The Status of Green Technologies in Ethiopia

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Outline

Introduction

- Definition of green technology
- The need for green technology
- Why Green Technology for Ethiopia?
- Genesis of Ethiopia Green Economy
- Green Technology supporting Policy in Ethiopia

Climate resilient green economy of Ethiopia

Green technology education and research

Major achievements of Ethiopia in going green

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Definition of Green Technology

GT is defined as **products**, **equipment** or **systems** which satisfy **minimized degradation of the environment**, **reduced GHG emissions**, **safe for use** and **promote healthy and improved environment** for all forms of life (Malaysian Ministry of E, GT & W)
Ethiopia Development Strategy

• Ethiopia aims to achieve middle-income status by 2025 while developing a green economy.

• The green economy path intends the country to limit its net GHG emissions in 2030 to 145 Mt CO$_2$e or lower instead of 400 Mt CO$_2$e.

• This constitute a 64% reduction (CGRE, 2011) from BAU in 2030.

In my presentation green economy is considered as broader concept; while GT is as one of peculiar characteristic of GE.
The need for green technology

• Is to meet development priorities through accessing low GHG emitting services (mitigation) or reduction of the vulnerability of sectors (adaptation) so as minimize the adverse impacts of climate change (UNFCC, 2010).
Why Green Technology for Ethiopia?

• Ethiopia’s economy and social wellbeing are already exposed to climate variability and weather extremes though Ethiopia’s GHG emission contribution is negligible Eg1.
• Ethiopia’s agriculture (38.5% of GDP & 80% employment source), is primarily rain-fed & highly sensitive to fluctuations of climate Eg2.
• Energy source mainly from hydro Eg3.
• In terms of infrastructure (World Bank, 2008) indicated that climate change will increase the maintenance costs of the country’s road network between $10 million to $21 million, depending on the climate model used.
Genesis of Ethiopia Green Economy

• One of the outcomes of CoP15 (2009) was the establishment of GCF ... **developed countries to provide additional financing** for developing countries amounting to USD 30 billion in the period 2010-12 and the pledge to mobilize USD100 billion by 2020 in order to help developing countries cope with the impacts of climate change and achieve the deep cuts in global emissions to limit global temperatures below 2 degrees Celsius

• **Lessons from South Korea**

• Immediately following the CoP15 Ethiopia embarked in developing CRGE strategy – **proactive**

• **Such proactive move was very correct since the context invites**
CRGE enabled the country to have GHG inventory

Total GHG emissions of ~150 Mt CO$_2$e in 2010

Greater than 85% of GHG emissions in Ethiopia come from forestry and agriculture

Ethiopia’s total emissions represent less than 0.3% of global

Source: CRGE
Additional abatement potential of ~19 Mt CO$_2$e from exporting green power to regional markets.

Source: Ethiopia CRGE, 2011
Out of the forestry emission

– Deforestation for *agricultural land* - 50%

– Due to fuel *wood consumption* - 46%

– Formal and informal *logging* - 4%
Green Technology supporting Policy in Ethiopia

• **Constitution** (1995) Article 44 clearly stated that all people have a fundamental right to an environment adequate for health and wellbeing

• Ethiopia is signatory for the **UNFCCC** as of 1994

• **Environmental Proclamation** -1997

• **Ratified** Kyoto Protocol in 2005

• Energy Proclamation (2013) aims to incentivize private sector investment in **renewable energy**

• CRGE (2011) is known as overall strategy for achieving **green growth** in Ethiopia

• etc
Ethiopia CRGE considered to transform

1. Agriculture
2. Forestry
3. Transport
4. Energy &
5. Industry
1. Agriculture: CSA

- Crop productivity improved from 16.5 q/ha to 17.82 q/ha implies intensification.

- Land under SWC was 3.2m ha in 2011 but in 2015 it became almost 11m ha, implies SWC brought farm lands with out deforestation.
Yet, major water sources still untapped
In terms Technological Options

RWH System

- In-situ RWH Systems
  - Zai pits
  - Cons. Tillage
  - Terraces
  - Level Bunds
  - Ditches
  - Drainage
  - SWC

- Runoff Catchment Systems
  - Check Dams
  - Weirs
  - Irrigations Canal
  - Ponds – Lined / unlined
  - Underground tanks
  - Infiltration ditches
  - Groundwater recharge
  - Sand/Subsurface dams

- Roof Catchment Systems
  - Ferro-cement tanks
  - Masonry tanks
  - Spherical tanks
  - Underground tanks
  - Recharge wells

Technology

- Soil Storage

- Soil and structural storage

Storage

Application

GREEN WATER
- Crop and Livestock production
- Upgraded rain-fed farming
- Agroforestry
- Full and Supplementary irrigation

BLUE WATER
- Domestic water
- Groundwater recharge
- Livestock production

Ethiopia receiving 1 billion m³ RF per year
Africa as a whole being using only 3-5% of Rain water, except South Africa and some N. Africa countries.
2. Forestry

• Globally the GHG emissions due to deforestation and forest degradation are about 15%.
• The 2010/11 projections indicated that unless action is taken to change the traditional development path, an area of 9 m ha might be deforested between 2010 and 2030. Over the same period, annual fuel wood consumption will rise by 65%.
• So, the Ethiopia strategy in forestry sector has been to increase GHG sequestration in forestry, i.e., protecting & re-establishing forests for their economic and ecosystem services including as carbon stocks.
Strategy in place to reduce deforestation

1. Reduce demand for fuel wood

2. Increase afforestation, reforestation, and forest management to increase carbon sequestration
   - Only REDD+ envisaged as abatement potential estimated 130 million tCO₂e
   - The Ethiopia REDD+ RP considered the REDD+ area coverage can be 91,689,400ha and projected USD 5,108,379,9120 carbon revenue per year
   - Also planting

• In general the forest coverage increased from about 10% to 15%. Yet, reports suggest that it has reach 40%

In forestry sector it seems going green is on track

1/20/2017
3. Transport

- *Transport*-related CO$_2$ emissions are expected to increase **57% worldwide** in the period 2005 to 2030. Out of this **80% of the predicted increase** will be from developing countries.

- Road transport is globally responsible for **74%** of all transport emissions but Rail accounts for **2%**.

- In Ethiopia emissions from transport are projected to grow from around 5 Mt (3% of the country total) CO$_2$e in 2010 to **40 Mt CO$_2$e** in 2030.
...transport

- The Addis light train planned to carry **15,000** passengers per hr per direction and hence **60,000** in all four directions
  - To transport **60,000** passengers about **5,000 taxi of 12 seat** would be needed
- The Addis Djibouti railway is **98% completed**
- Ethanol: petroleum blending saved **41 million USD in 5 years**
- Railway network (>5000Km) and the Light Rail Transit and supported projects are expected in reductions of **9 Mt CO₂e/year** by 2030.

Indicates – ER from transport sector is also progressing
4. Energy

- Globally about 1.2 billion people worldwide do not have access to electricity. As a result **renewable energy** development is considered critical to close this energy-access gap sustainably.

- Currently renewable energy contributes only **16%** of global energy consumption, and it is growing very rapidly.

- In 2010/11 the emissions in the electric sub-sector amount to 5 Mt CO$_2$e or a share of **3%** of the country’s total emissions (CRGE, 2011). While the global average for electric power generation’s emission is more than **25%**.
...On-going efforts in energy

Waste-to-energy:

• The Reppie Waste-to-Energy will be producing **green energy** from municipal solid waste (MSW).

• The facility will be eliminating over **1,000 tons** of waste every day

Solar

• Ethiopia Electric Power signed MoU with Green Technology Africa (GTA) to develop **300 MW** of solar power in the country, which is stated as an aggressive drive to expand grid access

• **Wind farms**
...in summary energy sector

- In 2010/11 total power was 2000 but now 4,180MW
- Those all RE projects constructions completed 52% (weighted average)
- EES plan 9.415 million achieved 8.875 – implies 40% less wood and 50% IAP (health and forest coverage) and 1tCO₂ ER per year per stove
- Wind – 153MW
- Geothermal -32MW
- Biogas plan was 26,000, but accomplished 11,618 – implies reducing CH₄ reduction
- Solar technology distribution and plant – plan was 3.16million while accomplished 2.032million

Over all implies diversification of RE
5. Construction

• Construction include: buildings, transportation systems and facilities, power lines, dams, etc

• Global predication indicates that more infrastructures are likely to be built in the next 20 years than in the past 6,000 years, which seems true in Ethiopia

• Total buildings-related emissions are expected to increase from 5 Mt CO2e (3% of the country total) in 2010 to double in 2030

This time the concept and practice of Green infrastructure sees low in Ethiopia so far
New concept: Green Infrastructure

In Ethiopia promoting green infrastructure is infant except the new condominium.
6. Manufacturing

• Manufacturing itself consumes \( \frac{1}{3} \)rd of the global energy supply and emitting 25% of the global GHG emissions

• There is **untapped opportunity** in manufacturing sector in Ethiopia
## GHG Emission Reduction Potential tCO₂e if Cement Industries Go Green

<table>
<thead>
<tr>
<th>S.No</th>
<th>Cement Factory</th>
<th>Fuel switch to biomas (20% maximum) per annum</th>
<th>Total for 10 years crediting period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mossobo cement factory</td>
<td>69,552</td>
<td>695,520</td>
</tr>
<tr>
<td>2</td>
<td>Mugher</td>
<td>97,736</td>
<td>977,360</td>
</tr>
<tr>
<td>3</td>
<td>Derba Midroc</td>
<td>193,200</td>
<td>1,932,000</td>
</tr>
<tr>
<td>4</td>
<td>Habesha</td>
<td>97,736</td>
<td>977,360</td>
</tr>
<tr>
<td>5</td>
<td>National cement</td>
<td>69,552</td>
<td>695,520</td>
</tr>
<tr>
<td>6</td>
<td>Abissiniya</td>
<td>6956</td>
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</tr>
<tr>
<td>7</td>
<td>Jema</td>
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</tr>
<tr>
<td>8</td>
<td>Koka</td>
<td>6956</td>
<td>69,560</td>
</tr>
<tr>
<td>9</td>
<td>Dashen</td>
<td>6956</td>
<td>69,560</td>
</tr>
<tr>
<td></td>
<td><strong>Total for 10 years crediting period</strong></td>
<td><strong>4,676,376</strong></td>
<td><strong>4,676,376</strong></td>
</tr>
</tbody>
</table>

Source: CDM Investment Guide, FDRE EPA, UNEP Riso & UNDEP
7. Waste Management

• Solid waste generation proportion from AA in terms of physical composition, **organic waste account 60%**, **recyclables 15 %** and others 25%. This implies potential for **energy generation & fertilizer production**.

• In Addis Ababa alone carbon crediting period for 7 years could range between **200,000-300,000 tCO₂e** generated from SWM.

  Eg. The Ethiopian Electric Power Corporation (EEPCO) has already contracted out the Repi Waste disposal to produce **50MW** of power out of the refuse which had accumulated for half a century in Addis Ababa.

• From the new SWM area there is a possibility to generate **626.7MW** by 2030 (MoWE)
• In Addis Ababa waste management approach of the industries is said to be *End-of-Pipe* than *Waste-to-Energy* principles (Solomon Legesse Hailu, 2011).

• So, given industrialization is taking off in Ethiopia, the possibility of going green is high
Globally the fossil fuel based global economy is found to be not sustainable. As a result much is expected from science and education

- **Scientists and industries** working together, can accelerate **innovation and build the workforce** needed to implement the growing clean energy economy (Teketel Yohannes, 2014)

- Academia embarking more than ever on **strategic research on climate change sensitive sectors** seems critical. For instance **GT quality control, standardization, etc**

- But, except few initiatives like signing MoU with Arizona State University and two Ethiopian Universities AASTU & ASTU, the efforts seems not visible
In summary

1. DPs of Ethiopia (World Bank, UN agencies, AfDB, Norway, U.S.A, Bank of China and others have been praising the Ethiopia CRGE and some of them have been financing green technology based programs and projects like renewable energy, railways, REDD+, SLM, waste –to- energy and so on

2. Sector wide
...summary

Since 2010/11

- **Agriculture** is on the way to– **CSA** but needs more
- **Forestry** coverage increased from about 9% to 15%
- **Transport** is transitioning towards **RE** based **mass transport & ethanol-benzene blending**
- **Energy** base is being **expanding** and under **diversification** within renewable energy
- **Manufacturing** itself has been enjoying energy from renewable sources, but needs to look at more
- **Greening waste management**
6. Opportunities

- Presence very supportive policy and leadership
- Many options are there to transform agriculture towards more greener
- Forestry coverage can go up to 40%
- Transport - replacing petrol or diesel engines with new electric or hybrid motors
- **Energy** - Ethiopia has the potential to generate RE from hydro, geothermal, wind and solar amounting 45,000, 7000, 1350 and >300 MW, respectively. Hence fossil fuel dependency can be further minimized
- **Manufacturing** - the country’s low levels of industrialization
- **Green Job** - global direction towards low-carbon and sustainable economy
Broadly defined, climate finance is:
- Total finance available for climate change mitigation and adaptation initiatives.

Within the UN Climate Convention (UNFCCC), the narrow interpretation refers to:
- Transfers of public resources from developed to developing countries, in light of their obligations to provide "new and additional financial resources".

A public intervention must have triggered the private sector financial flow.
Eg. Green Climate Fund

• GCF set up by the UN
  – Public sector and private sector facility
  – 50% be allocated to climate adaptation
  – First only 8 projects approved globally

• GCF in Ethiopia
  ✓ Only Public Sector Facility, administered by Ministry of Finance
Observed Challenges

• Coordinating institution is not visible despite respective Ministries are on top of GT

• Financing going green

• Academia seems not sufficiently driving

• Citizens seem unaware of going green

• Both load has been on government

• Sufficient MAE framework is yet not in place

• Sense of urgency to move out of BAU
Conclusion

• Climate scientists reported that 95% of global climate change is due to human induced activities. So, the world as a whole must act swiftly to move towards science based deep cuts of GHG emissions & consider relevant to context recommendations.

• The country zero-net carbon emissions by 2030 through green technology is indeed commendable. However, local to international cooperation is indispensable to scale up better practices and adapt and/or generate new green technologies.

• Looking ways how to get one office services to coordinate

• Detailed study needed to generate evidences
Thanks for your attention!