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Literature Review of the Impact of Climate Change on Economic Development in Northern Ghana

Opportunities and Activities

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Abbreviations

Clean Development Mechanism	CDM
Climate-Smart Agriculture	CSA
Environmental Protection Agency	EPA
Farmer Producer Organisation	FPO
Ghana Agricultural Development and Value Chain Enhancement Program	ADVANCE
Government of Ghana	GoG
International Non-Governmental Organisation	INGO
Ministry of Food and Agriculture	MoFA
Memorandum of understanding	MoU
Photovoltaic	PV
Reducing Emissions from Deforestation and Forest Degradation	REDD
Sustainable Land Management	SLA
Small and Medium Enterprises	SME

1 Study purpose and methodology

1.1 Overview and purpose

Northern Ghana is more vulnerable to the volatile weather patterns caused by climate change than the rest of the country because it is poorer, drier and more heavily dependent on subsistence agriculture. In trying to raise standards of living for Northern Ghanaians, approaches that combine economic development (in particular agricultural development, given the importance of agriculture to the northern Ghanaian economy) with responses to climate change offer potential triple win outcomes of economic, social and environmental gains.

The objectives of the study are as follows: To identify i) existing evidence on risks and opportunities associated with climate change as regards economic development, and in particular agricultural development, in North of Ghana; ii) knowledge gaps; iii) mapping of external inputs; in order to inform a) measures incorporated into relevant DFID programmes; and b) DFID's strategy for development in the North (see Annex 1 for full terms of reference).

The study attempts to summarise key findings from the existing information about opportunities for mitigation and adaptation and to briefly map existing activities. To achieve this, the paper details evidence available from a review of literature on opportunities for mitigation/adaptation; a review of programme documentation; and telephone interviews with relevant stakeholders.

For the purposes of this study, northern Ghana is considered to include the three regions of Upper West, Upper East and Northern region. It should be noted that in terms of climatic area (guinea savannah) and living conditions, areas in the north of the Volta and Brong Afaho regions are very similar and are in fact covered by some programmes focused on northern Ghana and this study includes such programmes when appropriate.

1.2 Approach

Review of opportunities

The literature review of opportunities for climate change adaptation and mitigation sought to identify papers and reports which outline and consider advantages and disadvantages of the following opportunities (see figure 1). The review focused on papers regarding areas of West Africa with similar climates to northern Ghana, particularly literature on northern Ghana itself, but also relevant literature from across the continent. Additional opportunities to those listed in figure 1 were not examined in detail but have been included where they emerged in the literature review. A total of 48 papers were identified through a Google search of terms in figure 1, Eldis and ODI literature on the subject was also checked for relevance, the papers were briefly overviewed and findings from the papers are in Section 2 below.

Figure 1: Potential opportunities for mitigation/adaptation in Northern Ghana

Opportunities
Climate smart agricultural practices and integrated water resource management (e.g. agroforestry techniques, drought resistant seeds, crop diversification, irrigation)
Renewable energy including rural electrification initiatives;
Weather information services;
Financial services and weather-related insurance;
Capacity of local authorities and links with national initiatives;
Climate finance access;
Infrastructure (e.g. water storage, storm shelters).

Source: Terms of Reference, Annex 1

Review of programme documentation

The review of programme documentation consisted of a brief analysis of online programme information and searches for programme reviews and evaluation documents of the programmes listed in figure 2. A small number of additional programmes were added to this list where they were identified through interviews, but this list is by no means a comprehensive map of all donor activity in northern Ghana, nor necessarily a representative overview – but it seeks to act as an indication of types of programme, across a range of donors and donor partnerships.

Figure 2: Relevant Donor Programmes in West Africa

Programmes/Activities
GIZ on crop insurance and weather services
World Bank and USAID Ghana Commercial Agriculture Project on land rights, large-scale investment in irrigation and agricultural schemes
USAID various, including access to finance (FINGAP) and agricultural value chains work (ADVANCE)
AfDB/IFAD comprehensive Northern Rural Growth Programme
CIDA various food security interventions
AFD and JICA – rice production
DANIDA – agricultural development through mentorship, access to finance
WFP – emergency food security programme

Source: Terms of Reference, Annex 1

Evidence from Stakeholders

Telephone interviews were conducted with 9 stakeholders (see Annex 2 for details). Questions sought to understand the scope of programmes in northern Ghana and to clarify how programmes are relevant to climate change mitigation/adaptation, lessons learned through programme delivery and best practice that can be drawn, and, depending on the role of the interviewed, asked about opinions on priorities in terms of climate change for northern Ghana and their views on donor collaboration and gaps in current programming.

The report proceeds as follows: section 2 summarises key findings from the literature on opportunities under two broad categories – agriculture and non-farm livelihoods. A few examples of initiatives that are potentially innovative and/or relevant to northern Ghana are included. Section 3 reviews donor activity, a sample of programmes' scope across areas identified in section 2, and summarises findings from telephone interviews. Finally, findings from the stakeholder interviews are summarised. Conclusions are given in section 4.

2 Review of the effectiveness of opportunities to address climate mitigation

The northern Ghanaian population is predominantly poor, rural and reliant to some degree on small-scale farming. Few northern Ghanaians, however, are able to rely on agriculture alone for income, so non-farm livelihood sources are also important to food security and to living standards more generally. Diversification of the rural economy, however, has not happened, so rural households are largely dependent on subsistence farming (Wiggins & Leturque, 2011), supplemented by basic, low-income non-farm livelihood approaches.

The following issues present potential barriers improved economic and environmental outcomes for northern Ghana. The first set of issues relate to land and land use – tenure in Northern Ghana restricts female landownership and specifically relating to trees, dis-incentivises individuals to plant because of the local chief has rights over crops from any tree planted by an individual in the community. Low soil organic matter and limited availability of plant nutrients, in particular phosphorus and nitrogen, are major bottlenecks to agricultural productivity, which is further hampered by substantial topsoil losses through wind and water erosion. (Stanturf et al, 2011). Soil degradation is not helped by practices such as end of harvest crop burning and lack of crop diversity and low yields, in part linked to poor soil quality, further limit farmers' ability to withstand risk.

Constraints within agricultural supply chains are a challenge to food security and livelihoods. Upstream, inputs are expensive, access to knowledge (e.g. through extension services) and technology is limited and credit options for smallholders are minimal. Downstream, market linkages are weak – hard infrastructure (e.g. feeder roads, energy supply) is lacking as is soft infrastructure (e.g. capital and R&D, also education and health). Social issues also impact agriculture – the disproportionate number of women who are poor smallholder farmers, and their low social status, limits access to inputs and capital, lowering income (African Small Farmers Group, 2010).

There are the two major issues for economic, and in particular agricultural development, from a climate perspective. The first is that weather is increasingly erratic in Northern Ghana, with rainfall becoming less predictable and an increase in major events such as floods, droughts and wind storms. The second issue relates to reducing contributory factors towards local and global climate change, the former relating to use of natural resources and the latter focusing more on carbon emissions. The two sections below consider both of these factors when reviewing agricultural (section 2.1) and non-farm (2.2) opportunities to jointly approach climate change and economic development.

2.1 Agriculture, livestock, forestry and land

Certain agriculture and forestry practices can support climate mitigation whilst improving rural livelihoods. Efficient and informed use of resources, in collaboration with other resource users, offers high potential gains.

Traditional cropping systems in semiarid areas such as the northern savannah zone in Ghana are dominated by cereal-based systems, usually combining two or more crops in a field. Intercropping minimizes risk of crop failure from drought or flooding and spreads the need for labour over a longer period (Stanturf et al, 2011). Millet and sorghum are the most important grain staples grown in the Upper East and Upper West regions, and maize, millet, and sorghum are important staples in the Northern Region (Dietz et al., 2004; Gyasi et al., 2008). Yam is an important food crop in the Northern and Upper

West regions (EPA, 2008). Of these crops, millet is the least risky with regard to climate-induced fluctuations in yield followed closely by sorghum and maize, making all of them important for food security. Rice and cotton have much wider variation in productivity year to year. Some farmers also grow vegetables in gardens and irrigated plots during the dry season. Northern Ghana is the most important part of the country for livestock production, giving it an advantage over the south in this regard. Cattle, goats, sheep, chicken, guinea fowl, and pigs are the main animals raised (Dietz et al. 2004, Hesselburg and Yarro 2006). For some agriculturally-dependent communities in the Upper East and Upper West regions, household food security relies more on livestock than on farming (Dietz et al., 2004; Hesselburg and Yarro, 2006; Van der Geest, 2004).

The following have been identified from the literature and are considered below:

- Climate-smart agriculture and sustainable land management
- Water management systems and irrigation
- Weather information systems
- Land tenure and tree planting
- Extension services and agricultural training
- Inputs (seeds) and cash crop production
- Market linkages – storage, transport
- Value chain and landscape approaches

The sub-section is divided into agricultural practices – where more obvious links to environmental improvement opportunities can be found – and market development, where environmental factors are typically secondary, although examples of opportunities are mentioned.

Agricultural practices

Climate-smart agriculture (CSA), conservation agriculture and sustainable land management (SLM), for the purposes of this study, are considered as being broadly similar, whilst recognising that CSA has a direct focus on reducing CO2 emissions, whereas conservation agriculture and SLM address resource use and resilience as well as emissions. All cover practices such as: improvement to yield and reduced need for chemical fertilizers– crop diversification and rotation, intercropping, tillage etc.; agronomy; improved livestock management; sustainable irrigation and integrated water resource management; agroforestry techniques. This section also considers practices which specifically respond to climate threats such as droughts.

There is a wide literature on CSA and SLM practices (for example Branc et al (2011); FAO (2010); Grainger-Jones (2012); Lee (2012); Scherr et al (2012)), advocating for the benefits of such practices and providing case study examples of where initiatives are being undertaken to promote them. There is less rigorous analysis of the success or otherwise of such schemes, but anecdotal evidence is in favour of best practice techniques on climate-smart agriculture being of high potential benefit to low-income, smallholder farmers in particular – simply because a large component of the approach involves making best use of available resources.

Food security is important for agricultural communities, and this is helped by increasing yields. Yet placing pressure on agricultural land, in the face of less reliable climate patterns, through intensifying crop protection in unsustainable ways is a short-sighted and risky approach. Intensifying agriculture through the use of higher inputs can lead to higher total emissions in the long run (in the atmosphere and per hectare) due to, for example, increased use of fertilizers, water, energy use or animal feed (Wollenberg et al, 2011). In Vietnam, for example, emissions from increased paddy rice cultivation and pig rearing are predicted to overtake mitigation, unfortunately, from carbon sequestered from avoided deforestation after 20 years (Leisz et al, 2007).

In terms of evidence to support priority areas for Northern Ghana, Branc et al (2011) find that techniques which are most promising in enhancing food security at smallholder level are also effective in increasing system resilience in dry areas. Most climate-smart practices show significant mitigation potential in humid areas but smaller co-benefits in dry lands, whereas in dry areas **water management** is found to be more effective and combined with improved soil fertility can lead to large-scale productivity gains (Branc et al, 2011).

Water infrastructure in the Northern Region is relatively under-developed compared to the rest of the country and improvements could help increase household drinking water quality and health; freeing up labour; increase water supplies for livestock; and increase water availability to support dry season household gardens and cash crop production (Stanturf et al, 2011).

Most agriculture in Northern Ghana is rain-fed, and due to the costs of irrigation, this is unlikely to change significantly in the short term (Cooper et al, 2008). There are water management interventions which could support smallholder irrigation – such as rainwater harvesting- an upgraded variation on rain-fed agriculture, and micro-irrigation systems, particularly targeting dry season garden production (i.e. smaller plots close to homes) for food security. For communal land or farmers with appropriate sites, large storage structures such as earth dams or water pans can be considered (Ngigi, 2009), although this requires higher upfront investment – the links of which might require state or donor (or even private sector) investment. See table 1.

Access to irrigated plots, even just for some crop production, increases the livelihood security (Stanturf et al, 2011). Large-scale **irrigation** schemes are uncommon in the three northern regions, although some irrigation schemes exist in Upper East. Irrigation development is expensive and on a large-scale relies on high input farming so excludes poor smallholders. Irrigation schemes can also mean that siltation becomes a problem, soil quality and productivity can be decreased, existing land uses are often displaced, herder-farmer conflict can be exacerbated, and disease-carrying insects may proliferate (Stanturf et al, 2011).

Table 1: Water development options in Northern Ghana

Options	Status
Small scale dams	Extensively inserted by government, donor projects, and NGOs throughout the North. Generally successful, but cost is high and maintenance pathways (for larger repairs) not well established. Poor mitigation of health and environmental impacts.
Dugouts	Extensively inserted by government, donor projects, and NGOs throughout the north. Generally successful, but poor mitigation of health and environmental impacts. Rises in numbers of migrant cattle could make these sites sources of friction.
Culverts/bridges for water retention on feeder roads	This technology works well with high maintenance and extensive supervision (as in the AFD project). However, post-project community maintenance is extremely poor and this technology will not work unless much greater training investments are made.
Pumping from rivers	This is being tried informally on some river systems in Northern Ghana and undoubtedly produces the best return (in terms of land cultivated per dollar) of any of these technologies. Although collective pumps theoretically have economic advantages, in practice households prefer small individual pumps because a) they control refuelling and maintenance, and b) they can easily be moved by bicycle. One of the objections to

	pumps is that they introduce inequity, but experience from other West African countries suggests that individuals will cycle long distances in order to make use of their productive advantages.
Natural flood-plain irrigation	This technology is not established anywhere in Ghana, although it works well in some neighbouring countries (Mali, Nigeria) and has potential along the White Volta. Advantages are that it makes maximum use of natural fish production and is environmentally beneficial (limited standing water and river-bank protection). Disadvantage is that it requires significant initial investment in earthworks, community training, and cooperation (does not work for an individual household).
Wind pumps	Just two wind-ups have been installed on an experimental basis in Northern Ghana and it appears that neither pump is being properly maintained, nor are the gardens being irrigated to maximum efficiency. Should be treated with caution until proven to work.
Drip technology	Although potential is great on existing dams, drip irrigation is only now being implanted on an experimental basis by ICRISAT. Given the high maintenance and the short training time envisaged by ICRISAT, the viability of this technology is doubtful at best.

Source: Blench and Dendo 2007

Weather information services are important to farmers. Seasonal precipitation forecasts for West Africa have improved to the point that forecasts may be of value to agricultural users, especially farmers. Yet despite improvements in climate forecasting, the application of forecasts faces key challenges such as the fact that certain subgroupings of end users of climate information remain excluded from its potential benefits, or under-served: one characteristic, gender, dominates such exclusion (Archer, 2003).

Ingrama et al (2002) studied agricultural production systems in three agro-ecozones of Burkina Faso to establish farmer interest in and ability to use forecasts, lead-time required for greatest forecast value, needs for dissemination of forecast information and found that potential value of forecasts differed among the three zones, with greatest apparent value to farmers of the central plateau and least to cattle herders of the Sahel. While farmers in all three zones expressed strong interest in receiving seasonal precipitation forecasts, they were much more interested in receiving forecasts of when the rains would start and end, and whether there would be interruptions in rains (Ingrama et al, 2002).

In terms of CSA and LSM, many examples of good practice build upon practices which are also comparatively cheap and easy to implement. For example, Niger is home to a tree expansion programme that has spread organically from village to village and farmer to farmer and resulted in a major transformation of landscapes. Rules regulating the use of trees on farms were revised in 1993, giving farmers a freer hand and stronger incentive to grow trees. The practice mainly involved the selection and protection of tree species that were regenerating naturally from seed or roots in the soil (World Bank, 2011)

Planting trees to promote intercropping increases the number of economically-valuable trees (e.g., mango, shea), reduce soil erosion, increase fuel wood supplies, and promote a host of other benefits that enhance livelihood security can be beneficial from an environmental and an economic standpoint. A barrier to tree planting is the tree tenure system in northern Ghana where when a person plants an economically-valuable tree, it is the property of the chief who has the right to its products, though he usually shares them with the person who planted the tree, thus dis-incentivising individuals from tree planting and need to be considered and perhaps addressed if tree planting programmes are pursued (Stanturf et al, 2011).

Diao and Sarpong (2007) argue that better **land tenure** security will lead to significant changes in soil fertility management practices. Staple crop production in Ghana has increased substantially, primarily through land expansion; arable land has more than doubled in size since 1980 (Wiggins & Leturque, 2011). Yet for more sustainable land management practices to be taken up, farmers need security of tenure to invest. Land tenure is also important to accessing credit, and in northern Ghana in particular, where customary tenure biases strongly against women, is an important factor to consider in developing livelihoods programmes.

Many farmers in developing countries access **seeds** from traditional systems of exchange where trust and reciprocity are key to the functioning of the system and serve to ensure quality standards. Lack of information about the quality and genetic content of seeds acts as a constraint as climate change shifts the geographic suitability of crop varieties. Local markets are one way to extend exchange networks in the informal system. This could be achieved through developing institutions to facilitate information flows for informal sector seed in local markets such as local seed and genetic diversity fairs, labelling systems, certification and training of traders (Lipper, Anderson, & Dalton, 2010).

Interviewees highlighted problems for seed distribution in northern Ghana, with limited supply and shortage of seed cleaning facilities (a USAID project to address the latter is due to commence next year). Also, the Environmental Protection Agency (EPA) is perceived as not policing the use of chemicals such as fertilisers as effectively as it might, although again projects a being developed to address this through public-private partnerships which raise awareness and provide protective clothing.

Across Africa, public **extension services** have been declining due to inadequate financial and human resources and poor infrastructure. New initiatives are needed to enhance service delivery to smallholder farmers, especially for climate change adaptation interventions. With new challenges and technological advances, the role of extension services has become more complex. Extension services are now expected not only to provide consultation on agronomic concerns but also on such areas as sustainability, biodiversity and natural resource conservation (Venkatesan and Kampen 1998), as well as climate risk reduction. The transfer of local knowledge between farmers should not be overlooked. An effective extension service is one that can absorb and disseminate indigenous practices along with supplementary technological advances (Berhanu 2008). Peer learning through farmers' exchange visits and on-farm demonstrations have been found to be effective modes of technology transfer (Ngigi 2008). Furthermore, extension agents must be sufficiently armed with the capability of providing timely and competent consulting relevant to local needs and thus able to build adaptive capacity through increased exposure and knowledge transfer to vulnerable smallholder famers (Ngigi, 2009).

Whilst farmer training schemes exist, this study has found little evidence of **farmer-to-farmer learning** between northern and southern farmers, nor with farmers from different countries, for example to increase willingness to trial new crops – this is an area for potential exploration, already being thought about in the form a project building indigenous knowledge for CSA from across East and West Africa.

Market Development

Storage and transport act as constraints to market development with a significant proportion of crops being wasted through spoilage as they cannot get to market in time. Grain storage can provide an important buffer against crop failures resulting from climate variability. Efforts to improve food storage facilities could help promote this practice but alone may be insufficient. It may also be necessary to expand food production in order to create surpluses and to find alternative means of generating cash to meet household monetary needs (Stanturf et al, 2011). Wider economic opportunities

could be found in increased local processing. Local processing facilities are lacking in northern Ghana. Establishing local processing facilities – for example, for producing shea butter or soybean oil – would make it possible to manufacture value-added products and could also help create non-farm jobs (Stanturf et al, 2011). Reducing food wastage and securing incomes through sales are important to livelihoods, but the former is also significant from a resource efficiency perspective.

Cash crop production is an important climate change adaptation strategy for farming households in northern Ghana (Stanturf et al, 2011).Also, **road infrastructure and access to markets** is relatively poor in the north. Investments in improving access to markets and roads would improve market conditions. A need also exists for policies promoting stable and favourable crop prices. Better access to credit will also help farmers invest in cash crop production. Projects in northern Ghana that focus on improving the entire value chain that links farmers to agricultural services and markets, for example the Ghana Agricultural Development and Value Chain Enhancement Program (ADVANCE), also hold promise. (Stanturf et al, 2011)

Lack of access to **credit** is widely recognised as a constraint to farmers from smallholders to larger commercial or nucleus farmers seeking to expand production. The availability of financial services can also play an important role in mitigating risk, crop and livestock insurance products offer potentially significant safety nets to farmers. Farmers in Northern Ghana typically rely on self-insurance at a household level. Livestock represent a form of savings that people can invest in in good times and that provide a critical buffer in bad times (such as climate crises – drought, floods) because they can be sold for cash that can then be used to purchase food when needed. Goats, sheep and pigs have high value and play an especially important role in food security (Hesselburg and Yarro, 2006). Another coping mechanism is recourse to non-farm income. Neither option is secure.

Findings from a study in Burkina Faso are useful to Northern Ghana. The study of a weather-index insurance system revealed that the farmer's gain from an insurance contract is higher in the driest part of the country and that maize and groundnuts are the most suitable crops to implement an insurance system since their respective yields show a large variance and a generally high correlation with the weather index (Berg et al, 2009).

Patt, Suarez and Hess (2010) suggest that whilst micro-insurance schemes can assist farmer coping strategies in times of crisis, a critical challenge for implementing such risk transfer programmes is helping participants understand how insurance operates, not least because there is evidence that farmers with a poor understanding of insurance are less likely to use it. Experiments in Ethiopia and Malawi, investigating farmers' understanding and the effectiveness of a role-playing game, found that role-playing games may be an important tool for improving understanding (Patt, Suarez, & Hess, 2010).

Livestock loan programs modelled on traditional practices in which relatives loan animals to kin who have lost their herds or who wish to start new ones have been successful in some parts of Africa. High potential exists for developing livestock husbandry as a climate change adaptation strategy in northern Ghana. (Stanturf et al, 2011)

Based on evidence from USAID's Feed the Future programme, Stanturf et al (2011) found that addressing food security by focusing on the entire **value chain** appears to be a promising approach, although there is room for better alignment between needs and current activities As climate-smart interventions must consider the wider impacts of programmes, better understanding of the interconnections between smallholders and wider landscapes need to be developed, hence scaling up 'multiple benefit approaches' (Grainger-Jones, 2012). Many such benefits accrue to the farmer, in terms of increased yield, improved food security and reduced reliance on inputs. There is also large potential for emissions reductions within smallholder agriculture, of global public benefit

and potentially of direct benefit to Government of Ghana (GoG) emissions reductions targets. Two brief examples: planting acacia trees in maize fields increases yields improving its organic and nitrogen content and water retention capacity of soil. Secondly, helping pastoralists manage land better can have a substantial impact on their livelihoods, but also on the reduction of greenhouse gas emissions (Grainger-Jones, 2012).

Whilst climate-smart initiatives can be undertaken in isolation, integrated landscape management approaches, which explicitly incorporating adaptation and mitigation can help ensure consistent outcomes. However, landscape approaches are complex to set up and run, requiring multi-stakeholder engagement and ideally reasonable time-periods for implementation. Delivering climate-smart landscape initiatives widely and at scale requires strengthened technical capacities, institutions and political support for multi-stakeholder planning, governance, spatial targeting of investments and multi-objective impact monitoring (Scherr, Shames, & Friedman, 2012).

A final area of opportunity is **climate finance**.

> "It can be argued that the current carbon finance regime is too complex for application in the dry lands of Africa where very specific needs of carbon markets (clear boundaries, monitoring carbon gains) are difficult to achieve. Dry lands carbon is so widely and thinly spread that its ownership is difficult to define and compensating the thousands of people responsible for managing it is a challenge. The international community should consider a compact between donors and the inhabitants of the dry lands in which 'conventional' overseas development assistance increases and continues to play its important poverty-alleviation role, where adaptation funds flow to the poorest, and where carbon finance rewards the millions of people involved in dry lands land management." (UNCCD, UNDP, UNEP, 2009)

Given that smallholder farmers are both in need of capital and are important actors in climate mitigation, adaptation and biodiversity enhancement, improving access to climate finance should be a win-win solution (Grainger-Jones, 2012). However, multiple barriers to coordinated financing for climate-smart agriculture exist – uncertain public funding sources, fragmentation of climate finance, separation of public funds supporting agriculture and supporting climate action and weak monitoring systems to track the multiple benefits of climate-smart agriculture (Shames, Friedman, & Havemann, 2012). For both public and private finance, better evidence-based measurement is needed of the emissions impacts of diverse approaches in different agroecological zones (Grainger-Jones, 2012).

An Agricultural Carbon Project in Kenya is regarded as an innovative example for climate-smart agriculture within and outside the World Bank because while increasing productivity and enhancing resilience to climate change, smallholder farmers will receive payments for greenhouse gas mitigation based on sustainable agricultural land management (Woelcke, 2012). The following lessons have been drawn from this project: project design should focus on farmers' interests and address food security and increased yields before carbon sequestration; transaction costs and ease of access should be monitored; strong extension systems and technical and financial capacity are important; providing smallholder farmer access to carbon revenues requires special technical expertise (Woelcke, 2012).

Smallholder farmers can benefit from limited opportunities in the voluntary carbon market and through the **Clean Development Mechanism (CDM)** but the technical challenges to including soil carbon are a constraint e.g. there is a need to secure permanence in the increase in soil carbon content as it can be lost quickly if soil management practices change (Grainger-Jones, 2012). There is also a need to establish procedures for regularly estimating the increase in carbon content, which varies from

season to season as a result of management practices. In addition, a further challenge is posed by the need to ensure that carbon credits are typically paid on the basis of verification of increased carbon levels - particularly important for smallholders who often require upfront financial support to make needed investments in new practices (Grainger-Jones, 2012). Lack of secure land tenure, particularly for women in northern Ghana, means that smallholders risk expropriation of their land if carbon revenue streams increase profits (Grainger-Jones, 2012).

The distribution of **REDD** projects seems to mirror the experiences of CDM initiatives, with few REDD demonstration projects in Africa, suggesting continued inequitable distribution of projects as seen under the CDM thus it is imperative that rights and equitable governance approaches be instituted as safeguards for the effective implementation of REDD initiatives (Whande, 2010). A recent proposal is that CDM in Africa could succeed if approached from a programmatic perspective where different projects are implemented under a single umbrella programme to reduce transaction costs(Whande, 2010). The promotion of CDM plantation projects in Africa has reopened opportunities for land grabbing. In Tanzania this takes the form of converting large grasslands and sensitive biodiverse areas to monoculture tree plantations of water-guzzling invasive exotic trees (Karumbidza & Menne, 2010). Ghana's REDD+ efforts are directed at the High Forest Zone, not the northern guinea savannah where livelihood impacts of climate change are most severe. A wide suite of social and physical benefits, such as livelihood diversification and defence against desertification, could be realised from implementation of REDD+ if it was aligned with the Northern Savannah (McFarland, 2012).

2.2 Rural Livelihoods

Beyond agriculture a range of climate-friendly opportunities exist to support economic development in northern Ghana. The first is improved access to energy, particularly through **renewable energy** sources. Recent studies have sought to establish causality, and have also reviewed the impacts of electricity provision on rural poverty incidence, micro and SMEs, and on women, in all cases considering the livelihood impacts (Scott et al, 2013). It is commonly recognized that electrification activities in rural areas of developing countries should be accompanied by complementary services (Peters, Harsdorff, & Ziegler, 2009) if there is to be productive uptake of opportunities that electricity can provide in terms of livelihood improvements. Willingness to pay is high and exceeds the average supply cost where grid connection is feasible (World Bank, 2008). But because of the high up-front costs of most rural electrification options and the low cash capacity of rural households, innovative small scale financing must be provided so micro credit, leasing and prepaid meters for fee-for-service provision seem to be the most promising options (Reiche, Covarrubias, & Martinot, 2000).

In terms of productive uses of power, however, much electricity in poor households is used for basic functions such as lighting and charging mobile phones. Increasing use to include micro enterprise (such as selling food) or installing micro irrigation systems using energy-powered pumps are likely to require inputs of capital and to an extent, knowledge. For the poorest households energy access alone is unlikely to have significant effects on standard of living.

In terms of economic development and climate change, renewable energy sources are of dual interest in that they not only address issues of emissions from fossil fuel energy sources, but also potentially offer lower cost energy solutions over their lifecycle in terms of user charges to remote and poor rural households. Off-grid investments usually have a lower rate of return to those responsible for installing them than grid extension, however, because the costs are more and the benefits less. (World Bank, 2008).

In rural areas far removed from grid-electricity, public solar photovoltaic (PV) electrification projects have helped improve the economic activities of micro-enterprises

beyond daylight hours. Through fee-for-service approach some rural micro-enterprises in Ghana were provided with access to solar PV systems to enhance their output. The relationship between solar PV electrification and enterprise output is under-researched however a small survey revealed that the cost avoided by using solar PV in the enterprises instead of kerosene lanterns was US$1 – 5/month and additional income after sunset was US$ 5 – 12/day in grocery (merchandise) enterprises (Obeng & Evers, 2010).

A ''flexy-energy'' concept of hybrid solar PV/diesel/biofuel power plant, without battery storage, has been developed to not only make access to energy possible for rural and peri-urban populations in Africa but also to make the electricity production sustainable in these areas. For landlocked countries like Burkina Faso (and also for northern Ghana), this concept could help them to reduce their electricity bill and accelerate their rural and peri-urban electrification coverage (Azoumah et al, 2011).

Biogas is another renewable energy source tested in Ghana. Appolonia, a rural community in Ghana, has been used in a demonstration project as part of the Ministry of Mines and Energy's Renewable Energy Programme where biogas is used to fuel a combustion engine for generating electricity supplying 230V electricity for domestic use. The biogas system was commissioned in 1990 and electricity is transmitted over a total distance of about 1km to more than 20 houses, various social centres (2 churches, 1 mosque, 1 video centre and 2 drinking bars and a school) plus 20 streetlights have been installed throughout the village. (Mensah, 2000)

To promote Ghana's rural electrification, Bailey, Chotimongkol, & Isono (2007) proposed an environmentally and financially sustainable generation system, exploring the idea of partial electrification and a village community centre serving the villagers' needs using electricity, thus significantly reducing electrification cost while still being capable of providing access for electricity to all villagers.

As mentioned above, diversifying the northern Ghanaian economy through **non-farm livelihoods** is important. Income in the savannah (portions of Brong-Ahafo, and the entirety of the Northern, Upper West, and Upper East regions) comes primarily from agriculture, which constitutes 75 %, the largest share, of household income; non-farm related enterprises constitute 12 %, and wages from employment constitute 6 % (Stanturf et al, 2011). Given low and irregular incomes from farming for most smallholders, alternative sources of livelihood outside the farm are often an economic necessity. In northern Ghana, these activities, especially important during the dry season, include hunting, fishing, non-timber forest product harvesting, local manufacturing, charcoal production, petty trade, and wage labour (Dietz et al., 2004; Hesselburg and Yarro, 2006; Whitehead, 2002). Non-farm activities are likely to play an increasingly important role in household livelihoods in the future because they offer opportunities for diversification when agriculture becomes more risky (Stanturf et al, 2011).

Some livelihood options, such as making and selling charcoal, offer quick and relatively easy cash at large environmental cost. Declines in tree cover will make charcoal production and firewood collection, as well as gathering and manufacturing forest species like shea nuts, more difficult in any case (Stanturf et al, 2011). Not only do additional sources of livelihoods need to be developed, but in the case of charcoal and firewood, supporting alternative sources of cooking energy would help curb demand and consequently impact on supply. Shea butter schemes, for example, have also been important to reducing dependence on charcoal to supplement incomes.

Ghana's northern savannah regions, particularly the Upper East, are also receiving areas for migrants from Burkina Faso, Mali, Niger and Nigeria, particularly Felani herders who have been migrating to the area since the early twentieth century (Stanturf et al, 2011). By the 1960s, the Fulani population in northern Ghana had grown considerably and competition over resources (and often, over cattle destroying crops) has led to increased conflict between herders and farmers (Stanturf et al, 2011). However, economic

relations between Fulani herders and farmers can be symbiotic and mutually advantageous.

Out-**migration**, particularly amongst the young, is another poverty reduction solution at the household level but causes leaves the older generation to perform manual labour, even if they are able to benefit from **remittances** send from urban areas by family members. Between 1984 and 2000, 18.4% of people born in northern Ghana migrated south with the Upper West Region exhibiting the highest rates of outmigration (26.9 %). The main destinations of migrants from the north are Kumasi and Accra, the cocoa belt frontier in the northern part of the Western Region, and productive farming areas to the south (Van der Geest, 2008). Those who have skills, such as mechanics, carpenters and teachers typically migrate to urban areas; unskilled farmers typically migrate south to places where farming is more favourable. Climate change is a factor for outmigration across the northern regions. Migrants do not only remit money, but exposure to educational opportunities and skills in urban areas and even abroad can be important to building propensity to engage in climate-relevant activities and promote these to family members back home.

Microenterprise and small-scale agri-business, often in the form of low level processes, provide jobs, as does the service industry – food production (catering) and transport services of both crops and people, using motorised vehicles (lorries, cars etc) but also bicycles.

Another service industry which could offer economic and environmental benefits is **tourism**. Small-scale tourism operations have begun to pop up in Northern Ghana, however, the impact of the tourism industry on overall employment remains minimal (Stanturf et al, 2011). A large, unrealized potential exists to develop ecotourism, for example around Mole National Park and to generate associated jobs in the park and in surrounding communities. The A Rocha Ghana project has helped two local communities develop ecotourism infrastructure. Our interviews with residents of one of these villages revealed that ecotourism generates some money, but if the money must be shared with all households in the community, it gets spread too thinly. Finding ways to best share the benefits of ecotourism development beyond those directly employed by the sector is one challenge to be faced (Stanturf et al, 2011) if the livelihood potential of tourism is to be expanded as part of diversification of the economy. Northern Ghana has cultural assets it could better promote, such as interesting architectural buildings such as Larabanga mosque. Backpacker and volunteer tourism are most common in northern Ghana, but as transport links to the south improve, tourism and related opportunities could be developed.

3 Mapping of Activities

A brief mapping exercise was undertaken for this study, comprising a brief review of project and programme documentation, a brief review of donor strategies and interviews with a small number of stakeholders on relevant programmes within their remit and where possible, their broader opinions on needs and current activities in Northern Ghana. Owing to the brevity of the study, the review is restricted to interviews with bi- and multi-lateral donor activity and does not attempt to cover NGO activity. Neither has it attempted to cover private sector activities in Northern Ghana in the form of inclusive business or social enterprise type activities. Further, it should not be interpreted as a comprehensive mapping of all relevant activity in this sector and region, but rather a snapshot of some key activities. As such, it cannot comprehensively inform gaps but does provide indications of clusters of work themes and also brief insights into donor leads within specific areas and thematic trends.

Who are the key actors in northern Ghana? In terms of climate change at the national level in Ghana, policy is coordinated by the Environment and Natural Resources Advisory Council (ENRAC) which operates at Cabinet level to coordinate between ministries. The Environmental Protection Agency (EPA) sits within the Ministry of Environment, Sciences and Technology (MEST) where it is responsible for developing national climate change policy and integrating priorities into sectoral plans (Stanturf et al, 2011). The Ministry of Lands and Natural Resources (MLNR) is the lead national entity responsible for REDD+ activities in Ghana and the Ministry of Finance and Economic Planning (MoFEP) leads the Forest Investment Programme and coordinates the budget support programme under the Natural Resource, Environment Governance Programme (NREG). Climate change is also being mainstreamed into Ghana's Shared Growth and Development Agenda.

In northern Ghana, NGOs – local and international – have held the prominent role in delivering development programmes. In the last few years, however, particularly since Ghana's advance to lower middle income status, increasing bi- and multi-lateral donor focus has been given to northern Ghana and indeed none of the donors reviewed in this study excluded northern Ghana from programming, regardless of the size and scope of their engagement in Ghana.

Section 3.1 provides a snapshot view of donor activities in Ghana, where possible also indicating activities in northern Ghana specifically. Table 2 builds on work by Stanturf et al (2011) in their comprehensive review of climate change activity in Ghana for USAID; a few additional categories have been added using information from interviews. In section 3.2 a sample of donor programmes are mapped against the opportunity areas identified in section 2, with additions of disaster risk management and private sector engagement which were raised during interviews. Section 3.3 summarises findings from telephone interviews.

3.1 Donor activities

Donors reviewed for this study were: the World Bank, GIZ, USAID, CIDA, AfD, Danida and FAO. In addition, certain IFAD, JICA and UNDP programmes were reviewed. 12 different organisations were contacted for an interview, of those still in post in Ghana and available to speak during the time period available, 8 were interviewed (see Annex 2).

Focus on both agriculture and climate change are universal components across donor programming. The extent to which the two are viewed in unison varies however. Several donors prioritise food security and whilst climate change is mainstreamed across

programmes, the degree to which CSA or SLM practices, for example, are promoted varies.

Community-based approaches to identifying climate change adaptation strategies (e.g., CARE) and strategies for enhancing food security (e.g., Canadian International Development Agency or CIDA) have been implemented in the northern regions and appear to hold promise. Activities include adopting agroforestry practices, crop diversification, planting drought-resistant and short-season varieties, practices to enhance soil moisture retention in fields, minimal tillage, composting for fertilizer, planting dry season vegetable gardens, developing surface wells, rearing small stock (chickens, guinea fowl, goats, sheep, and pigs), and actions to reduce burning of fields. Practices that are successful at the local level could potentially be scaled up. (Stanturf et al, 2011)

USAID commissioned a Climate Change Vulnerability and Adaptation Assessment in 2011 (Stanturf et al), drawn on in this study, which outlines USAID's intention to mainstream climate change across programming, as many donors have done or are in the process of doing. Stanturf et al (2011) highlight the need for increased meteorological data and enhanced capacity to use such information in Ghana.

Table 2 below provides a brief overview of strategic and programmatic focus of a range of donors and INGOS. The table builds on work by Stanturf et al (2011), with additional columns added based on information from interviews. It is not a comprehensive review of donor or INGO activity – the donors listed by Stanturf was added to again on the basis of information from phone interviews.

The table indicates northern Ghana is a focus area for around half the listed organisations. Agriculture, food security and water management are important strategically to most organisations; specific work on land tenure issues, access to credit, biodiversity and agri-business development are targeted by some organisations but not others.

Table 2: Donor and INGO Activities in Ghana and Northern Ghana

Organization	REDD/CDM	Agriculture	Food Security	Forestry	Biodiversity	Water management and WatSan	Bio-energy, Renewable energy & waste	Land Tenure	Research	Disaster risk management	Rural non-farm livelihoods	Credit & Financial	Agri-business and processing
SNV	X	X		X		X	X		X				
CIDA**		X	X	X	X	X			X				
DFID**	X	X							X		X	X	X
Norad									X				
Netherlands Embassy	X			X	X	X							
UNDP**	X	X	X			X	X			X			X
GIZ		X				X						X	X
World Bank	X	X	X	X		X				X			X
Care**		X	X	X	X	X		X		X		X	
Oxfam**	X	X	X	X	X	X			X				
Danida**		X										X	
AfD		X	X			X			X			X	
FAO**		X	X	X			X			X		X	
USAID		X	X			X				X		X	

X = activity in Ghana. X = activity in Northern Ghana (N.B. this is only an indicative list)
** = strong Focus on Northern Ghana across programmes.

Source: Modified from Stanturf et al (2011) with additions by the author, based on donor websites and stakeholder interviews

3.2 Programmes in Northern Ghana

Table 3 below seeks to map areas of intervention of some key programmes operating in Northern Ghana. Programmes are mapped against the opportunity areas identified in section 2, with additions of disaster risk management and private sector engagement which were raised during interviews. Not all programmes reviewed below operate exclusively in northern Ghana, but northern Ghana is an important area within each. Interesting, a couple of programmes have recently shifted their focus from national to exclusively covering the three northern regions of the country.

As the table below shows, there is strong focus on value chain and landscape approaches, covering key areas for SLM and CSA through crop practices and diversification, development of credit options, extension services and inputs, market outlets and infrastructure, as well as extensive work on disaster risk management and use of new technologies such as weather information tools. Less evidence is apparent through these programmes of efforts to diversify the local economy from agriculture, or to specifically create green jobs, for example through renewable energy projects.

Table 3: Mapping of Selected Programmes Active in Northern Ghana

Activity Area / Programme	CSA/SLM techniques	Water Management	Weather information services	Tree planting	Land tenure	Inputs and extension services	Agri-business and processing	Value chain and landscape approaches	Financial services and weather-related insurance	Climate finance access	Renewable energy	Infrastructure	Non-farm livelihoods	Private sector engagement	Cash crop production	Food security	Enhancing local institutional capacity	Gender and age	Disaster risk management
GIZ Ghana Agricultural Insurance Programme			√						√	√		√		√					
World Bank & USAID Ghana Commercial Agriculture Project	√		√		√		√	√						√	√		√		
USAID FINGAP					√		√	√	√					√					
USAID ADVANCE	√					√		√						√	√				
AfDB/IFAD comprehensive Northern Rural Growth Programme								√									√	√	
Food Security Through Cooperatives in Northern Ghana, CIDA	√		√	√												√			
Resilient and Sustainable Livelihoods Transformation in Northern Ghana, CIDA	√																√		√
Food Security and Environment Facility, CIDA	√								√									√	

Ghana Environmental Management Project, CIDA	√	√		√	√												√	√	
Lowland Rice Development Project, Danida, JICA and AfD	√	√					√	√				√					√		
Resilient landscapes for sustainable livelihoods, UNDP, MoFA, WFP, FAO, UNU	√	√															√		√
National Feeder Roads Rehabilitation and Maintenance Project, World Bank								√				√							

3.3 Key observations from programme review and interviews

Based on programme evaluation reports (one full programme evaluation was obtained, others were available but not in English) and programme documentation, and also interviews with staff involved on programmes, this section outlines recurrent themes in terms of issues faced and lessons learned, and innovative and best practices. Two main areas came out from discussions with stakeholders – firstly, suggestions of general best practice on developing and delivering programmes and working with other actors. Secondly, issues more specific to economic development and climate change programming in northern Ghana – priorities mentioned, and also additional programme information, particularly new programmes.

Importance of collaborative working

The discussions with stakeholders revealed that there has been a marked increase in donor activity in northern Ghana in the last few years. Previously, much donor activity focussed on the South and agricultural development and climate activities in the north were dominated by government and NGOs. Some concern was expressed that the proliferation of similar activities risks undermining existing programmes. For example, there will be four different projects with demonstration plots in one area near Tamale next year, one risk of which is that several different practices are advised and the lack of clarity about which practice to follow limits the effectiveness of all programmes.

However, there was positive evidence of embedded collaborative practices, including one programme which has 17 MOUs with local related projects and another interviewee who said that a monthly meeting of donors working on agriculture now takes place at which all new projects are discussed and sometimes feedback sought on feasibility studies etc. Needless to say many programmes work with a range of development partners, and a significant proportion have direct links to government ministries, in particular the Ministry of Food and Agriculture (MoFA).

It was also noted that programmes tend to congregate and that there remain areas of the north of Ghana where there is very little donor activity, for example in the far north of the Volta region, which is difficult to access.

Collaborative approaches are also important at the programme level. Engagement with local communities has been vital to uptake of new crops and new processes. AfD have found participatory approaches particularly useful within their Rice Sector Support Project. Even amongst farmers themselves, improved communication between farming communities and agricultural policy and research institutes is essential to improve the adequacy of their activities (FAO, 2010). Engagement with the local community and key local stakeholders should start at the proposal stage (Boudreau, 2013).

A couple of the projects work with Farmer Producer Organisations (FPOs) on capacity building and also to engage them directly in project delivery. The calibre of FPOs is perceived to vary widely, largely dependent on the quality of leadership.

One interviewee also stressed the importance of clarity and simplicity. Many northern Ghanaian smallholder farmers lack the capacity to implement numerous and complex new practices, so keeping programmes simple and setting realistic objectives over reasonable time periods for change is important.

A USAID programme currently getting underway will actually map the landscape northern Ghana, using remote sensory mapping of land use, land cover and also to build a picture of existing infrastructure to help inform natural resource management and governance issues.

Operational experiences from Northern Ghana

One interviewee perceived anecdotally through her work that farmers in Upper East and Upper West engaged more willingly with new schemes to improve or diversify crop production than their counterparts in Northern region. She suggested could be attributed to both the difference between farming practices – in Northern region farmers tend to live at greater distance from their land and to use more mechanised approaches, thus making conservation agriculture practices more of a challenge to implement. The second observation she has made through her work is that education levels amongst the smallholder farming community in Northern region are perhaps lower. The best education facilities in Upper West and Upper East, however, tend to see their students migrate out of the north of the country.

Uptake and knowledge transfer

Use of demonstration models seems common across programmes and is viewed as being a successful way of engaging with farmers and equipping them with information from which they can make individual choices about practices they wish to pursue.

One interviewee mentioned that schemes through which hand-outs are given, such as seeds, can undermine attempts to ensure that farmers are aware of the appropriate market channels they need should they wish to continue with a new seed, or product, or approach once a given programme has ended or the trial phase is complete.

Similarly, as mentioned above, there is always a risk that diverse programmes can end up promoting different practices to the same farmers – for example, value chain programmes focussed on cash crops for livelihood improvement often mainstream climate-related activities, but do not necessarily focus on conservation agriculture practices, so farmers might get conflicting messages about whether or not to use fertiliser.

FAO is collaborating on a project to gather and share indigenous knowledge to support climate-smart agriculture as such knowledge is often not widely disseminated nor included in national policy. Northern Ghana does not have much by way of indigenous coping strategies, but does have indigenous resources which could be developed to serve this purpose.

Weather information services are another proven example of beneficial intervention in Northern Ghana in terms of both technology development and knowledge sharing. The USAID-funded ADVANCE project has invested in tropical weather forecasting technology, which allows farmers to receive advice on weather and correspondent actions on their farm via voicemail on their phones. In the face of irregular rainfall and declining farmer confidence on traditional planting and harvesting practices, this has been welcomed.

Land use

In reviewing existing programmes, the focus on maize, rice and soybean production in notable. This is in large part due to the fact that these are crops which can both be consumed domestically and sold as cash crops, offering two potential forms of livelihood and food security.

One interviewee suggested that tree planting is important as increasing tree cover provides not only positive climate change outcomes but clear economic benefits over time. Tree tenure issues have been successfully overcome through community tree planting projects and use of tree products.

Regardless of the crop, soil erosion and nutrition are also highlighted in the literature and by interviewees as vital to the agricultural future of northern Ghana, connected to which is reducing the practice of burning fields post-harvest and supporting re-forestation. Upper West is currently seen to be doing better on sustainable land management and reducing burning in particular, it is perceived to be because of highly motivated teams working in the area.

Finance

GIZ has led the development of a weather-related crop insurance scheme which is new for Ghana where no insurance company had previously underwritten a retail market crop or livestock insurance product – partly because they lacked the technical experience to design and rate such products, also because of the perceived high risk exposure of agriculture, problems of moral hazard and administrative cost and complexities of delivering products to rural smallholders (Stutley, 2010). The GIZ programme has demonstrated that there is scope to deliver micro-level crop insurance, albeit through partnerships which still require a degree of subsidisation, and also to design meso-level products for larger farming operations. No evidence on effects/outcomes of the programme was available as programme evaluation information is in German.

Beyond insurance, Danida is involved in a value chain facility, part of which focuses on increasing credit to agriculture through a loan guarantee facility for commercial banks, risk sharing with a bank to provide capital to farmers. Larger commercial banks are better suited to provide capital to larger farmers, so smaller rural banks are targeted to lend to smallholders. The programme has also been seeking to support rural banks which lack capacity, particularly those in the north of the country. This is done in part by facilitating mergers to allow banks to consolidate assets and provide wider and more stable services to borrowers. The merger process has been difficult to initiate, but will shortly receive government assistance owing to a new increase in the capital rural banks need to hold.

The Climate Innovation Centre is a new programme currently being developed by infoDev (an impact investment organisation linked to the World Bank) and Danida. Taking experience from a Centre developed in Kenya, the programme will encompass government, donor, private sector and academic actors and will provide capital to SMEs as well as providing technical support and policy assistance.

Climate change focus through agricultural development and food security programmes

Climate change is seeing increasing prominence at the national level in Ghana and across donor programming. This is exemplified through an AfD programme on lowland rice production, where since 2009 the EPA must conduct environmental assessments prior to any work commencing.

Focus on disaster risk reduction, particularly as a result of severe climate-related disasters in 2009 (flooding and drought), is seen in some programmes for example a component of FAO's Resilient Landscapes for Sustainable Livelihoods programme with UNDP, WFP, UNU and MoFA looks at community disaster risk management, building on a 1-district intervention by Care International, looking for synergies between climate change adaptation, disaster risk reduction and sustainable land management. The programme also provides a community disaster resilience fund, with microcredit for smallholders and a larger revolving fund for times of bigger crisis.

The primary focus of several donors is food security, not climate change, and while the two are often complementary, this prioritisation is important to informing how and where climate-smart practices can feasibly be targeted. Socio-economic resilience in the face of climate change is seen as important, requiring support through both commercial financial products (such as crop insurance) and more commonly, through social protection schemes. Ability to experiment with new approaches to agriculture requires a degree of income stability and protection from disaster. Anecdotally through interviews, stakeholders see climate-smart agriculture as having a positive impact on food security.

4 Conclusions and Findings

Northern Ghana faces a range of deep economic and environmental issues which limit development, but solutions to many of them are identified in both the literature and donor strategies and programming. Northern Ghana has long been marginalised within the country and now that increased focus is being given to improving agricultural practices, market development and economic diversification, the region seems well-placed to make strong progress over coming years. If climate change issues are addressed along economic ones. Climate change is a particularly big threat to the north, and although mainstreaming of climate activities seemed to be universal, based on telephone interviews, there is a diversity of practices and intensity of engagement on climate change throughout programming which needs to be overcome if farmers are to systematically implement mitigation and adaptation practices and if opportunities in the wider non-farm economy for emissions reductions and resource efficiency are to be achieved.

Section 2 identified opportunities such as the importance of improved water management for more effective climate-smart agriculture in northern Ghana, the potential for renewable energy in farm and non-farm livelihood improvements as well as job creation, the potential value of improving access to climate finance through integration of northern Ghana in REDD+ and the use of farmer-friendly technology, such as voicemail in local languages to communicate weather information, which is important in overcoming capacity issues, such as low literacy levels.

The mapping of donor strategies and activities in section 3 gives clear indication that both climate change and the three northern Ghanaian regions are increasingly important priorities for most organisations, which in turn highlights the need for effective coordination and collaboration not only amongst donors and INGOs, but with government and local institutions and actors. With what seems to be a significant increase in donor activity in the region, coordination and monitoring of activities will be important to both the success of individual programmes but also to ensuring the longer term benefit to the local population. This longer term benefit needs to be clearly mapped out in programming, with realistic short and medium term objectives and identification of relevant actors.

Donor activities on food security, cash crop development, market development, credit access, use of technology, use of participatory approaches and effective engagement with government and local institutions are all very positive and DFID's current programming incorporates many key components for economic development in the region.

In terms of evidence for additions to DFID strategy and programming, a few areas come out from the review. Specific focus on developing environmentally neutral or even green jobs in the non-farm economy seems to be one area where there is potential for increased activity. Similarly, CSA and SLM practices do not appear to be consistently recommended nor mainstreamed through current programmes, and priorities of different crops (particularly new cash crop promotion) would do well to consistently take a landscape approach, regardless of the limits of particular programmes. Renewable energy and waste management programmes were not strongly evident in the review. Knowledge-sharing across similar climatic zones, in particular neighbouring Burkina Faso, is starting to be developed but is an area of potential opportunity. Addressing low education levels is also important to both environmental and economic outcomes. This study, as has been highlighted throughout, is brief and does not provide comprehensive enough evidence to identify donor and NGO programming gaps. However, further research could provide more detailed mapping – there was clear interest in this from interviewees. Ideally, it would also include thorough mapping of national and municipal

government activities. This review has not considered the role of the private sector in improving sustainable livelihoods in the north, although evidence from programmes and interviews shows their potential importance through value chain and landscape programmes in particular.

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Annex 1 – Terms of Reference

Terms of Reference: Literature Review of impact of climate change on economic development in northern Ghana

Objective

To identify i) existing evidence on risks and opportunities associated with climate change as regards economic development, and in particular agricultural development, in North of Ghana; ii) knowledge gaps; iii) mapping of external inputs; in order to inform a) measures incorporated into relevant DFID programmes; and b) DFID's strategy for development in the North

Context

DFID Ghana is in the final stages of designing a suite of programmes to promote economic development in the North of Ghana, with a focus on the agricultural sector. These include:

1. Market Development (MADE) in the North of Ghana (M4P approach addressing market system constraints)
2. Ghana Greenfields Investment Programme (establishing PPPs for two irrigation schemes)
3. Catalytic Fund for agri-business (investment into companies to enhance production of crops in northern Ghana)
4. Institutional support to the Savannah Accelerated Development Authority (SADA – GoG institution to promote investment in northern Ghana)
5. Support to entrepreneurs and start-ups (two potential programmes to provide financing and TA to emerging businesses across Ghana)

Also relevant is an ongoing Millennium Villages programme carried out in the North with accompanying evaluation.

As the North of Ghana is the most vulnerable region to the impacts of climate change and the agricultural sector the most vulnerable sector, more analysis is needed on the implications of climate change for the objectives of these programmes. DFID's programmes relating to the North are at different stages of development, and various pieces of work on Climate and Environment has been carried out for these.

However, a comprehensive review of the existing evidence, literature and research on the impact and opportunities presented by climate change to agriculture in the North has not yet been carried out. Together with mapping activity in this area (by donors, Government of Ghana and others), this would serve to inform the different stages of design and implementation of DFID's programmes. It would also inform wider strategy for DFID work in the North, and feed into early thinking on the office's approach to climate and environment programming.

Government engagement on C&E and the North

The National Climate Change Adaptation Strategy (NCCAS) has specific agriculture objectives including access to credit, off grid energy, agricultural productivity, extension services, crop/livestock selection that is resilient. National reference scenarios are being prepared on basis of stakeholder consultation, covering all parameters and regions. This strategy identifies that a donor support group is needed.

The creation of SADA is a response to a need for public policy action to provide additional resources and a regionally focused strategic framework to address the widening economic gap for Ghana. SADA has been set up as a development agency to promote competitiveness and productivity in the northern savannah areas. A core part of SADA's strategy is adaptation to climatic changes.

DFID-supported regional programming
CARE Adaptation Learning Programme (ALP), addressing livelihoods challenges in relation to climate change in selected communities across Africa, including in Ghana, and making links into higher level advocacy on climate change.
Adaptation for Smallholder Agriculture Programme (ASAP – implemented by IFAD) is a regional programme but will include Ghana, and focus on climate resilience approach to value chains, business models to incorporate climate risks, adoption of technologies.
West African Food Markets Programme – (run by Africa Regional Department) focusing on enhancing the production and cross-border trade of major food crops, including indicatively northern Ghana.

Indicative list of activities by other donors in northern Ghana
GIZ on crop insurance and weather services
World Bank and USAID Ghana Commercial Agriculture Project on land rights, large-scale investment in irrigation and agricultural schemes
USAID various, including access to finance (FINGAP) and agricultural value chains work (ADVANCE)
AfDB/IFAD comprehensive Northern Rural Growth Programme
CIDA various food security interventions
AFD and JICA – rice production
DANIDA – agricultural development through mentorship, access to finance
WFP – emergency food security programme

Output
A report no longer than 20 pages (not including annexes) which provides an overview of and comprehensive references for existing knowledge and analysis, on the implications of climate change for economic development in the North of Ghana with particular reference to the agricultural sector, and identifies where there are gaps in this knowledge. The report should also summarise evidence available for effective approaches to address this. This should focus on overarching trends, projections, risks and opportunities.

Scope
The report should include sections on:
1. IMPACT OF CLIMATE CHANGE: What is known about the current and future impact of current climate variability and projected climate change on the following interlocking issues:
    a. current cropping systems and practice (disaggregating main crops);
    b. water resources: rainfall patterns (past and future), groundwater;
    c. value chains (including infrastructure used) and market demand;
    d. poverty and vulnerability, setting out identified impacts on different demographics (eg based on geography, livelihoods, gender etc);
    e. social dynamics including conflict risk and impacts of planned land tenure reforms, smallholder versus commercial farming initiatives.

2. OPPORTUNITIES: What is known about the effectiveness of approaches in this context to mitigate this impact, including but not restricted to:
    a. climate smart agricultural practices and integrated water resource management (eg agroforestry techniques, drought resistant seeds, crop diversification, irrigation);
    b. renewable energy including rural electrification initiatives;
    c. weather information services;
    d. financial services and weather-related insurance;
    e. capacity of local authorities and links with national initiatives;
    f. climate finance access;
    g. infrastructure (eg water storage, storm shelters).

3. ACTIVITIES ONGOING: brief overview of strategies and programmes of donors, Government of Ghana and other actors, based on available documents. It should also review for comparison a limited number of DFID approaches in similar environments vulnerable to climate change (eg M4P programmes such as PropCom in Nigeria, Africa Enterprise Challenge Fund, regional programmes such as CARE resilience programme, West African Food Markets programme etc).

The report should set out the state of current knowledge and critical gaps in this knowledge. It should also include a quick analysis of the measures set out in the programmes already approved (MADE, AgDevCo) for management of climate risk and maximising opportunities. (Separate work will be commissioned to inform programmes not yet designed, which will build on the general analysis from this report.) The main focus of the report though should be on section 1 above.

Method

- Literature review: analysis and research by Government, donors, multilaterals on Ghana and on agriculture and climate change (*see Annex A*).
- Programme documentation review: Northern development programmes already approved (MADE, AgDevCo) and other relevant DFID Ghana programmes (e.g. climate change, social protection). DFID programmes on agricultural markets in other countries (eg PropCom Nigeria).
- Telephone interviews: discussions with relevant stakeholders as appropriate (contacts to be provided by DFID Ghana).

DFID Ghana
January 2013

Annex A – early selection of documents

World Bank Economics of Adaptation to Climate Change: Ghana
http://climatechange.worldbank.org/sites/default/files/documents/EACC_Ghana.pdf
http://climatechange.worldbank.org/sites/default/files/documents/EACC_Ghana2pager.pdf

Social dimensions of climate change in Ghana (World Bank)
http://beta.worldbank.org/sites/default/files/documents/Ghana-EACC-Social.pdf

National Climate Change Adaptation Strategy (NCCAS)
http://www.adaptationlearning.net/sites/default/files/GHANA-%20National%20Climate%20Change%20Adaptation%20Strategy.doc

DARA Climate Vulnerability Monitor report on Ghana
http://daraint.org/wp-content/uploads/2012/09/CVM2ndEd-CountryStudy-Ghana.pdf

TAMD scoping report Ghana (Quest:IPCC SREX: Lessons for the Agricultural Sector
http://cdkn.org/wp-content/uploads/2012/10/SREX-lessons-for-agriculture-sector.pdf

Mappings of donor programmes by Private Sector Development Working Group; Deprived Areas Working Group; Heads of Cooperation group.

DFID programmes:

Adaptation for Smallholder Agriculture Programme – Business Case and Climate and Environment Note (*Quest: 3685467 and 3685545)*
Market Development in northern Ghana (*Quest: 3770575 and 3770543*)
AgDevCo Greenfields Investment (*Quest: 3739859 and 3741225*)
PrOpCom M4P programme in Northern Nigeria (*Quest: 3639325 and 3756276*)
CARE Adaptation Learning Programme (Quest: 3262373)
Concept notes for Catalytic Fund and entrepreneurship.
West African Food Markets draft Business Case

Annex 2 - Interviewees

People at the following organisations were contacted for interview:

ADVANCE Project (USAID)
AfD
CARE (Adaptation Learning Programme)
CIDA-PSU
Danida
EMBRAPA, Embassy of Brazil
European Commission (EEAS)
FAO
GIZ GH
UNDP
United Nations University
USAID
World Bank

And the table below shows those who were interviewed for the study:

Name of Interviewee	**Organisation**	**Job Title**
Catherine Phiri	ADVANCE Project (USAID)	Project Director Northern Ghana
Priscilla MORISSET	AfD	Project Officer, Agriculture, Rural Development and Environment
Romeo Adomah-Darteh	CIDA-PSU	Senior Environmental Analyst/Advisor
Lars Jøker	Danida	Programme Coordinator - Support to Private Sector Development
Benjamin De Ridder	FAO	APO Climate Change
Arnt Diener	GIZ	Junior Agric. Insurance Advisor, IIPACC Project (Innovative Insurance Products for the Adaptation to Climate Change)
Yasuko Kusakari	United Nations University	Socio-Economist, specialist on Northern Ghana
Justice Odoi	USAID	Environmental Specialist
Waqar Haider	World Bank	Sector Leader, Sustainable Development

Anna Antwi (Food Security & Agriculture Advisor, CIDA-PSU) offered to be interviewed but unfortunately the phone line was too poor for the interview to be completed.