حكومة رأس الخيمة
Government of Ras Al Khaimah

reem
فريق رأس الخيمة لكفاءة الطاقة والطاقة المتجددة
RAK ENERGY EFFICIENCY AND RENEWABLES TEAM

بلدية رأس الخيمة
Ras Al Khaimah Municipality

RAS AL KHAIMAH ENERGY EFFICIENCY & RENEWABLES STRATEGY 2040

ANNUAL REPORT 2018

His Highness Sheikh Saud bin Saqr Al Qasimi
Supreme Council Member & Ruler of Ras Al Khaimah

"Energy and water are essentials of our lives and prosperity. They are an integral part of the social and economic development that we aspire to, so we must preserve and invest in them. The application of modern technology and the use of modern building materials in addition to the use of renewables will provide opportunities for all sectors to benefit from energy and water at a lower cost."

His Highness Sheikh Mohammed bin Saud bin Saqr Al Qasimi
Crown Prince of Ras Al Khaimah and Chairman of the Executive Council

"Competitiveness in energy and water costs is key to our development. Efficiency and care in the use of energy and water as well as the adoption of renewable sources of energy support competitiveness of our economy and conservation of the natural resources of our Emirate."

بلدية رأس الخيمة
Ras Al Khaimah Municipality

His Excellency Munther Mohammed bin Shekar Al Zaabi
Director General, Ras Al Khaimah Municipality and
Chairman, Energy Efficiency & Renewables Committee

"The Energy Efficiency & Renewables Strategy 2040 stems from the vision of His Highness Sheikh Saud bin Saqr Al Qasimi to have sustainability as a source of competitiveness for Ras Al Khaimah. Considering the climate change challenges faced globally, this strategy is part of Ras Al Khaimah's contribution to the climate change mitigation efforts of the UAE and the world. It addresses all energy and water consumers across Ras Al Khaimah.

The strategy was set up in collaboration with government entities at the local and federal level, and also aims to encourage participation of the private sector in Ras Al Khaimah."

FOREWORD

The Ras Al Khaimah Energy Efficiency & Renewables Strategy 2040 (EE&R Strategy) was launched in 2018 under the patronage of His Highness Sheikh Saud bin Saqr Al Qasimi, to support competitiveness of Ras Al Khaimah's economy over the long run, by reducing energy and water consumption, and by increasing the use of renewables. It targets 30% energy savings, 20% water savings, and 20% contribution from renewables by 2040.

The Energy Efficiency & Renewables Office (Reem) of Ras Al Khaimah Municipality is the dedicated government body responsible for monitoring and supporting the implementation of the EE&R Strategy, and also for driving the implementation of specific programs within the strategy. An Energy Efficiency & Renewables Committee (EE&R Committee) comprised of representatives of various government entities has also been set up to support Reem in the implementation of the strategy. The completion of this necessary institutional set-up in 2018 has laid the foundation for success of the strategy.

Andrea Di Gregorio
Director, Reem
Ras Al Khaimah Municipality

The strategy was developed in a collaborative effort together with many government entities. The nine (9) programs of the strategy address all forms of energy and water consumption in the Emirate. Each program is led by one or more specific government entities, who manage the implementation of the program, and are responsible for annual targets contributing to the overall targets of the strategy.

We are proud to have kicked off the strategy to a robust start in 2018, with the development and activation of all nine (9) programs within the year. The year 2018 was especially significant as it saw the development and approval of Barjeel, the first green building regulations of Ras Al Khaimah. Several projects were launched as part of the Building Retrofits program, which is now supported by specifically developed standards for energy performance contracting, an accreditation scheme and incentives for energy service companies, which are receiving significant market response. The Efficient Vehicles program was launched with three components: an incentive scheme to promote adoption of electric vehicles, the installation of the first few electric vehicle charging stations in Ras Al Khaimah, and the launch of a government efficient vehicles procurement program. Solar Programs, Energy Management, and Energy from Waste programs have already started through pilot projects.

2019 will mark the beginning of the next phase of the EE&R Strategy, when we will ramp up strategy implementation. As the activities under the strategy grow, so will the capabilities of Reem to provide the expertise and support required to implement all programs.

I am proud to present to you this first edition of our annual report, summarizing the EE&R Strategy and our achievements in 2018. I hope you find the information contained in it useful, and I look forward to even greater achievements in the coming year.

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EXECUTIVE SUMMARY

1 EXECUTIVE SUMMARY

This is the first publication of the annual report of the Energy Efficiency and Renewables Strategy of Ras Al Khaimah, for the year 2018. The strategy comprises 9 programs supported by 5 enablers, is fully integrated into the wider Ras Al Khaimah Vision 2030 for Energy, Renewables and Utilities, and is aligned with the federal agenda on energy, water and the environment. It supports competitiveness of the Ras Al Khaimah economy by reducing costs and increasing availability of energy and water, while also building local capabilities in related sectors.

The EE&R Strategy targets 30% energy efficiency, 20% water efficiency, and 20% contribution from renewables by 2040, compared to business as usual. Intermediate targets and a roadmap have also been developed to guide the implementation of the strategy.

The strategy is expected to bring more than 9bn AED of direct net benefits to the economy of Ras Al Khaimah on a present value basis. Additional social, economic, environmental, health, and safety benefits are also expected.

A dedicated organizational set-up has been put in place to ensure effective strategy implementation. Each program is assigned a responsible government entity (Program Owner) and other supporting entities. The strategy implementation, reporting and continuous update is driven by Reem, which is also the program owner for some key programs. An Energy Efficiency & Renewables Committee, comprising senior representatives of key government agencies for the strategy, and chaired by Ras Al Khaimah Municipality, has also been set up to support implementation.

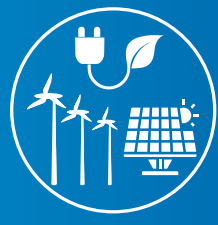
Significant achievements were made in 2018 in setting up the framework of the EE&R Strategy and activating the programs. The most notable of these achievements are:

- Development of Reem within Ras Al Khaimah Municipality
- Activation of the works of the Energy Efficiency and Renewables Committee
- Pledge of commitment of Program Owners to the EE&R Strategy and its targets
- Approval of Barjeel, the Green Building Regulations of Ras Al Khaimah
- Launch of the Retrofit Program, under the guidance of a dedicated Emiri Resolution, with the first guaranteed savings building retrofit project of Ras Al Khaimah Government
- Completion of Ilkhair Nurshed, a large-scale water fittings replacement program by FEWA
- Launch of waste to energy, alternative fuels, and on-site solar PV pilot projects
- Launch of an efficient vehicle procurement initiative, under the guidance of a dedicated Emiri Resolution
- Launch of a first set of incentives for ESCOs and energy auditors, in support of local market capacity building

These initial accomplishments are the bases of a growing pipeline of projects, expected to result in significant energy and water savings in the coming years.

30% Energy Savings

20% Water Savings



20% Renewables

RAS AL KHAIMAH ENERGY EFFICIENCY & RENEWABLES STRATEGY 2040

2 RAS AL KHAIMAH ENERGY EFFICIENCY & RENEWABLES STRATEGY 2040

2.1 Policy & Economic Context

Ras Al Khaimah is undergoing a remarkable transformation and growth in multiple sectors of its economy. Energy and water are central to the policy agenda of the Government of Ras Al Khaimah, and the EE&R Strategy is meant to support competitiveness of the economy in different ways:

1) **Cost competitiveness:** energy efficiency and renewables measures will reduce the cost of energy and water for consumers in Ras Al Khaimah, thus promoting savings for residents and competitiveness for industrial and commercial enterprises.

2) **Availability:** the development of renewables production capacity in Ras Al Khaimah will improve the availability of energy in Ras Al Khaimah, thus reducing the existing dependence on electricity and fuel imports.

3) **Capacity building:** a new market for products and services related to energy-efficiency and renewables will be developed in Ras Al Khaimah, thus contributing to additional economic growth and the development of local skills and capabilities in these specialized fields.

The EE&R Strategy has been designed to be fully integrated into the wider Ras Al Khaimah Vision 2030 for energy, renewables and utilities, while also contributing to the goals of various federal agendas and plans. The framework of strategic plans guiding energy efficiency and renewables in Ras Al Khaimah, as shown in Figure 1, comprises the UAE National Agenda Vision 2021, the UAE

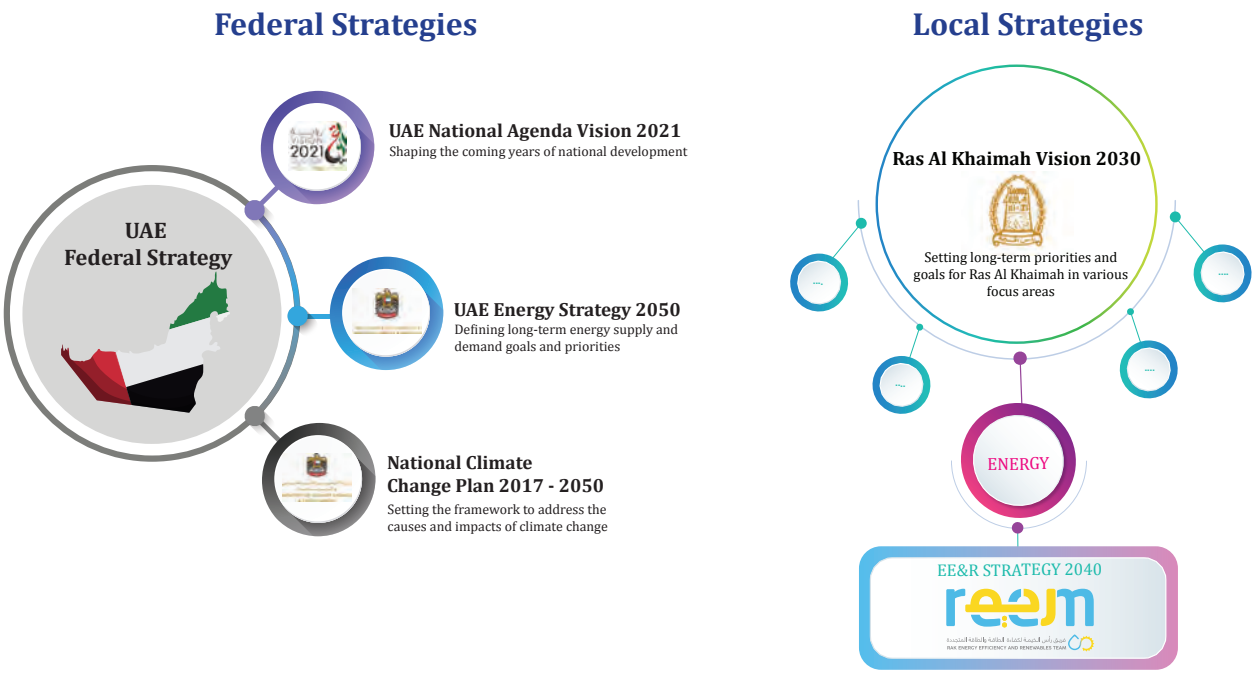


Figure 1: Universe of relevant Strategic plans in Ras Al Khaimah

Energy Strategy 2050, and the National Climate Change Plan 2017 - 2050 at the federal level; and the Ras Al Khaimah Vision 2030 and the EE&R Strategy on the local level. Each of these strategies is governed and driven by different government entities acting in unison.

Specifically, the EE&R Strategy supports the ambition of Vision 2030 for Ras Al Khaimah as a competitive and sustainable investment destination, with distinguished public service standards. In this context, efficiency in energy use and adoption of renewables technologies are key in achieving two important pillars of the Vision 2030 for the energy, renewables and utilities focus are: energy competitiveness and sustainability of energy and public services.

The targets of the EE&R Strategy for Ras Al Khaimah are also fully in line with federal targets, as shown in Figure 2.

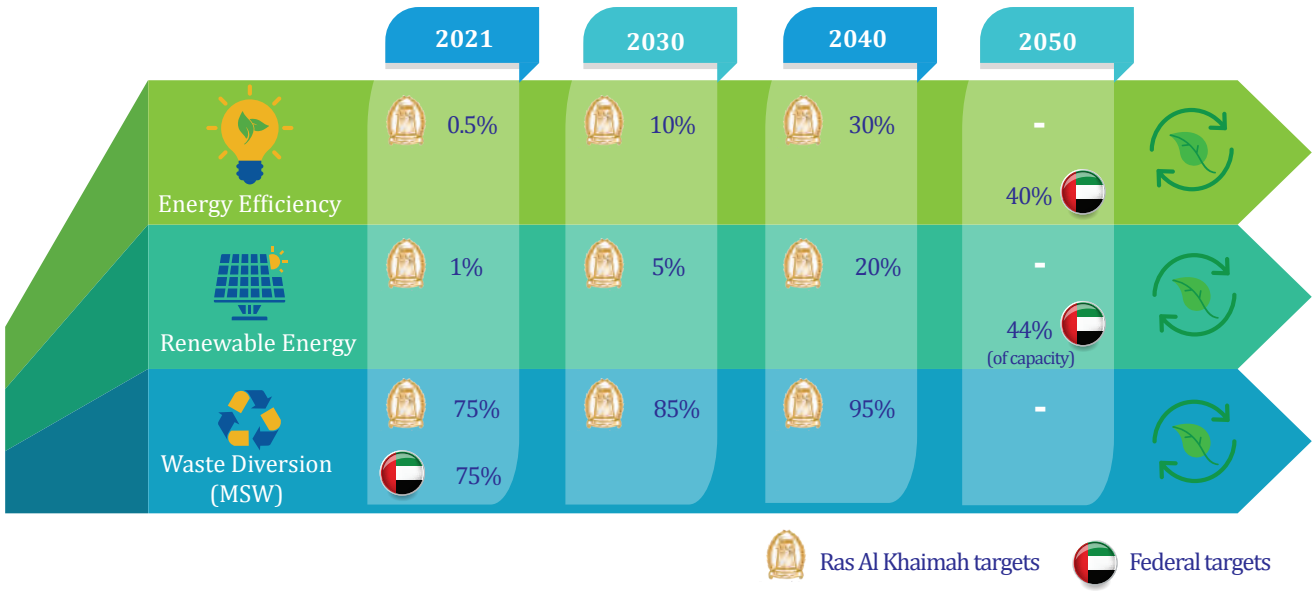


Figure 2: EE&R Strategy targets compared to federal targets

2.2 EE&R Strategy

The main objective of the EE&R Strategy is to ensure reliable and cost competitive access to energy and water resources for consumers in Ras Al Khaimah, by reducing the energy intensity of the economy and increasing the use of renewables resources. The strategy comprises nine (9) programs, and five (5) enablers over the period of 2018 to 2040, complemented by an implementation roadmap, targets, business case, and the necessary institutional set-up. The strategy is summarized overleaf.

2.2.1 Benefits of the EE&R Strategy

The EE&R Strategy is expected to bring more than 9bn AED of net benefits to the economy of Ras Al Khaimah on a present value basis.

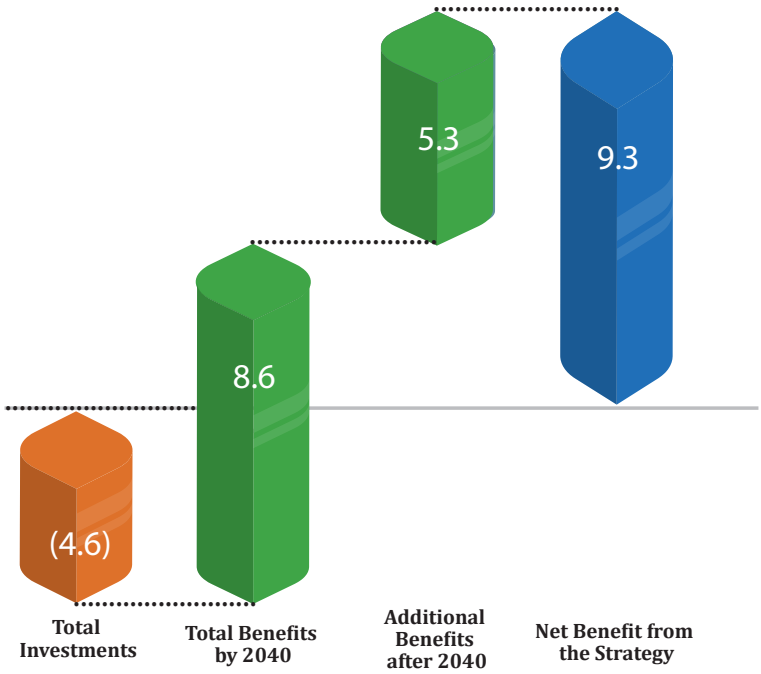


Figure 3: Benefits & costs of the EE&R Strategy (AED bn)

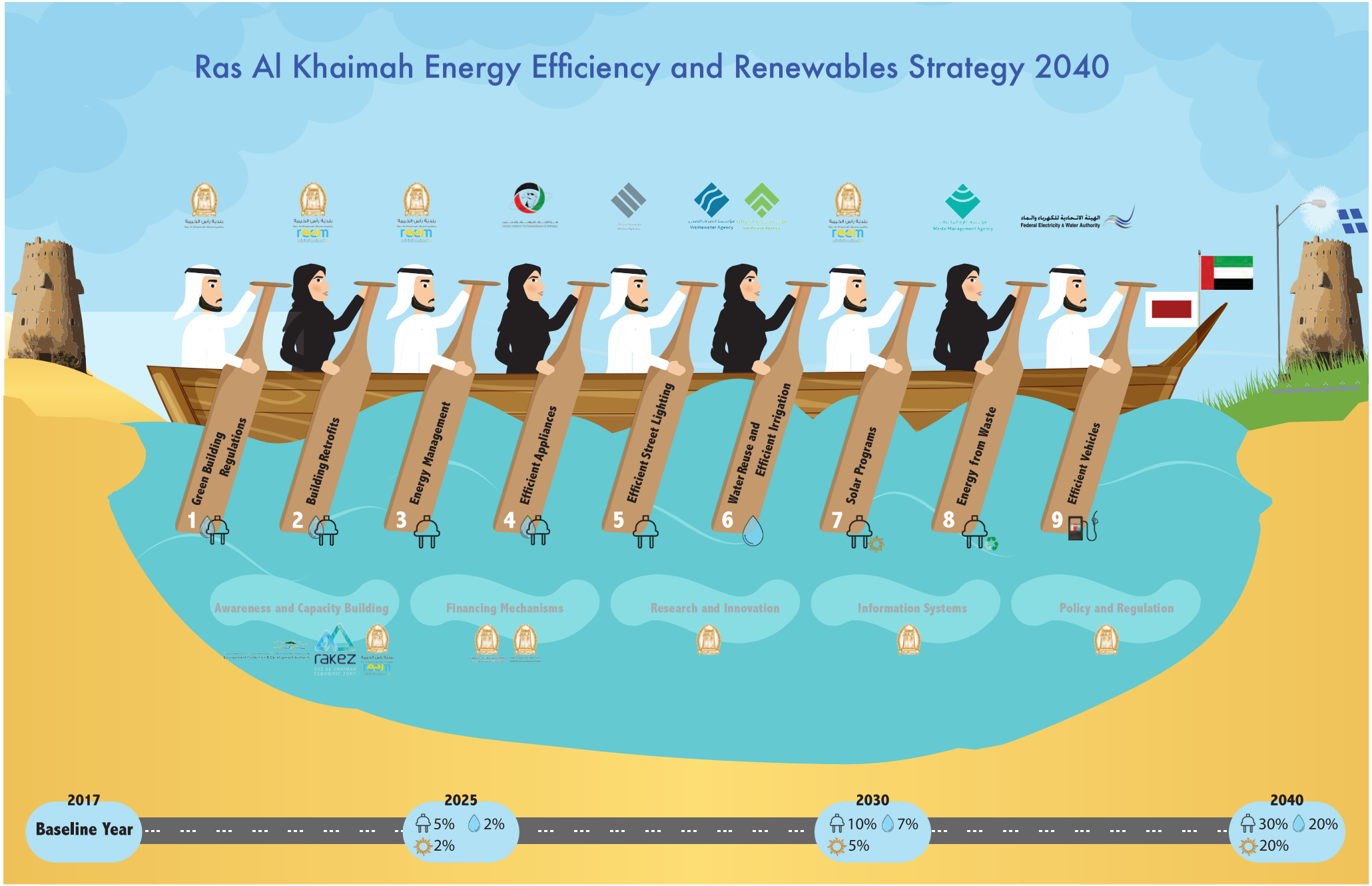
Other significant benefits of the EE&R Strategy include the following:

1) **Social Benefits:** The EE&R Strategy will improve the positioning of Ras Al Khaimah as an attractive place to live and work. Additional jobs will be created for both national and expat communities.

2) **Economic & Market Benefits:** The strategy will provide additional resilience to the economy against price fluctuations of various conventional fuels. Increased competitiveness of the economy will attract more business and industries, while further entrenching existing businesses in Ras Al Khaimah. Local markets will be created for energy efficiency and renewables products and services, which will contribute to GDP growth, and create opportunities for private sector development. Enhanced work environments, efficient equipment, and proper maintenance practices will improve the overall productivity of the

economy. The strategy will benefit the real estate sector as the added value of efficient buildings is expected to gradually translate into price and rental premiums. The tourism sector will benefit from an image of concern towards environmental and economic sustainability.

3) **Environmental, Health, and Safety Benefits:** Implementation of the EE&R Strategy will create better living and working conditions through healthier indoor and outdoor environments in Ras Al Khaimah. It will also promote safety by replacing old equipment while reducing the use of hazardous substances. Environmental benefits will come from better waste management practices, treatment and reuse of wastewater, use of electric and fuel efficient vehicles, and use of local plant species.


Ras Al Khaimah Energy Efficiency and Renewables Strategy 2040
Green Building Regulations
Building Retrofits
Energy Management
Efficient Appliances
Efficient Street Lighting
Water Reuse and Efficient Irrigation
Solar Programs
Energy from Waste
Efficient Vehicles
1
2
3
4
5
6
7
8
9
Awareness and Capacity Building
Financing Mechanisms
Research and Innovation
Information Systems
Policy and Regulation
2017
Baseline Year
2025
5%
2%
2%
2030
10%
7%
5%
2040
30%
20%
20%

2.2.2 EE&R Strategy Programs

The nine (9) programs are designed to together address most of the different forms of energy and water consumption in Ras Al Khaimah. The implementation of the strategy and programs is expected to be supported primarily by five (5) enablers. The programs and the enablers are briefly described in Figure 4 below.

Program	Brief & Objectives
1. Green Building Regulations	Introduce and periodically upgrade green building regulations for new buildings. Introduce efficient community guidelines and a building rating scheme at a later stage.
2. Building Retrofits	Execute comprehensive energy efficiency improvement projects for at least 3,000 existing buildings by 2040, starting with large government and commercial buildings with high energy consumption.
3. Energy Management	Promote best practices in energy management at key energy and water users, representing >30% of the total electricity consumption.
4. Efficient Appliances	Promote adoption of energy and water efficient appliances and equipment (such as air conditioners, refrigerators and water fixtures). Implement mechanisms to enforce appliance efficiency standards.

Program	Brief & Objectives
5. Efficient Street Lighting	Adopt efficient lighting technologies (such as LEDs) for 400+km of existing street lighting and for new roads. Apply dimming and switch-off measures.
6. Water Reuse & Efficient Irrigation	Increase wastewater collection and treatment. Reuse at least 95% of the TSE produced by 2040. Implement efficient irrigation measures to allow for expansion of public green spaces.
7. Solar Programs	Promote solar energy for on-site and utility scale applications, with an ambition to reach 1,200 MWp of total capacity by 2040.
8. Energy from Waste	Develop a range of waste-to-energy capacities to contribute at least 2% of the primary energy consumed in Ras Al Khaimah.
9. Efficient Vehicles	Promote adoption of efficient vehicles with a focus on EVs and hybrids, starting with government fleets.

Enablers

- **Awareness and Capacity Building** — Development of efficiency-consciousness in RAK society, and building local skills and capacities
- **Financing Mechanisms** — Ensuring adequacy of capital for energy efficiency & renewables projects in RAK
- **Research and Innovation** — Supporting research and development of new energy efficient solutions and technologies
- **Information Systems** — Creation of data processing tools to support projects and monitor strategy progress
- **Policy and Regulation** — Adoption & enforcement of regulatory measures promoting implementation of the programs

Figure 4: EE&R Strategy programs & enablers

2.2.3 Roadmap & Targets

The implementation of the EE&R Strategy will be undertaken from 2018 until 2040.

The year 2018 marks the activation phase, when the EE&R Strategy itself and the institutional set-up are established and the implementation of the early initiatives is started. The period from 2019

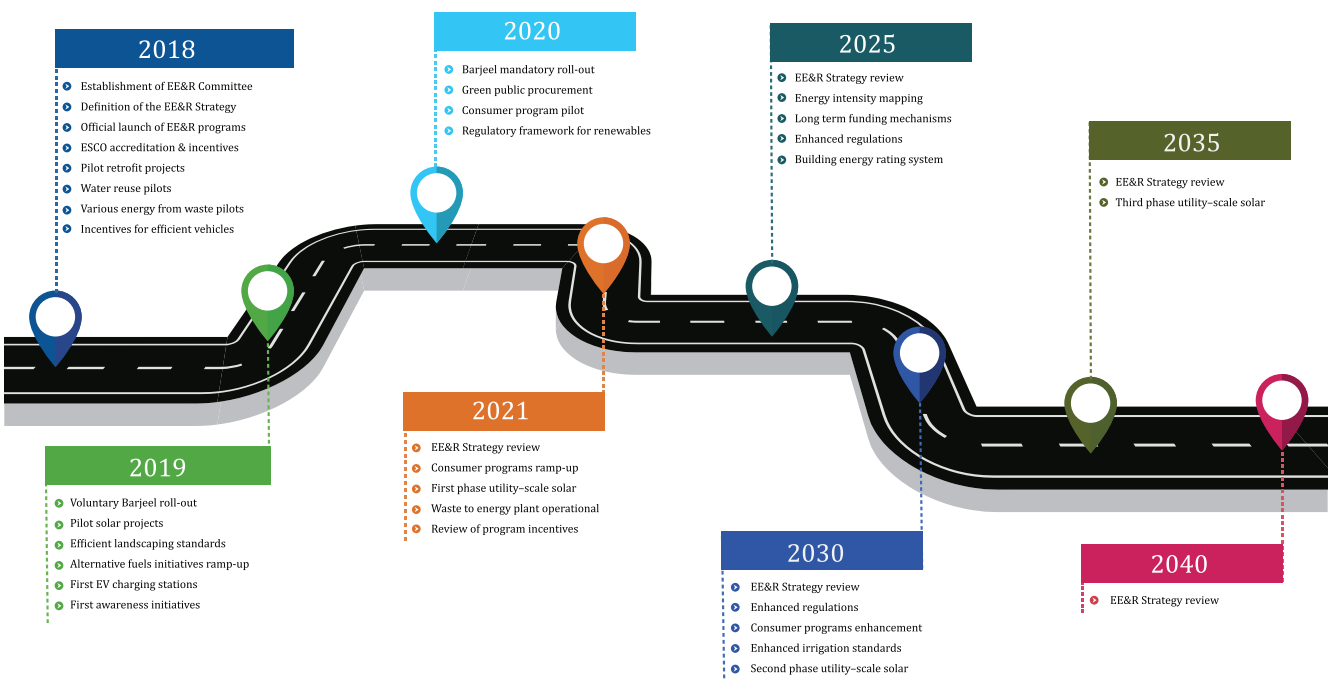


Figure 5: EE&R Strategy roadmap

until 2021 is the ramp-up phase, when all the programs and most of their constituent initiatives are gradually developed. The EE&R Strategy implementation shall reach the full scope of its activities during this period, barring some exceptional initiatives to be activated in the future. The remaining period from 2022 until 2040 is the phase of continuous implementation of the EE&R Strategy.

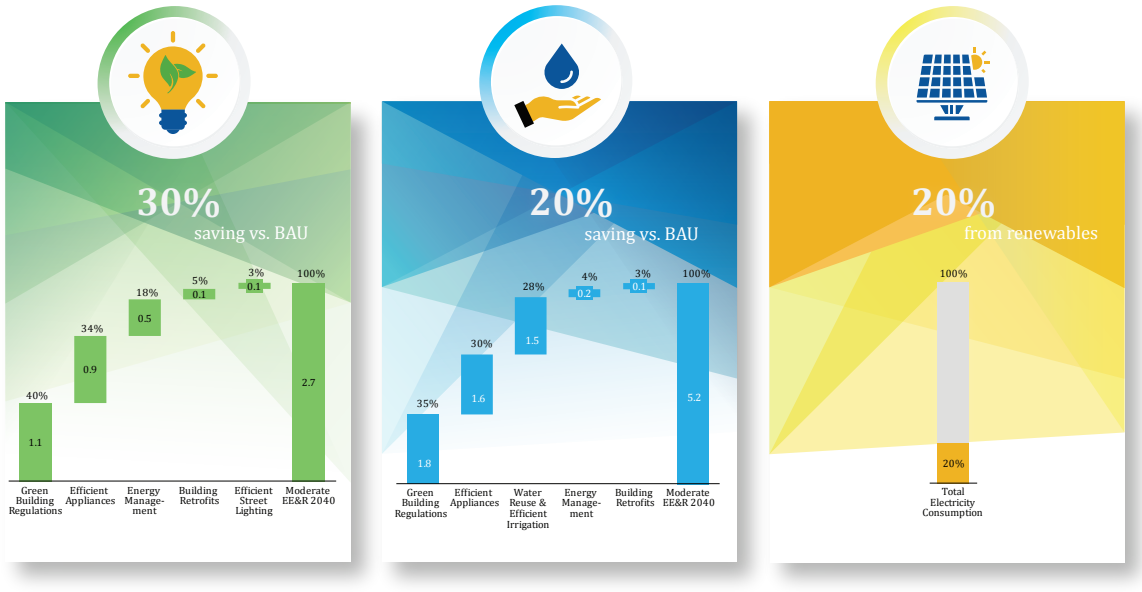


Figure 6: EE&R Strategy targets

Targets for the strategy overall and for each program have been agreed with all key stakeholders.

Intermediate targets have been set to guide strategy implementation towards the final 2040 targets.

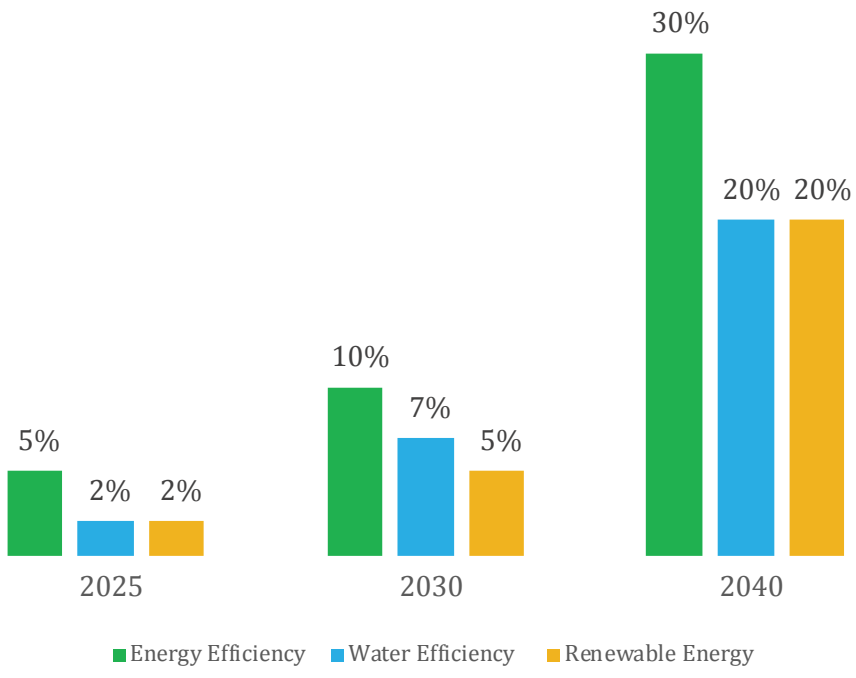


Figure 7: EE&R Strategy intermediate targets

2.2.4 Institutional Set-up

A dedicated organizational set-up has been put in place to ensure effective strategy implementation. This includes Reem (part of Ras Al Khaimah Municipality), the Energy Efficiency & Renewables Committee, and the government entities responsible for implementation of each of the programs and initiatives of the EE&R Strategy.

The institutional set-up created for the EE&R Strategy implementation and its place in the overall institution of the Government of Ras Al Khaimah is depicted in the figure below.

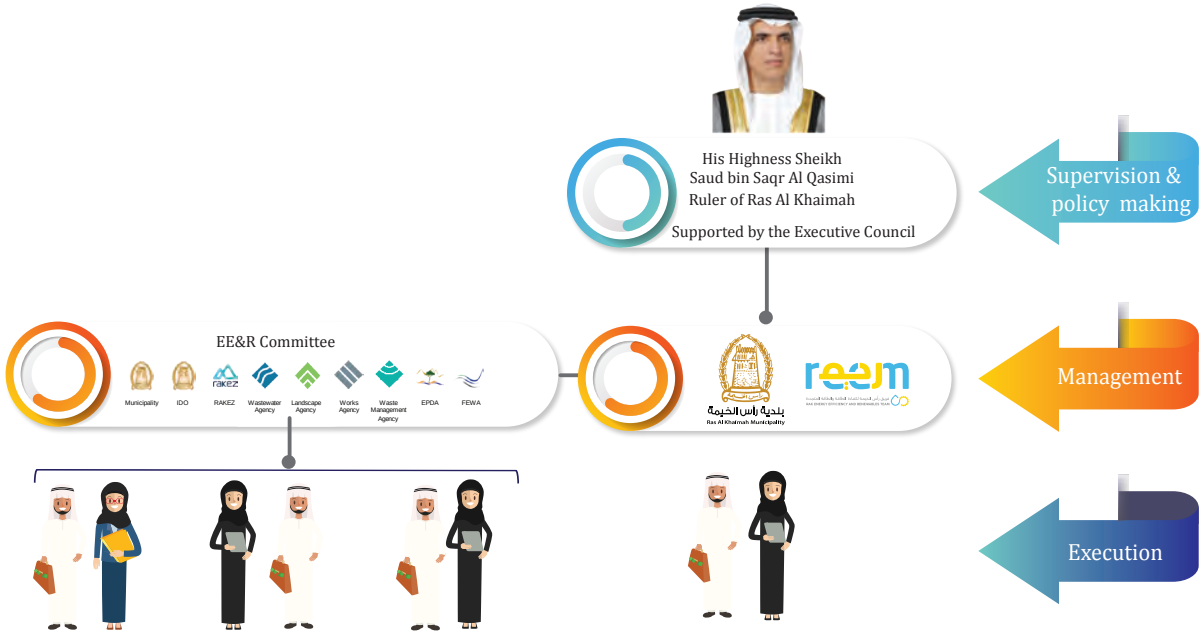


Figure 8: Institutional set-up of the EE&R Strategy, within the government of Ras Al Khaimah

2.2.4.1 Reem

Reem, the Energy Efficiency & Renewables Administration of Ras Al Khaimah Municipality is the government office dedicated to driving and reporting on the implementation and continuous update of the EE&R Strategy. Its main organizational functions are the following:

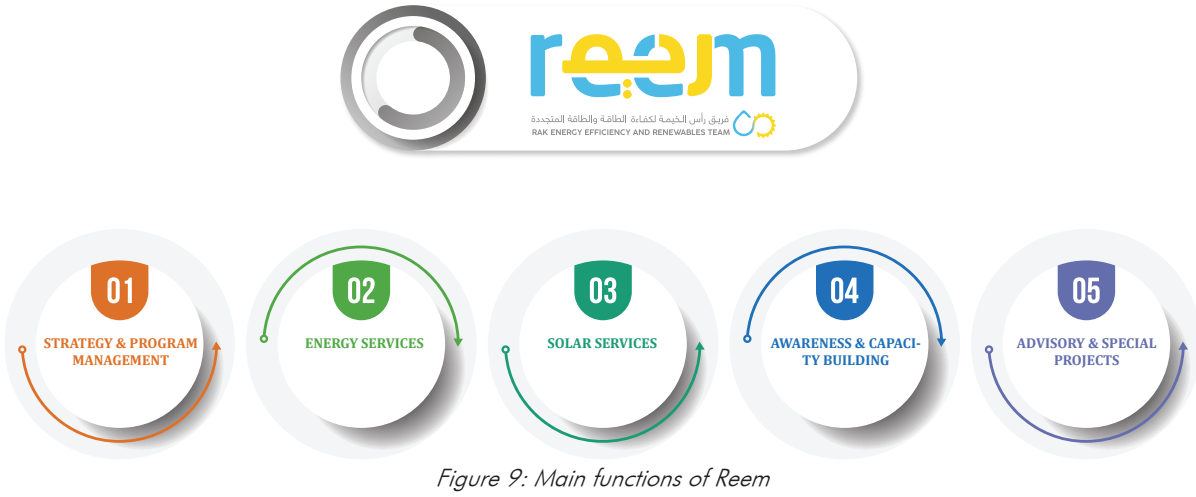


Figure 9: Main functions of Reem

2.2.4.2 Energy Efficiency & Renewables Committee

The Energy Efficiency & Renewables Committee guides and supports Reem in the implementation of the EE&R Strategy. It comprises senior representatives of those government agencies that are essential to the implementation of the EE&R Strategy, and is chaired by Ras Al Khaimah Municipality.

Figure 10: EE&R committee meeting

H.E. Munther Mohammed bin Shekar
Director General, Ras Al Khaimah Municipality
Chairman

Alan Turner
Executive Director, PSD Wastewater Agency
Member

H.E. Ahmed Al Hammadi
Director General, Public Services Department
Member

Mark McGuire
Executive Director, PSD Landscape Agency
Member

Dr. Saif Al Ghais
Executive Director, Environment Protection and Development Authority
Member

Eyad Ismael
Group Director of Engineering, Ras Al Khaimah Economic Zone
Member

Salim Bin Rabee'a
Executive Director
Electricity Directorate
Federal Electricity & Water Authority
Member

Nitin Johar
Head of Treasury, Investment and Development Office
Member

Sonia Nasser
Executive Director, PSD Waste Management Agency
Member

Andrea Di Gregorio
Director, Reem Ras Al Khaimah Municipality
Member and Secretary

2.2.4.3 Implementation Responsibilities

Each program of the EE&R Strategy is assigned to a Program Owner, selected on the basis of its mandate and expertise, which is the entity responsible for overall execution of the initiatives of that program, and is accountable for the achievement of program targets and operational objectives. In most cases, supporting entities are also identified to provide support to the Program Owner through the activation of program enablers or the execution of some initiatives within the program. The program owners and supporting entities are shown in Figure 11.

Program	Program Owner	Support
1. Green Building Regulations	Ras Al Khaimah Municipality	RAKEZ
2. Building Retrofits	Ras Al Khaimah Municipality, REEM	Investment and Development Office
3. Energy Management	Ras Al Khaimah Municipality, REEM	RAKEZ
4. Efficient Appliances	Kuwait Authority for Partnership Projects	Ras Al Khaimah Municipality, REEM
5. Efficient Street Lighting	Works Agency	Federal Electricity & Water Authority
6. Water Reuse & Efficient Irrigation	Wastewater Agency, Landscape Agency	Ras Al Khaimah Municipality, REEM
7. Solar Programs	Ras Al Khaimah Municipality, REEM	Investment and Development Office, Waste Management Agency
8. Energy from Waste	Waste Management Agency	Wastewater Agency
9. Efficient Vehicles	Federal Electricity & Water Authority	Ras Al Khaimah Municipality, REEM

Figure 11: Program owners & supporting entities for all programs

H.E. Ahmed Al Hammadi
Director General,
Public Services Department

"The Public Services Department has adopted three key initiatives in support of the EE&R Strategy: Efficient Street Lighting, Water Reuse & Efficient Irrigation, and Energy from Waste.

This stems from our sense of responsibility towards future generations. We are planning to preserve our natural resources to the best of our ability for future generations."

2.3 Initial Achievements

2.3.1 EE&R Strategy Activation

By the end of 2018, the EE&R Strategy has marked a series of important accomplishments:

- Development of Reem within Ras Al Khaimah Municipality.
- Activation of the works of the Energy Efficiency and Renewables Committee.
- Pledge of commitment of Program Owners to the EE&R Strategy and its targets.
- Approval of Barjeel, the first Green Building Regulations of Ras Al Khaimah.
- Launch of the Retrofit Program, under the guidance of a dedicated Emiri Resolution, with the first guaranteed savings building retrofit project of Ras Al Khaimah Government.
- Completion of Llkhair Nurshed, a large-scale water fittings replacement program by FEWA.
- Launch of waste to energy, alternative fuels, and on-site solar PV pilot projects.
- Launch of a government efficient vehicle procurement initiative, under the guidance of a dedicated Emiri Resolution.

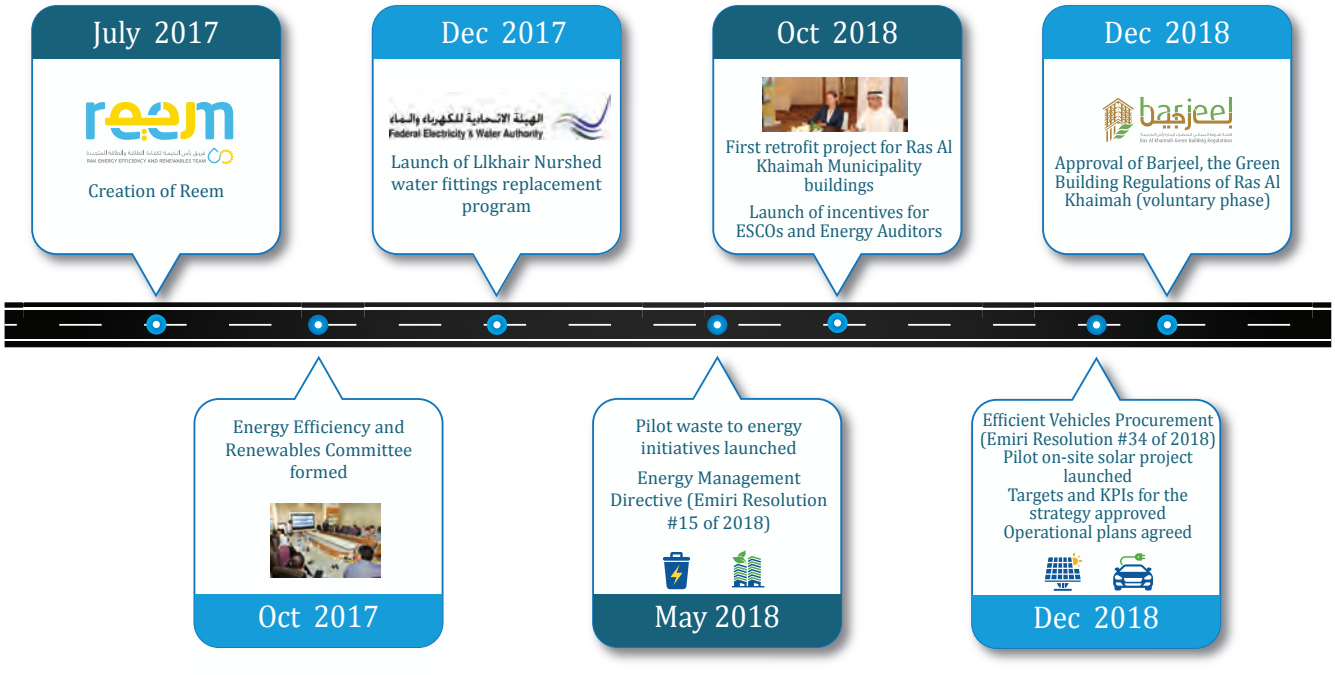


Figure 12: Initial achievements of the EE&R Strategy by 2018 year end

2.3.2 Energy & Water Savings

5.7 TWh of electricity and 13.1 BIG of water were consumed in Ras Al Khaimah in 2018, with a CAGR of electricity consumption of about 4% over the last 3 years. The trends of energy and water consumption and savings in Ras Al Khaimah are shown below.

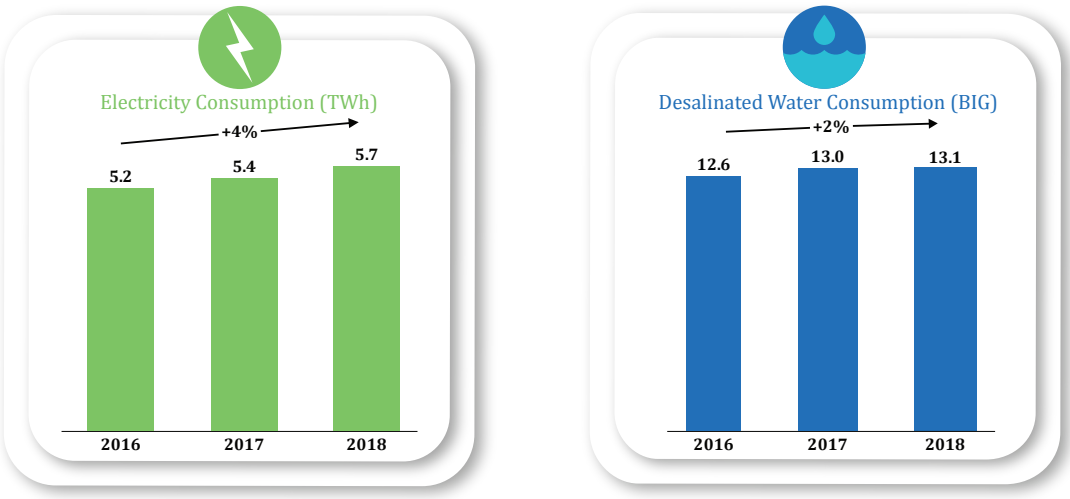


Figure 13: Electricity and water consumption trends in Ras Al Khaimah

Energy savings of 1.3 GWh were achieved due to a building retrofit project for two (2) buildings of RAK Hospital, initiated before the launch of the EE&R Strategy.

Water savings estimated at close to 300 MIG were achieved from the Ilkhair Nurshed initiative of FEWA, under which water fittings and fixtures were replaced or retrofitted in about 6,000 homes free of cost.

EE&R STRATEGY PROGRAMS

3 EE&R Strategy Programs

3.1 Green Building Regulations

Program Owner: بلدية راس الخيمة Ras Al Khaimah Municipality

Supporting Entities: rakez RAS AL KHAIMAH ECONOMIC ZONE

Barjeel, the Green Building Regulations of Ras Al Khaimah, is one of our most important new municipal regulations. It has been built through a process of consultation with experts from more than 70 entities, representing the private sector and the federal and local government. Barjeel is designed to be simple and focused on measures with direct economic benefits.

Barjeel sets minimum sustainability standards for all new buildings in the Emirate of Ras Al Khaimah. Adoption of Barjeel was approved in December 2018 by Resolution No. 6 of 2018 of the Executive Council of Ras Al Khaimah. It is expected to result in 1 to 2 billion AED of net benefits for Ras Al Khaimah over the long term.

Abdulla Samhan
CEO, Technical Affairs Sector
Ras Al Khaimah Municipality

Figure 14: Est. costs and benefits of Barjeel for a new UAE national villa

We have decided to have a gradual implementation of Barjeel, to allow the market to adjust smoothly to the new requirements. For this reason, a one-year voluntary phase of Barjeel was launched on 29 January 2019, before the regulations are enforced. During the voluntary period, Ras Al Khaimah Municipality, within its jurisdiction, offers incentives for early adopters of Barjeel in the form of reduced building permit fees. An important part of our work is to ensure that the market has the capabilities to implement Barjeel. We have verified that all types of Barjeel-compliant products and materials are readily available in Ras Al Khaimah.

"Barjeel establishes minimum requirements across five areas of sustainability. It is designed to be simple and focused on measures with a direct economic benefit."

Nina Riehle
Senior Sustainability Specialist
Ras Al Khaimah Municipality

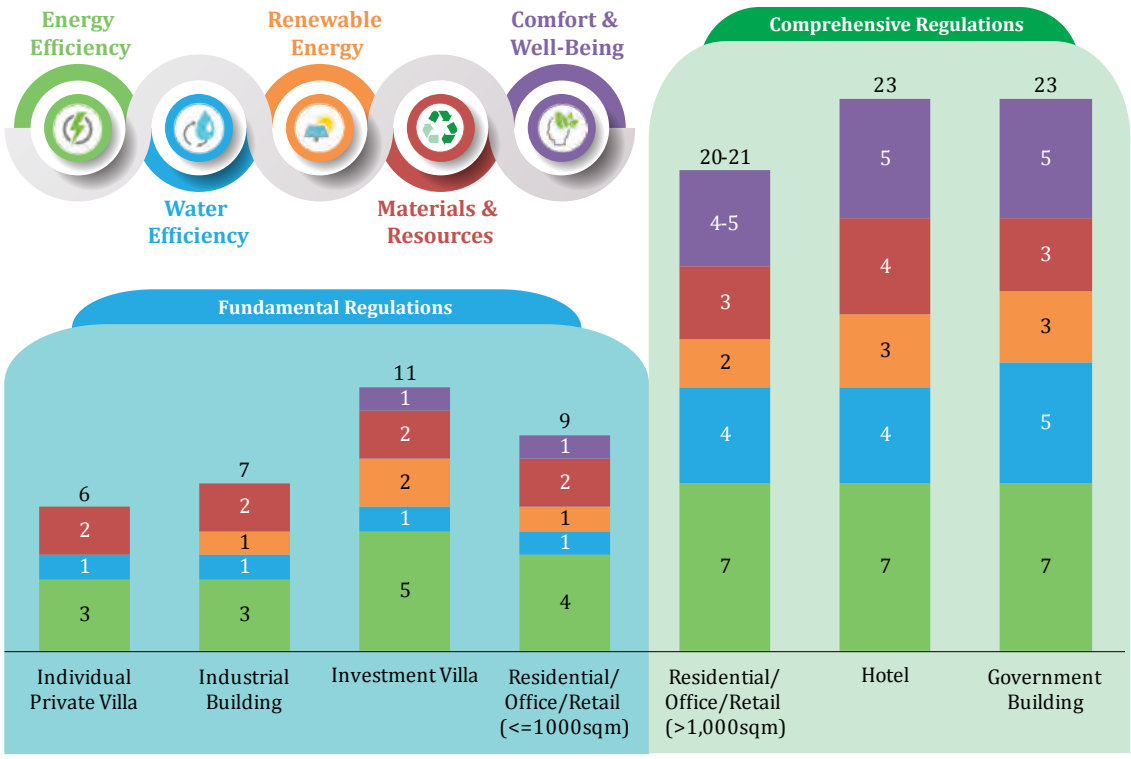


Figure 15: Number of Barjeel requirements for selected building types

Anwer Hadi Faraj
Barjeel Project Manager
Ras Al Khaimah Municipality

"The regulations are calibrated to different types of buildings, entailing requirements for which the market is expected to quickly adapt.

There are two levels of requirements in Barjeel:

- **The Fundamental Regulations** with few and simple requirements for small buildings, and
- **The Comprehensive Regulations** with additional requirements for larger and more complex buildings.

UAE national villas and industrial buildings are expected to comply with a subset of the fundamental regulations."

Starting from December 2018, extensive training sessions have been conducted for the municipality technical staff and consultants to introduce Barjeel to them and guide them through the implementation process. Such sessions will be periodically repeated.

We will continue to support the market to prepare for mandatory implementation in the future. Our future plans also include guidelines for efficient communities and advisory services for developers, to support them in getting the best results when adopting Barjeel.

Figure 16: Stakeholder consultation workshops

Figure 17: Barjeel training sessions for consultants

Figure 18: Barjeel approval by the Executive Council of Ras Al Khaimah

"We believe that Barjeel will further strengthen Ras Al Khaimah's strategic positioning as a leading destination for investments in the industrial sector."

Ramy Jallad
CEO, RAKEZ

Moosa Al Beqaishi
UAE National &
Resident of Ras Al Khaimah

"For the villa of my son, we will follow Barjeel guidelines, to avoid spending a fortune on energy and water bills, while also contributing to conserving our beloved Emirate."

"We at RAK Properties are fully prepared to implement this regulation in our projects, as part of our commitment to our valued investors."

Mohammad Al Tair
COO, RAK Properties

3.2 Building Retrofits

Program Owner: Ras Al Khaimah Municipality, reem

Supporting Entities: Investment and Development Office Government Of Ras Al Khaimah

Existing buildings represent the majority of electricity consumption and a large portion of water consumption of Ras Al Khaimah. A retrofit project can substantially reduce the energy and water consumption of a building by replacing or optimizing equipment or systems without interrupting the normal operations of the building. The Building Retrofits Program is therefore an important component of the EE&R Strategy. In 2018, we have laid the foundation of a retrofit program which is expected to grow quickly and provide tremendous benefits to the government, the private sector, and residents of Ras Al Khaimah.

Henrique Pereira
Senior Manager
Energy Services
Ras Al Khaimah Municipality

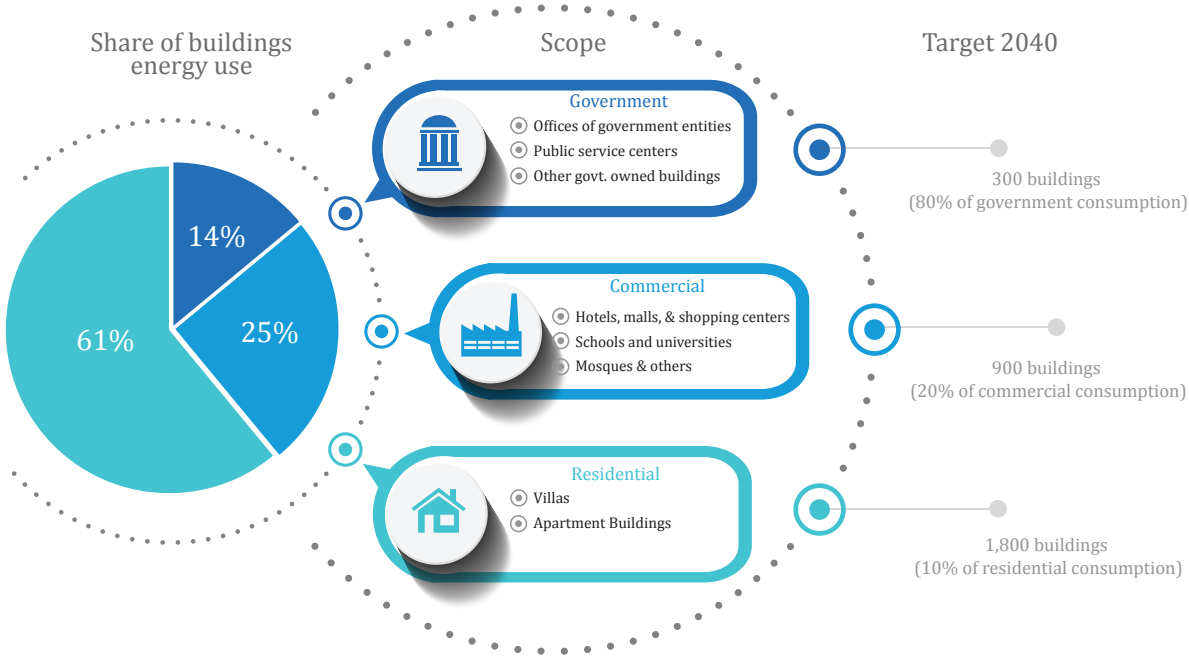


Figure 19: Retrofit program plan & targets

Our ambition is to ensure that at least 3,000 buildings are retrofitted in Ras Al Khaimah by 2040. The first projects have been started within the government, in order to set best practice examples and develop market capacity. However, for the success of the program, it is important that projects extend relatively quickly to commercial, residential, and other types of buildings.

In order for the market to function smoothly even without direct government intervention, we have developed a strong framework, including mainly an ESCO accreditation process, standard contracting processes and templates, incentives for set-up of ESCOs and Energy Auditors, and project facilitation services for the government and semi-government sectors. Our framework supports both

guaranteed savings and shared savings contracts based on an energy performance contracting model, which puts the responsibility of providing energy savings on the ESCO. Financing support

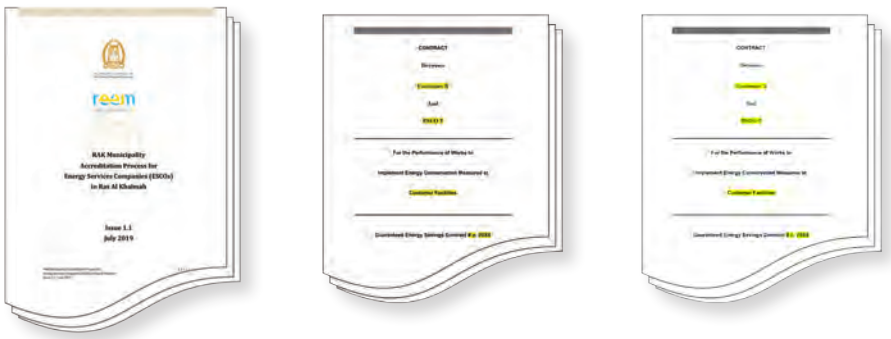


Figure 20: Accreditation process and standard contracting templates

for government and semi-government retrofit projects is also made available through Ras Al Khaimah Department of Finance and the Investment and Development Office (IDO). 17 ESCOs had already made preliminary registrations with Reem in 2018, and 15 ESCOs received a full accreditation in Q1 2019.

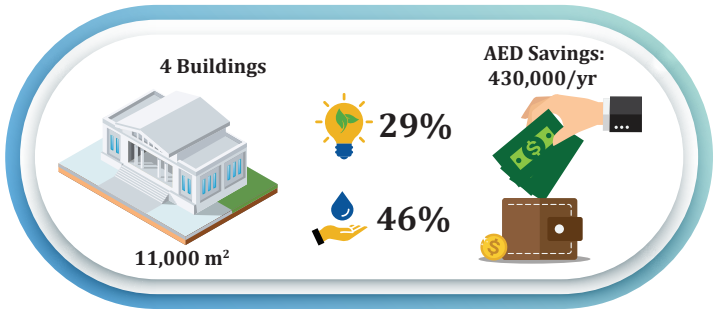


Figure 21: Focus on Ras Al Khaimah Municipality projects

The first government building retrofit project was contracted in October 2018, for 4 buildings for Ras Al Khaimah Municipality, with 38% savings expected in utility costs over 5 years.

A strong pipeline of projects in being created, as a result of the 170 buildings audited by Reem in 2018.

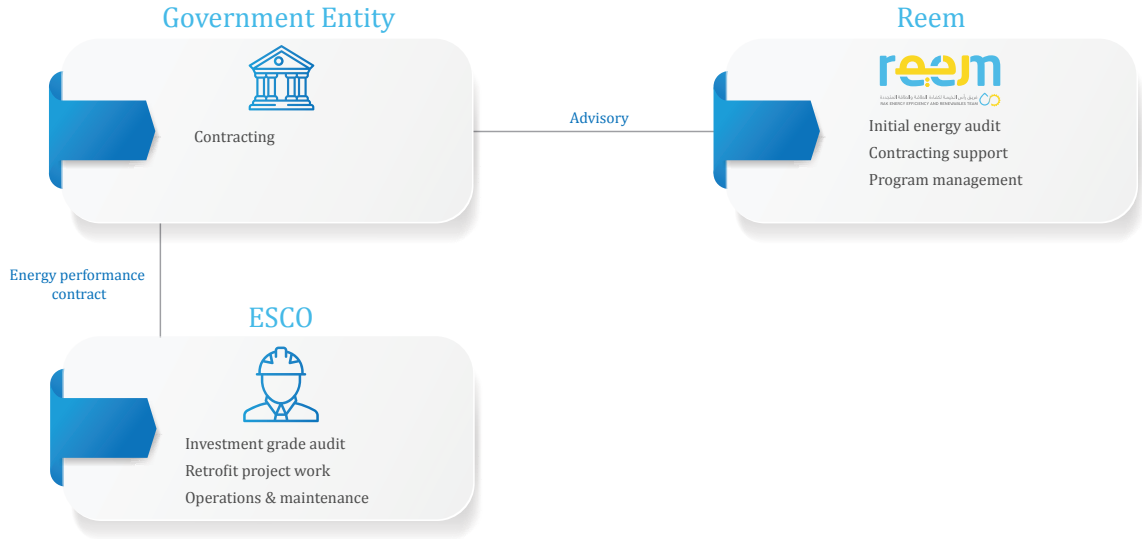


Figure 22: Reem's role as a facilitator

Figure 23: Model villa draw at Ras Al Khaimah Municipality

Reem, in partnership with Masdar, has also launched the Model Villa initiative, as a first step to create awareness of building retrofits in the residential sector. A local family villa has been selected through a public draw, and will be retrofitted by Masdar free of cost in 2019. The villa will then be showcased in awareness campaigns and events, as an example of best practices of energy and water savings in local family villas.

3.3 Energy Management

Program Owner: بلدية رأس الخيمة Ras Al Khaimah Municipality reem

Supporting Entities: rakez RAS AL KHAIMAH ECONOMIC ZONE

Industrial facilities account for about 45% of the electricity consumption and also for most of the direct consumption of coal and natural gas of Ras Al Khaimah. More than 60% of this consumption is concentrated in a handful of high energy users in the cement, quarrying, ceramics, glass, and building materials sectors.

Henrique Pereira
Senior Manager
Energy Services
Ras Al Khaimah Municipality

Energy being one of their main cost items, industries in Ras Al Khaimah have already undertaken multiple initiatives to improve their energy consumption. However, a systematic management of energy and water consumption is often lacking, with only a handful of facilities following ISO 50001 certified energy management practices. An energy management system helps an organization make positive changes not just in their energy consuming systems, but also in the processes and behaviours that lead to high energy and water consumption. In this way, an energy management system complements energy retrofit works conducted for the same facilities. To take full advantage of this complementarity, energy management should be implemented not just in industrial facilities, but also in large government and commercial organizations.

> Star Cement has implemented ISO 50001 since 2016, resulting in a culture of energy consciousness and significant improvements in our operations.
>
> ***S.D.K. Sankara Rao***
> *Electricals Manager, Star Cement*

Figure 24: Emiri resolution no. 15 of 2018

H.E. Munther Mohammed bin Shekar signing a consultancy contract for ISO 50001 implementation support to Ras Al Khaimah Municipality

The Energy Management Program, led by Reem, aims to promote systematic energy management practices such as ISO 50001 across high energy users among industries as well as commercial and government entities in Ras Al Khaimah. The EE&R Strategy targets implementing such energy management systems in at least 30 such high energy users by 2040.

The government is expected to lead by example in this program. It is with this purpose that Emiri Resolution No. 15 of 2018 mandates all local government and semi-government entities of Ras Al Khaimah to achieve 20% energy and water efficiency in their operations and facilities by 2022, through both building energy retrofits and energy management. Ras Al Khaimah Municipality, represented by Reem, is nominated to support government entities in achieving these goals.

In 2018, the first government project to implement the ISO 50001 energy management system was launched, which would cover most of the facilities of Ras Al Khaimah Municipality. As part of this project a workshop was held with Star Cement, which is ISO 50001 certified for its Ras Al Khaimah facility since 2016, to learn from their implementation experiences. This project is currently underway, and is expected to be completed in 2019. In the coming years, the initiative will be extended gradually to additional government entities. At the same time, a program to support energy management in industrial facilities will be designed and rolled out. This is expected to consist primarily of industrial energy audits, training and knowledge sharing events, as well as individual support to establishments particularly interested in implementing energy management.

3.4 Efficient Appliances

Program Owner: Emirates Authority For Standardization & Metrology

Supporting Entities: Ras Al Khaimah Municipality, reem

Over 20% of all electricity consumption in Ras Al Khaimah is due to domestic appliances such as window and split ACs, refrigerators, washing machines, and water heaters. However, setting minimum requirements for appliance efficiencies is not enough. The Efficient Appliances Program aims to improve the energy and water efficiency of appliances used in Ras Al Khaimah.

Abdulla Al Maeeni
Director General
ESMA

The primary driver of this improvement is the enforcement and continuous update of appliance performance standards, under the responsibility of the Emirates Authority for Standardization and Metrology (ESMA). Major household appliances in the UAE are today subject to minimum energy performance standards and are required to display standard comparative labels indicating their efficiency level. Appliances that do not meet

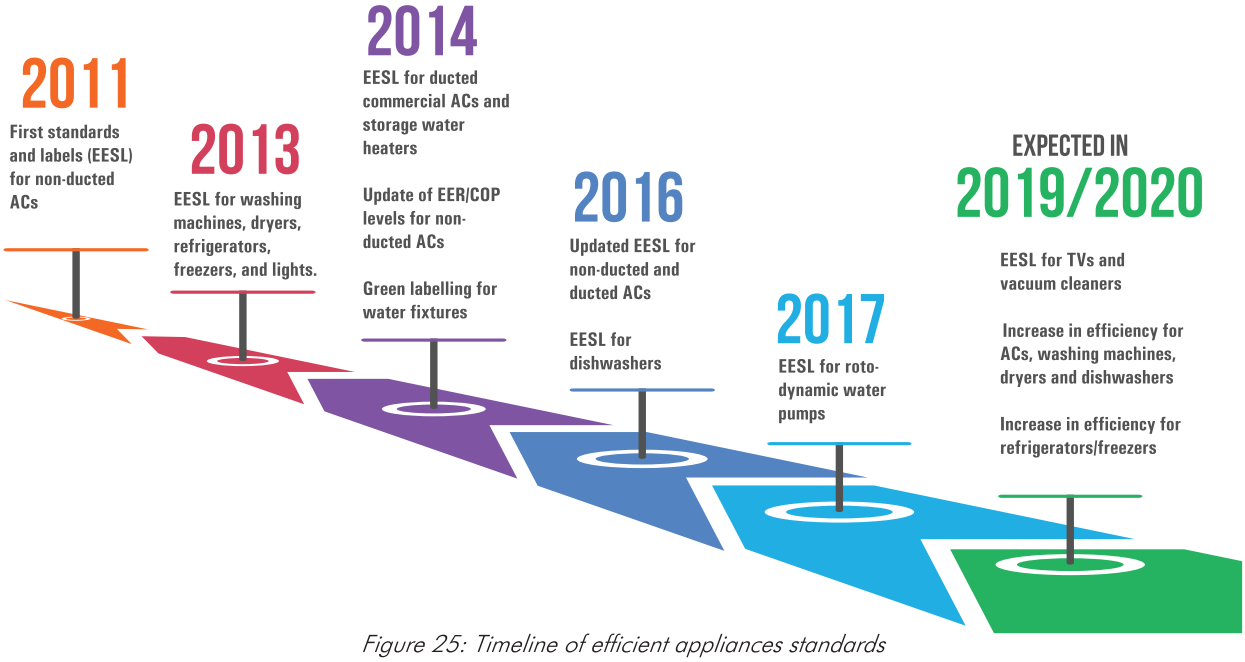


Figure 25: Timeline of efficient appliances standards

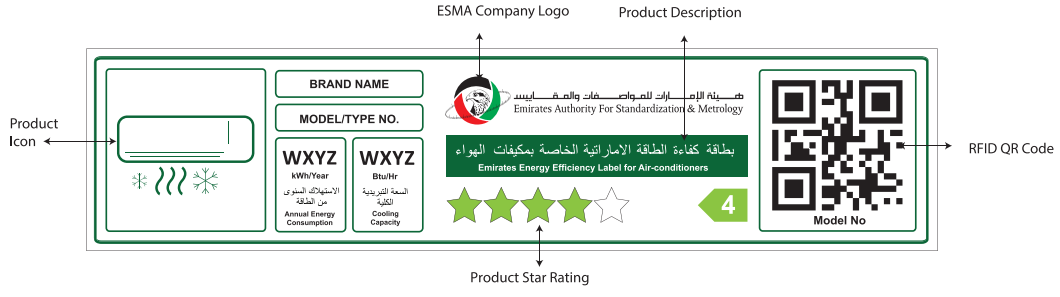


Figure 26: Energy efficiency rating label design

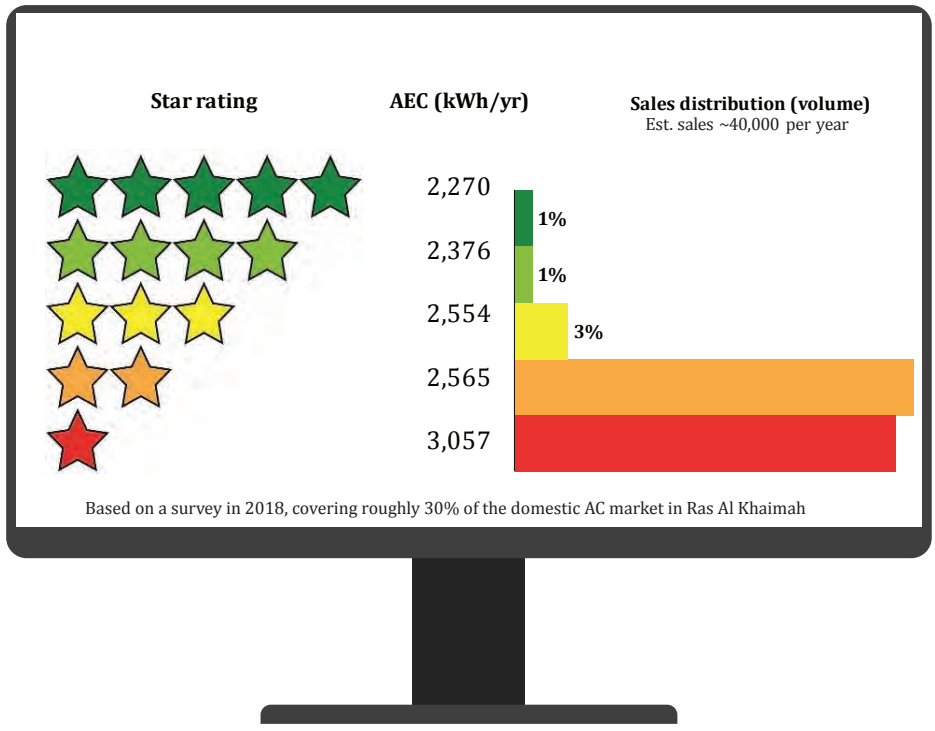


Figure 27: Distribution of AC sales by star rating in Ras Al Khaimah (2017)

the minimum efficiency standards (corresponding to 1-star on ESMA's labels) are not allowed to be marketed in the UAE. ESMA plans to induce improvements in the efficiency of appliances by periodically updating the minimum standards.

A survey was conducted jointly by ESMA and Reem in 2018, which showed that inefficient 1-star and 2-star rated ACs dominated sales in Ras Al Khaimah, with nearly 95% of all AC sales being in these two categories. This reflects the enormous potential to improve the efficiency of appliances in Ras Al Khaimah by encouraging customers to adopt higher classes of appliances.

Replacement programs are one of the routes being pursued to capture this potential. In 2018, FEWA has made big strides in promoting efficiency in water use, through its Ilkhair Nurshed Program, by retrofitting or replacing water fittings at close to 6,000 villas and many schools and government buildings in Ras Al Khaimah. Nearly 300 MIG of water were saved in 2018 due to this program. The success of this program paves the way for additional initiatives for other equipment and appliances, such as lighting, air conditioners and refrigerators. A different type of solution is represented by promotional programs, whereby different types of appliances are offered to consumers at a discount to market prices.

Going forward, Reem will support ESMA's energy efficiency standards and ratings through awareness campaigns and promotional programs for consumers. The first important awareness campaign featuring efficient appliances will be launched in 2019, and the first promotional program is expected in 2020 - 2021. Discussions are ongoing with various industry players to design and test both these initiatives.

3.5 Efficient Street Lighting

Program Owner: مؤسسة الأشغال Works Agency

Supporting Entities: الهيئة الاتحادية للكهرباء والماء Federal Electricity & Water Authority

The Works Agency is a recently organized unit of the Public Services Department, set up in 2017. It is responsible for the construction, operation, and maintenance of public roads, street lights, sidewalks, drainages, and other roadside infrastructure in Ras Al Khaimah. The Works Agency manages over 2,000 kilometers of roads in Ras Al Khaimah, over 400 kilometers of which is covered by street lighting.

One of the main goals of the Works Agency is to increase coverage of street lighting in Ras Al Khaimah, in line with the Ras Al Khaimah Vision 2030 target of achieving 65% coverage of street lighting by 2030.

With the planned expansion of street lighting, it becomes more important to consider efficiency improvements in the electricity consumption of street lighting. For this reason the Works Agency intends to adopt LED for all new street lighting expansion in Ras Al Khaimah. In addition to using LEDs for new street lights, we are also working on replacing existing lights, within routine maintenance cycles. With this method, we have already replaced existing Sodium Vapour street lights with LEDs on 100 kilometers of roads. This has resulted in about 65% savings in electricity consumption for those lights.

Ahmed AlSayed Ban
Executive Director
Works Agency
Public Services Department

A faster method for street lighting replacement through retrofit projects is being tested. In late 2018, RAKEZ contracted its own street lighting replacement project, for about 1,500 street lights in its free zones. This project is expected to be completed in 2019, and will be the first street lighting replacement project of Ras Al Khaimah since the launch of the EE&R Strategy.

> We are proud to have launched one of the first projects for street lighting retrofits in Ras Al Khaimah, comprising a replacement of 1,500 street lighting luminaries and the installation of lighting control systems on the roads of the Al Hamra Free Zone. The project is expected to yield more than 65% energy savings. We hope that the example of this project will lead to more street lighting retrofits in Ras Al Khaimah.

Eyad Ismael
Director of Engineering
RAKEZ

3.6 Water Reuse & Efficient Irrigation

Program Owner: مؤسسة الصرف الصحي Wastewater Agency; مؤسسة الزراعة التجميلية Landscape Agency

Supporting Entities: بلدية رأس الخيمة Ras Al Khaimah Municipality; reem

Alan Turner
Executive Director
Wastewater Agency
Public Services Department

Mark McGuire
Executive Director
Landscape Agency
Public Services Department

The Wastewater Agency and the Landscape Agency are recently organized units of the Public Services Department, set up in 2017. The Wastewater Agency is responsible for the collection and treatment of wastewater in Ras Al Khaimah, while the Landscape Agency is responsible for building and maintaining public landscapes and parks. These two agencies are now gearing up for a new period of growth, as we have set ambitious targets of 95% reuse of treated wastewater (TSE) and 20m^2 per capita of total landscapes by 2030, in support of Ras Al Khaimah Vision 2030.

The Wastewater Agency has initiated many projects towards modernizing and expanding wastewater collection and treatment capacities in Ras Al Khaimah. Our efforts have led to a 6% increase in wastewater collection and treatment in 2018, compared to the previous year. Another significant achievement in 2018 was the activation of pilot TSE sales to industrial players. A master planning study has been started, to better plan further development of the wastewater collection network and treatment capacities for newer areas of the city.

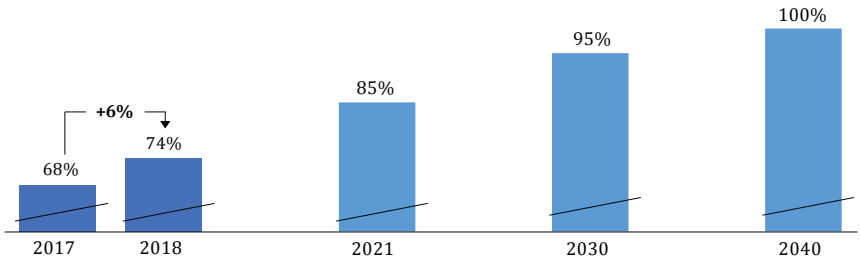


Figure 28: Share of TSE reused
(%, values for 2021, 2030, and 2040 are targets)

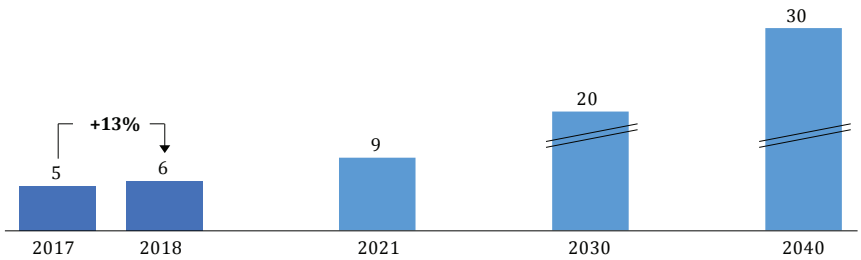


Figure 29: Landscape area per capita
(m^2, values for 2021, 2030, and 2040 are targets)

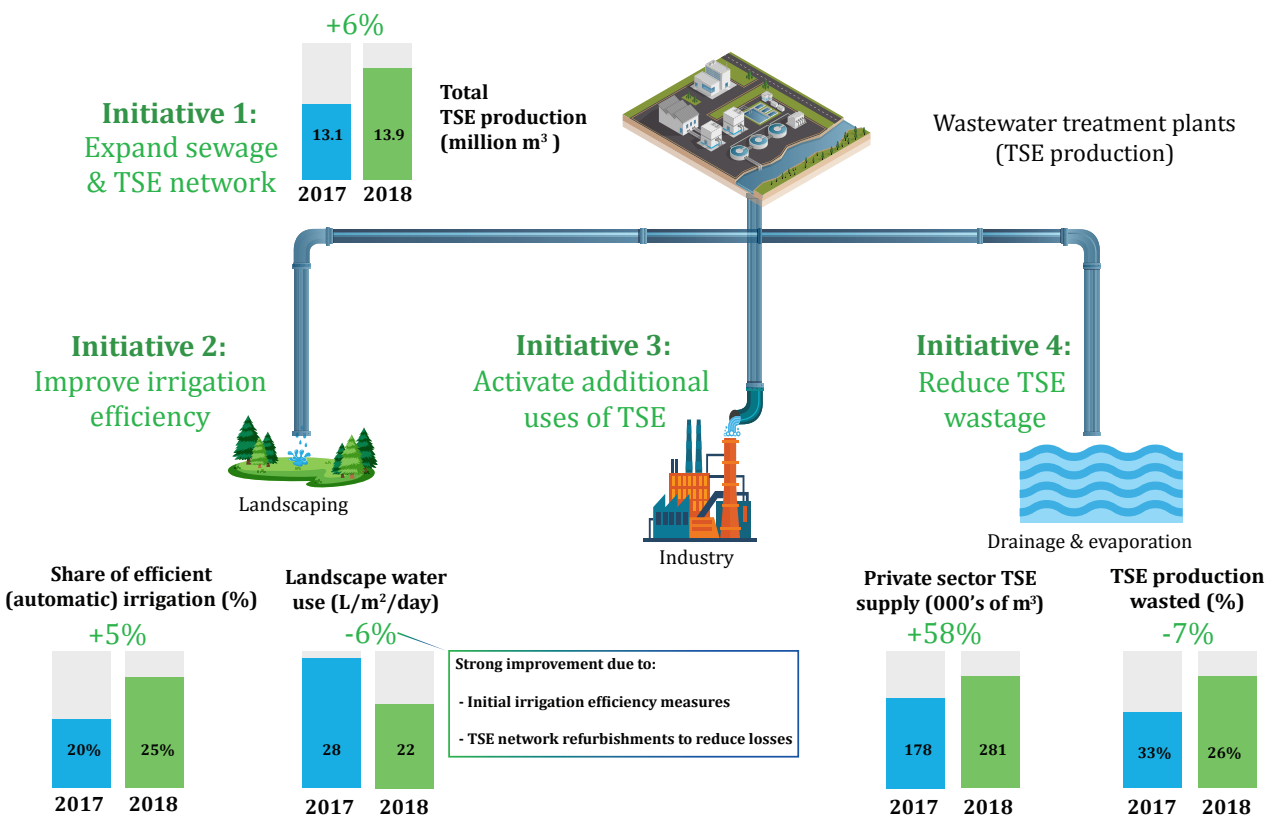


Figure 30: Summary of wastewater flows in Ras Al Khaimah

Figure 31: Example of an efficient landscaping approach in Ras Al Khaimah

Despite the expected increase in TSE production in the coming years, we expect TSE demand from landscaping to outstrip our supply around 2022, if we continue our legacy irrigation practices. With our ambition for expansion of green areas, increasing the efficiency of irrigation is necessary to ensure that adequate TSE is available for public landscaping. The Landscape Agency has the key role of increasing efficiency in irrigation activities, to conserve the available TSE. A key step in this direction in 2019 will be the development of water efficient landscaping standards, which will codify best practices to improve future landscapes in Ras Al Khaimah. The new standards will, as a minimum:

- Define the optimal share of hardscaping and softscaping for public landscaping areas;
- Require the use of native and adaptive species for the majority of public greenery, and identify those species that are acceptable from a water consumption standpoint; and
- Require adoption of minimum water efficiency standards in irrigation systems for public greenery.

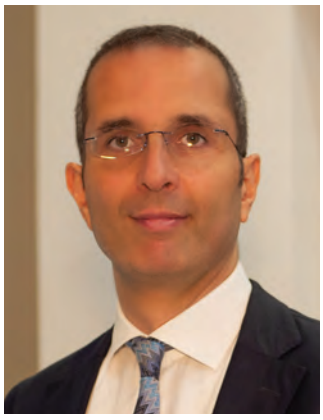
With the development and implementation of such landscape efficiency standards starting from 2019, we can ensure continued availability of TSE for use for industrial and other purposes.

3.7 Solar Programs

Program Owner: بلدية رأس الخيمة Ras Al Khaimah Municipality reem

Supporting Entities: Investment and Development Office Government Of Ras Al Khaimah; مؤسسة إدارة المخلفات Waste Management Agency

Ras Al Khaimah offers major potential opportunities for development of solar power generation capacities. Strong solar irradiation with over 300 days of sunshine a year, availability of land and abundance of low-rise buildings with suitable roofs contribute to a highly favourable natural setting for efficient solar generation. Our Solar Program has been designed to address this area of opportunity through regulatory support, pilot projects, and capacity building initiatives in the initial years, while preparing for larger-scale deployment projects in the future.



Andrea Di Gregorio
Director, Reem
Ras Al Khaimah Municipality

A detailed assessment of rooftop solar potential was carried out jointly by Reem and the Investment and Development Office (IDO), using data available from the GIS Center of Ras Al Khaimah Municipality. This study helped us set our target of 1,200 MWp of solar capacity in Ras Al Khaimah by 2040, of which 600 MWp will be from rooftop installations and 600 MWp from utility-scale developments.

A key enabler for this program is the issuance of regulations setting the conditions for solar projects to be connected to the existing grid. A favourable regulatory system would include as a minimum a net-metering policy for rooftop solar installations, and an IPP Framework for utility-scale installations. The development, issuance, and adoption of these regulations is expected from Federal authorities, and is of the utmost priority as it would mark the removal of a major barrier to solar energy deployment in Ras Al Khaimah. In the meantime, solar readiness requirements for buildings have been included in Barjeel, which is expected to be released in 2019 and become mandatory in 2020. These requirements will ensure that most new buildings be ready to take advantage of future solar rooftop installations.

While a regulatory framework is under development, Reem has also started working closely with FEWA to develop some pilot projects in Ras Al Khaimah. A tender process has been launched for the first solar pilot project of Ras Al Khaimah Municipality. This project envisages about 250 kWp of solar capacity installed on new carports at the Municipality head office, and is expected to be completed

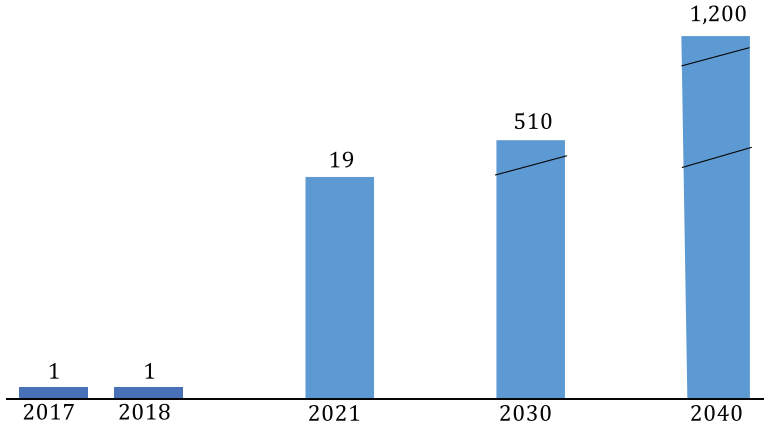


Figure 32: Solar power capacity
(MWp, values for 2021, 2030, and 2040 are targets)

Figure 33: Focus on RAK Properties projects

in early 2020. Another project of a similar type has been recently contracted by RAK Properties for a capacity of 1 MWp. For utility-scale solar, initial evaluations and land allocations are being carried out for multiple projects. An MoU was signed by the Waste Management Agency with UTICO, a private utility company, for a medium-sized solar installation at Al Jazeerah Landfill.

Going forward, Reem will continue to pursue pilot solar projects, pending the issuance and adoption of a favourable regulatory framework, and will continue developing its solar team to drive growth of renewables in Ras Al Khaimah.

> The IDO had taken the initiative in 2016 to develop the market for solar rooftop installations through an assessment of potential opportunities and exploration of stakeholder interest.
>
> We are pleased that the results of these studies have supported Reem in designing the Solar Program. We will continue to support Reem in the Solar Programs, with a particular focus on funding mechanisms.

Nitin Johar
Head of Treasury
Investment and Development Office

3.8 Energy from Waste

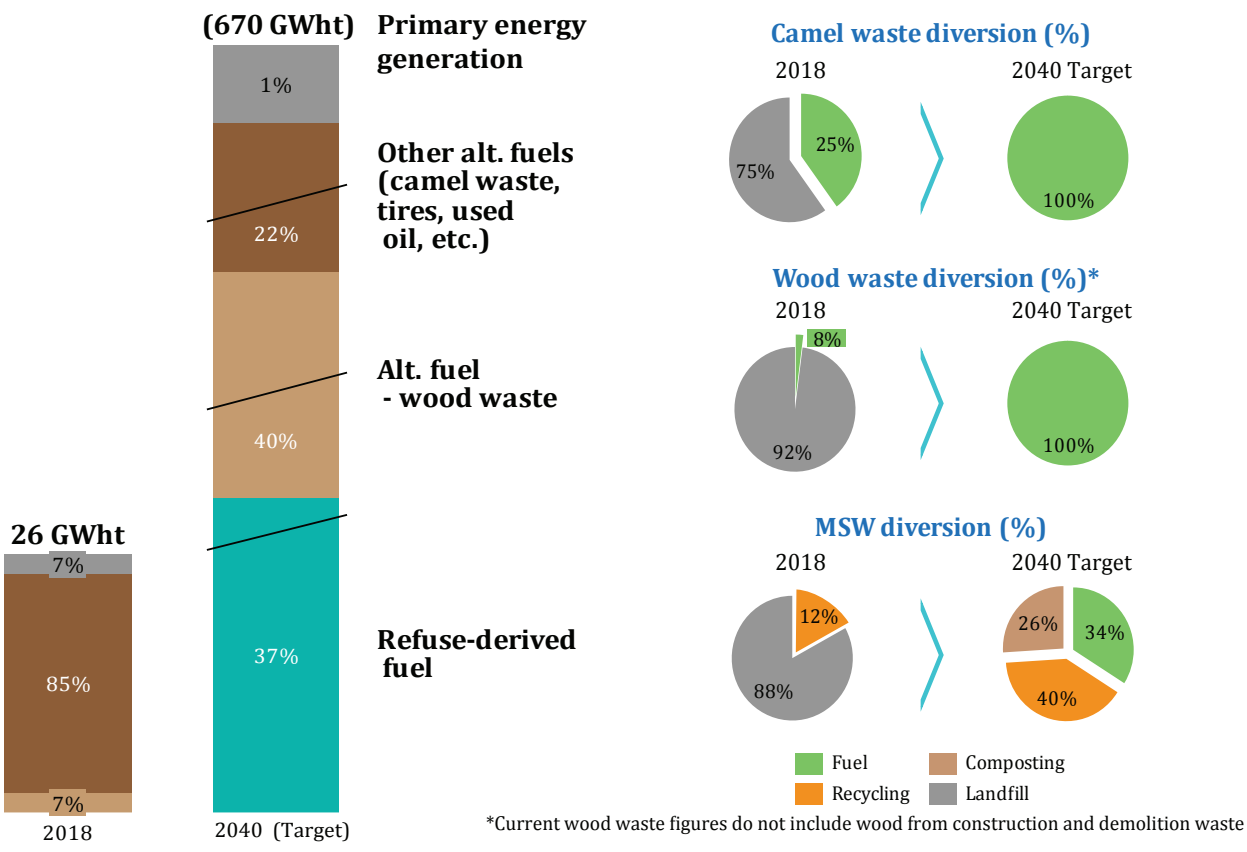
Program Owner: مؤسسة إدارة المخلفات Waste Management Agency

Supporting Entities: مؤسسة الصرف الصحي Wastewater Agency

The Waste Management Agency is a recently organized unit of the Public Services Department, set up in 2017. It is responsible for the safe and timely collection, recycling, treatment and disposal of all types of waste generated in Ras Al Khaimah. The Energy from Waste Program of the EE&R Strategy integrates seamlessly into the broader waste management strategy of Ras Al Khaimah. We have built a flexible strategy, allowing us to explore two to three treatment options for every waste stream available in Ras Al Khaimah.

In 2018, we piloted several initiatives, including alternative fuels and gasification of MSW. We tested alternative fuels such as camel waste, wood, brown grease, tobacco waste, domestic wastewater sludge, and tire-derived fuel; and we are proud of having used more than 5,000 tons of waste material as alternative fuels in 2018. These alternative fuels initiatives will be further developed in 2019.

Sonia Nasser
Executive Director
Waste Management Agency
Public Services Department



*Current wood waste figures do not include wood from construction and demolition waste

Figure 34: Program achievements in 2018 and targets for 2040

Figure 35: Signing of an MoU to cooperate in regulating used cooking oil between Public Services Department, Ras Al Khaimah Municipality, and Ras Al Khaimah Tourism Development Authority

Figure 36: Signing of the MoU for development of a landfill gas to electricity facility between Public Services Department and UTICO, on the occasion of WETEX 2018 in Dubai

Another important milestone was the signing of an MoU with UTICO to develop a landfill gas to electricity facility and a solar plant at our Al Jazeerah Landfill. When complete, this would be among the first such projects in the region. In 2019 we expect to reach an agreement with UTICO on these two projects, and commence construction in 2020.

In 2019, we plan to ramp up and commercialize our supply of alternative fuels, with regulatory support from the Ministry of Climate Change and Environment (MOCCAE). With our new materials recycling facility coming up in early 2019, we are now ready to scale up several alternative fuels initiatives. We are in the process of making several project opportunities available for investors to transform materials into alternative fuels in Ras Al Khaimah. Such opportunities are in the fields of biofuels from used cooking oil, refuse-derived fuel from domestic solid waste, and tire-derived fuel from waste tires, among others.

3.9 Efficient Vehicles

Program Owner: الهيئة الاتحادية للكهرباء والماء Federal Electricity & Water Authority

Supporting Entities: بلدية رأس الخيمة Ras Al Khaimah Municipality; reem

The global transportation industry is currently in the midst of a revolution caused by the advent of electric vehicles (EVs). Electric transportation technologies offer several advantages to users; energy efficiency is one of the most important. With respect to conventional vehicles, EVs consume a much lower amount of energy per kilometer, due to the inherent efficiency and simplicity of an electric motor and a battery, as compared to an internal combustion engine. Hybrid vehicles and fuel-efficient conventional vehicles also help reduce urban pollution and carbon dioxide emissions, thus helping preserve the environment.

Salim Bin Rabee'a
Executive Director
Electricity Directorate
Federal Electricity & Water Authority

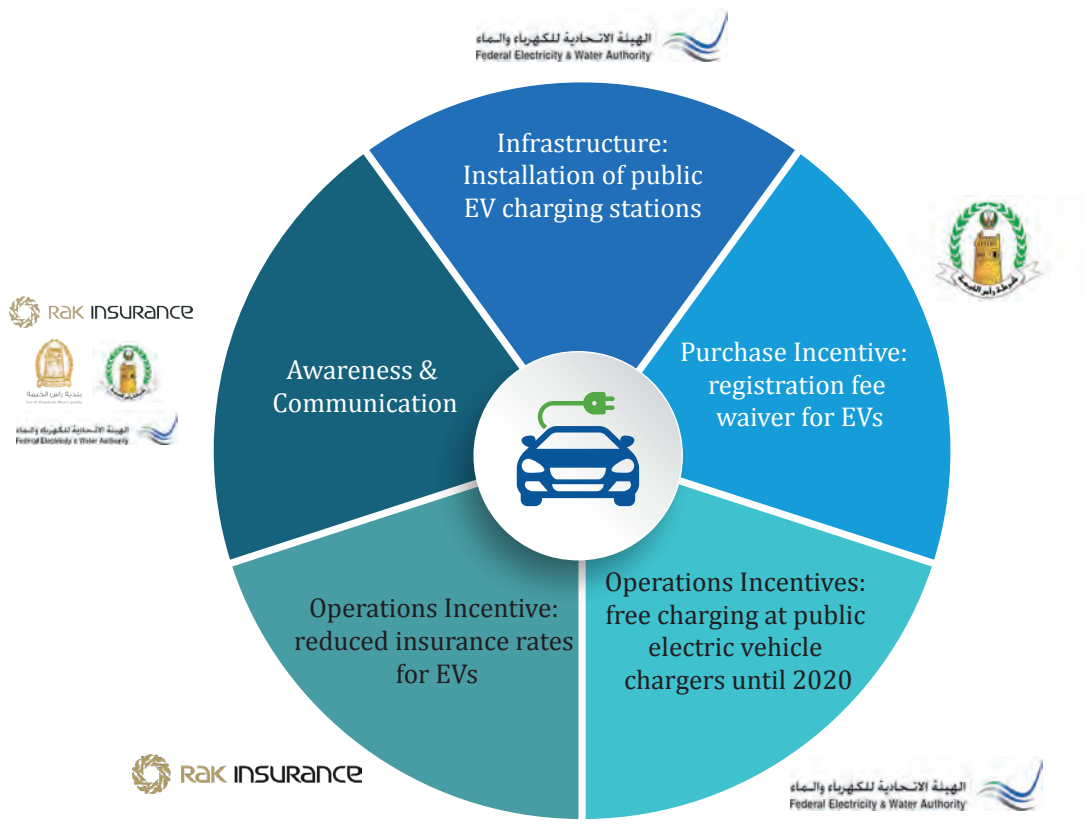


Figure 37: Efficient vehicles program design

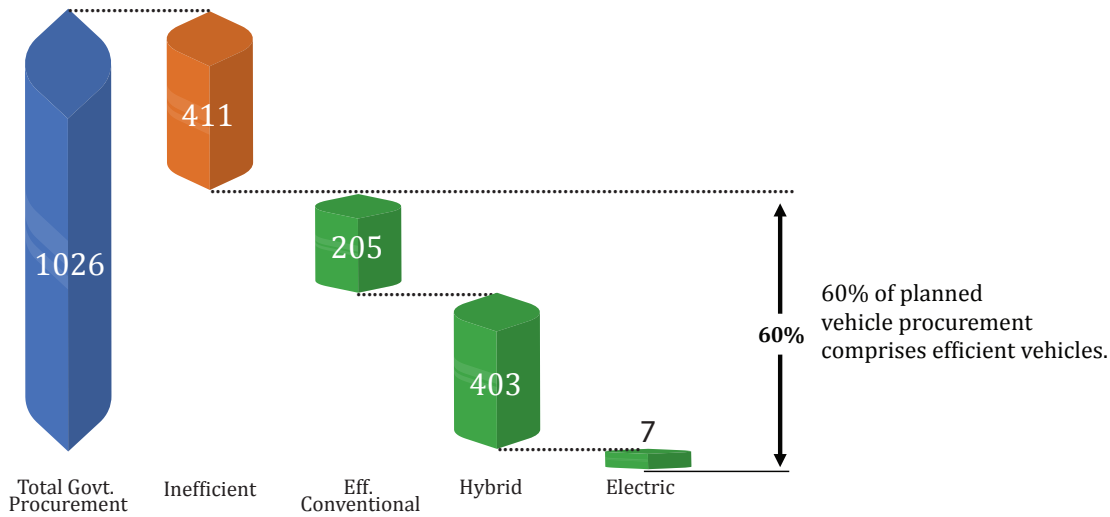


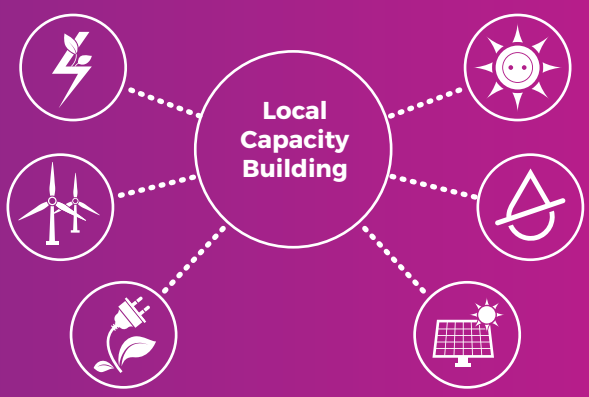
Figure 38: Government vehicle procurement plans in 2019

The Efficient Vehicles Program of the EE&R Strategy aims to promote efficient vehicles, including EVs, hybrids, and fuel-efficient conventional vehicles, to improve the energy efficiency of the transportation sector in Ras Al Khaimah. The program targets EV and hybrid vehicle sales to reach 50% of the total vehicle sales in Ras Al Khaimah by 2040.

Several initiatives have been launched as part of this program in 2018, to promote EV ownership and to support EV and hybrid owners throughout the vehicle lifecycle. With support from Ras Al Khaimah Municipality, what was initially a FEWA program to launch EV charging stations, became a much wider program with the participation of federal and local government entities together with the private sector. Apart from FEWA's projects to develop public charging infrastructure and provide free charging until 2020, Ras Al Khaimah Police has waived vehicle registration fees for EVs until 2021, and Ras Al Khaimah National Insurance Company P.S.C., a publicly traded company, is providing discounted auto insurance to EV owners. This incentive program for EV owners is a beautiful example of collaboration between federal government, local government and private sector.

The government is expected to lead by example in this program. With this in mind, Emiri Resolution No. 34 of 2018 requires that at least 30% of the vehicles purchased by government entities from 2019 until 2021 be efficient vehicles. At least 10% of all purchases are mandated to be EVs or hybrids. The remaining 20% can be EVs, hybrids and also conventional vehicles, as long as their ESMA efficiency rating is "Good" or above. Reem is coordinating implementation of this resolution and supporting planning of vehicle purchases in the concerned government entities. FEWA is also purchasing EVs, and has already deployed some to its offices in Ras Al Khaimah. Government purchases of EVs and hybrids are expected to lead to increased presence and visibility of EVs on the streets, which will build comfort towards EVs in the minds of the general public.

Going forward, important steps are being made to build the infrastructure for electric vehicles. We foresee for 2019 the completion in Ras Al Khaimah of a network of 20 public charging stations by FEWA, and some additional installations are expected from Ras Al Khaimah government and the private sector, such as hotels and mall operators. As the charging station infrastructure develops in Ras Al Khaimah, sales of EVs are also expected to accelerate.



LOCAL CAPACITY BUILDING

4.1 Green Procurement

An important step towards sustainability in Ras Al Khaimah is to create awareness of the different energy efficient products and services available. The government plans to take the lead in procuring sustainable and energy efficient products, as part of a green procurement initiative.

The EPDA is taking the first steps in this initiative. For example, we are using sustainable products such as solar powered LED lights in the refurbishment of 8 fishing port facilities in Ras Al Khaimah. This is expected to significantly reduce our energy demand, while also serving as pilot case for green procurement. We will design the green procurement initiative based on our learning from pilot projects, and roll out this initiative throughout the government in the coming years.

Dr. Saif Al Ghais
Executive Director
Environment Protection & Development Authority

Environment Protection & Development Authority

Figure 39: Solar LED lighting improvements at fishing ports

4.2 Local Capacity Building

One of the most important enablers of the EE&R Strategy is the development of local technical and management capabilities in the energy and water industry in general, and particularly in the field of energy efficiency and renewables.

Some organic market development was observed in 2018, as a result of the increasing pipeline of project opportunities. This included for example the establishment of solar EPC contracting firms in Ras Al Khaimah, and also the emergence of building energy auditing capabilities, for example at Ras Al Khaimah Research and Innovation Center.

In 2018, attractive incentive schemes were launched to support the further development of local capabilities and a local market for products and services related to energy efficiency and renewables. This is part of a broader supply market development strategy, which will guide the introduction of additional measures in the future.

Akshay Datar
Senior Strategic Planning Specialist
Ras Al Khaimah Municipality

4.2.1 Incentives for ESCOs and Energy Auditors

ESCOs and Energy Auditors have been identified as high-priority companies for the implementation of the EE&R strategy, as they play an important role in market development for building retrofits and energy management. As a result of a collaboration between RAKEZ, DED and Reem, the government of Ras Al Khaimah has introduced incentives for ESCOs and Energy Auditors who decide to set up their business in Ras Al Khaimah, both in the free zones (incentives provided through RAKEZ) and in the mainland (incentives provided through DED).

Under this initiative, an estimated 60% discount in the standard RAKEZ business set-up fees for three (3) years is available for business set-up in the free zone with RAKEZ, and a full waiver of all local government fees for business set-up for three (3) years is available in the mainland with DED, as per Figure 40. Market response to the initiative has been favourable, with several companies taking advantage of the incentives to set up their business in Ras Al Khaimah within a few months from launch of the scheme.

For more information on these incentives for ESCOs and Energy Auditors, and how to benefit from them, please visit Ras Al Khaimah Municipality website.

Figure 40: Incentives for ESCOs and energy auditors

4.2.2 Incentives for Adoption of EVs

The promotion of efficient vehicles is at the core of the Efficient Vehicles program, and EVs are the most energy efficient type of vehicle currently available. In order to promote the initial adoption of EVs in Ras Al Khaimah, an incentive program was developed, supporting EV owners throughout the life of the vehicle. The program includes a registration fee waiver by Ras Al Khaimah Police until 2021, provision of free charging at FEWA EV charging stations until 2020, and availability of discounted EV insurance rates from RAK Insurance, as described in section 3.9 Efficient Vehicles.

OUTLOOK FOR THE FUTURE

5 Outlook for the Future

Every program of the EE&R Strategy has been activated in 2018, and from 2019 we will enter the ramp-up phase, when implementation will both accelerate and extend in scale.

2019 is the year when pilot projects will bring initial results and feedback to the program frameworks that have been established. Barjeel, the green building regulations of Ras Al Khaimah, will be tested across a variety of building types in its phase of voluntary application. The retrofit program will see completion of the first projects and reinforcements in the supply side of the market. The energy management program will complete the first example of ISO 50001 implementation in the government of Ras Al Khaimah. The solar program will start developing initial examples of rooftop implementations. Electric vehicles will start being supported by an infrastructure network.

Further steps are expected on the regulatory side, to better address energy and water efficiency at community level, to support the water reuse and efficient irrigation program with more complete standards, and to prepare for a more structured implementation of the solar programs.

On the side of awareness and capacity building, continued effort will be directed towards reinforcement of the supply side of the market, in fields including sustainable design, energy services, renewables, where training will be reinforced and incentive schemes will be activated.

More specifically, some of the most important actions as part of the implementation plan for 2019 are the following:

1) Monitor the voluntary phase of Barjeel, along with additional activities in preparation for mandatory implementation such as awareness campaigns, training for consultants, and internal recruitment and process updates.

2) Develop guidelines for master developments to ensure efficiency of energy and water use at a community level.

3) Assess the potential for retrofit projects in government buildings and complete the ISO 50001 project at Ras Al Khaimah Municipality, in compliance with Emiri Resolution No. 15 of 2018.

4) Develop concept consumer programs to encourage adoption of efficient appliances and equipment.

5) Develop and adopt efficient landscaping standards for public landscapes, while also activating additional uses of TSE to increase its utilization.

6) Further develop alternative fuel production initiatives while supporting federal government plans for large-scale waste to energy plants.

7) Progress in establishing a regulatory framework for distributed renewables, while proving the benefits of solar PV through initial pilot projects in government, commercial and industrial applications.

8) Further develop the infrastructure of public and government EV charging stations.

As we enter the ramp-up phase, the strategy monitoring and support mechanisms must be strengthened, to ensure the right level of support to each program. The main priorities of Reem in this regard are as follows:

1) Detail and finalize the M&V methodology and risk management process for the EE&R Strategy, and put in place reporting mechanisms and tools.
2) Develop the Reem team in the fields of Awareness and Capacity Building, and Solar Programs.
3) Articulate and activate the strategy to develop supply market capacity in the energy efficiency and renewables sectors.
4) Explore new initiatives, business models and financing mechanisms for residential retrofit and solar PV projects, energy management, and efficient vehicles.

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