

Perceptions of Integrated Water Resources Management in Myanmar

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Abstract

This paper identifies perceptions of Integrated Water Resources Management (IWRM) in Myanmar, as a proxy for the adherence of future water resources planning to the principles of IWRM. As of now, it remains unclear how this concept is understood in Myanmar and what principles of IWRM are considered important. Q-methodology was applied to identify perceptions, based on the response of a set of key stakeholders. The sample consisted of 31 participants from union, regional, and local governments, NGOs, academics, and private sector. Four distinguishing viewpoints and narratives were identified. Results showed that institutional arrangements and mechanisms for public participation are considered to require thorough attention for successful implementation of IWRM in Myanmar.

Keywords

Myanmar, IWRM, public participation, Ayeyarwady River, Q-methodology

1 INTRODUCTION

In 2010, Myanmar re-entered the global scene after 22 years of isolation under direct military rule (Jones, 2014; ADB, 2014). The country is changing at a rapid pace due to numerous political and economic reforms (Kattelus et al., 2014; IISS, 2011; International Crisis Group, 2012). Since 2011, a semi-civilian government led by former president U Thein Sein has made efforts in shifting from a closed economic system to one that is market-oriented (The Asia Foundation, 2014). In November 2015, the first free elections since decades resulted in a major win for the National League for Democracy (NLD) and in March 2016, U Htin Kyaw was chosen as the new leader of Myanmar, with Aung San Su Kyi taking a special role as State Chancellor and Minister of Foreign Affairs (Irrawaddy, 2016). The economic reforms bring new opportunities for both Myanmar and foreign investors and international donors have lined up to take part in the transformation of Myanmar, resulting in steady economic growth¹. Expected changes in the agricultural and hydropower sector, due to high-energy demands in the region (IEA, 2015), will increase pressure on Myanmar's water resources (Kattelus et al., 2014). In addition, socio-economic changes, such as increasing living standards and urbanisation, already increase pressure on the domestic water supply. In spite of the country-wide abundance of water resources, spatial and temporal distribution is highly uneven, resulting in water scarcity and desertification in the central dry-zone, floods and salinization issues in the Ayeyarwady Delta, and flash floods in the North and Westerns parts of Myanmar. In addition, deforestation due to illegal logging cause erosion and sedimentation in the rivers and reservoirs, the former causing problems for navigation. Myanmar's climate is strongly influenced by the Indian Monsoon circulation (Taft and

¹ 8.5 percent in real terms in 2014/2015, but is project to slow down to 6.5 in 2015/2016 due to natural disasters (World Bank, 2016).

Evers, 2016). Variability and a change in patterns such as intensification of pre-monsoon tropical cyclones (Wang et al., 2013), early termination of monsoons, the increase in average rainfall in most areas, and a declining trend in other areas (Shrestha and Aung Ye Htut, 2016) are expected to aggravate flood events and drought periods.

The decades under military rule has left Myanmar with weak institutions and capabilities with ineffective bureaucratic structures (Sagarik and New, 2015; OECD, 2014), which are highly hierarchical (Nixon et al., 2013). Although changes are set in motion through the merge of several ministries, moving from 32 to 21 ministries in 2016, institutional reforms take time. Water management in Myanmar is scattered throughout ministries and departments resulting in the overlap of responsibilities in some sectors (OECD, 2014), while other remain neglected. Gaps in institutional resources affect Myanmar's capacity to implement and enforce effective laws and regulations (SEI, 2015). Water resources are managed ad hoc, without clear long term planning. The hierarchical organisation of ministries and departments results in the absence of, or very little cooperation and policy integration. Decisions have to move up and down the hierarchical ladder resulting in delays in planning and implementation (Myanmar government official, personal communication, February 2016).

In the National Water Policy (NWP) adopted by the government in 2014, Myanmar acknowledges all the issues mentioned above, and calls for an integrated water resources management (IWRM) approach in order to face these and future problems that will arise as a direct result of the country's development that is now set in motion (Myanmar National Water Policy, 2014). IWRM can be defined as *"a process that promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems"* (GWP, 2009).

The concept of IWRM was enshrined by the United Nations (UN) through the Sustainable Development Goals (SDG) in 2015, which sets specific targets to be reached by 2030. Goal 6.5 specifically describes: "By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate" (UN, 2015). IWRM is not a new concept, nor is there one best, successful way or blue print for implementation that can be projected on each river basin (GWP, 2000). In the late 80s early 90s, IWRM was linked to sustainable development and managing water resources as an integral part of the nation's social and economic development (Snellen and Schrevel, 2004). With the Dublin principles, the role of women and society was acknowledged through the promotion of a participatory approach to water management involving users, planners and policy-makers at all levels. In addition, the principles state that water has an economic value, and should be recognised as an economic good (GWP, 1999). In previous years, IWRM has received considerable criticism as well, calling the concept too vague, (Butterworth et al., 2010 p69) too amorphous in definition (Biswas, 2004) and being described as a 'nirvana concept' (Molle, 2008), a concept that societies should strive to reach, but with a fairly low likelihood that they may reach it. An important principle of the participatory approach to development is the incorporation of local people's knowledge into programme planning (Cooke and Kothari, 2001). Participation is expected to enhance the effectiveness of water resources management (Özerol and Newig, 2008), and to involve and empower local communities. Critical scholars, such as Cleaver (1999) suggest that "participation has been translated into a managerial exercise based on 'toolboxes' of procedures and techniques" and in order to achieve the intrinsic value of participation, appropriate techniques are needed to ensure real involvement in decision-making. Fung (2006) states that appropriate techniques or "mechanisms for public participation vary along three important dimensions: who participates, how participants communicate with one another and make decisions together, and how discussions are linked with policy or public action". These are questions that need to be addressed, to find successful mechanisms for Myanmar, where

a governance system with space for participation has been absent for decades and where participation is not a matter of course.

With regards to compliance with goal 6.5 of the SDGs, Akkerman et al., (2015) recognises that practical approaches on how to measure the extent to which water management plans are adhering to the principles of IWRM are rare. The authors propose a framework consisting of four constructs that are understood as important parameters that will give an indication of the extent of implementation of IWRM in a river basin, which are: (1) policy integration, (2) public participation, (3) gender inclusion, and (4) adaptivity.

In 2014, the World Bank granted a loan of US\$ 100 million to the Myanmar government for the implementation of the Ayeyarwady Integrated River Basin Management Project (AIRBMP). The project aims to strengthen integrated, climate resilient water management in the Ayeyarwady River Basin through a multi-phased approach (AIRBMP, 2014). This project provides the opportunity for Myanmar to manage its relatively untouched water system according to IWRM principles. In line with the adoption of the IWRM-based national water policy by the Myanmar government, a national water law in preparation, and acknowledging the literature regarding the ambiguity of the IWRM framework with many possible ways of implementation, Myanmar now has to determine what they value and understand as good IWRM practise to translate policy into nation wide practical plans.

This research project aims to study perceptions of four constructs underlying IWRM, 'policy integration, public participation, gender inclusion, and adaptivity' among people who are responsible for the implementation of future water management plans in Myanmar. The perceptions of these four constructs will serve as a proxy for the adherence of future water management plans to the principles of IWRM. Policy integration is expected to be challenging for a country as Myanmar where hierarchical structures are the norm (UNDP, 2015). Furthermore, the organisation of effective public participation involving people that have not been able to freely speak their mind for decades is expected to pose challenges.

2 MATERIALS AND METHODS

The four constructs proposed by Akkerman et al., (2015) were adopted from the framework to measure IWRM, and provide the theoretical foundation of this study. Policy integration and cooperation is expected to be low between ministries and department considering decades under military rule. The study of perceptions of policy integration aims to reveal how cooperation and integration is currently experienced, how this can be improved, and how this will contribute to the implementation of IWRM. In line with the IWRM principles and having expressed the intention of a participatory approach in the NWP, perceptions of public participation are explored. After decades of suppression, the organisation of public participation and consultation is expected to be challenging and needs thorough deliberation. The Dublin principles stress the important role of women in water management. Myanmar is a fairly traditional country in terms of the division of roles between men and women, especially in rural areas. Men traditionally hold higher positions in governmental organisations. The gender aspect is explored through the position women currently hold in water management, whether people consider women to be in- or excluded and what this means for the implementation of IWRM. The fourth construct 'adaptivity' entails to which extent plans take into account that the future is uncertain. It aims to reveal perceptions of strategic planning, possible climate change effects, and relations between climate- and land use change.

2.1 Q-Methodology

Perceptions of IWRM are studied using Q-methodology. This mixed-method research (Work et al., 2015) provides a foundation for the systematic study of subjectivity, a person's viewpoint, beliefs, and attitudes (Brown, 1993; Van Exel and De Graaf, 2005). Q-methodology is intended to systematically reveal individual perspectives, and to group them into shared perspectives using quantitative factor analysis (Raadgever et al., 2008). Q-methodology does not require a large sample of participants; in fact, it is argued that in keeping smaller numbers, the emphasis on quality is maintained (Watts and Stenner, 2005). Though, the quality of the sample then becomes more important. In this method, not the questions or statements but the participants are the variable (Work et al., 2015). It involves the analyses of the ranking of statements (Q-set) about IWRM, onto a Q-grid according to a (quasi) normal distribution; with a ranking-order from most agree to most disagree.

This research was conducted in four clearly distinguished parts. First, the development of the statements, second the selection of the participants (P-set), third the ranking of the statements by participants, referred to as the Q-sort, and fourth the data analysis and interpretation.

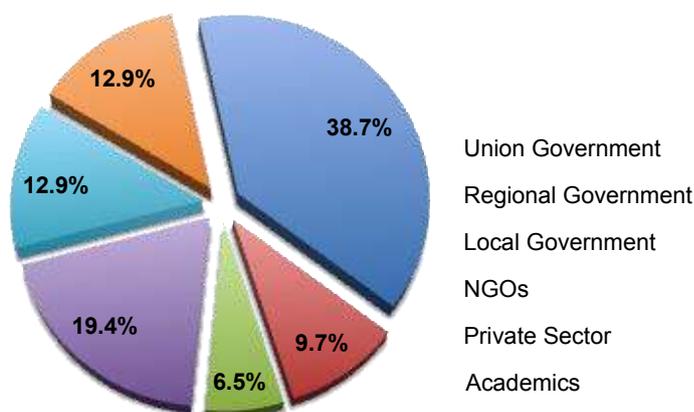
2.1.1 Development of statements

To identify different perceptions the participants might have about the topic, semi-structured interviews with eight native Myanmar working in the water sector at both national and local level were conducted. In addition, government reports, policies, reports from NGOs and international development and financial institutions were studied. This first phase of the study is also referred to as defining concourse (Van Exel and De Graaf, 2005). Initially, 87 statements were developed of which 41 formed the final Q-set.

2.1.2 Sample selection

Next the participants were identified, referred to as the P-set. An institutional and stakeholder map was developed to identify actors in the water sector in Myanmar ([see supplementary material](#)). Approximately 45 water professionals were approached to participate. Additional snowball sampling led to a total of 31 participants. The sample was composed of 12 national government officials, three regional government officials, two local government officials, four academics, six NGOs and four participants from the private sector. 48.4% of the participants are female and 51.6% male. 61.3% of participants are aged between 30 and 50, 22.6% are younger than 30, and 16.1% older than 50.

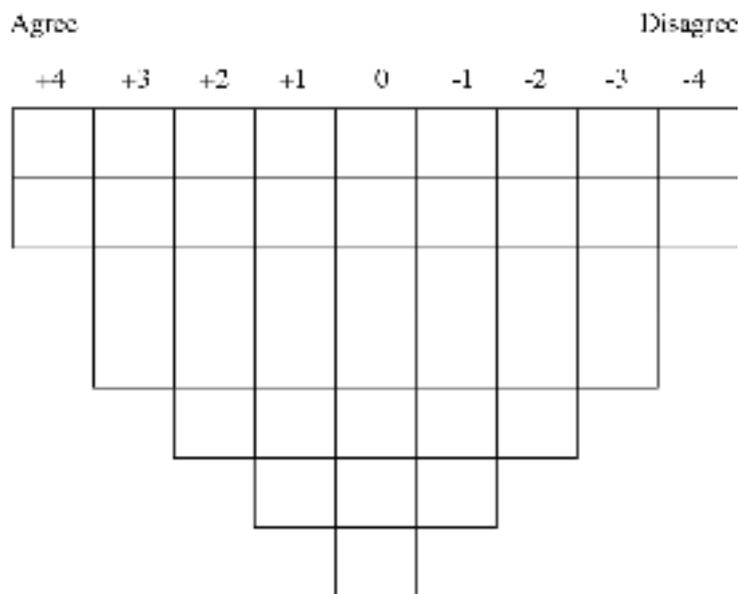
Figure 1. Sample composition organised by organisation.



2.1.3 Q-Sorting

The Q-sortings were conducted in person and usually took place at the offices of the participants. The Q-sorting started with a short introduction to the research topic, an explanation of the procedure and the assurance of anonymity. Second, the participants received cards with the statements, which they classify as agree, disagree or neutral. Third, the participants distributed the statements from most agree (+4) to most disagree (-4) (Figure 2). The far edges of the distribution represent strong opinions, either agree or disagree, while the statements in the middle of the Q-grid represent neutral or less strong opinions. The Q-sort was finalized with an interview to explore the motivations behind the particular distribution of the cards.

Figure 2. Design of the normal distribution.



The design and especially the kurtosis, the sharpness of the peak of the normal-distribution curve depends on how controversial the topic is. Considering the political climate of the last decades, with little space for critical thinking as well as the current organisational climate in the ministries being the opposite of what IWRM advocates, a flattened kurtosis has been chosen to force the participants to take a stronger agree or disagree position. If the interests and knowledge of the respondents is expected to be low, the distribution should be steeper in order to leave more room for ambiguity and indecisiveness in the middle of the distribution (Van Exel and De Graaf, 2005). When respondents are expected to have strong opinions, as in the case of this research considering the national water policy and the AIRBM project in Myanmar's largest river basin, the distribution should be flatter to provide more room for strong (dis) agreements with statements.

2.1.4 Data analysis and interpretation

The factor analysis, which is a mathematical technique that reveals underlying explanations for patterns in a large set of data (Webler et al., 2009), was performed using the software package PQMethod, version 3.2.1. Sorts were entered into the programme and a principle component factor analysis was performed. The analysis showed five factors, which are particular arrangements of statements (Webler et al., 2009), with eigenvalues higher than 1, which is generally considered as the threshold for a solid foundation for the study (Watts and Stenner, 2012). Following this line of

reasoning, the varimax rotation was performed for five factors. The correlations matrix produced by the software showed high correlations between the different factors, meaning little variation in viewpoints (Watts and Stenner, 2012). In addition, one factor in particular did not seem to represent a very distinguishing viewpoint. For these reasons four factors were retained for the final analysis and interpretation. Table 1 shows the loadings per factor for each Q-sort. Each factor represents a particular arrangement of statements, which is a particular viewpoint. The loadings indicate to which extent a participant’s sort is in compliance with this factor, and thus to which extent the participant has that viewpoint.

Table 1. Loadings for each Q-sort per factor. The bold loadings represent significant loadings.

Q-Sort	Factor A	Factor B	Factor C	Factor D
1	0.64	0.04	0.20	0.56
2	0.57	0.33	0.51	0.21
3	0.44	0.40	0.05	0.60
4	0.65	0.32	0.18	0.53
...
29	0.54	0.08	0.43	0.59
30	0.34	0.38	0.10	0.71
31	0.72	0.18	0.16	0.20
Explained variance	23%	8%	14%	24%

The four factors represent four viewpoints with a total explained variance of 69%, which is far above the minimum of 35% described by Watts and Stenner (2012). Crib sheets were used for the final interpretation of the data. In a crib sheet, the statements are organised as follows. For each factor, statements with the highest and lowest scores as well as statements with a higher and lower score than any other factor were extracted from the factor array table.

3 RESULTS

Table 2 shows the distinguishing statements for each factor and loadings of individuals, grouped by organisation. Thus for factor A, five individuals that load on factor A are working for NGOs, five work for the Union Government, etc. The table also shows that there are 10 statements which are neither distinguishing for any factor nor is there consensus among the factors. In addition, there are 13 consensus statements that all viewpoints either reject or confirm. From the factor arrays in table 2, four narratives are developed that describe each factor. The narratives are created through the analyses of the distinguishing statements, the highest, and the lowest rankings and are organised by construct. The presentation of the narratives was adopted from Minkman et al., (2016). Statements are presented following the format ‘statement number: ranking number’ i.e. ‘4: +2’ meaning statement four, ranking +2. In addition, quotes from post-sorting interviews with the participants are used to reveal motivations for rejecting or confirming statements. Quotes end with ‘Q(number)(organisation), i.e. Q3 NGO, meaning the quote belongs to the Q-sort of participant 3 who works for a NGO.

The organisations are coded as follows: Union government is described as UGOV, regional government as RGOV, local government as LGOV, Non-governmental organisation as NGO, private sector as PRIV, and academics as ACAD.

Table 2 statements sorted by distinguishing statements for each factor (A-D) (pink colour) with the corresponding factor arrays, and the number of participants that load on

each factor grouped by organisation. The statement colours represent the four constructs, grey for policy integration, green for adaptivity, blue for public participation, and white for gender.

Statements	A	B	C	D	Loadings
16. The Union Government should make all the water management decisions because they have the knowledge and the power	-4	-2	-3	-2	N=17, Male: 59% Female: 41% NGO: 5 Union Govern: 5 Regional Govern: 2 Local Govern: 1 Private: 2 Academics: 2
17. Only full cooperation between all ministries will lead to sustainable and effective water management in Myanmar	4	-2	2	2	
28. Water management planning should cover at least the coming 25 years	0	3	1	3	
39. The current hierarchy in the government stands in the way of integration and cooperation	1	-1	-1	0	
3. Regional governmental offices should receive more water management responsibilities	2	4	0	2	N=5, Male: 60% Female: 40% NGO: 2 Union Govern: 3
4. Every department should be responsible for their own data collection	1	3	1	1	
36. Women have the natural right to water, since they are the main users	0	1	-1	0	
38. Public participation is empowering for vulnerable groups	1	0	2	1	
6. The number of ministries involved in water management has to be reduced to achieve integrated water management	-2	0	4	-1	
9. Citizens don't have enough knowledge about water management, therefore it is better to not involve them in water management decisions	-3	-4	-2	-3	
15. Public participation makes the decision-making process too long	-2	0	-2	-3	
21. Future land use changes will be more important than climate change	-1	-3	-1	-2	
24. Men are more capable of making integrated water management decisions	-3	-1	-3	-2	
16. The union government should make all the water management decisions because they have the knowledge and power	-4	-2	-3	-2	
17. Only full cooperation between all ministries will lead to sustainable and effective water management in Myanmar	4	-2	2	2	
35. Women should participate in water user groups	0	3	0	0	
3. Regional governmental offices should receive more water management responsibilities	2	4	0	2	N=11, Male: 64% Female: 36% Union Govern: 7 Local Govern: 1 Private: 3
6. The number of ministries involved in water management has to be reduced to achieve integrated water management	-2	0	4	-1	
9. Citizens don't have enough knowledge about water management, therefore it is better to not involve them in water management decisions	-3	-4	-2	-3	
14. It is difficult to motivate people to participate in water management development	-1	-1	0	-2	
18. There are too many ministries involved in water management	-1	-1	1	-1	
23. I have experienced an increase of water problems in my daily life/work in the last five years	0	0	1	0	
28. Water management planning should cover at least the coming 25 years	0	3	1	3	
30. Involving women in water user groups will reduce water related diseases	0	1	-1	0	
36. Women have the natural right to water, since they are the main users	0	1	-1	0	
38. Public participation is empowering for vulnerable groups	1	0	2	1	

21. Future land use changes will be more important than climate change	-1	-3	-1	2	N=19, Male: 42% Female: 58% NGO: 5 Union Govern: 4 Regional Govern: 3 Local Govern: 2 Private: 2 Academics: 3
40. Integrating all relevant ministries involved in water management makes the process very time consuming	0	-1	0	-3	

3.1 Consensus statements

There is consensus among the participants on 13 statements (table 3). One statement is related to policy integration: 'Data should only be available for the ministries and departments, not to the public' (5: -4, -4, -3, -4) which is strongly rejected by all four viewpoints. Reasons mentioned by participants are: "A country is composed of people and the government. So data should not be only available for the government. It has to be shared with the public. They have the right" (Q2, UGOV), "we cannot make any research without data (Q28, ACAD), and "data is not adequate and not reliable" (Q1, NGO). There is also consensus on two statements regarding public participation. 'Local people know the local water system and should therefore be consulted' (12: +1), was ranked plus one by all four viewpoints and 'citizens have often local knowledge, policy makers should make use of that through consultation and participation meetings' (19: +2), was ranked plus two by all four viewpoints. Participants gave reasons such as "In the delta area, people know when tide will come and the water level increases. They know more than us sometimes" (Q11, UGOV), and "In the past, if the government does a project they never do public consultation. The public does not know what is planned and people cannot express their feelings because they are not consulted. They have no choice. In the future this must change" (Q26, UGOV).

Consensus statements related to gender are: 'Women are very busy to manage the household, and should therefore not be burdened with water management decision' (31: -2, -3, -2, -2), 'women can't contribute a lot in water management' (33: -3, -2, -4, -3), and 'I feel like women are excluded from decision-making processes regarding water management' (34: -1). The general understandings of gender among participants are: "women and men have same chances" (Q10, UGOV) and "in Myanmar women can participate in the water management sector. So they are not excluded. There isn't any rule for women to be excluded from water management" (Q3, NGO). Although the situation is not everywhere the same "I believe that women can contribute. But in the current situation, in some places, women cannot join public participation and consultation because only the head of the household goes to those meetings" (Q8, PRIV).

Participants rank the statements 'my work has changed due to climate change' (20: -1, 0, -1, -1) and 'land use changes have impacted the way my organisation works' (41: 0) in the neutral or slightly agree area. Examples that were given where: "sometimes we cannot pump groundwater for drinking water supply, I think that is due to climate change. We have to use surface water instead" (Q7, LGOV) and "climate change adaptations in livelihoods is part of our projects for five years, I see that there are more and more organisations getting involved" (Q24, NGO). "Deforestation, urbanization and mining are important land use changes in Myanmar. There is a lot of sedimentation in the river due to mining and deforestation, and also pollution from mercury. We have to dredge a lot because of that" (Q29, UGOV). Participants believe that ministries have to work together to reduce climate change impacts (22: +3, +2, +3, +4), and there is a general consensus that planning should cover more than 10 years in the future. All water management plans should incorporate climate change scenarios (27: +4), and have to be adapted regularly when new information is available (26: +3). In addition, participants

believe that the government has to inform its citizens more about possible climate change impacts (29: +2, +2, +3, +2).

Table 3. 9 Neither distinguishing statements nor consensus statements and 13 consensus statements with their corresponding factor arrays for factor A-D. The statement colours represent the four constructs, grey for policy integration, green for adaptivity, blue for public participation, and white for gender.

Statements	A	B	C	D	Loadings
1. Integration can best be reached through practical projects	3	2	0	1	Neither distinguishing nor consensus statements
2. Cooperation between ministries can make water allocation easier	2	0	2	1	
7. I don't think I can contribute anything to consultation meetings on water management	-2	-3	-4	-2	
8. People are more motivated to participate when it is clear how outcomes will be used	3	1	1	3	
10. I would like to participate in public participation and consultation meetings	1	2	2	0	
11. There should be separate consultation meetings for communities and government officials	-1	-2	-2	-1	
13. Providing information about river projects is not enough, people need to be asked what they think about it	2	1	0	1	
32. I think men and women should have the same opportunities to be involved in water management	1	1	3	3	
37. The men is head of the household and should therefore make decisions in relation to water	-2	-2	-3	-1	
5. Data should only be available for the ministries and departments, not to the public	-4	-4	-3	-4	Consensus statements
12. Local people know the local water systems and should therefore be consulted	1	1	1	1	
19. Citizens have often local knowledge, policy makers should make use of that through consultation and participation meetings	2	2	2	2	
20. My work has changed due to climate change	-1	0	-1	-1	
22. Ministries have to work together to reduce climate change impacts	3	2	3	4	
25. In water management planning we cannot look 10 years ahead since we don't know what will happen	-3	-3	-2	-4	
26. It is important to adapt water management plans regularly when new information is available	3	3	3	3	
27. All water management plans should incorporate climate change scenarios	4	4	4	4	
29. The government has to inform its citizens more about possible climate change impacts	2	2	3	2	
31. Women are very busy to manage the household and should not be burdened with water management decisions	-2	-3	-2	-2	
33. Women can't contribute a lot to water management development and planning	-3	-2	-4	-3	
34. I feel like women are excluded from decision-making processes regarding water management	-1	-1	-1	-1	
41. Land use changes has impacted the way my organisation works	0	0	0	0	

There are nine neither distinguishing nor consensus statements, of which five are regarding public participation. All four viewpoints agree or disagree with these

statements, but there is a difference in the level of agree/disagreement. For example, statement 7: 'I don't think I can contribute anything to consultation meetings on water management' was rejected by all four, but viewpoint B and C reject it stronger than viewpoint A and D. There are two statements regarding gender. For both statements, viewpoints A and B have a similar opinion.

3.2 Viewpoint factor A – 'Cooperation for effective water management'

Factor A explains 23% of the variance. 17 participants load significantly (i.e. loadings of 0.40 and above) on this factor. Five participants work for NGOs, five are union government officials, two are regional government officials, one is a local government official, and two participants work in the private sector as well as two academics from technical universities. Ten participants are men, while seven are women. Factor A has four distinguishing statements: 16, 17, 28, and 39.

3.2.1 Policy Integration

Participants with viewpoint A have the following viewpoint on policy integration: 'Only full cooperation between all ministries will lead to sustainable and effective water management in Myanmar' (17: +4). Motivations for strongly confirming the statement are: *"Ministries have different power, therefore cooperation is difficult. Myanmar is weak in cooperation, but now there is a little bit of change"* (Q20, ACAD). In addition, *"Full cooperation is very important for water management in Myanmar. Cooperation already exists, for example the National Water Resources Committee (NWRC), it is not enough now, but it will be in the future"* (Q4, RGOV). A possible explanation for the lack of cooperation mentioned by participants is the lack of capacity *"more cooperation will be reached when more staff is available at offices because now people have so much work, they can not join all meetings"* (Q4, RGOV). In addition, participants in this viewpoint subscribe the lack of cooperation to 'the current hierarchy in the government that stands in the way of integration and cooperation' (39: +1). A participant explained, *"with irrigation and hydropower projects for example, the different ministries should cooperate, but they don't. Hierarchy makes that difficult. Decisions go up and down different ministries"* (Q13, UGOV). People in this group reject that the union government should make all the water management decisions because they have the knowledge and power (16: -4). *"They also need to deliver some power delegation to the regional and the local government as well. So that their voices can be will be considered when they make the decision"* (Q1, NGO).

In addition, this viewpoint strongly agrees that integration can best be reached through practical projects (1: +3), that the number of ministries involved in water management does not need to be reduced to achieve integrated water management (6: -2), but that cooperation between existing ministries can make water allocation easier (2: +2).

3.2.2 Public participation

Participants in this group believe that providing information about river interventions is not enough: people need to be asked what they think about it (13: +2). They also believe that people are more motivated to participate when it is clear how outcomes will be used (8: +3). *"If people know what is the value of having this [public participation] and what will happen you know because, of course it has to be clear what the positive and negative parts are. In Myanmar people have no knowledge at all so it is difficult to motivate them. I mean mobilize them is very important. Once they are mobilized they will have the willingness to know and learn more about this project"* (Q1, NGO). Other participants explain *"We cannot do anything without people participation and people can only participate when they understand clearly what benefits or what effects they will get from this project and programme"* (Q4, RGOV), *"People have been cheated for 60 years, they should be told how we use their advice"* (Q25, NGO/GOV).

3.2.3 Gender

This viewpoint has no real strong opinions about gender, placing five out of nine gender statements in the neutral area of the distribution. This viewpoint rejects statements suggesting that men are more capable of making integrated water management decisions (24: -3), that men are the head of the household and should therefore make decisions in relation to water (37: -2), or that women are too busy running the household to participate in water management (31: -2). However, these statements are rejected by all four factors, meaning that these opinions do not stand out from the other three viewpoints.

3.2.4 Adaptivity

This group is unsure that water management planning should cover at least the coming 25 years (28: 0). Compared to the other viewpoints, the factor array for viewpoint A is the lowest. A participant that loads on this factor explains, *"in general, the government has 30 years plan. But I think we should first have short-term plans of 5 years because 25 years is too long. 10 is better"* (Q8, PRIV). A similar explanation from another participant explaining that: *"25 is too long. It should be 15. Some water sources are changing. The weather is changing"* (Q31, NGO).

3.3 Viewpoint factor B 'Decentralisation and gender focus'

Factor B explains 8% of the variance. Five participants load significantly on this factor. Two participants work for NGOs and three are union government officials. Three participants are male, while two are female. Distinguishing statements for factor B are: 3, 4, 6, 9, 15, 16, 17, 21, 24, 36, and 38.

3.3.1 Policy Integration

People with viewpoint B have the following perceptions of policy integration. Regional governmental offices should receive more water management responsibilities (3: +4), because regions know what is needed in their respective areas. *"We [Department of Meteorology and Hydrology] always first inform our regional offices, so they can manage the situation in their area. So yes, regional offices should receive more responsibilities"* (Q16, UGOV). This viewpoint is shared within another governmental organization *"in our department [Water Resources and Utilization Department] regional and district level are very much involved with the farmers. They must receive more responsibilities"* (Q15, UGOV). *"In reality, there is no decentralization. Regional governments have no power to manage their resources, but now this is changing. Government officials still live in the previous times where they had no power...but they know about their region. We have to invite all government levels to decision-making"* (Q24, NGO). Every department should be responsible for their own data collection (4: +3). Every department is responsible and have to be duty full to collect data (Q3, NGO). This group believes that there are too many ministries, and the number should be reduced to achieve integrated water management (6: 0). *"There is a lot of overlap between ministries, they get confused themselves about what their responsibilities are. If we combine some ministries this will work better"* (Q24, NGO), and *"maybe ministries should merge"* (Q15, UGOV). In terms of the division of power between the union government and the regional government, participants in this viewpoint believe that 'the union government should not make all the water management decisions because they have the knowledge and power' (16: -2), but that the union government has the "big vision" for the whole country (Q15, UGOV). Also, they have the facilities, data, technology, capacity and staff, experts and consultants. *"Sometimes they don't have all the knowledge, but then we can provide them with knowledge"* (Q16, UGOV). *"The government has the knowledge and the power, they have technical knowledge, but local people have local knowledge and experience. When there is no consultation, the local people don't trust their decision"* (Q24, NGO). The

group of viewpoint B believe that not only full cooperation between all ministries will lead to sustainable and effective water management in Myanmar (17: -2), but also the public and other stakeholders need to be involved (Q15, UGOV).

3.3.2 Public Participation

The perceptions in relation to public participation in this viewpoint are that public participation makes the decision-making process too long (15: 0), but that *"all people in Myanmar should participate because they need to save their livelihoods"* (Q12, UGOV) and *"if you organize participation at the local level, the process doesn't take too long"* (Q15, UGOV). There is a very strong belief that citizens don't have enough knowledge about water management (9: -4); therefore they should be involved in water management decisions so educate and raise awareness among citizens. *"Some don't have enough knowledge. They for example throw stuff into the river, therefore they need to be involved in water management"* (Q12, UGOV) and *"some are un-educated but some are educated and know their resources. We should involve them. If their local system will change because of our project, we need to invite them, otherwise they don't feel ownership and the change won't be sustainable"* (Q24, NGO).

3.3.3 Gender

Viewpoint B confirms positive statements related to gender to be the highest between all four statements, indicating that this group considers gender to be an important topic within IWRM. Participants confirm the statement that women have the natural right to water, since they are the main users (36: 1). Especially in rural areas women are the main water users. They use the water for the household tasks like cooking, cleaning, and washing. This group very much believes that women should participate in water user group (35: +3). In Myanmar, some farmers are organized in water user groups or water user associations. The men, as head of the household attend these meetings. Participants that load on viewpoint 2 believe that *"in water user groups it is difficult to make them [women] participate. I like for them to take part, but in reality it is difficult since they are housewife and have no education"* (Q15, UGOV). In addition, *"women have less decision-making power. We need to empower them. When we call a meeting, women come, but they don't speak. They don't feel confident to speak. They participate, but we don't get their voice"* (Q24, NGO). This perception is confirmed through the statement 'men are more capable of making integrated water management decisions' (24: -1), which is rejected by this group. *"Men and women are the same in my opinion. Women are also capable"* (Q16, UGOV). Although, some participants explain *"currently in Myanmar men are more capable to know technology. They are educated. In rural areas, women are not educated, now in cities yes. In general I don't accept the statements, but this is the situation in Myanmar at the moment"* (Q15, UGOV).

3.3.4 Adaptivity

Viewpoint B rejects the statement that future land use changes will be more important than climate change (21: -3). Participant in this group believe that land use change and climate change are related and cannot be seen separately. They are both considered important.

3.4 Viewpoint factor C 'Effective and participatory water management'

Factor C explains 14% of the variance. 11 participants load significantly on this factor. Seven union government officials, three work in the private sector and one local government official. Distinguishing statements for factor C are: 3, 6, 9, 14, 18, 23, 28, 30, 36 and 38. Seven participants in this group are male, while four are female.

3.4.1 Policy Integration

This group strongly believes that there are too many ministries involved in water management (18: +1), and that the number of ministries involved in water management has to be reduced to achieve integrated water management (6: +4). *"Irrigation department don't care for water quality. When they are building constructions, they don't involve our department. There should maybe only be 2 or 3 ministries, so that cooperation is very easy"* (Q21, UGOV). *"I feel like there should be one water ministry"* (Q6, LGOV and Q26, UGOV). *"All water related responsibilities like ground water etc. should be in one place. Then all data and information is easily accessible. Now it is very difficult to get access to data and share knowledge and information"* (Q26, UGOV). This group also believes that regional governmental offices should receive more water management responsibilities (3: 0). *"Since the new democratic system in 2008, regional offices were established. They have still not enough responsibilities; most remain with the union government. To have more responsibilities at the regional level makes water management more effective. Like in the Netherlands you have water boards, they are responsible for specific areas. We don't have that here"* (Q26, UGOV). *"Of course regional offices are very important for their area. They should know about water management and how to allocate the water"* (Q29, UGOV). *"Regional governments should receive more responsibilities according to the constitution, they should share responsibilities, but they still need more power"* (Q14, UGOV).

3.4.2 Public Participation

This group believes that it is difficult to motivate people to participate in water management development (14: 0), but that people should be involved in water management. *"Almost all people hate the government, so they don't trust the government"* (Q21, UGOV). They also state that it is difficult to motivate people to participate in water management because *"the public has its own interest"* and *"they don't want to give their time to water management, because they are too busy with survival"* (Q26, UGOV). In addition, they reject the statement that citizens don't have enough knowledge about water management; therefore it is better to not involve them in water management decisions (9: -2). In other words, citizens should be involved, they believe.

3.4.3 Gender

Viewpoint C distinguishes itself from the other viewpoints by rejecting the statements that 'women have the natural right to water, since they are the main users' (36: -1) and 'involving women in water user groups will reduce water related diseases' (30: -1). Participants that load on this factor explain: *"everybody has the natural right, not just women"* (Q27, PRIV) and *"natural rights should not be subjective to gender"* (Q9, UGOV). In addition, this group rejects the statement that women can't contribute a lot to water management development and planning (33: -4) as one participant explains: *"actually, people recognize the role of women in water resources. They have knowledge and experience including nature conservation. Women are responsible for water collection for their daily life and their family. They suffer the most if there are problems with water collection, therefore it is important to include them in water management"* (Q14, UGOV).

3.4.4 Adaptivity

I have experienced an increase of water problems in my daily life/work in the last five years (23: +1). Participants that load on this group have experienced the most water problems such as water scarcity and flooding. The high number of government officials that load on this factor can possibly explain this ranking. YCDC is for example responsible for drinking water supply, which faces many problems in Yangon. Union ministers have a good overview over water problems in the country. This group believes that water

management planning should cover at least the coming 25 years (28: +1). *"5-10 years is considered to be not enough because based on my work, we work with flood occurrences of 50-100 years"* (Q10, UGOV).

3.5 Viewpoint factor D 'Adaptive to change'

Factor D explains 24% of the variance. 19 participants load significantly on this factor. Five participants work for NGOs, three are regional government officials, four are union government officials, three participants are academics, two participants work in the private sector, and two are local government officials. Distinguishing statements for factor 4 are: 21 and 40. Eight participants in this group are male, while eleven are female.

3.5.1 Policy Integration

Integrating all relevant ministries involved in water management makes the process very time consuming (40: -3). This statement is understood as a negative statement, in that sense this group rejects this statement, because integrating all relevant ministries is believed to be necessary in water management (Q27, PRIV).

3.5.2 Public Participation

Within this viewpoint motivating people is perceived as difficult ranking the statement 'it is difficult to motivate people to participate in water management development' (14: -2) the lowest among the other factors. Different reasons are mentioned for this ranking *"it is difficult to motivate people to participate because there is no connections (to rural areas). If transportation to other communities is easy, they want to come because it concerns their lives"* (12, UGOV) and *"in our country, people are almost not educated. I feel it is very difficult to motivate people in Myanmar"* (Q13, UGOV). People in this group also reject the statement public participation makes the decision-making process too long" (15: -3). *"Public participation is important, it makes the process easier. They contribute to my work sometimes. And if they are involved and a storm comes, if we tell them and give them information, they obey when we tell them to leave their house"* (Q10, UGOV).

3.5.3 Gender

Gender is not considered important in this viewpoint. Participants in this group don't rank gender statements the highest or lowest (-4, +4) nor do they rank them higher or lower in this factor than in other factors.

3.5.4 Adaptivity

Participants in this group rank statements related to adaptivity the highest. Both statements 'ministries have to work together to reduce climate change impacts' (22: +4) and 'all water management plans should incorporate climate change scenarios' (27: +4). Participants with this viewpoint also consider 'future land use changes will be more important than climate change' (21: +2). A participant explains: *"land use change is more important because land use change is causing climate change, and deforestation leads to erosion and floods"* (Q28, ACAD). Another academic agrees with the statements explaining: *"land use change is one of the sources that lead to climate change. The mismanagement of land use and we have a lot of land use change in Myanmar. To mitigate climate change we should manage land use change"* (Q30, ACAD). This viewpoint strongly rejects the statement 'In water management planning we cannot look 10 years ahead since we don't know what will happen' (25: -4). *"To be sustainable 10 years is not enough"* (Q30, ACAD). However, it also emphasized that there is a need for accurate data to be able to plan for 20 years or longer.

4 DISCUSSION

4.1 Reflection on methodology

Although Q-methodology has proven itself to be a very helpful methodology for the identification of viewpoints (Minkman et al., 2016), applying this method in Myanmar had a number of implications. Sample composition was biased by language skills and familiarity with the concepts. This resulted in the under-representation of local citizens and non-English speakers, even though translation was provided. Ideally, all important stakeholder groups should be reflected (Raadgever et al., 2008), and the inclusion of local (rural) stakeholders is an important principle of IWRM. Their viewpoints are not represented in this study and, given the difference between rural and urban areas in terms of the role of men and women and water use for agricultural practises, the inclusion of local (rural) stakeholders could have resulted in more distinctive viewpoints, with stronger opinions regarding policy integration in urban areas, and stronger opinions regarding gender and adaptivity in rural areas.

Second, the method turned out to be very time consuming. The placement of the statements took in certain cases already one hour, leaving little time for the post-sort interviews to explore motivations behind the sorting. Considering that this is the most important part of the research to reveal underlying motivations and values, there was more to explore. Topics were only discussed briefly, while there could have been more in-depth understanding. Similar points were raised in Q-method based research in western context, where for example language barriers were absent. Minkman et al., (2016) explains that due to time-limitations, the post-sort interview could not cover all statements and that “full-availability of interview fragments would have resulted in even more exciting outcomes” (p18).

Third, asking people about IWRM potentially produces socially desired answers, given the desirable nature of the concepts as discussed earlier in this paper. The Q-set consists of similar cards but phrased both positively as well as negatively. Asking for motivations behind the placement of the statements provided an understanding to which extent their answer was sincere. Asking for examples or experiences also provided insight in the reliability of their answer.

4.1.1 Sample

IWRM promotes integration throughout all governance levels and sectors, including state and non-state actors. Ideally, the sample group should include a wide-range of actors. Underrepresented in the present study are local people living in rural areas. Myanmar is a very large country with many ethnic minorities. The majority of government officials are from the Burmese group, which represent approximately 60% of the total population. Further study is needed to understand perceptions of IWRM throughout all states and regions, with specific attention to ethnic minorities. Q-methodology being a small-sample method, a different method might be better suitable i.e. focus group discussion in addition to personal interviews. A study of ‘notions of environmental management in Nigeria’ used focus group discussions to successfully gain insights into people’s understanding of the ‘environment’ and how the environment should be managed (Akpabio, 2006). Kangur (2008 p133) describes the application of focus groups in water management decision-making in a Transboundary River Basin Commission as a useful method for getting an overview of limits of trade-offs for common benefit in water management. In addition, organised discussions can contribute to the awareness of IWRM throughout the country.

4.1.2 Statements

A common reaction to the statements was that the Q-set contains a lot of similar cards. To some extent this was deliberately done as a control mechanism. Although this deviates slightly from the prescribed method, stating that the Q-set should be as diverse as possible to cover all possible aspects of one topic (Watts and Stenner, 2012), this turned out to be very helpful, since a lot of participants became quite confused during the sorting and control questions helped to clarify. If this research were to be repeated, it would however be proposed to reduce the number of statements by removing the 'control' statements to leave more room for more in-depth conversation to reveal motivations behind the sortings. Watts and Stenner (2012) suggest that if you want to use less than 40 statements, the statements need to be more general to broaden the coverage of each.

The statements do not cover transboundary issues, which from a current Union perspective are minimally addressed as 95% of the area of the Ayeyarwady River Basin lies in Myanmar and is by many considered a 'national river'. However in an increasing federalisation of the country, transboundary as cross-state issues, will become of high importance in Myanmar. The framework selected here to measure IWRM (Akkerman et al., 2015) does not (fully) address transboundary issues, with as only reference 'what processes are there to coordinate policies between governments'. It would make this framework more in compliance with the SDG that specifically addresses transboundary issues, and makes it more widely applicable. Transboundary issues could easily be incorporated in the framework when an institutional dimension is added, reflecting on the extent to which institutional arrangements and policies are in place for coordination between riparian countries and states, and to which extent they are followed.

4.1.3 Correlations

The correlations between the four factors are very high indicating that there is little variation between the factors, meaning that they should be understood as variations of the same viewpoint, rather than being four very unique viewpoints. This means that in general, there is quite a consensus on what is considered to be important aspects of IWRM among the participants, which is reflected in the high number of consensus statements. This can also be a production of a too homogeneous sample, with mainly higher educated people of which about 55% works for governments. A more inclusive sample, with more rural stakeholders from different geographical locations, and with different ethnicities will probably produce more distinguishing viewpoints.

Table 2. Correlation between the factor arrays.

	A	B	C	D
A	1.000	0.687	0.793	0.875
B	0.687	1.000	0.709	0.757
C	0.793	0.709	1.000	0.797
D	0.875	0.757	0.797	1.000

4.2 Reflection on IWRM implementation in Myanmar

Policy integration and cooperation within and between ministries is experienced as very limited, resulting in long decision-making processes, inefficiencies, and delays in the implementation of plans. However, with the new government, participants expect this to change quickly. The culture of organisation at present, meaning the segregated organisation of departments and ministries makes it challenging for practical projects such as the Ayeyarwady Integrated River Basin Management Project (AIRBMP) to adhere to IWRM principles. An important aspect here is the absence of data sharing between ministries. Making policies with insufficient and/or unreliable data is already difficult, let alone integrating policies when information is not shared. There are speculations whether the Ayeyarwady River Basin should have a river basin organisation, or whether a new ministry should be established for natural resources management. These institutional arrangements are important aspects of IWRM. Participants believe that regional governments should receive more responsibility for efficient decision-making that is in line with the need of the regions and states. Increasing responsibilities would also strip away some of the hierarchical structure that is experienced as an obstacle to integration. In addition, there is an urgent need for expert knowledge and capacity as well. Cooperation between ministries and the sharing of knowledge is one of the key aspects of policy integration. Most government officials with water management tasks are engineers. Considering possible impacts on fish populations or local livelihoods as a result of closing off a river arm is not necessarily something they are trained in. Whether a more holistic approach advocated by IWRM is going to be successful depends to a large extent on the cooperation between ministries and departments and most of all the sharing of knowledge and data.

4.2.1 Public participation

The results of this study show a consensus on the need for the involvement of citizens in water management decisions. How this will be organised in future plans however has yet to be determined. The statement 'there should be separate consultation meetings for communities and government officials is rejected by all four viewpoints (11: -1, -2, -2, -1). Given that the peak of the distribution lies slightly to the right (towards disagree), the scores have to be understood as a mix of agree, disagree, and neutral, indicating that people are unsure on how to organise participation that leads to empowerment and effective water management. All four viewpoints confirmed the statement 'providing information about river projects is not enough, people need to be asked what they think about it' (13: +2, +1, +0, +1). Linking this to Fung's 'democracy cube' which is a tool to determine the degree of participation, the participants agree that "listen as spectator" is not enough, there should be room to "express preferences", though this rates still pretty low on the 'modes of communication and decision' scale (Fung, 2006). Dungumaro and Madulu (2003) describe a case in India, where the ability of stakeholders to negotiate with other stakeholders at higher levels concerning issues that affect their livelihoods, determines the level of empowerment. The capacity to negotiate is then linked to meaningful participation. Returning to the democracy cube, deliberate and negotiate does rate as 'intense' modes of communication and decision. Questions remain about who should participate, and how outcomes are linked with policy or public action.

4.2.2 Gender

The results related to gender inclusion deviate from what I had expected to find in the sense that results show that women do not feel excluded from decision-making. Participants agree with the statement that the men is head of the household, confirming that Myanmar has a 'traditional' family situation, the men is not perceived as being more capable to make water management decisions, nor should he make all decisions in relation to water. There actually are some participants that confirm that women are

excluded when it comes to higher positions in the government, though within their family situation this is experienced to be equal.

5 CONCLUSION

This research sought to understand perceptions of IWRM as a proxy for the adherence of future water management plans to the principles of IWRM. Using Q-sort, we identified four different viewpoints among 31 participants who all work in the water sector in Myanmar.

Policy integration and public participation are perceived as the two topics with the strongest disagreements out of the four constructs. Seven out of the 13 consensus statements concern adaptivity, meaning that this construct is perceived similarly among the participants. In addition, statements regarding adaptivity systematically scored high, indicating that it is believed to be a very important part of water management in Myanmar. All plans should incorporate climate change scenarios and the government has a major responsibility to inform its citizens about possible climate change impacts. Viewpoint one has strong opinions about policy integration believing that decision-making power should be more equally divided among government levels, and only full cooperation will lead to effective and sustainable water management. Viewpoint two also believes that decentralisation is important for IWRM and they emphasize the importance of the role that women play in water management. Viewpoint three believes that public participation is empowering for vulnerable groups, though they also have strong opinions about gender equality. Viewpoint four distinguishes itself from the others through their opinion that future land use change is more important than climate change. They perceive this topic as very important for future water management in Myanmar. Climate change receives a lot of attention, which can be partly subscribed to donors' focus on climate change, while land use changes such as deforestation cause major negative impacts in Myanmar.

This article reveals high ambitions of Myanmar water professionals to implement all aspects of the IWRM approach to water management in the country, with special focus on policy integration and cooperation as well as on public participation. On-going projects such as the Ayeyarwady Integrated River Basin Management Project will provide further knowledge on the extent these ambitions can be implemented, given the current segregated organisational structure in the water sector as well as limited experience with public participation.

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