Mainstreaming climate change into water policies: a case study from Burkina Faso
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ABSTRACT
Climate change (CC) in Burkina Faso is projected to materialize by, among other things, an increased frequency and intensity of extreme weather events. Not properly addressing the impacts of these projected CCs on water resources will yield enormous economic and social cost and compromise the country’s development objectives. However, Burkina Faso’s National Water Strategy (NWS) had not sufficiently addressed CC impacts, and recently development partners have started an initiative to help fill these gaps. The current study aims at documenting lessons learnt from this multi-partner process of integrating CC adaptation (CCA) into the NWS. The integration process was done using the climate proofing tool, an approach based on evidence of the vulnerability of water resources to CC. It consisted of (i) an initial assessment of the integration of CCA into the NWS and (ii) a formulation of a set of actions to reduce the vulnerability of water resources to CC. Lessons drawn from the CCA integration process are also presented.

Key words | adaptation, climate change, climate proofing, National Water Strategy, water resources

HIGHLIGHTS
- The initial National Water Strategy (NWS) does not sufficiently address climate change (CC) impacts.
- The climate proofing for the development tool was effective in integrating CC adaptation measures into the NWS.
- Climatic trends, exposure units and effects were identified.
- A list of CC adaptation actions to be integrated into the NWS was established.
- Lessons learnt from the process of mainstreaming CC into the NWS are presented.

INTRODUCTION
Climate change (CC) and its impacts are currently a major worldwide concern (IPCC 2013). Developing countries, due to high exposure and limited adaptive capacities, are reported to be the most vulnerable ones (IPCC 2014). They are, therefore, those in greatest need of support for CC adaptation (CCA; IPCC 2007; Ayers & Dodman 2010).

Specifically, for West Africa, many impact studies have shown severe consequences of CC on water resources (Ruelland et al. 2012; Mahe et al. 2013; Aich et al. 2014). This includes significant changes in river flows (Aich et al. 2014).
and increased risk of water stress and flooding (Oyerinde et al. 2014; Sylla et al. 2015). Other authors also reported, as a consequence of an increase in temperature, a decrease in precipitation associated with the intensification of the seasonal cycle and the frequency of extreme events (Piani et al. 2010; Yira et al. 2017), although large uncertainties remain (Salack et al. 2015).

The West African Sahel has, over the past decades, experienced climatic situations characterized by fluctuations in arid and humid periods. This resulted in recurrent extreme events such as droughts and floods, and increased water stress (Kasei et al. 2010). Reduction in rainfall and water resource decline for Sahelian countries will have severe consequences on socio-economic and health sectors (Bognini 2012). Several hydrological studies carried out in this part of Africa have shown considerable changes in river regimes. This includes a decrease in the runoff from large basins, a decrease in river levels, and an increase in the drying up coefficient of these basins (Bamba et al. 1996). Several studies achieved similar results and additionally reported that, under changing climate conditions, the decrease in rainfall will cause a drop in base flow and groundwater recharge (D’orgeval 2006; Boubacar 2012).

Water is a major development issue for Africa. Water access is more affected by the economic scarcity of water, linked to a growing demand. Moreover, Nguimalet et al. (2016) report that this resource is quantitatively and qualitatively lacking due to unfavorable climatic conditions, population growth, pollution and insufficient hydraulic infrastructures. Under current CC conditions, the implementation of adaptation strategies to cope with the potential impacts of CC on hydrological systems is an imperative for rational water resource management (Piani et al. 2010; Zougmoré et al. 2019).

Burkina Faso is already suffering the adverse effects of CC. As a result, the country has developed many CCA initiatives, including a National Climate Change Adaptation Plan (NAP) adopted in September 2015. The NAP is the national repository to facilitate a systematic integration of CCA into development efforts. This Plan provides guidelines for CCA development policies in priority sectors vulnerable to CC (agriculture, livestock, health, environment, energy, infrastructure and water resources).

However, Theokritoff & D’haen (2019) indicated that national policies do generally not adequately support CCA actions. Integrating CCA into short- and medium-term development policy decisions is, however, an effective response to CC (Persson & Klein 2008).

This integration is strongly supported by many international funding agencies, which recognize the advantages of the approach as a means of ensuring the sustainability of investments (Lebel et al. 2012).

Many studies have explored various barriers that could limit the process of integrating CCA into policies. These barriers mainly include an uncertainty of scientific knowledge (Dessai & Van de Sluijs 2007), insufficient funding and appropriate technologies (Dike et al. 2018) and weak state institutions (Roberts 2010; Nambi & Prabhakar 2011; Eisenack et al. 2014). These constraints are exacerbated by the lack of clear methodologies to study how such an integration is applied in practice (Tang et al. 2009; Ayers et al. 2014). As a consequence, there are few studies addressing the use of tools for integrating CC into the planning process.

This study is a contribution to the integration of CCA into water sector planning through the National Water Strategy (NWS) of Burkina Faso. It is based on the use of the climate proofing tool. The study essentially apprehends (i) the level of CC integration into the NWS, (ii) water resources exposure to CC, taking into account the country’s regional disparities and (iii) the appropriate CCA measures to be implemented into the NWS including monitoring-evaluation indicators and a budget.

Climate proofing is primarily based on the identification of affected resources and livelihoods and can be applied to all development sectors at national and local levels. Burkina Faso is in the process of updating its NWS in order to integrate the Sustainable Development Goals and harmonize its water planning tools. This represents a real opportunity to develop climate resilience for the water sector. Moreover, the study is in line with the strategic axis #5 of Burkina Faso’s NAP which focuses on the systematic integration of CCA into development policies and strategies. It can guide future initiatives and research on the integration of CC into development planning, as to date few studies have investigated on this integration (Theokritoff & D’haen 2019).
METHODOLOGY FOR MAINSTREAMING CC INTO THE NWS

The climate proofing of the NWS

The literature has identified several approaches to integrating CC into development planning (Traoré 2015; Di Gregorio et al. 2017; De Roeck et al. 2018; Weikmans 2018). However, Ayers et al. (2014) have shown that there is no single best approach for achieving CC integration. While previous studies have applied (i) expert-based opinion (Brouwer et al. 2015; Roy & Chan 2014), (ii) vertical and horizontal approaches (Rauken et al. 2015; Di Gregorio et al. 2017) and (iii) literature review and semi-structured interviews (Swart et al. 2014; De Roeck et al. 2018) to assess climate policy integration, this study used the Climate Proofing for Development (CPD).

The CPD was chosen for its flexibility and ease of use as well as its previous application in many countries such as Benin and Senegal, respectively, for the National Health Development Plan (PNDS) and the Action Plan for Integrated Water Resources Management (PAGIRE) (GIZ 2018, 2019). Moreover, the CPD is among the six main tools identified that can serve as a model for taking into account CC in the definition of development policies and programs in three West African countries, namely Mali, Senegal and Burkina Faso (UICN 2017).

Climate proofing refers to making a plan or an investment more resilient to CC. It also indicates that climate policies are integrated into policy documents. ‘CPD’ is an approach developed by GIZ to enable decision-makers and planners to systematically integrate CC into planning processes at national, sectoral, local and project levels (Hahn & Fröde 2010). The methodological framework consists of (i) an analysis of planning tools and documents to assess the extent to which CC is taken into account and (ii) the level of integration of CCA measures in order to ensure a long-term sustainability of investments and reduce the sensitivity of development activities to the current and future climate (Klein et al. 2007).

The CPD tool is ideally applied from the beginning of the planning phase but can also be used when revising planning. The description of the evolution of climate parameters, the choice of exposure units (EUs), the determination of biophysical and socio-economic effects and the identification of adaptation strategies are the main steps necessary for the application of CPD (Table 1).

The approach adopted for the process of integrating CC into the NWS has faithfully followed the steps mentioned above while applying the CPD tool except for the integration step (integration is, however, addressed in the conclusion section).

The CPD of the NWS was implemented in July 2019 and involved about 30 experts working in the field of CC and water through a number of meetings and a national workshop. Initial presentations were made on the CPD to equip participants. The presentations focused on, among other subjects, (i) the CPD tool, (ii) the vulnerability of water resources in Burkina Faso, (iii) a case study on the ‘vulnerability of water resources to CC: key concepts, principles, methods and results’, (iv) the challenges of CC in Burkina Faso and (v) the NWS.

The initial level of CC integration into the NWS

The application of CPD involves a prior identification of entry points for CC integration that can take place at

| Table 1 | Main steps of the CPD approach |
|---|---|
| **Step 1: Preparation of the process** |
| Identify the entry point or planning document (SNW) |
| Identify key stakeholders and define their responsibilities |
| Collect information |
| **Step 2: Analysis** |
| Identify climate trends and the EUs |
| Describe biophysical and socio-economic effects |
| Evaluate the level of each identified climate risk |
| Defining the impact chain of CC on the EU |
| **Step 3: Stock options** |
| Identify and prioritize CCA options |
| Analyze the coherence of the proposed actions |
| Formulate monitoring-evaluation indicators |
| Budgeting identified actions |
| **Step 4: Integration** |
| Integrate adaptation measures into planning and budgeting processes |
| Set up a monitoring-evaluation system |
different levels and stages of planning (GIZ 2013). Eriksen & Naess (2003) suggest three key dimensions that need to integrate CC, namely (i) natural resource management, (ii) poverty reduction and economic development, and (iii) humanitarian assistance. In the current study, a literature review on the vulnerability of water resources and the economy of the country guided preliminary discussions between the authors and the ministerial authorities in charge of Agriculture, Water and Animal Resources. A couple of working sessions helped assess the planning situation in the water sector of the country and led to the identification of the NWS as the entry point for CPD application to the national water resource management policy (step 1). Once the entry point was identified, consultations were held with stakeholders to demonstrate the need to address CC in the NWS (step 1). The consultations primarily discussed issues related to CC, the vulnerability of water resources to CC and the benefits of integrating CCA into the planning process. Once a common understanding was achieved and the expected results and objectives set, the analysis of the NWS was carried out to assess its level of CC integration. The assessment was based on a series of indicators adapted from the literature (Klein et al. 2007; Huge & Hens 2009; Huq et al. 2012; Brouwer et al. 2013). The consideration of CC was done according to (i) the identification of water-related challenges due to CC, (ii) the accurate representation of CC, (iii) the presentation of the causes and impacts of CC, (iv) the vulnerability of water to CC, (v) the identification of options, instruments or technologies promoted to strengthen the consideration of CC and (vi) the attention given to the process of mainstreaming of CCA. Each of these indicators has been assessed on a scale as follows: 0 = not mentioned; 1 = identified but not elaborated; 2 = identification or elaboration of the concept. Based on the total score, the initial level of CCA integration into the NWS was interpreted following Huq et al. (2012): 0–4: little or no progress in the process of integrating CC into the planning document under consideration; 5–8: the document has a growing level of understanding of the requirements of climate-sensitive policies and recognizes the need to integrate climate-friendly measures into them and 8–12: this is an intermediate step, where the document develops plans and tools to address the adverse effects of CC.

### Assessment of climatic parameters, EUs and impacts

The workshop participants (experts) identified climatic trends and EUs as well as biophysical and socio-economic effects at the national level. They also identified for each EU and changing climate variable the factors affecting its vulnerability and the water sub-sector to be potentially impacted.

### Identification of CCA options

The identification of adaptation options during the workshop was done in three focus groups consistently with the three pillars of the NWS. The experts reviewed all the actions contained in the NWS and proposed additional ones, taking into account the CC dimension and the adaptation measures related to the water sector as proposed in the country’s NAP.

The identified additional CCA actions have been budgeted (following the same rules and standards that were used to budget the initial NWS actions and ongoing experiences). These CCA actions were further broken down into monitoring–evaluation indicators in the NWS.

### RESULTS

#### Initial status of CC integration in the NWS

CC is mentioned as a risk factor and as a major constraint to the implementation of the NWS in the body of the initial document. Although reference is made to the negative impacts of CC on water resources and adaptation actions, these impacts and actions are not specifically developed. Nor does the NWS take into account CC aspects at the analytical, policy and budgetary levels. The level of integration of CC into the NWS was therefore assessed as low (Table 2). For illustration purposes, one notes that an analysis of water resources in the face of CC is missing in the ‘diagnostic section’ of the NWS. As the initial analysis is formulated, it mainly addresses the state of water resource availability, its quality, demands and uses.
Analysis of the vulnerability of water resources to CC

The hazards the country’s water resources are exposed to in a context of CC are essentially temperature rise, winds, decrease and increase in rainfall and drought.

The increase in temperature

Climate models generally agree on a rising temperature trend for the future in the country (LAME 2012; Salack et al. 2015; LeJeune & Saeed 2019). This increase in temperature, in relation to the induced increase in potential evapotranspiration, will potentially have adverse consequences on water resources. Both the availability (will decrease) and demand (will increase) will be negatively affected. This will impact water productivity, water needs and the efficiency of use for sectors like agriculture, livestock and energy (Novoa 2012).

The rise in temperature will also result in a warming of water, which reduces its capacity to biodegrade certain pollutants, leading to a decrease in quality (Novoa 2012). This vulnerability will be worsened by the current poor level of water management.

The winds

Winds are not listed as a major climate hazard for the country, unlike others regions such as Asia, Australia, North America, Oceans and Small Islands (IPCC 2014). Nevertheless, participants insisted that winds be considered among the climatic hazards in the context of Burkina Faso, due to their effects on water resources and infrastructures, particularly in the Sahelian and Sudano-Sahelian zones. Strong wind impacts are very similar to those caused by rising temperatures. The induced negative consequences are a decrease in water quantity and quality, the destruction of hydraulic infrastructures and the decrease in water supply and availability (Boer et al. 2012). However, these negative impacts will be accentuated by other factors such as population growth, deforestation, poor agricultural practices and the poor quality of construction materials (Novoa 2012).

Drought

Drought is a phenomenon that occurs when rainfall is significantly below normal recorded levels and causes significant hydrological imbalances that are detrimental to land resource production systems (IPCC 2001). It affects the quality of surface and groundwater, thereby reducing the availability of water resources.

It therefore increases water insecurity and generates conflicts over access to water that will be aggravated by many factors of vulnerability, including poverty, poor management, low level of water governance and knowledge of the resource. The country drinking water supply situation remains vulnerable as evidenced by recurrent water shortages in all cities. Possible reasons include a low storage capacity of dams and the high demand from a rapid growing population.

Increased precipitation

Increased precipitation can lead to increased water availability that can improve agricultural production and hydroelectric potential. However, the projected increase in rainfall intensity can lead to an increase in shallow groundwater contamination (Macdonald et al. 2009) and the destruction of water and sanitation facilities. This will be aggravated by vulnerability factors like poor design, low-grade construction materials, obsolescence of dams, as well as institutional governance and incivility. Increased rainfall will also be reflected in increased runoff, high peak flows and waterlogging. This will result in floods. Factors such as poor land use and deforestation will aggravate

| Indicator | Identification of water-related challenges due to CC | Exact representation of the CC | Presentation of the causes and impacts of CC | Vulnerability of water to CC | Identification of CC option | Attention to the integration of CC | Total |
|-----------|--------------------------------|--------------------------------|--------------------------------|-----------------------------|----------------------------|--------------------------------|-------|
| 1         | 1                              | 1                              | 0                              | 1                           | 0                          | 4                              |       |

Table 2 | Assessment of the initial level of integration of CCA into the NWS

F. Basson et al. | Climate change adaptation and water policies of Burkina Faso
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these impacts. Moreover, floods have an important health impact as vectors of many diseases such as malaria or dengue fever could rapidly proliferate (Hébert et al. 2014).

**Decreased precipitation**

The hydrological regime is dictated in the country mainly by precipitations. As such, the effects of a reduced rainfall will translate into a decrease in infiltration, degradation of water quality and a drop in river flows (Bamba et al. 1996).

Moreover, a decrease in rainfall can lead to a reduction in groundwater recharge and a drop in groundwater levels. Such a situation will have negative impacts on the different sectors of the country’s socio-economy.

**Identified CCA actions to be integrated into the NWS**

The CCA actions to be integrated into the NWS as identified by the participants are presented in Table 3. These actions were deemed effective despite a projected uncertain precipitation change signal for the country (also referred to as ‘no-regret’ actions). The actions are presented consistently with the three strategic axes of the NWS. They are consistent with the priority adaptation needs of the water sector contained in Burkina Faso’s NAP and focus on (i) strengthening the mobilization and development of water resources, (ii) strengthening the preservation and protection of water resources, (iii) strengthening knowledge on water resources in the context of CC and (iv) improving access to sanitation (Burkina Faso 2015).

**DISCUSSION**

**Analysis of the application of the CPD to the NWS**

Elaborating policies that integrate adaptation to CC represents a major challenge for development. The evaluation of the initial NWS shows that the CC dimension was not sufficiently taken into account. This is in line with the results achieved by Huq et al. (2012) who demonstrated that water resource development policies have not sufficiently integrated the issue of CC impacts. This can be partly explained by a low ownership of national climate information and action tools by key actors in the planning process and their lack of knowledge of the issues and vulnerabilities related to the impacts of CC. The low ownership of climate information tools by the actors was already noted in an analysis of institutional barriers to adaptation to CC in Burkina Faso (Basson et al. 2020, in press). Indeed, a weak coordination of actions to address CC and a lack of knowledge of most sectoral ministries about the National Climate Change Adaptation Plan (the national reference framework for adaptation measures) was reported.

Besides a low ownership, several authors (Inderberg & Eikeland 2009; Ayers et al. 2014) point out that despite the level of technology, information, financial and human resources, weak and inefficient institutional structures are major constraints to successful climate adaptation planning.

These institutional factors include a weak collaboration between actors, the lack of leadership and insufficient financial resources (Cuervas et al. 2015; Uittenbroek 2016; Mees 2017). Huq et al. (2012) added the lack of a contextual understanding of CC issues as a reason for the low integration of CCA into planning documents. They suggest improved coordination among stakeholders as key to making these documents climate-resilient.

Aylett (2015) conducted a survey on the urban governance of CCA in 350 municipalities on five continents. Findings from this study indicate that 75% of respondents reported that their local governments are integrating adaptation into long-term or sectoral plans. The results of the current study also corroborate the findings of authors such as Rauken et al. (2015) and Di Gregorio et al. (2017), who, using the vertical and horizontal policy integration approach, reported that none of the major development planning documents have comprehensively integrated CC. In contrast, other more recent studies such as De Roeck et al. (2018), based on literature review and semi-structured interviews with experts as well as European Union (EU) aid activities in nine developing countries, indicated that all the evaluated policies show high levels of CCA integration into EU development efforts for the 2014–2020 policy cycle. In the same vein, Swart et al. (2014) showed that 56% of the analyzed land use and water management projects took CC into account.

However, many authors (Ayers et al. 2014; Picketts et al. 2014) have shown that there is a real lack of information on
| Axis 1. Knowledge, mobilization and management of water resources | Axis 2. Universal access to safe drinking water and sanitation | Axis 3. Governance of the water and sanitation sub-sector |
|---|---|---|
| 1.1. Update standards for hydrological and hydraulic facilities/works design taking into account future climate conditions | 2.1. Clean up existing water infrastructures to increase their water storage capacities | 3.1. Create an interactive platform for dialog between water users to change the behavior of stakeholders with regard to the protection and uses of water |
| 1.2. Develop and promote technologies (local ecological materials and bank revegetation) to reduce evaporation from water bodies | 2.2. Use water surface cover plants to reduce evaporations | 3.2. Hold regular sessions of the interactive platform |
| 1.3. Develop and promote mechanisms for managing the risk of structural failure (early warning system) | 2.3. Build U-shaped reservoirs for the purpose of reducing the loss (through evaporation) of the quantities of water mobilized | 3.3. Support the organization of the national water forum for communication and advocacy for water resource management in the context of CC |
| 1.4. Implement groundwater recharge solutions | 2.4. Reinforce/build water and wastewater drainage facilities | 3.4. Advocate for a national water and climate research institute |
| 1.5. Improve the national hydrological observation network (hydrology, piezometry, water quality and water uses) | 2.5. Harness deep groundwater potential | 3.5. Advocate for a national platform for the dissemination of information on water and climate |
| 1.6. Set up a hydrological forecasting service to improve knowledge of water resources and consequently design-adapted management | 2.6. Establish water production centers (surface water or groundwater) to improve the supply of drinking water | 3.6. Develop and update a national multi-hazard plan for preparedness and response to climate-related water disasters |
| 1.7. Develop a hydrological information system (produce hydrological forecast bulletins) | 2.7. Build multi-villages drinking water systems to ensure water availability | 3.7. Update the action plan of the environmental Unit of the Ministry of Water and Sanitation (MWS) |
| 1.8. Establish a national water research institute (for climate impact assessment) | 2.8. Update standards for drinking water supply and sanitation facilities | 3.8. Advocate for the implementation of the action plan of the environmental Unit of the MWS to improve the integration of CC into water resource management |
| 1.9. Set up hydrological models for the national basins, and develop and improve soil conservation techniques | 2.9. Harness rainwater harvesting to increase the quantity of water available | 3.9. Strengthen the capacity of MWS actors to facilitate the development of projects eligible for climate-related funds |
| 1.10. Improve climate and hydrological impact research capacity (training PhD and MSc students on climate and water) | 2.10. Establish wastewater collection, treatment and redistribution plants (domestic and industrial) to avoid wasting water (increase availability) | 3.10. Establish a committee responsible for developing projects eligible for the various climate funds |
| 1.11. Investigate and develop floating photovoltaic power plants | 2.11. Develop and promote water-efficient technologies | |
| 1.12. Strengthen the protection of dyke and dam embankments | | |
| 1.13. Create windbreaks around surface water bodies (to secure and protect banks and prevent silting and excessive evaporation) | | |
| 1.14. River banks and ecosystems, and groundwater protection against invasive species and pollution | | |
how CCA integration is applied in practice. This could explain the lack of knowledge about the integration process. In general, for African cities, climate planning is assigned to the responsibility of a small team or consultants. This makes it the only region where a significant percentage of cities reports that CC planning efforts are being done by a consultant (Aylett 2015).

This confirms the idea that the lack of human and expert resources considerably hinders the integration of CCA into local planning (Mukheibir & Ziervogel 2007; Moser & Ekstrom 2010). Roberts (2010) adds that CC requires specific skills related to it. Swart et al. (2014) suggest institutionalizing the application of climate proofing in environmental impact assessments and all strategic environmental assessments.

Participants in the process of CCA integrating into the NWS have developed a chain of CC impacts on water resources based on increasing temperatures, winds and changes in precipitation (drought, decrease and heavy rainfall). Similar results were observed in Senegal by GIZ (2019) with the application of CPD to PAGIRE. Other authors (Bodian et al. 2018; Sane et al. 2018) have used the same climate indicators to characterize climate variability and its impacts on water resources (runoff, infiltration, piezometry and quality). Furthermore, the GWP (2012) highlighted droughts and floods as the main challenges that Africa should address to ensure its water security. These climate hazards are likely to affect both the quantity and quality of water resources. CC is therefore expected to exacerbate water shortages by affecting rainfall, increasing temperatures and disproportionately affecting water resources (Roudier et al. 2014).

Exposure of water resources to these climate hazards impacts other sectors like agriculture, livestock, forestry, health, energy, fisheries and habitat. It also affects the performance of water and sanitation facilities and increases conflicts of access to water among users. Gordon et al. (2013) reported changes related to electricity generation, as well as agricultural and industrial water use. According to IPCC (2007), by 2025, 25 African countries will be subject to water shortages and water stress due to drought. The proposed CCA actions to be integrated into the NWS aim at facing an increase of temperatures (e.g. harnessing groundwater potential and using water cover technologies) and both increase and decrease of precipitations (e.g. increasing surface water storage capacity, strengthening hydraulic facilities, improving drainage capacities and developing early warning systems). Water governance actions are also proposed for an effective climate-resilient water strategy.

The vulnerability of water resources is likely to be exacerbated by factors such as water sector governance, socio-economic context, land use and population growth. The impacts of CC will potentially undermine development challenges and the resilience of ecosystems and people. Development planning responses play a key role in meeting these challenges. Burkina Faso is not on the fringes of this situation, which requires the implementation of adaptation options to improve the resilience of different sectors of activity and populations. Therefore, adaptation options have been identified to reduce the adverse impacts of CC on water resources. Following the CPD of the NWS, the overall score obtained by the amended NWS equals nine (it is worth noting that the initial NWS was 4), meaning that the new NWS document has integrated plans and tools to address the adverse effects of CC (Table 4).

Indicators for monitoring and evaluation of the formulated CCA actions and the estimated cost of implementing each option were proposed. The induced cost of integrating the CCA into the NWS was estimated by experts to US$ 813 744 701.60, i.e., an increase of about 11% compared with the initial NWS. In addition to the identified adaptation measures, the participants recognized, as Aylett (2015) did, the importance of formal education and training programs on climate as an effective strategy for integrating CC into

| Table 4 | NWS made climate-sensitive |
|-----------------------|---------------------------|
| **Indicator**         | **Identification of water-related challenges due to CC** | **Exact representation of the CC** | **Presentation of the causes and impacts of CC** | **Vulnerability of water to CC** | **Identification of CC option** | **Attention to the integration of CC** | **Total** |
|-----------------------|----------------------------------------------------------|---------------------------------|------------------------------------------|---------------------------------|---------------------------------|---------------------------------|----------|
| 1                     | 1                                                         | 1                               | 2                                       | 2                               | 2                               | 2                               | 9        |
planning. Stakeholders also argue that multi-stakeholder collaboration is needed to facilitate the integration of CC into the planning and budgeting process (Moser & Ekstrom 2010; Swart et al. 2014; Vincent et al. 2017; Runhaar et al. 2018).

Lessons learnt from the process of mainstreaming CC into the NWS

The following lessons were drawn from the process of mainstreaming CC into the NWS and might be useful in guiding future initiatives.

- Carefully choosing the entry point based on available information and the existence of opportunities to influence processes

  Integrating CC into science-based planning is a fundamental step. The choice of the NWS was mainly based on the availability of vulnerability studies in the area of water resources and economics carried out under the PAS-PNA project. These elements have truly guided since the initial discussions with planners from the different Ministries in charge of Agriculture, Water and Animal Resources. Thus, the interviews carried out made it possible to establish the planning situation and on the basis of this assessment, only the NWS offered a better opportunity to be subject to the process of CC mainstreaming because it was already undergoing a revision process (although at an advanced stage).

- The need to start the CPD process as early as possible at the beginning of the writing/revision process of the targeted policy

  By the time the CPD was to start on NWS, the development/revision of the NWS was at an advanced stage as the draft was validated by stakeholders (in December 2018) but was not yet approved by central committee. The actors who produced this first version of the document were reluctant to the CPD process because, in their opinion, the NWS took sufficient account of CC.

  However, the analysis of the document showed that although CC was mentioned in many places in the NWS, there was no methodological description of the vulnerability of the sector with respect to which concrete adaptation actions were proposed. There was therefore a lack of understanding of what the integration of CC into policy documents should be. The NWS steering institution also had a negative perception of the CPD approach which, apart from questioning the quality of the NWS on CC integration aspects, would also change the structure of the document. It was therefore important to conduct the exchanges with the stakeholders very tactfully and to give them an easily understandable explanation of the CPD approach, particularly reassuring them that, in this case where the policy revision was already at an advanced stage, the initial steps (assessments) of the CPD could also find that CC was already sufficiently integrated in the policy document and there would be no need to continue the process. Thus, starting the CPD at the beginning of the planning phase seems appropriate to avoid those difficulties. Indeed, it allows for a harmonized understanding of the actors on the relevance of the CPD process and facilitates the effective consideration of CC in planning.

- Bearing in mind the additional cost of identified climate actions and guiding stakeholders to explore opportunities for resource mobilization for the additional CCA

  The integration of CC into policy documents generates additional costs beyond the traditional development activities of the sector. As such, the application of CPD to the NWS led to an increased budget of 11% (compared with an initial budget) for climate options to be integrated into the planning. Moreover, supports from CC specialists are needed during the CPD process which also comes with a cost. Thus, to avoid actors feeling that their attention was drawn to new costs without any opportunity to mobilize funds to cover them, it is essential that the team leading the CPD approach also supports actors for identifying opportunities of climate finance (e.g. Green Climate Fund and Adaptation Fund) to support the identified CCA.

- The need for the approach to be as participatory and inclusive as possible, to increase stakeholders’ sense of responsibility and ownership

  The CPD involved participants from the technical services involved in the implementation of the NWS, the scientific community, Civil Society and the Private Sector. The involvement of stakeholders in the process has, on the
one hand, strengthened the sense of responsibility and partnership/ownership and, on the other hand, facilitated the identification of shared measures for improving the resilience of water resources to CC.

- The opportunity of using the CPD approach to strengthen the capacity of stakeholders

Integrating CC into policies is not always understood by sectoral actors and is not straightforward. Indeed, actors most often consider that mainstreaming CCA is limited to merely mentioning ‘CC language’ in policy documents. Whereas a good understanding would consist in first establishing the vulnerability of the sector to CC and then defining specific actions to address the expected climate impacts. During the CPD workshop, information on CC and its impacts was provided to participants.

The sharing of knowledge through the various presentations helped to build the capacity of some stakeholders on the concepts of CC issues and the process of integrating CC into planning.

**CONCLUSION**

Integrating CCA into the NWS forms part of the requirements of international climate agreements and contributes to strengthening climate governance. It is also a means of attracting technical and financial partners addressing CCA. From the results of the study, the application of the CPD tool to the NWS resulted in CCA actions that induced a substantial increase of the original budget.

The proposed adaptation actions include: (i) measures that aim at increasing water storage capacity through harnessing groundwater resources, protecting hydro systems to face water shortage, (ii) measures that aim at strengthening and updating standards for hydraulic facilities to face high discharges and flood hazards and (iii) measures aiming at improving water governance. Moreover, the process of mainstreaming CC into the NWS has yielded a number of lessons that could guide future initiatives as the country is in the process of revising most of its development plans: (1) carefully choosing the entry point based on available information and existence of opportunities to influence processes; (2) the need to start the CPD process as early as possible at the beginning of the writing/revision process of the targeted policy; (3) bearing in mind the additional cost of identified climate actions and guiding stakeholders to explore opportunities for resource mobilization for the additional CCA; (4) the need for the approach to be as participatory and inclusive as possible, to increase stakeholders’ sense of responsibility and ownership and (5) the opportunity of using the CPD approach to strengthen the capacity of stakeholders.

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**DATA AVAILABILITY STATEMENT**

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

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