# COLLABORATIVE DESIGN OF PATHWAYS TO SUSTAINABILITY

## Guidebook for designing and running in-person workshops

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# ABOUT THE PROVENANCE OF THIS GUIDEBOOK

This guidebook is based on the Policy Simulation guidebook created within the Integrated Solutions for Water, Energy, and Land NEXUS (ISWEL) Project[1] led by the partnership between the International Institute for Applied Systems Analysis (IIASA), the Global Environment Facility (GEF), and the United Nations Industrial Development Organization (UNIDO). The ISWEL Project was implemented between 2017 and 2020 and the main goal was to develop tools and capacities to support the management of the water, energy and land nexus. The project took a global approach but also zoomed into two transboundary basins facing important development and environmental challenges: Zambezi and Indus.

Through the transboundary work, the project established partnerships with stakeholders in the Indus and Zambezi basins to identify and simulate through modelling techniques long-term cost-effective solutions to meet water, energy and land development goals in an integrated manner. Alongside, the partnership also developed several participatory tools, including scenario planning and nexus simulation tools, aiming for technical and non-technical audiences to build a common understanding of the sectoral challenges and interlinkages across the three sectors in the basin, and gain a practical and hands-on experience on future scenarios and pathways.

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1) https://www.iswel.org/

# ABOUT THE SDG-PATHFINDING PROJECT

The *SDG-pathfinding: Co-creating pathways for sustainable development in Africa* project[2] (*SDG-pathfinding* hereafter) is a Belmont Forum-funded project (2021-2023). The overarching goal of *SDG-pathfinding* is to develop tools and capacities that can help localise the SDG agenda in African countries using participatory bottom-up approaches. The project takes a transdisciplinary approach that specifically aims to:

I) Develop and test innovative tools to lift local capacities for framing complex sustainability challenges using a systems thinking approach and explore adaptative pathways to meet the SDG agenda at the local level, and

II) foster multi-stakeholder collaboration to promote social learning and innovation on how to localise the SDGs.

Since the project approach is "future-building", it brings together a mixture of different participatory tools, including the Collaborative Systems Mapping of Sustainable Pathways (CoSMoS) developed in the context of ISWEL but now integrating different innovations, including 1) modifications tailored to address sustainability challenges and pathways at the local level, and 2) analogue version of the tool ready to be used in face-to-face format in addition to the existing online one.

# ACKNOWLEDGEMENTS

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2) https://iiasa.ac.at/projects/sdg-pathfinding

# OVERVIEW

The guidebook is meant as a practical introduction and step-by-step instruction on how to design and apply the Collaborative Systems Mapping of Sustainable Pathways (CoSMoS) method. The process has been developed to bridge the gap between science, policy, and society. Scientific knowledge about sustainability challenges was used to develop multiple global scenarios. However, stakeholder engagement in scenario planning is often misunderstood as a way to give expert input to scientists and provide feedback on research results. If scenario efforts are to be useful for policy development, they need to clearly indicate the sphere of control where stakeholders representing specific decision unit(s) can develop robust strategies. The CoSMoS process allows them to develop strategic insights by building on selected representations of real-world structures and processes. The guidebook provides a necessary basis to understand the process so that readers can use it, adapt it to specific circumstances, and successfully execute it.

The guide is an updated version of the ISWEL guidebook on Policy Simulations and is designed as a manual for organisations interested in using Collaborative Systems Mapping of Sustainable Pathways for face-to-face workshops. This includes organisations directly or indirectly involved in the process of policy development, especially in the context of various crises, such as climate emergency, biodiversity loss, rise in populism, and many others. The methodology strongly emphasises the positive, active, and inclusive approaches to co-creating sustainability pathways to desired futures.

The guidebook will:

1. explain the assumptions underlying the co-creation of scenarios and pathways,
2. compare and contrast them with other, similar tools, and
3. instruct how to adapt, design and run new CoSMoS workshop sessions.

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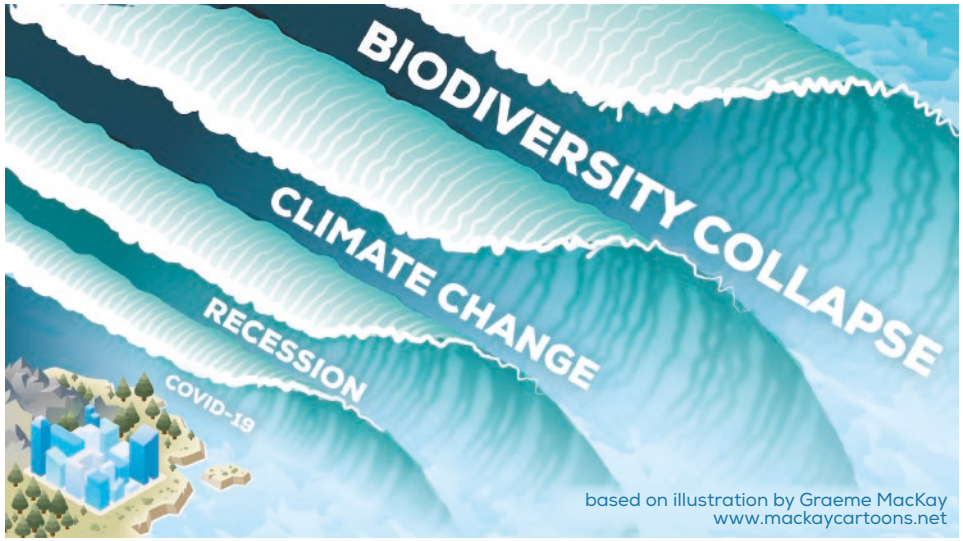
# INTRODUCTION




**The age of multiple crises: climate, biodiversity, populism, and others**

Living in a world of unprecedented global challenges, each and every one of us has stakes in the future. Behind the most recent crisis of the COVID-19 pandemic, other, more perilous emergencies loom on the horizon: economic recession, climate change, biodiversity collapse, and more. But despite anticipating them, we, as stakeholders of the Earth, are unable to craft a consistent, unified response.

The reason for this is three-fold. First, the challenges are intricately complex, to the extent that even our best attempts to tackle them often fail or lead to unexpected side effects. Consequently, we are left with a feeling of uncertainty, especially about making decisions with a long-term perspective in mind. To make matters worse, everyone's judgement is warped by their different interpretations of reality, personal values, and worldviews - a widespread ambiguity over the right diagnoses and solutions. As a result, we not only fail to see both the big picture and the interconnections between its elements but also are unable to initiate the necessary collaboration between different fractions of polarised society.

All of the above points to the need to find a new approach to navigate complexity, keep uncertainty at bay, and communicate effectively despite ambiguity. This new approach needs to include scientists, policymakers, and society. To achieve this several barriers need to be addressed.

Scientists use the rational model to discover how the world works. They report their findings in scientific papers, using complicated terminology that needs to be translated for a layperson to understand. Finally, they usually need a long time to reach solid conclusions and form recommendations.

Policymakers face entirely different challenges. They cannot ignore the public as they need their support. They have to respond to emergencies, and in doing so often resort to many compromises. Their communication is often replete with acronyms. Lastly, they work under huge time pressure and often sacrifice quality for the sake of promptness.

Although policymakers represent societies, there is a need to include NGOs, communities, and citizens in this dialogue. In such a broad participatory process, contradictory positions are bound to emerge on the right course of action. But if science, policy and society representatives could put together the jigsaw puzzle whose pieces are scattered among them, we would be able to see a more comprehensive view of the situation. With this emerging clarity a shared direction for action might become possible.

New communication channels between science, policy, and society can be arranged with the aid of new, innovative processes – such as the Collaborative Systems Mapping of Sustainable Pathways or CoSMoS.

### The case for stakeholder engagement

Stakeholder engagement became increasingly important in research and practice for social-ecological systems. The trend is very strong and clear – for example, adaptive management (scientists and policy-makers working together using a more experimental approach to decision-making) evolved into adaptive co-management (broad engagement of stakeholders focused on deliberation). Moreover, the main purpose of such processes shifted from specific policy outcomes to a broader "social learning" effect that happens not only on an individual level but also propagates through organisations and wider social networks.

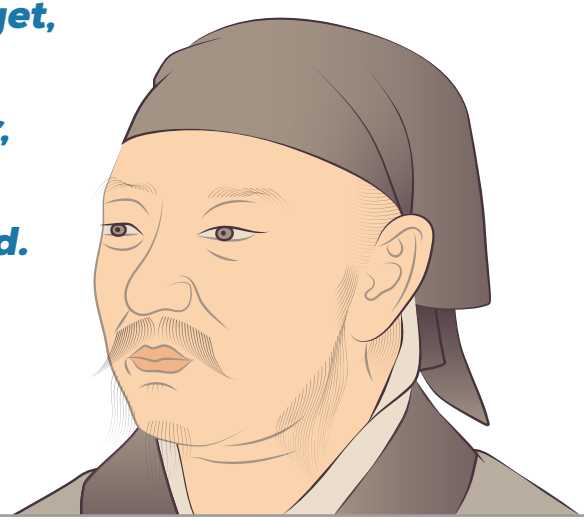
Anybody who affects or is affected by current decisions and potential future events is a stakeholder and should be involved in the decision process. As we saw, this process can be informed by a combined input of science and policy. However, information alone is not enough to make stakeholders act. For that, they need to be actively engaged, and their knowledge, experience, and ideas for solutions, are considered as input. What's more, with the right level of engagement, decision-making can become something more than just an attempt to solve a problem. It can foster long-term thinking and create insights that spread beyond its original domain.

***Tell me and I forget,***

***Show me and***
***I may remember,***

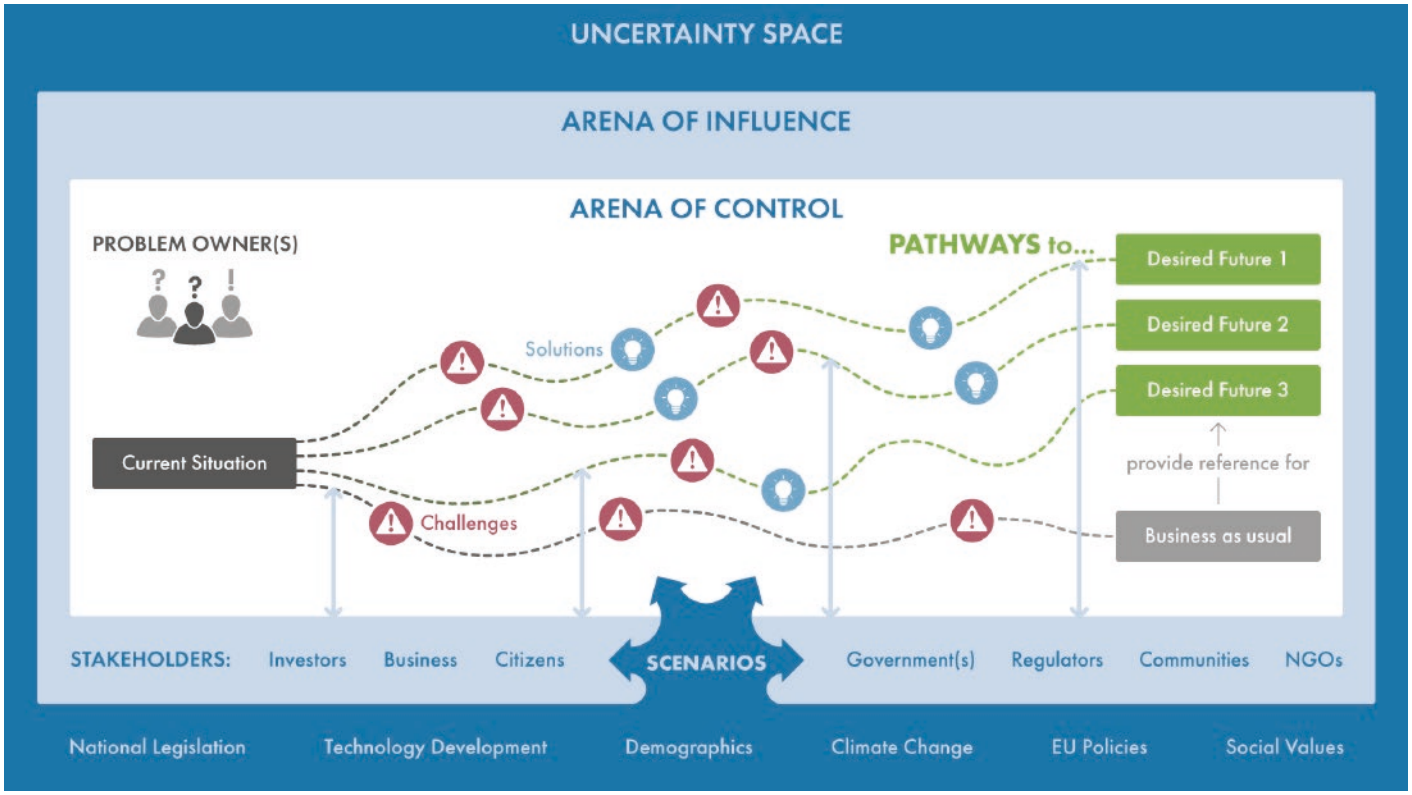
***Engage me and***
***I will understand.***

**Xunzi**



### Guidebook audience

The tools and techniques explored in this guidebook can be used by practitioners in disaster risk management, climate adaptation, and broadly understood sustainable development, to engage wide audiences, foster discussion about important societal challenges, and create an environment for co-designing options. At the same time, the guide also constitutes a valuable resource for people interested in experiential learning and the facilitation of workshops. The guidebook offers background and insights on the CoSMoS methodology, explains how to use it in in-person workshops and adapt to different needs and goals, and shares practical tips for effective engagement and facilitation. For guidance on conducting online workshops, please refer to the Policy Simulations Guidebook developed for the ISWEL Project.




# BACKGROUND

**What is Collaborative Systems Mapping of Sustainable Pathways?**

Collaborative Systems Mapping of Sustainable Pathways (CoSMoS) is a participatory, interactive, and visual process with an associated tool for systems mapping through which stakeholders, related by a common issue, co-design sustainability pathways. In this process, they first create a mutual understanding of the current state of the system in question, which also forms the basis of a business-as-usual scenario. They then devise visions of their desired futures and collectively explore possible strategies (or sets of actions) to reach them. These strategies, also known as pathways, can be tested against a range of external scenarios and drivers. This process allows the participants to deepen their understanding of the system, and identify barriers and levers on the path to their desired futures.

The CoSMoS process is framed by three domains (illustrated below). An arena of control is where problem owners can effectively make decisions and develop pathways to their desired futures. Problem owners can range from small organisations (e.g. a municipality) to large ones (e.g. EU), to countries and regions (e.g. a river basin). Problem owners operate within a context that transcends their arena of influence, and therefore encounter, and must take into consideration, other important stakeholders.

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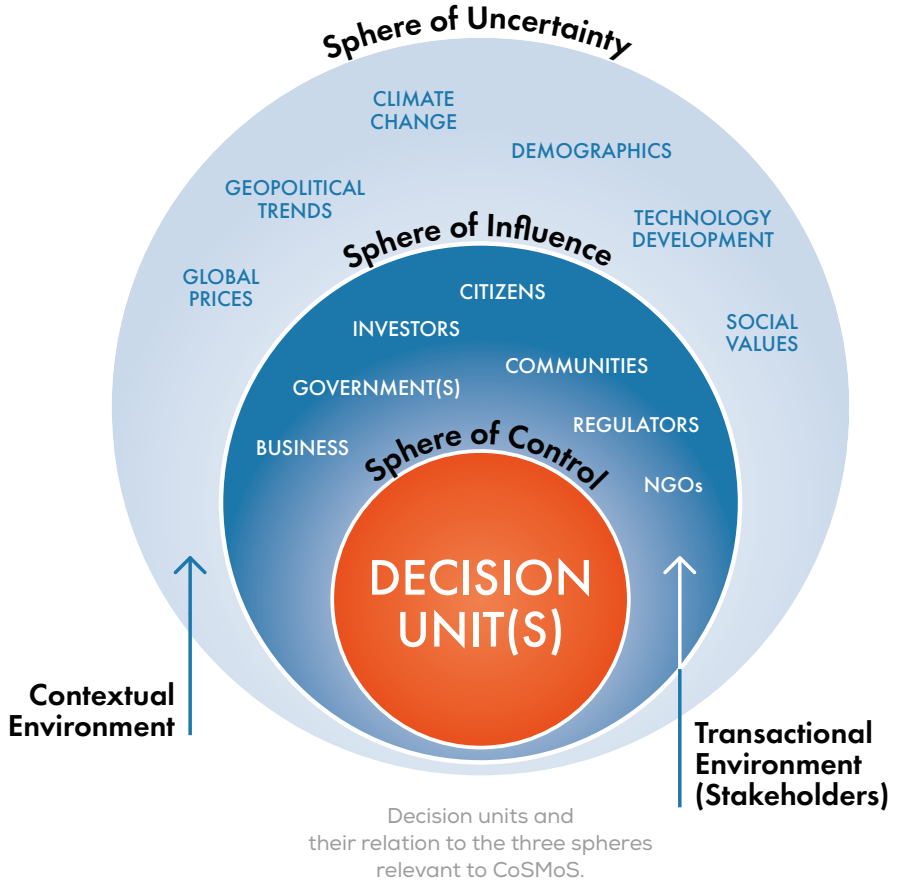
The pathways they develop can both impact and be impacted by these stakeholders and their worldviews, decisions, and actions. Taken together, these two arenas function within an uncertainty space, which encompasses a range of external scenarios. To ensure that their pathways are robust against such scenarios, participants are invited to collectively identify the most important drivers and constraints externally, which translate to various opportunities and threats internally.

CoSMoS builds on the scenario methodology. Scenarios are useful in supporting policy-making processes at different stages, as well as in helping to build systems and strategic thinking among stakeholders who often work and take action within their knowledge silos. Many reviews and evaluations of past scenario processes demonstrate that they have been quite successful, especially in the business context, in supporting strategic decision-making at all stages of the policy cycle (Volkery & Ribeiro 2009). By exploring different scenarios, participants can prepare for a wide range of future possibilities informed by existing development plans, visions and strategies. However, despite this potential, both research and practice expose many problematic areas in the scenario methodology, especially when it is applied in global contexts (van Notten et al. 2003). One such challenge is to address the specific needs of diverse participants who are willing to find a promising future for their localities against challenging global trends (Parson 2008).

In a scenario planning process, participants should jointly delineate two spheres. One is their internal sphere of influence, i.e. the context in which they can effectively make decisions and develop policies. The other is an external sphere of uncertainty, i.e. a space where they need to agree on the most important drivers and constraints that result in various opportunities and threats affecting the internal sphere.

For CoSMoS, one should identify the decision unit(s) (Zurek & Henrichs 2007). They can range from a small organisation to a city, large country or region, river basin, or a group of countries (e.g. EU). Within the decision unit's sphere of influence, participants jointly co-design pathways to their desired future. These pathways need to be made robust against the various global scenarios within the sphere of uncertainty.

## SCENARIOS TO SUPPORT POLICY




Decision units and their relation to the three spheres relevant to CoSMoS.

The sphere of control is also called a "transactional environment". A thorough understanding of that environment – who the actors are, what priorities they set, what capacities they have to drive decisions, and what their governance structure is – is key to driving sustainability transitions.

# HOW THE COSMOS PROCESS WORKS

The CoSMoS process is broken down into steps in the picture below. Although it is presented in sequential order, the process is not entirely linear - the steps are fluid and will overlap with each other during the process.

## 1 PROBLEM

Participants face a complex, real-world challenge that calls for innovative responses and requires the integration of a wide range of data, insights, and tacit knowledge.

## 2 DIFFERENT PERSPECTIVES

CoSMoS provides an accessible, visual representation of the problem and connects stakeholders with diverse backgrounds, values, tasks, and goals. Together, they can explore the issue from different perspectives.

## 3 COMMUNICATION

The unique setting allows participants to present their positions on the problem, propose their desired responses, and negotiate and influence others. This leads to a free exchange of ideas and bridges communication gaps.

## 4 COMPLEXITY

Throughout their discussions, participants discover the most important variables influencing the decision units, identify interconnections, design responses and options, and test how they will impact other actors and the whole system. In this process, both the problem and the consequences of possible solutions become visible in their entirety.


## 5 CREATIVITY

Participants discover their creative potential and go off the beaten track. Abstract ideas become tangible, opening new, original, and inspiring pathways into the unknown.


## 6 CONSENSUS

Within this safe environment, participants are more empathetic, trusting, and willing to cooperate. Even when debates become heated, all voices are heard, trade-offs are negotiated, and a joint strategy is developed.

## 7 COMMITMENT TO ACTION

After finding common ground despite differences, participants commit to implementing their jointly developed strategy and using their experience and knowledge to face real-life challenges.

Participants of a CoSMoS process explore actual policy issues, work with real-world data, and assume roles reflecting the ones they have in reality. At the same time, design elements derived from serious games facilitate communication between participants (Geurts, Duke, & Vermeulen 2007) and enable them to get feedback on their decisions (Harvey, Liddel, & McMahon 2009). Thanks to this sophisticated yet user-friendly approach, even participants without relevant academic backgrounds can successfully engage in highly complex CoSMoS processes.

When following a scenario, participants usually look at the proposed problems and options from the perspective of their real-life roles, values, and experiences (van der Heijden 1996). This becomes problematic when abstract concepts and terms are used and when participants are engaged mostly verbally producing written narratives, as is often the case in many scenario development processes. This is why gaming techniques should be implemented, as they stimulate a broader range of ideas and emotions in participants, and consequently make the activity more effective. These techniques include using physical representations of reality such as maps, boards, and special cards, as well as representing institutional and organisational roles by assigning them to participants. Such role-playing can also stimulate users' imagination by immersing them deeper in the simulated reality. CoSMoS processes are flexible enough to accommodate a variety of tools and techniques (Toth 1988) that can make them more visually appealing and interactive. As a result, they become more accessible and foster the development of more concrete, robust, and policy-relevant pathways.

CoSMoS can be integrated with several systems mapping methods such as Concept Maps, Causal Maps, or Institutional Mapping, among others. These methods usually operate at higher levels of abstraction - therefore, they should not replace but rather complement concrete representations in CoSMoS.

**When to use CoSMoS?**

CoSMoS is well suited to make complexity manageable and understandable. It is used to tackle challenges involving many moving parts and fields of expertise, as well as in any situation where communities need to plan for the future in a collective effort such as the implementation of the SDGs or climate change adaptation. The method brings together people of diverse backgrounds and experiences to work on a common challenge. As described above, the strength of the approach is getting stakeholders together and combining their shared knowledge, experience and expertise to develop a shared understanding of challenges.

CoSMoS is an innovative process used to develop creative strategic thinking and decision-making capabilities. They are used in a variety of complex topics and generate positive results that enhance understanding and be used for future planning.

CoSMoS, and its precursor Policy Simulations, have been used as part of projects focusing on different topics. In SDG-pathfinding, CoSMoS was used by the stakeholders to devise sustainability pathways in line with the UN's sustainable development goals.

In the SDG Pathfinding project, we used CoSMoS with local stakeholders in both the Fimela catchment, in Senegal, and the Swartkops catchment in South Africa. In both cases, local communities came together and created systems maps that represented: i) their collective judgement of the current trajectory of both catchments and ii) the visions or desired futures for their catchments. These maps are the foundation from which they can develop, deliberate, and select future pathways to achieve their local sustainable development goals. The main innovations rely on the fact that CoSMoS can be used to address multiple SDGs simultaneously, allowing for the exploration of interdependencies.

Visioning: Mapping the desired future for the Fimela catchment

CoSMoS workshop participants discuss the current state of the Swartkops catchment

The SDG Pathfinding consortium consisting of the International Institute for Applied Systems Analysis (IIASA, Austria), the National Research Institute for Agriculture, Food and the Environment (INRAE, France), Groupe d'Action et d'Initiative pour un développement Alternatif (GAIA, Senegal) and the Rhodes University (RU, South Africa) are continuing to work towards integrating CoSMOs within a broader suite of established participatory approaches, methods and tools, such as the Coupler des Outils Ouverts et Participatifs pour Laisser les Acteurs s'adapter pour la Gestion de l'Eau (CoOPLAaGE) and Strategic Adaptive Management-Adaptive Planning Process (SAM-APP).

In Fimela, the first step was to identify the major system elements of the catchment and translate them into French. This allowed the participants of the CoSMoS process, i.e. the local stakeholders, to engage in the process more effectively. They then co-developed a system map to have an assessment and a shared understanding of the current state of their catchment. Based on this current map and using a similar process, the stakeholders then laid out their visions or desired future for their catchment. With this renewed understanding and vision of their catchment, the stakeholders focused on the most pressing issues that their communities faced and the potential pathways to address them. In this regard, the stakeholders, with the help of the system maps, co-created a serious game about the salinisation of their cropping fields, which is a primary concern of the community. It also enabled them to delve into the problem deeper.

In the Swartkops catchment, the stakeholders did a preliminary assessment of their catchment using the STEEP-H analysis (Odume et al. 2022) before undertaking a CoSMoS process, but their assessment was converted into a system map representing the current state of the catchment. This system map was validated by the stakeholders before using it to co-create a system map of their desired future using the STEEP-H analysis framework. They then used the vision system map to create causal loop diagrams to identify the different interdependencies of the catchment system elements and then devised strategic plans to address the different challenges confronting the inhabitants of the catchment taking into account these interdependencies.

Here are examples of the STEEP-H cards developed together with Rhodes University and the Swartkops stakeholders participating in the process


# DESIGNING A COSMOS PROCESS

**Defining system boundaries and framing the problems**

As described in Section II, Background, CoSMoS' systems mapping tool is an effective device for garnering stakeholder engagement, creating a common understanding of challenges we face, and enabling strategic future planning. The CoSMoS methodology is well suited for a variety of situations and topics and is highly adaptable to fit your needs whether it be planning for climate change adaptation projects in a region or mapping out an energy transition process.

To design a CoSMoS tool that can be used in the workshop, you first need to frame the system you will be working with. This system can be a country, a region or any geographical area. The next step is to define or identify the elements, represented as cards that depict the system's structure. While CoSMoS has a set of pre-defined cards devised according to the water-energy--land nexus framework derived from the ISWEL Project's Policy Simulation, the thematic areas and the associated cards can be co-designed based on the main features identified in the preliminary stages when contextualising the system under investigation and its boundaries. For example, in the SDG-pathfinding project, our partners from Rhodes University used the STEEP-H analytical framework (Odume et al. 2022) to examine the Swartkops catchment. This involves listing Social, Technological, Environmental, Economic, Political and Historical factors that help contextualise the current situation, related to water security and its crosscutting linkages to SDG challenges in the catchment.

Not less important is to translate these cards into the local language to maximise stakeholder engagement. Once the boundaries of the system are established, you can move on to the objectives and aims of the project and the CoSMoS process. Often, a CoSMoS process is realised through a series of workshops. It is important to understand what is to be achieved by hosting a workshop and what the results will be used for. A CoSMoS workshop is part of a larger process, not a means to an end. It is used to collect data, share knowledge and connect stakeholders.

Since CoSMoS for sustainability pathway development creates collaborative visions for the future, those visions must be based on scientific facts and built upon existing and accepted global development and climate scenarios. These scenarios should be shared with stakeholders during the introduction so that they can agree and understand the context of the future they are mapping during the workshop.

### Choosing participants and identifying stakeholders

After deciding the overall topic and aim of the CoSMoS process implemented through a workshop, the next key step is to consider what kind of stakeholders the workshop should address. Even though stakeholders are often already identified at the start of a project, there still might be a need to further frame who needs to be involved. CoSMoS allows bringing together stakeholders from different backgrounds and locations so that they can jointly discuss, share information and collaborate by modifying a visual representation of their region, city or any other predefined system of their interest.

A CoSMoS workshop's goal should determine its design and participants. The designers should have a clear idea of what is needed and expected from stakeholders. On this basis, they decide whether a mixed group of participants or a specific type of background and expertise should be involved.

### STAKEHOLDER MAPPING/SNOW-BALLING METHOD

As explained by Varvasovszky and Brugha (2000) "stakeholders can be defined as actors who have an interest in the issue under consideration, who are affected by the issue, or who - because of their position - have or could have an active or passive influence on the decision-making and implementation processes". One of the commonly used methods in stakeholder analysis is the 'snowball technique', in which you start with identifying a few stakeholders at the beginning of the process and ask them to recognise new ones (either in terms of single individuals or entire categories of stakeholders). This method is usually supported by other methods and tools for stakeholder identification.

After initial stakeholders are defined, through brainstorming, preliminary identification or by researchers, they are asked to identify new stakeholders by providing names, their organisations, institutions etc. It is often carried out in the form of interviews - face-to-face interviews with checklists, semi-structured interviews or structured interviews with questionnaires (Varvasovszky & Brugha 2000). Remember that in this technique, actors will be usually selected at the end of the process. It is recommended to engage a wide range of stakeholders, also non-expert and marginalised ones, without narrowing down the list (Leventon et al. 2016). The findings can be presented in different forms - matrices, charts, position maps, network maps, and other figures for presenting data (Varvasovszky & Brugha 2000).

Reflect on the number and diversity of participants appropriate for achieving the workshop's objectives. We recommend not having too few participants as this will limit the level of detail and knowledge sharing during the CoSMoS process. Even though large workshops may cause facilitation issues, you can work this challenge around by using breakout groups, increasing the number of facilitators, or even doing multiple workshops with smaller groups. Having too few participants or facilitators), however, may limit the intended stakeholders' engagement and input, negatively affect group dynamics or lead to incomplete outputs. Ensuring full participation in the CoSMoS process is crucial for a successful workshop.

**Workshop process**

Once the CoSMoS process has been defined and adapted to your specific project's aims and objectives and stakeholder profiles have been determined, it is time to go through the different elements that make up the CoSMoS workshop.

In this section, we will go over the different exercises making up the CoSMoS workshop and analyse why and how to use them. With that said, not all the exercises are required in a workshop. The workshop designers can pick and choose among these exercises to suit the objectives of the workshops and the needs of the participants.

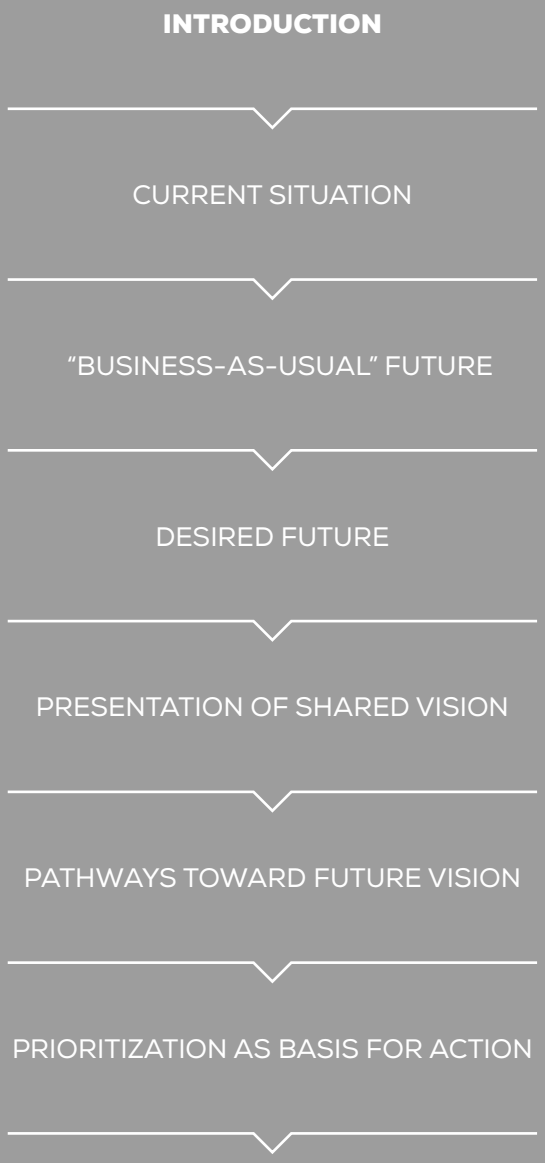
## STEP 1: INTRODUCTION

The first step of any workshop is introducing the objectives and expected outcomes of the workshop to participants. At this stage, the agenda should also be shared to let participants know what will happen and what they will be asked to do.

It is important to present the aim of the project the workshop is linked to and what is expected of each stakeholder. Participants should also understand what their input and the workshop results will be used for and what next steps are already planned for the project.

With the increasing pressure to engage stakeholders in research projects, resulting in multiple workshops, we can observe a 'stakeholder fatigue', which discourages them from participating in yet another workshop. This affects some topics and regions more than others, but it is understandable that one might be tired of participating in multiple workshops over the years and fail to see any results or follow-ups.





During this step, ask participants to quickly introduce themselves and answer an open-ended question, such as: *What are your expectations for this workshop?* or *What are you hoping to learn today?* This step is useful to characterise the participants and for facilitators to prepare potential break--out groups for future steps.

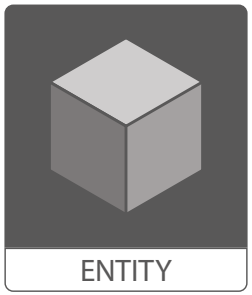
### STEP 2: CURRENT SITUATION

Systems mapping is a central part of the CoSMoS process. The process of stakeholder-led pathway development starts with characterising the current situation of the system which is the focus of the workshop. This is done by representing the different important elements found in a region or city or by highlighting the current vulnerabilities found within a system. The systems mapping approach presented here utilises a simplified visual format made up of a predefined set of indicators used to create a visual and engaging representation of the system. Geographical maps are used as the base, while cards depict system elements.

A **system map** is a visual representation of a given system that demonstrates its components and boundaries, as well as the components of the surrounding environment at a point in time.

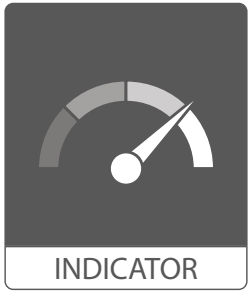
The main use of a system map is to represent the system structurally and to communicate the results to others. It enables one to clearly express thoughts for analysis; decide on structural elements; experiment with boundaries; adjust the level of interest; and communicate to others the basic structure of the system.

The systems mapping activity is a process during which stakeholders identify and spatially point out system elements on a map of a given system. System elements can be divided into three main groups:




Entities are physical, environmental or man-made elements that can be located in the system. Examples of entities are agricultural areas, lakes, glaciers, hospitals, roads, industry etc. One heuristic to identify entities is to imagine taking a picture of the focus area and checking what can be found there. By identifying entities and placing them on the map, participants take stock of their focus area - what exists there.


Processes represent changes happening in the system. These processes can be naturally recurring, like rainfall and snowmelt, or be influenced by outside forces such as tourism, cooperation or migration. Processes are changing the existence or properties of some entities - for example, evaporation reduces water level in the lake, and deforestation reduces forest area. It is a useful heuristic to think about processes linked to different entities and vice versa to make a comprehensive representation of a given system.



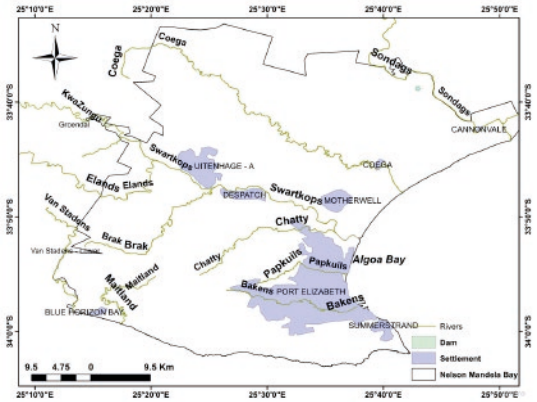

Indicators represent different characteristics of the system that can't be reduced to simple entities or processes. They may be linked to actors' perceptions, or be a combination of different factors calculated using a formula. A very well-known example of an indicator is Gross Domestic Income (GDP) in Economics or Return on Investment (ROI) in business or Carbon Footprint in sustainable development. Other examples include pollution indices, energy/water demand, health risk, water quality, or educational achievement. They can be calculated based on measurable variables or based on perceptions or judgments.

**Attributes of Entities:** All entities can be further characterised by using attributes - to indicate either an assessment of its state (e.g. high, low, or uncertain) or a trend indicating a direction that a given entity is changing. Other attributes may convey risks or opportunities or other relevant categories based on concepts such as resilience, robustness, power, etc. The attributes are linked to specific entities on the map.

Through the collaborative mapping of these three categories (and their attributes), stakeholders create a common understanding of the state of their system and use it as the basis for future planning activities.

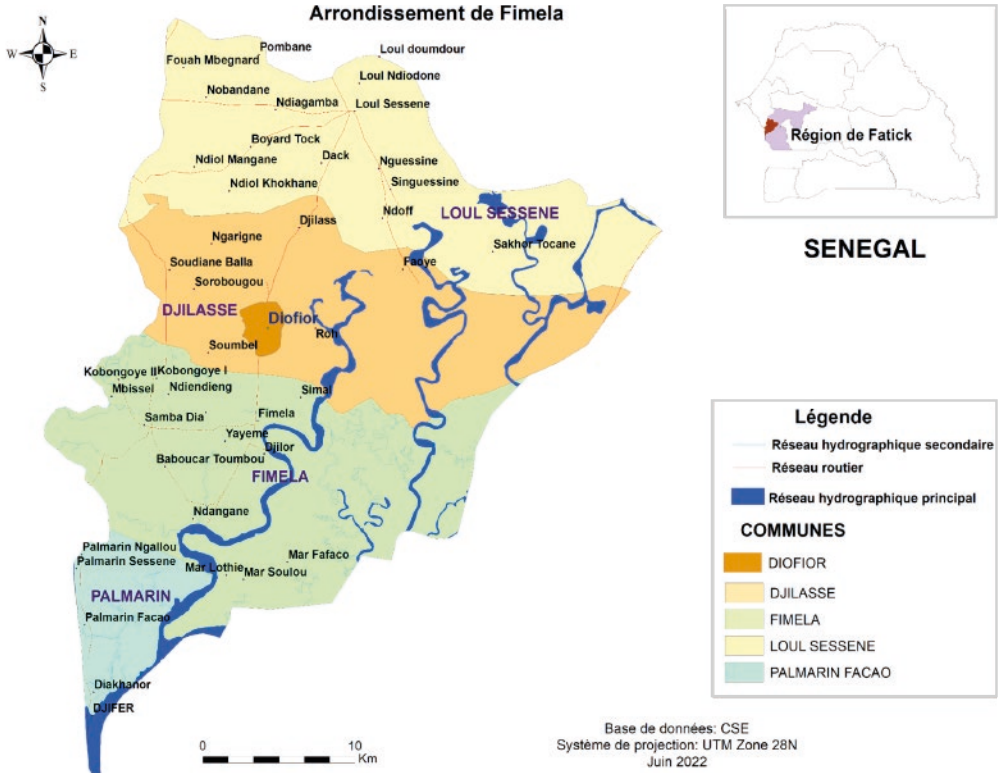
During the CoSMoS process, participants will use visual elements to voice their concerns and express their knowledge and ideas. Here are the main elements they will interact with:

**MAP** - Due to the geographical aspect of the systems mapping approach, maps are used to represent the area of focus of the workshop in a simplified visual format. They can include information such as borders, cities, rivers, lakes, land use, and topographical information. Below are some examples of maps created for workshops:




The Nelson Mandela Bay Municipality map used during the Swartkops catchment stakeholder workshops shows the settlement areas and river networks in and around the municipality.

**MAP: Spatially Aggregated Units** - Elements are placed on a map according to a spatial connection, but some elements can span over large spatial areas; in such cases, placing the same card multiple times over the map could be misleading, i.e. for heatwaves or droughts. To accommodate such wide-ranging elements, 'Spatially Aggregated Units' are added alongside the map to place cards into. The cards placed there represent elements that extend their influence over large spatial areas. These Spatially Aggregated Units can represent regions of a country, cities, national parks, and other areas of focus.




A map of the Fimela district was printed and used during the stakeholder workshops. This map shows the 5 municipalities comprising the district, and the road and river networks.


Examples of 'Spatially Aggregated Units' during the workshop in the Fimela district.

**Cards** - The cards are a way for participants to map the existing and projected elements and changes within the system they are analysing. They are put alongside the map. The placement and causal connections between the cards are at the basis of the systems mapping exercise. Providing a set of cards that allows for creating a complete representation of the system is crucial, but too many cards increase the complexity of the exercise and limit stakeholder engagement.

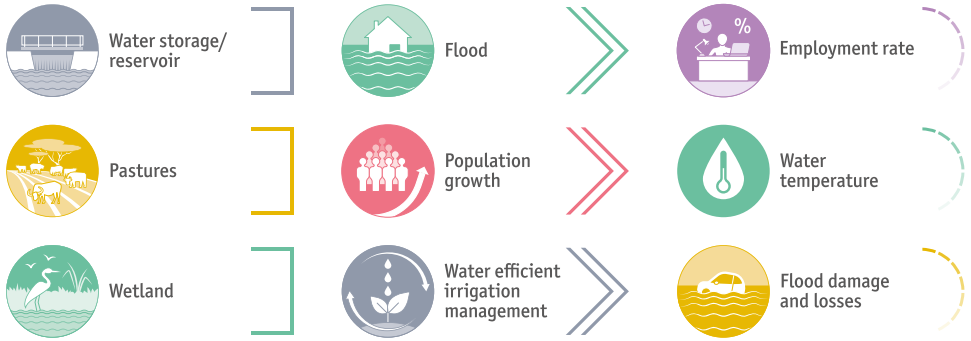

Printed cards need to be prepared and cut before the workshop and handled by participants, therefore they have simpler geometric shapes that are still easily identifiable.

**Printed cards for face-to-face workshops** - The cards are first divided into three categories according to what they represent in the system, namely entity, process and indicator. The symbol appearing on the right-hand side of the card depends on the type of element the card represents:

**Entities** are represented by rectangular cards with an unfinished rectangular symbol at the right edge.

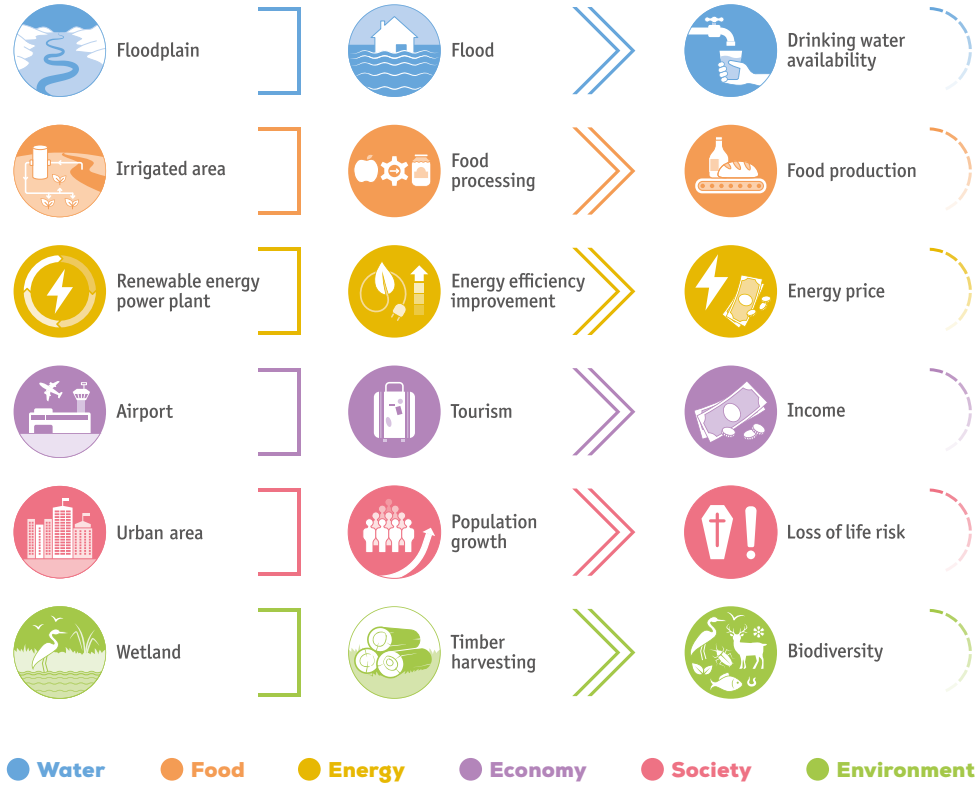
**Processes** are represented by rectangular cards with a double arrowhead symbol at the right edge.

**Indicators** are represented by rectangular cards with an arc symbol on the right edge.



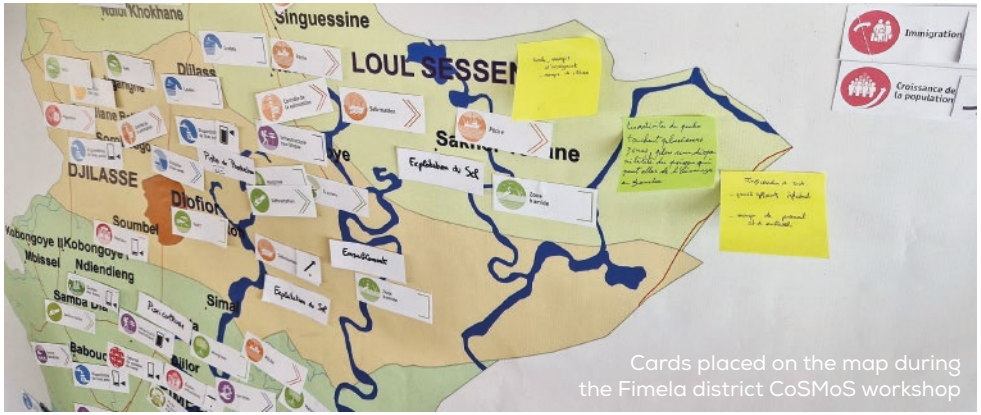

The use of these three types of cards with symbols helps to differentiate between them when creating causal connections. It is also useful for the analysis of the workshop results.

The colour of the card corresponds to its thematic area (e.g. green for environment, red for society, yellow for energy). Each card has a custom icon along with its name to make it easily identifiable and create a visual connection between all the provided material. As mentioned earlier, themes and cards can be customised using different frameworks. Below are examples of themes and cards related to the water-energy-land nexus.



Cards were chosen to provide sufficient information without narrowing down participants' scope of exploration and breadth of choices. It is also encouraged to use sticky notes to add elements that might not be included in the card selection.

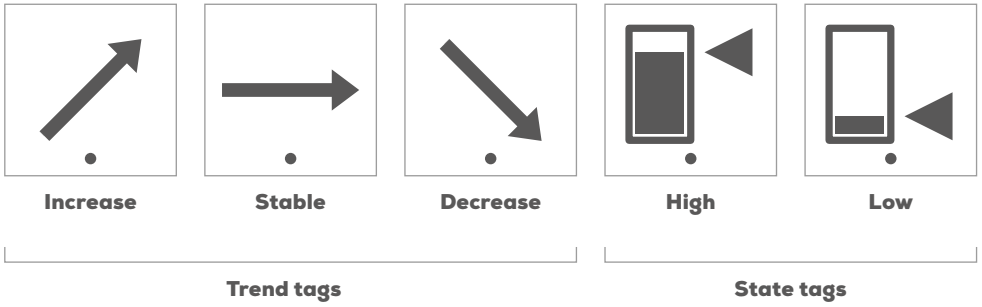
The categories of cards presented in this guidebook emerged during past workshops. Depending on the focus of the workshop, different card themes can be introduced to represent the needs of the workshop.



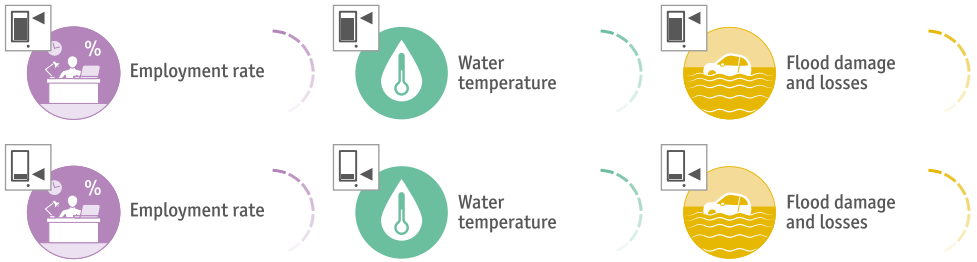
Cards placed on the map during the Fimela district CoSMoS workshop

**Attribute tags** - A series of attributes and trend tags are provided to add detail or meaning to a card or link it to a specific location. The attributes and trend tags increase the meaning and knowledge value of each card by adding information about its importance, general trend, state in the system, or location. Those tags come in the form of a small icon which can be added next to a card.

Different attribute tags are used to represent the potential states and trends of system elements. These tags can add a lot of information to an existing card but also can change its meaning so it comes closer to what the stakeholders intend. Certain cards can lack nuance without the use of attributes.



Trend and state attribute tags were created to increase the information that each card can provide.



Examples of different meanings of cards with state tags. The cards in the top row indicate a high employment rate, high water temperature and severe flood damage and losses, while the cards in the bottom row indicate the opposite.

Trend tags can also be combined with state tags to further increase the information provided by each card. In the example below we can see that high water temperature events are increasing, while high levels of flood remain steady over time.

Multiple tags can be added to increase the level of detail of the cards.

The materials concerning thematic areas should be chosen to provide sufficient information without narrowing participants' scope of exploration and breadth of choices. Participants should mainly use the cards provided, but they can also use sticky notes to add information that they feel might be missing from the cards.

This activity can be done in a plenary session or in breakout groups depending on the number of participants and the focus of the workshop.

When dividing participants into smaller groups, it is important to consider their composition. Dividing participants into sectoral groups based on their expertise can be used to get specific information about a geographic or thematic area. On the other hand, using mixed groups will lead to a holistic view of the system, which can further enhance knowledge sharing. Both have advantages and drawbacks, but the decisions should be taken before the workshop.

## STEP 3: "BUSINESS-AS-USUAL" FUTURE

Based on the assessment of the current situation made during the previous steps, participants develop a "business-as-usual" (BAU) vision of the future, i.e. a series of changes to the existing situation that is likely to happen if current policies continue. This step creates a baseline vision of the future that will happen unless action is taken to change the situation. BAU is an important step as it gives participants an overview of the unwanted consequences of inaction.

There are two methods for accomplishing this task. One way is to use the systems mapping approach. This method uses the same visual elements that were introduced in the previous step (map, cards and attributes) to develop a "business-as-usual" vision of the future. The change is represented visually with markers such as "increase" and "decrease", or by adding elements on the map. On the one hand, this method gives a more precise vision of the BAU by being able to geographically locate areas of high risk (and of high opportunities). On the other hand, this process is time-consuming and can be perceived as tedious, which may lead to participants being overwhelmed and disconnected from the process. An alternative to this method in developing the BAU future is to use the cover story canvas method (Sibbet 2011), as described below.

**Cover Story Canvas: How it works**

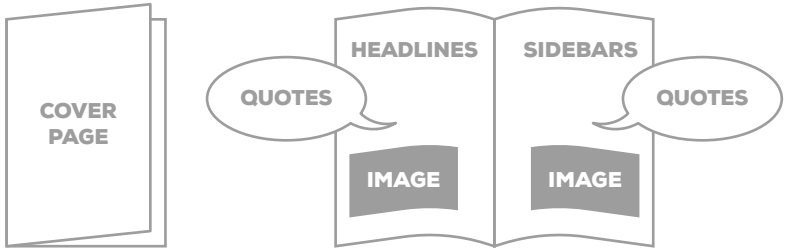
Example instruction: *Imagine it is 2050. No significant changes in actions, strategies, and policies, locally and globally, were taken to slow down and prevent climate change. Now the impacts of inaction are affecting your region. You read a newspaper article describing it. What would it say?*

In smaller working groups, and given a time limit of between 30 to 45 minutes, participants work on visual templates. The templates should be filled like a real newspaper - with headlines, quotes, text, and images - that describes a future where no significant actions were taken to change the status quo.

After completing the templates, participants present their newspaper articles and other groups give feedback. If the vision of the desired future is also created in the same manner, there is an opportunity to compare the BAU and the desired futures and generate discussion.

While the cover story canvas is less precise than a BAU systems mapping exercise, this approach also concisely captures the concerns or fears of the participants in a shorter period, which can be a powerful tool for communication with other stakeholders.

Example of the template to be used



## STEP 4: DESIRED FUTURE

After developing a common understanding of the current situation with participants and having them create a "business-as-usual" (BAU) future, it is time to start working on an alternative future vision and pathways leading to them. Unlike the process of characterising the ongoing situation (which concerns the current state, existing policies, and directions of their system) or the BAU scenario (where participants imagine the future due to inaction), the process of developing future pathways starts from a clear, simultaneously ambitious and realistic, vision of what can be achieved. Developing and mapping a shared desired future vision is an innovative process involving creative strategic thinking and decision-making.

If a BAU future was developed using the cover story canvas method, you can employ the same method in creating the desired future (DF) or futures for their area (e.g. community, region, country or territory). Unlike the BAU cover story, the DF cover story generates a common goal, hope, and encouragement. It gives participants motivation to go further in their reflection, generating creative thinking and passion. This process can create a vision that is optimistic, imaginative, yet realistic and tangible. The vision should be both rational and inspirational.

The desired future vision can be expounded using systems mapping on a new empty map, set to represent the region on a future date. Its selection depends on the workshop's focus. The activity works similarly to the visioning exercise described above, but this time participants are invited to interact directly on the map and place elements on their geographical location. The same cards that were introduced in the previous steps are to be used on a new map.


The results of a Systems Mapping Exercise exploring the current situation (left) and future vision (right) of the Swartkops catchment obtained from one of the three groups.

**Cover Story Canvas of the Desired Futures**

Example instruction: *Imagine it is 2050. A successful energy transformation took place in your region and you read a newspaper describing it. What would it say?*

In smaller working groups, participants work on visual templates, in the same way as described in the vision of the business-as-usual scenario above. The templates should be filled like a real newspaper - with headlines, quotes, text, and images. Groups should define tangible goals for the transformation. Actions should be defined along such themes as technology, assets, regulations, and society. The duration of the desired future (DF) cover story exercise can be adapted to the needs and constraints of the group. If this step is done with several groups, each group works independently on their own cover story template.

After completing the templates, participants present their newspaper articles and other groups give them feedback. If BAU futures were also envisioned using the cover story canvas method, this is a perfect opportunity to compare the BAU and DF side-by-side. In a broader sense, the BAU and DF convey the fears and hopes, respectively, of the participants about their future and the future of their area. Consequently, the activity develops a sense of agency and serves as a first step towards the development of their sustainable pathways.

While a DF cover story can be employed on its own without a BAU cover story, it conveys a more powerful narrative when the two kinds of future scenarios can be compared.

This activity can be done as a plenary session or in breakout rooms depending on several factors:

**the size of the group.** It is better not to have too many participants working on the same map. This will ensure that the process is a collaborative effort made through discussion and sharing of ideas.

**expected insights.** If you want each vision to have a specific focus, assign participants to groups according to their specific expertise. This way, they can work in parallel on visions specific to the environment & water, economy and energy for example.

**sensitivity of the topic.** If the topic is sensitive or controversial, it could lead participants to object or block proposals for the vision. Topics such as energy transition in some regions can be quite political and could lead to some sort of objections by certain participants.

A group working on a visioning exercise

Developing a systems mapping view of a common future vision enables participants to collaboratively represent what their region could look like in the near future. This process is used to create a compelling vision, as well as to help decide on how to achieve it and to inspire action. This process can involve participants of any experience level as it uses creative thinking to generate visions that can range from highly creative to detailed and very structured. This method can work for short, medium and long-term visions. If this step is done with several groups, each group works independently on a map and uses cards to create their future vision.

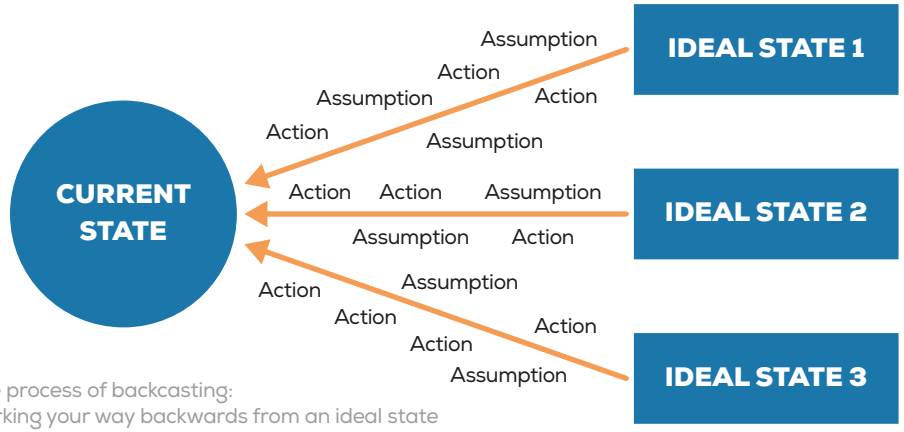
## STEP 5: PRESENTATION OF SHARED VISION

At this stage, different visions of the desired future will have been developed by the groups created in the workshop. Each group should present and explain their future vision in a plenary session with time for a discussion. This allows participants to develop a shared understanding of what others see as desired futures.

Each group should assign a representative who will explain their vision using the map they have developed. The presentation should be relatively short with room for discussion between all the participants.

CoSMoS workshop in the Fimela district in Senegal

For each ideal state, work backwards from the state and repeatedly ask the question *what assumptions and actions must we take to get to the ideal state?*




The process of backcasting: working your way backwards from an ideal state (or desired future) to the present or current state (based on illustration by Wilson (2011)).

## STEP 6: PATHWAYS TOWARD FUTURE VISION

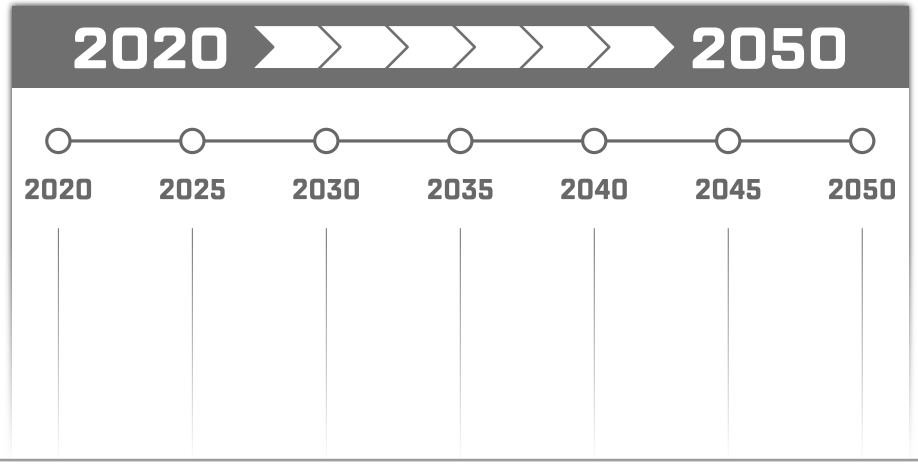
After developing a future vision spatially on a map, pathways leading up to that future vision should be developed. In a collaborative effort, the many steps towards that future vision are discussed and placed on a timeline, which highlights the strategies, milestones, and decisions needed. Pathways can be developed in different ways and with different approaches, such as backcasting. Backcasting is a planning method that starts with defining a desirable future and then proceeding backwards from that future to the present to strategise and plan how it could be achieved (Vergragt and Quist 2011).

After sharing and discussing the different group visions that were developed leading to a shared common vision of the future, the main system elements (entities, processes, and indicators) should be arranged into a timeline to create pathways toward the shared future vision.

Participants first place major elements on a timeline template, indicating the desired time when each should be completed. From there, other, minor elements are laid out in between the major ones to map out the process of finalising the vision.

**Timeline template**

Using a timeline template participants use cards and sticky notes to create a pathway towards the future vision. The timeline should be filled using a backcasting approach to focus more on the path towards the goals than the goals themselves.





Working on the timeline during the Indus River Basin CoSMoS workshop.

It should be remembered that this approach is about visioning, not forecasting. This is the start of a conversation about a future vision and the pathway should not be considered a hundred per cent accurate. It should be realistic without being limited by a lack of expert knowledge or uncertainty.

## STEP 7: PRIORITIZATION AS BASIS FOR ACTION

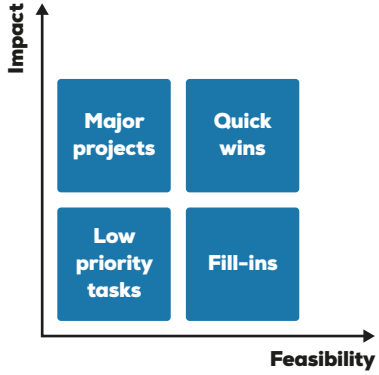
After the timeline is filled, a prioritisation of both the map and timeline elements should be done. This will highlight what participants feel are the key areas of action to focus on to reach the future vision and to take the discussion further.

The prioritisation exercise aims to highlight the most important elements that have been placed by the participants on the map and the timeline. It is achieved by way of voting. Each participant has a pre-determined number of votes to use in the form of dots. You can decide on the number of votes per participant based on the number of attendees and the variety of elements to be voted on. Ask participants to vote on the most important aspects of the map and the timeline. They should do it by placing the (voting) dots next to the cards located on the map and timeline. After the prioritisation exercise, choose the elements with the highest number of votes. We recommend choosing between 5 and 10 elements that will represent key areas for action.

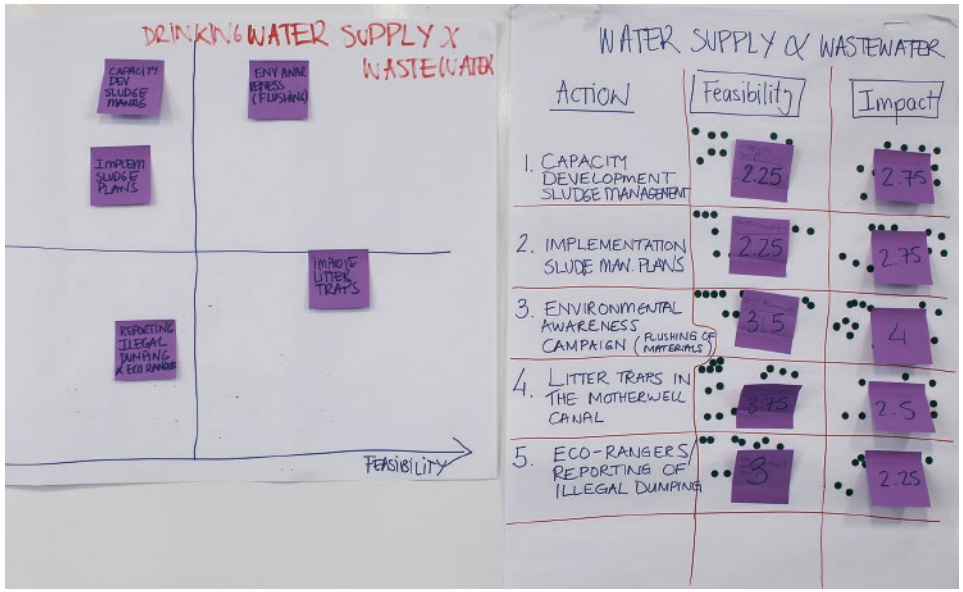
Another method of prioritisation is a simplified multicriteria analysis. In this method, participants rank the different options (or actions) under the chosen criteria using a Likert scale. Each option is then graphed using the scores for each criterion as the coordinates. The options are then prioritised according to their position in the graph.

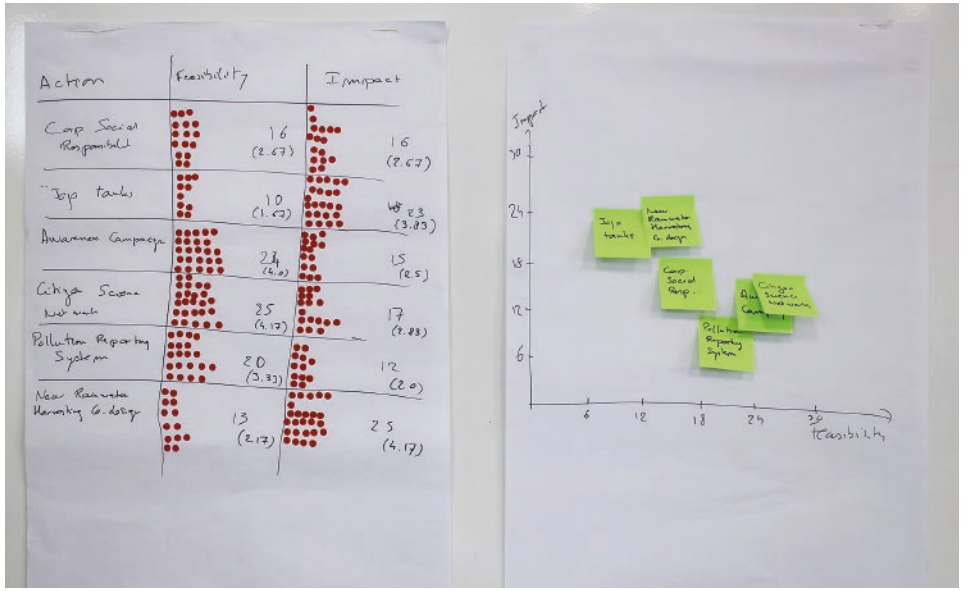
To illustrate a simplified multicriteria analysis for prioritisation, imagine a list of options is scored from 1 to 5 on two criteria: impact and feasibility. If you graph these options using the criteria as your axes and the scores as your coordinates, this will result in a graph that can show you the quick wins (high feasibility with high impacts) as well as the options with the lowest priority, i.e. has low feasibility and low impact.

| | Feasibility | Impact |
|---|---|---|
| **Option 1** | 1 2 3 4 5 | 1 2 3 4 5 |
| **Option 2** | 1 2 3 4 5 | 1 2 3 4 5 |
| **...** | 1 2 3 4 5 | 1 2 3 4 5 |
| **Option 3** | 1 2 3 4 5 | 1 2 3 4 5 |




This method was used in the workshops in the Swartkops catchment case study for the SDG-pathfinding where the participants prioritised actions linked to water security issues for several subsectors, namely water supply and sanitation, water resources management, and economic uses. These prioritised actions are thought to be actions that the local Living Lab can move forward and are perceived to deliver the most benefits.




After prioritising the options or actions, to assess how people feel about the finally agreed solutions, actions or steps, the method Gradients of Agreement (GoA, see below) (Kaner & Lind, 2007) can be employed. This is the point in the process where the group decides on the course of action, but the facilitator wants to check "Are we really ok with what we developed?", "Are there still any reservations?". If the objections are serious, the GoA can reveal the type of hesitations more finely than yes/no voting - and suggest a course of remedy - possibly another iteration of the earlier steps of the process. It is important to highlight that the aim of the tool is to stimulate discussion and see where people are on the topic. It doesn't determine winners or losers.

### Gradients of agreement



| | |
|---|---|
| **Whole-hearted Endorsement** | *I really like it.* |
| **Agreement with a Minor Point of Contention** | *Not perfect, but it's good enough.* |
| **Support with Reservations** | *I can live with it.* |
| **Abstain** | *This issue does not affect me.* |
| **More Discussion Needed** | *I don't understand the issues well enough yet.* |
| **Don't Like But Will Support** | *It's not great, but I don't want to hold up the group.* |
| **Serious Disagreement** | *I am not on board with this – don't count on me.* |
| **Veto** | *I block this proposal.* |

This is the Gradients of Agreement Scale. It enables members of a group to express their support for a proposal in degrees, along a continuum. Using this tool, group members are no longer trapped into expressing support in terms of "yes" and "no". The Gradients of Agreement Scale was developed in 1987 by Sam Kaner, Duane Berger, and the staff of Community At Work. It has been translated into Spanish, French, Russian, Mandarin, Arabic and Swahili, and it has been used in organizations large and small throughout the world.

## STEP 8: DEBRIEFING

The debriefing is the time when we close the experiential learning cycle. Experiential learning requires us to experience a problem, reflect on its causes, brainstorm solutions and challenge them from different perspectives. CoSMoS leads participants from understanding their current situation to imagining desirable futures, and in the process, they construct sustainability pathways that include different solutions. The process helps them to navigate complexity, understand the diversity of underlying values, and attempt to

define a shared ground for the future they all want. All these steps may require a look back and an additional round of reflection on the process itself.

*Were all the voices heard? Were women and minorities represented and offered opportunities to express their concerns?*
*Are there some issues requiring more data? A more detailed analysis?*
*Were there any conflicts? What were the reasons? Is there something that can be done about them?*
*Were there any important topics that were ignored altogether?*

The time for debriefing may vary but it is recommended to plan between 30 minutes to 1 hour to be spent on debriefing activities. During the session, also make sure that all the voices are being heard, including quiet participants. If you are short on time, reduce the time you spend summarising what happened and let participants begin reflecting on their actions. Consider using breakout groups for the first of the session, if the whole group is large.

**Results overview**

In the first phase of the debriefing, take a few moments to summarise what happened during the workshop. You might want to go through all the steps and brief on the most important aspects found in each.

**Evaluation**

The last step of workshops is an evaluation to determine if the process was adequate and whether there are important remarks that need to be taken into account. This is also a means of self-learning for the workshop organisers. Likewise, we also want to evaluate the social learning that transpired, e.g. what did participants learn through this exercise? Did this process uplift their capacities in responding to their system? Did they learn from other stakeholders? One way to accomplish this is by conducting a survey. You can distribute a workshop survey, either as a hard copy or as an online survey, to gather feedback on the exercise. You get better results when you distribute it in person, but participants may find an online survey easier to fulfil and send back. These surveys will help you develop and/or improve the process and understand what aspects are most informative and what could be conveyed better. As you close the workshop, you may decide to introduce some additional steps, but it is up to you.

## OPTIONAL: ROLE-PLAYING EXERCISES

One of the main challenges of workshops is to maintain active stakeholder attention and engagement. Active participation often becomes problematic when abstract concepts and terms are used and if participants mostly speak and write. Introducing CoSMoS elements and gaming techniques to the systems mapping method provides participants with a flexible and customisable collaboration experience.

**Why use role-playing elements during workshops?**

CoSMoS can be integrated with many other participatory methods, such as role-play, visual representations, and interactivity, bringing additional perspectives. Role-play can expand the participants' imagination through stronger immersion in the simulated reality. Visual representation and interactivity make the exercise more accessible and produce more concrete, robust, and policy-relevant pathways.
Moreover, role-playing games have also been successful in simulating how people address complex resource decisions such as sharing water for irrigation in Africa (Barreteau et al. 2001), farming and subsidies in North America (Taff 1998), and land use change around national parks in Poland (Krolikowska et al. 2007). Role-playing games are highly flexible and leave room for individuals to demonstrate their initiative and imagination (Ladousse, 1987), which is an advantage in games involving policymaking.

After working on the current situation and getting a common understanding for all participants, a role-playing activity can be used to shift participants' focus away from the current situation and towards a future vision.

# FACE-TO-FACE COSMOS WORKSHOPS


**Preparation of materials and room setup**

Conducting CoSMoS workshops in a face-to-face setting requires the printing of material (maps and cards) and preparation of supporting equipment. When working on a CoSMoS and its elements, keep in mind that most items should be designed for single-sided printing. Some of the elements on print--outs (e.g. cards) will need to be cut to size. You also need to collect other materials to lead the workshop, such as tokens (for prioritisation exercise) and badges. After you have printed and collected all the necessary materials, you will need to organise them.

Below you can find a list of all elements. It provides specific information about what you need to run the workshop in a face-to-face setting (Table 1). In Table 2, you can also find the instructions that will help you get the required space to run a CoSMoS workshop.

Before you go further in setting up the workshop, please take some time to read the other sections of the guidebook.

## TABLE 1

**Elements for Printing:**

- Map
- Cards

This includes elements to print. Ideally, a map should be printed in a large format (it depends on the number of participants and the level of detail that you want to reflect on the map). We recommend printing a map in a printing house. If using a home A4 printer, divide the map into sections and print one section per sheet. Laminating the map can be useful if you want to write directly on it. You can also prepare additional sheets around the map, e.g. showing particular regions or other areas.

**Cut to size: Cards**

Some of the materials will need to be cut to size.

**Other materials:**

- 1 type of tokens
- 1 small container
- sticky notes of different colours (e.g. yellow, orange, green, violet)
- Mounting or adhesive putty
- Stand (for the cards)
- Flip charts with paper and pens (different colours)
- Bell

You also need to collect other materials to lead the workshop. Tokens will be used in the prioritisation exercise. Put them in the container. As mentioned before, we don't want to narrow down participants' scope of exploration and breadth of choices - they can write additional elements on sticky notes and place them on the map. Mounting or adhesive putty, such as Blu Tack, allows you to stick the cards to the map, but also remove them easily without damaging the map or the cards. The stand is to neatly arrange and provide easy access to the cards. You can devise your own stand using stiff paper. Flipcharts with paper and pens will be used mainly for the magazine cover exercise - 1 set per group. The bell is used to signal or draw the attention of the participants, for example, moving to the next step of the process.

**Moderator materials**

- Workshop protocol
- Room setup
- Facilitation FAQ
- Debriefing outline

Finally, you can print out moderator materials, including the workshop protocol and the debriefing outline.

**Sort all other materials and put aside**

## TABLE 2

**Room Requirements**

Keep the number of participants in mind when selecting a room. You will have quite a bit of furniture, which you will see in a moment, and they will need space to move.

**Workshop area**

One large table - minimum dimensions of 1 and a half metres by 2 metres - is needed for the map.

**2-3 tables**

Ideally, you will have a couple of extra small tables or desks for group work.

**Moderator table**

An additional table is needed for moderator materials.

**Chairs**

You should have chairs available for participants, even though they will mostly be standing.

**Projector screen**
**Laptop/Notebook**

A projector screen is optional but may be used if you would like to display a presentation or video along with your introduction. Projectors are also necessary for the hybrid version of the workshop, i.e. if some participants are attending on-site and some of them are joining online.

## Workshop preparation and facilitation

The success of the workshop depends largely on your preparation. Once you have gone through all the steps of workshop design and preparation, facilitation is the last step in this process. Below you can find a few tips for workshop preparation and facilitation.

**1 Day before the workshop:**

Set the meeting agenda, share it with your co-moderators (if that's the case) and send it to the participants 1 day before the workshop;

We recommend to confirm the list of the participants, room reservation and event's schedule (in case your session is a part of the larger event);

Send participants relevant practical information (address, contact details, times, etc.);

Prepare the materials you will need for the workshop (printouts of the agenda, script, list of the participants and contact details, laptop, brochures, flipchart pens, etc.).

**Tips for workshop facilitation:**

Prepare for your facilitated session (room setup, materials, script and others);
Set upon the tasks for each moderator/co-moderator;

Prepare yourself for being flexible in time and workshop flow. Be prepared for unexpected events such as time shifts, e.g. if your workshop is part of a larger event;

Create your work environment with climate-setting, clarify the aim of the workshop and the workshop flow;

Remember to take a break, even if very short, so that participants can drink water and stretch their legs;

If possible, you can take the notes during the workshop that you can use for the evaluation;

After the workshop remember to meet with your co-facilitators to evaluate the workshop (action review) as well as follow up the workshop participants with a survey.

## After the workshop

Besides thanking the participants for their attendance and contributions, it is good practice, or even imperative, to share the results of the exercise, such as a report that summarises challenges, vision, pathways, or even the action plans, for them to have a sense of moving the state of affairs forward as well as a call to action.

# REFERENCES


Barreteau, O. Bousquet, F., & Attonaty, J.M. (2001).
Role-playing games for opening the black box of multi-agent systems: method and lessons of its application to Senegal River Valley irrigated systems. *Journal of Artificial Societies and Social Simulation, 4(2).*

Geurts, J. L., Duke, R. D., & Vermeulen, P. A. (2007).
Policy gaming for strategy and change. *Long Range Planning*, 40(6), 535-558.

Harvey, S., Liddell, A., & McMahon, L. (2009).
*Windmill 2009 - NHS response to the financial storm*. The King's Fund.

Kaner, S., & Lind, L. (2007).
*Facilitator's guide to participatory decision-making* (2nd ed). John Wiley & Sons/Jossey-Bass.

Krolikowska, K., Kronenberg, J., Maliszewska, K., Sendzimir, J., Magnuszewski, P., Dunajski, A., & Slodka, A. (2007).
Role-playing simulation as a communication tool in community dialogue: Karkonosze Mountains case study. *Simulation & Gaming*, 38(2), 195. https://doi.org/10.1177/1046878107300661

Ladousse, G. P. (1987).
*Role Play*. Oxford, UK: Oxford University Press.

Leventon, J., Fleskens, L., Claringbould, H., Schwilch, G., & Hessel, R. (2016).
An applied methodology for stakeholder identification in transdisciplinary research. *Sustainability Science 11*, 763–775. https://doi.org/10.1007/s11625-016-0385-1

Odume, O., Nnadozie, C., Griffin, N., & Akamagwuna, F. (2022).
*An ecosystem-based climate resilience approach to assure water security in the Amathole District Municipality, Eastern Cape, South Africa* (Research Report Volume 1). Institute of Water Research.

Parson, E. A. (2008).
Useful global-change scenarios: current issues and challenges. *Environmental Research Letters*, 3(4), 045016.

Sibbet, D. (2011).
*Visual teams: Graphic tools for commitment, innovation, and high performance*. John Wiley & Sons, Inc.

Taff, S. J. (1998).
*AgLand: The Game. Simulating Real-Life Decisions and Consequences*. University of Minnesota Extension Service. Regents of the University of Minnesota.

Toth, F.L. (1988).
Policy Exercises: Objectives and Design Elements. *Simulation & Games*, 19(3), 235-255.

van der Heijden, K. (1996).
*Scenarios: the Art of Strategic Conversation*. John Wiley & Sons, Inc.

van Notten, P. W. F., Rotmans, J., van Asselt, M. B. A., & Rothman, D. S. (2003).
An updated scenario typology. *Futures*, 35(5), 423–443.
https://doi.org/10.1016/S0016-3287(02)00090-3

Varvasovszky, Z., & Brugha, R. (2000).
A stakeholder analysis. *Health Policy and Planning*, 15(3), 338–345.
https://doi.org/10.1093/heapol/15.3.338

Vergragt, J. P., Quist, J. (2011).
Backcasting for sustainability: Introduction to the special issue. *Technological Forecasting and Social Change*. 78(5), 747-755.

Volkery, A., & Ribeiro, T. (2009).
Scenario planning in public policy: Understanding use, impacts and the role of institutional context factors. *Technological Forecasting and Social Change*, 76(9), 1198–1207.
https://doi.org/10.1016/j.techfore.2009.07.009

Wilson, C. (2011, August 2).
*Method 16 of 100: Backcasting. Designing the User Experience at Autodesk.*
https://dux.typepad.com/dux/2011/08/method-16-of-100-backcasting.html

Zurek, M. B., & Henrichs, T. (2007).
Linking scenarios across geographical scales in international environmental assessments. *Technological forecasting and social change*, 74(8), 1282-1295.