climate policy

country study

Policy and regulatory framework for renewable energy and energy efficiency development in Ghana

WILLIAM GBONEY*

International Institute of Infrastructural Economics and Management (I3EM), PO Box KD 530, Kanda, Accra, Ghana

What external support is needed to assist Ghana's domestic policies to overcome domestic barriers and increase the scope, scale and speed of adoption of renewable energy and energy efficiency technologies? Although Ghana has a well-established regulatory environment and institutional set-up, international cooperation and support are required to leverage domestic policy and create an enabling environment to accelerate the transition to affordable and reliable renewable energy. International support can also be used to enhance the activities of the Energy Foundation and energy service companies (ESCOs) as well as to increase the adoption of energy efficiency technologies through residential and industrial demand-side management (DSM) activities.

Policy relevance: Despite domestic and international financial incentives, barriers from the regulatory framework and from conventional practice prevent the utilization of renewable resources in both grid-connected and off-grid applications. Tackling these barriers requires both government commitment towards a comprehensive strategy and support from different stakeholders to explore viable solutions. Such action can be supported, but not replaced, with international support for capacity building, technical assistance and finance. Experience from Ghana points to some success for such a strategy for energy efficiency measures but also highlights the importance of domestic and international structures that ensure continuity of an institution with sufficient resources for programme and project execution.

Keywords: capacity building; climate policy; domestic policies; energy efficiency; energy sector; international support; regulatory framework; renewable energy

Quel est le soutien exterieur requis pour appuyer les politiques intérieures du Ghana pour écarter les barrières intérieures et augmenter l'ampleur, l'échelle, et la rapidité d'adoption des technologies en énergies renouvelables et en efficacité énergétique? Bien que l'environnement réglementaire et les institutions ghanéennes soient bien établis, une coopération et un soutien extérieurs sont nécessaires pour faire levier aux politiques intérieures et créer un environnement propice à l'accélération de la transition vers un système d'énergies renouvelables abordable et fiable. Un soutien extérieur peut aussi être dédié à l'augmentation des activités de la Fondation de l'énergie et des entreprises de service énergétique « Energy Service Companies » (ESCO) ainsi qu'à l'adoption accélérée de technologies d'efficacité énergétique grâce à des activités de gestion de la demande « demand-side management » (DSM) résidentielle et industrielle.

***Pertinence politique:** Malgré les incitations financières intérieures et extérieures, les obstacles propres au cadre réglementaire et à la pratique courante bloquent l'emploi des ressources renouvelables dans les applications à la fois connectées au réseau et hors reseau. L'engagement du gouvernement vers une stratégie globale est nécessaire pour surmonter ces obstacles, ainsi que le soutien de diverses parties prenantes dans l'analyse de solutions viables. De telles mesures peuvent être soutenues, mais non remplacées, par un soutien international au renforcement des capacités, une aide technique et des fonds. L'expérience ghanéenne révèle le succès de cette stratégie en ce qui*

E-mail: wkgboney@yahoo.com

doi:10.3763/cpol.2009.0636 ISSN: 1469-3062 (print), 1752-7457 (online) www.climatepolicy.com

concerne les mesures d'efficacité énergétique, tout en illustrant l'importance des structures nationales et internationales garantissant la pérennité d'une institution à l'aide de ressources suffisantes à l'exécution de programmes et projets.

Mots clés: cadre réglementaire; efficacité énergétique; énergies renouvelables; politique climatique; politiques intérieures; renforcement des capacités; secteur de l'énergie; soutien international

1. Introduction

Despite the increasing deployment of low-carbon technologies, greenhouse gas (GHG) emissions from fossil fuels have continued to increase (IPCC, 2007). As noted by Sims et al. (2007), the absence of effective government policies can cause GHG emissions from fossil fuel combustion to rise from a global figure of 26.1 $GtCO_2$-equivalent in 2004, to between 37 and 40 $GtCO_2$-equivalent by 2030. The challenge for both developed and developing countries is a massive shift of the energy sector to low-carbon technologies within the next 10–20 years (Avato and Coony, 2008).

Ghana is a developing country which is endowed with abundant renewable energy resources (e.g. biomass, solar, hydro and wind) (Akuffo, 2003). This article provides insight into renewable energy (RE) and energy efficiency (EE) policies in Ghana, and identifies the barriers (including regulatory, human and institutional capacities, and financial constraints) that prevent the widespread deployment of RE and EE. It does not suffice to address these barriers individually, as has been shown by the failure of the Clean Development Mechanism (CDM) fund, which tends to focus on addressing only financial issues. A comprehensive action plan, which combines efforts in all these areas, is therefore required. The article also identifies the domestic policies that are 'slow-moving', and which would require international support and cooperation in order to increase the scale, scope and speed of RE and EE adoption in Ghana.

2. Policy description on renewable energy and energy efficiency

The overall Ghana government policy on renewable energy is aimed at removing the barriers which have hampered the exploitation of the country's renewable resources, by attracting investment, as well as by building local capacity for accelerating the transition to a sustainable market (DANIDA, 2002). This policy has led to the development of Ghana's strategic national energy plan, which set a national target of 10% RE in the country's energy mix by 2020 (Energy Commission, 2006). The government's energy policy has also sought to enhance energy efficiency (EE) through demand-side management (DSM) activities.

To ensure the effective integration of RE and EE into the country's energy sector reforms, the government established two regulatory agencies in 1997: the Energy Commission (EC) and the Public Utilities Regulatory Commission (PURC). The EC was set up to recommend the development and utilization of Ghana's energy resources. The EC is also responsible for developing the overall renewable energy regulatory and legislative framework, in order to ensure the wide adoption of RE. The second regulatory body, PURC, is responsible for developing suitable feed-in tariffs and regulating quality of service delivery.

A third institution, the Energy Foundation (EF), was created in 1997 as a public–private partnership. The Energy Foundation's focus is on the promotion of energy efficiency development, and providing energy solutions for residential and industrial consumers. Despite the strong institutional set-up and abundant RE sources available, these resources have not been harnessed, due to the barriers discussed in the next section.

3. Domestic barriers and drivers

The inability to harness the abundant RE resources is attributable to the following factors, which were identified at a recent workshop held in Accra, Ghana (Gboney, 2009), to discuss how to create the enabling domestic environment for international support and cooperation, towards enhancing RE and EE technology transfer.

Absence of legal RE policy and regulatory framework

Despite the government's commitment to the development of RE, the absence of a comprehensive legal and regulatory framework has been a major barrier for independent power producers (IPPs) to invest in RE technologies (RETs). For instance, the absence of network access rules and a transparent network pricing framework is hindering the development of RE. The government's policy also seeks to encourage the development of mini-hydro and other mini-grid-connected RETs, but the absence of well-documented tariff principles, as well as the non-existence of appropriate regulatory capacity on mini-grid systems, have continued to act as barriers. Furthermore, there is no incentive for the development of stand-alone systems, because of a lack of a suitable pricing framework which would enable such systems to sell back power to the electric distribution company.

Lack of access to credit and long-term finance

Another barrier identified is the general reluctance on the part of the domestic banks and other financial institutions to finance RETs (United Nations, 2008). Ghana possesses a well-developed financial sector comprising 25 banks, made up of commercial, merchant and development banks, with a total of 310 branches country-wide. In spite of this, financial support and access to long-term credit have not been available to RE and EE for the following reasons:

- The perceived riskiness of RE projects
- Inadequate funds available to the banks
- Lack of experience and in-depth understanding by bank staff on how to carry out credit risk analyses of RE and EE projects
- The inability of the private entrepreneurs and the energy service companies (ESCOs) to present bankable proposals.

Weak domestic capacity of local stakeholders

The stakeholders' workshop also brought to the fore the general lack of capacity in both the banking and non-bank financial institutions, with regard to RE and EE, infrastructure project finance, project risk allocation, and the review of Power Purchase Agreements (PPAs). It was also noted that the RE developers and the ESCOs do not possess the capacity to prepare feasibility studies and business plans, or to carry out environmental impact assessment of RE and EE projects.

Absence of an all-inclusive rural electrification policy

Although there is an energy policy covering the RE sector, the policy fails to clearly define rural electrification policy vis-à-vis grid extension plans and off-grid programmes. This policy gap has affected the deployment, diffusion and commercialization of RE technologies in rural communities and peri-urban areas.

Lack of appropriate technical capacity for the maintenance of RE systems

Another barrier that has been identified is the weak technical capacity of private entrepreneurs in the installation and maintenance of RE technologies, especially solar PV systems and EE appliances. This issue needs to be addressed through international support and cooperation, in order to generate the necessary technological change and to enhance the country's capacity to embrace new RE and EE technologies.

Lack of appropriate technical standards

The absence of well-documented technical standards for both RE and EE technologies was also identified as a barrier affecting the deployment and diffusion of RETs in Ghana. The country has already put in place a mandatory appliance standards and labelling regime, which requires retailers of room air-conditioners and compact fluorescent lamps (CFLs) to import and sell only products that conform to the minimum efficiency and performance standards of the Standards Board (Energy Commission, 2007). However, the standards for refrigerators and other industrial equipment which have the potential to reduce consumer demand through the use of more efficient appliances are yet to be put in place.

Lack of information and stakeholder awareness

Most stakeholders who were interviewed during this study seem to have limited knowledge of the costs, benefits, performance and opportunities for RETs and EE equipment in Ghana. It was also noted that architects and builders fail to take account of energy efficiency in their building designs.

Limited scope of operation of the Energy Foundation

Although the Energy Foundation appears to have made some modest gains in promoting energy efficiency, the study has revealed that its activities are limited to the capital city, Accra, and a few of the regional capitals. Figure 1 shows the regional distribution of activities, while Figure 2 depicts the relationship between the Foundation's activities and regional share of population.

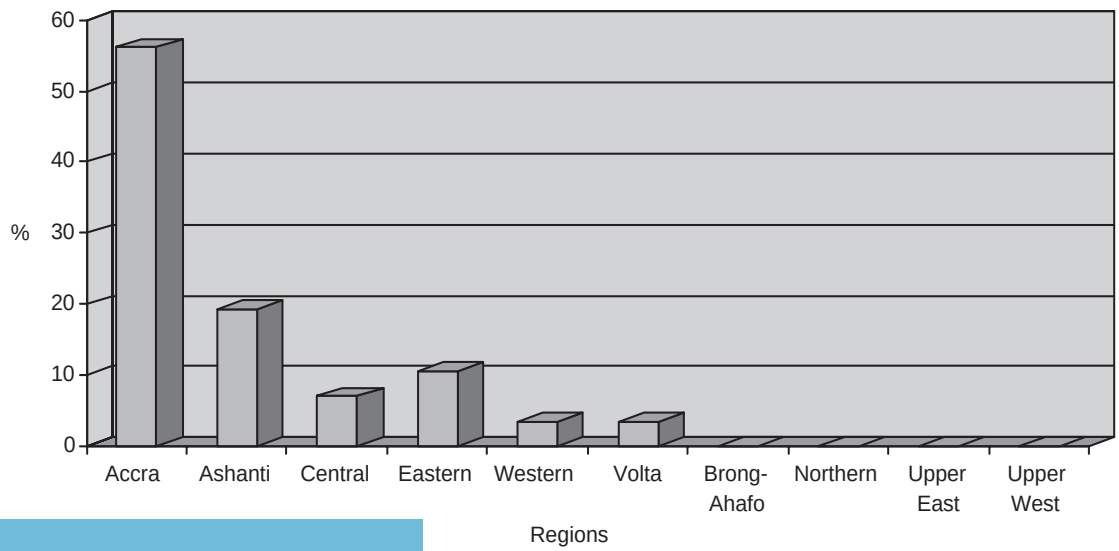

FIGURE 1 Regional distribution of Energy Foundation activities

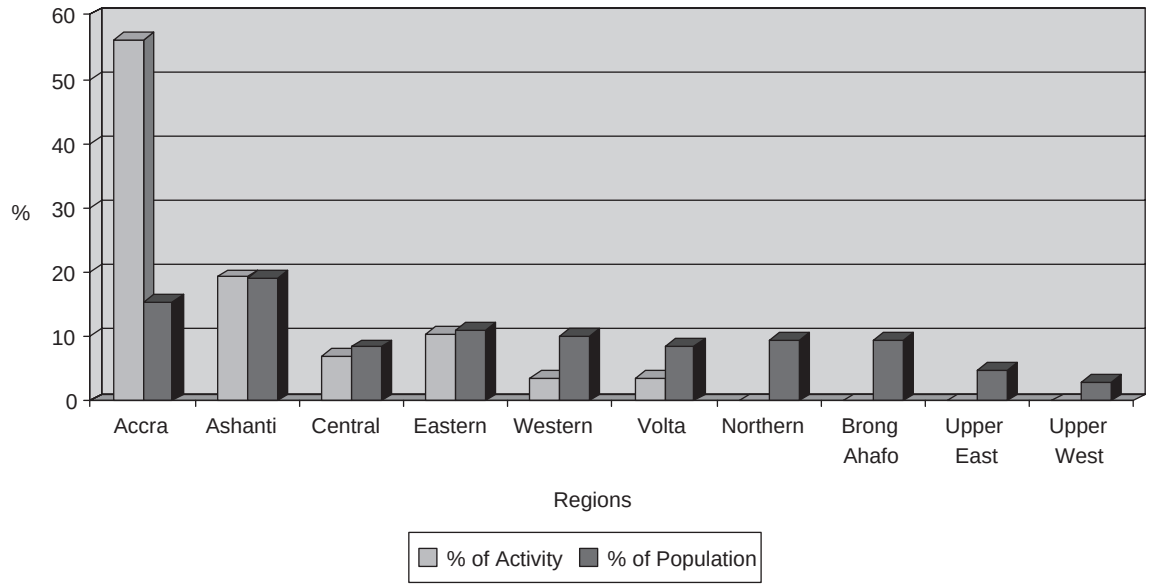

FIGURE 2 Relationship between population distribution and Energy Foundation activities in the regions

As shown in Figure 2, most of the Foundation's activities are based in Accra, Ashanti, Central and Eastern regions of Ghana. This may be due to the high population and hence greater industrial activity in these regions. It is, however, important that the Foundation's activities are extended to the other regions, especially the Northern, Brong Ahafo, Upper East and Upper West regions, whose main economic activity is agriculture. This is very important if Ghana is to make a significant contribution towards reducing global GHG emissions.

Figure 3 depicts the key activities of the Energy Foundation. Energy efficiency in buildings, energy management and audits are the main activities of the Foundation. The Foundation

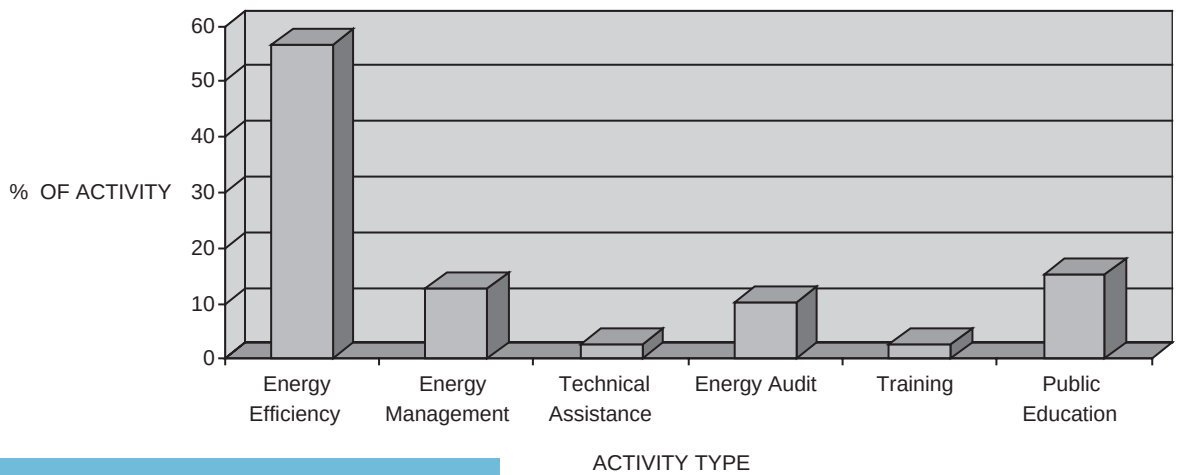

FIGURE 3 Key activities of the Energy Foundation

has also intensified its public education programme to raise the awareness of residential consumers and industrial users of electricity about DSM activities, and how they can reduce energy consumption.

Figures 1, 2 and 3 clearly indicate that more effort and international support is required in order to enable the Energy Foundation to intensify its activities, and enhance the scale and scope of its operations country-wide.

In light of the above barriers, the workshop also identified the following as the *key drivers* which can unlock domestic policy and provide a conducive environment for technology transfer, to enhance the scale, scope and speed of RE and EE deployment in Ghana:

- Creation of the appropriate regulatory and legal frameworks to incentivize the private sector to invest in RE and EE projects.
- Development of standards for technology performance. The workshop recommended that the Ghana Standards Board should liaise with the Energy Commission and Energy Foundation to develop codes, standards and certification to provide end-users with performance awareness.
- The need to develop innovative financing mechanisms, which would permit the bundling of small projects to enhance their financial viability.
- Public awareness and the establishment of information centres, to provide potential users with information and data on equipment costs and performance.
- The level of interest from academics, private entrepreneurs, regulators and policy makers is a clear manifestation of the willingness of stakeholders to contribute towards developing a comprehensive domestic strategy, which would support the adoption and absorption of RE and EE technologies.
- Capacity building, especially training in technology, regulatory economics, financing and management.
- The use of South–South cooperation to enhance technology transfer.

4. International support mechanisms and actions to overcome barriers

This section examines in detail the mechanisms and actions which can be used to build on the domestic policy and drivers identified at the Accra workshop, in order to overcome the barriers to facilitating the rapid diffusion of RE and EE technologies. The following actions and mechanisms are also expected to catalyse Ghana's efforts to deliver a successful RE and EE technology transfer.

Technical assistance

Even though the country currently possesses good policy and regulatory regimes, these appear to be limited to conventional energy sources. International support is required to develop appropriate mandated market policies, which would encourage both private- and public-sector investment. Assistance is also required to develop model PPAs for small RETs (<10 MW), in order to promote mini-grid system development. It is also imperative that the overall policy is redefined to clearly show the roles of RE off-grid system and grid-extension plans. International support, which builds on domestic policy and recognizes off-grid systems, would enhance the deployment, diffusion and commercialization of RETs in rural communities and peri-urban areas in Ghana.

Capacity building: human and institutional

The general lack of knowledge on RE and EE systems on the part of banks and non-bank financial institutions can be surmounted by using international and public-sector financial support to build the capacities of the financial institutions. To be able to 'unlock' domestic policy, promote private-sector investment and build an overall enabling environment, support would be required to assist RE developers and the ESCOs in the preparation of feasibility studies and business plans. Training and capacity building are also required for the regulatory agencies and staff from the country's Ministry of Energy, in policy formulation and regulation of both grid and off-grid systems.

Overcoming the financing barrier

Currently, Ghana's government provides almost 100% capital subsidy for grid-connected systems, while off-grid systems receive no support. One mechanism which could be used to support the private sector is an IDA (International Development Association) partial risk guarantee scheme. This approach has the potential to lower the perceived risk assumed by international lenders, who are reluctant to support private-sector initiatives in both the RE and EE sectors. The guarantee can cover areas such as regulatory, political, currency convertibility and transferability.

The country can also overcome the financing barrier by taking advantage of the World Bank's Clean Technology Fund (CTF), to increase investment in projects and programmes that contribute to the demonstration, deployment and transfer of RETs and other low-carbon technologies (World Bank, 2008). The advantage that the CTF possesses is that it can be used to provide grants and concessional financing to developing countries, and it can also combine with public and private resources to scale up the deployment of RETs and other low-carbon technologies (World Bank, 2008).

Ghana can also benefit from financing under the Clean Development Mechanism (CDM). Since most of the rural areas in Ghana still use woodfuel (which leads to deforestation) and kerosene, the carbon reduction potential resulting from the use of alternative sources is likely to be significant enough to enable mini-grid RETs to qualify as a CDM project. In 2002, realizing the benefit of mini-grid systems for reducing GHG emissions, the World Bank and the Global Environment Facility (GEF) created the Community Development Carbon Fund (CDCF). This fund is aimed at extending carbon financing to small projects, including mini-grid renewable systems. It is designed to reduce the CDM transaction cost of mini-grid renewable energy systems by allowing small-scale projects to be bundled together into a portfolio so that they can be developed as one larger CDM project.

The country can also take advantage of the government's micro-finance scheme, which is operated by the country's rural community banks, to support the development of off-grid systems. The support can be in the form of a partial credit guarantee and the provision of credit facilities by the World Bank and other multilateral and bilateral agencies, so that these rural banks can offer long-term credit of at least 10 years to micro-, small and medium enterprises (MSME) to develop mini-grid RE systems.

With regard to energy efficiency, it has been observed that the ESCOs' potential to undertake EE activities on a large scale or expand their activities is limited because of their weak balance sheets. International financial support can be utilized to leverage the government's scheme on micro-financing in order to provide co-financing support to the ESCOs.

Actions on technical standards

Although the mandatory appliance standards and labelling regime on room air-conditioners and CFLs is in existence, discussions with stakeholders at the Accra workshop suggest that codes,

standards and certification for RE and EE equipment still need to be implemented, in order to reduce the high risk and negative perceptions of RETs and EE equipment. In that regard, international support and government financial support can be used to support the Standards Board and the Energy Commission, to set up test and certification centres in various parts of the country, and to provide purchasers of RE and EE equipment with performance assurance.

Promoting stakeholder awareness

The limited information on RE and EE technologies as a barrier can be overcome if a 'centre of excellence' is established at one of the local universities. The centre can serve as a platform which would bring experts from academic, business, government and finance sectors together to discuss and address issues relating to RE and EE, as well as climate change, in a more focused manner. Such centres could be used to improve access to information for stakeholders and facilitate international cooperation (Staley et al., 2008). The centre would thus enhance information flow with international energy and climate agencies such as the UNFCCC, while assisting in the development and strengthening of local enterprises.

5. Conclusions

The study has highlighted the key domestic policies and institutional set-up in Ghana's renewable energy and energy efficiency sectors. Despite the huge potential RE resources in Ghana, these have not been harnessed due to a multitude of barriers. The article therefore examined how these barriers can be surmounted by leveraging domestic policies, through international cooperation and support, to increase the scope, scale and speed of RE and EE adoption in Ghana.

Building an enabling environment is very crucial to increasing the scale of technology transfer, and enhancing the use of RE and EE technologies. Even though the regulatory framework and the institutional set-up appear to be well established, it was noted that international support and cooperation could be utilized to enhance the capacity of the regulatory agencies, the Energy Foundation, policy makers and other stakeholders. The regulatory bodies need to have an in-depth understanding of some of the well-established methods for regulating mini-grid systems.

Many RE and EE projects have become unsustainable in developing countries due to inadequate attention to the availability of local skills for design, installation, operation, repair, spare parts management and technology transfer. This barrier can be addressed with international financial support and a twinning arrangement, in the form of North–South and South–South cooperation, as well as support from the World Bank and other multilateral donors.

The study also identified the lack of access to long-term financing as a barrier which needs to be addressed. Donor support can be utilized for demonstration or pilot projects for most rural RETs. The government's micro-financing scheme can be leveraged to provide support to rural consumers to purchase stand-alone systems. Most of the rural banks are unable to offer loans with repayment periods exceeding 20 months.

International financial support can therefore be given to these banks to co-finance credit for off-grid RE systems. This would enhance the consumer's ability to repay the loans, through the extension of the 20-month loan repayment period to at least 5 years. These actions, if well implemented, have the potential to increase the scale of deployment and diffusion of off-grid systems in Ghana, especially in the rural areas, to accelerate the attainment of 10% of RE in the country's energy mix by 2020. The study also noted that one way of overcoming the financing barrier is to build the human capacity of the bank and non-bank financing institutions in RE

and EE credit analysis, project risk allocation and infrastructure project analysis, using the appropriate technical and financial assumptions.

The study also highlighted the country's ability to take advantage of international finance mechanisms such as the World Bank's Clean Technology Fund (CTF) to promote the deployment and transfer of low-carbon technologies, as well as the Community Development Carbon Fund (CDCF) to finance small projects, especially mini-grid RE systems. The CDCF has the advantage of allowing small-scale projects to be bundled together into a portfolio, to be developed as one larger Carbon Development Mechanism (CDM) project.

References

Akuffo, F., 2003, *Indigenous Energy Resource Catalogue for Ghana,* Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

Avato, P., Coony, J., 2008, *Accelerating Clean Energy Technology Research, Development, and Deployment*, World Bank Working Paper 138, Washington DC.

DANIDA, 2002, *Support for the Development and Management of Renewable Sector Programme Support, Project Completion Report,* DANIDA Energy Sector Programme Support for Ghana.

Energy Commission, 2006, *Strategic National Energy Plan, 2006–2020: Woodfuels and Renewables*, Accra, Ghana.

Energy Commission, 2007, *Ghana Appliance Energy Efficiency Standards and Labelling Programme*, Energy Commission, Accra, Ghana

Gboney, W., 2009, *Workshop Report: International Support to Promote Technology Transfer and Deployment, for Renewable Energy and Energy Efficiency in Ghana*, Summary of discussions during the workshop in Accra, Ghana on 8 April 2009 [available at www.eprg. group.cam.ac.uk/wp-content/uploads/2009/05/ghana-workshop-report_final1.pdf].

IPCC, 2007, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK and New York.

Sims, R.E.H., Schock, R.N., Adegbululgbe, A., Fenhann J., Konstantinaviciute I., Moomaw, W., Nimir, H.B., Schlamadinger, B., J., Torres-Martínez, J., Turner, C., Uchiyama, Y., Vuori, S.J.V., Wamukonya, N., Zhang, X., 2007, 'Energy supply', in: B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds), *Climate Change 2007: Mitigation.* Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK and New York, 252–322.

Staley, B., Goodward, J., McMahon, H., 2008, *From Positions to Agreement: Technology and Finance at the UNFCCC*, Discussion Paper, World Resources Institute, Washington, DC.

United Nations, 2008, *Identifying, Analysing and Assessing Existing and Potential New Financing Resources and Relevant Vehicles to Support the Development, Deployment, Diffusion and Transfer of Environmentally Sound Technologies*, Interim Report by the Chair of the Expert Group on Technology Transfer, FCCC/SB/2008/INF.7, UNFCCC, Poznan, Poland.

World Bank, 2008, *Climate Investment Funds (CIF)*, The World Bank Group, Washington, DC [available at http://web.worldbank.org].