Life Cycle Assessment of the framework of Cyprus Energy Policy

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HERAKLION 2019 Conferen

PRESENTATION CONTENTS

PURPOSE

- ✓Energy is necessary for life and development
- ✓Energy is connected to impacts to the environment and the society throughout its life cycle
- ✓Energy is connected to economic growth and prosperity.
- ✓Energy is a key element of sustainable development
- ✓Energy policy is important to minimize negative impacts and maximize benefits.
- ✓Cyprus faces challenges for its energy future

PURPOSE

- To investigate the Life Cycle framework of the Cyprus Energy Policy

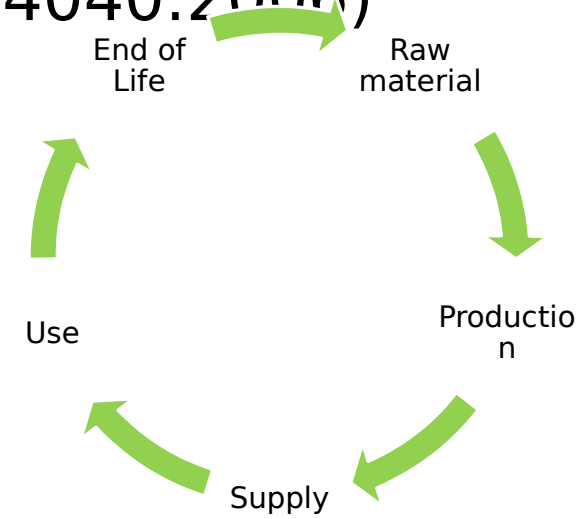
- To detect suitable sustainability indicators for Life Cycle assessment of the island’s Energy Policy

METHODS

Life Cycle Assessment (LCA)

LCA is a standardized technique that:

"addresses the environmental aspects and potential environmental impacts (e.g. use of resources and the environmental consequences of releases) throughout a product's life cycle from raw material acquisition through production, use, end-of-life treatment, recycling and final disposal (i.e. cradle-to-grave)" (ISO 14040:2006)



METHODS

Life Cycle Assessment (LCA)

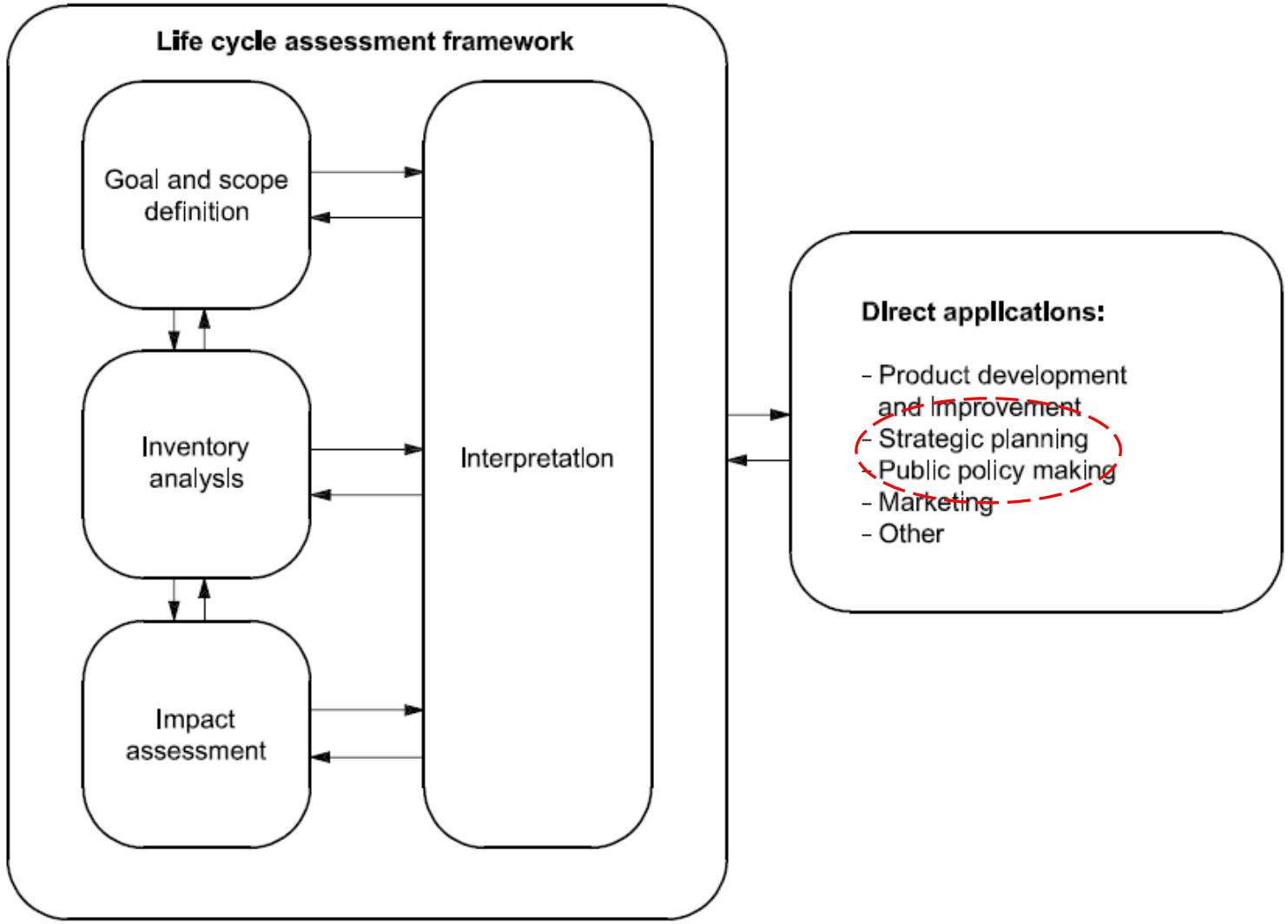


Figure 1 — Stages of an LCA

Source: ISO 14040 : 2006

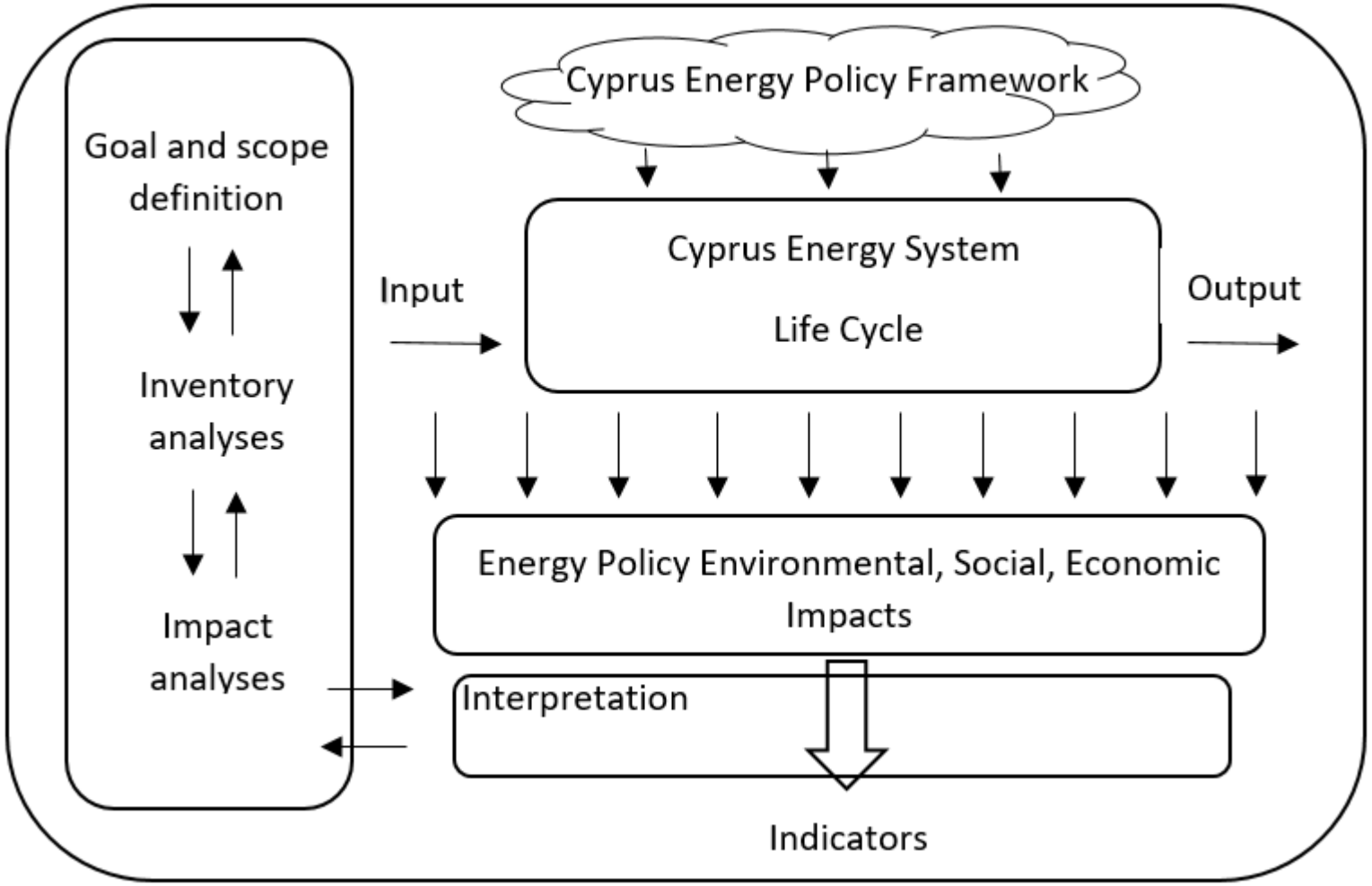
METHODS

Sustainability Indicators

- ✓ Widely used tools for sustainability measurements
- ✓ Energy planning assessment tool
- ✓ Able to cover
  - ✓ economic,
  - ✓ social and
  - ✓ environmental issues

METHODS

LCIA indicators detection method



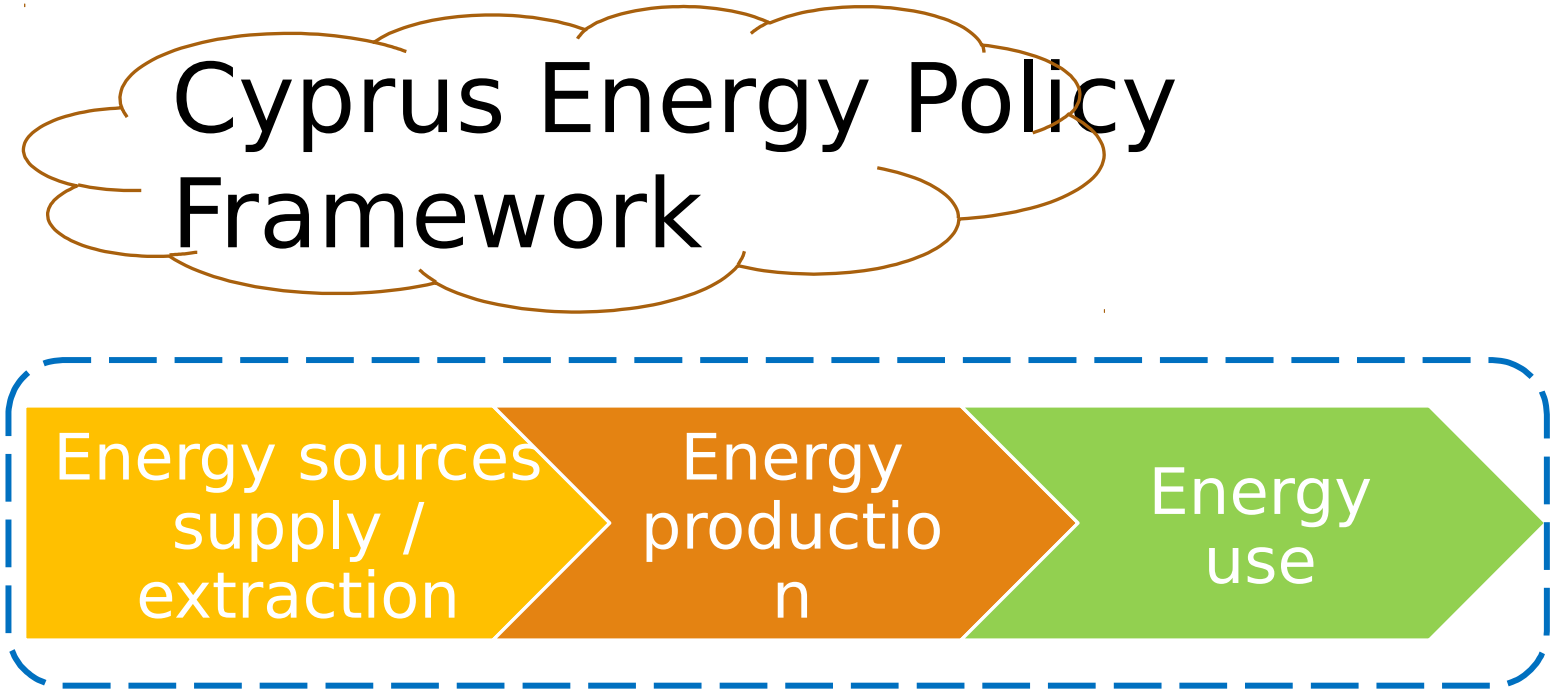
LIFE CYCLE ASSESSMENT

Area under study

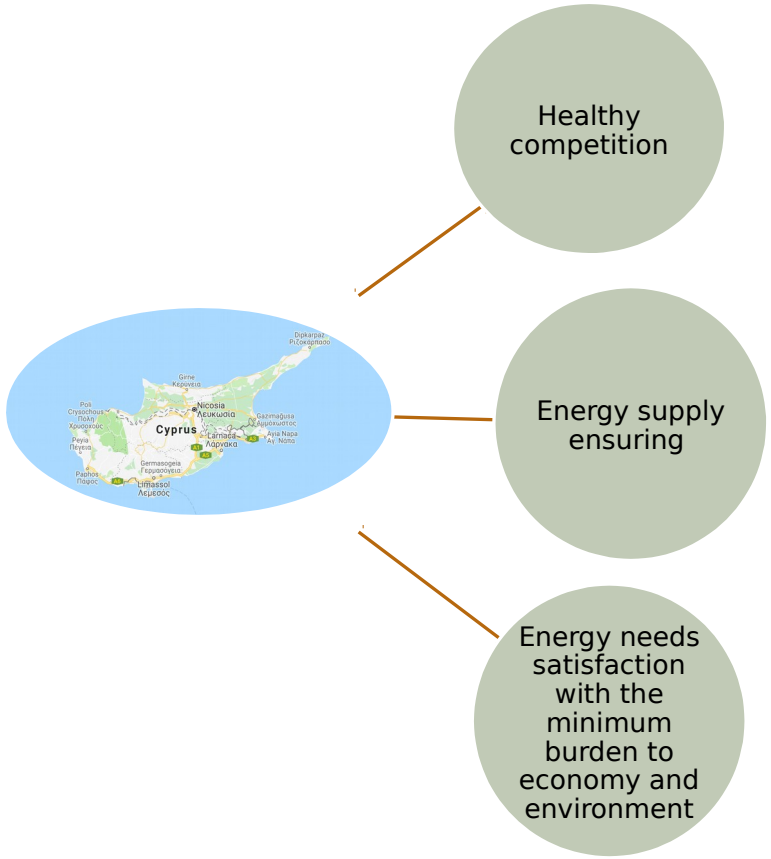
Source: Google maps and (PIO, 2019)

LIFE CYCLE ASSESSMENT GOAL AND SCOPE

System boundaries



CYPRUS ENERGY POLICY LIFE CYCLE INVENTORY
Policy axes

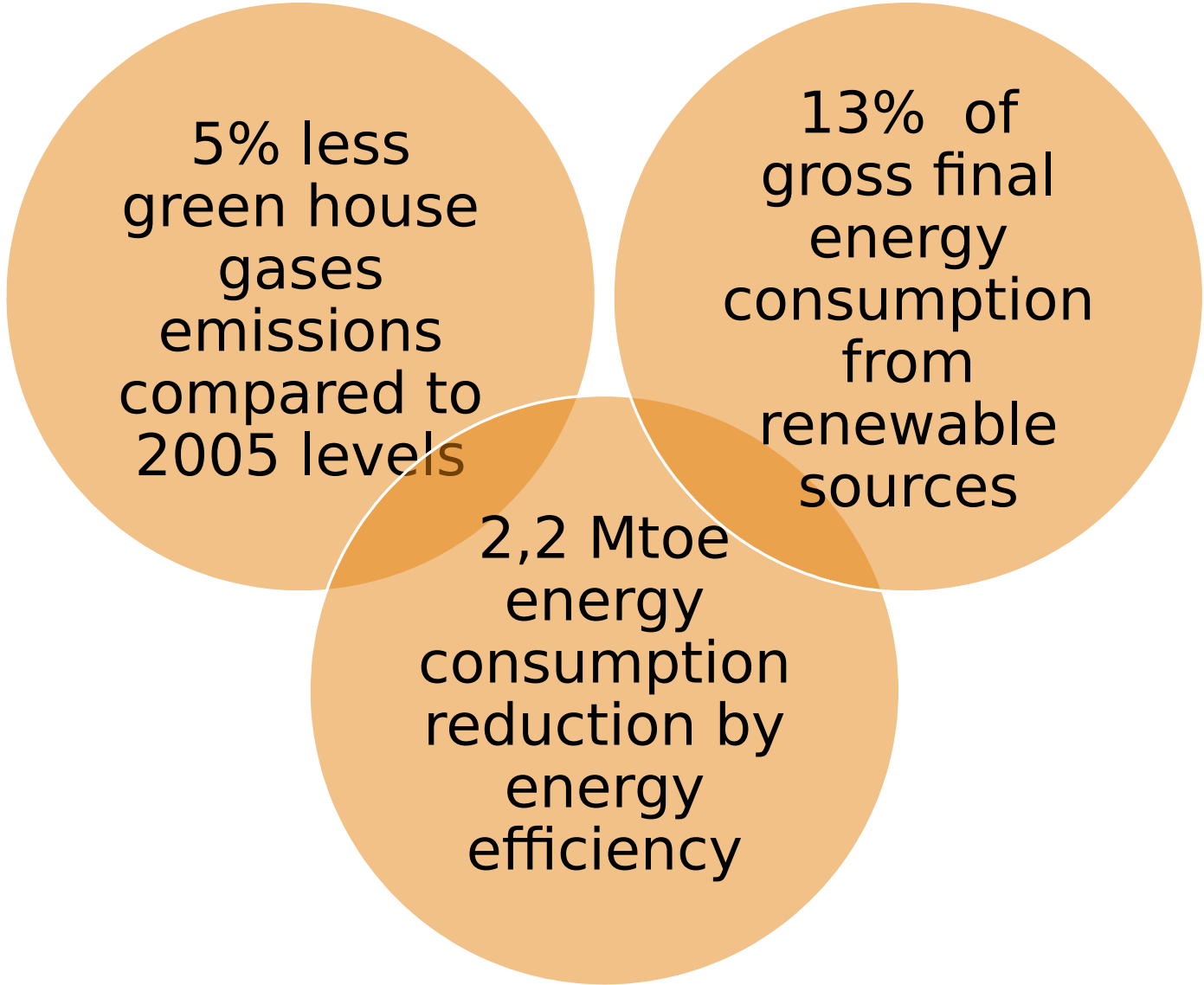


- Electricity and gas market liberalization.
- Oil market liberalization
- Oil stock terminals creation.
- Development and use of energy saving technologies.
- Domestic Renewable Energy Sources exploitation.
- Protection of the environment from industrial pollution.
- Use of more friendly to the environment energy forms e.g. natural gas

source: EAC, 2019

INVENTORY

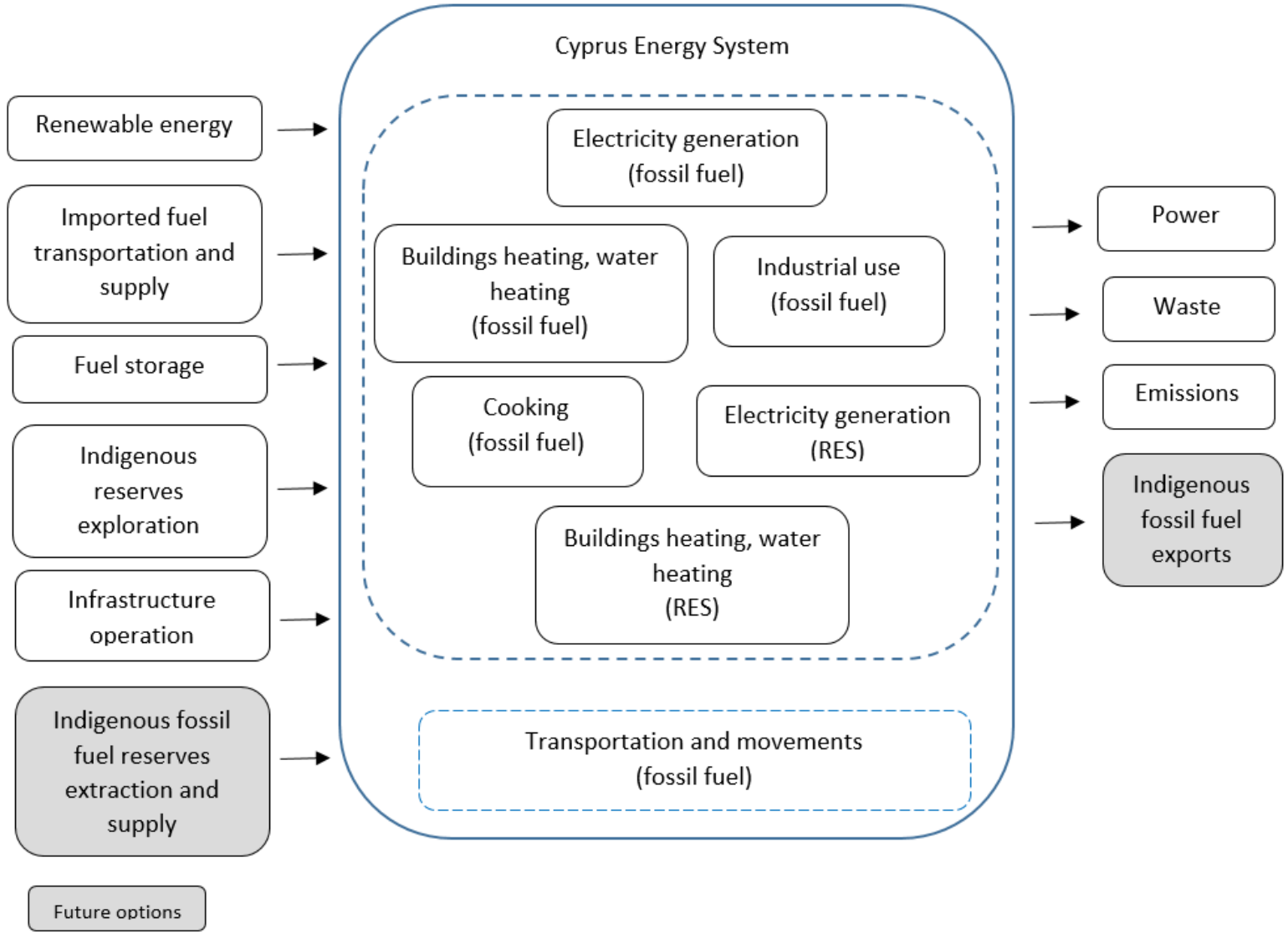
Cyprus 2020 Energy targets



source: EC, 2019

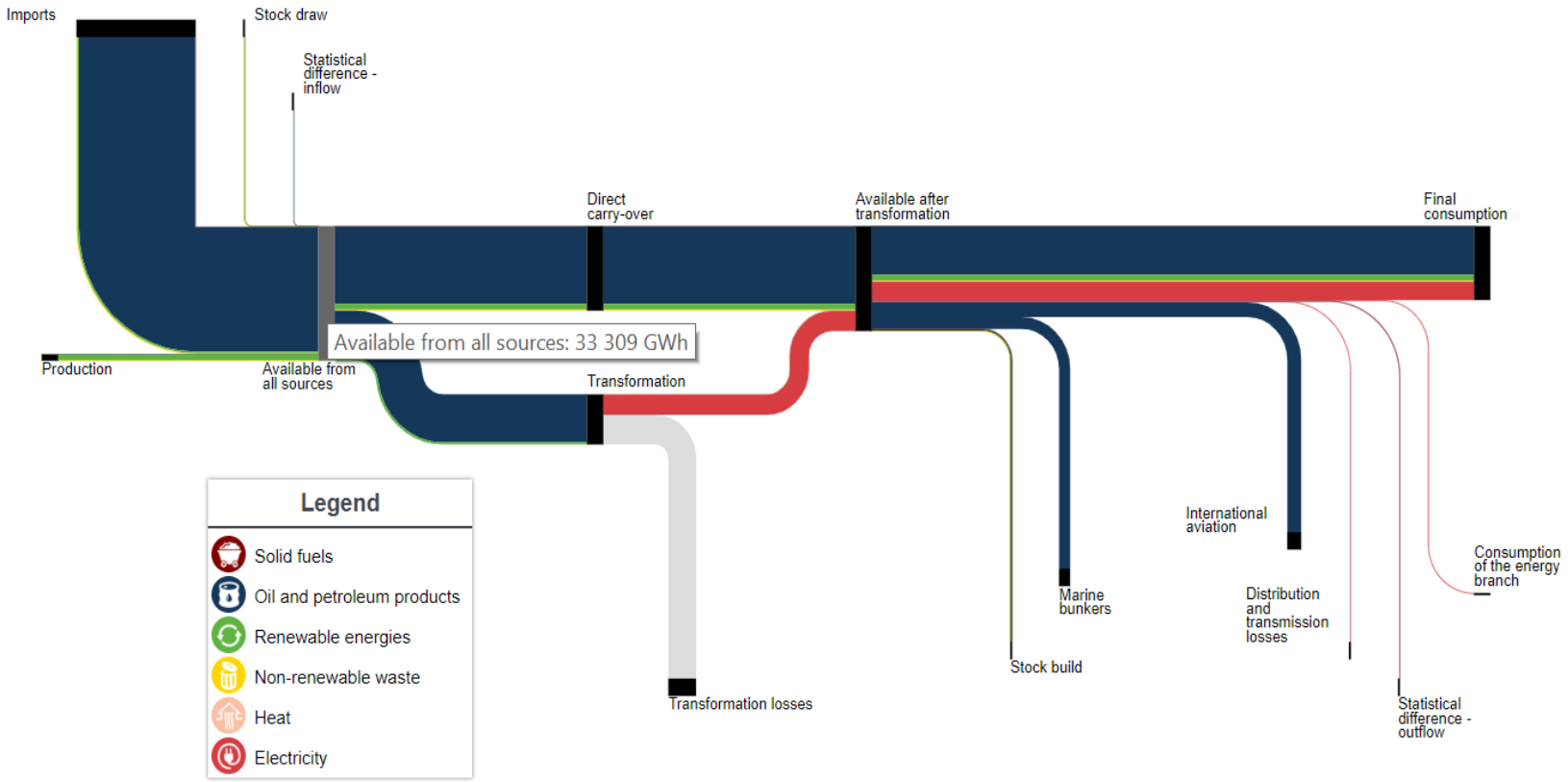
POLICY LIFE CYCLE INVENTORY

Cyprus Energy System



CYCLE INVENTORY

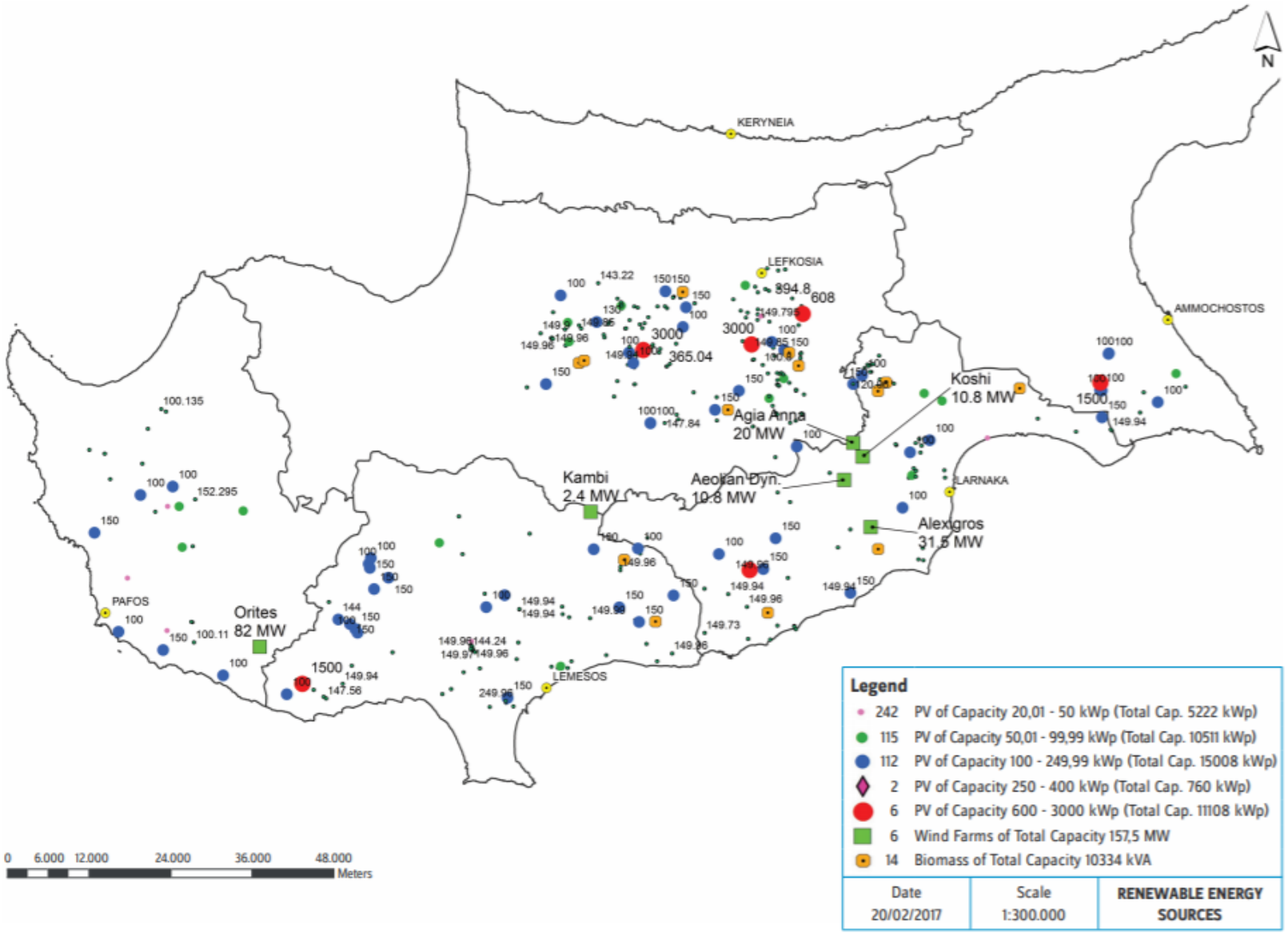
Cyprus Energy balance 2017



source: EUROSTAT, 2019

INVENTORY

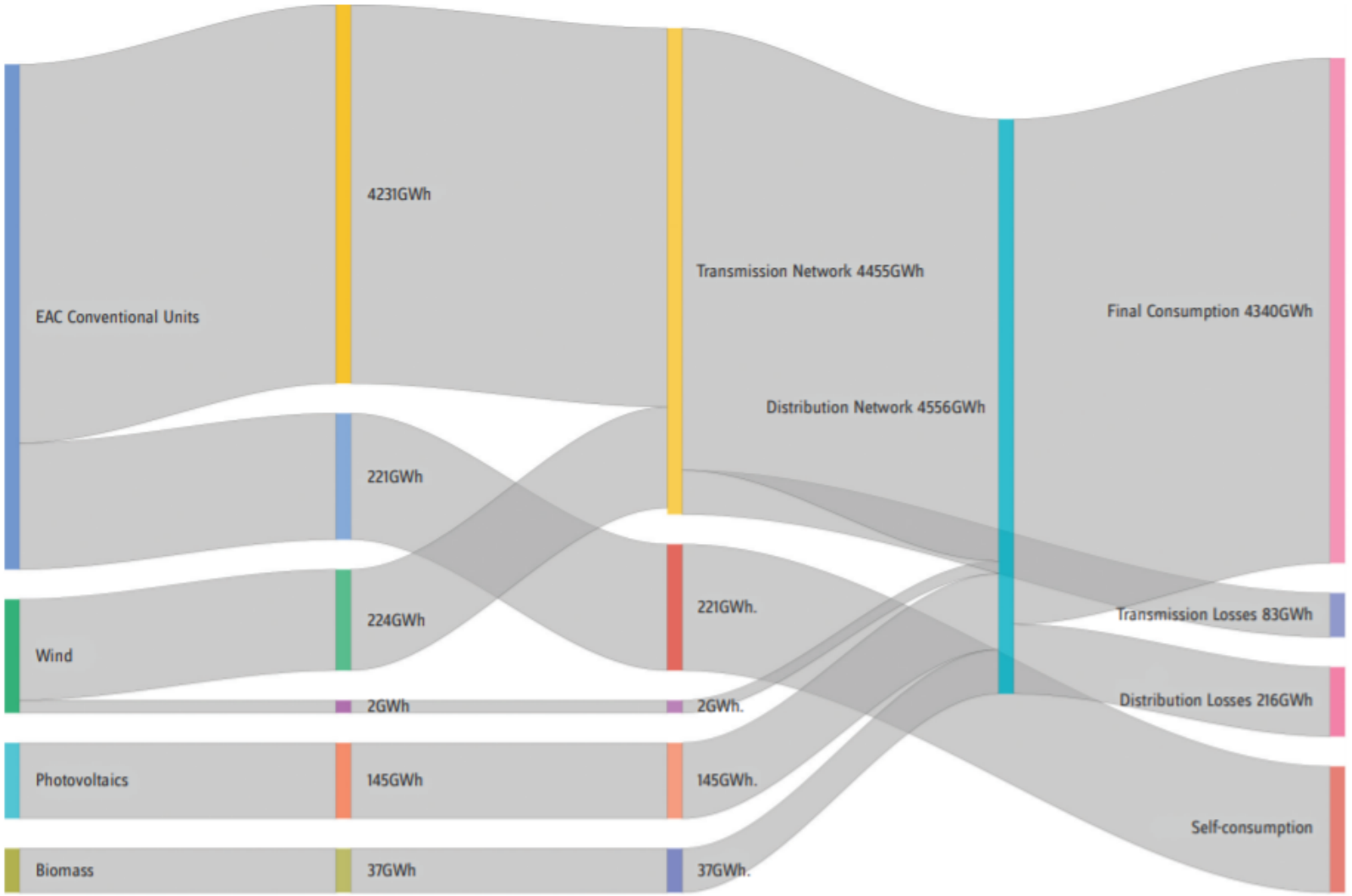
Cyprus Energy resources



Presentation and Geographical Distribution of Licences for RES Units by 20
(CERA, 2017)

INVENTORY

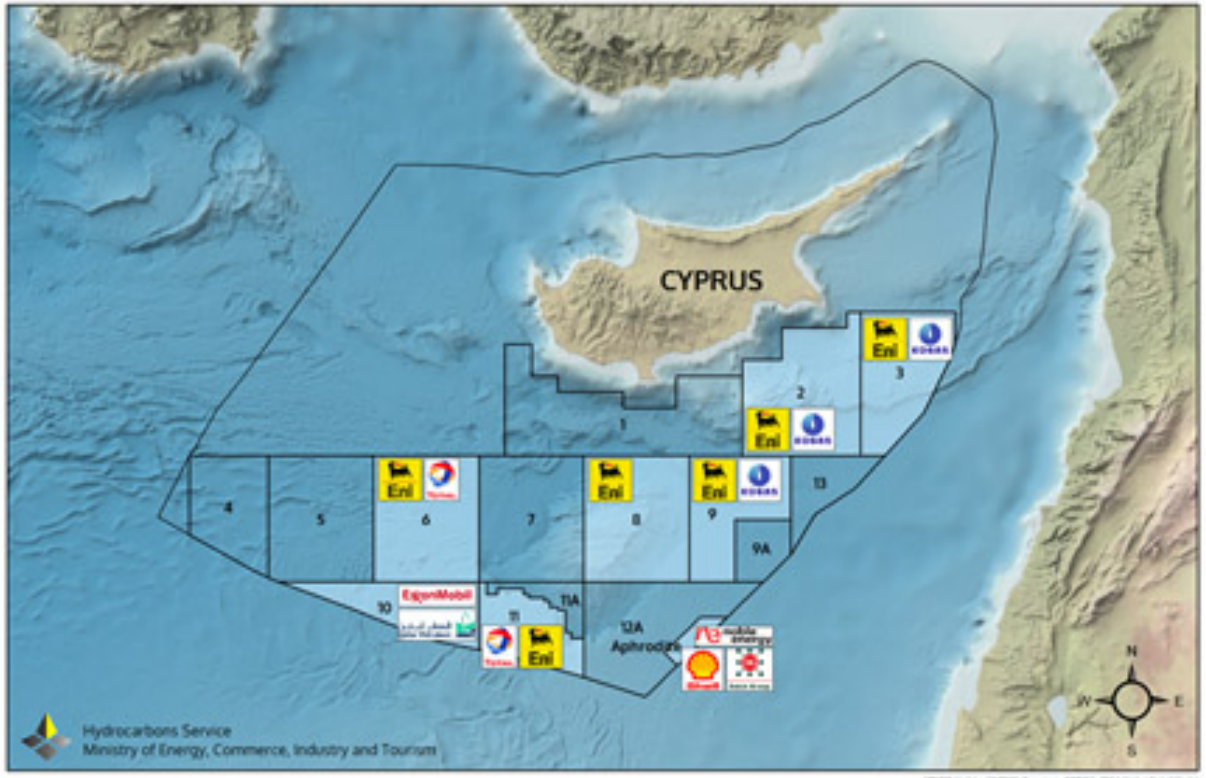
Cyprus Energy resources



Sankey Diagram for the overall electricity generation in 2016 (CERA, 2017)

INVENTORY

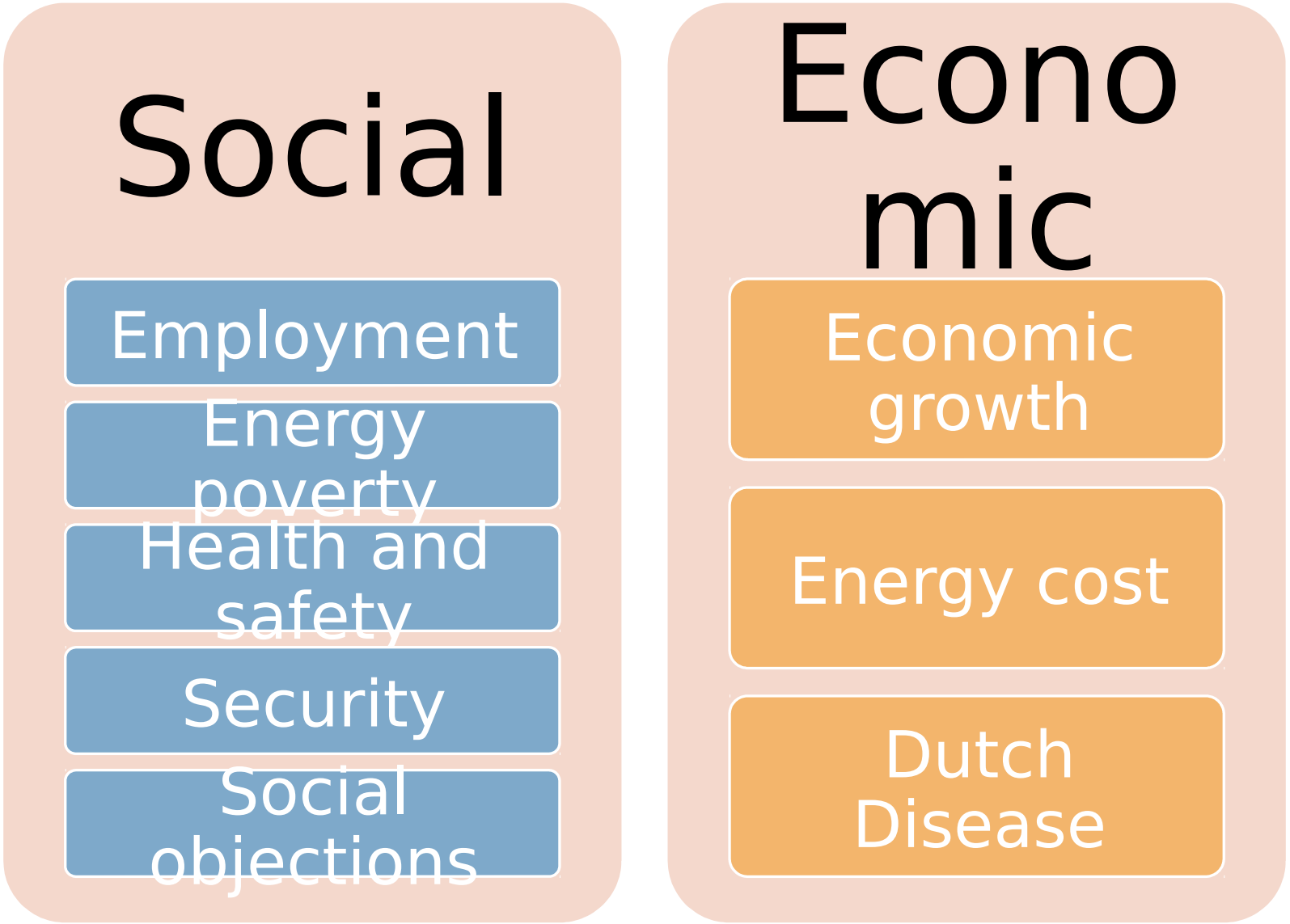
Cyprus Energy resources



Hydrocarbons Exploration licenses and licensed companies map (Hydrocarbons Service, 2018)

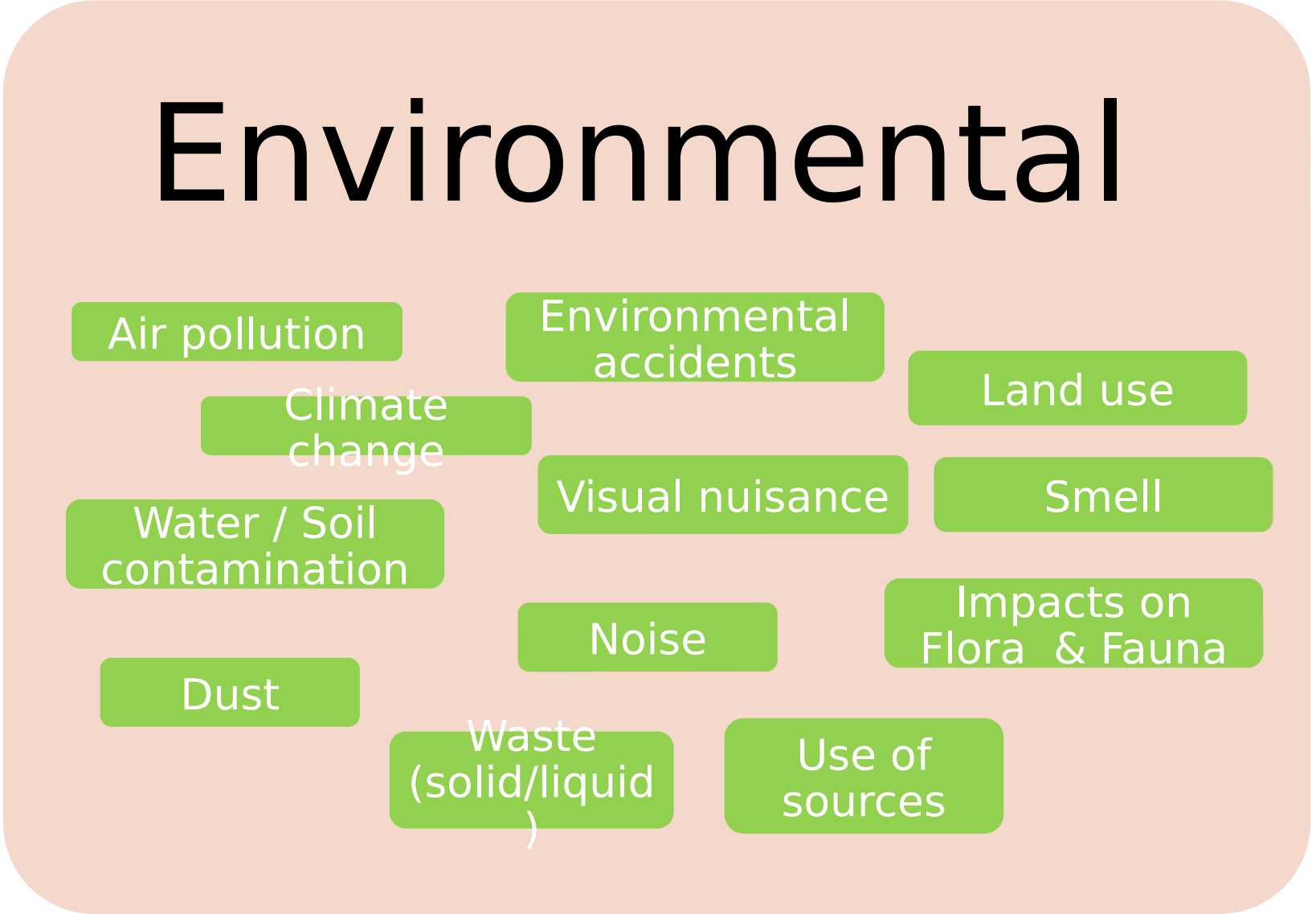
ENERGY POLICY LIFE CYCLE INVENTORY

Energy policy impacts



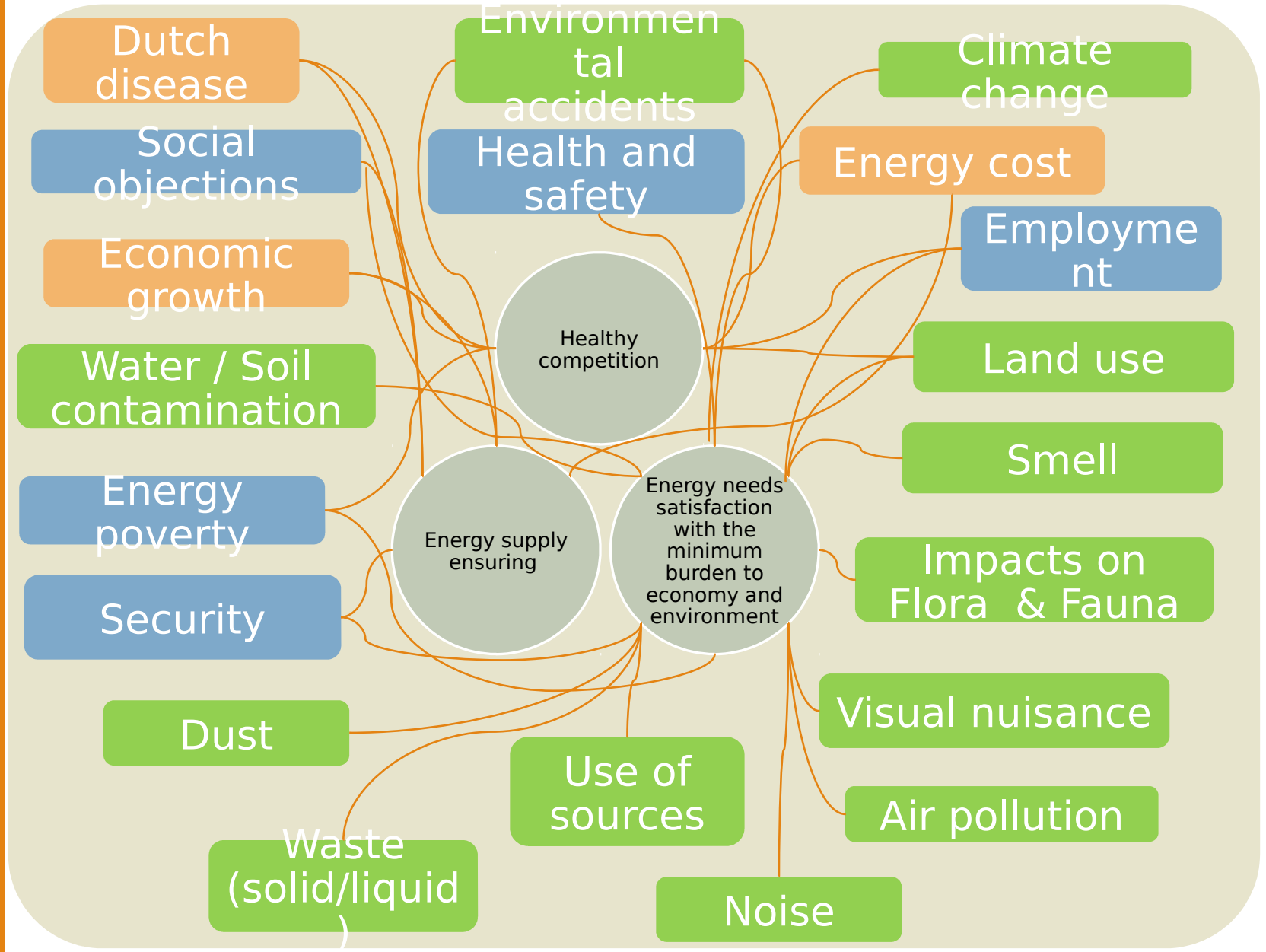
ENERGY POLICY LIFE CYCLE INVENTORY

Energy policy impacts



POLICY LIFE CYCLE INVENTORY

Energy policy impacts by axis



LIFE CYCLE ASSESSMENT SUSTAINABILITY INDICATORS

Impact category	Indicator	Unit
Environmental		
Climate change	Carbon Dioxide mass emitted	CO_2 Kg MWh^{-1}
Pollution (Air pollution & water / soil contamination)	Emissions total mass	Kg MWh^{-1}
Waste (solid/sludge)	Total waste (solid/sludge) mass produced	Kg MWh^{-1}
Dust	Dust mass emitted	Kg MWh^{-1}
Smell	Smell related complaints	no MWh^{-1}
Land use	Occupied land for infrastructure	m^2 MWh^{-1}
Visual nuisance	Plant area	m^2 MWh^{-1}
Noise	Noise related complaints	no MWh^{-1}
Use of sources	Water use	m^3 MWh^{-1}
	Oil use	ltr MWh^{-1}
Impacts on flora and fauna	Species impacted	no MWh^{-1}
Environmental accidents	Number of environmental accidents	no MWh^{-1}

LIFE CYCLE ASSESSMENT SUSTAINABILITY INDICATORS

Impact category	Indicator	Unit
Social		
Employment	Employment needs*	Work positions MWh^{-1}
Health and Safety issues	Health and Safety incidents	no MWh^{-1}
Social objections	Total number of complaints by the society	no MWh^{-1}
Energy poverty	No of electricity interruptions to households	no MWh^{-1}
Security	Energy by domestic sources *	MWh of domestic resources MWh^{-1}
Economic		
Economic growth	Annual GDP difference*	€ MWh^{-1}
Energy cost	Mean price of energy	€ MWh^{-1}
Dutch disease	Domestic energy business sector turnover	€ MWh^{-1}

* The higher is preferable

CONCLUSIONS

- ✓ Cyprus is depended to energy imports
- ✓ The island has indigenous energy resources
- ✓ There are options for alternative energy policy scenarios
- ✓ Energy policy can be assessed by life cycle impact indicators
- ✓ Policy formulation could be based on this assessment results and connected targets
- ✓ Further work: LC indicators to be calculated for current and alternative policy scenarios

THANK YOU