The CoOPLAGE approach: When actors model their situation, principles or plans together for sustainable, empowering decision-making and change

Nils Ferrand, Emeline Hassenforder, Wanda Aquae-Gaudi

Chapter 2

The CoOPLAGE approach: When actors model their situation, principles or plans together for sustainable, empowering decision-making and change

Nils Ferrand, Emeline Hassenforder and Wanda Aquae-Gaudi[1]

CoOPLAGE is the acronym for "Coupler des outils ouverts et participatifs pour laisser les acteurs s'adapter pour la gestion de l'environnement[2]. This approach aims at guiding stakeholder participation (citizens, elected officials, managers, etc.) in the decision-making process with regard to their environment. This chapter presents the fundamental principles of the CoOPLAGE approach (empowerment, intervention research, true participation in decision-making, reflexivity on desired changes as well as a mix of engineering and do-it-yourself). In line with works on the modelling of complex systems, the background of this approach is also reviewed here. Lastly, the various CoOPLAGE tools are introduced, then detailed in the different chapters of this book.

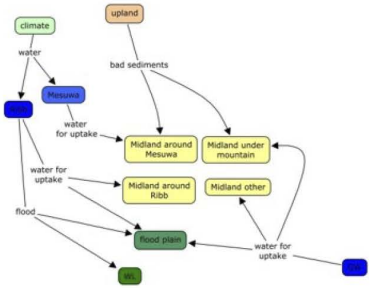
CoOPLAGE is a set of complementary tools designed to meet the needs of stakeholders in supporting socio-environmental transition. With these tools, stakeholders can:

- share their views of a socio-environmental situation,
- explore the outcomes of their practices and choices in terms of public policy,
- choose how to organise decision-making and assign roles,
- discuss principles of justice,
- propose action plans to deal with complex issues, and
- monitor and evaluate where they stand in their change process.

The CoOPLAGE suite of tools has been built over the years by researchers from the G-EAU joint research unit "Water Matters" in Montpellier in response to the decision-making needs of their field partners in various operational projects in France and abroad.

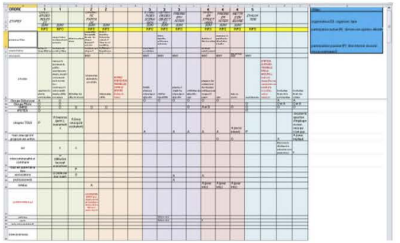
With and for all stakeholders, the participatory modelling process is at the heart of the CoOPLAGE approach (Box 2.1). Participatory modelling consists of constructing,

1. Wanda Aquae-Gaudi is a fictional author created in 2010 to represent the CoOPLAGE collective. With more than 100 contributors since 2008, it was necessary to recognise the contributions of everyone in the design of methods and scientific productions. Wanda's list can be found at the end of the book.
2. Coupling Open and Participatory Tools to Let Actors Adapt for Environmental Management

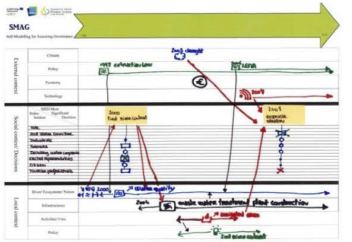


Role-play representing a socio-environmental system (Wat-A-Game tool)

Natural resource management plan representing a management strategy (CooPlan tool)



Participation plan representing a decision-making process (PrePar tool)



Timeline representing the past governance of a territory (SMAG or self-modelling for assessing governance tool)

Figure 2.1. Examples of models representing different systems
(tools mentioned in parenthesis are explained below and in the different chapters of this book)

together with different stakeholders, an object (the model) that allows a number of questions to be answered on a real target system (Minsky, 1965). The object in question can be, for example, a role-playing game, a timeline, a map, a diagram or a matrix. The system represented by this object can be, among other things, a territory, a decision-making process or a management strategy (figure 2.1). The idea is that the object, or model, should enable the various actors to step back from the system, so that they may ask themselves the right questions, consider its various components and take a fresh look at it. The object thus acts as a kind of critical mirror of the system to support collaborative decision-making between the actors. But beyond the ultimate use of the object in decision-making, what is important is the construction of the object as such (the modelling). By building a common representation of their system, the stakeholders learn to work together, exchange their different views, and take ownership of the issues and actions to be taken. They thus build the conditions for their own empowerment and collaboration towards socio-environmental transition.

This approach is therefore very different from classic coordination approaches where models, options, choices and regulations are provided by external, technical, administrative or political actors. Even when these approaches are guided by information sharing, consultation or light forms of communicative participation, they are still perceived by those in action as being controlled by experts and decision-makers, and therefore outside their own control and responsibility.

In what follows below and in the various chapters of this book, we will see how the CoOPLAGE approach can be concretely implemented in the field via different principles and methods. The rest of this chapter is devoted to positioning CoOPLAGE as an instrument for supporting socio-environmental transition.

Box 2.1. Historical background behind the CoOPLAGE approach

CoOPLAGE participatory modelling is in line with works on modelling complex industrial or socio-environmental systems that followed and were based on Jay Forrester's (1968) system dynamics and his famous World II model, which backed "The Limits to Growth" (Meadows *et al*., 1972) and the opinions expressed by the Club of Rome (figure 2.2). Modelling linking society and the environment has been present in France since early precursory works on "cybernetics" that were extended to socio-economic systems (Moles, 1968; Wiener, 1950). Cybernetics is a science that exclusively studies communications and their regulation in natural and artificial systems (Wiener, 2019). It allows for all encountered mechanisms to be explained and understood using a few simple logical building blocks, such as the emitter (which emits information), the receiver (which receives information) and the feedback (action of an effect on its own origin).

However, it is essentially the work on ecological or epidemiological modelling that has led to the questioning of interdisciplinarity and the linking of models, which also required bringing people together (Pave and Jollivet, 1993; Schmidt-Lainé and Pavé, 2002) and, in France, initiating and supporting the cross-cutting environment-life-society programme by key figures (J.-M. Legay, M. Jollivet, A. Pavé, J. Weber, S. Van Der Leeuw).

In the early 1990s, a trend towards complex systems, their modelling and ultimately their control appeared. This trend mobilised, on the one hand, a more theoretical

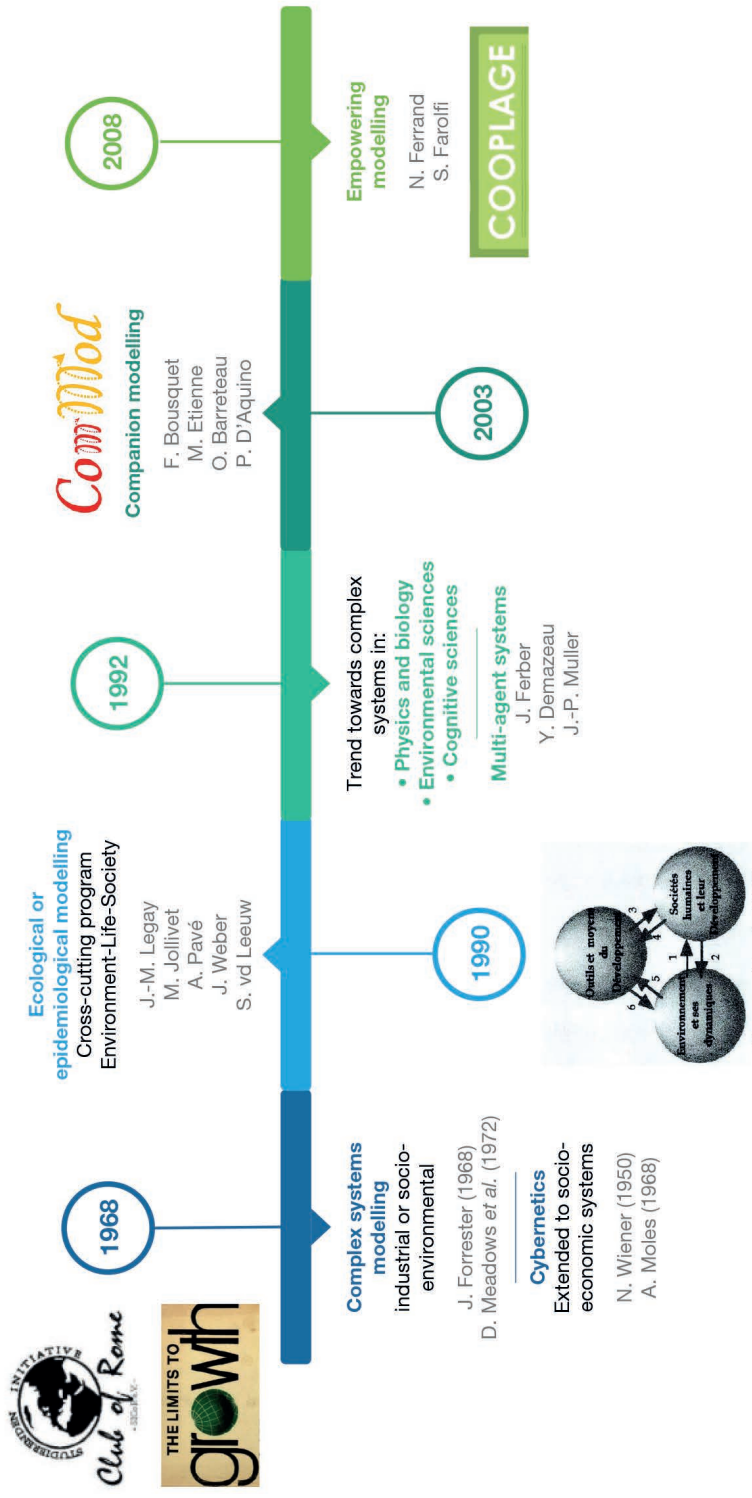


Figure 2.2. Historical background behind the CoOPLAGE approach

Box 2.1. (next)

orientation in physics and biology (dynamic systems and chaos, cellular automata, networks, percolation, renormalisation), and on the other hand, the aforementioned environmental sciences (with a growing link to geography via D. Pumain and L. Sanders), and lastly the emerging cognitive sciences between connectionism, artificial intelligence and evolutionism.

In France, since 1992, these reflections very quickly benefited from a specific contribution from research on multi-agent systems (J. Ferber, Y. Demazeau, J.-P. Muller), be it in modelling, simulation or problem solving. Multi-agent systems are a set of computer processes that run simultaneously. They allow several agents living at the same time, who share common resources and communicate with each other, to be simulated (adapted from Bousquet *et al*., 1999). By facilitating a more natural and direct description of entities and dynamics, these individual-centred models have improved the dialogue with non-expert actors. Finally, model linking has required new thinking on the exchange of viewpoints, their dynamic implementation and adequate formalisms, and more broadly on the production and use of knowledge through modelling.

This is the basis upon which F. Bousquet, M. Etienne, O. Barreteau, P. D'Aquino and others initiated "Companion Modelling" (Etienne, 2011). Companion Modelling (or ComMod) aims at bringing different stakeholders to gradually get to know each other, exchange their arguments and viewpoints in order to build a shared view of an issue (a model) and jointly develop an accepted solution. The main ComMod methods and tools are role-playing, multi-agent modelling and social simulation. The ComMod approach is therefore an original way of approaching modelling, which is often used to support collective decision-making processes concerning the sustainable management of renewable natural resources. The approach gives non-scientific actors a role in the co-production of models. The modeller-facilitator role is central, as this person is the mediator of the various perspectives and the delivery doctor* of a common model. This requires specific expertise and strong intervention, which at first seem contradictory to the objectives of autonomy and social dissemination. From 2008, a complementary perspective put forth by N. Ferrand and S. Farolfi has provided a change in scale in Companion Modelling and has broadened its effects. This has led to the principles and tools of "empowering modelling" and to the foundations of the CoOPLAGE method of letting actors do as much as possible on their own, while facilitating their collaboration through adequate meta-models.

* In the sense of 'bringing to life'.

⏩ Complementary postures for innovative engineering

The specificities and tools of the CoOPLAGE approach

Having acknowledged the capacity of all actors[3] to produce, formalise and compare their knowledge in structured models that can be used together, we sought to gradually empower these actors by freeing them from the facilitator. To achieve this, three concomitant constraints or objectives were taken into consideration:

– the materials (language, method, hardware kit, software) to guide them step by step in their process;

3. Including illiterate populations, through the use of appropriate materials.

– sufficient control through these materials to verify the quality of the model produced, in relation to the actual knowledge of the concerned sectors (water, environment, economy, etc.);
– the possibility of using the produced models for knowledge or decision-making needs, with and for the users, for example through social simulation (role-playing) or computer simulation.

In addition, whereas the body of works on Companion Modelling has focused on the dynamics of socio-environmental systems, their resilience and adaptation, CoOPLAGE sought to model other target systems or issues, based on the real needs of stakeholders. We detail these variations below. In practice, this meant proposing modelling kits, i.e. material for table-top work, accessible to all and which allow for acceptable models of the territory to be collectively established. These models can then be used to explore different transformation options and their consequences through simulation.

This led to the development of the Wat-A-Game set of tools, more specifically to the basic INI-WAG kit, and its multiple thematic and territorial variations (figure 2.3 and see chapter 12). A watershed model can be built using these tools. Various elements represent the river, its tributaries, fields, towns, forests, as well as the territory's dynamics (for instance hydrological and financial represented by circulating different coloured beads),

Figure 2.3. The Wat-A-Game Tool: A role-playing game to be built and played collectively

various actors (using role cards) and the activities they carry out there (using activity cards chosen by the players). Once constructed, the role-playing game allows the players to explore different possible transitional paths (for example by changing the activities carried out by the players or by testing the consequences of a specific event in the game). The tools in the Wat-A-Game family provide a common framework with reusable elements (a lexicon), rules (a grammar set) and a protocol to be followed together. Variable levels of modelling are proposed, from the simple reproduction of an existing model, to the mapping of a system and finally the independent production of new model elements (activities, roles, resources). From an initial model oriented towards quantitative water management, users can, for example, add quality or biodiversity issues, or add new roles. A variety of experiments have been set up using INI-WAG, including "Eau en Jeu®" (an educational kit on integrated water management for schools[4]), "L'Eau en Têt" (see chapter 13), WasteWAG (see chapter 14) and MyRiverKit (a methodological kit to raise awareness of the concept of ecosystem services[5]).

Similarly, the CoOPLAN method for participatory planning (see chapter 17), PrePar for participation engineering (see chapter 9), JustAGrid for justice dialogue and Self-Modelling for Assessing Governance (SMAG) for governance diagnostic, are also based on participatory modelling processes of different types of systems (respectively management strategies, decision-making processes, sharing and governance rules, figure 2.1). Initially, the aim is to "get the modelling done", then to gradually minimise the amount of guidance required to "let it happen". This involves, on the one hand, rapidly training local facilitators and, on the other hand, providing manuals and "self-facilitating" materials, i.e. that participants can facilitate themselves, without having to call upon a facilitator.

This set of tools and methods form the CoOPLAGE approach. These tools are currently being digitised on the CoOPILOT platform (see chapter 8). This digitisation constitutes a further step towards empowering the actors, which, however, has not yet been evaluated from an operational standpoint.

From needs-based pragmatics to research-intervention

Whether at INRAE or at Cirad (French public research institutions having hosted CoOPLAGE development), "field" culture is fundamental. Responding to the needs of stakeholders in various countries is the focus, alongside knowing how to help stakeholders formulate these needs. In parallel, our research, by virtue of its mandate to support public policies, must also respond to two other challenges: on the one hand, to generalise what we have learned from our various experiences so that this can be used elsewhere in an independent manner (in particular to minimise the need for public intervention), and on the other hand, to produce methodological innovations through experimental approaches that can lead to designing and evaluating the performance of various approaches and tools for multi-stakeholders, multi-issue and multi-level contexts.

However, these three issues (meeting the needs of stakeholders/generalising results/producing innovations) are often conflicting. Meeting the needs of stakeholders often

4. http://eauenjeu.org

5. http://www.gesteau.fr/vie-des-territoires/my-river-kit-un-jeu-de-role-pour-sensibiliser-la-gestion-integree-des

implies continuity with their perceptions and current practices, which are not always compatible with the introduction of innovations that may, on the contrary, be at odds with these same perceptions and practices. Moreover, evaluating the performance of the innovations resulting from our research, in view of their potential dissemination, would require experiments with control groups to allow the various factors involved to be controlled, as is for instance done in experimental economics[6]. However, the real socio-political decision-making contexts in which we work with a limited budget (e.g. decentralising natural resource management in Tunisia, piloting participation in water policy in New Caledonia, involving citizens in institutional river management systems in France, etc.), do not allow this type of experimentation to be easily implemented. This posture often renders fragile results compared to purely descriptive research or research based on formal experiments, but at the same time it allows for truly new methodological venues to be explored.

Thus, starting with the field's needs, sometimes in an opportunistic manner, and based on the principles of CoOPLAGE, our research-intervention frameworks have a double impact: the exploration of new methods, sometimes stabilised, and various socio-technical changes for the actors in the territories. The failures encountered (non-adoption, resistance, behavioural inertia, impact limited to the project) provide new resources for the next experiment. Supported by large-scale training, we have gradually disseminated these principles and practices internationally, with the latent hope of having a lasting impact on multi-actors decision-making practices at various levels.

Truly participating in the decision on and for oneself

Participation and decisions are too often separated. Participation is too often used to facilitate the acceptance of decisions by different actors (see chapter 6). In which case, participation is restricted to communication aimed at convincing the "public" to welcome a project decided elsewhere ("acceptology"). In France, the 2016 ordinances on environmental dialogue seek to correct this by bringing the requirement for participation to an earlier project stage, so as to first discuss the opportunity, then the options and their implementation (see chapter 4). But the distribution between open, citizen participatory processes, technical and administrative appraisal, and political choices remains very unbalanced, backed by arguments concerning time, capacity and socio-economic risk (no politician wants a project with a private sector pre-agreement to be called into question by citizen participation). There are many decision-making stages for which the choice of involving these stakeholders is never made explicit or contested. Who frames and initiates a consultation for a project? Who should decide on the decision-making process? Who should participate in the diagnostic? Who can discuss "what is right"? Who can propose actions and plans? Who votes and chooses? Who implements? Everyone is involved, but there is little space to modify the roles.

As part of our experiment on support methods, we have therefore tried to ensure that the actors themselves question the place of each and everyone in the decision. This was achieved in particular through publication of the PrePar framework with support from

6. This would involve, for example, comparing a group that has tested an innovation with another group with similar characteristics that has not tested the innovation. Along these lines, the work in development economics that is best known to the general public is that of Esther Duflo, who received the so-called Nobel Prize in Economics in 2019.

the Rhône-Mediterranean-Corsica water agency[7]. It is based on a reference framework with eight decision-making stages (downloadable from http://frama.link/RMCPart). For each stage of the decision (diagnostic/definition of objectives/planning, etc.), stakeholders can define the desired degree of participation (low/medium/high) and then choose the appropriate participatory methods (Hassenforder *et al.*, 2020).

Testing the involvement of new actors in a decision obviously requires that they be able to do so effectively, be it in terms of capacity, resources or legitimacy. This is why, apart from a general methodological inventory, we have also sought to provide solutions to stages that have not been dealt with much elsewhere: for example, by exploring how to get people to participate in the construction of a participatory observatory (and not in the observatory itself), (see chapter 16), how to discuss and co-organise participation on a large scale, how to reintegrate monitoring and evaluation into participation to make it an asset rather than a constraint (see chapter 10), or how to mobilise digital technology to monitor the process, beyond electronic debate (see chapter 8). The aim lies in re-legitimising and putting into action the stakeholders, including citizens, in stages that are generally occupied by managers and specialists and, in this way, creating co-engagement and long-term efficiency.

Questioning, monitoring and evaluating "multi-impacts": reflexivity on change at the heart of empowerment

Firstly, the challenge of empowerment reflects the need to decentralise and minimalise intervention by public authorities. In the long term, the aim is to support the most appropriate mechanisms for developing "strong resilience"[8] locally, i.e. the capacity of stakeholders who share territories and common environmental goods to choose their future, to control their resources and to steer their dynamics, with minimised external intervention, particularly public aid and regulation. An additional methodological challenge is the fact that the various groups of actors have varying levels of conditions to resilience, which are interdependent to some extent. From this angle, the primary challenge is to help stakeholders define what they want for themselves and their environment, the acceptable pathways to achieve this, and to enlighten them on the dynamics that will allow them to evolve towards these objectives. Without prejudging their ability to choose efficient strategies (which is the subject of other CoOPLAGE tools), they must at least know where they stand and where they want to go. But any and all action has multiple environmental and social impacts, both direct and indirect.

Since the launch of the "ENCORE" (External / Normative / Cognitive / Operational / Relational / Equity – Ferrand and Daniell, 2006) monitoring-evaluation framework, we have sought to qualify all of these impacts in a global manner: whether they be transformations induced by the actors on their environment, normative changes (e.g. in values or preferences), cognitive learning, changes in practices and concrete behaviour, or

7. In the scope of the 'What participatory strategy for local water management with citizens' project (2016-2020).

8. Resilience in its classical definition (Botta and Bousquet, 2017) for socio-ecological systems refers to '*the capacity of an ecological and social system to absorb or withstand a disturbance or stress, while maintaining its structure and functions through processes of self-organisation, learning and adaptation*'. As the authors mention, we are more in a 'development' perspective that targets the most vulnerable as a priority (Ferrand *et al.*, 2014).

changes in relational structures and social justice. It is not just a question of observing these impacts "from the outside", with an analytical aim, but of making the actors themselves "take into account" what is changing. These "multi-impacts" are certainly difficult to measure, especially all of them, even more so "from the inside", i.e. by the actors themselves. Nevertheless, the fact that they are taken into account by the stakeholders themselves, and the fact that structured dialogue is taking place on these themes, already guarantee that what is deeply and durably at stake for them is highlighted.

Here again, modelling is at the core of our approach: the ENCORE framework and associated approach (Hassenforder *et al.*, 2016) allow actors to collectively model the desired changes and reflect together on the paths to achieving them. To this end, we are currently working on the principles of "endo-evaluative participation". The aim is to minimise the tools dedicated to evaluation (questionnaires, etc.), which are often a burden for participants to complete, and to maximise data collection on the impacts of the process through the participatory tools themselves. For example, an indicator on the strain or solidarity created between participants can be added to a role-playing game, in order to evaluate relational impacts through a simple and non-disruptive methodological adaptation. In parallel, this ambition of endo-evaluative participation is also expressed through integrated and adaptive thought on both the evaluation and the engineering of the process. In simple terms, the aim is to reflect on the changes desired, and think about how to achieve them, then to evaluate whether these changes are being achieved, and if necessary adapt the process if they are not. In any case, a major focus of our work is placed on making the participants themselves think about monitoring and evaluation as well as the engineering of the participatory approach. This is done in particular by setting up pilot groups including citizens (see insert 3 in chapter 17). This approach is quite different from classic analytical scientific approaches that advocate the independence of the evaluation stage. Reflexivity and change control are what take precedence here.

Co-adapting practices and policies: planned engineering or DIY along the way?

Most of the requests we receive are from public authorities. In general, we are called upon to help a pilot group to design and organise a participatory process that includes stakeholders at very different levels (ministers, elected officials, administrators, economic actors, experts, researchers, associations, locals, the socially excluded, etc.). The initial aim of a certain number of these requests is acceptability of a decision: in other words, for the decision-makers and pilots of the participatory process, the objective is to get a decision accepted, for example the creation of a new reservoir or the implementation of a new regulation. As researchers and for those who facilitate the process, our goal is then to help make this request evolve towards a vision of co-construction and co-evolution, i.e. to make the pilot group and decision-makers understand that involving other actors in a decision that has already been taken is of little or no interest. To accompany this evolution, it is important to get the groups to ask themselves a certain number of questions related to the organisation of participation: which roles should be given to which actors (pilot, reference person, participation warrant, facilitator, observer, etc.)? What should be imposed and what should be discussed in the participatory process? What materials should be used? What training is needed? Should an external facilitator be hired or should someone be trained internally? How should sub-groups of participants

be organised? How can "silos be broken down"? How can trust be rebuilt? etc. In trying to answer these questions, the pilot members of a participatory approach often find themselves in a "do-it-yourself" (DIY) posture based on empirical know-how and observation rather than on systematic theories. This only works within the limits of the pilots' skills, hence the need to call upon experts.

To overcome this "DIY" stage, different options need to be tested in different contexts and with different actors for each of these questions in order to analyse which options are the most relevant to the final objectives. This is what we seek to do by conducting comparative analyses of the different participatory approaches we support. This has also led us to propose a "meta-model" for participation engineering, i.e. a model that can be used for different participatory processes, in different contexts and with different actors, and which can be transferred to any pilot group to enable it to design and implement its own participatory process quickly and with minimal support.

This meta-model is the PrePar method, mentioned above and presented in the chapter 9. PrePar proposes a participation engineering framework centred on systematic deliberation of the forms of involvement of all actors at each stage. Participants are asked to define the actual roles of the different actors in the successive decision-making stages. The method thus allows for a participation plan to be produced, in principle, and details the different actions to be carried out, the participatory methods to be used and the actors to be involved. A digital version of the method (ePrePar) is available.

The deliberation carried out through the PrePar process provides the basis for drawing up a participation charter. Here again, using PrePar in a participatory way is a new approach, the implementation of which constitutes a major change in posture and supports impactful social learning: the stakeholders, including citizens, discuss the way in which they will be associated to the target decision, as well as the commitments and responsibilities of each. The subsequent adherence to the rules and results depends on this, and consequently the mutual trust between participants, regulators and organisers of the participatory process. Admittedly, however, this participatory planning "of the participatory process" has as much value as a preparatory process as the plan produced, which can be quickly adapted, modified, adjusted... Consequently, there is a real compromise between this planned engineering, structured by the meta-models in PrePar, and all the adaptive steering required later by the contingencies of the socio-political path.

⏩ The decision model of the CoOPLAGE support platform

The goal of the CoOPLAGE tools is therefore to accompany and coordinate the decision-making stages of actors at all levels, from citizens to elected representatives and managers, in order to facilitate technical, social and institutional changes that are compatible with environmental constraints and achieve the sustainable effects sought by the participants.

The decision model presented in table 2.1 and figure 2.4 can be used as a synthesis of all the CoOPLAGE tools and the decision-making stages at which they can be mobilised. Each step corresponds to a stage in decision-making:

Participation =
"Sharing decision process + Piloting + Preparation + Diagnostic + Prospective (foresight) + Preferences + Planning + Prioritisation + Implementation".

These steps were initially based on the four phases of the decision-making process identified by Simon (1977) "Intelligence/Design/Choice/Review" and have been adapted to best fit the needs of stakeholders and the standard steps in elaborating water policy (for details, see annex 4 in Hassenforder *et al*., 2021). Although CoOPLAGE allows stakeholders to reflect on all the steps in the preliminary engineering phases, only some of them are actually formalised (table 2.1).

The different approaches and tools as well as their operational implementation are presented throughout this book and in figure 2.4.

Table 2.1. The decision model of CoOPLAGE and its instrumentation (extended version)

Step	Description	Corresponding CoOPLAGE tools
Sharing	Combine face-to-face and digital means to structure and share the process between actors at all levels	CoOPILOT (digital platform containing all CoOPLAGE tools)
Piloting	Co-construct criteria to evaluate the process and its socio-environmental impacts, then monitor and use these criteria to pilot and adapt along the way	ENCORE (External, Normative, Cognitive, Operational, Relational, Equity – corresponds to the different types of impacts that can be evaluated)
Preparation	Train the actors, then co-design and organise the participation by discussing roles, commitments and methods, to obtain a consensual participation plan and charter	PrePar (to prepare and reflect on a participatory approach) MOOC Terr'Eau & co (online course for training in the CoOPLAGE approach) INI-WAG (Wat-A-Game basic kit to understand the principles of an integrated water management role-play)
Diagnostic	Observe, diagnose, understand and model the social and environmental situation	ROCK (River Observation and Conservation Kit – observation sheet to be created to observe a river or a territory) SMAG (Self-Modelling for Assessing Governance – to produce a diagnostic of the past governance of a territory)
Prospective	Imagine future scenarios, explore possible paths, simulate	CreaWAG (version of Wat-A-Game to create role-plays on integrated water management) and the so produced specialized models and games
Preferences	Discuss the goals and constraints of the actors in order to define the management framework, with a specific focus on social justice	JustAGrid (to dialogue on justice issues)
Planning	Formulate options for action, then characterise and assemble them into multi-level, feasible and efficient territorial strategies	CoOPLAN (to develop an integrated water management plan in a participatory manner)
Prioritisation	Compare and prioritise strategies in order to choose one	
Implementation	Assist in institutional (governance) and operational (technical, economic) implementation	

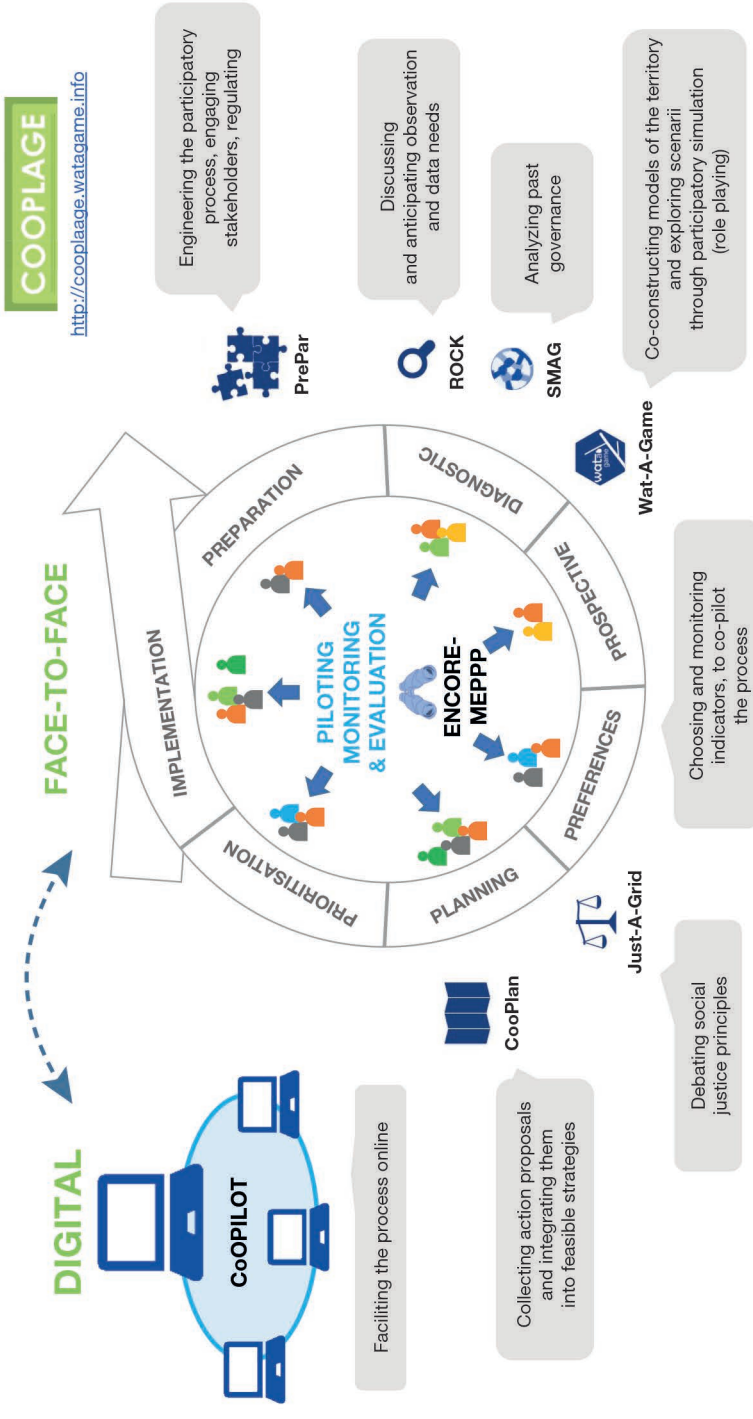


Figure 2.4. CoOPLAGE decision model and its instrumentation

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