



Hashemite Kingdom of Jordan

Intended Nationally Determined Contribution (INDC)¹

Jordan's INDC Summary

Jordan nationally determines to reduce its greenhouse gas emissions by a bulk of 14 % until 2030. This contribution of GHGs reduction will be unconditionally fulfilled at, maximally, 1.5 % by the Country's own means compared to a business as usual scenario level.

However, Jordan, conditionally and subject to availability of international financial aid and support to means of implementation, commits to reduce its GHGs emissions by additional, at least, 12.5 % by 2030.

The outcome targets above are accompanied by a diverse combination of numerous GHGs cut-oriented actions in all involved sectors of emissions in addition to the adaptation actions in targeted sectors. These actions (policies, strategies, legislations, measures, etc) are articulated in this document. The methodological approaches underlying Jordan's INDC are included in this communication as well.

ملخص بالعربية

تنوي المملكة الأردنية الهاشمية القيام بالإسهامات المحددة وطنيا للحد من انبعاثات الغازات المسببة للاحتباس الحراري بنسبة تخفيف تصل لغاية 14٪ حتى عام 2030. علماً بأن الحد الأقصى لنسبة التخفيف غير المشروطة هي 1.5٪ مقارنة بمستوى السيناريو المعتاد. كما أن المملكة تلتزم بالحد من انبعاثات غازات الدفيئة بنسبة تصل على الأقل لغاية 12.5٪ بحلول عام 2030 مشروطة بتوافر المساعدات المالية الدولية ودعم وسائل التنفيذ.

يرافق الأهداف التخفيفية هذه مجموعة متنوعة من العديد من إجراءات التخفيف من غازات الدفيئة في جميع القطاعات المعنية بخفض الانبعاثات بالإضافة إلى إجراءات التكيف في القطاعات المعنية. وهذه الإجراءات (السياسات والاستراتيجيات والتشريعات والإجراءات، الخ) تم تضمينها في هذه الوثيقة مقرونة بالأساليب والمنهجيات التي أدت إلى تحديدها.

1. Welcoming Remarks to Jordan's INDCs

The Government of the Hashemite Kingdom of Jordan (GoJ) welcomes you to Jordan's diversified (a wide rainbow of combination of outcomes and actions) INDC. Jordan believes that such contribution sets an ambitious target, proportionate to the circumstances of such a small developing country if necessary financial support and means of implementation made available to the country to implement such contribution. The unconditional outcome target is aiming at reducing Jordan's greenhouse gases (GHGs) emissions by 1.5 % by 2030 compared to a business as usual scenario levels. The conditional outcome target is aiming at reducing Jordan's GHGs emissions by 12.5 % by 2030. The two targets will be achieved based on implementing at least 70⁺ projects (43 sectoral projects resulted from the mitigation scenario assessment articulated in the 2014 Third National Communication Report to UNFCCC and another around 27⁺ sectoral priority projects proposed concurrently or newly planned and not listed in the TNC Report, i.e., proposed after the development of the TNC. The later group of projects was disseminated to INDC document by involved stakeholder line ministries and organizations in response to INDC formulation process. This 70⁺ project 14-percent INDC of Jordan, of which many projects are now under execution by relevant institutions, will be implemented under the guidance of the overarching national *Climate Change Policy of the Hashemite Kingdom of Jordan 2013-2020*. The climate change policy of Jordan is a holistic nation-wide policy encompassed strategic objectives and measures for mitigation and adaptation. It is considered the first of its kind in the Arab Region and, in terms of sectoral coverage, in the Middle East, covering the pre-2020 period, which was developed voluntarily as a demonstration of the self-commitment of a small yet an ambitious country. The *Policy* itself as well will be extended at the end of its term to 2030 (another ambitious action-style contribution of Jordan) to concurrently go in line with and serve as an overarching umbrella guiding and monitoring the implementation of the 70⁺-project 14-percent GHGs emission reduction pathway of activities until 2030.

This combination of a holistic national-level *Policy* aiming at guiding sectoral objectives and measures, accompanied by an ambitious mitigation target decided upon by GoJ, which could be met systematically if sufficient support is effectively provided to the country, will be a first, yet a serious step in line with the 2°C objective.

The estimated cost to reach the 14% target is totaling USD 5,700,000,000 from which GoJ has already secured USD 542,750,000 by its own means to meet the unconditional target; which means the Country is in need of

¹ Jordan's INDC development process was supported by GIZ through the Global GIZ Project "Support to Selected Partner Countries in Developing their Intended Nationally Determined Contributions (GIZ-INDCs Global Project)" - A project of the International Climate Initiative (IKI).

USD 5,157,250,000 to fulfill its conditional target.

With regard to adaptation to climate change and before developing of the National Climate Change Policy of Jordan 2013-2020, which advanced concrete strategic objectives, measures, and instruments to adapt the Country to climate change impacts in each involved sector (water, coastal areas, agriculture/food security, health, tourism, biodiversity, and socioeconomic situation/poverty), Jordan conducted (2009-2013) a major joint program of water and health sectors' adaptation namely "*Adaptation to Climate Change to Sustain Jordan's MDG Achievements*" with a total budget of USD 4.13M. The program's outcomes were to develop sustained access to improved water supply sources, despite increasing water scarcity due to climate change and to strengthen the capacity for health protection and food security under conditions of water scarcity. Moreover, and in continuation of national actions, the Country mainstreamed climate change in its *National Strategy and Action Plan to Combat Desertification (2015-2020)* which was recently aligned with the global UNCCD 10 year Strategy. Jordan also mainstreamed climate change into the *National Biodiversity Strategy and Action Plan (2015-2020)*, which was also recently aligned with the global CBD-10 year Strategy.

Finally, all sustainable development-oriented plans in the country have led to a crowning national effort, which will be the development of a national strategy and action plan for transitioning towards the green economy in Jordan (2016-2025) which is currently under development. All of such climate change-response actions demonstrate the extraordinary efforts and the size of involvement of such a small country in the fight against climate change.

2. Climate Change and Sustainable Development Circumstances in Jordan

2.1. GHGs and climate change actions undertaken pre-2020

Based on the base year 2006, Jordan's share in global greenhouse gas emissions was 28,717 Gg of CO₂ eq., which is 28.72 million ton (Mt) of CO₂ equivalent (detailed breakdown of emissions shares per surveyed sectors and covered gases is provided in the TNC Report to UNFCCC and the accompanying inventory submitted in late 2014). The Country's bulk share of GHGs represents only around 0.06% of global total according to a global GHGs analysis conducted in 2010². According to World Bank, the CO₂ metric tons per capita emission is 3.4 in 2010.

As Figure 1 below illustrates, energy (including transport)-related activities have the dominant share of GHGs emissions in Jordan totaling 73% followed by almost close percentage for both waste and industrial activities totaling 10% and 9% respectively. Activities from Agriculture and LULUCF have the lowest, also close percentages, of 5% and 3.0% respectively.

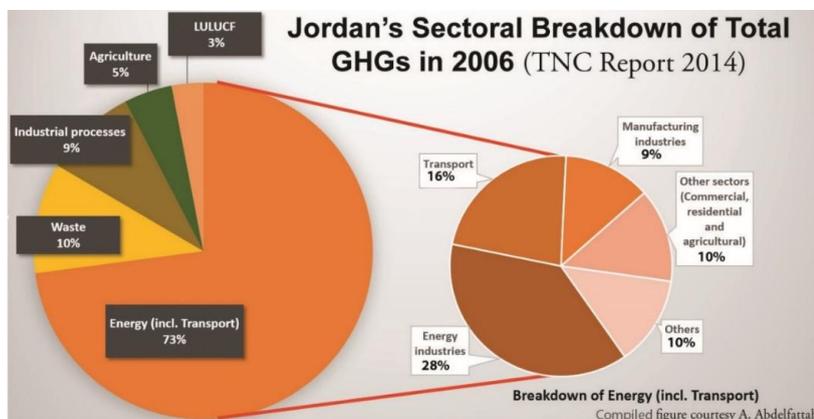


Figure 1. Jordan's greenhouse gas emissions by sectors in 2006.

These emissions are expected to grow according to the 2006 baseline scenario used in the TNC (2014) to 38,151 Gg, 51,028 Gg and 61,565 Gg of CO₂ eq. in the years 2020, 2030 and 2040 respectively due to normal growth models. The role of the energy sector and sub-sectors as the leading emitter of GHGs is expected to increase in the future from 73% of total emissions in the year 2006 to 83% in the year 2040 according to a BAU scenario. Therefore, it is anticipated to focus the mitigation efforts of the Country on this sector.

The baseline scenarios was based on 2014 conditions, which were deeply relying on imported fossil fuel and the delay in renewable and alternative energy projects as well as interruptions in gas supplies. Now, in 2015 the conditions have changed with more emphasis on renewable and gas. We believe when Jordan develops its BUR based on 2010 inventory the baseline scenario will lead to a peak year.

² United States Department of Energy's Carbon Dioxide Information Analysis Center (CDIAC) for the United Nations, 2010. The data only considers carbon dioxide emissions from the burning of fossil fuels and cement manufacture, but not emissions from land use, land-use change and forestry. Emissions from international shipping or bunker fuels are also not included in national figures.

Historically, Jordan was amongst the most active countries in the region with regard to involvement in international climate change efforts and response actions. Jordan was amongst the first group of developing countries to ratify the UNFCCC and make an accession to the Kyoto Protocol in 1994 and 2003 respectively. In response to its obligations towards the UNFCCC, Jordan prepared and submitted its Initial National Communication on Climate Change in 1997 and the Second National Communication in 2009. Moreover, Jordan has launched its Third National Communication Report to UNFCCC in December 2014. In line with that, Jordan has systematically continued its efforts in responding to climate change by developing and starting implementing national strategies and policies; of which Jordan, supported by UNDP, has developed a national climate change policy in 2013, the first comprehensive policy in the Arab Region and the Middle East as elaborated above.

However, Jordan, as a non-Annex I country, has, so far, no commitments for GHG emission reduction targets. Nevertheless, Jordan believes that there is a large potential for mitigation, even though Jordan's total GHG emissions are very small in absolute terms compared to other countries as indicated above. Developing full-fledged NAMA projects and capacity building in establishing and running an effective MRV system both on macro level and on sectoral and activity levels are highly needed since MRV is looked at as prerequisite for developing NAMAs. More dedicated efforts are needed to provide institutional capacity strengthening for data collection and management particularly with regard to mitigation. There is good improvement in renewable energy policies, strategies, laws and by-laws formulation but improving robust implementations still needs further work. However, there is now so much activities going on renewables in the Country. Private sector engagement in climate change activities is still not at the expectation level but slowly improving and good progress is taking place in investment in renewable energy sector particularly. However, the overwhelming majority of climate initiatives and projects in Jordan are still donor-driven. Thus, the pledged reduction of emissions by 2030 of 14 % compared to a BAU scenario levels still require substantial international financial support and a paradigm shift in national planning that includes the allocation of domestic resources for low carbon emission growth strategies.

2.2. Climate change vulnerability of Jordan and impacts

Climate change is expected to affect sustainable development, economic growth and society. Based on outcomes from the latest Third National Communication Report to UNFCCC (2014), serious vulnerability and impacts results are expected based on modeling and projections analyses. Predicted trends indicated that the annual precipitation tends to decrease significantly with time. Simultaneously, the mean, maximum and minimum air temperature tends to increase significantly by 0.02, 0.01, and 0.03 °C/year, respectively. On the other hand, the relative humidity tends to increase significantly by an average of 0.08%/year. In addition, the dynamic projections predicted more extremely likely heat waves and likely drought events, dry days, and potential evaporation among other potential impacts (TNC 2014).

2.3. Sustainable development challenges in Jordan

Located at the heart of the Middle East, Jordan is a small upper-middle income county with scarce natural resources (in particular water), and a small industrial base within the service sector (the later contributes around 70% of GDP) which dominates the economy. The country is shaped by its geography, history, geopolitics and scarcity in natural resources. The government identified poverty and unemployment as two of the most important challenges the Country faces. The challenge of meeting the increasing energy demands is another pressing issue. Before elaborating on the expected GHGs growth patterns and mitigation potential, it is important to present some information about Jordan especially in light of current development challenges impacted by economic and regional political situation.

The demographic characteristics of the Jordanian population show that the Jordanian development process faces a challenge in providing basic needs in such a developing country. Jordan has a total population of approximately 6.388 million. However, over the past decade, Jordan has seen considerable economic and social achievements; GDP per capita has increased from JD (1512) in 2004 to about JD (3670) in 2014. Jordan has also invested significant resources in infrastructure facilities serving the citizens, made remarkable human development achievements, maintained stability and attracted foreign and domestic investment. These achievements were accompanied by some challenges that are still unresolved, mainly the development gap between governorates, high unemployment rates, especially among young people and the relative decline in certain competitiveness indicators. However, the general situation in Jordan, the level of infrastructure, and the institutional development help Jordan to leap ahead and start addressing and overcoming challenges. His Majesty King Abdullah II has highlighted the most prominent challenges, the way to the future and the social and economic model that the country aspire in his letter to the government to develop a vision for the next decade.

In His Majesty Abdullah II Ibn Al Hussein's Opening Address at the World Economic Forum on the Middle East and North Africa, 2015, His Majesty highlighted the importance of securing reliable sources of energy saying {quote} "We also need to find the opportunities in challenge. To define our region by problems and not

solutions is to miss huge potential. Rapid urbanization, education requirements, water scarcity, the need for reliable energy, building health and transport infrastructure: these are critical issues for most of our countries.”, “In Jordan, we are looking to new projects in urban development, water infrastructure, and a diversified, long-term energy platform” “Today, Jordan is bringing solar heating and lighting to our schools and offices, electric vehicles to our streets and industries, a digital system for our health sector, e-payments for transactions, even iris recognition for channeling assistance to refugees. These are just a few examples. You at this Forum, and your peers in the region, will create many, many more.” {end quotes}

The high annual growth rates of demand for energy (4-5% for primary energy and 5.3% for demand for electricity) for the period 2015-2025 remains one of the highest in the world and thus is considered one of the Kingdom’s most significant development challenges. In 2013, total primary energy consumed in Jordan was about 8.2 million tons of oil equivalent, 82% of which were crude oil and oil derivatives, 11% natural gas, 3% renewable energy and imported electricity and 4% petroleum coke and coal. The national energy sector’s main concern is the provision of adequate energy for development with the least possible cost and best quality. The energy sector still suffers from extreme fluctuations of oil prices and the ability to secure constant and sustainable energy supply for the country.

While Jordan has achieved many sustainable development goals, sustaining these results and reducing the burden of the energy sector on economic and social development will increasingly depend on the transition to a sustainable energy future. The high cost of importing energy puts a heavy burden on the public budget already constrained by running costs. Since the prices of energy imports have increased with high risk in constant supplies, this situation spurred governmental action to improve energy efficiency and provide additional energy resources. The running policy of the GoJ in the field of energy was shaped through the adoption of the Updated Master Strategy of Energy Sector in Jordan for the period 2007-2020. The main goals of the Strategy are to secure reliable energy supply through increasing the share of local energy resources such as oil shale, natural gas in the energy mix, expanding the development of renewable energy projects, promoting energy conservation and energy efficiency and awareness and generating electricity from nuclear energy. The options include as well a diversification of Liquefied Natural Gas (LNG) possibly from Qatar or the new Leviathan Basin in the Eastern Mediterranean (thus, a new LNG port is already operational in Aqaba); new oil and gas pipelines from Iraq; and search for new shale potentials.

The running energy strategy is to transform the energy mix from one heavily reliant on oil and natural gas to one more balanced with a higher proportion of energy supplied by oil shale and renewable sources. The energy strategy sought to increase reliance on local energy sources to 25 % by 2015, and up to 39 % by 2020 as set in 2020 Energy Strategy. Placing more emphasis on the utilization of renewable energies will alleviate the dependency on the traditional energy sources, especially oil, which is imported from neighboring countries. This will also be paralleled with the reduction of energy produced from oil from 82% in 2013 to reach 50% in 2020.

The 2013 Arab Future Energy Index (AFEX) showed that Jordan has made progress in this regard, ranking second in the Arab region for renewable energy trends and the second for energy efficiency. The 2012 Energy Efficiency and Renewable Energy Law no. 13 is also a key enabler, providing incentives for sustainable energy solutions as Jordan seeks to increase renewable energy from 2% of overall energy in 2013 to 10 % in 2020, and to improve energy efficiency by 20 % by 2020.

The influx of Syrian refugees into Jordan has increased the demand for energy and electricity. In addition to long-standing structural challenges in the energy sector in terms of supply, demand as well as management, Jordan also faces exacerbating factors resulting from the increase of Syrian refugees, who comprise nearly 13 % of Jordan’s 6.388 million population. Although Syrian refugees and forced migrants fall within the lower-income bracket and average energy consumptions remain less impactful on the broad energy challenges in Jordan relative to core energy users in the Country, total residential energy consumption has risen significantly.

From another corner, the development of industrial and services sectors in Jordan, accompanied with the increase of Jordanian population and the increase of numbers of vehicles has resulted in an increase in the GHGs and pollution emitted to the ambient air in the last decades. Transport sector in Jordan is a major contributor to increasing emissions of greenhouse gases. With a percentage of 16% of emissions share to the bulk GHGs of Jordan, transport sector is the second source (after energy sector emitting 28%) of GHGs emissions in the country. The Ministry of Transport (MoT) launched a long-term national strategy 2014 in which the sustainable transport is one of its pillars. Mobility of people and freight is a widely shared goal amongst transport policy makers in Jordan; therefore, the MoT is obliged to form its policies in line with sustainable transport trend. One of the major objectives of the long-term transport strategy at MoT is to increase the total number of commuters using public transport as a percentage of the total number. In 2010 this percentage stood at 13 percent, 9 of which were taxis. It is anticipated that this percentage would increase by implementing programs and projects that will enhance the quality of service of the whole public

transit network to 25 percent by 2025.

The environmental sustainability of Jordan's transport strategies are focused on three main aspects, namely *emissions, energy consumption, and traffic reduction*. MoT believes it is important to reduce all emissions from transport sector (i.e. CO₂, CO, PMx, NOx expressed in tons per day). MoT will also work on reducing percentage of fuel consumption (in tons per day) which might be achieved through the implementation of the transport strategy. With regard to traffic reduction, MoT will work on this contribution in terms of reduction of V-km at national level and in densely populated areas by type of vehicle (i.e. car, HGV, LGV and expressed in 1000v-km per day). MoT believes that introducing higher order public transit systems such as bus rapid transit (BRT) systems is key to improving the transport service in the country. MoT is already taking on the Zarqa- Amman project that would link to the Amman BRT system that is being implemented. Initial steps are being taken to tackle other probable viable routes including Salt- Sweileh- Baqaa.

Serious measures are being taken to implement the national railway system, which would be a cornerstone of the planned multimodal network that would play a major role in the ease of the transport of goods within the country and the surrounding region. With such system in place, the reductions of emissions from these activities are obvious. MoT believes that utilizing latest technology in the transit sector can add to the efficiency of operations; implementing applications that connect taxis to customers for instance can reduce idle time thus reducing energy usage thereby reducing emissions. Acquiring accurate data for origin and destination of passengers can pave the way for better route planning, thereby increasing the ride ability and shortening trip distances. Moreover, MoT is targeting to increase transport sector reliability. Adopting and implementing policies related to fleet characteristics would also enhance efficiency and reduce emissions. Issues related to fleet service life, replacement incentives, and reconfiguration of technical elements will have a positive effect on energy consumptions and reducing CO₂ and other greenhouse gases emissions.

2.4. Demographic, economic and political challenges

One of the main demographic and thus political determinants for Jordan and thus development implications is migration. Being at the crossroads of two major areas of instability and prolonged conflicts, Jordan has become the destination for several waves of forced migrants from Palestine and lately from Iraq and Syria. Since 2011, and until February 2015 Jordan has hosted over 650,000 refugees from Syria, with approximately three-quarters living in urban areas across the Country and one-quarter living in refugee camps in the northern region. The waves of refugee influxes are still on going, as the conflict has no foreseeable solution. Based on data from Department of Statistics (DOS) obtained at the end of 2014, the total number of unregistered Syrian people in Jordan is 750,000 people while the registered number with UNHCR is 650,000. The grand total number of Syrian in Jordan is 1.4 million persons.

Jordan has been affected by not only the adverse regional and global developments such as the political situations in the area but also by the continuing global financial and economic crises as well as the rise in commodity prices in the international markets. The rapid growths in economic activities, population and successive influxes of refugees over the last decade have imposed additional demands on energy resources. As matter of fact, Jordan is a country with limited indigenous energy resources. Jordan imports about 97% of its energy requirements, which includes mainly crude oil, oil derivatives and natural gas. Local sources cover the remaining 3% of requirements with renewable energy contributing only a small proportion to this mixture. This 97% import of energy needs is accounting for almost 20% of the GDP, which makes the country completely reliable on and vulnerable to the global energy market.

2.5. A future sustainable development vision in favor of low-carbon economy

Recently, the GOJ launched in mid of 2015 Jordan's 2025 National Visions and Strategy, which charts a path for the future and determines the integrated economic and social framework that will govern the economic and social policies based on providing opportunities for all. Jordan 2025 includes more than 400 policies or procedures with performance indicators (including energy, water, waste, agriculture and other mitigation-oriented sectoral policies, procedures and indicators) which will lead to reduction of GHGs that will be implemented through a participatory approach between the government, business sector and civil society. Most importantly, the 2025 National Vision and Strategy has set a 11% Key Performance Indicators (KPIs)-style "targets" for renewable energy share in the total energy mix in 2025 as well as increasing the percentage of the contribution of natural gas in the energy mix to 39%. Quoted from the Vision, "*There is no doubt that given the current financial pressures on our economy and its people and the elevated and continuing level of insecurity and conflict in our region, Vision 2025 is ambitious.*" Jordan is a small open economy with population growth rate much higher than the global average. Therefore, due to the small size of our local economy, it is difficult to deliver high-quality sustainable growth and create the number and quality of jobs needed to employ Jordanians over the next decade and beyond. Although we have made

significant progress over the past decade, significant challenges lie ahead as we seek to achieve greater and better quality prosperity for all Jordanians.

3. Jordan's Mitigation Contribution

3.1. Mitigation outcomes

- Jordan has set a KPI-style "target" of 11% of renewable energy share in the total energy mix in 2025. This KPI is articulated in *Jordan 2025-A National Vision and Strategy* (launched June 2015).
- The unconditional GHGs reduction outcome target is aiming at reducing Jordan's GHGs by at maximum 1.5 % by 2030 compared to a business as usual scenario levels. This target will be arrived at based on implementing tens of projects, some of them are part of the 43 sectoral projects resulted from the mitigation scenario assessment articulated in the Third National Communication (TNC) Report to UNFCCC and some are priority projects proposed recently by GHGs emission sectors after developing the TNC and communicated to MoEnv. The implementation of some of these projects already started.
- The conditional outcome target is aiming at reducing Jordan's greenhouse gas emissions by at least 12.5 % by 2030. This target as well will be arrived at based on implementing tens of projects, some of them are part of the 43 sectoral projects proposed in the TNC Report to UNFCCC and some are priority projects proposed recently by GHGs emission sectors after developing the TNC and communicated to MoEnv. The implementation of some of these projects already started.

The estimated cost to reach the 14% target is totaling USD 5,700,000,000 from which GoJ has already secured USD 542,750,000 by its own means to meet the unconditional target, which means the Country is in need of USD 5,157,250,000 to fulfill its conditional target.

3.2. Mitigation actions

National-level actions

- *Developing the National Strategy and Action Plan for Transitioning towards the Green Economy in Jordan 2016-2025.* This activity is currently under execution and the green growth strategy is expected to be developed in 2016.

Sectoral actions

i. Energy Sector

- *Developing and utilizing the local conventional and renewable sources of energy (expanding the development of renewable energy projects) and encouraging investment in renewable energy:* Raising awareness about the incentives provided by the renewable energy and energy conservation law; improving the attractiveness of renewable electricity tariff by basing the purchase price on the cost of production (depending on the energy source and size of the project); encouraging and supporting local industries to manufacture renewable energy components; implementing the power purchase agreements on the long-term from renewable energy producers; and activating the recently established *Renewable Energy and Energy Efficiency Fund (JREEEF)*.
- *Encouraging the use of solar energy for water heating:* through the provision of short-term support for the purchase of solar water heaters.
- *Requiring the implementation of green building codes:* by setting clear standards for construction, materials and land based on best practices; and requiring all new buildings in the public sector to comply with *Leadership In Energy & Environmental Design (LEED)*.
- *Rationalizing energy consumption in all sectors and improving their efficiency and raising awareness about the long-term financial benefits of energy efficiency:* Improving the collection of data on energy use patterns and identifying the most useful data on the efficiency of energy use for policy makers; providing appropriate financial incentives for energy efficiency projects; and providing funding to allow schools, hospitals and other facilities assessing the potential of saving energy, and making energy-related capital improvements in their facilities. Implementing programs of energy audits and energy efficiency measures in public and governmental buildings; conducting awareness campaign to promote solar water heaters in different sectors and awareness campaigns to promote energy efficiency through energy audit; and establishing In-House Show Room in the Ministry of Energy and Mineral Resources (MEMR's) premises to advise public people including professionals in how to save energy in all aspects.
- *Attracting private sector investment to the energy sector:* Reducing administrative obstacles in order to take advantage of the JREEEF to support investment in early stage.
- *Diversifying the sources and kinds of energy and diversifying sources of natural gas imports:* Ensuring

safe and flexible gas deals in the short, medium and long-terms and finding additional sources of natural gas to supply industries and distribution projects in cities (KPI-style “target” of 39% natural gas in the energy mix in 2025).

- Expanding the use of solar cooling in commercial and industrial facilities: Jordan has been experimenting the application of solar cooling technologies for use in commercial buildings and industrial process to help in introducing sustainable energy systems and reducing GHG emissions from the cooling sector. Successful attempts have been documented and the country is now ready for an expanded and upscale introduction of solar cooling technologies.

ii. Transport Sector

iii. Transport is by far the largest energy consumer in the Kingdom and the second emitter of GHG according to the 3rd National Communication Report. Main programmes and projects under transport sectors are:

- Launching the MoT’s long term national transport strategy in 2014 in which the sustainable transport is one of its pillars;
- Increasing the total number of commuters using public transport as a percentage of the total number to 25 % by 2025;
- Introduction of the Zero Emission Electric Vehicle (ZEV) in Jordan will be implemented in various phases with the eventual deployment of 3000 charging stations (on grid & off grid) by to support 10000 ZEVs by the private sector. The ZEV charging stations will be powered by renewable energy. The programme will be implemented through a partnership between the Greater Amman Municipality and the Ministry of Environment and the private sector within a Public Private Partnership (PPP) agreement. The outcomes of the initial phase will guide the upscaling of this programme in a wider context that goes beyond 2020. The Jordanian government in coordination with the private sector will develop the supporting legislation needed to ensure a secure and transparent introduction of the ZEV in the kingdom.
- Reducing all emissions from transport sector (i.e. CO₂, CO, PM_x, NO_x expressed in tons per day);
- Reducing percentage of fuel consumption (in tons per day) achieved through the implementation of the transport strategy;
- V-km reduction at national level and in densely populated areas by type of vehicle (i.e. car, HGV, LGV and expressed in 1000v-km per day);
- Implementing the national BRT system;
- Implementing the railway system, which would be a cornerstone of the planned multimodal network that would play a major role in the ease of the transport of goods within the country and the surrounding region. With such system in place, the reductions of emissions from these activities are obvious;
- Increasing transport sector ridability through adopting and implementing policies related to fleet characteristics to enhance efficiency and reduce emissions thus yielding positive effect on energy consumptions and reducing CO₂ and other greenhouse gases emissions;
- Ensuring the inclusion of energy efficiency considerations when buying transport modals.

iv. Waste Management Sector

- Developing a system for sorting, re-using and recycling (KPI-style “target” to reduce percentage of solid waste that is disposed of in landfills from 80% to 60% in 2025 and increasing percentage of treated and re-used solid waste from 20% to 40% in 2025.

v. Industries Sector

- Encouraging investment in solar and wind energy projects near industrial clusters;
- Providing alternative energy sources and motivating local industry to use alternative energy sources;
- Implementing comprehensive programs for renewable energy and rationalizing energy through JREEFF, to include the provision of technical and financial support windows for programs and projects such as Revolving Fund, Equity Finance, Guarantees, and Grants to various sectors, including residential sector, as well as managing and organizing comprehensive awareness campaigns for renewable energy and energy efficiency .

vi. Water Sector

- Improving energy use efficiency in water utilities, and implementing a number of projects based on renewable energy sources (hydropower, solar, wind) as well as biogas and energy production from sludge (KPI-style “target” to reduce energy used per billed cubic meter (billed kW/m³) from 4.175 in base year 2013 to 4.065 in 2015).
- Developing the Ministry of Water and Irrigation’s (MWI) Energy Efficiency and Renewable Energy Policy for the Jordanian Water Sector (2015) starting with utilization of sludge and other biosolids to generate energy, which is one of several projects announced under the policy, which seeks to achieve a 15 % reduction in energy consumption of billed water by the year 2025 through the introduction of economically feasible and environment-friendly power generation systems based on renewable energy sources.
- Introducing renewable energy as a source to supply water systems.

vii. Agriculture and Food Security Sector

- Afforesting 25% of barren forest areas in the rain belt areas on which the rate of precipitation exceeds 300 mm.

3.3. Up-front Information

3.3.1. Quantifiable information on the reference point (including, as appropriate, a base year):

Baseline scenario/base year: A Business as usual scenario was used (but 2006 was used as a base year for GHG inventory in the TNC upon which the core component of Jordan’s INDCs were based).

Emissions in base year: **28.72.3 million ton (Mt) of CO₂ equivalent** (a sectoral breakdown of emissions shares per surveyed sectors is provided in Figure 1 above but a detailed sub-sectoral and gas type breakdowns of the GHGs are provided in the TNC Report and the accompanying inventory submitted to UNFCCC in late 2014).

3.3.2. Time frames and/or periods for implementation

Time frame of the commitment is until end of 2030. The quantified commitment by 2030 is relevant to the GHGs reduction targets while the other packages of mitigation actions (and tied KPI-based targets) are anticipated to be achieved by 2025 based on timeframe adopted by Jordan 2025-a National Vision and Strategy (launched in 2015).

3.3.3. Scope and coverage

Gases covered: Carbon dioxide (CO₂); Methane (CH₄); Nitrous oxide (N₂O); Sulphur hexafluoride (SF₆); Perfluorocarbons (PFCs); and Hydrofluorocarbons (HFCs).

Base year for gases covered: all 2006.

Sectors covered: energy (including transport), waste, industrial processes, agriculture and land-use, land-use change and forestry (LULUCF) and solvents.

Furthermore, GHG emissions from bunker fuels have also been estimated and reported as a memo item (these emissions are not included in the national GHGs inventory total). In addition to the sectoral approach, the reference approach has also been used for the estimation of CO₂ emissions from the overall fuel consumption figures for the time frame between 2000-2010.

3.3.4. Planning processes and tracking of progress

Short-term

Jordan’s well organized and institutionalized planning process for combating climate change has started in 2013 by voluntarily developing the *National Climate Change Policy for the Hashemite Kingdom of Jordan 2013-2020* as mentioned before. The provisions of this Climate Change Policy are being integrated/mainstreamed in environmental, social and economic policies and legislation in the Country. In particular, the Policy’s provision will be integrated in the National Green Growth Plan and Implementation Roadmap, which is currently under development and will be launched in 2016 and will cover six sectors (energy, water, waste, transport, tourism and agriculture). The INDC proposed for Jordan is envisioned as the core element of the said National Green Growth Plan. This helps dual implementation of the INDCs and the Country’s green growth plan.

The National Committee on Climate Change is mandated to monitor the progress in the implementation of the Climate Change Policy on the national level and thus the INDC. A large share of the objectives of the Policy will be implemented through sector strategies under the responsibility of the sector’s ministries (energy, water, agriculture, health, and others). Their progress will be monitored by each involved sector on the basis of the specific monitoring framework adopted in the respective sector’s policies and strategies.

Medium- to long-terms

The national implementation will be based on the time frame of the commitments, which is until end of 2030 for the GHGs reduction targets and until 2025 for the other packages of mitigation actions (and tied KPI-based targets) based on timeframe adopted by Jordan 2025 Vision. The GHGs reduction targets' achievement will be tracked through the information in Jordan's national inventories and Biennial Update Report (BURs). The preparation of the first BUR for Jordan will start in 2016 and is expected to be completed in late 2017. Jordan will strive to put in place a functioning MRV system for GHG inventory and mitigation progress based in the appropriate institutional and technological settings available. For the other packages of mitigation actions (and tied KPI-based targets) proposed in Jordan 2025, the Vision has set a "*Performance Management Framework for Implementation*" to assure that the policies, measures, and KPIs articulated in the Vision will be fulfilled. In each section of the 2020 Vision, a number of KPIs have been chosen to measure progress, and where possible, objective and internationally used KPIs have been selected. This is to ensure transparency in measuring progress. The governmental executive programs that will be prepared based on this Vision will measure progress in the short and medium terms. The time-period covered by the Vision was divided into three phases, and each phase will be evaluated to see what has, and what has not been, achieved in order to ensure continuing the implementation of policies and initiatives of the said Vision. The Prime Minister's *Delivery Unit* was re-established to follow up the most important initiatives proposed and overcome the obstacles facing the Vision's implementation in order to assure commitment and effective implementation.

3.3.5. Assumptions and methodological approaches including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals

The INDCs of Jordan are based on the following methodologies and assumptions and methodological approaches:

As a non-Annex I country, the inventory information provided by Jordan is according to the guidelines for Parties not included in Annex I as required by decision 17/CP.8. The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 1997) have been used. In addition, and as encouraged by decision 17/CP.8, the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Inventory (IPCC 2000) and the IPCC Good Practice Guidance on Land Use, Land Use Change and Forestry (IPCC 2003) have also been used specially in the uncertainty estimation. The UNFCCC software for Non-Annex I countries has been used for the preparation of the national inventory. Sectoral (bottom-up) approach has been used to estimate the GHG emissions and removals from the following sectors:

- Primary energy,
- Renewable energy,
- Energy efficiency,
- Transport,
- Industrial processes,
- Waste, and
- Agriculture

Furthermore, GHG emissions from bunker fuels have also been estimated and reported as a memo item (these emissions are not included in the national total). In addition to the sectoral approach, the reference approach has also been used for the estimation of CO₂ emissions from the overall fuel consumption figures for the time frame between 2000-2010. The direct GHGs whose emissions have been estimated in this national inventory are:

- Carbon dioxide (CO₂);
- Methane (CH₄);
- Nitrous oxide (N₂O);
- Sulphur hexafluoride (SF₆);
- Perfluorocarbons (PFCs); and
- Hydrofluorocarbons (HFCs)

Emissions of the following indirect GHGs also have been estimated and reported in this inventory:

- Oxides of nitrogen (NO_x);
- Carbon monoxide (CO);
- Non-methane volatile organic compounds (NMVOC); and
- Sulphur dioxide (SO₂).

However, as the indirect GHGs have not been allocated global warming potential, they are not included within Jordan's aggregate emissions. In the current inventory, tier one method has been used except for the estimation of emissions from domestic and international aviation where tier two methods was used based on the number of landing and take-off (LTOs), types of aircrafts and total fuel consumption and for the agriculture sector tier two was used for the first time. For the energy sector, available emission factors were used when applicable (a summary of GHGs breakdown for Jordan per sectors are illustrated in Figure 1 above).

The 43 GHG mitigation projects proposed in the mitigation scenario in the TNC covers the seven sectoral areas mentioned above. The cost, benefits and CO₂ emission reduction were analyzed for each proposed 43 mitigation projects in the TNC. Net present value method was used in the financial calculations, by converting all of the future revenues and costs over the period of the project based on today's cost. The same approach was utilized when calculating CO₂ emission reductions over the lifetime of the proposed projects. A discount rate of 8 % was used in all calculations. The discounted unit cost of reduced emissions is the quotient of the discounted net cash flow to the discounted emission reductions. If the analyzed mitigation projects are executed, they will lead to annual reductions of 3538 Gg in the year 2020; and are expected to increase to 5176 Gg in the year 2030, which represents around 9% of baseline emissions. Based on the unit abatement cost and abatement marginal cost curve, the most feasible options seem to be linked with the energy projects in general (energy efficiency and renewable energy projects with unit cost range from -13 to -274 JD/t CO₂).

3.3.6. How Jordan considers that its intended nationally determined contribution is fair and ambitious, in light of its national circumstances

Taking into consideration that global efforts to reduce greenhouse gas emissions must be differentiated according to a Party's responsibility and capability, Jordan believes that its very diversified INDC (a combination of a wide rainbow of outcomes and actions) set together an ambitious target relevance to its small amount of GHGs emission share and development circumstances. The Country's bulk share of GHGs represents only around 0.06% of global total according to a global GHGs analysis conducted in 2010. According to the World Bank, the CO₂ metric tons per capita emission is 3.4 in 2010 as said before. Nevertheless, this small share of GHG did not justify a reluctant reaction of the Country. To the contrary, Jordan, historically, was amongst the most active countries in the region with regard to involvement in international climate change efforts and engagement in response actions as explained above. Most importantly, Jordan has voluntarily developed a national climate change policy in 2013, the first comprehensive policy in the Arab Region and the Middle East. In fact, Jordan willingly developed the *National Climate Change Policy for the Hashemite Kingdom of Jordan 2013-2020*. This policy is considered the first national-level comprehensive planning initiative to deal with the global phenomenon of climate change in a holistic approach in the Country. However, Jordan, as any of non-Annex I countries, has, so far, no commitments for GHG emission reduction targets. Nevertheless, Jordan believes that there is a large potential for mitigation, eventhough Jordan's total GHG emissions are very small in absolute terms, and compared to other countries as indicated above.

From another angle, the modest income levels of the Country along with development challenges described above, mainly poverty and unemployment as two of the most important challenges the Country faces as well as limitation in natural resources and energy challenges along with the demographic characteristics of the Jordanian population all show that the Jordanian development process faces a big challenge in providing basic needs in such a developing country. Moreover, the rapid growths in economic activities, population and successive influxes of refugees over the last decade have imposed additional demands on energy resources. While Jordan has achieved many sustainable development goals, sustaining these results and reducing the burden of the energy sector on economic and social development will increasingly depend on the transition to a sustainable energy future. The high cost of importing energy puts a heavy burden on the public budget already constrained by running costs. There is no doubt that given the current financial pressures on our economy and its people and the elevated and continuing level of insecurity and conflict in our region, the INDC of Jordan specially those presented in the Vision 2025 are all fair and ambitious.

3.3.7. How Jordan's INDC contributes towards achieving the objective of the Convention as set out in its Article 2

Compared to its very small share of GHGs, Jordan's very diverse spectrum of actions and outcomes of commitment with emphasis on those aiming at reducing its emissions by 14 % by 2030 relative to a business as usual levels puts this small country on a low carbon development track that is in line with the recommendations of the IPCC AR5 to reduce global emissions by minus 40 to 70 percent by 2050 below 2010 levels. The diverse package of national climate change legal documents, climate change-aligned sectoral strategies and policies and related action plans, the vigorously accelerated number of GHGs cut-oriented projects being developed in many sectors and the development of Energy Services Company (ESCOs), for which legislative and regulatory framework as well as certification mechanism are under development to organize their operations, all reflect the seriousness of the country in combating climate change and increasing the level of involvement in carbon market business. For such a small country, this huge number of GHGs reduction-oriented activities and projects will absolutely contribute towards achieving the objective of the Convention as set out in its Article 2.

4. Jordan's Adaptation Actions

Current status of vulnerability and potential impact in relevant sectors as well as proposed sectoral strategic objectives, measures, and instruments to adapt to climate change impacts were advanced in the *Climate Change Policy of Hashemite Kingdom of Jordan 2013-2020* for each involved sector (water, coastal areas, agriculture/food security,

health, tourism, biodiversity, and socioeconomic situation/poverty). These strategic objectives, measures, and instruments will be revised and augmented accordingly later on in the coming few years to address post-2020 era (most probably up to 2030).

Example of other pre-2020 adaptation activities of the Country are: integrating climate change adaptation during aligning the *National Strategy and Action Plan to Combat Desertification (2015-2020)* with the UNCCD 10-Year Strategy as well aligning the Country's *National Biodiversity Strategy and Action Plan (2015-2020)* with the CBD 10-Year Strategy.

The cost of implementing the adaptation measures proposed to involved sectors were not estimated in the national Climate Change Policy. Thus, involved line ministries and NGOs were approached in 2015 by official letters sent through MoEnv requesting such institutions to provide a list of priority adaptation actions for post-2020 era on the top of those proposed in the 2013-2020 Policy, including estimated cost of such measures (already secured funds and anticipated funds). In light of responses received by MoEnv, the following section lists such envisioned adaptation actions and information.

4.1. Water sector's adaptation actions

It is highly evident that water resources in Jordan are very vulnerable to climate change. Previous strategic studies and legal documents (i.e. Jordan's Second Communication Report to UNFCCC (2009) and National Climate Change Policy (2013), and the latest TNC (2014)) all have identified that scarcity of water resources is one of the major barriers facing sustainable development in Jordan that will be further magnified by climate change. Expected reduced precipitation, maximum temperature increase, drought/dry days and evaporation are the main determinants of climate change hazards. The impact of the increased evaporation and decreased rainfall will result in less recharge and therefore less replenishment of surface water and groundwater reserves. In the long term, this impact will extend to cause serious soil degradation that could lead to desertification, exacerbating future conditions and worsening the situation of the agricultural sector due to the lack of sufficient water that will affect the income of the agriculture sectors. Low income will ultimately reduce the ability to the adaptation to climate change with families unable to respond to the pressing needs for replacing traditional water supplies with new methods that require more spending (purchasing drinking water from tanks). In addition to climate change, the increased demand for water in Jordan during the last decade has contributed significantly to reducing per capita shares. The natural growth of economic activities and population increase have been exacerbated by the continuous flow of refugees from Syria in particular and thus increase the demand for water.

One of the major pre 2020 studies Jordan conducted in the field of water (and health) sectors' adaptation was from 2009 to 2013 namely "*Adaptation to Climate Change to Sustain Jordan's MDG Achievements*". The study's goals were to developing sustained access to improved water supply sources, despite increasing water scarcity due to climate change and to strengthening the capacity for health protection and food security under conditions of water scarcity. The main adaptation knowledge products of the said project were:

- Water Safety Plans (WSPs) as a risk management approach to protecting drinking water safety in five pilot areas;
- Critical laboratory equipment was procured and installed in the Ministry of Health's (MoH) water testing labs;
- The capacity to adapt to climate change in the area of food security was strengthened through the identification and dissemination of climate resilient techniques;
- A model farm reusing treated wastewater was created for use as a training and demonstration center;
- Piloted interventions for showcasing, awareness campaigns targeting stakeholders at different levels, and training programmes enhanced the capacities of local communities, youths, decision makers and professionals in this regard. This included the establishment of the *International Center for Water and Environmental Research* at Al Balqa Applied University;
- Health vulnerability assessments and a national adaptation strategy and plans of actions for health protection from climate change were conducted in six critical areas: heat waves, nutrition, water and food-borne disease, vector-borne disease, occupational health and air-borne and respiratory diseases;
- Capacity to adapt to climate change was strengthened in the Zarqa River Basin (ZRB), where extensive studies were conducted to assess and model climate change impacts on water quality and availability as well as to identify adaptation measures addressing these impacts.

Other water adaptation projects implemented in Jordan in partnership with the MoEnv's key partners, mainly IUCN, were:

- The Regional Knowledge Network on Water (R-KNOW) implemented through Regional Knowledge Network on Systemic Approaches to Water Resources Management project (2011-2015). The project

aspired to create a Regional Knowledge Network on Water that will assist in strengthening the application of systematic approaches to water management and structured around the following thematic areas:

- Water and climate change.
- Water governance.
- Water, food and energy nexus.
- Sustainable water technologies.
- SWIM-Sustain Water MED project: It is one of the demonstration projects within the SWIM umbrella and addressed sustainable wastewater and sanitation management in the MENA region. The project was implemented from 2012- 2015. It operated in four countries including Jordan. Each of the demonstration projects addressed a different aspect pertaining to wastewater treatment and reuse as well as rainwater management to demonstrate effective and cost- efficient wastewater treatment and reuse technologies through pilot projects.
- Water-DROP Project: aimed at developing an Integrated Water Resources Management (IWRM) approach at the Mediterranean Basin level for managing the related cross-sector issues through the enforcement of multi-stakeholder partnerships, in particular with public and private actors. The project as well implemented 35 rain water harvesting cisterns for the rural community and schools in Balqa Governorate in order to harvest the water from the roofs.

The downscaled climate data on Jordan in general and on the pilot study area assessed in the TNC (2014) in particular suggest that the long-term temperature and precipitation averages, for the periods 2020-2050; 2040-2070; 2060-2100 show a slight increase in temperature with slight decrease in precipitation. Thus, the following summarizes the adaptation policies and measures proposed in the Water Sector in the TNC (2014) on the top of the strategic objectives and measures advanced previously in the National Climate Change Policy of Jordan (2013). Nearly all the low cost options for the development of new water resources are challenging in Jordan. Since all rivers and aquifers are highly exploited, few options are left for developing new sources of water for drinking and irrigation

Adaptation measures & programs for the water sector include the following:

Residential water supply:

- Reducing water losses in distribution pipes;
- Introducing water metering;
- Introducing water saving technologies such as low-flow toilets and showers, and efficient appliances;
- Collection of rainwater for gardens, toilets, and other applications;
- Promoting water saving by awareness campaigns.

Irrigation:

- Introducing water saving technologies in irrigation schemes such as drip, micro-spray, and night irrigation, etc;
- Introducing new varieties of crops that use less water and are salt-tolerant;
- Increasing the efficiency of irrigation systems;
- Reforming water pricing;
- Using groundwater more efficiently.

Water quality:

- Improving wastewater treatment plants (WWTP);
- Recycling wastewater;
- Developing river protection and sanitation zones;
- Improving chemical and biological monitoring.

Socio-economic issues:

- Training people of different ages and social statuses on water saving and sanitation methods;
- Increasing public awareness to water related issues;
- Introducing water cleaning and softening technology;
- Introducing policy measures to ensure the equity in access to water;
- Carrying out studies to estimate the impacts of hydrological disasters such as flash floods and thunderstorms;
- Improving the drought prediction and mitigation system.

The above measures can be grouped in the following programs:

1- Groundwater protection

Most groundwater aquifers are exploited at more than double of their safe yield. The sustainability of

irrigation in the highlands and the Badia areas will be greatly endangered unless strict measures are taken to address this issue. As such, the development and implementation of an action plan is needed in order to ensure that plans for groundwater protection, management, monitoring and restoration are defined, integrated and managed in a cost-effective manner. However, such action plan needs:

- A strong legal basis, given by laws and by-laws of the Water Authority, 2002;
- Guidelines and legal provisions;
- An administrative structure for implementation and survey;
- Public involvement;
- Measures will also continue to be taken to protect the groundwater resources from all sources of pollution.

In order to improve groundwater situation in Jordan, MWI is establishing an integrated program to assess the availability and exploitability of all resources at rates that can be sustained over long periods of time. The mining of renewable groundwater aquifers will be checked, controlled, and reduced to sustainable extraction rates. MWI will further encourage the application of applied research activities, including artificial recharge to increase groundwater supplies, and the employment of new technologies that will optimize operation and development of groundwater systems and promote more efficient and feasible uses.

2- Surface water development

In Jordan, direct runoff from heavy rainfall lasts from less than an hour to very few days. This makes the management of this type of resource difficult. Possible measures are:

- Optimizing the development and use of this resource through supply-enhancing measures, including surface and subsurface storage, minimizing losses by surface evaporation and seepage, soil and water programs, and protecting surface water supplies from pollution;
- Development of sustainable management plans for surface water systems in Jordan Valley, conversion of open canal systems to a pressurized pipe system, giving priority to modernizing and upgrading systems, and precedence to water projects which make significant contributions to meeting rising municipal and industrial demands;
- Dams are required for storing flood waters during the wet winter seasons and releasing the water gradually during the summer seasons when the demand is high. Additionally, 'ordinary' reservoirs, so called desert dams (water harvesting) help increase groundwater recharge and provide water for pastoral use.

3- Demand management

Mobilization of additional water resources can be achieved through:

- Artificial groundwater recharge;
- Surface water reservoirs;
- Water harvesting;
- Increased re-use of treated wastewater;
- Use of non-conventional water resources;
- Desalination;
- Weather modification (cloud seeding); and
- Transfer of water among different basins in Jordan.

Various projects have been set up to reduce water consumption and to enhance water use efficiency by:

- Reduction of losses from the supply networks;
- Introduction of water saving technologies;
- Public awareness campaigns on water consumption;
- Adaptation of different cropping patterns.

4- Water resources monitoring system (quantity and quality)

- Ground water monitoring system;
- Surface water monitoring system; and
- Climate monitoring system.

The water sector investment according to the Executive Development Program for the coming 10 years (2025) is estimated to reach US\$ 4 billion.

4.2. Health sector adaptation actions

In addition to the general adaptation objectives, measures and instruments proposed for the health sector in the National Climate Change Policy of Jordan (2013-2020), as well as in the TNC, the Ministry of Health (MoH) issued the National Climate Change Adaptation Strategy, Plan of Action, and Early Warning System (EWS) to protect health from the potential impacts of climate change in 2013. The health sector's adaptation strategy, plan of action for the period 2013-2017, and EWS would have long-term potential for delivering improved health outcomes. The Strategy provides a roadmap to the health sector, as well as the many involved public agencies and organizations, to work jointly to improve the health of the Jordanian population, in particular the vulnerable groups (infants and children < 5 years, the elderly > 65 years, and pregnant women) in rural, desert, remote areas, and poverty pockets, and the environments in which they live, work, and play. The health sector's adaptation to climate change focuses on the adequate intervention measures required to reduce the impact of climate change on six climate-sensitive health issues, namely:

- Heat waves (health impacts of temperature related events);
- Water and food-borne diseases;
- Vector-borne diseases;
- Air-borne and respiratory diseases;
- Nutrition and food security; and
- Occupational health

The Action Plan (2013-2017) listed 24 proposed adaptation projects that fall under seven main categories as follows:

- Regulatory/legislative;
- Capacity building;
- Public education and communication;
- Surveillance and monitoring;
- Medical intervention;
- Infrastructure development; and
- Research and further information.

The proposed adaptation measures and projects are:

- Strengthening the preparedness and resilience of the health sector and increasing emergency rooms (ER) capacities;
- Building the needed capacities to conduct health vulnerability assessments;
- Educating and informing the public of the needed measures to protect health from the adverse impacts of climate change;
- Establishing an early warning system to trigger prompt public health intervention when certain variables exceed a defined threshold;
- Developing climate-informed disease control programs and surveillance systems using meteorological services to target vector control in time and space;
- Adopting more effective and rapid electronic exchange of surveillance data for rapid intervention, and establish, with the relevant ministry(ies), access to real-time air quality monitoring data to establish the link between respiratory diseases and air pollution and climate change;
- Introducing new indicators that are useful for protecting health, such as Air Quality Index, UV index, in cooperation with the relevant institutions; and
- Utilizing effective tools (e.g. GIS or Health Mapper) to link environmental and climatic factors to health outcomes.

Details of the projects can be found in "CHAPTER 9 ADAPTATION PROJECT PROPOSALS FOR THE SIX CLIMATE-SENSITIVE HEALTH ISSUES" in the National Climate Change Health Adaptation Strategy and Action Plan of Jordan, which can be accessed from the MoH's official website (www.moh.gov.jo). The estimated total cost for implementing the above mentioned projects and measures is USD 15,000,000. The information of portions of funds secured by the involved sector's (government) own means versus amount of funds not secured is not available at the time of preparing this document and could be obtained from the health sector's involved officials..

4.3. Biodiversity, eco-systems, and protected areas adaptation actions

The expected impacts from climate change on ecosystems in Jordan according to climate exposure and sensitivity of ecosystems are droughts, forest dieback, and community composition change, expansion of drier biomes into marginal lands, habitat degradation and species loss. It was noticed that the highest vulnerable ecosystems are forests (especially in the north) and fresh water ecosystems (especially in Jordan Rift Valley), that highlights the priority to perform adaptation interventions within these two ecosystems. The ecological

vulnerability assessment results that covered important biodiversity and ecosystem sites within the pilot area including Dibeen PA and Khyouf SCA had high scores of vulnerability that is compatible with the overall conclusion all over the Country. Adaptation strategies and measures in biodiversity should be prepared and implemented in order to achieve sustainable, healthy and resilient ecosystems in the future under threats of climate change and other stressors. Jordan has conducted good number of adaptation projects for the biodiversity and protected areas for the pre-2020 period such as Royal Society for Conservation of Nature's (RSCN) project.

In addition to the adaptation strategies mentioned in Jordan's Third National Communication (TNC) on climate change (please refer to the TNC to capture the adaptation priorities), the GoJ, through its strategic partners, mainly RSCN, Royal Botanic Garden, and IUCN-ROWA, intends to carry out the following actions that are envisaged to contribute to increase the adaptive capacity of the country's ecosystems to climate change, these are:

- Conducting a comprehensive review of the National Network of Protected Areas. The sought revision will aim at identifying/validating climate-vulnerable ecosystems, extending conservation efforts in PA-surroundings and designing buffer zones as deemed necessarily for strengthening the adaptive capacities of key ecological hotspots (time frame : by 2020);
- Establishing, in partnership with RSCN, a specialized unit that is responsible for implementing the adaptation strategies, liaising with different national stakeholders and formulating a range of ecosystem adaptation projects within Jordan (time frame : by 2025);
- Undertaking more research on vulnerable ecosystems and communities and appropriate adaptation priorities, in addition to identifying indicator species and carry out monitoring programs on climate change impact on key species. (time frame : by 2030);
- Enhancing the resilience of local communities impacted by climate change in areas within and surrounding PAs (including community-based pilot adaptation projects) (time frame : by 2030).
- Embarking on land use planning as a tool for adaptation to climate change, given that land use planning reduces the future carbon impact of new developments as well as improving resilience against natural hazards associated with climate change such as, but not limited to, drought and floods) (time frame: by 2030).

The total cost of the above activities is USD 3,000,000. The information of portions of fund secured by involved sector's own means versus amount of funds not secured is not available at the time of preparing this document and could be obtained from the aforesaid sector.

4.4. Agriculture/food security adaptation actions

Agricultural production is closely tied to climate, making agriculture one of the most climate-sensitive of all economic sectors. In the study area selected as a pilot in the TNC (2014), the climate risks to the agricultural sector are immediate and an important problem because the majority of the rural population depend either directly or indirectly on agriculture for their livelihoods. TNC analyses demonstrated that most of agricultural areas in Jordan are rain-fed which makes agriculture in Jordan more susceptible to climate change.

The rural poor will be disproportionately affected because of their greater dependence on agriculture, their relatively lower ability to adapt, and the high share of income they spend on food. Climate impacts could therefore undermine progress that has been made in poverty reduction and adversely impact food security and economic growth in vulnerable rural areas. Poor in rural areas in Jordan are expected to face the most severe consequences of climate change through disruption of livelihood options that depend on natural resource management. The expected impacts of climate change, particularly reduced agricultural productivity and water availability, threaten livelihoods and keep vulnerable people insecure. Thus, the key adaptation measure to climate change in the agricultural/food security sector will be setting and implementing a sustainable agriculture policy addressing;

- Developing agronomic and crop strategies that are intended to offset either partially or completely the loss of productivity caused by climate change through the application of defense tools with different temporal scales, e.g. short term adjustments and long term adaptations, and spatial scales, e.g. farm, regional or national level adaptation;
- Modification of policies and implementation of action plans with emphasis on socio-economic strategies intended to meet the agricultural costs of climate change;
- Supporting environment friendly agriculture and permaculture designs as well as conservation and sustainable utilization of plant and animals genetic resources for food and agriculture that are climate resilient and adaptive to climate change especially landraces to improve rural sector adaptive capacity to changing environment to enhance food security;
- Maintenance of old Roman wells for water harvesting purposes and establishment of new wells in the rural area;
- Establishment of an integrated drought monitoring and early warning systems;

- Use of different crops varieties and modification of cropping pattern and crop calendar including planting and harvesting dates;
- Implementation of supplemental irrigation, water harvesting techniques, maximizing treated waste water re-use in agriculture, improving water use efficiency and the augmentation of drip irrigation in irrigated areas and utilization of saline water in the irrigation of crops tolerant to salinity;
- Establishment of desalinization units or sea water and use for agriculture;
- For rain-fed areas: adaptation measures include, but not limited to, improving soil water storage to maximize plant water availability by maximizing infiltration of rainfall; application of conservation agriculture, which involves minimum soil disturbance and encompasses land preparation techniques that improve soil fertility; managing crop residue and tillage and conserving soil and water; using of supplemental irrigation from harvested rainwater in the critical stages of crop growth achieved through on-farm rainwater harvesting and management system, i.e. small farm ponds for microirrigation using drip or sprinkler irrigation systems. Larger rainwater storage structures to be constructed to provide supplementary irrigation water to a number of small farms or fields by using the micro-dams;
- Selection of tolerant crop varieties: shifting to cultivating crops that are more tolerant to droughts or lower water requirements;
- Crop diversification: including integration of different varieties of crops, both food and cash crops which will increase farmers' income;
- Urgent need for restoration of the degraded forest ecosystem, protection of forest and reforestation to increase the green land area for compensation and equilibrium purposes for CO₂ fixation and release of O₂ since forestry sector face many challenges that result in reduction of forest vegetation cover in Jordan to sustain and keep ecosystem services from this vital ecosystem;
- Raising awareness and declarations on Climate Intelligent Agriculture and promoting utilization of renewable energy and uses in agricultural and food production sector for cooling and heating purposes, for example in poultry production, nurseries, green houses, olive mill etc;
- Model development of the soilless and hydroponic agriculture for medicinal and herbal plants and vegetables for water saving; and
- Establishment of an integrated national monitoring center for climate information and data based linking weather and climate information from all deployed centers.

The pre-2020 information of portion of fund secured by involved sector's (government) own means shows that the GoJ spent about USD 160,000,000 on adaptation projects and activities in the agriculture and food security sectors in the country from its own means. The amount of needed fund was not available at the time of preparing this document and could be obtained from officials active in this field.

4.5. Sustainable development-oriented socioeconomic adaptation

The pre-2020 contribution of Jordan in this regard is obvious from Jordan's position portrayed in the Climate Change Policy of Jordan 2013-2020 and the actions and activities lead by Ministry of Social Development (MoSD); National Aid Fund (NAF), and MoSD's partners addressing vulnerability and impact of climate change on socio-economic development particularly vulnerable groups (mainly the poor and women with emphasis on those living in rural areas). Major initiatives and actions that are contributed by Jordan for inclusion of social dimensions in adaptation and mitigation responses, in coordination with MoSD, include, but not limited to:

- Adopting poverty fight programs fostering providing housing for poor people and supporting micro-projects for poor communities in light of unusual severe seasonal cold and hot weather conditions prevailed in the last decade (the coldest/snowy condition of 2013/2014 in the last 10 years and a record hot year in the summer of 2015);
- Developing emergency relief and aid to those affected by impacts of seasonal heavy snow storms specially the unusual latest storms;
- Diversifying income sources for affected communities from severe hot and cold conditions;
- Proposing on the National Budget a cost of 90,000 JOD to providing solar energy cells for poor household complexes and Nursing Homes to reduce electricity bills and increase access to clean energy sources;
- Replacing 10 large engine vehicles of the Ministry's fleet with hybrid cars;
- Assisting poor household complexes by installing water harvesting wells; and
- Investigating role of severe hot and cold weather conditions on rates of society crimes.

Jordan actions on the path towards a sustainable development-oriented socio-economic adaptation and the country's efforts in investigating the alleviation of climate change impacts on vulnerable groups could be seen in the following perspectives and actions:

- With regard to socio-economic cost-benefit analysis of the climate change mitigation and adaptation in the context of green growth, Jordan actions in this aspect stems out from the Country's position

that the socio-economic costs and benefits of climate change mitigation can only be assessed together with the other cost and benefits related to climate change mitigation activities. Energy-efficiency measures, for example, will also have an impact on economic growth, technology innovation, reducing import dependency and reducing poverty, amongst others.

- Dependence of such vulnerable groups on natural resources that are susceptible to climate change. It was found that 20% of the population depends on agriculture for their income. Agriculture vulnerability especially the rain fed and irrigated was also discussed in detail in the Climate Change Policy of Jordan. These discussions lead to the conclusion that this 20% of population which is part of the poorest segment will be most susceptible to climate change impacts;
- Dependence of communities on ecosystem services (water springs, rangelands and natural vegetation in medicine, etc.) that could be affected by climate change;
- A lack of assets which hinders effective adaptation by the poor segments of population;
- Settlements in high-risk areas (i.e. drought prone) in Jordan are known to be of the lower income groups, a fact which magnifies the impact of climate change on poverty of these groups;
- Low levels of education and professional skills that prevent members of poor households for shifting to climate-resilient sources of income; and
- Though gender issues are still under-investigated in Jordan, the role of women in economy of rural areas is known to be substantial. Women in these areas are traditionally responsible for the household economy and are active in field work as well. Any negative impact of climate change will be most sensed by women. Women make crucial contributions in agriculture and rural enterprises in drylands as farmers, animal husbandry, workers and entrepreneurs through their indigenous knowledge.

Thus, Jordan is committed to the following climate change strategic objectives and actions as related to sustainable development-oriented socio-economic adaptation with emphasis on vulnerable groups and gender mainstreaming.

For post-2020 actions, GoJ through MoSD proposes to:

- Providing support to civil society organizations and NGOs active in climate change from CBO Support Fund;
- Conducting awareness programs targeting local communities and societies on energy efficiency;
- Maximizing number of poor household complexes and Nursing Homes benefiting from solar energy technologies and installing solar water heaters;
- Developing emergency and fast response plan to providing emergency relief and aid to those affected by impacts of seasonal severe cold (mainly during snow storms) and hot conditions and support programs for incomes of families impacted by drought;
- Integrating gender considerations and the interest of vulnerable group in climate change policies and strategies in all relevant sectors particularly in national strategies for social development, poverty eradication, childhood and early childhood development in Jordan and develop, compile, and share practical tools, information, and methodologies to facilitate the integration of gender into policy and programming;
- Ensuring that financing mechanisms on mitigation and adaptation address the needs and conditions for implementation of poor women and men equally;
- Building capacity at all levels to design and implement gender-responsive climate change policies, strategies and programs;
- Ensuring that sector ministries will adopt the Action Plans suggested by the Program for Mainstreaming Gender in Climate Change Efforts in Jordan, the action plans specified the objectives, the actions and the indicators required. MoEnv and NCCC to monitor and encourage the implementation.
- Aligning Jordan's INDC to the Sustainable Development Goals (SDGs) agreed by the international community in August 2015 which will cover all development goals until 2030. Special attention will be put on linking the mitigation and adaptation measures specified in the INDC and beyond to SDGs from 1-5 which focus on addressing challenges of poverty, education, health, gender equality and other socio-economic conditions;

- Aligning Jordan's INDC with the National Poverty Reduction Strategy (PRS) that was launched in 2013. The PRS contains a special chapter on the resilience and adaptation to climate change impacts in Jordan and the enhancement of social structure to adapt to climate change.
- Enhancing codes of buildings for newly established residential complexes targeting poor families to include proper insulation; and
- Supporting care giving houses for the orphans, people with special needs and elderly people with measures to install solar energy and production of own electricity needs.