Externalites & opportunities

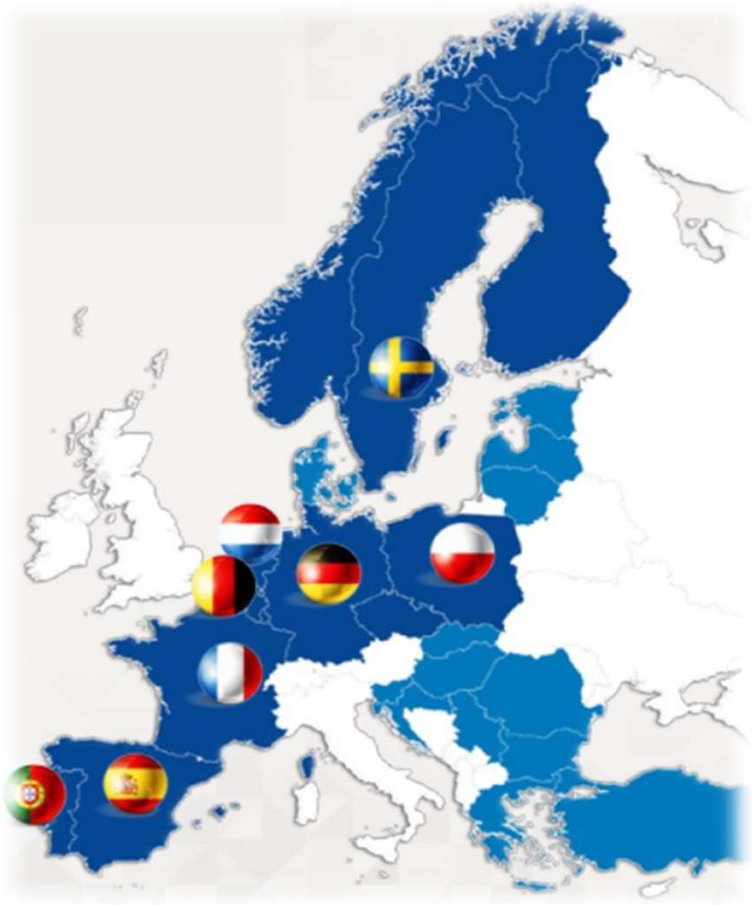
Impact of new transport and heating solutions on air quality in our cities

Marcin Lewenstein, InnoEnergy

Ultrafine Particles – Air Quality and Climate, Brussels, 16/05/2019

LARGEST BUSINESS ACCELERATOR FOR SUSTAINABLE ENERGY & CLEANTECH IN EUROPE

- Founded in 2010 by European Institute of Innovation and Technology
- **8 offices + 12 HUBs**
- **EU wide** scope
- 20+ shareholders (Industry, Universities, EU)
- 30-40+ new assets per year
- 100mEUR invested per year
- 850 + Startup Applications last year in Europe/y (+35% YoY)



MEMBERS AND PARTNERS

Thematic Fields

Energy for Circular Economy

Energy storage

Energy efficiency

Renewable energies

Smart and efficient buildings and cities

Smart electric grid

Nuclear instrumentation - Renewables conversion

Diagnosis

A call for action: average annual cost of air pollution in the EU is around 2.9% of its GDP

Total annual costs related to the health effects of air pollution in EU-28 in 2020*

243 BLN EUR

Minimum estimated effect

775 BLN EUR

Maximum estimated effect

These are values for the Business-As-Usual (BAU) scenario for air pollution in the EU. We argue that realisation of passive BAU is not desirable nor inevitable.

*Source: http://ec.europa.eu/environment/archives/air/pdf/Impact_assessment_en.pdf

Air pollution in Europe – links to energy use

In Europe, air pollution is primarily a result of the combustion of hydrocarbons in road transport and residential heating

Transport

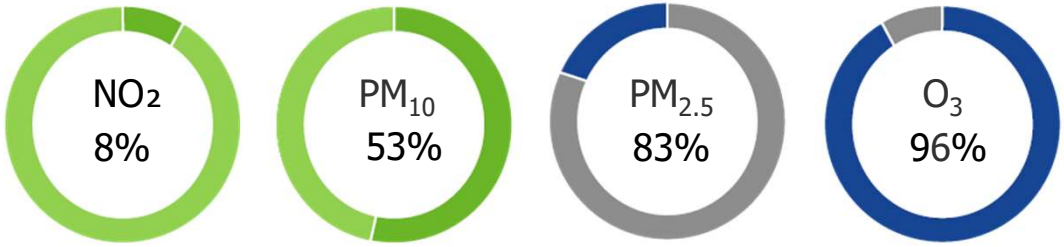
NO_X	CO_2	$PM_{2.5}$
39%	19%	11%

share of total emission

Heating

BaP	$PM_{2.5}$	PM_{10}	CO_2	SO_X
75%	57%	42%	42%	13%

Percentage of population exposed to air pollution concentrations above WHO air quality guidelines (UE, urban areas)



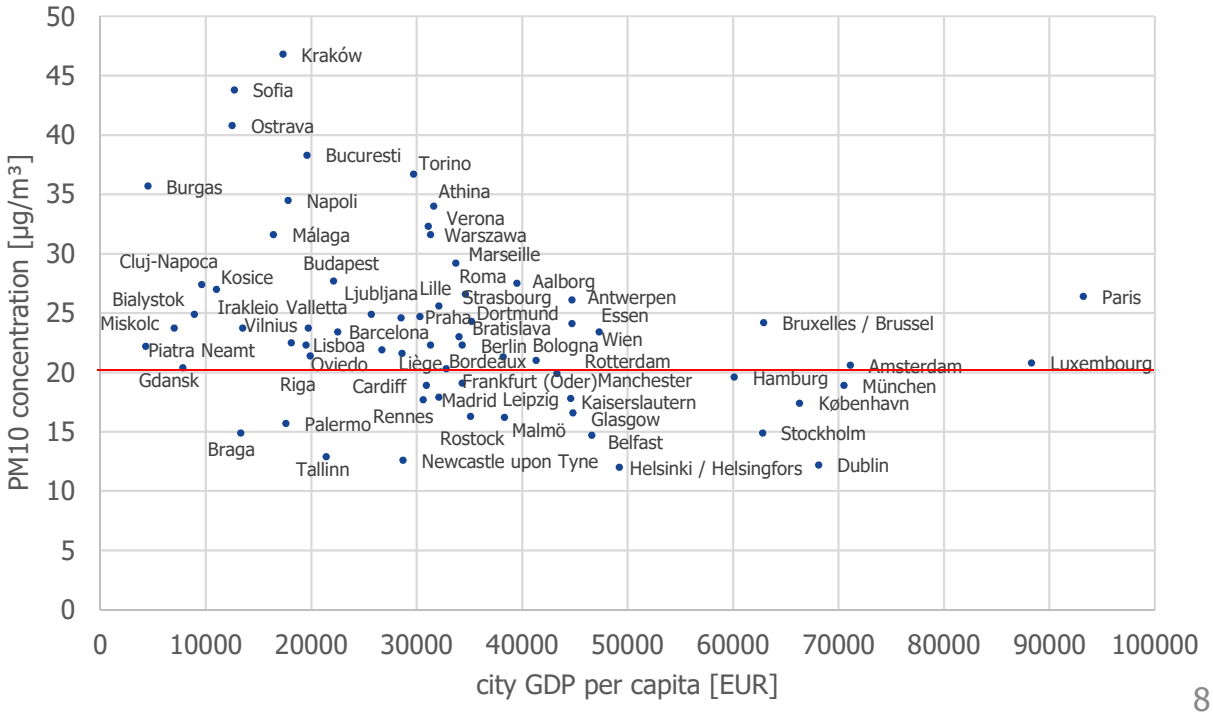
Source: European Environmental Agency

Outlook in selected EU countries and cities

The EU consists of many countries or regions that perform well in terms of economic growth, but fail to improve air quality.

- 78% of urban population exposed to PM_{10} levels above EU standards
- The highest share of BaP in EU-28
- Particulates and ozone concentrations above the EU and WHO limits
- On the regional level air quality not compliant with EU regulation
- Largest emissions of NO_x within the EU
- Only country with concentrations within WHO limits in 2015

In Europe smog prevalence in cities (measured by PM_{10}) is negatively correlated with GDP per capita, though relation is not very strong



Source: Analysis by Deloitte based on Eurostat

Clean Air Challenge project overview

Objective

Identification of solutions in transport and heating area that are optimal in terms of expected investment return and impact on air quality.

Scope of the study

- Technology
- Markets and economic incentives
- Societal awareness and education
- Public policies and regulations
- Key stakeholders

Deloitte.

Chief contractor

Reports is available online.
Please visit us at:
cleanair.innoenergy.com

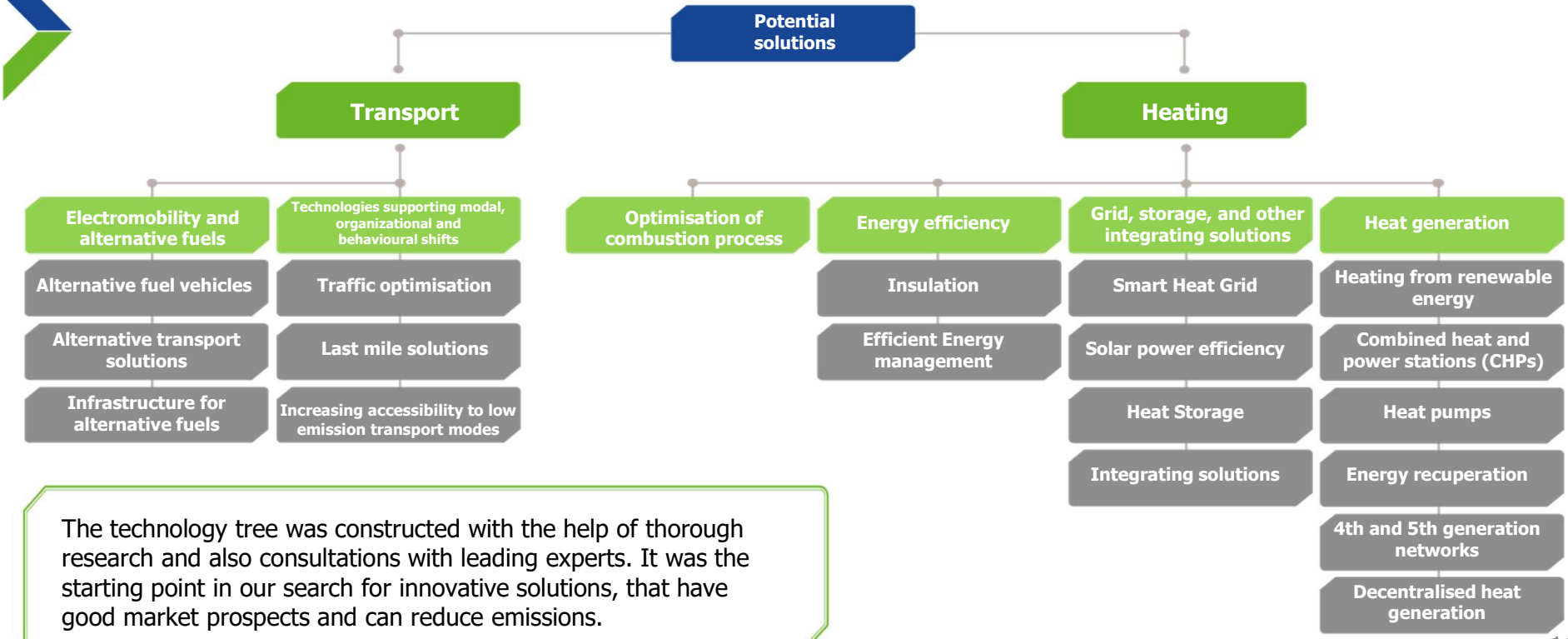
Variety of applied analytical tools

- Dedicated survey of experts' opinions
- Econometric panel models
- Macroeconomic simulation
- Case-studies
- Consultations with experts

Solutions

The technology tree

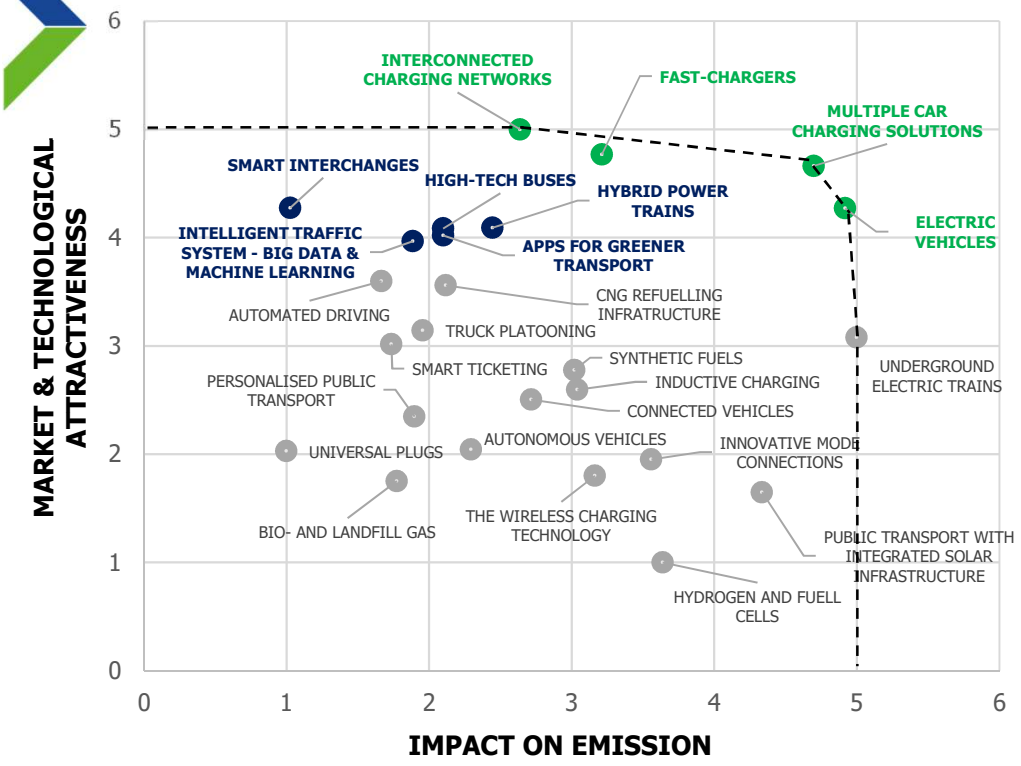
The technology tree summarizes the mapped innovative solutions in the areas of transport and heating.



The technology tree was constructed with the help of thorough research and also consultations with leading experts. It was the starting point in our search for innovative solutions, that have good market prospects and can reduce emissions.

Results for transport

Efficient solutions: market and technological attractiveness compared with impact on emission



Identified clusters and solutions in transport area:

1st Cluster: Electromobility

1. Interconnected charging networks
2. Fast-chargers
3. Multiple car charging solutions
4. Electric vehicles

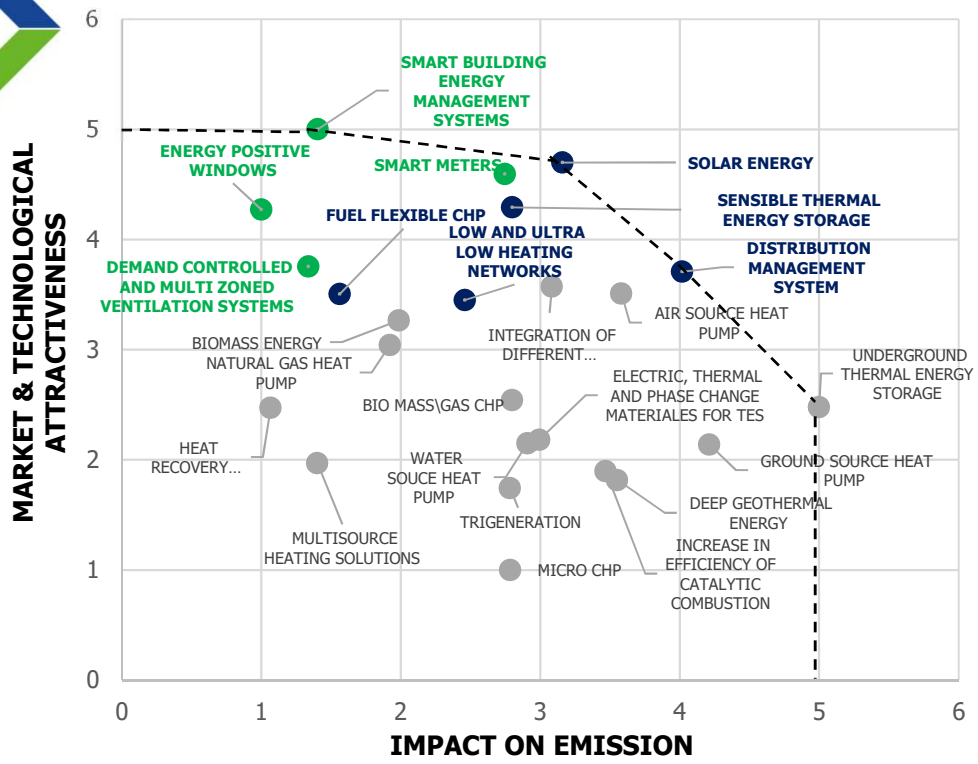
2nd Cluster: Smart public transport system

1. Smart interchanges
2. High-tech buses
3. Hybrid power trains
4. Intelligent traffic system - big data & machine learning
5. Apps for greener transport

Assumption: mid-term perspective (2025)

Results for heating

Efficient solutions: market and technological attractiveness compared with impact on emission



Identified clusters and solutions in heating area:

3rd Cluster: Smart buildings

1. Smart building energy management systems
2. Energy positive windows
3. Smart meters
4. Demand controlled and multi zoned ventilation systems

4th Cluster: Distributed generation and storage systems

1. Solar energy
2. Sensible thermal energy storage
3. Distribution management system
4. Low and ultra low heating networks
5. Fuel flexible CHP

Assumption: mid-term perspective (2025)

Results for non-technological enablers

Three key areas for supporting and implementing market forces

SOCIETAL AWARENESS AND EDUCATION » It has been shown that there is a direct correlation between a higher level of education, and concern about the environment.

REGULATIONS » The government can play a key role in creating a fertile environment for innovation, by investing in the foundations for innovation and by helping overcome barriers.

ECONOMIC INCENTIVES » More competition in transport and energy empowers the end user. The most important is a gradual increase of competition with market or quasi-market prices which replace traditional monopolies.

Potential impact

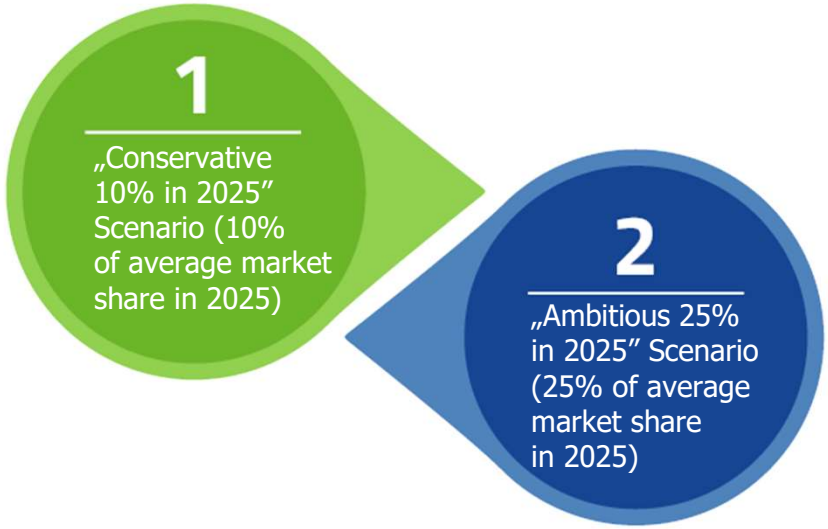
Potential impact of recommended solutions on the EU-28 economy: a scenario simulation

Scope of simulation: investments in 4 recommended clusters

- **Electromobility**
- **Smart public transport system**
- **Smart buildings**
- **Distributed generation and storage systems**

The simulation is based on the survey results regarding the potential impact on emission as well as estimates of external costs of air pollution made by the European Commission and data on air pollutants from the European Environmental Agency.

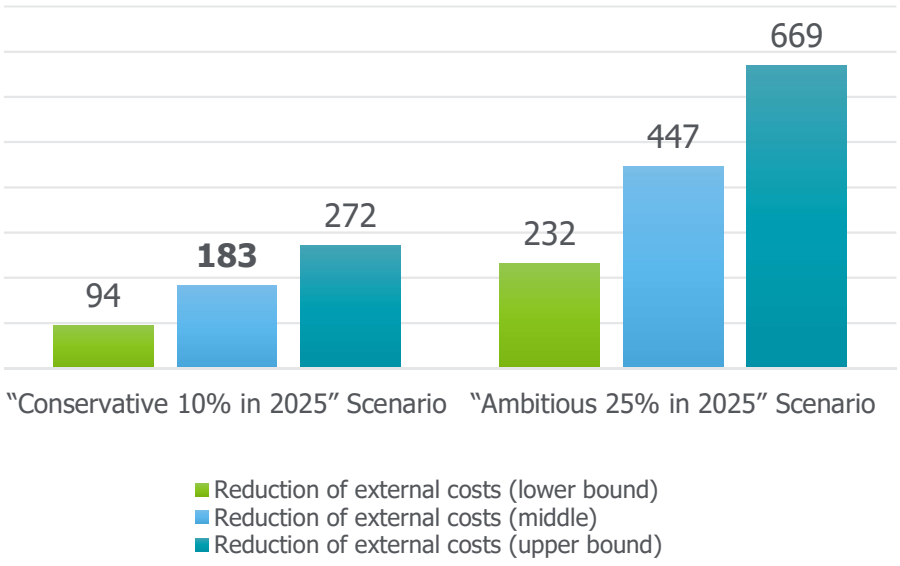
2 Scenarios regarding the pace of market and technological development:



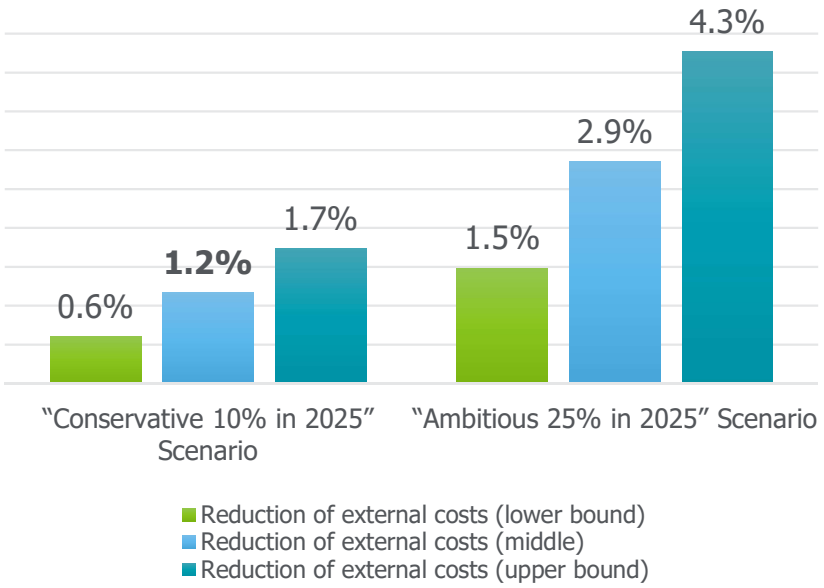
Results of the macroeconomic simulation

According to our simulated conservative scenario, European citizens might gain between 2018 and 2025:

183 BLN EUR **1.2%** GDP



(Net Present Value, aggregate 2018-2025, BLN EUR)



(Net Present Value, aggregate 2018-2025, % of GDP in 2018)

TOP 10 Innovators by InnoEnergy

11 Rankings mapping industrial and academic players in the global and European competition for new solutions to clean the air

Transport

- **Electric vehicles** for mass transportation in urban areas
- EV **charging** solutions & **infrastructure** systems
- **Natural** gas and **alternative** gases as transportation fuel
- **Hydrogen** as a transportation fuel
- Intelligent traffic systems using **big data** & **machine learning**

Heating

- Smart **Building Energy Management** systems
- Solutions for smart use of **electricity** for residential **heating**
- **Integrated** technologies and materials (e.g. combined heat and power, thermal energy storage)
- **Heat pumps**
- Building **insulation** technologies and materials
- Solution for **low temperaturę heat** and waste **heat utilization**

TOP 10 Innovators by InnoEnergy

1000+

Business and Academic players screened

- ✓ **190 000 patents analyzed**, from more than 90 patent authorities through Derwent Innovation

- ✓ **1100+ collaborations** (technology sharing, licensing, M&A deals, R&D collaborations etc.) identified using Eikon, Westlaw, press releases, annual reports
- ✓ **1400+ products and service*s*** identified using Eikon, company websites and third party databases
- ✓ Financial data for last 5 years from Eikon, annual reports, and SEC filings

- ✓ **60 000 publications analyzed**, 25 000 scientific journals from Web of Science, Inspec, Current Contents, and Conference Proceedings
- ✓ **90+ funding** (company investments and research grants) identified from white papers, press releases, university websites

Clean Air Challenge: concluding remarks

WHAT? » **Innovations offer a win-win solutions** to air pollution as they might simultaneously support socio-economic welfare and protect quality of life

HOW? » **Impact investing:** allocating capital in projects that offer a **positive market return and environmental effects**

WHY? » **Potential impact of investments in recommended areas is between 0.6 – 1.7% of GDP in the EU**, for the period 2018-2025 and conservative assumptions.

WHO? » **Broad and regular cooperation between private and public sector**, academia, NGO's is required.

InnoEnergy
Knowledge Innovation Community

Thank you!

General policy recommendations

Engine for clean air: green growth, innovation, education and data

Recommendation 1

Green and sustainable growth as an overarching goal of public policy makers. Allows to partially increase the quality of life

Recommendation 2

Sufficient room for markets with smart interventions in the field of design and implementation of **innovation**

Recommendation 4

Development of public databases to reduce the information barrier on the innovators and investors side

Recommendation 3

Education and social awareness as foundations for successful adoption of green innovations and changes in the pattern of consumption