.
For explicit interaction the regulatory side and other ongoing projects are highly interested to continue working with the SENSES team – banks wanting to understand, how scenario analysis is done and what the assumptions are behind. Capacity building workshops and webinars are mentioned as apt forms in the near future to support stakeholders in the uptake of climate change scenarios in their work.