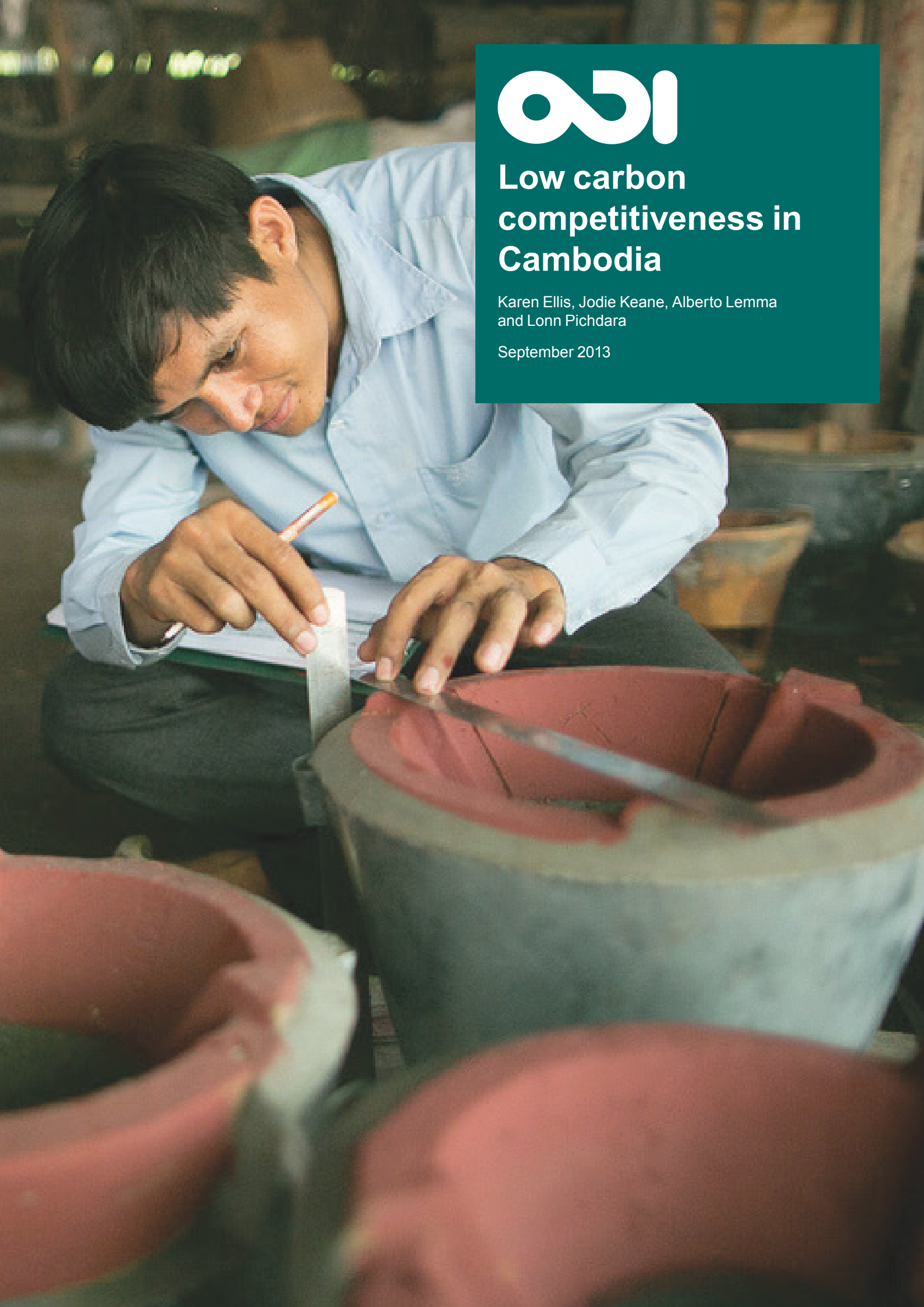




Low carbon competitiveness in Cambodia

Karen Ellis, Jodie Keane, Alberto Lemma
and Lonn Pichdara

September 2013





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Key messages

- Climate change, international mitigation policies, and natural resource scarcity will transform global trade patterns over the next decade, creating opportunities and threats for Cambodia's competitiveness and sources of growth. Policy-makers and businesses should act now to manage the risks and capitalise on the opportunities.
- With the substantial investment in hydropower, prospects for an improved electricity supply and lower prices are promising, and will improve Cambodia's competitiveness. But a diversified energy mix is important, given the seasonality and potential impact of climate change on hydropower generation capacity, and rising oil prices. Thus, developing other renewable energy sources could improve energy security and competitiveness in the long term.
- Some manufacturing firms in Cambodia are innovating to generate alternative sources of energy and to improve energy efficiency, yielding impressive cost savings. This could become a significant competitive advantage in a future low carbon global economy. Incentives could be strengthened with the right policy framework.
- Further growth of the tourism industry could yield significant economic and environmental benefits, but needs to be managed appropriately to ensure the sustainability of that growth, and to create a competitive advantage by strengthening Cambodia's brand as a green tourism destination.

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Abbreviations

Abbreviation	Description
APSARA	Authority for the Protection and Management of Angkor and the Region of Siem Reap
ASEAN	Association of Southeast Asian Nations
BAT	British American Tobacco
BCAs	Border Carbon Adjustments
CBET	Community-based Ecotourism
CCC	Cambodia Chamber of Commerce
CDC	Council for the Development of Cambodia
CDRI	Cambodia Development Resource Institute
CIF	Climate Investment Funds
DECC	UK Department of Energy & Climate Change
EAC	Electricity Authority of Cambodia
EDC	Electricité Du Cambodge
EEPSEA	Economy and Environment Program for Southeast Asia
EIA	Environmental Impact Assessment
EPI	Yale Environmental Performance Index
ERD	European Report on Development
FAO	Food and Agriculture Organisation
FASMEC	Federation of Associations for Small and Medium Enterprises of Cambodia
FDI	Foreign Direct Investment
FES	Friedrich Ebert Stiftung
GDP	Gross Domestic Product
GEF	Global Environment Facility

GGS	Green Growth Secretariat
GHG	Greenhouse Gas
GMP	Good Manufacturing Practice
GTZ	German Technical Cooperation Agency
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
LCCD	Low carbon competitiveness diagnostic
LDC	Least Developed Country
LIC	Low-income Country
MAFF	Ministry of Agriculture, Forestry and Fisheries
MDT	Mekong Discovery Trail
MFN	Most Favoured Nation
MIC	Middle-Income Country
MoE	Ministry of Environment
MoT	Ministry of Tourism
MOU	Memorandum of Understanding
NAPAs	National Adaptation Programmes of Action
NGGR	National Green Growth Roadmap
NIS	National Institute of Statistics
NSDP	National Strategic Development Plan
NTFP	non-timber forest products
PA	Protected Area
RDB	Rural Development Bank
RGC	Royal Government of Cambodia
SCI	Sustainable Competitiveness Index
SME	small and medium enterprises
SNV	Netherlands Development Organisation
TIES	The International Ecotourism Society
UNESCO	United Nations Educational, Scientific and Cultural Organization

UNIDO	United Nations Industrial Development Organization
UNWTO	World Tourism Organization
WEF	World Economic Forum

1 Introduction

Enhancing trade is a key focus of Cambodia's National Strategic Development Plan (NSDP) (2010), which set out a number of policies to promote export competitiveness and growth. The success of these policies will depend to a large extent on the global trade patterns shaping the opportunities that Cambodia faces.

Our analysis suggests that over the next ten years, climate change, international mitigation, and natural resource scarcity will transform global trade patterns and result in an inevitable shift over time to a low carbon global economy. What will this look like? What impact will it have on Cambodia's competitiveness and growth? What threats and opportunities will it create? And how should policy-makers and businesses respond?

Achieving competitiveness is important for achieving growth and development, and most countries are keen to identify and support domestic sectors where they may have a competitive advantage. At the same time, many countries are developing green growth or climate compatible development strategies in order to promote sustainable growth trajectories. Yet these two sets of analysis are rarely brought together to ask how climate change, mitigation policies and natural resource scarcity will affect patterns of trade and comparative advantage at the global level, or to assess the implications of these global changes for national policy.

These questions are the subject of a research programme that aims to analyse how these drivers might affect economic prospects in low-income countries (LICs), and how they might achieve 'low carbon competitiveness' (i.e. remain or become competitive in a future, low carbon global economy), and to develop a 'Low Carbon Competitiveness Diagnostic' (LCCD), a framework to help policy-makers analyse these issues in their own particular country context. The study does not purport to provide detailed policy recommendations, as that can be done only on the basis of much more detailed analysis. It simply aims to highlight these drivers of change and their possible impacts, to demonstrate the importance of taking these trends into account when designing a national growth policy, to suggest some possible policy responses, and ultimately to provide a diagnostic tool to assist with this analysis at the national level.

These issues have been explored through case studies in three LICs: Cambodia, Kenya and Nepal. The aim is to raise awareness and stimulate discussion about the issues at the national level in these three countries, while at the same time facilitating the development of the diagnostic tool, which would be applicable to a wider set of LICs. Once again, the objective is not to provide detailed policy recommendations, but rather to set out some possible policy and business responses to the issues identified, responses that would require further discussion and much more detailed analysis in each particular country context. This Policy Brief is the output of the case study in Cambodia.

1.1 Changing global trade patterns

The underlying hypothesis of this study is that the three drivers – increasing natural resource scarcity (particularly with the growing global demand for energy), climate change, and international climate change mitigation policies – will inevitably create transformational shifts in prices and patterns of production and demand in future. And the changes in competitiveness patterns generated are likely to

have implications for countries' growth strategies, and also for their incentives to achieve low carbon growth. For example:

1. Increasing natural resource scarcity – particularly relating to energy, land and water, and partly driven by economic growth in the emerging economies – will result in (for example)
 - higher oil prices, reducing the competitiveness of energy-intensive industries in oil importing countries, which could enhance incentives for energy-efficiency measures in those countries
 - increased competition for land and water, which could strengthen incentives for effective natural resource management and sustainable agricultural practices that improve land and labour productivity.
2. Mitigation policies introduced at the global level or by trading partners, which may affect export opportunities or import prices faced by developing countries, could result in (for example)
 - new standards requiring carbon footprinting of production in some sectors, potentially reducing access to markets for relatively energy-intensive products or products which are not certified
 - carbon taxation, which could lead to certain energy-intensive industries shifting to non-mitigating countries (often termed 'carbon leakage'), generating a possible trade-off between competitiveness and low carbon growth
 - increased climate finance to support the development of new green industries such as renewables (most likely from public funding sources in the short term, in the absence of well-functioning carbon markets).
3. The impact of climate change – in the sense of planetary warming – will be significant for some sectors. For example, climate change
 - will reduce yields and productivity of certain agricultural crops, undermining competitiveness of those products
 - is reducing the efficacy of certain renewable energy sources, such as hydropower, in certain contexts, undermining the competitiveness of countries reliant on them
 - threatens the prospects for tourism development by increasing the incidence of extreme weather events and by reducing water supplies.

1.2 The potential impact on countries' competitiveness and sources of growth

These changes could have significant implications for the sources of competitive advantage, growth, and economic opportunity that countries will face going forward. Our initial analysis suggests that a desire to remain competitive in the face of these drivers will generate a business case for low carbon investment in some sectors. This is particularly important in light of the poor state of carbon markets, which were previously seen as a key mechanism for funding the transition towards a low carbon growth trajectory in developing countries. In the absence of this funding, understanding the economic incentives that could help drive such a transition even in the absence of carbon markets will be key to developing smart and well-targeted policy and donor support mechanisms in the short and medium term.

However, in other cases there will be trade-offs between maintaining short-term competitiveness and achieving low carbon growth. Therefore, the analysis will aim to identify both synergies and trade-offs and identify implications for policy and donor support.

Policymakers are also faced with great uncertainty, relating for example to:

- Fossil fuel discoveries and technological innovation which will affect the evolution of energy prices going forward;
- Future global and national climate change policy regimes;
- The impact of climate change itself on different countries and economic activities;

-
- How patterns of demand will change in response to the three global drivers identified.

In this work we have posited various outcomes in different sectors based on existing knowledge and trends, but in many cases scenario analysis is warranted when weighing up different policy options, to take account of the uncertainties surrounding various factors. It is intended that the LCCD to be developed as the final output of this research programme would provide guidance on how scenario analysis could be implemented to assist with decision-making. This uncertainty also highlights the need for countries to adopt approaches to policy-making that allow for uncertainty, by building in flexibility and keeping options open for example.

This study focuses on the opportunities and risks facing LICs in particular. Previous ODI analysis suggests that competitiveness and growth prospects in LICs will be significantly affected by the global trends discussed above, through their impact on trade patterns (Ellis et al, 2010). Thus, competitiveness strategies in LICs will need to be reassessed if they are to be resilient in the face of these changes.

The analytical framework for this study was set out in an ODI Working Paper (Ellis, 2013). It identifies a number of transmission mechanisms through which the three drivers identified (natural resource scarcity, climate change and international mitigation) could potentially affect competitiveness, including

- the creation of new markets (domestic or international) or a reduction in the size of existing markets
- changes in prices of exports and imports due to changes in global supply and demand
- changes in costs due to changes in input prices
- changes in flows of foreign direct investment, and location decisions by multinationals
- impacts on the value of assets such as land, water resources, fossil fuel reserves, forests, etc.
- increased climate finance
- higher standards demanded in global value chains, and requirements for certification and labelling
- technology transfer.

1.3 The case study approach

The potential impacts identified in the analytical framework have now been assessed in three case study countries: Cambodia, Kenya and Nepal. This Policy Brief is an output of the case study in Cambodia.

The research programme covers the five tradable sectors of most relevance in terms of the trading and production patterns of low income countries: agriculture, forestry, energy, tourism and manufacturing. In each country case study we focused on three sectors; the energy sector was an area of focus in all three countries, given its pivotal position both in determining overall country competitiveness and as a potential export industry. The other two sectors were selected for each country depending on existing patterns of production and potential, and with the objective of covering the five tradable sectors listed above across the three country case studies. In Cambodia we have focused on the energy sector, the tourism sector, and the manufacturing sector. We have looked at the issues in forestry and agriculture through the other case studies.

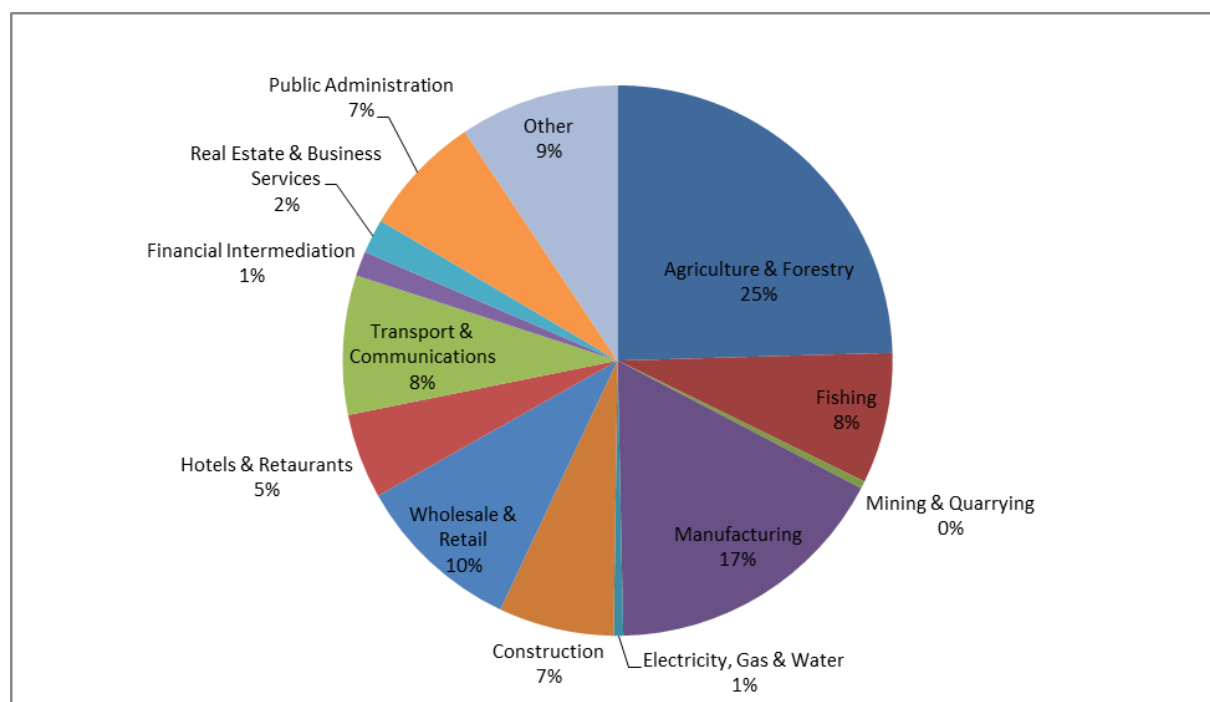
The remainder of this Policy Brief sets out the findings from the Cambodia case study. Section 2 provides some background in the form of a brief description of Cambodia's existing economic structure and growth dynamics, challenges and opportunities for growth and competitiveness as identified in recent studies and indices, and the country's growth and climate change response strategies. The Brief then examines the energy, tourism and manufacturing sectors in turn, discussing the various opportunities and threats they face, and possible implications and policy responses.

2 The economic context in Cambodia

Cambodia's economy has grown by an average of 7.8% per annum over the period 1994 to 2011 (National Institute of Statistics of Cambodia (NIS), 2013). Figure 1 below shows the importance of different sectors to the economy, and shows that agriculture and forestry play an important role, accounting for around a quarter of all Gross Domestic Product (GDP), while manufacturing represents 17% (NIS, 2012).

Growth in Cambodia has been largely driven by four sectors: garment manufacturing, tourism, construction and agriculture. The latest data on value added by economic sector shows that agriculture's role within the economy has gained in importance since 2005 (increasing by 4%) while industry's importance has declined overall (Cambodia Development Resource Institute (CDRI), 2012).

Figure 1: Cambodian GDP by Sector (2011)



Source: NSS (2012)

2.1 Challenges and opportunities for growth and competitiveness

Some measures suggest that the economic competitiveness of Cambodia is improving. The overall Ease of Doing Business rank (World Bank Doing Business Indicators 2013) has improved in the last year, partly due to the fact that Cambodia's score on the ease of accessing credit has greatly improved. At the same time, the ease of carrying out trade across borders and contract enforcement have also improved. On the other hand, the construction sector is facing greater challenges, and access to

electricity has worsened between 2012 and 2013 according to the Global Competitiveness Index (GCI) produced by the World Economic Forum (WEF).

Table 1 below shows how Cambodia scores on a number of key competitiveness-determining indicators from the Index, as compared with a number of other countries. The results show that in terms of energy and infrastructure, Cambodia is in a better position than either Bangladesh (its biggest garment competitor) or Vietnam, but scores very poorly on time required to start a business, compared to all other countries.

Table 1: 2012-13 WEF GCI scores for selected indicators

	Cambodia	Kenya	Nepal	Bangladesh	China	Thailand	Vietnam
Overall rank (2013)	85th	106th	125th	118th	29th	38 th	75 th
Quality of electricity supply	3.6	3.6	1.4	1.8	5.2	5.5	3.1
Quality of infrastructure	4.2	4	2.9	2.8	4.3	4.9	3.2
Quality of roads	4	3.9	2.6	2.8	4.4	5	2.7
Mobile telephone line – 100 pop.	69.9	64.8	43.8	56.5	73.2	113.2	143.4
Broadband subscriptions – 100 pop.	0.2	0.1	0.3	0	11.6	5.4	4.3
No. of procedures to start a business	9	11	7	7	14	5	9
No. of days to start a business	85	33	29	19	38	29	44
Availability of financial services	4.4	4.7	3.9	4	4.6	5.1	4.3
Affordability of financial services	4.2	4.4	3.7	3.7	4.6	4.8	4
Availability of latest technologies	4.8	4.9	4.3	4.4	4.4	4.9	3.6
Firm-level technology absorption	4.9	4.9	4.1	4.2	4.7	5	4
Capacity for innovation	3.2	3.5	2.4	2.4	4.1	3	3
Quality of education system	3.9	4.3	3.4	3.2	3.9	3.5	3.6

Source: WEF (2012)

In terms of environmental indicators, the Yale Environmental Performance Index (EPI) shows that Cambodia is in a better position than its regional neighbours and competitors for a number of indicators including air quality, water quality and agriculture (except for Thailand) – see Table 2. The Sustainable Competitiveness Index (SCI) compiled by WEF also gives Cambodia a relatively high score for environmental sustainability.

A recent growth diagnostic study (CDRI, 2011) identified access to *international* finance (due to concerns about foreign currency regulations), corruption, a lack of dispute settlement mechanisms, limited law enforcement and tax administration as likely constraints to growth, while access to finance is not identified as a particular constraint.

Another study (World Bank, 2009) states that the current growth dynamics are unlikely to be sustainable in the long term since the economic base is relatively narrow and there has been little progress in diversifying the economy. In addition, it raises concerns about the unsustainable use of natural resources – i.e. forests, fisheries, land and particular tourism assets such as Angkor Wat – resulting in environmental degradation and unsustainably high returns to certain assets such as land. The study concludes that Cambodia needs to develop a growth strategy around the comparative advantages associated with its abundant land, natural assets and inexpensive labour. Land price distortions and the currency appreciation led to increases in factor prices for both land and labour, which undermined wider competitiveness. These distortions need to be corrected in order to sustain growth. Cambodia also has opportunities to target more export markets and promote greater intra-regional trade.

Table 2: Cambodia SCI & EPI scores (2012)

	Cambodia	Nepal	Kenya	Bangladesh	China	Vietnam	Thailand
WEF SCI Rank	75 th	n/a	69 th	n/a	47 th	n/a	43 rd
Environmental sustainability score	4.47	n/a	4.63	n/a	3.69	n/a	3.99
Agricultural water intensity (lower is better)	0.4	n/a	7	n/a	12.6	n/a	11.8
CO ₂ intensity (lower is better)	0.89	n/a	0.58	n/a	3.32	n/a	2.69
Forest cover change	0.94	n/a	0.98	n/a	1.07	n/a	1
EPI rank	59 th	38 th	83 rd	115 th	116 th	79 th	34 th
Agriculture score	66.7	40.9	22.6	66.7	41.1	47.8	93.9
Forest cover score	28.3	100	75	81.4	93.2	81.4	87
Air quality score	64.4	55.2	58.5	63.7	18.2	43.8	42.9
Water resources score	45.3	37.3	39.4	14.2	12.2	37.8	18.2

Source: EPI (2012) & WEF (2012)

2.2 Cambodia's growth and climate change response strategies

Cambodia's growth strategy is built around the NSDP (RGC, 2010), which was established in 2006 and is updated on a regular basis. It has sections on different sectors including agriculture and forestry,

infrastructure and energy. The Royal Government of Cambodia (RGC) has also instigated various sectoral strategies including the Energy Sector Development Plan (ESDP) 2005-2024, and has developed the Rectangular Strategy for Growth, Employment, Equity and Efficiency (RGC, 2012) in which tourism is identified as one of the priority sectors. Though garment manufacturing has been a major source of growth in Cambodia, the Government has acknowledged it should not continue to rely on this sector for growth in the long term. Thus it is aiming to promote diversification, such as by increasing the role of agriculture in the economy through modernisation.

The Government of Cambodia produced a National Adaptation Programme of Action (NAPA) on Climate Change in 2006, which was designed to be integrated with the country's NSDP (RGC, 2006). The objectives of the NAPA were stated as (1) to understand the main characteristics of climate hazards in Cambodia (flood, drought, windstorm, high tide, salt water intrusion and malaria); (2) to understand coping mechanisms for climate hazards and climate change at the grassroots level; (3) to understand existing programmes and institutional arrangements for addressing climate hazards and climate change; (4) to identify and prioritise activities for adaptation to climate hazards and climate change.

In 2009, the Cambodian government introduced the 'National Green Growth Roadmap' (NGGR) (RGC, 2009) which aims to link together the country's pre-existing development strategies with the achievement of green growth. It discusses various opportunities and threats, and sets out interventions for the medium and long term in different sectors, including energy and tourism. These interventions include initiatives such as the promotion of eco-villages designed to facilitate sustainable management of tourism areas, and the promotion of green, eco-industrial parks that use green technology and green energy. The Roadmap aims to strengthen international competitiveness, develop the capacity of trade services, and support policy-makers in integrating the business sector into the global green economy.

While the NGGR does discuss some policies that can help to improve competitiveness in Cambodia, it does not address competitiveness issues in relation to each sector. Nor, crucially, does it consider future changes in trading opportunities resulting from climate change, mitigation and natural resource scarcity. This study can therefore add considerable value to the analysis that has been undertaken to date, and facilitate the discussion of possible policy responses.

3 The energy sector

3.1 Electricity supply

The lack of a reliable electricity supply has been identified as one of the biggest bottlenecks for Cambodia's competitiveness and development. The supply is insufficient to meet industrial demand; thus, companies have had to fall back on expensive private generators for their electricity requirements. Within the 2009 NSDP update, energy is one of the main issues addressed. The strategy aims to improve the supply of electricity and reduce tariffs, by encouraging investment in the construction of low cost electricity plants, by using Cambodia's coal reserves and by exploiting its hydroelectric potential.

In 2011 there was a total installed capacity of 569 MW of electricity in Cambodia, the majority based on thermal energy sources. The biggest source of energy was diesel, which accounted for 60% of all electricity generation capacity. However, there has been substantially increased investment in hydropower, especially between 2010 and 2011 (see Table 3 below), which has added around 200 MW of hydroelectricity, representing about 36% of total installed capacity. Much of this investment has been through joint ventures, thus utilising foreign capital and know-how.

According to the Electricité Du Cambodge (EDC), the main electricity provider in Cambodia, the installed capacity should increase to around 700 MW for 2013, and further increase to around 1500 MW by 2014. One third of the increase will be coal or diesel generated (by 2014, a 500 MW coal plant that is currently being built should start operating), and the remaining two thirds will be hydroelectric energy. (Hydropower is seasonal so will always be insufficient by itself.) The current aim is to reach a generation capacity of 3,600 MW by 2030.

Table 3: Electricity generation capacity for Cambodia, MW (2011)

Year	Total	Coal	Hydro	Diesel	Wood & Biomass
2010	360	13	13	328	6
2011	569	13	207	342	7

Source: EAC (2012)

The strategy is also looking to incentivise investments in renewable energy sources, such as solar and wind power, and in nuclear power. The private sector is expected to play an integral part in the strategy, being encouraged to invest in both energy production and distribution systems (RGC, 2009).

The ultimate aim of the NSDP is to improve energy security through a diverse mix of sources, including greater use of imported energy. Investments will be made in energy infrastructure in order to improve reliability (e.g. through more efficient electricity distribution systems) and to promote integration with the Greater Mekong Subregion energy pool, and through energy sharing arrangements with other Association of Southeast Asian Nations (ASEAN) countries. There is also the issue of seasonality of rainfall in Cambodia to consider, since the country has distinct rainy seasons (with increased availability of hydroelectricity) and dry seasons (where water scarcity may reduce the

production of hydroelectricity). International trade in electricity can help to alleviate this issue to some extent, by smoothing out the supply of energy over time.

Cambodia is currently importing energy from Vietnam, Thailand and Laos. However, according to the Electricity Authority of Cambodia (EAC), the main electricity regulator, tariff prices of imported energy are increasing by about 10% each year, which raises concerns about energy security, and highlights the importance of investing in domestic supply. The EAC states there is also scope to increase energy imports from other ASEAN countries, as the 2015 reforms to the ASEAN system would allow greater freedom to buy and sell electricity within the region. This would therefore diversify sources of electricity import, which could potentially help to allay energy security concerns. However, given the energy deficit within Cambodia, there appears little scope, either now or in the near future, to export electricity, as any new generation capacity will be needed to serve internal demand.

The price of electricity is currently relatively high in Cambodia. Table 4 below gives electricity tariffs in ASEAN nations in 2011 and shows that tariffs in Cambodia are significantly higher than those in most of its neighbours, especially for commercial and industrial enterprises.

Table 4: Electricity tariffs in ASEAN countries (US¢/kWh)

Country	Residential	Commercial	Industrial
Brunei	3.82-19.11	3.82-15.29	3.82
Cambodia	8.54-15.85	11.71-15.85	11.71-14.63
Indonesia	4.60-14.74	5.93-12.19	5.38-10.14
Lao PDR	3.34-9.59	8.80-10.36	6.23-7.34
Malaysia	7.26-11.46	9.67-11.10	7.83-10.88
Myanmar	3.09	6.17	6.17
Philippines	6.65-10.52	--	--
Singapore	19.76	10.95-18.05	10.95-18.05
Thailand	5.98-9.90	5.55-5.75	8.67-9.43
Vietnam	2.91-9.17	4.38-15.49	2.30-8.32

Source: ASEAN Center for Energy (2011)

The high price of electricity in Cambodia has undermined the competitiveness of Cambodian industries more generally. As a result, some companies have been taking steps to generate alternative sources of energy, or to introduce energy-efficiency measures in order to reduce their costs and improve competitiveness (see manufacturing section below). However, this kind of strategy seems less common in Cambodia than in some other LICs.

The EAC states that the overall plan is to reduce electricity tariffs in Cambodia, step by step, until 2030, by which time prices should have reached the minimum feasible, based on the optimal energy mix of renewables and fossil fuel-powered plants.

3.2 Energy and climate change

Cambodia is classified as highly vulnerable to the impacts of climate change (Economy and Environment Program for Southeast Asia, 2009), due to a combination of increased climatic hazards

(i.e. floods and droughts), increases in population density, and low levels of human development. The intensity and frequency of floods and droughts has increased, and changes are occurring in heat and rainfall patterns (United Nations Development Programme, 2012).

There is not a strong evidence base on the potential impacts of climate change on Cambodia's energy sector; however, the potential for climate change to affect hydrological systems creates serious risks for Cambodia given its increasing reliance on hydropower. EDC reports that some small hydroelectric power plants are already having problems fulfilling their full energy production capacity due to variations from predicted rainfall. Other countries, such as Kenya and Nepal, are also seeing the effects of climate change on their hydropower potential. Increased variability of hydropower generation capacity means it cannot be used as the base load energy source.

The Government's strategy for energy supply will need to become resilient to the effects of climate change. This suggests perhaps more focus on small hydro, spreading the risk by having more dispersed sites for power generation. It also suggests diversification of renewable energy sources; the potential to develop alternative renewable energy sources is discussed below.

3.3 Use of biomass

In rural areas, around 90% of people still use wood, charcoal and kerosene for their energy needs. Charcoal is a major source of energy in Cambodia, particularly in rural areas, although its production is currently illegal. Fuel wood is used not only by households but also by businesses (as discussed in the manufacturing section). However, anecdotal evidence suggests that wood is becoming harder to get hold of, collectors have to travel further afield, and prices are rising. Cambodia had forest cover of around 57% in 2010 (UNData, 2012); the government wants to maintain forest cover at around current levels, and logging activities have been banned since 2006. Total fuel wood use has been declining, from 9,924,000 m³ in 2001 to 7,501,000 m³ in 2009 (UNData, 2012).

There may be scope to sustainably manage charcoal and fuel wood production, including through the use of more efficient charcoal production kilns, and by careful management of tree plantations with a view to sustainable harvesting of fuel wood. The rising price of fuel wood is also incentivising firms to seek out other sources of biomass to burn, i.e. rice husks or bioethanol. One example is the Angkor Bio Cogen Rice Husk Power project, a 2 MW rice husk power generation plant near Angkor partly funded by the Clean Development Mechanism (CDM). Although this kind of development is fairly new, it indicates a potentially significant opportunity for Cambodia to develop more sustainable fuel sources, which will serve to protect the value embedded within Cambodia's forests while promoting improved competitiveness in a future low carbon economy.

3.4 Fossil fuels

Cambodia is currently a net importer of fossil fuels. By 2012 Cambodia was importing about 26,000 barrels of refined petroleum per day, with IMF data showing the value of imported oil fluctuating enormously between 2000 and 2011. This exacerbates concerns about energy security, as do expectations of an increase in the international price of oil over time.

Table 5: Value of oil imports into Cambodia 2000-2011

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
US\$ Billion	0.339	0.372	0.385	0.451	0.649	0.841	1.123	0.44	0.421	0.414	0.466	0.647

Source: IMF (2013)¹

¹ <http://www.imf.org/external/pubs/ft/weo/2012/02/index.htm>

Oil reserves were discovered in Cambodia in 2004, and oil production is scheduled to begin sometime in 2013. However, multiple previous estimated start dates have passed, including the latest estimate that it would start in 2012.² The Cambodia National Petroleum Authority (CNPA) states that even though petrol companies have indicated that they have made commercially viable oil discoveries, they have yet to begin drilling for it.

The CNPA is unclear, as yet, as to how any oil produced will be used (i.e. whether to refine it and use it domestically, or export it, etc.). Until the full extent of the reserves have been measured, and the commercial viability properly established, a clear strategy cannot be developed.

Cambodia also has coal deposits and offshore deposits of bituminous coal (Williamson, 2005). There is the prospect of a 400 MW coal-fired power plant near Siem Reap. Offshore gas deposits also were also discovered in 2004, but as with oil, the extent of the gas reserves – and the potential to exploit them – is still unclear (RGC, 2010).

These discoveries create the possibility for Cambodia to become a fossil fuel exporter. If and when these discoveries are confirmed as commercially viable, it will mean that Cambodia has some strategic choices to make about their use as part of the country's overall energy strategy. These fossil fuels could be exported to generate revenue that could be used to invest in domestic renewable energy generation, which could benefit competitiveness in a future low carbon global economy. Or they could be utilised domestically to substitute for imports. The pros and cons of each option would need to be weighed carefully.

The domestic consumption of these fossil fuels could in the short and medium term enhance energy security, promote industrial development, and potentially provide local benefits (including community shared revenues accrued from coal mining, local employment, stimulation of local business and improved infrastructure and skills development).

However, domestic usage of the fossil fuels would be likely to result in a higher carbon growth trajectory, and would reduce the incentive to invest in renewable energy sources. Thus it may not maximise competitiveness in the longer term, as compared with investing in the development of domestic renewable energy sources, as these domestic fossil fuel reserves will eventually run out and global fossil fuel prices could be much higher by then. Domestic usage of the fossil fuels could therefore result in higher domestic energy costs in the long term, and thus reduced competitiveness in Cambodia.

On the other hand, the export of the fossil fuels could potentially generate Dutch Disease, whereby the competitiveness of other tradable goods is undermined, leaving the economy relatively undiversified and more vulnerable to oil resource depletion. There is also a risk of creating stranded assets, (i.e. environmentally unsustainable assets which suffer from unanticipated or premature write-offs, downward revaluations or become liabilities³) perhaps as a result of increasingly stringent international mitigation policies, or competition from lower-cost Middle Eastern producers of fossil fuels. Thus the potential trade-offs between short- and long-term competitiveness should be assessed under different possible future scenarios with regard to fossil fuel prices, international mitigation policies, and technological developments.

3.5 Renewable energy

A number of other renewable energy sources are also being developed in Cambodia. The production of biogas at the household level is currently being implemented under the National Biodigester Programme (see Box 1 below), an initiative of the Cambodia Ministry of Agriculture, Forestry and Fisheries (MAFF) and SNV. Large scale biogas generation by rural enterprises or by community groups could also be commercially viable, particularly for those that rear livestock or are located

² <http://www.opendevelopmentcambodia.net/extractive-industrie/oil-production-delayed/>

³ <http://www.smithschool.ox.ac.uk/research/stranded-assets/>

nearby and hence have a ready source of feedstock, but this is not yet being implemented within Cambodia.

Rice millers in Cambodia are now considering using their waste rice husks in order to produce electricity, with support from the United Nations Industrial Development Organization (UNIDO) and technology brought in from foreign investors. However, the high upfront investment costs are hampering uptake. One option would be for the foreign companies to make the investment and for rice millers to sell them the husks; the millers would then buy the electricity back from the investors at lower prices than the grid. However, because of new hydropower coming online, the expectation is that grid prices will come down, and that this will undermine the value of any investments in alternative energy sources.

Nonetheless, the Soma Group, a Cambodian rice milling company based in Kampong Cham province, has reached an agreement with the US based GE Engines company to invest in a 1.5 MW electricity generating plant using rice husks, which is expected to be more cost effective than using a diesel generator.⁴ Another rice miller, Angkor Kasekam Roongroeung, has also set up a plant to convert rice husks to electricity, and plans to sell any excess electricity created to nearby villages, at a lower price than national grid tariffs (US\$0.22 per kW vs. US\$0.27 per kW).⁵

Box 1: National Biodigester Programme

The National Biodigester Programme is a joint project of the Cambodia Ministry of Agriculture, Forestry and Fisheries, and SNV, to pilot the use of biogas plants in rural households to replace traditional fuels (fuel wood, charcoal or kerosene) for lighting, cooking and heating. It is currently targeting 14 provinces and has so far installed around 20,000 units.

The programme is currently selling carbon credits on the voluntary market, where significantly higher prices are obtainable (e.g. between €5 to €15) as compared with mechanisms such as the CDM. It is currently selling 50,000 tonnes of CO₂, which helps to cover around 20% of project expenses. The programme estimated that it should become self-financing (through sales of carbon credits) once it has installed 50,000 units. However, the programme had initially hoped to obtain REDD funding, and this has not materialised; it may therefore be impossible to become self-financing.

The programme has reportedly resulted in a large amount of saved fuel wood and produced organic fertilisers (through a by-product of the biogas digestion process) that has helped reduce the need for chemical fertiliser, saving small farms around US\$50 a year on fertiliser costs.

The brick digester is constructed locally, creating jobs for masonry workers. Skilled masons have been assisted to form biogas construction companies. Six hundred have been trained, and 60 biogas digester-producing enterprises have been established. The aim is to create a sustainable, self-financing biogas sector. However, it was noted by one source that other NGOs that provide assistance with biogas for free could potentially undermine this achievement.

Solar energy is another option Cambodia could consider in its energy diversification strategy. So far, solar energy has been adopted only on a very small scale, largely by richer households in rural areas, and by some enterprises such as hotels and factories using solar lighting or solar water heaters. The technology is seen as complementary to biogas in rural areas, and initial investments can promote significant savings. According to one source, factories in Siem Reap have seen a one-year payback period for solar water heaters, yet uptake has remained low to date. Government regulation could

⁴ <http://biomassmagazine.com/articles/7870/ge-engines-to-power-cambodian-rice-husk-power-project>

⁵ <http://www.fastcompany.com/1710000/rice-husks-provide-alternative-chinese-coal-cambodia>

encourage the use of solar applications, by incorporating energy-efficiency considerations in building standards for example, which would incentivise construction companies to include them in new buildings. Allowing tax-free imports of green technologies such as solar panels may also help to develop the sector and increase the uptake of renewable energy technology.

Box 2: Khmer Solar

Khmer Solar is a provider of solar photovoltaic panels in Cambodia. It sells small solar home systems to relatively high-income people in rural areas (mainly for watching TV or recharging their mobile telephones) and provides electricity to mobile telephony towers for local cellular network operators. The company imports all its product components except the cables and placement racks, which are manufactured in-country.

The company sees the Government's desire for all households to have access to some form of electricity by 2020 as an opportunity to expand operations. It is currently also trying to promote 'grid tie-in systems' (i.e. a form of feed-in tariff system) whereby enterprises or households can be paid for giving electricity back to the national grid. The company says this could help create stronger incentives to invest in solar PV systems, as it would yield a shorter payback period, and thus would help alleviate electricity shortages. However, no moves seem to have been made in this direction to date.

Increased biofuel production could potentially alleviate energy security concerns by facilitating substitution of imported fossil fuels with locally produced biofuels (e.g. bioethanol) as well as providing a potential source of revenues if any surplus production is exported. With projected global demand for biofuels doubling from 21 million tonnes in 2011 to 41 million tonnes in 2020,⁶ there is a potentially significant market opportunity. The domestic market for biofuels would need to be stimulated through government policy, such as provisions requiring or permitting petroleum to be blended with bioethanol. However, this would need to be preceded by the development of sufficient supply from within Cambodia if it is to alleviate energy security concerns. While biofuels raise problems associated with competition for land and thus impact food security in many countries, this does not seem to be a major concern within the Cambodian context.

There has been some experimentation with biofuel crops for energy production in Cambodia in the past, mainly through donor led projects such as the rural energy distribution system set up in 2006 through GTZ funding⁷ and the collaboration between Canada Bank and Biodiesel Cambodia that researched the potential of *Jatropha* (Schott, 2009). However, the production of *Jatropha* for biofuels has been hampered by a lack of suitable technologies and allegedly fraudulent investment programmes.⁸

The advent of large-scale sugar production in Cambodia a few years ago has created the potential for both bioethanol production and bagasse-based electricity generation that can be sold to the grid, and foreign investment in bioethanol plants is increasing. The Thai company Bangchak Petroleum is planning to invest US\$32 million in a bioethanol plant to serve rising demand in the ASEAN Economic Community⁹, and the Japanese company Idemitsu Kosan has signed an MOU with the government to promote the production of ethanol from cassava.

Increased uptake and investment in solar and biomass energy technologies could be spurred through the implementation of an appropriate feed-in tariff for enterprises and households. There is also the

⁶ <http://www.nesteoil.com/default.asp?path=1,41,538,2455,8529,12421>

⁷ http://www.energia.org/fileadmin/files/media/pubs/biofuelsbook_cambodia.pdf

⁸ <http://www.opendevdevelopmentcambodia.net/tag/jatropha-plantation/>

⁹ <http://www.agra-net.com/portal2/home.jsp?template=newsarticle&artid=20017939377&pubid=ag072>

potential for Cambodia to leapfrog older grid technologies through the use of more modern and flexible smart grid technology, which would enhance the potential for renewable energy development. On the other hand, the fact that the country is undertaking such large-scale investment in hydroelectricity may be hindering any significant renewable energy investment plans enterprises may have had, as they wait to see how these new hydropower plants will affect the supply and price of electricity.

There is potential for carbon financing (e.g. through the CDM) for LIC producers of renewable energy and energy-efficiency measures. However, carbon prices have been falling and are expected to remain low in the short to medium term. As a result, the carbon revenue from CDM projects in LICs will be lower than was expected when the projects were initiated, reducing the attractiveness of future investments in the short to medium term at least. The carbon price is generally predicted to rise over the long term (Intergovernmental Panel on Climate Change, 2007; Department of Energy & Climate Change, 2011), but the size and pace of that increase is unclear, as it will depend on the extent of international mitigation. Voluntary carbon markets do, however, continue to provide a potential source of funding. Public climate finance is also likely to become increasingly available for investment in renewable energy generation, and may provide a better source of funding for investment in LICs in the interim.

3.6 Conclusions

Table 6 below summarises the main opportunities and risks that are currently faced in Cambodia's energy sector, associated with the three key drivers identified at the beginning of this report: natural resource scarcity, international mitigation policies, and the impact of climate change. Possible policy responses are suggested, for further discussion and exploration.

Table 6: Summary of energy sector opportunities and risks associated with three drivers

Opportunities / threats	Possible implications / responses
Natural resource constraints	
High electricity prices and limited access to energy have to date undermined competitiveness of Cambodian industry. Considerable investment in hydropower is expected to bring prices down in future.	Investment in alternative energy sources and innovative ways to access electricity will improve competitiveness in the long term, although falling prices resulting from investments in hydropower may undermine incentives for this.
Biomass (i.e. biogas digesters, bioethanol or rice husks) could provide a competitive source of energy in rural areas.	Put in place appropriate investment climate and regulatory framework. Create mechanisms to support access to finance to overcome upfront costs. Encourage foreign investment to bring capital and technology.
The introduction of feed-in tariffs and other measures, such as provisions in building codes, could help incentivise investment in renewable energy technologies.	Need for appropriate regulation, incentives, awards, demonstration projects, and access to finance to cover upfront costs.
Fossil fuel discoveries – for import substitution or export – will improve energy security, but could undermine development of renewables.	Strategic decisions faced, which will require analysis of long-term and short-term implications for energy costs and competitiveness.
Use of fuel wood, by both enterprises and households, could threaten the economic value of Cambodian forests if not managed sustainably, and could also pose a resource scarcity problem in the medium to long term for	Investment in alternative energy sources. Sustainable forest management (e.g. coppicing) by communities and the private sector could help to provide a more sustainable source of fuel wood.

enterprises dependent on fuel wood as a source of energy.

International mitigation policies

Access to finance through carbon market could support investment in renewables and energy-efficiency measures. However, such finance may be limited in the short term, though public climate finance may be increasing.

Develop a strategy that optimises contribution from public sources of climate finance in the short term, and positions Cambodia to access carbon markets in the longer term.

Biofuel production could serve domestic or growing international market.

Investigation of potential market for different types of biofuels, and policy framework that would help to develop the market. Need to balance competing demands for land.

Impact of climate change

Hydropower generation capacity reduced by dry weather undermines electricity supply.

Diversify energy generation base, invest in alternative sources of energy.
Increase focus on small hydro, spreading the risk by having more dispersed sites for power generation.

Until now, the high and variable costs, poor access, and unreliability of energy have significantly undermined the competitiveness of Cambodian business. However, with the substantial investment in electricity generation currently underway, prospects for an improved electricity supply and lower prices within the next few years are promising. A diversified energy mix is preferable, given the impact of climate change on hydropower generation capacity. Within the current mix, there is still a fairly high proportion of imported fossil fuels in Cambodia, which raises concerns about energy security. Developing alternative, renewable energy sources could provide greater energy security and improved competitiveness in the long term.

Some firms in Cambodia are at the forefront of innovation to secure alternative sources of energy for their own use and to sell to the grid, and it would seem sensible to encourage this as a way to enhance competitiveness and improve the energy supply in Cambodia, particularly in underserved areas. This kind of innovation could be the beginning of the kind of transformation that is needed to achieve a low carbon growth trajectory in Cambodia that will look very different from the high carbon growth paths that today's industrialised countries pursued. This innovation could be further incentivised by putting in place a conducive regulatory framework, such as feed-in tariffs and grid tie-in systems, etc.

With the recent discovery of fossil fuels, however, Cambodia may now face some strategic decisions about the uses of those fossil fuels, which will have important implications for the future energy mix and the competitiveness of industry. Exploitation of these fossil fuel reserves – if and when their commercial viability is confirmed – seems inevitable, and it will be important to utilise them and the resources they generate in a way that does not undermine the country's wider long-term competitiveness, or undermine incentives for the development of renewable energy sources.

Climate finance and carbon markets can potentially fund investment in LICs that will promote competitiveness in a future low carbon global economy. While some effort has been expended – by government, donors, and businesses alike – in developing projects that incorporate finance from carbon markets (through CDM for example) into the business plan, in practice this unfortunately now seems unlikely to yield much finance in the short term (although voluntary carbon markets currently represent a more promising funding source). Thus, a shift in focus seems warranted, to find other ways to support and incentivise the kinds of investments discussed here, which are linked to a wider business case based on energy prices. Given Cambodia's current profile as a LIC with considerable potential for renewables development, the country should be well positioned to secure public climate finance to support these kinds of investments.

4 The tourism sector

Tourism is a high-growth sector, representing a significant economic opportunity for many developing countries, including Cambodia. The sector can generate substantial revenues and boost economic growth, help sustain the trade balance, and contribute to regional and international integration. It creates jobs directly, as well as many indirect livelihood opportunities down the supply chain, e.g. supplying hotels with food. If responsibly managed, tourism can contribute to natural and cultural resource conservation, although it can also create challenges, relating for example to natural resource management – where growing tourism demand competes with other uses of energy and water, which are in short supply. It can also generate large volumes of waste and rubbish that pollute the local area and need to be managed.

Growth of the tourism industry can itself be jeopardised by poor natural resource management, for example where pollution reduces the value of tourism-related assets such as beaches and rivers, or where deforestation threatens water resources, biodiversity and the attractiveness of the landscape. Thus, the tourism industry has an interest in developing a sustainable and environmentally conscious sector and protecting the natural environment, and can act as an important advocate of green growth policies.

Ecotourism – as a specific subset of the tourism industry, defined as ‘responsible travel to natural areas that conserves the environment and improves the well-being of local people’ (The International Ecotourism Society (TIES), 2012; Blangy and Wood, 1993) – has been growing even faster at the global level, at rates up to two to three times higher than normal tourism activities (Food and Agriculture Organisation (FAO), 2011). Ecotourism allows countries to take advantage of, and at the same time preserve, their natural capital (e.g. forests and ecosystem services) through tourism-related activities and products aimed at environmentally aware international tourists.

By incentivising sustainable forest management, and by creating alternative livelihoods to unsustainable logging, fishing or conversion of forest area to other land-uses, ecotourism can create stronger incentives for green growth outcomes. In addition, there is often greater scope for inclusion of local communities in the value chain, as they tend to provide the majority of ecotourism services, as opposed to larger international or national tourism service providers (ibid).

While tourism offers significant potential for economic growth in Cambodia, the impacts of natural resource scarcity, international mitigation policies, and climate change itself could undermine the competitiveness and growth of the sector going forward.

4.1 The growth potential of tourism in Cambodia

Tourism is identified as one of the priority sectors in the Government’s Rectangular Strategy for Growth, Employment, Equity and Efficiency (RGC, 2012). It is recognised as contributing significantly to socioeconomic development through job creation, income generation, improvement of livelihoods, poverty alleviation, and green growth (Ministry of Tourism (MoT), 2012a). The tourism sector is the main contributor to growth in the service sector, accounting for just over 25% of GDP and 22% of total employment in Cambodia (1.8 million jobs) in 2012 (World Travel and Tourism Council, 2012).

The tourism sector has been growing at a rate of 20-30% per year since 1997, when the Siem Reap International Airport was opened. The number of domestic tourists went up to 8.2 million in 2012, a

3% rise from the previous year (*The Phnom Penh Post*, 2013), whereas international tourist arrivals to Cambodia reached 3.5 million in 2012, an increase of almost 24% compared to 2011, and air tourist arrivals went up by around 19% and 28% in Phnom Penh and Siem Reap respectively (MoT, 2012b). Domestic tourism also grew rapidly, as did growth in tourism from neighboring countries and the region. Of international tourists, the highest number came from Vietnam, followed by Korea, China and Laos. Long-haul tourists from Europe also showed an increase of 24%, despite the poor performance of Europe's economy (MoT, 2012b).

Tourism generated income of US\$2 billion in 2012 in Cambodia (MoT, 2012b). However, it is estimated that there was around a 25% loss of tourism revenue, through importation of foreign goods to supply the growing industry (MoT, 2012a). Increased domestic production of goods and services such as vegetables, fruit, fish, furniture, labour, and Cambodian expertise could help to capture more of the revenues for Cambodia.

There is scope to improve the local contribution to tourism through a more coordinated approach to value chain development (Ballard, 2005). For example, some hotel chefs have met with farmer groups to discuss product quality. Hotels and restaurants could contract directly with farmer associations to procure quantities of produce of specified quality. State, NGOs and civil society could work alongside farmers to provide technical advice and training in support of such contracts. These contractual agreements would have the benefit of specifying the terms of quality and guaranteeing a price for the farmers, which would provide the confidence needed to undertake investment in improved production. Donors could support these kinds of market development programmes, capitalising on private sector led opportunities in the tourism industry.

A study of the impact of tourism development in Siem Reap showed it made an important contribution to the local economy, with income from the tourism sector comprising around a quarter of total household incomes (Men, 2007). Another study confirmed that tourism in Siem Reap has helped to raise the well-being of local people by creating jobs and income-earning opportunities in construction, hotels and restaurants, and transport, as well as through increasing land values. However, the study notes that for many, the income earned is still very low, perhaps just enough to cover their subsistence. The major hindrances to the poor receiving greater benefit from tourism are cited as being a lack of education, skills, capital and social networks (CDRI, 2007).

Despite the vibrant tourism sector, its impact and development potential have not been maximised – particularly in relation to ecotourism. Ecotourism attracted just under 450,000 tourists to Cambodia in 2011, according to the Ministry of Tourism (MoT), a number that represents only around 16% of the total number of tourists. Cambodia's tourism sector has mainly concentrated on cultural, archaeological and historical heritage sites. In particular, the focus is around the UNESCO-listed World Heritage sites of Angkor Wat and Preah Vihear Temple.

The rapid growth of the tourism industry has exerted substantial pressures on these most popular destinations, and this necessitates a broad strategy for the diversification of attractions and the development of associated infrastructure. The north-eastern and south-western regions of Cambodia boast various tourism assets, such as Mekong River dolphin, Tonle Sap waterbirds, and attractive beaches, islands and coastal ecotourism sites. However, these areas still lack sufficient associated infrastructure. Thus, the further development potential for the tourism sector is substantial (MoT, 2012).

4.2 Carbon mitigation threats to Cambodian tourism

Increased air travel costs arising from higher fuel prices and aviation carbon taxation may reduce long-haul flights, affecting tourism growth potential. Air passenger duty is being imposed by a number of countries, and air travel is now a part of the European Emissions Trading Scheme, which could affect prices of travel to long-haul destinations such as Cambodia. However, this is likely to represent only a small proportion of the total cost, and evidence suggests that tourists may be relatively price inelastic, so the ultimate effect on tourism numbers may be limited. In addition, as much of the growth of

tourism to Cambodia is from neighbouring countries rather than from more-distant, rich countries, these risks may not represent too significant a threat.

4.3 Tourism and climate change

As discussed in the energy section above, Cambodia is classified as highly vulnerable to the impacts of climate change, the intensity and frequency of floods and droughts has increased, and changes are occurring in heat and rainfall patterns. This has the potential to disrupt tourism, through increased risk of extreme weather events and natural disasters, and impacts on tourism infrastructure, such as road damage, decreased availability of hydroelectricity, and damage to tourist facilities.

There may also be indirect effects, such as decreased crop yields leading to decreases in food availability and hence higher prices, which in turn could lead to more competition for food resources between tourists and local people. More detailed analysis of these risks to the tourist industry, and possible mitigation measures, could be used to improve the resilience of the sector.

4.4 Efforts to develop a sustainable tourism sector

Tourism has been described by the Royal Government of Cambodia as ‘Green Gold’ and is seen as an important element of the green economy, whereby sustainable and responsible tourism development can contribute to the development, preservation, protection and conservation of cultural, historical and natural resources, and to poverty reduction.

The Tourism Development Strategic Plan 2012-2020 was developed to showcase a clear long-term vision for tourism development in Cambodia, based mainly on the potential of ‘cultural and natural resources’. Cultural tourism is already prioritised within Cambodia, while ecotourism needs to be developed as a new kind of tourist attraction, which can in parallel contribute to climate change mitigation and green economic development (MoT, 2012a). The Plan emphasises a number of strategic objectives: tourism product development; tourism marketing and promotion; connectivity and travel facilitation and tourist transportation; a tourism safety system; negative impact management; a legal system and management mechanism; and human resource development.

A number of measures and campaigns have been initiated, aiming to develop Cambodia’s reputation as a green holiday destination. The Law on Tourism in Cambodia states that an ‘Eco label’ will be established and awarded to tourism operators who comply with environmental standards set by the Ministry of the Environment (MoT, 2009). In addition, MoT has coined the slogan, ‘Clean City, Clean Resort and Good Services’, which is designed to promote good practices, including the reduction of litter and waste, through training and awareness raising and incentivisation through awards made to individuals and organisations for outstanding achievements in this area.¹⁰

In another initiative, the ‘Stay Another Day Cambodia’ booklet has been published since 2007, and stems from a project established by the International Finance Corporation in cooperation with the German Technical Cooperation Agency (GTZ). Since 2009-2010, it has been put on a private sector footing, with support and collaboration between the Cambodian MoT, *Economics Today Magazine* and GTZ (MoT, 2012). The initiative aims to attract tourists to stay a little longer in Cambodia in order to learn more about the way of life, and to contribute more through visiting different charitable or tourist initiatives and volunteering their own time or financial assistance. Each of the initiatives listed has been carefully screened in order to ensure it is culturally, environmentally, and socially responsible. This seems like an innovative way to enhance the contribution of tourism to sustainable development within Cambodia.

The Government has recently developed the ‘One tourist, one tree’ initiative to promote green tourism and environmental protection. Gardens have been designated in 11 different provinces, in which tourists can plant trees to promote green growth (Xinhua English News, 2013). In February 2013, tourism officials also launched a new initiative called the Eco-Club designed to promote environmental

¹⁰ <http://ampilvillages.webs.com/documents/Tourism%20Marketing%20Strategy%202011-2013.pdf>

awareness and improve the image of Cambodian cities through better management and disposal of plastic bags. The program aims to recruit Cambodian youth to spread the word and educate the broader community on the benefits of clean cities. MoT said the Eco-Club will be promoted through schools, universities, factories and radio and television stations (ibid).

Though the overall impact of these initiatives is unclear, they do serve to demonstrate the potential complementarities between developing the tourism sector and establishing greener growth patterns.

4.5 Impacts of tourism growth on natural resources

Tourism growth has led to substantially increased consumption of energy and water. There can be significant opportunity costs – in terms of the development potential of other sectors – associated with the often very high energy and water usage in tourist resorts.

These resources are particularly constrained in Siem Reap, where there is a growing water shortage and where underground water is often used as a result. Authorities reportedly believe there are more than 6,000 illegal private pumps, including many constructed by hotels, and 1,000 wells sunk, across Siem Reap.¹¹ There are concerns that this may over time create instability, which could cause ancient monuments like Angkor Wat to crack or crumble. The Department of Urbanization and Development of APSARA (Authority for the Protection and Management of Angkor and the Region of Siem Reap) has collaborated with the Japan International Cooperation Agency (JICA) to examine water supply issues, and has concluded that the two existing reservoirs that currently serve Siem Reap will not be enough to meet the water demands of the city in future (APSARA, 2005). This could jeopardise ongoing tourism development in the area. These kinds of problems have led to calls for tourist volumes to be controlled in the Angkor Wat area. This example highlights the importance of understanding, measuring and managing the possible economic and environmental trade-offs associated with tourism development. One possible solution is to introduce a requirement for Environmental Impact Assessments (EIAs) to be undertaken, including consultation with relevant stakeholders, to assess the economic and environmental benefits and costs of any proposed tourism development project.

High levels of waste generation can also create problems. Total solid waste in Phnom Penh increased from around 900 tons in 2009 to about 1,000 tons per day in 2010 (Derkeiler, 2009; Euronet, 2012), with about 168,000 litres of waste water in 2007 (Leng, 2007). The lack of a waste water treatment system is likely to cause water pollution problems as well (Euronet, 2012). Appropriate regulation, waste management systems, recycling systems and waste-to-energy technologies are important in maintaining a safe and healthy environment that is attractive to tourists, and they can also create new green growth and job opportunities, if appropriate systems and incentives are put in place.

4.6 Green hotel initiatives

The Green Hotel Recognition Award was set up by ASEAN Member States to reward hotels that operate on environmentally friendly principles (*Travel Daily News*, 2012). Award ceremonies have been held every two years since 2008, the most recent being hosted in South Sulawesi in January 2012. The main criteria include

- environmental policy and activities relating to the operation of the hotel
- use of green products
- collaboration with communities and local organisations
- human resources development
- solid waste management
- energy efficiency
- water efficiency
- air quality management (indoor and outdoor)

¹¹ <http://www.guardian.co.uk/world/2010/sep/27/water-raiding-threatens-angkor-wat>

-
- noise pollution control
 - waste water treatment and management
 - toxic and chemical substance disposal management.

Objectives of the award are to improve environmental awareness amongst hotel operators and incentivise more environmentally friendly business models; to improve the competitiveness of the hotel industry and attract more tourists; and to improve the quality of hotels in the ASEAN region in order to support the region as a tourism destination. A total of 50 hotels in Cambodia have already received ASEAN's Green Hotel Standard (Björn, 2012).

The Angkor Palace Resort & Spa in Siem Reap Province, to give an example, was awarded the ASEAN Green Hotel Standard Award for the second time in a row (covering the periods 2008-2009 and 2010-2011). The Resort has put several initiatives in place to conserve the natural environment. These include a water saving campaign for in-house guests, the use of energy saving lights, and the treatment of waste water that is then used to maintain the garden (Grand Soluxe Angkor Palace, 2013).

Many of these kinds of initiatives make good business sense, helping to cut costs and overcome resource shortages (relating to water availability, energy blackouts, etc.) in addition to earning reputational and marketing benefits. However, there still seems to be considerable scope for improved awareness of these kinds of issues. For example, in other countries there is more recognition of the potential to use solar panels or solar water heaters in hotels, or to construct hotels using green principles that will save energy (e.g. reduce the cost of air conditioning) throughout the life of the building. Lack of awareness about the potential savings, as well as relatively high upfront costs, appear to deter much of this kind of investment in Cambodia.

The Frangipani Villa Hotels are an exception, as they have invested a considerable amount in energy-efficiency measures and renewable energy, including a solar water heating system and LED lighting. While the total cost of a solar water heating system can be anything from US\$20,000 to US\$50,000 depending on the number of guest rooms (15-25 rooms) – which is much higher than the cost of a traditional water heating system – a solar water heating system can generate considerable savings over its lifetime, which could be anything in the region of 15-40 years. Given that global energy prices are expected to rise, investing in energy efficiency and renewable energy technologies now could provide a considerable competitive advantage in future. Raising awareness through demonstration effects, better publicised awards, and wider public recognition could help. In other countries, advertisements have been taken out in the press for the cost savings of such energy-efficiency measures.

These kinds of investments will also help to build the reputation of Cambodia as a green vacation destination, which should attract increasingly environmentally conscious tourists to the country. Pressure from tour operators for more sustainable operations is slowly growing. Partly this reflects demand from customers for more sustainable vacations, but it is also a result of pressure from investors. This voluntary self-regulation is exemplified by the Travelife Award system – an international certification scheme, set up by tourism industry members, that awards a Gold, Silver or Bronze rating to participating hotels and accommodations (currently represented in 25 countries, of which Kenya is the only LIC to date) based on a number of environmental and social criteria.

Growth of such certification schemes may drive increased measurement of water and energy use and carbon emissions, and may become increasingly important for remaining competitive going forward. Thus, putting in place the necessary natural resource management policies, regulations, and private sector incentives for efficiency and sustainable natural resource management could help to enhance the sector's competitiveness, especially for early adopting LICs who can establish a reputation and associated international 'brand' for green tourism (European Report on Development (ERD), 2012). However, environmental awareness is relatively low amongst tourists from within the region; thus, pressure to adopt green measures may be less evident in current patterns of tourism growth in Cambodia.

4.7 Ecotourism potential and challenges

Ecotourism could create new sources of growth and income that will help to protect natural assets, including forests, and create a stronger economic case for improved natural resource management. A number of communities are interested in setting up ecotourism sites in Cambodia, but currently there is no legal or regulatory framework for ecotourism management. According to one source, MoT is now seeking financial support to develop a law on the management of ecotourism resources and community-based tourism. However, there is jurisdictional overlap between the Ministry of Environment (MoE), MoT and MAFF, and these competing objectives can complicate ecotourism strategy development. Thus, there is a need for a more coordinated and participative approach to developing a strategy for the ecotourism sector, that balances competing objectives.

Nonetheless, community-based ecotourism (CBET) initiatives have received support from NGOs and relevant ministries including MoE, MoT and MAFF. So far there are 56 ecotourism sites in Cambodia (*The Phnom Penh Post*, 2013); in the north-eastern provinces of Cambodia, where there is considerable potential for ecotourism expansion, ecotourism tourists increased by nearly 10% – a total of 53,374 tourists – compared with 2011. Most of the ecotourists were from France, China, the UK, Germany, Vietnam, Australia, the Netherlands, the US, Switzerland and South Korea. With unique natural assets such as the Irrawaddy dolphin, the Mekong River, forests and mountains, it is posited that the north-eastern parts could attract 1 million international and 5 million national tourists by 2020 (*ibid*).

Despite this growth, among those 56 sites relatively few of the CBETs have generated revenues and helped to conserve natural forest. Chambok CBET in Kampong Speu Province is held up as the most successful example, generating annual income in the region of US\$10,000 and attracting 11,200 tourists, 80% of whom were Cambodian, in 2011 (Lonn et al., 2012), largely because it is close to Phnom Penh and boasts a specific waterfall attraction. However, this shows that income generated by ecotourism is still very small as compared with the tourism sector as a whole. In addition, there is evidence that the economic gains are not shared equitably amongst the community (Men, 2006; Lonn et al., 2012). Local communities that participate in ecotourism usually consider it a secondary income source, with agriculture remaining their main income source.

The Mekong Discovery Trail (MDT) is a joint project between MoT Cambodia, SNV Netherlands Development Organisation and the World Tourism Organization (UNWTO), and it aims to foster sustainable forms of tourism to reduce poverty in the region and to conserve the Mekong River dolphin (SNV, 2010). MDT is part of a network of ecotourism journeys through some of the most natural and least populated parts of the Mekong in Cambodia in Kratie and Stung Treng Provinces (SNV, 2010; Tourism of Cambodia, 2013). The trail offers many kinds of local experiences including travelling by local horse carts, staying overnight in a homestay to experience local life, participating in tree planting to contribute to environmental protection, exploring local culture through traditional shadow puppet shows, travelling by houseboat on the Mekong at Stung Treng, mountain biking, sampling products made by local farms and markets, and trekking in the forests along the Mekong river (Tourism of Cambodia, 2013).

There are many challenges to developing Cambodia as a major ecotourism destination. First, specific tourist attractions – such as waterfalls, caves, and wildlife viewing opportunities – need to be identified and then developed, conserved and marketed successfully. Local tourists, and those from within the region, tend to be less interested in wildlife than tourists from further afield.

Second, there are issues around the conservation of ecotourism sites. Most potential ecotourism sites are located in protected areas. There are currently 23 protected areas (PAs) within Cambodia, including (i) national parks, (ii) wildlife sanctuaries, (iii) protected landscapes, (iv) multiple use areas, (v) Ramsar sites (wetlands of international importance), (vi) biosphere reserves, (vii) natural heritage sites, and (viii) marine parks. Protected areas comprise over 21% of the country and are mainly managed by MoE, though a growing number of fish sanctuaries and protected forest areas have been set up through MAFF.

Indigenous people continue to live inside the protected areas, and the MoE has designated ‘community protected areas’ inside the PAs, in which local people are permitted to consume natural resources for subsistence. However, population growth, unclear land tenure and user rights, and no demarcation around the PAs and ecotourism sites, undermine the effectiveness of these arrangements. In addition, there are only a limited number of PA authorities to guard and manage many thousands of hectares of PAs. Thus, conservation and protection of ecotourism sites is threatened, undermining incentives to invest in ecotourism enterprises.

Other potential ecotourism sites are in conflict with Economic Land Concessions granted by the government, which often result in areas of forest being cleared for other purposes. Forest degradation is also jeopardising the development of ecotourism. In particular, forest fires and unsustainable harvesting of non-timber forest products (NTFP) are causing problems in potential ecotourism sites (Lonn et al., 2012). Results from key informant interviews revealed that polluted water is also undermining ecotourism sites (river or streams), particularly as a result of mining activities. While there is a regulatory framework governing waste management, there is no regular monitoring of activities, and the law is not stringently enforced.

Tourism infrastructure – including sanitation systems, transportation, tourism amenities, and security – needs to be improved in order to facilitate the expansion of ecotourism. Most of the ecotourism sites are located in isolated protected areas, and road access is difficult, especially in the rainy season.

In addition, there is a lack of private sector involvement in ecotourism development, and members of the local community often lack the necessary skills and knowledge relating to food preparation, hygiene, hospitality, the provision of local guides (and related language skills), site and environmental management, pollution and waste management, etc. Usually not all members of the community are involved in the ecotourism initiative, and the remaining community members continue to undertake logging (legal or illegal), for either subsistence or cash, and degrade the forest in other ways, which undermines the value of the location as an ecotourism site.

Climate finance such as the Climate Investment Funds (CIF) could provide support for ecotourism projects as a way to promote livelihoods based on sustainable forest management. So could possible carbon finance mechanisms implemented through REDD+. However, given the slow rate of international progress on carbon markets, it seems safer to base ecotourism strategies on contributions from public sources of climate finance in the short term.

4.8 Conclusions

Table 7 below summarises the main opportunities and risks that are currently faced in Cambodia’s tourism sector, associated with the relevant drivers identified at the beginning of this report: natural resource scarcity, international mitigation policies and climate change. Possible policy and business responses are suggested, for further discussion and exploration.

Table 7: Summary of tourism sector opportunities and risks associated with three drivers

Opportunities / risks	Implications / responses
Natural resource scarcity	
Growth of tourism creates challenges for natural resource management (water and energy), including threats to the value of existing tourist attractions, e.g. in Siem Reap.	<p>Introduce Environmental Impact Assessment (EIA) for proposed tourism development projects, including consultation with relevant stakeholders.</p> <p>Invest in diversification of tourist attractions to reduce pressure on particular areas and promote more widespread benefits.</p> <p>Invest in infrastructure and services (e.g. water and sanitation) necessary for sustainable expansion of tourism.</p> <p>Develop appropriate regulatory framework.</p> <p>Raise awareness on natural resource management and green and sustainable tourism in the community and with tourists themselves.</p> <p>Consider costs and benefits of controlling tourist numbers.</p>
Poor waste management a threat to tourism growth and development more generally, but scope for market opportunities in recycling and waste to energy schemes.	<p>Introduce appropriate regulatory framework and explore options to develop new markets in recycling and waste-to-energy schemes.</p> <p>Implement and reinforce 3 R strategy: Reduce, Reuse and Recycle</p> <p>Introduce campaigns to improve the efficiency of resource consumption.</p>
Considerable potential to expand ecotourism to support sustainable development and green growth.	<p>Develop coordinated strategy for ecotourism development involving all relevant Ministries and stakeholders to balance competing objectives, and establish and implement an appropriate legal and regulatory framework.</p> <p>Strengthen protection and conservation of ecotourism sites.</p> <p>Officially demarcate all ecotourism sites.</p> <p>Measures to attract private investment in ecotourism, identified through public-private dialogue.</p> <p>Targeted investment in infrastructure, services, skills of local communities, and marketing of particular attractions to facilitate growth of ecotourism.</p>
International mitigation policies	
Aviation taxes and rising air transport costs may undermine tourism growth.	<p>Promotion of tourism from within the region.</p> <p>Ease travel and cross-border transportation by cooperating with neighbouring countries.</p>
Tourism industry as an advocate and driver of green growth patterns, so as to demonstrate green credentials as a source of competitive advantage.	<p>Collaborate with the tourism industry in rolling out initiatives to promote clean, attractive environment and to raise awareness.</p> <p>Target green tourist market segment.</p> <p>Promote 'Clean City Clean Resort and Good Services' movement to promote low carbon competitiveness of Cambodian tourist sector.</p> <p>Encourage the use of natural domestic products and energy-efficient technologies.</p>

Use of public climate finance to invest in green tourism initiatives and ecotourism.	Develop a strategy that optimises contribution from public sources of climate finance such as the Climate Investment Funds.
Growth in interest in environmental credentials from tourists and tourism industry will reward relatively green tourism destinations.	<p>Establish Cambodia's brand as a green tourism destination to create a competitive advantage.</p> <p>Introduce and strengthen standards, labels, award schemes that reward green credentials in the tourism industry, including energy efficiency and responsible water management, etc.</p> <p>Promote and expand ASEAN Green Hotel Recognition Award.</p> <p>Consider joining international Travelife scheme.</p>

Cambodia has benefited enormously from the fast growth of tourism in the last 10 years, and there is still much potential for further growth in the industry. However, appropriate management of natural resources is required to ensure that continued growth is not undermined. There is a need to diversify Cambodia's tourist attractions beyond the world heritage sites located at Siem Reap, in order to reduce environmental pressures in those areas, capitalise on Cambodia's other natural assets, and share the economic benefits of tourism more widely.

Increasing international emphasis on environmental credentials within the tourism industry is inevitable going forward, and will reward those tourism destinations that are perceived as relatively green. Therefore, establishing Cambodia's brand as a green tourism destination could be important to creating a competitive advantage for the future and the introduction of regulation or incentives to promote environmentally sound and energy-efficient practices within the industry will help to achieve that goal.

Within that context, investment in renewable energy and energy-efficiency measures by hotels can provide both cost advantages and reputational benefits. However, there appears to be less awareness about these issues within Cambodia as compared with other countries, so publicising the benefits and providing support and incentives for these investments may be warranted to maintain a competitive sector. Public sources of climate finance could potentially support the development of a green tourism sector, for example by supporting energy audits or the introduction of green energy by hotels, or by supporting ecotourism projects as a way to promote sustainable forest management.

There is enormous potential to develop the ecotourism sector, which could create new sources of growth and income that will help to protect natural assets, including forests, and create a stronger economic case for improved natural resource management. However, this sector is as yet fairly underdeveloped, and there is much that needs to be done to overcome the many challenges it faces.

The tourism industry itself has an interest both in developing a sustainable and environmentally conscious sector and in protecting the natural environment, and thus can act as an important advocate of green growth policies. As this study has shown, there are many potential synergies between developing a sustainable and lucrative tourism sector, and promoting sustainable and inclusive growth.

5 The manufacturing sector

The manufacturing sector accounts for around 17% of GDP (NIS, 2012), and industry as a whole accounts for around 23% of value added (see Table 8). The manufacturing sector thus plays a major role in the economy, providing formal employment opportunities.

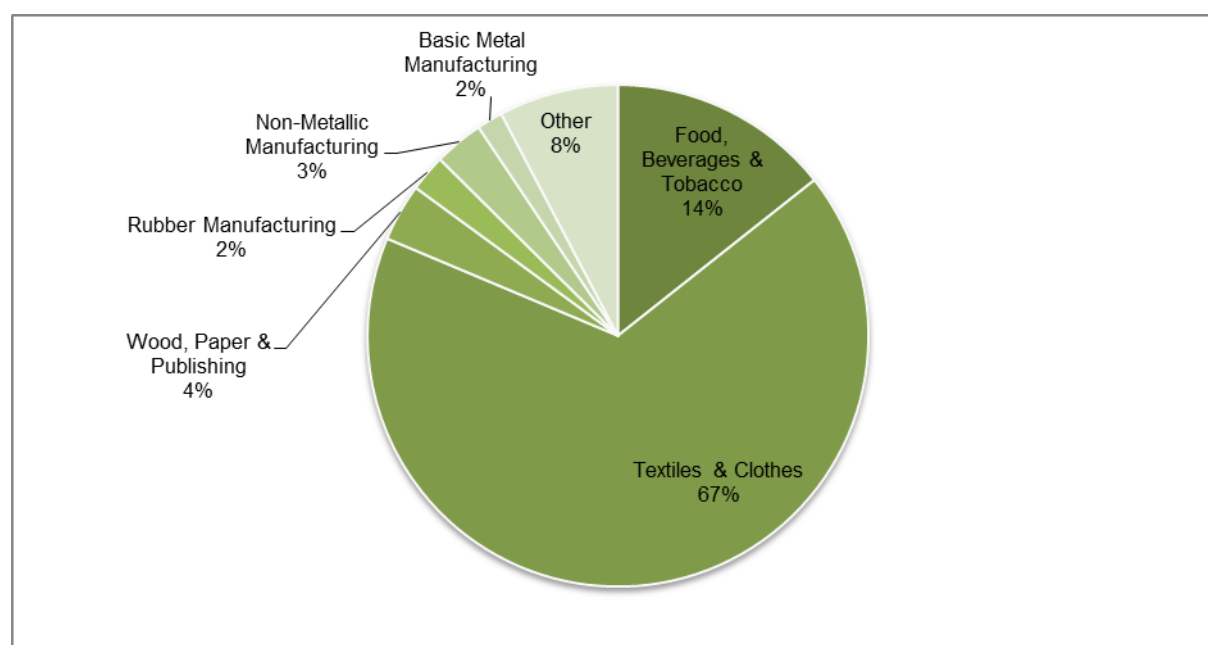
Table 8: Value Added (% of GDP) by sector for Cambodia, 2005 & 2010

Year	Agriculture	Industry	Services
2005	32	26	41
2010	36	23	41

Source: WB WDI (2012)

Breaking down the composition of the Cambodian manufacturing section (the latest official data from NIS is from 2008), shows the importance of the garment sector, accounting for over two thirds of the sector's value added (see figure 2 below). The food, beverages and tobacco sector is the second largest.

Figure 2: Breakdown of Cambodian manufacturing value added (2008)



Source: NIS (2012)

As a proportion of the overall manufacturing sector, the food and beverages sector has grown slightly over the period 2005 to 2011, according to figures from the Ministry of Economics and Finance. This has been driven by the growth of the country's agro-processing industry, according to the Council for

the Development of Cambodia (CDC), and particularly due to government policy promoting the export of rice products.

However, the garment sector continues to be the most important component of Cambodia's manufacturing sector. The importance of the garment sector to the country's economy can be attributed to the fact that Cambodia has benefited from Most Favoured Nation (MFN) status and Generalised System of Preferences (GSP) privileges provided by the United States and the European Union for a long period. The US has been the largest garment market for Cambodia, accounting for around two thirds of its exports, whilst the EU imports around one fifth (ASEAN, 2010).

Table 9: Breakdown of manufacturing sector major components (as a % of manufacturing) 2005-11

	2005	2006	2007	2008	2009	2010	2011
<i>Food, Beverages & Tobacco % of Manufacturing</i>	13.3	12.0	12.5	14.3	15.8	15.5	15.0
<i>Textile, Apparel & Footwear % of Manufacturing</i>	68.9	69.8	69.7	67.0	63.4	63.7	64.5
<i>Wood, Paper & Publishing % of Manufacturing</i>	3.2	3.1	3.3	3.7	4.1	3.9	3.8
<i>Rubber Manufacturing % of Manufacturing</i>	2.7	3.3	2.4	2.4	2.7	3.2	3.2
<i>Other Manufacturing % of Manufacturing</i>	11.9	11.9	12.1	12.6	14.0	13.7	13.5

Source: Ministry of Economic & Finance (2010)

The Government aims to expand and diversify the manufacturing sector (according to a speech by the Prime Minister Hun Sen¹²), mainly to increase the value added of existing core sectors, and support the promotion of foreign investment, though the nature of that support is unspecified. The government is concerned that the sector captures only a small proportion of the whole value chain, e.g. the garment sector is concentrated in the 'cut, make and trim' stage of the manufacturing process.

The Government also recognises that there are new industries in which Cambodia may have a comparative advantage (e.g. the furniture sector, construction sector, oil and gas) but does not specify how they will be developed, beyond the need to identify the appropriate sectors. According to the UNDP¹³, the government of Cambodia is formulating an industrial policy for the 2014-2018 period, although this is currently at an early stage.

¹² [http://www.un.org.kh/undp/media/files/special-pages/Key%20Note%20Address%20PM%20Hun%20Sen%20\(English\).pdf](http://www.un.org.kh/undp/media/files/special-pages/Key%20Note%20Address%20PM%20Hun%20Sen%20(English).pdf)

¹³ http://jobs.undp.org/cj_view_job.cfm?cur_job_id=37718

5.1 Energy use and energy efficiency

As discussed in the section on the energy sector, until now the high and variable costs, constrained availability, and unreliability of energy have significantly undermined the competitiveness of Cambodian businesses, including in the manufacturing sector. However, with the substantial investment in electricity generation currently underway, prospects for an improved electricity supply and lower prices within the next few years are promising, and this should give a boost to the sector.

Much of this investment is in hydropower, though, which could be affected by climate change, so developing a more diversified energy mix could be beneficial to boost the economy's resilience to climate change. In addition, within the current mix, there is still a fairly high proportion of imported fossil fuels in Cambodia, which threatens energy security. Firms themselves can develop alternative, renewable energy sources that can improve their own access to electricity and improve their competitiveness. Some firms are already beginning to do this, but regulatory mechanisms such as feed-in tariffs could help to strengthen incentives for such investment.

Much of the energy used in manufacturing currently comes from natural resources such as wood and charcoal. This energy is used to generate steam as well as in some circumstances electricity; it may be substituted for grid electricity as and when necessary, given the current need for timed blackouts in Phnom Penh due to energy shortages. According to one source, in an average-sized garment factory located in Phnom Penh, around 20 cubic metres of fuel wood are used per day in steaming processes such as ironing and packaging. Overall, the use of electricity in garment production is estimated to account for around 20-30% of total costs.

There are major concerns that the use of fuel wood within Cambodian industry is resulting in unsustainable levels of deforestation.¹⁴ One suggested solution involves reforestation and the creation of tree farms to provide a continuous ('coppiced'), sustainable supply of wood biomass, which could, along with agricultural residues, be used to generate electricity more efficiently (Bona and Dana, 2005).

As discussed in the section on the energy sector, the production of biogas is currently being implemented under the National Biodigester Programme, an initiative of MAFF and SNV. Although this is currently focused at the household level, large-scale biogas generation by rural enterprises or by community groups could potentially also be commercially viable, particularly for those that rear livestock or are located nearby and hence have a ready source of feedstock. This could help to reduce deforestation by substituting for fuel wood, but it is not yet being implemented within Cambodia on a large scale.

Some manufacturing companies are innovating to find alternative energy sources, e.g. through the use of their own waste materials as fuel. For example, rice millers are in some cases burning rice husks as a substitute for fossil fuel, as discussed in the energy section above. When excess electricity is produced, processors have the option to sell it to users as an off-grid source of energy.

This is a particularly valuable source of electricity in those areas where formal grid sources of electricity have yet to reach domestic producers, or where supplies are limited. Where plants have been established to make use of rice husks as a source of domestic electricity, rice farmers and processors offer to sell husks and then buy back the electricity generated. According to one source, the typical price per kilowatt of electricity produced through rice husk production is around 13 cents, compared to around 20 cents per kilowatt from the on-grid source.

Commercial enterprises in countries such as Kenya and Nepal have been innovating to find and generate alternative sources of energy to power their production process, e.g. solar energy and micro-hydro applications. This is not reflected to such a degree in Cambodia, although some companies have tried solar and found it to be commercially unfeasible, and according to industry players, the lack of feed-in tariffs has hampered large-scale (commercial) uptake of the technology.

¹⁴ For example, see Bona and Dana (2005).

In addition, according to the Cambodia Economic Association, many Cambodian firms are expecting the price of national grid electricity to fall – due to planned increases in national and foreign investments in large-scale hydroelectricity – which may make it unnecessary, and less commercially viable, for them to invest in alternative energy sources themselves.

UNIDO established a project in 2010 to improve energy efficiency in the industrial sector, in collaboration with the Ministry of Industry, Mines and Energy. UNIDO provides an energy audit and then subsidises up to 20% of the cost of energy-efficiency measures identified. Twenty firms have so far been audited, and these audits have shown the potential for them to achieve significant efficiency savings. Box 3 provides one short case study, and Table 10 gives some figures on the potential cost and emissions savings in a number of companies.

Box 3: Use of energy-efficiency measures in food processing factories

LyLy Food Industry Co. is a medium-sized, family owned enterprise that produces packaged snacks for sale in Cambodia. After feasibility tests of energy-efficiency measures produced positive results, the company introduced seven energy-efficiency projects worth over \$100,000. These include the use of a dual fuel generator to substitute for electricity purchased from the grid, installation of energy-efficient crisping ovens, and usage of flue gas heat in other parts of the manufacturing process. The overall payback period on the investments is estimated to be 20 months, and it is estimated that there will be a 66% reduction in total GHG emissions per year.

Source: UNIDO and Global Environmental Facility (GEF) Business Case Study, Industrial Energy Efficiency Cambodia (IEEC), Food Processing Sector

Although the UNIDO project focuses on identifying pragmatic approaches to saving energy, it is not clear that switching from grid energy to fuel wood-based electricity production – as cited in the example above – is a green solution, given the concerns about the unsustainable use of biomass for energy in Cambodia. However, this kind of solution could be more widely applicable if an effective and sustainable forest management system was put in place to ensure the ongoing supply of biomass.

Table 10: Investments in energy-efficiency measures: costs, savings and GHG reductions

Company	Investment Cost (\$)	Savings per year (US\$)	GHG Reductions (tons per year)	GHG Reductions (%)	Payback period
LyLy Food Industry Co.	390,000	237,600	941	66%	20 months
Sky High Garment Company	109,100	396,000	2,112	31%	4 months
Vinh Cheang Rice Mill	1,480,000	612,800	510	39%	30 months
Punleu Preah Atith Brick Company	502,000	373,000	1,338	10%	16 months
Peng Kimheng Ice Factory	62,000	249,340	634	78%	3 months

Source: UNIDO Energy Efficiency Case Studies (various years)

The UNIDO programme does, however, highlight one of the main barriers to the implementation of ‘green’ measures: the lack of sufficient capital in Cambodian firms that would allow them to undertake such measures. While the UNIDO project provides 20% of funding for proposed energy-efficiency measures (up to a maximum of US\$300,000), it argues that a very small proportion of Cambodian firms have the necessary capital to invest to make up the remainder of the required financing. The Rural Development Bank (RDB) of Cambodia will usually provide loans to rural companies only if they can prove that such investments will have a guaranteed payback. Even though the EAC has requested that the RDB help expand access to electricity, the RDB is constrained from doing so since the bank itself does not have enough funding to cover loans to enterprises and according to one source is able to respond to only around 10% of requests. Some financial institutions are providing loans specifically for green investments, but these are currently small-scale microfinance loans such as those provided by PRASAC.¹⁵

5.2 Environmental standards and regulation

All factories are expected to undertake an environmental impact assessment as part of the preconditions for their investment. Beyond that, there are few environmental standards or regulations that apply to the manufacturing sector in Cambodia. However, adherence to specific environmental standards within production processes may be increasingly required by major buyers and retailers importing goods from Cambodia, as they apply their own private voluntary standards.

In the food processing sector, some firms are required to meet ISO standards in order to sell to certain buyers. For example, to sell to the US, rice producers must meet ISO standards and also the ‘Best Control Systems’ standard. Another standard in operation in Cambodia is the Good Manufacturing Practice (GMP) standard, though environmental issues are not a main focus.

It is likely that there will be growing emphasis on environmental standards or certification down the manufacturing supply chain over time, as there already is in other sectors, such as agriculture and, increasingly, tourism. If so, this could have an impact on access to markets for Cambodian manufacturing companies. It is also possible that as mitigation policies are strengthened, countries could require trading partners to account for the carbon used in domestic production or face the imposition of border carbon adjustments (BCAs) (Keane, 2013) – though as Cambodia is a Least Developed Country (LDC), the imposition of such a measure would be highly controversial, and as yet there are no moves in this direction.

The Cambodia Chamber of Commerce (CCC, 2012) recognises that high-income country (HIC) retailers are imposing higher environmental standards on their foreign suppliers, including LICs. The CCC states that companies such as the UK’s Marks & Spencer expect their suppliers to meet all the company’s relevant environmental standards, in addition to any relevant national and international regulations. Other retailers, such as Tesco (again from the UK), have set up a carbon footprinting programme.¹⁶ Similarly, Walmart (one of the major US supermarket retailers), also expects its retailers to be leaders in terms of applying high environmental standards.¹⁷

The CCC (2012) states that China, one of Cambodia’s main competitors, is already a decade ahead in developing its regulatory environment, and this is strengthening the capabilities of Chinese companies to adhere to such standards. Similarly, garment manufacturers in Bangladesh, another main competitor in the sector, are also implementing energy-efficiency and environmental sustainability measures.¹⁸ The CCC is thus concerned that Cambodian manufacturers may increasingly lose access to lucrative markets and could be left behind by companies in competing countries, if Cambodia does not adhere to more rigid ‘green’ standards.

¹⁵ http://www.prasac.com.kh/index.php?option=com_content&view=article&id=177%3Aprasac-committed-to-providing-more-green-financing-&catid=55%3Awhats-news&Itemid=123&lang=en

¹⁶ [http://www.tescopl.com/assets/files/cms/Tesco_Product_Carbon_Footprints_Summary\(1\).pdf](http://www.tescopl.com/assets/files/cms/Tesco_Product_Carbon_Footprints_Summary(1).pdf)

¹⁷ <http://corporate.walmart.com/global-responsibility/ethical-sourcing/standards-for-suppliers>

¹⁸ <http://www.newclothmarketonline.com/promotion-of-social-environmental-and-production-standards-in-the-readymade-garment-industry-of-bangladesh/>

The Cambodian NGGR of 2009 discusses issues relating to energy efficiency and waste in the manufacturing sector. With regard to waste, the NGGR has several proposals: awareness campaigns to reduce manufacturing waste levels, greater enforcement of current waste management laws already in place, and the application of taxes and other fiscal tools aimed at dis-incentivising waste production. Air pollution from factories is also discussed in the NGGR, and it posits the need to implement air pollution caps (especially for larger factories) as well as potentially introducing emission trading schemes.

According to the Federation of Associations for Small and Medium Enterprises of Cambodia (FASMEC), there are discussions with UNIDO about how to introduce a ‘Green Award’ and logo to recognise and reward good environmental practice among businesses. However, this remains in the early stage of design. Generally FASMEC says it encourages its members to adhere to best practice standards such as the ISO standards, and it tries to share and promote best practice with its members.

5.3 Spillovers from Foreign Direct Investment

Multinationals can assist in providing positive economic spillovers through technology transfer and best practice management techniques. Box 4 illustrates how one multinational – British American Tobacco (BAT) – contributed to improvements in energy efficiency, increases in farm yields, improved environmental outcomes, and ultimately increases in profits for the producers and farmers that supply the company.

Box 4: Case Study from British American Tobacco

Tobacco is one of the most competitive cash crops in Cambodia. BAT has worked with farmers to increase yields and reduce use of agrochemicals. Drip irrigation methods have been promoted and demonstrations provided to farmers. This method of irrigation reportedly results in a 55% labour saving and a 25% increase in yield. It also helps farmers to adapt to varying weather conditions.

BAT also operates a reforestation programme, through which 14 million trees have been planted so far; this is partly to compensate for historical forest clearance for tobacco growing, but is also part of a strategy to promote integrated pest and soil nutrient management by growers, and help diversify their income sources, as some are fruit trees.

BAT has assisted with barn construction and modification, resulting in a 30% reduction in specific fuel consumption for processors in the drying tobacco leaf stage of production. Soft loans for producers are made available so as to undertake recommended investments in production.

The business case for these activities relates to the sustainability of supply of good quality tobacco leaf. Providing its farmers with relevant training helps BAT to develop good relations and strengthen its reputation, which will help ensure a reliable source of supply going forward. There are spillover benefits for other farmers too, who learn from BAT trained farmers.

Following an energy-efficiency audit by UNIDO, BAT operations in Phnom Penh has introduced energy-efficiency measures that include using more energy-efficient light bulbs and using movement sensors to switch off lights when not in use. These measures generated a 28% energy saving in one year (2006) and a 13% reduction in carbon dioxide emissions.

5.4 Conclusions

Table 11 below summarises some of the main opportunities and risks that are currently faced in Cambodia’s manufacturing sector, associated with the key relevant drivers identified at the beginning of this report: natural resource scarcity, international mitigation policies, and the impact of climate

change (though the latter is less directly relevant to the manufacturing sector). Possible policy and business responses are suggested, for further discussion and exploration at the national level.

Table 11: Summary of manufacturing sector opportunities and risks associated with three drivers

Opportunities / threats	Implications / responses
Natural Resource scarcity	
High prices, limited access and unreliability of energy supply undermine competitiveness of manufacturing sector.	Invest in energy infrastructure, including renewables.
Industry is driving unsustainable deforestation due to its consumption of fuel wood.	Establish sustainable 'tree farms' and technologies that convert biomass to electricity.
Investment by manufacturing firms in alternative renewable energy sources; e.g. agricultural waste or tree farms could create long-term competitiveness and generate additional revenue source.	Create incentives for more manufacturing firms to do this, e.g. through an appropriate regulatory framework and feed-in tariffs.
Energy-efficiency measures save money, improve competitiveness and reduce carbon emissions.	Consider implementing regulations regarding energy-efficiency audits. Advertise benefits of energy-efficiency measures as demonstration effect. Awareness-raising through small and medium enterprises (SME) organisations and financial services sector, etc.
Limited availability of finance for green investments.	Engage with financial sector to raise awareness and share risks.
International mitigation policies	
Public climate finance or carbon markets as a source of funding for green investment.	Develop a strategy that optimises contribution from public sources of climate finance.
Possible future green standards or labels or demands for carbon footprinting arising from international mitigation measures could undermine competitiveness and reduce access to markets for non-certified producers.	Introduce environmental regulation of the manufacturing sector and develop appropriate standards and labels, and other incentive mechanisms to encourage environmental best practice.
Impact of climate change	
Climate change could affect generation potential of hydropower, undermining the development of a reliable energy supply, with cost implications for the manufacturing sector.	Introduce regulation such as feed-in tariffs that encourage firms to innovate and invest in developing their own energy sources, in order to diversify the energy mix, improve resilience, and strengthen competitiveness.

The high price, poor access and unreliability of energy have significantly undermined the competitiveness of Cambodia's manufacturing sector to date. However, as firms are beginning to respond – by innovating to find or generate alternative sources of energy, and to introduce energy-efficiency measures – Cambodia could gain a competitive advantage in an international low carbon economy with rising energy prices. Despite some progress in this direction, it seems relatively slow compared with some other LICs, such as Kenya, which is introducing mandatory regulation requiring energy audits to be undertaken by energy intensive companies. Regulatory changes such as the introduction of feed-in tariffs could also help stimulate investment in new energy sources by the manufacturing sector.

A lack of environmental regulation, standards, certification or other forms of incentive could prove to be a competitive disadvantage in future, if environmental standards or certification become requirements to access certain international markets. Multinational companies can often be first adopters of these kinds of innovations, following best practice standards set in their home countries. This can yield spillovers for local firms if managed well.

Public climate finance or carbon markets could be a source of funding for investments in renewable energy technologies or energy-efficiency measures. However, carbon markets such as CDM unfortunately now seem unlikely to yield much finance in the short term. Nonetheless, strategies seeking public climate finance support for the kinds of investments discussed here could yield better results.

6 Conclusions

Enhancing trade is a key focus in Cambodia's National Strategic Development Plan of 2010, which sets out a number of policies to promote export competitiveness and growth. The success of these policies will depend to a large extent on the global trade patterns shaping the opportunities that Cambodia faces.

Our analysis suggests that over the next 10 years, global trade patterns will be transformed by climate change, international mitigation, and natural resource scarcity, resulting in an inevitable shift over time to a low carbon global economy. This study has been asking what this might look like. What impact will it have on Cambodia's competitiveness and growth? What threats and opportunities will it create? And how should policy-makers and businesses respond?

This report has examined how these issues could play out in Cambodia over the next decade, particularly focusing on the energy, tourism and manufacturing sectors. It has identified potential opportunities and threats to Cambodia's competitiveness and growth, and possible policy responses.

6.1 The energy sector

Until now, the competitiveness of Cambodian business has been significantly undermined by the high and variable costs, poor access, and unreliability of energy. With the substantial investment in electricity generation currently underway, however, prospects for an improved electricity supply and lower prices within the next few years are promising. A diversified energy mix is preferable, given the impact of climate change on hydropower generation capacity.

Within the current mix, there is still a fairly high proportion of imported fossil fuels in Cambodia, which raises concerns about energy security. Developing alternative, renewable energy sources could provide greater energy security and improved competitiveness in the long term. Some firms in Cambodia are at the forefront of innovation to secure alternative sources of energy for their own use and also to sell to the grid, and it would seem sensible to encourage this as a way to enhance competitiveness and improve the energy supply in Cambodia, particularly in underserved areas. This innovation could be further incentivised by putting in place a conducive policy and regulatory framework.

With the recent discovery of fossil fuels, Cambodia may now face some strategic decisions about the uses of those fossil fuels, and this will have important implications for the future energy mix and competitiveness of industry. Exploitation of these fossil fuel reserves – if and when their commercial viability is confirmed – seems inevitable, and it will be important to utilise them and the resources they generate in a way that does not undermine the country's wider long-term competitiveness, or undermine incentives for the development of renewable energy sources.

Possible policy responses:

1. Introduce an appropriate regulatory framework, including feed-in tariffs and other measures, such as energy-efficiency provisions in building codes, to incentivise investment in renewable energy technologies, and to diversify beyond hydropower. Introduce mechanisms to support access to finance in order to overcome upfront costs and encourage foreign investment to bring capital and technology, for example in solar and biogas technologies. Allowing tax-free imports of green technologies such as solar panels may also help the development of the sector and increase the uptake of renewable energy technology.
2. In order to ensure Cambodia's competitiveness in a future low carbon global economy, utilise Cambodia's domestic fossil fuel reserves (if their commercial potential is confirmed), in ways that support the development of renewable energy e.g. by exporting the fossil fuels and investing the revenues in renewables. Specify a clear direction for energy policy in order to avoid undermining incentives for private investment in energy generation – particularly of renewables – due to ongoing policy uncertainty.
3. Explore the feasibility of models for reforestation and sustainable forest management by communities and the private sector – such as the creation of tree farms to provide a continuous ('coppiced'), sustainable supply of wood biomass – in order to develop a sustainable source of fuel necessary to underpin economic development.

6.2 The manufacturing sector

The high price, poor access and unreliability of energy have significantly undermined the competitiveness of Cambodia's manufacturing sector to date. However, as firms are beginning to respond – by innovating to find or generate alternative sources of energy, and to introduce energy-efficiency measures – Cambodia could gain a competitive advantage in an international low carbon economy with rising energy prices. Despite some progress in this direction, it seems relatively slow compared with some other LICs, such as Kenya, which is introducing mandatory regulation requiring energy audits to be undertaken by energy intensive companies. Regulatory changes could help stimulate investment in new energy sources by the manufacturing sector.

A lack of environmental regulation, standards, certification or other forms of incentive could prove to be a competitive disadvantage for Cambodia's manufacturing industries in future, as environmental standards or certification increasingly become requirements to access certain international markets. The Cambodia Chamber of Commerce states that China, one of Cambodia's main competitors, is already a decade ahead in developing its regulatory environment, which is strengthening the capabilities of Chinese companies to adhere to such standards; they argue that Cambodian manufacturers could be left behind if Cambodia does not adhere to more rigid 'green' standards.

Multinational companies can often be first adopters of these kinds of innovations, following best practice standards set in their home countries. This can yield spillovers for local firms if managed well.

Public climate finance or carbon markets could be a source of funding for investments in renewable energy technologies or energy-efficiency measures. However, carbon markets such as CDM unfortunately now seem unlikely to yield much finance in the short term. Nonetheless, strategies seeking public climate finance support for the kinds of investments discussed here could yield better results.

Possible policy responses:

1. Introduce environmental regulation of the manufacturing sector, and develop appropriate standards and certification mechanisms and other incentives to encourage environmental good practice. Encourage FDI and promote lesson learning on energy efficiency and sustainable business models by organising training and demonstration projects through public-private partnerships.
2. Implement regulations regarding energy-efficiency audits. Publicise benefits of energy-efficiency measures, implement training and awareness-raising through small and medium enterprises (SME) organisations and financial services sector.
3. Create incentives for manufacturing firms to invest in alternative renewable energy sources, such as solar energy or waste to energy, through an appropriate regulatory framework and feed-in tariffs.

6.3 The tourism sector

Cambodia has benefited enormously from the fast growth of tourism in the last 10 years, and there is still much potential for further growth in the industry. However, appropriate management of natural resources is required to ensure continued growth is not undermined. There is a need to diversify Cambodia's tourist attractions beyond the world heritage sites located at Siem Reap in order to reduce environmental pressures in those areas, capitalise on Cambodia's other natural assets, and share the economic benefits of tourism more widely.

Increasing international emphasis on environmental credentials within the tourism industry is inevitable going forward, and will reward those tourism destinations that are perceived as relatively green. Therefore, establishing Cambodia's brand as a green tourism destination could be important to creating a competitive advantage for the future. Within that context, investment in renewable energy and energy-efficiency measures by hotels can provide both cost advantages and reputational benefits, but there appears to be less awareness about these issues within Cambodia than within other countries.

There is enormous potential to develop the ecotourism sector, which could create new sources of growth and income that will help to protect natural assets, including forests, and create a stronger economic case for improved natural resource management. However, this sector is as yet fairly underdeveloped, and there is much that needs to be done to overcome the many challenges it faces.

Possible policy responses:

1. Manage the growth of the tourism industry to ensure its sustainability, and to create a competitive advantage, help establish Cambodia's brand as a green tourism destination by introducing environmental impact assessments, by regulating the industry's waste and water management, and by adopting relevant standards, labels, and award schemes that reward green credentials, such as the international Travelife scheme.
2. Introduce a coordinated strategy for the development of the ecotourism industry, involving all relevant Ministries and stakeholders to balance competing objectives, and establishing an appropriate legal and regulatory framework. Strengthen the protection of ecotourism sites; make targeted investments in infrastructure, services, skills of local communities, and marketing of particular attractions; and undertake public-private dialogue to understand how best to attract private investment into ecotourism.
3. Identify opportunities for using climate finance to support the development of a green tourism sector, for example by supporting energy audits or the introduction of green energy by hotels, or by

supporting ecotourism projects as a way to promote sustainable forest management.

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