Global Energy Resource

- Energy is one of the major inputs and drivers of the economic development of any country.
- In developing countries, the energy sector assumes a critical importance in terms of ever increasing energy needs and the huge investments they require.
- Global energy consumption is increasing at an annual rate of 1.5% while available resources remain limited.
- Fossil fuels, particularly crude oil, are currently the primary energy source that fuels our planet, accounting for some 80% of global energy consumption.
- Energy consumption has a significant impact on our natural environment.

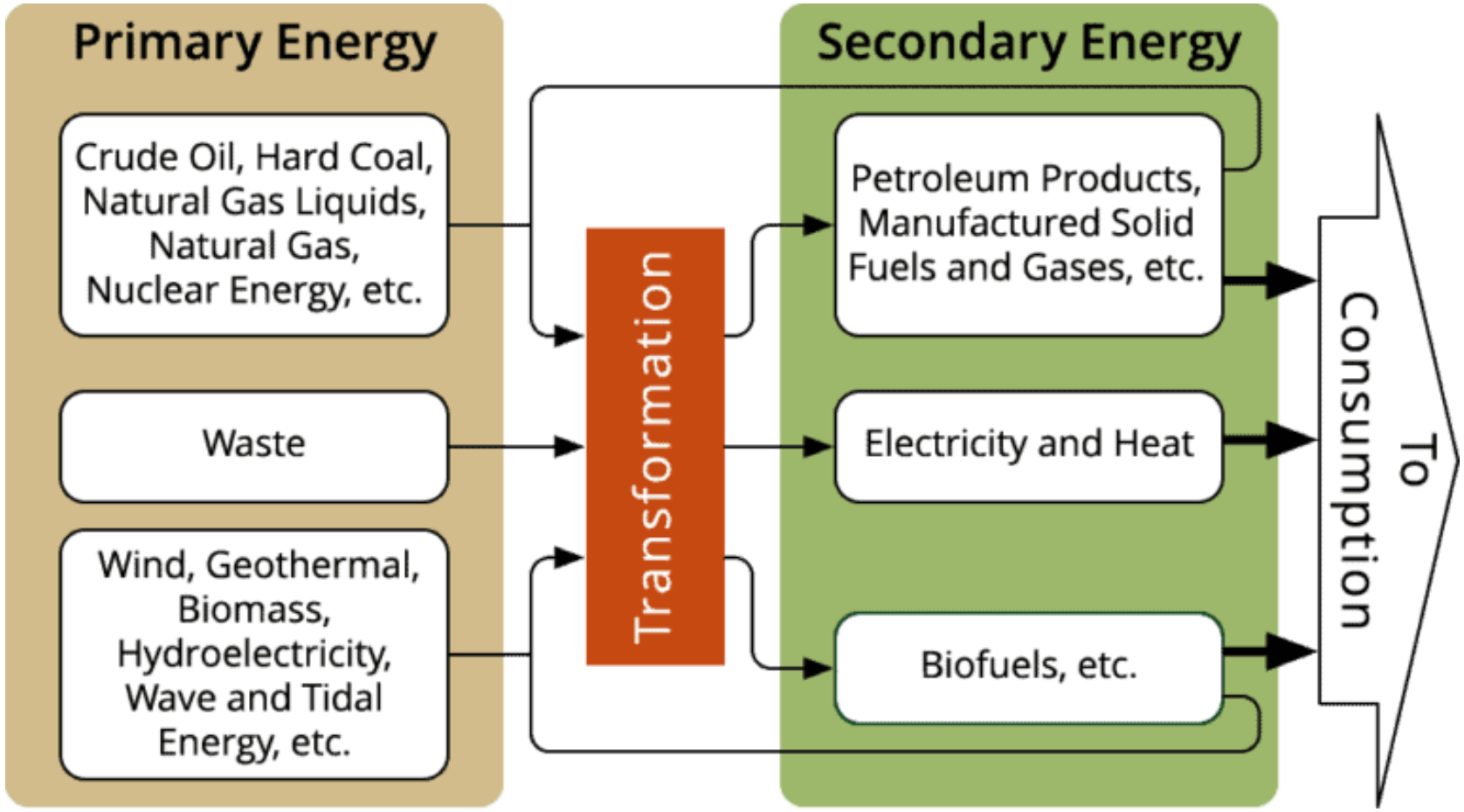
Classes of Energy

- Energy that we use can be classified into several types based on the following criteria:
  - Primary and secondary energy
  - Renewable and non-renewable energy
  - Commercial and non-commercial energy

Primary and Secondary Energy

- Primary energy refers to all types of energy extracted or captured directly from natural resources.
- Primary energy can be further divided into two distinctive groups:
  - Non-renewable (fossil fuels, e.g. coal, crude oil and its products, natural gas; nuclear, etc.)
  - Renewable (solar, wind, geothermal, tidal, biomass, hydro, etc.)
- Primary energy sources are converted in industrial utilities into secondary energy sources; coal, crude oil or natural gas, for example, can be converted into steam and electricity.

Primary and Secondary Energy



Commercial and Non-commercial Energy

- Commercial energy is energy available in the market for a defined price irrespective of the method of production. All forms of energy that are traded as commodities, whether from fossil fuels, nuclear or renewable sources, can be classified as commercial energy.
- The most popular forms of commercial energy are electricity, coal, refined petroleum products and natural gas. They are the predominant sources of energy for both industrial and household needs.
- Non-commercial energy are sourced within a community and its surrounding areas, and are not traded in the commercial market. They include fuels such as cattle dung and agricultural (green) wastes, which are traditionally gathered and used mostly in rural households.
- Non-commercial energy is often ignored in compiling a country's energy statistics.

Energy And The Environment

Weather and climate are not the same

- Weather – The condition of the atmosphere at a particular place during a short period of time
- Climate – The weather patterns typical for an area over a long period of time

Climate Change

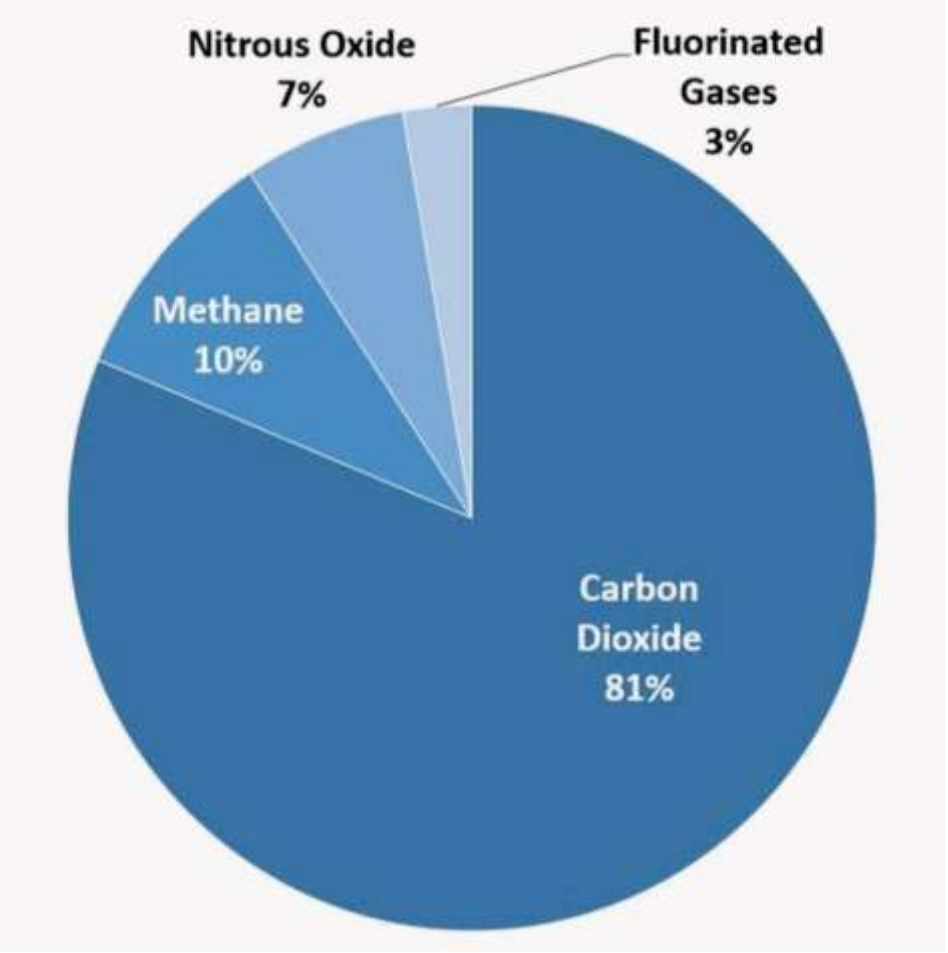
- Climate Change refers to a long-term changes in global temperatures and other characteristics of the atmosphere
- Climate has changed throughout Earth's long history, but this time its different.
- It affects our global environment and our social, economic and even political life.

Cause of Climate Change

- The greenhouse effect is the warming of the Earth's surface and the air above it. It is caused by gases in the air that trap heat from the sun. This heat trapping gases are called **greenhouse gases**.
- Greenhouse gases are gases in Earth's atmosphere that trap heat. They let sunshine pass through the atmosphere, but they prevent the heat that the sunshine bring from leaving the atmosphere.
- The most common greenhouse gases are Carbon dioxide, Methane, Nitrous oxide and chloroflorocarbon

The greenhouse effect

Main Greenhouse Gases



Main Greenhouse Gases

Greenhouse gas	Major Sources
Carbon Dioxide	Fossil fuel Combustion Deforestation Cement production
Methane	Fossil fuel production Agriculture Landfills
Nitrous Oxide	Fertilizer Application Fossil fuel combustion Industrial processes
Chlorofluorocarbon	Refrigerants

Effects of Climate Change

- Rising temperatures
- Rising sea levels
- Unpredictable weather patterns
- Increase in extreme weather events
- Spread of diseases
- Land degradation
- Loss of wildlife and biodiversity

Effect of Climate change in Nigeria

Social Impacts of Climate Change

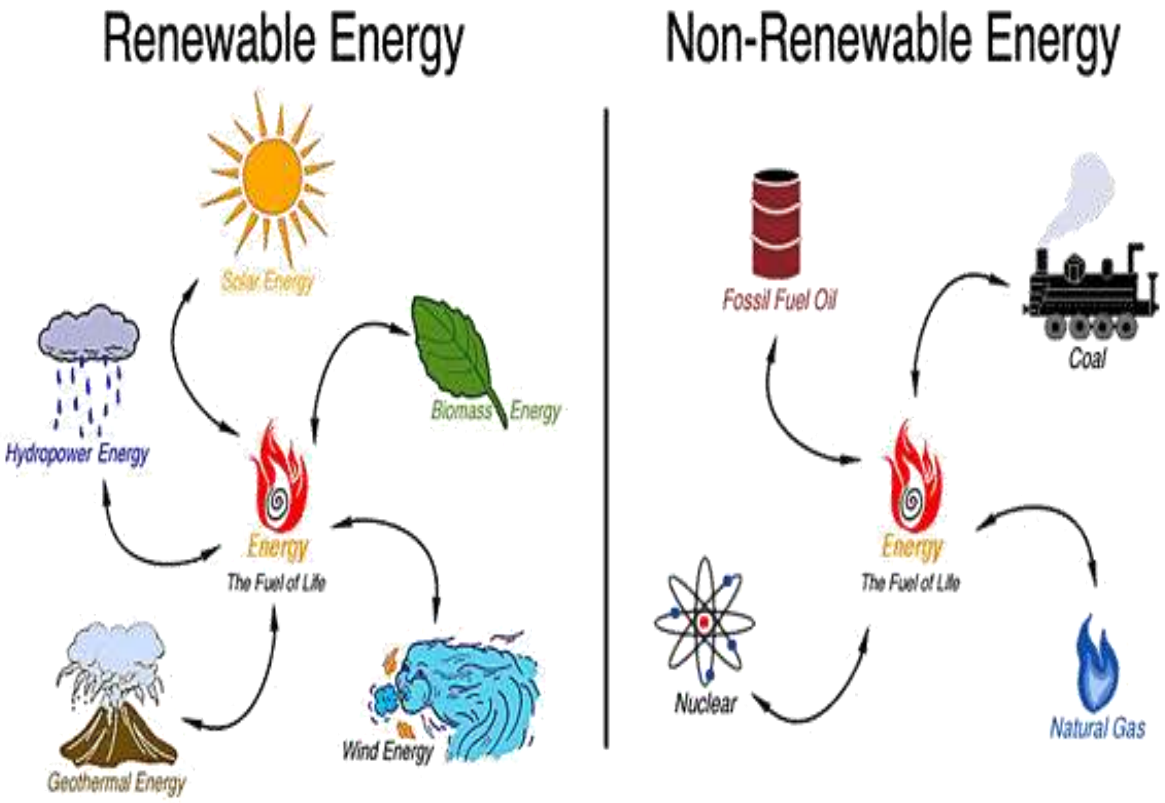
- Displaced people
- Poverty
- Loss of livelihood
- Hunger
- Malnutrition
- Increased risk of diseases
- Global food and water shortages
- Conflicts

Ways of Combating Climate Change

- Reducing emissions
- **Saving energy**
- Putting the 3Rs of sustainability into practice
- Acting against forest loss
- **Investing in renewable energy**

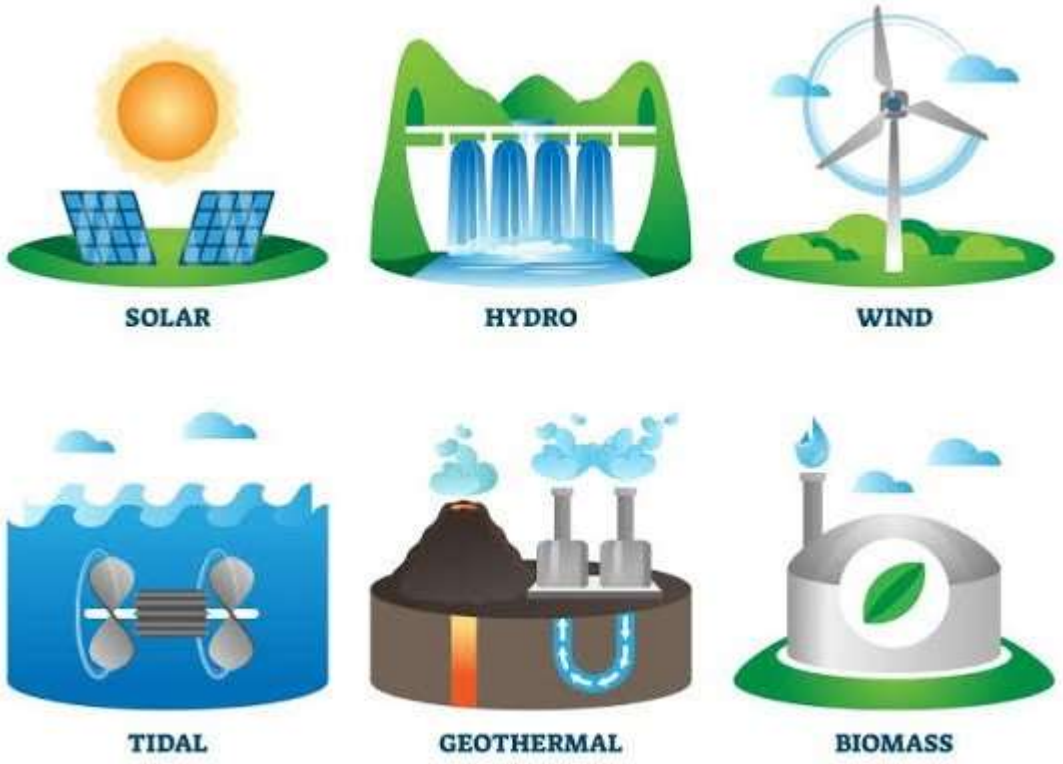
Energy

- Energy sources are divided into two groups: Renewable energy and Non-renewable energy
- Renewable (an energy that is replaced naturally and therefore used without the risk of finishing)
- Non-renewable (an energy source that cannot be easily replenished):



Renewable Energy Technologies

- Solar Energy and Solar thermal Power (Radiation from the sun)
- Wind(Changes from atmospheric pressure)
- Hydropower(Water in rivers, lakes, reservoirs)
- Geothermal(Heat from the earth’s crust)
- Biomass(Organic matter)
- Ocean thermal Power
- Tidal Energy(Upward and downward movement of the sea level)
- Wave Energy(Wind blowing over the surface of the sea)



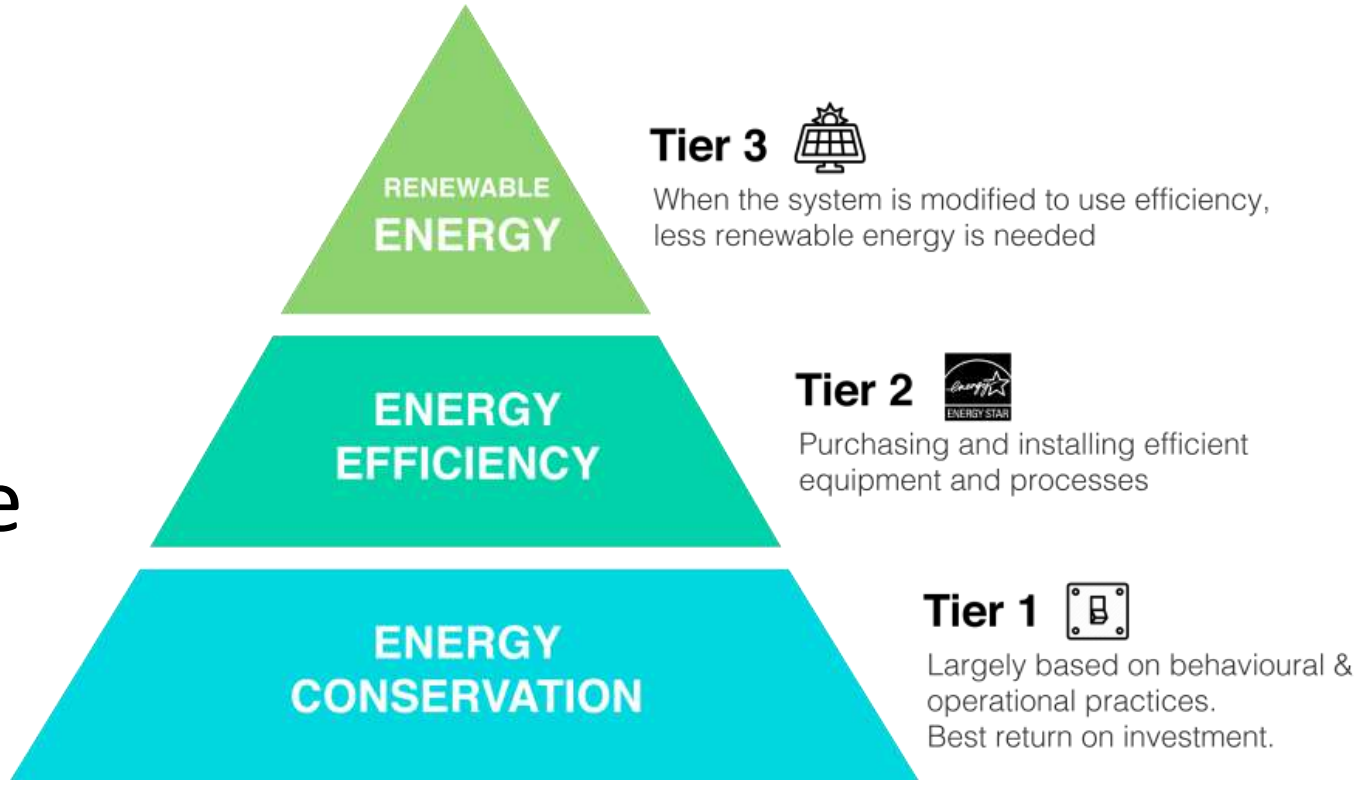
Why Renewable Energy

Advantages of Renewable Energy

- Eco-friendly
- Boosts public health
- Low reliance on foreign energy sources
- Empower rural dwellers
- Waste Recycling

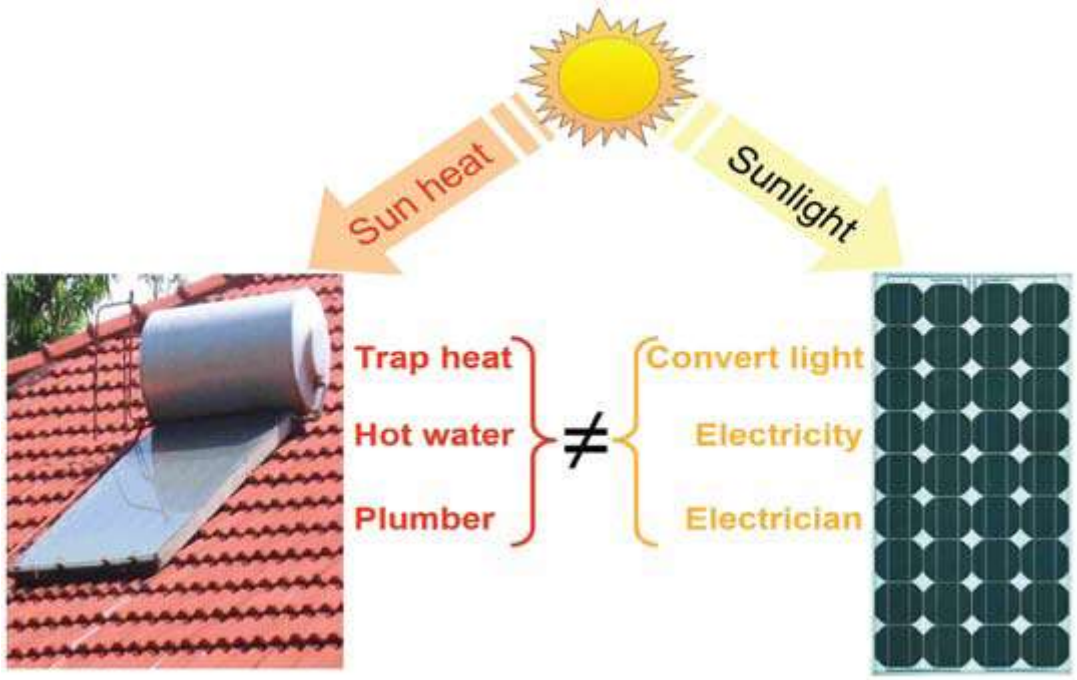
Energy Efficiency Pyramid

- The energy efficiency pyramid shows the processes and priorities to adopt before considering a renewable energy solution



Solar Energy

- The energy released from the sun is known as **Solar Energy**.
- It is renewable, free, widely available and clean form of energy that is currently in use by many home and business owners for variety of purposes.
- There are two main types of solar energy technologies - Photovoltaics (PV) and Concentrating Solar-thermal power.



Advantages of Solar Energy

- **Renewable and sustainable**
- **Reduced electricity bill**
- **Low maintenance**
- **Environmentally friendly**
- **PV operates even in cloudy weather conditions**

Disadvantages of Solar Energy

- **High installation cost**: The initial cost of purchasing and installing a solar system is fairly high
- **Production at night**: At night, no energy is produced so battery back-up system is required.
- **PV generates direct current**: Special DC appliances or inverters are needed.
- **Weather dependent**: Weather and location on the globe play roles in how efficient a solution can be provided by solar energy.
- **Uses a lot space**: The more electricity you want to produce, the more solar panels you will need, as you want to collect as much sunlight as possible

Some applications of Solar Energy

- Power generation
- Homes
- Heating
- Refrigeration
- Lighting
- Ventilation
- Transportation
- Power pumps
- Cooking food
- Distillation of water
- Security

karadzhalovo Solar Park

- Location: Bulgaria
- Capacity: 60.4MW
- No of solar panels: 214,000
- Cost of construction: 248million dollars

Noor CSP Plant

- Location: Morocco
- Capacity: 580MW
- Beneficiaries: Over 1million people

BUK Solar Power Plant

- Location: Nigeria
- Capacity of solar panel: 3.5MWp
- No of solar panels: 10,680
- Battery storage capacity:8.1MWh
- Backup generator: 2.4MW

Solar Refrigerator and freezer

Solar Reading Light and Flood Light

Solar Home Systems

Solar kiosk

Solar Water heater

Solar Air Conditioner

Hyundai Solar Hybrid Car

Energy Access and Poverty Alleviation

- “Energy poverty” is a situation where people are not tied to an energy grid, using dirty, polluting fuels and spend much time collecting fuel to meet their needs. The living situation diminishes health, income and happiness.
- Energy Access is a situation where households have reliable and affordable access to both clean cooking facilities and Electricity which is enough to supply a basic bundle of energy services.
- Nearly 1.6 billion people still have no access to electricity.

Status of Nigeria's Power Sector

6GW

operational grid capacity for population of over 200 million

80%

of operational energy capacity comes from off-grid diesel/petrol generators

90mil

people in Nigeria are without access to grid electricity

Source: Nigeria Energy Transition Plan

Solar Potential In Nigeria

- Nigeria has enormous solar energy potential , with fairly distributed solar radiation averaging 19.8Mj/m^2/day and average sunshine hours of 6h/day
- The assumed potential of concentrated solar power and photovoltaic generation is around 427,000MW.
- According to estimates, the designation of only 5% of suitable land in central and northern Nigeria for solar thermal would provide a theoretical generation capacity of 42,700MW

Nigeria's Renewable Energy Potential

Innovative Clean Energy Solutions In Nigeria

Asteven Solar PayGO solar system

AEFUNAI Solar Power plant

Asteven Solar tunnel

Mini-Grid in Northern Nigeria

Solar Off-grid estate in Abuja

Asteven Solar Off-Grid HQ Ogun

Innovative Clean Energy Solutions In Nigeria

Generator Assembling plant in Lagos

Total Petrol station

Solar Powered Cold Storage

Montessori School in Lagos

Global trend

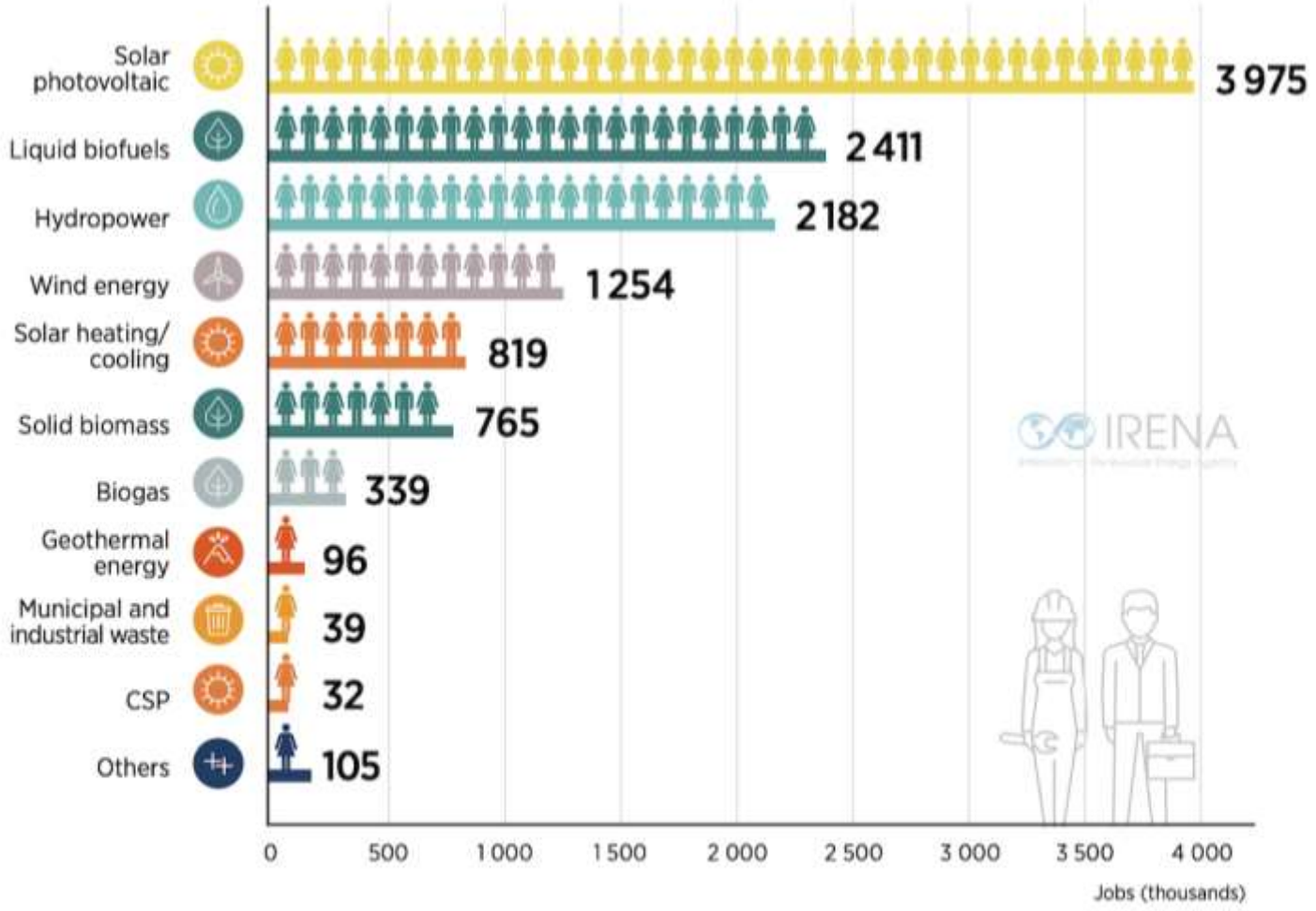
Google	Announced that it has reached 100% renewable energy target
facebook	Its operations are supported by 100% renewable energy
YAHOO!	Powered mainly by wind energy
amazon	Installed the largest rooftop solar array in Europe
apple	Helping to create 1.2GW of clean power

Career Prospects in the RE Sector

Source: IRENA

The rise of sustainable energy solutions has increased the demand for jobs in the sector

Career Prospects in the RE Sector



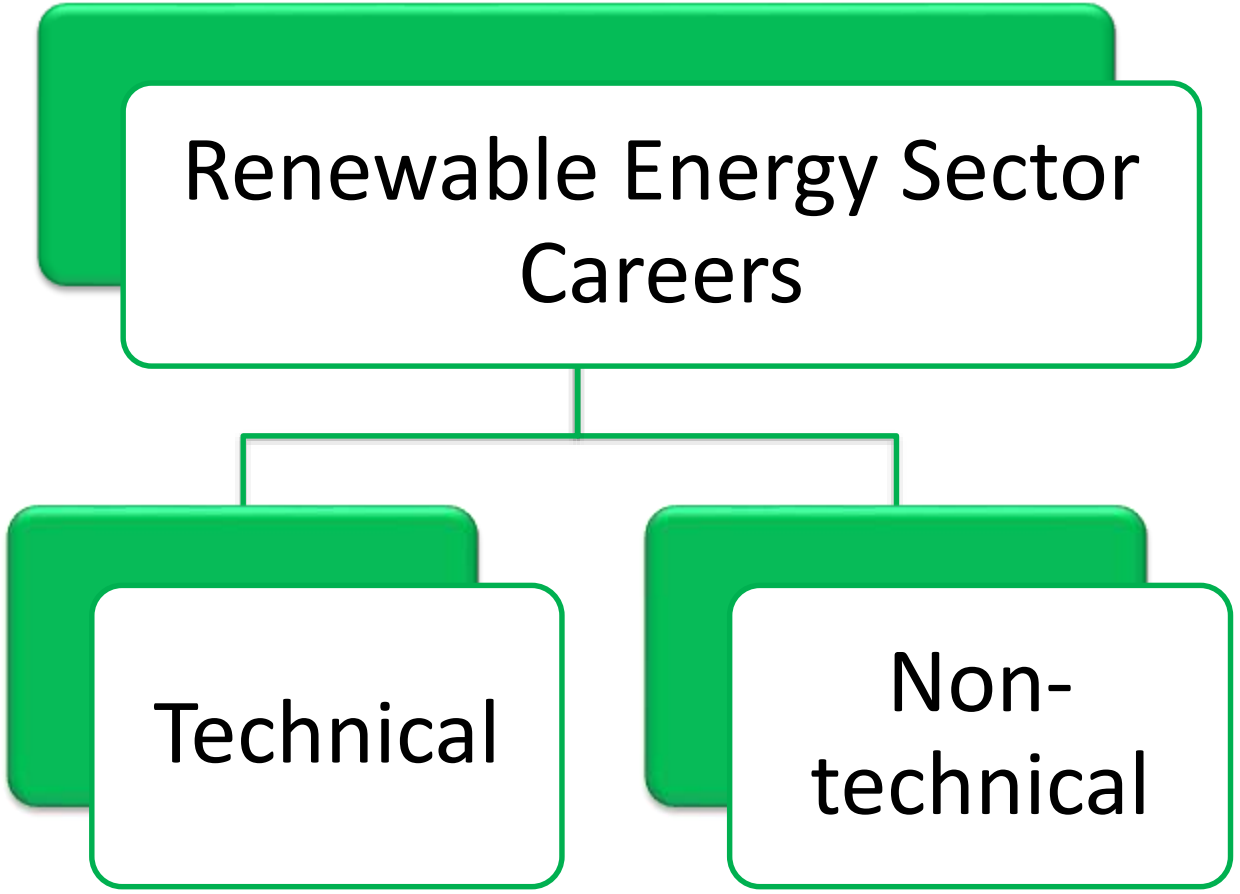
Note: CSP = Concentrated solar power. "Others" include tide, wave and ocean energy, and jobs not broken down by individual renewable energy technologies.

Source: IRENA Jobs database.

Career Prospects in the RE Sector

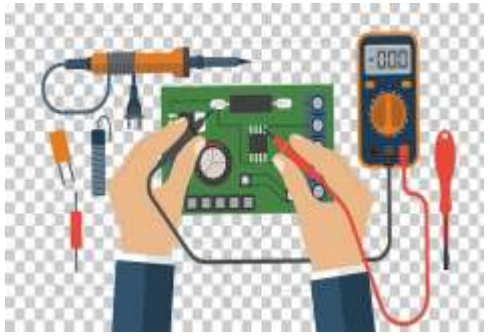
Lack of knowledge and technical skills are major barriers to the dissemination and usage of renewable energy and energy efficiency technologies in Africa

Career Prospects in the RE Sector



Technical Jobs In the Renewable Energy Sector

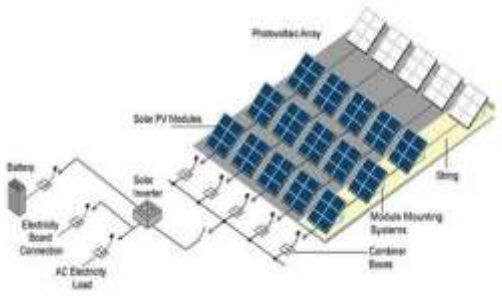
Solar Installation



Solar systems and inverter repairs

Operations and Maintenance

Solar PV Manufacturing and Assembling



Solar PV Design

Green Efficiency Energy Services

Energy Efficiency Specialist

Non-Technical Jobs In the Renewable Energy Sector

Management and Business Admin

Financial Services

Research and Development

Solar Sales and Marketing

Legal Services

Project Development

Non-Technical Jobs In the Renewable Energy Sector

Pico Solar appliances and solar home system market accounts for 98% of the direct informal jobs in the sector

Mini-grids will account for 40% of the informal jobs in the sector by 2023-2024

Reasons to consider a career in the solar industry

- The solar energy sector offers positions in different fields.
- Growth in the solar energy field is practical exponential
- You will contribute to improving the environment
- A solar career is the perfect path for those in dying industries.

Positioning and penetrating into the RE sector

Build capacity – technical and non-technical skills in the sector

Research and learn about RE trend

Proactiveness in thinking, networking and pursuing opportunities

Innovation and problem solving – think and execute ideas