KPPC Research Agenda for the Environment Pillar

مركز الكويت للسياسات العامة
Kuwait Public Policy Center

Empowered lives.
Resilient nations.

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1. Introduction

Background

The United Nations Development Programme (UNDP) and the State of Kuwait, represented by the General Secretariat of the Supreme Council of Planning and Development (GSSCPD), strive to enhance institutional capacities at various government agencies by providing them with the necessary technical support to strengthen their capacities and skills to perform their expected duties.

Under a framework of institutional and technical support for the establishment of the Kuwait Public Policy Centre (KPPC) project, UNDP collaborates closely with GSSCPD to support the establishment of a pioneer KPPC to address policy making gaps and mainstream policy research, analyses and studies in the policy-making process.

The KPPC seeks to be a reliable resource that will influence national policies and strategies. The project builds on UNDP's mandate and strategic vision and aims to promote efficient governance and institutional management. This project will provide a framework for how UNDP will accompany the GSSCPD in its objective to improve the quality of policy making in Kuwait and, in particular, on how the KPPC can contribute to that while operating under the umbrella of GSSCPD. *The Kuwait National Development Plan* sets the nation's long-term development priorities. It is organized around five themes, or desired outcomes, and seven pillars, or areas of focus for investment and improvement. Each pillar has a number of strategic programs and projects that are designed to have the most impact on achieving the vision of a New Kuwait.

Twenty key global indicators, and additional sub-indicators, will track and measure Kuwait's progress with the plan and its performance compared with other countries. Global indicator rank is out of a percentile of 100, 1 being at top of the rankings and 100 being at the bottom. Kuwait is aiming, in all indicators, for a position within the top 35 percent of countries by 2035.

Science is critical to tackling complex challenges for humanity - such as climate change, biodiversity loss, pollution and poverty reduction - as it lays the foundation for new approaches and solutions. How can science best fulfill this commitment to society? How can we create dynamic connections between knowledge and action? These concerns have led to a new approach: sustainability science.

Over the past few decades, research has helped create a better understanding of the linkages and possible impacts of human development on a regional and global level. There has been rapid progress within sectors and along single dimensions, but much slower development in interlinked areas such as nexus fields. The objective of this report is to further develop a research framework that would contribute to identifying potential comprehensive solutions in the coming years to support the successful implementation of development policies. A research framework can help to develop societally, economically and environmentally efficient instruments and achieve better policy coherence.

Purpose

The purpose of this report is to provide the scope of work for the priority, policy-oriented research required to inform policy design and delivery in line with the next KNDP medium-term plan 2020-2025.

A list of research titles, objectives and example research questions are presented alongside the research agenda. The research titles are not meant to be prescriptive for each of the areas identified; instead, each one should be considered as a broad guideline rather than a specific research topic. A best-practice methodology should be used to deliver the outputs.

The proposed research in this report would further strengthen the evidence base for environmental policy making for Kuwait and contribute to achieving New Kuwait objectives and targets. A simple model has been proposed to deliver both the short-term and longer-term strategic research. The objective of the proposed delivery model is to fill in the current gaps and develop capability in Kuwait, to address research needs as they come up and to fill in the gaps where there are emerging challenges.

Research is prioritized in the areas that will influence and address emerging issues for the environment pillar alongside applied immediate activities that will address policy and operational areas, and activities that will deliver commitments for the Kuwait National Development Plan, achieving Vision 2035.

Priority and strategic directions will be achieved by taking a balanced approach to delivering research that addresses immediate needs and longer-term strategic perspectives for the Kuwait National Development Plan, policy areas, objectives and targets for the environment pillar.

The research agenda is intended to support national policies and national plans. In addition, the research will benefit operational objectives and implementations of policies within the national planning process.

11. Renewable Energy

Research activity 1: Undertake Derisking Renewable Energy Investment Analysis (priority: high)

Undertake De-risking Renewable Energy Investment Analysis

Background

In line with the Emir's vision, Kuwait aims to promote renewable energy and increase the share of renewables in total energy demand to 15% by 2030.

Specifically, the government of Kuwait aims to:

- Enable the institutional and regulatory environment to promote renewable energy investments and maximize private sector involvement.
- Boost renewable energy investments in Kuwait at both utility and decentralized scales.
- Increase consumers' participation in achieving the 15% target.

Renewable energy investors face a range of risks including: political; policy and regulatory; technology; currency and liquidity; and power off-taker (IRENA, 2016)[1]. These risks and uncertainties not only affect the path of technological evolution and demand for renewable energy but more importantly, the cost of capital and the ability to finance projects. Therefore, risks and uncertainties may pose serious barriers to scaling up renewable deployments, and addressing them requires access to effective risk-mitigation instruments.

1 IRENA (2016b), 'Unlocking Renewable Energy Investment: The Role of Risk Mitigation and Structured Finance,' IRENA, Abu Dhabi. http://www.irena.org/DocumentDownloads/Publications/IRENA_Risk_Mitigation_and_Structured_Finance_2016.pdf

Policy and regulatory risks are those risks that are related to changes in investment incentives (for example, removal of renewable subsidies), unclear network codes, a grid connection costs model, and a prolonged permitting processes, among other factors.

Also, renewable investors face uncertainty where there is no specific renewable policy, as well as after policy incentives have been designed and implemented. The pre-implementation uncertainties are factors such as not knowing if, when, or what type of policy will be implemented to incentivize renewables. The post-implementation uncertainties are related to the stability of the demand, transparency of the government procedure, trust and insurance for long-term support.

Rigidities in the electricity sector's structure and a lack of coordination among the various institutions participating in the power sector are the main reasons for a lack of private sector involvement and the slow development and deployment of renewable energy technologies.

In order to increase renewable capacity, the government should consider allocating more sites for renewable projects. Private sector participation could also be expanded through foreign direct investment (FDI).

Private investors perceive several factors as investment risks, such as: lack of clarity of procurement programs; shifting policies; difficulty in obtaining permits; constraining real estate laws, especially where foreign ownership is not allowed – specifically, lack of clarity on land ownership and leasing laws; and cumbersome labor issues. Some of these factors may lead to high costs to the private sector for renewable energy projects, which may jeopardize their feasibility.

Engaging the private sector is also complicated by the administrative burden of procurement and unclear guidance on a number of factors including: the process for awarding contracts; selecting project sites; obtaining construction and environmental permits; and gaining access to the grid. For example, obtaining all relevant permits for renewable technology becomes expensive and lengthy, thus increasing transaction costs, and discouraging investors.

A core element is the need for an independent regulator who can design suitable regulatory frameworks for procurement and set out the necessary technical guidelines for integration of renewables within the existing power systems. At present in Kuwait, the regulator is not independent of government and is thus susceptible to political influence.

In 2013, UNDP issued the Derisking Renewable Energy Investment report[2]. The DREI report introduced an innovative methodology (the "**DREI methodology**") to quantitatively compare the cost-effectiveness of different public instruments in promoting renewable energy investment.

Objectives

The research activity aims to introduce an innovative, quantitative framework to assist policymakers in developing countries to cost-effectively promote and scale-up private sector investment in renewable energy.

2 Waissbein et al., 2013

Specifically, Derisking Renewable Energy Investment (DREI) aims to:

- Identify the barriers and associated risks that can hold back private sector investment in renewable energy.
- Put in place packages of targeted public interventions to address the identified risks.

Contents of work

The DREI framework systematically identifies the barriers and associated risks that can hold back private sector investment in renewable energy. It then assists policymakers to put in place packages of targeted public interventions to address these risks. Each public intervention acts in one of three ways - to reduce, to transfer or to compensate for risk. The overall aim is to cost-effectively achieve a risk-return profile that catalyzes private sector investment at scale. The end result is reliable, clean and affordable energy solutions for Kuwait.

The DREI framework consists of a suite of publicly available methodologies, financial tools/models and resources. Current renewable energy sectors covered by the DREI framework are (i) utility-scale, (ii) on-grid rooftop PV, (iii) off-grid mini-grids, and (iv) solar home systems.

The derisking approach suggests three core types of public instruments to deal with renewable energy risks. These are instruments to reduce risks, instruments that transfer risks, and instruments that compensate for risks by providing a financial incentive to investors in the renewable energy project when risks cannot be reduced or transferred.

Expected outputs

The final outputs of this research activity are:

- A complete report that analyzes the most cost-effective public derisking measures to promote private sector investment in large-scale wind energy and solar in Kuwait.
- Levelized Cost of Electricity (LCOE) Financial Tool (Excel – template is available).
- A 2-3 page summary of key points for decision makers.
- Workshop presenting and validating the findings.

Research activity 2: Evaluate renewable energy delivery in Kuwait (priority: high)

Evaluate renewable energy delivery in Kuwait

Background

In line with the Emir's vision, Kuwait aims to promote renewable energy and increase the share of renewables in total energy demand to 15% by 2030.

Specifically, the government of Kuwait aims to:

- Enable the institutional and regulatory environment to promote renewable energy investments and maximize private sector involvement.
- Boost renewable energy investments in Kuwait at two levels: utility - projects connected to the grid - and decentralized - projects connected at the end-user site.
- Increase consumers' participation in achieving the 15% target.

Despite some progress in adding renewables to the generation mix over the projection period, their share of total primary energy demand remains low in 2035, only 3% in the business-as-usual case; this factors in the hard pipeline projects, those already underway and likely to be completed, as well as predicted growth in demand over the next 10 years[3].

Currently there is no single source of truth when it comes to renewable energy data. Data is scattered among different institutions and reported differently in various government reports.

There is no monitoring, verification and evaluation system in place, and therefore it is unclear how to track progress toward the targets, build forecasts for the future or clearly determine when and how targets are going to be achieved.

Monitoring, verification and evaluation systems make it possible to identify the bottlenecks, track progress, provide robust evidence for the effectiveness of renewable energy delivery and offer a means to adjust policy instruments to make them more effective and efficient.

Objectives

The research activity aims to evaluate effectiveness in delivering Kuwait's national policy target toward the 15% share of energy demand by renewables by 2030.

Specifically, the research activity aims to:

- Assess the "appropriateness" of the renewable energy programs implemented to achieve national policy targets.
- Assess the effectiveness in delivering renewable energy projects, and whether following a business-as-usual scenario including hard pipeline projects leads to achieving the national target in 2030.

3 Kuwait Energy Outlook, 2019.

- Assess the effectiveness of the implemented renewable project in supporting the grid supply needs.
- Assess the suitability of the private sector engagement model used to implement the renewable energy projects.
- Assess the likelihood of renewable energy projects to continue delivering energy benefits to the network over the long-term (legacy).
- Identify emerging barriers and opportunities and facilitate adaptive management of renewable energy programs.
- Assess the effectiveness of the governance and stakeholders' engagement strategy in driving the renewables agenda in Kuwait.

Contents of work

The evaluation will use the OECD/DAC evaluation criteria of **relevance, effectiveness, efficiency and sustainability**, as defined and explained in the UNDP Handbook on Planning, Monitoring and Evaluating.

Evidence is an essential element of the evaluations. The evaluation will be used to collect and generate evidence to support the evaluation process by engaging relevant partners in refining the theory of change in each programmatic element, identifying causal relationships, testing assumptions, assessing specific indicators and data collection methods, processing and utilizing procedures, and defining a learning and research agenda.

The simplest indicators measure installed capacity or electricity output and growth rates thereof, either in absolute or percentage terms. These measures have the potential to provide a simple proxy for effectiveness with minimal data requirements. Measuring energy output offers advantages over measuring capacity growth.

More sophisticated measures include the European Commission indicator "Deployment Status Indicator" and IEA "Policy Impact Indicator." These include progress toward targets, share of electricity generated and attempts to capture the maturity of the market for renewable energy.

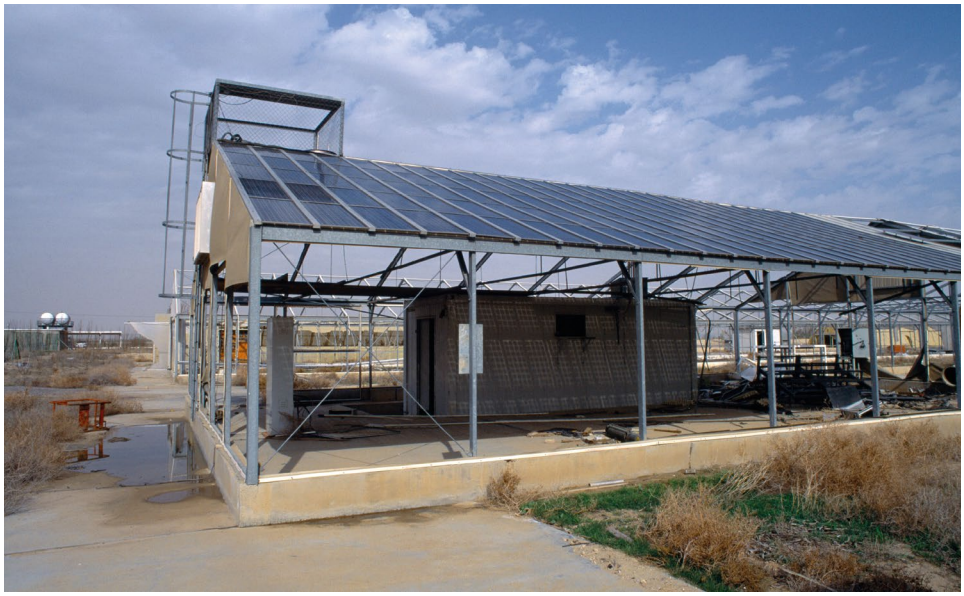
The evaluation will also assess the institutional feasibility. This provides a means of explaining the reasons behind the good/bad performance of a policy rather than a means of measuring policy outcomes. As a result, it is most appropriate for ex-ante evaluation of the potential of a policy to do well, and for developing a policy that is adapted to local conditions, rather than benchmarking a policy's performance ex-post.

Expected outputs

The final outputs of this research activity are:

- Renewable energy evaluation framework for Kuwait.
- Complete evaluation report that presents successes and challenges in achieving a renewable energy agenda in Kuwait.
- A 2-3 page summary of key points for decision makers.

III. Low-emission innovation



Research activity 3: Identify Energy Service Companies' (ESCOs) barriers and opportunities

Identify ESCOs barriers and opportunities (priority: medium)

Background

In order to facilitate the transition to low-carbon emissions, the policy framework also needs to lengthen planning and investment horizons; coordinate across ministries and different levels of government; establish and maintain long-term collaborative partnerships; place increased emphasis on diffusion of knowledge and existing technology, as well as invention of technology; and manage and overcome resistance to socio-technological change.

In Kuwait, buildings (government, residential, and commercial) consume about 80% of the electricity generated. The Kuwait Institute for Scientific Research (KISR) is the front-runner in developing the Energy Efficiency Technologies Program (EET) that aims to reduce energy consumption in new and old buildings by 30% and 10%, respectively.

In general, the market for Energy Services Companies (ESCOs) in Kuwait is still underdeveloped; however it is accelerating slowly. The reasons for the slow development of the ESCO industry in Kuwait are numerous. In order for an ESCO market to flourish, there are several key necessities, including available financing, expertise and a mature legal system. In the past, each of these areas has been lacking. Most of the region's available financing historically has being used to promote rapid growth.

Kuwait industrial development requires key energy services that could be potentially provided by ESCOs, such as energy management advisory services and energy audits.
An energy market will provide a broad range of energy solutions to Kuwaiti industries, including: the design and implementation of energy savings projects; retrofitting; energy conservation; energy infrastructure outsourcing; power generation and energy supply; and risk management.

The government could support the ESCOs in many ways, including: creating an incentives scheme for ESCOs as well as participants from industries; removing institutional barriers by allowing multi-year procurement; and piloting ESCO projects to better identify and address the barriers.

The ESCO market is essential to drive the low-carbon developments in the country. In order to grow the market, the government of Kuwait needs to thoroughly understand the market barriers and opportunities facing ESCOs.

Objectives

The research activity aims to assess barriers and opportunities for growing the ESCOs sector in Kuwait.

Specifically, the research activity aims to:

- Quantify the current size of the ESCO market, and collect data on the number of ESCOs services companies and the size of their businesses.
- Identify the underlying barriers facing an expansion of ESCO services from demand and supply perspectives.
- Better understand the demand perspectives (what end-users want), awareness of and behaviors toward energy-efficiency solutions and ESCO services.
- Identify future opportunities to increase demand and enhance supplies of ESCOs services in Kuwait.
- Suggest a new legal set up to enable a wider environment in which ESCOs can operate.

Contents of work

The research activity involves reviewing the existing market status in terms of both demand and supply. On the supply end, it is very important to establish a database containing information about existing ESCOs, including the size of the businesses, the quality of services and the key clients. On the demand side, the research will involve surveying key industries that potentially benefit from ESCO services, including awareness and willingness and behaviors toward energy-efficiency solutions.

The research activity would design a survey to target ESCOs to understand the underlying barriers and future opportunities.

The research would be delivered by a desktop review and analysis of ESCOs' market data, and a structured survey targeting ESCOs and decision makers at key industries believed to be key users of ESCO services.

Expected outputs

The final outputs of this research activity are:

- A comprehensive report on the status, barriers and opportunities to grow ESCOs' market in Kuwait.
- A 2-3 page summary of key points for decision makers.
- Workshop presenting and validating the findings.

IV. Air pollution

Research activity 4: Health impacts of air pollution (priority: high)

Assess air pollution-related health impacts in Kuwait

Background

Air pollution is a major component of Kuwait's environmental damage, and it has direct consequences on human health. Recent studies show that Kuwait's populated areas are affected by suspended dust from the region's natural resources and also from the uncontrolled emissions of industrial plants and power plants. One challenge is the increase of uncontrolled emissions directly to residential areas, thereby increasing exposure to pollution.

Kuwait is particularly vulnerable to air pollution that may result from industrial activities and climate change. Any slight shift in weather conditions may result in a significant increase in dust and air pollution, especially due to the geographic location and the natural circumstances of the country. This significant weather-related air pollution may have caused a large increase in mortality along with a loss of healthy years due to disability. These consequences may continue should climate change increase weather events such as dust storms[4].

There is substantial research evidence from around the world that both indoor air pollution and outdoor/urban air pollution have significant negative impacts on public health and result in **premature deaths, chronic bronchitis, respiratory disorders, and even cancer.** Indoor air pollution, especially in rural areas, can be even higher than outdoor/ urban air pollution due to the indoor use of biomass fuels for cooking and heating.

4 Kuwait Second National Communication on Climate Change, 2019.

The most significant air pollutant in terms of impacts on health is most commonly found to be particulate matter, especially fine particulates (PM10 or smaller).

Worldwide ambient air pollution accounts for:

- 29% of all deaths and disease from lung cancer.
- 17% of all deaths and disease from acute lower respiratory infection.
- 24% of all deaths from stroke.
- 25% of all deaths and disease from ischaemic heart disease.
- 43% of all deaths and disease from chronic obstructive pulmonary disease[5].

There is sufficient evidence in the published literature that shows a strong relationship between particulate matter (PM) air pollution and detrimental health outcomes (Cohen, 2015)[6]. Asthma is highly prevalent in Kuwait, affecting 15 percent of adults and 18 percent of children (Khadadah, 2012)[7]. Air pollution may be a significant factor in the exacerbation of symptoms in existing diseases and a sensitization of new cases (Guarnieri, 2014)[8]. The prevalence of illness in a population that is highly exposed to air pollution can lead to significant health and economic costs.

Objectives

The research activity aims to assess the health burden and related costs due to long-term exposure to key air pollutants in Kuwait, and the health benefits associated with changes in air pollution from power stations due to energy efficiency and renewable energy actions in Kuwait.

Specifically, the research activity aims to:

- Quantify the health impacts of air pollution in Kuwait.
- Apply cost-benefit analysis (CBA) methodology to quantify in monetary terms the degradation cost/health cost resulting from air pollution.
- Model the health and economic benefits from renewable energy and energy-efficiency policies.
- Establish Kuwait's first-ever set of health metrics to measure air quality changes in Kuwait for continuous monitoring.

Key Questions

- How does the policy address the problem or issue (e.g., increase access, protect from exposure)?
- What is the magnitude, reach, and distribution of benefit and burden (including impact on risk factor, quality of life, morbidity and mortality)?
- How do costs compare to benefits (e.g., cost-savings, costs averted, return on investment (ROI), cost effectiveness, cost-benefit analysis, etc.)?
- What population(s) will benefit? How much? When?

6 AJ, Brauer M, Burnett R, Anderson HR, Frostad J, Estep K, et al. 2015. Estimates and 25-year trends of the global burden of disease attributable to ambient air pollution: an analysis of data from the Global Burden of Diseases Study 2015. Lancet.;389:1907–18.

7 Khadadah M. 2012. The cost of asthma in Kuwait. Med Princ Pract. 22:87–91.

8 Guarnieri M, Balmes JR. 2014. Outdoor air pollution and asthma. Lancet. 383:1581–92.

- What population(s) will be negatively impacted? How much? When?
- Will the policy impact health disparities / health equity? How?
- Are there gaps in the data/evidence-base?

Contents of work

The research activity involves emissions and air quality modeling using real data from monitoring stations across the country. The modeling would rely on real-time historical data and forecast future trends in air pollutants based on different scenarios.

Population exposure modeling will then drive the quantification of the health burden attributable to long-term exposure by using World Health Organization (WHO) guidelines. On the other side, health benefits that result from pollution reductions attributed to Kuwait's 15% renewable energy target will be quantified.

Monetary valuation of the effects will be conducted using a CBA framework and accounting for different costs and benefits under different scenarios.

Modeling air pollution and associated health impacts in Kuwait may be undertaken for the following scenarios:

- Baseline scenario (business-as-usual) that forecasts air pollution trends in line with expected population growth and the Ministry of Electricity and Water's predicted growth of demand on power.
- Clean energy scenario assuming delivery of 15% renewable energy target by 2030.

Expected outputs

The final outputs of this research activity are:

- Report on air pollution impacts on human health in Kuwait.
- Cost-Benefit Analysis (CBA).
- A 2-3 page summary of key points for decision makers.
- Workshop presenting and validating the findings.

Research activity 5: Assessing air quality compliance barriers (priority: high)

Assess air quality compliance barriers

Background

Air pollution is a major component of Kuwait's environmental damage, and it has direct consequences on human health. Recent studies show that Kuwait's populated areas are affected by suspended dust from the region's natural resources and also from the uncontrolled emissions of industrial plants and power plants. One challenge is the increase of uncontrolled emissions directly to residential areas, thereby increasing exposure to pollution.

The EPL #42/2014 imposes very stiff and stringent penalties for non-compliance and frequently uses the courts to force violators to pay the fines. **Enforcement of EPL is distributed among several departments within KEPA** and is not coordinated with the enforcement mechanism of other government entities; there are no criteria for determining the nature, risk, gravity and severity of the incidents. **Large numbers of companies do not understand the law and its executive regulations** because they are difficult to comprehend and very detailed.

Two major courses of action may be taken to address a violation. One is the compliance approach, in which voluntary remediation measures are taken to bring about and to maintain compliance or to prevent, reduce or eliminate the risk of air pollution to human health or the natural environment. The second is enforcement, which involves prosecuting the responsible person/company who has committed an offense. The two approaches are referred to colloquially as the "carrot and the stick" which would both encourage and require behavior change. The "carrot" is related to compliance promotion while the "stick" is related to the threat of an enforcement action against violators.

Poor compliance and enforcement weaken promotion of the r**ule of law and good governance** and put the fairness and credibility of the environmental requirements at risk. Non-compliance **weakens investors' confidence** in Kuwait's environmental legal system, increases business risk and reduces competitiveness.

Environmental compliance and enforcement (ECE) indicators are necessary to ensure that the EPL and its executive regulations are effectively and fairly enforced and followed. At present, KEPA **does not have a set of indicators that measures performance** and maximizes the results of environmental regulation at a minimum cost for society. Compliance and enforcement indicators and tracking are inadequate, and **databases that track compliance and violation incidents are weak.**

The enforcement and compliance systems **lack for advisory actions, warning, compliance assistance and compliance incentives,** all of which will increase compliance.

The enforcement of air pollution standards is also challenged by the **lack of qualified inspectors** available to perform quality inspections on facilities that potentially violate the air quality laws. **A lack of appropriate monitoring and evaluation of compliance and enforcement** indicators hinders enforcement of relevant environmental laws.

Objectives

The research activity aims to assess compliance to EPL and air quality standards in Kuwait and underlying barriers to noncompliance.

Specifically, the research activity aims to:

- Quantify the current level of compliance with EPL and air quality standards.
- Identify the underlying barriers for noncompliance with EPL and air quality standards.
- Better understand the emitters' perspectives, awareness and behaviors toward air quality.
- Quantify the health impacts from air pollution in Kuwait.
- Establish a communications strategy aimed at overcoming barriers and increasing emitters' engagement and awareness.

Contents of work

The research activity involves a review of compliance and enforcement data in KEPA. This includes a review of fines, warnings, and all other records of violations.

The research activity would also map all existing sources of emissions in Kuwait, and design a survey to target operators of key industries to understand the underlying barriers that lead to noncompliance. This includes awareness, willingness to comply with air quality laws and behaviors toward air pollution.

The approach in delivering the research would be a desktop review and analysis of enforcement and compliance data, and a structured survey targeting decision makers at key industries believed to be key emitters of pollution.

Expected outputs

The final outputs of this research activity are:

- A comprehensive report on the compliance status and barriers to air quality regulations in Kuwait .
- A 2-3 page summary of key points for decision makers.
- Workshop presenting and validating the findings.

V. Waste Management

Research activity 6: Discussion paper on a circular economy approach for Kuwait (priority: medium)

Discussion paper on a circular economy approach for Kuwait

Background

Despite the small geographical area of the country and the relatively small population, the State of Kuwait, due to its constant need for urban expansion and subsequent development projects, along with its high standard of living, has one of the globe's highest rates of solid waste at 1.32kg/capita/day. Kuwait faces well-documented challenges in managing solid waste from various sectors, including: municipal; industrial; building and construction; medical; and electronics and electrical equipment.

Due to fast-paced urban development, residential areas have expanded over the years until reaching the edges of landfill sites, thus causing grave danger to public health. In addition, the State of Kuwait encourages private companies to deal with the recycling industry to reduce the amount of waste.

Kuwait has a limited number of recycling and reuse options. Currently, less than 2% of municipal waste is recycled, mainly through scavenging activities by collectors.

In the conventional management hierarchy, recovery of materials via recycling means that waste materials are processed industrially and then reformed into new or similar products. This process requires separation of waste at some stage (preferably at source). Recycling in Kuwait is stymied by three issues: poor separation of waste at its source; insufficient information on its economic feasibility; and low awareness of the necessity for doing so.

Existing recycling data is scattered among private sector recycling businesses in Kuwait, and the country lacks a centralized database about waste that would consolidate reliable information on recycling.

Waste recovery[9] is also limited in Kuwait and challenged by the instability of the political decision making process. A key waste-to-energy (WtE) project has been pending a final approval for well over 10 years. The project has struggled with a prolonged procurement process, government bureaucracy and final decision-making.

The feasibility of WtE projects in Kuwait is challenged by the availability of cheap and subsidized energy sources, and also by an absence of government subsidies, tipping fees, and power purchase agreements for the power generated from waste.

The fact that WtE benefits go beyond just energy is not well articulated to decision makers. WtE helps to reduce land consumption for landfills, landfill rehabilitation costs and greenhouse gases while providing a clean, renewable energy source.

WtE is increasingly being identified as a renewable energy source of great potential, as it integrates both waste management and renewable energy production into a feasible solution. Given the large amount of waste generated daily and the pace of life in urban communities that continues to aggravate the problem of waste, WtE offers an inexhaustible source of clean energy and also ensures that our waste is diverted from landfills.
Private sector participation in the waste recycling and recovery business is limited due to a lack of incentives, a clear legal framework and an absence of national recyclables standards. Waste recovery projects are also challenged by a lack of clear power purchase agreements.

Supporting better and repeated use of our resources helps the **circular economy** to retain the value of materials in the economy for as long as possible, reducing the unsustainable depletion of natural resources and impacts on the environment. **A circular economy has economic benefits, creating new industries, markets and products, and leading to new revenue streams and the creation of jobs.**

Applying the circular economy principles to waste management in Kuwait requires changes across all stages from production, use and reuse, recycling and disposal. It is a whole-of-system approach that requires accounting for the full cost and lifecycle of materials. It is also an approach that will help to **minimize reliance on virgin materials** and maximize the economic value of resources.

Less waste, more recycling and recovery means less use of landfills and, consequently, **reduced environmental impacts and lower landfill operation costs** - including reduced rehabilitation costs.

Objectives

The research activity aims to develop a policy discussion paper on the potential role of waste in Kuwait's circular economy. The paper would provide an overview of the circular economy, how it could be applied in Kuwait and the benefits it could bring.

9 Recover refers to converting non-recyclable waste materials into energy or useable materials, such as compost. Non-combustible materials, such as glass and metals, cannot be recovered; hence, they are sent to landfill to be disposed of in a sanitary way.

The paper presents key principles and international circular economy case studies. It aims to encourage dialogue on circular economy principles and how these might be applied in Kuwait. The paper also will propose the next steps and priority focus areas for the Kuwait government.

Specifically, the discussion paper aims to:

- Define circular economy and its principles in the context of Kuwait.
- Define the potential role of waste in Kuwait's circular economy.
- Develop a policy statement on circular economy and the role that the waste sector plays.

Objectives

The discussion paper will be informed by stakeholder consultations, research on international best practice approaches and an assessment of how these approaches would apply in the Kuwait context.

The discussion paper and draft policy statement are not limited to specific resources or materials, although recyclable plastic, paper and cardboard, glass and metals are given particular attention. In the wake of China's National Sword restrictions on accepting solid waste for recycling, and the resulting impact on the recyclable commodity markets across the world, a circular economy can lead to a more resilient local economy.

The principles presented in the discussion paper will cover all aspects of a product or service life cycle and show how the circular economy provides benefits to the society, economy and environment.

By incorporating circular economy principles into decisions and behavior and encouraging consideration of the true value of resources, we can develop a new, restorative model that builds economic, social and natural capital in an integrated manner.

Expected outputs

The final outputs of this research activity are:

- Discussion paper on the potential role of waste in a circular economy approach for Kuwait.
- Draft circular economy policy statement.
- A 2-3 page summary of key points for decision makers.
- Workshop presenting and validating the findings.

Research activity 7: Barriers and Opportunities for Waste Recycling businesses in Kuwait (priority: medium)

Barriers and Opportunities for Waste Recycling businesses in Kuwait

Background

Despite the small geographical area of the country and the relatively small population, the State of Kuwait, due to its constant need for urban expansion and subsequent development projects, along with its high standard of living, has one of the globe's highest rates of solid waste per capita at 1.32kg/day. Kuwait faces well-documented challenges in managing solid waste from various sectors, including: municipal; industrial; building and construction; medical; and electronics and electrical equipment.

Due to fast-paced urban development, residential areas have expanded over the years until reaching the edges of landfill sites, thus endangering public health. In addition, the State of Kuwait encourages private companies to work with the recycling industry to reduce the amount of waste.

Kuwait has a limited number of recycling and reuse options. Currently, less than 2% of the municipal waste is recycled, mainly through scavenging activities by collectors.

In the conventional management hierarchy, recovery of materials via recycling means that waste materials are processed industrially and then reformed into new or similar products. This process requires separation of waste at some stage (preferably at source). Recycling in Kuwait is stymied by three issues: poor separation of waste at its source; insufficient information on its economic feasibility; and low awareness of the necessity for doing so.

Existing recycling data is scattered among private sector recycling businesses in Kuwait, and the country lacks a centralized database about waste that would consolidate reliable information on recycling.

Waste recovery[10] is also limited in Kuwait and challenged by instability of the political decision making process. A key waste to energy (WtE) project has been pending a final approval for well over ten years. The project struggled because of a prolonged procurement process, government bureaucracy and a drawn-out process to reach a final decision.

The feasibility of WtE projects in Kuwait is challenged by the availability of cheap and subsidized energy sources, and also by an absence of government subsidies, tipping fees, and power purchase agreements for the power generated from waste.

The fact that WtE benefits go beyond just energy is not well articulated to the decision makers. In fact, WtE helps to reduce several factors - land consumption for landfills, landfill rehabilitation costs and greenhouse gases – while also providing a clean, renewable energy source.

10 Recover refers to converting non-recyclable waste materials into energy or useable materials, such as compost. Non-combustible materials, such as glass and metals, cannot be recovered; hence, they are sent to landfill to be disposed of in a sanitary way.

WtE is increasingly being identified as a renewable energy source of great potential, as it integrates both waste management and renewable energy production into a feasible solution. Given the large amount of waste generated daily and a pace of life in urban communities that continues to aggravate the problem of waste, WtE offers an inexhaustible source of clean energy and also ensures that our waste is diverted from landfills.

Private sector participation in the waste recycling and recovery business is limited due to a lack of incentives, a clear legal framework and an absence of national standards for recyclables. Waste recovery projects are also challenged by a lack of clear power purchase agreements.

Supporting better and repeated use of our resources helps the **circular economy** to retain the value of materials in the economy for as long as possible, reducing the unsustainable depletion of natural resources and impacts on the environment. **A circular economy has economic benefits, creating new industries, markets and products, and leading to new revenue streams and the creation of jobs.**

Applying the circular economy principles to waste management in Kuwait requires changes across all stages from production, use and reuse, recycling and disposal. It is a whole-of-system approach that requires accounting of the full cost and lifecycle of materials. It is also an approach that will help to **minimize reliance on virgin materials** and maximize the economic value of resources.

Less waste, more recycling and recovery means less use of landfills and, consequently, reduced environmental impacts and lower landfill operation costs including **reduced rehabilitation costs** including reduced rehabilitation costs.

SMEs wishing to enter value chains face different types of challenges for which they need practical, technical and legal advice and support.

Objectives

The research activity aims to identify key barriers and enablers to adopting circular economy business practices by using input from a literature review, discussions and an analysis of circular business models used by waste SMEs.

Specifically, the discussion paper aims to:

- Define the waste recycling value chain in Kuwait.
- Identify the motivations of potential businesses (particularly SMEs) to invest in the waste business under a circular economy concept.
- Identify the key barriers, drivers, innovations and best practices toward having businesses actively operating the waste market in Kuwait
- Define the opportunities for enhancing businesses' (particularly SMEs') engagement in the waste market in Kuwait.
- Provide policy recommendations for how the role of businesses (particularly SMEs) could be enhanced in the waste market.

Contents of work

Fostering the uptake of the circular economy concept among businesses and in policy-making requires analysis of the potential opportunities and benefits that a circular economy approach could yield for businesses and economies.

While the capacities of larger firms facilitate the adoption of and realization of benefits from circular business models, small and medium-sized enterprises (SMEs) are also increasingly aware of the benefits of closing loops and improving resource efficiency: saving material costs, creating competitive advantages and new markets are among the main reasons for SMEs to take action.

Numerous barriers can hamper the implementation of "circular" and "green" economy practices by businesses and SMEs. Those barriers can, for example, originate in the culture of policy making in the market chain in which the SME operates; the behavior of suppliers; and a lack of technical skills and finance. These barriers are further analyzed below on the basis of a literature review.

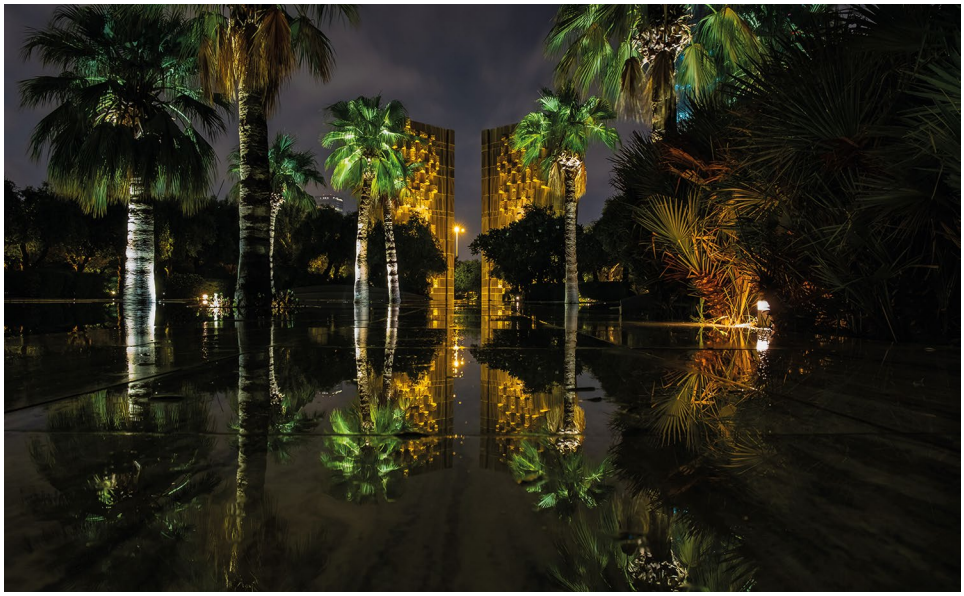
The research activity will explore environmental barriers, financial barriers, regulatory barriers, information gaps, administrative burdens, technical skills gaps, and a lack of support from the supply and demand network.

Expected outputs

The final outputs of this research activity are:

- Report on the status of the recycling market in Kuwait, and barriers and opportunities for businesses to grow the market.
- Policy recommendations on changes required to enhance the waste recycling market.
- A 2-3 page summary of key points for decision makers.
- Workshop presenting and validating the findings.

VI. Ecocities



Research activity 8: Urban Ecology Strategic Action Plan for Kuwait urban areas (priority: medium)

Urban Ecology Strategic Action Plan for Kuwait urban areas

Background

Since the first half of the twentieth century, Kuwait has transformed from a small walled city to a metropolitan area experiencing rapid and unprecedented population growth with only a relatively small increase in the dimensions of urban areas. Most of the developed areas are located along Kuwait's coast. This has created lifestyle, economic and environmental issues[11].

Based on the Emir's Vision to create a financial and trade center, Kuwait has a two-part strategy for planning its future. Part one is the Kuwait National Development Plan (KNDP), which outlines an economic development strategy through 2035. Part two is the Fourth Kuwait Master Plan (4KMP), which establishes the physical planning strategy through 2040.

4KMP recognizes sustainability as a key driver of the spatial plan and national plans generally. Its absence from preceding plans has resulted in the emergence of several unhelpful and unsustainable trends in energy, water, urban design, planning, health and human capital. Driving changes is the use of several scenarios that are used to make projections of future greenhouse gas (GHG) emissions and assess future vulnerability to climate change. Producing scenarios requires estimates of future population levels, economic activity, and the structure of governance, social values and technological change. Economic and energy modeling can be used to analyze and quantify the effects of such drivers.

11 Alghais and Pullar, 2016.

A well-planned, designed and managed green infrastructure for Kuwait will promote healthier living, reduce the impacts of climate change, improve air quality, encourage walking and exercise, reduce the carbon footprint, and improve biodiversity and ecological resilience. Moreover, research on natural capital demonstrates that investing in green infrastructure provides economic benefits to people, such as reducing the need for medical treatment.

The primary driver of diminishing biodiversity in Kuwait cities is the loss of habitat and the subsequent decline in the quality of the remaining habitat. Urbanization changes both abiotic conditions (e.g. microclimate, lighting, noise, hydrology, biogeochemistry, the introduction of artificial structures, and disturbance patterns) and biotic interactions (due to changes in the occurrence and abundance of organisms). These changes may decrease biodiversity in cities.

As Kuwait is witnessing vast urban development and considering establishment of new cities in accordance with the new 4KMP, it is becoming increasingly critical to address urban ecology and associated human well-being in urban planning.

Kuwait is experiencing a continuous decline in natural areas as a result of the accelerated pace of the urban encroachment to meet the increased demand for land by different sectors of the economy and the continuous increase in the number of foreign laborers in Kuwait. The coastal areas have been repurposed to residential and urban areas to meet the needs of the population, and the industrial, tourism and commercial sectors. As well, the submerged marine environments along the coasts are dredged for coarse sand, which is used in the construction industry.

Objectives

The research activity aims to develop an urban ecology strategic action plan for the urbanized areas in Kuwait to guide the development of 4KMP.

Specifically the research aims to:

- Review existing information.
- Provide flora and fauna surveys, vegetative mapping and habitat assessments.
- Identify priority sites, supporting sites and priority fauna species.
- Identify potential habitat linkages across key urban areas.
- Identify threats to biodiversity within urban areas.

Contents of work

The research activity would involve surveying flora and fauna in Kuwait's key urban areas, including defining the potential habitat linkages across these areas.

It is important that this research activity defines threats facing flora and fauna diversity in urban areas.

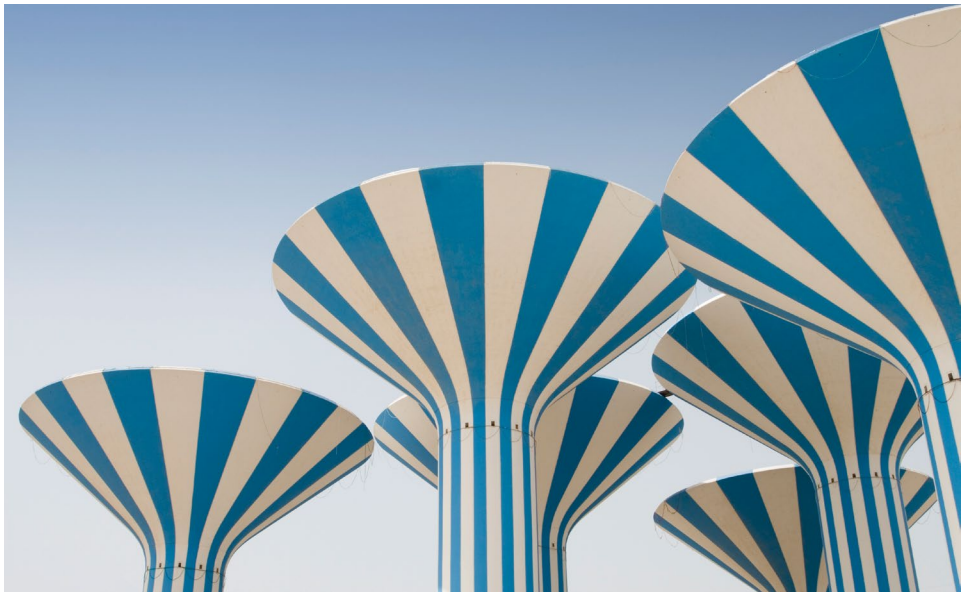
This information will form the basis for designing future interventions and actions targeting priority sites.

Expected outputs

The final outputs of this research activity are:

- Strategic action plan for conserving urban ecology in Kuwait.
- A 2-3 page summary of key points for decision makers.
- Workshop presenting and validating the findings.

VII. Sustanaible Water



Research activity 9: Assess public awareness, attitude and behavior toward sustainable water consumption (priority: high)

Assess public awareness, attitude and behavior toward sustainable water consumption

Background

Kuwait is one of the world's most water-stressed countries, with the lowest per capita renewable internal freshwater availability of any country[12]. The country is highly water stressed with an internal renewable capacity of less than 70 mm/y, and high dependency on trans-boundary aquifers[13]. Groundwater in Kuwait consists of fresh (less than 1,000 mg/l total dissolved solids (TDS)), brackish (1,000 to 7,000 mg/l TDS) and saline (between 7,000 to 20,000 mg/l, PAAF, 2006).

Due to large and continuous population increases, urban expansion, high-income levels and expanding economic activities, consumption of potable water in Kuwait has witnessed record increases since water desalination plants began operating. Between 2006 and 2016, potable water consumption increased by 3.3% per year and production of water increased by the same rate.

Rising per capita income together with government-fixed low prices have been responsible for a steep rise in average per capita water consumption (from around 113 l/d/capita in 1970 to a maximum of around 500 l/d/capita in 2002). To rein in this steep rise in water use, a substantial reduction in the subsidy should be one of the methods high on the agenda and considered in earnest.

12 FAO AQUASTAT data accessed June 2016.
13 Water resources trends: Hydrol. Earth Syst. Sci., 16, 3101–3114

Beside the rise in per capita consumption, the increase in population is another major factor in the rise of Kuwait's water consumption.

In addition, weak adoption of water-saving equipment at the consumer end, including drip irrigation and sprinklers for irrigation of private and public gardens, and limiting the timings of irrigation should save a large volume of water.

Objectives

The research activity aims to assess public awareness, attitude and practice toward the sustainable water issues such as efficiency in consumption, sanitation and hygiene.

Specifically, the research activity aims to:

- Measure the current level of awareness in regard to water efficiency, sanitation and hygiene.
- Identify the knowledge gaps and inform the future design of water awareness campaigns.
- Identify the underlying barriers facing behavior changes in regard to water consumption.
- Identify the future opportunities to inform water consumption awareness and behavioral change.
- Obtain scientific evidence to demand well-informed management policy development.

Contents of work

Evidence-based practice has become a worldwide concern for healthcare staff and administrators as well as researchers. Evidence-based practice has been considered critical to improving the quality of health services and achieving excellence in water sustainability.

A KAP survey is a representative study of a specific population to collect information on what is known, believed and done in relation to a particular topic — in this case, water sustainability. In most KAP surveys, an interviewer uses a structured, standardized questionnaire to collect data. These data then can be analyzed quantitatively or qualitatively depending on the objectives and design of the study. A KAP survey can be designed specifically to gather information about water consumption behaviors-related topics, but it may also include questions about general water practices and beliefs.

Expected outputs

The final outputs of this research activity are:

- A comprehensive report on the KAP in Kuwait.
- A 2-3 page summary of key points for decision makers.
- A workshop presenting and validating the findings.

Research activity 10: Assess the environmental, social and economic impacts of all types of wastewater (priority: high)

Assess the environmental, social and economic impacts of all types of wastewater

Background

Over 90 percent of the population is connected to a central sewage system. This offers an important potential for treated wastewater (TWW) reuse that can contribute to alleviating the water shortage problem. The complete plan is to distribute water from the Sulaibiyah treatment plant as follows: 40% to the south for the Wafra agricultural area, 40% to the north to the Abdally agricultural area, with 20% to remain in the Sulaibiyah area. There are GCC guidelines allowing use of quaternary TWW for growing vegetables, fruits and other crops in times of crises and the use. The tertiary TWW is used in landscaping based on the decisions from the Council Ministry number 29-30.

Kuwait has recently implemented a vigorous campaign that aims to reclaim and reuse all treated wastewater. An analysis of the historical records of the wastewater treatment plants has indicated that the reuse of reclaimed wastewater in Kuwait has greatly reduced the amount of pollutants discharged into the sea, from about 65% of treated wastewater in year 2000 to less than 30% in year 2010.

Wastewater reuse has proven to be economically feasible and environmentally acceptable. Recycling treated wastewater is now a common practice, especially in arid and semiarid regions where water resources are very limited. For water-scarce areas, wastewater reuse represents a reliable and steady supply of water throughout the year. In addition, wastewater reuse brings numerous economic and environmental benefits that include reduction of freshwater extraction from the environment, enhancement of crop productivity and reduction of environmental degradation.

In Kuwait, the primary use of treated wastewater is for municipal landscaping, while a significant volume is lost to the sea or adjoining wadis even after it is treated to the secondary level. The reuse of treated wastewater could be expanded for irrigating tree and fodder crops.

The treated municipal wastewater is of good quality and could be utilized beneficially in many applications other than agricultural irrigation. Wastewater reuse in the country needs to diversify, and the technical and socioeconomic constraints, particularly for urban reuse, need to be alleviated.

To maximize the benefits of wastewater reuse, the country needs to diversify the applications where such water can be used. Other applications such as urban domestic supply (e.g., **toilet flushing, vehicle washing, and fire protection), industrial supply (e.g., cooling water and boiler feedwater), environmental supply (e.g., irrigation of golf courses, hunting and equestrian clubs), and artificial recharge of groundwater should be encouraged.** In fact, artificial recharge is still at the experimental stage, and also there are very few environmental reuse applications of treated wastewater in Kuwait.

Objectives

The research activity aims to assess the environmental, social and economic impacts of the treated wastewater in Kuwait. Specifically the research activity aims to:

- Assess the impacts of discharging domestic wastewater on the marine ecosystem along Kuwait shoreline.
- Assess the social acceptance of using treated wastewater.
- Assess the economic return that the Government of Kuwait gains from treating wastewater.
- Assess the degradation cost of not treating wastewater.
- Suggest policies aiming at maximizing wastewater treatment and reuse.

Contents of work

Impact Assessment is a process of identifying the potential social, environmental and economic impacts of a proposal and of identifying appropriate measures that may be taken to minimize any impacts. The main purpose of an assessment is to inform decision-makers of the likely effects of a proposal before any decisions are made.

The research will integrate three development pillars (environmental, social and economic) by assessing the impacts of wastewater leakage into the marine environment, and assessing the social barriers toward using treated wastewater and assessing the degradation cost and economic benefits from the wastewater treatment.

The work under this research would involve mix methods including the Environmental and Social Impacts Assessment (ESIA) and Cost-Benefit Analysis (CBA).

Expected outputs

The final outputs of this research activity are:

- A comprehensive assessment report.
- A 2-3 page summary of key points for decision makers.
- A workshop presenting and validating the findings.

VIII. Research agenda delivery plan

Research activity	Priority	Timeframe	Stakeholders	Delivery approach
Research activity 1: Undertake derisking renewable energy investment analysis	High	2020	Ministry of Electricity and Water KISR Private sector	Delivered through UNDP/KPPC engaging consultants
Research activity 2: Evaluate renewable energy delivery in Kuwait	High	2020	Higher RE Committee Ministry of Electricity and Water KISR	KPPC engages a consultant
Research activity 3: Identify ESCOs' barriers and opportunities	Medium	2022	Chamber of Commerce KISR Private sector	KPPC and KISR
Research activity 4: Health impacts of air pollution	High	2021	KEPA (e-MISK) Ministry of Health	Requires environmentalist and economist capacities
Research activity 5: Assessing air quality compliance barriers	High	2021	KEPA Industries (emitters)	KPPC leads – engaging a consultant
Research activity 6: Discussion paper on a circular economy approach for Kuwait	Medium	2024	KEPA Kuwait Municipality	Partnership with a leading global economic institution
Research activity 7: Barriers and opportunities for waste recycling businesses in Kuwait	Medium	2023	KEPA Kuwait Municipality SMEs	
Research activity 8: Urban ecology strategic action plan for Kuwait urban areas	Medium	2021	KEPA Kuwait Municipality	Ecological surveys led by KEPA
Assess public awareness, attitudes and behaviors toward sustainable water consumption	High	2020	Ministry of Electricity and Water Kuwait Municipality	Public surveys
Assess the environmental, social and economic impacts of all types of wastewater	Medium	2022	Ministry of public works Ministry of Electricity and Water Kuwait Municipality	Partnership with KEPA and KISR

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