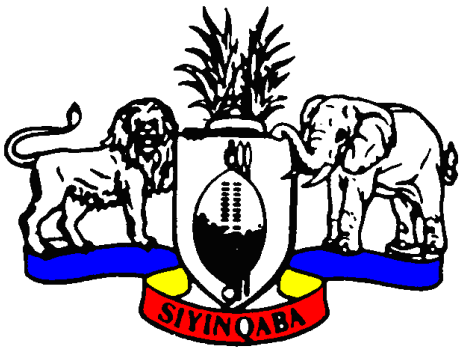
GOVERNMENT OF ESWATINI



MINISTRY OF NATURAL RESOURCES AND ENERGY

ENERGY EFFICIENCY and CONSERVATION POLICY:

Yonga Emandla, Ukhulise Umnotfo

Conserve Energy, Grow and Secure the Economy

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Executive Summary

Background

The Southern Africa Development Community (SADC) estimates of the energy efficiency potential are conservatively between 20-30% across many segments, and member countries have not harnessed the full potential to date. The SADC Centre for Renewable Energy and Energy Efficiency (SACREEE) hosted by Nambia has been established to support member states on the implemenation of Energy Efficiency (EE) and Energy Conservation (EC) measures. For the Kingdom of Eswatini the Energy Efficiency and Conservation Policy (EE&CP) represents a win-win option by providing positive returns to energy consumers and the environment through the reduction of environmental pollution, energy costs and the carbon footprint of the energy sector, and by enhancing energy security.

The rational for the EE&CP is to reap the multiple socio-economic and environmental benefits associated with energy conservation within Eswatini, these include

- Poverty alleviation through interventions that will discourage energy wastages habits.
- Reduction of trade-deficit through the minimization of petroleum and electricity imports and further stabilize Eswatini economy from volatile international energy prices.
- Ease the public budget on unnecessary monthly energy bills for maintaining Government buildings and transport services.
- Optimum usage of natural resources such as hardwood that is collected from the indigenous forest as firewood.

The overall goal of the Energy Efficiency and Conservation Policy is to stimulate energy efficiency programmes to promote sustainable development in the country as the country transition into the First World status in line with the objectives of the National Energy Policy, 2018.

The main objectives of the Energy Efficiency and Conserbvation Policy are to:

- Enhance energy security by optimising existing local energy sources;
- Mitigate the detrimental effects of climate change and environmental degradation.
- Provide a framework for the Energy Regulator to encourage sustainable energy supply
- Provide the guidelines for achieving affordable energy access for all.

The National Energy Policy consists of sub policies for three priority energy efficiency areas which are buildings, lighting and appliances and equipment which are in common across most economic sectors, and sector specific sub-policies for transport and industry. The Energy Department under the MNRE will be the hub for reviewing, implementation, and monitoring of the EE&CP interventions.
In order to facilitate a fruitful implementation of the EE&CP, Government shall commit to develop the relevant legislations and regulations. The development of the legislative framework shall be aligned to regional and international practices in order to improve implementation of EE&CP initiatives.

The policy statements for the Eswatini Energy Efficiency and Conservation Policy are outlined here:

Building Priority Area Policy Statements

1. **Policy Statement on Building Code**
   The Government shall develop a National Buildings Energy Efficiency and Conservation Code of Eswatini that will act as minimum energy requirement for building standards for existing and new buildings.

2. **Policy Statement on Periodic Audits of Government Buildings**
   The Government shall periodically commission energy efficiency audits in her buildings to enforce and improve the overall energy performance.

3. **Policy Statement on Re-Commissioning of Existing Buildings**
   The Government shall promote the re-commissioning of old buildings to optimize energy efficiency and conservation where appropriate through retrofitting with modern cost effective technologies.

4. **Policy Statement on the Mix of Energy Sources**
   The Government shall encourage the integration of energy efficiency measures in the designing of new constructions and also include a mix of efficient renewable energy solutions to reduce grid electricity demand during peak hours.

5. **Policy Statement on Energy Efficiency Certification of Buildings**
   The Government shall launch an EE certification programme that will provide mandatory information for potential buyers or renters of properties, and further assist in growing the market for energy efficient homes, offices and industrial buildings.

Lighting Priority Area Policy Statements

6. Policy Statement on Minimum Energy Performance Standards for Lighting
   The Government shall adopt and enforce minimum energy performance standards and labelling programme to gradually phase out inefficient lighting products, (including inefficient ballast, lamp housing, fixture and lighting controls), as soon as it is technically and economically viable in all sectors of the economy.

7. Policy Statement on Government Building Lighting and Street Lighting.
   The Government shall promote the energy conservation programs such as the use of occupancy sensor controlled lights in offices, programmed daylight and motion sensor street lighting systems, as well as the use of solar systems for lighting public spaces.

8. Policy Statement on the Incorporation of Natural Light in Buildings

The Government shall promote the use of lighting designs that incorporate the use of natural light particularly in commercial and industrial buildings.

Appliances and Equipment Priority Area Policy Statements

9. Policy Statement on Appliances and Equipment

The Government shall adopt and enforce mandatory minimum energy performance standards for all appliances and some domestic and office equipment, and require energy consumption labels for all such in line with regional and international practices.

10. Policy Statement on Energy Efficiency Code for Industrial Equipment

The Government shall establish an Energy Efficiency Code for energy intensive industrial equipment such as electric motors, distribution transformers, compressors, boilers and pumps, and further encourage implementation of energy efficiency measures in the design and operation of industrial systems and processes.

11. Policy Statement on Efficient Cook Stoves

The Government shall strengthen its programmes to ensure local research –and design, production and effective roll out of efficient cook stoves as part of a wider strategy to reduce consumption of woodfuel, and further adopt financing mechanisms to ensure affordability of efficient cook stoves by the wider population.

Transport Economic Sector Policy Statements

12. Policy Statement on Minimum Fuel Standard

The Government shall develop and enforce fuel efficiency standards for light and heavy duty vehicles that will deliver fuel cost services and reduce emissions of harmful gases to the environment.

13. Policy Statement on Fleet Management

The Government shall advocate for the purchasing of a wider range of vehicles in all orgaisations with large vehicle fleets to minimize the use high engine capacity vehicles in services where they are not required.

14. Policy Statement on Efficient Mode of Transport

The Government together with Municipalities shall periodically commission studies on the cost and benefits of improved urban planning and the promotion of non-motorized modes of transport in urban area such as car-free zone and cycling lanes.

15. Policy Statement on Efficient Public Transport

The Government together with Municipalities shall periodically commission studies on effective strategies on promoting the use of mass transit systems such as buses to curb traffic congestions in the country's roads thereby reducing fuels wastage associated with traffic jams. In addition municipalities will set the right price for curb parking and ring-fence the funds obtained for urban planning and implementation.

16. Policy Statement on Eco-Driving

The government shall ensure that eco-driving is incorporated in driver training programmes in order to conserve energy.

17. Policy Statement on Advocacy of Energy Efficient Transportation

The Government shall periodically provide information on fuel consumption ratings of different vehicles and energy efficient driving tips.

18. Policy Statement on Emerging Fuel Efficient Technologies

The Government shall periodically review trends on the research and development activities of fuel efficient technologies, including hybrid, electric vehicles, and emerging alternative EE technologies and publicize significant developments.

19. Policy Statement on Annual Vehicle Energy Performance Inspections

The Government shall develop an annual vehicle inspection programme for enforcing vehicle MEPS.

20 Policy Statement on urban expansion planning

The government shall periodically conduct assessments of the potential for expansion of urban and upcoming development areas to ensure that future developments incorporate efficient transport measures.

Industry Economic Sector Policy Statements

21. Policy Statement on Energy Management Standard

The Government shall require large energy intensive industry and encourage other industrial energy users to conform to SZNS ISO 50001 or an equivalent protocol that encourages energy management.

22. Policy Statement on Eswatini Industry Partnership for Energy Efficiency

The Government of Eswatini and Eswatini Industry shall assist establish a Eswatini Industry Partnership for Energy Conservation that will assist Eswatini Industries to become leaders in energy efficiency where outstanding performers are encouraged through incentives such as awards.

23. Policy Statement on Support for Small to Medium Enterprises

Eswatini SMEs shall be encouraged to retrofit production equipment with modern energy efficient technologies through grants from the Eswatini Energy Efficiency Council.

24. Policy Statement on Creating an Energy Efficiency Demand

The Government shall create an enabling environment to ensure ready access to finance and establish incentive packages to support the advancement of industrial energy efficiency.

Government Advocacy Policy Statements

25. Policy statement on Energy Efficiency Entity

The Government shall establish an Energy Efficiency Council suitable for the country's context with a primary function to develop, facilitate and coordinate implementation of programmes aiming to improve energy conservation and efficient use of energy in all demand sectors.

26. Policy Statement on Enabling Legislation

The Government commits through the Eswatini Energy Regulatory Authority to develop all required legislation and associated regulations to facilitate unhindered and trouble-free implementation of the Energy Efficiency and Conservation Policy.

27. Policy Statement on Raising Energy Efficiency Awareness

The Government shall continue its efforts to raise public awareness and information dissemination on end-use energy efficiency measures, such as appropriate efficient use of equipment and appliances.

28. Policy Statement on Cost-reflective Tariff Structure

The Government shall develop and implement a programme for the gradual adoption of cost-reflective electricity tariffs for consumers while maintaining the lifeline tariff.

29. Policy Statement on Funding Research and Development

The Government shall provide funding support for research and development on improving technologies and systems that enhance energy efficiency and conservation.

30. Policy Statement on Energy Statistics

The Government shall establish a national database of energy information to assist each energy sector improve its energy consumption performance.

31. Policy Statement on Funding Energy Efficiency Programmes

The Government shall explore all viable funding mechanisms and identify the most suitable or combination of, taking cognizance the country's context and the specific needs of the preferred funding mechanisms to promote energy efficiency and conservation.

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List of Acronyms

CSO	Central Statistics Office
DSM	Demand Side Management
EC	Energy Conservation
EE	Energy Efficiency
EEP	Energy Efficiency Policy
ESKOM	South African Electricity Utility
GoE	Government of Eswatini
HVAC	Heating, Ventilation, and Air Conditioning
IEA	International Energy Agency
ISO 50001	Energy Management System: Requirements with Guidance for use.
MCIT	Ministry of Commerce, Industry & Trade
MEPD	Ministry of Economic Planning and Development
MEPR	Minimum Energy Performance Requirements
MEPS	Minimum Energy Performance Standards
MNRE	Ministry of Natural Resources and Energy
MoA	Ministry of Agriculture
MoF	Ministry of Finance
MTEA	Ministry of Tourism and Environmental Affairs
NDS	National Development Strategy, 1997
NEESAP	National Energy Efficiency Strategy and Action Plan
NEP	National Energy Policy, 2003
NGO	Non-Governmental Organization
PRSAP	Poverty Reduction Strategy and Action Plan, 2007
RE	Renewable Energy
SACREEE	Southern African Centre For Renewable Energy and Energy Efficiency
SADC	Southern African Development Community
SE4ALL	Sustainable Energy For All
EEC	Eswatini Electricity Company
ESERA	Eswatini Energy Regulatory Authority
SWASA	Eswatini Standards Authority
TFEC	Total Final Energy Consumption
TJ	Tera joule
TPES	Total Primary Energy Supply

1 BACKGROUND AND RATIONAL

The importance of energy efficiency and conservation in the Kingdom of Eswatini economy cannot be overemphasized. The country's energy security is currently at risk because of high energy imports in the forms of electricity and petroleum products. Globally the International Energy Agency[1] (IEA) is making sustained efforts to reduce demand-side energy through the promotion of energy efficiency (EE) measures around the world. The Southern Africa Development Community[2] (SADC) estimates of the energy efficiency potential are conservatively between 20-30% across many segments, and member countries have not harnessed its full potential to date. The SADC Centre for Renewable Energy and Energy Efficiency (SACREEE) hosted by Namibia has been established to support member state fast track implementation of EE measures. For the Kingdom of Eswatini the Energy Efficiency and Conservation Policy (EE&ECP) presents a win-win option by providing positive returns to energy consumers and the environment through the reduction of environmental pollution, energy costs and reduction of the carbon footprint of the energy sector, and by enhancing energy security.

1.1 Energy Challenges

1.1.1 Energy security.

Energy security is at the heart of Swaziland's economic fragility. Eswatini's energy demand is currently served by six primary sources that include (a) local resources constituting hydroelectricity and biomass in the form of wood fuel mainly from the indigenous forests for households and solid biomass for industry from plantation forests and bagasse from the sugar industry, and (b) imports in the form of petroleum products, electricity, and bituminous coal, as shown in Figure 1.[3] The country relies entirely on imported electricity for base load which is normally around 80% of the total electricity consumption. During drought periods when the national hydro capacity becomes unavailable, nearly 100% of the electricity consumed is imported. The future of the electricity supply is insecure South African electricity utility, ESKOM continues to be face with multiple challenges including a backlog of upgrading its power stations and transmission systems, and high outstanding bills from consumers, all of which pose great uncertainty in the future supply. A quick and viable solution to this energy insecurity of Eswatini is the establishment and implementation of an effective energy efficiency and conservation programme and rapid up-scaling of the country's vast potential for renewable energy (RE).

[1] IEA 25 Energy Efficiency Recommendations 2011
[2] SADC Renewable Energy and Energy Efficiency (SACREEE) Status Report (2018)
[3] MNRE Swaziland Energy master Plan 2017

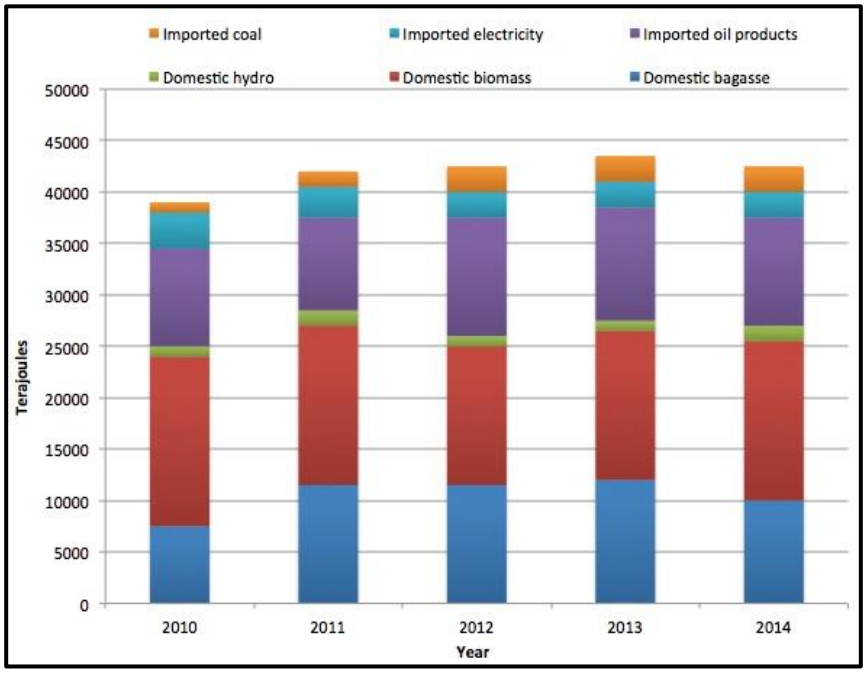

Figure 1 The Total Primary Energy Supply for Swaziland for the period 2010 – 2014

1.1.2 Environmental Degradation. Woodfuel remains the largest source of energy especially for rural households and schools for cooking and space heating. Urban households also use woodfuel for space heating, while meat butcheries, and fast food street vendors also use it for cooking. The hard wood from the indigenous forest in the east regions of Eswatini is the preferred choice for woodfuel. The over-reliance on woodfuel, combined with clearing of land for agricultural production and unplanned settlements has resulted in a rural energy crisis where demand for household energy has outstripped supply in some areas. This combination of high demand, aggravated by low-end use efficiency, has contributed to environmental degradation, rural poverty and rural energy shortage.[4]

1.1.3 Economic stress from oil market fluctuations. The pricing of petroleum products utilized mainly by the country's transport sector relies on world oil markets. Upward trend in the international oil markets cause a big stress to the Eswatini economy. There is a pressing need to reduce national petroleum import through mixing liquid fuels with locally produced ethanol, and also through energy efficiency and conservation programmes. The Government of Eswatini (GoE) together with local sugar related industries has initiated a hybrid liquid fuel programme that aims to supplement the import liquid fuels with the locally produced ethanol. Such initiatives and the implementation of the EE&CP programme are thus very important since they minimizes the impact of fluctuations in the energy import market.

[4] Kingdom of Swaziland. Sustainable Energy For All, Country Action Plan. 2014

The country is also in a process of increasing its strategic petroleum fuel reserves to last for 3 months. However, the density of motorized vehicles is increasing at a remarkable rate due to cheap second hand cars from overseas countries and increasing level of affluence, and therefore necessitate for the implementation of energy efficiency and conservation measures in the transport sector

1.1.4 Sustainable Development Goal (SDG) Targets. The seventh United Nations Development Programme's SDG Number 7 calls for Affordable and Clean Energy for all by 2030.[5] The regional development body SADC to which Eswatini is party has established the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE). The GoE has, therefore, commitments with the international community that must be met by the year 2030, and fast tracking an EE&CP programme can lead towards that achievement.

1.2 Sectorial Energy Use

The country's total final energy consumption (TFEC)[6] by economic sectors reached approximately 28,000 TJ in 2014 (as shown in Figure 2), despite the decline occurrence in 2011 which was a result of the recession in the country's economy. The recession led to the closure of key energy intensive industries, such as the pulp and paper manufacturing firm and a hold on private investment in manufacturing enterprises. In general, the energy consumption in all sectors over the years from 2010 to 2014 depicted a steady growth pattern with major sectors in 2014 being household (48%) and transport (35%) as shown in Figure 3.

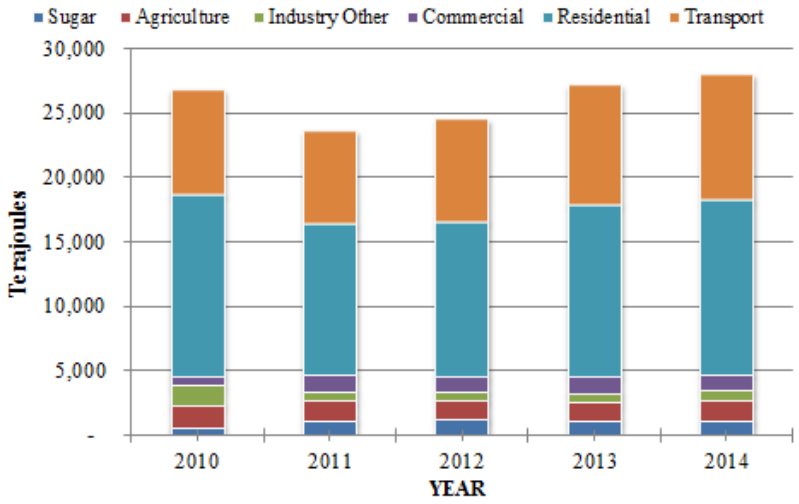

Figure 2 Total Final Energy Consumption by Sectors (2010 – 2014).

[5] UN Sustainable Goal 7, https://www.un.org/sustainabledevelopment/energy/
[6] MNRE Energy Balance, 2014

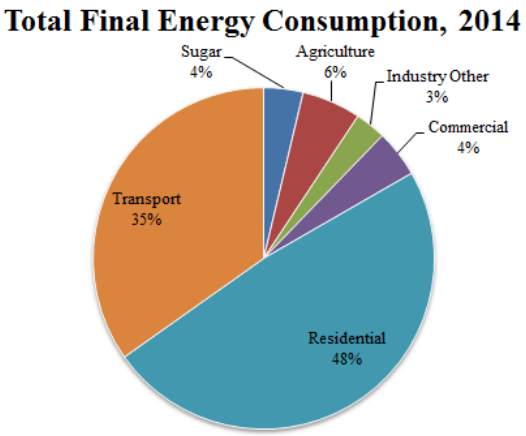

Figure 3 Total Final Energy Consumption by Sectors in 2014

1.2.1 Households sector. Energy consumption in this sector is driven by lighting, cooking, water and space heating, air conditions and refrigeration. The major energy source is woodfuel for cooking particularly in rural areas even though still used in urban areas. Electricity is used for cooking, refrigeration, air conditions and to power home appliances such as computers, television, radio, and battery chargers. With the increasing electrifications rates, electricity has become an important energy source for approximately 80% of households. Other energy carriers for Eswatini households include paraffin, candles, Liquified Petroleum Gas (LPG), and Solar energy.

1.2.2 Transport sector. The transport sector is the second major consumer of energy in the country (35%) as shown in Figure 3. A large portion of the imported petroleum fuels in the form of petrol and diesel are used by the transport industry. The transport sector includes light duty vehicles, buses and trucks that are utilized by the industry for transportation of goods. The Government of Eswatini owns a large fleet of light and heavy duty vehicles that is operated by the Central Transport Organisation (CTO). The number of light duty vehicles has grown drastically over the past ten years due to cheap second-hand imports from overseas countries. In 2011, the Global Health Observatory[7],data compiled by the World Health Organization reported that there were at least 153 013 vehicles registered in the country. This corresponds to a vehicle density of 1 motorized vehicle per 10 people. This is very high compared to other countries in the region including South Africa, the richest country by regional standards. The capacity of roads in Eswatini has not grown in the corresponding period leading to traffic congestion during peak hours in the cities. There is a lot of fuel and time wastage that occurs during heavy traffic, with heavy negative impact to the Eswatini economy.

1.2.3 Buildings (residential, commercial, industrial and public). Commercial building in Eswatini comprise of commercial spaces such as offices, banks, shops, hotels, restaurants, and some private medical and learning institutions. Public buildings include government offices, schools, tertiary institutions, medical institutions, correctional sectors, police entities and army barracks. Residential buildings constitute individual houses in urban and rural areas and blocks of residential flats and

[7] https://www.who.int/violence_injury_prevention/road_safety_status/2013/country_profiles/swaziland.pdf

apartments. Industrial buildings include factories and warehouses and agricultural pack houses. All these types of buildings offer opportunities for implementation of energy efficiency and conservation measures thorough various means. Currently, there is no comprehensive energy efficiency building code, and therefore there is an urgent need to include energy efficiency and conservation in the drafting of the Building Act and Regulations to cover the building envelope design and promote efficient lighting and heating, ventilation and cooling (HVAC).

1.2.4 Industry. In 2014, the industrial sector was responsible for about 13% of the country's TFEC, as shown in Figure 3. The Eswatini industrial sector encompasses the sugar industry, agriculture and other industries including textile, food processing, steel, water treatment, timber, wood products, mining and animal feed production. Electricity and petroleum products are the key energy carriers for the industrial sector. In 2014, electricity consumption represented about 86%, whilst consumption of petroleum products including diesel, petrol and paraffin, LPG, Heavy Furnace Oil (HFO) represented about 14% of the total energy consumed by the sector. To a limited extent coal is still used in some industries including the agriculture subsector.

1.3 Definitions: Energy Efficiency and Energy Conservation

1.3.1 Energy Efficiency (EE). This is using technology or applications that require less energy to perform the same function. Using a light-emitting diode (LED) lamp or a compact fluorescent lamp (CFL) requires less energy than an incandescent light bulb to produce the same amount of light is an example of energy efficiency. Typically an 18W CFL produces the same amount of light as a 100W incandescent light bulb. This means that the CFL bulb uses 82% less energy for the same function. There are a wide range of energy efficiency interventions and they may include the promotion of fuel efficiency in vehicles, energy efficient buildings that are designed in such a way that they optimize natural elements such as the sunlight and trees to allow the building to use less lighting, heating and cooling energy to achieve comfortable conditions inside.

1.3.2 Energy conservation (EC*).* This is any behaviour that results in avoiding the use or using less energy. Turning the lights off when leaving the room and driving less are both ways of conserving energy. Other examples of energy conservation include avoiding aggressive driving, ensuring the vehicle tyres are properly inflated, and using laundry line for drying clothes instead of a laundry machine.

1.4 Rationale for the Energy Efficiency and Conservation Policy

The purpose of the Energy Efficiency and Conservation policy (EE&CP) is to reap the multiple socio-economic and environmental benefits associated with energy conservation within Eswatini, these include

- **Poverty alleviation**. The EE&CP can enable the targeting disadvantaged groups assisting them to reduce energy wastage e.g. using a woodfuel efficient stove instead of an open fire to

reduce the resources required for acquiring woodfuel, using less electricity for specific purposes and thus lowering the monthly electricity costs.

- **Protection of foreign exchange resources.** EE and EC can reduce the overreliance on petroleum and electricity imports, thus protecting the country's foreign exchange resources.
- **Improvement in energy security.** EE and EC can improve the country's energy security and further reduce the impact of volatile energy prices from international markets.
- **Ease the public budget.** Investment in energy efficiency has the potential to reduce national expenditure. For example, implementation of energy efficiency measures in Government buildings would reduce the Government energy bills, and the same would apply for the transport sector.
- **Environmental impacts.** EE and EC can reduce detrimental environmental impacts. The burning of fossil fuels e.g. by the transport industry, is linked to local air pollutions and can be addressed by reduction of the unnecessary liquid fuel usage through EE and EC policies. EE and EC measures can contribute to the preservation of natural biomass resources and mitigation of deforestation and climate change through the reduction of wood harvesting for fuel from indigenous forests.

2 GOALS AND OBJECTIVES

The EE&CP consists of priority area and sectorial policies providing guidance to, amongst many others, Government ministries, legislators, energy consumers, and supporting partners regarding the country's commitment to improve implementation of EE and EC measures.

2.1 Goal

The overall goal of the EE&CP is to stimulate energy efficiency and conservation programmes to promote sustainable sectorial development in the country as she transition into the first world status.

2.2 Objectives

The main objectives of the Energy Efficiency Policy are to:

- Enhance energy security for the country by making better use of available energy sources;
- Mitigate the detrimental effects of climate change on the environment by reducing wasteful energy applications;
- Provide a framework for the Energy Regulator to consider when entertaining various energy supply interventions.
- Provide guidelines for setting targets relating to various EE and EC interventions and regulations in the domestic, commercial, transport, public and industrial economic sectors.
- Improve global competitiveness of local products through reduced energy input cost
- Provide the governance and monitoring structure for EE and EC programmes in Eswatini, including highlighting the role players for each respective process.

3 PRIORITY AREA AND SECTORIAL POLICY STATEMENTS

In order to provide a more comprehensive and practical EE&CP framework the IEA's[1] approach which uses priority areas is used in this policy development. This approach is suitable because some of the priority areas such as building, lighting, appliances and industrial equipment are in common for residential, commercial, government and industrial economic sectors of Eswatini. Industry and also transport have economic sector specific priority areas of energy efficiency and conservation that are stated under those sectors in this policy. The EE&CP implementation strategy to be developed later will address actions and activities for each economic sector. The policy statements for Eswatini EE&CP address the areas of buildings, lighting, appliances and equipment and the sectors of transport and industry, plus cross-cutting areas. These areas are deliberated in more detail below.

3.1 Energy Efficiency in Buildings

It was mentioned above that the buildings priority area is common across different economic sectors, and therefore there are variations due to the different purposes of use. In spite of these variations in the types of buildings their overarching energy efficiency policies can be developed through national building codes. Previous building codes and government inspectors respectively addressed mainly the structural integrity and safety of buildings and are not detailed in energy efficiency and conservation performance requirements. The slow adoption of EE and EC improvements in buildings can be attributed to low awareness of potential benefits, budget constraints, limited in-house technical capacity, inadequate skills for energy management, absence of minimum energy performance requirements (MEPR), and inadequate awareness on buildings' energy consumption and efficiency. Implementation of cost effective energy saving measures can play a vital role in improving the overall building energy performance.

1. Policy Statement on Building Code
The Government shall develop a National Buildings Energy Efficiency and Conservation Code of Eswatini that will act as minimum energy requirement for building standards on existing and new buildings.

2. Policy Statement on Periodic Audits of Government Buildings
The Government shall periodically commission energy efficiency audits in her buildings to enforce and improve the overall energy performance.

3. Policy Statement on Re-Commissioning of Existing Buildings
The Government shall promote the re-commissioning of old buildings to optimize energy efficiency and conservation where appropriate through retrofitting with modern cost effective technologies.

4. Policy Statement on the Mix of Energy Sources

The Government shall encourage the integration of energy efficiency measures in the designing of new constructions and also include a mix of efficient renewable energy solutions to reduce grid electricity demand during peak hours.

5. Policy Statement on Energy Efficiency Certification of Buildings

The Government shall launch an EE certification programme that will provide mandatory information for potential buyers or renters of properties, and further assist in growing the market for energy efficient homes, offices and industrial buildings.

3.2 Energy efficiency for lighting.

The ubiquitous nature of electric lighting in Eswatini presents an opportunity for large cost-effective potential to reduce the energy demand through application of energy efficient lighting systems in all sectors. Energy intensive lighting systems such as incandescent lamps (argon tungsten and halogen tungsten) and gas discharge lamps (fluorescent, high and low pressure sodium, high intensive mercury vapour, and metal halides) are still prevalent locally. The growing usage of light emitting diode (LED) lamps is recognized, but their initial cost in comparison with traditional lamps remains a barrier in fast-tracking their adoption. Other than initial cost, other barriers to the adoption of energy efficient lighting include inadequate awareness, absence of minimum energy performance standards (MEPS) and regulations for lighting.

6. Policy Statement on Minimum Energy Performance Standards for Lighting

The Government shall adopt and enforce minimum energy performance standards and labeling programme to gradually phase out inefficient lighting products, (including inefficient ballast, lamp housing, fixture and lighting controls), as soon as it is technically and economically viable in all sectors of the economy.

7. Policy Statement on Government Building Lighting and Street Lighting.

The Government shall promote the energy saving conservation programs such as the use of occupancy sensor controlled lights in offices, programmed daylight and motion sensor street lighting systems, as well as the use of solar systems for lighting public spaces.

8. Policy Statement on the Incorporation of Natural Light in Buildings

The Government shall promote the use of lighting designs that incorporate the use of natural light particularly in commercial and industrial buildings.

3.3 Energy Efficiency in Appliances and Equipment

Modern appliances and equipment

Appliances and equipment represent one of the fastest growing energy loads. Presently, energy-using appliances and equipment are not regulated in Eswatini and the country may be flooded with obsolete and underperforming appliances and equipment when it comes to energy efficiency. Mandatory MEPS and equipment labeling can help regulate the appliances entering the country. It is imperative that consumers are not only informed of the initial price but also the energy consumption capacity and the relative operating cost of the desired appliance or equipment. Appliance and equipment labelling has proven around the world to be a great motivation to manufacturers to engage in research and innovation to produce more efficient and reliable products.

Traditional biomass use

The use of traditional biomass in the country currently accounts for the largest portion of the TPES[6]. Traditional biomass is mainly used in rural households and schools for cooking, water heating and spacing heating. Some urban households also use traditional biomass for space heating. The use of biomass in meat shops (butcheries) and street vendors is alarmingly on the rise.

Open-fire is the prevalent cooking method in as far as traditional biomass usage is concerned. It is noteworthy that a large proportion of rural households with access to electricity still use wood fuel for basic cooking and water heating. This widespread cooking practice using open-fire with traditional biomass can have severe implications on human health, forest/land degradation and climate change. The high usage of traditional biomass in Eswatini can be attributed to factors, such as, availability of the resource at almost no cost, socio economic factors, education and awareness, cultural factors such as beliefs that food tastes better when prepared on open fire.

It is recognized that the MNRE has been promoting adoption of improved cook stoves and fuel switching since the promulgation of the National Energy Policy in 2003. A number of challenges were encountered in the process and these include high initial costs, household design preferences, poor quality of cook stoves on the market and inadequate skill to construct durable stoves. In recognition of the SE4ALL[8] goal to ensure universal access to modern affordable energy services, it is imperative to draw the country's attention to ensure effective rollout of improved cook stoves, and further encourage fuel switching as means to mitigate the high consumption of biomass in the country. Furthermore, focus will be directed at ensuring access to liquefied petroleum gas (LPG) stoves, ethanol stoves, biogas stoves and increased grid electrification. The delivery of this will involve skill development of rural entrepreneurs to produce and sell improved cook stoves, availability of LPG and ethanol for cooking, pilot projects for biogas generation at household level and access to the grid. The actions behind this also include actions towards sustainable growth of wood and monitoring of human health.

[8] SE4ALL

9. Policy Statement on Appliances and Equipment

The Government shall adopt and enforce mandatory minimum energy performance standards for all appliances and some domestic and office equipment, and require energy consumption labels for all such in line with regional and international practices.

10. Policy Statement on Energy Efficiency Code for Industrial Equipment

The Government shall establish an Energy Efficiency Code for energy intensive industrial equipment such as electric motors distribution transformers, compressors, boilers and pumps, and further encourage implementation of energy efficiency measures in the design and operation of industrial systems and processes.

11. Policy Statement on Efficient Cook Stoves

The Government shall strengthen its programmes to ensure local research –and design, production and effective roll out of efficient cook stoves as part of a wider strategy to reduce consumption of wood fuel, and further adopt financing mechanisms to ensure affordability of the efficient cook stoves by the wider population.

3.4 Energy Efficiency in the Transport Sector

The second major energy consumer in the country is the transport sector at 35% TFEC. The transport sector is currently dependent on liquid fuels, such as petrol, diesel and aviation fuel, as sources of energy. The road-transport sector remains one of the most challenging areas for improving energy efficiency and conservation; nevertheless, there is a great potential for energy saving improvements. Road transportation in Eswatini is dominated by old vehicle fleets and there is need to ensure that these vehicles are properly maintained for optimal fuel consumption. Traffic management, especially within towns and cities, remains one of the areas that require improvement in order to ensure energy savings are achieved in the transport sector.

Energy performance in the transport sector can be improved mainly through the following measures:

- Development of efficient mass transportation systems
- Efficient Urban planning that will incorporate non-motorized transportation such as walking and cycling.
- Efficient road infrastructure with smart traffic control system.
- Proper planning of residential areas particularly close to major economic hubs to incorporate mass transit systems.
- Development of annual vehicle performance inspection programme.

12. Policy Statement on Minimum Fuel Standard

The Government shall develop and enforce fuel efficiency standards for light and heavy duty vehicles that will deliver fuel cost services and reduce emissions of harmful gases to the environment.

13. Policy Statement on Fleet Management

The Government shall advocate for the purchasing a wider range of vehicles in all orgaisations with large vehicle fleets to minimize the use high engine capacity vehicles in services where they are not required.

14. Policy Statement on Efficient Mode of Transport

The Government together with Municipalities shall periodically commission studies on the cost and benefits of improved urban planning and the promotion of non-motorized modes of transport in urban area such as car-free zone and cycling lanes.

15. Policy Statement on Efficient Public Transport

The Government together with Municipalities shall periodically commission studies on effective strategies on the promoting the use of mass transit systems such as buses to curb traffic congestions in the country's roads thereby reducing fuels wastage associated with traffic jams. In addition municipalities will set the right price for curb parking and ring-fence the funds obtained for urban planning and implementation.

16. Policy Statement on Eco-Driving

The government shall ensure that eco-driving is incorporated in driver training programmes in order to conserve energy.

17. Policy Statement on Advocacy of Energy Efficient Transportation

The Government shall periodically provide information on fuel consumption ratings of different vehicles and energy efficient driving tips.

18. Policy Statement on Emerging Fuel Efficient Technologies

The Government shall periodically review trends on the research and development activities of fuel efficient technologies, including hybrid, electric vehicles, and emerging alternative EE technologies and publicize significant developments.

19. Policy Statement on Annual Vehicle Energy Performance Inspections

The Government shall develop an annual vehicle inspection programme for enforcing vehicle MEPS.

20 Policy Statement on urban expansion planning

The government shall periodically conduct assessments of the potential for expansion of urban and upcoming development areas to ensure that future developments incorporate efficient transport measures.

3.5 Energy Efficiency for Industry

It is recognized that the industrial sector in Eswatini is lagging behind in the adoption of EE and EC measures; as such are missing the benefits of their improvements. While there is significant potential to decrease energy consumption in this sector, opportunities to improve EE and EC are still underexploited. The significant scope of improving EE and EC in the industrial sector can be exploited through implementation of effective energy management systems and programmes, building capacity in energy auditing and the application of best available technology practices for EE and EC. The decision-making process regarding investments in energy efficient technologies by companies can be shaped by firm rules, corporate culture and internal perception of energy efficiency[9]. In order to motivate industrial companies to adopt and implement energy efficiency measures, the Government must consider putting in place drivers such as regulations and mandatory requirements supported with incentive schemes to advance EE and EC in the sector.

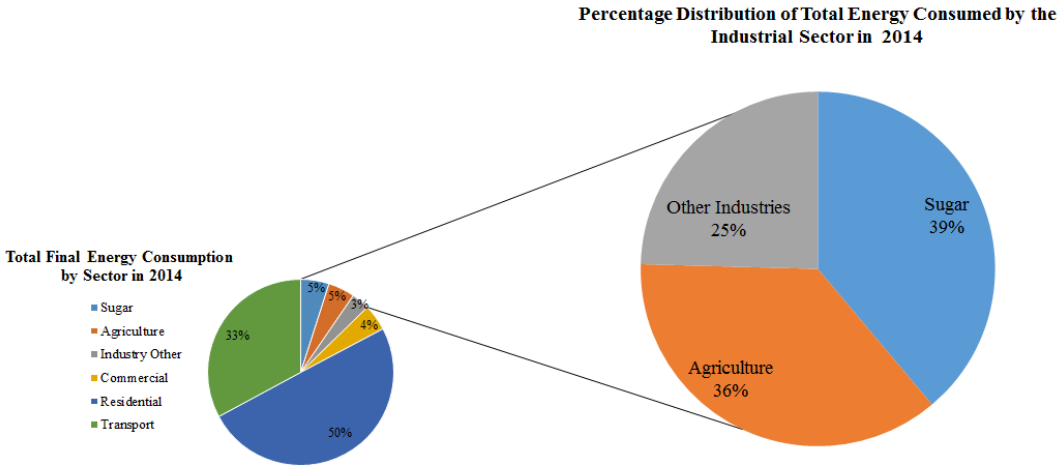

Figure 4 Energy Demand for the Industrial Sector

The Policy Statements enumerated below have been summarized to cover large industries, small and medium enterprises (SME), and the agriculture sector.

[9] IEA Energy Management Programmes for Industry 2012

21. Policy Statement on Energy Management Standard

The Government shall require large, energy intensive industry and encourage other industrial energy users to conform to SZNS ISO 50001 or an equivalent energy management protocol that encourages energy management.

22. Policy Statement on Eswatini Industry Partnership for Energy Efficiency

The Government of Eswatini and Eswatini Industry shall assist establish a Eswatini Industry Partnership for Energy Conservation that will assist Eswatini Industries to become leaders in energy efficiency where outstanding performers are encouraged through incentives such as awards.

23. Policy Statement on Support for Small to Medium Enterprises

Eswatini SMEs shall be encouraged to retrofit production equipment with modern energy efficient technologies through grants.

24. Policy Statement on Creating an Energy Efficiency Demand

The Government shall create an enabling environment to ensure ready access to finance and establish incentive packages to support the advancement of industrial energy efficiency.

3.6 Governance and Advocacy Policies

Government through the Energy Department at MNRE shall play an active role in promoting EE habits by informing Emaswati, businesses and local governments on energy efficient practices.

25. Policy statement on Energy Efficiency Entity

The Government shall establish an Energy Efficiency entity suitable for the country's context with a primary function to develop, facilitate and coordinate implementation of programmes aiming to improve energy conservation and efficient use of energy in all demand sectors.

26. Policy Statement on Enabling Legislation

The Government commits to develop all required legislation and associated regulations to facilitate unhindered and trouble-free implementation of the Energy Efficiency and Conservation Policy.

27. Policy Statement on Raising Energy Efficiency Awareness

The Government shall continue its efforts to raise public awareness and information dissemination on end-use energy efficiency measures, such as appropriate efficient use of equipment and appliances.

28. Policy Statement on Cost-reflective Tariff Structure

The Government shall develop and implement a programme for the gradual adoption of cost-reflective electricity tariffs for consumers while maintaining the lifeline tariff.

29. Policy Statement on Funding Research and Development

The Government shall provide funding support for research and development on improving technologies and systems that enhance energy efficiency and conservation.

30. Policy Statement on Energy Statistics

The Government shall establish a national database of energy information to assist each energy sector improve its energy consumption performance.

31. Policy Statement on Funding Energy Efficiency Programmes

The Government shall explore all viable funding mechanisms and identify the most suitable or combination of, taking cognizance the country's context and the specific needs of the preferred funding mechanisms to promote energy efficiency and conservation

4 Roadmap

To implement the EE and EC programme at Eswatini, MNRE will seek approval and support from Cabinet, who will then lobby the National Parliament to pass a Regulatory frame work for EE. The Energy Department under the MNRE will also draft an economic sector specific National Energy Efficiency Strategy and Action Plan.

4.1 Development of the National Energy Efficiency Strategy and Action Plan

The development of the National Energy Efficiency Strategy and Action Plan (NEESAP) is essential in advancing the national agenda on EE and EC. The NEESAP will address separately specific economic sectors; household, government, commercial, transport and industry. It will provide a

- Platform for stakeholder engagement thus building consensus and concretize the country's action on EE and EC. This will ensure alignment of energy efficiency programmes implemented by various institutions in the country with the NEESAP.
- Framework to aligned national EE and EC initiatives with the SADC EE programme that is contained in REEESAP 2016-2030.

The NEESAP shall be instrumental in the collection of baseline data at end use levels to inform specific sector programmes, strategies and actions plans.

4.2 Promulgation of Energy Efficiency Regulations

Enactment of EE and EC laws is essential in enabling the legislative framework for the successful EE&CP programme implementation. EE and EC laws will provide the statutory basis for the promulgation of rules and regulations including building codes, appliance labeling or minimum

energy performance standards and obligatory activities (*e.g.* accreditation, audits or investment) for consumers. EE and EC laws can also assign the responsibility for developing rules or implementing programmes, which in some cases involves establishment of new agencies or institutions..

4.3 Funding Mechanisms for Energy Efficiency Programmes

Establishment of funding mechanisms for EE and EC improvements is a critical aspect of effective energy efficiency governance, and should be treated with high priority from the onset. The commonly used funding mechanisms for EE and EC programmes include, government budget allocation, grants, energy or environment taxes, system public benefit charges, carbon financing, fees for service, donor funding and international development assistance. It is essential to identify the most suitable funding mechanism for Eswatini. The funding mechanism may include small surcharges on:

- Electricity bills
- Petroleum products

that could be collected using the most appropriate means.

5 Role Players and Institutional Responsibilities

5.1 Role Players

The role players and their contribution to the EE and EC programme are listed in Table 6. They include government entities, the national electricity company, IPPs, the Swaziland Energy Regulatory Authority, UNDP, funding agencies, research institutions and NGOs.

Table 1. Role players and their contribution to the EE programme

Main Organization	Role in EE and EC
Ministry of Natural Resources and Energy through the Department of Energy (DoE)	**1.** Execute the programme at national level **2.** Provide technical guidance **3.** Oversee governance issues
Ministry of Tourism and Environmental Affairs through the Climate Change Unit	Integrate climate change (mitigation and adaptation) with EE and EC programmes.
Ministry of Economic Planning and Development	**1.** Place energy efficiency at center of planning for socio-economics interventions. **2.** Provide resources mobilization support for EE and EC.
Ministry of Commerce, Industry and Trade	1. Prohibit the importation of energy inefficient equipment's 2. Guidance on promotion of EE in industry.
Eswatini Energy Regulatory Authority (SERA)	Develop the necessary regulatory framework for EE and EC. Execute the regulatory aspects of the programme at

	national level.
Eswatini Standards Authority	Guidance on the development of EE standards
Eswatini Electricity Company	Roll out demand management systems and smart grid to improve the reliability and efficiency of the grid.
Private Sector including timber, sugar, solar PV and wind power, industries.	Partnership in project implementation.
NGOs and public and private research institutions	Support EE and EC programme through the provision of advocacy and public sensitization, enterprise development and business plans for deployment, and research and information dissemination.

5.2 Institutional Responsibilities.

- **Government.** The Government, through Cabinet shall approve the Energy Efficiency Policy and oversee its implementation through MNRE. Cabinet shall motivate the Parliament of Eswatini to pass all required legislations and EE regulations.
- **Energy Suppliers.** Energy providers have regular contact with their customers and are rightfully positioned to deliver EE measures in a sustainable manner. In this context, energy providers shall refer to utilities, private electricity distributors, centralized and decentralized independent power producers (IPP).
- **ESERA.** The national energy regulator shall assist government to effect tariff structure that has incentive for low energy consumers without hindering the competitiveness of the Eswatini economy consumption.

6 MONITORING AND EVALUATION

MNRE shall develop a monitoring, reporting and verification (MRV) mechanism to periodically assess the effectiveness and relevance of EE programme. This Policy shall be reviewed at least once in every five years.