



*Empowered lives.
Resilient nations.*

Just Energy Transitions Africa

Jan VAN DEN AKKER

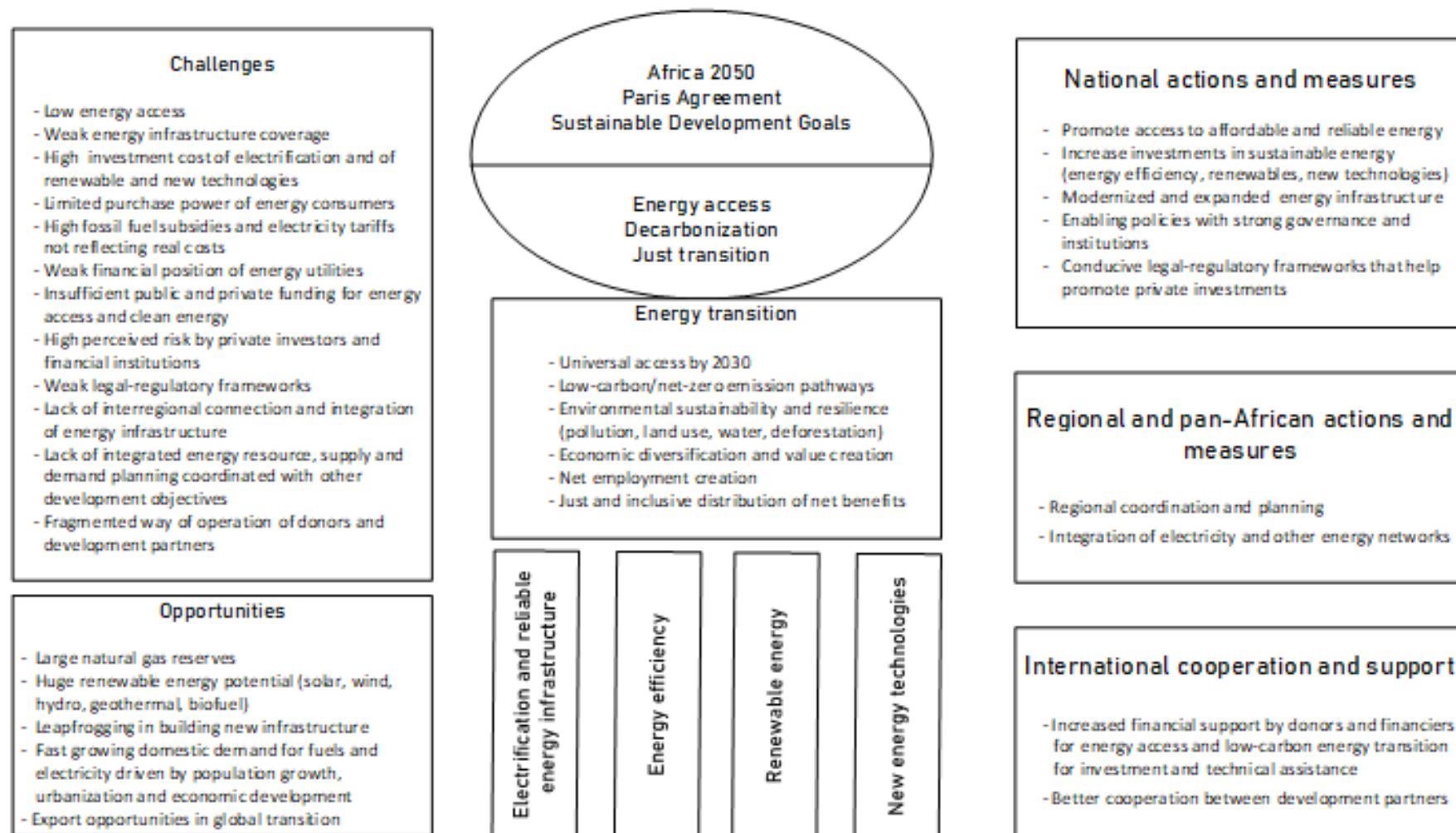
18 October 2022

Contents of the report

- Introduction
- Energy in Africa: situation and trends
- Towards an energy transition, globally and in Africa
- Elements of a just energy transition
- Enabling the just energy transition
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- Case studies

Contents - overview

Challenges and opportunities, goals and main elements in the energy transition and needed actions

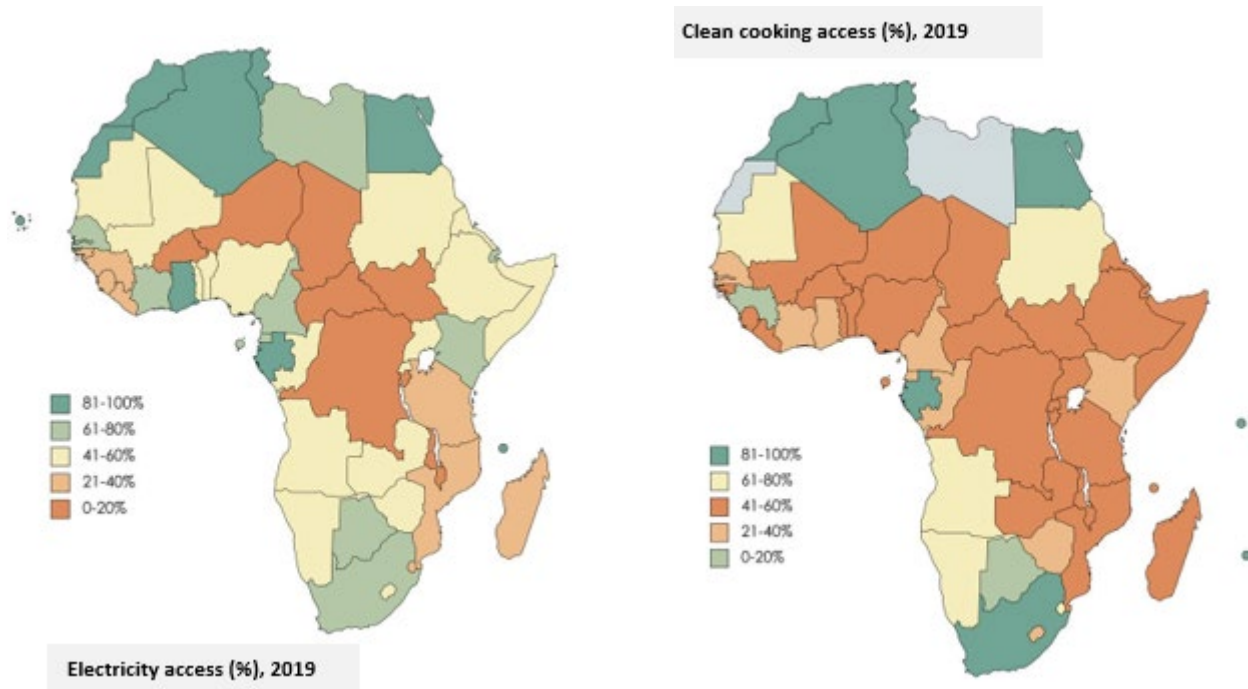
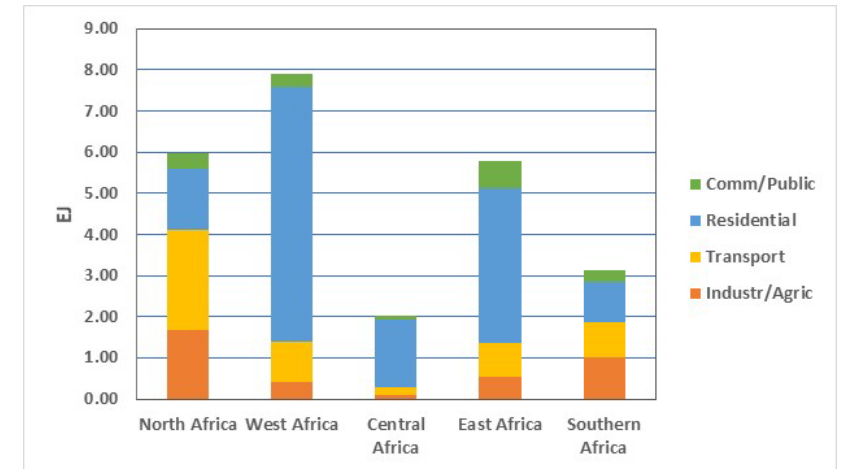
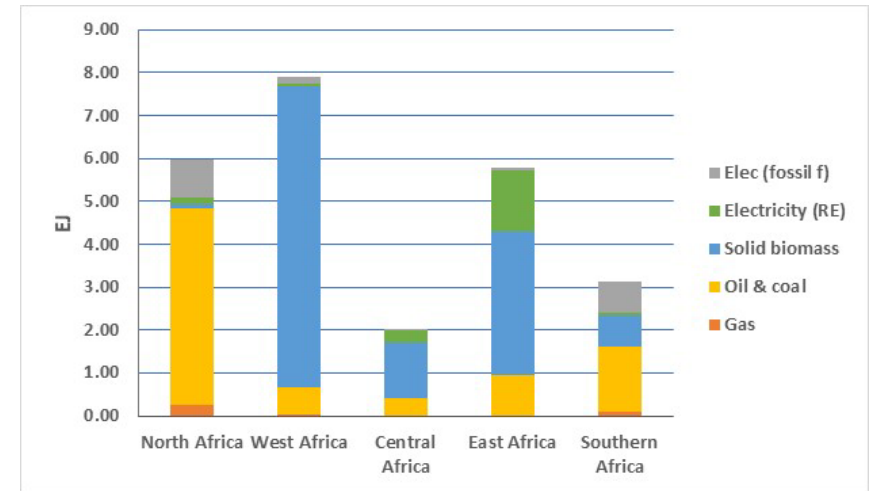


1. Introduction

- International context
 - Sustainable development Goals (SDGs)
 - SDG 7 (by 2030): 1) universal energy access for all by 2030, 2) increase substantially the share of renewable energy, 3) double rate of improvement in energy efficiency
 - Other SDGs
 - Climate change and Paris Agreement
 - Maintain average global temperature rise to “well below 2° C above pre-industrial levels
 - Pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels”, requiring reaching global carbon net neutrality soon after 2050
 - African Union Agenda 2063
 - By 2063, Africa’s energy systems will largely be based on renewable energy resources coupled with a strong and to a considerable extent localized manufacturing sector, highly qualified human resources and integrated energy infrastructure for both centralized and decentralized energy system

2. Energy in Africa

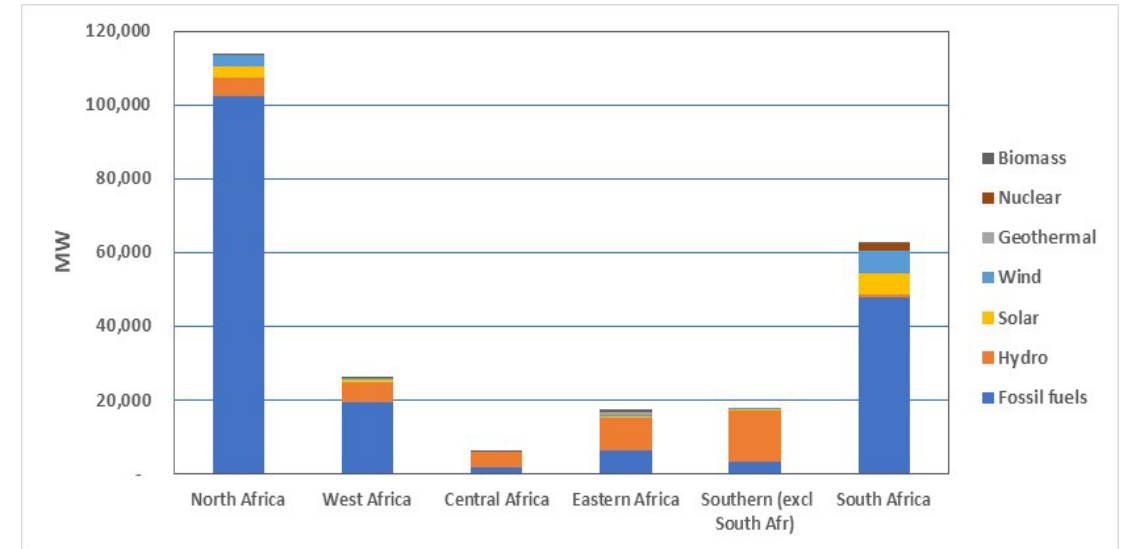
- Energy access
 - About 560 million people w/o access to electricity
 - About 940 million people w/o access to clean cooking fuels
 - Regional differences and between countries



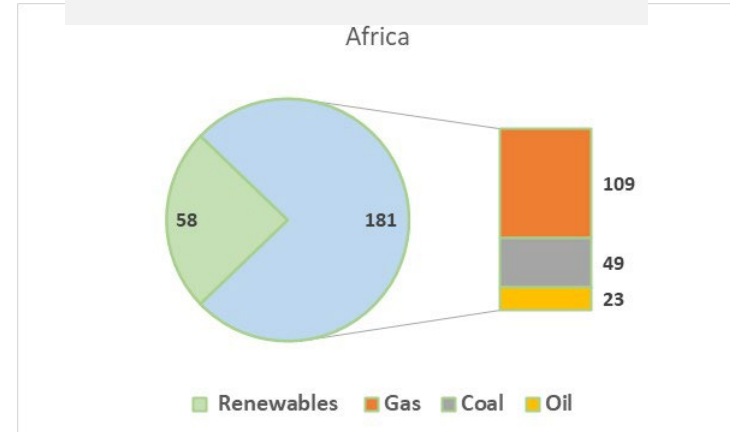
- Energy mix
 - Large share of fossil fuels for direct consumption and power generation
 - Dominant role of traditional biomass in residential sector

2. Energy in Africa

- Low per capita energy consumption
 - Global: 1920 koe
 - Sub-Saharan (w/o South Afr): 870 koe
 - South Africa: 2696 koe
 - USA: 6804 koe
- Energy mix
 - Share of renewable energy (hydropower) differs per region and per country
- Fossil fuel use and production unevenly distributed
 - Fossil fuel exporters and importers



Installed power generation capacity (GW), 2020



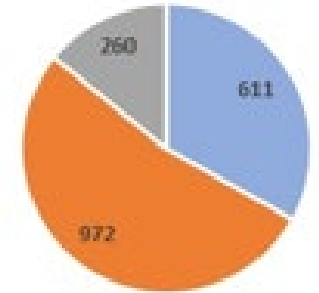
Crude oil (Mtons)		Oil products (Mton)		Natural gas (billion m ³)		Coal (million tons)	
<i>Demand</i>	134	<i>Demand</i>	187	<i>Demand</i>	160	<i>Demand</i>	215
<i>Production</i>	395	<i>Production</i>	111	<i>Production</i>	248	<i>Production</i>	276
- Nigeria	96	- Algeria	39	- Algeria	97	- South Africa	256
- Algeria	66	- Egypt	27	- Nigeria	47	- Mozambique	10
- Libya	53	- South Africa	19	- Egypt	62		
- Egypt	32	- Nigeria	3	- Mozambique/Tanzania	5		
<i>Exports</i>	294	<i>Exports</i>	38	<i>Net exports</i>	88	<i>Exports</i>	75
<i>Imports</i>	33	<i>Imports</i>	114	- LNG exports	51	<i>Imports</i>	14

2. Energy in Africa

- Energy situation (around 2020)
 - Issues
 - Relative low investment in energy access and in power
 - To achieve electricity access in Sub-Sah A: about USD 24 billion annually
 - Relative low private investment
 - Efficiency in power T&D
 - Financial situation of power utilities and enabling environment for private investors
 - Lack of integration (power pools) and gas infrastructure
- Issues and questions:
 - Grid extension vs minigrid and stand-alone electrification options
 - Role of improved stoves/biomass vs LPG
 - Level of penetration of variable solar and wind in power supply
 - Role of natural gas
 - Investments in new technologies

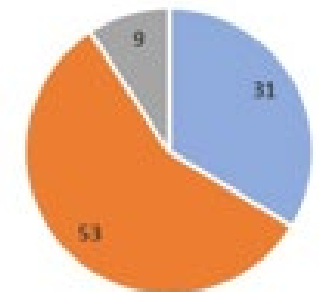
Energy investments

Global, billion, USD (2019)



■ Renewables; efficiency; storage
■ Fossil fuel: supply and power
■ Networks

Africa, billion, USD (2019)

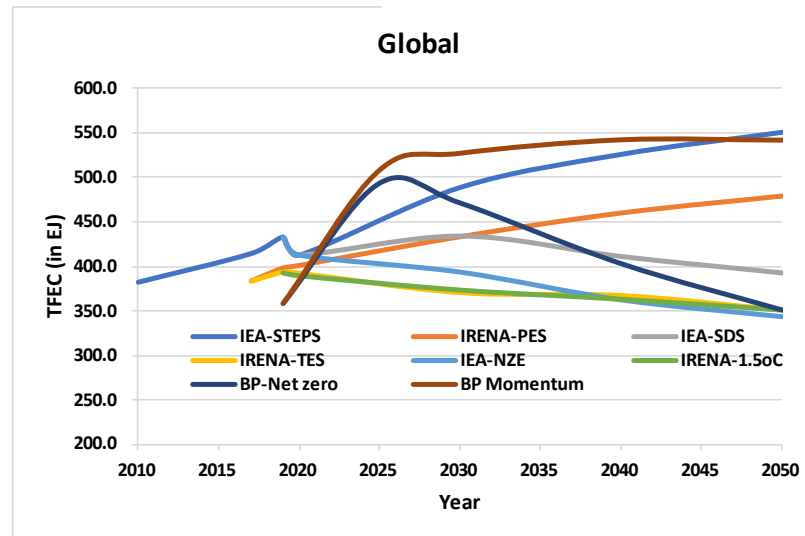
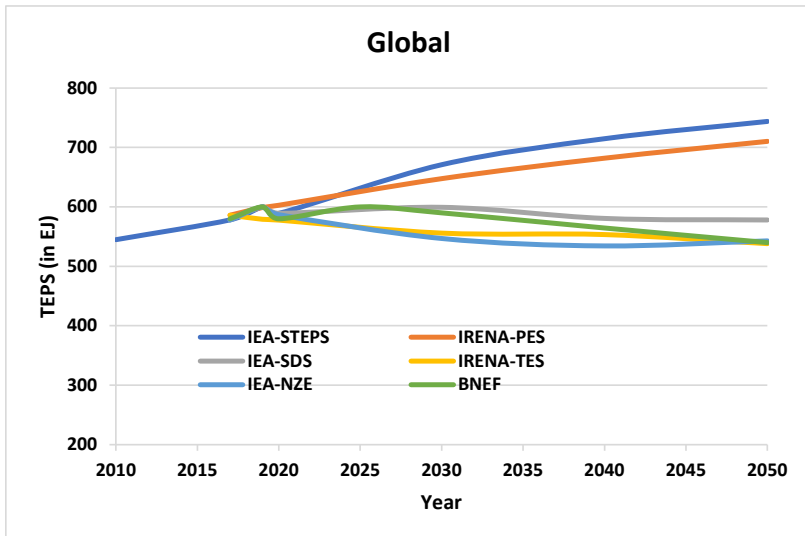
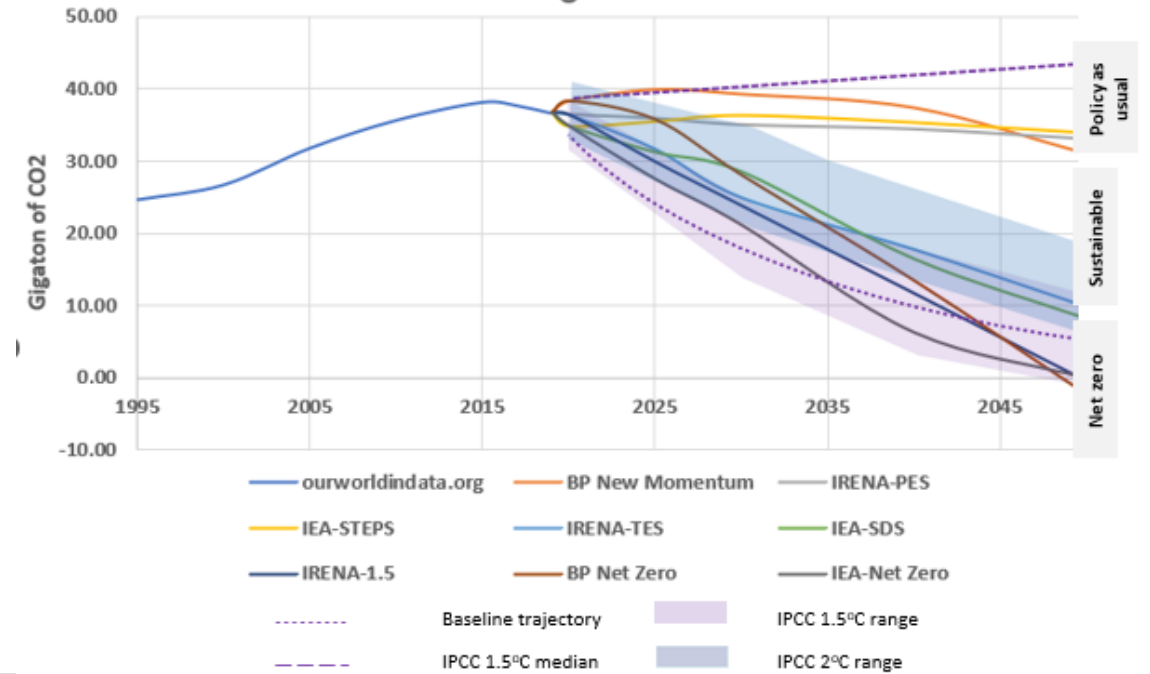


■ Renewables; efficiency; storage
■ Fossil fuel: supply and power
■ Networks

3. The energy transition

- Scenarios with low-carbon or net zero pathways
 - IEA, IRENA, MultiConsult/AfB, NZFR and other
 - Can be grouped in two or three types
 - Policy-as-usual;
 - Low-carbon/sustainable; Net zero emissions by 2050

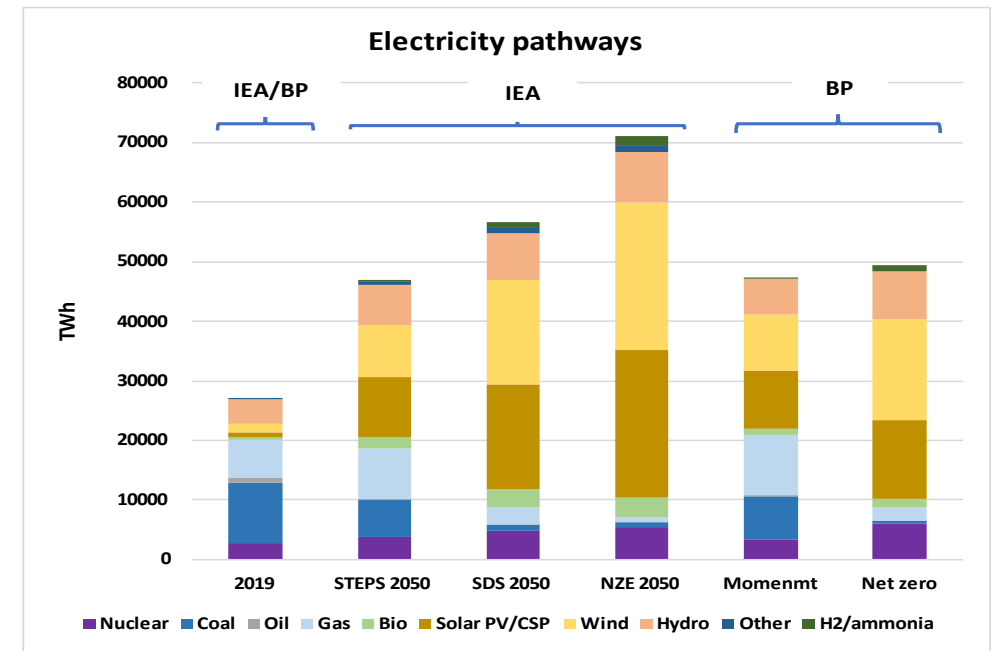
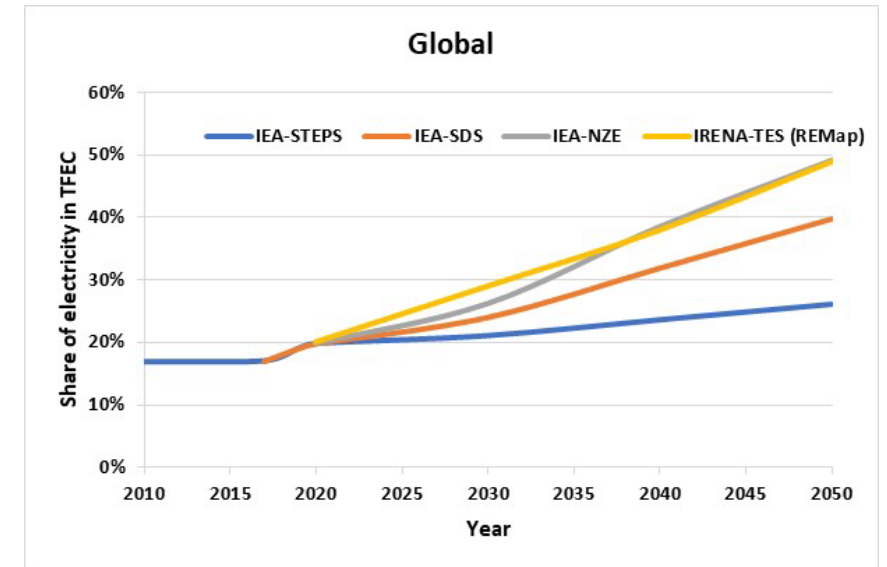
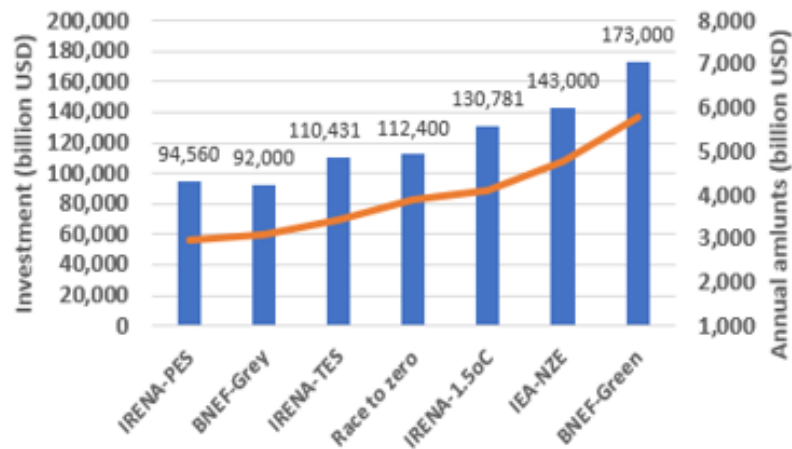
Exhibit 38 Carbon emission reductions in various scenarios compared with 'Paris-consistent' IPCC scenarios



3. The energy transition

- Global – sustainable / net zero
 - Higher end-use efficiency, flattening demand curve
 - Electrification of sectors
 - Higher share of renewables in heat and electricity
 - New energy carriers and technologies
 - Hydrogen and derived fuels
 - Electric vehicles and biofuels for transport
- The more low carbon the pathway, the more investment will be needed

Exhibit 32 Global total and annual energy investments 2017/20-2050



3. The energy transition

- Africa – sustainable / net-zero
 - Africa has large renewable energy resources
 - Universal access by 2030 in all ‘sustainable / net-zero pathways’
 - Energy demand in Africa will grow rapidly, due to
 - Expanded access to modern energy
 - population growth,
 - economic development
 - Electrification of demand
 - universal electricity access,
 - relative higher share of electricity in residential, productive and transport

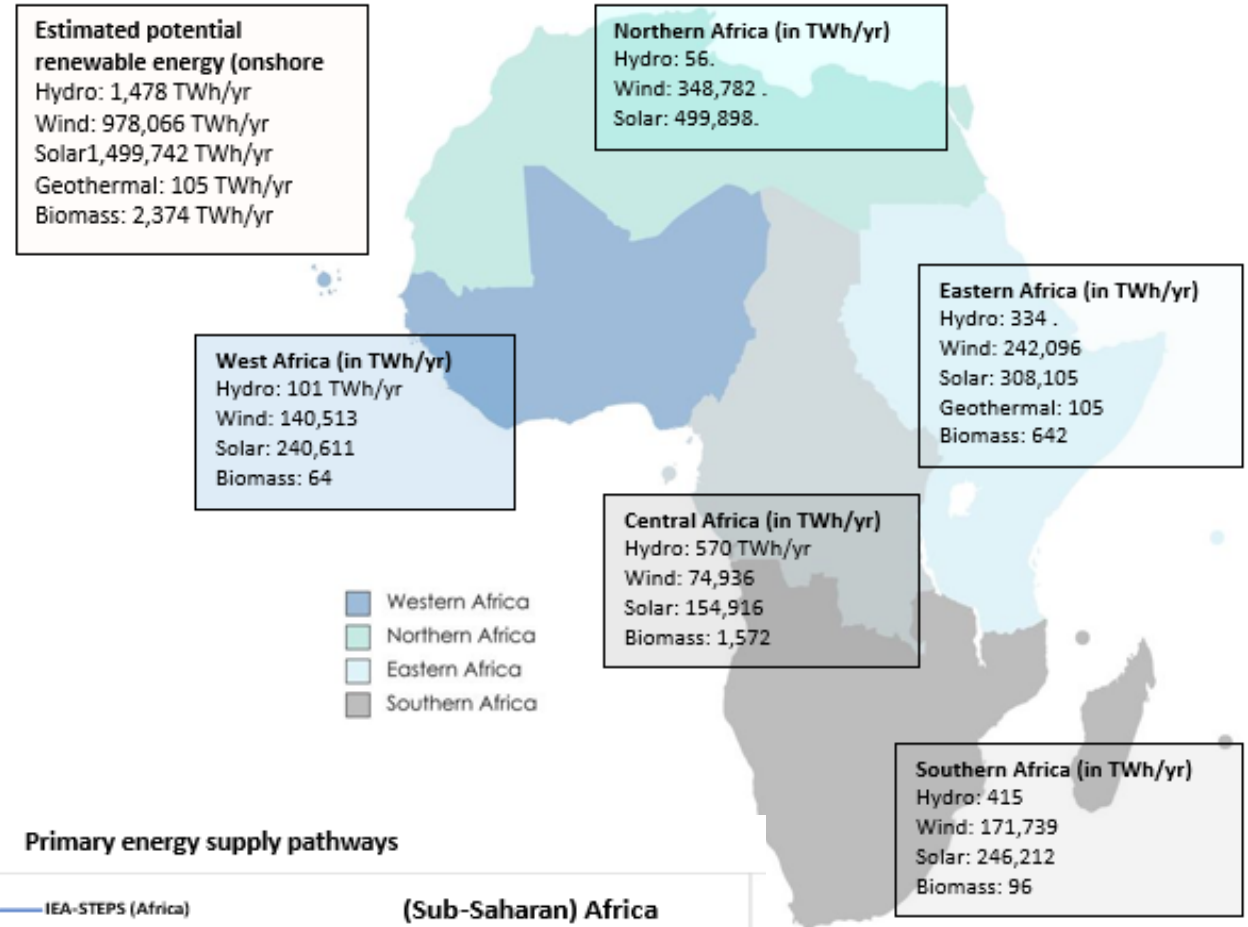
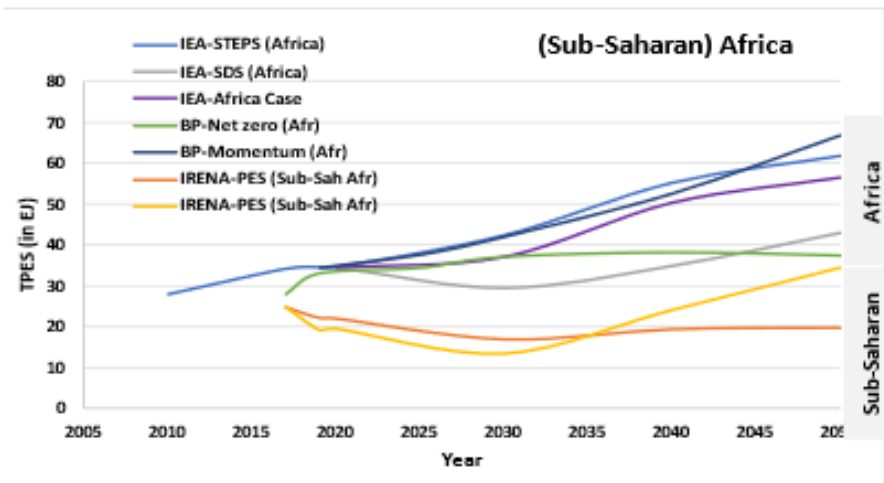


Exhibit 17 Primary energy supply pathways



3. The energy transition

- Africa – sustainable / net-zero
 - pathways’
 - Electrification of demand and more efficient use of energy
 - Higher share of renewable energy

Exhibit 19 Changes in energy demand per fuel and sector in 2030 in IEA SAS scenario



Exhibit 25 Power sector expansion, Sub-Saharan Africa

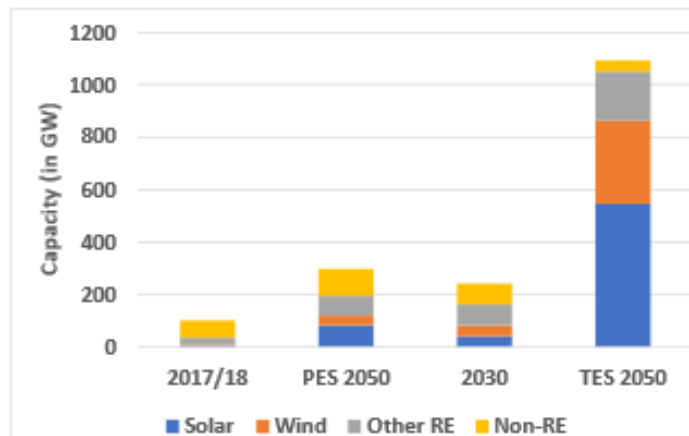
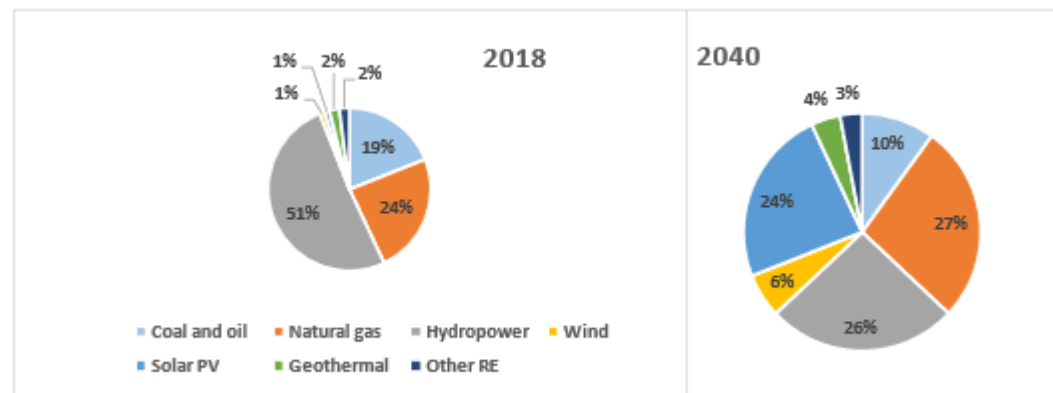
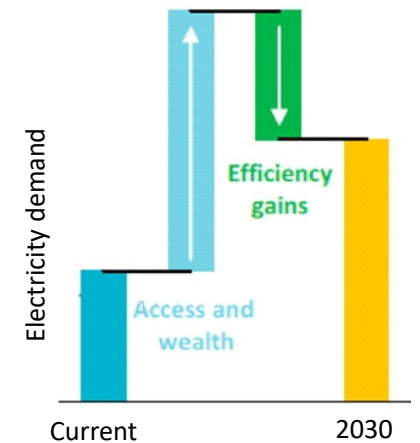


Exhibit 26 Power generation mix, Sub-Saharan Africa (excl. South Africa)



Own elaboration with data from IEA analysis (Africa case, in IEA, 2019)



3. The energy transition

- Issues and questions:
 - Grid extension vs minigrid and stand-alone electrification options
 - Role of improved stoves/biomass vs LPG
 - Level of penetration of variable solar and wind in energy mix
 - Coal and oil decline, but what will be role of natural gas and infrastructure; stranded assets or investing in the future; for domestic market or export?
 - Investments in new technologies (hydrogen, biofuels, electric vehicle infrastructure)

Exhibit 35 Total and annual energy investments 2017/20-2050 in Sub-Saharan Africa

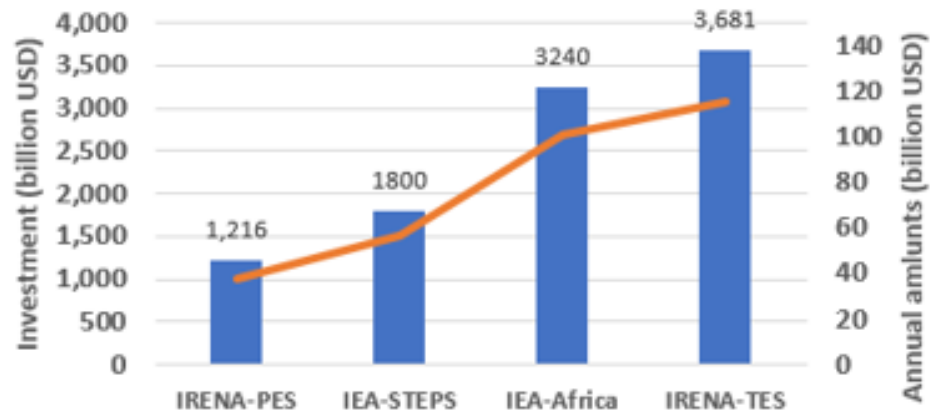
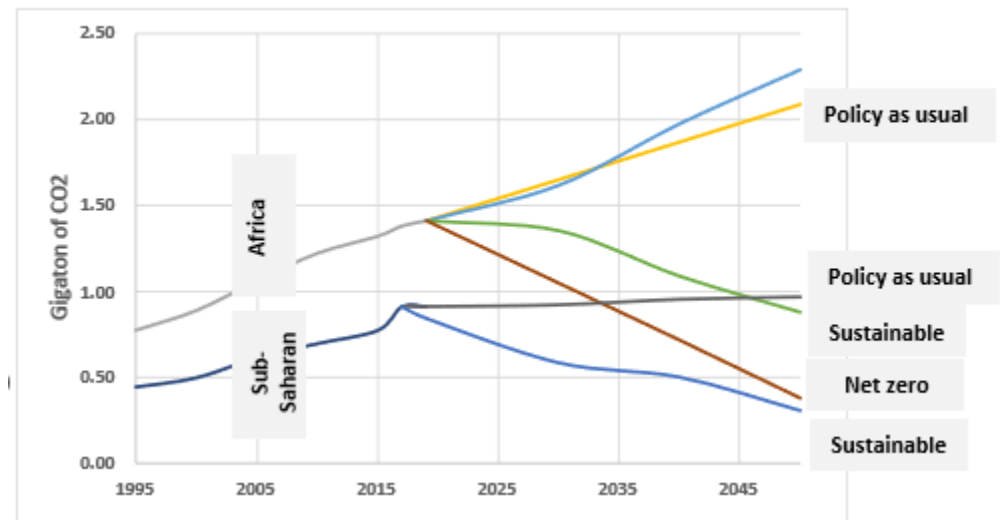


Exhibit 39 Carbon emission reductions in various scenarios for Africa and Sub-Saharan Africa



4. Elements of a *just* energy transition

- Environmental
 - Greenhouse gas emissions – historic, current emissions

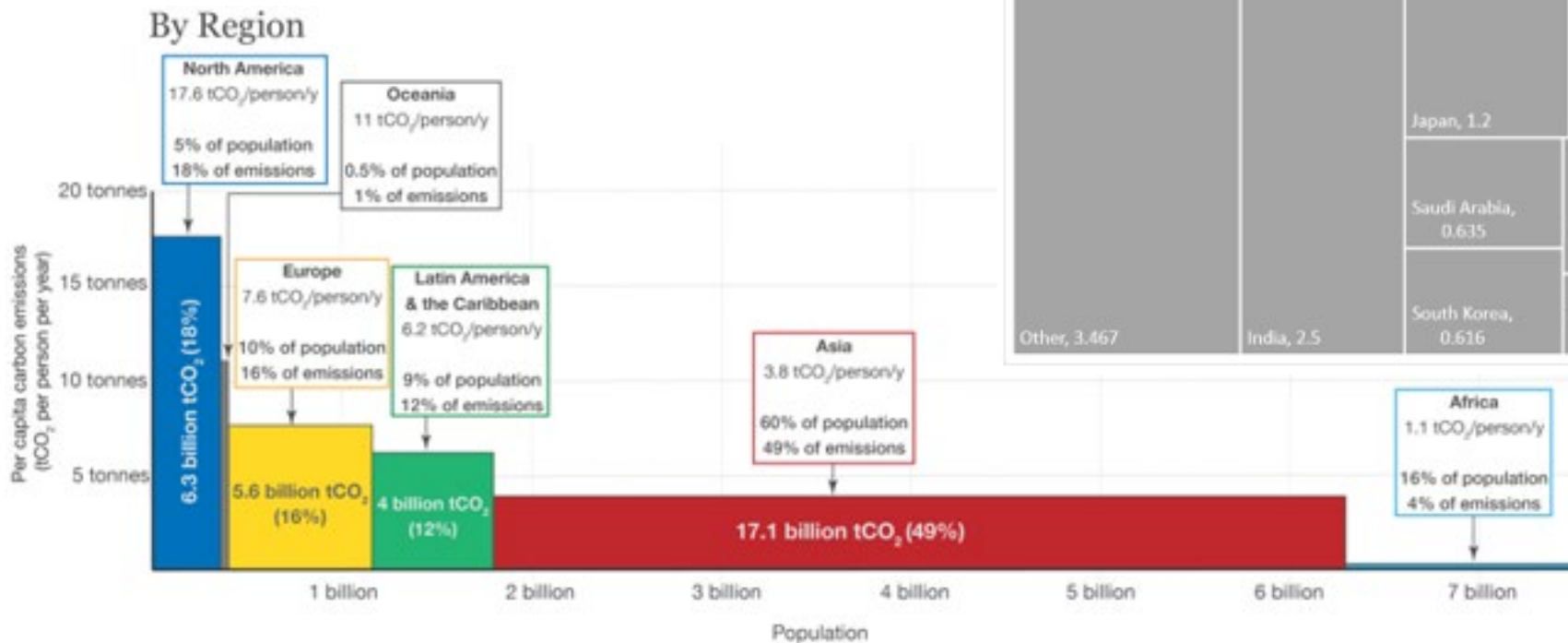
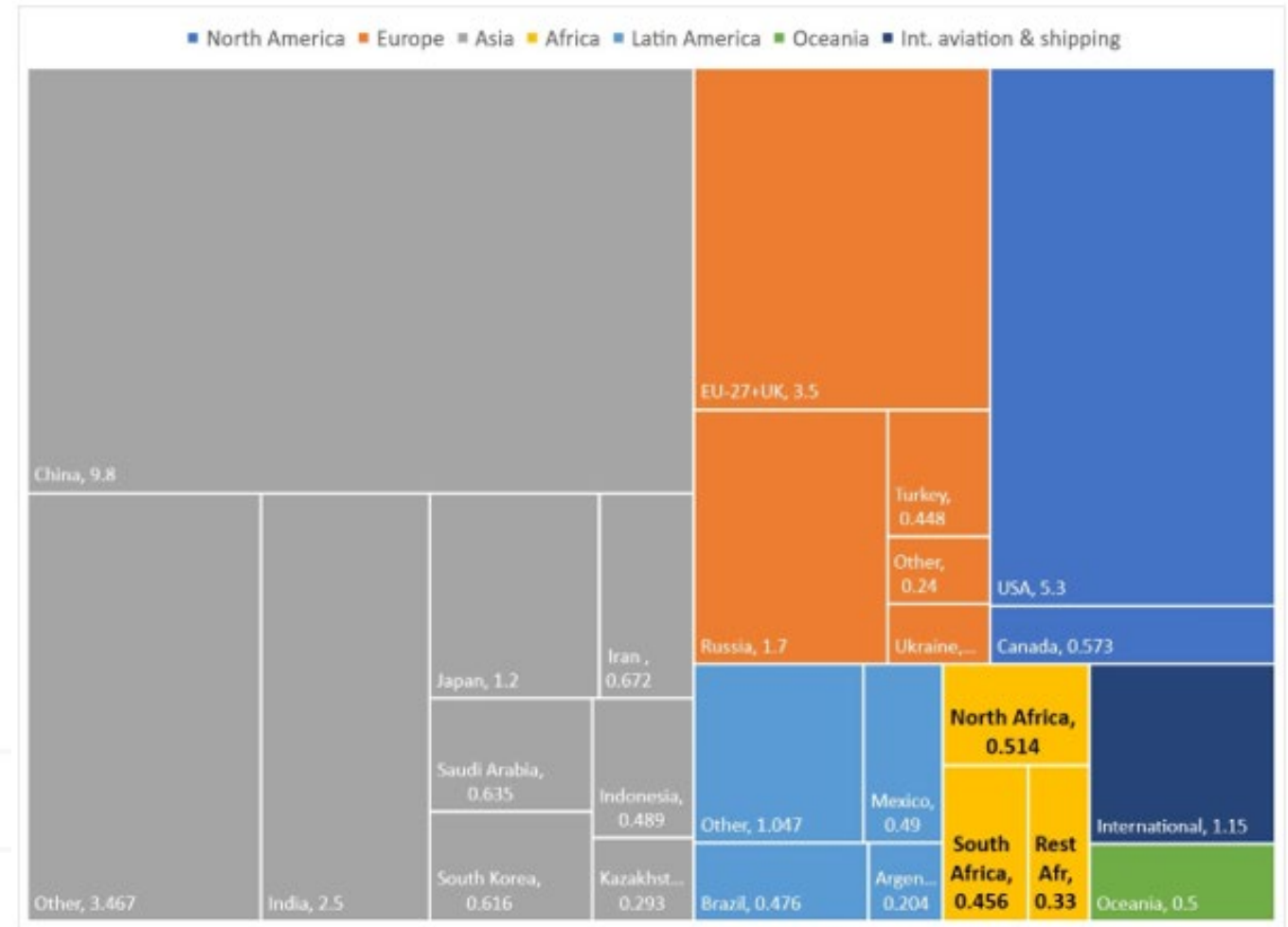
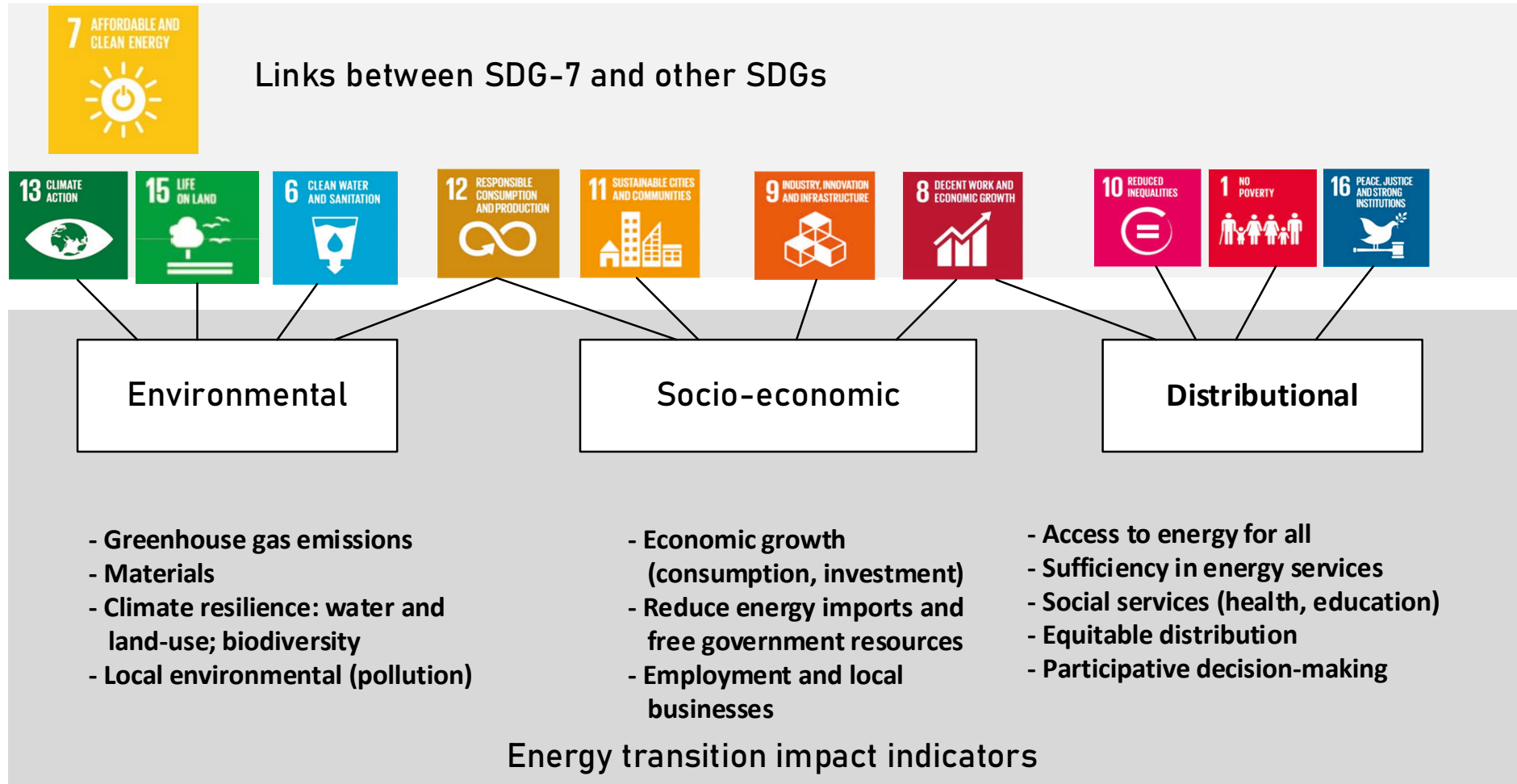


Exhibit 13 Cumulative CO₂ emissions 1751-2020 from fossil fuels



4. Elements of a *just* energy transition



4. Elements of a *just* energy transition

- Environmental / economic
 - Minerals and exports
 - Important in the energy transition will be copper, cobalt, nickel, lithium and rare earth elements (REEs, particularly neodymium and dysprosium). Worldwide, a small number of countries dominate the production of clean energy metals.
 - There is a danger that the dependency on oil and gas is replaced by a dependency on critical materials that are even more prone to be used as a geopolitical weapon
 - Local impacts of mining (environmental, labour conditions)
 - Who will be winners and losers?
 - Higher GDP per capita is not necessarily associated with higher equality with higher human development

Exhibit 42 Natural resources exports as % share in government revenue in selected countries

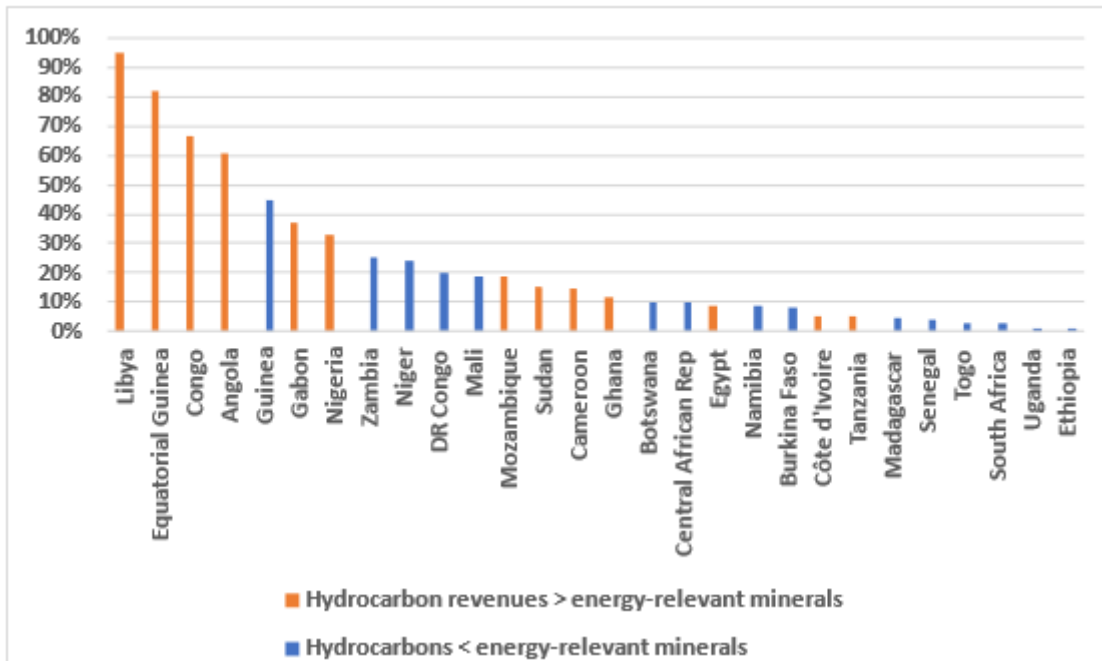
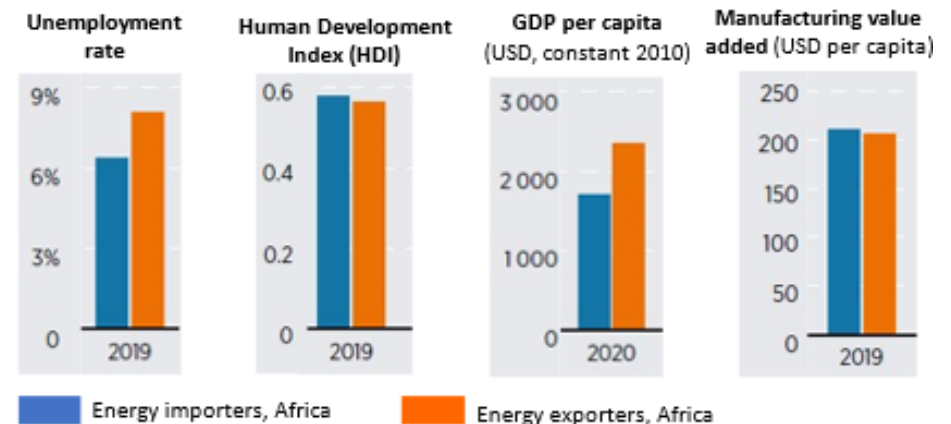


Exhibit 46 Socio-economic indicators of energy exporters and importers



4. Elements of a *just* energy transition

- Distributional
 - Universal access to electricity and clean cooking methods
 - But also: sufficiency and quality of service (users climbing up the energy ladder)
 - Participation level in decision-making
 - Stakeholder engagement, involvement communities, civil society
 - More inclusive governance structures
 - Equitable distribution of costs and benefits
 - Real cost of energy generation and service versus energy subsidies. Especially in power sector, state-owned power utilities are in financial troubling situation
 - Subsidies in Africa in the order of USD 40 billion a year
 - For comparison: power sector investment in Africa are about USD 35 billion annually. Investment needed annually in addition to achieve universal access by 2030 is about USD 24 billion annually
 - Rather than subsidise consumption (subvention too of the rich that consume most), help poor get connected to the system (grid connections; LPG infrastructure) with time-bound initial investment support
 - Subsidies make bad policy but good politics; once in place are difficult to withdraw. Any reforms to phase out subsidies for fossil fuels should therefore include measures to mitigate the likely negative impacts on the poorest

4. Elements of a *just* energy transition

- Socio-economic

- Economic growth

- Expected net economic growth and employment creation
 - Differences between countries (mineral exporters gain; oil exporters loose)
 - Differences between sectors (e.g., some manufacturing and retail will gain; as will services, transport, utilities will benefit from transition; coal and oil gas and supporting services will loose)

- Employment and businesses

- Job losses in coal sector and oil as well informal charcoal (biomass) sector
 - Substantial public investment in transition-related technologies and education can help create substantial new employment, while greater social spending, can counteract negative income impacts

Exhibit 43 Socio-economic outlook in IRENA energy scenarios 2019-2050 for Africa

	2019	2030		2050	
		PES	1.5°C	PES	1.5°C
Population (thousand)	1.065	1,352		1,947	
GDP (in 2019 USD trillion)	2.56	3.9	4.1	9.7	10.4
GDP difference PES-1.5°C		5.9%		7.1%	
Overall net employment (million)	280	548	569	722	747
Employment difference PES-1.5°C		3.8%		3.6%	
Energy sector jobs (million)	4.5	14.3	20	17.5	23
- Renewables	0.36	0.9	4.3	2.3	8.1

- Environmental / economic

- Water, energy and land use

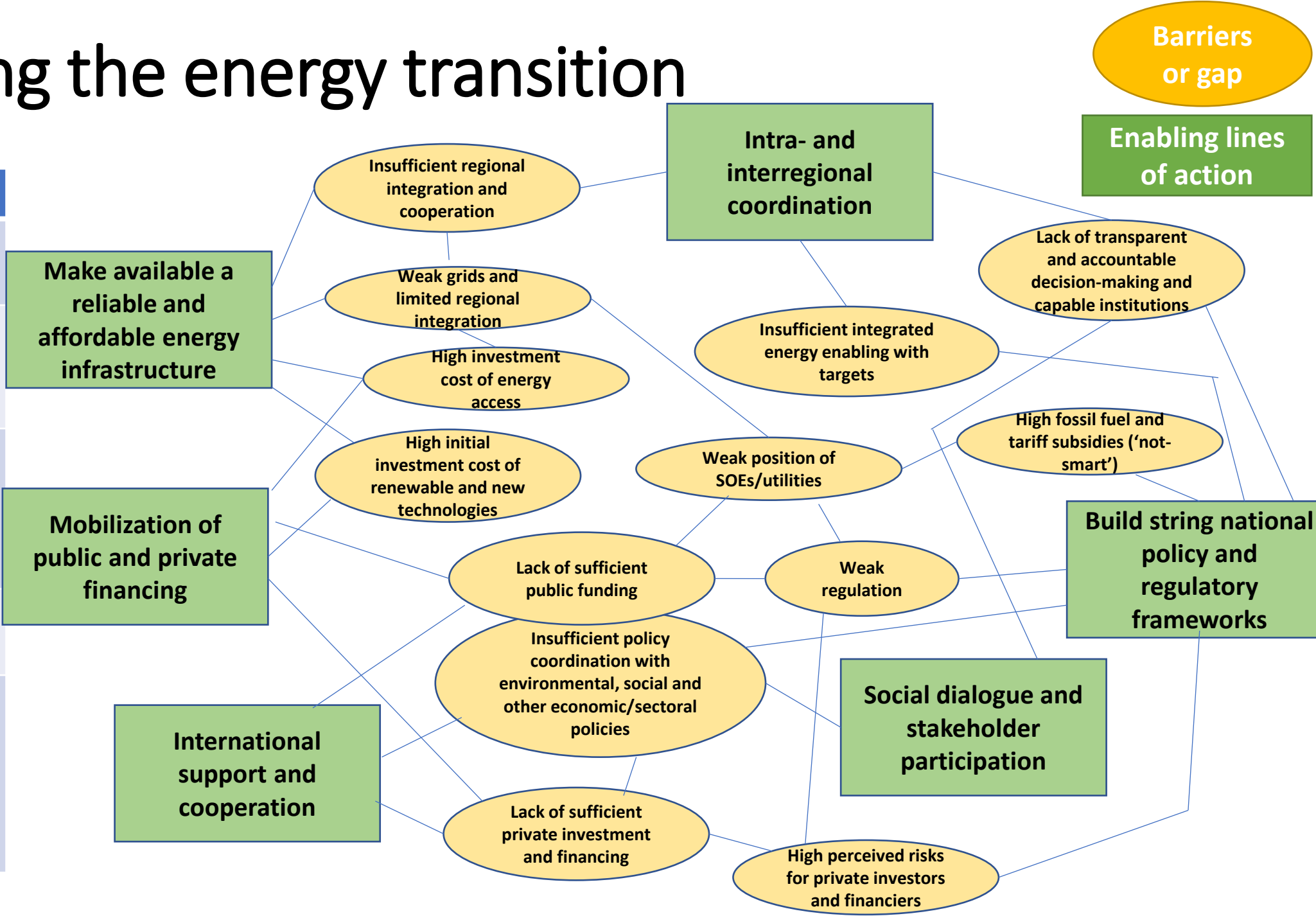
- Impacts of large hydropower
 - Biomass for energy (discussion on dedicated crops vs residues for biofuel production)

- Air pollution

- Transition to cleaner fuels implies less local pollutants
 - Transport, indoor biomass burning

5. Enabling the energy transition

- Objectives**
- Low-carbon or net-zero transition
- Universal access to reliable, sufficient and affordable energy
- Low pollution and sustainable use of water, land, minerals, natural resources
- Net economic growth and employment
- Equitable distribution of costs and benefits between countries, regions and groups within countries



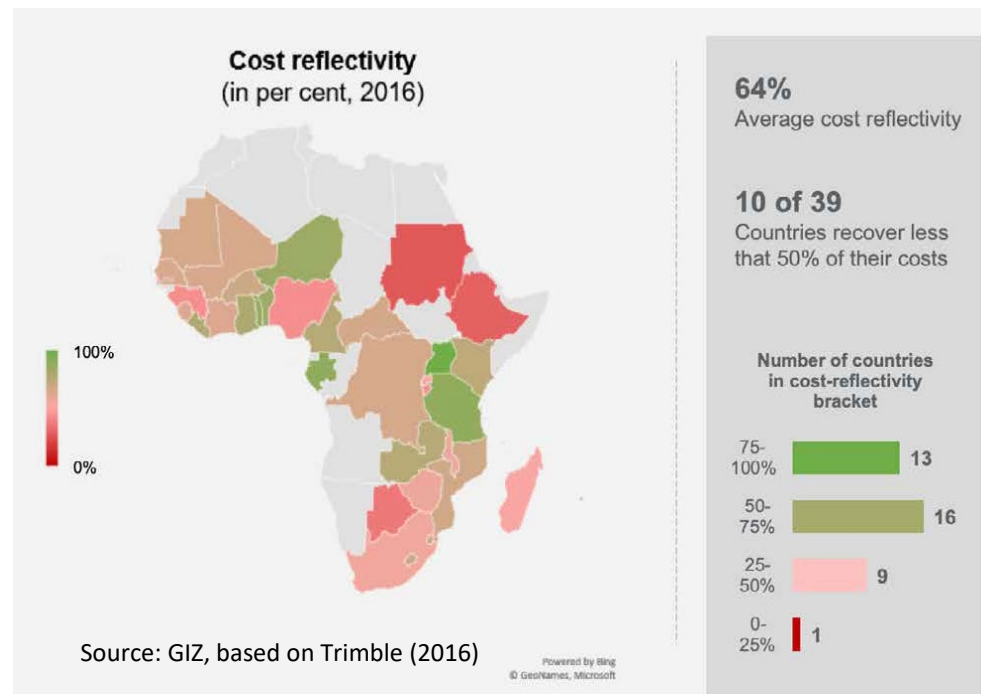
5. Enabling the energy transition

- Strong policy frameworks with targets and sound regulations
 - Targets for energy access, renewable energy, energy efficiency; greening the sector (phasing out coal, reduce oil dependence)
 - Integrated energy resources, supply and demand planning
 - Integrated on-grid and off-grid electrification planning; mini-grid and grid connection policy
 - Integration with other development policies (rural development, urban development, agriculture, mining, transport, etc.) and social policies (employment, income)
- Regulatory-legal-institutional framework
 - Financial sound management of energy sector; cost-reflective prices and tariffs
 - If subsidies are needed, these should be smart (e.g.; infrastructure rather than consumption; time-bound;)
 - Institutional setup (independent institutions and regulating agencies)

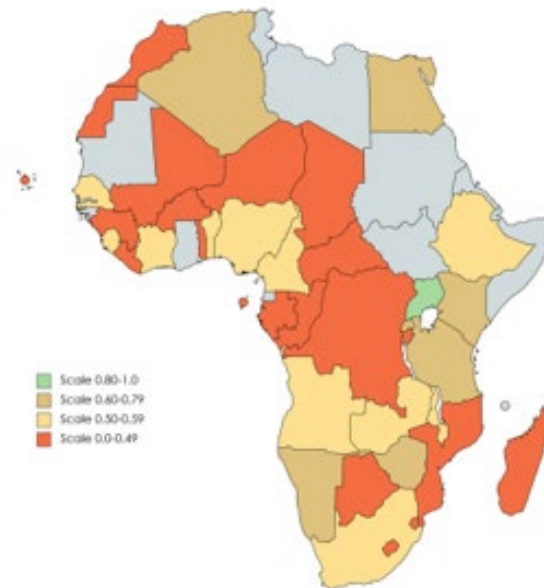
Enabling policies						Deployment policies								
Renewable		Energy eff.		Access		Grid		Regulations			Incentives			
NDC - RE target	National energy policy - RE target	NDC - EE target	National energy policy - EE target	Offgrid or RE electrification target	Clean cooking target	Cost-reflective power tariffs	Off-grid or RE network connection policy	Biofuel mandate	RE quota/mandates/obligations	RE net-metering policies	RE feed-in tariff	RE auctions or tenders	Tax incentives	Financial support, subsidies, rebates

5. Enabling the energy transition

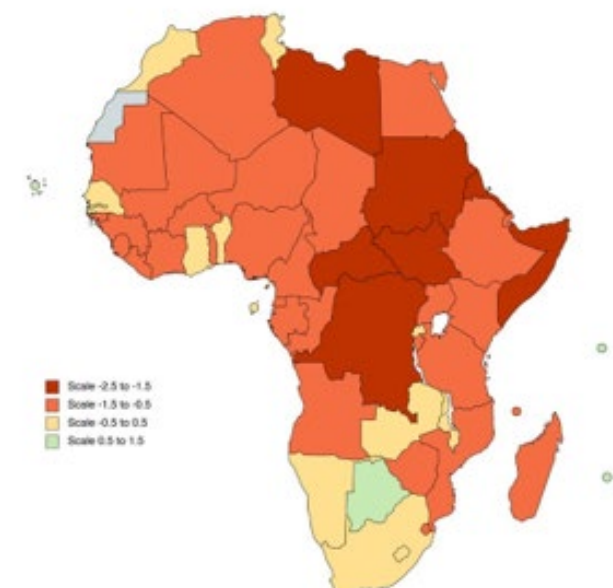
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AfDB's ERI ratings in 2021

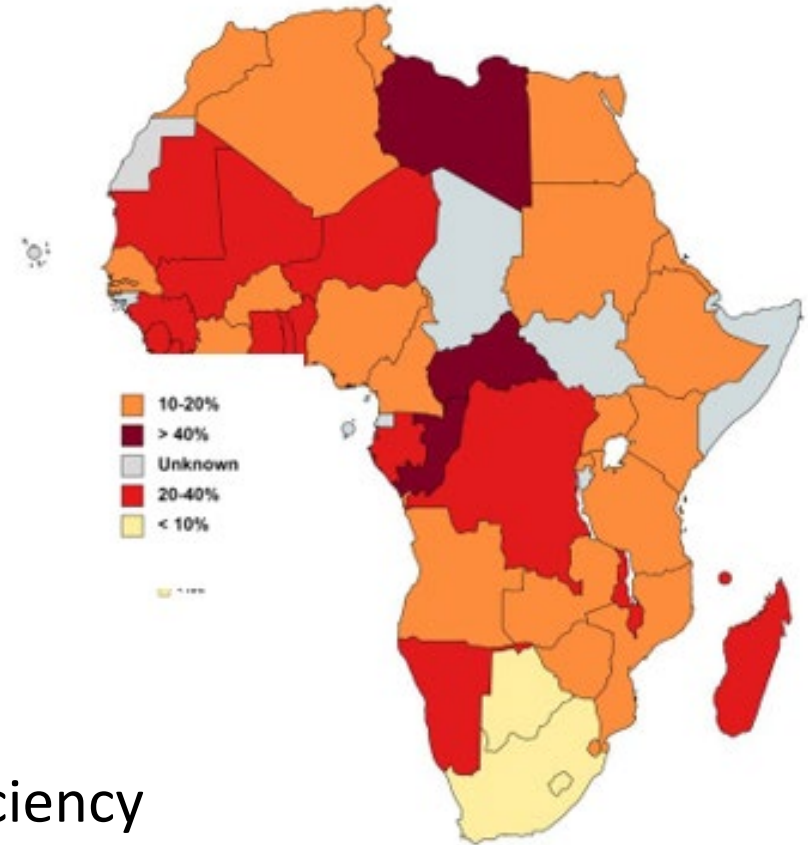
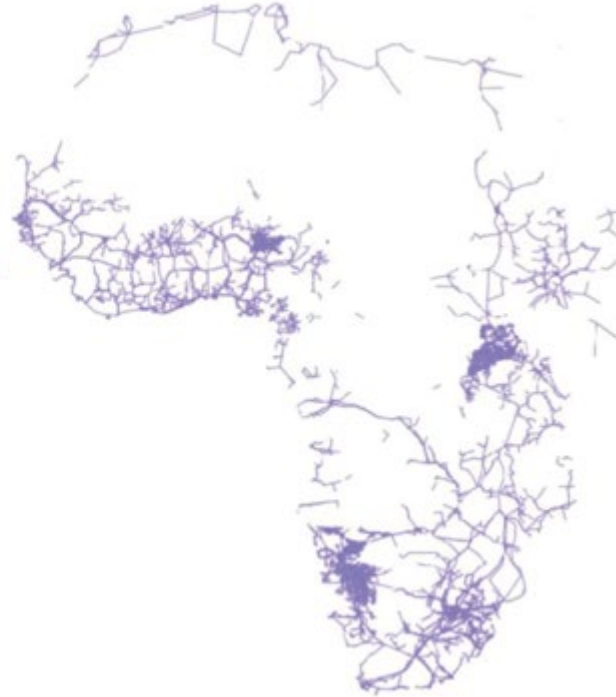


General governance index



5. Enabling the energy transition

Exhibit 9 Power system transmission and distribution losses, Africa



- Strengthening of national networks; increased T&D efficiency
- Increase access by grid expansion and decentralized options (minigrids and stand-alone solutions)
- Pan-African and regional cooperation and cooperation
 - Grid integration and power pools with
 - Regional planning and cooperate to find adequate mix of variable renewables (solar, wind) with base load (hydropower, biomass, natural gas)

5. Enabling the energy transition

- Natural gas infrastructure
 - Gas networks not well-developed
 - Stranded asset in net-zero carbon world or investment?
 - Domestic or export?
- Future:
 - Conversion of networks for H₂ operation



Exhibit 30 Connecting Africa and Europe with hydrogen



African hydrogen routes

5. Enabling the energy transition

- Mobilisation of public *and* private financing

Exhibit 36 Energy investments in IRENA scenarios per technology and measure (2018-2050), Sub-Saharan Africa

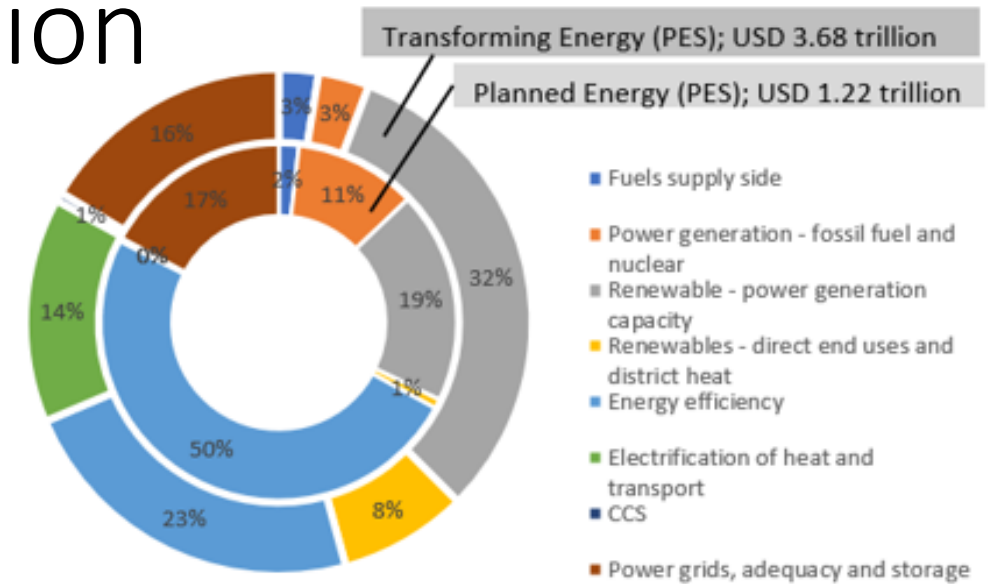
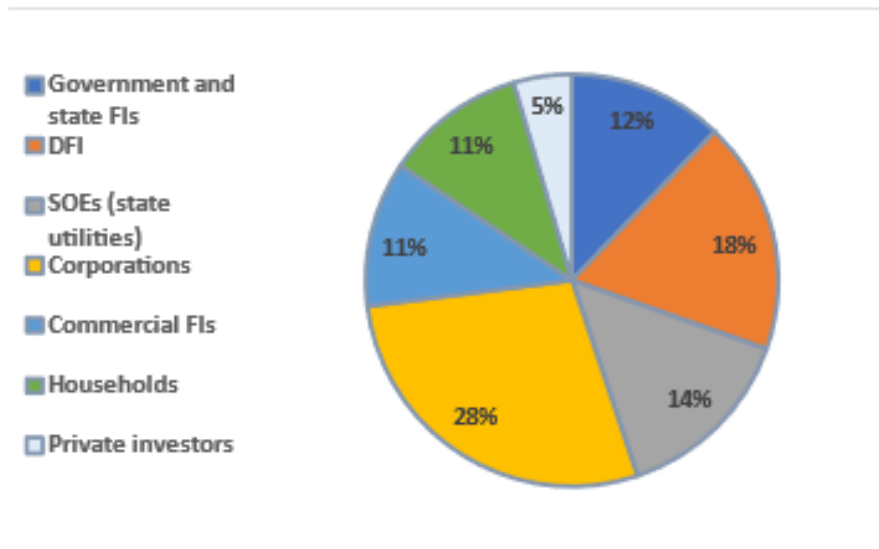
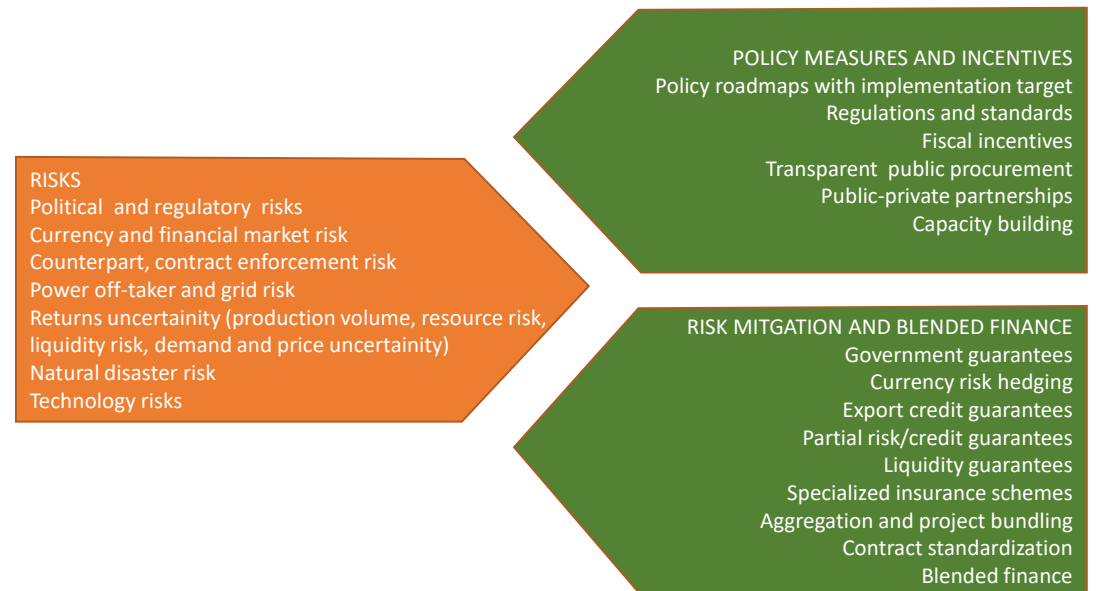


Exhibit 58 Financing of the energy sector investments in energy sector in Africa per source (2030)



Own elaboration based on data from Race to Zero www.gfanzero.com/netzerofinancing.



5. Enabling the energy transition

- International cooperation
 - Reducing fragmentation, increasing coherence and leveraging synergies between existing initiatives
 - Need for a new coordinated approach
- Time for an African Green Deal Plan?



Source: AfDB, IRENA



Source: GIZ

- Learning from history:
 - Roosevelt's New Deal
 - Marshall Plan
 - EU Green Deal

Methodology and expected results

- Expand and enhance the research relating to sustainable energy transitions in Africa
 - by extensive literature review,
 - validating the empirical research (comparing results, data, arguments pro and con),
 - and examining illustrative country case studies
- Organize the data and regional profiles relating to the sources and use of energy demand and supply in Africa, including graphs with historical trends and future scenarios
 - Compare and summarise scenario work or organisations such as IRENA, IEA, AfDB, companies (BP, other), NGOs (Net-zero)
- Assess realistic alternatives for African countries that
 - highlight the continent's comparative advantage in attaining sustainable pathways for transition, in accordance with the 2030 SDGs and the AU's Agenda 2063.
 - Highlight investment needs and sustainable financing challenges as well as the role of public and private stakeholders, development partner
- For discussion: role of UNDP in just energy transition in general and in Africa

Case studies (In focus)

- 1 GAS IN AFRICA AND MOZAMBIQUE
- 2 MINERALS, ENERGY AND POVERTY IN DR CONGO
- 3 JOBS, COAL AND THE JUST ENERGY TRANSITION IN SOUTH AFRICA
- 4 RURAL ELECTRIFICATION IN ZAMBIA AND NIGERIA
- 5 AMBITIOUS GOALS: CABO VERDE BECOMING 100% RENEWABLE ENERGY
- 6 RENEWABLE ENERGY IPP PROCUREMENT PROGRAM, SOUTH AFRICA
- 7 USE OF LPG FOR COOKING IN NIGERIA AND GHANA
- 8 SUBSIDY REFORM IN MOROCCO AND EGYPT
- 9 POWER SECTOR REFORM AND PUBLIC-PRIVATE PARTNERSHIPS IN UGANDA