



Deliverable 4.1 [TALANOA-Water] : Guidance document for pilot water laboratories

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TALANOA

- w a t e r -

Deliverable 4.1: Guidance document for pilot water laboratories VERSION 2.0

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Preamble

To follow and assist partners with the development of the TALANOA-WATER methods in labs, monthly informal meetings with at least one person per lab have been organized under Task 4.1 and coordinated by INRAE. These meetings are enabling us to identify opportunities for cross fertilization between labs and/or relevant complementary skills among the consortium. These meetings are organized at 10 CET on every first Tuesday of the month for maximum 2 hours (depending on the agenda), and have two possible formats: (i) “training” sessions to convey key ideas, as in the second monthly meeting, which was dedicated to inform the empirical application of the theoretical framework of the TALANOA dialogues; and (ii) roundtables where every partner reports on where the lab stands, and the difficulties & successes that have been faced. In the technical annex. Minutes, video recordings and presentations are available on the drive of the project and the Agora (website and app). A Klaxoon board that presents the workflow of the discussions in monthly meetings is also available online here : <https://app.klaxoon.com/join/ISG4CKT>

The monitoring of the work lab is also eased with this shared document : [TALANOA Sourcebook Metadata - Google Sheets](#)

1 Introduction

The aim of this deliverable is to provide guidance to the lab or case studies of TALANOA-WATER in order to be able to comply with the project objectives, to reach state of the art methodologies and to offer a similar framework for different case studies.

The content of this guidance is focused on two main aspects that are combined in TALANOA-WATER water labs: 1) the **iterative stock-taking method for co-generation (chapters 1-6)**; and 2) the development of a **participative approach** with stakeholders (**chapter 7**). The modeling framework is not developed in this guidance, since it belongs to WP3. The methodological iterative stock taking approach aims at exploring robust transformational strategies and assess their performance up to their implementation; while the participative approach involves a serious game that should provide, together with results from the modeling tools, content to be fed to the methodological iterative stock taking approach to inform decision making.

The ecosystem of innovation is also a concept that will serve as a basis for analysis and will help make some choices in the participation so that the project fulfills its transformative ambition.

The report first presents the methodological stock-taking process, detailing each of its steps in chapters 1-6, while chapter 7 presents the guidance for the participative approach, which details how, in practice, stakeholders will be engaged to realize the methodological pathway.

1.1 Recall of the objective of the project and the role of the labs

The objective of TALANOA-WATER is to inform and catalyze the adoption of robust transformational adaptation strategies to water scarcity under climate change that contribute to the IWRM objectives of social equity, economic efficiency and environmental sustainability. This overarching goal will build upon **four specific objectives (SO)**:

- SO-01: Design, realize and demonstrate institutional and technical feasibility and performance of a transition towards sustainable and inclusive growth in different natural and cultural environments in 6 *pilot water laboratories*;
- SO-02: Design, test and inform the adoption of robust transformational adaptation strategies to water scarcity under climate change, harnessing technological innovation (including non-conventional water sources), nature-based solutions, risk management instruments and behavioral incentives (*10+ strategies designed and 1 adopted per water laboratory*);
- SO-03: Design multi-sector and multi-stakeholder partnerships and novel financial mechanisms to secure sustainable investment into, and cost recovery of, transformational adaptation strategies (*sustainable adoption of TALANOA-WATER ecosystem of innovation in 3+ water laboratories*);
- SO-04: Synthesize and upscale the results obtained in the targeted pilot water laboratories to inform supra-national (e.g. EU) and national strategies for water resources management, climate adaptation, disaster risk reduction, sustainable development, and ecosystem protection in the Mediterranean area (*mainstream TALANOA-WATER results and insights in 4+ national and 1 supranational/EU climate adaptation strategy/plan*).

The means to reach these objectives are to share views, develop collective knowledge, build trust, achieve consensus and **unblock transformational responses** to water scarcity under climate change in six large-scale pilot water laboratories in the Mediterranean basin.

WP4 (LABORATORIES) will guide the implementation of the ecosystem of innovation developed in WP1-3 (focused on engagement, data and modeling, respectively) in six pilot water laboratories. The six pilot water laboratories span major ecosystem types and legal, political and regulatory systems across the Mediterranean. WP4 will build evidence on the impact of transformational adaptation; serve as proof-of-concept for the TALANOA-WATER ecosystem of innovation; and underpin legacy options in the six pilot water laboratories and elsewhere.

1.2 Methodological approach: iterative stock-taking co-generation process

The methodological approach operationalizes the iterative stock-taking co-generation concept presented in the project proposal and in the following figure. The stakeholder platform (WP1) guides engagement while the modeling informs the co-generation process (WP3). This iterative stock-taking approach involves five major steps: co-design, co-development, co-evaluation, co-identification and co-implementation (Figure 1).

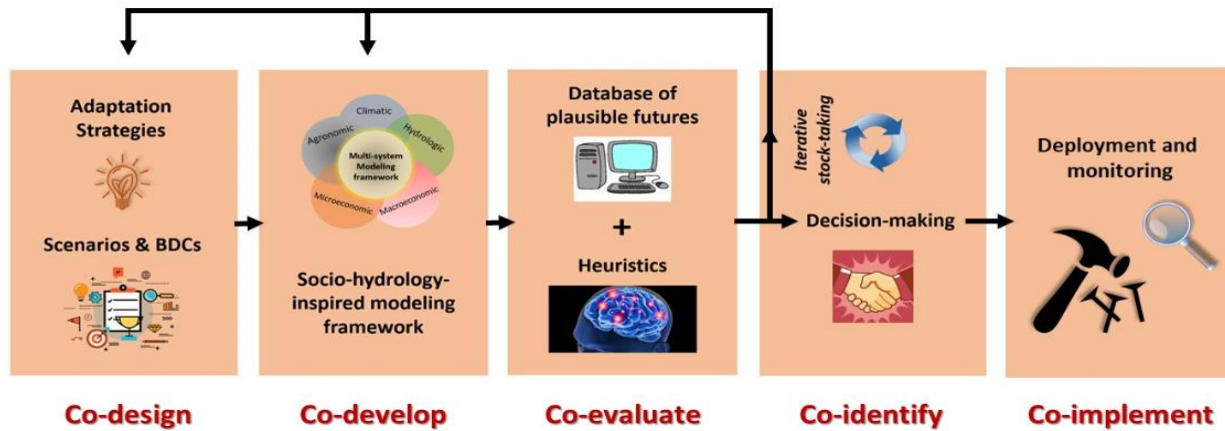


Figure 1 TALANOA-WATER iterative 'stock-taking' co-generation process (source: technical annex, TALANOA Water project)

The dynamic adaptive policy pathways approach is similar to that of TALANOA Water and can be an interesting source of inspiration (Haasnoot et al. 2013) as shown on the Figure below.

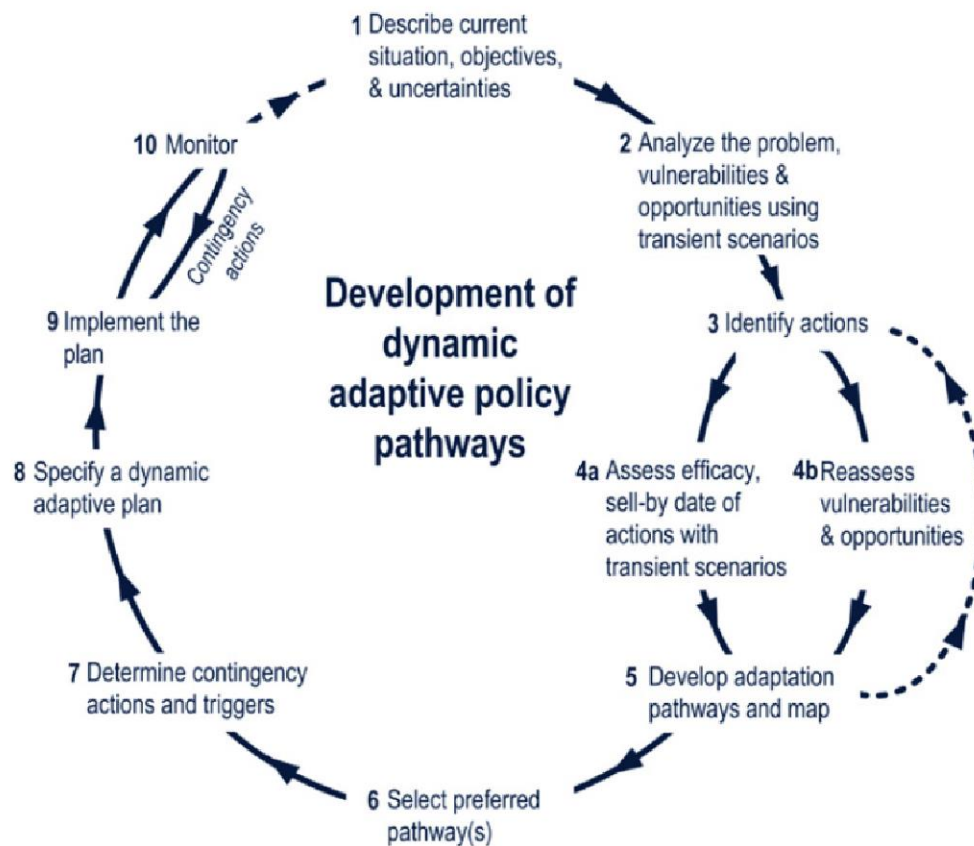


Figure 2 The dynamic adaptive policy pathways approach. Source : Haasnoot et al. 2013

Another important concept in TALANOA is that of robustness, as such the **robust decision making approach is also of inspiration to TALANOA labs**. The Robust Decision Making (RDM) approach is an iterative approach that engages decision makers through a participatory and deliberative process supported by computer modeling tools to represent, understand and assess the effect of uncertainty on policy strategies and decision making. This approach was formalized by the RAND corporation mainly in the 2000s (Lempert et al. 2003). The objective was to develop an approach that would allow the identification of robust short-term public choices and their adequacy in the context of longer-term policies such as sustainable development in a context of high uncertainty. It has since been applied several times to water management issues, for example for the Southern California Water Agency and its multi-decade water access plan and the 30-year planning of the Thames River Basin in Great Britain (Matrosov et al., 2013), and to climate change adaptation, as well as to other domains such as public spending on terrorism (Rand Corporation, 2013).

Building on this wealth of knowledge, a series of tools & methods will be deployed at lab scale in TALANOA-WATER. Each methodology will be adapted both to (i) the lab's specificities and (ii) the team skills, building on the complementary expertise of partners through cross fertilizations.

The necessary steps to the lab work are detailed in the table below, as per the Project proposal and Grant Agreement. In each of these steps, modeling, science and participation will need to be articulated. These steps are further detailed in the following sections.

Table 1 Overview of the methodology as described in the DoW

	ST No.	Title	Description	Element of WP1-3	Month
	ST4.1.1	Getting started	Research and assessment objectives will be agreed, along with analytical methods. Guidance will be produced (D4.1).	WP1	7-11
Iterative (stock-taking process)	ST4.1.2	Scenarios	Future scenarios will be used to force the modeling framework in WP3 and generate a baseline (conventional adaptation/no adaptation).	WP1—co-design, WP2, WP3	12-36
	ST4.1.3	Sustainable water use limits	<i>Basin Determined Contributions</i> (BDCs) capable of restoring the supply-demand balance in overallocated basins under future scenarios will be designed	WP1—co-design, WP2	12-36
	ST4.1.4	Strategies	Design of <i>transformational adaptation strategies</i> capable of achieving BDCs targets through the combination of four types of measures	WP1—co-design	12-36

ST4.1.5	Impacts & trade-offs	Impact of transformational adaptation strategies under future scenarios and BDCs will be assessed on indicators. Tradeoffs and uncertainty.	WP1, WP2, WP3	12-36
ST4.1.6	Robust decision-Making	Identify a <i>robust</i> adaptation strategy that contributes to IWRM objectives. Decision-making will be enabled through the provision of a combination of simulation results (mechanistic outputs) and <i>ad-hoc</i> interpretations of stakeholder experience.	WP1—co-identify	12-36
ST4.1.7	Proof of concept	Preferred robust adaptation strategies will be assessed in depth, and analyzed in terms of regulatory and other obstacles, feasibility and support from the involved institutions. Business plan drafted.	WP1—co-implement	37-39
ST4.1.8	Breaking ground	The practical implementation of the preferred strategy will be studied (partnerships, finance).	WP1—co-implement	40-41
ST4.1.9	Syntheses & recomm	The final step will summarize lessons learned, reflect about the transferability, and which risks to consider when designing similar schemes elsewhere. Draft business plan updated (input for D5.6).	WP1—co-implement	42-44

The originality of the approach is that it is not linear and that these steps overlap each other and can be cyclic as shown in Figure 1. Notably, the assessment step can foster new ideas and inform new strategies, and the implementation can be worked out since the beginning of the project while involving relevant stakeholders and activating the networks that influence, decide and implement.

1.3 The “Talanoia” research & intervention posture

In the design of the TALANOIA project the “posture” adopted to engage with stakeholders is the so-called “TALANOIA dialogues”.

Box 1 - Origin of the word “TALANOA”

In the Tongan language 'tala' means to speak or tell and 'noa' means something or nothing in particular (Vaiote, 2006; Otunuku, 2011). In the Fijian perspective, 'tala' is defined as 'to unload' and 'noa' is used with the prefix 'na noa' which means yesterday. Talanoa can therefore mean 'talking about nothing in particular' or 'unloading stories of recent events' (Nabobo-Baba, 2008; Farrelly & Nabobo-Baba, 2014).

Talanoa can be seen as a 1) method and a 2) methodology. In its view as a **method**, Talanoa is a qualitative research method of focus group discussion. It enables participants in a process to generate knowledge and provide solutions to problems and conflicts, ensuring respect for values established in the Fijian and Pacific tradition (Vaiote, 2006). The term is used in contexts where people engage in conversation based on their interests (Otunuku, 2011). Talanoa can also be considered informal conversation in its simplest definition (Farrelly & Nabobo-Baba, 2014).

In its view as a **methodology**, Nabobo-Baba (2008) presents Talanoa as a Fijian research framework that conceptualizes, prepares and plans research, enters the field, implements the Talanoa method, analyses and writes up, thanks, leaves, returns and reports back, and finally transforms and creates social change. Stewart-Withers et al, (2017) described the principles that guide Talanoa as a methodology. Some of these principles, adapted from Stewart-Withers et al, (2017) are presented in the table below. These principles partly reflect the posture of the ComMod approach (Etienne, 2009), which does not incorporate the emotional and spiritual dimension that characterizes Talanoa research.

Table 2 – Principle that guide TALANOA as a methodology.

Step	Posture and principles
Design	Project design in collaboration with those who understand the context
Preparation and planning	<p>Research takes time, the process is not linear, it requires patience and values silence</p> <p>Value is also in the process and not only in the conversations</p> <p>Researchers are part of the group and need to open up in personal aspects to create trust</p> <p>Emotions and empathy are at the heart of what researchers</p> <p>One must be humble and gracious, generous</p> <p>Members learn from each other</p> <p>Knowledge is co-constructed</p> <p>Recognition of multiple truths</p> <p>Research must benefit the community, the relationship must be sustainable</p>

Ritual offerings (Fijian customary process for entering the land)	<p>Reciprocity</p> <p>Research knowledge must be shared with the community</p>
The process	<p>Power sharing in research</p> <p>Recording and note-taking to accurately represent the discussions</p> <p>Talking and listening to people's hopes, dreams, aspirations, challenges, solutions</p>
Reporting, analysis, writing	<p>Knowledge is tested</p> <p>No closure as the research relationship is an ongoing engagement with the participants</p> <p>The relationship once established is for life</p> <p>The feedback and the report allow us to thank the knowledge transfer and the transformative process.</p>

Focusing on talanoa as a method, Otunuku (2011) states that the nature, degree, direction, place and time of talanoa are determined by the participants themselves. This method in itself aims to create an inclusive, participatory and transparent dialogue, through the creation of a dialogue platform in which participants tell stories (storytelling), debate, reflect, imagine, remember, share knowledge for better understanding and cooperation (Otunuku, 2011, Farrelly & Nabobo-Baba, 2014). The purpose of dialogue is therefore to build empathy and trust between participants, to produce decisions for the common good.

By focusing on collective action, this process should inform decision-making and advance intentions for change.

Within the framework of the TALANOA Water project, this research method is integrated into a broader participatory approach, which mobilizes other methods and tools to co-design and co-evaluate climate change adaptation strategies with the actors concerned by the subject. Talanoa can therefore be used as a method in participatory workshops and in working groups/subgroups, but is first and foremost a research posture.

The Deliverable 1.1 (Terms of Reference for the Stakeholder Platform and Talanoa Dialogue) has produced a “Decalogue” for stakeholder engagement:

1. Process orientated
2. Objective and outcome led, with clearly identified roles

3. Ensuring Representative Stakeholders are involved
4. User and Decision oriented
5. Joint product oriented
6. Gaming
7. Iterative
7. Inclusivity of different point of views
9. Trust
10. Monitoring, Evaluation and Learning (MEL)

These 10 principles are described in detail, including relevant scientific references, in D1.1 and are developed here in an operational manner.

1.4 The ecosystem of innovation approach

The concept of system of innovation will be central in TALANOA Water because it will serve the transformational ambition of the project. Indeed, operationalizing the idea of the system of innovation will make visible a variety of mechanisms on which we can build or rely on to understand and activate transformative adaptation.

From a practical point of view, labs have to adopt this concept to describe and analyze the system of stakeholders and identify who are the ones with specific roles in terms of innovation / adaptation adoption, experimentation, diffusion, training or assessments. This is described more in detail in Section 1.2b.

Box 2 - Innovation Definition

An “Innovation” is the introduction of a new “Solution” for a particular problem identified in the study region to improve a situation. It can be an “Equipment/Product”, or a “Procedure” and/or a “Methodology”, it can be a new organization or be a ‘social innovation’. Innovation can even be an innovation “by withdrawal”.

An innovation System is broadly defined as the set of organizations, institutions, their networks and knowledge flows that influence innovation within a socio-economic sector. It includes individuals of the socio-economic system. It also includes networks of experimental platforms where potential innovations will be tested and assessed (experimental farms, pilot treatment plants, monitoring stations, ...). It also includes rules and procedures that identify problems, potential solution testing and their adoption.

Pigford et al. (2018) highlight the derived concept of “ecosystem of innovation”, which explicitly considers the interdependencies, overlappings, transitions and interconnections between different networks of stakeholders from various sectors involved in an innovation process. The assumption that justifies

resorting to these concepts is that (environmental related) decisions are not only determined by individual characteristics but also influenced by the environment of the agent or system of innovation (Boyer & Touzard, 2021). The system of innovation can be characterized at different levels (local, regional, national and international).

For the TALANOA project it can highlight not only the importance of the different stakeholders and their role such as water users, but the relationship among stakeholders as well. Describing the ecosystem of innovation also requires that the roles of each stakeholder are specified with relation to adopting alternative measures or strategies that will be studied. This approach can help us to understand institutional and relational conditions of changes and for the application in our case studies is very useful for knowing what relations have to be triggered for implementing the different changes.

The classical approach to the ecosystem of innovation distinguishes four types of actors, which are in Figure 3 :

- ✓ Economic agents linked to value chain (farming, drinking water, industry) and the organisms that represents them
- ✓ Bridging institutions (in terms of knowledge): technical institutes, consulting
- ✓ Research and education
- ✓ Institutions characterization from the enabling environment (administrations, municipalities...)

NGOs for instance can be either in bridging institutions (if they experiment or provide technical advice) or in the enabling environment if they lobby for a given cause.

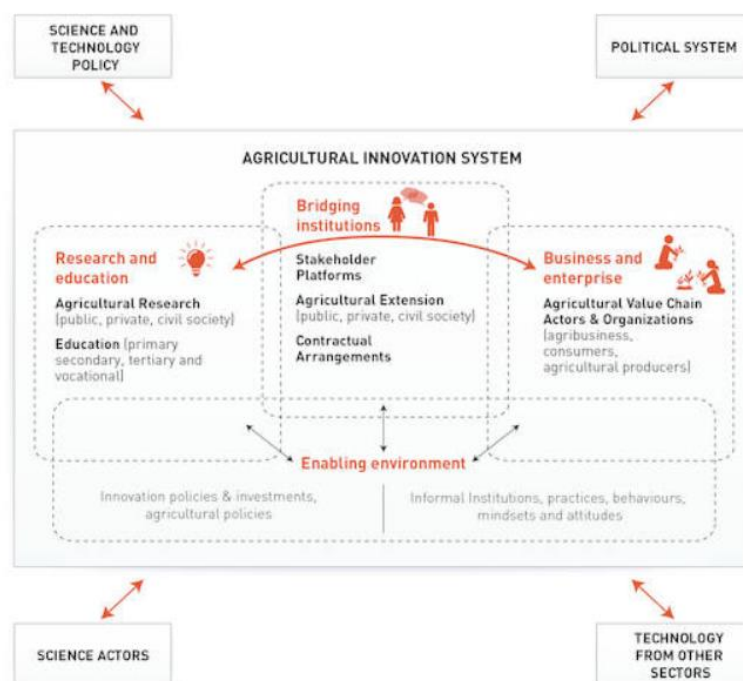


Figure 3 The Agricultural Innovation Systems (AIS) perspective “recognizes that agricultural innovation is a process involving many different actors and factors and that it can only take off if it meets the demands of its principal users” Source : AIS: a new take on innovation | The Tropical Agriculture Platform (TAP) | Food and Agriculture Organization of the United Nations | Tropical Agriculture Platform (TAP) | Food and Agriculture Organization of the United Nations (fao.org)

The innovation process can be described commonly in different steps. In each role the actors are different and the system behaves differently. This process can be decomposed in four steps, that are really close to the TALANOA Water methodology:

- ✓ Identification of the problem (e.g. climatic), state of the art
- ✓ Design and exploring choices
- ✓ Decision including ex-ante assessment
- ✓ Monitoring including ex-post assessment

The notion of Sociotechnical niches and regimes proceeds from the innovation system approach, providing a dynamic and multilevel perspective to socio-technical sustainability transitions (Geels 2018).

2 Step 1a: Getting started

2.1 Validating the geographical extent

While the location of the water labs was decided from the project onset, some labs spent some time after the project started to decide the scale at which the modeling and stakeholder engagement would focus within the lab. This was the case of France, for example. In this lab, two scales can be considered: the Aude Mediane & Aval River Basin will be the place where the modeling & stakeholder platform interaction will take place, while the whole Languedoc-Roussillon Region will be the lab for sourcing ideas of adaptation strategies for farming.

The extent of the lab for modeling and engagement purposes can be revised later on to address technical or socio-political reasons. This will not affect in any case the achievement of the project objectives.

2.2 Defining specific lab objectives

The objective of this first step is to characterize the objective of the whole project in the specific lab.

Research and assessment objectives should be agreed between the scientific team (TALANOA water partners) and the relevant stakeholder platform. This step is critical for engagement and, obviously, for the management of the project.

The analytical method that will be adopted should be determined by considering the skills in the lab scientific institution and in other partners' institutions. Other tools or skills of the stakeholders can be mobilized as well, particularly to ensure scientific results are actionable.

In this step it is important to plan in detail all the activities in the lab. This does not mean that no new activity can be added (e.g. new strategy assessment or adding several workshops after observing that one is not enough). For planning these adjustments to the original plan, this deliverable D4.1 should be of relevance. The first workshop is a key milestone in step 1a, and to revise the plan of activities.

To implement this step, it is recommended to use at least these methods / steps:

- ✓ Contact stakeholders individually with official letters or mails
- ✓ Have a first round of bilateral meetings at least with major stakeholders
- ✓ Organize a first workshop to define the objective and important assumptions that the lab will take (see below)

2.3 Identifying the stakeholders within the ecosystem of innovation

This step is critical both to ensure that the outcome of the scenarios, strategies and assessment of the strategies are done with relevant stakeholders that bring aboard all the key expertise. The selection of

stakeholders is particularly important as it is likely to influence the outcome of the participative process, and project (Jacobs et al. 2016).

To correctly identify the stakeholders, one must ask the following questions:

- ✓ who faces the problem and is the most vulnerable?
- ✓ who has the decision power on the measures we want to tackle?
- ✓ who can better characterize the problem and propose innovative solutions?
- ✓ who will implement the actions, innovation, practices, and solutions?
- ✓ who has influence (who finances, among other relevant aspects)?
- ✓ who can bring new ideas/ solutions ?
- ✓ who is affected by the decision ?

We should be careful to integrate in the process from the beginning people that represent all the socioeconomic system (even the informal sector that might be important in water management). It is also important to integrate people that might not care or will not care about the project but who are decision makers, at the very least to gather inputs that inform strategies.

The identification of stakeholders should also consider a **gender balance** by addressing the recommendations of the Conference on the Gender Dimensions of Weather and Climate Services (UNESCO, 2014), which explored women empowerment for the sake of building safer, stronger, and more resilient societies, and monitoring and promoting women access to training and transformational adaptation strategies such as irrigation. This is considered as important in TALANOA Water (see Impact Champions criteria in D1.2).

Once identified, **stakeholders should be organized in groups** such as : farmers, other professionals of the food & farming system, other water users, state & local government, NGOs, elected representatives. According to the needs of each lab, specific workshops with only one or some groups can be organized. Subgroups have the advantage not to use precious time of less relevant stakeholders on a specific topic, specify positions or proposals before turning to the whole group.

New stakeholders can be associated during the stakeholder engagement process if this is justified and explained to the group.

As of January 2023, all labs have identified their relevant stakeholders. An example of stakeholder list is available here for the French lab: [Parties Prenantes TALANOA Aude - Google Sheets](#)

2.4 Mapping stakeholders

Stakeholder mapping or stakeholder analysis can be done in TALANOA water to elucidate (i) the water governance and interaction with drinking water, industry or farming sectors as well as (2) within the agricultural and development sector. It can take different forms but always try to characterize the relationship stakeholders have with a particular issue (an innovation, the management of an infrastructure or an environmental issue...). A frequent representation is locating stakeholders on a 2-dimensional graph with one axis corresponding to *interest* and another with *influence* (power) (e.g. Reed & Curzon, 2015). Other representations include linking stakeholders (Medina et al., 2020) or pooling stakeholders & institutions in concentric circles. Almutairi et al. (2019) propose to draw the trajectories of stakeholders in different scenarios on an Influence/interest graph (see Figures below). In sector specific boundaries (for instance agricultural water use) it can be interesting to go as far as a network analysis (Chiesi, 2015), enlightening the importance of stakeholders and their relations.

To operationalize the ideas of the ecosystem of innovation approach, the following steps can be implemented to map the organizations that intervene already in the innovations or those that are likely to:

1 – Identify regional organizations

Depart from the regional scale to identify the organizations that support farming (and other water use sectors). This identification must be associated with a characterization of the different functions these institutions have with relation to the innovations: advice, funding or financing, technical advice or experimentation. This task results in a detailed mapping that will be further elaborated in the next steps.

2 – Interviews with these organizations

The aim of the bilateral interviews with organizations is to understand their official role (e.g. public policy) on innovation and informal role on specific innovations that happened in the past. Here we will investigate the specific topic of climate action and water related decisions and actions. Understanding the blocking attitudes is also of importance.

3 – Interview with local, economic actors

Here local actors that are adopters or potential adopters are interviewed on their perceptions, attitudes, and behavior around the innovation that is under study. These interviews enable us to identify other actors that are in the system of innovation such as SMEs, informal networks, NGOs, etc. which are only visible at local scale. These stakeholders must also be interviewed. The discussion should enable us to understand how the ecosystem of innovation is mobilized by the actor and how it can act. Questions like “ To whom do you ask advice before taking this (type of) decision? To whom would you ask for advice for this potential innovation” are relevant here. This will help us reveal their relational network. The network is interesting because it reveals the context of action.

In the interviews that can be complemented by media research, the transformation must be questioned. In which conditions actors could adopt or resist to change? What are the compromises they could agree on? It is also of foremost importance to consider intersectoral collaborations and relationships to identify innovations.

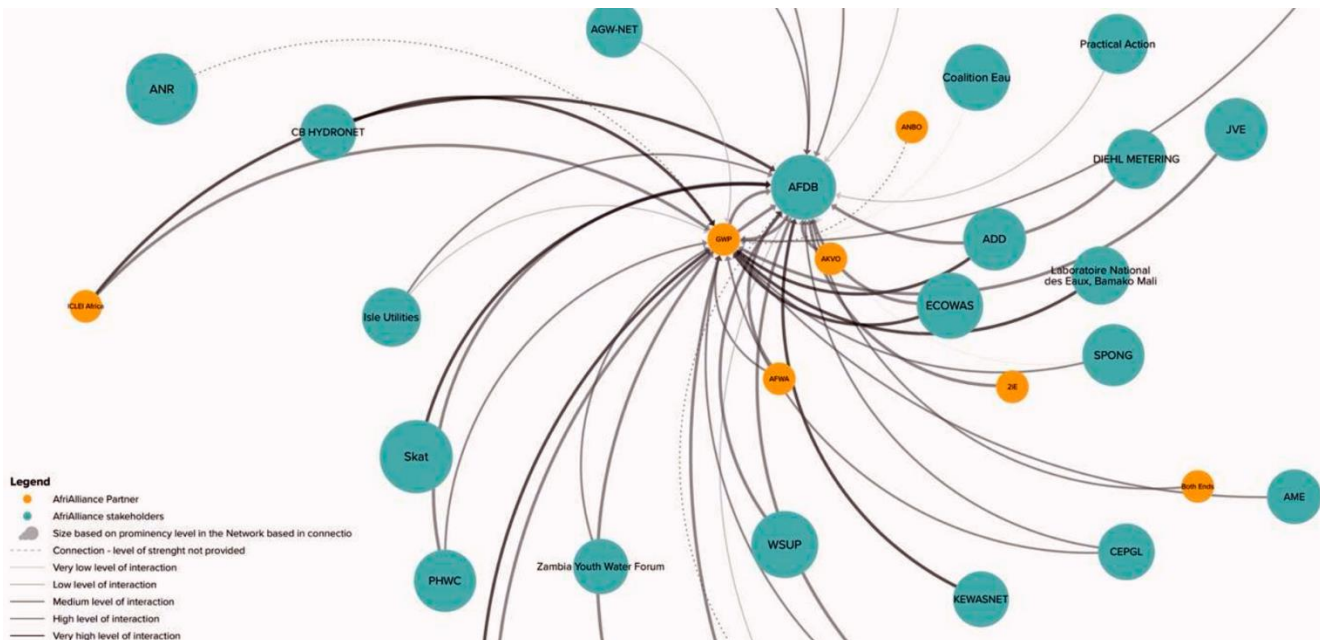


Figure 4 Example of a stakeholder relation mapping : Screen grab of the AfriAlliance Stakeholder Map with a focus of one of the key organizations according to the SNA Analysis: African Development Bank, Afdb. Source : Medina et al. (2020)

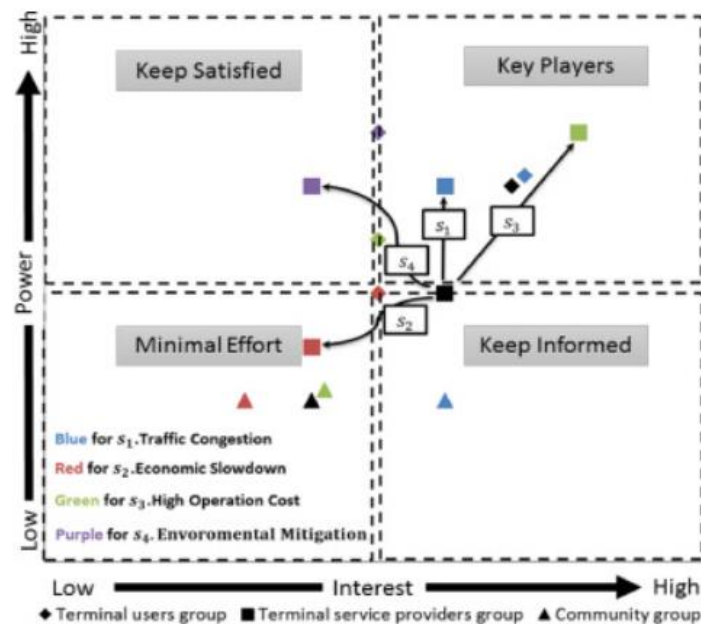


Figure 5 Example of Stakeholder mapping for four groups of stakeholders across all the scenarios; shapes represent groups of stakeholders and colors represent scenarios. Source : Almutairi et al. 2019

2.5 Collecting and organizing the data

With support of WP DATA a data management plan and data collection is organized per lab. Metadata of each lab has been published (D2.1) and data that has been openly shared and uploaded to public repositories. Partners should keep updating **metadata** constantly when new data is acquired and identified. This file should be used : [TALANOA Sourcebook Metadata - Google Sheets](#). This should become a useful tool in the daily work of the labs and not remain a reporting mechanism.

2.6 Monitoring the impact of the project: start & end surveys

In order to enable monitoring of our project impact, a survey to stakeholders must be deployed at the beginning and the end of the process. The project proposal referred to the SDG Integrated Water Resource Management ([Indicator 6.5.1 “Degree of integrated water resources management implementation \(0-100\)” - sdg6monitoring](#)) that can be applied to states or large river basins.

In the project the Champion’s procedure is an exercise through which all labs should fill in some criteria to adopt and report on some key indicators of their engagement process (Please refer to D1.2).

The minimum to achieve this goal is to have this survey done at the latest in workshop 1 and sending a second one after workshop 4. We suggest going further to illustrate how stakeholders evolve while monitoring the effect of the engagement and participatory process on knowledge, values, understanding and positions of stakeholders. An example of survey is given in Annex 2.

3 Step 1b - Design a stakeholder engagement protocol: the stakeholder platform

The stakeholder platform can be defined as a formal or informal space for various organizations with stake in water management to meet, exchange knowledge and deliberate joint actions.

The way stakeholders are engaged with the project can be called a stakeholder engagement protocol.

Once the major stakeholders and geographical extent of the lab is validated, labs should define precisely the content of their stakeholder engagement protocol. The project proposal and DoW already defines the structure and core stakeholders for each lab, as well as the series of workshops that have to take place and their objectives. The interactions between lab/local and international workshops of the project are recalled in the figure below.



3.1 From stakeholders to a stakeholder group



Figure 6 From individual stakeholders to an operational stakeholder platform

The **lab rapporteur** has already been chosen in all the labs, she/he is expected to attend all local workshops and international workshops (Standardi et al. 2021).

A **steering committee** is optional and can be very interesting in large stakeholder groups: this governance level should help monitor progress towards objectives of the stakeholders (and thus reinforce their motivation towards engagement) and assist in the organization of workshops and specific sessions (for instance with the identification of experts that could share ideas or results). Arbitrations might be necessary (at this level) in order for the project to advance at a satisfactory pace, to avoid situations in which a participative session does not reach its objective because of too much debate or too much conflict.

This should be detailed in each lab and presented and validated during the first workshop.

3.2 Design the governance mechanisms of the process

It is essential that the elected representatives and the water laboratories have clearly defined and jointly agreed goals. There should also be a common vision on the roles of each, and an agreement on the outcomes during the first workshop. Representatives who can provide practical knowledge and have a good share of information on the case study, as well as who can identify the feasibility of relevant innovations emerging from the TALANOA-WATER lab activities should be considered and engaged. Those who are central in the national policy debate and who can act as experts on assessing the viability of results generated from the projects (model results, findings, etc.) can also be engaged.

The network of stakeholders should be discussed and validated in the first workshop or at least at the beginning of the process. To ease the definition of the governance, roles should be attributed to people or groups of people. A scheme can help in illustrating the governance roles. An example for the French lab is

provided below that includes a “groupe de travail”/core working group, a lab steering committee, the lab rapporteur, and the scientific team of TALANOA water:

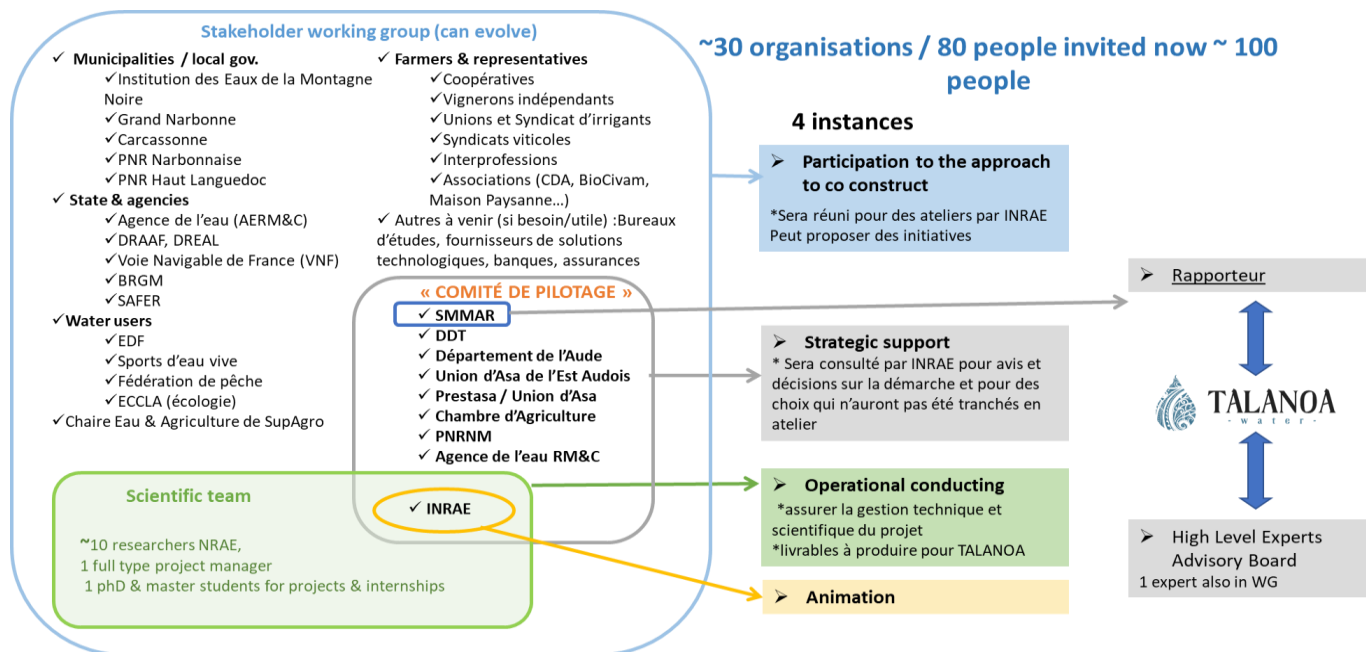


Figure 7 Example of governance overview of Governance proposal scheme for the French lab

3.3 Design of the science- policy workshops: the backbone of the engagement process

The science-policy workshops have already been defined in the project description of work and are represented in Figure 8. The program announced in each workshop is very ambitious particularly in the first steps of the project, and may need to be adapted to the situation in each lab to address possible delays and/or contingencies, always keeping in mind the objectives of the project and ensuring their achievement. Some partners preferred, for instance, to split workshop 1 in two distinct appointments: one with the aim to present the project and the tools that will be developed, meet the stakeholders and start engaging them; and another to implement one participative exercise, for instance defining basin determined contributions.

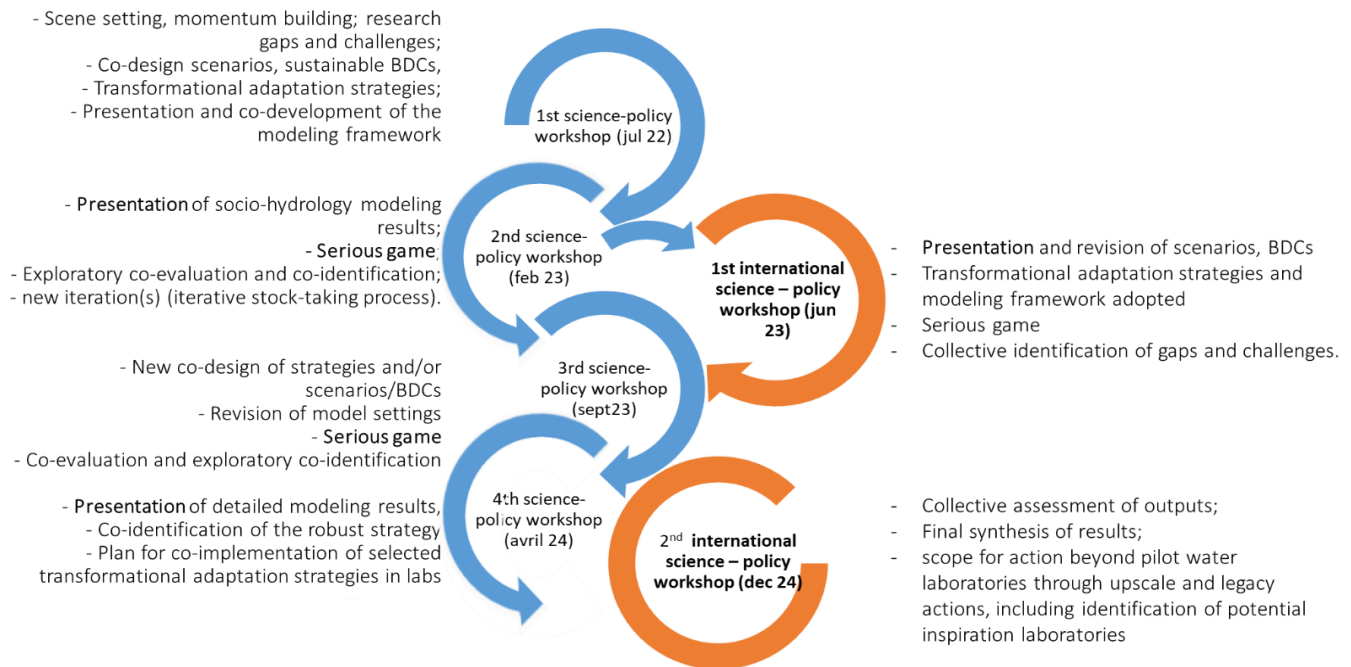


Figure 8 Workshops foreseen in the description of work

All lab coordinators will adapt this graph and methods to their lab. A more detailed graph should also be produced to be certain to have all objectives planned along the workshops held. For instance, if a workshop is split into 2 workshops, the initial objectives for that single workshop should be met in these two separate workshops, or at least during the following workshops. The graph below represents the content of the workshop and how it links to the iterative stock taking process (repetition of some steps with new material).

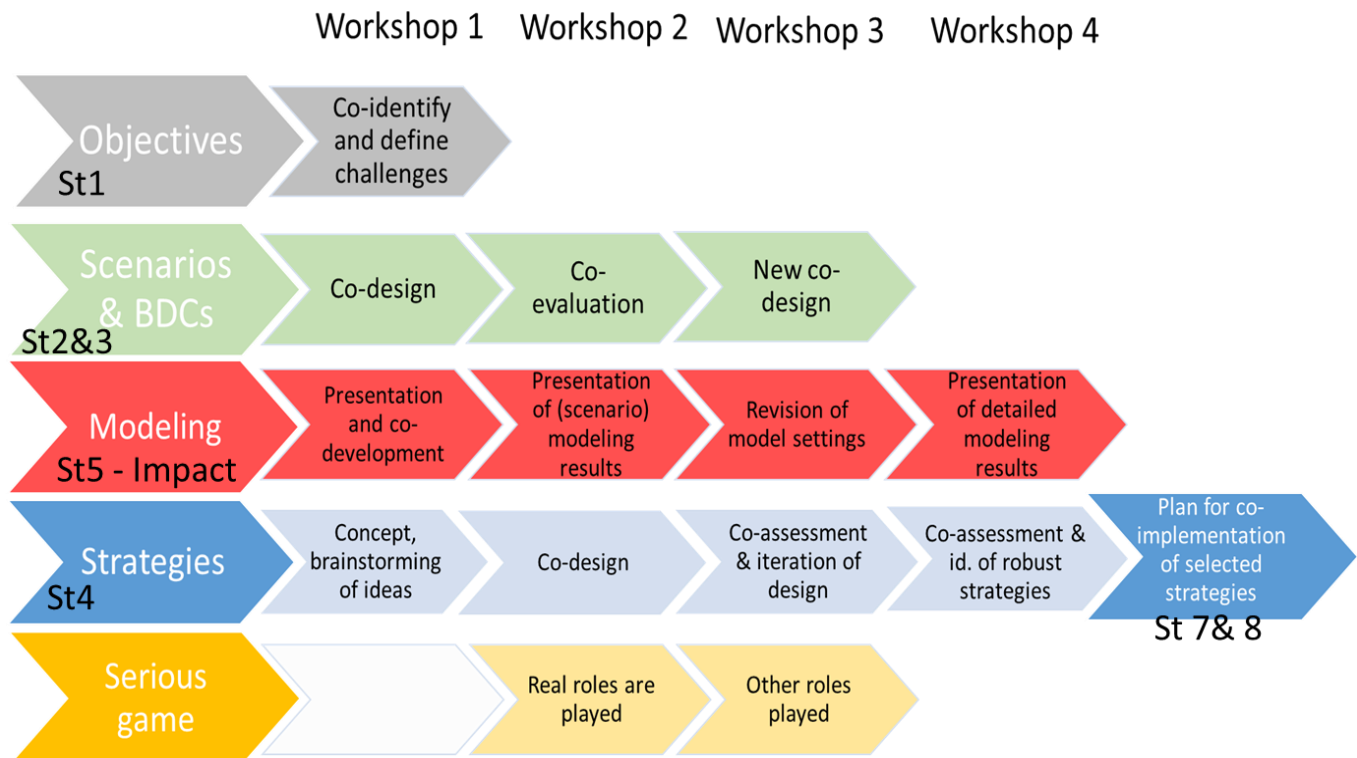


Figure 9 Specific agenda items of the workshops

In all workshops a synthesis of the results and steps realized to that point should be presented to all participants to inform or recall the achievements thus far. This is important both because new people can join and to ensure all participants start from a common knowledge.

4 Step 1.3 Development and use of a serious game

According to D1.1 In workshops 2, 3, and 4 a serious game for evaluating and revising transformational adaptation strategies, understanding how stakeholders make decisions, enhancing transparency and trust, and building consensus will be developed and used. Serious games should be applied in all labs. In the serious game in workshops 2 and 4 we will use detailed information from each water lab, and stakeholders will adopt their real-life roles, which helps to underpin the development of ad-hoc transformational adaptation strategies. The game in workshop 3 will focus on learning and will be executed on a more abstract level, allowing participants to take other roles than they have in real-life to learn about the complex structure of the problem and interdependencies between actors.

Within the framework of the TALANOA project and its objectives, the design and use of a serious game (SG) (or role playing game) is useful for co-identifying and co-assessing, with the stakeholders of the territory, transformational adaptation strategies in the face of climate change. Indeed, the TALANOA Water labs are complex and present several uncertainties on the (future) rules of water management and

abstraction. They often face a problem of access to sufficient clean water resources in the short term and are characterized by the presence of several stakeholders (users) and managers with different interests.

The SG will make it possible to simplify a complex system and to simulate the current and future dynamics linked to agricultural development and access to water. This shared representation of the problems will then allow dialogue and definition with different stakeholders of water innovations and agricultural development decisions to deal with water scarcity under different scenarios (climatic, economic).

4.1 Serious games: tools to formalize and stage a problem

Participatory models can be associated with the so-called "*serious gaming*" approach which can be applied to a variety of problems (Voivov et al., 2016).

There is now a large literature defining what a serious game is and describing its different fields of application, including psychology, health and education sciences, politics, business and ecology. This literature also characterizes the different purposes SG can be used for: to support decision-making, to support teaching or a learning process, to inform, to communicate, to enhance knowledge, to share and articulate views and data (Alvarez & Djaouti, 2011; Schmoll, 2011).

In these different fields of application, there are also several ways of naming these devices, even if they sometimes share the same objectives: *serious games*, *simulation games*, *role playing games*, etc.

A "serious" game or "role-playing" game can be defined as "an artificially constructed competitive activity with a particular objective, defined according to a set of rules and constraints, and situated in a specific context", and which does not have entertainment as its main objective (Abt, 1979; Michael & Chen, 2006). (Hays, 2005) and which does not have entertainment as its primary purpose (Abt, 1979; Michael & Chen, 2006). The game can therefore be used to focus participants' attention on specific aspects of a problem that the process organizers wish to highlight to enable (i) the construction of a shared vision of the problem and (ii) the discussion of solutions collectively.

The game contains a model defined as a system composed of different objects and variables and their interactions. In the game approach there is a combination of models and simulations (Hays, 2005; Voivov et al., 2016). The game can take the form of a computer game, a game board, a theatrical simulation, or a mixture of these different formats. However, in educational sciences for example, serious games are often associated with computer game-based learning (Cheng et al., 2015). In the companion modeling approach for natural resource management, the serious game can take all of the above forms depending on the problem to be addressed and the context. It is generally inserted into a process, as a tool, to achieve desired objectives. Indeed, Abrami & Becu (2021) emphasize the need to distinguish between the role-playing device (the artifact and the way it is used in a workshop), the process in which it is embedded (the wider participatory process and the partnership that drives it), and the social and territorial context (the action arena).

4.2 Serious games applied to natural resource management

Since the 1990s, and more particularly in the field of companion modeling¹, role-playing games have been shown to be useful as tools for supporting public decision-making or collective reflection on resilience involving natural resource management (d'Aquino & Bah, 2013; d'Aquino & Bah, 2014). The game thus facilitates the negotiation process between actors faced with complex management problems which is often the case in common good management problems or, said differently problems involving a shared environment or shared resources. By putting the problem into a situation, players learn together, have to coordinate and make collective decisions (Hassenforder & Daré, 2020).

Indeed, games allow players (actors concerned by the problem) to interact around a device (game board, computer, hybrid) to find solutions to a problem, in an environment shared by the players, under a set of rules that govern their behavior and interactions (Dionnet, 2008; Hassenforder & Daré, 2020; Abrami & Bécu, 2021). The general objective is to facilitate the collective exploration of complex problems (Barreteau et al., 2021).

In the particular context of water management, Dionnet (2008) formulates three reasons why games are useful:

- To help actors discuss, negotiate and decide together on complex multi-actor and inter-organisational problems, through the more experimental exploration of decision-making processes, without leading to direct real-life consequences;
- To discuss 'sensitive' or taboo issues of equity of access to resources, social justice of water in decision-making processes. During the simulations, the situations that are reproduced are close to reality, but keep a distance from the real world, facilitating discussions on these sensitive issues (Daré, 2005).
- To address the issue of sustainability and project oneself into the long term. The games allow participants to think ahead by projecting themselves into the future through scenario analysis.

Furber (2018) and Jackson and Keys (1984) also identify decision-making contexts in water management where serious games seem to be particularly useful: in complex systems or with significant uncertainty, with the presence of multiple actors with divergent perspectives (political, scientific) and processes that present time constraints. These are the case in TALANOA Labs.

¹ A participatory approach that ranges from raising the awareness of stakeholders through the chosen question, the state of the art of the question, the design of the model, the choice of the tool and implementation of the model, the verification, validation and calibration of the model with local stakeholders, the exploratory simulation and the evaluation of the effects of the participatory process (Etienne *et al.*, 2010). It applies modeling and simulation through games as a framework for reflection and dialogue in order to collectively explore and debate futures (Abrami & Bécu, 2021; Mathevet & Bousquet, 2014)

4.3 The design of serious games: stages

There is no recipe for designing a serious game, but a number of steps should be followed to ensure consistency and functionality in the process.

Voivov et al, (2016) generically describe the 5 steps to follow in serious game design:

- ✓ characterisation of characters, content and game operations (rules),
- ✓ model development to formalize interactions and key factors,
- ✓ visual design of modeled elements, order of operations and player interactions,
- ✓ game construction
- ✓ preparation for game use, testing of game prototypes and creation of the instruction manual.

As part of the collective design of a CREA-WAG² serious game prototype to represent water management issues in a watershed, Abrami and Bécu (2021) also described 6 phases to be followed: 1) engagement of the modeling group, 2) scoping (specification of the issue, usage, scales and indicators related to the issue), 3) conceptual modeling (spatial structuring of the territory, inventory and choice of actors and resources, analytical mapping of the links between actors, issues and resources), 4) prototyping and pre-testing (definition of activities per role, specification of objectives, design of the board and simulation of a game turn, calibration during the pre-test), 5) finalization (reworking and specification of the board, roles, activities, dynamics, resources, scenarios, events of a game turn), 5) calibration (of activities, scenarios with abstract and simplified values, and relative orders of magnitude) and 6) external testing (with an external group).

These modeling frameworks that support the design of serious games have several points in common: **the need to build a conceptual model of the system** to be represented (actors, resources, actions, interactions) before the visual and graphical development of the modeled elements, and the importance of pre-testing/validation before use.

² Developed by Irstea (today INRAE), the Wat-A-Game (WAG) tool allows stakeholders to create a complex watershed model from very simple elements and to simulate, through a serious game, actions, innovations and public policies, in order to discuss and reflect on strategies. WAG, inserted in the CoOPLAaGE tool suite, contributes to support participatory management. The CREA-WAG tool or protocol enables the collective design of a game prototype by guiding the following points: spatial and social analysis, strategies, resources, actors, dynamics, external scenarios, implementation



In addition to this framework, the ComMod collective³ have formalized in a more structured and complete way the steps to be followed and the questions to be asked to design a serious game (Etienne, 2015). It should be noted that it is also necessary to clarify the objective and the place of the game in the process to which it belongs, as well as to define the posture of the designers and facilitators of the participatory process (neutrality or non-neutrality with regard to power asymmetries, for example - see Barnaud *et al.*, 2016).

The table below presents a framework for designing serious games adapted from Etienne (2015) (available on line see references)

Table 3 Steps for the set up of a serious game

Steps	Description	Questions to ask / remarks
Define the objectives of the serious game	Several objectives can guide the design: Sharing and/or producing useful knowledge... Enriching an approach, research... Building a shared representation of a system To contribute to the understanding of the functioning of a territory Facilitating exchanges between actors: Creating links, Strengthening a team Explore future scenarios collectively : Identify strategies/solutions, Explore alternatives	What are the objectives of serious games? Why use a game in the process? Will the game be presented? At what stage of the process?
Define what you want to stage	Defining what to stage depends on the objectives, the problem and the level of understanding of the system. What we want to stage involves imagining the integrating scheme, the coherence and articulation between the elements of the system. It is therefore necessary to think first of all about the problem and the dynamics that we wish to represent and secondly about the resources available (information, material, time), the actions, the phases or stages in which these actions take place, the rules that provide the framework and the structure for managing time, resources and actions	What do we want to represent? a dynamic? a problem of access and distribution of a resource? a dilemma of collective action? Do we want to represent social, political, economic, ecological etc. dynamics? What is expected from the different interactions?

³ Training School for Researchers Designing a ComMod support modeling approach: putting actors in a situation to share representations and simulate dynamics, organized by several members of the ComMod collective and the co-organising institutions: INRAE, CIRAD, IRD, Lisode, Université Côte D'Azur, AJYR, ETH Zürich.



<p>Choose the level of realism / abstraction</p>	<p>The game must allow participants to break out of their usual patterns and must preserve the essential features of reality so that the results are usable and useful (Dionnet, 2008). However, the interest of a proximity between the game and non-fiction (or reality) in the appropriation of the tool by the participants has been highlighted (Daré, 2005).</p> <p>The level of realism should therefore be chosen according to the objectives and issues at stake.</p> <p>The 3 levels of representation are as follows: Realistic and contextualized representation of actors, resources, environment. Ex: 6 types of vine growers Abstract representation (implicit reality) that simplifies the categories of actors, resources and environment. Ex: Vine growers Representation without explicit link to a particular context. Imaginary/virtual world. Ex: farmers</p>	<p>What level of tension do the actors have with the problem being addressed?</p> <p>Are the problems of the territory reproduced in other territories?</p> <p>Recommendations:</p> <p>If the game deals with sensitive topics, it is advisable to maintain a higher degree of abstraction, in order to ensure calm discussions</p> <p>If the game deals with a concrete topic, it is advisable to maintain a more realistic and contextualized environment to achieve an effective discussion.</p> <p>The realism of the representation can reassure the participants and encourage them to introduce their knowledge to run the simulation well</p>
<p>Choose the type of calibration</p>	<p>Calibration consists of articulating the data in a coherent way to stage the dynamics one wishes to represent.</p> <p>The type of calibration should be chosen according to the objectives identified, the existing data :</p> <p>Realistic: The game is designed with real values, same units and same time steps Proportional: orders of magnitude and proportions are preserved</p>	



	Forced: values are chosen to quickly bring about the desired situation	
Simplification of the model	A model represents a reality but must keep the simplification of a complexity. The simplification of the game will limit the number of roles and actions. It is therefore necessary to define the elements that are kept and those that are removed.	
Identify roles	The key actors related to the problem have been identified before. In this step, a choice should be made: The role for each key actor: an organization, a person, an interest group, an activity (agriculture, mayor etc.) How and who will take on the role: one or more players, several roles for one player etc. Identify the objectives for each role: missions, motivations, intentions, degree of freedom to interpret the role	
Identify actions	Each player who plays a role must also perform a number of actions. There are several categories of actions that have different impacts on the resources in the game, on the game environment and on other players: Sharing information Calculate/analyze a situation Negotiate (bilaterally, collectively) Making decisions: buying, selling, changing land use, investing, applying for credit etc.	
Defining who knows what	For players to make decisions they need to have access to information, or not... because sometimes they have to make decisions in contexts of high uncertainty. In this step it is necessary to define what information is required: - Available to all players. Ex: input prices - Reserved for a particular player. Ex: manager who has access to water abstraction data.	What information do each of the players have according to their roles to make their decisions?
Choose the representation of space	The space can be represented in several ways, depending on the objectives and issues: maps, diagrams or no representation at all (absent). It can be formalized visually with mental maps, virtual maps, cellular automata, game boards, artifacts, drawings, models etc.	
Define the time step	Each round in the game is represented by a time interval that has to be defined according to the processes and dynamics	What time interval does each round represent?



	<p>(ecological, economic, social etc.) that are to be staged, and the important decisions related to the question at hand.</p> <p>For example, the dynamics of flooding and infrastructure damage may have a time step of 1 year, while the process of investment in agriculture may take 5 years</p>	
Building the rules of the game	<p>In order to frame the game and represent the problem that is going to be staged, it is necessary to formalize the rules that regulate the actions of each player.</p> <p>There are several types of rules:</p> <p>Rules shared by all players (restrictions on access to water in times of drought)</p> <p>Individual rules (e.g. access to a particular market, conditions for accessing credit)</p> <p>In order to frame the game, the rules of the game session should be formalized: stages of the actions, time to negotiate, etc.</p>	
Developing the media	<p>The materials play an important role in the playful aspects of the game and in making the available information explicit:</p> <p>The flow of tangible resources: counters, banknotes (money), marbles (water, pollution)</p> <p>Hazard: dice, draw, luck card</p> <p>Regulatory aspects: rules of the game, sheet</p> <p>Data, information: sheets, checklists</p> <p>Character trait: identity card</p> <p>The game board</p>	
Stages of the game - sequence diagram	<p>In order to understand how the game unfolds, it is necessary to formalize the stages or sequence of actions that will be repeated in each round. This helps to give coherence and to articulate the different components of the game.</p> <p>e.g. draw of weather hazards → players fill in decision sheet → pool manager validates information and analyses data → manager provides players with logs → facilitator asks players to make a report → players change ground covers etc.</p>	
Duration of the game	<p>The duration of the game will be defined according to the scenarios that will be staged.</p> <p>The game must last long enough for the dynamics to emerge and for consultations/negotiations to take place during the game, without any dead time.</p> <p>There should be time for the game and time for debriefing/discussion afterwards.</p>	
IT or not	<p>Computers can be useful when there are complex calculations to be made. It can be used to display output results and record players' decisions.</p>	



	Games without computers are sometimes easier to play, flexible and transparent. In the hybrid format the physical board and game pieces are maintained, and the computer simulator simplifies the logistics and allows more options to be explored by saving time and visualizations (Abrami & Bécu, 2021)	
Validate the game	Validating the game with the actors reveals whether the representation of the system/game is coherent and whether the technical choices made are relevant.	

4.4 Conduct of a serious game session

To ensure that a serious game session runs smoothly, a number of criteria must be met (Dionnet, 2008; Abrami & Bécu, 2021):

- ✓ A team trained in the game to ensure its animation, assistance to the players and observations of the interactions between the players.
- ✓ A place that is neutral to all actors and easily accessible. The room should be flexible and spacious enough for the actors to move around.
- ✓ The agenda should include at least half a day (welcome of participants, game session, explanation of the game, simulation, debriefing, breaks)

A game session consists of two parts: The simulation of the game and the debriefing time.

Simulation: the game starts with an explanation of the objectives, the rules and the game itself. An observation strategy should ideally be put in place. A serious game observation manual has been published by Hassenforder et al, (2020) to characterize the game session, report on the facilitator's influence on the course of the game and the players, understand the evolution of their behavior, enrich and contextualize the debriefing, evaluate the effects of participation (learning, practices...) and carry out a comparative analysis of the sessions.

During the simulation of the game, it is important to avoid time-outs and to keep the attention of all players. The game and scenario should be adapted to the actors and behavior.

Debriefing: time should be devoted to debriefing (feedback) as it is just as important as the simulation. Indeed, after the end of the game, the actors must be able to discuss their strategies/behaviors during the game and the results produced (strategies, impacts/effects) in order to put this discussion into perspective. In this way, participants can reflect on the experience they have just had and then draw conclusions/learnings that are useful for their understanding of reality. It is at this point that actors can

then imagine and design intentions for change. This discussion should be facilitated to allow participants to go back and forth between the game and reality.

In summary, the debriefing should be able to address the following points (Chamberland & Provost, 2011): 1) the expression of emotions (what the players felt), 2) the description of what happened during the game, when and how, 3) the analysis that links what happened in the game and its link to reality and 4) the return to reality to discuss/contribute to the problems and the objectives pursued

After the debriefing, the players can initiate work, in plenary or in sub-groups, to discuss the objectives for which the game was designed and mobilized (strategy building, discussion of the action plan, etc.).

5 Defining scenarios (Step 2) and strategies (Step 3)

5.1 Definition and articulation between scenarios & strategies

First it is worth defining these two central terminologies:

Scenarios can be thought of as a coherent combination of driving forces and outcomes in a given future setting. The timeframe should be specified. We suggest resorting to multiple time frames for the analysis but the central horizon of discussion and projection is proposed to be 2050. Scenarios include, but are not limited to, Representative Concentration Pathways scenarios, and **Shared SocioEconomic Pathways (SSP)**.

Strategies are actionable levers for change that are central in TALANOA Water. They are a coherent combination of measures of different types.

Note that distinguishing scenarios and strategies in TALANOA Water is necessary. The combination of both will lead to **global scenarios** as shown on Figure 8. Global scenarios integrate both exogenous drivers (scenarios) and endogenous drivers (strategies) whose impacts can be collectively or separately assessed. This is similar to the concept of integrated scenarios that would be to move from a purely emission vision (RCPs) towards integrated scenarios that also deal with the conditions of emissions and adaptations.

In the serious game and workshop this distinction is relevant and practical because stakeholders have no influence on scenarios, while they do have on strategies. This doesn't mean that scenarios cannot be discussed with stakeholders in terms of occurrence and relevance.

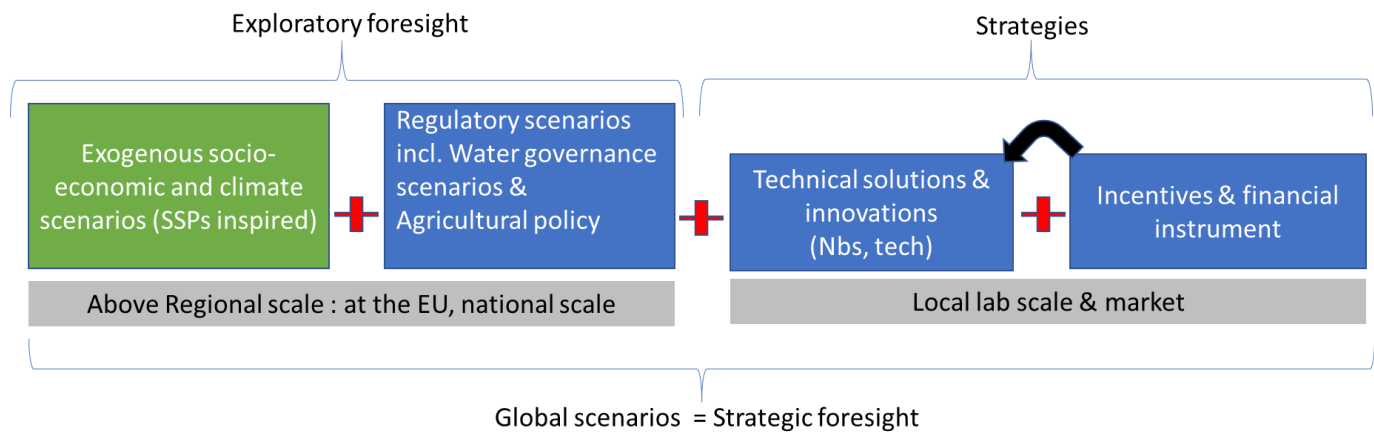


Figure 11 Overview of the articulation between scenarios and strategies in TALANOA Water

Different horizons are interesting to take into account for uncertainty and delay or adapt some decisions in the future so as to reflect adaptive management. The different horizons that are suggested are:

- ✓ 2025: start of the implementation phase of TALANOA. Some decisions can be taken, at least those that are robust to short term uncertainty.
- ✓ 2035: is an intermediate horizon where the medium term effect of strategies taken in 2025 or before will become effective. It can be a second point in time where new decisions are taken. Extreme events (crises for the water management system) or critical changes can occur before or after this horizon, and spur the adoption of new strategies. For instance in the French lab, this horizon can be considered to be the at which new varieties of wine (planted in 2025) are at a mature level of production and will produce their effect in terms of climate change adaptation.
- ✓ 2050 is the main horizon of interest in TALANOA dialogues in terms of impact assessment of adaptation strategies. The difference between climate scenarios can be considered as still relatively modest (e.g. ~0,6-0,7 degrees between the two extreme scenarios (SSP1-1,9 and SSP5-8,5))
- ✓ 2080, or alternatively 2100 (or both) is a secondary horizon that can be considered as indicative in terms of long term impacts of the global scenarios, on hydrology mainly, but also on the economic system. This is because climate scenarios will create a significant impact on the water system at these horizons in our labs and across the Mediterranean. They might not be really considered as 'decision horizons' for decision makers in 2025, but they will act as awareness-raising horizons.

These different horizons (more can be integrated if needed according to outcome in workshops) will all be discussed when designing the serious game.

Box 3 - SSPs & RCPs – Source : Pörtner et al. (2022)

Representative concentration pathways (RCP) are trajectories that correspond to alternative concentration in GHG in the atmosphere. The four RCPs that have been selected by the works of the IPCC has been selected in order to provide a maximum diversity over all the scenarios published in the literature. They are labeled with the radiative forcing that they reach in 2100 in W/m² (or the quantity of energy that the earth receives) : namely 2.6, 4.5 , 6 and 8.5 (the upper bound in terms of emissions) with RCP4.5 and RCP6.0 as intermediate scenarios, and RCP2.6 a peak and decline scenario reaching 3 W m⁻² before 2100.

Shared Socio -Economic Pathways (SSP) is a concept that emerged in the 2010 decade and adopted in the last IPCC cycle of reports. They are associated with the idea that there is no unique socio-economic world that would reach the different RCPs. As such they have been built to cover the space of alternative radiative forcing but also alternative socio-economic development. These two dimensions can be associated with both (i) the adaptation challenge that is associated with alternative visions of socio-economic development and inequality and (ii) the mitigation challenge that is directly associated with alternative emission visions.

Before designing and adapting to labs the method to co-construct scenarios and strategies it is important to make clear what they will be used for. Two major uses will be made in TALANOA, and this comes with implications in terms of format. They will both:

serve as inputs for the modeling chain and exercise. The consequence is that they need to be concrete and quantified (areas, importance) and connected through key variables to the model;

be a major co-construction object and outcome from the TALANOA dialogue participative approach. This requires that they are narratives, in the form of storylines, that they are understandable by a large public from citizens to elected representatives. It also means that no more than a few (≤ 5) can be drafted, more would be too complex to work with during debates.

5.2 Step 2 Scenarios

As stated above scenarios are an important element of the TALANOA Water project and stakeholder engagement. They are described as external drivers of the territories and their impact in terms of socio-economic development in the territory under study.

Different dimensions are :

- the climate, because the assumption is that it has a significant impact on hydrology and water resources availability. Climate scenarios will be used as inputs in hydrological modeling and

agronomic modeling, either as a direct input or resorting to model intercomparison experiments such as CMIP6 or ISIMIP.

- the exogenous socio-economic and technological environment that is key because it both constrains the development options for the territory and sets a global environment that will be more or less suited for the emergence of the endogenous strategies.
- endogenous (within the territory) socio-economic and technological innovation and development.

TALANOA Water lab specific scenarios should be **narratives or storylines** that need to be easily understandable by the diversity of stakeholders. Both text and graphical representations as well as other ideas such as mock press articles (for instance in serious games) can contribute to illustrate these scenarios. These narratives are associations between strong trends, factors of change, or drivers that are coherent and then impact on key variables like demography, land use, etc.

We suggest taking as a basis for our project the work done by the IPCC and the 5 SSPs that are published in the last AR6 IPCC report, and adapt and interpret them to the labs that are investigated in TALANOA. The interesting feature that makes SSPs universal is that they combine two dimensions: (i) the climatic one (that is central in TALANOA) and (ii) the socio-economic context that will affect both mean and distribution of income and development levels that are central for emission and adaptation scenarios. The SSPs narrative that are published in O'Neill *et al.*, (2017) have been extracted in the Annex 5. Specific assumptions regarding water use sectors such as agriculture can also be found inside O'Neill *et al.*, (2017). The four extreme scenarios are convenient to be used but might not all be important and relevant in TALANOA Labs (adaptation is needed). The fifth scenario has been characterized to avoid works that pick a unique extreme scenario. This scenario is not necessary, in principle, in TALANOA, except if this argument might be raised by stakeholders that want a “middle road” scenario.

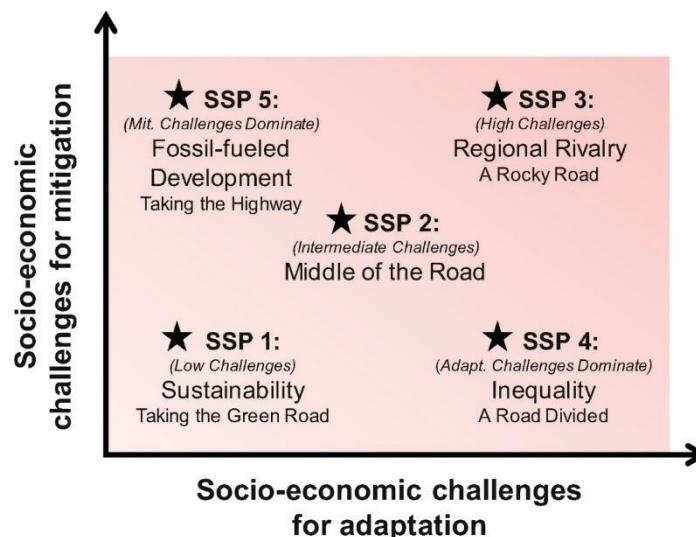


Figure 12 The five SSPs used in the last IPCC exercise – Source: O'Neill et al. (2016)

To produce the TALANOA lab specific scenarios we thus recommend using the IPCC SSPs and associate them with other foresight exercises that can be found in the grey and scientific literature, should they be of relevance. In particular exercises on land use and agricultural foresight would be interesting in TALANOA. If available, and complementary to the economic modeling, land use scenarios for the Mediterranean region can be used. Bilateral exchanges with experts are also recommended to produce relevant scenarios.

A specific point we should integrate in the scenarios is the occurrence of major water management crises before or after each horizon. These are mechanically integrated in the climate scenarios but it would be different and interesting to integrate them also in the narratives to discuss whether the occurrence of such events happen before or after major investments / adaptation have been taken. These can also be alternative options within the scenarios (that would illustrate the uncertainty within a scenario).

These scenarios will be used to force the modeling framework in WP3 and generate a baseline (conventional adaptation/no adaptation) that will be used in workshop 2. They can also be directly used by the serious game (during or after workshop 2) as context given per game or even per table played.

5.3 Step 3 Sustainable water use limits (BDC)

The third step is the elaboration and agreement of *Basin Determined Contributions* (BDCs). These are defined in TALANOA as water use limits or allocations capable of restoring the supply-demand balance in overallocated basins under future scenarios. These will rely on water accounting results and inputs from stakeholders. They need to be time dependent and this should be characterized along a timeline, according to specific horizons that have been chosen.

Alternative approaches can be considered in different labs, for instance in France, institutionally determined “volume prelevable” (“abstractable volumes”) are agreed on and are the objective of the quantitative water basin management plans. These will be the base for our modeling and engagement work before the hydrological modeling is operational. However several limits exist with these “fixed” thresholds: (i) the resource (rain) evolves constantly (yearly variations and climate variability), (ii) the demand also, making models more adapted to test alternative scenarios accounting for climate change in user and resource balances as well as other evolutions. This is why this variable will vary upon scenarios.

5.4 Step 4 Strategies

This step will guide the design of *transformational adaptation strategies* capable of achieving BDCs targets through the combination of different types of measures:

- ✓ nature-based solutions,
- ✓ technological innovation and water/climate services,

- ✓ risk management and financing instruments and
- ✓ economic and behavioral incentives. Investment costs of the strategy assessed.

The strategies are the mix of measures that can be used to resolve the current water imbalances and the adaptation to climate change of water users. Alternative strategies are to be investigated in the labs alongside stakeholders. Strategies are the key element of the transformative ambition of the project.

Among the strategies above, “Nature based solutions” (NBS) is a very popular concept in institutional arenas and documents but is not straightforward for field/operational stakeholders so that it needs to be “translated” to real context as concrete measures. The interest of NBS or green infrastructure is that they can be designed to produce landscape scale benefits. An example is agro-ecology in farming such as improving soil structure to increase soil water capacity for instance with conservation agriculture.

Three steps must be applied in the design of adaptation measures:

- ✓ The **identification and characterization of individual adaptation measures** of the different types (above). This identification will be made with a brainstorming and literature review by the TALANOA team and by engaging stakeholders and gathering their feedback in local workshops and serious games. In workshop 2 the design of strategies is a main agenda point to be covered. It is important that all ideas, even if marginal, are considered. Some (preliminary) types of measures are already identified in the project proposal and DoW.
- ✓ The **selection of measures** can be made both with stakeholders during workshops, or in vis-à-vis or follow-up restricted workshops if it is too ambitious to do this selection in a crowded workshop. Compromise should be reached during an open and inclusive debate, in both cases. Voting can also help decide on which measure to adopt, if consensus is not feasible. However, the scientific TALANOA team must ensure that a wide range of measures or sets of measures are considered and modeled, to ensure stakeholders can assess the impact of a wide range of measures, and revise their choices. An important criterion to consider in the selection of measures is the *transformational* ambition of each strategy. To this end, partners can present strategies on a gradient from low to high transformative ambition.
- ✓ The next step is to combine these measures in **coherent strategies**. To reflect on what is a coherent combination one must reflect on the general context in which these strategies will be able to both exist and be efficient. Each of the exogenous scenarios will have asymmetric impacts on the strategies, and thus the use of a matrix that crosses scenarios and strategies and shows their impacts can be a useful tool to explore combinations (Figure 13).

Another tool that can help the combination and integration of strategies in a given scenario is to reflect on who will support, and initiate, each measure-i.e., the stakeholders related to each of the measures. This

will connect to the system of innovation approach and rely on relationships and intention of each of the different stakeholders of the ecosystem to design relevant strategies, including:

- ✓ The state or local governments for instruments and regulations
- ✓ Individual water users (farmers, domestic water users, industries)
- ✓ Third parties: e.g. service providers like technical advisors or solutions; banks or insurance
- ✓ Collective organization that are existing or to be founded

	S1 Green road	S2 Middle of the road (heterogeneity)	S3 Regional rivarly (betw and within countries)	S4 - Pessimistic
Business As Usual				X
Strategy 1			X	X
Strategy 2		X	X	
Strategy 3	X	X		
Strategy 4	X			

Figure 13 Example of combination of scenarios X strategies : each X will represent a global scenario that will be modeled and discussed in workshops. The title and location of crosses are only examples.

The introduction of different horizons (see above) introduces the option for adding or modifying strategies at different stages in time as advocated by the Dynamic Adaptation Policy Pathways Framework (Haasnoot et al. 2013). An example of application of Dynamic Adaptation Policy Pathways to the farming sector is provided by Cradock-Henry *et al.*, (2020). The idea is that all options must not necessarily be taken immediately and irreversibly and some alternative pathways can be taken in the future after nowadays uncertain futures are revealed.

Dynamic Adaptation pathways are sequences of possible actions typically depicted as a decision tree or an underground map and articulated around critical tipping points. Tipping points are the points at which an action is no longer relevant / performing as expected. At this point the trajectory is changed and a new measure/strategy adopted (see Figure 5). Each path or sequence is a possible adaptation pathway that

leads to an objective in different ways. Tipping points can be calculated with computer simulations. Each of the trajectories has different costs and benefits that need to be calculated for each and represented, for example, on a scorecard showing costs, direct and indirect effects. This approach was illustrated with the case of the Rhine Delta in the Netherlands where the issue of sea level rise poses a planning problem with major uncertainty (Haasnoot et al. 2013).

These different steps can be developed both in internal meetings and during workshops.

6 Co-Assessment phase

6.1 Step 5 Impacts & trade-offs

The impact of transformational adaptation strategies under future scenarios and BDCs will be assessed using two complementary methods:

- ✓ Co-assessment with stakeholders in workshops or surveys. It is important to have in mind the roles and position of stakeholders when analyzing results. Combining assessments is a complex problem that can be addressed through weighting. Alternative deliberating methods can be used.
- ✓ Assessment with the modeling tools developed

Indicators of performance have to be determined with the group of stakeholder and accounting for the principles of IWRM. At least:

- ✓ Indicators representing the water & ecology such as streamflows, aquifer status (qualitative, quantitative), and indicators that reflect on the status of water bodies. Indicators reflecting GHG emissions level by strategies can also be used.
- ✓ Economic indicators such as income generated in relevant economic sectors (e.g. farming), and their distribution. The cost of strategies should also be assessed.
- ✓ Social indicators such as inequalities should also be a dimension of the assessment (distribution of the previous indicators in time and space)
- ✓ Enablers and barriers in the innovation system should be considered to assess impacts and particularly to redesign or optimize the strategies.

The indicators need to be made clear and discussed in workshop 2 when modeling is discussed.

Uncertainties should be presented to stakeholders leveraging ensemble modeling. Specific attention should be paid to the complexity of communicating uncertainty. Decision makers are averse to uncertainties and they represent a risk for engagement.

Assessing tradeoffs between strategies is a critical input to inform stakeholders on the advantages and disadvantages of policies. The baseline (or *laissez-faire* scenario) will be a reference to illustrate the pros and cons of the strategies assessed. Comparing different strategies is also important to identify advantages and disadvantages of alternative policies, identify tradeoffs, and address them. This will be challenging because, in general, no strategy will outperform all the others in all the criteria. Taking the time to explore the different trade-offs is important for stakeholders and decision makers.

6.2 Step 6 Robust decision-Making

TALANOA-WATER aims to help stakeholders identify, for each lab, a *robust* adaptation strategy that contributes to IWRM objectives. It is important that TALANOA-WATER can only inform, but not take the decision, since decision making is outside of the scope of the project. However, by assessing the impacts of a diversity of strategies under multiple scenarios, TALANOA-WATER will provide the mechanistic inputs that are necessary to inform a robust decision making which, if complemented with a successful engagement and commitment by stakeholders, can affect decision making. TALANOA-WATER will catalyze decision making through stakeholder engagement activities that involve the analysis of the simulation results from models, notably serious games in which these mechanistic inputs from models will be combined with heuristics that leverage on the expertise of stakeholders to identify those policies that are regarded as robust.

Box 4 : The concept of robustness and robust strategies

The concept of robustness in the field of climate change mitigation and adaptation and more generally in the analysis of long-term policies, particularly those related to sustainable development and in decision science (Lempert et al. 2003) emerged following the observation of a strong and irreducible uncertainty, which cannot be characterized by probabilities of occurrence, on the evolution of the climate -among others-. Robustness makes it possible to analyze the risks incurred by the strategies considered under multiple scenarios. Each combination of strategies and scenarios leads to a unique plausible future.

Robust strategies are strategies that are insensitive to the uncertainty linked to the future. That is to say, rather than asking the question of which future will occur, robustness seeks to prepare for all possible futures by identifying the strategy(ies) that will deliver a satisfactory outcome in all, or most, possible futures. Flexible or reversible strategies are typically robust strategies because they will be able to adapt to different unpredictable evolutions. The main target is to minimize the cost of error.

Robustness differs from the principle of optimality; decision making thus is no longer a question of evaluating and choosing a policy or strategy in a given certain universe in which all the parameters are known and for

which all the performance indicators (costs, benefits, etc.) could be anticipated with certainty and the optimal strategy identified. Robustness assumes that major uncertainties will lead to different results and therefore different decisions depending on the futures considered. As these different futures cannot be characterized from the point of view of their probability of occurrence (central assumption), the performance indicator cannot be aggregated to an average indicator, and optimization can therefore no longer be used. On the other hand, we can analyze the results of all the strategies in all the scenarios, thanks to different robustness criteria, to explore the most robust strategies. We can also analyze the errors made a posteriori and analyze how a strategy performs compared to the strategy that would have been chosen with perfect information. This is the notion of regret.

Robust decision making principles are explained for instance in Graveline (2020), who gives an example within a hydro-economic modeling exercise. Making use of the concept of robustness explained in the box above encourages to manipulate the extent of the scenarios not like a uniform population of scenarios that can be treated through the arithmetic mean, but rather to look for extreme scenarios and give them more weight than they would have had with a standard mean synthesis of results. One popular criteria for robust decision making is the MinMaxRegret criterion (Savage criterion). Other criteria are the Maximin, Laplace criterion, Hurwicz criterion, or heuristic *ad-hoc* decisions.

Box 5 - The MinMaxRegret Criterion

This criterion introduces a new concept: regret, also called opportunity cost. Regret is the difference between a given performance (strategy s and future f) and the best performance in a given state of nature. We can also calculate a relative regret by dividing the regret by the best performance. After calculating the regret for each of the strategies in the set of states of nature, we choose the strategy that has the smallest maximum regret evaluated in the set of states of nature. This criterion is the one chosen by Lempert et al (2003) who formalized the Robust Decision Making approach.

6.3 Step 7 Proof of concept

Preferred robust adaptation strategies will be assessed in depth with the models and stakeholder engagement. They will be analyzed in terms of regulatory and other obstacles, feasibility, and support from the involved institutions. Barriers and enablers will be thoroughly reviewed following on the analysis developed during the assessment step.

Business models are a relevant exercise that should be developed in TALANOA-WATER, including during workshops to discuss the conditions favoring the successful implementation of a robust strategy (a Business Model Canvas is provided in Annex 6).

7 Implementation phase

The TALANOA Water project is an innovation project with implementation and impact at its core, which should be realized during the lifespan of the project. This is a major challenge that necessitates adequate tools in order to be achieved.

7.1 Step 8 Breaking ground

This step consists in the practical implementation of the preferred strategy.

This part and the following assume that a decision has been taken by stakeholders. This decision should be taken by stakeholders and achieve a certain quorum (to be defined by stakeholders), with the support of science but without the influence of scientists beyond informing through modeling exercises. This step requires also that the policy calendar matches that of TALANOA - it may be that the decision is taken but the timing is inadequate and therefore the implementation of the strategy, and the breakthrough, is postponed. Even if one or the two preconditions for a successful implementation do not realize in the labs, the team can still work on the implementation phase by translating TALANOA results into a “transformative” plan. This requires identifying leaders that will take charge, in the future, of the implementation of the strategy; building relevant partnerships; identify a possible timeline for implementation; and defining plans to address the barriers that could deter transformation.

The conditions that can favor implementation should be studied in detail with the support of the key stakeholders. Some of these aspects can be addressed in the last workshop (4).

7.2 Step 9 Synthesis & recommendations

The final step validates the outcome of the project. This final step will be articulated around the final project meeting and international workshop. The event will make it possible to present the final results of the project, including modeling results and evidence from the field. Also a synthetic document should be written for the stakeholders that participate in the project. This document should both present the process and a valuation of the results obtained. This final document should also detail the “transformative plan”, a policy notebook that presents key insights for the design of robust policies, and which will be the main product produced by the TALANOA-Water project for policy makers in labs, and beyond. The limits of the approach as well as the uncertainties should be clearly reported and communicated in this document.

This final step will summarize lessons learned, reflect about the transferability, and which risks to consider when designing similar schemes elsewhere.

Sometime will be dedicated to ask stakeholders, with the help of a survey, their feedback and recommendations for future research. The assessment survey can be enriched by asking stakeholders about:

- ✓ their interest, the limits, their confidence in the process and on the models
- ✓ what they liked, disliked and would change in the process

8 Practical steps and tools to engage with stakeholders on participative events

8.1 Organizing a workshop: general features

Each workshop should be organized and worked out in detail according to specific objectives, which are to be co-generated alongside stakeholders.

Partners will need a minimum of 2.30 hours to organize a participative workshop. Ideally partners should mobilize their group for a (small) whole day.

Some short presentations of the project and of the context should be provided, ideally ensuring that the attendance will learn something from this workshop.

The number of participants will determine the methods and/or the need for parallel groups and parallel sessions. It is challenging to have a balanced participation with much more than 10 active people.

Exploratory sessions in small (split) groups and sessions where small groups present their ideas to the whole group and suggest to the large group to react and start a debate can be also a useful tool.

8.2 Prepare the workshop

The following activities should be systematically conducted to prepare a workshop.

Two months ahead:

- ✓ Choose a date in a common agreement between the lab coordinator and the lab rapporteur who must attend necessarily all the workshops
- ✓ Produce a document presenting the aim of the workshop
- ✓ Invite all stakeholders, and ask them to confirm their attendance, detail the aim and tentative agenda of the event with mail or paper invitation

Two weeks ahead of the workshop:

- ✓ Produce a document presenting the aim and detailed agenda of the workshop (see Annexe 3 for the French first workshop announcement paper) (minimum 1 page)
- ✓ Send a recall mail to stakeholders and attach the document; ask stakeholders to be represented by a colleague if they are not able to attend on the meeting day.

Material

You will need to prepare some material that depends on the tools chosen:

- ✓ some material that can serve the presentation(s) (maps, slide presentations, reports)
- ✓ posters that will support discussions in split sessions, or paperboards designed before or during the workshop.
- ✓ blank papers, post-its, pens for the participants (commercial packs exist on the Internet and can be helpful⁴)

In some cases, you might want to resort to web applications to support specific engagement formulas, such as voting.

8.3 During the workshop

The facilitation team should be ideally composed of 3 people from the lead partner institution: 2 that facilitate and 1 that will take care of the minutes and photo & video recording during the workshop (plenary session at least).

Provide a sign-off sheet, in which you ensure people agree for the use of their image and recordings and collect professional contacts of all participants.

Assign rapporteurs to all side events in order to be able to produce written feedback and results from all exchanges including sub-group discussions.

Clearly state and post (on the walls) the TALANOIA rules of the workshop (see Box below): transparency, mutual respect and trust, listening, Empathy. This is really important, central in our project and brought by the concept of the Talanoa Dialogue (see Standardi et. al, 2021).

Box 6 : TALANOIA Rules

"Talanoa is a traditional word used in Fiji and across the Pacific to reflect a process of inclusive, participatory and transparent dialogue. The purpose of Talanoa is to share stories, build empathy and to make wise decisions for the collective good. The process of Talanoa involves the sharing of ideas,

⁴ [Neuland AG - Mallettes et ensembles pour workshops - Mallettes et ensembles pour workshops](#)



skills and experience through storytelling. During the process, participants build trust and advance knowledge through empathy and understanding. Blaming others and making critical observations are inconsistent with building mutual trust and respect, and therefore inconsistent with the Talanoa concept. Talanoa fosters stability and inclusiveness in dialogue, by creating a safe space that embraces mutual respect for a platform for decision making for a greater good.”

Clarify rules for carrying out the dialogue: either a small roundtable mode where everyone can talk or a larger discussion where people can speak only following a pre agreed formula (e.g., raising hand) and if the facilitator gives him/her the floor.

Clarify roles in a session:

- ✓ Facilitation roles that try to open the debate, never give their own opinion, reformulate to make sure ideas are understood by all.
- ✓ Active participants that are speaking/contributing
- ✓ Listening/ reporting participants. Assigning listening roles to some experts can be interesting to not hinder others from participating (the risk is that others won't want to speak after him or rely on him to express the problems and the ideas).

Box 7 : Participative toolbox

There is a large diversity of facilitation tools to be deployed during workshops to help exchanges between participants and reach objectives. These can be optimized according to the number of participants and their diverse expertise and/or point of view. One can consider resorting to either:

- ✓ full group (plenary) or small group work
- ✓ individual reflection times can be articulated with sharing and discussion in a small group (from 2 people to 6 people). An interesting sequence is the “1,2, 4” meaning to reflect first individually then sharing the idea in groups of 2 and then in groups of 4. This last step enables us to communicate the synthesis with the whole group.

ideas can be either written on cards (post its) or shared orally (the facilitator should write it down, on cards so that participants see the ideas getting organized or cumulated, and make sure the idea is clearly understood)

Some ideas of tools are :

- ✓ the plenary debate : all that have questions or ideas raises their hands and speak up

- ✓ The World Café is a collective intelligence facilitation format. There are as many tables as thematic or the same question is given to all the tables but that differs from one stage to the other. One person (ideally from the organization) must remain at each table for the duration of the World Café and do a synthesis to the newcomers. Participants change tables at each session. There are ideally around three sessions of 20 minutes each.

An anonymous assessment at the end of the workshop (see Annex 4). The interest of having the assessment at the end of the session and on paper is that more feedback will be collected than email-based post-workshop surveys.

8.4 After the workshop

- write detailed minutes and video recordings
- ask for validation of the minutes to the stakeholders and offer them the possibility to amend them
- publish the minutes on a shared space open to anyone on the web
- consider doing a written, recorded (or other format) summary of your workshop

8.5 Secondary facilitation tools to ensure continuity in the engagement process

Storing data and information for all

To ensure a continuity in the engagement of stakeholders, trust, transparency and relevance of the process content are essential. These are the essential characteristics of the TALANOA dialogue approach (Standardi et al. 2021). Concretely, this means that stakeholders must, at any time, be able (i) **to find information** relative to the ongoing process & **share data or views** with the group.

Specifically, they must be able to **find information on**:

- The members of the stakeholder group
- The advancement of the process including agenda and minutes from workshops (and videos).
- The information from “science” tools such as models, sources of data used, and simulation results (database of plausible futures) if already available.

And be able to share with the lab and the group members:

- Data or reports they have on the topic of water management that can help assess the strategies and scenarios discussed.
- Ideas of strategies they can have
- Positions on some strategies and arguments

To this end we rely on communication tools supported by TALANOA Water and specifically the internet web site (www.talanoawater.com) and the app (Agora) that conform the water agora hub. The hub can be adapted to each lab (translation is ready in several labs, and about to finish in others), where this information should be published and updated regularly. **The Water Agora hub** encompasses all channels of communication of the project, including live access to project workshops and other meetings, so to actively engage, discuss, build consensus, take decisions and coordinate actions within the TALANOA-WATER network of scientists and stakeholders, also under mobility restrictions/lockdown.

Other options for storing and making data available includes the creation of **virtual spaces where stakeholders** and scientists can exchange information in between workshops. The choice of an option can be decided with the stakeholders during the first workshop. The options include creating :

- a Facebook group (eg. In France the group [\(20+\) Agriculture, Eau et changement climatique - Aude / TALANOA | Facebook](#) was created)
- a mailing list (e.g. Framalist) : any member of the list can send mails to the list
- a chat & work application such as Discord or Slack: where people can exchange ideas and documents.

Graphical sketch noting

Another option that can be used is the resort to **graphical facilitation tools**. This means trying to sketch note all the events and other information the scientific team wants to share on panels that are largely based on graphics.

The following figures provide an example (more can be seen in the French lab first workshop minutes). The idea is that these graphs can be used or reworked on to tell the story of what happened along the process and recall past steps. Other panels like this have been drawn during workshop 1 in the French Lab. They have been realized by two specialists (subcontracting).

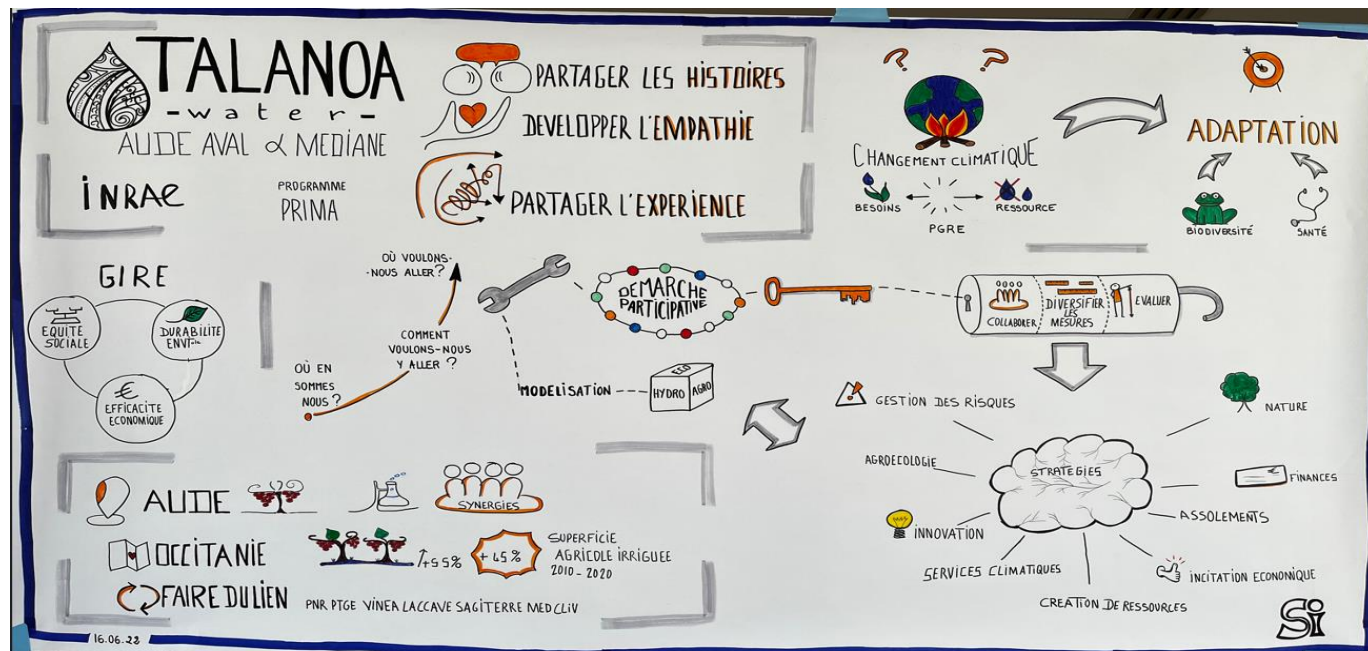


Figure 10 Example of a sketch noting panel drawn to explain in the first workshop what TALANOA Water project is about.

Training Sessions for Stakeholders

This idea has been suggested during a WP4 internal workshop. This would allow preparing the stakeholders, or their representative staff, for acting as agents of transformation. Technical training sessions on running a model for instance, and introducing the staff to data inputs and outputs, will increase their involvement and will make common visions more concrete. Training sessions may take place at a further stage of the project, once water laboratories are confident enough about the tools and models they are employing. Such sessions, which can be in the form of 1/2 day summer or winter schools, will be of mutual benefit, where water labs may make use of the practical value added by stakeholders to their science, and stakeholders would learn new tools that may enrich their skill sets in fields related to water management, monitoring, irrigation technologies, etc.

9 Conclusion and perspectives

This guide should help TALANOA partners to design & implement their activities in the Water labs. Adaptations will be needed in all labs, but keeping the general approach identical is important to be able to compare and reflect on the quality and interest of this TALANOA approach.

The challenges will be to stay as ambitious in terms of modeling and assessment as well as on the participative ambition including the serious game. Some articulation between these two aspects will need to be further worked out by labs.

To complement this guide partners, express their interest for training sessions on the serious game issue that took place during the general assembly in Montpellier in December 2022.

The perspective of this work is that this methodological proposal is discussed again with all the partners and adapted to local constraints and opportunities keeping the core as close as possible to this proposal in order to ensure a collective comparison and exchange opportunities among labs.

This guide might be revised with the test and advances in the labs.

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Annex 1 - Icebreaker ideas

Everybody walks in the room, when a clap is made people exchange their name and institution and something else that is less formal (preferred wine colour, preferred spot in the territory...)

To make presentations : the facilitator calls groups of people (farmers, representative from the state...) that group in front and quickly present themselves in front of all and add a pin on a map to say from where they are coming.

(with preparation) bring an object and tell why you took this one in the context of the present meeting/workshop.

Reactivating ideas (after a lunch break for instance)

Everybody stands up choose another “red” and “blue” person in their mind. Successively, they must stand right in the middle of their blue & red, hidden from their blue by their red, the closest to their red and further from their blue...

Together you must to the quickest time (and guess before hand) how long you will take to bring an object from the first person seated right in front to the last person seated left on the back.

With drawings by groups of two, with a big envelope and a paper inside you must draw your partner without looking at what you are drawing.

Seated back to back one explains to the other a graphic that he must draw on a paper ...without looking at the original drawing.



Annex 2 Example of paper questionnaire on the relationships of stakeholders

What are your networks/relationships (to contribute to the evaluation of the process).

For each of the institutions/services/persons invited, can you specify your relationship. If you have never dealt with this organization/person, leave the line blank.

Name Organization or Farmer		I know his name	I am interested in his/their activities	We meet in meetings	I ask for advice / this organization advises me/us	We work together in projects or organization	Other (personal acquaintan ce, have been colleague.)
<i>Exemple</i>		<i>X if yes</i>	<i>I read their newsletter</i>				
HERE ALL participants or stakeholder should be listed							
Mister Henri Steeve	Institution						

Annex 3 – Template that should be in the announcement document for the workshops

(Logos)

Title

Lab

Date & time

Summary of the project

*(~ 10/20 lines) problem setting
previous steps & results*

Objective of the workshop

(about 5/1 lines)

Who will attend

Detailed agenda

The TALANOA Project :

<https://talanoawater.com>

[Un projet du programme PRIMA : PRIMA: Partnership for Research & Innovation in the Mediterranean area \(prima-med.org\)](#)

Your contact is XXX

Practical Information : xxxx



Annex 4 Anonymous assessment of the TALANOA Water workshop

Date & place of the workshop

To help us improve the approach, please answer these few questions

	Agree	Do not agree	Don't know	Precise please
The objectives of the TALANOA project are clear and transparent				
The governance of the project is relevant				
My role in this process or project is well defined				
The workshop was useful				
The participants present are representative of all points of view				Who is missing
The way of working (facilitation) was effective				
The facilitator was neutral with respect to the content of the discussions				
I learned new things at this workshop				
I was able to express my ideas				
I think this project will provide useful information/solutions for water management in the Aude				

Are you know familiar with these terms (common language) :

(to be defined according lab)

Term 1 (ex : available volumes or BDC) yes No

Term 2 (ex : ecological flow yes No

Do you want us to stay in contact with a social media in order that each one can make circulate information, ideas or spread thoughts and to identify new actors interested in the approach ?

yes No



If yes, which is your favorite?

Linkedin

Facebook

Mailinglist

No preference

other :

Recommandations

for

TALANOA:

.....

.....

.....

.....

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Thank you for your participation !

Annex 5 – The SSPs narratives : Extract from O’Neill et al. (2016)

SSP1: Sustainability – Taking the green road

The world shifts gradually, but pervasively, toward a more sustainable path, emphasizing more inclusive development that respects perceived environmental boundaries. Increasing evidence of and accounting for the social, cultural, and economic costs of environmental degradation and inequality drive this shift. Management of the global commons slowly improves, facilitated by increasingly effective and persistent cooperation and collaboration of local, national, and international organizations and institutions, the private sector, and civil society. Educational and health investments accelerate the demographic transition, leading to a relatively low population. Beginning with current high-income countries, the emphasis on economic growth shifts toward a broader emphasis on human well-being, even at the expense of somewhat slower economic growth over the longer term. Driven by an increasing commitment to achieving development goals, inequality is reduced both across and within countries. Investment in environmental technology and changes in tax structures lead to improved resource efficiency, reducing overall energy and resource use and improving environmental conditions over the longer term. Increased investment, financial incentives and changing perceptions make renewable energy more attractive. Consumption is oriented toward low material growth and lower resource and energy intensity. The combination of directed development of environmentally friendly technologies, a favorable outlook for renewable energy, institutions that can facilitate international cooperation, and relatively low energy demand results in relatively **low challenges to mitigation**. At the same time, the improvements in human well-being, along with strong and flexible global, regional, and national institutions imply **low challenges to adaptation**.

SSP1, with its central features of commitment to achieving development goals, increasing environmental awareness in societies around the world, and a gradual move toward less resource-intensive lifestyles, **constitutes a break** with recent history in which emerging economies have followed the resource-intensive development model of industrialized countries. To some extent, elements of this scenario can already be found in the proliferation of “green growth” and “green economy” strategies in industrialized and developing countries ([UNEP, 2011](#), [UNESCAP, 2012](#)), although their efficacy has been questioned ([Bina and La Camera, 2011](#)). As emphasized by [Ocampo \(2011\)](#), for these strategies to succeed there would need to be innovation in both industrialized and developing countries and adequate human and financial resources. Such innovation has been spurred by environmental policy ([Ambec et al., 2013](#), [Porter and van der Linde, 1995](#)), and this SSP assumes that policy changes are driven by changing attitudes. The focus on equity, and the de-emphasis of economic growth as a goal in and of itself in high-income countries, leads industrialized countries to support developing countries in their development goals, including green growth strategies, by providing access to human and financial resources and new technologies.

SSP2: Middle of the road

The world follows a path in which social, economic, and technological trends do not shift markedly from historical patterns. Development and income growth proceeds unevenly, with some countries making relatively good progress while others fall short of expectations. Most economies are politically stable. Globally connected markets function imperfectly. Global and national institutions work toward but make slow progress in achieving sustainable development goals, including improved living conditions and access to education, safe water, and health care. Technological development proceeds apace, but without fundamental breakthroughs. Environmental systems experience degradation, although there are some improvements and overall the intensity of resource and energy use declines. Even though fossil fuel dependency decreases slowly, there is no reluctance to use unconventional fossil resources. Global population growth is moderate and levels off in the second half of the century as a consequence of completion of the demographic transition. However, education investments are not high enough to accelerate the

transition to low fertility rates in low-income countries and to rapidly slow population growth. This growth, along with income inequality that persists or improves only slowly, continuing societal stratification, and limited social cohesion, maintain challenges to reducing vulnerability to societal and environmental changes and constrain significant advances in sustainable development. These moderate development trends leave the world, on average, facing **moderate challenges to mitigation and adaptation**, but with significant heterogeneities across and within countries.

SSP2 does not imply a simple extrapolation of recent experience, but rather a development pathway that is consistent with typical patterns of historical experience observed over the past century. For example, emerging economies grow relatively quickly and then slow as incomes reach higher levels, the demographic transition occurs at average rates as societies develop, and technological progress continues without major slowdowns or accelerations. Thus it is a dynamic pathway, yet one in which future changes in various elements of the narrative are consistent with middle of the road expectations, rather than falling near the upper or lower bounds of possible outcomes. There are likely many reasons that trends in SSP elements could end up being moderate, and no specific stance is taken here as to motivating forces.

SSP3: Regional rivalry – A rocky road

A resurgent nationalism, concerns about competitiveness and security, and regional conflicts push countries to increasingly focus on domestic or, at most, regional issues. This trend is reinforced by the limited number of comparatively weak global institutions, with uneven coordination and cooperation for addressing environmental and other global concerns. Policies shift over time to become increasingly oriented toward national and regional security issues, including barriers to trade, particularly in the energy resource and agricultural markets. Countries focus on achieving energy and food security goals within their own regions at the expense of broader-based development, and in several regions move toward more authoritarian forms of government with highly regulated economies. Investments in education and technological development decline. Economic development is slow, consumption is material-intensive, and inequalities persist or worsen over time, especially in developing countries. There are pockets of extreme poverty alongside pockets of moderate wealth, with many countries struggling to maintain living standards and provide access to safe water, improved sanitation, and health care for disadvantaged populations. A low international priority for addressing environmental concerns leads to strong environmental degradation in some regions. The combination of impeded development and limited environmental concern results in poor progress toward sustainability. Population growth is low in industrialized and high in developing countries. Growing resource intensity and fossil fuel dependency along with difficulty in achieving international cooperation and slow technological change imply **high challenges to mitigation**. The limited progress on human development, slow income growth, and lack of effective institutions, especially those that can act across regions, implies **high challenges to adaptation** for many groups in all regions.

SSP3, with its theme of international fragmentation and a world characterized by regional rivalry can already be seen in some of the current regional rivalries and conflicts, but contrasts with globalization trends in other areas. It is based on the assumption that these globalization trends can be reversed by a number of events. For example, economic woes in major economies could spark increasing discontent with globalization and spur protectionist instincts. Alternatively, regional conflict over territorial or national issues could produce larger conflict between major countries, giving rise to increasing antagonism between and within regional blocs. Such a reversal of globalization trends due to regional conflict has happened before, for example on the eve of World War I (e.g. [Ferguson, 2005](#)). Regional rivalries reduce support for international institutions and development partners, thus weakening progress toward development goals, resulting in substantial changes to current trends in population growth, human health and well-being, and environmental protection in some low- and middle-income countries.

SSP4: Inequality – A road divided

Highly unequal investments in human capital, combined with increasing disparities in economic opportunity and political power, lead to increasing inequalities and stratification both across and within countries. Over time, a gap widens between an internationally-connected society that is well educated and contributes to knowledge- and capital-intensive sectors of the global economy, and a fragmented collection of lower-income, poorly educated societies that work in a labor intensive, low-tech economy. Power becomes more concentrated in a relatively small political and business elite, even in democratic societies, while vulnerable groups have little representation in national and global institutions. Economic growth is moderate in industrialized and middle-income countries, while low income countries lag behind, in many cases struggling to provide adequate access to water, sanitation and health care for the poor. Social cohesion degrades and conflict and unrest become increasingly common. Technology development is high in the high-tech economy and sectors. Uncertainty in the fossil fuel markets lead to underinvestment in new resources in many regions of the world. Energy companies hedge against price fluctuations partly through diversifying their energy sources, with investments in both carbon-intensive fuels like coal and unconventional oil, but also low-carbon energy sources. Environmental policies focus on local issues around middle and high income areas. The combination of some development of low carbon supply options and expertise, and a well-integrated international political and business class capable of acting quickly and decisively, implies **low challenges to mitigation. Challenges to adaptation are high** for the substantial proportions of populations at low levels of development and with limited access to effective institutions for coping with economic or environmental stresses.

SSP4, with its emphasis on both across- and within-country inequality, seems less well represented in previous scenario literature, and we discuss its assumptions in more detail here. Its central feature of rising inequality is assumed to arise from a number of factors discussed in the inequality literature, including skill-biased technology development (where technology replaces many low-skill jobs; [Jaumotte et al., 2008](#), [Lansing and Markiewicz, 2012](#)) or capital returns ([Piketty, 2014](#)). Another key factor is the assumed generally low and highly unequal investments in education. Expanded education has been an important contributor to lowering inequality in the recent past ([OECD, 2011](#), [Cornia, 2012](#)); this narrative assumes the converse, that limited access to education can increase inequality. In addition, less affluent groups are assumed to have weak political power, fewer economic opportunities, and limited access to credit ([Vindigni, 2002](#), [Bénabou, 2000](#)), constraining both educational opportunities and income growth and making inequality more persistent. At the same time, those at the top end of the income scale ([Atkinson et al., 2010](#), [Roine et al., 2009](#)) see their relative position reinforced through institutional changes that strengthen their bargaining power at the expense of low earners ([Kumhof and Ranciere, 2010](#), [Piketty et al., 2011](#)). Across countries, the assumption that growth results in separation into different country income groups is consistent with the idea of “convergence clubs” ([Galor, 1996](#), [Quah, 1996a](#), [Quah, 1996b](#)) as opposed to the conditional convergence hypothesis ([Barro and Sala-i-Martin, 2003](#)).

There is very mixed evidence on the current inequality trends within and across countries. Wage inequality across countries has generally been increasing since 1980 in both OECD and non-OECD countries ([Galbraith, 2011](#)). While a simple population-weighted measure of international income dispersion is falling, this is almost entirely due to China, and except in the very recent past, the measure has been rising when China is excluded ([Milanovic, 2012](#)). Historical experience regarding within-country inequality is mixed, while SSP4 assumes that it increases in the long term. For some countries this means that recent trends will eventually reverse. This is plausible because such improvements can be temporary. For example, falling inequality within Latin America appears to be largely due to expanded education and reforms introduced by leftist governments ([Cornia, 2012](#)). SSP4 assumes increasingly restricted access to education, which could plausibly halt or reverse improvements. In addition, ([Galbraith, 2011](#)) notes that downturns in inequality from populist governments rarely endure.

It is also important to note that this pathway envisions a slow down, but not a halt to or reversal of the growth of the global middle class. [Kharas \(2010\)](#) defines the global middle class as consisting of people with daily expenditure between \$10 and \$100. He estimates that there are 1.8 billion people in the global middle class in 2009 (~25% of the global population), and that this total could rise to 4.8 billion (~60%) in 2030, due almost entirely to East Asia. The

SSP4 narrative assumes that growth is substantially smaller than it is in this outlook, but does not assume that it is halted entirely.

Finally, the assumptions that inequality and a perception of scarce energy resources lead to a decline in social cohesion and increased potential for conflict are consistent with scholarship in these areas. Empirically, there is a significant negative relationship between inequality and social cohesion across a variety of measures (trust, solidarity, dysfunction; [Uslaner, 2002](#), [Bjørnskov, 2008](#), [Wilkinson and Pickett, 2009](#), [Kemp-Benedict, 2011](#), [Paskov and Dewilde, 2012](#)). Similarly, there is historical precedent for conflict over energy resources in consuming countries ([England, 1994](#)) and in producing countries ([Ross, 2004](#)), with potential for intensification if resources are further constrained ([Lee, 2005](#)).

SSP5: Fossil-fueled development—Taking the highway

Driven by the economic success of industrialized and emerging economies, this world places increasing faith in competitive markets, innovation and participatory societies to produce rapid technological progress and development of human capital as the path to sustainable development. Global markets are increasingly integrated, with interventions focused on maintaining competition and removing institutional barriers to the participation of disadvantaged population groups. There are also strong investments in health, education, and institutions to enhance human and social capital. At the same time, the push for economic and social development is coupled with the exploitation of abundant fossil fuel resources and the adoption of resource and energy intensive lifestyles around the world. All these factors lead to rapid growth of the global economy. There is faith in the ability to effectively manage social and ecological systems, including by geo-engineering if necessary. While local environmental impacts are addressed effectively by technological solutions, there is relatively little effort to avoid potential global environmental impacts due to a perceived tradeoff with progress on economic development. Global population peaks and declines in the 21st century. Though fertility declines rapidly in developing countries, fertility levels in high income countries are relatively high (at or above replacement level) due to optimistic economic outlooks. International mobility is increased by gradually opening up labor markets as income disparities decrease. The strong reliance on fossil fuels and the lack of global environmental concern result in potentially **high challenges to mitigation**. The attainment of human development goals, robust economic growth, and highly engineered infrastructure results in relatively **low challenges to adaptation** to any potential climate change for all but a few.

SSP5 foresees accelerated globalization and rapid development of developing countries, including a significant improvement of institutions and the economic participation of disadvantaged population groups. Such trends have little historic precedent, particularly on the global scale. Only a limited number of nations have managed the transition to a market economy with effective institutions ([Lane and Montgomery, 2014](#)), and the long-term prospects of currently rapidly developing economies such as China, India and Brazil remain uncertain. However, two historically unprecedented developments in the recent past suggest a break from past trends. First, the economic success of emerging economies and more recently least developed countries has given rise to an emergent global middle class that has been lacking in most regions of the world ([Kharas, 2010](#)). The new middle class could stabilize global economic development by promoting robust growth in demand for services and goods. It may also generate societal pressure toward improved institutions and more participatory societies as for example has been observed in Brazil. Second, the digital revolution enables a global discourse of a significant and increasing fraction of the global population for the first time in human history which may lead to a rapid rise in global institutions and promote the ability for global coordination ([Keohane and Nye, 2000](#)).

For references check paper



Annex 6 – The business model canvas

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