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RENEWABLE ENERGY IN EAST AFRICA AND THE EU PERSPECTIVE

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1. INTRODUCTION

- With the Kyoto Protocol and the each time higher awareness of the effects of climate change, many countries started planning different objectives and/or strategies in regards to energy efficiency, climate change and renewable energy sources.
- It is the European Union the one that have taken the lead worldwide in promoting green energy:
  - Ever since the 1950s the EU based its birth on energy resources and energy pacts.
  - One of the first aspects considered by the EU concerning the energy sector was its liberalization with the aim of enhancing competition within the sector.
  - Since the beginning of 2000 in the Lisbon Agenda, now updated and known as EUROPE 2020 a green energy objective is included

1. INTRODUCTION

- **Socio-economic development** requires **energy** as one of the essential inputs (Johansson and Goldemberg, 2002).
- The **Millennium Development Goals** (MDGs) makes even more relevant addressing the challenges and prospects for energy service provision in the region:
  - ✧ Providing energy access to all
  - ✧ Ensuring supply security
  - ✧ Mitigating gas emissions
  - ✧ Policies limiting the use of fossil fuels
- The low capital and adaptive capacity makes developing economies (especially African countries) more vulnerable to extreme weather and the climate change would negatively impact their energy systems (Wesseh Jr. & Lin, 2017).

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2. BACKGROUND OF RENEWABLE ENERGY

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2. BACKGROUND OF RENEWABLE ENERGY

- **Ever since the oil crisis in the 1970s**, governments started to look actively for **fossil substitute** energy, especially renewable energy sources (e.g., wind, solar, biomass, etc.).
- **Fossil fuels represented more than 80% of total primary energy and around 70% of electricity generation**.
- Despite that, **policy makers** and **private decision makers** are searching for a sustainable transition towards **fossil-free system**. This **implies at least two main priorities**:
  - **Renewable energy sources** development and promotion;
  - **Energy efficiency**.

2. BACKGROUND OF RENEWABLE ENERGY

- The **African Development Bank** considers green growth as the top priority of its development strategy (2013-2020):
- East Africa having wind and solar as the fastest growing renewable energy technologies

Renewable energy potential across Africa

Region	Wind (TWh/yr)	Solar (TWh/yr)	Biomass (EJ/yr)	Geothermal (TWh/yr)	Hydro (TWh/yr)
East	**2,000-3,000**	**30,000**	**20-74**	**1-16**	**578**
Central	-	-	49-86	-	1,057
North	3,000-4,000	50,000-60,000	8-15	-	78
South	16	25,000-30,000	3-101	-	26
West	0-7	50,000	2-96	-	105

Source: African Development Bank

2. BACKGROUND OF RENEWABLE ENERGY

- Increased investment and policy support for cheaper and more stable production recipe (e.g., fossil fuels) would allow considerable contribution of African countries to reduce the effects of climate change (Wesseh Jr. & Lin, 2017).
- The use of renewable energy sources might be a significant determinant in the:
  - ✧ Reduction of energy poverty;
  - ✧ Stimulating economic growth;
  - ✧ Ensuring environmental sustainability.

2. BACKGROUND OF RENEWABLE ENERGY

- According to the UN Economic Commission for Africa (2014) report, electrification rate in Eastern Africa is fare below 60% except for Mauritius and Seychelles with almost 100% => huge potential for investment in many of these countries

Countries	Electrification rate	Countries	Electrification rate
South Sudan	1	Burundi	2
DRC	11.1	Malawi	9
Uganda	12	Zambia	18.8
Tanzania	13.9	Zimbabwe	41.5
Kenya	16.1	Comoros	46
Madagascar	19	Djibouti	55
Ethiopia	22.5	Mauritius	99.4
Eritrea	32	Seychelles	99.8
Eastern Africa	**27**	**Sub-Sahara Africa**	**30.5**

2. BACKGROUND OF RENEWABLE ENERGY

- Business potential → FDI → economic growth => policy makers should take steps for attracting FDI
- East African Government have taken some of these steps to achieve a self-sustainable industrial development + improve upon the competitiveness of the industrial sector (Madoda, 2014)
- East African Countries (EAC) approved in Nov 2011 the Industrialization Policy
  - ⇒ Its goal: structurally transform the manufacturing sector higher added value and product diversification (Adom & Amuakwa-Mensah, 2016)
  - ⇒ It is assumed that this will promote sustainable economic growth and development in the region
  - ⇒ It is required to search for the connecting factors able to facilitate the integration of the goals of sustainable economic growth and environmental quality this beeing a more desirable economic situation for any developing country

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3. ENERGY OBJECTIVES

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3. ENERGY OBJECTIVES

EU energy objectives

EUROPE 2020 → one out of five objectives is focused on green energy: **20/20/20 objective**

- EUROPE 2020´s energy and environment objective:
  - **20%** less greenhouse gas emissions compared to the level of 1990
  - **20%** energy from renewable source
  - **20%** more energy efficiency
- Under the evolution of many countries towards achieving this objective, **European Energy Strategy 2030** changed the 20/20/20 objective to a more ambition one => ….

AFRICAN energy objectives

- The **consumption of modern energy** services including increased energy access for productive users **X2**.
- The use of **modern biomass technologies** for industrial purposes to be explored
- **50%** inhabitants in rural areas should use **modern energy for cooking**
- **75%** of the poor urban and peri-urban should **have access to modern energy** serviced for basic needs
- **75%** of schools, clinics and community centres should have **access to electricity** as it might enhance their competitiveness
- **Motive power for productive uses** should be made **available in all rural areas**

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4. ENERGY POLICY: TOOLS FOR PROMOTING RE

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4. ENERGY POLICY: TOOLS FOR PROMOTING RE

- Throughout different policies and mechanisms, governments continued shaping these aspects. This is not meant just for protecting the environment, but also for facilitating the access to energy of millions of people that have difficulties in this sense, as well as for creating new opportunities (REN21, 2015).
- http://www.iea.org/publications/freepublications/publication/keyworld2016.pdf.

4. ENERGY POLICY

Promoting programs for developing renewable energy

Items	Objects	Fiscal incentive tools	Non-financial incentive tools
Research, development and demonstration (RD&D)	• Government • Electric producers • Grid producers	• Subsidies for research and development • Capital grants • Third-party finance	• Legislation and international treaties • Research, development and demonstration • Guidelines for energy conservation • Public investment
Investment	• Government • Electric producers • Grid producers	• Capital grants • Bidding system • Subsidies for investment • Third-party finance • Investment tax credits • Accelerated depreciation	• Voluntary programs • Regulatory and administrative rules
Production and distribution	• Electric producers • Grid producers	• Guaranteed Price • Production tax credits • Tradable certificates	• Obligations • Voluntary programs
Consumption	• Government • Consumers	• Consumer grants/rebates • Excise tax exemptions • Net metering • Fossil fuel taxes	• Obligations • Government purchases • Green pricing • Public awareness

Source: Liao et al. (2011)

4. ENERGY POLICY: TOOLS FOR PROMOTING RE

- Nowadays not all countries are situated in the same phase of the renewable energy promotion. It is true that the majority of the countries worldwide are already in the intermediary stage of developing renewable energy market. Still, many differences could be highlighted according to their development stage

Phase	1st Stage: Undeveloped market	2nd Stage: Developing market	3rd Stage: Developed market	Phase
Steps	R&D, investment	Production	Consumption	Production, consumption
Goals	• To establish renewable energy market	• To improve the production of renewable energy	• To improve the consumption of renewable energy	• To replace fossil fuel by renewable energy • To return to the free market mechanism
Non-market based policies	• Regulatory instruments • Policy processes • Voluntary agreement • Education and outreach			
Market based policies	• RD&D	• Financial • Incentives/subsidies • Tradable permits	• Financial • Public Investment	• Liberalization
Specific applications	• R&D grants and subsidies • Demonstration	• Investment deduction • Tax credit • Accelerated depreciation • Guaranteed price • Obligations and tradable permits	• Tax incentives • Grants and subsidies • Public investment	• Removal of the fossil energy subsidies • Carbon tax • Green pricing • Removal of RE incentives/ subsidies
Mechanisms	Quota system	Quota system, Price system	Price system	Free market system

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4. Energy policy

THE CASE OF THE SPANISH RE ENERGY POLICY

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4. ENERGY POLICY

- Promoting renewable energy sources, for the Spanish government meant the increase of the tariff deficit. Since early 2000s, but especially since 2005, a growing trend marked the beginning of a new stage, which ended in a tariff deficit (cumulative) of more than 32,000 million euros until the end of 2012. Despite the sharp increase in the rate paid by consumers in recent years and the efforts to find the optimal recipe in energy regulation, the increasing importance of renewable energy sources in the energy mix have contributed considerably to the increase of the tariff deficit, expected to follow the same path in the future (Fabra and Fabra, 2012).
- Sallé-Alonso (2012) pinpoints that tariff deficit could have been solved with small adjustments (each two, three or six months) with a frequency adapted to the size of the imbalance detected. In his opinion, the government has four different regulative keys as depicted below in figure 6. Accordingly, an improper management of the four keys is the reasons of the accumulation of the tariff deficit of the Spanish system.
- Tariff deficit is the difference between the recognized rights of incomes and the electricity tariffs.

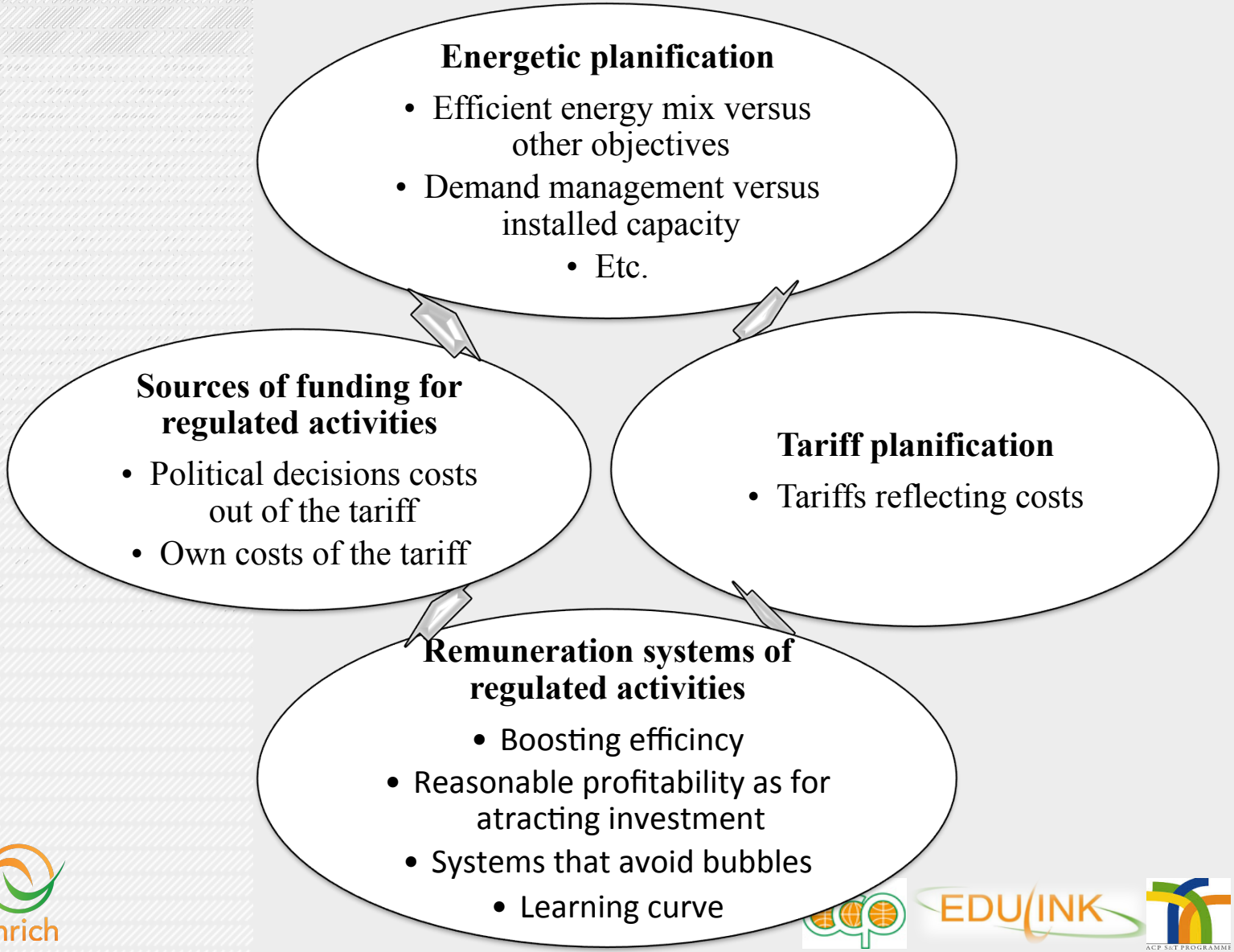
Law 82/1980	• Conservation of Energy and shy **RES support**
RD 2366/1994	• Electricity produced by **hydro sources, cogeneration and RES** • basic contractual relationship between RES-E producers and distribution companies • Distributors buy the electricity surplus of plants with less than 100 MW installed capacity

Law 54/97	• Liberalization of the electricity market +**Strong support of RES**
	  • Different treatment under special regime
	  • Guaranteed grid access
	  • Price support

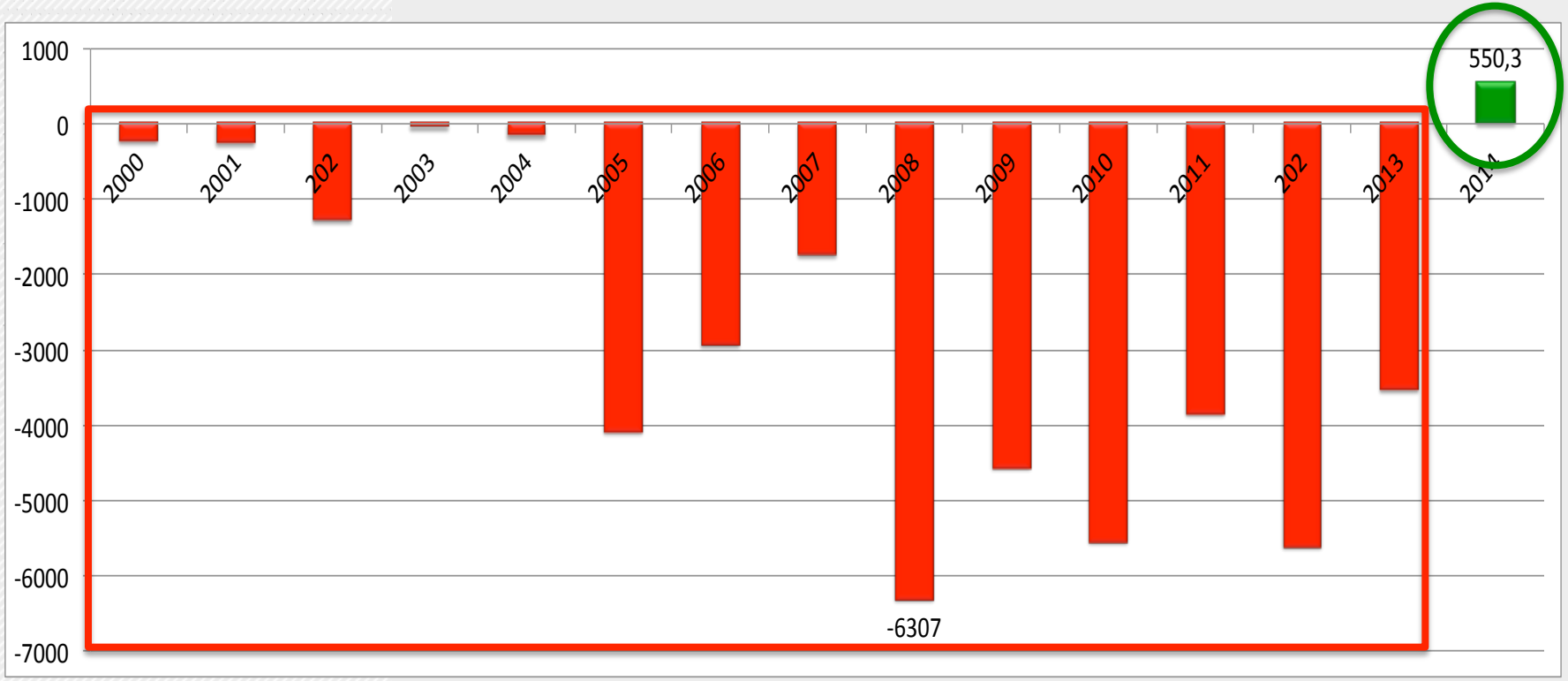
RD 2818/1998	• Options for RES-E generators: **fixed-premium or fixed-feed-in**
	• **Double issue**:
	  • creates **huge imbalances**
	  • **overloads** the final price for **consumers**

PFER 1999	• Set commitments for 2010 → final production of **RES-E 29.4%**
RD 436/2004	• support based on the **average electricity tariff**, annually set • encouraging the participation of RES-E in the wholesale electricity market • intermittent RES-E generation and their impact with an increasing share on the stability of the grid focus • triggered an increase of RES-E generators choosing to sell their electricity directly to the market

PER 2005-2010	• **New targets** for RES-E (30.3% by 2010), • New targets for thermal applications and biofuels
RD 661/2007	• Disengages RES-E from the average electricity tariff and uses CPI • **A cap-and-floor system for RES-E supp**ort
RD 1578/2008	• **Disincentives for PV** by rationalizing the support of RES-E from PV
RDL 1/2012	• **suppression** of the pre-assignment procedures of incentives • cut of **economic incenti**ves for new installed plants of electricity generation from **cogeneration, RES and waste**
RDL 9/2013	• creation of a **management register of own consumption system** of electric energy
RD 900/2015	• regulates the administrative, technical and economic conditions and generation for **own consumption**
RD 947/2015	• Support for new installations of plants for generating electricity from **biomass and wind energy**


Energetic planification
• Efficient energy mix versus other objectives
• Demand management versus installed capacity
• Etc.
Sources of funding for regulated activities
• Political decisions costs out of the tariff
• Own costs of the tariff
Tariff planification
• Tariffs reflecting costs
Remuneration systems of regulated activities
• Boosting efficincy
• Reasonable profitability as for atracting investment
• Systems that avoid bubbles
• Learning curve

Evolution of the tariff deficit in Spain (2000-2014)



5. CONCLUSIONS

- Trend of a great transition to clean energy and more energy efficiency
  - ⇒ Strategic initiatives:
    - ✧ **EU**: The European Energy Strategy 2030, 20/20/20 objective, Climate Change Strategy 2040, etc.
    - ✧ **Africa**: the African Renewable Energy Initiative, Sustainable Energy for All, etc.
    - ✧ **Other international organisations**: World Bank, etc. ……
  - ⇒ High business potential in renewable and energy efficiency that must be supported through tools designed and implemented by the government based on real needs of the society

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