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# Assessing Coherence between Sector Policies and Climate Compatible Development: Opportunities for Triple Wins

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**Abstract:** Climate Compatible Development (CCD) aims to deliver adaptation and mitigation without compromising development progress. To date, adaptation, mitigation and development related to key climate-sensitive sectors have often been treated separately. This paper uses qualitative document analysis, content analysis, expert interviews and a multi-stakeholder workshop to: examine the extent to which policies in climate-sensitive sectors align in framing adaptation, mitigation and development action; and identify key areas of policy coherence in Ghana. The paper answers the following questions: (i) To what extent are Ghana’s agriculture, energy, water, forest and wildlife sector policies aligned with climate adaptation, mitigation and development? (ii) What is the extent of policy coherence amongst climate-sensitive sector policies? (iii) Where are the key intervention points available to enhance CCD activities? Findings demonstrate that Ghana’s climate-sensitive sector policies in agriculture, water, energy, forest and wildlife arenas have elements that demonstrate good alignment with adaptation, mitigation, and development priorities. However, as yet, there is only “limited coherence” between climate-sensitive sector policies. The paper identifies the following intervention points: (i) the need to attach greater importance to the threat posed by climate change to agriculture; and (ii) the need to address the lack of inter-agency and inter-ministerial approaches for building partnerships with other stakeholders. Multi-stakeholder workshop discussions highlighted significant challenges relating to limited coordination amongst institutions and agencies, limited institutional capacity and a lack of resources in ensuring coherence. This requires strengthening of national institutions such as the Environmental Protection Agency (EPA) to provide appropriate mechanisms to ensure effective collaboration amongst climate-sensitive sectors to deliver “triple wins”. The EPA could exert greater influence by nominating “climate champions” in sector ministries.

**Keywords:** climate change; mitigation; adaptation; development; Ghana; sub-Saharan Africa

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## 1. Introduction

Climate change disproportionately affects sectors such as agriculture, water, energy and forestry in rural Africa [1,2]. Most economies and land-based livelihoods are highly sensitive to changing rainfall patterns because of their dependence on rain-fed agricultural systems and challenges of widespread poverty, low infrastructural development and weak adaptive capacity [1]. Climatic projections suggest that more intense droughts are likely to cause many parts of Africa to be drier into the future [1]. Increased incidence of extreme storms and floods are also projected [3]. Sub-Saharan Africa (SSA) is anticipated to experience both seasonal and annual rainfall variability [4,5]. Rising temperatures in combination with increased rainfall variability can adversely affect land-based livelihood systems that

support many households across SSA. For instance, a decrease in yields of major staple agricultural crops such as maize and wheat has been projected [6] with the area of crop land suitable for agricultural production also expected to decrease significantly [7].

Responses to climate change are being made through both mitigation- and adaptation-facing policy developments and multi-level planning initiatives. Mitigation aims at reducing atmospheric greenhouse gas concentrations. The international community has acknowledged that emission reductions alone cannot prevent the dangerous consequences of climate change and that adaptation is paramount [8]. Adaptation is defined as actions and processes to moderate the adverse effects of climate change whilst exploiting opportunities presented by climate change [9]. Adaptation involves adjustment in ecological, social, or economic systems so as to respond to effects or impacts of climate change [10]. Adaptation may be “autonomous” (in which case, coping strategies are mostly temporary and reactive in nature) or “planned” (whereby conscious policy options or response strategies address future climate stresses) [11]. Adaptation and mitigation have both received considerable attention in the Nationally Determined Contributions of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), in which member states outline their intended adaptation and mitigation actions for holding global warming to well below 2 °C above pre-industrial levels and pursue efforts to limit this to 1.5 °C [12].

Growing literature suggests that “Climate Compatible Development” (CCD) can provide “development that minimises the harm caused by climate impacts, while maximising the many human development opportunities presented by a low emission, more resilient, future” [13] (p. 1). It is argued that CCD offers opportunities to achieve “triple wins” [14,15], whereby adaptation efforts, mitigation strategies and development go hand-in-hand. In this paper, CCD is conceptualised as progress that offers benefits for adaptation, mitigation and development.

Various studies have highlighted the potential and challenges of trying to realize the promise of CCD [15–18]. For West Africa, Tanner et al. [19] provided insight into the political economy in Ghana’s artisanal fisheries, and identified institutional failing as the major constraint to CCD in the fisheries sector. Ellis et al. [20] highlighted relationships between mitigation and energy security and natural resource efficiency goals, as well as linking adaptation processes with resilience, growth and poverty reduction as socio-political forces influencing CCD policies and processes. However, there remains limited empirical evidence on how to best align such triple wins with climate-sensitive sector policies to ensure coherence and reduce vulnerability to climate change. This paper targets this gap by using Ghana as a case study to investigate the extent to which climate-sensitive sector policies align with the key components of CCD (i.e., adaptation, mitigation and development).

Policy alignment is the process of adjusting different sectoral policies to bring greater coherence between them. Policy coherence is defined as “the systematic promotion of mutually reinforcing policy actions across government departments and agencies creating synergies towards achieving the agreed objectives” [21] (p. 3). Understanding policy coherence is important as it provides useful insights into how the design of policy options could enhance policy effectiveness by creating synergies whilst moderating conflicts among their objectives [22]. Coherent policy approaches can lead to greater effectiveness and efficiency, and can reduce competition for limited budgets and resources [23]. This analysis is particularly important because sector policies were not specifically developed to tackle climate change and we seek to identify elements of CCD found in these national policy documents, and those which are not yet considered in sectoral-based policies and planning. Identifying where there are coherence and conflicts can help policy makers devise a more coordinated approach that holistically addresses adaptation, mitigation and development.

The aim of this paper is to examine the extent to which policies in climate-sensitive sectors are consistent with each other in framing adaptation, mitigation and development actions, and identify key areas of policy coherence in Ghana. It answers the following research questions:

- (i) To what extent are Ghana’s agriculture, energy, water, forest and wildlife sector policies aligned with climate adaptation, mitigation and development?

- (ii) What is the extent of policy coherence amongst the climate-sensitive sector policies of Ghana's economy?
- (iii) Where are the key intervention points available to enhance CCD activities?

## 2. Climate Change, Agriculture, Water Resources, Energy and Forest Resources in Ghana

Ghana was chosen as a case study country because it represents a hotspot of climate change vulnerability [24] and has initiated a number of policies and programmes to reduce the adverse impacts of climate change on livelihoods (see e.g., [25]). Antwi-Agyei et al. [26] demonstrated the vulnerability of Ghana's food production systems to climate change, particularly in the form of drought. Ghana has a long history of a systematic and institutionalized climate policy and is one of the first African countries to develop a comprehensive climate change policy [27], making good progress towards the Sustainable Development Goal on Climate Action. As part of the requirements under the UNFCCC, the government of Ghana through its Environmental Protection Agency (EPA) submitted its Initial National Communication (INC), the Second National Communication (SNC) and the Third National Communication (TNC) to the UNFCCC in 2000, 2011, and 2015, respectively. The INC provided opportunities to shape poverty reduction and laid the foundation for the development of subsequent climate change initiatives including the Strategic Environmental Assessment and Ghana Growth and Poverty Reduction Strategy II (GPRS II). The SNC and TNC described various sectors of Ghana's economy for climate change mitigation and adaptation. Under the Paris Agreement, Ghana submitted its Intended Nationally Determined Contribution in 2015 (ratified as Nationally Determined Contribution (NDC) in 2017) and outlined several mitigation and adaptation actions in sectors including energy, agriculture and forestry [28], elaborating the country's sectoral adaptation and mitigation contributions in alignment with the national development vision [28]. The long-term goal of Ghana's adaptation is to increase "climate resilience and decrease vulnerability for enhanced sustainable development, whilst [its] mitigation goal is to unconditionally lower its greenhouse gas emissions by 15 percent relative to a business as usual scenario emission of 73.95 MtCO<sub>2</sub>e<sup>2</sup> by 2030" [28] (pp. 3, 7). Ghana's vulnerability to climate change and variability [26] presents an opportunity to explore how CCD is framed.

At a sectoral level, agriculture contributes significantly to the Ghanaian economy and provides a source of livelihood to many low-income families and is particularly vulnerable to climate change. At the same time, climate change is projected to substantially affect water resources [29], which will have negative effects on agriculture and other natural resource based sectors. Owusu and Waylen [29] reported that between 1951 and 2000, there was downward trend in precipitation across all agro-ecological zones in Ghana. Decreased water flow linked to climate change could result in conflict [30] and place the few existing irrigation facilities under considerable stress, negatively affecting agricultural productivity [31].

Climate change impacts on water resources could also have devastating implications for the energy sector as Ghana relies heavily on hydropower [32]. Whenever there is limited inflow of water into the Akosombo Dam, this leads to energy crises. Indeed, climate change adds a "significant amount of uncertainty to the already uncertain operation of hydropower systems" [32] (p. 4). Energy is also important with regards to its contribution to greenhouse gas (GHG) emissions. The country's forest resources and wildlife face considerable threats from illegal logging, regular bush fires, deforestation, destruction of habitat and biodiversity and use of unsustainable farming practices [33]. In the high forest zone, Tamakloe [34] estimated that, since the 1940s, about 90% of Ghana's forest has been lost. Biomass in the form of charcoal and firewood is a major source of GHG emissions. The forestry sector also plays a significant role in providing livelihood safety nets through the provision of non-timber products such as wild fruits, snails, honey and herbal medicines [35].

### 3. Research Methods

This paper adopts a two-stage methodology in analysing how CCD is framed in policies in Ghana's climate-sensitive sectors: agriculture, water, energy and forest and wildlife. These sectors were selected because of the considerable threat they face from climate change and because of the significant role the natural resource base plays in supporting the livelihoods of the majority of Ghana's population [36]. Indeed, these sectors are particularly critical for the livelihoods of natural resource-dependent communities [36] and contribute significantly to Ghana's GDP, so any threat from climate change can present considerable challenges to the country's economy. Additionally, these sectors can directly or indirectly contribute to mitigation actions through carbon sequestration and emission reduction. It was also important to draw a manageable boundary around the study, so other sectors affected by climate change and CCD (e.g., health and transport), which do not directly address climate change adaptation and mitigation issues were omitted. Consideration of these sectors, alongside those of, e.g., education, would nevertheless offer interesting avenues in follow-on research from this paper.

#### 3.1. Qualitative Document Analysis

The first stage involved the use of qualitative document analysis (QDA) to examine how CCD is framed in sector policy documents. In QDA, emphasis is placed on the meaning and implications of text within the document, rather than simply the presence of keywords [37]. This study used QDA to understand the extent to which sector policy documents align with the concept of CCD, and the degree of policy coherence among these policies. The QDA process involves subjective scoring and we ensured consistency by following explicit steps aimed at providing an in-depth analysis. These include: (i) setting criteria for the selection of documents; (ii) collecting documents; (iii) articulating main areas of analysis; (iv) coding the documents; (v) verifying preliminary results; and (vi) analysing the findings [37]. The building blocks for the QDA were informed by Ghana's climate change policy [27], which has three key policy objectives: (i) effective adaptation; (ii) social development; and (iii) mitigation. Ghana's NDC [28] also highlights various adaptation and mitigation actions in contributing to national development.

Appropriate indicators for the three building blocks of CCD were selected based on the literature [38] and validated with local stakeholder and expert interviews. For adaptation, the indicators included livelihood diversification [39], development of drought resistant crop varieties, development of early warning systems, food security, and development and promotion of irrigation schemes [40]. Other indicators of adaptation included the incorporation of indigenous knowledge [41], awareness creation and education, and security of land tenure [42]. Indicators of mitigation included tree planting woodlot establishment, agroforestry practices [43], promotion of liquefied petroleum gas and biodiversity conservation [44]. For development, we adopted indicators such as access to credit, private sector participation and development, capacity building, community empowerment, gender mainstreaming and good governance [45].

A scoring system was developed (Table 1) based on the work of Gouais and Wach [46]. To determine the extent to which the policy documents align with the building blocks, each of the sector policy documents was analysed separately. Interactive content analysis was conducted to identify the dominant narratives in each of the policy documents [47]. Each policy document was thoroughly read to identify evidence in support of CCD as outlined in Table 1. All assessments of alignment were supported by quotes from the policy to ensure auditable rationale for each assessment [46].

**Table 1.** Scoring criteria for alignment of the sector policy documents with key pillars of CCD (Modified from [46]).

Type of Alignment	Description of Alignment	Score
High alignment	The sector policy aligns strongly with the indicators of triple wins (adaptation, mitigation and development (A/M/D)). Policy devotes attention to the particular building block and includes specific activities for achieving the particular block.	3
Partial alignment	Although the policy supports the various indicators of A/M/D, it is less clear and distinct in terms of how the indicators and each particular building block could be achieved. There is limited evidence present of how the specific indicators as well as the building blocks could be achieved in practice.	2
Limited alignment	The sector policy supports a particular indicator of the A/M/D building block but there is a lack of evidence to support alignment with it.	1
No alignment	There is no evidence in the document to suggest that the sector policy supports the implementation of the building block or even encourages it.	0

To determine the level of coherence amongst sectoral policy documents, Table 2 was used following a similar procedure to that described by [46].

**Table 2.** Scoring system for policy coherence (Modified from [46]).

Type of Coherence	Description of Coherence	Score
High coherence	The policy aligns strongly with other sectors. Policy devotes specific attention to alignments within these sectors and in relation to climate change adaptation. It includes numerous and detailed complementary activities (including projects) for achieving that.	3
Partial coherence	The specific policy supports other sectors, although it is less clear and distinct as to how it could be achieved. Relatively fewer details and activities are included within the policy.	2
Limited coherence	The specific policy supports other sectors. Lack of relative details in terms of activities and plans.	1
No coherence	There is no evidence in the policy to suggest alignment with other sectors.	0

### 3.2. Expert Interviews and Stakeholder Workshop

The second stage involved using expert interviews to explore policy coherence amongst the various climate-sensitive sector policies. Experts were purposefully selected based on their expertise in one of the four sectoral policies under consideration. A prerequisite for the selection of experts was that they had a longstanding and comprehensive overview and understanding of the policy in their sector. In all, 20 experts affiliated with the various Governmental Ministries and Agencies, local Universities and Research Institutions were selected, and asked to score the level of coherence between their respective sector policy and that of the other policies.

Additionally, a national stakeholder workshop with 40 experts drawn from across Government Departments ( $n = 8$ ) including national sectoral representatives and regional extension officers, NGOs ( $n = 4$ ), international bodies ( $n = 2$ ) and academic researchers ( $n = 26$ ) was held in Kumasi, Ghana in June 2017, to: (i) validate the results of the alignment exercise; and (ii) score the coherence amongst the sectoral policies through small group discussions split by sectors.

## 4. Results

### 4.1. Aligning Climate-Sensitive Sector Policies with Adaptation, Mitigation and Development

Analysis of climate-sensitive sector policies shows that they align differently with each of adaptation, mitigation and development (Table 3). For instance, while the food and agriculture sector development policy phase II (FASDEP II) is framed as a development policy scoring “high alignment”



with development, the forest and wildlife policy is set up as a mitigation policy, scoring “limited alignment” with adaptation and “partial alignment” with development. Development is also given priority in the water policy providing “partial alignment”. Table 3 also shows that the FASDEP II and water sector policies are quite unclear and scored “no alignment” with mitigation.

FASDEP II is the policy framework that guides agricultural development and interventions in Ghana [48]. The purpose of the policy is to “*enhance the environment for all categories of farmers, while targeting the poor and risk-averse producers*” [48] (p. 1). It has six policy objectives: “(i) food security and emergency preparedness; (ii) improved growth in incomes; (iii) increased competitiveness and enhanced integration into domestic and international markets; (iv) sustainable management of land and environment; (v) science and technology applied in food and agriculture development; and (vi) improved institutional coordination” [48] (p. 22). There is a “partial alignment” of the FASDEP II with adaptation. The policy is set out to improve food security to enhance rural livelihoods that will promote development. The FASDEP II is therefore consistent with national development objectives, especially those identified in the Growth and Poverty Reduction Strategy II (GPRS II) and the Ghana Shared Growth and Development Agenda (GSGDA) 2010–2013, which has the goal of accelerating economic growth through job creation and poverty reduction [49]. Under the GSGDA, 2010–2013, the agricultural sector development strategy seeks to accelerate the modernisation of agriculture for the structural transformation of the Ghanaian economy. Overall, FASEDP II was rated to have “limited alignment”. FASDEP II recognises the importance of climate change and variability to food security. For instance, it states “*seasonal variability in food supply and prices due to climatic changes and other natural occurrences make it difficult for Ghana to meet its food demands all year round, especially in the three northern regions*” [48] (p. 25). The same policy attributes fluctuations in food production from “*year to year to frequent variations in the magnitude of rains during and between growing seasons. This recurrence of climatic stress destroys crops and livestock. Rainfall is a major determinant in the annual fluctuations of household and national food output. This creates food insecurity at household levels, which can be transitory in poor communities and chronic in distressed areas*” [48] (pp. 7–8). However, the policy is short on details as to how mitigation and adaptation efforts could be incorporated into farming practices and extension advice.

The water policy [50] provides a framework for the sustainable management of various water resources in Ghana. In all, the national water policy seeks to “*achieve sustainable development, management and use of Ghana’s water resources to improve health and livelihoods, reduce vulnerability while assuring good governance for present and future generations*” [50] (p. 19). The Water Policy focuses on access to potable water, water resource management, climate change and water for food security [50]. The policy scored “partial alignment” with CCD in terms of both adaptation and development (Table 3). This is reflected in the way the policy has been set out to achieve food security. For example, the water policy highlights specific activities to achieve food security including “*supporting the establishment of micro-irrigation and valley bottom irrigation schemes among rural communities with the assistance of district assemblies*” [50] (p. 23). The policy addresses issues relating to flooding and drought closely linked to climate change and variability. For instance, it indicates that appropriate technologies would be applied to provide the “*necessary information for detection and early warning systems for floods and drought*” [50] (p. 27). Additionally, the policy recognises adaptation measures including rainwater harvesting, which has the potential to be harnessed to improve food production. The provision of water is also given particular prominence in key government documents including the GSGDA [49].

**Table 3.** Scores of various sector policy documents in relation to the building blocks of CCD. See Table 1 for the explanation of scoring.

Sector Policies	Building Blocks of Climate Compatible Development			Overall Alignment
	Adaptation	Mitigation	Development	
Food and agriculture policy	(2) FASDEP II mentions specific strategies for the attainment of food security including developing appropriate irrigation schemes for different categories of farmers to ensure production throughout the year, as well as the introduction of high-yielding and short-duration crop varieties.	(0) The various indicators of mitigation that were assessed in the analysis were not given adequate consideration in the FASDEP II.	(3) The policy sets out to improve food security to enhance rural livelihoods that will promote development.	(1.33) limited alignment
Water policy	(2) Specific activities to address climate change are highlighted including: <i>“(i) construction of flood protection structures at appropriate locations; (ii) apply appropriate technologies to provide the necessary information for early warning systems for floods and drought; and (iii) ensure rain water harvesting techniques are incorporated into the building code and enforced”</i> [50].	(0) Although the water policy recognises climate change, it does not provide specific actions to encourage mitigation efforts.	(2) Recognises that water is at the heart of Ghana’s effort to reduce poverty and improve economic development. It promotes sustainable development.	(1.33) limited alignment
Forest and wildlife policy	(1) The policy acknowledges climate change and seeks to develop climate change adaptation and mitigation measures. However, it is short of details on how these can be achieved.	(3) Recognises the threat posed by climate change to forest and wildlife resources and proposes specific activities to address this including: <i>“(i) establishment of a savannah eco-restoration fund to be accessed for tree planting along ecologically sensitive area; (ii) enactment of legislations to guide allocation of carbon rights; (iii) promote sustainable management of savannah woodland; (iv) increase biodiversity conservation”</i> [51].	(2) Provides specific actions aimed at development including <i>“(i) consolidate good governance through accountability and transparency; (ii) enhance active participation of communities and landowners in resource management; (iii) promote small and medium forest and wildlife enterprises as a means of job creation for the rural and urban poor”</i> [51].	(2.00) partial alignment
Energy policy	(0) There is lack of evidence on how the policy would promote climate change adaptation.	(2) The energy policy seeks to deliver mitigation by reducing carbon emissions. It also mentions waste-to-energy resources that seek to divert waste from landfill into energy resources, further reducing emission of GHGs including methane and carbon dioxide. The energy policy seeks to <i>“support sustained regeneration of woody biomass resources through legislation, fiscal incentives, and attractive pricing”</i> [52].	(2) With regards to development, the energy sector policy promotes the mainstreaming of gender issues aimed at reducing the dependency of women on biomass (including firewood and charcoal). The policy also promotes economic development.	(1.25) limited alignment
Overall alignment	(1.25) limited alignment	(1.25) limited alignment	(2.25) partial alignment	

The forest and wildlife policy was formulated in 2012 and aims to provide a comprehensive guide to forest and wildlife management. Some of the key indicators assessed including good governance of forest ecosystems and resources, forest plantation development and community capacity building are highlighted in this policy. By promoting good governance, this policy encourages actions aimed at tackling the threat of climate change for livelihoods of forest dependent communities. Table 3 shows that the forest and wildlife policy is rated to have “limited alignment” with adaptation and “high alignment” to mitigation. This policy recognises the threat posed by climate change to forest and wildlife resources and proposes a number of activities to reduce these impacts [51]. Whilst highlighting the role of the forest sector in socioeconomic development as well as community based conservation, the policy outlines plans for establishment of national parks aimed at encouraging recreation as well as for educational purposes. The forest and wildlife policy also encourages community based conservation practices [51]. These practices could promote development at the local level that can facilitate climate change adaptation thereby building resilience to climate change. The forest and wildlife policy scored “partial alignment” with development.

The energy sector policy aims to guide the development and management of Ghana’s energy sector in the light of the emerging oil and gas sectors. The energy sector policy has the objectives to: “(i) secure long-term fuel supplies for the thermal power plants, and (ii) reduce technical and commercial losses in power supply; minimise the environmental impacts of energy supply and consumption through increased production and use of renewable energy and make energy delivery efficient” [52] (pp. 8–9). The energy policy is rated to have “no alignment” with adaptation. The policy scored “partial alignment” with both mitigation and development.

#### 4.2. Policy Coherence among Climate-Sensitive Sector Policies

Table 4 shows the results of the content analysis and the stakeholder scoring of level of coherence amongst climate-sensitive sector policies. Notably, there is only “partial coherence” between FASDEP II and the water sector policy. Improving access to water for increased food security reinforces the attainment of one of the key goals of the FASDEP II in terms of achieving economic development via increased agricultural productivity. All the policies exhibit coherence through their mainstreaming of gender issues. There is also coherence between the energy and water policies. For instance, tree planting, which is highlighted in the forest and wildlife policy, interacts positively with the water policy. A key result emerging from the analysis is that indicators such as food security, capacity building and public awareness are all considered across all the sector policies analysed. Agriculture acts as a significant catalyst driving deforestation in many dryland farming systems [53]. However, the FASDEP II and the forest and wildlife sector policy have “limited coherence”.

Table 4 further shows that the qualitative document analysis via content analysis produced different results compared to the stakeholder-led analysis. For instance, whilst the content analysis of the energy policy showed overall scoring of “limited coherence”, the stakeholder scoring produced “partial coherence”. However, there were instances where both the content analysis and the stakeholder scoring produced similar results. For instance, Table 4 shows that FASDEP II scored “limited coherence” for both the content analysis as well as the stakeholder analysis. Importantly, the results show that the climate change policy was rated to have “high coherence” by stakeholder scoring and partial coherence from content analysis.



**Table 4.** Coherence between sectoral policies aimed at tackling climate change and variability.

Policy/Strategy	Energy Policy	Water Policy	Forest/Wildlife Policy	Agriculture Policy (FASDEP II)	National Climate Change Policy	Nationally Determined Contributions
Agriculture	(0) No specific statements to suggest sectoral alignment with the water policy.	(3) Highlights the significance of water for food security. Specific details are provided.	(1) Recognizes interactions with agriculture but provides no details.	N/A	(3) Highlights the vulnerability of agriculture to climate change and details specific actions including (i) the development of climate resilient agricultural systems; and (ii) building climate resilient infrastructure.	(3) Recognizes the vulnerability of the agricultural sector and highlights specific activities and projects to address this vulnerability.
Energy	N/A	(0) No specific statements to suggest sectoral alignment with the water policy.	(0) No statements to suggest sectoral statements are coordinated and/or aligned.	(0) No statements to suggest sectoral statements are coordinated and/or aligned.	(1) Recognizes the vulnerability of the energy sector to climate change and provides specific activities. However, lacks specific details on how the sector will respond to climate change.	(2) Highlights energy as vulnerable to climate change. Details some specific actions to reduce the vulnerability of the energy sector.
Forest and wildlife	(0) No specific statements to suggest sectoral alignment with the forest.	(1) Enacting legislation to support the implementation of national wetland conservation strategy.	N/A	(1) General statements on sustainable natural resource management with no specific details.	(2) Create national awareness about the role of forests in climate change (mitigation and adaptation). Supports training and education in forest resource management at district levels in carbon rights allocations.	(3) Identifies the vulnerability of Ghana's forests to climate change and elaborates several activities and projects to reduce such vulnerability.
Water	(2) Recognizes the role of sustainable water resource management in meeting current and future energy needs and provides some examples including tree planting.	N/A	(1) Adopts sustainable practices that avoid damage to critical natural capital and irreversible ecological processes	(2) Highlights the role of water for food security and provides specific details such as water use efficiency techniques in agriculture and reduce transmission losses of irrigation systems.	(1) Highlights the importance of improving the management of aquatic ecosystems in order to provide ecosystem services and other related livelihoods for local communities. However, there is lack of detail on how to achieve this.	(2) Recognizes the vulnerability of the water sector. Provides specific activities and projects to achieve this.
Climate Change	(2) Improves construction of hydropower schemes, irrigation systems and water supply infrastructure to improve efficiency.	(2) Recognizes climate change as a major issue and provides specific details and actions in addressing these challenges.	(3) Supports initiatives for the enhancement of carbon sinks through afforestation, reforestation measures and rehabilitating degraded natural ecosystems.	(2) Recognizes the vulnerability of the sector to climate change and details specific activities to improve and harmonize research activities in climate smart agriculture.	N/A	(3) Climate change is recognized as a cross-cutting issue for Ghana's development. All the other sectoral projects outlined in the NDCs are aimed at addressing climate change.
Content analysis average	1.00 (limited coherence)	1.50 (partial coherence)	1.25 (limited coherence)	1.25 (limited coherence)	2.00 (partial coherence)	2.60 (full coherence)
Stakeholder scoring (average)	2.00 (partial coherence)	1.67 (partial coherence)	1.86 (partial coherence)	1.40 (limited coherence)	3.00 (full coherence)	N/A

Results from expert interviews also show that there is a lack of inter-sectoral collaboration aimed at achieving greater coherence. For example, an expert at one of the sector ministries remarked:

*The FASDEP II focus was on policy strategies in achieving agricultural modernization and sustainable utilization of resources in the sector; hence it is limited to very few inter-sectoral linkages [with other sectors].* (Expert interview, Accra, April 2017)

Both stakeholder workshop and expert interviews reveal the lack of institutional capacity to achieve coherence among these sector policies. An expert in the national water institute noted:

*Institutions' responsibility for agriculture and energy, for example, are mentioned in the policy document including their specific activities in relation to water. However, it is not clear what roles these institutions have been assigned in the policy to ensure the achievements of the objectives and policy actions. What should actors in the agriculture sector, for example, do to advance the aims of the policy? This is not available in the document.* (Expert interview on National Water Policy, Accra, April 2017)

## 5. Discussion

Although the policies analysed here were developed to respond to sectoral development imperatives rather than climate change needs, it is notable that they all included elements of CCD. The analysis highlighted that sector policies are aligned differently with the different elements of CCD. Most of the policies align with development (Table 3). Most of Ghana's development plans including economic and social transformation, as stated in the GSDSA (2010–2013), are based on the modernisation of the agricultural sector [49]. For instance, Ghana's NDC is anchored in anticipated 40-year long-term development, the GSGDA (2010–2013) [49] and the National Climate Change Policy [27].

Although climate change is seen as a development issue that has the potential to derail Ghana's efforts in attaining a middle-income status [49], our analysis shows that key sectoral policies including the FASDEP II currently have "limited alignment" with key indicators of CCD, particularly indicators of mitigation. This poses a potential threat to longer term agricultural production and sustainability (cf. [54]). This is an important oversight and highlights an important intervention point. Although there are a few references in the FASDEP II to indicators such as food security, early warning systems, development of resistant crop varieties and irrigation development, the FASDEP II and its counterpart the Medium Term Agricultural Sector Investment Plan (METASIP) do not give prominence to climate change. The perceived need for governments to achieve short-term development wins places CCD projects that may be socially beneficial in the long-term in jeopardy [20]. It is important to stress that the National Climate Change Policy [27], the National Climate Change Strategy [25], the GSGDA [49], as well as the NDC [28] have all given considerable attention to the threat posed by climate change to Ghana's agriculture. The NDC, for example, has highlighted specific adaptation measures including climate smart technologies, early warning systems and resilience building. However, these need to be supported by sectoral policies that are well aligned.

Our analysis also demonstrates that the energy policy and forest and wildlife policy documents are heavily skewed towards mitigation (Table 3). For example, the forest policy emphasises the establishment of forest plantations as well as the creation of woodlots. The greater emphasis on mitigation is attributed to the realisation that society cannot adapt perpetually to climate change and therefore there is a need to reduce the emissions of GHGs through appropriate mitigation measures [55], alongside enacting adaptations to cope with current and future climate impacts.

Alignment towards mitigation has partly been explained by Ghana's obligation to international conventions such as the UNFCCC [56]. Articles 3.4 and 4.7 of the UNFCCC encourage developing countries to implement mitigation actions. The Copenhagen Accord referred to incentives for developing countries to continue to develop on a low-emission pathway. According to the 2010 Cancun Agreements, by 2020, it is expected that Annex-1 Parties would have provided USD 100 billion

per year to “fast-start” finance the mitigation activities in developing countries. Wilkes et al. [57] (p. 3) stated that such “commitments are seen as providing an essential basis for incentivizing and enabling low-emission development planning and scaled-up implementation of mitigation action in developing countries”. This suggests that mitigation efforts at the national level may be internationally driven with further encouragement coming from increasing pressure for “green growth” [58]. Our analysis corroborates Ellis and co-workers’ [20] meta-analysis of CCD in developing countries, suggesting that CCD remains driven by international-level processes.

Ghana’s Initial National Communication, the Second National Communication and the Third National Communication to the UNFCCC emphasised mitigation ahead of adaptation. On the contrary, the National Climate Change Policy [27] and the National Climate Change Adaptation Strategy [25] all seek to promote effective adaptation as a means of dealing with threat of climate change. Similarly, Ghana’s NDC focuses on both adaptation and mitigation. The lack of organised Civil Society Organisations and domestic political influences have been cited for the increased external influences on issues related to climate change [56]. Although Ghanaian societies are aware of climate change, they lack capacity in terms of resources to bring pressure to bear on politicians and decision makers on the need to integrate climate change into sector policies. The failure of sector policies to fully align with CCD, particularly adaptation, has serious implications in dealing with climate change impacts in Ghana in a joined-up way. Adaptation is critical for resource poor farmers as it involves adjustments in livelihood choices and farm practices compared with mitigation efforts that may rely on expensive technologies to initiate. This gap highlights another important policy intervention point. There is the need to fully align climate-sensitive sector policies to incorporate adaptation practices that can help households to reduce their overall vulnerability to climate change.

The mainstreaming of gender issues was one of the key indicators used and the results suggest that both the energy policy and FASDEP II show strong indications of doing this. This is important, as women will be disproportionately affected by the adverse impacts of climate change [59]. Glazerbrook et al. [60] have emphasised the vulnerability of women to climate change using a case study from northeast Ghana. Gender issues relating to climate change largely reflect wider dynamics of power and politics at the local and national levels that can potentially stifle efforts aimed at ensuring policy coherence. Sectoral policies should adopt gender-sensitive approaches and tackle institutional power dynamics in order to encourage women’s participation in activities aimed at achieving CCD. This also supports development objectives at higher political levels e.g., in the African Union’s Agenda 2063 [61].

While policy coherence leads to complementarities amongst the sector policies, our findings suggest that a number of challenges constrain policy makers, national institutions and agencies such as the Ghana’s EPA, which are mandated to realise “triple wins” of adaptation, mitigation and development [20]. One key challenge relates to institutional barriers including unclear differentiation of responsibilities and roles, which often leads to conflicts and competition amongst various sectors for climate change funds [62]. Overcoming such challenges requires an appropriate enabling environment that will build the capacity of national institutions and agencies such as the EPA and the Ministry of Food and Agriculture to respond to the threats posed by climate change [23]. The EPA has a coordinating role in providing leadership for “triple wins” by ensuring effective collaboration and coordination amongst the sectors adversely affected by climate change. There is a need to encourage inter-agency and institutional collaborations and information sharing among different agencies aimed at addressing issues related to climate change [63] and foster knowledge networks [64]. Another challenge relates to a lack of capacity to deliver CCD in the institutions, agencies and ministries responsible for dealing with the threats posed by climate change. The EPA could exert greater influence by having “climate champions” in these sectors to ensure that next review of these policies incorporate key elements of CCD. These “climate champions” are individuals who may already be working in the various sectors who are given the responsibility for championing climate change issues in the sector policies. To be effective, the capacities of these champions need to be strengthened through appropriate training by the EPA. A further challenge is that achieving policy coherence amongst sector policies

will involve compromises and trade-offs that need to be clearly defined by relevant state institutions and agencies mandated with integrating climate change across different sectors of economies in SSA [65]. This represents another important policy intervention point as there is a strong need for inter-ministerial and inter-agency approaches aimed at fostering better integration of CCD into sector policy documents and for trade-offs to be both identified and proactively tackled. Another challenge relates to the current economic situation, where there is intense competition for scarce national resources and inherent vested interests and institutional agendas. The tendency of international bodies to drive local climate change policy agenda [56] through capacity building and financial support may also serve as barrier to the implementation of CCD and achievement of policy coherence, particularly if projects are approached in a fragmented, stand-alone manner. Thus, a lack of harmonisation between donor projects for climate change initiatives can contribute negatively to the goal of CCD [66].

The level of coherence between the FASDEP II and other climate-sensitive sector policies needs to be further unpacked. Achieving food security is a major concern for most of the policies analysed. Increasing food security through the expansion of farm land, as outlined in the FASDEP II, has the potential to increase deforestation on two fronts. First, smallholders with limited non-farm resources, are likely to resort to other strategies such as firewood harvesting and charcoal production to finance the purchase of farm inputs including fertilizers [67]. Second, more farmlands are likely to be cultivated which will further alter land cover and carbon fluxes and could lead to increased emissions [68]. This is particularly important in the context of the significant role played by agriculture as the main livelihood strategy for many low income families [69]. The FASDEP II and the forest policy could be linked through agro-forestry systems. Forests can sustain household food security through the provision of non-timber forest products such as snails and fruits [70], offering an important safety net during times of adverse weather.

The literature suggests that achieving CCD will require multi-stakeholder engagement as well as private-public partnerships that aim to promote greater dialogue amongst stakeholders to drive CCD across multiple sectors [71]. For instance, partnerships could draw on the strengths of local stakeholders including chiefs and other opinion leaders to facilitate exchange of valuable climate information and knowledge, ensuring “climate champions” are present at the local level too. Partnerships will be vital because different partners bring different competences and can help to address some of the capacity and resourcing issues faced by the national institutions and agencies highlighted in this analysis.

## 6. Conclusions and Implications for Climate Change Policy

This paper has assessed the extent to which policies in climate-sensitive sectors align with each other in framing adaptation, mitigation and development actions and identified varying levels of coherence amongst these policies in Ghana. Using qualitative document analysis, content analysis, expert interviews and a multi-stakeholder workshop, the findings suggest that Ghana’s sectoral policies in agriculture, water, energy, forest and wildlife are skewed towards development with acknowledgment of climate change as a threat to these sectors. Many of the sector policies either have “limited alignment” or “partial alignment” with adaptation. This has implications for efforts to enhance the resilience of livelihoods to climate change, because climate change is seen as a development issue, and it is adaptation activities that can potentially advance development. Further, results suggest that there is “limited coherence” amongst climate-sensitive sector policies. It is important that such coherence amongst sector policies is enhanced to create synergies. This could be done by strengthening state institutions and agencies responsible for enacting policies for promoting a resilient local economy. The EPA could exert greater influence by nominating “climate champions” in sector ministries to ensure greater coherence in the next review of these sector policies, as well as engaging “climate champions” at the local level through partnerships including the traditional authorities.

Our analysis has highlighted various challenges including a lack of inter-sectoral collaboration and the lack of institutional capacity to enhance coherence amongst sector policies. This calls for concerted efforts from national and local institutions to prioritise actions and programmes to overcome

these challenges. It requires strengthening of institutions and agencies and the provision of appropriate mechanisms to ensure effective collaboration amongst these climate-sensitive sector policies to deliver “triple wins”. The paper identifies the following intervention points: (i) the need to attach greater importance to the threat posed by climate change to agriculture—this is vital to address because of the high dependency of smallholders on this sector and the risks of trade-offs linked to actions in other sectors, e.g., forestry; (ii) the need to better align sector policies with adaptation: the current “limited alignment” means people are not well prepared for future changes and that capacity remains low for dealing with adverse climate impacts; and (iii) there is a need to address the lack of inter-agency and inter-ministerial approaches as well as build partnerships with other stakeholders. Such approaches are vital in overcoming institutional and capacity challenges that are currently confronting national agencies and institutions who co-ordinate integrated environmental and climate change planning.

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