Action C2 - Modelling for the Mid-Century Climate Strategy

# Models and tools for calculation of GHG emissions up to 2050

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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.

# General context

- Several **strategic documents** require expert bases in a form of **projections**
- **NECP**, **Long Term Climate Strategy**, GHG Reporting (**UNFCCC** - United Nations Framework Convention on Climate Change), reporting **N**ational **E**mission reduction **C**ommitments Directive, …
- Assessment of the **national** goals (meeting the **targets**)
- Enabling **quantitative bases** for dialogue with **national** stakeholders and **EU** representatives



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# Why models?

- The purpose of the model is to **understand** a specific segment and show how such a segment **affects society**, its **sociological** components, **economy** and **environment**
- Model results are usually in a form of **projections**
- Assessment of **scenarios for reducing GHG** in the sectors of transport, industry, buildings, energy supply, agriculture, LULUCF
- **Results** of the model must reflect selected **assumptions** and the **approximations** used, which the designer of the model assumed in the planning



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# Models used

- **REES-SLO** (**R**eference **E**nergy and **E**mission **S**ystem model for **SLO**venia→ simulation model)
- **Power System Optimisation** model (Monte Carlo opt.)
- **CETRA** (**C**entral **E**uropean **TRA**nsport model)
- **Macroeconomic model** (General Equilibrium Model)
- **LULUCF Model** (Land Use, Land Use Change and Forestry Carbon Budget Model)
- **Agricultural model** (AGRI LIVESTOCK and AGRI SOILS)



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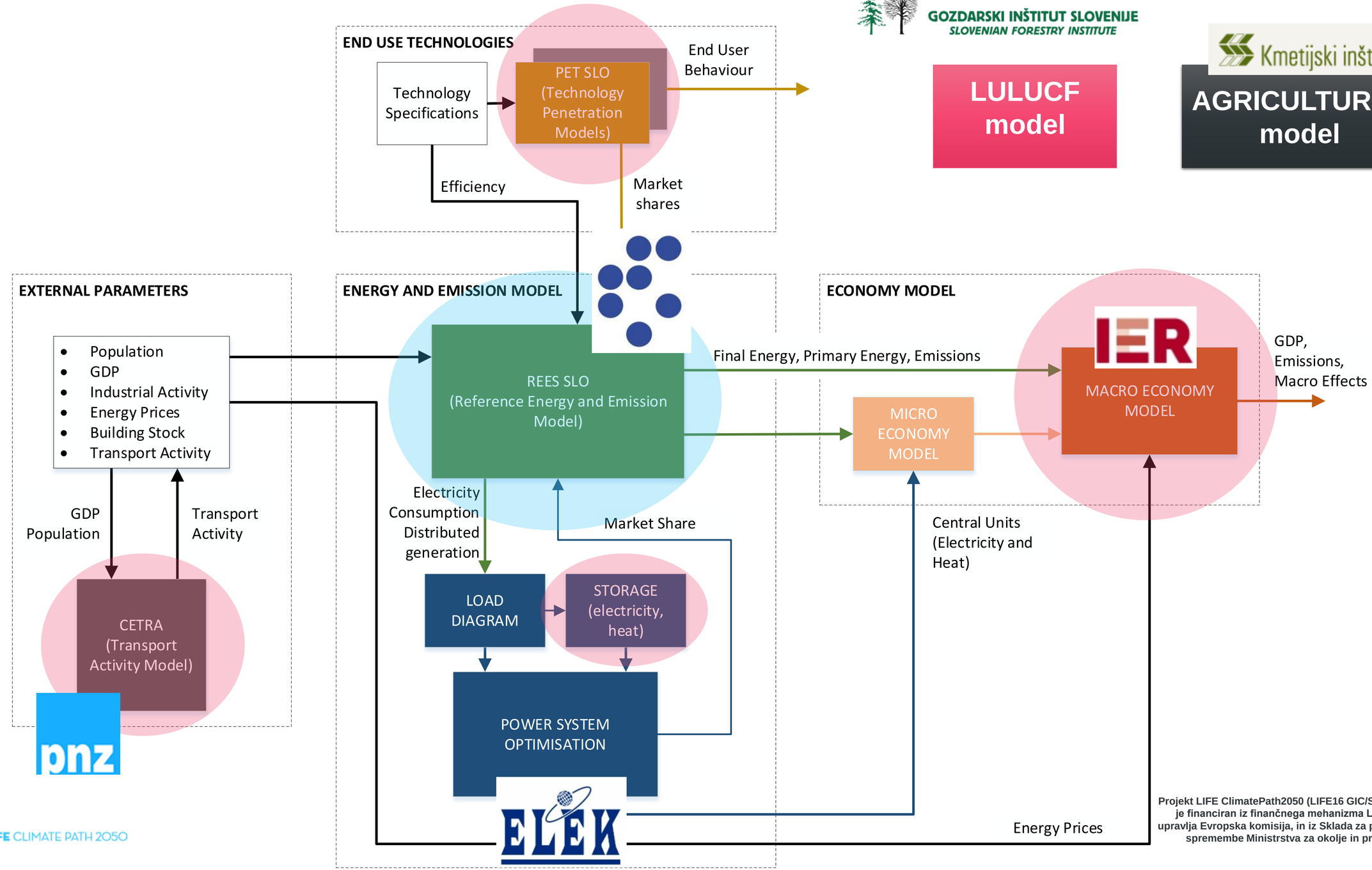
SLOVENIAN FORESTRY INSTITUTE

LULUCF model

Kmetijski inštitut Slovenije
AGRICULTURAL model



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# REES-SLO model

- Complete **renewal** of the model has been done
- New model for **Industrial sector** (energy intensive vs. other branches); **Household sector** → **Building stock model** → link with GIS systems (heat maps and spatial analysis) and **Transport sector** → **link** with **CETRA** transport activity **model**
- **Updated** technology database (technologies, market shares, efficiencies)
- **Link** with **Macroeconomy** GEM model



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# Power System Optimisation model

- **New** hourly electric **demand curves** (year 2017)
- Technical, economic and environmental **data for existing and new power plants**, (hydroelectric, nuclear, thermal and pumped hydro storage) **have been updated**
- Hydrological data with **impact of climate change on hydrological conditions** has been updated
- A **new interface** for hourly operation of wind and photovoltaic PP was applied



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# CETRA model

- Existing national transport model of Slovenia was **upgraded** to calculate effects of proposed measures to GHG emissions
- Model was **upgraded** to enable calculation of emissions (GHG) using **HBEFA 4.1** (Handbook emission factors for road transport) methodology
- Model was used to **calculate scenarios** of transport policies, infrastructural measures…
- Model results were used in NECP and Climate Strategy



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# MACROECONOMIC model

- Modeling **macroeconomic** and sector-level effects of climate and energy policy
- The Social Accounting Matrix (SAM) was **updated** with **additional commodities and activities** (e.g. Nuclear fuel and Synthetic gas, production from HPP, TPP, NPP, RES, Transmition, Distribution and Trading)
- **Exogenous factors were extended** for the period 2015-2050 (link with REES-SLO)
- **Additional data was prepared** (energy inputs, energy efficiency, investments etc.)



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# LULUCF model

- Carbon Budget Model from Canadian Forest Service (CBM-CFS3 1.2) has been used as a basis and **applied to Slovenian circumstances**
- **Inventory data from Slovenian Forest Service** was used for the year **2014**
- For each forest type and sub-category of species mixture, **growth curve** was developed
- Alternative **harvesting scenarios for Slovenia** have been simulated using CBM-CFS model



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# AGRICULTURAL model

- The **AGRI LIVESTOCK** and **AGRI SOILS** models were **linked** together
- A **module** for estimating gross and net **nitrogen balance has been added**
- **New emission sources** (rabbits, composts, digestate) **were added** to the model
- An **updated methodology** for estimating emissions of nitrous oxide, ammonia and nitric oxide (EMEP/EEA 2019) was implemented



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# Thank you and stay safe.

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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:

ELEK

**ELEK, načrtovanje, projektiranje in inženiring, d.o.o.**

ZRMK

**Gradbeni Inštitut ZRMK, d.o.o.**

IER

**Inštitut za ekonomska raziskovanja**

**Kmetijski inštitut Slovenije**

pnz

**PNZ svetovanje projektiranje, d.o.o.**

**Gozdarski inštitut Slovenije**

www.PodnebnaPot2050.si

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