Green Growth Opportunities and Requirements in Egypt

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published by: giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
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Executive summary

The objective of this study is to identify the key opportunities for green growth in Egypt, discuss the framework conditions necessary for achieving them, and make policy recommendations. Green growth opportunities are defined as those which achieve the triple goals of (i) economic growth, (ii) social inclusivity, and (iii) environmental sustainability or improvement. The social dimension is addressed by prioritising these opportunities in terms of their potential to generate jobs, thus allowing the benefits of these new opportunities to be shared in a socially inclusive manner.

The study has been commissioned by GIZ, with a view to assisting the Egyptian Ministry of Industry and Foreign Trade (MTI), and the Egyptian-German Private Sector Development Programme (PSDP) on behalf of BMZ, to further promote green growth and green job creation in Egypt.

The aim of the study was to identify a small number of sectors where there are significant opportunities for green growth and job creation, that can potentially be achieved in a reasonably short time frame, and at relatively low cost to the public budget. In other words, to identify low hanging fruit, and explain in practical terms how they can be harvested.

This is crucial given the current juncture within Egypt, where public resources are very tight, and where employment generation is a priority for a transition government facing enormous public pressure to deliver new political freedoms and economic opportunities. Although environmental concerns are not currently high on the political agenda, and nor is there much awareness about the problem amongst the public, it is nonetheless a serious looming problem that will need to be tackled within Egypt sooner rather than later.

The team identified three broad and inter-related sectors of focus for this study: (1) Renewable energy generation and renewable energy applications; (2) the construction sector; and (3) the agricultural waste sector. These are all areas which would generate significant potential for green growth and jobs, if the right framework conditions were put in place. This could be achieved largely through private sector action, at limited cost to the taxpayer, if the enabling conditions were put in place through an appropriate policy framework and supportive institutional environment.

In the renewable energy generation and appliances section, the report discusses the potential for wind power and solar power (photovoltaics, solar water heaters and concentrated solar power), both of which have considerable potential within Egypt due to its geographical characteristics. The wind power sector is the most developed, and government policy is promoting this sector most strongly. Solar water heaters also provide a significant opportunity within Egypt – a possible low hanging fruit – linked to the construction of green buildings and retrofitting of existing buildings. Photovoltaics and concentrated solar power applications are currently less developed and further from achieving market viability.

Developing the renewables sector will be important for Egypt’s energy security going forward, as the the country’s stock of fossil fuels is being depleted, and national demand for energy is rising fast. It also holds the promise of generating many jobs, and becoming a lucrative export market for Egypt.
The most obvious recommendation to support market development in the renewables sector is the phased reduction and removal of fossil fuel subsidies. However, even in the absence or slow implementation of subsidy reduction, it should be possible to make progress in developing the renewables sector, through improvements in the enabling environment and other framework conditions governing the sector. The proposed Unified Electricity Law will help to create better framework conditions in the sector to support private sector investment. But what is ideally needed is a planned and determined shift to renewable energy: a clear, long term, holistic implementation plan for the development of the sector, which gives consideration to private sector incentives, likely developments in both domestic and international demand for renewables, and technological innovation, and which considers how the whole supply chain can be developed to generate a competitive industry along with broad based growth and job generation. Specific recommendations include:

1. Public education of benefits and public-private dialogue in order to mobilise support for the required transformation.
2. Use of economic incentives to stimulate private investment e.g. procurement policies, differential pricing and taxation to promote renewable technologies, financing mechanisms etc.
3. Use of licensing requirements for industrial energy users to incentivise use of renewable energy.
4. Use of downstream regulation e.g. new building codes, to incentivise or require use of technologies such as solar water heaters (as discussed further in the next section).
5. Investment in connections of renewable energy generation installations to the grid, potentially through public/private partnerships.
6. In the longer term, investment in infrastructure to facilitate the export of renewable energy.
7. Development of a clear regulatory framework for the renewable energy industry.
8. Policies to promote local production of inputs for renewable energy technologies.
9. Capacity building and development of the SME sector, and new financing mechanisms.
10. Increased funding and support for energy R&D, and mechanisms to facilitate coordination and commercialisation of R&D efforts.
11. Development of necessary skills and accredited training courses.
12. Accessing carbon market mechanisms such as the Clean Development Mechanism.

In the section on the construction sector, the focus is on green buildings, and the potentially large job creation potential associated with green construction and retrofitting of existing buildings with energy efficient appliances such as solar water heaters. Many of the possible energy efficiency improvements can quickly pay for themselves in terms of reduced energy bills. However, fossil fuel subsidies are again undermining incentives to undertake green construction within Egypt. Nonetheless, incentives for green construction could be created in other ways. Specific recommendations include:

1. The development of a green construction strategy, as proposed in the Egyptian Competitiveness Report, by convening public and private sector representatives from the construction industry, to develop a plan and establish the standards and incentives for green construction.
2. The continuation / strengthening of the system of progressive electricity tariffs dependent on relative energy efficiency, in order to incentivise energy efficiency improvements. The introduction of a progressive tariff for gas pricing also.
3. Enhancing enforcement of building codes and reviewing their achievability.
4. Performance ratings and labelling schemes, accompanied by a marketing drive and media campaign to raise consumer awareness.
5. The introduction of fiscal or other financial incentives to incentivise energy efficiency.
6. The introduction of energy efficiency requirements into Government procurement of construction projects.
7. Working with financial institutions to improve access to credit for the upfront costs of energy efficiency measures.
8. Market studies, demonstration projects and awareness raising campaigns for both the industry and consumers.
9. Incorporation of energy efficiency into higher education programmes and increased R&D expenditure and network building between existing R&D players.
10. Working with the private sector to identify where there are gaps in the availability of suitable materials and technologies within Egypt.
11. Working with SMEs to help them comply with standards.
12. Investigating international sources of green climate finance that may help to underpin the necessary investments.

In the section on agricultural waste management, the report focuses on the potential to ameliorate one of the most visible of Egypt's environmental problems, the 'Black Cloud' that engulfs much of Cairo at certain times of year, as a result of the burning of agricultural waste. There are multiple potential uses of this waste, including conversion into energy in different forms, the production of compost, the production of animal feed, and as a substrate for the production of food crops such as mushrooms, all of which could generate significant job and export opportunities.

Once again, the most obvious way to create a more enabling environment for the development of the agricultural waste sector would be to reduce energy and fuel subsidies, and to a lesser extent fertiliser subsidies, which would generate increased demand for alternative sources of fuel, energy and compost, and thus stimulate demand for agricultural waste as an input. Other recommendations include:

1. Enforcing more strictly the ban on the burning or unauthorised dumping of agricultural waste, which would increase the supply of the raw material.
2. Consideration of the optimal location and number of authorised dumpsites and exploration of different models of public and private provision of these dumpsites, and associated economic incentives.
3. Pilot projects to explore the financial viability of the different potential uses of agricultural waste, and a more coordinated approach to investment in pilot projects.
4. Investment in R&D, and promotion of networks and linkages to facilitate commercialisation.
5. Assessment of the potential to access different forms of climate finance for such projects.
6. Research, data gathering, and analysis, in order to inform the development of a strategy.
7. Feasibility studies, investigation of export markets and matchmaking between market participants.
8. Discussion with market players to identify skills gaps and ways to plug them.

Suggested priorities for MTI specifically, are listed in the box below.

Generally speaking, in order to encourage green growth across all relevant sectors, the first priority is to create the incentives that will motivate private investment, and make it financially viable, which can either be through the removal of disincentives (e.g. fossil fuel subsidies), through explicit public funding, or through innovative use of ‘carrots’ to reward businesses demonstrating appropriate behaviours (which are better than ‘sticks’ which are harder to enforce). In parallel to this, there is a strong need within the Egyptian context to raise awareness amongst the public and business sector, about both the environmental costs of ‘business as usual’, and the potential market opportunities and financial, economic and social benefits of new green solutions and technologies. Thus there is a need for education and media campaigns, consultation processes, public/private dialogue, and civil society engagement strategies.

Once demand and awareness has been created, the priority will switch to building local capacity and skills in order to overcome any supply constraints and thus maximise the benefits to Egypt in terms of growth opportunities and job creation. However, where market demand is strong, private players may be expected to begin to respond in a more concerted way, thus ameliorating some of these supply side constraints themselves.
A coherent, joined up government strategy is ideally needed to achieve these objectives most effectively, setting out a clear vision for the future, and an action plan specifying the targets, timeframes, resources, responsibilities (incl. public sector vs. private sector), and success indicators.

To conclude, there is significant potential to achieve green growth in a number of sectors within Egypt. However, the current political uncertainty is an enormous disincentive to private investment, so the sooner greater clarity is achieved on the future Government’s economic stance and policy direction, the better. However, it is clear that environmental issues are not currently top of the political agenda within Egypt, and public awareness of the impending problems is very limited. Nonetheless, once Egypt has a new Government in place, perhaps with a much stronger mandate to make transformational changes, the potential to make progress on these issues may be stronger than it has ever been before.
Suggested priorities for MTI

**Renewables sector**

**Long term goals**
- Push for: fossil fuel subsidy removal; implementation of the National Electricity Law; improved regulatory framework for renewables; and development of a cross-Ministerial strategy to develop the sector.
- Explore public/private partnership framework to invest in connections of renewable energy generation installations to the grid.

**Potential quick wins**
- Take steps to reduce disincentives for foreign investment in renewables incl. speeding up the investment process, creating a one stop shop for potential investors, and signalling welcome to foreign investors.
- Introduce licensing requirements or ‘carrots’ for industrial energy users to incentivise use of renewable energy.
- Undertake awareness raising activities, develop quality standards, and support the provision of accompanying training for local SMEs so they can better serve domestic renewables industry.

**Green construction sector**

**Long term goals**
- Push to build on current dialogue approaches pursued by EGBC, in order to develop a green construction strategy, review and adjust existing standards, strengthen enforcement, and develop performance rating / labelling schemes.
- Work with the private sector to identify where there are gaps in the availability of suitable materials and technologies within Egypt, and explore the possibility to promote the development of these industries locally.

**Potential quick wins**
- Work with financial institutions to improve access to credit for the upfront costs of energy efficiency measures, or to provide subsidised credit programmes or credit guarantee schemes.
- Work through schemes designed to support SMEs and professionals involved in the sector, to raise awareness of market opportunities and build relevant skills and capacity, including helping SMEs to comply with standards.
Agricultural waste management industry

Long term strategies

• Through dialogue with the private sector, analyse industrial and trading opportunities arising from agricultural waste, and undertake market assessment / feasibility studies to understand the opportunities and constraints.
• Work with other government departments including MALR to tackle these constraints, identify priority areas for reform and support, and develop an institutional and regulatory framework that effectively underpins market development.
• Establish a network of relevant stakeholders, including the agribusiness industry, to discuss and develop a strategy for the sector, and to make linkages between different parts of the supply chain, in order to stimulate market development.

Potential quick wins

• Through public-private dialogue, explore the feasibility of creating incentives for private developers to establish private waste management plants.
• Establish a communication strategy and action plan to raise awareness and community participation in existing market opportunities.
The objective of this study is to identify the key opportunities for green growth in Egypt, discuss the framework conditions necessary for achieving them, and make policy recommendations.

Green growth opportunities are defined as those which achieve the triple goals of (i) economic growth, (ii) social inclusivity, and (iii) environmental sustainability or improvement. Green growth is often construed as a more positive agenda than sustainable development, as it focuses attention less on the trade-off between economic and environmental goals, and more on the economic opportunities that are generated by efforts to improve environmental performance. It seems likely that there will sometimes be trade-offs between economic and environmental goals, but that there will also be many occasions when these goals will be mutually consistent and reinforcing. These will be defined as ‘green growth opportunities’ for the purposes of this study. The social dimension is addressed by prioritising these opportunities in terms of their potential to generate jobs, thus allowing the benefits of these new opportunities to be shared in a socially inclusive manner.

It is often argued that achieving green growth requires transformative change in the way that economies are run – a significant departure from ‘business as usual’. In other words, the concept and objective of green growth needs to be ‘mainstreamed’ into all aspects of economic policymaking. It also requires that the private sector itself recognises (i) the threats to their existing business models posed by environmental challenges, and (ii) the new market opportunities and scope to achieve improved competitiveness associated by investing in new ‘greener’ business models and technologies. It is argued that if the private sector in a particular country does not respond to these risks and opportunities, perhaps because of lack of awareness or capacity, it will be competitively disadvantaged in the long term, as other firms develop more sustainable business models and gain a first mover advantage. Public policy has an important role to play in incentivizing and facilitating the private sector to respond to these challenges in a timely way.

The study has been commissioned by GIZ, with a view to assisting the Egyptian Ministry of Industry and Foreign Trade (MTI), and the Egyptian–German Private Sector Development Programme (PSDP) on behalf of BMZ, to further promote green growth and green job creation in Egypt.

MTI’s primary objectives are to promote sustainable economic growth and employment generation, particularly through the promotion of small and medium-sized enterprises (SMEs), and the development of the local manufacturing industry. Much of PSDP’s work has focused on improving competitiveness, particularly of SMEs, and has operated mainly at the meso and micro level. GIZ more broadly already has a number of programmes in Egypt which could contribute to green growth.

In addition, there has been quite a lot of Government-led work designed to promote the development of sectors which may contribute to green growth. Thus there is a good amount of existing work and analysis to draw on. This study is designed to help show how linkages might be made between the meso / micro level of engagement that has been where most PSDP activity has been located to date, and the macro level framework conditions which ultimately guide the incentives facing private sector actors in Egypt.

The aim of the study was to identify a small number of sectors where there are significant opportunities for green growth and job creation, that can potentially be achieved in a reasonably short time frame, and at relatively low cost to the public budget. In other words, to identify low hanging fruit, and explain in practical terms how they can be harvested.

This is crucial given the current juncture within Egypt, where public resources are very tight, and where employment generation is a priority for a transition government facing enormous public pressure to deliver new political freedoms and economic opportunities. Although environmental concerns are not currently high on the political agenda, nor is there much awareness about
the problem amongst the public, it is nonetheless a serious looming problem that will need to be tackled within Egypt sooner rather than later.

Building on initial suggestions coming out of previous engagement and consultation processes, as well as a review of the existing literature and a stakeholder consultation, the team identified three broad and inter-related sectors of focus for this study: (1) Renewable energy generation and renewable energy applications; (2) the construction sector; and (3) the agricultural waste sector.

These sectors were chosen on the basis that they:

- had significant potential to generate green growth and jobs;
- could make a clear contribution to environmental improvement; and
- that this could be achieved largely through private sector action, at limited cost to the taxpayer, if the enabling conditions were put in place through an appropriate policy framework and supportive institutional environment.

Initial ideas for the sectors of focus were drawn from previous work by GIZ, by suggestions from stakeholders consulted, and by reviewing the literature. This was narrowed down to three sectors on the basis of our own (qualitative) economic analysis in each case of:

- the size of the potential market opportunity;
- the labour intensity of production in that market;
- the availability of the necessary qualification base (determining potential even if not existing skills) in the local labour force;
- the main barriers to market development, and the extent to which they could be overcome reasonably rapidly through policy and institutional reform; and
- the associated costs and trade-offs which also determine political feasibility.

The next three sections consider each of these sectors in turn, discussing the opportunities associated with them, the current framework conditions governing them, and policy recommendations that could help to unlock those green growth opportunities. Framework conditions analysed include:

- The overarching legal and regulatory framework within which the sector operates, including Ministerial oversight and relevant Government policies and strategies for that sector;
- Important policy determinants e.g. laws, regulations, standards, subsidies, taxes, investment rules etc.
- The political economy of potential policy reform;
- The institutional framework e.g. regulatory bodies, trade associations, voluntary standards, public/private partnerships, donor engagement;
- The current state of demand and supply, both internationally and locally, and how that might evolve in future;
- Local supply conditions and challenges;
- Skills requirements and availability;
- Knowledge / awareness amongst relevant players and cultural factors;
- Any additional market failures identified and not yet covered under previous headings.
2 Renewable energy generation and renewable energy appliances

2.1 The opportunity

There are a range of specific green growth opportunities arising in this sector. Renewable energy generation – both wind and solar – is hailed as an area of strong potential comparative advantage for Egypt as a result of its geography, with high wind and sun potential. However, energy subsidies which are keeping fossil fuels cheap, are prohibiting the development of the renewables sector, which has fallen behind in terms of size and performance compared with other countries.

If the renewable energy sector can be developed in Egypt this presents opportunities for jobs in production, inputs, parts, maintenance, servicing and other related industries. It can also generate export revenues given the growing global demand for renewable energy.

The wind energy sector

Maturing wind generation technology, increasing oil prices, and a desire in many countries to reduce reliance on fossil fuels, (bolstered by increasing financial incentives, emissions reductions commitments, and a desire for energy security), is resulting in fast growing demand and investment in installed capacity in wind generation at the global level. Egypt has a strong economic wind energy potential, (ranked fifth in the countries of the EU-MENA region) due to its geography, particularly within the Gulf of Suez and the western desert region. However, Egypt’s investment in wind energy generation is very low relative to other countries within the region; total current capacity is 550MW, but it is estimated that the Gulf of Suez alone has a potential for 20,000MW of wind capacity. The contribution of wind to overall national electricity production is still less than 1%. The wind generation sector is currently almost completely state-run and donor funded.

However, Egypt’s Renewable Energy Strategy stipulates that 20% of total electricity generation will come from renewables by 2020, including 12% from wind and 8% from hydropower (MOEE, 2010). If policies are put in place to implement this goal, this would generate significant investment in wind energy. The observed positive market reaction to the announcement of plans to increase the contribution of wind energy to the electricity grid is a clear indication that the Egyptian private sector is willing and able to react to clear signals.

Technologies are maturing as a result of large scale implementation in the last few years, and there are now new business opportunities, capitalising on expected increases in electricity tariffs and a more liberalised electricity market. There are opportunities for both small stand-alone wind turbines, and also larger wind-parks which can be connected to the national grid.

Many jobs may be generated up and down the supply chain for the wind energy generation industry, from local manufacturing of parts, through to operation and maintenance (O&M). Local manufacturing industry is now beginning to develop to support the wind generation industry. The private Sewedy Group has established El Sewedy for Wind Energy Generation (SWEG) which is building capacity through alliances with international suppliers. It has developed some local manufacturing capability including in wind-turbines and tower manufacture. Local manufacturers are also able to supply cables and transformers. All of which can generate local jobs.

Currently no O&M companies exist in Egypt, as these activities are undertaken by the New and Renewable Energy Authority of Egypt, (NREA), though SWEG has plans to establish an O&M company. Existing wind farms have been breaking down, and there has been a serious shortage of skills within Egypt to maintain them.

The solar energy sector

Egypt is one of the world’s most attractive sites for solar energy thanks to ample sunlight and proximity to existing and potential energy grids. Solar energy can be harnessed through various technologies including:
1. Photovoltaic (PV) technology that produces electricity directly from solar energy;
2. Solar heaters;
3. Concentrated Solar Power (CSP) systems, which produce steam that can be used for industrial purposes, for water desalination, or in a turbine to produce electricity.

These need to be considered separately.

Photovoltaic technology is expensive to install, and currently not competitive with wind power generation, though as technology develops it could become more competitive in future. Egypt has high PV potential, which is as yet largely unexploited. No grid-connected PV generation systems currently exist in Egypt. Rather PV technology is used in specific stand-alone applications (e.g. solar powered mobile telephone towers) or in unconnected power generation systems, where it is used for parts of an industrial load (e.g. lighting). It is also the main power supply for some villages, as part of demonstration projects funded by donor agencies. A feed-in tariff for PV would help to develop the market, but it is not expected to be introduced until the tariffs for wind energy have been established.

Local manufacturing of PV technologies is very limited and there is heavy reliance on international suppliers. However, the industry generates some job opportunities for local service providers and installers. A study on local content potential for PV and wind energies showed significant potential in decentralised PV.

PV activities have been fairly limited, to small applications in remote areas that are not connected to the grid. As nearly 99% of Egypt’s population is connected, there does not seem much potential expansion possible in terms of residential demand, unless different patterns of demand and supply are developed for PV technologies. However, demand for stand-alone PV power supply systems is high within the communication sector (e.g. for mobile phone networks), and for military, aviation and navigation aids, and for signs on highways. The total installed capacity of PV applications reached about 6 megawatts by mid-2008.

Solar water heaters can be used in both residential and commercial contexts, and are placed on rooftops in order to capture solar radiation to produce hot water, which is then held in storage tanks. This is a relatively low-tech option, and could be highly cost-effective, significantly reducing energy bills. However, investment costs for solar water heaters are relatively high compared to prices of conventional heating equipment (electric or gas heaters), and the subsidisation of fossil fuel energy reduces incentives for its adoption, and as a result the local market remains limited and undeveloped.

There is more local manufacturing of components for solar water heaters than other renewable technologies. According to the Egyptian Competitiveness Report 2010, there are around 4 local companies manufacturing and installing water heaters, and another 5 which install imported systems. Although most components and raw materials are available in the Egyptian market, around 90% are still imported. If ways can be found to increase and enhance the quality of locally produced components and raw materials this could be another potentially significant source of job creation.

It has been estimated that 250,000 solar water heaters were installed by 2007, resulting in greenhouse gas emissions savings of about 0.25 million tons CO2 equivalent annually. Another study estimates that this represents only around 5% of the national potential market. This implies that 100% coverage would save in the order of 5 million tons CO2 equivalent annually.

There is great potential for increased demand if the framework conditions were improved, and already significant demand from the commercial sector, (though this is largely being met through imports currently, because of the poor quality of locally manufactured solar water heaters). This sector thus represents a potential low hanging fruit.
Concentrated Solar Power (CSP) systems produce steam that can be used for industrial purposes, or in a turbine to produce electricity, or for water desalination. Although technical potential for CSP is significant within Egypt, integration of CSP in industrial processes remains very limited, although there are some CSP projects scattered across Egypt. Thus demand is still very limited and stimulated by NREA. There are currently no clear plans for expanding CSP.

However, a recent World Bank (2011) study assessing the local manufacturing potential for CSP projects in the MENA region found that in the Kuraymat project establishing a CSP plant in Egypt (involving Orascom industries), around 60% of the value was generated locally rather than from international players (though some of the key components had to be sourced from international suppliers), which compared favourably to other projects implemented in the MENA region. They noted that this enabled those firms to gain knowledge which they should be able to use for future CSP projects, and concluded that local industry is already capable of developing and building CSP projects in Egypt, and that this experience should become a reference point for CSP projects in the region. So once again the potential for local industrial development and job creation is clear.

They also noted that Egypt had for a long time been a regional leader in the glass industry which is valuable for the renewables sector, but that the industry now faces a challenge in adapting its capacity to higher technology content, noting that MENA countries now need to become ‘centres of excellence’ rather than relying on their traditional position as low cost, low skilled manufacturing centres.

2.2 Framework conditions

The potential for development of the renewable energy sector in Egypt is highly dependent on framework conditions governing the energy sector as a whole. Egypt has oil and natural gas reserves, but these are being depleted quickly, and it will be difficult to maintain this high rate of production going forward, as the cost of extracting remaining resources is expected to increase significantly, and likely to become prohibitively expensive. Egypt has in recent years become a net oil importer, and with demand for energy in Egypt growing fast, and a constrained supply, Egypt could potentially face a serious energy shortage in the near future, and require increasing imports, which would reduce energy security and make Egypt more vulnerable to international oil price shocks.

Despite these serious impending problems, both oil and gas are subject to heavy subsidies, which clearly incentivise higher fossil fuel use and more energy intensive forms of production and behaviour by firms and households alike. These subsidies also seriously undermine the incentives to invest in renewable energy technologies, as it means they are much more expensive than the subsidised fossil fuels. Price distortions favour energy intensive industries at the expense of labour intensive industries. This is undoubtedly retarding Egypt’s participation in new, high growth industries and technologies and threatens the long-term energy competitiveness of the Egyptian economy.

The subsidies also cost an enormous amount of public money, which is crowding out expenditure on public services, and looking increasingly untenable at the current juncture, with the public finances facing growing difficulties. There has been pressure to reduce energy subsidies for many years, but there are significant political economy barriers to their removal which have significantly hampered progress.

Nonetheless it is inevitable that over time the price of renewable energy will fall and the price of conventional fuel will rise. This by itself should generate an incentive to invest for the long term. Indeed, previous to the revolution there was quite a lot of investment into both conventional and wind energy projects, though the political uncertainty is now hampering further investment.
The 3 independent power providers made good profits over the last 10 – 15 years, and private energy generation is seen as a potentially lucrative opportunity, with Egypt often also acting as a gateway to the rest of region.

The Government has now said that it will remove subsidies from energy-intensive industries such as cement, steel and fertiliser and has set out a schedule for achieving this. This has resulted in some investment in alternative forms of energy by those companies.

Although Egypt is now a net oil importer, it continues to export oil and gas under long term contracts. But since the world oil price has increased considerably in recent years this has meant that export prices were lower than spot world market prices. This represents an enormous opportunity cost, and has led to the renegotiation of a number of contracts.

More generally, all aspects of the energy sector are dominated by the state, which is responsible for more than 99% of all generation. The transmission utility is a state owned monopoly, the distribution utilities are also state owned, and bulk sale prices are regulated by the state. All of this prevents or strongly discourages private involvement.

A new Electricity Law was endorsed by the Cabinet in 2008, though it has yet to go to Parliament, which will now take place at the end of 2012 at the earliest. The law will gradually permit more private involvement in the energy market, by allowing third party access to the infrastructure owned by the Ministry of Electricity, and unbundling ownership of the distribution system. This will facilitate private sector investment in energy generation and distribution. Competition will be encouraged by allowing a limited number of qualified consumers to contract directly with generators. This will be phased in gradually, with some flexibility to avoid market shocks, but a timetable will be set and announced in order to provide the clarity needed by private investors. Privatisation could potentially transform the market for independent service providers.

The same approach will be taken to the market for renewable energy generation. The Electricity Transmission Company and distributors will be mandated to connect renewable energy power plants to their networks. The NREA will call for competitive bids to construct renewable power plants, and the transmission company will also call for competitive bids to construct connection infrastructure. In due course, a feed-in tariff will be introduced for the purchase of renewable energy. To help cover the grid’s costs to support renewable electricity, a Renewable Energy Fund will be established. Its main source of finance will be the subsidies saved from fossil fuels, which otherwise would have been used for electricity generation. These reforms will undoubtedly move things in the right direction, if and when they are implemented.

Thus there is a plan to involve private companies in wind generation in future through a competitive bidding process, initially with associated guaranteed long-term power purchase agreements to reduce risks for investors. The plan is to target highly qualified international developers with strong finances and offering significant technology transfer. Preference will be given to those committing to use a higher share of locally manufactured components. In due course a feed-in tariff will be introduced, taking into consideration the prices achieved in stage one.

There is currently very limited scope for trade in energy as physical interconnection between Egypt and neighbouring countries is weak. This limits the potential for domestically generated renewable energy to be exported to Europe or other countries where demand for renewables is likely to grow. Strengthening the interconnection is likely to be very costly and does not seem imminent.

Beyond the large scale wind generation industry, the local market for renewable energy applications (e.g. solar water heaters, and photovoltaic technologies) is undeveloped. Overall awareness of the availability of these products – and of their potential financial viability – is
very low amongst potential consumers, and the local companies supplying these products are not well known either. There are some SMEs operating in the market, but they tend to lack technical and financial capacity to expand.

In addition, SMEs involved in the renewable energy sector are poorly supported and weakly networked, and have no association to represent them and interact on their behalf with other stakeholders such as policymakers, regulators, and donors and consumer organisations.

As a result the market for local renewable energy applications does not seem to be working well. Despite what seems to have been a reasonable level of existing demand for some potentially locally-produced appliances, such as solar water heaters e.g. by hotels and restaurants, these do not seem to have been available from the local market, and have instead had to be imported, or dropped from plans. This may be partly because of the poor quality of locally produced solar water heaters in the past. Grant funded NGO programmes to install solar water heaters have sometimes undermined market development by paying insufficient regard to the quality and ongoing maintenance of units supplied, giving the whole sector a bad reputation.

There seem to be many skills gaps that need filling. For example, there is a severe shortage of skills to maintain wind farms. The system for vocational education in Egypt is highly fragmented and there are no common standards for qualifications. The Ministry of Environment does not have a mandate to identify skills gaps and develop qualifications to address them.

The culture of entrepreneurship is relatively limited within Egypt, as most well qualified individuals have traditionally seen formal employment as the optimal form of livelihood – indeed almost as an entitlement – and thus do not see entrepreneurship as a desirable alternative. This weak entrepreneurial culture is also reflected in the banking sector, which tends not to serve the SME
sector well, or to be good at evaluating new small business prospects. However, arguably the binding constraint is know-how rather than access to finance for the SME sector. While for investments with a long payback, access to finance may present more of a binding constraint. A shortage of patient capital for long term projects is a problem in many countries globally.

2.3 Policy recommendations and economic considerations

Policies have clearly been starting to move in the right direction, although it remains to be seen whether the policy direction will remain the same under the new government, and whether the planned policies are actually implemented. The current political uncertainty is an enormous disincentive to private investment, so the sooner greater clarity is achieved on the future Government’s economic stance and policy direction, the better.

The removal or reduction of fossil fuel subsidies is clearly a key element of the framework conditions that would be conducive to development of the renewables sector. Reducing fossil fuel subsidies represents a significant win-win, as it would save a lot of public money. But it would also, of course, push up prices to users. This generates three main areas of concern:

1. Whether the removal of subsidies will hurt poor people. But energy subsidies do not target the poor well. A high proportion of the subsidies go to large consumers of electricity, which tend to be people in high income brackets e.g. owners of high energy consumption cars, and energy intensive industries who can then make excess profits. Sustaining energy subsidies limits the Government’s ability to invest in health, education and infrastructure, which are important for the country generally, and particularly for the poor. Replacing energy subsidies with monetary payments to poor households is one option that may be politically expedient, and would also be a more efficient way to target the poor with assistance.

2. Whether the removal of subsidies will damage the private sector, by driving up costs and reducing their competitiveness on world markets. The counter argument is that artificially low energy prices are significantly distorting the market, making Egypt’s production methods and general way of life highly energy intensive, which will reduce the competitiveness of Egypt in the long term. Price distortions favour energy intensive industries at the expense of labour intensive industries, so maintaining energy subsidies may be retarding Egypt’s participation in new, high growth industries and technologies. In fact the removal of fossil fuel subsidies could help Egypt to benefit from first mover advantages. There will be winners and losers in the global transition to cleaner energy, and pioneering countries will develop industries and technologies which will open avenues for indigenous development and export, alongside opportunities for outward FDI generating new markets and profitable investment opportunities for the Egyptian private sector. The growth of energy intensive industries while energy is artificially cheap is likely to become a liability in the medium term.

3. Whether the removal of energy subsidies will damage traditional fossil fuel producers within Egypt. Even this is unlikely to be a significant problem, as demand is growing faster than supply, and Egypt’s reserves are projected to run out in the not too distant future, so the exploitation of fossil fuels is likely to continue to the extent possible in any case, even as alternative energy sources are developed.

Thus there is little economic downside from the removal of fossil fuel subsidies. However, some of the necessary changes will be politically challenging, and have been stymied in the past by vested interests opposed to reform. Removal of fossil fuels subsidies has been a challenge in many other countries, as they are both unpopular with big business, which claims their removal will undermine its competitiveness, as well with the public,
who fear it will push up household energy prices – particularly affecting the poor. In practice fossil fuel subsidies tend to disproportionately benefit richer people, who have higher energy consumption, so are not a good way of targeting assistance to the poor. Yet this is a strong coalition for government to fight, and many countries maintain fossil fuel subsidies for this reason.

The considerations above suggest that subsidies should be phased out over time, to give people time to adjust, and should be undertaken in a politically sensitive way, that neutralises vested interests opposed to reform, and focuses on how money that is saved will be spent in future.

This may involve compensating those groups who are losing out from the reform, and it could also involve the establishment of a new, better targeted welfare system to support the poor. In addition, some of the subsidies should be redirected to supporting renewable energy, as is currently planned, notwithstanding the need to use some of the savings to pay down debt and improve the public finances.

In addition, ways can be found to reduce subsidies that will stimulate other green improvements. For example, the Energy Efficiency Unit of the Supreme Energy Council has proposed a new concept for a scheme whereby the price charged to a business for electricity depends on how energy intensive it is compared with the average for the sector. If is higher than the average level of energy intensity, the business must pay a higher price.

Thus the process of reducing energy subsidies clearly needs to be implemented carefully, but given the strength of the case, and the fact that action will be urgently needed in order to sort out the public finances in the short term and avert energy crises in the medium term, and given there will be a new Government in place, potentially with a much stronger mandate to make transformational changes, the potential to make progress on this under the new Government looks perhaps stronger than it has been before.

However, even in the absence or slow implementation of subsidy reduction, it should be possible to make progress in developing the renewables sector, through improvements in the enabling environment and other framework conditions governing the sector. In any case, given that growth in demand is outpacing growth in the supply of fossil fuels, and prices of conventional fuels will inevitably rise going forward, while the cost of renewables will fall, the longer term direction of travel seems inevitable, and this in itself should strengthen investment incentives.

What is ideally needed is a planned and determined shift to renewable energy: a clear, long term, holistic implementation plan for the development of the sector, which gives consideration to private sector incentives, likely developments in both domestic and international demand for renewables, and technological innovation, and which considers how the whole supply chain can be developed to generate a competitive industry along with broad based growth and job generation. The policy should set out targets, timeframes, resources, responsibilities (incl. public sector vs. private sector), and indicators and needs some flexibility to respond to changing conditions, as well as more detailed plans for the short term.

It should be developed in conjunction with the various relevant Government Ministries, the private sector, and civil society, (including universities and researchers developing new technologies), while attempting to predict and address political economy barriers to action. An appropriate institutional set up is needed to achieve this. The existing Supreme Energy Council may have adequate authority to do this successfully, but will have to overcome challenges associated with inter-Ministerial policies and inconsistencies within current mandates.

Such a holistic framework or Action Plan – if credible – would provide the increased clarity needed to create the right incentives for the private sector to invest and innovate in renewables. The positive market reaction to the announcement of plans to increase the contribution
Box 1: Case study on PROSOL

The Tunisian Solar Programme (PROSOL) – a joint initiative of the Tunisian National Agency for Energy Conservation (ANME), the state utility Société Tunisienne de l’Electricité et de Gaz (STEG), and the United Nations Environment Programme – provides an example of successful solar thermal market development. It took a holistic approach, actively involving all the sector stakeholders, including the banks. The project incorporates: (i) a loan mechanism for domestic customers to purchase SWHs, paid back through the electricity bill; (ii) a capital cost subsidy provided by the Tunisian government; (iii) discounted interest rates on the loans which were progressively phased out; (iv) supply side promotion; (v) establishment of a quality control system; (vi) an awareness raising campaign; (vii) a capacity building program; and (viii) carbon finance through the CDM.

Over 50,000 Tunisian families now get their hot water from the sun, and as of 2008, PROSOL helped avoid 214,000 tonnes of cumulative CO2 emissions. Jobs have been created as 42 technology suppliers were officially registered and at least 1000 companies installed the systems. The annual avoided subsidies of displaced LPG for the Government were estimated at around $3 million in 2008.

of wind energy to the electricity grid is a clear indication that the Egyptian private sector is willing and able to react to clear signals. The already planned liberalisation under the Unified Electricity Law and the removal of fossil fuel subsidies may be expected to have significant impacts on private investment, if progress towards them is credible. However, much more could be done.

Specific policies that could be adopted within the context of an Action Plan as set out above, potentially with the support of international donors, could include:

1. Public education of benefits (e.g. in terms of energy savings and future risk mitigation) and public-private dialogue in order to mobilise support for the required transformation. This should be based on an informed assessment of the costs and benefits of different approaches, and also the costs of inaction, to make a strong case. National, informed dialogue is the first step needed to get this transformation underway. The Egyptian public currently has a fairly limited awareness of either the looming threats or the potential opportunities Egypt faces.

2. Political economy considerations / analysis designed to understand poverty impacts and to identify and address the vested interests who are likely to be opposed to the reform. The development of political tools will be needed to neutralise the potential mobilisation of these vested interests.

3. Use of economic incentives to stimulate private investment e.g. procurement policies, differential pricing and taxation to promote renewable technologies, financing mechanisms etc. Other than the expected Unified Electricity Law, the main policy promoting renewable energy technologies is the reduced customs tariff for equipment and components.

4. Effort should be made to attract foreign investment in renewables. There is also a need to speed up the process for investment in the renewable sector (i.e. tenders should be handled more efficiently). A one stop shop could be set up for all potential investors, including small wind farms. At the same time, service providers from abroad could be required to train local counterparts within Egypt to facilitate skills transfer.

5. Use of licensing requirements for industrial energy users to incentivise use of renewable energy. For example, new cement plants are already required to provide their own energy sources, and this has stimulated their interest and investment in stand-alone renewable energy generation projects. Similarly, the Government could introduce a requirement that some proportion (e.g. 25%) of energy in hotels should come from solar energy sources over a certain time period. Or if a property developer uses solar water heaters they will be given a licence to build more rooms or more apartments.

6. Use of downstream regulation e.g. new building codes, to incentivise or require use of technologies such as solar water heaters (as discussed further in the next section).

7. Investment in connections of renewable energy generation installations to the grid. This can potentially be at least partly privately financed, if there is sufficient liberalisation (e.g. of transmission, distribution, pricing etc.), to allow private involvement. The proposed new Electricity Law states that it will be the state-owned transmission and distribution utilities that will construct and finance new connections. International experience has shown that relying on the establishment of these connections through state owned utilities can become a major bottleneck to development of the sector. This is particularly true when state owned utilities are likely to suffer from a shortage of investment capital at times when the country is in financial difficulties. Thus some form of public private partnership framework should be sought.

8. In the longer term, investment in infrastructure to facilitate the export of solar power based electricity.
This is likely to generate much stronger incentives for renewable energy development, particular in light of trends coming from Europe to purchase more renewable energy, and the opportunities associated with emissions trading schemes. In the meantime, it could be possible to explore a virtual market whereby natural gas is exported and is paid for by European consumers under a carbon market mechanism, if it is being replaced in the domestic national grid within Egypt by solar energy.

9. Development of a clear regulatory framework for the renewable energy industry, and the development, testing, certification and enforcement of standards e.g. quality standards for solar water heaters, under the Egyptian Electric Utility and Consumer Protection Regulatory Agency.

10. Some reorganisation of the bodies governing the sector may be required. The New and Renewable Energy Authority (NREA), an organisation affiliated to the Ministry of Electricity and Energy, currently has responsibility for developing the renewable energy sector in Egypt. However, this means it has responsibility both for policy on renewables, as well as developing, operating and maintaining most wind farm projects within Egypt, which could represent a potentially significant conflict of interest, particularly following liberalisation and greater private sector involvement in the sector.

11. A clear strategy for the development of the solar energy sector would also make sense, building on the strategy already articulated for the wind sector.

12. Policies to promote local production of inputs for renewable energy technologies, both to generate jobs and economic opportunities locally, and to avoid negatively affecting the national trade balance through increasing imports. Indeed, the current import incentives for components of renewable energy generation need to be revisited and tailored to optimise the pace of transformation and the development of the local supply chain. The creation of a local industrial base to serve this growing industry could also provide an important political asset to sustain progress in the initial stages of the transformation. This should be focused on the wind energy sector in the first instance, as that will have the most growth potential initially.

13. However, policies to stimulate local production also need to balance the short term costs of requiring local input production, which will depend on existing local production capacity, and its quality, cost and reliability vis-à-vis imported components. For example, it may be best to put in place incentives for 20% of solar water heaters to be locally produced, with a target to increase that proportion to 40% within a specified time frame. If too strict, local input requirements can jeopardise the success of the sector as a whole. This will clearly vary product by product. Policies to promote localisation of supply should therefore be designed carefully to promote and incentivise improved local production over time, with minimum short run cost to downstream users, and also with the aim of reducing investment costs in the long term, thus improving the feasibility of the renewable sector in Egypt.

14. Capacity building and development of the SME sector is also required, including the development of SME networks, and perhaps the creation of an umbrella body that can undertake roles such as establishing an up to date catalogue of suppliers, providing a repository of market information to keep involved SMEs up to date with new developments, provide matchmaking services between suppliers and consumers, undertaking value chain studies, developing marketing materials and training courses, and providing representation within policy debates.

15. Increased funding and support for energy R&D, and mechanisms to facilitate coordinated R&D, linking
Construction of a wind farm near Zafarana
the various players involved to each other and to market players. This could build on the approach adopted for the GIZ-supported Innovation Networks which already cover 9 different sectors including solar water heaters and green construction. Feasibility studies, and the introduction and expansion of demonstration projects in the different technologies could also be valuable, alongside the strengthening of intellectual property rights. Development of necessary skills and accredited training courses. Specific training is needed to improve local capacity in design and construction, operation and maintenance, and engineering. Undergraduate and postgraduate courses are required, with accredited qualifications established in cooperation with NREA. A process of identifying key skills gaps should be undertaken. MTI’s Productivity and Vocational Training Department (PVT) can address vocational training for green sectors, but there is also a need for a more coordinated approach to developing technical and vocational education and training, with inter-Ministerial cooperation including with the Ministry of the Environment. It is also important to discuss with other market players how best to provide training e.g. through public or private provision.

16. New financing mechanisms for SMEs. Most SMEs seem to finance start-up from their own funds. There does not seem to be a strong culture of lending to SMEs within the banking sector. Policies to encourage banks to develop new lending streams for SMEs, and some form of subsidisation (e.g. in the form of loan guarantees) could be considered in light of the substantial externalities, and to facilitate demonstration to banks of the potential commercial value of this sector. In addition, financing mechanisms to support the upfront investment in renewable energy by consumers may also be considered.

17. The Clean Development Mechanism has been used for three wind projects to date in Egypt. Further consideration should be given to the potential for both public and private climate finance to contribute to investment in the renewable sector in Egypt. Streamlining procedures, particularly those related to the Designated National Authority (DNA) may assist with the aim of accessing private investment funds. The development of a mechanism or umbrella organisation (e.g. a sustainable energy users association) to aggregate small projects together into larger projects could also facilitate increased access to mechanisms such as CDM.

A GTZ / MTI study on the prospects for the renewable energy sector in Egypt produced in 2009 also sets out a detailed proposal for a ‘roadmap’ to achieve the development of the sector.

There are some risks associated with future oil and carbon prices, and technological developments which may result in competitive dominance of one form of renewable energy over another. However, there will always be some uncertainties, and there are substantial risks and costs associated with inaction as well, thus calculated risks will need to be taken going forward, and diversification e.g. into different types of renewables may be recommended to minimise those risks.

In sum, if the new energy law is implemented it should generate more jobs, and as there is growing demand for energy, these jobs are unlikely to be at the expense of jobs in the fossil fuel energy generation sectors – they are perhaps more likely to be at the expense of imported fuel. While it is possible that in the short run at least, the cost of domestically produced renewable energy will be higher than fossil fuel imports, there are many significant long run gains to set against this short term cost, such as energy security (bearing in mind the substantial fiscal burden of higher net imports of oil if oil prices continue to rise or spike in future), jobs, FDI bringing physical capital with associated technological spillovers and human capital investment, development of local manufacturing, and potential future comparative advantage generating future outward investment opportunities.
Long term goals
• Push for: fossil fuel subsidy removal; implementation of the National Electricity Law; improved regulatory framework for renewables; and development of a cross-Ministerial strategy to develop the sector.
• Explore public/private partnership framework to invest in connections of renewable energy generation installations to the grid.

Potential quick wins
• Take steps to reduce disincentives for foreign investment in renewables incl. speeding up the investment process, creating a one stop shop for potential investors, and signalling welcome to foreign investors.
• Introduce licensing requirements or ‘carrots’ for industrial energy users to incentivise use of renewable energy.
• Undertake awareness raising activities, develop quality standards, and support the provision of accompanying training for local SMEs so they can better serve domestic renewables industry.

Box 2: Top priorities for MTI to promote the renewable sector
3 Construction Sector: Green Buildings

3.1 The opportunity

The construction sector contributes around 4-6% of GDP in Egypt and around 7-8% of total employment, including many jobs for low skilled or unskilled workers. In addition, the employment elasticity of the construction sector is high, implying that a relatively small increase in economic activity in the sector will have a significant impact on employment.

At the same time, the construction sector offers significant potential for improvements in energy efficiency. The building sector is the biggest single consumer of final energy worldwide, using 35-40% of energy resources and contributing about a third of all energy-related CO2 emissions. The sector also offers the highest potential for energy savings and the use of renewable energies.

By improving building design, and using well-known technologies such as insulation, solar water heaters, and efficient lighting etc., substantial energy savings can be made – enough to make the initial investment required in energy efficiency improvements pay for itself within a short time period.

Thus at no additional cost to the overall economy, strengthening incentives for energy efficiency in both existing and new building stock in Egypt could stimulate significant numbers of new job opportunities in the construction sector – particularly through the retrofitting of existing buildings with insulation and solar water heaters etc. It would also facilitate the development of – and job creation in – local manufacturing industries involved in supplying the necessary products and materials. As discussed above, the potential for Egyptian produced solar water heaters is particularly clear.

Green construction more generally involves planning, design, construction and maintenance of buildings in a way that achieves resource efficiency and energy efficiency, including greenhouse gas emissions reduction, pollution prevention, noise abatement and waste removal. International best practices have shown that green construction can yield a 40%+ saving on construction costs and improved lifetime performance. The trend towards green construction is becoming increasingly apparent across the whole MENA region, thus mastering it could also increase competitiveness of the Egyptian construction industry, enabling it to become a regional pioneer in this field.

3.2 Framework conditions

Once again, energy subsidies are undermining incentives to adopt energy efficiency measures in buildings. The MED-ENEC project which supported energy efficiency in the construction sector of 10 southern and eastern Mediterranean countries including Egypt, showed in its pilot projects an average saving of 57% of primary energy for heating and cooling, compared to a conventional building in the same country. Such savings should in principle generate strong demand for energy efficiency measures in both new and existing buildings. However, energy subsidies significantly undermined those incentives within Egypt, and meant that the payback period before the cost of any initial investment was recouped (in terms of savings on energy bills), was much longer than it would otherwise have been, estimated at 30 years in the case of Egypt.

Of course, the incentives depend very much on who is paying for the electricity, and who is paying to invest in energy efficiency. As it would likely be homeowners who are investing in energy efficiency measures, but who do not pay the full cost of energy due to the subsidies, their incentives are low. However, by reducing demand for electricity in buildings, energy efficiency measures would also substantially reduce the cost of subsidies paid by the government, thus the government itself will potentially gain financially from the energy efficiency measures over a certain time period, and this may provide a case for government to pay for, or subsidise, the energy efficiency measures itself. However, given short run current financial constraints this may not be feasible, and removal of the subsidies would be the better solution for the economy as a whole.
Green building standards are another important way to incentivise investment in green construction, and could work even in the absence of subsidy removal if enforced properly. The Ministry of Housing, Utilities, and Urban Development is responsible for developing and updating the national Building Energy Efficiency Codes (BEECs). The residential BEEC was introduced by a ministerial decree in 2005 and a commercial BEEC was established in 2009. Both codes were developed with international assistance provided through the United Nations Development Program and the Global Environment Facility. The residential BEEC is expected to reduce electricity for cooling in air conditioned new homes by 20 percent while improving comfort in non–air conditioned new homes. Both codes and a third BEEC for public buildings are mandatory. But the process of BEEC enforcement is still in a very early stage, and compliance is negligible. A comprehensive implementation program was designed but has not been implemented. Thus, basic compliance tools are still lacking and capacity building has not taken place.

The Egyptian Green Building Council, (EGBC) was established in 2009 with an objective to promote green construction, and comprised Government officials from many departments (including MTI), business leaders, NGOs and labour leaders. One of the aims was to encourage building investors to adopt BEECs as well as other sections of existing codes targeted at energy efficiency and environmental conservation.

The EGBC also developed the Green Pyramid Rating System (GPRS), upon which a consultation document was published in April 2011. The GPRS provides three levels of voluntary certification for green buildings based on defined requirements. This mirrors similar schemes that have been developed in other countries, and which provide evidence that owners, investors and the public are starting to place a premium on certified green buildings. Whether this is also likely to be the case within Egypt remains to be seen, and probably depends in large part on the success of associated awareness raising activities and culture change required in order to achieve real improvements in environmental awareness and decision making. Currently there seems to be little awareness and information about the building code among the stakeholders involved.

Another relevant scheme is the Green Star Hotel Initiative, which is a public / private partnership that has been developed by Orascom Hotels, AGEG Consultants and GIZ. It is a voluntary eco-label initiative, by which hotels are awarded a certain number of green stars depending on their adoption of various sustainability and energy efficiency related measures, and thus could potentially increase demand for green construction in the hotel sector. This is a voluntary scheme, designed to respond to the growing environmental awareness of international consumers, who are increasingly questioning the environmental credentials of the various tourism services they consume when travelling abroad. However, this kind of environmental awareness is currently seen much less amongst Egyptian consumers.

Other market failures that are undermining the adoption of energy efficiency measures in buildings include the following:

- Developers and potential clients are not aware of the technical and financial potential of the energy efficiency measures.

- Suppliers and developers (noting that the sector is dominated by SMEs and exhibits a high level of informality) lack know-how for the identification, procurement and implementation of appropriate energy efficiency measures. The informal nature of the sector also discourages investment in skills and training of the workforce. The construction sector supply chain is fragmented, and different players within it have different interests and risk perceptions. There is a lack of skilled engineering, architecture, installation and maintenance capacities.

- There is a lack of financing to pay for the higher upfront costs of green construction. Potential clients
Box 3: Case Study on Green Buildings

The German Alliance for Work and the Environment introduced a major initiative to retrofit German homes. The Alliance is a collaborative effort between the German government, unions, NGOs, and employers’ federations. From 2001–2006, an estimated $5.2 billion of public subsidies stimulated close to $20.9 billion in investment and resulted in 342,000 apartment retrofits by March 2006. Energy efficient measures included improving heat insulation of roofs, windows, and walls; introducing advanced heating technologies and controlled air ventilation systems; and using renewable energy such as PV or solar thermal systems.

An estimated $4 billion was saved through additional tax revenues and reductions in unemployment benefits, along with 2 percent of annual emissions attributed to buildings in Germany. In 2005, the funding was increased to almost $2 billion per year. For every $1.4 billion invested in the program, 25,000 additional jobs were expected.

often do not have the financial capacity and liquidity to bear the upfront cost of energy efficiency investments, even if they are aware of their likely profitability. Egyptian banks have little experience and expertise in evaluating energy efficiency projects, they are usually not interested in the relatively small credit amounts, and do not take into account the higher available income of the borrowers through energy cost savings in future.

- The economic benefits of the energy efficiency improvements often do not accrue to those bearing the costs, particularly when a property is rented out by the landlord to a tenant.

3.3 Policy recommendations and economic considerations

The Egyptian Competitiveness Report recommends that the Egypt adopts a green construction strategy, by convening public and private sector representatives from the construction industry, to develop a plan and establish the standards and incentives for green construction. This strategy development could build on the work and multi-stakeholder approach adopted by the EGBC. Measures could include:

1. The continuation / strengthening of the system of progressive electricity tariffs, a sliding scale for electricity prices, which starts low, but escalates as energy use per unit increases. This would strengthen incentives for energy efficiency measures by property owners. A progressive tariff could also be introduced for gas pricing.

2. Enhancing enforcement of building codes. Investing in more inspectors to strengthen enforcement would create jobs directly, would raise awareness and compliance, and could even be self-financing through the imposition of fines for non-compliance. Alternatively this task could be outsourced to a private company.
3. This should however, be accompanied by a review of regulations and standards to promote energy efficiency. Current regulations may not be effective because they are too ambitious, and thus unrealistic and unachievable for many contractors. Thus it may be necessary to review existing regulations in dialogue with those in the industry, and adapt them as necessary, to make them more achievable, with a view to gradually strengthening them over time. Thus a phased approach could be applied.

4. Performance ratings could be introduced for specific features such as air conditioning and ventilation. Development and marketing of labelling schemes could be undertaken. A major marketing drive and media campaign could be launched in conjunction with the EGBC to raise awareness about its new Green Pyramid Scheme. International quality and energy efficiency management norms (e.g. the ISO standards) could be adopted and adapted for Egypt and promoted in the industry.

5. The introduction of fiscal or other financial incentives e.g. green taxes, eco-taxes, or landfill taxes could be introduced to generate revenue that can be used to subsidise the initially higher costs of green construction, and that can also potentially increase the attractiveness of green buildings. Property developers using energy efficient technologies e.g. solar water heaters, could be given additional rights e.g. extra land, or rights to build more apartments etc.

6. Government procurement requirements could be introduced e.g. requiring that developers abide by minimum energy efficiency standards for Government-financed low income housing projects for example. Energy efficiency requirements for public buildings could be adopted.

7. Working with financial institutions to improve access to credit for the upfront costs of energy efficiency measures, (detailed recommendations for this were provided in the KfW report “Promotion of Energy Efficiency in Egypt through Financial Institutions”)

8. Studies, demonstration projects and awareness raising campaigns for both the industry and consumers, to illustrate the costs and benefits of improved energy efficiency measures. This will work most effectively where there are expectations of increased energy prices going forward.

9. Incorporation of energy efficiency into higher education programmes and increased R&D expenditure and network building between existing R&D players.

10. Working with the private sector to identify where there are gaps in the availability of suitable materials and technologies within Egypt, and explore the possibility to support the development of these industries locally.

11. Working through schemes designed to support SMEs and professionals involved in the sector, to raise awareness and build relevant skills and capacity, including helping SMEs to comply with standards.

12. Investigating international sources of green climate finance that may help to underpin the necessary investments. Sectoral projects could be developed that could qualify for CDM e.g. for efficient lighting or appliances.
Manufacturing of a wind power station
Box 4: Top priorities for MTI to promote the green construction industry

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<th>Long term goals</th>
<th>Potential quick wins</th>
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| • Push to build on current dialogue approaches within EGBc, in order to develop a green construction strategy, review and adjust existing standards, strengthen enforcement, and develop performance rating / labelling schemes.  
• Work with the private sector to identify where there are gaps in the availability of suitable materials and technologies within Egypt, and explore the possibility to promote the development of these industries locally. | • Work with financial institutions to improve access to credit for the upfront costs of energy efficiency measures, or to provide subsidised credit programmes or credit guarantee schemes.  
• Work through schemes designed to support SMEs and professionals involved in the sector, to raise awareness of market opportunities and build relevant skills and capacity, including helping SMEs to comply with standards. |
4 Agricultural waste management

More than 50 percent of the Egyptian population depend on agriculture as their main economic activity, and an enormous amount of agricultural solid waste is generated every year. The sound disposal of agricultural solid waste is thus one of the most pressing environmental problems currently facing the country.

It is also one of the most visible, because the burning of agricultural waste, and particularly rice straw, has in large part been responsible for the creation of what has become known as ‘the black cloud’ of pollutants which affect Cairo and the Delta region during the months of October and November each year.

Egypt is a major rice producer, generating around three million tons of rice straw annually, most of which is still being disposed of through burning in open fields which is both wasteful, inefficient, and highly polluting. However, this continues largely because of the costs, time pressures, and logistical difficulties associated with other methods of removal of rice straw.

Available statistics indicate that only around 40 percent of generated agricultural solid waste (about 6.9 million tons/year) is currently utilized, while the remaining 60 percent is discarded as waste, either burnt, or illegally dumped, both of which cause major environmental problems. However, there are many potential uses of rice straw (and other agricultural residues), which represent significant market opportunities. Thus rather than being viewed as a problem, agricultural waste should be recognized as a resource that might be utilized to generate income and help conserve other, non-renewable resources. There are various potential uses for agricultural waste, which are discussed in turn below.

4.1 The opportunity

Production of biofuel which can be sold domestically, or exported

Residues from rice have been widely exploited for heat in rice producing countries worldwide. For example, many hundreds of thousands of people continue to cook on specially designed rice husk stoves. Others use gasification and biogas systems on a household scale and others explore community-scale electricity generation from locally produced biomass. However, there seems to be very limited use of rice residues for energy in households in Egypt, although R&D and pilot-scale ventures have attracted attention and some agency-led investments have been made. Small-scale use for home heating and/or cooking was more common in the past, before rural areas were electrified and/or supplied with relatively low-cost LPG gas in transportable bottles. So thus far, energy from straw has remained small in scale in Egypt, and is still being piloted, although a number of proposals for larger-scale exploitation have been made.

Agricultural residues can be burned to generate electricity to provide energy for farmers, or used as feedstock for village-based centralized waste to energy (WTE) plants; it can also be used to create biogas at the household level through small units, or used to produce biogas on a more industrial scale.

Generation of biogas from agricultural residues has been promoted by the Government for many years, with a number of small demonstration units established. Two Government-funded plants have been constructed with technical and financial assistance from China. Gas produced is currently piped free of charge into houses in local villages for cooking. This technology has considerable potential to be of value in other Egyptian villages. However, with widespread access to modern power/fuels in recent years, and subsidized prices, there has been limited demand for alternative forms of energy. This may change over time as discussed previously.
But another market option to explore is the potential for export. For example, rice straw pellets can be manufactured and exported. A large-scale straw pelleting plant was commissioned in 2008 for the sale of pellets into export markets. One private factory has been established so far producing biofuel from rice straw. This plant was expected to create around 200 jobs, and there are plans to build new plants elsewhere.

Straw briquetting is another option that has been developed in recent years. During 2008, a joint Austrian-Egyptian initiative resulted in the establishment of a straw briquetting plant which was expecting to sell most product to the EU. A second plant is planned on the basis of the success of the first according to Hissewy (2008b). If successful this may result in further investment.

Locally this could also be used for small-scale industries such as crop drying and intensive poultry production. However, the relatively high costs of harvesting and transporting rice straw, and of manufacturing the pellets required for industrial feedstock, make it uncompetitive with traditional fuels within Egypt, under current conditions.

Composting

Compost is the main traditional outlet for small-scale rice producers with an estimated 20 percent of all home-grown straw being made into compost for local use. With the reduction of state subsidies for manufactured fertilizers, small-scale production is likely to increase. Rice straw compost is also produced on a commercial scale, with a few new large-scale factories having been constructed in recent years, and methodologies for production adapted for local use. There is considerable scope to increase commercial production, although market feasibility will depend on location and other factors. Compost has properties that will help with the reclamation of desert lands, and extending agricultural areas, which are important Government objectives. Thus commercial compost production could also potentially be stimulated by public investment programmes for land reclamation.

There is a large demand for compost made from agricultural solid waste and the demand is growing. It has been estimated that the present demand for compost is around 53 million tons annually for the old Nile Valley land and 1.5 million tons a year for reclaimed land. The demand for compost for reclaimed desert land is expected to reach at least 30 million tons by 2017. With the present national production capacity of compost being only about 20.7 million tons per year, there is clearly plenty of scope for expansion in production for the national market alone. These statistics suggest there is considerable economic potential for compost production in Egypt.

Livestock feed

Rice straw is a crucial ingredient of livestock feed during certain times of the year. Yet less than 25 percent of the rice straw available is used for livestock production and that which is produced is at small-scale, on the farm itself, rather than in bulk, on an industrialised basis. Industrial processing of straw to manufacture livestock feed offers clear commercial potential, but more detailed assessment of costs, potential demand and product development options would be required.

There has been a significant increase in the cost of animal fodder in Egypt in recent years, due to the growing population and shortage in areas required for cultivation of foodstuffs. Given increasing demand for meat and dairy products nationally, investment in industrial-scale production is under consideration, thus demand for livestock feed is likely to grow, so this potential opportunity warrants further examination.

As a substrate for the production of food crops, particularly mushrooms

Small quantities of mushrooms have been produced commercially in Egypt for more than 20 years, but domestic production has been outstripped by imports. In recent years, commercial-scale production has begun to expand in Egypt, with 3-4 large producers now in business and several new investments planned or underway. Both
small-scale and commercial large-scale production is possible. Reporting from an FAO project has highlighted the value of small-scale mushroom production units for farm households, rural communities and village enterprises. The MALR/CAER has been promoting small-scale mushroom production to rural communities for more than four years, providing the training courses required and the materials required. Upfront investment costs are low, and profit margins are clear.

A report by ILO (2010) states that the Egyptian Environmental Affairs Agency (EEAA) has a programme to promote the recycling of rice straw as an alternative to open burning, and that their goal is to generate around 100,000 new jobs, including through the baling of rice straw and cultivation of mushrooms in 600 different locations in the Delta region.

So in sum, this sector has the potential to generate significant new market opportunities for large and small scale enterprises, and many associated jobs, and at the same time to significantly reduce pollution. However, there has been limited development of the sector, and the commercial viability of some of these options remains unproven. This is in part because of limited incentives to use alternative forms of energy, due to subsidized energy as discussed above, partly because of the costs of doing business, and lack of appropriate investment climate and legal and regulatory framework, and partly because of immature technologies which have not enabled prices to fall sufficiently to make these options viable. However, in some technologies there has already been investment by the private sector, with some apparent success, thus it seems that with a few improvements to the enabling environment there may well be the potential for some quick wins in terms of market growth and job creation in the industry, along with visible environmental improvements.

4.2 Framework conditions

The waste management and recycling sector in Egypt generally is not regulated and there is no overarching solid waste management (SWM) law. Instead, the legal
framework is established in many different pieces of legislation. The Ministry of Agriculture and Land Reclamation has the main responsibility for providing oversight of the agricultural waste sector, in cooperation and coordination with the Ministry of State for Environmental Affairs (MSEA) and the EEAA.

Of particular relevance in terms of agricultural waste management have been the steps taken to limit air pollution resulting from the burning of agricultural waste. These include Environmental Law No. 4/1994, which was amended in Law No. 9/2009, and which stipulates that farmers who practice rice straw burning can be fined up to L.E. 20,000, and prohibits dumping of waste in areas other than those specified in residential, industrial and agricultural areas and waterways. The EEAA has established a hotline for the public to report incidents of burning.

In principle, these changes in policy should strengthen the potential for a market in agricultural waste products, as farmers seek alternatives to burning their waste which should increase the supply of these by-products. While this may have happened to some extent, in practice these laws do not appear to be enforced very effectively, which means that incentives for farmers to collect and sell their waste products remain weak, and so supply remains limited.

Box 5: Case study on converting agricultural waste

UNEP’s International Environmental Technology Centre (IETC) is working with local institutions, government, business and communities in two pilot areas in Nepal and Sri Lanka to promote the re-use of agricultural waste. It has published guidelines on how to assess waste agricultural biomass – including rice husks, grass, and fruit and vegetable waste – and to identify appropriate technologies and business models. Working with principal partners the National Cleaner Production Centre in Sri Lanka, and the Society for Environment and Economic Development in Nepal, UNEP has trained communities and helped local partners to procure and install technologies to treat some 2000 tonnes per annum of rotten vegetables in Nepal, and 1000 tonnes per annum of mixed dry agricultural waste in Sri Lanka, across the two pilot areas. The projects have generated compost as well as heat used to dry limes and other fruit, enhancing livelihoods in one of Sri Lanka’s poorest areas. This approach is now being rolled out in other countries.

The traditional practice adopted by farmers in the past was to store agricultural waste on the roofs of their houses for use as fuel for their home ovens. However, the increasing dependence on butane gas stoves has resulted in a decreased reliance on agricultural waste as a source of fuel. In addition, current Ministry of Agriculture regulations ban the storage of agricultural solid waste, as a measure for combating crop diseases and pests, as well as preventing fire hazards.

Thus farmers’ incentives are to dispose of the waste as cheaply as possible. The ban on the burning of waste – if properly enforced – would be expected to increase the dumping of waste. However, transportation costs and fees for dumping at official dumpsites create incentives for dumping of waste in unauthorised locations. Dumping on the banks of canals and drains appears to be a common means of disposal. The often significant quantities dumped at such sites represent a major problem and have to be removed regularly through maintenance work performed by crews from the Ministry of Water Resources and Irrigation (MWRI), generating costs for the public budget.

These constraints on the supply side are matched by constraints on the demand side also arising from the framework conditions. As already discussed, subsidies for energy and fuel drive down incentives for alternative fuel sources, and subsidies of fertilizer have reduced demand for compost made from agricultural waste. The removal of these subsidies would be expected to have a significant impact on demand for – and thus prices paid for – agricultural waste that can be converted into energy, fuel or compost.

Even in the absence of subsidy reduction, export markets may provide some potentially profitable market opportunities using agricultural waste inputs as outlined above, and this suggests a potentially important role for MTI in developing this sector. Some private players are already beginning to capitalise on these opportunities and going forward it seems likely that there will be increased demand for agricultural waste from a variety of sources. Thus a more strategic approach to managing this sector at the policy level may be beneficial, cutting across government departments, in order to provide the enabling conditions for market development, based on discussions with the private sector about potentially lucrative market opportunities and the main constraints to their development, and thus to maximise the scope for industrial development, market opportunities for SMEs, and job creation.

4.3 Policy recommendations and economic considerations

The most obvious way to create a more enabling environment for the development of the agricultural waste sector would be to reduce energy and fuel subsidies, and to a lesser extent fertiliser subsidies, which would generate increased demand for alternative sources of fuel, energy and compost, and thus stimulate demand for agricultural waste as an input.

Another way would be to enforce more strictly the ban on the burning or unauthorised dumping of agricultural waste, which would increase the supply. In combination with this, the removal of fees on authorised dumpsites in agricultural areas could be one way of increasing their use, and the cost of provision by local government could potentially be recouped by the sale of that accumulated waste for industrial purposes. While farmers would have to bear the increased costs of collection and removal of waste products, they would at least not have to bear the cost of dumping, and may in fact be able to generate revenue, if the industrial users are willing to pay for the waste. They may be willing to do this if accumulating the waste all in one place sufficiently reduces the cost of sourcing this as an input to industrial processes, such that it becomes economic to pay for those inputs. This is likely to be dependent on economies of scale, transportation costs and the potential to build processing plants near the authorised dumpsites. Thus the optimal location and number of authorised dumpsites could also be investigated. Different models of public and private provision of these dumpsites could also be explored. Incentives could be cre-
ated e.g. in the form of free land to be given to developers to encourage the establishment of waste management plants.

In addition there may be scope to scale-up or develop further some of the pilot projects that have been initiated to explore uses of agricultural waste (e.g. for briquetting, gasification, etc.), and to expand them or undertake new public/private partnerships in order to ameliorate some of the risks private players would face in developing new markets and technologies in light of considerable uncertainty about future market demand.

There is also scope to continue to invest in R&D, and to support the adaptation and pilot testing of new technologies, and to promote networks and linkages between those already involved in R&D and market players, in order to maximise efficiency and progress in terms of bringing new technologies to market. Feasibility studies and market assessments could also assist in this regard.

The potential could also be explored as to whether these industries could be eligible to receive different forms of climate finance e.g. carbon credits through the Clean Development Mechanism, or grants through mechanisms such as the Global Environment Facility.

Currently there seems to be little coordination and shared interest in the development of this market. Separate parallel investments are underway, and there appears to have been little analysis of the impact of potentially competing demands for agricultural waste, how that might evolve, what impact that will have on prices, and what that means for the future viability of the various different industries that could potentially be developed now.

Indeed there seems to be generally limited information available about the agricultural waste sector in Egypt, so there is a case to undertake more research, data gathering, and analysis, in order to inform the development of a strategy. This would also help to overcome information asymmetries which may prevent market development.

In addition, this information could provide the basis for proactively seeking domestic or foreign investment in the sector. The FAO recommends that a useful start could be made by accurately confirming the quantities of agricultural waste that are likely to be available on an annual basis. Without reliable information of this kind, the potential market size remains open to conjecture and estimation, and this uncertainty may undermine investment.

While the Ministry of Agriculture and Land Reclamation (MALR) leads on many aspects of this issue, it is clear that cross-departmental collaboration is needed to support the industrial development opportunities that agricultural waste offers. While MALR’s main focus is inevitably agricultural and rural development, the role of MTI should be to consider industrial and trading opportunities arising from agricultural waste, to liaise with the private sector to understand the market opportunities and constraints, and to work with other government departments including MALR to tackle these constraints, identify priority areas for reform and support, and develop an institutional and regulatory framework that effectively underpins market development.

The MTI provides national services that link investors with manufacturers and traders, and has responsibility for state policy that encourages the expansion of industrial development and the sustainable exploitation of national resources. It can do this by promoting investment, ensuring quality, providing incentives, information and infrastructure, and channelling national effort. Thus it is well positioned to play a role in promoting awareness of the industrial opportunities associated with agricultural waste, develop a market development strategy, and to help establish a network of relevant stakeholders, including the agribusiness industry, to discuss and develop a strategy for the sector, and to make linkages between different parts of the supply chain, in order to stimulate market development. Establishing a communication strategy and action plan to raise awareness and community participation will also be an important part of the overall strategy.
In addition, there is a need to develop the human capital and skills needed to fulfil labour requirements for the sector. The ILO points to a number of labour and training needs in agriculture waste management:

1. Drivers of tractors and trailers used in the field: training is required in maintenance of tractors and trailers, driving skills, occupational safety, communication skills.

2. Technicians for the operation of compressors: training is required in operation and maintenance of compressors, occupational safety etc.

3. Loading workers: training is required in loading trailers, communication skills, occupational safety.

4. Technicians working in rice straw recycling: training is required in composting techniques and handling, occupational health and safety.

Discussion with private players to identify any skills gaps and consider the best way to build these skills is recommended, for example to ascertain whether the private players can build the skills through on-the-job training, or whether publicly supported schemes are needed.

Artificial incentives such as these are best used to stimulate initial market development and/or overcome market failures relating to uncertainty, but should ideally not be established with a view to maintaining them in the long term – unless this is an explicit decision taken to overcome other market failures that cannot be tackled at source. However, a focus on improving the enabling environment, understanding the market and providing better information, and promoting coordination across the different players – thus tackling market failures at source – should be the first priorities.

Small-scale livestock producers currently dominate market demand for rice straw, so if and when industrial-scale straw processing industries begin to dominate the market, driving up the price of rice straw, then this will likely increase the costs of those farmers, and may reduce their access to low-cost feed. This combined with the possible increased use and production of compost, which is likely to substitute for organic fertilisers based on farm animal manure, may result in a double blow for livestock farmers. Some form of protection or compensation for these farmers may thus be considered desirable or politically expedient.
Long term strategies
• Through dialogue with the private sector, analyse industrial and trading opportunities arising from agricultural waste, and undertake market assessment / feasibility studies to understand the opportunities and constraints.
• Work with other government departments including MALR to tackle these constraints, identify priority areas for reform and support, and develop an institutional and regulatory framework that effectively underpins market development.
• Establish a network of relevant stakeholders, including the agribusiness industry, to discuss and develop a strategy for the sector, and to make linkages between different parts of the supply chain, in order to stimulate market development.

Potential quick wins
• Through public-private dialogue, explore the feasibility of creating incentives for private developers to establish private waste management plants.
• Establish a communication strategy and action plan to raise awareness and community participation in existing market opportunities.

Box 6: Top priorities for MTI to promote the agricultural waste management industry
5 Conclusions

There is significant potential to achieve green growth in a number of sectors within Egypt. This paper has discussed a number of specific green growth opportunities, all of which exhibit clear potential to generate economic, social and environmental gains. The existing framework conditions within Egypt – particularly fossil fuel subsidies – are undermining the development of all three at this stage, but with the right conditions in place, much could be achieved by private players in the development of these markets, without the need for substantial public funding. In the absence of major or swift reforms to fossil fuel subsidies, there are other steps that could be taken to generate the incentives needed to underpin market development.

Thus the first priority is to create the incentives that will motivate private investment, and make it financially viable. This could be through the removal of disincentives (e.g. fossil fuel subsidies), or through explicit public funding, but often incentives can also be created in other ways i.e. through innovative use of ‘carrots’ to reward businesses demonstrating appropriate behaviours.

In parallel to this, it seems there is a strong need within the Egyptian context to raise awareness amongst the public and business sector, about both the environmental costs of ‘business as usual’, and the potential market opportunities and financial, economic and social benefits of new green solutions and technologies. Thus there is a need for education and media campaigns, consultation processes, public/private dialogue, and civil society engagement strategies.

Once demand and awareness has been created, the priority will switch to building local capacity and skills in order to overcome any supply constraints and thus maximise the benefits to Egypt in terms of growth opportunities and job creation. However, where market demand is strong, private players may be expected to begin to respond in a more concerted way, thus ameliorating some of these supply side constraints themselves.

A coherent, joined up government strategy is ideally needed to achieve these objectives most effectively, setting out a clear vision for the future, and an action plan specifying the targets, timeframes, resources, responsibilities (incl. public sector vs. private sector), and success indicators.

The current political uncertainty is an enormous disincentive to private investment, so the sooner greater clarity is achieved on the future Government’s economic stance and policy direction, the better. However, it is clear that environmental issues are not currently top of the political agenda within Egypt. Nonetheless, once Egypt has a new Government in place, perhaps with a much stronger mandate to make transformational changes, the potential to make progress on these issues may be stronger than it has ever been before.
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Published by
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Sector Programm Sustainable Economic development

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Design and layout
Schumacher. Visuelle Kommunikation
www.schumacher-visuell.de

Printed by
Top Kopie GmbH, Frankfurt
Printed on FSC-certified paper

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As at
November 2011

GIZ is responsible for the content of this publication.

On behalf of
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and Development (BMZ);
Division for development education and information

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