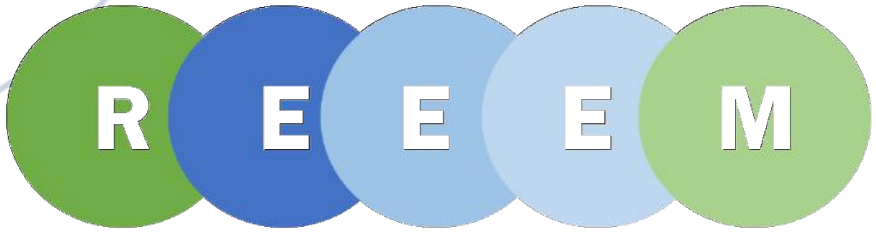
Integrated impact assessment of decarbonisation pathways for the European Union

Insights from the REEEM Project

Georgios Avgerinopoulos
division of Energy Systems Analysis
KTH Royal Institute of Technology
georgios.avgerinopoulos@desa.kth.se



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Overview of REEEM

Key figures

Funded under GA N. 691729, Horizon 2020 Low-Carbon Energy call LCE21-2015.

Objective

To gain comprehensive understanding of the **system-wide implications of energy strategies.**

Focus

Energy strategies focus on **transitions to a competitive low-carbon EU energy society**, as described by the Strategic Energy Technology (SET) Plan.

Methodology

A **large ensemble of models** to study the **role of technologies, innovation and consumers** in **EU decarbonisation pathways.**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Overview of REEEM

Objective

To gain comprehensive understanding of the **system-wide implications of energy strategies.**

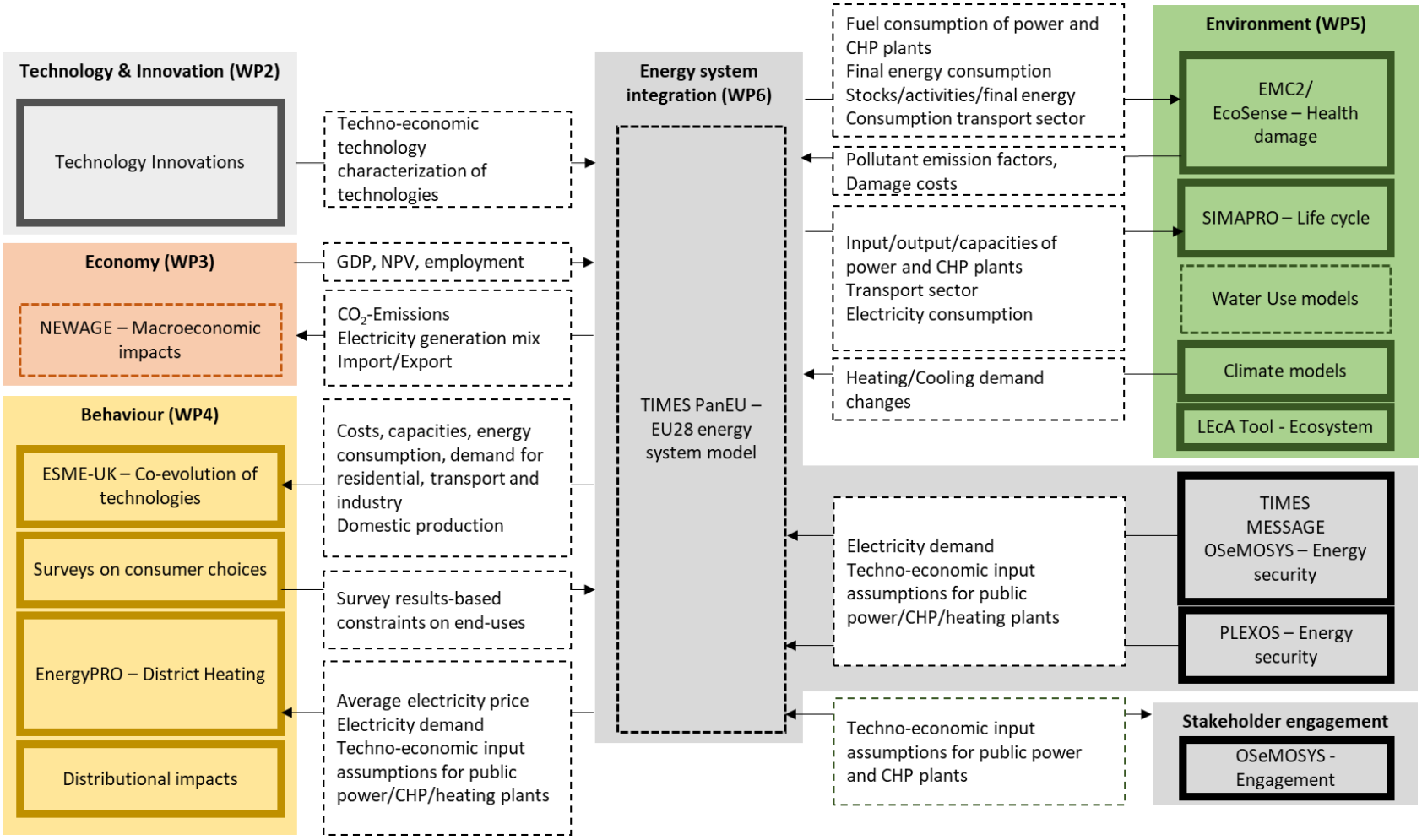
Focus

Energy strategies focus on **transitions to a competitive low-carbon EU energy society**, as described by the Strategic Energy Technology (SET) Plan.

Methodology

A **large ensemble of models linked together** to study the **role of technologies, innovation and consumers** in **EU decarbonisation pathways.**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.



https://github.com/ReeemProject

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Overview of REEEM

Objective

To gain comprehensive understanding of the **system-wide implications of energy strategies.**

Focus

Energy strategies focus on **transitions to a competitive low-carbon EU energy society**, as described by the Strategic Energy Technology (SET) Plan.

Methodology

A **large ensemble of models linked together** to study the **role of technologies, innovation and consumers** in **EU decarbonisation pathways.**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Technology maturity quantified in **5 dimensions** through **Innovation Readiness Level**. Elaborate **Technology Roadmaps**, to inform modelling inputs. First one July 2017.

Three roadmaps:

- **Energy storage**
- **Renewable energy technologies**
- Energy efficiency in residential and industrial buildings

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

REEEM

Overview of REEEM

Objective

To gain comprehensive understanding of the **system-wide implications of energy strategies.**

Focus

Energy strategies focus on **transitions to a competitive low-carbon EU energy society**, as described by the Strategic Energy Technology (SET) Plan.

Methodology

A **large ensemble of models linked together** to study the **role of technologies, innovation and consumers** in **EU decarbonisation pathways**.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

PanEU modelling

- **Pilot case study –** dynamics of a transition with shared or national targets
- **Base pathway –** in line with scenarios of the White Paper
- **Local solutions pathway –** impacts of consumers behaviours
- **Paris Agreement pathway –** feasibility of more ambitious targets

Regional / national / local case studies

- **Lithuania**: Ecosystem services
- **Helsinki, Kaunas and Warsaw**: District heating networks
- **Baltic countries**: Energy supply security
- **Balkans**: Grid dispatch
- **UK, Finland, Croatia**: consumer choices of end-use technologies – surveys
- **UK**: Co-evolution and crowding out of technologies

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Base Pathway

A future with no major disruptions.

Political	*Economic*	*Social*	*Environmental*	*Technological*	*Global*
Stronger decision making / policy parallels within clusters of Member States	***Growth at different speeds***	***Likely passive society in transition***	***Low availability of water (drying climate) and scarce resources***		***RCP4.5 - Global push to climate change mitigation driven by some regions / countries***

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Local Solution Pathway

Energy transition accelerated by communities and households proactively making low carbon choices.

Political	*Economic*	*Social*	*Environmental*	*Technology*	*Global*
Pace of local solutions leaves policy making lagging behind in the near to mid term	***Markets respond to consumer demand by ensuring affordable access to capital***	***Change of EU citizens' perception towards climate change and resulting behavioral shift***	***Stronger recognition of higher climate change impacts within and outside of Europe***		***RCP4.5 - Global push to climate change mitigation driven by some regions / countries***

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Paris Agreement Pathway

Higher political ambition, for a below-1.5C-increase world.

Political	*Economic*	*Social*	*Environmental*	*Technological*	*Global*
Stronger union, common policy framework, push to decarbonisation	***Competitiveness of the EU potentially affected by rapid shift to low-carbon economy***	***Strong societal engagement***	***Low availability of water (drying climate) and scarce resources***		***RCP2.6 and global R&D push to climate change mitigation***

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Mid-term insights

Example – pilot case study

Simplified, yet informative, pathway where EU Member States pursue a target of ***80% decarbonisation*** compared to 1990 levels, ***either sharing efforts, or individually***.

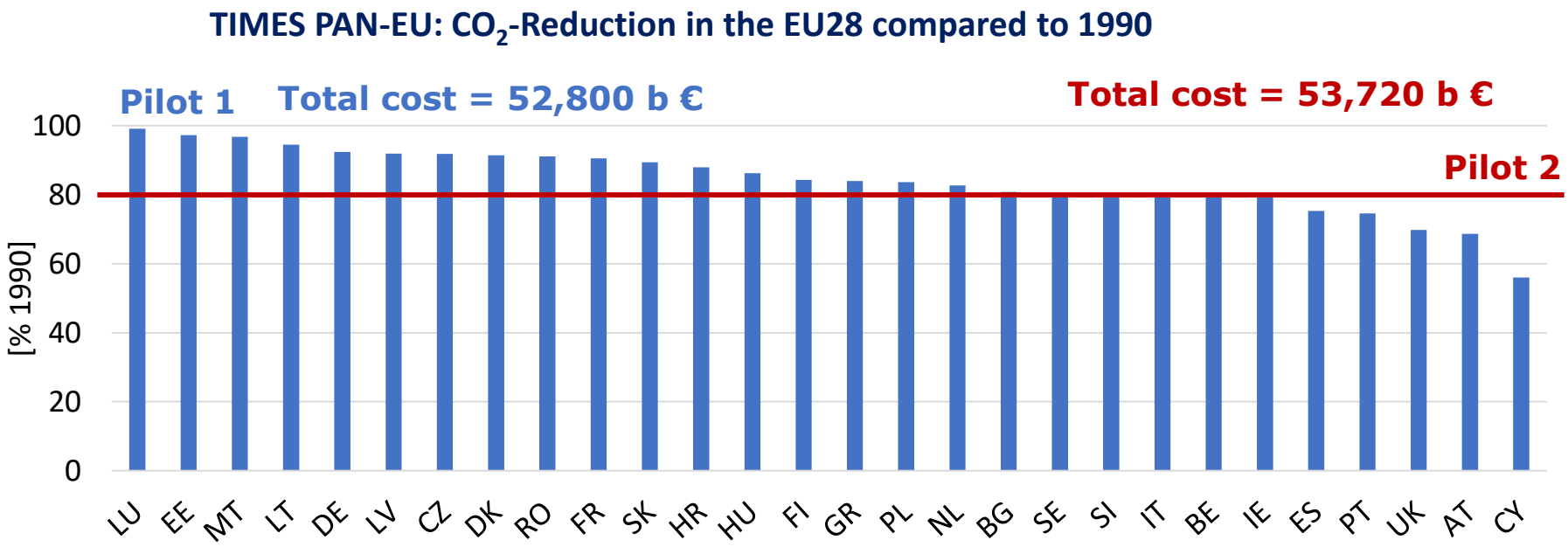
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Mid-term insights

Example – pilot case study

Pilot 1: *80 % GHG emission reduction target for the whole EU*

Pilot 2: *80 % GHG emission reduction target for every Member State*



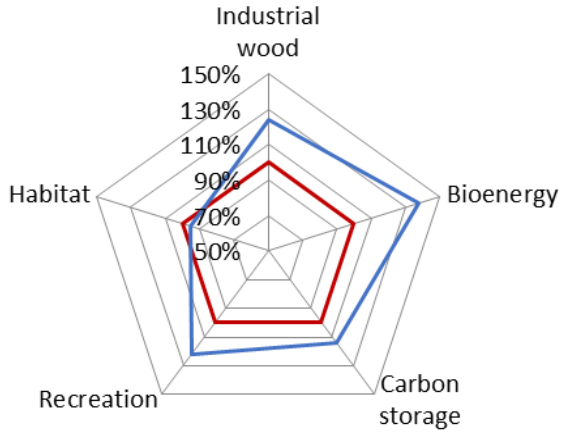
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Mid-term insights

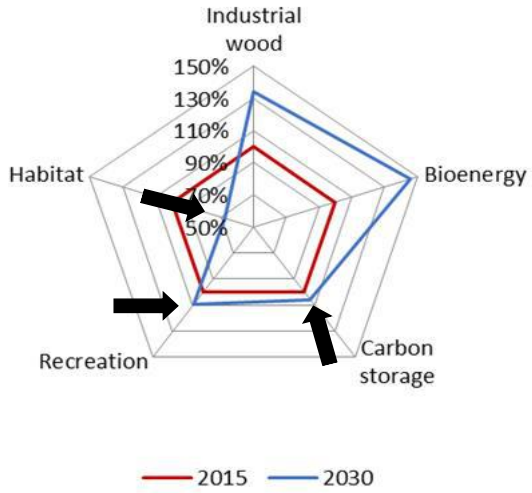
Example – Biomass for energy and ecosystem in Lithuania

The cost optimal energy system decarbonisation strategy may imply too high utilisation of forestry biomass than what the ecosystem can provide.

Less intense



More intense



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Conclusions

1) **Regional needs must be accounted for:** national needs cannot be always captured in continental analyses

2) **Trade-offs not always easy to spot:** correlations between different indicators must be examined

3) **Wider participation may lead to more widely acceptable strategies:** different stakeholders may bring in different ideas and knowledge

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Dissemination of the insights

1) **Policy briefs/Reports/Technology Roadmaps:** insights and recommendations from the assessments, for EC and national policy makers;

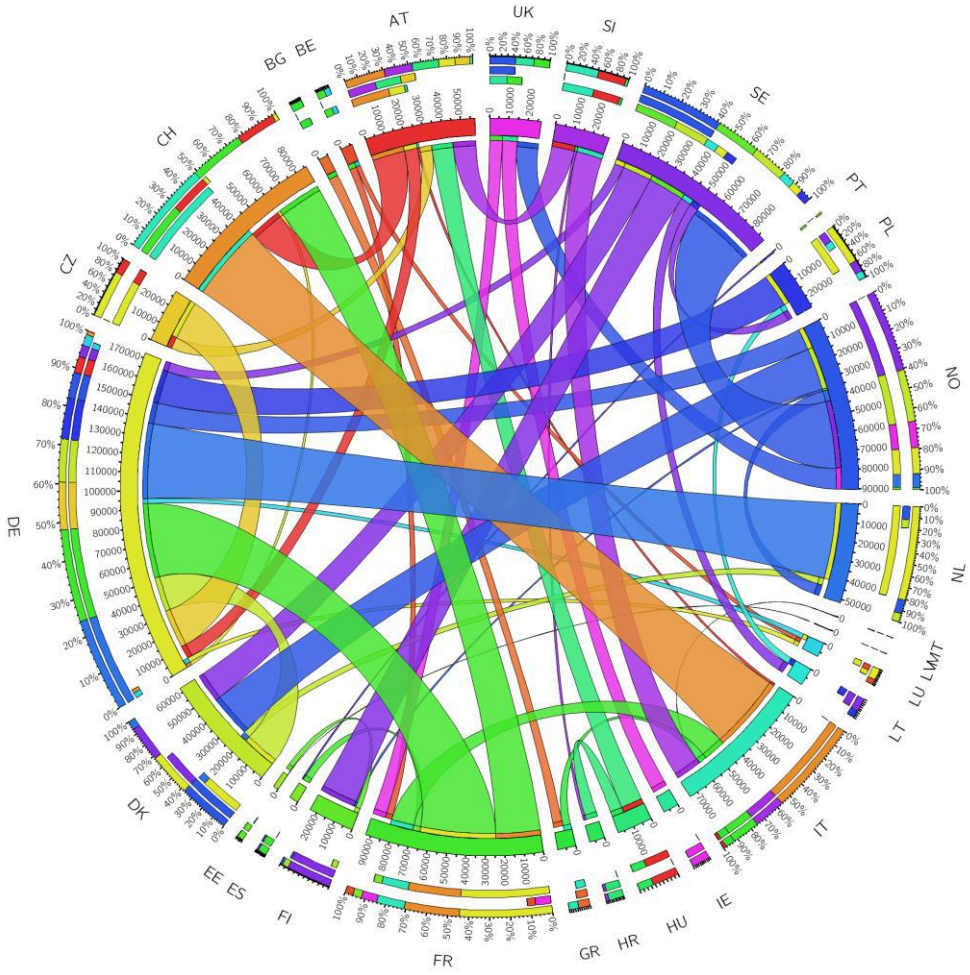
2) **Open Source Engagement Model:** ***low-threshold model in OSeMOSYS*** to emulate key findings and be employed as research infrastructure

3) **Learning simulation:** ***serious game***, to be played in HEI and demonstration sessions with pedagogical intent.

4) **Energy Modelling Platform for Europe (EMP-E):** annual events and EU-wide peer-reviewed digest of models for informing the EU energy transition

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Dissemination of the insights… An open source engagement model



http://www.reeem.org/index.php/osemosys/

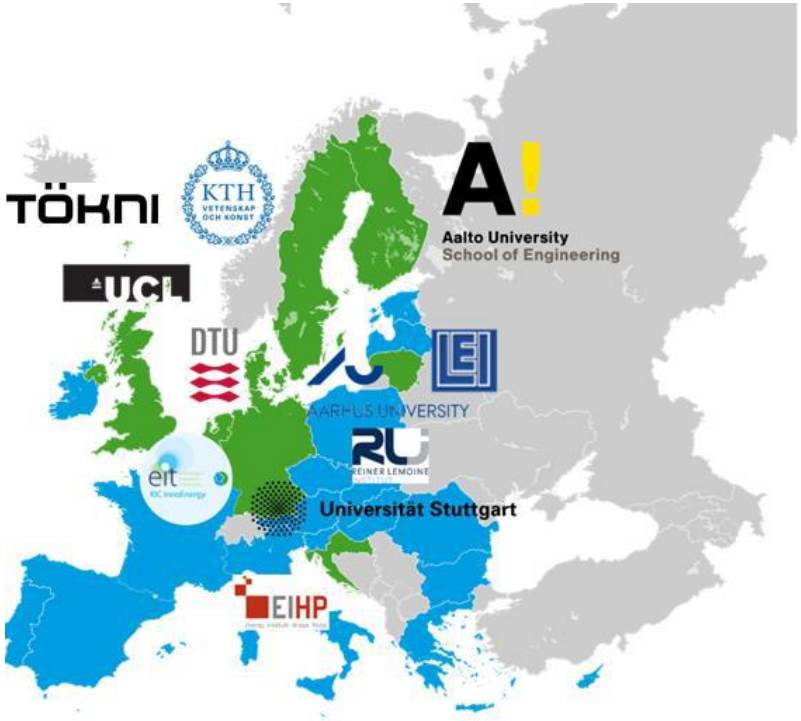
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Dissemination of the insights… And creation of a network

http://www.energymodellingplatform.eu/#

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.

Thank you



www.reeem.org

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691739.