Virtual stakeholder engagement for transboundary water management: approach, challenges, and limitations

Implication des parties prenantes à travers des ateliers virtuels pour un futur aménagement transfrontalier : approche, défis et limites

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Abstract. Water security is a complex challenge in transboundary basins: competing upstream-downstream demands and the pursuit of sovereign interests are key factors often responsible for fragmented water resource management. Designing a transboundary structure under these conditions requires common interests from which each country can benefit. On the Ruzizi River, which delimits the border between Rwanda and the Democratic Republic of Congo (DRC) upstream and between the DRC and Burundi downstream, two structures have already been built. The three riparian countries have been engaged since 1976 within the Economic Community of the Great Lakes Countries. It is through this body that the three member states decided to build a third dam to complete the cascade. TRACTEBEL is involved through a climate change resilience assessment which requires stakeholder engagement from the three countries. While stakeholder engagement is generally a difficult exercise, the process has been exacerbated by the COVID-19 epidemic. To adapt, the TRACTEBEL team proposed virtual workshops for local stakeholders, as well as the launch of a project website to encourage maximum interaction. The challenges and limitations of these solutions will be presented. This approach is the first step towards establishing a sustainable governance of the Ruzizi cascade.

Résumé. La sécurité de l'eau est un défi particulièrement complexe dans les bassins versants transfrontaliers : la poursuite d'intérêts souverains et des asymétries amont-aval sont des facteurs-clé souvent responsables d'une gestion fragmentée des ressources en eau. Concevoir un ouvrage dans ces

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conditions requiert d'établir une base commune d'intérêts supranationaux dont chaque pays pourra bénéficier. Sur la Rivière Ruzizi qui délimite la frontière entre le Rwanda et la République Démocratique du Congo (RDC) à l'amont puis celle entre la RDC et le Burundi à l'aval, deux ouvrages ont déjà été construits. Les trois pays riverains sont en réalité engagés depuis 1976 dans une coopération étroite au sein de la Communauté Économique des Pays des Grands Lacs. C'est à travers cet organisme que les trois États membres ont décidé de construire un troisième barrage pour compléter la cascade. TRACTEBEL est engagé dans ce projet à travers la réalisation d'une étude de résilience au changement climatique du futur aménagement. Impliquer l'ensemble des parties prenantes des trois pays dans cette étude est un exercice particulièrement difficile, surtout en temps d'épidémie et d'impossibilité d'accéder au terrain. Nous proposons deux ateliers virtuels ainsi qu'un site internet pour favoriser au maximum les interactions. Les défis et limitations de ces solutions seront présentés. Cette démarche générale constitue la première étape en vue d'établir une gouvernance viable et pérenne de la cascade Ruzizi.

1 Introduction

In 1992 at the International Conference on Water and the Environment, the Dublin Statement on Water and Sustainable Development was established based on the following principles:

- Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
- Water development and management should be based on a participatory approach, involving users, planners, and policy makers at all levels
- Water has an economic value in all its competing uses and should be recognized as an economic good [1].

Building on these principles, the concept of Integrated Water Resources Management (IWRM) was developed around the year 2000 in response to the growing recognition that our natural resources were under pressure due to growing populations, rapid development, increased pollution, and a lack of effective governance worldwide to address these challenges. Global Water Partnership (GWP) offers the following definition of IWRM: "a process which promotes the coordinated development of management of water, land, and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" [2].

While the term IWRM has gained popularity, GWP notes that water management is often achieved via a top-down approach, with minimal involvement from those stakeholders most heavily impacted, making IWRM a challenge to truly implement [2]. This is further complicated by transboundary watersheds in which upstream and downstream projects and stakeholders fall under different jurisdictions [3]. And finally, climate change exacerbates the problem by introducing a non-stationary element to water resources management and requiring the identification and inclusion of stakeholders who under future climate conditions may be newly impacted by the project of interest.

The purpose of this article is to present a case study of stakeholder engagement as part of a Climate Risk Assessment (CRA) in the Ruzizi River basin. The Ruzizi River delineates the border between Rwanda and the Democratic Republic of Congo (DRC) upstream and that between the DRC and Burundi downstream. The water source contains two existing

hydropower structures providing energy to the region. Since 1976, the three riparian countries have been engaged in close cooperation regarding the management of the Ruzizi Basin within the Economic Community of the Great Lakes Countries. It was through this body that the three Member States decided to build a third dam to complete the cascade, referred to as the Ruzizi III Hydropower Project.

The Ruzizi III Hydropower Project encompasses each of the above described challenges: a transboundary watershed supporting social and economic livelihoods in the region as well as home to precious ecosystems, all expected to be impacted by future changes in climate. The CRA study aims to apply the recently published International Hydropower Association Guidelines, herein referred to as the IHA Guidelines, during the Ruzizi III feasibility and design phases. The guidelines provide international best practice to incorporate climate resilience into hydropower project planning, design, and operations [4]. In following with the themes of IWRM, the guidelines place significant emphasis on the involvement of stakeholders throughout the CRA process. However, while the importance of stakeholder engagement is evident, the COVID-19 global pandemic introduced new challenges to the process and required the adaptation of existing stakeholder engagement methods.

This paper presents an example of the role of stakeholder engagement in addressing the multi-faceted problems facing water resources management through the following elements:

- A history of stakeholder engagement in water resources planning;
- An overview of the Ruzizi III project and stakeholders;
- The proposed and revised CRA stakeholder engagement methodologies;
- And lessons learned throughout the process.

2 History of Stakeholder Engagement in Water Resources Management

While the advent of IWRM can be considered a turning point for stakeholder engagement in water resources management, the concept has been evolving for decades as a means to mediate conflicting stakeholder interests. For example, in the 1950's the Harvard water program developed a more systems-based approach to water resources planning. Shortly after, the U.S. Army Corps of Engineers (USACE) built on the system-based concepts during their 1989 national drought study by engaging with stakeholders to determine the criteria to be used in accepting or rejecting a drought plan and then develop metrics with which to evaluate alternatives according to these criteria [5].

In 1991, participants in the US National Drought Study took stakeholder engagement one step further via workshops in which stakeholders participated in system model development followed by an application of the developed model to explore sector trade-offs of different system alternatives such as new reservoir operations. The study outcome suggested that this level of stakeholder engagement has the following benefits: (1) tapping into the knowledge and creativity of stakeholders early in the problem-solving process; (2) increasing the likelihood that stakeholders can take independent actions to reduce their drought vulnerability; and (3) enhancing the stakeholder support for final water management plans [5].

Following the success of the National Drought Plan, USACE began to develop these concepts beyond drought planning and renamed the method: Shared Vision Planning (SVP). The SVP method aims to integrate traditional planning principals with systems modeling and

stakeholder collaboration to improve water resources management decision making. The ultimate goal is to improve the economic, environmental, and social outcomes of water management decisions. Between 1990 and 2009, 21 national and international water resources planning case studies were completed using the SVP method. These case studies confirmed an increase in stakeholder trust and cooperation as a result of the transparency of the method. Likewise, the process of working together removed relationship barriers such as lack of communication and control issues. The application of the system model to explore possible alternatives increased the probability of finding a mutually acceptable solution among stakeholders [6].

A key element developed through these case studies is referred to as the "Circles of Influence" of stakeholders, presented in Figure 1. The goal is to develop stakeholder groups that vary in level of engagement based on the existing knowledge of the stakeholder and the potential impact of the project on the stakeholder. The four groups or circles are defined as follows:

- Group A - the model building team,
- Group B - the model users and validators,
- Group C - any interested members of the public, and
- Group D - decision makers.

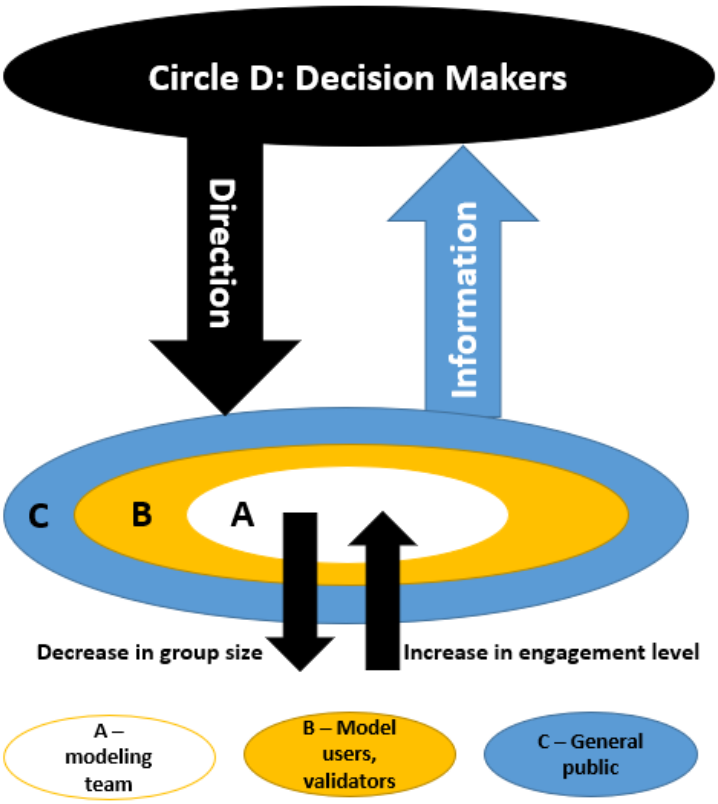

Fig. 1. Circles of Influence in stakeholder engagement adapted from Cardwell et al. (2009).

Group D consists of the decision makers who will receive information from the process in order to inform their decision making while also providing direction such as feasible or non-feasible alternatives. Group A consists of key subject matter experts who are leading the SVP process and the development of the model. This Group regularly exchanges with Group B throughout the model development process. Group B consists of government and non-governmental organizations involved in or impacted by the project. They should have technical knowledge of the system to aid in the model development and ensure that a range of sectors are represented in the process. And finally, Group C includes any interested members of the public. This group is less involved in the technical aspect of the SVP process but are kept informed at key phases in the process and provide feedback on elements such as (1) the identification of metrics and objectives to evaluate the problem; (2) selection potential system alternatives; and (3) evaluating the alternatives based on the model outputs. The level of engagement declines from Circle A to Circle C; however, communication must be maintained throughout the SVP process [7].

While the benefits of added stakeholder engagement are clear, negative aspects identified throughout these case studies include: (1) additional project costs; (2) the challenge of ensuring the most affected stakeholders are involved; and (3) a slower planning process due to the greater number of participants [5]. Basco-Carrera et al. (2017) provide a more recent evaluation of this type of technical, collaborative process in water resources management. They identified the following challenges of using collaborative processes in developing systems models for water resources planning: (1) conflicting goals between decision makers and stakeholders; (2) different levels of knowledge and expertise across the stakeholder groups; and (3) lack of communication between modelers (Group A) and stakeholders (Group B and C) results in the models being perceived as "black boxes" [8].

Despite these challenges, however, emphasis on stakeholder engagement continues to grow in water resources management through concepts such as IWRM and the water-energy-food nexus [9], as well as recently published climate change guidance documents [4-10]. These climate change guidelines encourage stakeholder engagement at each phase throughout the CRA process including:

- the identification of performance metrics and thresholds;
- the evaluation of system vulnerability to climate change;
- the identification of potential resilience measures;
- and the selection of a final climate resilience plan.

However, as climate change is a rapidly evolving area of research, the engagement of stakeholders presents new challenges for the communication of uncertainties. As highlighted by Basco-Carrera et al. (2017), different levels of knowledge and expertise across stakeholder groups make stakeholder engagement difficult. Therefore, as experts continue to advance in the area of climate change, communicating these advancements to stakeholders becomes more and more challenging [8].

As illustrated through this brief review, stakeholder engagement is an ever-evolving process and engineers, and planners are continuing to learn and adapt as the field of water resources management continues to advance.

3 Overview of Ruzizi III Project and Stakeholders

Ruzizi III HPP project is located on the Ruzizi River flowing from Lake Kivu to Lake Tanganyika at the border of Rwanda, Democratic Republic of Congo and Burundi. The

hydropower potential of the river is currently exploited by Ruzizi I and Ruzizi II Hydropower Schemes commissioned in 1959 and 1989 with a respective power capacity of 28MW and 45MW. The Ruzizi III project is located some 32km downstream of Lake Kivu and 13km downstream of the Ruzizi II Dam. It includes the dam, the hydropower plant and a 220kV transmission line to the dispatching station in DRC.

Ruzizi III HPP is part of the Programme for Infrastructure Development in Africa (PIDA) and involves Burundi, the Democratic Republic of Congo (DRC) and Rwanda forming the Economic Community of the Great Lakes Countries. It is a strategic project for the three countries as it will double Burundi's installed capacity, increase by a third the installed capacity of Rwanda and provide electricity in a DRC's region not connected to the grid.

It is the first regional power project in East Africa to be established as a public-private partnership (PPP). The Great Lakes Energy Organization (EGL), a sub-regional body which coordinates energy development in East Africa, is in charge of the project's implementation with the financial help of NEPAD-IPFF, a multi-donor Special Fund hosted by the African Development Bank to make regional or cross-border infrastructures projects investment ready.

The stakeholders involved in the management of Lake Kivu and the dams on the Ruzizi River include:

- The Lake Kivu and Ruzizi River basin organization (ABAKIR) which represents the three countries' interests and guarantees an integrated water resources management in the basin. They do not have any authority for deciding short-term water releases from the dams. Their objective is more about ensuring a long-term integrated management of Lake Kivu and the Ruzizi River that comply with international regulation, and about sharing the benefits obtained from the operation of dams.
- The owners and managers of the individual dams, in charge of operating them on a short-term basis, are:
  - Ruzizi I: SNEL, the DRC national electricity company
  - Ruzizi II: SINELAC (in which DRC, Rwanda and Burundi are equal shareholders)
  - Ruzizi III: L'Energie des Grands Lacs (EGL)
- The national operators of the electricity networks of the three countries, who ensure that the supply meets the demand.

A Centre of Coordination had also been suggested to the member states of the Economic Community of the Countries of the Great Lakes (CEPGL) to purchase water rights, optimize the production of electricity and serve as a unique interface between the country stakeholders [11].

As part of the Ruzizi III feasibility and design studies, the CRA aims to apply the recently released IHA Guidelines. The guidelines provide a practical approach to identify, assess, and manage climate risks to proposed and existing hydropower projects through a 5-phase process. Each of the 5 phases was applied to the Ruzizi III project. The final product is a Climate Risk Management Plan that builds climate resilience into the Ruzizi III project as well as a Monitoring, Evaluation, and Reporting Plan to ensure timely adaptation if needed. And finally, stakeholder engagement workshops are planned at key decision points throughout the process. More detail regarding the stakeholder engagement plan will be discussed in Section 4.

4 Stakeholder Engagement Methodology for the Ruzizi III Climate Risk Assessment

At the beginning of the Ruzizi III CRA, the TRACTEBEL team used existing knowledge of stakeholder engagement processes to develop a methodology best meeting the needs and constraints of the project. However, as previously mentioned, the Ruzizi III CRA was impacted by the COVID-19 pandemic, which restricted international travel and, therefore, limited stakeholder engagement. Therefore, TRACTEBEL was forced to adapt their stakeholder engagement method to meet the changing circumstances. Both the original and adapted methodology will be discussed herein.

The first step of the stakeholder engagement methodology was to identify stakeholder groups, or "Circles of Influence", as defined by the SVP methodology. The involved parties and their group classifications are listed in Table 1**.** As previously discussed, the classification of circles of influence is based on the role each stakeholder plays in the project, their technical knowledge, and their availability. Involvement increases from Groups C to A. Group A consists entirely of the TRACTEBEL Engineering CRA team. Their role is to lead the CRA as well as the development of a system model to be used in the CRA. They communicate at key points in the model development process with Group B to verify the system model development based on Group B's first-hand experience with operating the Ruzizi cascade.

Group C consists of less technical stakeholders, including relevant government and non-government organizations intending to represent cross-sector public interests. While their engagement is limited, they will be involved at key decision points in the CRA process such as determining system vulnerability to projected future climate changes as well as selecting potential resilience measures or alternatives.

And finally, Group D consists of the decision makers in the CRA process. It is the role of Group A to continuously communicate stakeholder feedback to Group D while Group D provides direction for the CRA process and ultimately, makes the final decisions.

Table 1. Circles of Influence for the Ruzizi 3 CRA Stakeholder Engagement Process.

Group	Description	Entitie(s)	Role
A	Modelers and CRA team	Tractebel Engineering Team	Develop models and complete CRA.
B	Operators of existing system with extensive technical knowledge	EGL, SNEL, SINELAC	Provide necessary data and information for system model development. Verify model results.
C	Representatives of the general public and stakeholders within the system	ABAKIR, CEPGL, Relevant government and non-government organizations	Review CRA results and provide feedback.
D	Final decision maker	Client	Direction throughout process and Final decision-making power.

The original and revised stakeholder engagement plan is presented in Figure 2. The original stakeholder engagement plan was based around an initial in-country mission for data collection and exchanges with subject matter experts (Groups A, B) as well as two in-country workshops at key decision points in the CRA process (Groups A, B, C, D). In between the kick-off mission and in-country stakeholder workshops, skype meetings were planned to review the model development progress with Group A, verifying model assumptions and reviewing model performance.

Following the COVID-19 pandemic, however, international travel was no longer feasible, and the plan was adapted. While the revised plan maintained the kick-off mission (Groups A and B) and two stakeholder workshops (Groups A, B, C, and D), everything was conducted virtually. To improve communication, the TRACTEBEL Team also launched a website to engage more continuously with stakeholders. The challenges and opportunities presented by these changes will be discussed herein.

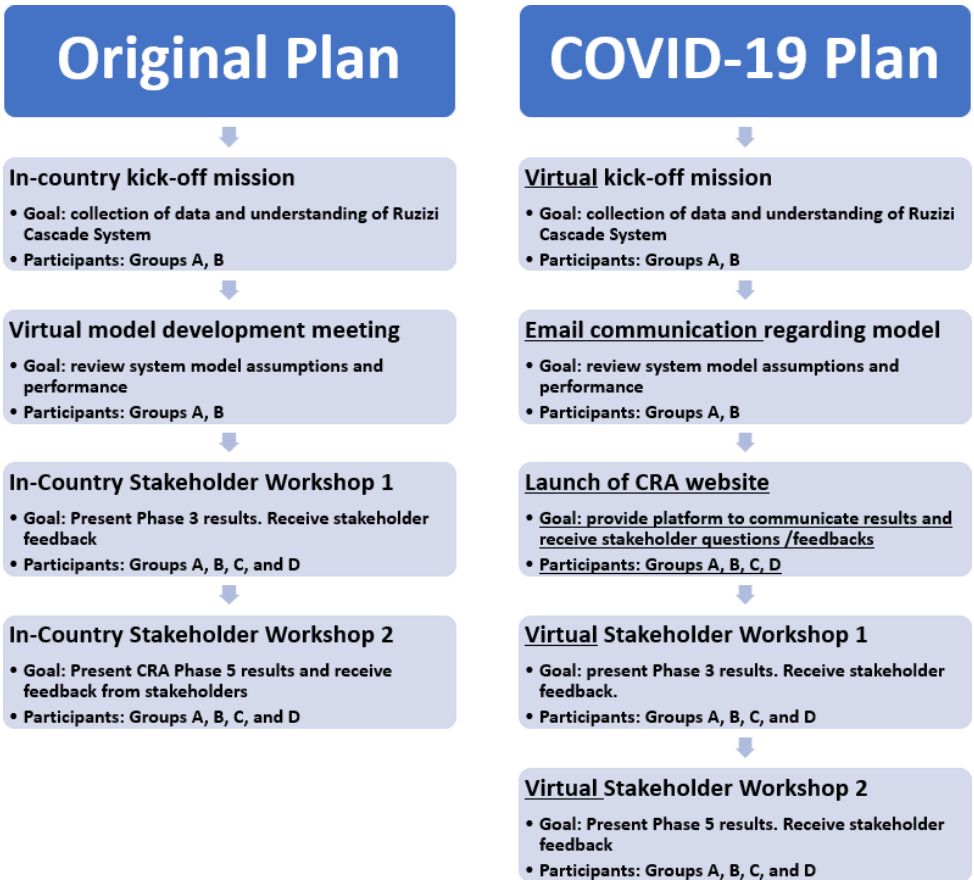

Fig. 2. Stakeholder engagement plan: Original (left) and COVID-19 adaptation (right). The changes in the original plan are underlined in the COVID-19 adaptated plan.

Virtual kick-off mission. The challenges and opportunities faced during the virtual kick-off mission greatly influenced the revisions made for the COVID-19 version of the stakeholder engagement plan. As is often the case with international collaborations, the poor quality of the Skype call hindered the kick-off mission. As a result, the Tractebel team continued to revise the originally planned virtual meetings for model development to continuous email exchanges and a website to communicate future results, as presented in the COVID-19 final plan. The virtual meeting did, however, provide the opportunity to have more participants from Group A, who would have normally been excluded due to travel budget limitations.

System model development (Groups A and, B) via email. Following the kick-off mission, Groups A and B continued to work together on the system model development via email exchanges. Group B shared relevant operating and observation data and verified the system reservoir model performance. The key challenge at this phase was the response timing. Not being able to directly communicate between groups resulted in delayed responses and, therefore, delayed project schedules.

Launch of website to communicate results, receive questions, and organize workshops (Groups A, B, C, D). The most significant adjustment to the Original Plan was the launch of a project website to better communicate project progress to stakeholders. After experiencing the poor connection during the virtual kick-off mission, the Tractebel team wanted to ensure that stakeholders had the opportunity to review the CRA progress and results independently of the proposed virtual stakeholder workshops and communicate any questions in advance. The greatest challenged posed by the website development, however, was the delay in timing. The website was an unexpected task in the CRA, and time was lost in identifying a contractor and designing a website. As a result, the CRA advanced more quickly than the stakeholder engagement element, meaning that certain decision points lacked stakeholder participation, particularly from Group C who has the most limited involvement. For future studies, this process will be anticipated in advance and completed early in the CRA process to ensure engagement with all stakeholder groups as the process advances rather than at the final stages of the process.

Given the website development delay, the project is only now launching the website. Anticipated challenges in communicating via the website are as follows:

- Appropriate technical level for audience. Basco-Carrera et al. (2017) highlight that different levels of knowledge and expertise across stakeholder groups make stakeholder engagement difficult. This is heightened by the lack of in-person discussion and opportunity to explain technical concepts. If the material presented on the website is too technical, we risk losing our audience early in the process.
- Ease of access. Due to confidentiality issues, the site required private accounts for stakeholders which creates an additional step to access information about the project and may deter stakeholder engagement
- Confidentiality. While private accounts are required, that does not ensure that the project information will not be shared. To avoid this, project information was embedded in the website without the option to download the documents.
- Internet limitations. The original idea was to include recorded presentations embedded in the website to provide more charismatic explanations of the CRA process and results rather than requiring stakeholders to read reports. However, concerns over internet quality outweighed the benefits of this option and only executive summaries of each phase were included on the website.

Despite these expected challenges, the Tractebel team also recognizes that there is a lot of potential for opportunities presented with this method. For example, the website offers the opportunity for stakeholders that might otherwise have been hesitant to ask questions and engage to so do privately via a direct message to our team. Furthermore, the duration of stakeholder engagement is increased. Whereas project budgets often limit opportunities for multiple in-country workshops, the use of a website to engage with stakeholders allows for a more centralized and visual means of communicating the progress of the project and receive feedback from stakeholders continuously rather than limited to the in-country workshops.

Virtual Workshops (Groups A, B, C, D). Based on the difficulties encountered during the virtual kick-off mission, the Tractebel team anticipates significant challenges for the workshops. A key challenge is the selection of the best medium with which to host the workshops. Rwanda recently placed a ban on the use of Zoom and not everyone has access to Microsoft Teams. And finally, the Skype call did not work well in initial meeting. The selection of a medium is yet to be determined and will be discussed in the presentation.

Based on this key challenge, the workshop duration will be significantly shortened. Whereas workshops usually last one day, the Tractebel team believes that it would be more difficult to keep stakeholders engaged via a virtual workshop. Therefore, workshops are being restructured to rely heavily on the website to communicate results. The Tractebel team plans to compile questions in advance, provide a brief presentation of the results, respond to the questions as a group, and provide the opportunity for any final questions.

As with the virtual kick-off mission, the key potential opportunity is the possibility to have greater attendance given the fact that international attendees may not have been able to travel to the original in-country workshops due to budget or travel restrictions.

5 Conclusions and lessons learned

As the field of water resources planning and management continues to evolve, the role of stakeholders is increasing. The Ruzizi III Climate Risk Assessment (CRA) aims to include stakeholders in system model development as well as key decision points throughout the process. Stakeholders were divided into “circles of influence” groups, ranging in technical knowledge and level of engagement and assigned different roles in the process. Group A included the TRACTEBL team tasked with developing the system model and conducting the CRA. Group B consisted of technical, subject matter experts such as current operators within the Ruzizi cascade to assist in system model development while Group C consisted of less technical stakeholders more representative of the general public and covering sectors outside of hydropower. And, finally, Group D consisted of the key decision makers, in particular the client.

The overall stakeholder engagement plan was significantly adapted following the COVID-19 pandemic, which limited international travel. Key changes to the stakeholder engagement plan included the shift from in-country missions and workshops to virtual meetings as well as the launch of a project website to communicate results. However, this posed a major challenge to the project due to delays in the website development. This was an unexpected task in the CRA, and time was lost in identifying a contractor and designing a website. For future studies, this process will be anticipated in advance and completed early in the CRA process to ensure engagement with all stakeholder groups as the process advances rather than at the final stages of the process.

In addition to project delays, good internet connection is a key element in the success of a virtual stakeholder engagement process. The Tractebel Team would have preferred more opportunities to interact with Group B in the system model development process. Skype calls were challenging while the response to email was often slow and the CRA process advanced quite quickly. Better internet connection would allow for more frequent Group A and B virtual sessions to ensure a both parties understand the communicated information.

While the adapted stakeholder engagement plan has faced difficulties, the replacement of in-country workshops with a website and virtual workshops may provide more opportunities than challenges. The website interactions allow for more continuous engagement with stakeholders rather than limiting interactions to two in-country workshops. In addition, it creates a more private means of communication for stakeholders hesitant to participate regarding technical subject matter. And finally, participant levels may increase as travel is no longer necessary to attend.

The virtual workshops are scheduled for the end of 2020 and the final conclusions and lessons learned will be discussed in detail during the presentation.

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