POLICY BRIEFING

NATIONAL ADAPTATION PLAN - KUWAIT

Environment Public Authority - Kuwait, 2019

Policy Briefing

National Adaptation Plan-Kuwait

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1. KUWAIT OVERVIEW

Figure 1: The Geographic Location and International Borders of the State of Kuwait

The State of Kuwait occupies a strategic position at the northern end of the Arabian Gulf. between latitudes 30°28'and 5°30' North and longitudes 33°46' and 30°48' East. It is bounded on the south by Saudi Arabia, on the north and west by Iraq, and on the east by the Arabian Gulf. The coastline of Kuwait is about 290 km long and the total land area is about 20,150 square km. Kuwait's territorial waters cover an area approximately 5700 square km as shown in Figure 1. The archaeological remains on Failaka Island indicate the long history of human settlement and the cultural heritage within the area that is modern-day Kuwait. Starting as a port town, Kuwait has quickly grown into a substantial force in oil and gas, which accounts for over %50 of the country's gross domestic product. The country is generally a sandy desert. The vegetation is scarce. The highest point being Muttla Ridge, which runs along the north coast of Kuwait Bay (Dickson, 1956).

Kuwait has an overwhelmingly urban population that has grown steadily over the past two decades. The total population grew was estimated to be about %4.1 per year on average between the years 1994 and 2011. The Kuwaiti population, as a share of the overall population, is ranged between %32 and %37. The growth rate is about %3.3 per year on average (INC, 2012).

2. CLIMATE IN KUWAIT

The climatic conditions in the State of Kuwait are hot, arid, with scanty rainfall. Hot and dry summer winds are usually experienced for the greater part of the year. Kuwait has a variable continental climate. Summer months are dry and very hot starting from March to October. The temperature in summer varies between from 46-42 °C, reaching 53.5 °C during daytime in August. The temperature in winter varies between from 17-7 °C with the lowest recorded temperature of 4- °C. Rainfall is erratic and inconsistent and shows great temporal and spatial variation (averaging 242.4-31.1 mm per year between stations), with most rain usually falling between November and May, although occasional showers may fall in October, and June to August is practically rainless (INC, 2012).

Frequent dust storms occur between May and September of each year. The dominant prevailing winds in the State of Kuwait are from the Northwesterly direction. Dust storms are particularly frequent in the summer and can reach speeds up to 100 km per hour (INC, 2012). Fog occurs particularly in the winter months, forming during the very early hours and disappearing by mid-morning, evaporation far exceeds rainfall throughout the year. On the coast, climatic extremes are probably less than inland. The maximum tidal range on the mainland coast is 4.0-3.5m; seawater temperature varies widely, from 12 °C (January) to 34 °C (July), and salinity from 3.8 to 4.2 % (Crystal, 2016).

The dust storms occurring in Kuwait are the main cause of serious health impacts such as asthma incidence rates of 175 per day and road traffic accident rates that are over three times normal rates (INC, 2012 and KISR, 2012).

3. CLIMATE PROJECTIONS AND KEY CLIMATE IMPACTS

Two scenarios of temperature rise were considered in the Second National Communication Report to the UNFCCC (SNC):

The first scenario, called RCP 4.5, was estimated considering low to medium emission increases; the other, called RCP 8.5, was estimated considering intensive uses of fossil fuel in this century. Figure 2 illustrates the expected temperatures based on the two scenarios. These temperatures were divided based on time intervals to draw detailed information of the future temperature trend for the next decades. Such detailed information would be a valuable mean in setting an adaption plan that imitates climate changes during each time interval. Overall, temperatures are expected to increase from 2.4 to 4.8 oC at the end of this century (SNC, 2019).

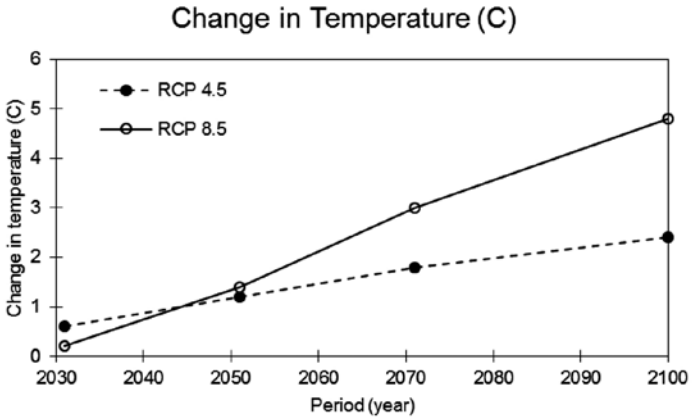

Figure 2. An illustration of temperature changes in different time intervals (SNC, 2019).

The same scenarios were used to predict precipitation changes over Kuwait. Both scenarios showed that precipitation values are expected to decrease due to climate change in this century. Figure 3 illustrates the expected decreases in precipitation based on the two scenarios. The precipitation values are expected to fall from %25 to %30 comparing to the baseline data recorded from 1986 to 2005. The expected temperature

and precipitation values for the surrounding regions were also provided in the report.

In conclusion, severe temperature increases and decreases in precipitation values would fundamentally change the ecosystem functions and socioeconomic aspects. Some recommended efforts to minimize the effect of these changes are tree plantings to decrease the albedo, educating citizens and raising public awa)19)

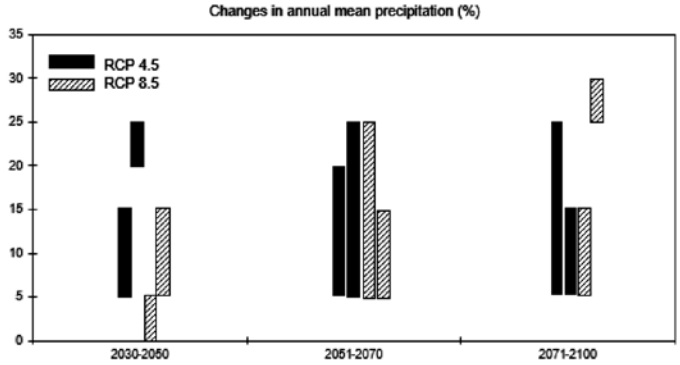

Figure 3. Illustrates Precipitation Changes in Different Time Intervals (SNC,2019)

4. SUMMARY OF SECTORS IMPACTS AND VULNERABILITIES

4.1 Climate stressors and climate risks – Marine life and Fisheries

The main climate stressors on marine life and fisheries are the increase in sea surface temperature (SST), ocean acidification and the increase in the water salinity. In Kuwait, the SST increases from about 15.5 oC in January to about 32.5 oC in August. This wide range of SST significantly disturbs coral reef ecosystems (NAP, 2019). The ocean acidification is another stressor on the biotic and abiotic processes within Kuwait marine and coastal ecosystems. Kuwait seawater salinity ranges from 38.6 to 42.4 psu: This range is relatively high compared to the southern Arabian Gulf waters near the Strait of Hurmoz that

has an average salinity of 37–36.5 psu (Carpenter et al., 1997). The increase in salinity can be related to the decrease of Shatt Al-Arab discharge because of upstream water regulations and high evaporation rates associated with weather temperatures and water shallowness (NAP, 2019). The main climatic stressors and risks identified in this sector can be summarized in Table 1.

Table 1. Climate stressors and risks in the Marine and Fisheries sector

Climate stressors and climate risks – Marine and Fisheries	
Stressors	**Risks**
Increased SST	Coral Reef Disturbance (Bleaching)
	Fish migration
	Effecting aquatic organisms' production
Ocean Acidification	Reducing the growth of many aquatic organisms
Increased Salinity	Negatively affects biotic and abiotic processes, disturbing microplankton, such as foraminifera

4.2 Climate stressors and climate risks – Coastal Zones

The main stressor in the coastal sector is the Sea Level Rise (SLR). The recent estimation of IPCC to SLR mentioned that sea level would rise from 0.26 to 0.82 m by the end of the 21st century (IPCC, 2014). As a baseline, 0.5 m SLR scenario was adapted to assess the vulnerability of Kuwait's coasts to SLR. Three other scenarios were also considered (1 m, 1.5 m and 2

m of SLR). The areas on risk were identified for the four SLR scenarios by comparing the high-water tide to the elevations of the area adjacent to the coast. The inundated areas were estimated to be about 214 km2 at SLR of 0.5 m and 498 km2 at SLR of 2 m. The geographic distribution of inundated areas at SLR of 0.5 m revealed that the northern islands of Kuwait, especially Boubyan Island, would be highly impacted. The island would encounter a massive inundation of about %50 when sea level rises 2 m (NAP, 2019). The main climatic stressors and risks identified in this sector can be summarized in Table 2.

Table 2. Climate stressors and risks in the Coastal sector

Climate stressors and climate risks – Coastal Zones	
Stressors	**Risks**
Sea Level Rise	Damage to essential infrastructure
	Damage to private properties
	Disturbance of coastal ecosystems

4.3 Climate stressors and climate risks – Human Health

Kuwait is exposed to harsh environmental conditions, such as heat wave and dust storms. The combination of asthma, dust events, and risks of heat waves are clear examples of harsh environmental impact on human health. In Kuwait, more than %15 of the children and %18 of the adults are suffering from asthma. The climate change consequences depredating the air quality are expected to add more pressure to the vulnerable people in Kuwait. (SNC, 2019). Dust storms and heat waves are expected to be severer and more frequent due to climate change. The main climatic stressors and risks identified in this sector can be summarized in Table 3.

Table 3. Climate stressors and risks in the Health sector

Climate stressors and climate risks – Health	
Stressors	**Risks**
Increases in occurrence and severity of dust storms	Threaten asthma patients
	Degradation of air quality
	Obstruction of human activities
	Increases health service expenditure
Increased Temperature	Threaten people's lives
	Increases health service expenditure

4.4 Climate stressors and climate risks – Water Resources

Kuwait is experiencing a dramatic increase in the water demand for freshwater resources because of the exponential growth in population, urbanization, industry, and agriculture. The water consumption rate in Kuwait is around 520 l/c/d which is a very high consumption rate compared to the international rates. This is due to the very high percentage of losses not only because leakage but mainly owing to the bad usage of water (floor wash, car wash, irrigation, etc.). Kuwait relies on three water resources: desalinated water, brackish groundwater and treated wastewater to fulfill its water demand in domestic, agriculture, and industrial sectors. In the second national communication of Kuwait, the consumption rates of these three water resources were reported based on the current and future demands (SNC, 2019). The main climatic stressors and risks identified in this sector can be summarized in Table 4.

Table 4. Climate stressors and risks in the Water sector Climate

stressors and climate risks – Water	
Stressors	Risks
Limited Water Resources	The threat of experiencing drought
	Affecting Industry and agriculture
High Water Consumption per Capita	The threat to fulfill the water demand in domestic, agriculture, and industrial sectors.

5. FUTURE POLICY AND PROPOSED ADAPTATION ACTIONS

Proposed adaptation actions per sector were identified in the Kuwait National Adaptation Plan (NAP), a national policy document that was officially endorsed in March 2019. These actions are a way forward to support the climate change adaptation in Kuwait as shown in Table 5. Also, there are some general actions that shall be taken into consideration in order to support Kuwait in its efforts to adapt to the changing climate. These general actions can be summarized as follows:

- Abide by and enforce KEPA's Law No.42 of 2014 amended by Law No. 99 of 2015.
- Abide by and enforce KEPA's Law No. 8 on "Green House Gases" issued in June 2017.
- Issue a guideline and/or standard to specify and evaluate the climate change/ emissions reporting system, adaptation indicators, etc.
- Enforce and understand the national communications and adaptation plans in Kuwait.
- Invest in developing climate change related information services in order to facilitate access to data and climatic information.
- Promote the planning of low emission zones, to reduce

emissions and adaptation climate change.

- Prepare and encourage a Low-Emission Development Strategy and action plan for climate change adaptation based on Kuwait's first and second national communication.
- Promote awareness and consideration of the forecasted Sea level Rise (SLR) in planning new coastal development especially in Boubyan, Hareer City and Khiran regions knowing their high vulnerability to climate change;
- Raise awareness of the public population and stakeholders about climate change and environmental threats, starting from schools through to universities.
- Provide training programs that aim at raising the technical capacity at key institutions through training workshops in the adaptation to climate change.
- Improve communication, collaboration, and integration between the research institutions and the different authorities of the government by sharing information and data related to climate change adaptation in all sectors.
- Establish a specialized research center for climate change studies with a focus on proposing suitable adaptation and mitigation actions relevant to the impacted sectors.

Table 5. Actions to support the adaptation to climate change in Kuwait (NAP, 2019)

Adaptation Actions to enhance the resilience of the Fisheries and Marine Sector.	
Medium-term actions	- Designation of new marine protected areas.
	- Develop and implement local marine conservation and restoration options.
	- Develop adaptation and development plans for Marine life and Fisheries.
	- Support research and initiatives to gather and obtain enough information on the impact of Climate Change on the marine ecosystem in Kuwait.
	- Develop medium-term initiatives to conserve marine biodiversity in the rapidly changing climate.
Long-term actions	- Prepare of marine ecosystem-based adaptation strategy measures in areas at risk of climate change impacts.
	- Develop adaptive management to rapidly changing marine regimes with Climate Change.
	- Develop prediction capacity to anticipate possible future consequences of Climate Change and most threatened ecosystems in the marine.
	- Develop monitoring capacity to prevent overfishing.
	- Model of the impact of climate change on marine life and fisheries for use in policymakers for conservation, recovery and sustainable use of marine resources.
	- Develop a crisis plan and management to confront climate change effects.

Adaptation Plans to enhance the resilience of the Water Resources	
Medium-term actions	- Incorporate measures for adaptation to climate change into actions carried out by the Ministry of Electricity and Water.
	- Invest in high end and accurate programs to refer to information about water level based on hydraulic models.
	- Control water prices such as water consumption are fair and reasonable by all consumers.
	- Increase water block-tariff to control unnecessary water consumption.
	- Utilize technologies to reduce water consumption.
	- Adapt efficient irrigation methods to reduce water losses.
	- Improve irrigation systems to help utilize and conserve water in a more sustainable way, like bio-diverse planting, hydro-zoning, and PO irrigation.

Long-term actions	- Design effective policies to preserve and protect water resources.
	- Support research and development to model the impact of climate change on water resources.
	- Involve more environmentally sustainable methods of water treatment like Reverse osmosis, where the net energy consumption is lower than other methods.
	- Invest in the installment of water-efficient devices in homes, where the consumption of water is better regulated and limited.
	- Develop integrated climatic and hydrological models and assess climate change impacts on water resources management.
Adaptation Plans to enhance the resilience of the Coastal Zone	
Medium-term actions	- Provide financial aid for preventative and protective actions for coastal damage.
	- Make sure that the required resources to undergo projects and initiatives concerning the construction, research or communication are available.
	- Raising awareness among decision-makers in Kuwait to incorporate SLR scenarios into development plans
	- Legislating laws to restrict negative anthropogenic activities in the coastal zones to maintain the coastal wildlife

Long-term actions	- Establish a specialized center for coastal management and build and organize information and tools for climate risk modeling and generation of qualified responses within the Coastal Zone.
	- Protect coastlines from SLR by constructing protection barriers.
	- Develop better and more intensive laws and policies regarding coastline protection and conservation.
	- Prepare for better adaptation potential for future setbacks and scenarios (i.e. new construction projects near the high-risk coastline should withstand SLR scenario in the future).
Adaptation Actions to enhance the resilience of the Human Health Sector	
Medium-term actions	- Develop warning systems for extreme weather conditions combined with a communication strategy for alerts.
	- Increase drought-proof vegetation to reduce dust fallout from dust storms.
Long-term actions	- Include information and instructions about Climate Change Effects on Health in the early education curriculum.
	- Establish a research and monitoring network on climate and health, with a focus on analyzing the expected climate change impact on health.

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