



University of Piraeus
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Renewable Energy Sources (RES) in Global Politics

Regulatory Frameworks for
Renewable Energy Sources

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Piraeus, 2023



The Development of Renewable Energy Sources and its Significance for the Environment

Presentation Outline

Regulatory Frameworks for RES:

A comprehensive review of the literature on regulation frameworks that are employed around the world and are related to the use of RES.

- Introduction
- Support Policy
- Market Regulation
- Technology Transfer
- Barriers
- National and International Environmental Policies

Introduction

Regulation refers to the process of *making, monitoring, and enforcing* **rules** that are established by a state.

These **rules** are mandated by a country to produce appropriate and desirable outcomes.

Regulatory instruments include:

- command regulation
- control regulation
- market creation
- education instruments
- information instruments
- economic instruments
- self-regulation
- voluntarism
- property rights
- fiscal instruments and charge systems
- financial instruments
- liability instruments
- performance bonds
- deposit refund systems
- the removal of perverse incentives

Introduction

The regulatory frameworks are related to different dimensions of RES, including:

- Environmental policy
- Public policy
- Commercial policy
- Economic policy

These regulations are required to overcome market failures and produce desirable outcomes.

Regulatory interventions could be classified into three main groups:

- 1. Economic regulation**
- 2. Regulation of anticompetitive behaviour**
- 3. Social regulation**

Support Policy

Support policies play a key role in enhancing renewable energy consumption.

Regarding RES in addition to parameters such as decreasing technology costs caused by advancement and economies of scale, the rapid growth of RE has been driven mainly by supporting policies.

Because some sources of energy such as natural gas and coal are available in the market at lower prices, RE could not be economical without government support.

Support policies could be applied from the research stage to commercialization for both:

- ✓ the **supply side** (i.e., academia, research centres, and firms)
- ✓ the **demand side** (i.e., consumers, public and private sectors, imports, and exports)

Specific Ways to Support Policies Drive Enhanced Consumption

Market Competitiveness:

Support policies, such as subsidies and tax incentives, make RE more financially competitive with traditional fossil fuels, encouraging consumers and businesses to choose cleaner options.

Risk Mitigation:

Financial incentives and guarantees provided by support policies help mitigate the financial risks associated with investing in RE projects, making them more attractive to investors.

Technological Innovation:

Policies that allocate funds for research and development stimulate innovation in RE technologies, leading to advancements that improve efficiency and reduce costs, making them more accessible and appealing.

Specific Ways to Support Policies Drive Enhanced Consumption

Consumer Affordability:

Financial incentives, like tax credits or rebates for RE installations, reduce the upfront costs for consumers, making RE technologies more affordable and accessible.

Regulatory Framework:

Support policies often establish a clear regulatory framework that provides stability and certainty for investors and developers in the RE sector, facilitating project planning and execution.

Infrastructure Development:

Investment in RE infrastructure, supported by policies, helps build the necessary systems for the efficient generation, transmission, and distribution of RE.

Specific Ways to Support Policies Drive Enhanced Consumption

Public Acceptance:

Policies that promote public awareness and education about the benefits of RE can create a positive public perception, encouraging widespread acceptance and adoption of cleaner energy sources.

Energy Security:

Diversifying the energy mix through support policies reduces dependence on a single energy source, enhancing energy security and resilience against supply disruptions.

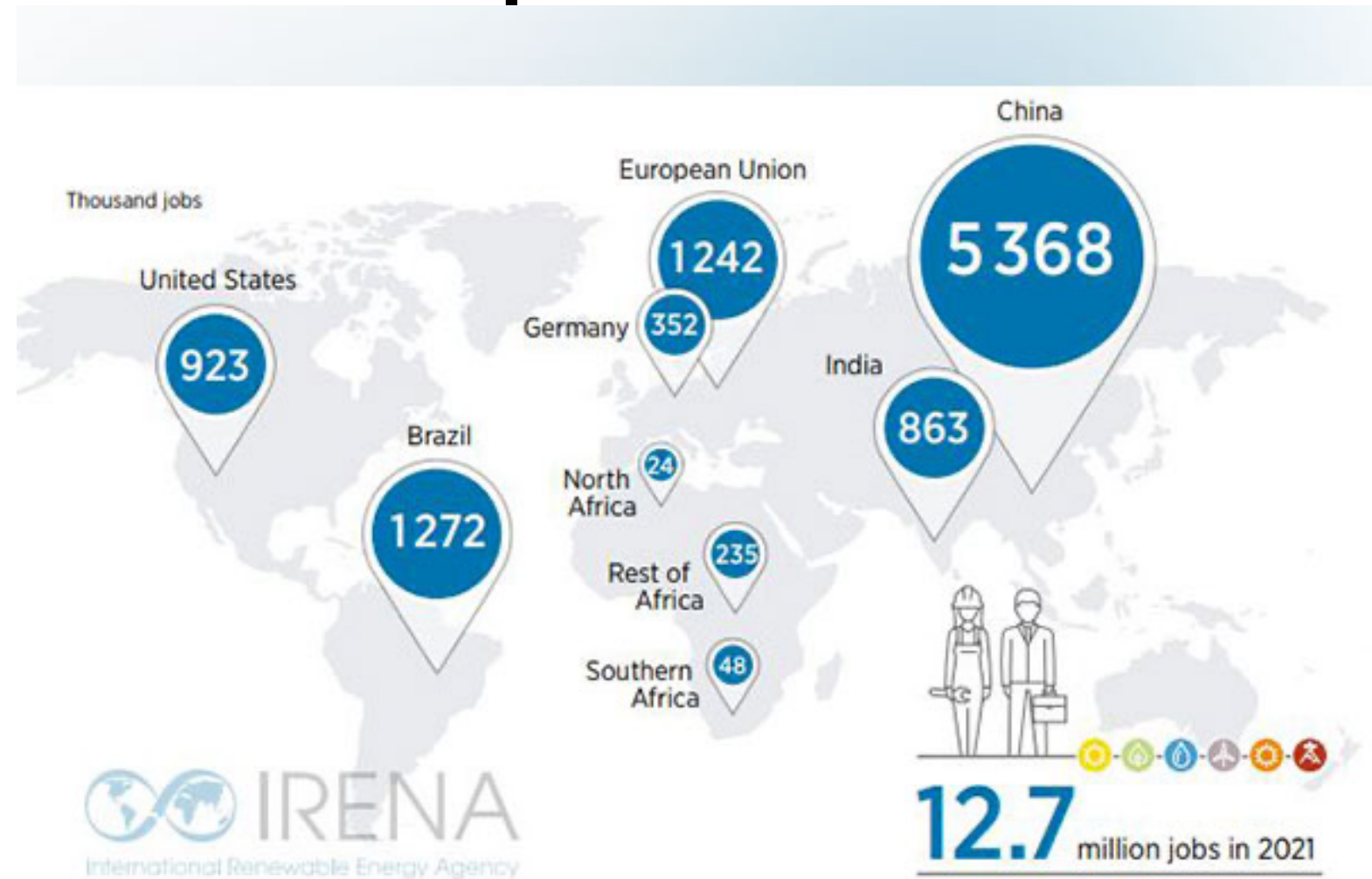
Global Cooperation:

International collaboration on RE policies can lead to shared knowledge, technology transfer, and joint efforts to address global challenges related to climate change and sustainable energy development.

Specific Ways to Support Policies Drive Enhanced Consumption

Job Creation:

Policies that incentivize RE projects contribute to the creation of jobs in the renewable energy sector, stimulating economic growth and supporting local communities.



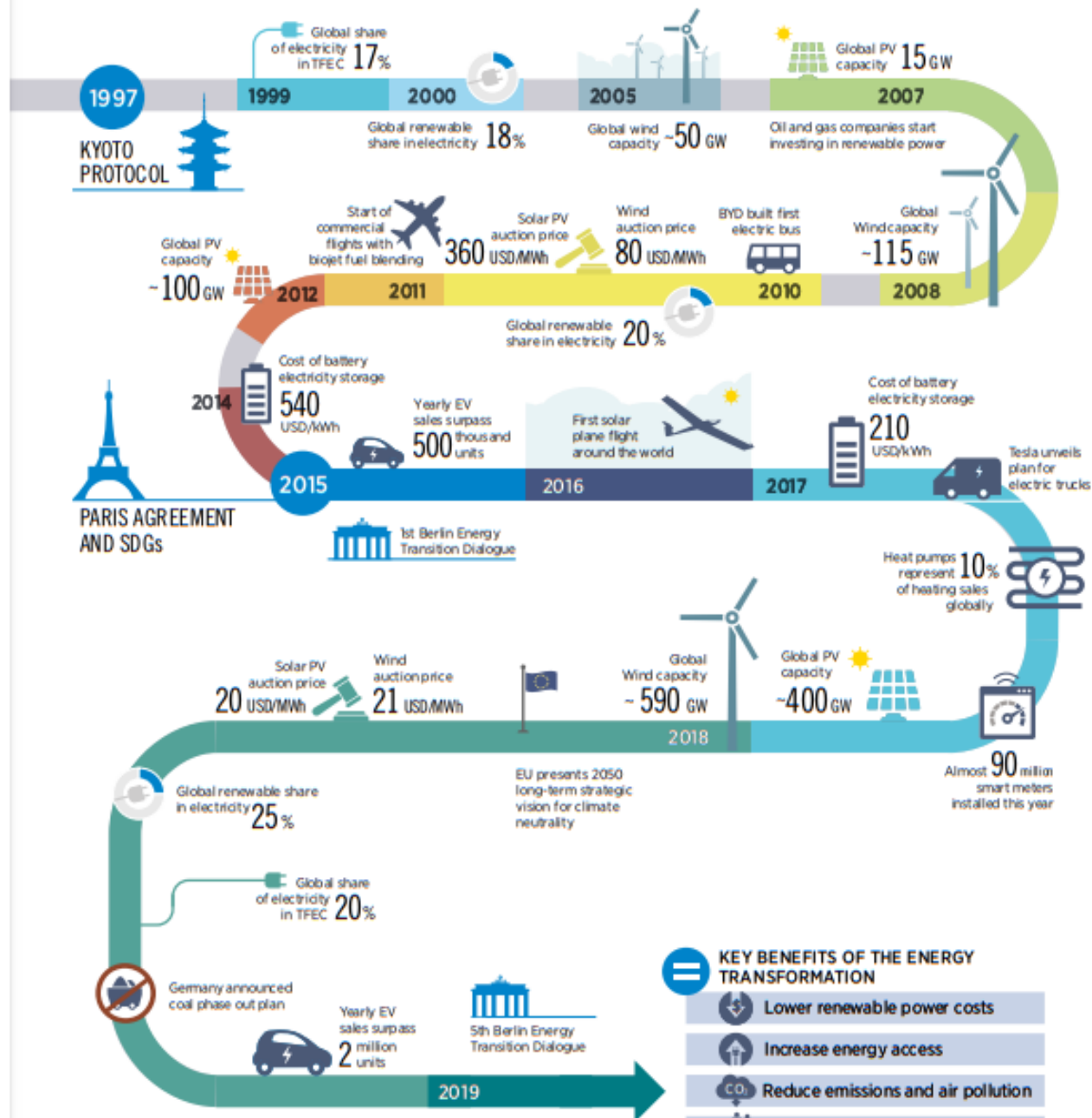
Specific Ways to Support Policies Drive Enhanced Consumption

Environmental Benefits:

By encouraging the use of RES, support policies contribute to reducing greenhouse gas emissions and other environmental pollutants, promoting a cleaner and healthier environment.

Long-Term Planning:

Policies that set long-term targets for RE consumption provide a roadmap for the transition to sustainable energy, giving businesses and investors the confidence to plan for the future.



Sources: (IEA, 2018c); (IRENA, 2018f); (GWEC, 2015); (Reuters, 2007); (IRENA, 2018d); (INSIDEEVs, 2019b); (IEA-PVPS, 2018); (EV Volumes, 2019); (Solar Impulse, 2019); (IRENA, 2017c); (Electrek, 2017); (IEA, 2019); (GlobalData, 2018); (EC, 2018a)

Renewable Energy Directive (2009/28/EC)

Since the introduction of the Renewable Energy Directive (2009/28/EC), the share of RES in EU energy consumption has increased from **12.5% in 2010** to **21.8% in 2021**.

According to Eurostat, **Sweden** had the highest share of renewables in its consumption (62.6%), ahead of **Finland** (43.1%) and **Latvia** (42.1%).

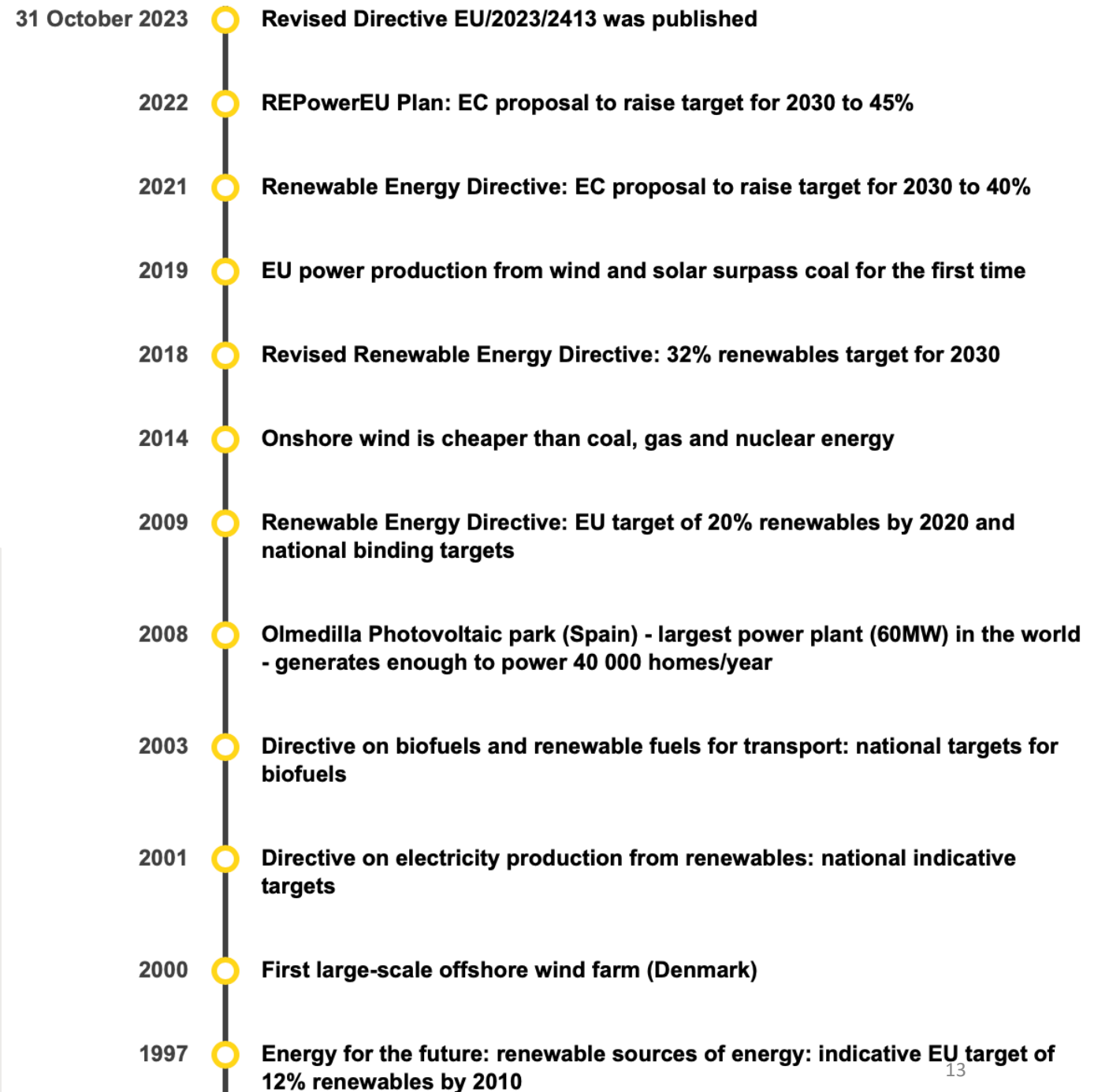
Under the **European Green Deal**, renewable energy is a pillar of the clean energy transition.

It comes at a low cost and is home-grown, which reduces Europe's dependency on external suppliers.

This is why the EU's level of ambition on increasing the share of renewables in its energy mix and the measures needed to achieve this are regularly revisited.

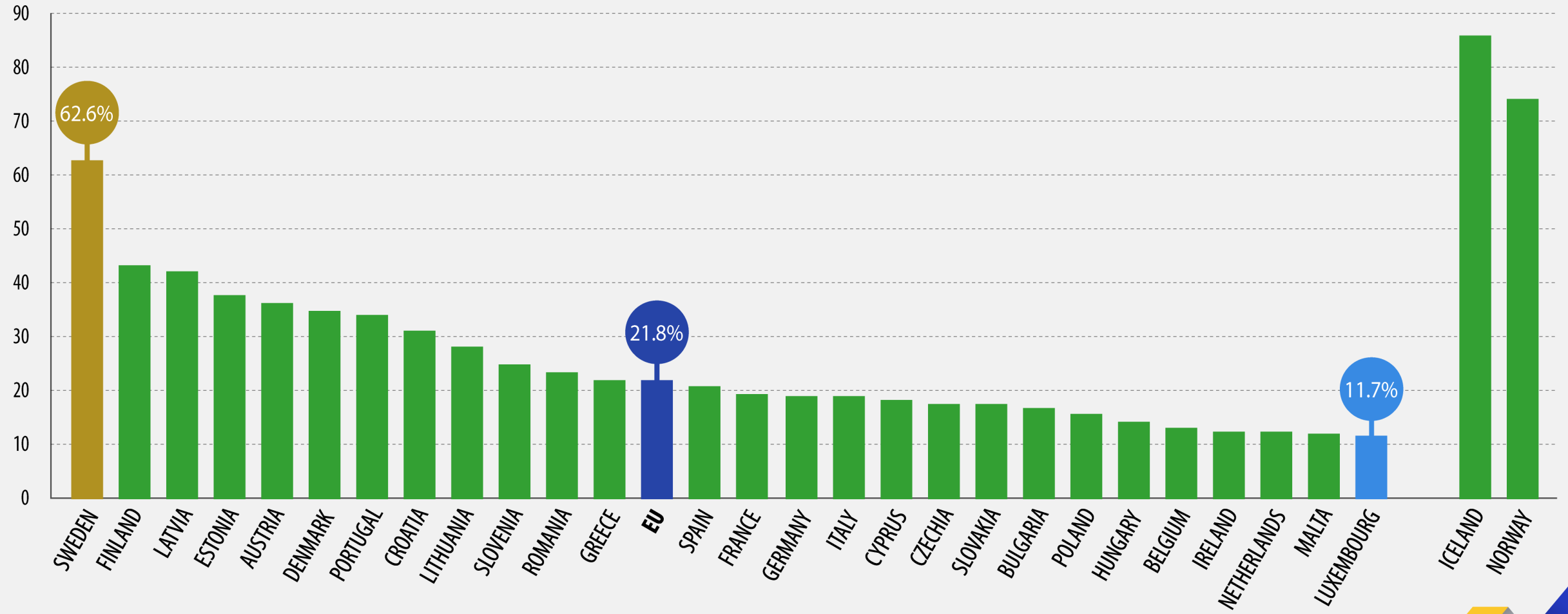
Timeline for renewable energy in the EU

https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en



Overall share of energy from renewable sources in the EU, 2021

(% by country)



Market Regulation

The regulatory mechanism has a central role in developing the generation of power using RES.

Governmental support is required to facilitate new technology applied to developing renewable energy.

The lack of a regulatory framework and market environment to support new technology and investment increases the probability of market failure.

In addition to grid modernization, efforts to enhance energy efficiency and adapt current policy, regulatory frameworks, and market environments are crucial to support investment in new technology.

Aspects of governmental support for RE

Financial Incentives:

Provide subsidies, tax credits, and grants to make RE projects financially viable and attractive to investors.

These incentives help level the playing field with traditional energy sources.

Renewable Portfolio Standards (RPS):

Enact and enforce RPS, which mandate a certain percentage of energy generation to come from RES.

This encourages utilities to invest in and integrate renewable energy into their portfolios.

Feed-in Tariffs (FiTs):

Implement FiTs that guarantee a fixed payment for RE producers, providing them with a predictable revenue stream and incentivizing the development of renewable projects.

Market Regulation

The five main aims of the EU's energy policy (Energy Union, 2015):

1. Diversify Europe's sources of energy, ensuring energy security through solidarity and cooperation between EU countries;
2. Ensure the functioning of a fully integrated internal energy market, enabling the free flow of energy through the EU through adequate infrastructure and without technical or regulatory barriers;
3. Improve energy efficiency and reduce dependence on energy imports, cut emissions, and drive jobs and growth;
4. Decarbonise the economy and move towards a low-carbon economy in line with the Paris Agreement;
5. Promote research in low-carbon and clean energy technologies, and prioritise research and innovation to drive the energy transition and improve competitiveness.

<https://www.europarl.europa.eu/factsheets/en/sheet/68/energy-policy-general-principles>

Technology Transfer

“A technology transfer typically includes the transfer of the technology design as well as the transfer of the property rights necessary to reproduce the technology in a particular domestic context”

(Lewis & Wiser, 2007)

Advanced technology and investment in new technology are essential in promoting RE consumption.

The unit cost for power generation through RES is more than for conventional resources such as fossil fuels.

This cost could be reduced by advanced technology and economies of scale.

 Designing appropriate regulations to promote technological innovation is crucial.

Technology Transfer

It is necessary for governments who set targets for emission reduction within a certain period to facilitate investment in low-carbon technologies from the demonstration to the commercial stage.

There should be a proper link between actors in order to take advantage of interactive learning and new ideas.

Appropriate capability is required to learn rapidly and effectively.

Otherwise, it is not possible to transfer and apply new technology.

Barriers

The most important challenge in deploying RE is the intermittent character of some RES such as wind and solar energy.

This intermittency causes uncertainty in using electricity on demand.

When power generation is faced with a shortage of demand, a solution should be available.

Wind turbines and economic factors such as other RES are taken into account in environmental issues because of their impacts on flora and fauna and the noise impacts on neighbourhood residents.

Barriers

The unit cost of power generated by RES is generally higher compared to that of conventional sources of energy such as fossil fuels and nuclear power plants.

This cost has decreased notably during the last decade because of technological advancements, which was achieved by supportive government policies.

Lack of knowledge and education of consumers is another challenge in taking advantage of renewable energy sources.

Social acceptance and buyer readiness are among the most important factors for market implementation.

RE development policies will not be successful if they cannot influence customer acceptance at the stage of buyer readiness.

All these barriers should be overcome by appropriate policies in order to develop RES.

National and International Environmental Policies

Environmental policy refers to the commitment of an entity at the level of an organization, government, or group of countries (regional or international) to regulations regarding environmental issues.

International institutions such as the United Nations Environmental Program (UNEP), World Environment Organization (WEO), and Intergovernmental Panel on Climate Change (IPCC) for global environmental management have made several efforts in this direction.

Many bilateral and regional agreements and international organizations deal with environmental issues.

Both resource-rich and resource-poor countries have tried to apply degrees of environmental protection to overcome climate change issues.

The possibility of using energy transition and new technology has created challenges in terms of energy security and environmental management.

National Environmental Policies

- **Environmental Impact Assessment (EIA) Regulations:**

Many countries have regulations requiring an assessment of the Environmental Impact of proposed projects before they are approved.

The goal is to ensure that potential environmental effects are considered and mitigated.

e.g., Horizon 2020: ORCHYD project (<https://www.orchyd.eu>)

- **Renewable Energy Policies:**

Many nations have policies promoting the use of renewable energy sources, such as solar and wind power, to reduce dependence on fossil fuels and mitigate climate change.

International Environmental Policies

- **Paris Agreement:**

A landmark international accord that aims to limit global warming to well below 2°C above pre-industrial levels.

Countries commit to reducing greenhouse gas emissions and enhancing climate resilience.

- **Montreal Protocol:**

Addresses the depletion of the ozone layer by phasing out the production and consumption of ozone-depleting substances such as chlorofluorocarbons (CFCs).

- **United Nations Framework Convention on Climate Change (UNFCCC):**

Provides the overall framework for intergovernmental efforts to address climate change.

The annual Conference of the Parties (COP) meetings discuss and negotiate actions to combat climate change.

Εργασίες;