

EUROSAI WGEA – TRAINING SEMINAR ON
SUSTAINABLE ENERGY
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Basic information on energy
issues



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Sustainable energy

- energy which, in its production or consumption has minimal negative impacts on human health and the healthy functioning of ecosystems, including the global environment, and that can be supplied in a sufficient amount not only to present, but also to future generations without putting a burden on them;
- an issue covering two main fields – energy generation and energy efficiency.



Obstacles to be overcome

- inadequate and imprecise legislation/policy;
- high costs;
- poorly functioning state system;
- poor public awareness;
- insufficient competitiveness of energy from renewables;
- scepticism of investors.



Basic information on energy issues

- Energy resources



- Energy supply



- Energy consumption, energy savings and energy efficiency



Renewable energy resources

- biomass
- hydropower
- wind energy
- solar energy
- geothermal energy



Biomass

- use for heating and water heating, as well as for electric power generation and transport;
- specific vegetable species, secondary products, or waste are used to generate energy;
- advantages;
- disadvantages.

Hydropower

- the energy of water can be obtained by using its flow (kinetic power) or its pressure (pressure potential head), or also as a combination of both of these at the same time;
- potential energy originates as a consequence of gravity and depends on a difference in elevation levels. It is also possible to use water heat gradient for energy generation;
- advantages;
- disadvantages.



Wind energy

- rotors of turbines driven by streaming air used to generate energy;
- the size of the turbines varies anywhere from small simple turbines up to individual large turbines that can be grouped at wind farms;
- advantages;
- disadvantages



Solar energy

- energy deriving from the Sun;
- can be used passively or actively;
- advantages;
- disadvantages.



Geothermal energy

- geothermal energy is the energy obtained directly from heat stored deep underground in the form of hot water or steam;
- advantages;
- disadvantages.



Step 1 – Chapter 1







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Advantages and disadvantages of different types of renewable energy

Basic information on selected RERs

	Advantages	Drawbacks	Site constraints
Biomass 	Combustion of purposefully planted biomass does not increase CO ₂ emissions in atmosphere. Possibility to use biomass for production of biofuels.	NOx emissions from combustion. Using agricultural land for growing biomass crops.	Need of agricultural land to produce biomass and degradation of arable soil as a consequence. Planting of monocultures.
Hydropower 	No CO ₂ emissions. No waste generated. Ability to connect quickly to the energy grid.	High investment costs; Environmental impacts – biodiversity harm. Variable operational hours.	Availability of suitably located water resource; Ocean energy demanded coastline infrastructure; Investment in energy grid.
Waste 	Direct combustion or production of biogas (also utilizable for transport as biofuel). Part of a waste management.	Greenhouse and dangerous gases emissions. Risk of smell inconvenience.	Location close to waste generation and disposal.
Wind 	No CO ₂ emissions; No waste generated during operation.	High investment costs; Potential noise; Intermittence of energy generated.	Needs specific wind blow intensity; High investments in energy grid. Necessity of the location accessibility for heavy equipment during construction.
Solar 	No CO ₂ emissions; No waste generated during operation. Low operational costs.	Used cells are hazardous waste; Dependency on sunshine duration and solar intensity.	Suitable location and orientation needed. Investments in energy grid.
Geothermal Energy 	No CO ₂ emissions; No waste generated during operation. Energy supply continual.	High installation costs. Possible leaks of toxic volcanic gases.	Greatest efficiency in geologically appropriate locations.

First application(s)  Electricity production  Heat production  Warming water

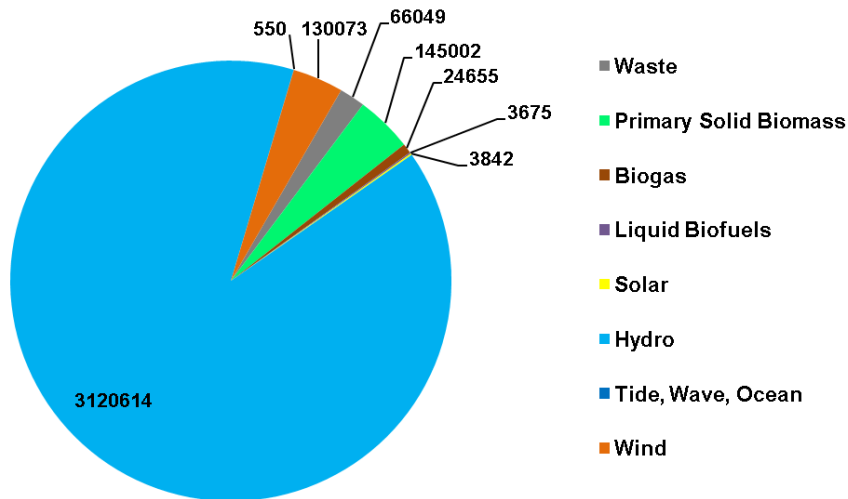
Source: Inspired by www.grida.no

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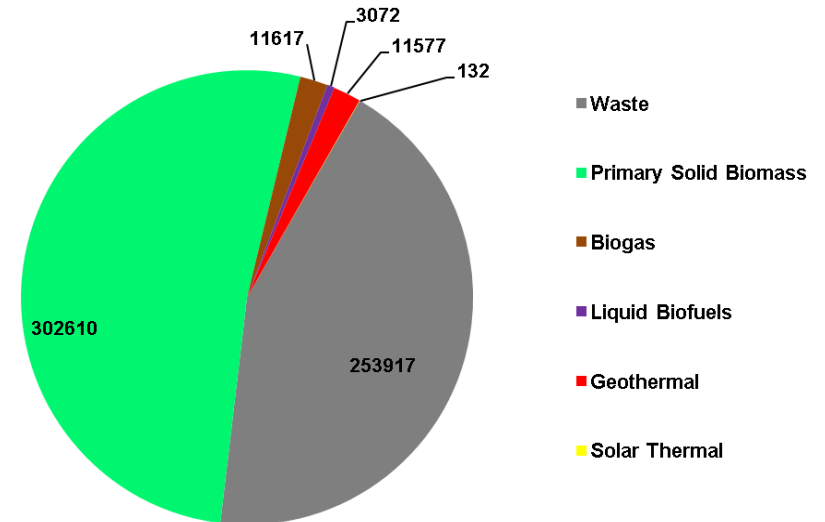
Use of renewable energy resources

World Electricity Production from Renewables in GWh



Source: IEA 2009, data 2006

World Heat Production from Renewables in TJ

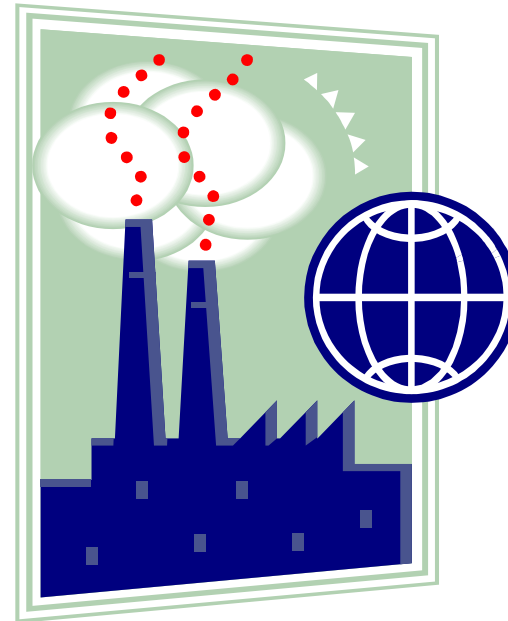


Source: IEA 2009, data 2006



Non-renewable energy resources

- coal
- natural gas
- crude oil



Non-renewable energy resources

- nuclear power



Energy supply

- substantial issue
- limitation on the transmission of energy
 - ◆ power losses
 - ◆ negative impact on certain types of renewable energy resources
 - ◆ capacity of transmission grid
 - ◆ availability and stability in energy supply



Energy consumption

- in principle, the energy is consumed in three basic forms
 - ◆ electric energy
 - ◆ thermal energy
 - ◆ combustion of fuels in transport
- the biggest energy consumer – industry



Step 1 – Chapter 1

- the main factors influencing energy consumption
 - ◆ energy savings
 - ◆ energy efficiency



Step 1 – Chapter 1

- other selected factors
 - ◆ higher living standards
 - ◆ higher industrial activity
 - ◆ raising safety standards
 - ◆ expansion of ICT
 - ◆ transportation sector
 - ◆ environment-focused projects
 - ◆ higher hygienic and health standards



Thank you for your attention!

Questions?

→ cont. Chapter 2

