

- Optical Channels
 - Colour: qualitative differences
 - Saturation, opacity: quantitative differences

Gestalt Principles

The Gestalt theory formulates rules of how we perceive the world and hence how designer convey meaning.

- Proximity, grouping: Proximity occurs when elements are placed close together. They tend to be perceived as a group.
- Similarity: We perceive elements as belonging to the same group if they look like each other.
- Closure, figure/ground: We perceive figures from elements even when parts are missing. Sometimes negative space creates its own figures.
- Good figure/Prägnanz, Continuity/Common fate: Elements are separated to their simplest components. We tend to continue paths in their origin direction.
- Symmetry/order: We expect elements to continue in their origin pattern. Everything that is not according to that pattern causes irritation.
- Connectedness, common region: Elements are perceived as group if a third element encloses or connects these.

Diagram Types

Diagrams, charts or plots use visual variables and the Gestalt principles to make patterns visible, allow comparison and reveal correlation. → [Diagram Type Reference](#)

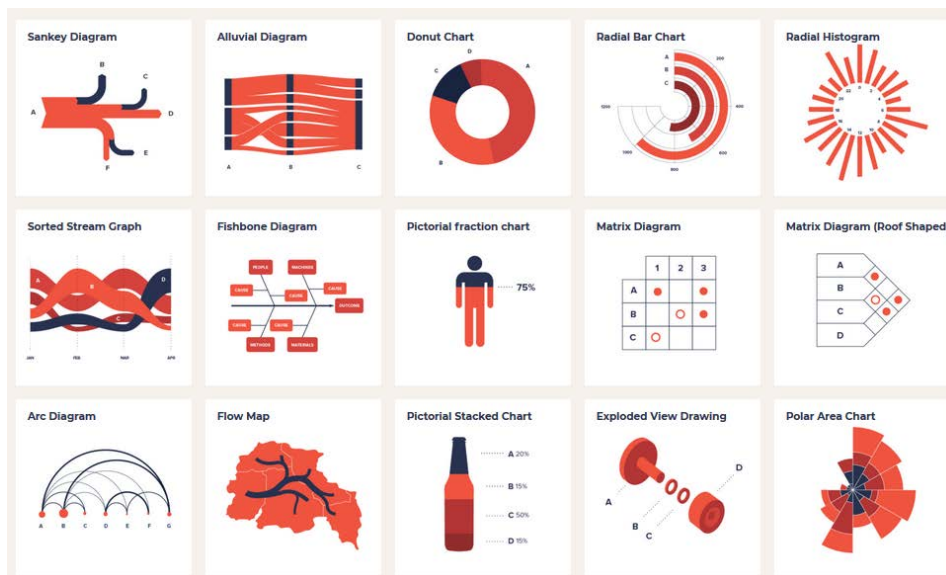


Figure 1 Courtesy: <http://datavizproject.com/>

Workshop

For the workshop the participants and the consortium are separated into 4 groups, as indicated below.

Groups

Group 1 - Boris Mueller, Guido Schmidt Traub, Minna Hekanaho, Elmar Kriegler, Sandra Tenggren

Group 2 - *Fidel Thomet*, Miles Perry, Jakob Thomae, Volker Krey, Cornelia Auer

Group 3 - *Jonas Parnow*, Eric Fee, Takuya Hara, Kasper Kok

Group 4 - *Lavinia Baumstark*, Michael Pimmer, Daniel Huppmann, Nienke Ansems

Assignment

The groups were given paper, pens, scissors and visualization templates (printed on paper, as well). The following tasks were accomplished:

- Pick one Dataset that looks interesting
- Pick one SSP that looks interesting
- Visualize the selected data over time AND regions
- After 20 minutes, add an additional SSP or data set
- Aim for comparisons, narratives, expressiveness
- Use or ignore the diagram types - that's up to you!

Results

The following results were presented to the entire group of stakeholders and consortium.

Group 1

- Cartogram visualizing CO2 Emissions
 - SSP regions morph over time depending on emissions
 - Similar regions get closer together
 - Further details & visualizations in tooltips
- Visualizing inequality in a fracture-chart
- Comparing baseline-scenario to 2°-scenario in a pyramid
- Tree-map showing total CO2 emissions and for each region with slider to control time and forcing

Group 2

- Visualizing growth of solar energy to estimate potential for investments in solar power
 - Stacked bar-chart for absolute values
 - Line chart to visualize growth over time
 - Map to visualize regional growth
 - CO2 emissions as context data
 - Focus on development until 2050

Group 3

- Compare land use change across scenarios, regions and time
 - Use of Sankey-chart to emphasize on land use change
 - Micro-narratives: cropland-growth stops, when rainforest vanished

Group 4

- Visualizing cropland use in abstract maps (for spatial context)
 - Circles visualize cropland absolute, compared to total land and to current cropland use
 - Comparison between scenarios through multiples / side-by-side comparison

Miscellaneous

In the discussion of the entire participants the following miscellaneous points arose:

- Visualizations should really be driven by the use case not data-driven.
- The time scope from the business perspective is especially challenging, as mostly only the next 20-30 years are of interest. On the other hand they only make sense regarding the long term perspective.
- Also the depiction of relative rather than absolute values can be of high interest, e.g. regarding the developing countries, having a growth of 100% in renewables which is from the relative perspective instantly significant. However, compared to developed countries in an absolute terms this would be vanishingly low.

Co-production of knowledge The Advisory panel (policy and business)

Aim: Understanding important factors for stakeholders working with scenarios

Question: What factors are to be addressed in shaping scenarios?

Process: The participants were given a short presentation of what they were asked to do. They were given 5 post-its each which they were instructed to only write one topic in one word or two. As they wrote we collected the notes and placed them on the wall, trying to do a preliminary clustering. When everyone was done, the participants were invited to the wall of post-its and together with the facilitator they had a discussion while clustering the notes. The exercise led to a set of 7 clusters. We were not able to place two single post-its due to time constraints. The participants were probed by the facilitator when the discussion came to a stand-still to understand what a note meant and where it should be clustered.

Further analysis of clustering and topics will be incorporated into scope of goals to be reached within the aim of the SENSES project.



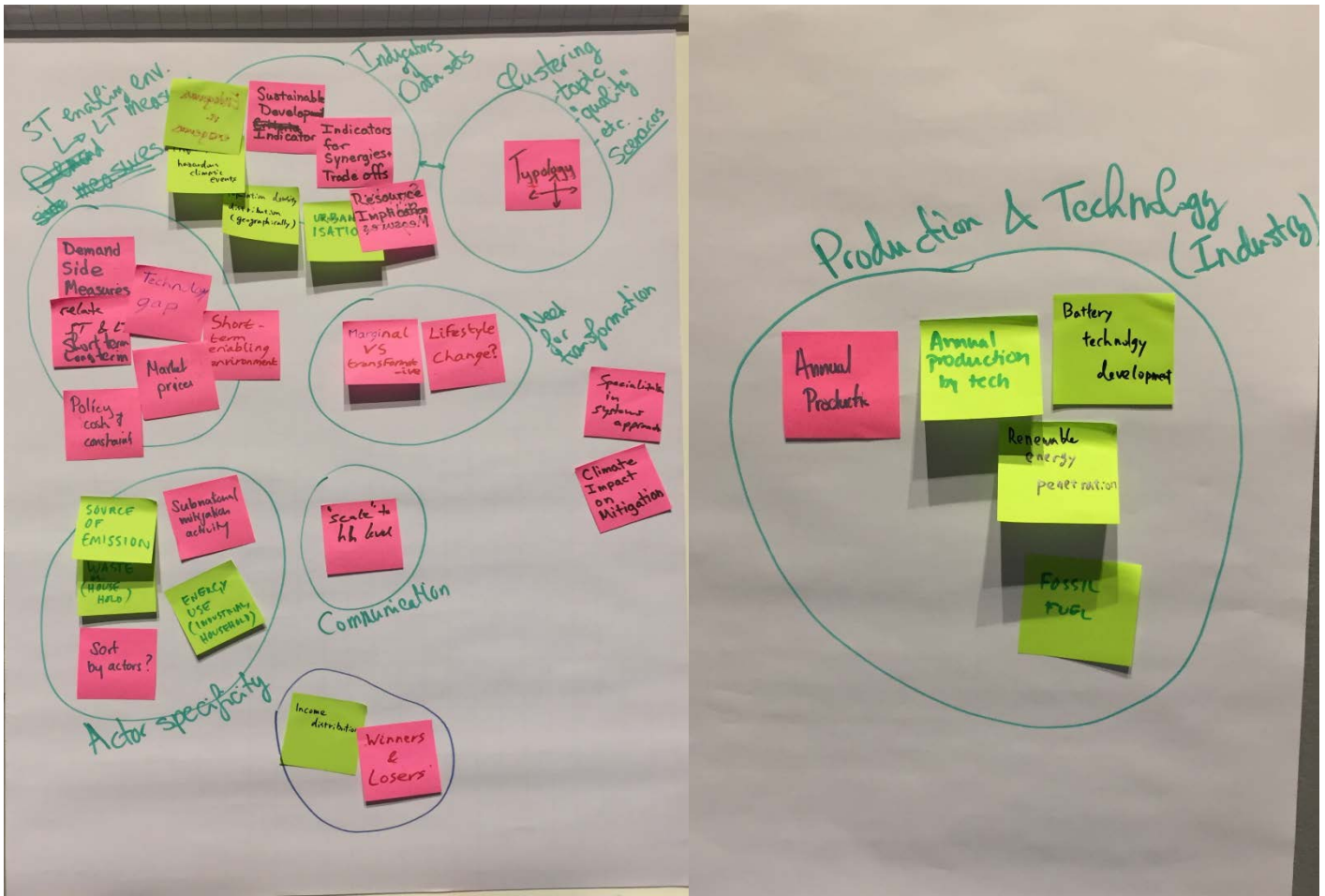
Pic 1. The participants writing on post-its.



Pic 2 post-its without clustering



Pic 3. Clustering process



Pic 4. Clusters after discussion

Results

Overall, stakeholders **confirmed the need for SENSES** and its focus on climate services and scenario communication. Almost all clusters relate to the fact that there are too many scenarios that are not always communicated towards policy and business stakeholders in the best way possible. This needs to be improved.

Clustering the scenarios by topology

Stakeholders strongly expressed the need for a (tailor-made) **scenario typology and classification** that would guide the use of type of scenarios:

- If users don't know what scenarios means what if they could get scenarios under different topics. Knowing what the topic of the scenario aims to would make scenario analysis easier.
- Output variables and other aspects that give the scope of the scenarios.
- Is two degrees aligned with the carbon budget?
- Deciphering scenarios by breaking up what kind of information it can give. Sub-sectors, high-level assumptions and many details but with a lot of uncertainties. How would this be communicated?
- Classify scenarios accordingly.

Clustering of indicators within the scenarios

Stakeholders strongly expressed the need for **tailored indicators** to improve the usability of scenarios:

- Add indicators on sustainable development/other topics such as actors, urbanization, industry, SDG, households to hang on to scenarios to visualize what implications these trajectories would have in different scenarios. Thus, see what is politically or economically feasible. I.e. more detail on other factors that have impact on our development.
- What happens on the global level when including these indicators? Macro-economic indicators, interesting for certain users. To understand macro-contexts. Influence the policy and action we can take and indicate what technology/policy can solve or break the trajectory if it is against the 2 degree target and SDGs.
- Another aspect: urbanization is a very important indicator for what would happen overall. What would each of these scenarios look like if different aspects of urbanization are fulfilled?

Stakeholders singled out **technology, inequality, transformation, and actor-specificity** as issues that need to specifically be included in any set of scenarios

Need for transformation

- Marginal and transformative scenarios
- Is *marginal* the 2 degree target or transformative scenarios is needed to meet 2 degrees?
- Lifestyle changes: is it needed in a 2 degree world.

Production and technology

- Energy, production, a changing industry, technology development.
- Roll-up of a technology: all the way from production processes-to use. Which impact on policy will that make?

Actor specificity

- Different scales and sectors of society: So we can see what would need to happen on different sectors and at the household level.
- Household level. What would affect households, how the *Jonson's* will have to change under different pathways. How they consume something to bring back to home more easily. **Communication** is important and is there a choice between nice life or saving the planet- show that it will not be awful.

Short-term enabling environment for long-term measures

Stakeholders stressed the need to **link short-term and long-term measures**:

- Policy, market price and enabling environment together.
- Scenarios to show what we need to put in place now so we can develop technology aligned with future goals and short-term policy measures to enable actions now which can lead to a long-term change that we need.
- Policy levers – co-ordinate transport and power to talk with each other.
- Outputs: what for the long-term goal would really help. Both short term enabling environment but also in the cluster for need for transformation.
- The impacts on the demand side which might have long-term and indirect effects are needed to understand.

Communication

- Uncertainty with extreme events: Takuya Hara was the only one mentioned this.
- Climate impacts and granularity – a problem where the extreme events will happen.
- Assumptions in indicators. What indicators are there and what do they mean?
- Elements of distribution
- What is the share of something, use the scenario as input to write their own risk model. To find out if you are a winner or loser. Some people already know this.
- Political blockage – the ones already in power don't want change. "Everything needs to be an opportunity" – something like an opportunity-framing.
- Granularity – you will not capture winners or losers in scenarios: scenarios are less actors specific than what we want to know.

Further insights

Stakeholders used different types of scenarios interchangeably, mixing normative pathways and mitigation scenarios with exploration, and qualitative stories on transformations with indicators derived from quantitative model output.