Presentation of scenario analysis of reducing GHG (climate change mitigation) in Slovenia until 2050

Models and methods for scenario analysis

Matevž Pušnik, Andreja Urbančič, Matjaž Česen, Stane Merše, Katarina Trstenjak

Energy Efficiency Centre

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Projekt LIFE ClimatePath2050 (LIFE16 GIC/SI/000043) je financiran iz finančnega mehanizma LIFE, ki ga upravlja Evropska komisija, in iz Sklada za podnebne spremembe Ministrstva za okolje in prostor RS.

Projections?

- The projection is **not a prediction**

  Electric cars will represent 10% of the Slovenian car fleet in 2030

- Projection is an analysis of **where we come to** if we carry out a certain **set of measures** under **certain circumstances** (assumptions)

  …if subsidies and tax incentives are available for electric vehicles and incentives for the installation of charging infrastructure, given the assumed technological development of cars, we project that electric cars will represent 10% of the Slovenian car fleet

- Projection is a tool that enables **what if analysis**

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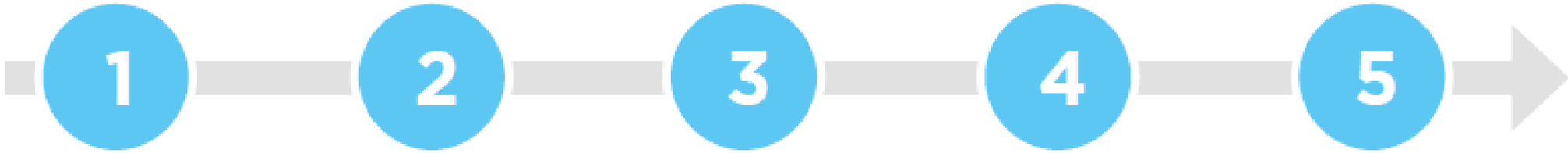
Key steps of projections preparation in support of Long term Climate Strategy 2050



Setting up the analysis

Framework of the analysis

Design of scenarios and measures

Criteria for comparing scenarios

Projections of external parameters

Economic activity, energy prices, emission alowences, etc.,...

Projections of GHG emissions

Modelling different scenarios, future measures and levels of ambition

Impact assessment

Employment, public finances, polutants, sectoral goals, energy security, …

Decision support

Assessment of results, recomendations, guidelines, dissemination in support of decision making

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Modeling approaches

- **Econometric** – extrapolated historical data used to describe future energy-economic interactions; assessment of individual technologies is not possible
- **GEM** – ensuring general or partial equilibrium of systems → **Macroeconomic** energy-economic interactions between sectors are described through the input-output economic flows;
- **Optimization** – LP, Monte Carlo; optimizing costs according to selected variables taking into account the boundary conditions of the system
- **Simulation** – mathematical description of a real energy system, technologically oriented

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Modeling approaches(2)

- the purpose of energy systems models is to **understand** a specific segment in energy and show how such a segment **affects society**, its **sociological** components, **economy** and **environment**
- the results of the model of the considered energy system must **reflect** the selected **assumptions** and the **approximations used**, which the designer of the model assumed in the planning
- mainly **hybrid models are used**, which combine approaches (**simulation + optimization + GEM**)

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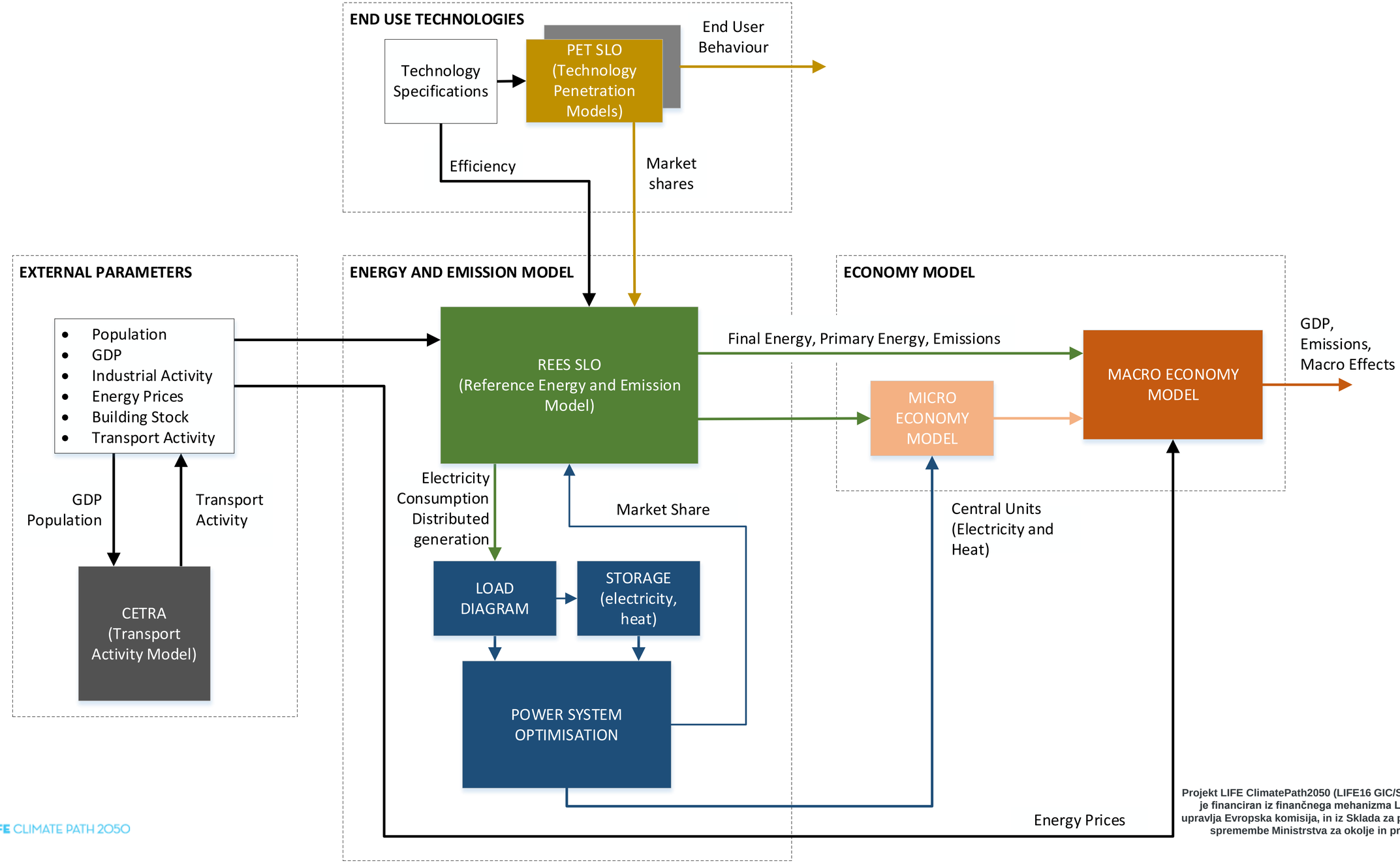

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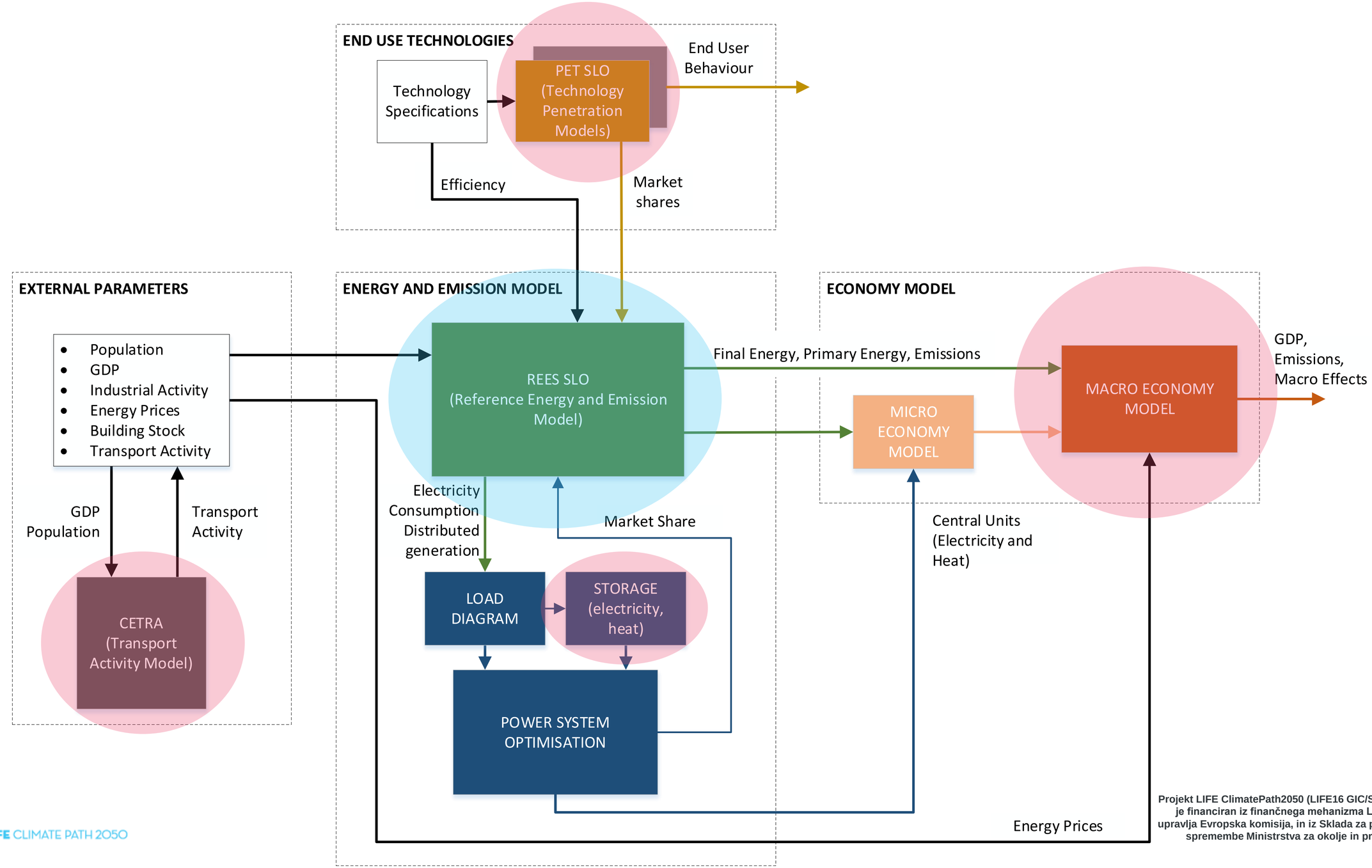

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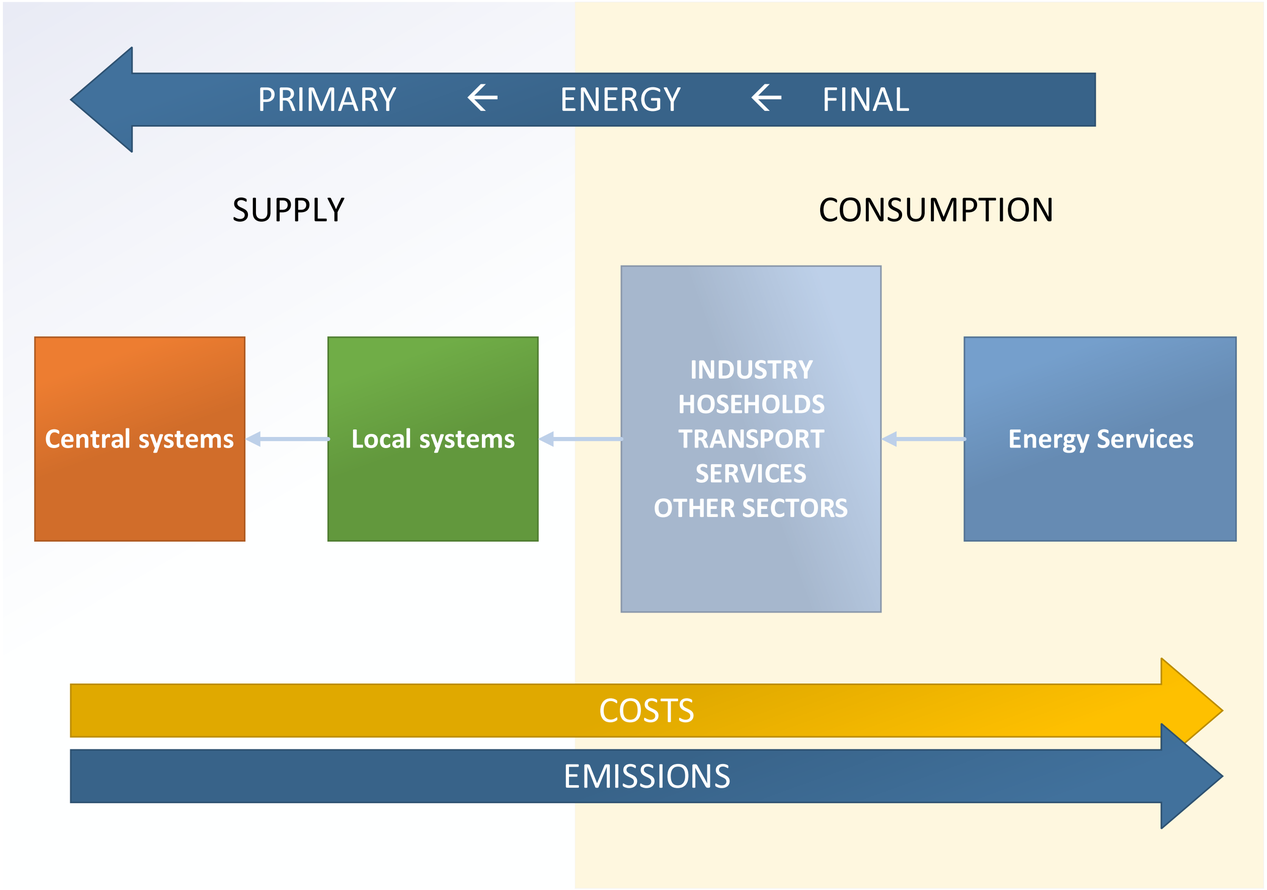
Structure of REES-SLO model



- linear **simulation** model
- technology-oriented (**bottom up**) model
- designed in **MESAP**, a free structure system design tool
- **input parameters**: industrial activity, building stock, demography, transport work, energy prices,…

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Leading parameters of the REES-SLO model

- The leading parameters of the **REES-SLO** model are **sector-specific**
- Industry sub-model - as a leading parameter **economic activity** of individual industries is used (for steel & cement **index of physical production**)
- Households sub-model - building **stock**, building **areas**
- Services sub-model - building **areas** and **employment rate**
- Transport sub-model - **transport work**

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Technology database of REES-SLO model

- **Specific technologies** that are or will be relevant for an individual sector (efficiencies, emission factors, market shares) are modelled
- **Transport technologies, vehicle types** → transport sector
- **Heating, cooling, lighting technologies** → households, services, industry
- Industrial processes → **furnaces, electric motors, compressed air**
- Introduction of **parallel technologies** where fuel replacement or significant technology improvement is expected

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Key results of REES-SLO model

- **Energy balance** by sectors and fuels, final energy consumption, primary energy, domestic production, imports / exports
- **Selected energy indicators** - share of RES in final energy, import dependence, security of supply
- **Emissions** - GHG by sectors and by fuels and by technologies; other emissions, NOx, SO2, NMVOC, PM;
- **Costs** - by sectors and fuels, cost structure (price, network charges, taxes), **investments** - by sectors and technology groups

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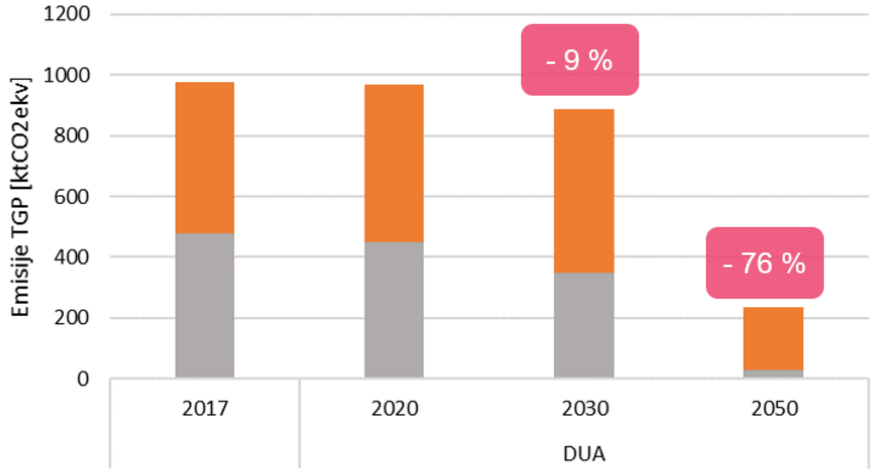
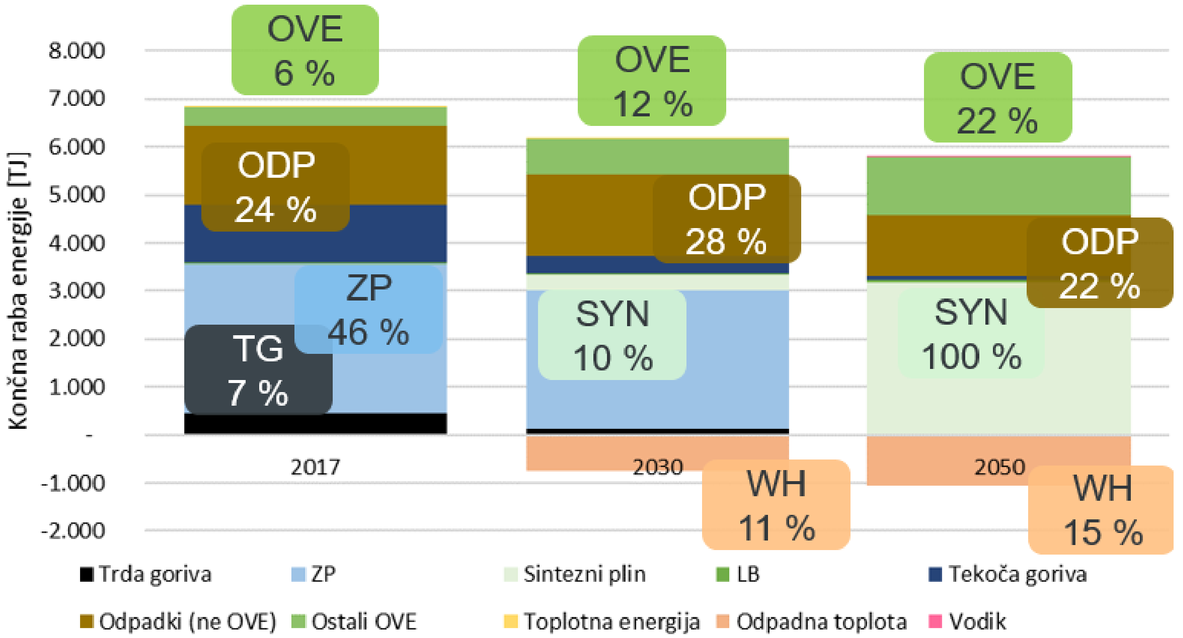
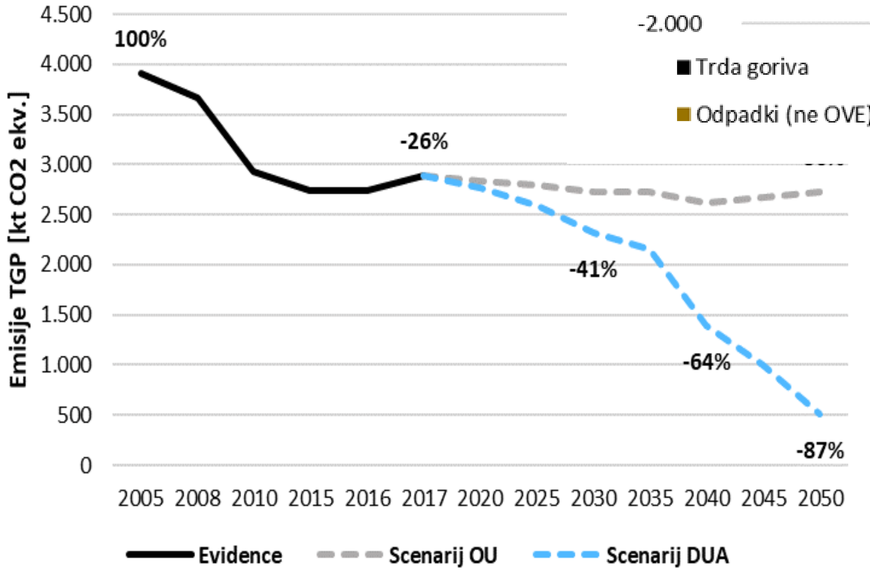
Example of REES-SLO model results



Delež EM v sektorju
35 %





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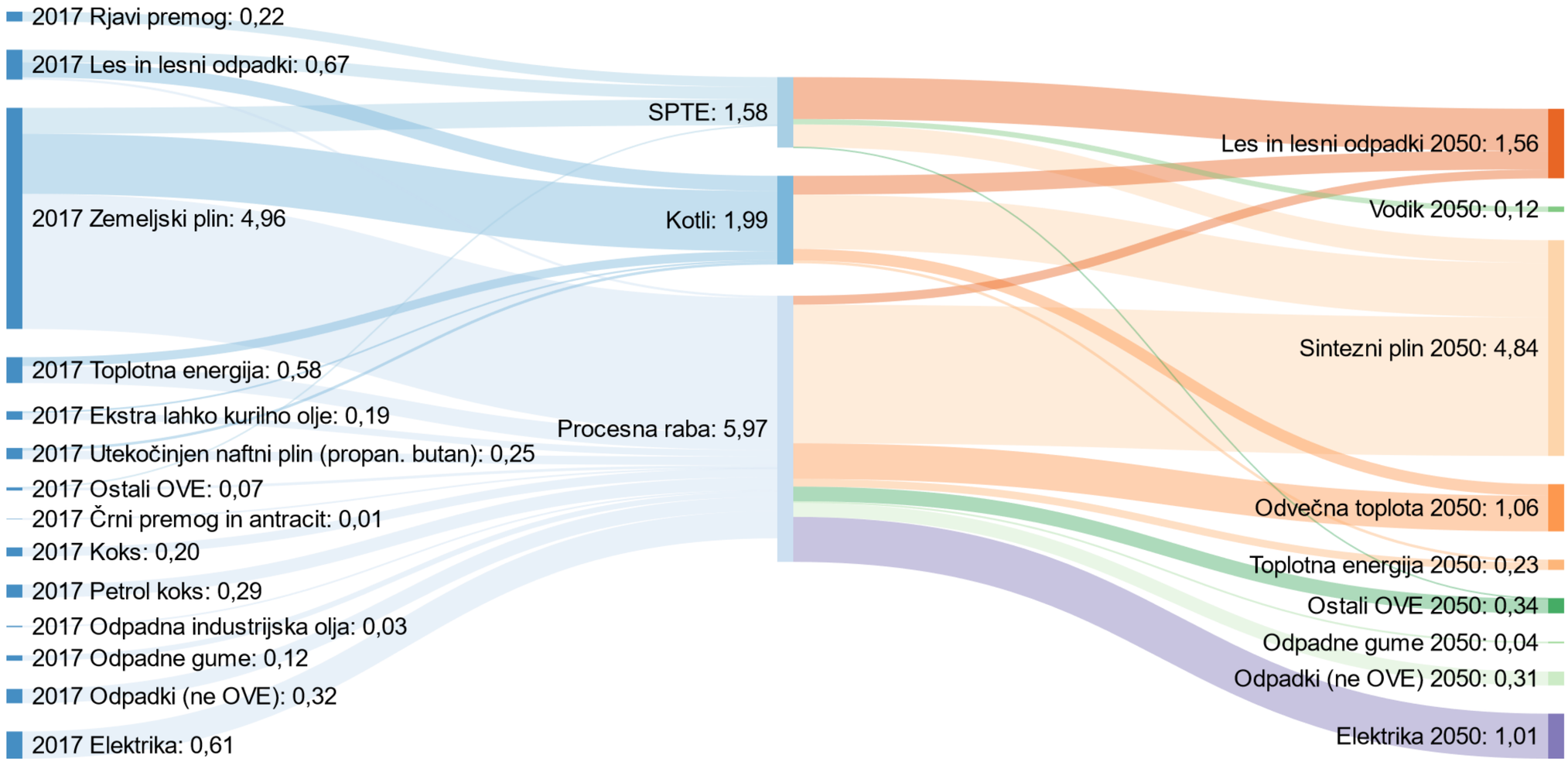
Example of REES-SLO model results(2)



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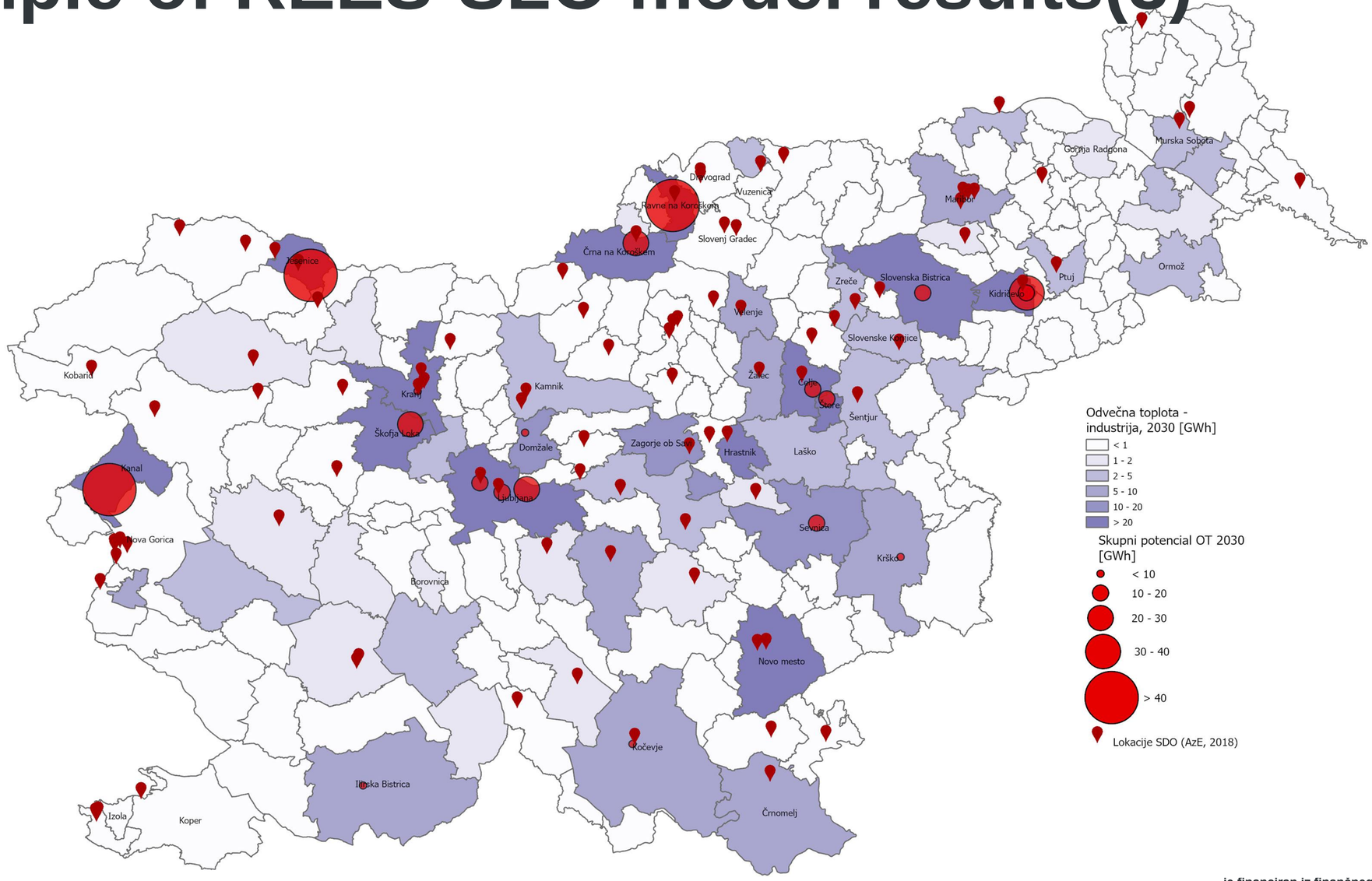
Example of REES-SLO model results(3)



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Conclusion

- The REES-SLO model represents the **methodological core** of the calculation of projections and scenario analyses
- Presented tools and models **enable an insight** into the energy, environmental, economic and macroeconomic effects through **scenario analysis** (reaching consensus → key role of decision makers)
- The use of projections enables **a structured overview and analysis of the effects** of implemented measures of the selected energy policy

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Challenges

- **Circular economy**, resource efficiency, product design and sustainability
- Evaluation of **socio-economic effects** (behavior, energy poverty)
- Addressing changes in the **economic and social paradigm** (energy efficiency vs. energy sufficiency)
- Evaluation of the **impact** of scenarios **on the structure of the economy** (national vision of economic development, strategies, policies, bases?)

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Thank you and stay safe.

matevz.pusnik@ijs.si

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LIFE CLIMATE PATH 2050

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Vodilni partner projekta LIFE Climate Path 2050:

Institut “Jožef Stefan”
Center za energetsko učinkovitost

Vodilni partner projekta LIFE Climate Path 2050:

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Kmetijski inštitut Slovenije

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Gozdarski inštitut Slovenije

www.PodnebnaPot2050.si

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