



## CLEAN COOLING SESSION

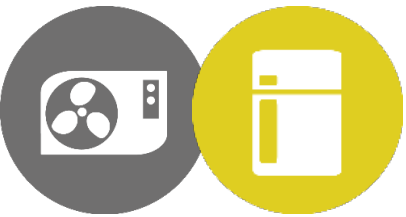
### U4E Country Saving Assessments

in East and Southern African regions for cooling products

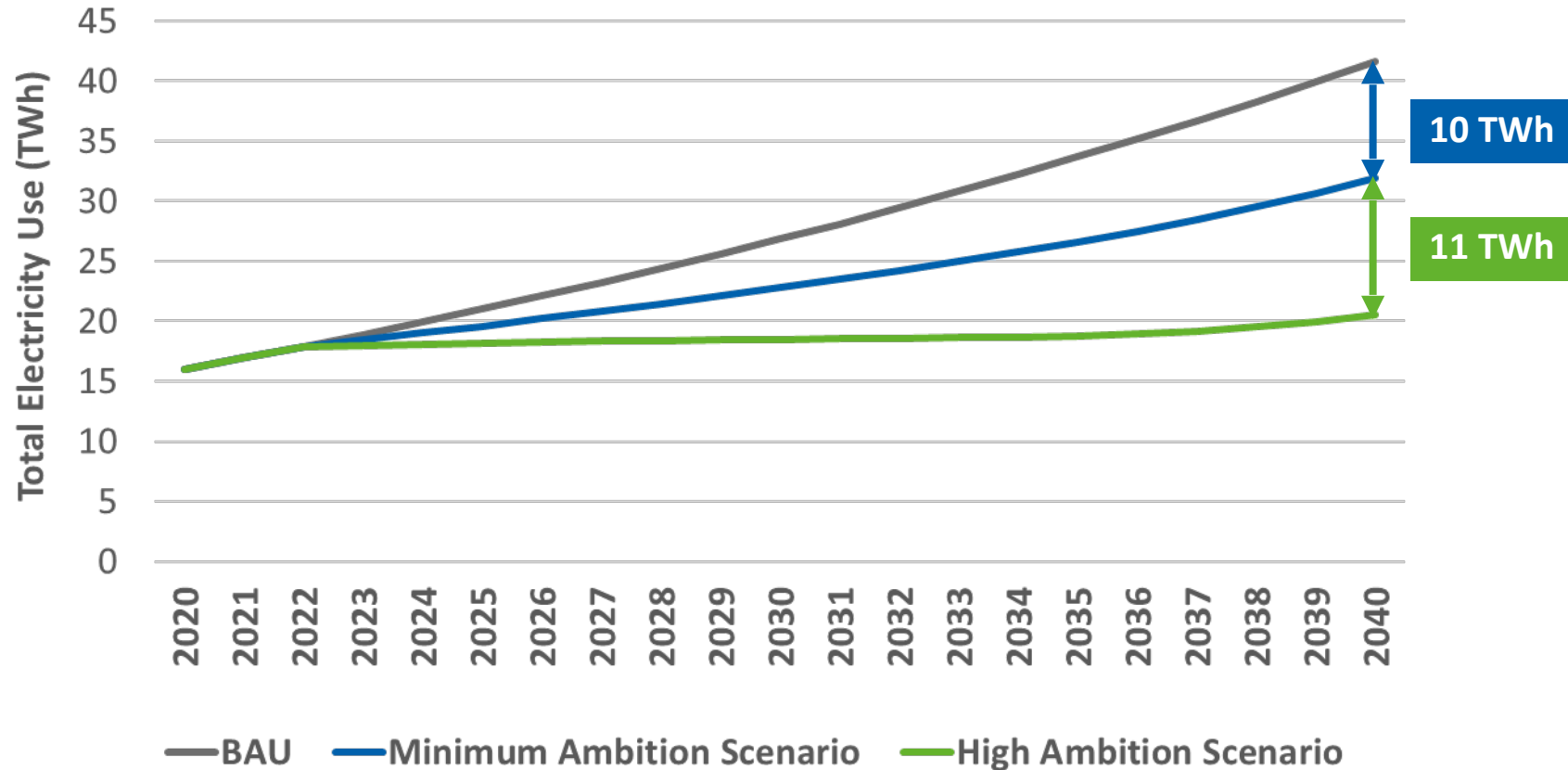
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29 March 2023



# Saving Opportunities in East and Southern Africa from Energy-Efficient Cooling products



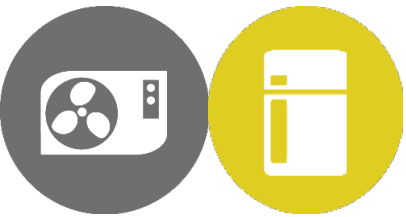
\*Displayed are annual savings in 2040

## Annual Savings in 2040\*:

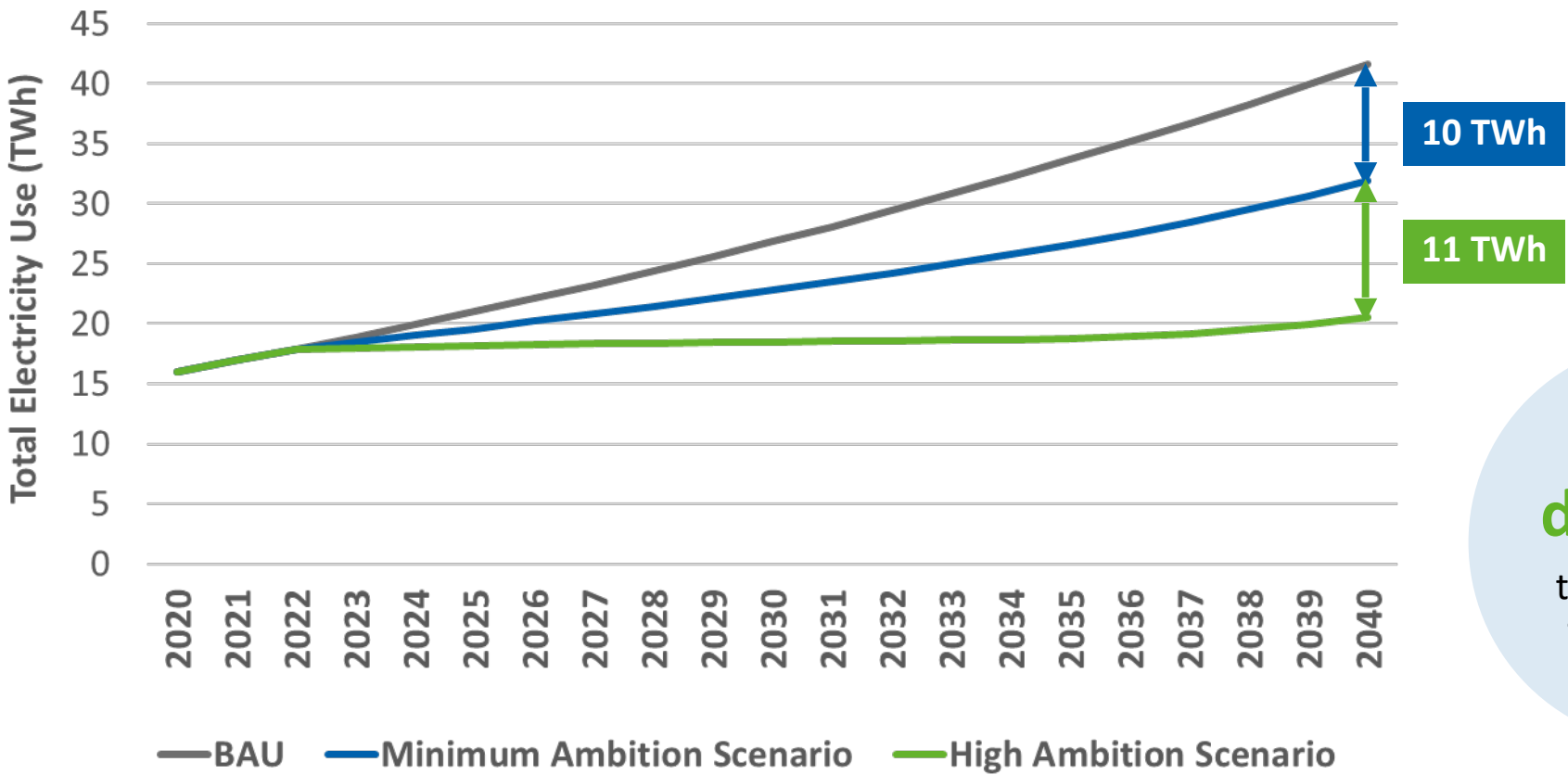
**10 TWh** of electricity consumption, which is equivalent to:

- **4+ Power stations** [500 MW each]
- **8 Million tonnes of CO<sub>2</sub>**
- **1.2 Billion USD on electricity bills**

— BAU  
— Minimum Ambition Scenario  
— High Ambition Scenario



# Saving Opportunities in East and Southern Africa from Energy-Efficient Cooling products



By 2040 the **electricity consumption** used for cooling is forecasted to increase by **133%**

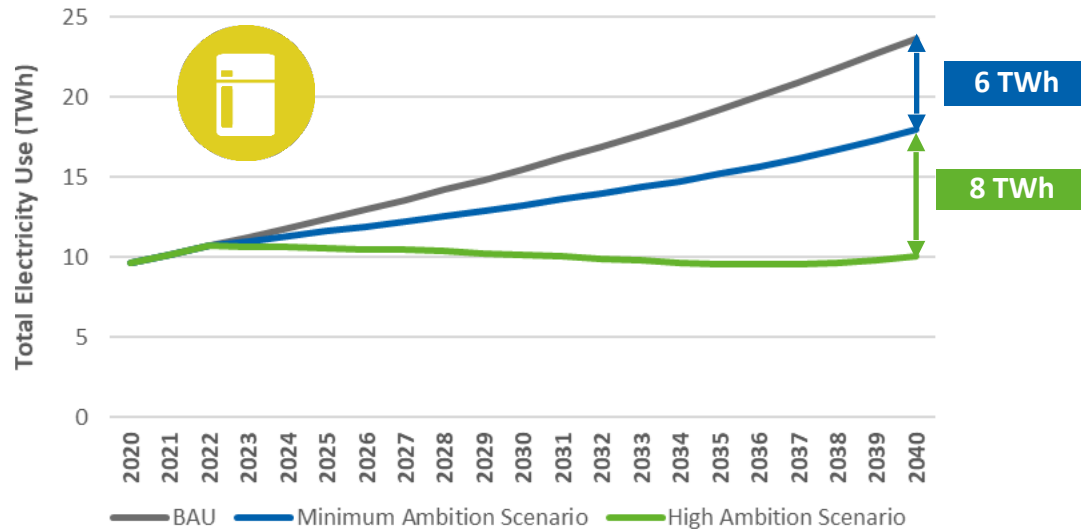
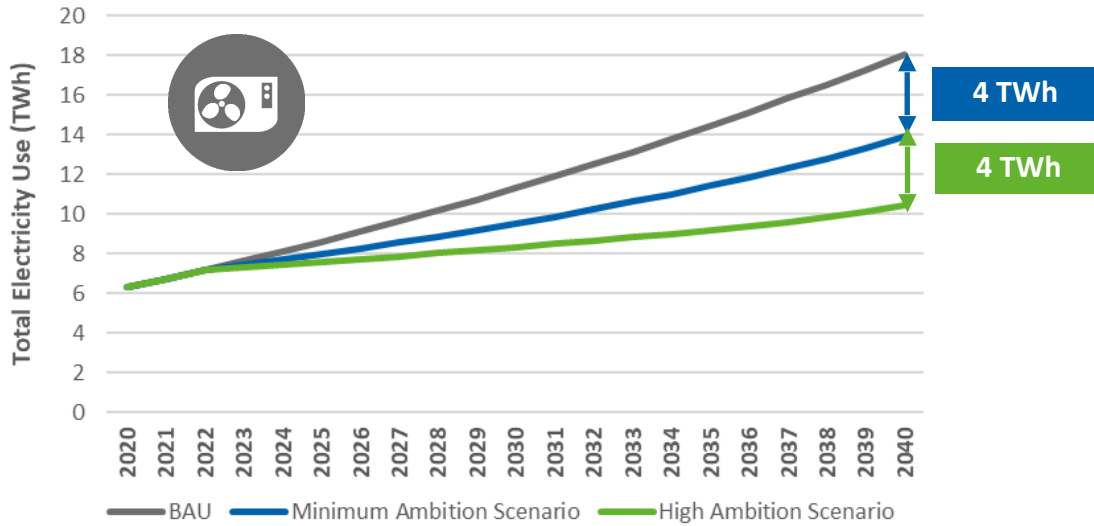
\*Policies can **decrease** this growth to **78%** in 2040

\*\*More stringent policies can even **decrease** this growth to **15%** in 2040

\*Displayed are annual savings in 2040

\*Minimum Ambition Scenario  
\*\*High Ambition Scenario

# Saving Opportunities in East and Southern Africa for Room Air Conditioners and Residential Refrigerators



## Electricity consumption growth by 2040

Scenario	Room Air Conditioners (TWh)	Residential Refrigerators (TWh)
Business As Usual Scenario (BAU)	151%	121%
With Minimum Ambition Scenario (MEPS)	94%	68%
With High Ambition Scenario (HEPS)	45%	*(6)%

## Annual Savings in 2040\*

Category	Room Air Conditioners	Residential Refrigerators
Electricity Savings (TWh)	4	6
equivalent to:		
Power Stations [500 MW]	2	2+
Million tonnes of CO <sub>2</sub>	3.4	4
Billions of USD in electricity bills	0.5	0.7

\*Minimum Ambition Scenario (values rounded)

\*( ) indicates 2040 % demand is below the 2022 electricity consumption



# Country Savings Assessments

## Objective

Analysis on potential impact of adopting Model Regulation guidelines for lighting, room air conditioners, residential refrigerators, commercial refrigeration equipment, industrial electric motors and distribution transformers.

These product categories are responsible for >50% of electricity usage today.

## Overview

- The assessment provides three scenarios: **Business As Usual Scenario (BAU)**– No policy intervention; **Minimum Ambition Scenario** – assumes Minimum Energy Performance Standards (MEPS) implemented; **High Ambition Scenario** – Assumes MEPS are implemented at a higher level of ambition for six products.
- The **energy savings potential** is calculated till 2040 and is computed based on the difference between total energy consumption in the ambition scenarios and that of the BAU scenario and is expressed in terms of **GHG emissions mitigated, Capacity (Power plants) avoidance and financial savings.**



### COUNTRY SAVINGS ASSESSMENT

#### Kenya

**Lighting**

**Room Air Conditioners**

**Residential Refrigerators**

**Commercial Refrigerators**

**Industrial Electric Motors**

**Distribution Transformers**

**INTRODUCTION**

The Country Savings assessments provide a summary of the benefits attained from improved energy efficiency and climate friendly lighting, cooling appliances, and equipment. A market transformation can be obtained through measures such as Minimum Energy Performance Standards (MEPS), product labelling, market monitoring and verification, and financial incentives. For each product, the analysis considers three different scenarios:

- Business As Usual:** Assumes that no actions are introduced and that the efficiency of products in the market continues to develop in line with historical trends in the absence of regulation.
- Minimum Ambition:** In which MEPS are introduced in line with the basic requirements of the United Nations Environment Programme (UNEP) United for Efficiency (U4E) Model Regulation Guidelines.
- High Ambition:** In which more ambitious actions are implemented in line with the highest levels proposed in the Model Regulation Guidelines.

More detailed breakdowns for lighting, cooling appliances and equipment can be found on the UNEP U4E website.

**REPORT CONTENTS**

- Page 1 Introduction
- Page 2 Overview of benefits
- Page 3 Higher ambition to help reach energy and climate goals
- Page 4 Detailed benefits and typical product assumptions
- Page 5 Savings potential in context
- Page 6 Country data, product assumptions and methodology

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### OVERVIEW OF BENEFITS

**ANNUAL SAVINGS IN 2040\***

- Reduce electricity use by over **2.1 TWh** which is over **17%** of the total current national electricity use
- Save electricity worth over **480 million US\$** equivalent to more than **1 power plant [500MW each]**
- Reduce electricity CO<sub>2</sub> emissions by over **1.7 million tonnes** equivalent to **980 thousand passenger cars**

**ELECTRICITY SAVINGS OVER TIME\***

**OTHER BENEFITS ACHIEVED IN 2040\***

- Increased grid connection to **1.1 million households**
- Reduced cumulative direct GHG emissions by **1.8 million tonnes**

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### HIGHER AMBITION TO HELP REACH ENERGY AND CLIMATE GOALS

THE MORE AMBITIOUS THE REGULATION, THE MORE SAVINGS ARE POSSIBLE

By 2040, electricity consumption is projected to increase by **101%**. Minimum ambition policies could reduce this increase to **65%**. More ambitious policies could further reduce this increase to **30%**.

**MEET GLOBAL CLIMATE GOALS BY SIGNIFICANTLY DECREASING EMISSIONS**

**PRODUCT SHARE OF CO<sub>2</sub> EMISSIONS SAVINGS BY 2030 AND 2040\***

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### DETAILED BENEFITS AND TYPICAL PRODUCT ASSUMPTIONS

**ANNUAL SAVINGS IN 2030 AND 2040\***

Product	2030	2040	2030	2040	2030	2040
Cooling	Electricity (GWh)	260	720	73	180	140
	Electricity Bills (million US\$)	57	160	16	39	31
	CO <sub>2</sub> Emissions (thousand tonnes)	210	580	58	140	100
Lighting and Equipment	Electricity (GWh)	63	43	65	220	170
	Electricity Bills (million US\$)	14	9.4	18	47	37
	CO <sub>2</sub> Emissions (thousand tonnes)	51	35	65	170	140

**CUMULATIVE SAVINGS BY 2030 AND 2040\***

Product	2030	2040	2030	2040	
Cooling	Electricity (GWh)	1,100	6,200	320	1,800
	Electricity Bills (million US\$)	240	1,280	69	360
	CO <sub>2</sub> Emissions (thousand tonnes)	870	3,900	260	1,300
Lighting and Equipment	Electricity (GWh)	410	360	370	1,300
	Electricity Bills (million US\$)	89	210	81	400
	CO <sub>2</sub> Emissions (thousand tonnes)	330	770	300	1,500

**PRODUCT CONTRIBUTION TO CUMULATIVE ELECTRICITY USE & SAVINGS BY 2040**

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### SAVINGS POTENTIAL IN CONTEXT

OTHER OPPORTUNITIES COMPARED WITH MEPS BY 2040

Minimum Energy Performance Standards are developed specifically to improve product efficiency in a market, but other important steps can be taken to reduce electricity consumption further.

**ROOM AIR CONDITIONERS**

**Savings compared**

- Ensuring products are correctly sized at the time of installation
- Implementing best practice ongoing maintenance practices
- Raising the temperature set point for MEPS-compliant units from 22°C can save between 6-10% per degree up to 27°C
- The use of control systems, sensors and thermal zoning. The savings from AC controls varies greatly depending on the situation but typical savings can be:
  - 28-35% for small offices
  - 32-35% for small retail
  - 24% for supermarkets

**LIGHTING**

- Occupancy & daylight sensors used in all appropriate settings can typically save up to:
  - 40% in commercial settings
  - 30% in industrial settings
  - Dimming controls at off-peak times can typically save as much as:
    - 25% for street lighting

**INDUSTRIAL ELECTRIC MOTORS**

- The use of Variable Speed drives in all suitable applications could give an average saving of as much as:
  - 20% when used with pumps
  - 20% when used with fans/blowers
  - 30% when used with compressors
  - 5% when used in mechanical applications

**DISTRIBUTION TRANSFORMERS**

The main savings opportunities for distribution transformers come from management practices such as:

- Ensuring transformers are correctly sized at the time of installation
- Implementing best practice ongoing maintenance and winding

Using Smart Grids brings other benefits including:

- Reducing projected increases in peak demand by as much as 24%, allowing:
- reduced capacity overall
- delays in maintenance/replacement requirements
- reduced CO<sub>2</sub> emissions from peaking plants
- Allowing improved integration of distributed and renewable generation, and more electric cars both with associated CO<sub>2</sub> emissions benefits

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### COUNTRY DATA, TYPICAL PRODUCT ASSUMPTIONS AND METHODOLOGY

**GENERAL INFORMATION**

Population: 55 Million  
 GDP per capita: 1,933 US\$  
 Electrification level: 79.2%  
 CO<sub>2</sub> emission factor: 0.83 kg CO<sub>2</sub>/kWh

**ELECTRICITY MARKET**

Residential electricity tariff: 0.22 US\$/kWh  
 Transmission and distribution loss factor: 17.6%

**TYPICAL PRODUCT ASSUMPTIONS**

Product	2022 Unit Energy Consumption (kWh/year) in Minimum Level	2022 Unit Energy Consumption (kWh/year) in High Ambition Scenario	Type of Product	
Lighting	LED Linear	2000 (LED)	LED Linear	
	LED Point	2000 (LED)	LED Point	
	LED Panel	2000 (LED)	LED Panel	
Cooling	Commercial Refrigeration	330	247	2 door upright freezer of average capacity
	Room Air Conditioners	1,431	964	1.5 ton split system air conditioner
	Industrial Electric Motors	IE0	IE2	IE0
Equipment	Distribution Transformers	See note	Level 1	Level 2
	Room Air Conditioners	1,431	964	1.5 ton split system air conditioner
	Industrial Electric Motors	IE0	IE2	IE0

**METHODOLOGY**

The analysis uses the UNEP U4E Country Savings Assessment to estimate the impact of implementing policies that improve the energy efficiency of each product category. The model methodology is provided below (based on U4E for more information):

- The saving potential for refrigerators, commercial refrigeration and air conditioners use is based on model approach combined with market data on typical product performance. Future growth is projected based on established relationships between consumption and other socio-economic indicators.
- The lighting analysis uses a bottom-up model with market data on typical products to estimate current light demand. This is projected forward in line with IE estimates of future building electricity use. It is then used with an estimate of future energy efficiency to calculate electricity consumption. The efficacy is based on assumptions about future trends in lighting and product efficacy in different scenarios.
- The equipment models are bottom-up estimates. The electricity use of motors is based on the typical relationship to industrial GDP, while distribution transformers are based on the total capacity required for a total national electricity demand. Electricity use is shared between several typical products and applications based on market data. In both cases, the improvement in average stock efficiency is based on end-of-stock turnover and new sales.

The waste potential in each scenario assumes Minimum Energy Performance Standards (MEPS) are introduced in 2022 at two different levels of ambition (minimum and high) as shown in the Typical Product Assumptions table above. Further details of the modelling approach and assumptions are available on the U4E website.

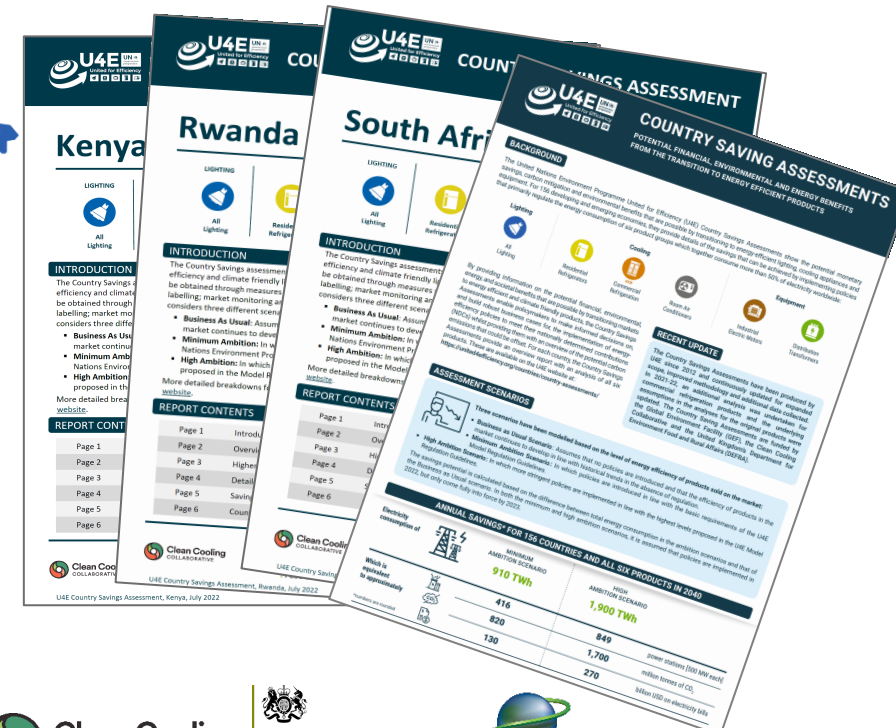
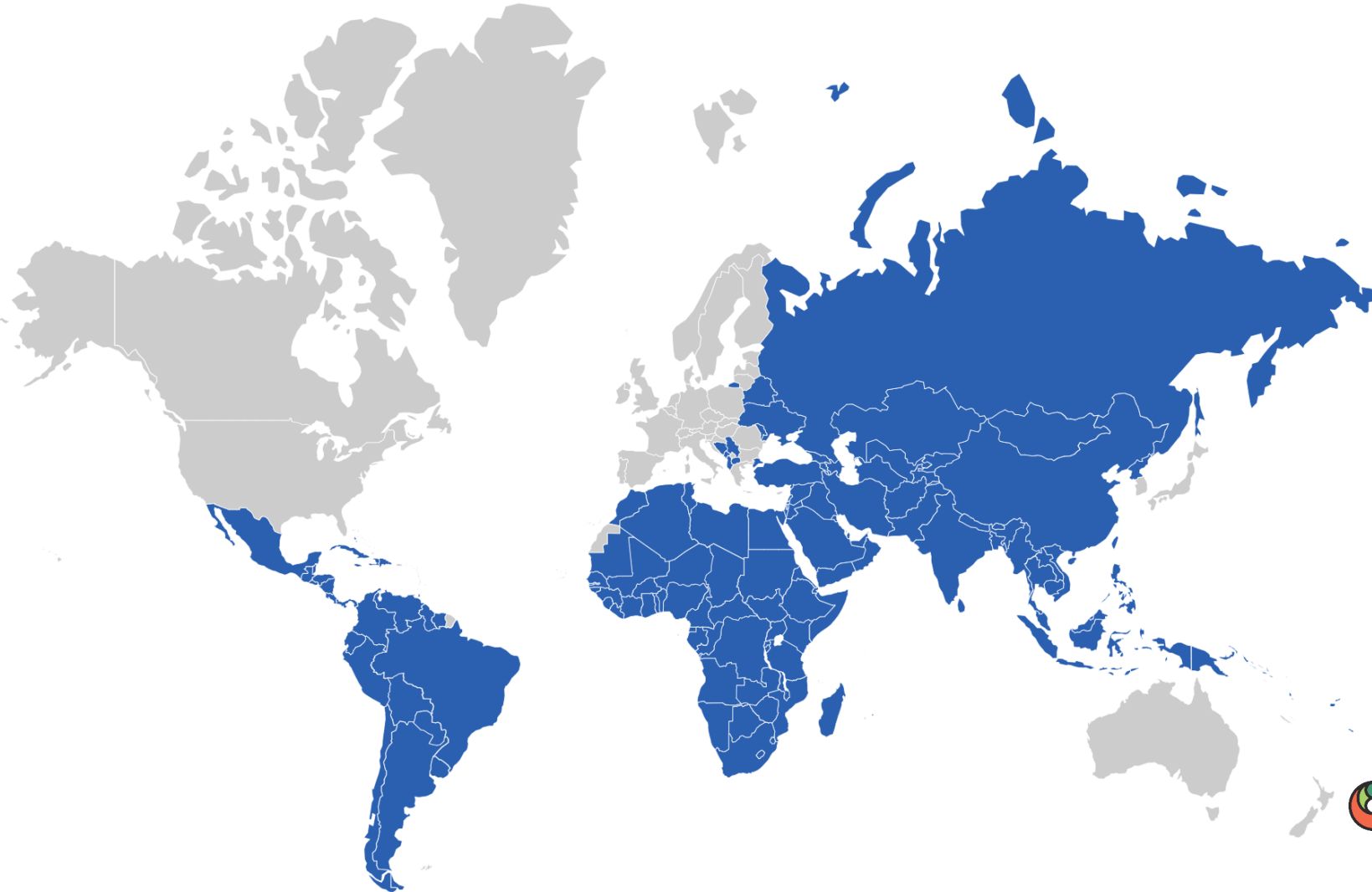
For more information contact: unep-u4e@un.org

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\*Available in English for all 156 developing and emerging economies. French and Spanish translations are available for select countries



# U4E Country Savings Assessment- Updated 2022



- 156 developing countries and emerging economies have been assessed under the U4E Country Saving Assessments
- Explore for each country on: <https://united4efficiency.org/countries/country-assessments/>
- U4E Country Savings Assessments Factsheet is available [here](#)



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TRANSFORMING MARKETS TO ENERGY-EFFICIENT PRODUCTS



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