REPORT ON ASSESSMENT OF CLIMATE INNOVATION AND ENTREPRENEURSHIP IN GHANA

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EXECUTIVE SUMMARY

Introduction

Climate change has become the most challenging environmental problem facing the world currently. The effect and impact of climate change traverse countries, regions and continents. Mainstreaming the strategies for climate innovations in the national development plan is particularly desirable since climate change can bring an immediate disastrous effect on people’s livelihoods. With support from the World Wide Fund (WWF) and the Swedish International Development Cooperation, the Science and Technology Policy Research Institute (STEPRI), in cooperation with the consulting firm Innogate Aps, undertook an assessment of climate innovation and entrepreneurship in Ghana. The assessment generally aimed to take stock and initiate a process to accelerate climate innovation in Africa using Ghana and Tanzania as case studies. More specifically the project will assess the level of development of national climate innovation systems and the conditions facing climate entrepreneurs in Ghana.

Methodology of the Assessment

The assessment adopted three approaches to collect the necessary information needed. These methods included a desk research to survey the available literature, field interviews with key persons in government, research, NGOs and private sector. A stakeholder-workshop was organised to present the findings of the assessment and solicit inputs.

Findings of the Assessment

The outcome of the assessment is that there was low level of awareness due partly to the manner in which climate change and climate innovations are communicated to non-scientist and non-technical persons. The problem of inadequate funding for climate change activities in general was attributed to the low level of awareness among policy makers, who are difficult to convince to provide funding in respect of budgetary allocations and release.

Knowledge institutions also acknowledge that climate change as a discipline of study is relatively new and so there is little capacity in teaching climate change and therefore other related issues such as climate innovation and entrepreneurship in the country. There is absence of aggressive advertisement on these technologies as well as absence of clear policies and projects to encourage innovations.

In terms of the activities they are engaged in, NGOs have facilitated the establishment and growth of artisanal and small scale climate entrepreneurs. There are also investments in some climate entrepreneurs engaged in the development and production of energy efficient cooking stoves that increases the efficiency of charcoal burning. Typical of NGO-activities, NGOs have been engaged in advocacy to promote the achievement of energy efficiency in large public institutions and industries, as well as advocacy for the adoption of renewable energy.

On the part of the knowledge institutions, most of them are teaching and research institutions whose work mainly border on establishing the science of climate innovation and collecting the Ghanaian evidence of climate change. Some of them are working with local (usually rural) communities to understand the phenomenon and how they can adapt to it having worked with these communities to identify their vulnerabilities.

There are entrepreneurs in Ghana who are dedicated to identifying and using technologies for mitigating adverse environmental impacts. These are mostly in the area of converting waste
(biodegradable waste) and sewerage into energy by subjecting the waste to anaerobic conditions (using biogas technology). There are entrepreneurs in Ghana assisting industries to improve on their energy efficiency through heat and mass transfer. Some of the entrepreneurs are in the business of assembling and packaging climate technologies, mainly photovoltaic systems for sale in Ghana. Although during the interviews respondents indicated that there was a lot of collaborations among stakeholders in industry, research, NGO and government, the reality however is that in terms of the content or the terms of the collaborations, many were ad hoc and loose, and took place on a case by case basis depending on specific projects.

A number of challenges were identified during the interviews and workshop. Low capacity with respect to knowledge on climate change communication and knowledge on climate innovations were challenges identified by many actors. There is also a seeming lack of political will to support capacity building programmes by for instance passing enabling legislation and providing budgetary support for capacity building. The absence of a policy presents other challenges when it comes to integrating climate solutions/innovations into the national development agenda. The absence of a clear policy also presents the challenge of a lack of clear cut basis or incentive for investing in the climate entrepreneurship. Other challenges mentioned by respondents included difficulty in obtaining tax exemptions to import equipment for research in knowledge institutions; poor working conditions (remuneration and facilities) of researchers in public knowledge institutions; and the ability to manage the expectations of collaborators/stakeholders in research, especially with respect to the outcomes of the research.

Despite these challenges, attractive climate innovation opportunities are available to Ghanaian entrepreneurs – attractive both in terms of climate mitigation and adaptation and in terms of economic development. Some of these include biogas from waste treatment, use of sawdust as an alternative to wood and micro hydro dams.

**Conclusion and Recommendations**

The four identifiable stakeholder categories – government, knowledge institutions, entrepreneurs and civil society – are currently involved in a range of initiatives which if properly executed and coordinated will bring significant pay-offs to the country as a whole. There is therefore the need for holistic action on the part of the stakeholders. While the stakeholders make efforts to achieve the envisaged holistic action, external support such as coming from WWF and other international bodies could be focused to promote synergy and amplify the impacts.

It is recommended that to address the challenges in the short-term, there is need to improve on the level of awareness and dispel the erroneous perception that climate technologies are exotic. Repackaging the manner in which information on climate change and climate innovations are disseminated to the general public is essential. Additionally there is need to promote the uptake of the existing relatively simpler technologies. The adoption of these technologies could pave the way for the adoption of other sophisticated innovations when available. It is also recommended that in the long-term an institution be designated and adequately supported to serve as the anchor to coordinate, facilitate and focus, in a periodic manner, the various interactions that go on among the actors in the quadruple helix. In the medium to long-term, there is need to reconsider legislation that will provide incentives to investors to invest in climate enterprises so that they can enter the markets and up-scale their business activities. Technical and financial support should be sought and provided to the Clean Production Centre of the EPA to enable it commence business.
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Introduction

Climate change has become the most challenging environmental problem facing the world currently. The effect and impact of climate change traverse countries, regions and continents. Today the debate on climate change is less about evidence than about effective local and global response to the challenge. An important means of response is the development and diffusion of innovations to address specific contextual problems coming with climate change. Stimulating and diffusing such innovations are crucial components of national development strategies.

Mainstreaming the strategies for climate innovations in the national development plan is particularly desirable since climate change can bring an immediate disastrous effect on people’s livelihoods; extreme weather conditions occur more often and natural resources reduce because of increased temperature and other natural disasters. Such effect in developing countries can be particularly devastating given the relatively low capacity of these countries to handle impacts of natural disasters.

There is enough scientific evidence to prove that the potentially negative impacts of climate change are immense, and Ghana is particularly vulnerable due to lack of capacity to undertake adaptive measures to address environmental problems and socio-economic costs of climate change. These include climate change associated health problems, climate induced disruption of agricultural systems, flooding of coastal areas and sea erosion and low operating water level of the main hydro-electric dam in the country at Akosombo. The Akosombo dam since its construction in 1965 was producing about 80% of national electricity supply until recently when reduced levels of precipitation have affected its electricity production\(^1\).

With support from the World Wide Fund (WWF) and the Swedish International Development Cooperation, the Science and Technology Policy Research Institute (STEPRI), in cooperation with the consulting firm Innogate Aps, undertook an assessment of climate innovation and entrepreneurship in Ghana.

The assessment generally aims to take stock and initiate a process to accelerate climate innovation in Africa – by building on amongst others, the Ghana Technology Needs Assessment implemented under the United Nations Framework Convention on Climate Change (UNFCCC). More specifically the project will assess the level of development of national climate innovation systems and the conditions facing climate entrepreneurs in Ghana. A similar assessment is currently being undertaken in Tanzania. Having conducted the assessments, the project will identify preferred systems for national and international technology transfer that will enable climate innovation entrepreneurs to develop and grow.

This report presents the assessment of climate innovation and entrepreneurship in Ghana. The report is in five main parts. Following this is the background and objectives of the assessment, followed by a description of the methodology used in conducting the assessment; a presentation of the assessment outcomes, and the conclusion and recommendations.

Assessment background and objectives

The Earth Summit and After

In 1992 at the Earth Summit in Rio de Janeiro, the United Nations Framework Convention on Climate Change (UNFCCC) was adopted with the objective to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

A voluntary approach was adopted by 162 countries to achieve this objective. However, by 1993 it had become clear that the voluntary approach would not succeed and the doubt over anthropogenic climate change was disappearing and the threats posed by climate change were now real. The Kyoto Protocol was adopted in 1997 as an enforceable programme to achieve the objectives of the UNFCCC. The Kyoto Protocol entered into force in 2003.

Throughout the Convention process, the Conference of Parties (COP) to the UNFCCC recognises the important role environmentally sound technologies play in averting the threat of climate change. Therefore the COP, by its decision 13/CP.1, recalled the relevant provisions of the Chapter 34 of Agenda 21 on “Transfer of Environmentally Sound technology, Cooperation and Capacity Building”2.

The COP’s decision 7/CP.2 also requested the Convention Secretariat to give high priority to the development and completion of a survey of the initial technology needs, as well as, technology information needs, of Parties not included in Annex I to the Convention (non-Annex I Parties). Decision 4/CP.4 also urged non-Annex I Parties, in the light of their social and economic conditions to submit their prioritised technology needs, especially those relating to key technologies to address climate change in particular sections of their national economies, taking into account state-of-the-art environmentally sound technologies. Further by its decision 4/CP.4, the COP requested Subsidiary Body for Scientific and Technological Advice (SBSTA) to establish a consultative process aimed at achieving agreement on a framework for meaningful and effective actions to enhance implementation of Article 4.5. Article 4.5 urges developed country Parties and Annex II Parties to take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly to developing countries, to enable them to implement the provisions of the Convention2.

Through the consultative process, a framework for technology transfer was developed. This framework became the subject of negotiation during the second part of the Sixth Conference of Parties as part of Bonn Agreement for implementation of the Buenos Aires Plan of Action. At the Seventh Conference of Parties (COP7), by decision 4/CP7 the framework for meaningful and effective implementation of Article 4.5 was formally adopted.

As part of fulfilling developing countries’ commitment to the UNFCCC, these countries were required to conduct technology needs and needs assessments. Existing technology needs assessments carried out in African countries within the framework of UNFCCC and findings coming out of the dialogue within the African European Climate Innovation Initiative

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(AECII) have revealed that Africa faces special conditions, challenges and opportunities for climate innovation entrepreneurs, investors and policy makers.

Firstly, in Africa the institutional frameworks for facilitating innovation in general and climate innovation in particular are largely little developed. Secondly, awareness of and aspiration for overcoming climate challenges through actively pursuing climate innovation opportunities is not well developed.

The analysis that this report seeks to undertake will respond to these shortfalls and thereby facilitate an improved foundation for African countries engaging in global climate change efforts and in benefiting from new growth opportunities provided by climate innovation and entrepreneurship.

This initial assessment in Africa using Tanzania in East Africa and Ghana in West Africa as case studies, reviews the general conditions for facilitating climate innovation through joint efforts among stakeholders within the quadruple helix – the government, knowledge institutions, private sector and civil society – with a particular emphasis on supporting climate innovation entrepreneurs in bringing their products (i.e. their “climate solutions”) to the market.

A goal analysis

A climate innovation, by WWF’s definition, is: ‘a transformative technology (non-fossil, non-nuclear goods or services) that can have a significantly positive effect on climate change if applied at scale.’

WWF wants to cross-fertilize the global climate and innovation agendas, for the benefit of business as well as the health of our planet. Entrepreneurs, investors and policy makers are the primary stakeholders in this strategy. By using the power of best practice WWF can get attention from target groups. This attention is used to highlight weaknesses and impediments in the innovation and commercialisation process, e.g. unaligned regulation, lack of competence, limited access to financing etc. WWF will approach relevant decision-makers and engage in collaboration with relevant stakeholders to catalyze improvements in such areas.

The analysis will be performed at two levels which are both important for the understanding of how different parts of the African innovation system works:

1. On the ground analysis of prevailing framework conditions for enhancing national climate innovation systems in Africa i.e. the day-to-day reality and available resources for climate entrepreneurs to work in the country.
2. Identification of preferred systems for technology transfer that will enable African climate innovation entrepreneurs to develop and grow.

Building on the components 1 and 2 the assessment will provide the basis for (a) recommendations to policy makers, investors and entrepreneurs, and (b) taking informed decisions on approaches on how to further activities and collaborations that will strengthen the national innovations system in Ghana and Tanzania specifically and in Africa more generally.
Building on experiences and new findings the assessments will support climate innovations in reaching the market – be it through development and facilitation of new climate solutions, new productive partnerships within the four helix, and new platforms for channelling and advancing climate innovation and entrepreneurship.

The Concept of National Innovation System

It has been recognized that the innovation systems in many African countries are not in the best of conditions although in many cases the human resources are available to tap. Therefore if the overall innovation system calls for improvement, so does the climate innovation system. Innovation is an interactive process involving various critical actors working in a given socio-economic and cultural system to bring about improvements or advances in the production of goods and services. It is a dynamic process and it implies specific behaviours and performances, with obvious implications for outcomes. The concept of Innovation System has become an important framework for understanding technology development and diffusion in recent times. Thus the National Innovation System (NIS) succinctly underscores the vitality of mechanisms that enhance the participation of stakeholders in the utilization and development of technology. Within the NIS, the emphasis is on how these agents or actors influence each other to generate new forms of knowledge. More importantly, the NIS puts the spotlight on the institutions and the relationships among the respective actors, drawing on and harnessing their synergies for innovation and development.

The Climate Innovation System (CIS) as analysed in this study defines the critical actors in four main categories. The quadruple helix structure of the CIS puts emphasis on the following categories of actors:

- Government actors – the executive overseeing public ministries, departments and agencies, parliament and judiciary;
- Private sector actors – entrepreneurs, investors, bankers, etc.; and
- Knowledge actors - scientists and researchers (mainly in research institutions and universities)
- Civil society - non-governmental organizations, social and political agents.

Figure 1 outlines the nature of the roles, linkages and interactions among these critical actors in the system. Needless to say, the inter-relationships among the units of the system are much more complex. For example, the knowledge actors acquire or generate knowledge to produce climate innovations for the respective entrepreneurs who in turn produce for consumers. The government, for example, through its budgetary allocation directs the activities in the knowledge actors. Investment activities whether from the private sector or public sector stimulate climate innovations in industry.

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Assessment methodology

The assessment adopted three approaches to collect the necessary data or information needed. These methods included a desk research to survey the available literature and field interviews with key persons in government, research, NGOs and private sector. A stakeholder workshop was organised to present the findings of the assessment and to solicit more input.

Desk research

Desk research was conducted by consulting available relevant documents relating to climate change, innovation, technology, climate entrepreneurship and national policies and plans. This exercise provided enough background information to contextualise the assessment and
to validate some of the findings from the field interviews. It also served to point out where to obtain further information.

Interviews

Interviews were conducted with 25 people selected from various actors in government institutions (ministries, departments and agencies), non-governmental organizations, knowledge institutions, and the private sector. Three separate interview guides were developed to facilitate systemised qualitative and quantitative data collection. The interview guides were separately tailored to elicit responses from government institutions, knowledge institutions, NGOs and the private sector. Please see appendix for interview guides.

Stakeholder workshop

One stakeholder workshop, with participation of entrepreneurs, knowledge institutions, NGOs and government was organised. The workshop saw presentations from representatives from government, a representative from the private sector, a representative from the knowledge institutions and a representative from the NGOs. Proceedings of the workshop are available in a separate report. Some climate innovations were showcased as successes (see Boxes 1 and 2). Apart from the presentations the workshop participants were tasked to perform two assignments: -

(i) to identify two main challenges facing the various actors in the quadruple helix;
(ii) to identify three key systemic shortfalls that needs to be resolved; and
(iii) to identify three actions that are critical in the short term, and three actions that are critical in the long term to provide sustainability.

Findings of the Assessment

The National Context

Ghana is found in West Africa, precisely located on Latitudes 4°5’N and 11°5’N and Longitudes 3°5’W and 1°3’E. Ghana’s neighbours include the Republic of Togo to the east, Burkina Faso to the north and Cote d’Ivoire to the west. The country covers an average area of 238,539 km². Extensive water bodies including the Lakes Volta and Bosomtwe occupy 3,275 km² while seasonally flooded lakes occupy another 23,350km². The territorial waters extend 200 nautical miles out to sea in the Gulf of Guinea.

The population of Ghana in March 2000 was estimated at 18.4 million people with about 74% of the population being described as rural. The population distribution varies across the ecological zones of the country with the savannah and forest zones carrying about 51.4% and 48.6% respectively. Population has tripled over the past four decades; from 6.7 million in 1960 to 18.4 million in the year 2000. It is currently estimated to be about 22 million people. Projections indicate that population figures will reach 27.0 million by 2010 and 33.6 million by the year 2020. The major employment sectors in Ghana are agriculture, industry and services with about 50.6% of the labour force deriving their income from agriculture alone.

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6 Ministry of Environment and Science (2000): Ghana’s National Initial Communication to the UNFCCC
7 University of Ghana (2005): Agro-ecological zones and land cover trends in Ghana (Draft)
9 MOFA (2007): Food and Agriculture Sector Development Policy
National efforts towards climate change

According to the Intergovernmental Panel on Climate Change10 (IPCC) there is no country and region of the world that will not be affected by climate change. Climate change is by far the most challenging environmental problem facing the world at present. To meet this challenge squarely, human imagination and ingenuity are already beginning to respond to the problem, by identifying and developing technologies and practices both for mitigating climate change and adapting to it. Climate innovation has been identified as an inevitable component of the world’s convergence towards a low carbon economy.

Ghana ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and acceded to the Kyoto Protocol in 2003. Countries that have ratified the Protocol have committed themselves to reduce the emission of six greenhouse gases (GHGs), or trade in emissions if they maintain or increase emissions of the GHGs. These GHGs are carbon dioxide, methane, nitrous oxides, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.

In 2003 Ghana produced its technology needs and needs assessment (TNA) as required by the UNFCCC. Through a consultative process, a set of criteria was adopted for selecting relevant technologies within energy and waste sectors. The criteria included contribution to addressing climate change, development benefits and market potential of the selected technologies. Within these, sub-criteria were defined based upon which a number of technologies were identified11. The following technologies were identified in the energy sector:

- Energy efficient technologies, including energy efficient lighting and industrial energy efficiency
- Solar PV- technology
- Small and mini hydro
- Natural gas development and distribution technologies
- Natural gas combined cycle technologies
- Solar water heaters
- Wind
- Biomass for power generation
- Transport (use of biodiesel from e.g., Jatropha)

In-depth analyses were done for the development of technology transfer implementation plans.

Similarly, some technologies were identified in the waste sector. These include the following:

- Landfill methane gas capture and power generation
- Anaerobic and methane generation technologies for wastewater handling (biogas technologies)
- Composting technologies
- Combined heat and power generation from sawmill residue (co-generation)

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Ghana’s TNA makes several recommendations pertaining to the use of technology in the energy and waste sector to address climate change problems. Some of these recommendations include:

- Developing policy guidelines that will address issues like subsidies, ownership, tariffs, awareness, standardization, quality control, institutional set up and the right of supply and promoting private sector involvement in the transfer of technologies.
- Build indigenous capacities to develop technologies locally.
- Develop policy, regulations and enforcement capacities for increased public and private participation in energy efficiency programmes, taking into consideration the programmes already implemented by the Energy Foundation.
- Review Technology Transfer Regulations need to allow the incorporation of issues consistent with the criteria for encouraging the introduction of these technologies, in particular the reduction of GHG emissions.

**Level of awareness of climate innovations**

The following discussion is based on the outcome of interviews conducted with key persons in government, non-governmental organisations, knowledge institutions and enterprise. From the government point of view there is low level of awareness. Following from the low level of awareness of climate change and climate technology issues, there is the challenge at the district level where local level plans and programmes are drawn. What arises from this therefore is the inability to link climate change issues to wealth creation and poverty reduction. It appears that the manner in which climate change and climate innovations are communicated to non-scientist and non-technical persons is very difficult for understating and therefore accounts for some of the reasons for the low level of awareness.

It was also reported that there appears to be a low level of awareness even among policy makers who were supposed to make regulations that will provide incentives for climate innovation. The problem of inadequate funding for climate change activities in general was attributed to the low level of awareness among policy makers, who therefore are difficult to convince to provide funding in respect of budgetary allocations and release.

Furthermore, it has also been identified that due to the low level of awareness, the Ghanaian general public is sceptical about the efficacy of available technologies. Even those who are aware of existing innovations and technologies are slow to adopt them. This therefore has negative implications for up scaling and promotion which are needed for the growth of climate enterprise.

There was the opinion that there are simple innovations and technologies that are environmental friendly and could be used, especially in the energy sector; however it appears that many people think that because climate change has been moved on top of the development agenda nationally and internationally, sophisticated innovations and technologies, which will usually be imported into the country should be sought.

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There was admission that the lack of awareness does not mean that nothing is ongoing. Indeed many of the respondents were of the view that the missing link was between the scientist/technical persons and the general (lay) public in Ghana.

From the perspective of the entrepreneurs, there appears to be a lack of awareness on climate change issues in Ghana. Awareness with respect to the causes of climate change is non-existent whiles there is some awareness about the effects and impacts of climate change that are evident in the observation of temperature increases and its corollary heat waves; and the droughts and floods that the country has witnessed over the years. From the perspective of climate entrepreneurs in Ghana, there is also low level of awareness of the technologies available for promoting climate change mitigation and adaptation. Even more worrying is the view that it is difficult to identify these technologies where there is awareness about them therefore making it difficult for the adoption of these technologies. Although some of the enterprises were doing well to promote these known technologies, most of them were at the market penetration stage.

From the perspective of a climate entrepreneur who also is a researcher in one of the universities in Ghana, there is immense knowledge available on climate technologies; however what remains is the availability of funding to translate the knowledge into finished products.

According to some entrepreneurs, the government appears not to have a clue as to how to assist the companies promote these technologies. As evidence, most of them referred to certain policies (tax breaks) and legislations that the government made that were supposed to help the growth of climate enterprises but which have ended up not benefitting them.

Generally, the perspective on the knowledge institutions did not reflect a general lack of awareness, perhaps because they have been the point of the generation and repository of most of the knowledge. However, a few of the representatives in the knowledge institutions mentioned that they have observed a generally low level of awareness on climate change issues among Ghanaians although there appears to be a relatively high level of awareness on environmental issues.

The knowledge institutions also acknowledge that climate change as a discipline of study is relatively new and so there is little capacity in teaching climate change and therefore other related issues such as climate innovation and entrepreneurship. Following from the low level of awareness is the fact that there is little and in many cases no stakeholder buy-in with respect to the sustainability of pilot projects to demonstrate some available technologies for later up-scaling.

The knowledge institutions also recognise that even where technologies for climate solutions exist, because of the communication methods used, there is low level of awareness among the general public in Ghana on the better climate innovations, partly due to the absence of aggressive advertisement of these technologies as well as absence of clear policies and projects to encourage these innovations. It has also been alluded that the low level of linkage between the knowledge institutions on one hand, and industry and government on the hand is due to the reluctance of some people (due to self-centred interest) in some of the knowledge institutions to share the knowledge accumulated on climate change. This is further exacerbated by the situation where researchers and scientists’ career progression path is highly linked favourably to publications in scientific journals and not so much to publications that will inform policy makers, industry and the general public about innovations.
Additionally, knowledge institutions themselves acknowledge that they have challenges in accessing information on climate change issues, particularly relating to the science of climate change, and information of experts in climate change and innovation. It appears that there is fragmentation of information on climate change in Ghana, which has the potential to lead to duplication of efforts.

Civil society organisations active in climate change such as Concern Universal have emphasised the need for enhancing awareness of climate change challenges and the innovations needed to address them. Some of these organisations are contributing to raising the level of awareness. However there is much more to do to enable the ordinary Ghanaian to fully appreciate the challenges and to adopt available innovations to mitigate or adapt to climate change.

**Ongoing activities**

The Government of Ghana has a Ministry of Environment Science and Technology that has established the Environmental Protection Agency (EPA) as the Designated National Authority (DNA) on climate change in Ghana and a focal person has been appointed. Additionally, a National Climate Change Committee in the Ministry was recently inaugurated. There are other Ministries, Departments, Agencies and Commissions that have various programmes, projects and activities relating to climate change, climate innovation and entrepreneurship. The government does its possible best to participate in the international agenda as far as climate change is concerned; especially in activities that are promoted by the UNFCCC and geared towards achieving the objectives of the UNFCCC.

Among the activities that institutions under the Government of Ghana are undertaking include the promotion of energy efficiency practices and technologies in industry and buildings (mainly of public buildings). This is being done by the EPA in collaboration with other government institutions such as the Energy Commission, Energy Foundation, and the Kumasi, Institute of Technology and Environment (KITE). Further to the promotion of energy efficiency in industry, the government has set up a clean production centre to provide technical support to companies in the industrial city of Tema. This Centre is yet to commence work.

Government through its Ministries, Departments and Agencies (MDAs) principally the EPA and other collaborators has commissioned and undertaken numerous studies on the assessing the impacts, vulnerabilities and adaptation to climate change of the various sectors of the country to climate change and based on these studies; early warning systems have been designed.

The government through the National Development Planning Commission (NDPC) in collaboration with the EPA is considering the mainstreaming of environmental issues and by implication climate change issues into the national development plan and budget. Indeed there are ongoing 10 pilot projects in Ghana where 10 District Assemblies have been assisted to mainstream climate change adaptation and disaster risk management into their district plans.

Through the collaboration of the EPA and the Forestry Commission (FC), which is spearheading, the government of Ghana is preparing to participate in the international mechanisms on reduced emissions from deforestation and degradation (REDD). This also shows that Ghana is committed to the sustainable management of its forest resources.
government through some of its institutions has been contemplating the development and implementation of some clean development mechanism (CDM) projects. The FC for instance is about to implement a CDM project in the Pamu Brekum Forest Reserve.

To facilitate the promotion of renewable energy, the government is taking steps to provide an enabling platform for renewable energy resources to be exploited in the country. In this direction the government is considering a renewable energy law. The Energy Commission and the Ministry of Energy have committed themselves to pursuing the passage of this law. It is envisaged that the national renewable energy law will provide for the institution of regulations on pricing and tariff, mandatory purchase, and the provision of incentives (tax exemptions and subsidies for instance) that will facilitate the deployment of renewable energy technologies in Ghana. In the mean time the government is implementing pilot projects on renewable energy.

Other activities in the area of afforestation and agro-forestry are being undertaken by the government of Ghana to increase the carbon sinks of the country. Whiles the national electricity production facility, the Volta River Authority (VRA), is making efforts to reduce the emission of carbon dioxide and nitrous oxides from its thermal plants. The percentage of electricity generated from hydro of the total electricity consumed in Ghana has recently been decreasing therefore calling for supplementation with electricity generated from thermal sources. Therefore among the steps that VRA is undertaking include the perfection of a single cycle plant to a combined cycle plant.

Recognising that biomass constitutes a larger share (about 60%\(^\text{13}\)) of total energy used in Ghana, and that most of it is used for domestic and small scale commercial activities, there were efforts to promote the popularisation of the use liquefied petroleum gas (LPG) in Ghana. This was particularly reinforced by the then expectations of Ghana procuring natural gas from Nigeria through the West Africa Gas Pipeline Project (WAGPP). However the popularisation suffered at some point following the delays in the completion of the WAGPP. It is expected that with the discovery of oil and gas in commercial quantities in Ghana this initiative will be reinvigorated.

It appears that there are a number of NGOs in Ghana that are engaged in facilitating the development and growth of climate entrepreneurs in Ghana. Of the six NGOs contacted, all but one indicated that they have facilitated the establishment and growth of artisanal and small scale climate entrepreneurs. Some NGOs have invested in the establishment of clean energy entrepreneurs who are deploying solar lanterns and other photovoltaic systems. There are also investments in some climate entrepreneurs engaged in the development and production of energy efficient cooking stoves that increases the efficiency of charcoal burning.

Another NGO indicated that it has facilitated the development of a treadle water pump for irrigation by small scale farmers. This technology is significant in the sense that it does not depend on electricity or fossil fuel for power to operate.

Typical of NGO-activities, The NGOs have been engaged in advocacy to promote the achievement of energy efficiency in large public institutions and industries, as well as the advocacy for the adoption of renewable energy. The Energy Foundation has for instance collaborated with the Energy Commission, the Ministry of Energy to replace incandescent

lamps with compact fluorescent lamps. A preliminary assessment of this indicates that the government made a lot of savings from this in terms of the amount of money it would spent on purchasing crude oil to operate thermal plants. Additionally the foundation has identified a number of CDM projects and proposed them to companies and government agencies. These CDM projects are yet to be developed though.

Some NGOs are engaged in promoting the establishment of tree nurseries by supporting with training of the seedling growers. These NGOs have also encouraged farmers to plant these trees on their farms. Concern Universal, one NGO, has worked with the traditional leaders of Nkoranza, a community in Ghana where charcoal burning is high, to ban indiscriminate burning of charcoal in the community.

Among other activities that the NGOs in Ghana are doing is the facilitation of interaction between the private sector and government on environmental issues. They also support research in the area of climate change, while some of them work with young people on environmental issues. This is especially significant for achieving the sustainability of their activities.

On the part of the knowledge institutions, most of them are teaching and research institutions whose work mainly border on establishing the science and collecting the Ghanaian evidence of climate change, working with local (usually rural) communities to understand the phenomenon and how they can adapt to it having worked with these communities to identify their vulnerabilities. It should be pointed out that climate change research in the knowledge institutions has only been recent although environmental concerns have being on their research agendas for a long time.

Many of the activities that knowledge institutions in Ghana are undertaking that relate to climate change include a number of activities geared towards assisting vulnerable communities to adapt to the impact of climate change. For instance at the University of Ghana, the Regional Institute for Population Studies with other collaborators are working with farmers in a livelihood mapping exercise as well as studies to map flooding details of some communities that are vulnerable to (climate change-induced) flooding. The study also involves understanding the linkages between land use and land cover change. These activities also involve building the capacity of rural communities to enumerate and interpret information on climate change, vulnerability and adaptation.

Studies are also undertaken by some knowledge institutions to understand the seasonal variability of rainfall and trends of temperature in Ghana. These studies are done to identify the other stressors apart from climate change and are useful in designing adaptation and mitigation measures for vulnerable communities. Knowledge institutions have also been providing information on climate change to policy makers and have assisted in policy formulation.

On a broader scale, and looking at national development paths, the University of Ghana is undertaking a project to understand the linkages that can be established among knowledge institutions in Ghana, and the kind of linkages that can also be established between knowledge institutions and industry. In addition, some of the knowledge institutions are engaged in providing consultancy services to industry and individuals.

The Energy Centre of the Kwame Nkrumah University of Science and Technology (KNUST) is proposing to work with the Department of Economics and the Faculty of Law of KNUST,
to undertake policy studies with respect to embedded generation tariffs and the related licensing regulations towards stimulating the private sector to develop renewable electricity projects. The centre is also providing training in renewable energy through hands-on short courses and post-graduate programmes by distance learning. Some fellows of the Centre are supervising post-graduate students who are developing CDM projects based on biogas technology by bundling the public universities together. Other CDM projects based on biogas are being conceived for second cycle educational institutions in Ghana.

In addition the Centre is proposing to undertake a number of Researches, Development and Demonstration (RD&D) activities in energy technology and management. In particular the projects will focus on energy technologies including the following fuel cells, energy storage, solar refrigeration and evaporative coolers, multi-functional platforms, improved wood fuel stoves, LPG/ natural gas conversion and end-use devices, new materials for solar panels and wind turbines.

There appears to be a lot of ongoing activities that relate to climate change and to some extent climate innovation and entrepreneurship that are being undertaken by entrepreneurs. There are entrepreneurs in Ghana who are dedicated to identifying and using technologies for mitigating adverse environmental impacts. These are mostly in the area of converting healthcare waste, biodegradable waste and sewerage into energy by subjecting the waste to anaerobic conditions (using biogas technology). Recognising that the adoption of these technologies is at an infant stage, the entrepreneurs are also driving the uptake of biogas technology in the country.

There are entrepreneurs in Ghana assisting industries to improve on their energy efficiency through heat and mass transfer. Mainly these entrepreneurs collaborate with companies outside Ghana to develop the technologies to improve the systems.

There are also a number of enterprises that are engaged in assembling and packaging climate technologies, mainly photovoltaic systems for sale in Ghana. These are mainly sold to households, hotels and medium size companies. There are also some entrepreneurs engaged in designing and constructing rainwater harvesting technologies.

**Level of stakeholder collaboration**

Although during the interviews respondents indicated that there was a lot of collaborations among stakeholders in industry, research, NGO and government, the reality however is that in terms of the content or the terms of the collaborations, many were ad hoc and loose, and took place on a case by case basis depending on specific projects. Furthermore, many of the collaborations were nurtured among stakeholders during participation in common events such as workshops, seminars and other fora. Deliberate efforts to reach out to other stakeholders were almost absent. The challenge with this is that many times there was no pursuit of the network beyond the fora.

This been said, it should be pointed out that there are cases where formal frameworks exist to facilitate collaborations between and among stakeholders in government, NGO, research and industry. For many of these collaborations that happened on set formal structures, the tools often used included memorandum of understandings between or among institutions. These are usually for a specified period of time and are mostly based on projects. In this case contracts are signed among stakeholders who are enjoined to produce some deliverables. This was the case as reported to be happening among stakeholders in government.
One observation worthy of mention is that there was a sense of strong collaboration among actors in the same sphere of the quadruple helix. For instance it appeared that actors in government collaborated more (given the background of collaboration provided above) with other actors in government than actors in NGOs and actors in the knowledge institutions. Collaboration between actors in government with actors in industry was relatively low. Many of the government actors who interact with industry were regulators such as the EPA and Energy Commission. There was also a sense of close collaboration between actors in the knowledge institutions and actors in NGOs, especially in establishing pilot projects and conducting studies.

Government institutions had a very good network and link to district, municipal and metropolitan assembles who they collaborate to for instance develop local level plans and implement these plans. The NGOs indicated that they had the strongest of collaboration with the assemblies though their spread was limited as compared to the actors in government.

It should be mentioned that many of the collaborations that exist among actors in research (knowledge) were with foreign institutions that mostly provide funds for research and other collaborations. The area where collaboration between actors in knowledge and actors in industry is strongest is the provision of consultancy services to industry by knowledge institutions on a one-off basis.

Challenges in climate innovation and entrepreneurship

A number of challenges were identified during the interviews and workshop. Low capacity with respect to knowledge on climate change communication and knowledge on climate innovations were challenges identified by many actors. To go around this challenge many of the actors were collaborating with other government and knowledge institutions that have the specialised knowledge. With respect to the challenge of communicating climate change, it was identified that the source of the challenge was in packaging the information on climate change such that it reduces its apparent abstract nature to reality for ‘ordinary’ people to understand. It is worth also noting that the efforts to train people and therefore improve on the capacity are moving very slowly.

Another area of limited capacity is with respect to facilities. Many of the knowledge institutions had very limited access to the internet, which they considered as crucial to obtaining information from scientific databases that are available; linking up with other knowledge centres to conduct research and communicating effectively with foreign collaborators. Other capacities with respect to facilities include obsolete and broken down equipment at laboratories,

Exacerbating the challenge of low capacity is the seeming lack of political will to support capacity building programmes by for instance passing enabling legislation and providing budgetary support for capacity building. This is perhaps so due to the absence of a policy on climate change and climate innovation, thereby creating an unattractive policy environment. Furthermore, even though there are a few regulations (in the absence of a policy), it is difficult implementing these regulations to make companies comply. The absence of a policy presents other challenges when it comes to integrating climate solutions/innovations into the national development agenda. The absence of a clear policy also presents the challenge of a lack of clear cut basis/incentive for investing in the climate entrepreneurship.
Low level of awareness on climate change issues in Ghana and of climate innovations was a challenge identified by a majority of the respondents. This challenge was tied to the revelation that there was a challenge with dissemination of information on climate issues. This was also attributed to the situation where knowledge was polarised/personalised rather than being institutionalised. This resulted in the case where it was difficult accessing information on climate change in the absence of an individual who had sole access to the information.

It was pointed out that the absence of an effective body coordinating climate change activities at a high level (for instance, ministerial level) in government was a major challenge since there was no ‘rallying’ point with respect to climate change and climate innovation. Further exacerbating this is the fact that there is so much under the government’s ambit such that it makes it difficult for government to give the needed attention to climate innovations.

Inadequate funding was identified as a challenge by many of the respondents. For the private sector, funding was difficult to come by with respect to expanding enterprises and this was mostly the case because of the low level of understanding and the expectations of the financial institutions that could provide the funding. Many knowledge institutions could not find the funds to produce prototypes of their innovations whereas government agencies had difficulty obtaining funds to implement programmes on climate change and to invest in green development.

Transfer of knowledge and technologies from researchers to engineers and contractors was identified to be very low and nonexistent in some areas. This means that engineers who design and build facilities with contractors were oblivious of the technologies and were most unlikely to utilise them.

The challenge of behavioural change, from consumption of old climate-degrading technologies to consumption of climate-friendly technologies was also mentioned. However, accompanying this challenge was the issue of affordability, since many of the climate-friendly technologies have an initial high cost relatively the other technologies.

Other challenges mentioned by respondents included difficulty in obtaining tax exemptions to import equipment for research in knowledge institutions; poor working conditions (remuneration and facilities) of researchers in public knowledge institutions; and the ability to manage the expectations of collaborators/stakeholders in research, especially with respect to the outcomes of the research.

Opportunities for climate innovation and entrepreneurship

Notwithstanding the challenges identified during the assessment, a number of opportunities were also uncovered, that have potential for developing and growing climate entrepreneurship in Ghana. Boxes 1 and 2 present two cases of the many climate entrepreneurship that have been successfully established in Ghana.

Government representatives pointed out that Government of Ghana (GoG) realize that climate change is taking place and calls for appropriate strategies and mechanisms for mitigating and addressing the impacts of climate change. GoG has an important role to play in realizing the objectives of UNFCCC, and in particular with regard to:

- Promoting and cooperating on developing, applying and diffusing, including
transferring, technologies, practices and processes that control, reduce or prevent certain anthropogenic emissions of GHGs in all relevant sectors.

- Formulation of the needed policies to encourage entrepreneurs to make investments into climate innovation solutions.
- Development of frameworks and projects that can benefit from the “Kyoto mechanisms” such as Activities Implemented Jointly (AIJ) and Clean Development Mechanism (CDM).

A major opportunity yet to be exploited at scale by the private sector is farming of jatropha for bio-fuel. Sustainable large scale farming of jatropha for bio-fuel could provide new jobs and incomes to many of those people in Ghana who are most affected by climate change – namely those living in the three northern regions were soil and weather conditions (increasingly) make it difficult to sustain incomes and life on traditional farming.

The cases above demonstrate the opportunity to turn the threat of increased climate change and need for adapting to current climate change into a business opportunity – while at the same time generate jobs and income and improved quality of life.

A number of other attractive climate innovation opportunities are available to Ghanaian entrepreneurs – attractive both in terms of climate mitigation and adaptation and in terms of economic development. Some of these include biogas from waste treatment, use of sawdust as an alternative to wood and micro hydro dams.

However to reap the opportunities, the challenges facing climate innovation and entrepreneurship – lack of communication and collaboration among stakeholders; inadequate policies and incentives; and a reluctance to change – call for a response.

On the basis of the outcome of the assessment, and observing that the current NCIS does not adequately support climate innovation and entrepreneurship in Ghana, a new framework is proposed in this report. This framework (Figure 2) proposes for closer collaborations to be established among the actors in the quadruple to enhance knowledge production and technology transfer. Actors in government together with the relevant stakeholders outside of that sphere, within this framework would formulate policies and regulations that will provide incentives and compel the private sector to invest in climate innovations and commission knowledge institutions to carry out research. The role of NGOs would be to advocate and collaborate with government to consider the right policies and regulations that will engender climate innovations. Additionally NGOs in view of their strong linkages to communities at the grass root level should collaborate with knowledge institutions and the private sector to establish proof-of-concept demonstration centres in the communities and undertake technology transfer projects. This will, in many respects, serve to create awareness about climate innovations in Ghana. Together all these activities are geared towards generating climate innovations and encouraging climate entrepreneurs to emerge and grow.
Figure 2: A proposed framework to enhance climate innovation and entrepreneurship in Ghana

**Government**
e.g. MEST, EPA, Energy Commission and GIPC
- Policies, regulations & sensitisation

**Entrepreneurs**
e.g. climate enterprises, investors and financial institutions
- Policies, regulations, R&D finance, and pilot projects
- Commissioning research & technology transfer

**NGOs**
e.g. Energy Foundation, KITE, Concern Universal, EnterpriseWorks, etc...
- Policy advocacy & sensitisation
- Commissioning research & Pilot projects

**Knowledge Institutions**
e.g. CSIR, University of Ghana, KNUST.

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**Climate Innovation & Entrepreneurship**
Concern Universal (CU) is an international not-for-profit development and relief Non-Governmental Organization established in 1976 in the U.K. Concern Universal Ghana has been in operation since 1999 and over the period, The NGO has worked together with local partners – NGOs and communities – to design, implement, monitor and evaluate programmes in Livelihoods and Environment, Micro-finance, Water and Sanitation and Hygiene, Health and HIV/AIDS, and Disaster Risk Reduction.

Among its flagship programmes is the micro credit /micro finance programme. The micro credit/micro insurance programme currently works with 2,300 women in the Upper West Region in response to the effects climate change. In addition, Concern Universal is supporting 3 communities and 2 schools in the Lawra District to promote growing of vetiver grass for soil erosion control, agriculture improvement, disaster mitigation and income generation through weaving of handcrafts.

The Vetiver System is the premier soil erosion method outside of temperate zones. Narrow hedgerows of Vetiver grass will spread out rainfall runoff across the slope, act as a filter to trap erosion sediment, create natural terraces and reduces the velocity of rainfall runoff. It has application for on farm soil and water conservation, rehabilitation of eroded lands, and prevention of erosion on sloping lands.

The Vetiver System has many agricultural uses for: soil and water conservation, soil moisture improvement, groundwater recharge, recycling soil nutrients, pest control, mulch, forage, clean up of agricultural contaminated waste water, protection of farm infrastructure (canals, drains, roads, and building sites.

In the Upper West Region, the Vetiver System is also being used to reduce potential disasters caused by extreme rainfall events and subsequent devastating flooding. Steep slope protection by Vetiver grass reduces potential land slippage caused by high rainfall events.

The next stage of the NGO’s Vetiver Programme is to use the vetiver grass as a source of excellent material for handicrafts, particularly if the leaves are properly processed first. Thus, adding to the quality of communities and community effort.
EnterpriseWorks/VITA (EWV) is an international not-for-profit organization working to combat poverty through economic development programs based on sustainable, enterprise-oriented solutions. EWV has developed and is promoting the use of improved, high-efficiency ceramic-lined cook stove that burns less charcoal and other biomass.

The ceramic-lined metal stoves are approximately 40% more efficient than the traditional stoves commonly used in Ghana. That means an average annual savings of 570 kg of charcoal saved per year, or 1.4 tons of charcoal saved over the 2½ life of the typical stove.

In Ghana, where charcoal can cost, on average, US $0.19 per kilogram, the annual savings amount to US $108 per stove per year. This is a significant savings in a country where the per capita GDP is US 600. The stove pays for itself in charcoal savings after three weeks of use. Over its life, a typical stove will save its owner US $270. The savings generally accrue to women, who then have that money disposable for other expenses related to children and household needs. It has been estimated that every 1000 conservation cook stoves will reduce the amount of deforestation by the equivalent of 46.0 hectares.

Considering that charcoal combustion emits 3.01 tons of CO$_2$ per ton of charcoal, not including CO$_2$ emission during the production of charcoal from wood. EWV estimates that every 1000 stoves in use, reduces CO$_2$ emissions by 1716 tons per year.

The programme has provided employment to Tinsmiths who make the metal cladding of the stoves. A productive Tinsmith turns out 625 stoves in a year, earning the equivalent of approximately US $880. Currently, the project is working with 120 tinsmiths.

The ceramic liners are manufactured by medium-scale ceramics enterprises that employ 5-8 people and earn approximately $1890 for every 1000 liners produced. There are five medium-scale certified ceramicists who are currently supplying over 7000 high quality liners every month to the tinsmiths nationwide.

Stove vendors or retailers and distributors, who typically earn approximately US $940 for every 1000 stoves sold, perform the distribution and resale of the Gyapa charcoal stoves. These sales agents form the link between the manufacturers and the end users of the stoves.

EWV approaches sustainability from a business perspective. The activities must serve a real need of its beneficiaries, who signal their genuine interest in them by investing their own capital in the expectation of a greater return. Purchasing the technologies at the full unsubsidized price directly from local manufacturers or sales agents, without project intermediation, ensures that both manufacturer and purchaser reap enough of benefit to continue the activity beyond the life of the project.
Conclusions and Recommendations

Climate innovations are the vital means of mitigating and adapting to climate change. The assessment of climate innovations and entrepreneurship in Ghana has shown that there are opportunities for addressing the climate change challenges innovatively. More importantly, the four identifiable stakeholder categories – government, knowledge institutions, entrepreneurs and civil society – are currently involved in a range of initiatives which if properly executed and coordinated will bring significant pay-offs to the country as a whole. There is therefore the need for holistic action on the part of the stakeholders. While the stakeholders make efforts to achieve the envisaged holistic action, external support such as coming from WWF and other international bodies could be focused to promote synergy and amplify the impacts.

Short-term recommendations

The assessment uncovered a number of challenges and systemic shortfalls. To address these, certain measures need to be put in place. In the short-term, to improve on the level of awareness and dispel the erroneous perception that climate technologies are exotic, there is need to repackage the manner in which information on climate change and climate innovations are disseminated to the general public. Additionally there is need to promote the uptake of the existing relatively simpler technologies. The adoption of these technologies could pave the way for the adoption of other sophisticated innovations when available.

The Ghana Investment Promotion Centre (GIPC) should collaborate with climate enterprises to undertake vigorous media campaigns and advertisement to promote climate innovations. Also the GIPC should make special promotions to attract investments for climate enterprises. In pursuance of this, avenues must be identified to match local entrepreneurs with investors who want to invest in climate technologies, especially foreign investors. Recently Ecobank and Databank have evolved financial schemes through which the general public can invest in climate innovations. Such interventions must be institutionalised by policy in the long term.

Furthermore, in the short-term, the cost-benefit analysis of using climate innovations against traditional/conventional innovations should be conducted to provide evidence to the general consuming and investment public. This is necessary since in many cases the decision to patronise technologies is determined to a large extent by economic reasons than ecological.

An institution should be designated and adequately supported to serve as the anchor to coordinate, facilitate and focus, in a periodic manner, the various interactions that go on among the actors in the quadruple helix.

Long-term recommendations

In the medium to long-term, considering the revelation by the assessment that most of the climate entrepreneurs were at market penetration stage of their development. There is need to reconsider legislation that will provide incentives to investors to invest in climate enterprises so that they can enter the markets and up-scale their business activities.

Technical and financial support should be sought and provided to the Clean Production Centre of the EPA to enable it commence business, since the centre when operational would assess industries in the country and make recommendations pertaining to their production processes for compliance. Furthermore, voluntary compliance of clean production should be
institutionalised in Ghana, with the view that this will progressively move towards strict compliance.

There is need to conduct an assessment of the various pilot projects on climate innovation including renewable energy that have been on-going in the country. The assessment will be useful in informing decision-making as well being the precursor to future up scaling of the technologies.

Considering that research and teaching of climate change, climate innovation and entrepreneurship is relatively new in Ghana, support in the form of capacity building should be given to the Universities and research institutions to enable them develop the human resources they need to initiate projects in climate innovations and transfer the knowledge acquired.

There should be established, an institutional mechanism through which technology and innovations from knowledge institutions (both local and international) can be transferred to local entrepreneurs and knowledge institutions that do not have such technologies.

The study revealed that although there appeared to be some collaborations among the various actors in the quadruple helix, the reality is that these collaborations were on individual bases rather than institutional. Therefore there is need to strengthen collaborations among the various actors by institutionalising and documenting these collaborations by whatever means suitable.

The EPA as the Designated National Authority under the UNCCCD in Ghana should be supported to be proactive in sharing whatever information that must be shared. In this regard, the capacity of the EPA’s Climate Change Unit should be supported to improve on its human resource capacity.

The government should improve on financing basic and applied research and development, especially some proof-of-concept demonstrations. This will lay the foundation for publicly available ideas for others to work with.

The state should establish a functioning system of patents. This system should provide incentives for companies and knowledge institutions to invest in developing new and unique technologies that will be protected from copying by rivals over a period of time.
**Annex 1: List of stakeholders interviewed**

<table>
<thead>
<tr>
<th>Name of respondent</th>
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Annex 2: Interview Guides

Building Capacity to Accelerate Climate Innovation and Entrepreneurship

By WWF and Sida in collaboration with Innogate and STEPRI

(Government and NGOs)

Interviewee, organisation

Date and place

For Government:
Description of general policy towards climate change and climate entrepreneurs

For NGOs:
Description of general objectives towards climate change and climate entrepreneurs

Ongoing activities aiming at decreasing or limiting CO2 emissions or similar estimations for its contribution to climate change mitigation.

How are these activities measured for their contribution to climate change mitigation and/or adaptation?

Describe the current level of interaction with companies/markets, (including investors) knowledge institutions, NGO’s and other government institutions.

– is this likely to change in the future?

Describe your institution’s mode(s) of interaction with entrepreneurs, investors, NGOs and other government institutions

Is the interaction organized in set collaboration structures or does it happen on a case by case basis?

Status and approach on IPR (what activities or policies are in place – and what can we expect for the future?)

Approach and experiences with financing of technology and knowledge transfer to enhance climate innovation in companies (e.g. public funding, loans, external investors, revenues from customers etc)

What is your strategy and objectives for climate innovation and entrepreneurship for the next 12-36 months?

What key activities will be implemented to reach the objectives?

Needed resources, financing and support to fulfill the objectives – from whom?

Institutional and national challenges for engaging into climate innovation and entrepreneurship activities that will support climate change mitigation and climate change adaptation – what are the national challenges and what are the international challenges?
Other knowledge institutions, governments institutions, NGOs and/or companies that you would advice us to talk to?

Please summaries your views on the general conditions for promoting climate friendly business and products in your country. What is the day-to-day reality and availability of technology, knowledge and finance for climate innovation and entrepreneurship?

What is in your opinion the three most important actions needed in order to promote climate innovation and entrepreneurship?

Any other comments?

Will you be able to (or did you) participate at the workshop on 18 June 2009?

Building Capacity to Accelerate Climate Innovation and Entrepreneurship

By WWF and Sida in collaboration with Innogate and STEPRI

(Knowledge institutions)

Interviewee, organisation

Date and place

Description of knowledge institutions, ownership and core knowledge services

Ongoing activities aiming at supporting climate entrepreneurs, for example through technology and market research.

How are these activities measured for their contribution to climate change mitigation and/or adaptation?

Describe the current level of interaction with companies/markets (including investors), other knowledge institution, government institutions and NGOs.

– is this likely to change in the future?

Describe your institution’s mode(s) of interaction with entrepreneurs, investors, NGOs and government

- is the interaction organized in set collaboration structures or does it happen on a case by case basis?
Status and approach on IPR (are IPR applied, if not why and what are the implications for your knowledge institution and the companies your institution collaborates with)?

Approach and experiences from financing of technology and knowledge transfer to enhance climate innovation in companies (e.g. public funding, loans, external investors, revenues from customers etc)

What is your knowledge institution’s strategy and objectives for climate innovation and entrepreneurship for the next 12-36 months?

What key activities will be implemented to reach the objectives?

Needed resources, financing and support to fulfil the objectives – from whom?

Institutional and national challenges for engaging into climate innovation and entrepreneurship activities that will support climate change mitigation and climate change adaptation – what are the national challenges and what are the international challenges?

Other knowledge institutions, governments institutions, NGOs and/or companies that you would advice us to talk to?

Please summaries your views on the general conditions for promoting climate friendly business and products in your country. What is the day-to-day reality and availability of technology, knowledge and finance for climate innovation and entrepreneurship?

What is in your opinion the three most important actions needed in order to promote climate innovation and entrepreneurship?

Any other comments?

Will you be able to (or did you) participate at the workshop on 18 June 2009?

**Building Capacity to Accelerate Climate Innovation and Entrepreneurship**

*By WWF and Sida in collaboration with Innogate and STEPRI*

*(Climate entrepreneurs and investment partners)*

Interviewee, organisation

Date and place

Background of the company and its founders. Current status on ownership.

Business focus – and use of technology and innovative solutions in production.
What is the product’s potential for decreasing or limiting CO2 emissions, or similar estimations for its contribution to climate change mitigation and adaptation?

What are currently the key markets and customers – and what changes can be expected in the future?

Status and approach on IPR (are IPR applied, if not why and what are the implications for the company)?

Describe the usual process from product idea to product development and selling at the market.

How does the company find the first paying customer for a new product?

Describe the current level of interaction with other companies/markets, (including investors) knowledge institution, government institutions and NGOs.

– is this likely to change in the future?

How is application of new technologies, innovation and product development financed? (e.g. public funding, loans, external investors, revenues from customers etc)

What is the company’s strategy and objectives for the next 12-36 months?

What key activities will be implemented to reach the objectives?

What resources, financing and other support are needed to reach the objectives – and from who?

Challenges for market expansion – nationally and internationally?

Other actors in your industry (or from knowledge institutions, NGOs and government) that you would advice us to talk to?

Please summaries your views on the general conditions for promoting climate friendly business and products in your country. What is the day-to-day reality and availability of technology, knowledge and finance for climate entrepreneurs such as yourself?

What is in your opinion the three most important actions needed in order to enable climate entrepreneurs, such as yourself, to develop and grow?

Any other comments?

Will you be able to (or did you) participate at the workshop on 18 June 2009?
Annex 3: Summary of Minutes of the Interviews

a. Government Respondents:

1. Mr. Agyeman-Bonsu is the National Climate Change Coordinator at the Environmental Protection Agency. The EPA is the Designated National Authority (DNA) for Ghana under the UNFCCC. The DNA’s objectives are consistent with the main objective of the UNFCCC, which is “to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic [originating in human activity] interference with the climate system”.

   The EPA is promoting energy efficient technologies in the country and is preparing the national climate change Strategy for mitigation and adaptation. Additionally the EPA has commissioned a number of studies on climate change in Ghana. The EPA works in close collaboration with the Energy Commission, KITE, Institute for Social, Statistical and Economic Research (ISSER) in the basis on MoUs and with the private sector on ad hoc bases. The EPA’s strategic objectives includes the passing of the climate change bill into law, formulation of national climate change policy, establishment of the climate change commission, and implementation some CDM projects in Ghana. The EPA has among its challenges, capacity building and inadequate political will and support/commitment.

2. In addition to Mr. Agyeman-Bonsu, Mr. Samuel Anku, Director of Intersectoral Networks at the EPA was also interviewed. According to him, the EPA has among its duties, making and enforcing guidelines and standards, creating awareness and sensitizing the general public, conducting technical research on environmental issues, networking with players in and outside the environmental issues, and providing technical advice to government.

   The EPA has submitted Ghana’s First Communication to the UNFCCC and is currently preparing the Second Communication. It has also undertaken inventory of auto emissions in the country, collaborated with the Energy Commission, Energy Foundation and others to replace incandescent lamps with compact fluorescent lamps.

   According to Mr. Anku, the EPA also suffers from the general lack of awareness on climate change issues and the scepticism among Ghanaians about the efficiency of new technologies. The EPA among its activities include enforcing permit conditions on environmental cleanliness and ensuring that companies the Aboadze Thermal Plant and saw milling companies to go into cogeneration.

3. Mr. Winfred Nelson is a Principal Planning Analyst with the National Development Planning Commission. He spoke for the organisation. The NDPC has no specific policy on climate change, however its interest is in development issues and insofar as climate change affects development, the NDPC has become interested in it. NDPC has also been interested in environmental issues so far as
national development programmes have impacts on Ghana’s physical environment.

With respect to climate change, the NDPC’s activities include providing development frameworks to district assemblies to prepare their district plans taking into considerations measures these districts can take to mitigate climate change or adapt to its impact. Nationally, the NDPC is working with the EPA to mainstream environmental issues into the national long-term development plan. Its collaboration with the EPA also involves piloting climate change and disaster risk management in 10 districts in Ghana.

The NDPC faces a number of challenges including inability of local authorities and other policy makers to appreciate the nexus between climate change and poverty, or the nexus between climate entrepreneurship and poverty reduction. They also face the challenge of accessing information on climate change in Ghana.

4. Mr. Edward K. Nsenkyire is the former Chief Director of the Ministry of Environment, Science and Technology. His also the immediate past Board Chairman of the Forestry Commission. He is a farmer now. He mentioned that at time he was in office at the Ministry of Environment, Science and Technology, there were discussion on establishing a Climate Change Authority but the discussion did not go far. In his view such a body is needed. Among the climate change-related activities the Ministry is implementing are efforts to control bush fires, especially in the savannah ecological zone of Ghana, popularisation of the use of liquefied petroleum gas for domestic heating instead of using fuelwood, and collaborating with other organisation to embark on reforestation exercises. He observed that there is a lack of political will, especially when it comes to allocating funds for most of the ministries’ activities. He also noted that there was a lot of political interference in the administration of Ghana’s Forestry Resources which the allocation of protected forests for commercial logging or mining activities. Low public awareness was cited as a challenge.

5. Mr. Emmanuel Amekor is a Principal Environmental Officer of the Volta River Authority (VRA). The VRA manages the Akosombo Hydroelectric Dam that generates electricity for use in Ghana. The VRA also generates electricity from thermal sources. The climate change-related policy of the VRA is to reduce the emission of carbon dioxide (CO₂) and nitrous oxides (NOₓ). It also has a policy objective to increase the available carbon sinks in the country. Activities ongoing in the VRA include afforestation exercises, designing thermal plants to reduce the emission of CO₂ and NOₓ and perfecting a single cycle thermal plant into a combined cycle plant. The VRA Collaborates with the Environmental Protection Agency, Forestry Commission and the Forestry Research Institute of Ghana (CSIR-FORIG) and the Energy Commission. Obtaining funds to carry out its activities is a challenge facing the VRA. According to the

6. Mr. Joseph Essando-Yedduh is Chief of Strategic Planning and Policy at the Energy Commission. The Commission’s mandate is to regulate, manage and develop the utilisation of energy resources in Ghana. With respect to climate
change, the Energy Commission’s objective is to pursue the goal of The Montreal Protocol on Substances that Deplete the Ozone Layer. Among the on-going activities implemented by the Commission include replacement of incandescent lamps with compact fluorescent lamps, establishment of a climate change unit within the Commission, building its capacity in the areas of climate change and entrepreneurship, advocating for the passing of the renewable energy law, and in the near future replacing old refrigerators with new environmental friendly ones. The Commission interacts very well with the Energy Centre of Kwame Nkrumah University of Science and Technology (KNUST), Institute of Industrial Research (CSIR-IIR), Institute of Social Statistical and Economic Research (ISSER), NDPC and EPA.

7. Ms Melody Ocloo is a Programme Officer with the Climate Change Unit of the Forestry Commission (FC). According to her, the FC does not have specific policy objectives relating to climate change yet, but given that forests are major CO₂ sinks, the commission by this extension is implementing activities relating to climate change. The Commission participates in global climate change negotiations and events, is the lead agency for promoting the Reduced Emission from Deforestation and Degradation (REDD). Most of the FC’s programmes are biodiversity related programmes and the Commission is about to implement a Clean Development Mechanism (CDM) project. The Commission collaborates with the CSIR-FORIG, EPA, KNUST, Centre for Remote Sensing and Geographic Information System (CERGIS) and Geography Department of University of Ghana. The FC faces limited capacity in the area of climate change and entrepreneurship. In addition, it is affected by the absence of a body coordinating the various ministries who have linkages to climate change.

8. Mr. Wisdom Ahiataku-Togobo is Head of Renewable Energy at the Ministry of Energy. The Ministry has been in promoting the development and utilisation of renewable energy, promoting energy efficiency in petroleum systems. The Ministry is facilitating a transition from government-owned energy production systems to private power generations. Above all these, the Ministry is creating the enabling platform for these to take place. It is currently formulating a renewable energy law. The strategic objective of the Ministry is to increase the share of renewable energy from the less than 5% to about 10% by the year 2020. A major challenge to the Ministry in this regard is the absence of a core institute promoting renewable energy, the high cost of clean energy systems, frustrations in obtaining carbon credits.

b. NGO Respondents:

1. Mr. MacDuff Phiri is the Country Director of Concern Universal (CU), a UK-based charity organisation working in Ghana. The approach of CU is has been around climate change adaptation and disaster risk reduction and so mot of its programmes are on livelihoods of mostly rural people. CU has collaborated with other NGOs and provided training to tree seedlings growers, worked with some communities to ban indiscriminate burning of charcoal, established a micro insurance scheme among farmers in some communities. CU interacts with a lot of NGOs and grass root community organisations. CU is hoping to commence programmes that will support carbon trading in the near future. CU’s challenges
include the slow pace at which banks are accepting their ideas relating to micro insurance. The challenge of convincing rural communities to ‘put away’ money for the purpose of insurance is one that confronts CU.

2. The British Council (BC) is a charity organisation whose purpose is to “build engagement and trust for the UK through the exchange of knowledge and ideas between people worldwide”. Mr. Benjamin Yaw Manu is Project Delivery Manager at British Council. The British Council has programmes in many areas. With respect to climate change, they are engaged in raising awareness about it, facilitating policy dialogues, supporting research. BC is also using proof-of-concept projects to raise awareness about clean technologies. BC interacts with the Faculty of Engineering of the KNUST, NGOs, and Zoomlion. It engages the government at many levels.

3. Mr. Seth Mahu is Component Programme Manager at EnterpriseWorks. According to Mr. Mahu, the objective the organisation as far as climate change is concerned is in synch with the UNFCCC objectives. Among their activities include the development of a stove that is efficient in charcoal burning as compared to the traditional coal pots. It has also developed a treadle pump for small scale irrigation. EnterpriseWorks has facilitated the establishment of climate enterprises using these climate innovations. This NGO collaborates with knowledge institutions but these are mostly institutions abroad. The NGO is looking for avenues to integrate its activities into government programmes and projects. Its challenges include inadequate funding, too many bureaucracies, limited capacity and the high expectations of collaborators.

4. Mr. Kofi Asante was interviewed for the Energy Foundation. The Energy Foundation Ghana is a non-profit, public-private partnership institution, devoted to the promotion of energy efficiency and renewable energy. It has been undertaking energy efficiency campaigns, providing energy efficient solutions and renewable energy to the Ghanaian economy, collaborated with the EC and Ministry of Energy to replace incandescent lamps in Ghana and developed some CDM projects for implementation. They collaborate with a many stakeholders in their endeavours. One challenge to them is the absence of a national plan or strategy to integrate climate solutions into the economy. They also have problems of limited capacity and the non-enforcement of regulations.

5. Mr. Frank Atta-Owusu, Projects Manager of KITE. It is a Ghanaian Not-for-Profit development organisation and a leading actor in the Energy, Technology and Environment sectors in Ghana and the West Africa Sub-Region. KITE pursues programmes that aim at achieving environmental sustainability. KITE has invested in clean energy entrepreneurs who are deploying clean development systems. It has undertaken an assessment for the possible use of street vegetable oil instead of fossil diesel to power vehicles. It also engaged in advocacy for the adoption of energy efficiency mechanisms. KITE faces the challenge of unattractive policy environment in respect of pricing and tariffs.
c. *Climate Entrepreneurs:*

1. Mr. Philip Acquah is the CEO of Pheebe’s Company Limited. It is a group of companies that provide many services, among which is providing expert advice of climate technologies. It identifies and recommends for construction of climate technologies for waste industry. The company is collaborating with another company to drive the uptake of biogas technology in the country. The biggest challenge is the absence of mechanisms for technology transfer from knowledge institutions to contractors and engineers.

2. Sola Light Company assembles and sells solar systems. The CEO is Mr. Mawuli Tse. The company has the ambition to manufacture these systems locally. In the view of the CEO, the policy environment is not conducive for the development of climate innovations and this is further compounded by bureaucracies in the public institutions that should provide assistance to the private sector.

3. Biogas Engineering Limited is a private company that provides services on biogas technologies. It also designs and builds biogas systems for homes, commercial and public places. The Director and CEO is Dr. Elias Aklaku. Apart from biogas technology, this company also designs and constructs rainwater harvesting systems for homes and schools. The CEO believes that the absence of systems to protect the work of inventors from pirating is a challenge to innovation. He also believes that inadequate funding is a bane on the development of climate innovations in Ghana.

4. Tropical Energy Resources is a company that is looking at generating energy (electricity) from biomass. According to the CEO Maj. (Rtd) Ibrahim Rida, the main focus of the company is to dispose municipal waste by converting into energy for use. However, its ability to convince the municipal authorities to provide the waste to the facility is a challenge. The irony though is that the cities are engulfed in so much waste. It appears also that the government is not providing the necessary incentives to promote this line of business activity.

5. Mr. Seth Twum-Akawboah is the Acting Director of the Business Development Services of the Association of Ghana Industries. The association is an umbrellas organisation representing industries in Ghana. It is not engaged in direct production but in policy advocacy on behalf of its members and for all Ghanaians. Challenges that companies in Ghana face include low demand for goods and services due to the low purchasing power of the population braced by high production costs. They also face cheap imports from other countries.

d. *Knowledge Institutions:*

1. Dr. Nii Ardey Cudjoe is a Lecturer at the Regional Institute for Population Studies (RIPS) at the University of Ghana. Institute provides demographic training. He has been conducting research on the perception of farmers about climate change, research on mapping the livelihoods of farming communities and working with farmers to realise the imminent impact of climate change and fashion out adaptation mechanisms. Challenges include the absence of a national policy on climate change and that there is little consultation among actors on climate change in Ghana.
2. Dr. Delali B. Dovie is a Lead Scientist at the University of Ghana and also of the Water Resources Commission. He has conducted basic research in water. The Water Resources Commission is at the inception stage of its climate change programme. It has so far undertaken mapping of flooding details together with assessing land use and land cover change trends. The Commission is also building the capacity of local people to enumerate and interpret information on climate change vulnerability and adaptation. The challenges identified by Dr. Dovie include the apparent attitude of some scientists who do not want to share information on the subject. Apparently climate change is a gold mine. There is also the challenge of change with respect to the curriculum to ensure that climate change and related issues are taught at the universities.

3. Prof. Abeeku Brew-Hammond is the Acting Director of the Energy Centre of the KNUST. The centre provides training, research and consultancy services. Its research is market-oriented and the centre is engaged in product development. The centre suffers from unreliable low speed internet coverage,

4. Dr. Leonard K. Amekudzi is a Lecturer and Climate Scientist at the Physics Department of KNUST. The Physics Department has a Climate Science Unit where research on climate and weather are on-going. The Unit also conducts environmental monitoring, awareness creation and provision of weather information. The Unit is also undertaking research on seasonal variations of rainfall and on trends in temperature. The Unit has problems with funding its activities. There are also problems with clearing equipment imported into the country through the ports. There are problems with accessing the internet and being able to transfer large amounts of data over the internet facilities available. The overall working conditions and conditions of work are not the best. There is very limited capacity in the area climate science in Ghana.

5. Dr. Peggy Oti-Boateng is the Director of The Technology Consultancy Centre (TTC) of KNUST. This centre provides technology consultancy and research to persons or organisations who desire such services. It is also the catalyst between the KNUST and the community around. The centre is developing an energy efficient coal pot, developing a solar farm to generate electricity, and promoting agronomic practices that do not disturb the soil greatly. Major challenges of the centre include inadequate funding and the absence of clear national policies to work with.

6. The Bureau of Integrated Rural Development (BIRD) is located in KNUST. The Director is Dr. Paul Sarfo-Mensah. It is a research centre that also serves as a link between KNUST and the community. It conducts basic, applied and contract research. It also carries out outreach programmes and policy advocacy. This centre has challenges with human resource capacity, office space and of dealing with the challenges of their stakeholders with respect to the outcomes of research. Dr. Sarfo-Mensah also called for closer collaboration among the MDAs, research institutions and the Universities.

7. Mr. Emmanuel Donkor is a Lecturer at the College of Engineering of KNUST. His core area of interest is teaching and researching waste water treatment, water
treatment and sewerage design. His challenge is the absence of demand on climate technologies and the inadequacy of equipment in the departments.
REPORT ON CLIMATE INNOVATION AND ENTREPRENEURSHIP WORKSHOP IN GHANA

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)
SCIENCE AND TECHNOLOGY POLICY RESEARCH INSTITUTE (STEPRI)

Gordon Akon-Yamga and Suley Kamil Mohammed
July, 2009
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EXECUTIVE SUMMARY

Background

Representatives of the business community, knowledge institutions, government and non-governmental organizations participated in a workshop organized by the Science and Technology Policy Research Institute (STEPRI) as part of an assessment of the level of development of the national climate innovation system and the conditions facing climate entrepreneurs in Ghana. The assessment is part of an initiative of the World Wide Fund (WWF) to accelerate climate innovation and entrepreneurship in Africa.

Workshop findings and conclusions

Entrepreneurs have a particularly important role to play in bringing forward new products and services for mitigating climate change however, climate innovation entrepreneurs face a number of challenges in Ghana. Some of these are: inadequate enabling environment (legislation, incentives etc.) targeting development of climate entrepreneurship; low level of collaboration between knowledge institutions and industry – resulting in little technology and innovation diffusion; low level of collaboration between enterprises and foreign partners – also resulting in little technology and innovation diffusion; and most climate innovation enterprises are small and often sole proprietorship which restricts their capacity to undertake innovation, investments and market expansion activities.

Knowledge institutions can play an important role in developing and transferring research and innovation to entrepreneurs for commercial application. However, the knowledge institutions face a number of challenges. Some of these including: little financial resources for research and innovation activities within the area of climate innovation and entrepreneurship; little demand from government for including knowledge institutions in science and technology policy development in general – and in climate innovation and entrepreneurship policy development in particular; academic reward mechanisms do not encourage interaction and collaboration with enterprises on climate solutions; and academic “jargon” makes it difficult for entrepreneurs to understand and apply new knowledge in a business context.

Government pointed out that the threat posed by climate change on the nations development, especially with respect to the cost of coping with extreme weather events, crops failure and other emergencies could be enormous if adequate care is not taken. Therefore the Government is taking some steps to mitigate effects of climate change and to prepare the
country to be able to adapt to climate change. In this regard the Government will among other things establish and resource the National Climate Change Committee; finalise a national climate change adaptation strategy; and adopt appropriate legislation for the transfer of technology for end-use.

NGOs and civil society groups have an important role in connecting to and reaching out – both at community level and to the general public. However, they are also faced with a number of challenges. Some of these include: a lack of platforms for stakeholder collaboration and dissemination of good practice at national level; shortage of funds and consequent sustainability and outreach issues; and difficulties in getting the attention from government, also resulting in difficulties with assuring sustainability and outreach through replication of good practice.

Even with the above challenges, a number of visionary climate innovation entrepreneurs speaking at the workshop demonstrated that they had nevertheless managed to develop commercially viable business ventures while at the same time making a contribution to mitigate and adapt to climate change. Examples of climate mitigation innovations are the Gyapa ceramic charcoal stove and a micro credit scheme enabling small scale farmers to insure them against loss of income because of poor harvest resulting from drought or floods.

A major opportunity yet to be exploited at scale is farming of jatropha for bio-fuel. This should however be done with clear policy on land use. The workshop participants agreed that various stakeholders have important roles to play in this regard and therefore called for the following actions:

Building capacity at all level of society: 1) Entrepreneurs should build capacity to benefit from climate technology, research and innovation, 2) Knowledge institutions should build capacity to communicate and collaborate better with industry and government, and 3) government should build capacity to respond better to climate innovation challenges and opportunities. Civil society groups and NGOs have furthermore an important role to play in reaching out and building evidence based knowledge and facilitate localised solutions.

Activities to create awareness of the opportunities for turning the threat of increased climate change and the need for adaptation to current climate change into a business opportunity.
Finally, it was agreed that the activities for building capacity, creating awareness and implement a platform for stakeholder collaboration requires active facilitation. The participants did not address who such facilitation could be
Introduction

On 18 June 2009 43 representatives of the business community, knowledge institutions, government and non-governmental organizations gathered at a workshop on climate innovation and entrepreneurship organized by the Science and Technology Policy Research Institute (STEPRI) of the Council for Scientific and Industrial Research (CSIR) in Accra.

The workshop was organized as part of an initiative of the World Wide Fund (WWF) to accelerate climate innovation and entrepreneurship in Africa. Within this initiative STEPRI in collaboration with Innogate Aps of Denmark are currently undertaking an assessment of the level of development of the national climate innovation system and the conditions facing climate entrepreneurs in Ghana. The assessment will identify preferred systems for technology transfer and stakeholder collaboration that will enable climate innovation entrepreneurs to develop and grow.

A similar assessment is being undertaken in Tanzania. Together the assessments will make a contribution to enhance the understanding of national and international decision makers of the conditions for climate innovation research, development and diffusion (RD&D). At international level the assessment will be communicated to the United Nations Framework Convention on Climate Change (UNFCCC) amongst others.

It is an important objective of the assessment to identify and communicate best practices – and thereby demonstrate that challenges of climate mitigation and the need for adaptation can also be used as additional opportunities to grow new enterprises; more and better jobs; and improved quality of life. Below follows a full report of proceedings of the stakeholder workshop.

Some useful definitions:

“A climate innovation is a transformative technology (non-fossil, non-nuclear goods and services) that can have a significantly positive effect on climate change if applied at scale” (WWF)

“A climate entrepreneur is someone who undertakes the organization and management of an enterprise, applying a climate innovation, and assuming the risks as well as the opportunity for profit” (Innogate)
Opening

Welcome

The workshop participants were welcomed to the STEPRI Auditorium by the director of STEPRI, Dr. George O. Essegbey. According to the director, the climate innovation workshop and therefore the climate innovation study project for which it is a part is to contribute to the dialogue on climate change. The project aims to identify and communicate climate solutions thereby helping to transform the threat of climate change into business opportunities across the country. He further reiterated the need for communication between the sectors namely research, industry, government and the non-governmental organizations. He stated that the workshop was a platform to initiate this dialogue, to enable climate innovations make their mark. He mentioned the mandate of STEPRI in promoting Science, Technology and Innovation and explained that the climate innovation study was in line with this mandate and commended Mr. Thomas Winter of “Innogate Aps” for his dynamic role and assistance in bringing the study and workshop into fruition.

Introduction to workshop

Mr. Thomas Winther of Innogate Aps and Mr. Gordon Akon-Yamga of STEPRI introduced participants to the “Building Capacity to Accelerate Climate Innovation and Entrepreneurship” Project and the workshop. Mr. Winther first began and gave a background to the project and some the activities that have been undertaken and what remains to be done whiles Mr. Akon-Yamga presented some preliminary findings of the fieldwork in Ghana. A summary of the presentations a provided below.

Mr. Thomas Winther of Innogate Aps began the introduction to the workshop by informing the participants of the partners involved in the “Building Capacity to Accelerate Climate Innovation and Entrepreneurship” Project. They include: the Swedish International Development Cooperation Agency (SIDA), the World Wide Fund for Nature (WWF), Innogate Aps, the Science and Technology Policy Research Institute (STEPRI), Ghana, University of Dar Es Salam, Tanzania and the Tanzania Chamber of Commerce.

Climate innovations have been identified by the WWF network as an inevitable component in society’s transformation to a low-carbon economy. By addressing the field of innovations WWF wants to highlight measures that can accelerate the dissemination of new technological systems and other innovative solution. It is in this light that WWF with the support of SIDA
and the partnerships of Innogate Aps and the Science and Technology Policy Research Institute (STEPRI) are undertaking the climate innovation and entrepreneurship study in Ghana. Innogate, in a similar partnership with University of Dar Es Salam and the Tanzania Chamber of Commerce is undertaking the study in Tanzania.

Mr. Winther outlined the objectives of the project as:

- Assessing the national climate innovation system in Ghana,
- Assessing the conditions for climate entrepreneurship in Ghana and the
- Identification of frameworks for collaborations and actions that will enable climate entrepreneurs to develop and grow.

According to Mr. Winther, the methodology adopted to achieve these objectives include desk research to review all relevant documents relating to climate innovation and entrepreneurship in Ghana, conducting field interviews with key persons in government ministries, departments and agencies, non-governmental organizations, entrepreneurs/investors and in knowledge institutions. As part of the study, a stakeholder workshop will be organised to synthesise ideas on climate innovation and entrepreneurship in Ghana.

In his presentation, Mr. Winther provided definitions for climate innovation and climate entrepreneur to put participants in the right context. He referred to WWF’s definition of climate innovation as ‘a transformative technology (non-fossil, non-nuclear goods or services) that can have a significantly positive effect on climate change if applied at scale’ and then defined climate entrepreneur as ‘someone who undertakes the management and organization of an enterprise, applying a climate innovation and assuming the risks as well as the opportunity for profit’.

Referring to Ghana’s Technology Needs Assessment (TNA) document, the presenter mentioned some of the challenges that were identified to include:

- Ghana’s vulnerability to climate change due to inadequate capacity to undertake adaptive measures to address environmental problems and socio-economic costs of climate change
- The absence of technology transfer intermediaries
- Enormous challenges with existing policies, legislative and institutional frameworks
- Lack to financial resources, adequate capacities and a culture of technology development
Despite these challenges however, the presenter observes that the TNA also mentions some opportunities that can be utilised. These include:

- Biomass resources (other than wood fuel) and energy crops have strong potential for energy production
- Ghana has potential for mini hydroelectric dams
- The exists a national drive to achieve a comprehensive energy efficient economy

With this background provided, Mr. Winther then proceeded to outline activities of the workshop as follows:

- A presentation of the preliminary findings by Mr. Gordon Akon-Yamga of the survey on climate innovation and entrepreneurship in Ghana.
- Presentations from a representative of government, NGOs, knowledge institutions and entrepreneurs on programmes on climate innovations, cases and solutions.
- Two break sessions. One each to identify stakeholders’ key challenges and to propose strategies and systems for technology transfer and use.

**Preliminary findings on climate innovation and entrepreneurship assessment**

Mr. Akon-Yamga presented the preliminary findings of the interviews he has had with persons in government agencies and departments, knowledge institutions, non-governmental organisations and climate enterprises.

According to Mr. Akon-Yamga, his preliminary findings based on interviews he has conducted with some persons in government and NGOs reveal the following:

- The absence of clear government policies relating directly to climate entrepreneurship. This notwithstanding there are NGOs in the country that have specific objectives towards climate change and climate entrepreneurship
- There were on-going activities that have the potential to reduce CO₂ emissions, sequester CO₂, and contribute to adaptation to climate change although the objectives for doing so were not directly articulated to relate to climate change.

Mr. Akon-Yamga continued, that his interviews with climate entrepreneurs revealed the following preliminary findings:

- Most of the climate entrepreneurs were mostly sole proprietors with their main business focus being providing solutions to environmental problems in the areas of
energy and waste. Their clients were mainly other businesses, some hotels and hospitals. These clients were introduced to the entrepreneurs by other persons, mostly friends and relatives of the entrepreneurs who had previously employed the services or products of the entrepreneurs.

- Although most of the products and services the climate entrepreneurs provided had the potential to reduce CO2 emissions, the actual amounts were unknown by the entrepreneurs or difficult to calculate based on the descriptions given by the entrepreneurs.

- None of the entrepreneurs interviewed had policies regarding intellectual property rights. This shows that there was little, if not none, application of intellectual property rights by the entrepreneurs.

- Since most of the entrepreneurs were deploying technologies that they have either imported or have adapted, the application of new technologies were financed by the entrepreneurs’ own funds (re-investments). Some said obtained funding from NGOs and international organisations, where they have to set up pilot projects in communities.

- Among the challenges identified by the entrepreneurs were a general lack of awareness on climate issues and the climate technologies that are available, lack of finance to fund concept/ideas into innovations, especially producing prototypes and unsupportive government policy.

According to Mr. Akon-Yamga, he found out during interviews with persons in the knowledge institutions that:

- The main knowledge services provided by the knowledge institutions were teaching, research, outreach and technology consultancy.

- Many of the knowledge institutions had activities on-going relating to climate change, but few were directed at supporting climate entrepreneurs. Many of them were related to collecting and providing information relating to the ‘science’ of climate change and also supporting rural communities to enable them adapt to the impacts of climate change.

- There appeared to be a strong collaboration between the knowledge institutions and communities in which they worked. Also the respondents mentioned that they had strong collaboration with other knowledge institutions, NGOs and government institutions.
• Many of the knowledge institutions do not have specific policies concerning intellectual property rights, although aspects of IPR are applied in some projects and activities, in particular acknowledging funding source when producing reports and scientific publications.

• Many of the projects undertaken by the knowledge institutions were implemented with assistance from international funding and scientific organisations.

• A number of challenges were enumerated by the knowledge institutions, including inadequate funding; lack of access to information; little consultation from government when it comes to formulation of national policies and programmes on climate change; challenges with clearing research equipment from the ports—high taxation; and bureaucracy.

With the two presentations from Messrs Thomas Winther and Gordon Akon-Yamga, presentations, the workshop was then provided with some background for further deliberations.

**The importance of climate innovation and climate entrepreneurship**

*Representative of government- Chief Director, MEST*

Mr. K.A. Tabi of the Ministry of Environment, Science and Technology read the speech of the Chief Director of the Ministry. He observed that the government of Ghana, like many other nations, recognises that climate change is real and has dire consequences for the Ghana’s development. According to Mr. Tabi the cost of coping with extreme weather events, crop failures and other emergencies related to climate change is growing steadily higher. The human costs are also multiplying. Low-income economies like ours are especially vulnerable to adverse effects of climate change combined with the already prevailing pressures of poverty.

He noted that Ghana has participated and continue to do so in efforts being made at the international level to address the challenge of climate change. He added that Ghana since ratifying the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 has submitted its first communication to the UNFCCC Secretariat and ratified the Kyoto Protocol and prepared a technology needs and needs assessment.

Mr. Tabi continued that the government recognises that the mechanisms provided under the Kyoto Protocol provide immense opportunities for the country to use to achieve sustainable
development. Furthermore, he added that although the percentage share of electricity generated from the Akosombo hydroelectric dam in the overall electricity consumed in Ghana is decreasing whiles electricity generated from thermal plants is increasing, measures are being taken to reduce the overall carbon dioxide emissions by installing combined cycle utility plants that have higher generation efficiencies and the adoption of appropriate policy measures for effective transfer of technology for end-use energy efficiency enhancement. These measures would offer excellent opportunities of projects within the frameworks of the Activities Implemented Jointly (AIJ) and Clean Development Mechanism (CDM).

*Presentation from a representative of knowledge institution*

Dr. Delali B. Dovie of the Water Resources Commission and University of Ghana delivered a presentation on the title “New forms of knowledge institutions and adaptation to climate change”. Dr. Dovie explained that there are differences between the effects and impact of climate change in climate science. The two are used interchangeably but scientifically incorrect. This follows the argument that there are several units of exposure to the stresses (or events, eg drought, flood) made up of the biophysical environment which encompasses all the natural and socioeconomic systems. He further added that the biophysical environment first responds to the stressors of which the outcomes translate into the effects (first point of call or primary exposure). It is this emerging effect that other systems respond to (eg human beings through households) and in science we say that there is now an impact. It is this impact that humans will often respond to through various landuse practices which again leads to factors that drive the climate change phenomenon if not checked.

According to Dr. Dovie humans are adapting to climate change and variability impacts and it sometimes involves community action where people gather to consciously embark on certain activities for the benefit of all. It may include dryland farming, access to Non-Timber Forest Products (NTFPs), river bed dugouts to enhance access to water for domestic, and farm use.

Dr. Dovie explained further that the environment is holistic to the vulnerable and therefore one cannot divorce livelihoods from impacts of extreme events. What is seen as an outcome of a multivariate statistics scaling down large datasets that simply say that in time of drought, households will normally be dependent on dryland cropping, NTFPs, and welfare grants (eg child support grants). For floods as an outcome of CC, you will notice that two variables are very strong along the 1st quadrant and suggesting that they are important adaptation tools in times of floods (e.g. informal employment and remittances).
Representative of NGO- Mr. MacDuff Phiri, Concern Universal

The next presenter was Mr. MacDuff Phiri, Country Director of Concern Universal (CU), a UK registered charity organisation. Mr. Phiri shared with participants the activities of Concern Universal in Ghana. He talked about CU’s support to some local communities in Nkoranza to ban the indiscriminate production of charcoal in their communities, train farmers in raising tree seedlings and planting of fruit trees, among many other activities.

According to Mr. Phiri, the effects of climate change including higher temperatures and less rainfall are being felt throughout the country. There have been reports of drought and flood in many parts of the country. In particular the droughts that preceded the floods in Northern Ghana that led to crop failure and loss of livestock and other livelihood opportunities were cited by Mr. Phiri to put across the point very strongly.

Referring to a recent World Food Programme report, Mr. Phiri said the largest share of Ghana’s population live in rural areas who are mostly also farmers. Therefore, the greatest impact of climate change will be on food security.

In their approach to helping communities build resilience to climate change risk, they have promoted the mainstreaming of disaster risk reduction into development and humanitarian policy and planning at the district assembly level by providing training in the Sphere approach. In their approaches, they also consider the need to identify conservation, agricultural methods, land, water and soil management practices that are based on traditional knowledge since the knowledge is close to the local people and therefore can easily be adopted by them. Furthermore in communicating climate change issues, there is need to develop and use communication strategies based on indigenous knowledge systems that could help accelerate learning and knowledge sharing on climate change adaptation.

Apart from these, other considerations that are taken into consideration in helping communities build resilience to climate change include establishing micro-credit schemes that serve as micro-insurance schemes, which have been highly successful. Concern Universal has also contributed increasing the capacity of local communities to access and use multi hazard risk information to enhance their early warning systems for climate related disasters such as drought and floods.

Mr. Phiri further postulated that to achieve climate change risk management with multiple benefits, there is need to forge innovative partnerships that build adaptive capacity of
vulnerable communities, including increased access to climate risk management knowledge, information and services. Innovative strategies should be employed to help with the education of communities on climate risks that lead to empowerment for action. This means ‘localising’ the message to make the effects/impacts of climate change relevant to local communities. Lat but not the least, Mr. Phiri adds that low-cost strategies that are known and have been used on a pilot bases should be tested and spread widely beyond small geographic areas. This can be done through trade and value-chain improvements.

Mr. Phiri concludes his presentation by advocating that four important things ought to be done immediately. These are:

- Substantial investment in research and development of clean energy
- Afforestation programmes
- Institution of measures to halt the dumping of electronic wastes in Ghana
- Recycling of waste

**Representative of business**

Mr. Phillip Acquah, Chief Executive Officer of Pheebe’s Company Limited made a short presentation of the importance of climate innovations from the perspective of a climate entrepreneur in the waste sector to energy sector. As a former employed of the Environmental Protection Agency (EAP) and a Consultant to the United Nations Environment Programme (UNEP), he provided some insight into what Ghana has done as part of her commitments to the United Nations Framework Convention on Climate Change (UNFCCC) and also as national programmes on the environment.

According to Mr. Acquah, although a National Climate Change Committee was established a couple of years back, however the committee was never well resourced and so it could not perform its functions as was expected of it (it should be mentioned that the Committee has recently been re-inaugurated and hopefully would be resourced). He went further to say that the EPA led the country to produce its first national communication to the UNFCCC, having prepared its inventory of green house gases (GHGs). Other activities undertaken by the government/EPA include a project with the National Development Planning Commission to mainstream climate change issues into the national development planning framework. Additionally was commissioned and it conducted strategic environmental assessments of the various sectors of the economy.
Mr. Acquah was then critical of the nation for not riding on the back of the national inventories conducted to develop development plans. He cited Germany as an example of a country that used its national inventory exercise as an anchor around which many development plans are linked to. For example, based on Germany’s national inventory, the country set itself the target to achieve reduction in its solid waste to about 20%, which it has since achieved. However, Ghana after conducting its national inventory has ‘lost’ the document.

According to Mr. Acquah, waste is an affront to knowledge, so the question that must be answered is how we can develop and appreciate waste as a resource and not see it as nuisance. He pointed out that there are 10 sewerage transfer points in Accra where mostly power is expended to blow-aerate the sewerage to kill the bacteria and other pathogens. Instead of doing this, he argues that the sewerage in each of the transfer points have the potential to generate between 0.1 megawatts and 2.2 megawatts of electricity if the sewerage is subjected to anaerobic conditions and the gas captured and used to fuel power plants or used for heating/cooking. He proposed that the various universities and other tertiary institutions can take advantage of this to manage their wastes. He proposed that such a technology could be integrated into other national programmes, such as the school feeding programme, being implemented by the government. If done, these could serve as demonstration sites where further studies could be done or to convince people that the technology works.

**Case on climate solutions**

*Energy - Mr. Seth Mahu, EnterpriseWorks/VITA*

EnterpriseWorks/VITA (EWV) is an international not-for-profit organization working to combat poverty through economic development programs based on sustainable, enterprise-oriented solutions. EWV has developed and is promoting the use of improved, high-efficiency ceramic-lined cook stove that burns less charcoal and other biomass.

The ceramic-lined metal stoves are approximately 40% more efficient than the traditional stoves commonly used in Ghana. That means an average annual savings of 570 kg of charcoal saved per year, or 1.4 tons of charcoal saved over the 2½ life of the typical stove.

In Ghana, where charcoal can cost, on average, US $0.19 per kilogram, the annual savings amount to US $108 per stove per year. This is a significant savings in a country where the
per capita GDP is US 600. The stove pays for itself in charcoal savings after three weeks of use. Over its life, a typical stove will save its owner US $270. The savings generally accrue to women, who then have that money disposable for other expenses related to children and household needs. It has been estimated that every 1000 conservation cook stoves will reduce the amount of deforestation by the equivalent of 46.0 hectares.

Considering that charcoal combustion emits 3.01 tons of CO$_2$ per ton of charcoal, not including CO$_2$ emission during the production of charcoal from wood. EWV estimates that every 1000 stoves in use, reduces CO$_2$ emissions by 1716 tons per year.

The programme has provided employment to Tinsmiths who make the metal cladding of the stoves. A productive Tinsmith turns out 625 stoves in a year, earning the equivalent of approximately US $880. Currently, the project is working with 120 tinsmiths

The ceramic liners are manufactured by medium-scale ceramics enterprises that employ 5-8 people and earn approximately $1890 for every 1000 liners produced. There are five medium-scale certified ceramicists who are currently supplying over 7000 high quality liners every month to the tinsmiths nationwide.

Stove vendors or retailers and distributors, who typically earn approximately US $940 for every 1000 stoves sold, perform the distribution and resale of the Gyapa charcoal stoves. These sales agents form the link between the manufacturers and the end users of the stoves.

EWV approaches sustainability from a business perspective. The activities must serve a real need of its beneficiaries, who signal their genuine interest in them by investing their own capital in the expectation of a greater return. Purchasing the technologies at the full unsubsidized price directly from local manufacturers or sales agents, without project intermediation, ensures that both manufacturer and purchaser reap enough of benefit to continue the activity beyond the life of the project.

**Questions and Answers**

Following the presentations was a question and answer session where some clarifications were made. The clarification was to the effect that when talking about climate change people should be careful not to mix adaptation with mitigation since the two are different. It is usually important to distinguish between the two from the onset or to be precise when talking about each of the two terms.
The second comment was to the effect that it appears the world over, particularly at international fora and in the Kyoto Protocol (KP), there has been too much emphasis on mitigation while adaptation has been relegated. The situation has led to little incentives going to those engaged in activities that promote or support adaptation programmes while the advanced economies commit so much financial resources to mitigation.

Contributing to the discussion, a participant added that beyond local community engagement, there is need for the provision of incentives to encourage people who wish to adopt sound environmental practices. Another call was made for the Designated National Authority (DNA) to improve on its engagement with stakeholders on climate change issues.

**Breakout 1: Challenges for enhancing climate innovation and entrepreneurship in Ghana**

After the various presentations were made and some time allowed for clarifications, participants were constituted into two groups to go into the first break-out session to identify two main challenges facing the various actors in the 4 helix, vis-à-vis the government, NGOs, entrepreneurs and knowledge institutions. Each group elected a chairperson to coordinate and structure the discussions, and a secretary to record major decisions and to report back at the plenum.

**Report to plenum from breakout 1**

*Group one’s report*

The general observation made by this group was that there was a communication gap amongst the various actors in the 4 helix. The group then went ahead to identify the following challenges.

With entrepreneurs the group reported that there was a problem with communicating among them because it was not easy for them to identify other players in the field. Furthermore, it was difficult communicating because every entrepreneur was protecting their businesses. The other problem identified that affected the entrepreneurs was their inability to access information. Information pertaining to opportunities available for investment in the sector, and information on (government or other) programmes being implemented that they can make contributions to and benefit from.
Regarding the knowledge institutions, this group reported that although there is knowledge on climate change, most of the knowledge and research is not focused on climate innovation. Second, there is very little interaction, on one hand, between the knowledge institutions and on the other hand between the other actors in the 4 helix.

With the government, the problem associated with them is the ability of technocrats in policy making institutions to take the science from the knowledge institutions and interpret the science to the policy maker to understand very well and to then make laws. The second problem identified that is associated with government is the inability to implement policies, especially global policies (agreements) aimed at reducing or limiting carbon dioxide emissions.

*Group two’s report*

According to this group, a major challenge facing entrepreneurs is the lack of coordination among the actors in the helix. The group also identified the inadequacy of policies with respect to providing incentives to the private sector to invest in climate technologies and the lack of information on policies (the fragmented nature of the information).

With regards to the knowledge institutions, this group also identified lack of coordination among the various actors in the 4 helix as a challenge. According to the group, although there appears to be some kind interaction among the actors, it is structured to address climate innovation and entrepreneurship. The second challenge identified was the absence of a national strategy to address the issue of climate innovation.

For the government, one challenge is the failure to distinguish between the government and the state, which leads to the over politicisation of government decisions. The second challenge associated with the government was the fear of change; of the unknown which is making policy makers develop ‘cold feet’.

After the presentations from the two groups, Mr. Winther summarised the key challenges identified by the two groups as follows:

- Communication and information
- Policy/incentives
- Limited partnership
- The fear of change
Breakout 2: Systems and strategies for technology transfer that will enable climate innovation entrepreneurs to develop and grow.

In the second breakout session, the same method as used in the first breakout session was used. Each group elected a secretary and a chairperson to identify three key systemic shortfalls that needs to be resolved, three actions that are critical in the short term, and three actions that are critical to provide sustainability

**Report to plenum**

*Group one’s report*

This group reported that to deal with the challenge of communication and information, there should be intra agency/institution information sharing, but this can be done if information/knowledge is institutionalised than personalised as the status appears to be. Furthermore the group reports that (public) institutions can also share information on their websites for access, this of course will complement the establishment of information desks in institutions to provide accurate and up-to-date information. Additionally, the group observes that implementing agencies should communicate information to the local people through the mass media that has become very vibrant in recent times.

On the issue of policies/incentives, the group reported that the government on-going activities relating to development policy and planning should capture climate change issues. In the long term, the proposed African Union (AU) mitigation and adaptation fund should be supported and encouraged. Ghana and it neighbours should strive to develop common policies in the area of climate change.

To encourage the private sector or entrepreneurs, the numerous bureaucracies should be removed as a form of incentive to entrepreneurs in this area to develop and grow. To deal with the challenge of lack of partnership, the group suggested that platforms be created for more interaction between stakeholders while at the same time suggesting that stakeholders should involve more political partnerships.

To noted that the fear of change challenge can be dealt with by ensuring that policies are state-owned rather than putting political party colours on policies. Additionally, the group suggested that change managers should be encouraged to drive innovations.
**Group two’s report**

Group two identified the three key systemic shortfalls to include: (i) a lack of collaboration amongst the various stakeholders; (ii) a lack of capacity in respect of human resource, financial and infrastructural resources; and (iii) insufficient understanding of the discourse on climate change.

The group also identified three key actions that need to be implemented in the short term. They outlined: (i) the creation of a platform for further collaboration among the various stakeholders; (ii) the need to intensify public awareness creation on climate change and to increase the participation of the public in climate change discourse; and (iii) engagement of the government for the preparation of a long term policy plan.

The group then concluded that to ensure that the above-mentioned measures remain and are effective, pursue programmes that will raise the level of understanding of the nature of climate change. This programme, according to the group must be gradual and systematic. Furthermore, such a programme should be approached through a national policy with the firm engagement of the government.

**General Plenary Session**

During the general plenary discussion the initial discussion focused on the Institutionalization of knowledge in all stakeholder institutions, ministries and departments where though such information might be available they had been personalised to the point where the absence of particular individuals meant that such information could not be accessed. Participants felt that this occurrence was inimical to the progress of climate innovations and to the country in general and therefore called for the institutionalisation of such knowledge.

Others also called for a multi sectoral approach and the dissemination of information to all sectors of society to deal with the issue of climate innovations. They concluded that not one institution, ministry or department could adequately address the issue and therefore there was the need to bring all stakeholders on board to deal with the issues involved.

It was also emphasized that information should be disseminated widely to industries and that there was the need for collaboration between government institutions and industry on climate innovations. The need for industries to be adequately involved was motivated by the realisation that the business approach was a much more effective tool in dealing with this.
This is because once industries were made to realise the potential inherent in climate innovations they were likely to get involved and this is going to go a long way to drive the issues forward.

The point was also made that government should take the initiative on the issue of climate innovations instead of the country’s ‘development partners’ doing so. It should lead rather than sit back and allow others since that is one of the ways the best output can be obtained. It was observed that on so many critical issues such as this, the government had usually allowed other agencies and organizations to take the lead role and this had led to a situation where such efforts could not be sustained. Thus in order to enable climate innovations succeed there is the need for government to take an active and keen interest in the issue.

The need for public sensitization on the issues was also emphasized. In this regard the role of the media was found to be very crucial. Discussions centered on the need for those in the media to be provided with in-depth knowledge of the issues involved for them to provide effective public education.

Finally participants were of the view that as a matter of urgency there should be a network of in place of who is doing what in climate innovations (change). The Ministry of Environment Science and Technology should compile that information and make it available to all stakeholders so that at every point in time all stakeholders will be advised by that and guided accordingly.

**Conclusion and closing**

According to Mr. Thomas Winter the main challenges identified through the climate innovation/entrepreneurship workshop were as follows:

- Communication
- Information sharing between the various stakeholders
- Policies and Incentives
- Lack of partnership/collaboration between the various stakeholders
- Fear of change

In his view the blame should not be put completely on the shoulders of government and that everybody has roles to play in this especially the stakeholders. Regarding the solutions it was important to move the issue higher on the agenda of government and also there was the need
to bring in the business mindset in helping to resolve these challenges. Regarding the actions required he listed the following:

- Building capacity
- Building awareness
- Localising the message and approaches
- Engaging media strongly
- Platform for collaboration and
- Facilitating stakeholder collaboration

Mr. Akon-Yamga expressed the need for maximum cooperation especially from the various stakeholders with whom he was hoping to work closely with to pursue the agenda of climate innovations. He further added that the final report will be shared widely among the various stakeholders present.

Dr. George Essegbey concluded the workshop with the view that there was the need to focus on the issue of climate innovation/entrepreneurship and that Science Technology and Innovation was required to get to the market place to benefit the people. He emphasised the need for information flow and the role of the media in this endeavour of documenting and disseminating knowledge about climate innovations.
### ANNEX 1: PARTICIPANTS LIST: STAKEHOLDER WORKSHOP ON CLIMATE INNOVATION AND ENTREPRENEURSHIP.

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ANNEX 2: WORKSHOP PAPER

PRELIMINARY ASSESSMENT OF CLIMATE INNOVATION AND ENTREPRENEURSHIP IN GHANA

Summary:

With support from the World Wide Fund (WWF) and the Swedish International Development Cooperation, the Science and Technology Policy Research Institute (STEPRI) is currently, in cooperation with the consulting firm Innogate Aps, undertaking an assessment on climate innovation and entrepreneurship in Ghana.

The assessment aims to take stock and initiate a process to accelerate climate innovation in Africa – by building on amongst others on the Ghana Technology Needs Assessment implemented under the United Nations Framework Convention on Climate Change (UNFCCC). More specifically the project will assess the level of development of national climate innovation systems and the conditions facing climate entrepreneurs in Ghana. A similar assessment is currently being undertaken in Tanzania. Having provided the assessments, the project will identify preferred systems for national and international technology transfer that will enable climate innovation entrepreneurs to develop and grow.

It is key to the assessment to use the power of best practices – and thereby demonstrate that challenges imposed by increasing emissions and climate change can be used as a new opportunity to grow new business; more and better jobs; and reduce poverty.

Background and Introduction

In 1992 at the Earth Summit in Rio de Janeiro, the United Nations Framework Convention on Climate Change (UNFCCC) was adopted with the objective to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

A voluntary approach was adopted by 162 countries to achieve this objective. However, by 1993 it had become clear that the voluntary approach would not succeed and the doubt over anthropogenic climate change was disappearing and the threats posed by climate change were now real. The Kyoto Protocol was adopted in 1997 as an enforceable programme to achieve the objectives of the UNFCCC. The Kyoto Protocol entered into force in 2003.

Throughout the Convention process, the Conference of Parties (COP) to the UNFCCC recognises the important role environmentally sound technologies play in averting the threat of climate change. Therefore the COP, by its decision 13/CP.1, recalled the relevant provisions of the Chapter 34 of Agenda 21 on “Transfer of Environmentally Sound technology, Cooperation and Capacity Building” (Ghana’s TNA, 2003).

The COP’s decision 7/CP.2 also requested the Convention Secretariat to give high priority to the development and completion of a survey of the initial technology needs, as well as, technology information needs, of Parties not included in Annex I to the Convention (non- Annex I Parties). Decision 4/CP.4 also urged non-Annex I Parties, in the light of their social and economic conditions to submit their prioritised technology needs, especially those relating to key technologies to address climate change in particular sections of their national economies, taking into account state-of-the-art environmentally sound technologies. Further by its decision 4/CP.4, the COP requested Subsidiary Body for Scientific and Technological Advice (SBSTA) to establish a consultative process aimed at achieving agreement on a framework for meaningful and effective actions to enhance implementation of Article 4.5. Article 4.5 urges developed country Parties and Annex II Parties to take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally
sound technologies and know-how to other Parties, particularly to developing countries, to enable them to implement the provisions of the Convention.

Through the consultative process, a framework for technology transfer was developed. This framework became the subject of negotiation during the second part of the Sixth Conference of Parties (COP6 bis) as part of Bonn Agreement for implementation of the Buenos Aires Plan of Action. At the Seventh Conference of Parties (COP7), by decision 4/CP7 the framework for meaningful and effective implementation of Article 4.5 was formally adopted.

As part of fulfilling developing countries’ commitment to the UNFCCC, these countries were required to conduct technology needs and needs assessments. Existing technology needs assessments carried out in African countries within the framework of UNFCCC and findings coming out of the dialogue within the African European Climate Innovation Initiative (AECII) have revealed that Africa faces special conditions, challenges and opportunities for climate innovation entrepreneurs, investors and policy makers.

Firstly, in Africa the institutional frameworks for facilitating innovation in general and climate innovation in particular are largely little developed. Secondly, awareness of and aspiration for overcoming climate challenges through actively pursuing climate innovation opportunities is not well developed.

The analysis that this report seeks to undertake will respond to these shortfalls and thereby facilitate an improved foundation for African countries engaging into global climate change efforts and in benefiting from new growth opportunities provided by climate innovation and entrepreneurship.

This initial assessment in Africa using Tanzania in East Africa and Ghana in West Africa as case studies, will review the general conditions for facilitating climate innovation through joint efforts among stakeholders within the triple helix with a particular emphasis on supporting climate innovation entrepreneurs in bringing their products (i.e. their “climate solutions”) to the market.

A goal analysis

A climate innovation, by WWF’s definition, is: ‘a transformative technology (non-fossil, non-nuclear goods or services) that can have a significantly positive effect on climate change if applied at scale.’

WWF wants to cross-fertilize the global climate and innovation agendas, for the benefit of business as well as the health of our planet. Entrepreneurs, investors and policy makers are the primary stakeholders in this strategy. By using the power of best practice WWF can get attention from target groups. This attention is used to highlight weaknesses and impediments in the innovation and commercialisation process, e.g. unaligned regulation, lack of competence, limited access to financing etc. WWF will approach relevant decision-makers and engage in collaboration with relevant stakeholders to catalyze improvements in such areas.

The analysis will be performed at two levels which are both important for the understanding of how different parts of the African innovation system works:

1. On the ground analysis of prevailing framework conditions for enhancing national climate innovation systems in Africa i.e. the day-to-day reality and available resources for climate entrepreneurs to work in the country.
2. Identification of preferred systems for technology transfer that will enable African climate innovation entrepreneurs to develop and grow.

Building on the components 1 and 2 the assessment will provide the basis for (a) recommendations to policy makers, investors and entrepreneurs, and (b) taking informed decisions on approaches how to further activities and collaborations that will strengthen the national innovations system in Ghana and Tanzania specifically and in Africa more generally.
Building on experiences and new findings the assessments will support climate innovations in reaching the market – be it through development and facilitation of new climate solutions, new productive partnerships within the triple helix, and new platforms for channelling and advancing climate innovation and entrepreneurship.

**The expected results with indicators based on the project’s own goal**

This project will involve a large number of African stakeholders from industry, knowledge institutions, governments and non-governmental organizations in a dialogue to improve the foundation for African countries engaging into global climate change efforts and in benefiting from new growth opportunities provided by climate innovation and entrepreneurship.

Through this dialogue the project will reach out to civil society and directly – by providing fact-based recommendations – strengthen their capacity to advocate in favour of specific initiatives aimed at increasing national climate change efforts.

Through stakeholder consultations, analysis and recommendations aimed at improving the functionality of the national innovation systems within the area of clean tech and climate entrepreneurship the project will provide new instruments and tools to enable that the private sector can work as an engine for growth – thereby creating new and better job opportunities and poverty alleviation.

*Strengthening civil society*

The project is a primary study project to find out the innovation conditions in Africa. The future work after the analysis will be tremendous and there is great potential. Only relying on technology transfer will make the African countries more vulnerable which weakens their capacity for adaptation and to build resilience against climate change. WWF as a typical civil society organization wants to through climate innovation projects to help African countries to build their own civil society which can take the space to decide on climate adaptation, developmental and environmental needs to meet climate change in a sustainable and equitable manner.

*Improved conditions for the poor*

Climate change can bring an immediate disastrous effect on people’s livelihoods – in particular in developing countries where extreme weather occur more often and natural resources reduce because of increased temperature and other nature disasters. To tackle the climate change, there is a need for innovative technologies and solutions. WWF respect and support the developing countries’ right to development. Besides the technology transfer from developed countries to developing countries, WWF also see the potential for improving more generally the national innovation systems.

*Contribute to building the national climate innovation system*

It has been recognized that the innovation systems in many African countries are not in the best of conditions although in many cases the human resources are available to tap. Therefore if the overall innovation system calls for improvement, so does the climate innovation system. Therefore the recommendations that will be made from this project will contribute to building the national innovation system but with emphasis on climate innovation.

**The Ghanaian Case**

According to the Intergovernmental Panel on Climate Change (IPCC, 2001) there is no country and region of the world that will not be affected by climate change. Climate change is by far the most
challenging environmental problem facing the world presently. To meet this challenge squarely, human imagination and ingenuity are already beginning to respond to the problem, by identifying and developing technologies and practices both for mitigating climate change and adapting to it. Climate innovation has been identified as an inevitable component of the world’s convergence towards a low carbon economy.

There is enough scientific evidence to prove that the potential negative impacts of climate change are immense, and Ghana is particularly vulnerable due to lack of capacity to undertake adaptive measures to address environmental problems and socio-economic costs of climate change. These include climate change associated health problems, climate induced disruption of agricultural systems, flooding of coastal areas which are already undergoing erosion and low operating water level of the only hydro-generating dam in the country, (which produces 80% of national electricity supply), as a result of reduced levels of precipitation (Ghana’s TNA, 2003).

Ghana ratified the United Framework Convention on Climate Change (UNFCCC) in 1995 and acceded to the Kyoto Protocol in 2003. Countries that have ratified the Protocol have committed themselves to reduce the emission of 6 green house gases (GHGs), or trade in emissions if they maintain or increase emissions of the GHGs. These GHGs are carbon dioxide, methane, nitrous oxides, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.

In 2003 Ghana produced its technology needs and needs assessment (TNA) as required by the UNFCCC. Through a consultative process, a set of criteria was adopted for selecting relevant technologies within energy and waste sectors. The criteria included contribution to addressing climate change, development benefits and market potential of the selected technologies. Within these, sub-criteria were defined based upon which a number of technologies were identified. The following technologies were identified in the energy sector:

- Energy efficient technologies, including energy efficient lighting and industrial energy efficiency
- Solar PV- technology
- Small and mini hydro
- Natural gas development and distribution technologies
- Natural gas combined cycle technologies
- Solar water heaters
- Wind
- Biomass for power generation
- Transport (use of biodiesel from Jathropha)

In-depth analyses were done for the development of technology transfer implementation plans.

Similarly, some technologies were identified in the waste sector. These include the following:

- Landfill methane gas capture and power generation
- Anaerobic and methane generation technologies for wastewater handling (biogas technologies)
- Composting technologies
- Combined heat and power generation from sawmill residue (co-generation)
- Incineration technologies

Ghana’s TNA makes several recommendations pertaining to the use of technology in the energy and waste sector to address climate change problems. Some of these recommendations include:

- Frequently updating the TNA and making new action plans
- Promote private sector involvement in the transfer of the identified technologies. In addition, policy guidelines that will address issues like subsidies, ownership, tariffs, awareness, standardization, quality control, institutional set up and the right of supply, must be developed.
- Climate Technology Initiative and other relevant bilateral, multilateral, International Governmental Organisations (IGOs) and NGOs, that are in the position to do so, should play the role of technology transfer intermediaries by matchmaking investors in the developed countries with relevant Ghanaian entrepreneurs. These intermediaries could play these following additional roles, matchmaking with finance providers, training for in-country businesses and for the intended end users of the new technologies, technical assistance to policy makers on creating an enabling environment.

- Ghana must work towards acquiring and developing critical technologies that can be employed to address the climate change problem.

- Indigenous capacities must be developed because an exclusive dependence on imports can prove harmful in the future.

- Renewable energy technology friendly attitude must be developed and a suitable pricing framework in competitive applications must be instituted. Also, RETs must be incorporated in energy conservation and efficiency strategies of the country.

- The Government must develop policy, regulations and enforcement capacities for increased public and private participation in energy efficiency programmes, taking into consideration the programmes already implemented by the Energy Foundation.

- A requisite policy to implement the development and utilization of renewable energy resources and incentives to attract investment capital for renewable energy technologies must be put in place.

- Local production of standardized solar water heaters should be encouraged and the public well informed about their benefits. Also regulations, code of installation and recommended practices should be developed.

- Government should formulate policies and strategies that will make it mandatory for all future sanitary landfills to integrate methane recovery systems for energy utilisation. Development partners should help with technical and financial resources to implement the strategy and for acquiring the necessary technology pieces.

- Local authorities should be resourced to develop institutional framework to ensure effective waste management.

- The local authorities must undertake public education and promote waste segregation at source. Also, the public must be encouraged to use compost.

- The Technology Transfer Regulations need to be reviewed so as to allow the incorporation of issues consistent with the criteria for encouraging the introduction of these technologies, in particular the reduction of GHG emissions.

The Climate Innovation Study: Preliminary findings from the fieldwork

The climate innovation and entrepreneurship assessment in Ghana commenced in May 2009 with desk research and interviews of a number of key persons in government and non-governmental organisations, practitioners in the private sector and in the academia. Some preliminary observations were already been made. These are summarized below:

- Interviews with government institutions and non-governmental organisations (NGOs) have revealed:
  1. There is an absence of clear government policies relating to climate entrepreneurship although some policy objectives relating to the environment and therefore indirectly to climate change are developed.
  2. Some of the NGOs had specific objectives towards climate change and climate entrepreneurship.
  3. There are on-going activities that have the potential to reduce CO2 emissions, sequester CO2, and contribute to adaptation to climate change although the objectives for doing so are not directly related to climate change.
  4. There are indications that strong collaborations existed between the government agencies and their stakeholders, and similarly with the NGOs and their
stakeholders. There are also some structures for collaboration and interaction in place.

5. Several challenges are identified by the government agencies and the non-governmental organisations.

- Interviews climate innovation entrepreneurs have revealed:
  1. Climate entrepreneurs are mostly sole proprietorship with their focus on providing solutions to environmental problems in the areas of energy and waste.
  2. Their clients are mainly other businesses, institutions, and hospitals. These clients are introduced to the entrepreneurs by other persons, mostly friends and relatives of the entrepreneurs who have previously employed the services or products of the entrepreneurs.
  3. Although most of the products and services the entrepreneurs provide have potential to reduce CO2 emissions, the actual amounts were unknown or difficult to calculate.
  4. There little, if not none, application of intellectual property rights by the entrepreneurs.
  5. The application of new technologies are financed by the entrepreneurs own funds (re-investments). Some obtain funding from NGOs and international organisations.
  6. Among the challenges identified by the entrepreneurs are a general lack of awareness on climate issues and climate technologies, funding ideas into innovations, especially producing prototypes, unsupportive government policy.

- Interviews with knowledge institutions have revealed:
  1. The main knowledge services provided by the knowledge institutions interviewed are teaching, research, outreach and technology consultancy.
  2. Many of the knowledge institutions have activities on-going relating to climate change, but few are directed at supporting climate entrepreneurs. Many of them are related to providing information and other support to rural communities to enable them adapt to the impacts of climate change.
  3. There appears to be a strong collaboration between the knowledge institutions and communities in which they work, as well as strong collaboration with other knowledge institutions, NGOs and government institutions.
  4. Many of the knowledge institutions do not have specific policies concerning intellectual property rights, although aspects of IPR are applied in some projects and activities.
  5. Many of the projects undertaken by the knowledge institutions are implemented with assistance from international organisations.
  6. A number of challenges are enumerated by the knowledge institutions, including inadequate funding; lack of access to information; little consultation from government when it comes to formulation of national policies and programmes on climate change; challenges with clearing research equipment from the ports-high taxation; and bureaucracy.
ANNEX 3: POWERPOINT PRESENTATIONS

Climate innovation and entrepreneurship

Accra, Ghana

18 June 2009

By Thomas Winther, Innogate Aps

Project partners:

- World Wide Fund (WWF)
- Swedish International Development Cooperation Agency (SIDA)
- Innogate Aps
- Science and Technology Policy Research Institute (STEPRI)
- University of Dar Es Salaam and Tanzania Camber of Commerce

Objectives:

- Assess the national climate innovation system (in Ghana and Tanzania)
- The conditions for climate entrepreneurship i.e. for transforming the treat of climate change into a business opportunity
- Identification of frameworks for collaboration and action that will enable climate innovation entrepreneurs to develop and grow

Approach:

- Desk-research
- Interviews
- Workshop
- Report
- Communicating:
  a) climate change mitigation and adaptation business opportunities
  b) restraints phasing climate entrepreneurs
  c) proposals that can catalyze improvements through joint action
What is a climate innovation?

- “a transformative technology (non-fossil, non-nuclear goods and services) that can have a significantly positive effect on climate change if applied at scale” (WWF)

What is a climate entrepreneur?

- “someone who undertakes the organization and management of an enterprise, applying a climate innovation, and assuming the risks as well as the opportunity for profit” (Innogate).

Ghana Technology Needs Assessment, 2003

Some challenges identified:

“Ghana is particularly vulnerable due to lack of capacity to undertake adaptive measures to address environmental problems and socio-economic costs of climate change”

“There is a need for technology transfer intermediaries … to enhance the effective transfer of climate technologies”

“Exiting policies, legislative and institutional frameworks … reveals enormous challenges…”

“Lack of the necessary financial resources, adequate capacities and a culture of technology development have… undermined laudable policy directives”

“Biomass resources other than wood fuel such as crop residues, sawdust and energy crops (e.g. Jatropha, cassava, sugarcane etc.) have strong potential for energy production”

“Ghana has substantial mini hydro potential”

“There is a national drive to achieve a comprehensive energy efficient economy”

... please note that the TNA emphasized only on the energy and waste sectors and did not include challenges and opportunities in forestry and agriculture!
What is next today?

- Preliminary findings from interviews with stakeholders
- Introductions, cases and solutions from government, entrepreneurs, ngos and knowledge institutions
- Breakout session to identify stakeholders’ key challenges
- Breakout session to propose strategies and systems for technology transfer and use that will enable entrepreneurs to develop and grow

Thank you!
tw@innogate.net

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**Preliminary Findings of the climate innovation and entrepreneurship assessment in Ghana**

_Gordon Akon-Yamga_  
_CSIR-STEPRI_

- The climate innovation and entrepreneurship assessment in Ghana
  - Interviews with a number of key persons in
    - Government and non-governmental organisations;
    - Some entrepreneurs in the private sector; and
    - Knowledge institutions

- Preliminary findings from interviews with government institutions and non-governmental organisations (NGOs):
  - Absence of clear government policies relating directly to climate entrepreneurship
  - Some of the NGOs had specific objectives towards climate change and climate entrepreneurship.
  - There were on-going activities that have the potential to reduce CO2 emissions, sequester CO2, and contribute to adaptation to climate change although the objectives for doing so are not directly related to climate change.
Preliminary findings from interviews with government institutions and non-governmental organisations (NGOs):

- There were indications that strong collaborations exists among stakeholders
- Several challenges were identified by the government institutions and the NGOs

Preliminary findings from interviews with climate entrepreneurs reveal that:

- Climate entrepreneurs were mostly sole proprietors with their focus on providing solutions to environmental problems in the areas of energy and waste.
- Their clients were mainly businesses, educational institutions and hospitals.

Although most of the products and services the entrepreneurs said they provide have potential to reduce CO2 and CH4 emissions, the actual amounts were unknown or difficult to calculate.

Preliminary findings from interviews with climate entrepreneurs reveal that:

- There was little application of intellectual property rights by the entrepreneurs.
- The application of new technologies were financed by the entrepreneurs own funds (re-investments). Some obtained funds from NGOs.
- The challenges identified by the entrepreneurs included a general lack of awareness on climate issues and climate technologies, funding ideas into innovations, especially producing prototypes, absence of government policy.

Preliminary findings from interviews with knowledge institutions:

- The main services provided by the knowledge institutions interviewed were teaching, research, outreach and technology consultancy.
- Many of the knowledge institutions have activities on-going relating to climate change, but few are directed at supporting climate entrepreneurs. Many of them are related to providing information and other support to rural communities to enable them adapt to the impacts of climate change.
- There appears to be a strong collaboration between the knowledge institutions and communities in which they work, as well as strong collaboration with other knowledge institutions, NGOs and government institutions.
Preliminary findings from interviews with knowledge institutions:

- Many of the knowledge institutions do not have specific policies concerning intellectual property rights, although aspects of IPR are applied in some of their projects.
- Many of the projects undertaken by the knowledge institutions are implemented with assistance from international organisations.
- A number of challenges were enumerated by the knowledge institutions

Thank you,

Gordon Akon-Yamga

yamga16@yahoo.com

IMPORTANCE OF CLIMATE CHANGE INNOVATION

Mr. MacDuff Phiri,

Concern Universal

EFFECTS OF CLIMATE CHANGE

- Higher temperatures and less rainfall (energy crisis)
- Floods and droughts (crop failure and loss of livestock)
- Disasters (famine, floods)

BUILDING RESILIENCE TO CLIMATE CHANGE RISK

- Promoting integration of disaster risk reduction into development and humanitarian policy and planning. (SPHERE Training)
- Reducing vulnerability through capacity and livelihood resilience actions on disaster prevention, mitigation and preparedness

BUILDING RESILIENCE TO CLIMATE CHANGE RISK

- Identifying and conserving agriculture, land, water and soil management practices that are based on traditional indigenous knowledge
- Applying communication strategies based on indigenous systems that would help
accelerate learning and knowledge sharing on climate change adaptation.

**BUILDING ADAPTATION TO CLIMATE CHANGE**

- Micro-credit (micro-insurance) schemes
- Improve the capacity of local communities to access and use multi-hazard risk information to enhance their early warning systems for climate related disasters: droughts, floods.

**CLIMATE RISK MANAGEMENT WITH MULTIPLE BENEFITS**

- Forge innovative partnerships that build adaptive capacity of vulnerable communities, including increased access to climate risk management knowledge, information, and services
- Use innovative means to help educate communities on climate risks that leads to empowerment for action
- Test innovative, low-cost strategies to spread climate risk beyond the local level (e.g. trade and value-chain improvements; micro-finance)

**WHAT OUGHT TO BE DONE**

- Substantial investment in clean energy (R&D)
- Plant more trees
- Institute measures to stop dumping of waste products (electronics) - Government
- Recycle waste

THANK YOU

**Promotion of Improved Biomass Cookstoves in Ghana**

**EnterpriseWorks Vita Approach**

Mr. Seth Mahu

**Funding:**

- USAID- April 02 to Dec 05
- The Shell Foundation (Phase I)- Feb 04 to Dec 06
- The Shell Foundation (Phase II)- June 07 to July 08
- EPA, USA- Sept 07 to Aug 09
- JPMorgan/ClimateCare- Nov 08 to ...
Others

- Centre for Entrepreneurship in International Health and Development (CEHID), University of California, Berkeley
- Aprovecho Research Center – Oregon
- Columbia University, NYC
- Industrial Research Institute, CSIR-Ghana
- Ministry of Energy – Ghana
- Energy Commission-Ghana

Strategies and Approaches

GUIDING PRINCIPLES

- Stove must be affordable and an improvement over existing types/designs
- Profitable value chain
- Profitable with a short pay back period for the end user
- Locally available and not dependent on special imported parts or materials

BUSINESS DEVELOPMENT ASSISTANCE

- Product Development Services
- Production Training Services
- Quality Management Services
- Management Advice Services
- Market Access Services

Creating Distribution Networks: The Supply Chain

Marketing & Promotion

-Branding
  - Name “GYAPA” for Good Fire
  - Catch phrase “Aben da da” for “already cooked”
  - Promotion
  - Logo
  - Stickers
  - Flyers
  - Posters
  - User manuals

-Advertisement
  - Newspaper, Radio and TV

-Demonstrations – Where?
  - Rural and Urban Markets
Demonstrations - When?
- On market days
- Synchronized with extensive advertisement campaigns

Results and Impact
- Ceramicists (5) - net profit of $0.55/liner
- Stove manufacturers (111) - net profit of $0.67/stove
- Stove retailers (337) - net profit of $1.5/stove
- 2008 Sales: 68,000

Benefits to Households/Environment
- Rural households with little or no income – (mainly wood stoves)
  - Savings on fuel
  - Savings on time used in collection of fuel
  - Less exposure to the dangers of IAP
- Rural/urban Household who can afford to buy cooking fuel –
  - Benefit from 35% savings on charcoal
  - 40 to 90% improvement on air quality
  - 2,700ha of forest saved
  - 53,000tonCO2 emission reduced

Challenges & Solutions
- Quality – Ceramic Liner, Manufacturing process, Customer Returns
- Pricing
- Marketing – Expansion, Promotional materials, Advertisement
- Supply Chain – Bulk distributors, stockist
- Ceramicist – Demand too high, working capital, more ceramicists

Future Plans and Goals

Future Plans/Goals
- Market expansion through a Distributor model
- Projected annual sales of 100,000 stoves
- Request
- Funding support – Working capital loan
- Technical assistance
- Offers
- Experience sharing
Future Supply Chain based on a Distributor model

LESSON LEARNED

Social Marketing with the general public

+ 

Commercial Marketing with entrepreneurs

= 

Sustainable transfer of technology

Win – Win

Profitable for producer and consumer