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The role of bioenergy in the clean energy transition and sustainable development: lessons from developing countries

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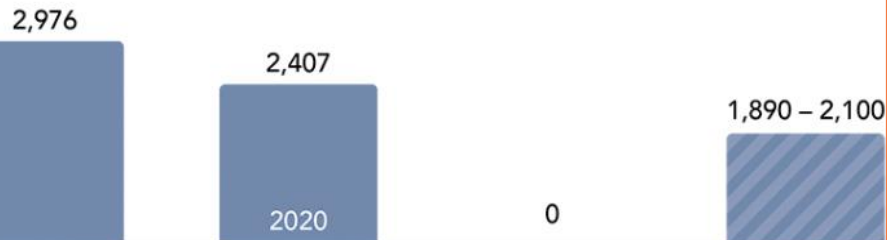


Access to Clean Fuels and Technology

Target 7.1.2 Universal Access to Clean Fuels and Technology

millions of people without access

OFF-TRACK



Universal Electricity Access

Baseline 2010

Current

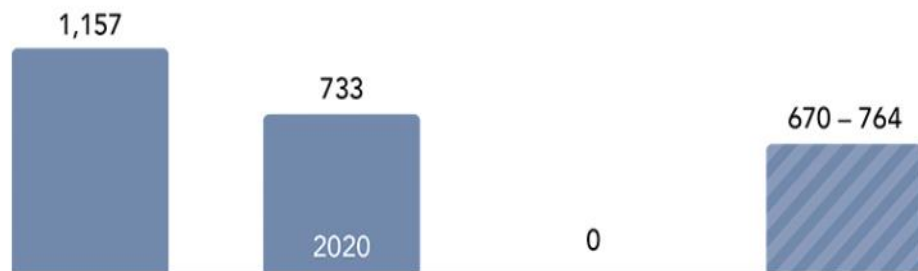
Target 2030

Scenario 2030

Target 7.1.1 Universal Electricity Access

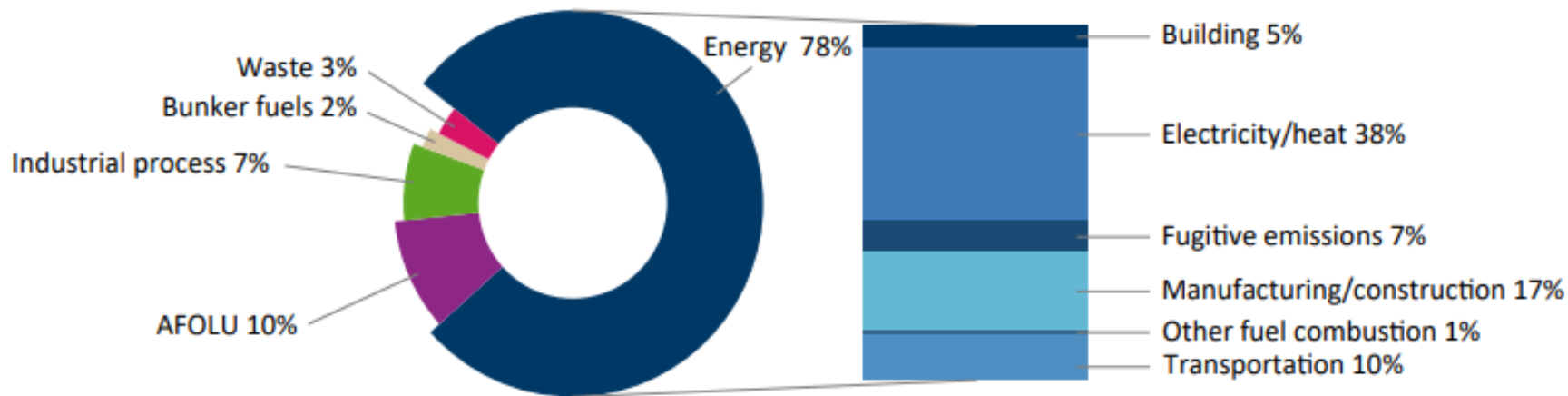
millions of people without access

OFF-TRACK





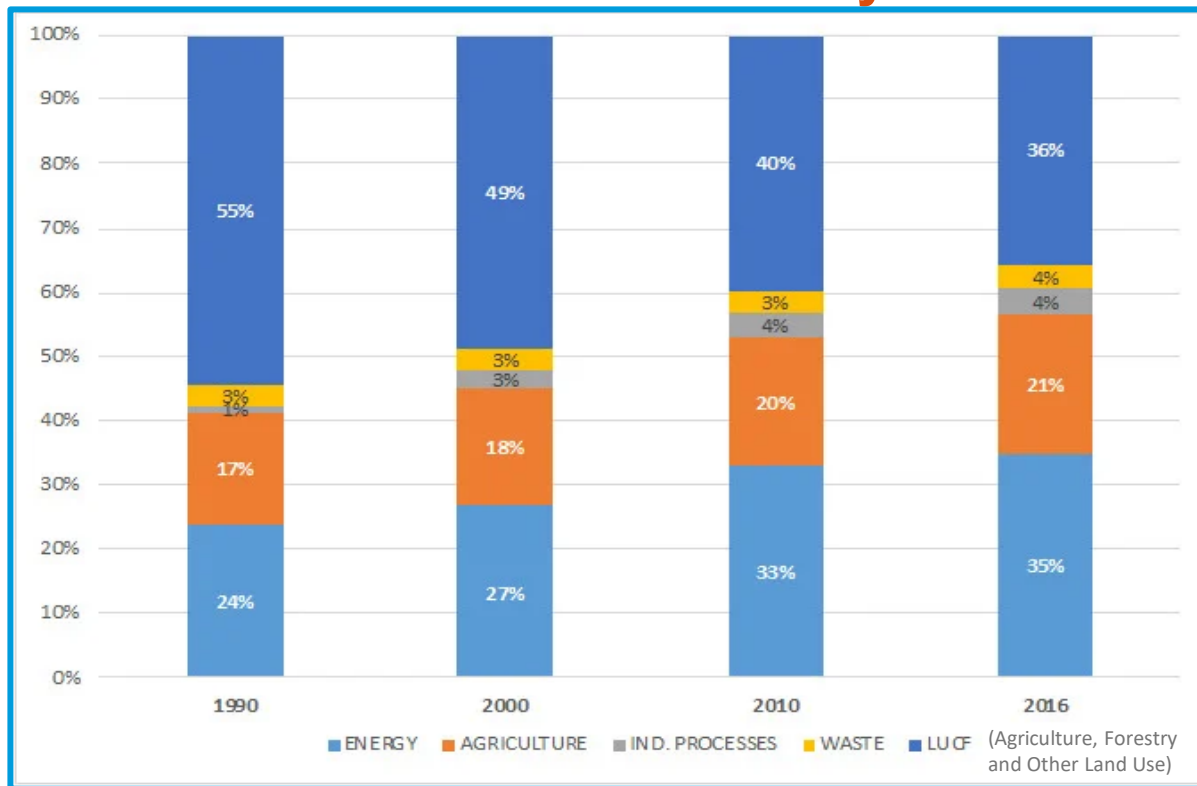
Greenhouse gas emissions in the Asia-Pacific region by sectors, 2020



Source: UNESCAP, 2022

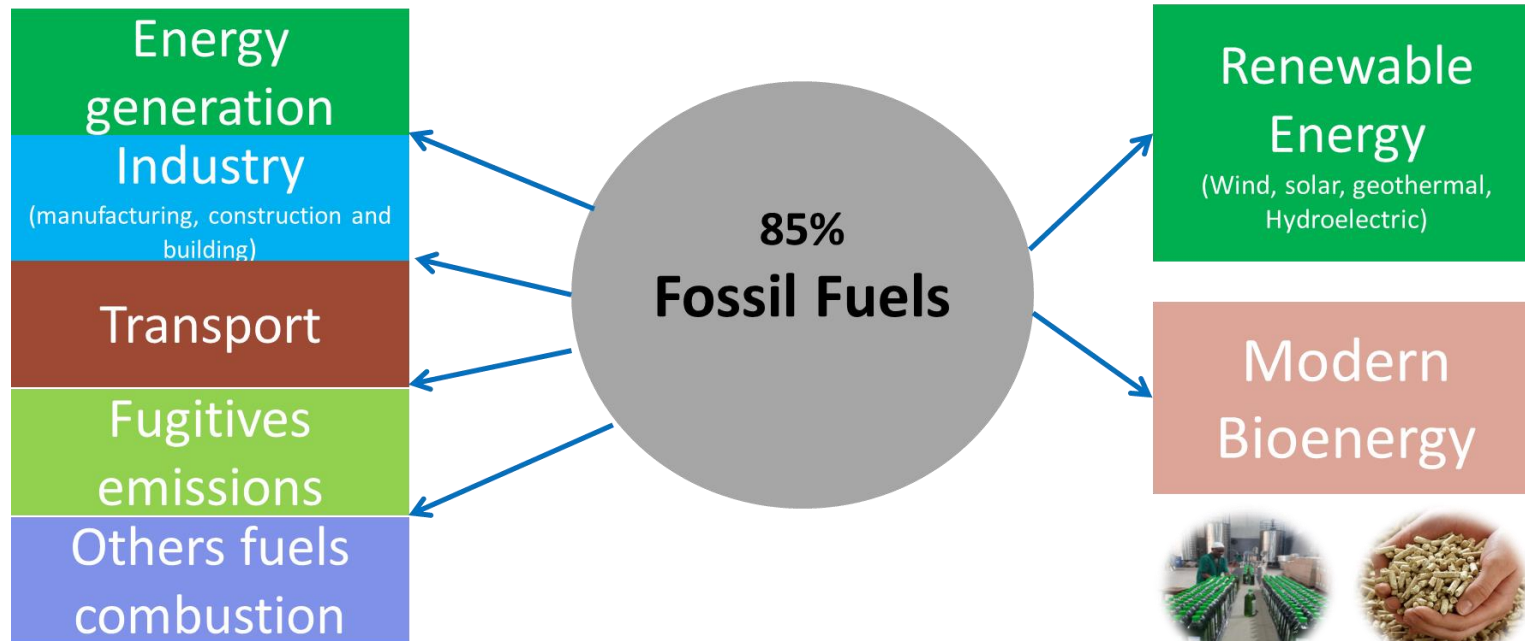


Evolution of Africa's GHG emissions by sector 1990 - 2016 (%)





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Benefits of **Bioenergy** development for DC, LDC and SIDS:

- ✓ Replace considerable share of fossil fuels from transportation;
- ✓ Graduate to Tier 4/5 of clean cooking options;
- ✓ Reduce rate of deforestation;
- ✓ Cut GHG emissions in several sectors;
- ✓ Save Forex from fossil fuel import;
- ✓ Make Agriculture and industry sector vibrant;
- ✓ Energy security and self reliance;
- ✓ Overall economic prosperity and well-being;
- ✓ Meeting SDGs & NDC targets.



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UNIDO bioenergy program focus:

- ✓ Decarbonizing Industry, agriculture, households and energy sectors;
- ✓ Agro-industrial waste to electricity, process heat and biofuels;
- ✓ Assisting member states in creating a bioenergy industry and value chain to meet the energy demand of households and transport sector.

Guidelines on sustainable bio-economy development (FAO, 2016)

- | | | |
|----------------------|-----------------|-----------------|
| 1. Food security | 5. Resources | 9. Trade |
| 2. Natural resources | 6. Governance | 10. Consumption |
| 3. Economic growth | 7. Technologies | 11. Cooperation |
| 4. Communities | 8. Innovation | |

Waste from food processing for captive power-biogas from avocado waste - Kenya

Project Background:

Produce extra virgin avocado oil/export and residues (skins, stones, waste water for electricity and heat.

Plant parameters:

Two digesters: 1,400 m³ capacity

Feedstock input: 3600 t/year

Biogas output: 410,000 KWh (el) & 200,000KWh(th)



Biogas from avocado waste in Kenya (Olivado)

Lessons learned:

- Profitable
- Circular economy by waste to energy and biofertilizer
- Improved reliability of electricity supply

Waste from agro-business for biogas production from captive and grid - power biogas from vegetable residues and maize stalks - Kenya

Project Background:

Supply power to the host factory for the cold storage and vegetable packaging.

Plant parameters:

Installed capacity: 2.4MW

Daily feedstock: 150 tonnes

Digester: 5,652 m³ : replaced 6 m Lit of Diesel



Biogas plant in Naivasha, Kenya (Vegpro)

Lessons learned:

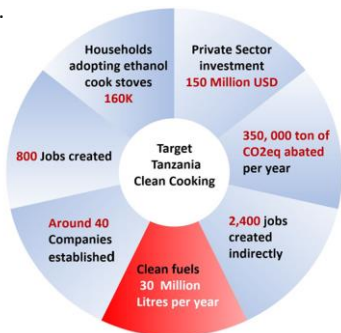
- The digested from a biogas is better fertilizer
- Industrial size & quality are viable in Africa
- Trained and qualified personnel is a key



Bioethanol cooking program a stove and fuel delivery facilitation project-Tanzania

Project Background:

Modern ethanol cook stove in 160,000 households
Market Enabling Framework (MEF) a private model.



- Ethanol bottling capacity: **2.4 MM litres/year**
- GHG emissions saving net: **1,434 TCO₂-eq/year**
- Ethanol cook stoves sales: **10,000**
- Volume of ethanol sold: **124,000 litres/year**
- Private sector inv: **1.1 million USD**

Biogas-based electricity generation for export to the grid from food production residues - Brazil

Project Background:

The plant produce biogas from waste (9 dif substrates such as slaughterhouse waste, potato wastes, UHT milk).

Plant parameters:

Power generators: 1.2 MW
Feedstock: 13,000 tonnes of waste per year
Power/generation: 8,910,000 KWh/9,720,000 KWh (th)
Annual revenues/sales: 900,000 USD + 360,000

Lessons learned:

- Proper waste disposal and prevent environmental pollution
- Provide training in biogas technology
- Balance between imported and locally produced equipment needed



Cassava field



Gelan Distillery in Ethiopia. (Project Gaia Inc.)



Biogas from agroindustry's residues (Castrolanda)



Challenges in implementing Bioenergy Projects

Problems faced

Policy and Regulatory Framework

- ✓ Lack of conducive policies & regulatory frameworks
- ✓ Some national policies still focus on traditional mainstream activities which indirectly support the use of fossil fuels
- ✓ Discontinuity of some policies due to government changes
- ✓ Mismatch between policies and implementation

Financing

- ✓ High level of investment cost (import)
- ✓ Unfavorable or no FITs / Reluctance of utilities to buy power from small producers
- ✓ Reluctance of commercial banks to finance bioenergy projects
- ✓ Reluctance of major climate finance entities such as GEF/GCF of finance bioenergy projects
- ✓ Unfair competition from subsidized fossil fuels

Feedstock supply, process and technology

- ✓ Lack of skills and training in new technologies (imported) lead to project failures
- ✓ Lack of feedstock availability studies cause additional cost in purchasing and transporting
- ✓ Availability of bio-residues is often overlooked/Lack of proper resource assessment & data/seasonal availability

Capacity Building and Communication

- ✓ Lack of understanding of bioenergy technologies
- ✓ Investors do not understand the importance of a secured feedstock supply
- ✓ Policymakers and financial institutions have not been exposed to similar types of projects



Conclusions

- Bioenergy has a very promising future as only a very small fraction of its potential has been exploited so far. That potential can easily be achieved without tapping into food crops and experiencing competition with food production;
- Bioenergy is a strong catalyst towards the development of local and regional circular bioeconomy;
- Potential to strengthen agriculture and industry sectors contributing to overall economic development;
- Improve self reliance in energy;
- Contribute to achievement of SDGs and NDC commitments.



Recommendations

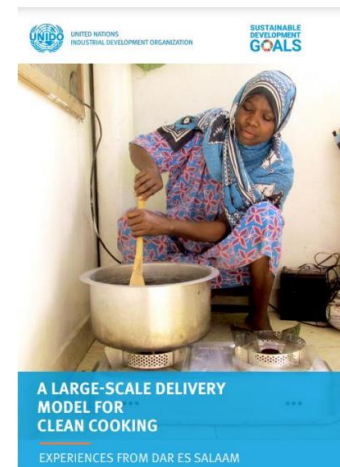
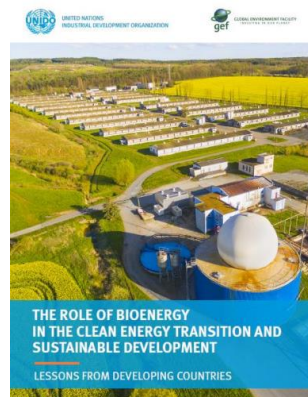
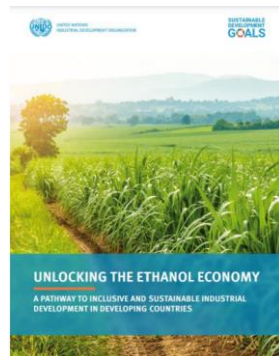
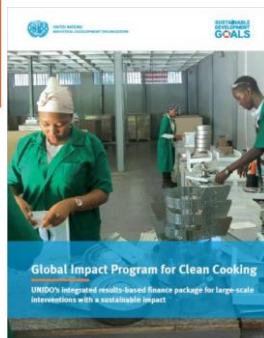
1. Policy, regulations and implementation need to be planned and coordinated;
2. Biomass **resource assessment** need to be an integral part of national energy policy making exercise;
3. Bio-economy guidelines (FAO) and Bioenergy **sustainability indicators** developed by GBEP need to be considered;
4. Building **local capacities** to adopt and adapt as well as operate and maintain bioenergy technologies;
5. Create **level playing field** by reducing or eliminating fossil fuel subsidies, favourable FITs & PPAs;
6. Create conducive **financing environment** for bioenergy technologies.



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UNIDO Bioenergy Publications





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Thank you

