# Evaluating the impacts of participatory processes for water management: a theoretical proposal based on the capability approach

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**Abstract:** Public participation to manage water resources is largely promoted by institutional actors from national to international scale. Progress is still required to understand, depending on specific variables such as contexts, issues or implementation protocols, how participatory processes impact the individual participants, the group and eventually their decisions and practices. The need for a scientific evaluation tool applied to participatory processes and their transformative impacts has thus emerged during the last decade. We argue in this contribution that the capability approach can support researchers and practitioners in specifying, identifying and understanding changes occurring among individuals and groups taking part in a participatory process because of the twofold link that exists between the capabilities of participants and the participatory process they undertake. Once this has been considered, several methodological choices are required and reviewed here to define an operational evaluation framework, starting with the choice of the relevant capabilities to integrate into it.

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# 1   Introduction

> "Water is a subject in which everyone is a stakeholder'" [Ken'ichi et al., (2016), p.70]

Since the end of the 1980s, institutional actors, from the national to the international scale, have largely promoted the use of participatory methods to manage natural resources, especially water resources. Academics and practitioners have indeed questioned and criticised top down solutions and centralised public natural resources

management for their lack of legitimacy and efficiency in initiating social or governance changes (Pahl-Wostl, 2009; Daniell, 2012). The participatory management of water resources encompasses various geographical scales and concerns fields as diverse as flood or water scarcity mitigation and the integrative management of water uses, such as potable water, sanitation, food and energy production, industry and social uses (recreational, spiritual, for instance) (Huitema et al., 2009; Daniell, 2012; Madrid et al., 2013; Mochizuki et al., 2018). Furthermore, extensive empirical studies and theoretical developments have demonstrated that local communities and institutions could efficiently manage these resources (Ostrom, 1990; Dietz et al., 2003). This twofold dynamic has led to a significant development in public participation in the field of water resources management (WRM).

We define public participation as *arrangements* where various stakeholders gather and together contribute to a decision-making process, in a more or less direct and formal way (Van den Hove, 2001), thereby "allowing people to influence the outcome of plans and working processes" [European Commission, (2003), p.iv]. Many forms of public participation in WRM exist or are advocated with impacts just as broad and various depending on the form that a participatory process takes and the associated level of stakeholders' involvement (Ridder et al., 2005).

Participatory processes have traditionally been associated with "benefits for democratic society, citizenship and equity" [Reed, (2008), p.2420] as they would increase public trust in decisions and civil society and favour the emergence of co generated knowledge and social learning, which has been recognised as a key issue in water management for a long time (Pahl-Wostl et al., 2007). Participatory processes have also been associated with the emergence of collective action. This may directly impact group dynamics towards medium and long term social and relational changes. Games in particular have demonstrated their relevance to promote dialogue between stakeholders and to understand the complexity of the issues related to water management (Barreteau et al., 2003; Ferrand et al., 2009; Kuper et al., 2009). In France for instance, these were integrated into several operational guides promoting participation for water management (Hassenforder et al., 2020).

Participatory processes are also associated with the transformation of local people and communities towards the achievement of change, as well as "the enhancement of [their] capabilities to define and address their own needs and aspirations" [Duraiappah et al., (2005), p.5; Sen, 1999; Daquino, 2007; Frediani, 2015]. Capabilities correspond to the freedoms of 'being' or 'doing' available to people and that they have reason to value. They represent valued opportunities available to a person or a group of people. Eventually, through the transformation of participants, participatory processes are expected to enhance "the quality and durability of environmental decisions that are made through engagement with stakeholders" [Reed, (2008), p.2420; Seghezzo et al., 2017].

Public participation in environmental management has also been subject to criticism. Several studies have pointed out that participatory processes could be used as mere tools to achieve objectives pre set by governing forces (Frediani, 2006; Daquino, 2007; Bawole, 2013). These studies also noted that the processes could serve as consensus building and aim mainly at solving ordinary conflicts, thereby losing sight of their initial and long term ambition of transforming the society and empowering marginalised individuals and groups (Blondiaux and Fourniau, 2011).

The monitoring and evaluation of participatory processes and their effects on participants have consequently developed. As Bellamy et al. note, evaluation is

fundamental to supporting "progressive learning at individual, community, institutional and policy levels" (2001, 408; in Hassenforder et al., 2016). Significant proposals have notably taken the shape of procedural assessments, such as the nine criteria approach, based on acceptance and process criteria (Rowe and Frewer, 2000; Rowe et al., 2004), theory based evaluation frameworks such as the Canberra Protocol, which compares theoretical objectives set by researchers for a participatory project and actual realisations (Jones et al., 2009) or generic and adaptable context process outputs/outcomes frameworks such as the monitoring and evaluation of participatory planning processes (MEPPP) framework (Hassenforder et al., 2016).

There are nevertheless few such proposals and progress in this field has been rather slow (International Association for Public Participation – Canada, 2016). They certainly tend to focus on the quality of the process or on the substantial effects on the environment (Syme and Nancarrow, 2002), rather than on the transformations that participants themselves undergo. Several challenges also arise, in particular the difficulty of establishing a consensual normative definition of an effective participatory process, of the appropriate evaluation criteria for it and of operational approaches to research methods, as well as its costs, considered to be high (Blatrix and Méry, 2019). The capture of collective values, and their development over time in a decision making arena, represent another methodological difficulty for the evaluator (Barbier and Larrue, 2011; International Association for Public Participation – Canada, 2016).

This article tackles this challenge and introduces a theoretical framework to design an innovative and operational evaluation tool. This tool should allow the measurement of certain transformative and learning effects resulting from participatory processes. As the article makes clear, this means drawing on the capability approach (CA) in order to analyse how participatory processes could be a vector of such transformations. The evaluation of capabilities is important because their existence may eventually lead to the improvement of the overall capacity of participants to manage water resources. Participants who possess a set of capacities related to collective action that they value should be better able to take full advantage of a participatory process, depending on their interests and strategies. This may in turn lead to more sustainable management because, when participants exercise their agency and decide to act out of free will and in the interest of managing water together, the decisions taken are likely to be more acceptable and longer lasting (Johnson, 2002; European Commission, 2003; Blomqvist, 2004; Barbier and Larrue, 2011). Hence, the main objective of this article is the integration of capabilities, on both the scale of individual participants and of the whole group, in an evaluation framework in order to measure how their capability space is impacted by participation processes.

This article is structured as follows: Section 2 discusses the main definitions and practical applications related to the CA and Section 3 demonstrates that the CA provides new insights into the understanding of the changes occurring among individuals and their links with a collective that undertakes a participatory process. Section 4 demonstrates that through the appropriated practical specifications, it is possible to operationalise the CA into an evaluation framework. Sections 5 and 6 discuss the shape such a tool could take and additional challenges that should be dealt with to build a functional evaluation tool, before concluding on this research.

## 2 Why and how the CA is relevant to evaluating participatory processes for water management

Using the CA is a non-canonical proposal to develop an evaluation framework for public participation. We discuss here the potential benefits of looking through the CA at the expected transformative effects of participatory processes.

### 2.1 From individual to collective capabilities

Sen defines capabilities as the various functionings that a person can choose to adopt, according to his or her values, in order to achieve his or her expected lifestyle (Sen, 1999). In this definition, achieved functionings are related to well being achievements. Both potential and achieved choices are taken into account by the CA, which is related to positive freedom, and correspond to the possible 'beings' or 'doings' available to an agent. When combined, these constitute the agent's capability set. This capability set depends on the person's access to resources (material and non material goods) and on his or her conversion factors, whether they are internal (psychological, cultural factors…) or external (environmental, social, political, cultural factors …) (Sen, 1999; Robeyns, 2005). Another important notion related to the CA is the agency of people, which is the ability of a person to pursue and realise goals in accordance with his or her values (Sen, 1999; Deneulin and Shahani, 2009). Generally associated with one's ability to choose, agency can be defined as "a special type of capability which underpins the whole process of the capability approach" [Crocker, 2007; in Frediani, (2010), p.180]. Figure 1 synthesises how those notions are inter combined to form a capability sequence.

Many researchers, including Sen, acknowledge the importance of social interactions in the CA because obtaining a capability is a process that is strongly reliant on the social opportunities available to people, as well as their "relations with others and on what the state and other institutions do" [Sen, 2002; Drèze and Sen, (2002), p.6]. However, they also argue that it is practicable solely at the individual level and that well being cannot be assessed at the collective level (Pelenc et al., 2015). They use the concept of *socially-dependent capabilities* to describe capabilities that would appear out of the interactions between agents [Sen, (2002), p.85; Bakhshi and Dubois, 2008]. Others have acknowledged the existence of collective capabilities, that is to say capabilities, that could only be reached and developed by individuals through the action of a group and through a free and voluntarily engagement in collective action (Ibrahim, 2006; Panet and Duray-Soundron, 2008). As Pelenc et al. (2013, p.78) explain it, collective capabilities allow "the interacting group of people to carry out things and achieve states of being that would not be possible when acting alone". It is this definition that we retain in this article.

When considering a participatory process, collective capabilities are reached through the exercise of collective agency (Pelenc et al., 2015). Interacting individuals together choose a common goal to pursue, meaning that they possess a collective agency. They can then transform the collective capabilities at their disposal into collective actions, that is to say, into achieved collective functionings. Several feedback loops take place along the way, as Figure 1 shows. Achieved functionings actuated by a group impact that group's set of capabilities in return, as well as the individual capabilities of its members. This might eventually lead to an update of individual and collective goals. In the same way, the actions a group undertake to reach its objectives also impact its collective agency, as well as the individual agency of its members.

A defining feature of collective capabilities is that they cannot be reduced to a function of the individual capabilities of the group members. Collective capabilities do not correspond to the aggregation or the average of the individual capabilities of the group members. Instead, they can be either superior or inferior to those (Ibrahim, 2006; Duray-Soundron, 2008). They are inherent to each group and emerge according to the social interactions taking place among the group, as well as between the group and its direct political, social, cultural, economical environment. As Stewart (2005, p.4) puts it, "since people are essentially social, their social networks form an important part of their total well being". For instance, collective capabilities will emerge among a group when agreements or alliances take place. Moreover, as demonstrated by Seguin (2015), certain conflicts among a group can also be a source of learning, creativity and collective growth, and eventually lead to improved capabilities. In contrast, collective capabilities might also not exist among a group when certain disagreements or conflicts prevent people from discussing, learning and growing together, or because of what Stewart has called "the constricting effects of families or communities" [Stewart, (2005), p.4; Panet and Duray-Soundron, 2008]. The CA, because it focuses not only on people's values and interests, but also on their resources and conversion factors, can help researchers and practitioners to understand the roots of power imbalances, of unequal distribution of capabilities and of conflicts in certain water management situations.

Collective capabilities can be considered as pre requisites for the collective management of common goods (Pelenc et al., 2013), such as water resources. That is why they have a central place in this research. Some authors even argue that the only way for individuals to improve their individual capabilities, that is to say their freedom of choice and their ability to act, would be to join collective action, such as a participatory process, even in a passive way (Duray-Soundron, 2008). One of the main features of the CA is to see people as agents of change and not as passive subjects. Moreover, some capability scholars have argued that participatory processes represent a potential method "by which participants [...] together set social and economic objectives that are mutually constructive and that expand their real freedoms" [Frediani, (2006), p.2]. This is why we consider that the CA is a relevant and innovative framework in which to develop an evaluation tool and to measure potential transformations occurring among groups during a participatory process.

## 2.2   Making the CA operational: recommendations from the literature

Several authors have issued recommendations on developing an operational evaluation tool, going into more or less detail, through the sequence that consists in transforming the capability theory into *an object of practical value* [Comim, (2001), p.1]. Robeyns (2006) argues that three theoretical specifications should be made in order to operationalise the CA:

1    whether to focus on capabilities or functionings

2    which capabilities should be selected

3    whether capabilities (or functionings) should be aggregated and weighted.

In the case of participatory processes for WRM, our choice was to focus on the capability space of participants (Figure 1), instead of on their functionings. We consider the latter procedure insufficient to understand what a group does and could do, or to understand its

motivations (Panet and Duray-Soundron, 2008). The capability space allows researchers to grasp the way in which the transformations of resources are affected by conversion factors and how, combined with individuals and collective choices, abilities and opportunities, they can shape the capability set and eventually the functionings of a group. The choice of the capabilities will be addressed in a dedicated section (Section 4). The aggregation and weighting of capabilities will not be at the centre of our evaluation tool because its first aim is descriptive and it is solely meant to track the existence and the evolution of selected capabilities emerging from interactions between individuals. Moreover, measuring the aggregation of capabilities in a participatory perspective would take the focus off the emergence and strengthening of individual and collective capabilities, due to the pooling of resources, conversion factors and individual capabilities, as well as the interactions taking place between participants. Nevertheless, because the analysis of the varying importance given by people to different functionings is an important aspect of the CA (Comim, 2001), it should not be completely removed from the evaluation material.

Finally, as a complement to those specifications, Bonnard (2015) suggests discussing whether an evaluative analysis (measuring the state of certain capabilities at several moments of a participatory process) or a formative or prospective analysis (measuring the evolution of the capability set of the participants throughout a participatory process) should be conducted. In the case of the research presented here, the choice was made to head towards an evaluative analysis, where the evolution of one individual and two collective capabilities were to be monitored through the participatory process.

## 2.3 *Existing proposals to identify and evaluate individual and collective capabilities*

Despite the relevance and the interest of looking at participatory process through the CA, as well as the operational methods suggested in the literature on capabilities, few evaluation tools based on it have been developed. At first sight, the challenge is difficult indeed. As Panet and Duray-Soundron (2008) explain, analysing a situation such as a participatory process through the grid of the CA implies evaluating both what a person does and what that person could do, as well as the motivation behind the choices made – or not made; this imperative leads to a counterfactual difficulty. Moreover, capabilities are exerted in the course of decision, action and interaction, and not as a natural condition; investigation of this presents a challenge.

Among the existing attempts, we can cite the proposal of Grunfeld (2013) who has developed an analytical frame, taking the shape of a development and evaluation tool for initiatives in the field of information and communication technologies for development, combining theories from the latter with the CA. This frame was built based on semi structured focus group sessions and face to face interviews. Another researcher, Gigler (2004), developed an individual and collective evaluation framework based on data from several consultation workshops conducted with indigenous people in Peru. El-Harizi and Klemick (2007) and El-Harizi (2008) developed a tool to measure the collective capabilities of local communities in Sudan and their capacity to manage natural resources. They focused on six categories of capabilities (level of autonomy, ability to take initiatives, ability to manage funds, ability to organise, ability to manage communal land, 'level of achievement') to create a tool called 'community capability index'. To build this index, the researchers asked an expert panel to devise six weighted categories

of capabilities, measured using forty five indicators. A survey was then carried out among local communities so that they could evaluate their capabilities themselves. Several scholars working in the field of health economics have also developed evaluation grids, such as the ICECAP A grid (Al-Janabi et al., 2012; Flynn et al., 2015; ICECAP-A – University of Birmingham, 2016) and ICECAP O grid (Grewal et al., 2006; Coast et al., 2008; ICECAP-O – University of Birmingham, 2016), based on two rounds of semi structured interviews with adults including older people. Finally, we also single out the CAPFLO project (de Voogt et al., 2019), which focuses on the strengthening of social capacities related to flood risk management through the use of participatory methods. Even though social capacities do not correspond to capabilities, the authors provide an interesting monitoring grid that tracks the *resources* and *abilities* [de Voogt et al., (2019), p.90] of people, in order to determine the state of their social capacities. Researchers used semi structured interviews, a door to door survey and desktop research to fill in their indicators.

Like most monitoring and evaluation methods, these proposals are built with combinations of observation, questionnaires, focus groups and 'grey' material processing. They capture observable facts or subjective assertions from participants. But they can hardly provide any insights into actual collective processes when new management situations are faced, as these behaviours are mutually influenced. Here lies the interest and innovative aspect of our evaluation framework: in order to measure the capabilities of people, we suggest relying not only on these classical evaluation devices, but also on a 'performance test' where people's choices are put to the test and challenged.

## 3    The CA and participatory processes: a twofold link

The CA is a multidimensional normative framework which structures some fundamental individual and collective human features required for fruitful participation and the induced transformations of participants. In this section, we detail a twofold link that exists between public participation and the CA, as illustrated in Figure 2.

On the one hand, owning a certain set of capabilities may ensure the attainability of an effective participatory process (Duraiappah et al., 2005). The use of the CA to evaluate participatory processes is also relevant because participation can allow the members of a community to discuss, debate and agree on the justice principles they value. This calls for the use of specific procedural capabilities among a group of participants called *participatory capabilities* (Frediani, 2015). Participatory capabilities could impact the capacity and propensity of people to participate fruitfully. They represent the freedom, that is to say the choice, the ability and the opportunity of an agent or a group of agents to achieve objectives related to the effective progress of a participatory process. Those objectives are notably related to inclusion, equal partnership, transparency, sharing power, sharing responsibility, empowerment and cooperation dimensions (Duraiappah et al., 2005). In this way, examples of participatory capabilities include: *being able to cooperate among or as a group, being able to take and share responsibility among the different members of the group, being able to share power among the different members of the group, being able to ensure transparency and an equal diffusion of the information, being able to be inclusive towards any person who is concerned by WRM and wishes to join the participatory process, being able to recognise and take into account every participant's skills and abilities in the participatory process,*

*being able to promote within the group accountability, mutual learning and even empowerment* (Duraiappah et al., 2005; Frediani, 2015). The presence or lack of these participatory capabilities among a group of participants can influence how effectively a participatory process progresses.

On the other hand, participatory processes may impact the emergence and the strengthening of individual and collective capabilities. Participatory processes give participants the opportunity to work together, make decision proposals and become actors of change. During the period of a participatory process, participants may change their values because of interactions with each other and public discussion, and solve disagreements or conflicts among themselves. They may also develop knowledge or skills solicited during the process, sometimes thanks to the very process of managing conflicts (Seguin, 2015). By giving people the opportunity to deliberate over what they want, what they can do, what they could do, how to attain their objectives and act to achieve them, participatory processes allow them to influence and share control and commitment over a set of different actions, such as priority settings or policy making (The World Bank, 1996; Paz Goldfarb and Grinberg, 2002).

Participatory processes can impact groups of participants and their management of water resources in many ways. Those impacts can be normative (changes in the values and preferences of the participants), cognitive (changes in the knowledge, learning process and comprehension related to the environment, and consequently representations and beliefs of the participants), relational (change in the social relationships among the group), operational (change in the practices and the actions of the group), external (change in overall water management) and/or be related to the social justice regime among the group and the changes as they affect other agents (Rydannykh, 2011; Ferrand and Daniell, 2006; Daniell, 2012). Individual and group transformations impact the empowerment of participants and their ability to function as social actors and agents of change, as well as to mobilise their capacities, take decisions and eventually manage water resources (Duraiappah et al., 2005). Thus, they impact their individual and collective capabilities.

We propose to name this type as 'participation-triggered' capabilities. They differentiate themselves from participatory capabilities by their focus on the collective achievements, rather than on the quality of the participation process itself. They correspond, for example, to *being able to choose a decision making process, being able to collect information and make a diagnosis, being able to define a problem to deal with, being able to identify the actors related to this problem, being able to discuss the issue, propose solutions and assess them, being able to establish strategies and assess them, being able to choose a solution to collectively manage water, such as an action plan, being able to implement this solution and to monitor it, etc.* (Ferrand et al., 2017).

We note here that certain capabilities (e.g., *being able to cooperate as a group*) can be both participatory and participation-triggered. Indeed, participants can learn during the participatory process how to participate fruitfully. Since this twofold link exists between public participation and the CA, we consider this normative framework to be particularly relevant in evaluating participation.

## 4    Selecting capabilities to evaluate

### 4.1   How to select the most relevant capabilities to building a participation evaluation framework

Sen argues that the list of capabilities that should be valued and evaluated for each context ought to be the outcome of a public deliberation process (Sen, 2004a; Claassen, 2011). As a consequence, he does not provide clear practical guidelines on how to assess or identify capabilities. Other scholars (e.g., Nussbaum, 2000; Alkire, 2002) have however built operational lists of capabilities and chosen the capabilities they considered the most important to evaluate. We endorse this latter position because we aim at evaluating capabilities among groups of participants and comparing the results for similar capabilities between various groups. Moreover, participatory identification of valued potential functionings is a time consuming process, especially since it adds to the time already required to implement the participatory process itself, as well as its evaluation.

In an effort to keep the evaluation frame broad and to focus on the impacts of participatory processes on the participants and their ability to manage a resource, several capabilities relevant in themselves for collective action in the field of WRM, and which fall into the category of participation triggered capabilities, will be chosen here. These capabilities and their indicators should allow evaluation if, in a given social context, participants are capable of performing some of the most common tasks related to collective action for WRM. This choice echoes a discussion carried out by Frediani (2015, p.7), who argues that the success of participation should be measured in relation to its impact on the agency of individuals and groups. Consequently, participatory capabilities as described previously are not taken into account in the evaluation framework. We note here that if these participation triggered capabilities seem particularly relevant to study in the context of participatory WRM, they are not specific to it and can be useful in other management contexts.

### 4.2   Which capabilities exactly should be selected to evaluate the impact of a participatory process on its participants?

Once this choice has been made, several other questions related to the selection process of the capabilities are to be answered before it is possible to develop an evaluation tool. For instance, which capabilities *exactly* should be selected? What should their 'level of specification' be? How many of them should be included in an evaluation tool?

Measuring the existence and the evolution of one collective capability implies understanding what the resources and the conversion factors mobilised are, both at the individual and collective levels.

Because the process of measuring one capability requires long and careful planning, as well as thorough analysis, we narrow down the number of capabilities that we evaluate to three. The limitation allows an exploration of the detailed mechanisms behind both individual and collective capabilities, and consequently of the resources and conversion factors behind them. The measurement tool should eventually be operational and usable by researchers, and also by process managers. Through its use they should better understand how a given participatory process impacts people and establish which capability is absent, low or strong. This would allow them to facilitate the process accordingly, depending on their objectives. Consequently, because it is a process that

requires long and careful planning, as well as thorough analysis, it is considered to be more judicious to start with a small subset of capabilities related to collective action. Focusing on three potential beings and doings to integrate into the evaluation tool allows an exploration of the detailed mechanisms behind both individual and collective capabilities, and consequently of the resources and conversion factors behind them.

For the same reasons, from an operational perspective, we have considered it wiser to select 'broad' individual and collective capabilities (for example 'being able to cooperate together as a group'), instead of more detailed ones (such as 'having the necessary cognition to express its ideas' or 'having the necessary experience to express its ideas'). A 'broad' capability refers to a capability whose related indicators (e.g., resources and conversion factors) are numerous and well defined. Such capabilities might, for the participants undertaking the evaluation process, relate more easily to concrete 'beings' and 'doings' related to collective action for water management.

Consequently, the process of choosing the final three capabilities led us to first make an extensive list of capabilities related to participatory WRM (Loudin, 2019), based on the capability literature (Ostrom, 1990; Max-Neef, 1991; Ostrom et al., 1994; Drèze and Sen, 2002; El-Harizi and Klemick, 2007; Crawford and Ostrom, 1995; in Pelenc, 2017). We then divided the listed capabilities into several categories: individual and collective categories, but also thematic categories, such as freedom of speech, autonomy, cognition, having responsibilities, cooperation and working together, collective action or mobilisation. For each capability, the appropriate indicators were defined. Lastly, the most relevant capabilities for collective action for WRM that could be integrated into a practical and operational evaluation instrument were selected.

Consequently, no capabilities related to the relation of the group of participants with other groups, authorities or institutions were selected, since these would not easily fit into the frame of what can be practically measured during a participatory process. From this short list we singled out three participation triggered capabilities that correspond to critical features used to cope with socio environmental adaptation for the members of a group who engage in a participatory process:

1  *Being able as an individual to express oneself in a determined social context.* In order to contribute to long-term social changes, it is important to ensure a constructive and inclusive deliberation process where every participant has the opportunity and the capacity, if he or she wishes, to discuss his or her point of view.

2  *Being able to collectively identify and put into words a problematic situation and share a diagnosis of it.* This ability is important for participants if they want to engage in collective decision making (Lardon and Piveteau, 2005). It corresponds to collective interpretation and judgment of a situation, depending on the beliefs and values of the people (Dutton et al., 1983).

3  *Being able to collectively create rules to manage a socio-ecosystem (formulating at least one management rule, validating and respecting any such rules).* The ability to take part in decision-making and rule-design for the local stakeholders is a key to collective environmental resource management (Ostrom, 1990).

These three capabilities cover the participatory WRM needs through deliberation, diagnosis and self-regulation. Once this decisive choice has been made, the design of an operational tool can be discussed.

## 5    Results and discussion

The evaluation of a participatory process through the CA will aim at assessing the distribution of these three individual and collective capabilities among the group of participants and at the group level.

The capability framework provides a specific and relevant set of indicators to assess a participatory process and whether transformative effects are taking place. They are the concepts of resources, conversion factors, capabilities and achieved functionings that we defined in section 2.1 and which are represented in Figure 1.

As illustrated in Figure 1, in order to understand the reasons behind the existence or absence of the three evaluated capabilities, we can look at the absence or the existence of the associated resources and conversion factors. The resources can correspond to time, money or knowledge about the managed socio ecosystem. The conversion factors can correspond to social norms, the state of power relations between participants and external actors, or the availability of public goods. The capabilities can be unachieved or achieved. In the latter case, they correspond to achieved functionings, that is to say an action that can be observed (and hence represent another indicator for the existence of the associated capability).

Following the Companion Modelling approach (Barreteau et al., 2003) and the social experimental approach of Ostrom (2005) and Poteete et al. (2010), we argue that in order to capture the three targeted capabilities, with their collective dimension and not the functionings alone, we could set up a social experiment based on mixed methods (both quantitative and qualitative) and several measurement devices where participants would, together, observe, deliberate, decide, act and react in a simulated situation. This social experiment would encompass a realistic simulation of participatory water management in which the capabilities of the participants would be challenged, as well as a questionnaire and a focus group in which participants would reflect individually and collectively on their behaviours and values. The triangulation of these various data should improve the reliability of the evaluation. In this way the evaluation tool would aim at assessing how participants interact and work together, without helping them or advising them to act in any special way. It would take place outside the structure of the actual participatory process people take part in, following an *ex ante ex post* protocol, so that the transformations in participants' capabilities could be followed and evaluated (Loudin, 2019).

In addition to the challenges previously discussed to developing an operational and efficient evaluation framework based on the CA to measure the transformations occurring in groups during a participation process for WRM, several other questions are left open with regard to the production of a viable and useful tool.

1   *Can every participatory process be evaluated with such an apparatus, or only specific ones?* For example, can this evaluative framework be similarly implemented for citizen juries and multi-stakeholder workshops? Or is it possible to develop a universal apparatus that could evaluate the transformations taking place in groups involved in any participatory process? We argue that if every participatory process could in theory be evaluated with such a tool, the specification required during the design phase actually limits their number. The choice of the three observed capabilities, for example, would lead us to focus on participatory processes offering the highest level of engagement, where participants could make a definite input into

the decision-making process (Rowe and Frewer, 2000). Moreover, the process of evaluating capabilities could be useful in conflictual participatory processes. Indeed, it could provide a moment that would allow for potential underlying tensions in the group to be made explicit. In this way, it could provide a discussion platform, thus helping the group to solve conflicts and even strengthen their capabilities.

2   In relation to this last remark, another essential question that must be discussed concerns the analyses of the results: *To what extent are the results of an experimental measure representative of what is happening 'outside' the social experiment, during the participatory process?* Despite the practical objectives set up in designing the evaluation methods, it would be necessary to collect the participants' point of view on the potential gap in this real life behaviours-social experiment behaviour, in order to minimise or highlight its existence. It is very likely that the accuracy of the evaluation results obtained through such a social experiment would greatly depend on its design (e.g., the realism of the simulation, its engagement for participants, etc.).

3   How should the context in which the evaluation takes place be taken into account? As Frediani (2015) puts it, 'through activities rooted in local practices, multiple values frequently ignored can be expressed and captured to guide participatory processes'. It would be interesting for the measure to be included in the evaluative framework apparatuses, by which relationships of power and local specificity impacting water management on the local scale could be detected, and included in the analysis strategy. But how does this fit into the frame of a practical-and-quick-to-implement evaluation tool? We argue that, as a first step, in order to understand whether such a capability evaluation tool based on social experience is functional, this information should be taken into account.
    The results could help us better understand how essential this information is in evaluating capabilities and whether it should be a central part of the analysis in a time-condensed context.

## 6   Conclusions

The CA is a relevant framework to assess the effect of participatory processes on individuals and groups, as it puts an emphasis on autonomy, collective action and empowerment dynamics. These criteria are essential in strengthening the sustainable involvement of a population in WRM. Because the development of a group's and group members' capability spaces impact the participatory process and vice versa, it is a privileged approach that should be applied to the development of an evaluative framework.

    The challenges to developing such a readable and comparable evaluation tool to measure transformative effects related to participation and to produce reliable assessments are numerous. Even though several authors have during the last decade suggested rules and guidelines to operationalise the CA, there is no general consensus. The final decisions concerning the major methodological and practical choices to be undertaken consequently depend on the objectives and specificities of each assessment and evaluation project. In the frame of this research, three individual and collective capabilities related to collective action, called 'participation-triggered capabilities' were

chosen, based on the literature, to be part of our evaluation tool and correspond to: being able as an individual to express oneself in a predetermined social context; being able to collectively identify and put into words a problematic situation and make a diagnosis of it; and being able to collectively create rules to manage a socio-ecosystem by formulating at least one management rule, validating and respecting any such rules. Further operational specifications remain to be defined in order to make an evaluation tool based on the CA that can be easily used in the field by water managers and practitioners. They lead us to consider the use of a social experiment as a promising and effective way to implement such an evaluation framework.

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