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Assessing the societal adoptability of participatory water management: an application of the Motivation and Ability (MOTA) framework

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ABSTRACT

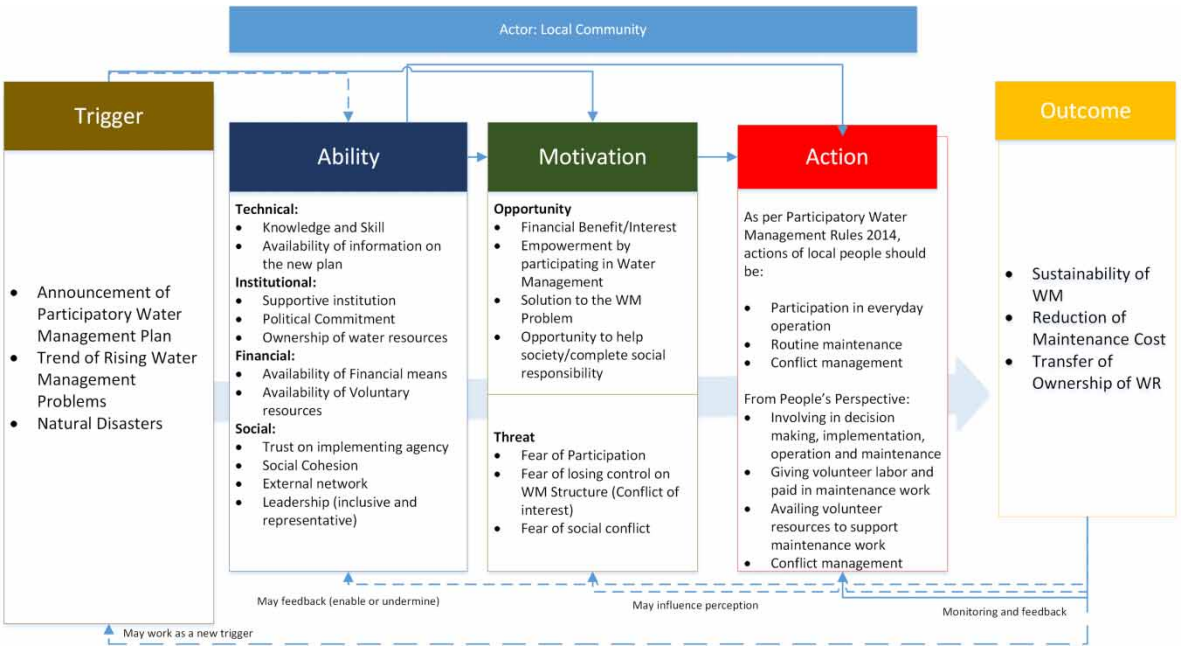
Exploring whether society is sufficiently equipped and motivated to adopt planned interventions is vital for modern plan development trajectories. The Motivation and Ability (MOTA) framework offers a tool to assess the societal adoptability of plans by exploring stakeholders' motivations and abilities. It was originally developed to assess plan implementation feasibility for structural measures of flood management in the Mekong Delta. Further development is necessary before applying the tool in other contexts and for other types of planning interventions. Institutional measures like participatory water management (PWM) have long been recognized as essential elements for water management, but have so far also remained out of the reach of conventional planning assessment tools such as cost–benefit or cost-effectiveness analyses. This research, therefore, aims at extending the MOTA tool in the context of PWM reforms in Bangladesh. It does this by, first, further detailing the MOTA components and identifying indicators for quantification and, second, an expert validation and application of this framework for coastal communities in Bangladesh. Our results suggest that the MOTA framework is capable of informing policymakers and implementing agencies about how to enhance the stakeholders' motivation and ability to ensure an enduring implementation of PWM reforms.

Key words: Bangladesh, Motivation and Ability framework, Participatory water management, Policy implementation, Strategic planning

HIGHLIGHTS

- The Motivation and Ability (MOTA) framework appeared recently to capture the societal and institutional dimensions in assessing the implementation feasibility of structural measures.
- This research further extends the MOTA framework and tests whether this can be applicable in case of assessing the implementation feasibility of soft measures like participatory water management.

GRAPHICAL ABSTRACT



INTRODUCTION

The challenges in implementing strategic plans and policies are widely recognized: what is planned is not always implemented and what government agencies consider to be implemented is not always adopted by the society (e.g. Pritchett *et al.*, 2013; Phi *et al.*, 2015; Ménard *et al.*, 2018). This justifies why an assessment of whether the plan is implementable from the government's perspective and adoptable by society should be an integral part of the strategic planning and policy formulation.

The traditional planning assessment tools, e.g. multi-criteria analysis, cost–benefit analysis, environmental impact assessment, strategic environmental assessment, and robustness assessment, are mostly focused on the performance of a plan and its impacts on the economic and physical (e.g. water) system. These are required, but not enough to confirm that plan implementation by government agencies is feasible and that it can be successfully adopted by societal stakeholders (Nguyen *et al.*, 2019a). Phi *et al.* (2015) propose the Motivation and Ability (MOTA) framework (Phi *et al.*, 2015; Nguyen *et al.*, 2019a) to assess plan implementation feasibility, as dependent on governmental implementability (of the government and semipublic agencies involved in plan implementation and delivery) and societal adoptability of the target group (societal actors, such communities and businesses). This is done by taking into account the motivation and ability of the actors, and the opportunity and threats perceived by them, building on similar earlier methods in this area (Ajzen, 2002; Fogg, 2009; Hermans & Thissen, 2009). The tool is mostly applied to assess plans for capital-intensive large infrastructural strategies like building urban flood prevention infrastructures (Phi *et al.*, 2015) and more generic livelihood transformations – without further detailing of how to bring them about (Nguyen *et al.*, 2019b). While evaluating the implementation of strategic delta plans or water management policy, focusing on infrastructural measures or abstract transformation pathways will only cover parts of the plan. Institutional and governance-related

measures[1] are considered as key components of long-term strategic plans, with critical relevance for plan implementation and sustainability (Brandes & Kriwoken, 2006; Korbee *et al*., 2019).

The government of Bangladesh has recently formulated its first-ever long-term strategic plan, the Bangladesh Delta Plan 2100 (BDP 2100). It includes a diverse set of institutional measures (GED, 2018). Reform of participatory water management (PWM) is one of them. Implementation of such a strategic measure is influenced by institutional setting. Similar to infrastructural measures, it is essential to diagnose whether these institutional measures are feasible to implement. Most of the traditional planning assessment tools are not well suited to deal with the impacts of institutional measures and cannot be used to determine whether the society is capable and motivated to adopt such institutional measures. Therefore, the new challenge is how to diagnose the implementation feasibility of institutional measures as prominent parts in many long-term strategic plans. The earlier application of MOTA suggested the potential for including institutional measures (Korbee *et al*., 2019; Nguyen *et al*., 2019b), but it needs further development for contextualization and quantification. In this background, this research aims to further detail the MOTA framework and extend it to quantify societal adoptability in the context of an institutional measure. It does so for PWM reforms in Bangladesh. In this way, the research also aims to inform and aid the implementation of the BDP 2100 by bringing out detailed insights into the societal adoptability of proposed PWM reforms.

To that end, this paper first briefly discusses the theoretical background of the MOTA framework and the societal and institutional context of PWM. Thereafter, it explains the methods for the indicator selection, MOTA operationalization and scoring, and the indicator framework validation and test application. After that, it describes the main results: (i) an extended MOTA indicator framework and (ii) the outcome of the expert validation and test application. Finally, the results are further discussed with the outcomes and their implications, before concluding the paper with the key highlights of our work.

THE MOTA FRAMEWORK FOR ASSESSING STRATEGIC INSTITUTIONAL INTERVENTIONS

Earlier development of MOTA

The MOTA framework is essentially an actor analysis tool, which provides a measure to assess the likelihood of an action of an actor by assessing its motivation and abilities (Phi *et al*., 2015). Building on existing actor analysis methods (Hermans & Thissen, 2009), the MOTA framework was designed to develop a more specific and operational instrument for quantitative stakeholder analysis in the water sector. Phi *et al*. (2015) developed the framework interlinking existing actor analysis methods and behavioral models (Ajzen, 2002; Fogg, 2009). Fogg's behavioral model is the base of the MOTA framework, which states that a behavioral action happens when motivation, ability, and trigger act together (Fogg, 2009).

The MOTA framework was originally developed to assess the implementation feasibility of a drainage improvement plan of Ho Chi Minh City. The implementation feasibility was defined by the adoptability of the plan by the

[1] We recognize that in the water resources management domain, often a distinction is made in hard and soft measures (Sovacool, 2011; Wesselink, 2016), in which the first relates to infrastructural measures and the latter to other policy instruments to influence target group behaviour and to manage our water resources. Yet, other fields of environmental management regard hard measures as regulatory coercive instruments and soft measures as incentivizing and stimulating measures, like a.o. knowledge dissemnination, voluntary agreements, and subsidies (Hertin *et al*., 2004). In this paper, we considered the first explanation, yet we are reminded that "soft measures" are a problematic term, as they are often hard to implement. Therefore, we decided to move forward in this paper with infrastructural measures (measures that require construction in the physical environment, like dikes, weirs, and sluices) and institutional measures (measures that focus on the rules of the game and its players). Participatory management is thus an institutional measure as it influences the rules of the game, the institutionalized involvement of farmers in water resources management.

adopting actors (i.e. the society) and the implementability of the implementing actors (i.e. the government agencies involved in direct implementation) (Phi *et al.*, 2015). The theoretical framework was later implemented in the Mekong Delta of Vietnam to assess the societal adoptability of different livelihood transformation strategies of the Mekong Delta Plan (Nguyen *et al.*, 2019b). Thereafter, as the development of MOTA was continued, it traveled beyond the Mekong Delta and was applied in Bangladesh to anticipate farmers' climate change adaptation responses where the author adopted the MOTA framework in combination with a framed scenario approach (Kulsum, 2020).

Need for extending MOTA for the quantification of institutional measures

In earlier applications of MOTA in Vietnam, MOTA scores were subjectively quantified by experts and through surveys among stakeholders to compare the implementation feasibility of different alternative plans and strategies. In those quantifications, MOTA scores were constructed by further operationalization of MOTA elements for ability and motivation. Ability was quantified by a subjective measurement of its components, i.e. technical ability, financial ability, institutional ability, and social ability, following either a numerical scale (Phi *et al.*, 2015) or a custom-built Likert scale (Nguyen *et al.*, 2019b). In such quantification, components of ability remained relatively abstract and subjective. Phi *et al.* (2015) do point out this limitation in their original article and discuss the need for detailing out the MOTA components and modification of the quantitative techniques.

Later, MOTA applications for the Vietnamese Mekong Delta Plan provided more elaborated and transparent quantification processes (Nguyen *et al.*, 2019a, 2019b). Although MOTA was mostly applied in the cases of infrastructural measures, some applications were found assessing non-infrastructural measures in long-term plans, like agriculture transformations (Nguyen *et al.*, 2019b). On that note, we assume that the MOTA framework can be further adjusted and extended to address the implementation feasibility of institutional measures, which is needed in the BDP 2100 (Bangladesh Water Management Rules 2018 as well), i.e. PWM reform.

PWM and the need for exploring societal adoptability

In the scientific literature, with its origin in the political upheavals of democracy during the 1970s (Razzaque, 2009), the notion participation meant to be the participation of the governed in the government, and it was then defined from the perspective of the citizen power and democracy (Arnstein, 1969). Public participation, which is referenced as any form of engagement as minimum as information sharing or as highest as citizen control (Arnstein, 1969; Swapan, 2016), is not a new idea. Early forms of public participation were practiced in managing rural water resources in Europe around 1,000 years ago (Razzaque, 2009). Even in a developing country like Bangladesh, village-level flood management and irrigation infrastructures were traditionally built by the local community, during and before the 1900s (van Staveren *et al.*, 2017).

Contemporary forms of participation started appearing globally in planning and management due to the influence of international policies and rules, e.g. Stockholm Declaration 1972, Rio Declaration 1992, Agenda 21, Arhus Convention of 1999, Hague Declaration of 2001, Water Framework Directive of EU in 2000, and Berlin Rules of 2004 (Razzaque, 2009). With time and gradual development, participation as a theory of citizen rights and empowerment evolved to become an approach or tool of resource management and governance (Razzaque, 2009). It is also framed by different terminologies like public participation, popular participation, collective action, community-based/driven action, and stakeholder engagement with a core concept of people's involvement for a common objective (Kyamusugulwa, 2013). It is thus commonly defined as the inclusion of non-state actors in decision-making and implementation (Wesselink *et al.*, 2011; Mancilla García & Bodin, 2019).

In the case of water management where a participatory approach is recommended to deal with increasing water problems, future challenges, and uncertainties, mapping and analyzing stakeholders are more important

and should be scientific (Stanghellini, 2010). Successful or effective implementation of PWM depends on the competent design and contextualization of participatory processes, within the local societal and political settings (Von Korff *et al*., 2012). In addition, the capacity and willingness of state actors and the non-state actors alike are key determinants of the effectiveness (Tosun, 2000; Webler & Tuler, 2001; Kapiriri *et al*., 2003; Hobbs & White, 2012; Von Korff *et al*., 2012; Swapan, 2016).

Another importance of exploring willingness, motivation, and resources to participate is that participants might have different problems and different rationales than what are perceived by the implementing agencies (Wesselink *et al*., 2011). In rural communities, PWM is implemented with the aim of transforming the water governance from state-controlled to community-controlled structures and thereby transfers the state's responsibility of managing water resources to the community (Sultana, 2009). Therefore, it is important to know the ability and motivation of the community to take such responsibilities. Public participation in developing countries is commonly criticized due to poor outcome, inefficacy, and lack of motivation (Tosun, 2000; Hobbs & White, 2012; Swapan, 2016). There is an argument that some basic physiological requirements must be met before motivating the community to participate and unfortunately communities in developing countries are socioeconomically deprived to meet such requirements which ultimately demotivate them to participate (Hobbs & White, 2012). The exploration and quantification of the communities' ability and motivation would tell whether the PWM plan will be adoptable.

PWM in Bangladesh and outlining what needs to be evaluated by MOTA

An important step of MOTA is to define the expected actions of the actors for which motivation and abilities are to be assessed. In this application of MOTA, the expected action of actors (local people in this case) is participation in water management. This participation has both normative perspectives set out by international literature and the legal and administrative perspective outlined in national rules and strategic plans, e.g. Bangladesh Water Management Rules 2014 and BDP 2100.

In Bangladesh, participation is defined differently in different policies and legal documents. The National Water Policy 1999 defined participation as a right of the people. The Guideline for Participatory Water Management 2000 (GPWM) defined it as a process of influencing of water management-centric decision. The Participatory Water Management Rules 2014 defined participation as a responsibility of the local people and it transferred the ownership of water management projects to water user groups. The ownership was defined as a package that includes the responsibility of everyday operation, regular maintenance, periodic maintenance, and emergency maintenance of medium- and small-scale projects without any financial arrangements. In practice, public participation is added to a project in compliance with a legal requirement to get the project approved by the Government. In the recently established BDP 2100, participation is again considered an important element for future sustainable water management. Based on the PWM Rules 2014 and the BDP 2100, we, therefore, considered that the expected participation of the local people in water management would include (i) participation in the planning and implementation process, (ii) taking responsibility for everyday operation, and (iii) taking responsibility of regular maintenance.

METHODS: EXTENDING THE MOTA FRAMEWORK FOR PWM IN BANGLADESH

Developing the indicator framework

This research is an integrative literature review. The literature was searched in scientific databases using relevant keywords like 'Participation', 'Participatory Water Management', 'Willingness to Participate', 'Evaluation of Participation', and 'Indicators of Participation'. The literature found was then selected purposively considering relevancy to the topic. A preliminary list of the relevant indicator was identified, reviewing indicators of

willingness to participate (Cavalcanti *et al*., 2010; Franzén *et al*., 2015; Jennewein & Jones, 2016), adapting community participatory models (Swapan, 2016), cultural barriers to participate (Macnaghten & Jacobs, 1997), limits to community participation (Tosun, 2000), priority setting for participation (Kapiriri *et al*., 2003), outcomes of participation (Rowe & Frewer, 2000; Perkins, 2011; Pineda *et al*., 2014; Ballester & Mott Lacroix, 2016), good participation process (Krueger *et al*., 2001; Dyer *et al*., 2014), the success of participation (Özerol & Newig, 2008), and a few more relevant literature found by snowballing.

Thereafter, an exercise of indicator mapping (Supplementary Material, Figure 1) was performed to see interlinkages among the indicators and their relationships with MOTA components. This exercise helped to create a conceptual map of the indicator framework, resolve double counting, and exclude indicators irrelevant to the MOTA components. Besides, informal discussion with relevant experts (mostly from implementing agencies – the deputy team leader (DTL) of BDP 2100, DTL of the Blue Gold Program of Bangladesh Water Development Board (BWDB) implementing PWM, Chief Water Management of BWDB, and two more field level officers of BWDB implementing PWM) helped to refine the indicator list.

Once the list of the indicators was ready, each indicator was translated into a simple question to aid the quantification process during surveys or focus group discussions with local water users. Answers were scored on a numeric scale ranging from '0' to '5' (Supplementary Material, Table 1).

Expert validation and test application

The indicator framework was validated and tested by case application in a session during an interactive expert workshop. The expert workshop was a part of a 2-day MOTA workshop organized in Khulna, Bangladesh, in September 2020. The 30 workshop participants consisted mainly of staff from local non-governmental organization (NGOs), local relevant government agencies, local universities, and a national-level research institute, as well as a few graduate students from local universities. For the expert validation and application, the participants were grouped into seven groups (small farmer, medium farmer, large farmer, agricultural labor, shrimp farmer, rice farmer, and local civil society organization (CSO) and NGOs). The participants were asked to apply the MOTA indicator framework to quantify the societal adoptability of PWM in the south western coastal region of Bangladesh from the perspective of the actor groups they were assigned to. Each group first quantified the MOTA-ability indicators by making use of the indicator quantification questionnaire and weighted each indicator thereafter using a scale ranging from '0' (not important) to '5' (very important). The MOTA score for each ability component was then calculated as the weighted average. Each group presented their results to other groups. After the discussion, the groups were allowed to revise their indicator if judged necessary. Taking the final scores from the interactive expert group exercise, the final MOTA-ability score was calculated by averaging the score of the four components for each actor group, which was then normalized following the min–max method (OECD, 2008) and converted into a percentage score.

RESULTS: MOTA INDICATORS FOR THE SOCIETAL ADOPTABILITY OF PWM IN BANGLADESH

Triggers

In the original article on the MOTA framework (Phi *et al*., 2015), the 'trigger' was defined as an event or a trend that can change the behavior of an actor by influencing his/her ability and perceived opportunity or threat. Since a trigger is a causative factor, the influence of a trigger would depend on the intensity of the trigger (Nguyen *et al*., 2019a). However, for our case, the main triggers identified were the announcement of new plans for PWM, increasing pressures from water management problems, and natural disasters. Although these triggers could be quantified, we have not considered them for separate quantification because the measurement of ability, opportunity, and threat would be inclusive of the effects of the triggers.

Table 1 | MOTA indicators for quantifying societal adoptability.

Indicator	Justification
MOTA element: ability	
Ability Component 1: financial	
Availability of fund	Participatory activities from people's perspective need additional financing (Özerol & Newig, 2008). Case studies in Bangladesh found the unavailability of financial resources as an important reason for nonfunctional water user groups, which were established for ensuring community participation in a polder (Pineda *et al*., 2013, 2014).
Availability of voluntary resources	Community participates in water management by giving voluntary labor or donating construction materials and such volunteer resources are considered important keys to the functionality of PWM in Bangladesh (Pineda *et al*., 2014).
Ability Component 2: institutional	
Supportive institution	Legitimate assurance of reflection of the outcome in the policy or decision motivates people to participate (Carter & Hill, 2007; Perkins, 2011). The institutional framework to implement the participatory process must be designed to make the state actors remain actively involved in the participatory process (Jiménez *et al*., 2019). Decentralization of the governance, ensuring an enabling environment for participation, makes the institutional framework supportive (Jiménez *et al*., 2019).
Political commitment	Political commitment to ensure participation, the role of people in decision-making helps to achieve community trust in the participatory process and thereby motivate them (Cavalcanti *et al*., 2010). For a developing country like Bangladesh where legislation is inadequate or lacks enforcement, strong political commitment from local leaders, local administrators, and implementing agencies might motivate people to participate.
Feeling of ownership	The feeling of ownership also equips the community to continue participation (Dyer *et al*., 2014; Samaddar *et al*., 2017). In PWM, the ownership implies that the community feels the water resources and the allied infrastructures are community resources, and therefore the operation and management of the project is the responsibility of the community. Such a feeling of ownership motivates the community to participate.
Ability Component 3: social	
Trust on state actor	Lack of trust in state actors, including the government, undermines their efforts of ensuring public participation (Macnaghten & Jacobs, 1997). Visibility or transparency of the participatory process and past examples of successful participation influence local people whether to trust the state actors (Rowe & Frewer, 2000; Samaddar *et al*., 2015; Ballester & Mott Lacroix, 2016). If we take the indicator – 'trust on state actor', it also captures the influence of a good participatory process which ensures equity and visible role of each participant.
Social cohesion	Social cohesion is defined as the extent of connectedness and solidarity in society (Manca, 2014). Receiving cooperation from others and the internal relation of the society are most factors that influence willingness to participate (Cavalcanti *et al*., 2010). Stronger social cohesion leads to better community participation (Desbureaux, 2018).

(*Continued*.)

Table 1 | Continued.

Indicator	Justification
External network	Most of the successful cases of participatory management were directly benefited by external agencies like NGOs and development partners (Samaddar *et al*., 2017; Jiménez *et al*., 2019). PWM cases in Bangladesh also support the statement that external supports help the mobilization of community and thereby motivate them to participate (Dewan *et al*., 2014; Heering, 2014).
Inclusive and representative leadership	The opinion of a leader influences the community to accept any management measures (Cavalcanti *et al*., 2010). Responsible (Lammerink *et al*., 1999; Webler & Tuler, 2001) and committed leadership (Lammerink *et al*., 1999) motivate people to participate and thus become an important condition of the effective participatory process (Krueger *et al*., 2001). An inclusive leadership (Krueger *et al*., 2001) protects the marginal from being excluded by the power elites and thus motivates local people to be in the participation process ensuring equity and free from elite capture. A representative leader is a link between the community and the external stakeholders (van Maasakkers *et al*., 2014).
Ability Component 4: technical	
Knowledge and skill (on water management and participation)	Lack of technical knowledge often makes people shy to participate due to the fear that their opinion might be rejected by the technical people (Bardhan, 2000; Kapiriri *et al*., 2003).
Availability of information on new plan	Announcement of a new plan acts as a trigger to perceive the community whether the new plan would bring opportunity or threat to them (Phi *et al*., 2015). It also influences the ability by availing new information.
MOTA element: motivation	
Motivation Component 1: opportunity	
Financial benefit	Sometimes people due to their socioeconomic necessity expect financial benefits for participation in the planning process (Kapiriri *et al*., 2003). In Bangladesh, financial benefits like the opportunity of earning money as labor also motivate people to participate in water management (*Source*: Interactive Expert Group Discussion). Moreover, people who could make productive use of water, e.g. farmers and fishermen, show more interest in participation in water management due to their financial benefits (Buisson *et al*., 2017).
Resolving water management problem	Improving the management of common pool resources is a common motivation behind participatory management (Jennewein & Jones, 2016; Swapan, 2016). Therefore, a solution to the problem can be foreseen as an opportunity to participate.
Empowerment	Participation must bring an opportunity of being empowered by ensuring a visible role in decision-making (Krueger *et al*., 2001; Ballester & Mott Lacroix, 2016). If people do not see this opportunity, they will not participate.
Fulfilling the moral and social obligation	When the community feels that the management of the local water resources is the responsibility of the community, they feel participation in water management is a moral thing to do to fulfill a social obligation. Such feeling appears in the community when they are aware of their ownership and right.
Motivation Component 2: threat	
Fear and shy to participate	In most of the cases, marginal people fear to participate (Tosun, 2000; Kapiriri *et al*., 2003). The fear is that their objection or opinion can be used against

(*Continued*.)

Table 1 | Continued.

Indicator	Justification
	them (Tosun, 2000). Marginal people often feel shy to participate or to make any opinion, assuming that their opinion might be rejected by the technical experts (Kapiriri *et al*., 2003).
Fear of social conflict	In a heterogeneous society, different groups of people might have different interests in water resources management. In such cases, people may think public participation in managing water resources, which may increase conflict (*Source*: experts' opinion during MOTA workshop in Khulna). On that argument, they refrain from participation.
Fear of losing control	It has been known during the MOTA workshop that people, especially large shrimp farmers who are controlling the water management infrastructures, oppose PWM.

Ability

Phi *et al.* (2015) defined the ability with three categories – financial, institutional, and technical. However, this extension of MOTA brings an important change by adding social capacity to the ability component of MOTA. Since social capital plays an important role in community capacity and drives the community toward a collective action (Krishna, 2002; Nakagawa & Shaw, 2004; Marré & Weber, 2010), for assessing societal adoptability, 'social capacity' has been added to the ability component of MOTA. The social capacity here refers to the social capital concept and includes social bonding and cohesion, trust, external network, and trust in state actors (Table 1).

Similar to the original MOTA framework, financial capacity refers to the availability of funds and budget. This research proposes the availability of funds and the availability of voluntary resources as two indicators of the financial capacity of the society to adopt PWM (Table 1).

The institutional capacity also follows the original MOTA framework, which is defined as institutional arrangements, coordination, rules, and regulation. To quantify the institutional ability, we have proposed three indicators – supportive institution, political commitment, and feeling of ownership (Table 1).

The technical capacities have also been defined as the original MOTA framework by referring to knowledge, skill, and information. For quantifying the technical capacity of the society to adopt the PWM plan, this research proposes two indicators – knowledge and availability of information on the new plan.

Motivation

Motivation is one of the important elements of MOTA (Phi *et al*., 2015; Nguyen *et al*., 2019a). In this extension of MOTA, motivation is defined as a degree of recognizing opportunity or threat from the proposed PWM reforms, which would drive water users in a community to decide whether to participate in water resources management. It thus adopts the reasoning of Phi *et al.* (2015) that the motivation is a function of perceived opportunity and threat.

Opportunity and threats

While extending the MOTA in the context of societal adoptability of PWM, we explored opportunities (advantages) and threats (disadvantages) of participation in local water management. For quantifying the opportunity of PWM, which would motivate the community to adopt the PWM plan, this research proposes four indicators (Table 1). On the other hand, three indicators have been identified to quantify the threat of the PWM, which could be perceived by the community and ultimately undermine the motivation. Those indicators are fear and/or shy to participate, fear of social conflict, and fear of losing control.

MOTA indicator framework for participatory water management

Based on the above discussion and the identified indicators in Table 1, an analytical framework of MOTA has been constructed to explain the societal adoptability of PWM reforms in Bangladesh (Figure 1). The extended MOTA framework (Figure 1) here shows the aforementioned triggers, ability, and motivation variables that influence the actions of water users in a local community concerning proposed PWM reforms. The expected actions of PWM have already been devised in the Participatory Water Management Rules 2014. However, such actions only reflect the perspective of the implementing agencies. While testing and updating the framework during the MOTA workshop, what would be the expected actions of PWM from people's perspectives were also identified. Finally, the framework also indicates the expected outcomes of PWM. The outcome again can act as a trigger and may feedback the ability as well. An outcome may also change the community's perception of opportunity and threat.

RESULT OF THE TEST APPLICATION OF MOTA INDICATOR FRAMEWORK FOR ASSESSING THE ABILITY OF COASTAL COMMUNITY IN BANGLADESH TO ADOPT PWM

Scores quantifying MOTA-ability indicators obtained by the interactive expert workshop are presented in Table 2, and a further detail (weightage of indicators and calculated MOTA-ability scores) is provided in Supplementary Material, Table 2. In addition to the table that explains that values of ability indicators are different for different livelihood groups, scores of different MOTA-ability components of different livelihood groups are shown in Figure 2, which illustrates the ability with reference to four ability components – financial, institutional, social, and technical.

In general, the ability scores of four components are low, below '3' except the CSO-NGO group which is practical because CSO-NGOs are institutes whereas others are livelihood groups (Figure 2). Among the four components, the financial ability is varying widely among the groups than other ability components. The financial

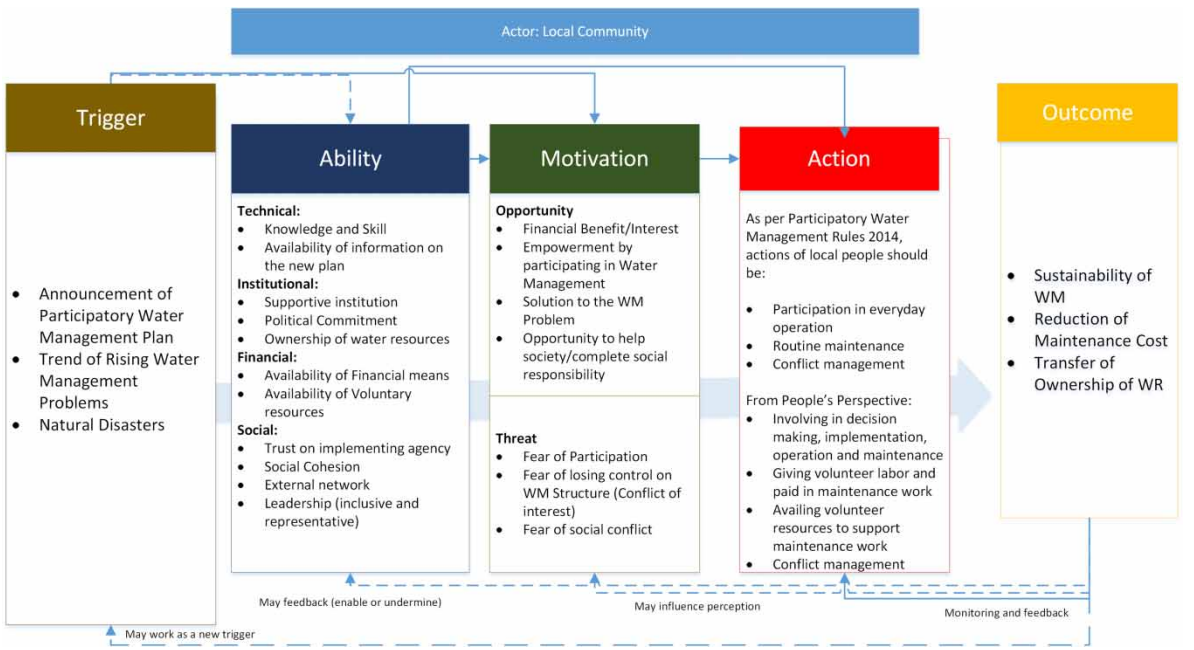


Fig. 1. | MOTA analytical framework for the societal adoptability of PWM.

Table 2 | Scores of MOTA-ability indicators and components.

		MOTA score[a] for ability							
		Scale 0 ~ 5							
Component	**Indicator**	**SF**	**MF**	**LF**	**AL**	**CSO-NGO**	**RF**	**SrmpF**	**Weights (0 ~ 5)[b]**
Financial	Availability of financial means	0.5	1	1	1.3	2	1	0	3
	Availability of voluntary resources	2	3	2	3.8	3	3	4	4
Institutional	Supportive institution	1	1	2	1.8	4	1	3	5
	Ownership of water resources	1	4	3	1	3	3	3	5
	Political commitment	2	1	1	2	3	1	1	4
Social	Trust on implementing agency	1	2	1	2	3	1	0	4
	Social cohesion	2	4	3	3.5	4	4	2.5	4
	External network	1	2	3	3	5	1	3	3
	Leadership	1	1	2	1.8	3	2	4	4
Technical	Knowledge and skill	2	2	3	2.8	5	3	2	5
	Availability of information on the new plan	1	3	2	2	4	2	2	4

SF, small farmer; MF, medium farmer; LF, large farmer; CSO-NGO, civil society organization and non-governmental organizations; SrmpF, shrimp farmer.
[a]Score is a number quantifying the indicator, which was done by the experts following the MOTA operationalization method.
[b]Weights of each indicator were set by the experts. First, each group decided the weights independently, and they presented the weights to all, discussed, argued, and finally, all participating experts agreed to a common weight.

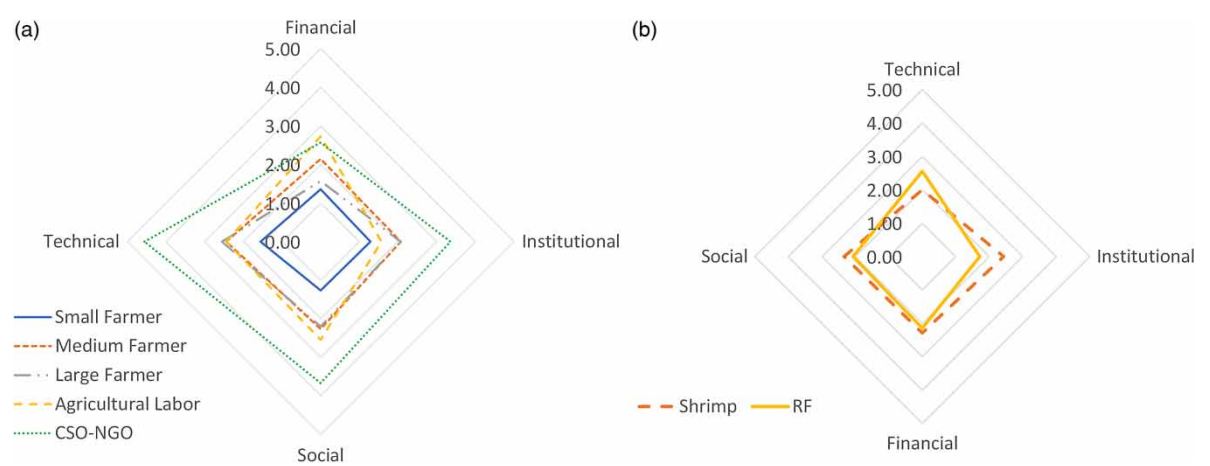


Fig. 2. | Status of four MOTA-ability components for different livelihood groups: (a) comparison among small farmer, medium farmer, large farmer, agricultural labor, and CSO-NGOs and (b) comparison between shrimp farmers and rice farmers (RF).

ability component is constructed by two indicators – availability of financial means and availability of voluntary resources. The availability of funds is very low in the case of all groups, and it varies between '0' and '2' among the groups (Table 2). Whereas the availability of voluntary resources is better, it varies between '2' and '4' among the groups (Table 2). The CSO-NGO shows a better score because, according to the experts, CSO-NGOs have a better capacity in mobilizing the community in voluntary work. Among the livelihood groups, agricultural labor shows surprisingly better financial capacity, because the availability of voluntary labor is higher in their community. According to experts, agricultural labors are mostly available in voluntary work than other livelihood groups.

Similar to financial capacity, the institutional capacities of livelihood groups are also very low, whereas the CSO-NGO shows better institutional capacity than others again. Among the livelihood groups, shrimp farmers show little better institutional capacity than others. While assigning the score, the expert groups are playing the role of shrimp farmers, arguing that in most of the cases, shrimp farmers are local elites who have strong political powers, affiliation, or association. Moreover, shrimp farmers have a very strong business association and network making them very connected with the government, which ultimately help them to influence the process of formulation of rules and regulations. Since their business is highly connected with water, they have higher ownership than others.

Social capacity is also very low in the case of all livelihood groups. In the case of CSO-NGO, social capacity is higher than livelihood groups due to their better external network, social cohesion, and leadership. The shrimp farmer also has higher leadership ability, but the values of other indicators are low.

Technical capacity is almost similar for most of the groups, CSO-NGOs and small farmer group are exceptions. CSO-NGO shows higher technical ability, and the small farmer group shows very low technical ability than others.

There are differences in abilities between the rice farmer group and the shrimp farmer group as well. The shrimp farmer outranked the rice farmers in the case of financial, institutional, and social ability, but the rice farmers surprisingly show higher technical ability. According to the experts, the rice farmers have better knowledge on local water resources, knowledge on operation and maintenance of small-scale water management structures which equip them better than shrimp farmers to participate in local water resources management.

Finally, the overall ability scores of livelihood groups, which are the average of four components of each group's ability and represented in percentage, are low varying between 40 and 46% with an exception of the small farmer group, which shows a very low ability score (27.33%) (Figure 3). The CSO-NGO has moderate to good ability, which is around 70% (Figure 3).

The overall ability scores subjectively reflect the chances of adopting the PWM plan by different stakeholder groups, which are unfortunately not very encouraging except the CSO-NGO group. Although this is neither the direct measurement nor the self-assessed value, the group of experienced experts participating in the validation and testing agreed to this result and argued that the result reflects the practical scenario of field. The test results also match with the subjective assessment of PWM case studies in Bangladesh carried out earlier by Buisson *et al.* (2017) and Dewan *et al.* (2014, 2015), where they found lack of financial capacity, weak institutional settings, and lack of quality in the participation implementation process of the implementing agencies, and a few social contexts (e.g. heterogeneity of the society, inequity, elite capture, and conflict of interest among the society) are causing inefficacy in PWM in the coastal community.

Apart from exploring and quantifying the adoptability, the MOTA indicators here are also relatable to the measure for enhancing the societal adoptability as well as the implementation feasibility of PWM. Taking the indicator values into account, the policymakers and implementing agencies can plan capacity development program targeting the low-performing indicators. Moreover, based on the indicator scores and overall MOTA scores of different stakeholder groups, capacity development programs can be customized for each stakeholder group. Thus, the extended MOTA framework informs policymakers and implementing agencies on how to close the implementation gaps and ensure the effectiveness of PWM while reforming under the BDP 2100 initiatives.

DISCUSSION AND REFLECTION

The test application of the MOTA indicator framework validates that the indicators are sensitive to the changes of stakeholder's capacity and thus confirms its readiness to be applied in field research with different stakeholder groups for assessment of the societal adoptability of PWM. The scoring technique and presentation used matches

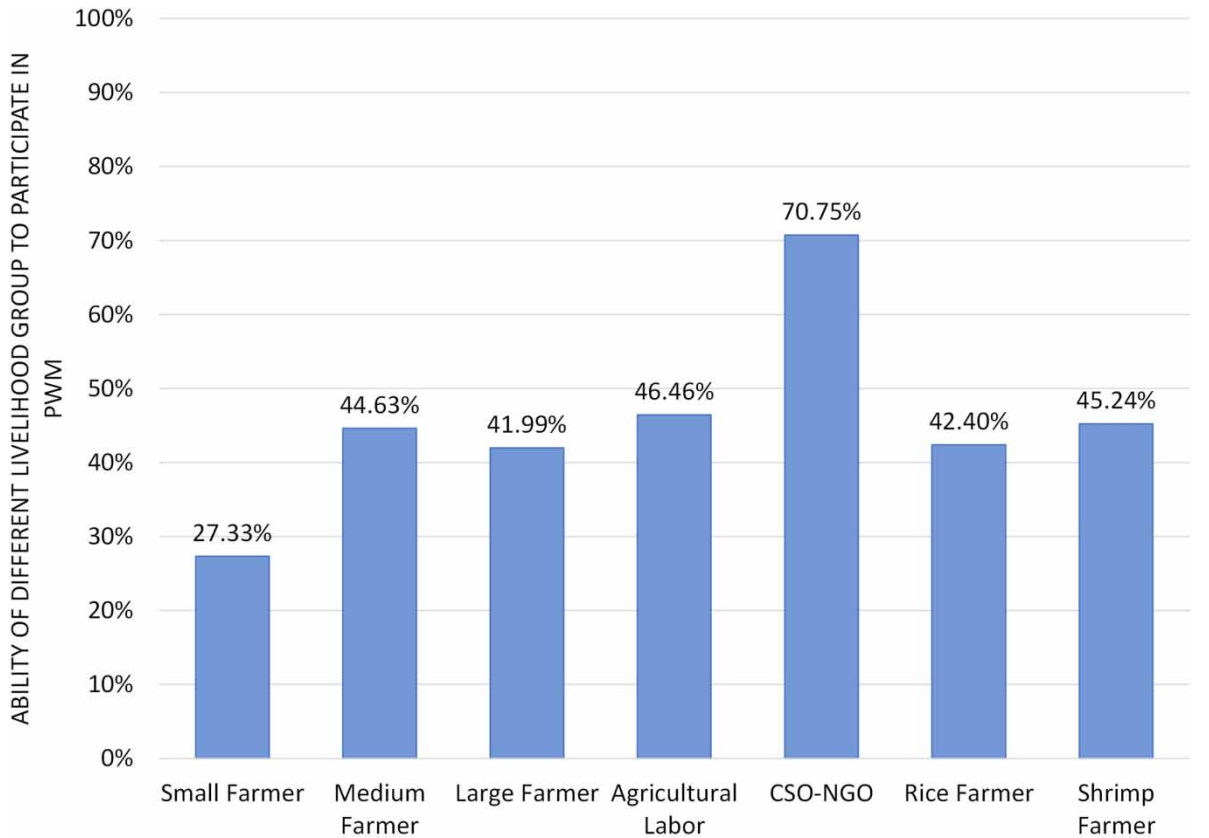


Fig. 3. | Ability of different livelihood groups to participate in local water management. *Note*: The overall ability score is the average of four ability components, which has been normalized and then represented in percentage.

with conventional ways of exploring the societal context, with relevant quantification techniques of qualitative assessment, and performance-oriented plan assessment tools. Therefore, this extended MOTA framework can be readily applied, along with other tools, for plan feasibility assessment.

In water management, many decision-makers and planners have an engineering background and feel comfortable with quantitative analyses to analyze problems and solutions. The quantification of the indicators in our presented MOTA framework aligns well with this thinking. In quantification, the MOTA framework relies on self-assessments through surveys or on expert judgements. Both have significant challenges and shortcomings, which cause some social scientists to be wary of quantified measures altogether. Our position is that these challenges in reliable quantification are real and that the limits of any (MOTA) study need to be clearly communicated in its presentation, but that such research is not impossible and can be useful – following earlier quantitative social studies cited above.

Our test application shows that the MOTA is quantifiable and it resonates with the mindset of these decision-makers and planners. By doing so, the MOTA framework offers a useful complement to other plan assessment tools and decision-making approaches that consider other planning dimensions, which are measurable and translated into numbers (as in cost–benefit analysis, multi-criteria analysis, and environmental impact assessment). Yet, at the same time, the MOTA framework also includes the thinking of social scientists, social workers, and

NGOs. That implementation is complex, political, and context-dependent and has different impacts on different societal actors. Moreover, by extending its scope to include assessment of measures related to institutional and social changes, it increases its application, enables communication, and broadens acceptance. Thereby, this research offers an additional planning tool to aid the implementation of the BDP 2100 in Bangladesh, with promises for similar applications elsewhere.

These first explorations further suggest that indeed the MOTA framework can be extended to also assess the feasibility of institutional and societal implementation measures. This is important, because, for the implementation of long-term goals and strategies, and a soft path or a soft implementation approach that considers necessary institutional reforms, social capacity enhancement, social acceptance, commitment, and adaptive learning is advocated (Brandes & Kriwoken, 2006; Korbee *et al*., 2019). Our extended MOTA framework for exploring societal adoptability supports assessing such institutional and social implementation measures and the social adoptability of a plan. It supports planners in flagging the need for capacity development and institutional reforms to increase the implementation feasibility of the proposed measures.

Our extended MOTA indicator framework for PWM is contextualized for the case of policy development in Bangladesh. However, the indicators are based on a comprehensive literature study covering PWM experiences around the globe. On this basis, researchers in other countries might be able to start using (and adjusting) the framework for their scientific or planning interests. This does not mean that our MOTA framework can be used without testing in other contexts, testing to the local context is an essential part of using any analytical framework.

The remaining question is whether our extended MOTA indicator framework is also useful for assessing other institutional measures, like water pricing, decentralization of government institutions, regulatory changes for water pollution, and introduction of a new early warning system for a disaster. Most of the indicators identified in our extended MOTA framework for societal adoptability are specific to the issue of PWM. We expect that for other institutional measures, the indicators framework needs to be adjusted to that specific measure. Nevertheless, we think that the overall approach of this research (e.g. the approach of operationalizing MOTA, scoring, calculating, and testing) can be followed by others for assessing the adoptability of other institutional measures. Replicating this framework one-on-one to other contexts would do no justice to the complexity of implementing water policies and plans.

CONCLUSION

In this paper, we have presented our work on extending and testing the MOTA framework (Phi *et al*., 2015; Korbee *et al*., 2019; Nguyen *et al*., 2019a, 2019b) for assessing the societal adoptability of an institutional measure, namely PWM in Bangladesh.

We conclude from our testing that the developed MOTA indicators indeed deliver insights into the societal capacity to participate, which informs policymakers and implementing agencies. Although our test results are limited to a relatively small group of experts, these expert estimates suggest that the financial, institutional, social, and technical abilities of societal actors are inadequate to support the successful and sustainable implementation of PWM. This implies that the capacity development of societal actors would be needed to make PWM successful. By detailing out the capacity (to participation) of different stakeholder groups into 11 indicator levels, the MOTA assessment framework opens up new information to design (and redesign) institutional measures that better fit the target stakeholders or to invest in the stakeholders to increase their adoptability of the proposed measures.

Our findings indicate that the MOTA framework is not issue bound and it can assess both large-scale infrastructural as well as institutional measures. However, this does not mean that the framework does not require any adjustment when to be used for different kinds of measures. Extending and adjusting the framework are possible

but require care and rigor. We also conclude nevertheless that the MOTA framework is not bound in the Vietnamese planning tradition and can be used to assess and inform planning in other planning cultures. This does not mean that such planning cultures do not matter in how, when, and by who the MOTA framework is used in assessing plan implementation feasibility.

To sum up, our work shows: First, the (extended) MOTA framework can assess the implementation feasibility of strategic measures. Second, the MOTA framework can be used beyond its original geographical boundary. Third, it shows a rigorous approach to adjust it for other planning assessment purposes, showing how the MOTA framework can be extended by reviewing the literature, operationalizing indicators, and expert testing. And finally, our work shows that the results of these activities provide informed outcomes (e.g. insights of stakeholders' capacity to adopt an institutional change) that can support planners and decision-makers to improve the implementation feasibility of their plans. With these findings, we hope to contribute to the debate about, and further development of, analytical tools that help to include notions of implementation feasibility in plan and policy development, thus improving the quality of those plans and policies.

DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

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