

Federal Democratic Republic of Ethiopia

Country Report

Hangzhou, November 12, 2017



Facts and Figures

- Established in 2011 as a **research university focusing on Science & Technology** to lead the industrialization of Ethiopia
- Location : outskirts of south east of Addis
- Area: 256 ha
- 5 colleges in the area of Science, Engineering and Technology
- Student : Total 8200
 - UG=7100
 - PG = 900 (Masters and PhD)




Team members:

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VISION OF AASTU



*“AASTU will be
internationally recognized
Ethiopian hub of science
and technology with **strong**
national commitment and
significant **continental**
impact by 2025”*

MISSION

to deliver the three pillars of higher education:

teaching,

research and

community services

at the highest possible, cutting edge standards to the nation.

Overview of the country



Location: Ethiopia is located in the northern part of Africa known as the 'Horn of Africa'

Geographic coordinates: Ethiopia extends from 3° - 15° north of the equator, and 33° – 48° east of the Greenwich Meridian.

Time Zone: GMT+3



Area:-1.14 million Sq.km.

Arable Land: 45%

Irrigable Area:10 million hectares

Irrigated Land: about 3%

Demography

Total population: about 102 million

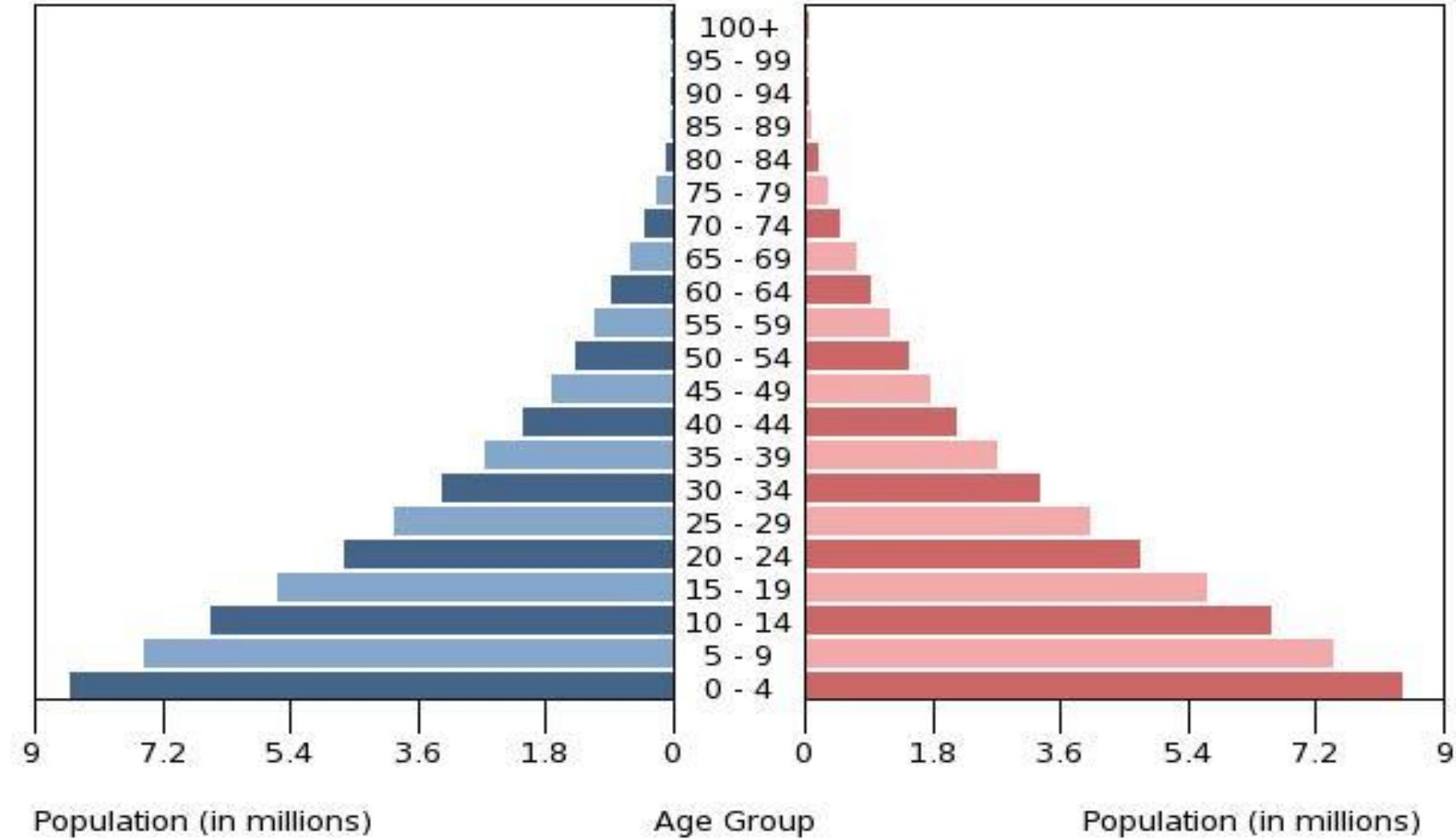
Population growth rate: 2.73% per annum

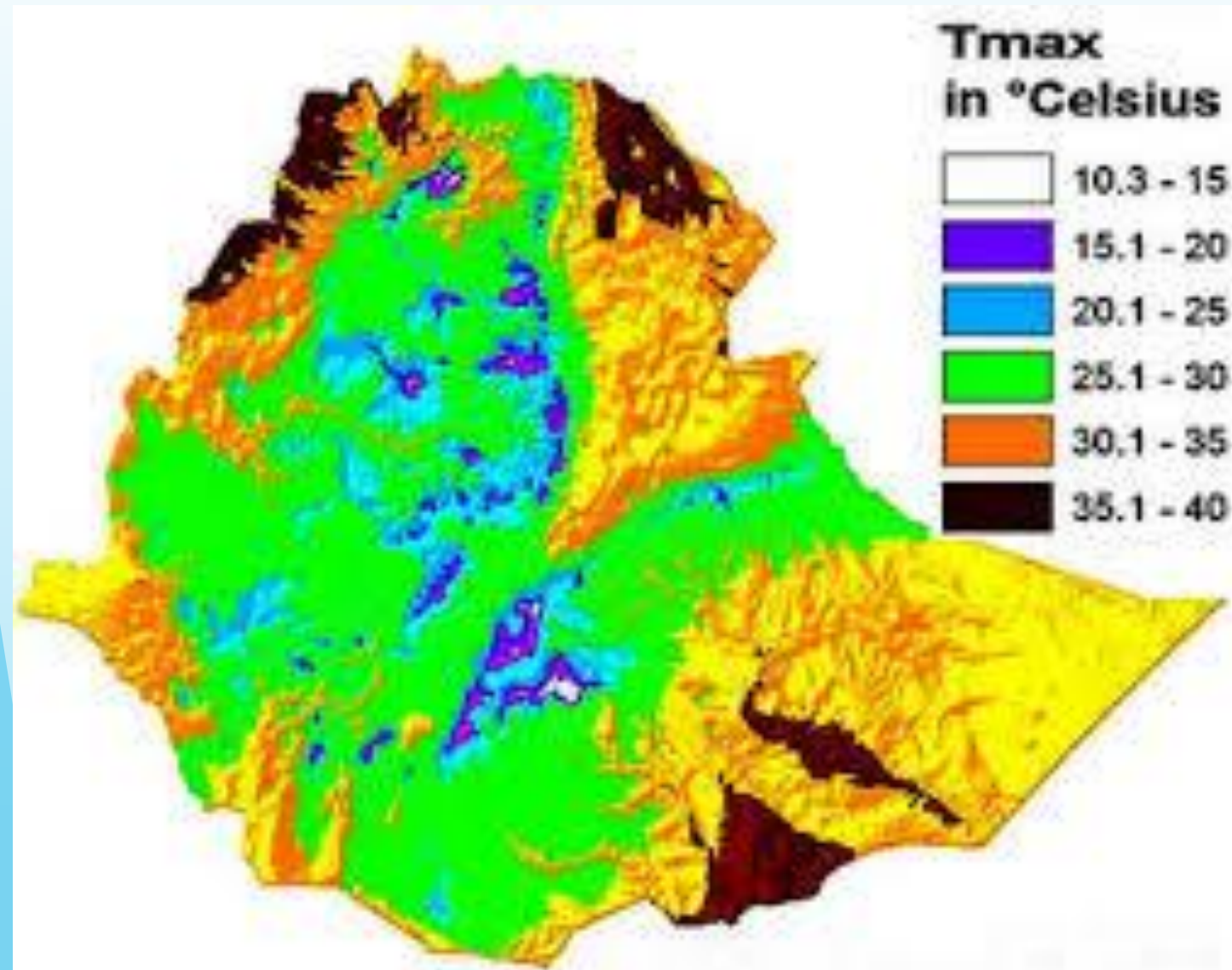
Population density: 67:1 sq.km

Male

Ethiopia - 2016

Female



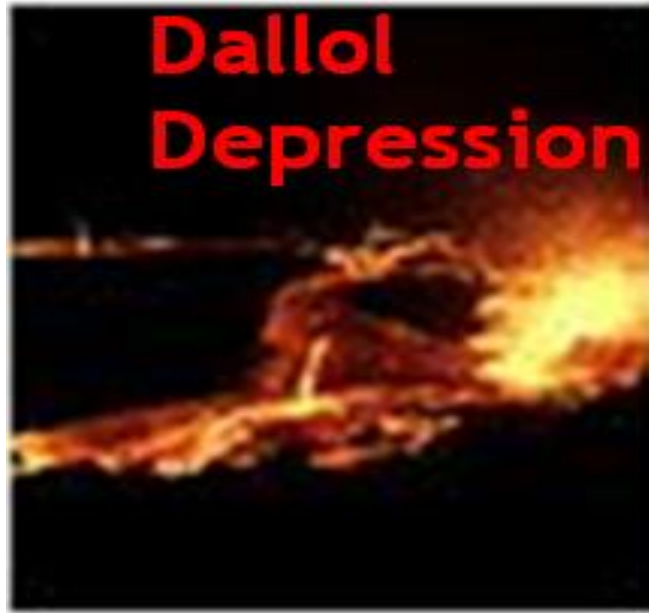


▶ Altitude:

- ▶ It ranges from **148 meters below sea level** at the Dallol Depression, in the east,
to **4620 meters** above sea level on the Ras Dashen in the north.

▶ Climate:

- ▶ Average Temperature ranges from 20°C to 30°C.
- ▶ Rainfall ranges from 200mm to 2000mm per year.



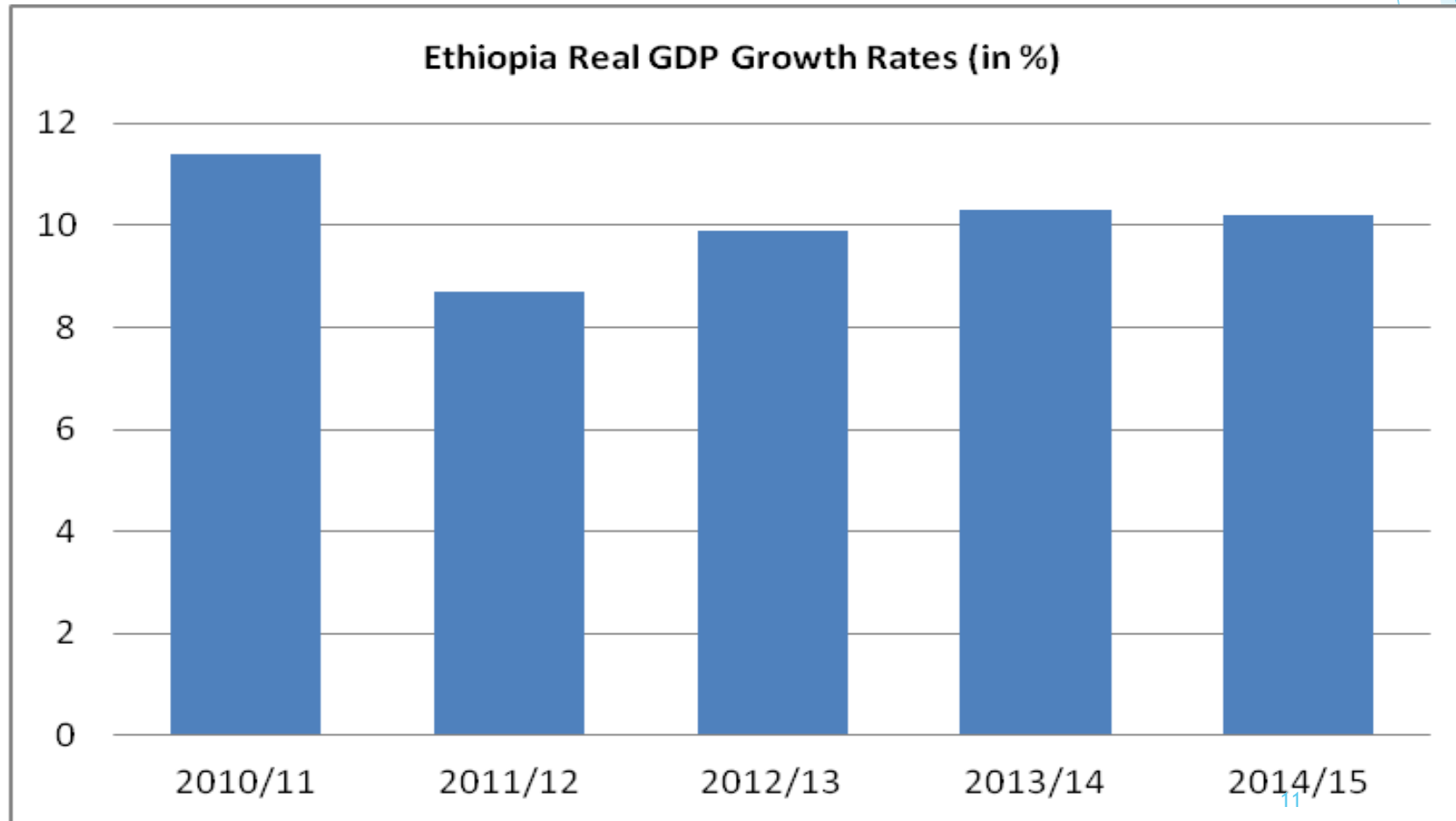
Ras-Dashen



Economic profile

Strategy: Agricultural Development led Industrialization (ALDI)

Economic growth rate in terms of date



General Energy and power Situation

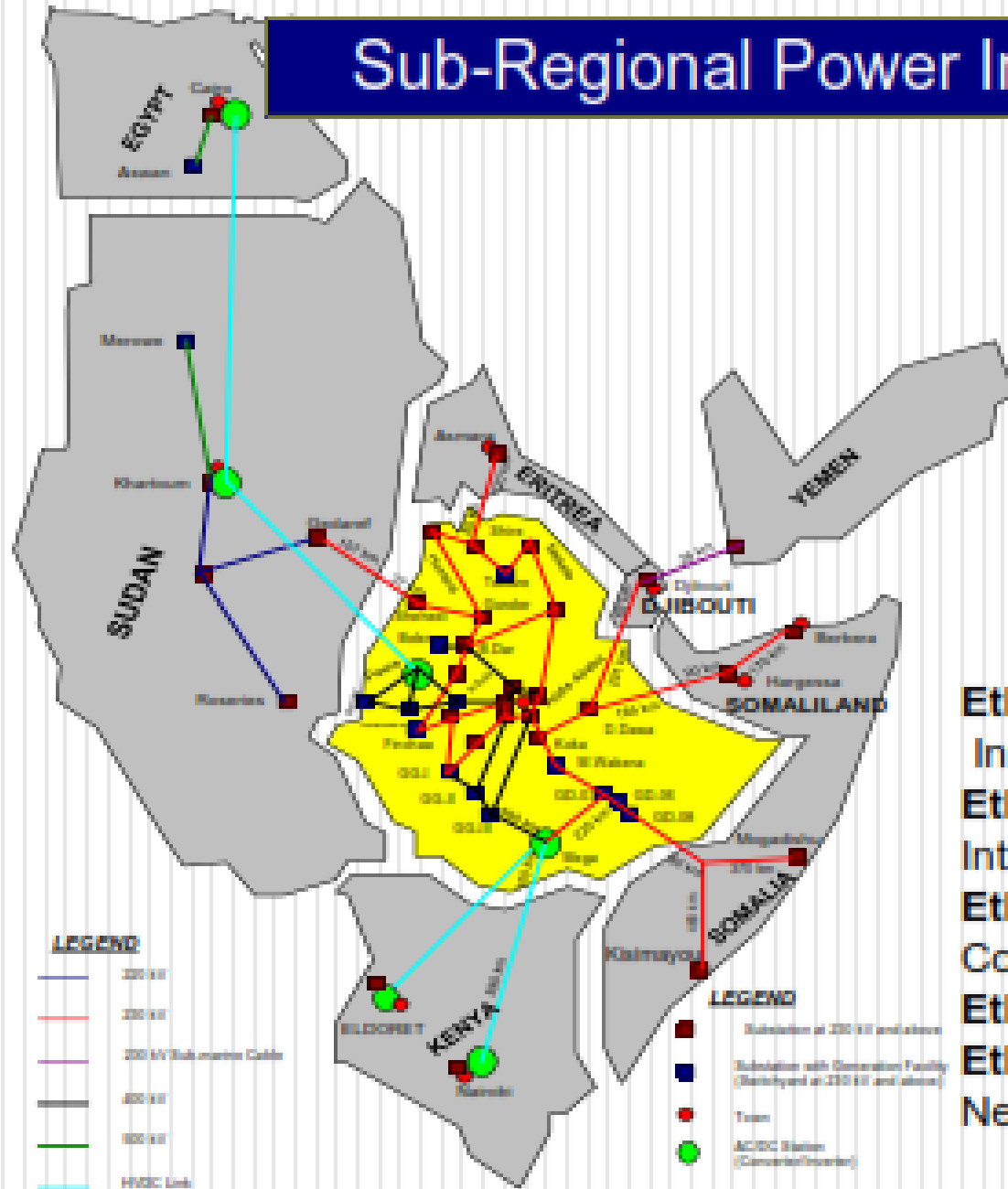
- ▶ Traditional biomass for **cooking** ~ 90 %
- ▶ Grid accessible to the population 55 %
- ▶ Per capita electricity consumption 77 kWh/year
- ▶ System installed capacity ~ 4230 MW
 - ▶ Hydropower (94%)
 - ▶ Wind and Geothermal (4%)
 - ▶ Diesel stand by (2%)
- ▶ Electricity demand growth by 32%
- ▶ Price 0.012 USD/kWh

The Energy Resource Potential

Resource	Unit	Exploitable Reserve	Exploited	
			Amount	Percent
Hydropower	MW	45,000	4230	< 10%
Solar/day	kWh/m ²	4 - 6		<1%
Wind: Power Speed	GW m/s	1350 > 7	324 MW	<1%
Geothermal	MW	7000	7.3 MW	<1%
Wood	Million tons	1120	560	50%
Agricultural waste	Million tons	15-20	~6	30%
Natural gas	Billion m ³	113	-	0%
Coal	Million tons	>300	-	0%
Oil Shale	Million tons	253	-	0%

Sub-Regional Power Interconnection

Possible Interconnection Lines with Neighbouring Countries



- Ethiopia - Sudan** – Interconnection started /100 MW/
- Ethiopia – Djibouti-** Interconnection started. /32 MW/
- Ethiopia – Kenya-** Construction started .
- Ethiopia – Somaliland-**
- Ethiopia – South Sudan-** Negotiation started

MoUs signed to Exports to Tanzania, Rwanda, Burundi, South Sudan and Yemen

The National Energy Policy

- ▶ Ensure a gradual **shift from traditional energy to modern energy**
- ▶ Ensure reliable **supply** of energy at **affordable prices**
- ▶ Streamline the development and utilization of energy resources
- ▶ Give priority to indigenous energy resources to **attain self-sufficiency**
- ▶ Increase **energy efficiency**
- ▶ Ensure **environmental sustainability**

The National Energy Policy-Major Objectives:

- ▶ Giving high priority to RE Development and follows climate resilient green economy strategy
- ▶ Considers Hydropower as the backbone of the country's energy generation and maximize its utilization ;
- ▶ Promoting and enhance other renewable energy sources development such as solar, wind, geothermal and bio-mass to increase RE mix there by Improving security and reliability of energy supply
- ▶ To be a hub for clean energy for regional and global cooperation like exchange of knowledge, transfer of technologies, strengthening cross boarder energy trade, etc.
- ▶ Promoting efficient, clean, and appropriate, affordable and adequate energy technologies and conservation measures.
- ▶ Improving the energy efficiency of systems and operations.
- ▶ Exploring for natural gas and other hydrocarbon fuels
- ▶ Encourages Public-Private Partnership in energy generation

Strategies to develop the energy sector

- ▶ Electric Power Generation Construction Programme
- ▶ Electricity transmission lines construction Programme
- ▶ Power Distribution and Expansion Programme
 - Universal Electrification Access Programme (grid-based)
 - Off-grid Rural Electrification
- ▶ National energy regulatory system for electricity and energy efficiency
- ▶ Alternative energy development and promotion
- ▶ Capacity building

Some of the major energy goals of the GTPII(2020)

- ▶ Increase power generation capacity from 2,000 MW to **10,000 MW**
- ▶ Increase grid access from 55 % to **75 %** of the population
- ▶ Double grid connections from 2 million to **4 million** households
- ▶ Increase households supplied with at least one kind of modern, **efficient** and renewable energy **source/technology** from **16 %** to **80 %**
- ▶ More than 1,500 towns and villages electrify/yr.
- ▶ To disseminate more than **3 million solar lanterns** and SHS; 9 million efficient cook stove with the assistance of Development partners (AfDB, WB ..etc)

Alternative Renewable energy development

- ▶ Solar
- ▶ Wind
- ▶ Geothermal
- ▶ Solid waste

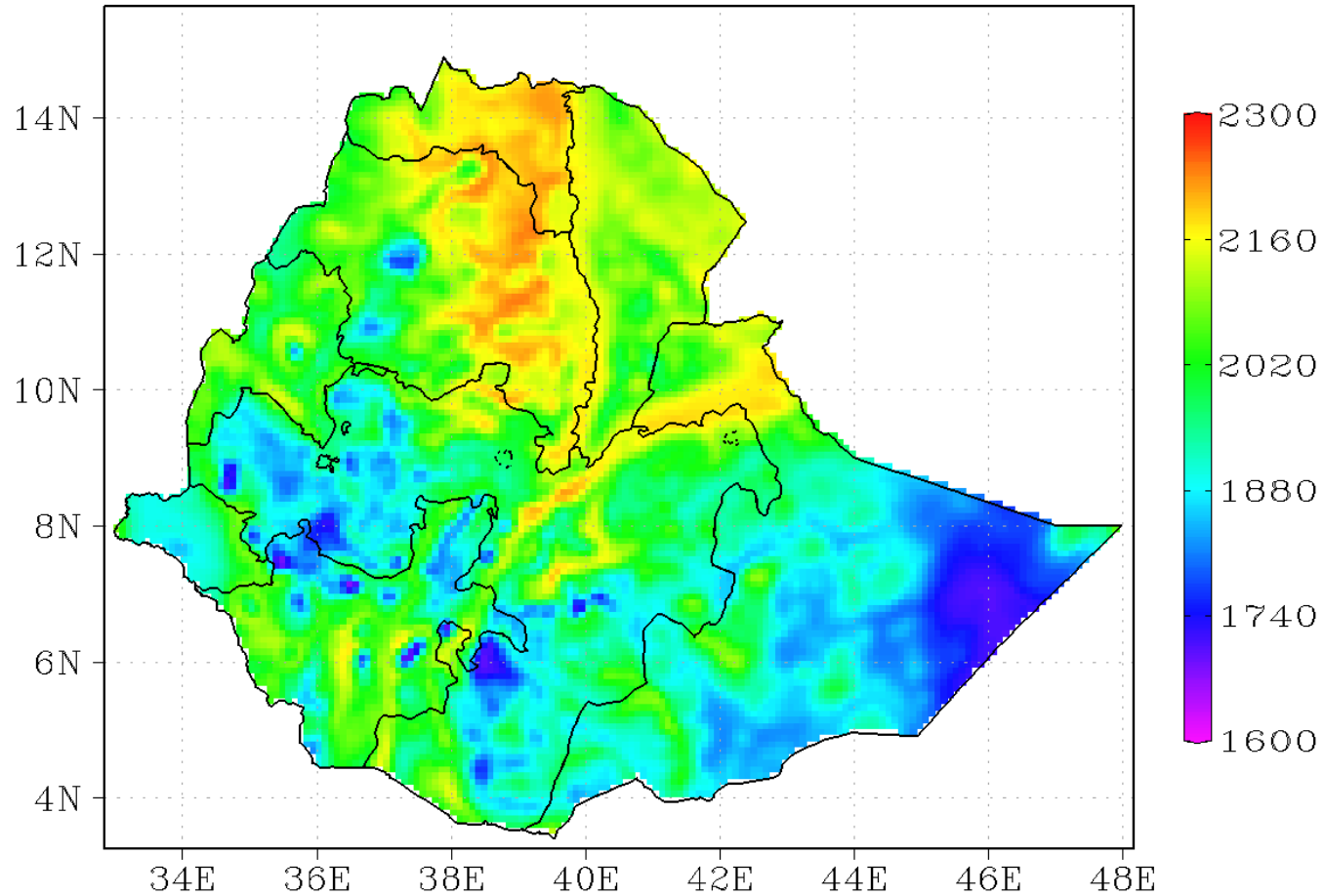
Solar and Wind Resource assessment

- ▶ The government of Ethiopia with the collaboration of Chinese government prepared solar and wind master plan for the whole country
- ▶ Based on the analysis of this master plan:

Ethiopia has a capacity of **1,350 GW** of energy from **wind**.

Ethiopia has annual total **solar** energy reserve of **2.199 million TWh/annum**.

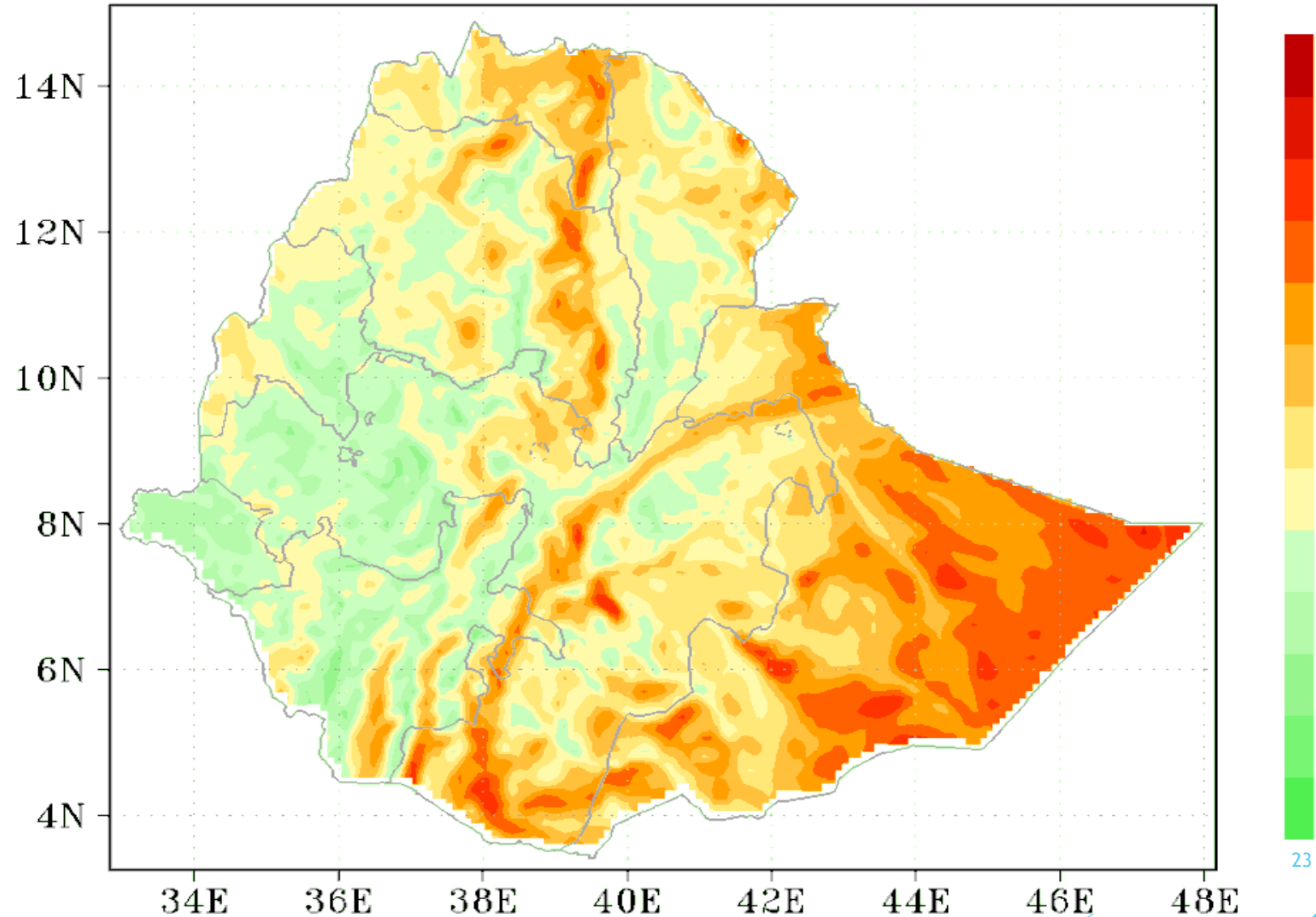
Distribution of average annual total solar radiation in kWh/(m².a) (1980-2009)



List of Recommended sites for short term Solar PV power Development

NO.	NAME	CAPACITY(MW)	AREA(KM2)	REGIONS
1	<i>Debre Berhan Pv power station</i>	10	0.39	Amhara
2	<i>Metehara pv power station</i>	50	1.6	Oromiya
3	<i>Dera solar energy Pv power station</i>	60	1.59	Oromiya
Total		120	3.58	

Distribution of Average Wind Speed in m/s at h=50m, 1,350 GW potential for exploitation (1980~2009)



Potential Installed Capacity in Each State and the Whole Country (Wind energy)

Country/state	Area (1,000 km ²)	Potential installed capacity (GW)
Amhara	155.0	59
Tigray	50.2	78
Afar	94.1	52
SNNP	109.9	26
Gembela	24.6	0
Oromiya	320.0	75
Benshagul	49.5	0
Somali	300.3	1,060
Ethiopia	1,103.6	1,350

ADAMA WIND FARM

51 MW (each 1.5 MW generating unit)



Power Plants currently completed and under construction

No	Hydro Plants	Installed Capacity MW	Average energy (GWh/yr)
1	Genale III	254	1,200
2	Gibe III Completed	1,870	6,240
3	Grand Renaissance	6,000	15,700
	Total	8,124	23,140
Wind Farms		MW	
4	Ashegoda Completed	120	450
5	Adama II Completed	153	479
	Grand Total	8,397	23,514

GIBE III Dam
(1870 Mw Generating capacity)

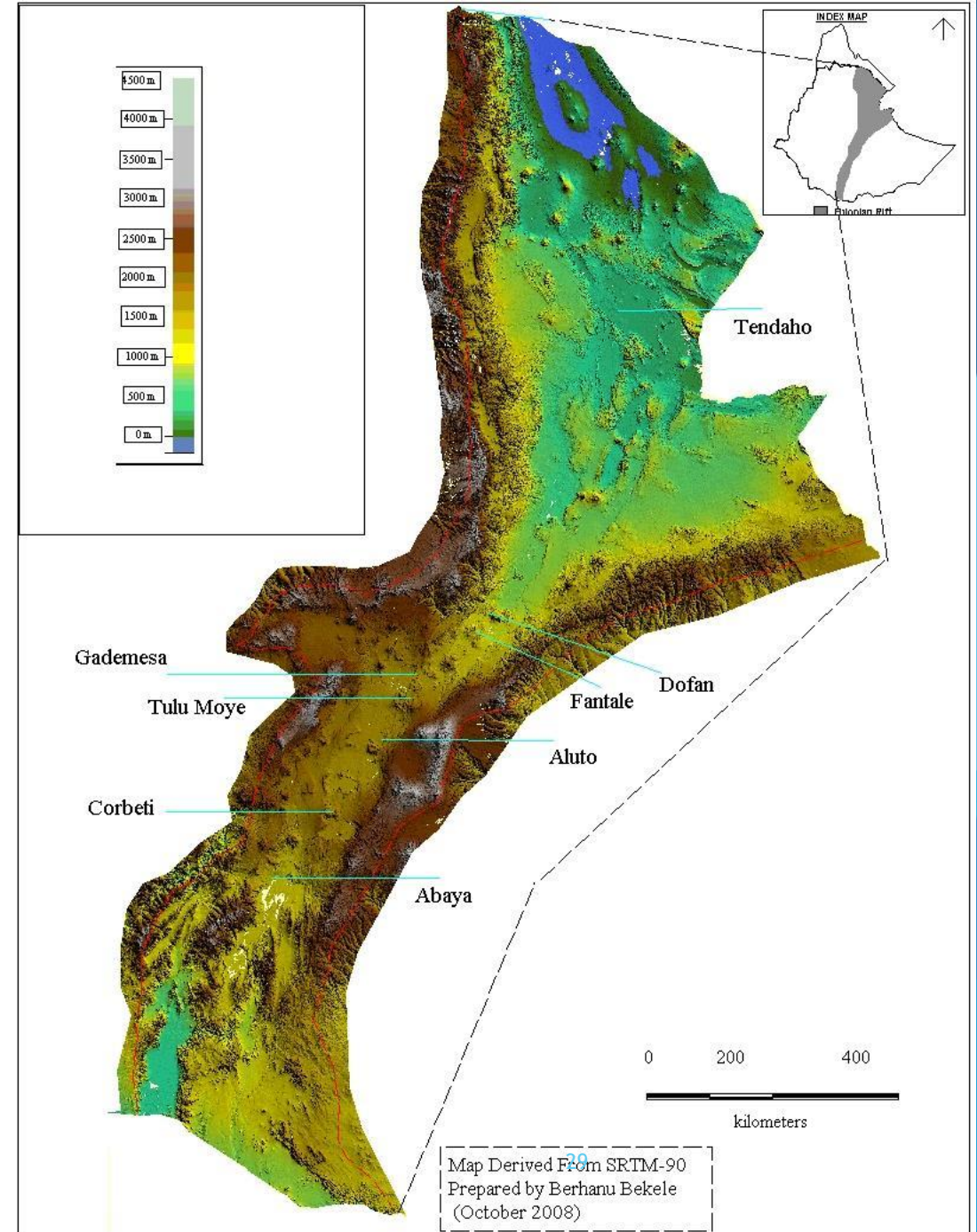


6,000 MW **Grand Ethiopian Renaissance Dam** Project under construction (The nation's project) (>60 % completed)

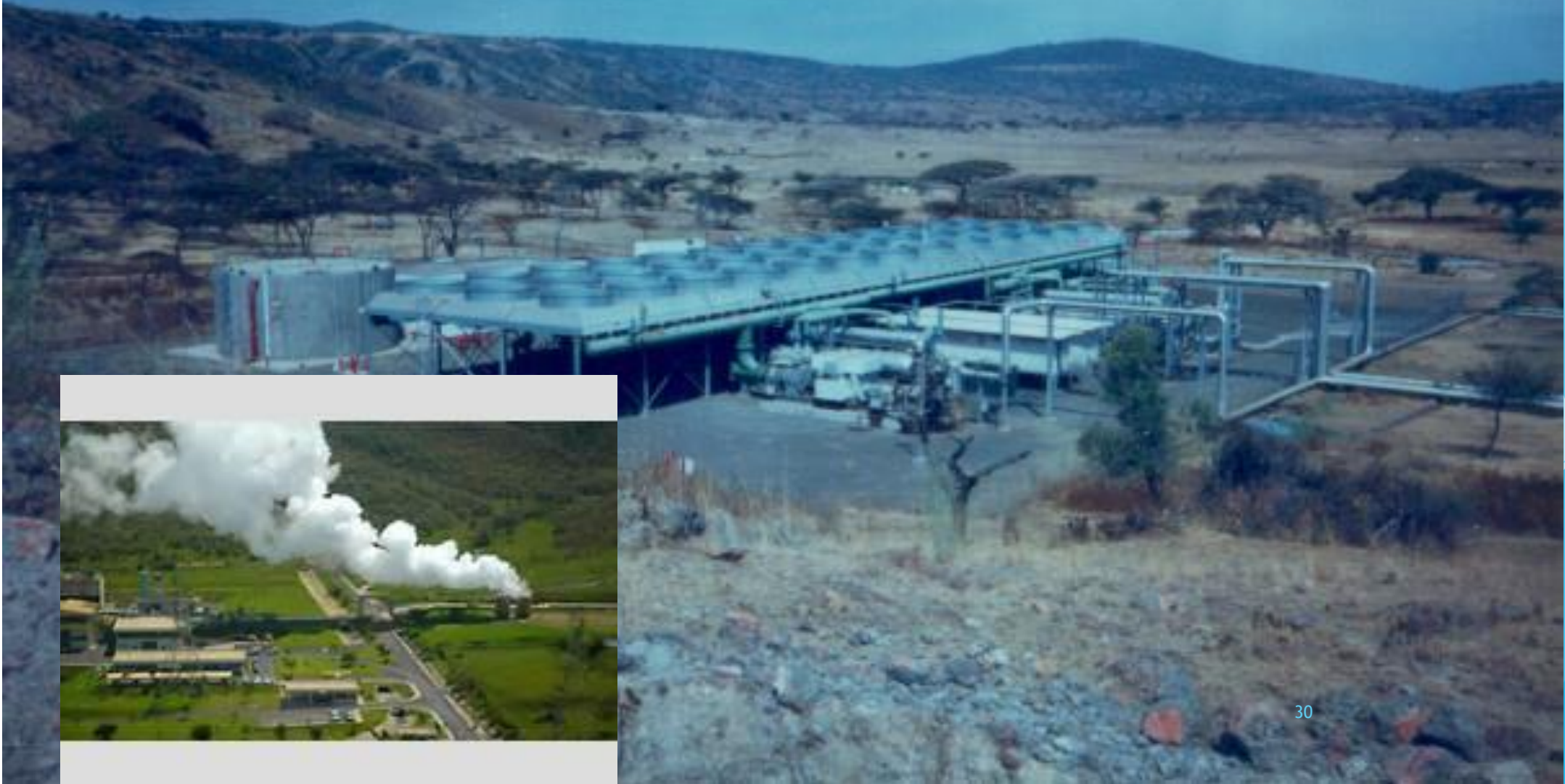


Geothermal Resources

- 16 Geothermal Prospect areas were identified for Electricity generation
- The resource is also for direct uses (agriculture, agro-industry etc)



THE ALUTO-LANGANO GEOTHERMAL 7.3 MW PILOT POWER PLANT



Solid Waste-to-electric power generation

Reppi Waste to Energy Project: (Removal of Waste)

50 MW Installed Capacity

Municipal Solid waste (Addis Ababa)

The first W to E Plant in Africa

95 % completed



Planned Power Generation Projects

Inline with the 25 Years Power Sector Master Plan

- ▶ Hydro = 11,015 MW
- ▶ Wind = 1,520 MW
- ▶ Geothermal = 1,270 MW
- ▶ Solar = 300 MW
- ▶ Biomass = 420 MW

- ▶ **Total** = **14,615 MW**

Challenges

- ▶ Financial source
- ▶ Institutional capacity
- ▶ Human capacity
- ▶ Technology challenge particularly for off-grid customers

Ethiopia will be climate resilient and have zero carbon growth by 2025

Thank you

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