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Fossil-Fuel Subsidies: A barrier to renewable energy in five Middle East and North African countries

Richard Bridle
Lucy Kiston
Peter Wooders

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Head Office
161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Website: www.iisd.org

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International Institute for Sustainable Development
Global Subsidies Initiative
International Environment House 2, 9 chemin de Balexert, 1219 Châtelaine, Geneva, Switzerland
Tel: +41 22 917-8373 | Fax: +41 22 917-8054

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1.0 Introduction

The paper explores the current status of fossil-fuel subsidies and renewable energy in five Middle East and North African (MENA) countries. A general introduction sets out the issues across the region.[1] The body of the paper looks at the five individual study countries. For each, it describes the structure of the energy sector, renewable energy status, and the status of fossil-fuel subsidies before making some observations on the impact of fossil-fuel subsidies, particularly in relation to renewable energy. The final section of the paper reviews the countries as a whole and draws some conclusions as to the status of renewable energy, and how it is affected by the existence of fossil-fuel subsidies.

The MENA region is characterized by considerable political and economic diversity. Further, the issues facing the energy sector in each country vary, depending on historical factors and whether a country is a net importer or exporter of hydrocarbons. The countries selected for analysis—Egypt, Tunisia, Morocco, Libya and Jordan—encompass the full range of large net exporters through to large net importers. However, commonalities also exist; particularly pertinent to this paper is the common dependence on, and a history of subsidizing, fossil fuels.

1.1 MENA Overview

1.1.1 Energy Sector Status

The MENA region accounts for 60 per cent of the world's proven oil reserves and 45 per cent of proven natural gas reserves (Organization of the Petroleum Exporting Countries, 2013), and yet there is considerable diversity in resource endowment by country. While some countries are significant producers of oil and gas, others have limited or no commercially viable resources. The balance of production with domestic demand determines the status of a country as a net exporter or importer. Table 1 summarizes this status, classifying each as a large or small net exporter or a net importer.

The MENA region is heavily dependent upon hydrocarbons for its energy supply. In 2011 natural gas accounted for 51 per cent of the region's primary energy supply and oil for 47 per cent, with coal, hydro and other renewables making up the balance. This dependency characterizes both those countries with large domestic resources and those with minimal domestic resources. Similarly, the electricity generation mix is dominated by fossil fuels, with gas accounting for 61 per cent of electricity generation and oil for 35 per cent in 2011 (International Energy Agency [IEA], 2013).

Across the region, ensuring energy security in the face of growing demand is an increasing concern. Physical supply has faced disruption in recent years. Libya in particular has seen political and civil unrest that has destroyed parts of the electricity infrastructure and temporary disruption has taken place in Egypt. Further, many producing countries face supply constraints, which raises concerns for both the producing country (which faces declining export earnings as well as potential import costs) and those countries that are dependent upon these exports. Finally, net importers face increasing international prices, straining already-stretched national budgets, a strain that is compounded by any energy subsidies that may exist.

[1] MENA countries include: Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, West Bank and Gaza, and Yemen

TABLE 1: NET OIL AND GAS EXPORTS BY COUNTRY, 2011

	COUNTRY	NET EXPORTS (KTOE)	COUNTRY	NET EXPORTS (KTOE)
Large Energy Exporting Countries	Saudi Arabia Qatar Iran Kuwait	404,109 175,699 139,072 120,504	UAE Algeria Iraq	107,772 103,557 101,381
Small Energy Exporting Countries	Oman Libya Yemen	49,513 17,411 11,500	Egypt Bahrain Syria	10,431 7,868 2,968
Net Energy Importing Countries	Tunisia Lebanon	-15,971 -44,035	Jordan Morocco	-47,971 -101,892

Footnotes: Data is sourced from the IEA, and refers to aggregated imports and exports of crude oil, oil products and natural gas. No account is taken of stock changes and bunkers. All data is in thousand tonnes of oil equivalent (ktoe). Note that the position of Libya as a small energy exporting country reflects lower than historic production in 2011, which resulted from production shut-ins.

1.1.2 Renewable Energy

To date, renewable energy remains relatively unexploited, accounting for just 1 per cent of total primary energy supply in the region, and 3.5 per cent of electricity generation in the region. In some countries, the share of renewable energy in total electricity generation is higher—regional leaders include Morocco (11 per cent in 2011), Egypt (9.5 per cent), and Syria (8 per cent). Renewable electricity generation is dominated by hydroelectricity, which accounts for 3.2 per cent of total supply, or over 90 per cent of total renewable energy generation. Only in Morocco and Egypt do non-hydro sources of renewable energy account for more than 1 per cent of total electricity generation.

This low level of deployment belies the fact that the MENA region is endowed with some of the best renewable energy resources in the world, accounting for 45 per cent of total global potential. Of this potential, the majority is accounted for by the solar resource, but the wind, hydro, biomass and geothermal resources are all also considerable (Jalilvand, 2012). Exploiting this resource could offer net importers the chance to meet energy needs at a lower cost than fossil fuels, and to secure their energy supply. For net exporters, exploitation of renewable resource offers an opportunity to retain resources for the future or increase exports through diverting production that currently services domestic demand. In both cases, there is the possibility of exporting electricity produced from renewable energy to other countries in the region or, depending on location, to Europe. While these possibilities are increasingly recognized, there are many barriers to renewable energy that need to be overcome, including the barriers posed by the existing dominance of fossil fuels and subsidies to consumers and producers using these fuels.

1.1.3 Fossil-Fuel Subsidies

For many years, governments in the MENA region have subsidized the consumption of fossil fuels. Estimates from the International Monetary Fund (IMF) suggest that MENA countries account for almost half of total pre-tax global energy subsidies, with expenditure reaching US$236 billion in 2011, compared to a global total of US$481 billion (IMF, 2013a). Pre-tax energy subsidies are measured as the difference between the value of consumption at world and domestic prices. Post-tax subsidies include an adjustment for efficient taxation and a correction for negative consumption externalities. Post-tax subsidies in MENA are estimated to account for around a fifth of global subsidies, approximately US$360 billion (IMF, 2013b).

For importing countries, fossil fuels represent an explicit cost to the national budget: governments have to make a financial transfer to suppliers to compensate for the difference between production costs (oil price plus refining costs plus marketing costs) and the retail price charged to end-consumers.

Calculating subsidies in producing countries is complicated by the price for oil or gas. In these countries, the government can mandate the national oil company to sell to the domestic market above or at the cost of production but below the international price. Accordingly, no losses will be made and therefore no financial transfer will be necessary. There is an argument that in this case there is no subsidy since the relevant benchmark price is their cost of production. The counter-argument is that the lost revenue from not charging the international price represents an implicit transfer and an opportunity cost for the economy.

The IEA estimated subsidies using the price gap method; comparing a benchmark international reference price, for all countries including importers and exporters, with national prices. The IEA concluded that, on an individual basis, MENA countries are among the largest subsidizers in the world with 12 of the 20 countries in the region having energy subsidies of 5 per cent of GDP or more (IMF, 2013b).

Most methodologies aiming to estimate fossil-fuel subsidies focus on subsidies to consumers. In addition, subsidies are often paid to producers of fossil fuels. These producer subsidies are beyond the scope of this report but may be significant in producer countries.[2]

1.2 Impact of Fossil-Fuel Subsidies

Fossil-fuel subsidies are frequently justified on the basis that they provide support and protection to the poor, through lowering direct and indirect fuel costs. However, evidence from MENA and beyond suggests that the benefits of subsidies accrue disproportionately to the wealthier sections of society and are frequently ineffective in meeting social goals (IMF, 2013a). While targeted social welfare is generally more difficult to administer, it is also much more effective, when properly designed, at improving the welfare of the poorest sections of society. A further justification for fossil-fuel subsidies is the impact on the competitiveness of industries. Increasing energy costs as a result of fossil-fuel subsidy reform may have negative short-term impacts on competitiveness, but the net benefit to the economy as a whole is likely to be positive.

Further, fossil-fuel subsidies exert pressure on national budgets, crowding out expenditure in other areas such education and health. Analysis by the IMF shows that in many countries, pre-tax subsidies for fossil fuels exceed government expenditure on education. Over the longer term, this is expected to have an impact on long-run productivity and inclusiveness of the economy. Low prices of fossil-fuel derived energy encourages over-consumption leading to excessive environmental impacts and undermining energy efficiency.

Of particular relevance to this paper, fossil-fuel subsidies introduce distortions to the energy sector. Underpricing of fossil fuels encourages their continued use at the expense of other energy types, particularly renewable energy. Climatic conditions mean that in many cases renewable energy sources— particularly solar energy—are already cost-competitive, with fossil fuels assuming full economic pricing. Correspondingly, reform of fossil-fuel subsidies could encourage deployment of renewable energy, with associated environmental benefits.

However, despite the advantages of reform, implementation remains politically sensitive. The following case studies highlight the benefits of reform, but also illustrate the difficulties that have been encountered in previous reform attempts.

[2] More information about producer subsidies is available on the GSI website: http://www.iisd.org/gsi/fossil-fuel-subsidies/fossil-fuels-what-cost.

2.0 Energy Subsidies and Renewable Energy by Country

2.1 Egypt

2.1.1 Energy Sector Status

Egypt is a producer of both oil and natural gas. Historically, Egypt has exported both oil and gas to the global market, but in recent years it has become a net importer of oil and natural gas exports have fallen. New oil discoveries have bolstered reserves and production in recent years, but oil production is in long-term decline, and the country faces the challenge of meeting increasing domestic demand from a dwindling base. Natural gas reserves are estimated to be the third highest in Africa, and natural gas production rose rapidly between 2000 and 2009, with the government encouraging the use of natural gas in place of oil and coal. However, production has been flat at just over 2,000 billion cubic feet since 2009, and meeting domestic demand has come at the cost of exports, which have fallen from 650 billion cubic feet in 2009 to 260 billion cubic feetin 2012 (Energy Information Administration, 2013)

The energy mix in Egypt reflects this resource base. Oil and gas account for 95 per cent of primary energy supply, with the majority of the balance being made up by biomass, hydropower and coal (IEA, 2013).

The electricity generation mix is dominated by gas (75 per cent of generation in 2011) with oil and hydropower also being important (16 and 8 per cent of generation respectively in 2011). The electrification rate in Egypt is almost 100 per cent, and while electricity use per capita is below the global average, it is above the average for both Africa and North Africa. However, demand is increasing at a rate of between 1,500 megawatts (MW) and 2,000 MW a year, and shortages and black outs are common (Norton Rose Fulbright, 2013).

2.1.2 Renewable Energy

Egypt has significant solar, wind and hydropower resources. The majority of hydropower resources have been developed—most notably the 2.1 gigawatt (GW) Aswan Dam produces 13,500 gigawatt hours (GWh) of power per annum—but solar and wind resources remain under-developed.

Egypt has one of the highest levels of solar radiation in the world, reaching up to 7.2 kWh/m^2/day in some southern sites (Egyptian German Joint Committee on Renewable Energy, Energy Efficiency and Environmental Protection, 2008). However, current installed capacity is limited to a 20 MW Concentrating Solar Power (CSP) project, which is part of the Kuraymat 140 MW Integrated Solar Combined Cycle (ISCC) plant. Egypt also has significant wind resources, particularly along the coasts of the Mediterranean and Red Seas (German Aerospace Centre [DLR], 2005). The most developed region to date is the Zafarana district on the Red Sea, where a series of developments between 2001 and 2010, financed partly with donor assistance, has led to a total installed capacity of 545 MW. A further 320 MW of wind power capacity—comprising the 200 MW Al-Zayt wind farm and the 120 MW Italgen wind project—are expected to come online in 2014. (RCREEE, 2013a).

The current National Renewable Energy Strategy was adopted in 2008, and aims to increase the share of renewable energy to 20 per cent of Egypt's electricity generation 2020. In terms of capacity, this equates to 8.52 GW, of which the majority will be wind power (7.2 GW). Two thirds of this capacity will be developed by the private sector and one third by the National Renewable Energy Agency (NREA) with financial assistance from international agencies and the Egyptian Ministry of Finance, and based on guarantees from the Central Bank of Egypt. Egypt's plans for solar energy are less ambitious than those for wind energy, with a 2017 target for the installed capacity of 100 MW of CSP and 40 MW of photovoltaic (PV) energy (REN21, 2013b).

2.1.3 Fossil-Fuel Subsidies

Energy subsidies in Egypt are reported to be among the highest in the world. According to the IEA (2014), the total subsidy as a share of GDP reached 10.2 per cent in 2012. In 2012 the greatest proportion of the subsidy payments, US$16.9 billion, was reported to be allocated to oil. Electricity subsidies were reported to be US$6.2 billion and gas subsidies were reported to be US$3.1 billion (IEA, 2014).

In the industrial sector, energy subsidies have been motivated in part to promote economic development, particularly in energy-intensive sectors such as steel, cement and chemicals (Vidican, 2014). While the motivation on the social side may have been to provide the population with access to affordable energy, reports suggest that the benefits accrue primarily to the well-off, with the richest urban quintile receiving 33 per cent of fuel subsidies in 2009 and the poorest quintile just 3.8 per cent (Abouleinein, El-Laithy, & Kheir-El-Din, 2009).

Since 1977 the government has made repeated attempts to reform energy subsidies. In 2004 it embarked upon an ambitious reform program that aimed to gradually increase the cost of gasoline, diesel and electricity (Castel, 2012). However, the program was suspended in 2009 due to economic and political concerns. Implementation remains challenging. A number of marginal pricing reform efforts for various fuels have been implemented since the revolution in Egypt in January 2011—most notably: a 220 per cent increase in the price of liquid petroleum gasoline (LPG) (previously frozen for 21 years) and a move to full cost recovery for gasoline 95 in April 2013; various natural gas price increases for residential, commercial and industrial consumers beginning in 2012; and several small ad hoc revisions to gasoline 80/92, diesel and end-user electricity prices. These did not, however, arrest soaring subsidy costs (World Bank, 2013a).

In early July 2014 the Egyptian government announced sweeping measures to increase energy prices paid by businesses and households. Large increases in the prices of diesel (+64 per cent), gasoline 80 (+78 per cent) and gasoline 92 (+40 per cent) were widely reported by the media; however, prices were also increased, often significantly, for gasoline 95, for residential and commercial users of natural gas (with, for example, a six-fold increase in prices for the largest residential users of natural gas), for heavy fuel oil and for all residential and commercial electricity tariff classes (Fahim, 2014; Saleh, 2014).

2.1.4 The Impact of Fossil-Fuel Subsidies

Energy subsidies have a large impact on the national budget. The IMF estimates that, in 2011, pre-tax subsidies for petroleum products, natural gas and coal reached 37.9 per cent of government revenues and pre-tax subsidies to electricity 10.4 per cent of government revenues. This exceeds expenditure on many critical social services, such as health and education (IMF, 2013b). Reallocating this expenditure to these services could have significant advantages in terms of enhancing the long-run productivity of the economy.

Within the energy sector, the presence of large subsidies bestows a cost advantage on fossil-fuel sources vis-à-vis renewable energy sources, thus acting as a barrier to renewable energy sources (Vidican, 2012). Removing this cost advantage through subsidy reform could encourage the development of the renewable energy sector, particularly given that the favourable resource in Egypt is likely to lead to low-cost wind and solar power. In turn, using renewable energy resources to meet domestic demand can free domestic fossil-fuel resources for export, with associated revenue benefits for the country.

2.2 Jordan

2.2.1 Energy Sector Status

Jordan's domestic fossil-fuel resources include some small natural gas reserves and oil shale deposits. While these oil shale resources are significant—Jordan is among the top five countries in terms of resources—they remain unexploited due to high costs of exploration and development. As a result, most of Jordan's energy needs—97 per cent in 2011—are met through imports of natural gas and oil (Electricity Regulatory Commission, 2012).

Over the past decade, imported natural gas has taken an increasing share in the primary energy supply. By 2009 natural gas accounted for 43 per cent of primary energy and crude oil for 56 per cent, with the remainder being made up by renewable energy resources (IEA, 2013). However, disruptions to the main transportation route (the Arab Gas Pipeline) in 2010 led to a fall in imports and in 2011, natural gas accounted for just 12 per cent of the primary energy supply, with increased crude oil imports making up the shortfall (84 per cent of total supply). In particular, the electricity generation sector—which typically meets 80 per cent of its fuel needs from imported gas—was forced to switch to oil products.

Concerns about the security of supply are magnified by increasing demand for energy—a result predominantly of population growth and increased economic activity. Current projections suggest that between 2008 and 2020, demand for primary energy will grow at a rate of 5.5 per cent per annum and demand for electricity will grow at a rate of 7.4 per cent per annum (Electricity Regulatory Commission, 2012).

This increasing demand, together with rising international fuel prices, leads to increased expenditure on energy imports and pressure on the national budget. In 2011, Jordan spent JOD4,019 million (approximately US$5.6 billion) on energy imports, with the majority of this expenditure (approximately US$5.2 billion) going to oil imports (Ministry of Planning and International Cooperation, 2013).[3] This equates to approximately 19 per cent of GDP in 2011.

2.2.2 Renewable Energy

Jordan has significant solar resources: the country lies in the global solar belt and has some of the strongest sunshine in the world, with solar radiation rates of between 5 and 7 kWh/m^2/day (Climate Parliament, 2013). The country is particularly suited to CSP, due to large areas of desert, high temperatures and low sunshine diffusion rates, but is also well placed to take advantage of solar PV technologies. While the wind resource is not of the same quality as the solar resource, it is still significant with a number of regions having wind speeds greater than 6.5 metres per second.

Jordan has already gone some way to exploiting these resources. At the end of 2012, total renewable energy capacity was estimated at 16.4 MW, or 0.5 per cent of total generation capacity. The majority of this capacity was hydroelectric (10 MW) and biomass (3 MW). Solar capacity was estimated at 1.6 MW, of which approximately 1 MW was decentralized PV generators; 180 kW was a project at El Hassan Science City; and 280 kW was a project at Petra. Two operational wind farms at Ibrahimyah and Hofa accounted for a total of 1.4 MW of generation capacity (RCREEE, 2013b). In addition, 760 MW of further capacity was in the pipeline at the end of 2012, of which solar projects accounted for 400 MW and wind projects accounted for 360 MW (REN21, 2013b).

In 2007 the government launched the National Energy Strategy (2007–2020), which aims to decrease the country's reliance on external energy sources and the associated financial burden. This strategy considers the development of oil shale resources, the development of nuclear capacity, energy-efficiency measures and the development of

[3] Converted at an average 2011 exchange rate of 1.4 Jordanian Dinar: US$1

renewable energy resources. It sets a target of 1,800 MW of renewable capacity by 2020, of which approximately 1,200 MW will be from wind, 600 MW from solar power and up to 50 MW from waste-to-energy facilities. The exploitation of renewable energy was given a legal basis in the 2010 Renewable Energy and Energy Efficiency Law; while this encourages private sector investment in renewable energy, areas of confusion remain, particularly in relation to the remaining tariff payable to renewable energy projects.

2.2.3 Fossil-Fuel Subsidies

In 2005 energy subsidies reached 5.8 per cent of GDP, and represented a considerable and increasing burden on the national budget (Fattouh & El-Katiri, 2012). In an attempt to alleviate this burden, the government introduced a wide-ranging reform of subsidies, encompassing petroleum products and electricity. Although subsidies were largely eliminated by 2009, they were re-introduced in the face of rising international prices and concerns over public opinion. In 2011, energy subsidies reached 6 per cent of GDP, with subsidies to electricity accounting for 3.8 per cent of GDP and subsidies to fuel accounting for 2.2 per cent of GDP (IMF, 2013b).

Prior to the reforms of 2009, crude oil was purchased from Iraq and Saudi Arabia, refined by the Jordan Petroleum Refinery Company and then sold at controlled prices, with the government covering the losses arising as a result of the difference in actual costs and controlled prices. Rising crude oil prices in 2004 made the cost of these subsidies unsustainable (GIZ, 2010b), and the government implemented a three-stage plan to gradually raise prices to international levels. The first stage saw an increase in the price of petroleum products, with gasoline prices increasing by around 10 per cent, fuel oil for power by 33 per cent and fuel oil for industry by 59 per cent. This however, did not prevent subsidies from growing, as international oil prices continued to increase and the government was forced to increase prices again in 2006. Finally, subsidies were fully removed in 2008, resulting in price increases ranging from 16 per cent for gasoline to 76.5 per cent for LPG (Fattouh & El-Katiri, 2012). To address concerns for the welfare and income of both industries and households, the government implemented measures to protect the poor, such as raising pensions, setting up special compensation schemes and expanding social programs.

The reform was a qualified success until 2011. Energy subsidies declined from 5.8 per cent of GDP in 2005, to 2.6 per cent in 2006, to 0.4 per cent in 2010 (Fattouh & El-Katiri, 2012). However, in 2011 protests against rising living costs and unemployment led the government to reduce fuel prices and to temporarily suspend the automatic fuel adjustment mechanism.

In the electricity sector, the government followed a separate reform, liberalizing the sector and setting up an independent regulator (the Electricity Regulatory Commission) that regulates the tariffs that the system operator (the National Electric Power Company [NEPCO]) and distribution companies that can charge end users. Appropriate setting of these tariffs meant that subsidies were reduced through to 2009. However, in 2010 subsidies rose as interrupted gas supplies forced NEPCO to use internationally priced fuel oil for generation, while selling power at regulated prices. As a result, NEPCO accrued JOD1.2 billion (approximately US$2 billion) in debt over the course of 2011.

Increasing budgetary pressure led to a number of reforms in 2012. In August 2012 the Electricity Regulatory Commission announced increases in electricity tariffs aimed at reducing the disparity between costs of generation and user end charges, thereby improving cost recovery in the electricity sector (Hazaimeh, 2012). In November 2012 the government announced that it had removed the remaining subsidies on oil products. To mitigate the effect on low-income households, a cash-based aid program targeting the lower-income segment of the economy was implemented.

2.2.4 The Impact of Fossil-Fuel Subsidies

Fossil-fuel subsidies exert significant pressure on the budget. Estimates from the IMF suggest that pre-tax subsidies to oil products reached the equivalent of 8.13 per cent of government revenues in 2011, and pre-tax subsidies to electricity the equivalent of 14.41 per cent. This expenditure displaces more productive expenditure in areas such as health and education.

As is frequently the case, energy subsidies in Jordan are regressive, benefitting the richer sections of the population. Estimates from the IMF suggest that, overall, the richest 20 per cent of households receive over 25 per cent more in subsidies that the poorest 20 per cent of households. In particular, the richest quintile accrues 50 per cent of the benefits relating to gasoline and 31 per cent of the benefits relating to diesel, with the poorest quintile receiving 8 per cent and 13 per cent, respectively (IMF, 2012a). The current system of subsidies is therefore an ineffective means of social protection; well-targeted benefit programs are likely to be more appropriate.

By lowering the cost of fossil fuels versus renewable energy, subsidies also act as a barrier to the deployment of renewable energy capacity. The quality of resources is such that wind and solar power are already cost competitive with generation from fossil fuels: estimates place the cost of wind at JOD0.04–0.14 per kWh and the cost of solar PV at JOD0.11–0.20 per kWh, compared to a cost of JOD19 per kWh for electricity from imported gas and JOD0.21 per kWh from diesel (Climate Parliament, 2013). However, fossil-fuel subsidies obscure this cost advantage and detract from the development of the renewable energy resource.

In this respect, the targeted development of oil shale resources and nuclear energy could also detract from the development of renewable energy, unless carefully managed. The Energy Strategy (2007) allocates up to US$2.1 billion in funding to the renewable energy sector, compared to US$2.4 billion for natural gas, US$3.4 billion for the oil sector, up to US$3.8 billion for oil shale exploration and up to US$5.8 billion for the power sector (Jordinvest, 2012).

2.3 Morocco

2.3.1 Energy Sector Status

In 2011, Morocco's primary energy demand was dominated by fossil fuels, with oil accounting for 74 per cent of supply, coal for 18 per cent and natural gas for 4 per cent. Biomass and hydropower accounted for a further 3 per cent and 1 per cent respectively, with renewable energy making a negligible contribution (IEA, 2013). Morocco has some developed reserves of oil and gas, which go some way to meeting domestic demand, but these reserves are limited and significant imports are still necessary to meet demand.[4] Thus, in 2009 Morocco imported 95 per cent of its energy requirement at a cost of MAD62 billion (approximately US$7.3 billion) International Renewable Energy Agency [IRENA], n.d.).

The electricity generation mix is dominated by coal (47 per cent of generation in 2011), with oil (26 per cent) and gas (16 per cent) taking lesser shares. Renewable energy makes up the balance with hydropower accounting for 8 per cent of generation in 2011, and wind power accounting for 2 per cent (IEA, 2013). Demand for electricity grew at a rate of 6–8 per cent per annum between 2000 and 2010, reflecting a successful electrification program and economic growth. Growth is expected to continue at the rate of 5–7 per cent between 2010 and 2020 (Paton, 2012). To meet this demand, an increase in generation capacity from 6,350 MW in 2010 to 14,500 MW in 2020 is planned. In addition, Morocco can also meet its demand, or export excess power, through two 400 kilovolt (kV) interconnectors to Spain and connections to Algeria (MED-EMIP, 2010).

[4] The country is largely underexplored and it is thought that there could be untapped resources of oil and gas.

2.3.2 Renewable Energy

Morocco has significant renewable energy potential—most notably, wind and solar power, but also hydro and ocean power. In common with the rest of the MENA region, conditions for solar power are excellent: average solar irradiation is estimated at 5.3 kWh/m^2/day, and potential capacity is estimated at 20,000 MW (REEGLE, 2012a). Wind resources are also strong, with wind speeds between 6 and 11 m/s at the best sites and an estimated potential of 25,000 MW across the country. Current deployment of renewable energy—2000 MW in 2012, of which hydro accounted for 84 per cent (1,745 MW), wind for 14 per cent (291 MW), and solar for 2 per cent (35 MW)—is far below this potential.

The development of the renewable energy resource was targeted under the 2008 National Energy Strategy, and given further impetus under the Renewable Energy and Energy Efficiency Plan. This plan focuses on developing alternative energy sources and implementing energy saving technologies, with a view to strengthening security of supply, ensuring access to affordable energy and developing the green industrial sector. It targets a share of renewable energy in installed generation capacity of 42 per cent by 2020, based on installed capacity of 6,000 MW, split equally across wind, solar and hydropower.

In support of these targets, government launched the integrated solar plan (2009) and the integrated wind plan (2010). Five projects with a total capacity of 2,000 MW have been identified under the solar plan and the first phase of the 500 MW Ouarzazate project is currently under construction. The wind plan identifies five projects with a total capacity of 1,000 MW—current capacity and capacity under construction accounts for the remainder of the target—and tendering is currently in progress. The total cost is estimated at US$12.5 billion, of which the solar plan accounts for U$ 9 billion and the wind plan for US$3.5 billion.

2.3.3 Fossil-Fuel Subsidies

The current system of fuel price subsidies was introduced in September 2000, when rising international pries led the government to intervene in the market and introduce regulated prices for gasoline, diesel, kerosene and LPG. The cost of these subsidies was limited by a series of price increases so that, by the end of 2006, the subsidies for gasoline, diesel and kerosene were largely eliminated, although they continued to apply to LPG. By 2009 although the end-user price was regulated, the cost of subsidies had fallen to a low of 1 per cent of GDP in 2009 (Achy, 2012).

In 2009 subsidies began to rise as the global financial crisis rendered further price increases difficult and international prices also began to increase. By 2011 gross fuel subsidies had risen to 5.1 per cent of GDP (IMF, 2013d). In response, the government announced a program of reform under which fuel prices would be liberalized and the poorer sections of society compensated through cash transfers. In early 2014, the government announced that subsidies had been eliminated for gasoline and fuel oil, and would be reduced for diesel during 2014.

In the past, the government has found it difficult to implement reform due to the threat of social unrest (Reuters, 2013). Balancing the need to take control of the costs of subsidies with the need to retain order remains a challenge in the current round of reform. To some extent, this is an issue of communication—the public perception of subsidies does not reflect the true economic impacts—and measures that focus on clear and effective messaging could mitigate the concerns of civil society.

2.3.4 The Impact of Fossil-Fuel Subsidies

Expenditure on fuel subsidies exerts significant pressure on the national budget: the budget deficit was 6.8 per cent of GDP in 2011, compared with estimated fuel subsidies equivalent to 5.1 per cent of GDP (IMF, 2013d). Fuel subsidies are granted at the cost of a balanced budget, or more productive expenditure such as spending on social services such as health and education.

Further, the benefits of the subsidies accrue disproportionately to the richer sections of society, especially in the case of diesel and gasoline (IMF, 2013d). This was explicitly recognized in the recent reform attempts where the government introduced targeted welfare measures with the aim of better protecting the poor.

Also in common with other countries discussed, the existence of fossil-fuel subsidies acts as a barrier—both in terms of cost and otherwise—to further deployment of renewable sources. For example, a report on the Ouarzazate CSP plant by the Climate Policy Initiative suggests that policies that support fossil-fuel consumption make it difficult for renewable technologies to compete, drain financial resources away from low-carbon investments and weaken the perception of the country's commitment on its climate targets (Climate Policy Initative, 2012). Correspondingly, removing fossil-fuel subsidies would remove one of the barriers to renewable energy deployment.

2.4 Libya

2.4.1 Energy Sector Status

At the end of 2012, Libya had proved crude oil reserves of 48 billion barrels—the largest endowment in Africa and ninth largest amount globally. Proved natural gas reserves were 54.6 trillion cubic feet, making it the fourth largest natural gas reserve holder in Africa. Reflecting this endowment, the primary energy mix in 2010 was 70 per cent oil, 29 per cent gas, and 1 per cent renewable energy (Energy Information Administration, 2013).

In 2010 Libya produced almost 1.65 million barrels per day of oil, of which approximately 1.5 million barrels were exported, and 594 billion cubic feet of gas, of which 344 billion cubic feet was exported. Production dropped in 2011 as a result of the civil war, and again in 2013 as a result of protests at oil fields and port facilities (Energy Information Administration, 2013). In 2012 oil production was 1.48 million barrels per day and gas production was 430 billion cubic feet.

The Libyan economy is heavily dependent on hydrocarbons: the IMF (2103e) estimates that oil and natural gas accounted for nearly 96 per cent of total government revenue and 98 per cent of export revenue in 2012.

As of 2010 Libya had a total electricity generator installed capacity of 6.8 GW, with oil fired generation accounting for just under two thirds of this capacity and natural gas accounting for the remainder. Electricity generation has more than doubled from 2000 to 2010, a result of economic growth and investment. However, supply has failed to keep pace with demand, and power outages have affected both end users and the oil industry.

2.4.2 Renewable Energy

Libya has an excellent solar resource: the average daily solar radiation rate is approximately 7.1 kWh/m^2/day in coastal areas and 8.1 kWh/m^2/day in the south. Research suggests that a 0.1 per cent Libyan land use for solar energy production would lead to energy production equivalent to 7 million barrels of oil a day, or almost five times the daily amount of energy produced from oil in 2012 (Mohamed, Al-Habaibeh, & Abdo, 2013). There is also significant wind potential, with average wind speeds on the coast reaching 7.5 m/s (United Nations Economic Commission for Africa, 2012).

Current renewable energy capacity is limited to a program of relatively small PV projects totalling 4.8 MW (REN21, 2013b). Two projects—the 60 MW Darnah wind farm and the 14 MW Al-Jofra solar PV project—are due to be commissioned in 2014. Other projects in the pipeline include the 180 MW Al-Magron wind farm and approximately 110 MW of solar capacity (RCREEE, 2013c).

The Renewable Energy Authority of Libya (REAOL) was founded in 2007 with the mandate to implement and promote the development of renewable energy projects in Libya. It aims to increase renewable energy capacity to 2,200 MW by 2025, and to increase the share of renewable energy in generation to 10 per cent in the same year (REN21, 2013b).

2.4.3 Fossil-Fuel Subsidies

The IMF estimates that in 2012, fuel subsidies reached US$6.4 billion, or 7.6 per cent of GDP (IMF, 2013c). Electricity subsidies accounted for a further US$0.9 billion, or 1 per cent of GDP. In addition to the subsidies allocated to the electricity sector through the budget, the underpricing of fuel inputs is estimated to be equivalent to 3.3 per cent of GDP. Overall, Libya has some of the highest energy subsidies in the world, with an average consumption subsidy of over 70 per cent of full cost.

Gasoline prices are amongst the lowest in the world—the government sets the level and covers the difference between this regulated price and the cost of production from the national budget. In the electricity sector, input fuels are provided to the state generation company at prices below world levels, and tariffs charged to consumers are also set at a level below cost recovery. The overall cost recovery is very low, ranging from 7.7 per cent in the residential sector to 37.5 per cent for public services (IMF, 2013c).

2.4.4 The Impact of Fossil-Fuel Subsidies

The IMF estimates that fuel and electricity subsidies accounted for 11.9 per cent of GDP in 2012, far outweighing spending on education (5.1 per cent of GDP) and health (1.8 per cent of GDP). Energy subsidies restrict the ability of the government to invest in public services, which would have a long-term benefit for the economy in terms of enhanced productivity, as well as social benefits for the population.

Currently, under-pricing encourages wasteful use of resources by end-users and discourages the implementation of energy saving measures. The effects are most clearly seen in per capita energy consumption, with Libya having much higher energy consumption per capita than countries with a comparable GDP (IMF, 2013c). Similarly, under-pricing fossil fuels discourages the development of renewable energy sources, since they appear relatively more expensive than fossil fuel sources than is actually the case, a factor contributing to the low levels of deployment.

Excess use of energy and underdevelopment of renewable energy represent a lost opportunity for the Libyan economy. At the very least, implementation of energy saving practices and renewable energy would free up fossil-fuel production for export to the international market, with associated revenue benefits. In addition, the development of a renewable energy industry in Libya could have further benefits in terms of job creation and economic diversification.

2.5 Tunisia

2.5.1 Energy Sector Status

Primary energy demand in Tunisia in 2011 was 9.5 million tonnes of oil equivalent (Mtoe) (IEA, 2013). This was met primarily by oil products (40 per cent) and natural gas (45 per cent), with biomass (15 per cent) and some renewable energy sources (less than 1 per cent) accounting for the balance. Natural gas has assumed an increasingly important role since 1990, when its share in primary energy was around 25 per cent.

These energy requirements are met to some extent by domestic fossil-fuel production. In 2012 oil production was 67,000 barrels per day (down from a peak of 120,000 in the early 1980s) and gas production was 68 billion cubic feet (compared to 20 billion cubic feet in the early 1980s). However, this production is insufficient to meet demand and Tunisia is a net importer of oil and gas, with net imports representing 20.7 per cent of energy use in 2011 (World Bank, 2013b).

Electricity generation capacity was just over 4,000 MW in 2012. Gas-fired generation accounts for around 90 per cent of this capacity, with 60 per cent of the gas produced domestically and 40 per cent imported from Algeria. The remainder of the generation mix is dominated by heavy fuel oil, with wind and hydropower taking small shares in the balance.

Between 1990 and 2000, power demand grew at a rate of 6.2 per cent per annum, reflecting economic growth and increasing living standards. The rate of growth slowed to 4.6 per cent per annum between 2000 and 2005, due to the introduction of energy-efficiency measures and fell further to 3.7 per cent between 2005 and 2009. Forecasts suggest a rate of growth in excess of 4 per cent between 2010 and 2030, which would require significant investment in power infrastructure (Lechtenboehmer, et al., 2012).

2.5.1.1 Renewable Energy

In common with much of the region, Tunisia has significant wind and solar resources, and land available to exploit these resources. Solar potential is high, with more than 3,200 hours of sunshine per year, and an average insolation of 5.0–5.5 kWh/m^2/day. Northern regions have wind speeds in the region of 7–10 m/s (REEGLE, 2012b). The proximity to Europe raises the possibility that, in addition to meeting domestic demand, power generated from renewable energy projects could also be exported to Europe.

At the end of 2012 renewable energy capacity accounted for 244 MW of generation capacity, or 6 per cent of total generation capacity (RCREEE, 2013d). Despite the strong solar resource, the majority of this capacity was accounted for by windpower projects—the Sidi Daoud Wind Farm (54 MW) and the first stage of the Bizerte Wind Farm (120 MW) —with hydropower accounting for a further 27 per cent of capacity. Solar power has traditionally been considered too expensive and is largely limited to use in domestic water heating systems, developed under the 2005 PROSOL program (REEGLE, 2012b).

Projects under development at the end of 2012 comprise 235 MW of wind capacity, including the second stage of the Bizete wind farm (70 MW), Kchabta (45 MW) and Thala (120 MW). Solar power projects under development comprised 55 MW of CSP and just over 25 MW of PV capacity (RCREEE, 2013d).

The promotion of renewable energy in Tunisia began in 1985, but came to the fore in 2004 when the National Agency for the Promotion of Renewable Energy was created and the Promotion Programme on Renewable Energy was initiated. Aiming to reduce the economic burden of energy costs, the government introduced a series of laws and programs targeting the development of renewable energy and energy-efficiency measure. The 2005–2007 three-year plan successfully reduced energy intensity through a combination of energy-efficiency measures, increasing natural gas in electricity generation, and installation of solar water heaters in the domestic sector (the PROSOL program). The 2008–2011 plan built on these measures, aiming to reduce energy intensity by 3 per cent per year and bring the share of renewable energy in primary energy consumption up to 4 per cent by 2011 (Lehr, Moennig, Missaoui, & Marrouki, 2012).

In 2009 the government launched the Tunisian Solar Plan (PST), which covers the period 2011–2016. The plan targets an 11 per cent share of renewable energy in electricity generation by 2016, equating to a 16 per cent share of renewable energy in total installed power capacity (610 MW). The plan is intended to promote the large-scale deployment of renewable energy for electricity generation, to enhance energy efficiency in order to manage energy demand and to establish interconnection lines for the purpose of exporting power to Europe. These goals will be achieved through a series of projects (approximately 40), split across five categories: solar power, wind power, energy efficiency, other projects, research and implementation of the PST (Lehr, Moennig, Missaoui, & Marrouki, 2012).

Over the longer term, the government has targeted a 25 per cent share for renewable energy in electricity generation by 2030, and a 40 per cent share in total capacity (4,000 MW). Of this capacity, the majority will come from solar power (1,500 MW of PV capacity and 500 MW of CSP capacity in 2030), with wind taking a slightly smaller share (1,700 MW in 2030), and solid biomass making up the remainder (300 MW in 2030) (REN21, 2013b).

2.5.2 Fossil-Fuel Subsidies

Prior to 2013 subsidies applied to a wide range of food and energy products, including refined petroleum products, natural gas and electricity. These subsidies were universally applied, with all parts of the population benefitting, regardless of their need. The IMF estimated that the cost of these subsidies was equivalent to 5 per cent of GDP in 2012, up from 2 per cent of GDP in 2010 and 1 per cent in 2004 (IMF, 2013b).

The government sets prices across the energy market, including those relating to transactions between public enterprises and margins of private operators, as well as the prices charged to consumers. Prices of all petroleum products and natural gas are set independently of the prices on the international markets, with any difference covered by the national budget. Furthermore, electricity tariffs are below the overall costs of recovery (IMF, 2012b).

A number of attempts to reform energy subsidies have been made. Despite no overarching subsidy reform plan in Tunisia, between 2005 and 2008, price increases of typically less than 5 per cent occurred several times per year. Although these price rises did not eliminate fuel subsidies, they meant that the majority of international price rises were passed through to consumers over that period (Blatter & Buzzell, 2013). In 2009 a new mechanism was announced, under which the subsidy was capped at the level that they reached when oil cost US$52 per barrel. Whenever the international price of oil exceeded this reference price by US$10 over a period of three consecutive months, prices of petroleum products were increased by an a priori fixed amount. This reference price was raised to US$60 in 2010 (GIZ, 2010b). However, in 2011 protests against living costs and unemployment led the government to implement a US$230 million package to reduce food and fuel prices and suspend the fuel adjustment mechanism.

In 2013 the government announced a program of reform, under which universal price subsidies would be replaced with a system of targeted benefits. Accordingly, fuel and electricity prices were increased by around 14 per cent between September 2012 and March 2013, generating 1 per cent of GDP in annual budgetary savings (IMF, 2013b).

This was supported by the introduction of targeted assistance to mitigate the effects on the poorest households. However, further increases planned for 2014 were scrapped in the face of domestic political unrest (Reuters, 2014).

This latest reversal continues a tradition of reversed reforms in the face of public protest. Possible reasons for the strong opposition to subsidy reform including income loss, the perception of international pressure driving reforms and the lack of a space for the airing of social, economic and political grievances (Blatter & Buzzell, 2013). In addition, public acceptance of reform is linked to the ability to communicate the case—accordingly, recent attempts at reforms have been framed as part of a wider program to provide investment to create jobs and improve social services.

2.5.3 The Impact of Fossil-Fuel Subsidies

Fossil-fuel subsidies have exerted increasing pressure on the Tunisian budget in recent years. The IMF reports energy subsidies of TND550 million (US$320 million) in 2010 and estimate that this figure increased to TND1,536 million (US$890 million) in 2011 and TND1,688 million (US$980 million) in 2012 (IMF, 2012b). The cost of subsidies tripled from an average of 0.9 per cent of GDP before 2010 to 2.8 per cent in 2012 (IMF, 2013b).

Moreover, the subsidies are regressive, benefitting higher-income households more than lower-income households. The IMF estimates that the highest-income households benefit almost 40 times more from energy product subsidies than the lowest-income ones. For example, the combined cost of gas and gasoline subsidies to the richest quintile is equivalent to the cash transfer program that benefits 133,000 poor families (IMF, 2013b). Reform of the subsidy system, such that generalized price subsidies are removed and targeted benefits introduced, would better protect those in need.

Given that Tunisia is currently a net importer of fossil fuels, there are budgetary savings that can be made by increasing renewable power in the generation mix. Depending on the extent to which the renewable power resource is developed, there is also potential to reduce domestic consumption of fossil-fuel production and divert this production to export. However, fossil-fuel subsidies disincentivize the deployment of renewable capacity by making it relatively expensive vis-a-vis fossil fuels. In particular, solar power has been considered too expensive in relation to fossil-fuel subsidies, and thus remains barely exploited.

3.0 Common Themes and Issues

The MENA region is significantly diverse, not only in terms of economic and political structures, but also in terms of energy resource and infrastructure. However, the preceding discussions also highlight common characteristics and trends in relation to energy status. This concluding section summarizes these commonalities and suggests some possible lessons for policy-makers in these countries.

3.1 Energy Status is Changing: Challenges, Concerns, Opportunities

The economic and political structures of the MENA countries are intimately tied to the continued availability of fossil fuels at low prices. However, the energy environment is changing, with the availability of fossil fuels no longer as assured as previously, and with fuel prices rising above their historically relative low levels.

In recent years, concerns about the security of supply have come to the fore. Producing countries have seen interruptions to supply as a result of civil conflict (Libya), flat-lining production (Egypt) and the long-term decline of resources (Tunisia). This has had an impact on net importing countries where the supply provided by traditional partners has fallen below historic levels and is no longer sufficient to meet demand. For these countries, reliance on favourable long-term contracts with a few key suppliers is a continued source of vulnerability.

Security of supply concerns have a cost dimension for net importers—short-term interruptions have caused recourse to international markets at a high cost to national budgets (see preceding discussion on Jordan for an example). Over the longer term, expiration of long-term supply contracts with regional partners can be expected to lead to higher import costs.

In this environment, renewable energy represents a real opportunity. For all countries, it offers the chance to diversify energy supply away from fossil fuels, minimizing the impacts of supply interruptions. Furthermore, it also offers revenue benefits to both groups of countries—exporting countries can increase earnings through reducing the portion of production serving domestic demand and increasing the proportion going to export while importing countries can reduce expenditure on fossil-fuel imports and the volatility associated with this expenditure.

3.2 Fossil-Fuel Subsidies Are Increasingly Burdensome and Have a Major Impact

Fossil-fuel subsidies have long been prevalent across the region, but have become increasingly burdensome with rising fuel prices. For countries without large domestic resources, this cost has particular acuity, since increasing international prices widen the gap between the price paid for imports and the price charged to consumers (assuming a less-than-proportionate increase in the latter). The real cost of this is strained national budgets and social expenditure that is lower than it could otherwise be. Similarly, in producing countries, the opportunity cost of keeping prices below the international level is a constrained national budget. Impacts are exacerbated by low prices leading to the over-consumption of fossil fuels.

The impact of fossil-fuel subsidies is also felt in the structure of the energy sector. The five country case studies suggest that favourable climatic conditions mean that renewable energy is already at cost parity with fossil-fuel power generation in many cases, and may be cheaper than fossil-fuel generation in other cases. This advantage—which implies that renewable energy would not need the same financial support as in other regions—is obscured by fossil-fuel subsidies. While other factors such as the political acceptability of renewable energy and the constraints of existing infrastructure to support increases in renewable-energy generation may also be important, the distortions in relative costs go some way to explaining why deployment of renewable energy in the region has been far below its potential.

The continued use of fossil-fuel subsidies presents a major barrier to renewable-energy deployment. In this context, and faced with the challenges described, governments looking to encourage renewable energy can attempt to reform fossil-fuel subsidies to create a level playing field for renewable energy (the first best solution in an economic sense); but if fossil-fuel subsidies remain an intractable problem, governments may wish to employ other measures to promote renewables so as to equalize the cost with fossil-fuel sources. As the share of electricity generation from fossil fuels is reduced, so too is the overall subsidy cost, as long any measures put in place to support renewables are not more expensive than the subsidies given to fossil fuels.

Many of the arguments against fossil-fuel subsidies apply equally to subsidies to renewable energy, yet many governments choose to provide subsidies for renewable energy on the basis that the benefits—such as the predictable long-term cost of renewable energy; the reduction of imports (or increase in exports); the reduction in greenhouse gas emissions and local air pollution; and the creation of jobs—outweigh the costs. While the case for fossil-fuel subsidy reform is very strong, the case for renewable energy subsidies is much less clear cut. All subsidies should be viewed critically and every effort should be made to avoid subsidies that adversely affect the financial health of the electricity sector and the wider economy.

3.3 Reform Has Been Attempted in Many Instances, But Remains Challenging

One obvious contribution to the issues described in the preceding two sections would be to reform fossil-fuel subsidies. The most direct impact would be in reducing the bill associated with subsidies. More indirectly, through encouraging renewable energy deployment, a reduction in energy costs and enhanced security could be realized.

However, reform is not an easy option. National governments across the world, painfully aware of the costs exerted by continued subsidies, have made many attempts to reduce or eliminate subsidies. While some of these attempts have been successful, there are also many examples of partial or complete failures. The key challenges for reformers are, above all, political; the immediate hardship caused by reforms may aggravate simmering political tensions. Reform is only possible where the reform process enjoys the support of influential stakeholders—or at least the absence of active opposition. Support for reform is contingent on a number of issues. First, the real and perceived impacts of the reform must be acceptable. Some groups will face higher energy costs as a result of the reforms; these groups must be convinced that the overall impact of the reforms justifies this increased cost, or they are likely to oppose the reforms. Second, some stakeholders may require compensation measures in order to support the reforms. Striking the balance between facing down opposition and providing compensation to affected groups is an intrinsic part of the process. Third, in the dialogue around reform, the population is often asked to forego a very tangible current benefit (low energy costs) in order that the government can provide more targeted support in the form of public services or other government spending. This trade-off will only be accepted if there is enough trust in the institutions of the state that the public believe that the reduction in spending on energy subsidies will be used effectively. Third, even when government plans may include elements that address the concerns of stakeholders, unless the plans are well communicated, the vacuum of information may breed opposition. Finally, the perception of the role of subsides may be very different from the reality. Despite the fact that the benefits of subsidies tend to be accrued by the wealthiest households, subsidies may still be publicly viewed as a poverty-alleviation tool (Beaton, Gerasimchuk, Laan, Lang, Vis-Dunbar, & Wooders, 2013).

The constraints posed by the political balance in the country may seem insurmountable, but they can perhaps be addressed if resources are available and the government is committed to reform. Even in the absence of an immediate opportunity, much of the groundwork can be laid to help to create the conditions for reform in the future. Studying the potential impacts of reform, carrying out stakeholder consultations and establishing the current level of support all provide the inputs to the development of a comprehensive reform plan. Engaging with regional and international initiatives to promote reform presents opportunities to share best practices and avoid pitfalls. In the run up to reforms, a communication strategy can be developed to raise awareness of the issue and to present the case for reform, which may help to create conditions that may be more conducive to reform in the future. The road to successful reform may be long, but with excellent preparation the chances of success are greater.

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International Environment House 2, 9 chemin de Balexert,
1219 Châtelaine, Geneva, Switzerland
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