CLIMATE POLICY AND INSTRUMENTS FOR GEOTHERMAL ENERGY DEVELOPMENT IN KENYA

Pacifica F. Achieng Ogola, PhD
Ag. Secretary, Climate Change
Ministry of Environment and Forestry
Kenya

29th November 2019

Presentation Outline

1. INTERNATIONAL LEGAL FRAMEWORK
2. CONSTITUTION OF KENYA AND VISION 2030
3. NATIONAL CLIMATE CHANGE PLANS & POLICIES
4. ENERGY IN A NUTSHELL
5. IMPLEMENTATION OF THE PARIS AGREEMENT AND CLIMATE CHANGE ACT - ROLE OF ENERGY
1. INTERNATIONAL LEGAL FRAMEWORK

UNFCCC 1992 drawn up at 1992 Rio Earth Summit

► Came into force in 1994
► Framework Convention
► Ratified by 197 countries
► Objective is to stabilise GHG emissions

Kyoto Protocol (KP) 1997

► Came into force in 2005, 192 parties
► Developed to meet the ultimate objective of the UNFCCC which is to “stabilize GHG concentrations in the atmosphere at a level that would prevent anthropogenic interference with the climate system”.... through quantified emission targets within a specified time frame.

• KP First commitment period (KP1): 2008-2012 (prescribed emission reduction targets for developed countries)
• KP Second commitment period (KP2: 2013-2020)
► 2015 Paris Agreement comes into effect in 2016.
► 2018 Paris Rule Book
Paris Agreement in Context

- 12 December 2015, 197 parties to the Convention agreed the first global international climate change agreement;
- 180 out of 197 parties have ratified;
- On 5 October 2016, the threshold for entry into force of the Paris Agreement was achieved;
- Entered into force on 4th of November 2016 a month after meeting the threshold;
- Considered an international treaty under the Vienna Convention;
- Employs a “hybrid legal structure,” with both legally binding and nonbinding components;
- Employs a top-down, rules-based system and a bottom-up system of pledge and review.
The Paris Agreement – long term global goal

The Paris Agreement’s ultimate objective as temperature goals

The Ultimate Objective of the Paris Agreement (Art. 2):

A. Keep temperatures well below 2°C

B. and to Pursue efforts for 1.5°C

The Long-Term Goal in the Paris Agreement (Art. 4):

C. Global peaking (as soon as possible) & “rapid reductions thereafter”

D. Net-Zero between 2050 and 2100, expressed as “balance between anthropogenic emissions by sources and removals by sinks in the second half of this century”

Source: M. Meinshausen, Australian-German Climate & Energy College, The University of Melbourne, climatecollege.unimelb.edu.au
Paris Agreement – long term global goal

Articles 3 and 4 of the Paris Agreement require that all Parties undertake and communicate ambitious effort through their **Intended Nationally Determined Contributions (INDC)** and acknowledges the need for early peaking of emissions. Article 7 focuses on enhancing adaptation efforts.

Source: M. Meinshausen, Australian-German Climate & Energy College, The University of Melbourne,
IPCC Special Report on Global Warming of 1.5 °C

- The Special Report on Global Warming of 1.5 °C was published by the Intergovernmental Panel on Climate Change on 8 October 2018.
- 6,000 scientific references, and was prepared by 91 authors from 40 countries
- There is a strong correlation and temperature increase
- “Global mean temperatures in 2017 were about 1.1 °C above pre-industrial levels
- Its key finding is that meeting a 1.5 °C (2.7 °F) target is possible but would require "deep emissions reductions
- 2 °C temperature increase would exasperate extreme weather, rising sea levels and diminishing Arctic sea ice, coral bleaching, and loss of ecosystems, among other impacts

Temperature has increased by about 1°C compared to pre-industrial period.

Source: NASA
1.5 Degree Centigrade Pathway

Actions consistent with the 1.5°C pathway include
► Shifting to low- or zero-emission power generation, such as renewables;
► Changing food systems, such as diet changes away from land-intensive animal products;
► Electrifying transport and developing ‘green infrastructure’, such as building green roofs, or improving energy efficiency by smart urban planning, which will change the layout of many cities.
Increase in Natural Disasters

Higher temperatures have resulted in more catastrophies such as flooding, draught, hurricanes, etc.

Source Munich RE
2. CONSTITUTION OF KENYA AND VISION 2030
CONSTITUTION OF KENYA 2010

- Recognizes the environment as a heritage for all Kenyans that must be sustained for future generations. Sustainable exploitation of natural resources;
- Requires that all existing policies, laws and other instruments be aligned to it.
- Defines the vision and principles necessary to steer the country’s environmental and climate change agenda;
- Specifies the obligations of different stakeholders in respect to the environment.

CONSTITUTION OF KENYA 2010

- Constitution of Kenya 2010- mentioned in the Climate Change Act, 2016
  - Article 10: National values and principles of governance
  - Article 35: Rights to access information
  - Article 42: Every person has a right to a clean and healthy environment;
  - Article 69: Obligation of the state in respect to the environment
  - Article 70: Environment and Land court
  - Article 232: Values and principles of public service
  - Article: 260: Definition of marginalized community
  - Chapter 6: Leadership and Integrity

**Implied**
- Article 48: Right to access to justice – Section 23
- Article 50: Rights to a fair hearing
- Article 118: Role of parliament in facilitating public participation
VISION 2030

- Vision 2030 aims to transform Kenya into “a newly industrialising, middle-income country providing a high quality of life to all its citizens in a clean and secure environment.”
- Vision 2030 projects 10% economic growth and that 3% of that growth will be affected by climate change, hence limiting a double digit growth;
- The Vision 2030 is implemented through Medium Term Plans;
- Current: Third Medium Term Plan (MTP3) in which climate change has been recognised as a thematic area;
- NCCAP is aligned to MTP 3 and CIDP2.
3. NATIONAL CLIMATE CHANGE PLANS & POLICIES
EXISTING CLIMATE CHANGE PLANS

- National Climate Change Response Strategy, 2010
- National Adaptation Plan, 2015-2030
- National Climate Change Action Plan, 2018-2022
  - Mitigation Technical Analysis Report 2018-2022
- Green Economy Strategy and Implementation Plan (GESIP) 2016-2030
- Nationally Determined Contribution (NDC)
Climate Change Policies

a) National Climate Change Framework Policy
   - To enhance adaptive capacity & resilience to climate change and promote low carbon
carbon development for the sustainable development of Kenya- **mainstreaming of change**;
   - Establish an **effective institutional framework** to, and mainstream climate change response
into relevant sectors;

b) Climate Finance Policy
   - Establishes the legal, institutional and reporting frameworks to access and manage climate
finance;
   - Goal of the Policy is to further Kenya’s national development goals through enhanced
mobilisation of climate finance that contributes to low carbon climate resilient development
goals;
   - Budget codes for tracking climate finance in place;
   - National Climate Change Fund Regulations in progress
Climate Change Act 2016

- Signed into law by the President on 6 May 2016
- Came into force on the 27 May 2016
- Act of Parliament that provides a regulatory framework for an enhanced response to climate change;
- Part of implementation of the requirements of the National Climate Change Action Plan 2018-2022;
- Provisions for Implementation international agreement (Paris Agreement and SDG13)

Objective and purpose of the Act

*Enhance climate change resilience and low carbon development for sustainable development.*
Legal framework for climate change and energy in Kenya

Energy Sector
- Kenya Vision 2030
- Electric Power Act 1997 (first deregulation of the power sector)
- Sessional Paper No. 4 of 2004
  - Electricity sub-sector
  - Petroleum sub sector
  - Renewable energy
- Energy Act of 2006
- Rural Electrification Master Plan
- Feed-in Tariff Policy (2008, revised to 2010)
- Draft Energy Bill and Policy 2015
- Public Private Partnership Act 2013

Climate Change
- Kenya Vision 2030
- Kenya Climate Change Response Strategy 2010
- National Climate Change Action Plan
- Climate Change Act 2016 – Annual reports
- Air quality regulations 2014
- Sector specific legislations
- UNFCCC Mechanisms and Agreements
4. ENERGY IN A NUTSHELL
The energy sector in Kenya is largely dominated by biomass (68% of the national energy consumption), electricity (9%) and imported petroleum (21%), with biomass (wood fuel, charcoal, and agricultural waste) providing the basic cooking and heating energy needs of the rural communities, urban poor and the informal sector Institute of Economic Affairs (2015),

Energy is mainly consumed in the manufacturing, commercial, transport, residential, power generation, and some street lighting sectors.

The national connectivity access rate increased from 47% in March 2013 to 70.3% in June 2017.

Significant private sector involvement, stand-alone solar photovoltaic (PV) systems are the most widely used technology in Kenya, with well over 200,000 systems installed and sales estimated at 20,000 systems per year.

About 87% of the rural population uses firewood for cooking and 82% of the urban population uses charcoal for cooking.
Climate Change in Kenya

• Kenya’s contribution to global emission is about 0.1%.

• Vision 2030 projects 10% economic growth and that 3% of that growth will be affected by climate change, hence limiting a double digit growth.

• Impact of climate change has mostly been felt on the energy sector, particularly hydropower projects and food security due to increase in extreme weather events such as droughts and floods.

• Strong relationship between climate change & energy security.

• Stronger relationship between energy and economic growth.

• Energy and emissions.

Masinga Dam during 2001 drought in Kenyā
Geothermal energy and other renewables

• Carbon dioxide (CO2) occurs naturally in most geothermal systems, however, development from geothermal energy has lower emissions per kilowatt hour (kWh) than fossil fuels.

• Concentration varies from field to field.

Comparison of carbon dioxide (CO2) emissions from selected energy sources in g/kWh (derived from Bertani and Thain, 2002)
Implementation of international climate change regime in geothermal energy projects

- Kyoto Protocol and Clean Development Mechanism
  - 35 MW Olkaria Geothermal Expansion Project;
  - 140 MW Olkaria IV, Units I and II Geothermal Project
  - 140 MW Olkaria I, Unit IV and V Geothermal Project;
  - Olkaria III Phase 2 Geothermal Project.

- The registered projects are at different stages of monitoring, reporting and verification (MRV) with an estimated total annual emission reduction potential of 1.6 million tCO2e per year.

- Olkaria II Geothermal Expansion was the first project in the County to be issued with 152,000 Certified Emission Reduction (CER).

- One ton of CO2 equivalent is equal to a unit of CER after it has undergone verification and issuance.

- All the above projects were registered in the first commitment period of Kyoto Protocol (2008-2012)
5. IMPLEMENTATION OF THE PARIS AGREEMENT AND CLIMATE CHANGE ACT
Opportunities in the NCCAP 2018-2022

- Disaster Risk Management
- Food and Nutrition Security
- Water and the Blue Economy
- Forestry, Wildlife and Tourism
Opportunities in the NCCAP 2018-2022

HEALTH, SANITATION AND HUMAN SETTLEMENTS

MANUFACTURING

ENERGY

TRANSPORT
Climate Change Mitigation Energy

- Climate change mitigation analysis in the energy sector considers both energy supply (electricity generation) and energy demand at the household, industrial and commercial levels.

- The three main electricity generation sources in Kenya are hydro, geothermal and thermal, together making up 98% of electricity sent to the national grid under normal hydrological conditions.
Kenya INDC/NDC target

- Kenya took a target of **30% abatement by 2030**
- From 6 sectors namely; energy, transport, industry, wastes, agriculture, forestry (carbon sinks) and adaptation actions in several sectors
- Kenya’s projected emissions for 2030 are 143 MtCO2e/year.
- Technical emission reduction potential is 60%.
- The INDC/NDC mitigation target takes a conservative approach of half the potential which is equivalent to 43 MtCO2e/year hence the 30% abatement target.
- The abatement potential in low temperature utilisation was not captured and can increase geothermal contribution to mitigation if implemented
The BAU projections show that by 2030, electricity generation will be the highest emitter of GHG emissions in Kenya.

Source: Government of Kenya (2015), Second National Communication
## Mitigation contribution by sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Technical potential (60%)</th>
<th>INDC Target (30%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2030</td>
<td>2030</td>
</tr>
<tr>
<td>Forestry</td>
<td>40.2</td>
<td>20.1</td>
</tr>
<tr>
<td><strong>Power Generation</strong></td>
<td>18.63</td>
<td>9.315</td>
</tr>
<tr>
<td>Transport</td>
<td>6.92</td>
<td>3.46</td>
</tr>
<tr>
<td>Energy Demand</td>
<td>12.17</td>
<td>6.085</td>
</tr>
<tr>
<td>Agriculture</td>
<td>5.53</td>
<td>2.765</td>
</tr>
<tr>
<td>Industrial processes</td>
<td>1.56</td>
<td>0.78</td>
</tr>
<tr>
<td>Waste</td>
<td>0.78</td>
<td>0.39</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>85.79</strong></td>
<td><strong>42.895</strong></td>
</tr>
</tbody>
</table>

**Total Emissions in 2030 143 MtCO2e/year**
In terms of sector abatement, geothermal energy is expected to abate more than 75% of GHG from power generation/supply sector compared to other renewables.

- **Geothermal power** has by far the largest abatement potential of 14 MtCO2e per year in 2030 equivalent to 5 GW, with other technologies varying between 0.5 and 1.4 MtCO2e.

- The INDC/NDC target takes a conservative approach and puts geothermal contribution at 2.7 GW.

- Power generation is expected to contribute 9.32 MtCO2e/year from the projected total of 43 MtCO2e/year from all sectors by 2030 at 30% abatement target.

More abatement can be achieved through industrial application from direct use which was not captured in the GHG abatement projections.
Proposed mitigation actions in energy

- Improved Cookstoves
- Cogeneration in Agriculture
- Renewable Lamps
- Energy Efficient Light Bulbs
- LPG Stove Substitution
- Solar Thermal Water Heating
- Clean Coal (USC)
- Landfill gas generation
- Solar PV - distributed grid-connected
- Hydro generation expansion
- Wind generation expansion
- Geothermal generation expansion
- Solar PV - distributed grid-connected
- Energy Demand

Estimated Technical Potential Emission Reductions in 2030 (MtCO2e)
<table>
<thead>
<tr>
<th>Sub-sector</th>
<th>Action</th>
<th>Emission Reduction (tCO₂e)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Action up to 2022</td>
</tr>
<tr>
<td>Energy Supply/Electricity</td>
<td>Developing new 2,405 MW of grid-connected renewable electricity generation and retirement of three thermal plants by 2022</td>
<td>9.2</td>
</tr>
<tr>
<td>Generation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy demand side</td>
<td>Develop and distribute 4 million improved biomass (charcoal and biomass) stoves by 2022</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td>Develop and distribute 1 million clean energy (LPG, biogas, and ethanol) stoves by 2022</td>
<td>0.8</td>
</tr>
<tr>
<td>Total Sector Emission Reduction</td>
<td></td>
<td>16.3</td>
</tr>
<tr>
<td>Potential of the Prioritized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Energy Generation Action 2018-2022**

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Availability of renewable energy resources</td>
<td>• Develop 2,405 MW of new renewables (</td>
</tr>
<tr>
<td></td>
<td>• Geothermal: 913 MW</td>
</tr>
<tr>
<td></td>
<td>• Solar: 442 MW</td>
</tr>
<tr>
<td></td>
<td>• Hydro: 93 MW</td>
</tr>
<tr>
<td></td>
<td>• Wind: 800 MW</td>
</tr>
<tr>
<td></td>
<td>• Biomass/Biogas: 157 MW and Distributed solar and mini-grids: 30 MW</td>
</tr>
<tr>
<td></td>
<td>• and retire 300 MW of thermal plants (Kipevu: 120 MW, IberAfrica: 108.5 MM and Tsavo: 74 MW) by 2022</td>
</tr>
</tbody>
</table>
Energy Efficiency – Power Sector

- Manage inefficiencies in electricity generation, supply and use
- Improvement of operational efficiency in generation and reduction of transmission and distribution losses
- Reduce the distribution and transmission losses from current 18% to 14% by 2020
- Improve electricity system utilization and efficiency through demand management
- Optimize the operations of the Seven Forks Dams
- Promote efficient lighting technologies such as LED and CFL bulbs (Distribution to households)
- Building efficiencies through codes and standards
- Energy efficiency programmes for users (industries, national and county governments, households)
- Awareness, training, skills, incentives for energy efficiency programmes (Enabling activities)
- Establish Standards and labelling for at least 5 additional products
Energy Efficiency – Household

• Develop and distribute 4 million improved biomass stoves by 2022
  • Charcoal (2 million)
  • Biomass (2 million)
• Develop and distribute 1 million clean energy stoves by 2022
• Develop LPG, biogas, and ethanol stoves and related supply chains
• Construction of 6,500 digesters every 5 years for domestic use and 600 biogas systems in various schools and public facilities by 2022.
• Energy demand actions would make a mitigation contribution of 7.1 MtCO2e per year by 2022
Geothermal energy and adaptation

- Geothermal contribution in adaptation can be achieved by identifying climate vulnerable sectors such as, agriculture (most vulnerable), energy (hydropower, biomass), fisheries, livestock, health, water, as well as heating and cooling requirements among others.

Lindal diagram for potential adaptation projects for Bogoria –Silali geothermal fields.
Source: Ogola et al., (2012)
Enablers

- Overarching Technology and innovation;
  - The technologies are identified in the MTAR and ATAR).
- Capacity development and knowledge management;
- Climate finance; and
- Measuring climate results - implementation matrix with national level indicators

For more information on the NCCAP
go to www.kcckp.go.ke
Conclusion

Geothermal Energy will still play a significant role in helping Kenya meet her obligations under the Paris Agreement!
Thank You

Dr Pacifica F. Achieng Ogola
Ag. Secretary / Head, Climate Change Directorate
Ministry of Environment and Forestry
NHIF Building, 12th Floor, Ragati Road
P. O. Box 30126 -00100
NAIROBI

Cell Phone: +254 722 296396
Email: pacie04@yahoo.co.uk