



Explore sustainable European futures

Tailor-made decarbonisation scenarios for Europe powered by the EUCalc model

e l'Italia

EUCalculator - Town-hall event

A new paradigm for the climate transition

Rome, 13th February 2020

Luís Costa

Potsdam institute for Climate Impact Research

RD2 - Climate Resilience

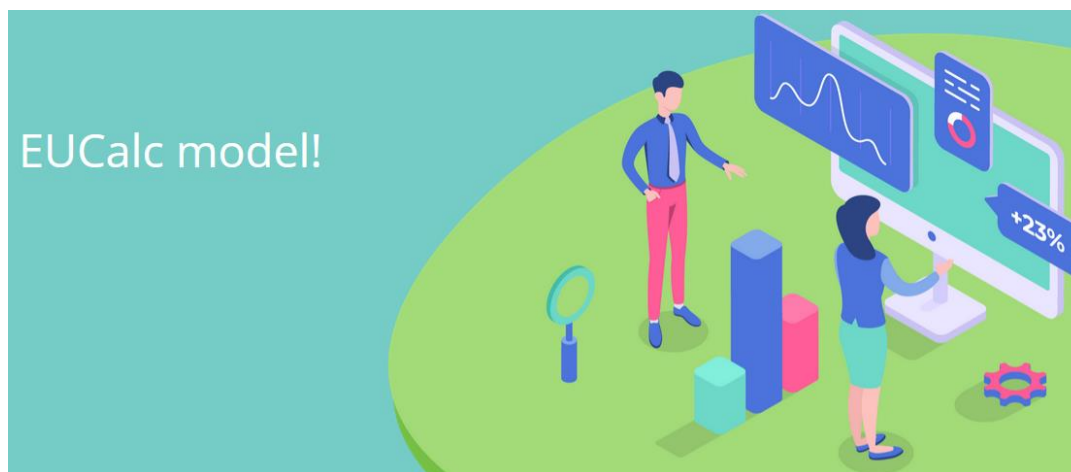


- Objectives
 - EUCalc in the existing modelling landscape
 - Defining features of the EUCalc model
 - Demonstration
 - Results of the EUCalc model
 - My2050
-

- New energy model for non-experts to support European and National decarbonisation plans.
- Access to model results and ability to modify its assumptions (within plausible boundaries).

User-centric

Accessible



- New energy model for non-experts to support European and National decarbonisation plans.
- Access to model results and ability to modify its assumptions (within plausible boundaries).
- Explore the option space for decarbonisation across sectors and associated impacts.
- Promote the transparency via model co-design with sectoral experts, open-source and detailed documentation.

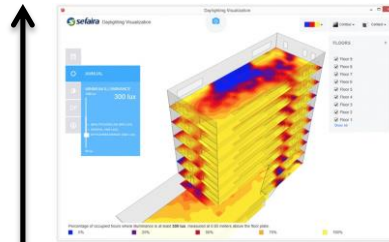
User-centric

Accessible

Wide option space

Transparent

Engineering-
based, sector
specific



Welcome to IMAGE 3.0

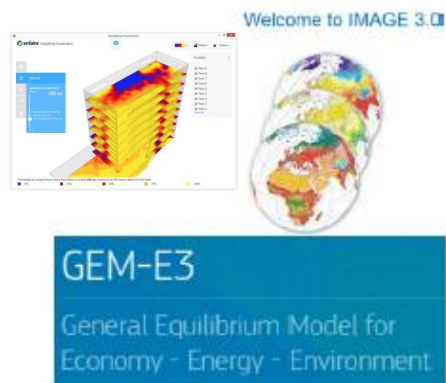


GEM-E3

General Equilibrium Model for
Economy - Energy - Environment

Comprehensive energy system,
economy interactions

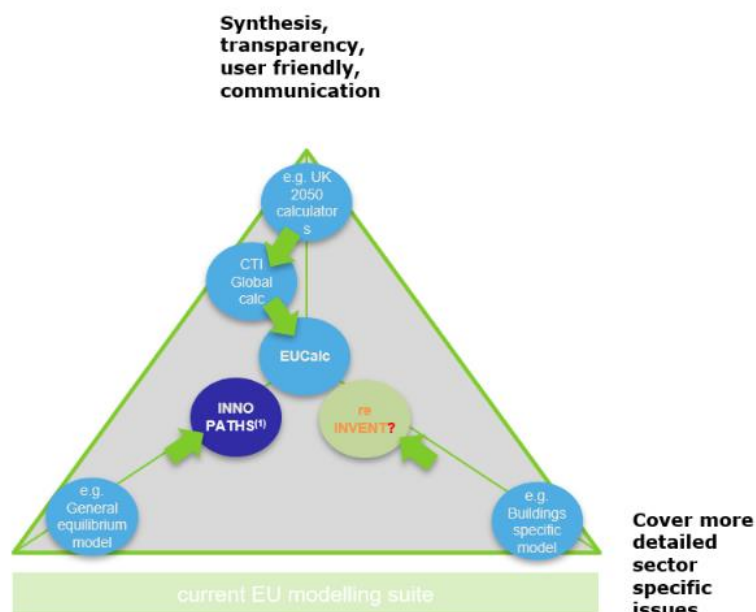
Depth of insights
(e.g., carbon
pricing, building
block)



Target group: Policy makers, active in
developing sustainable low carbon
development pathways for Europe.

Transparency and
usability by non-experts

Searching for the “sweet spot”



Historical development of modelling tools used by the EU



1993/1994

GEM-E3 Model
E³M - Lab

1998/2002



2006



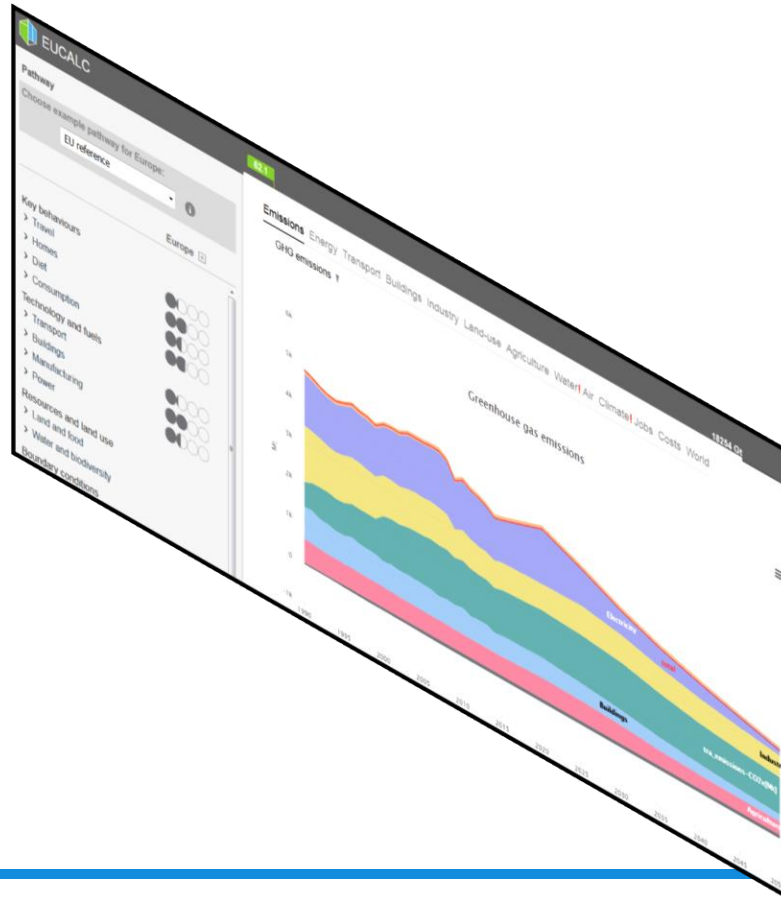
late 2000s



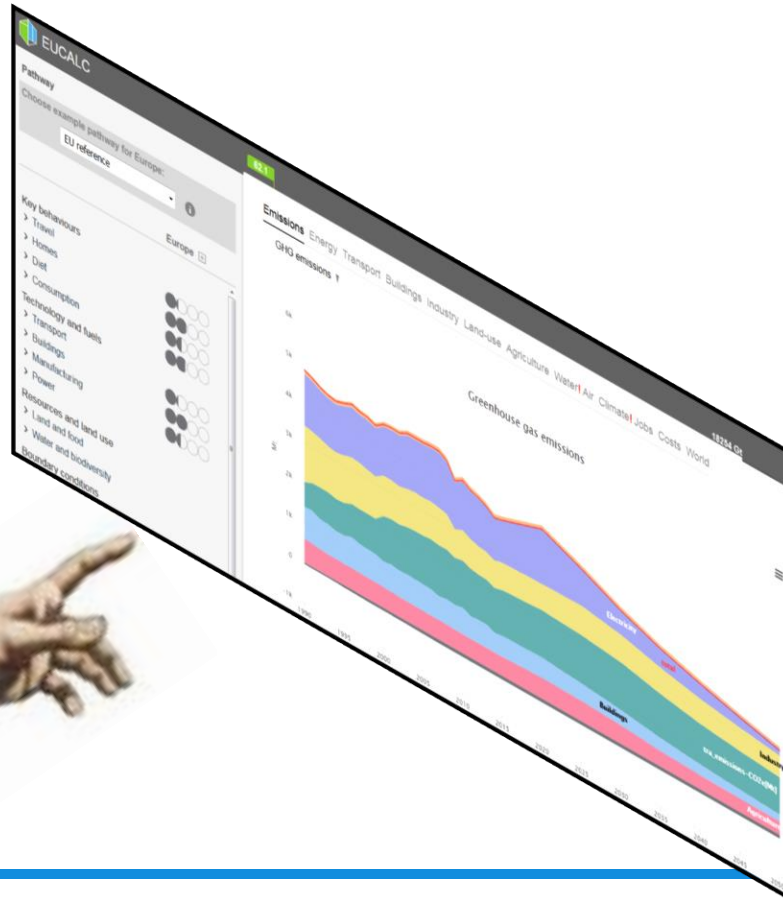
2017/2019

10 year+

Transition Pathway Explorer (user-centric web-interface)



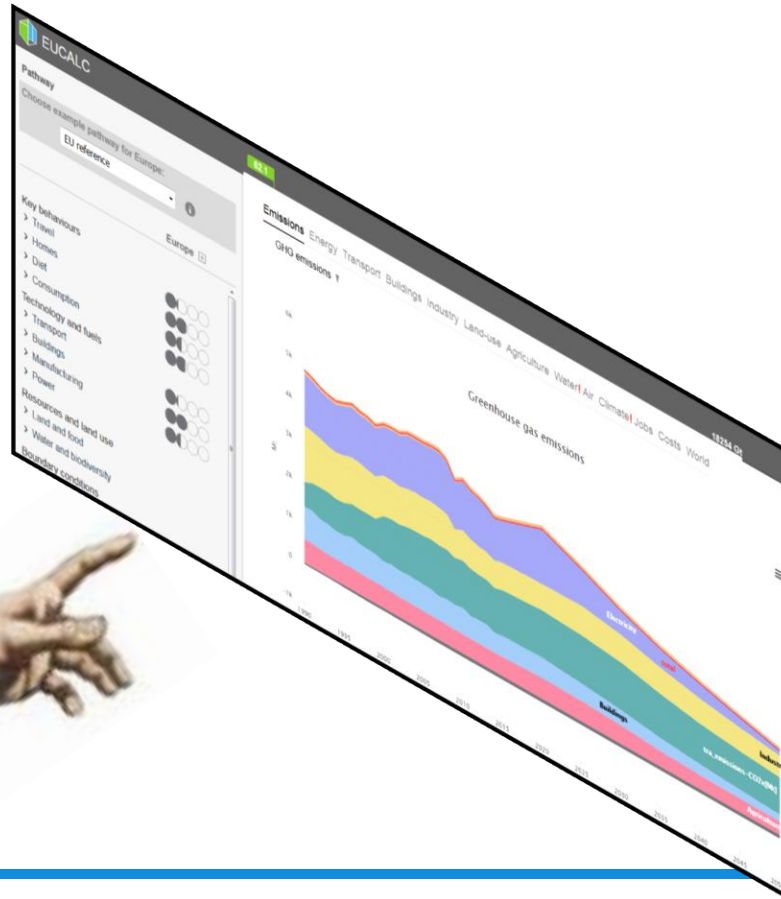
Transition Pathway Explorer (user-centric web-interface)



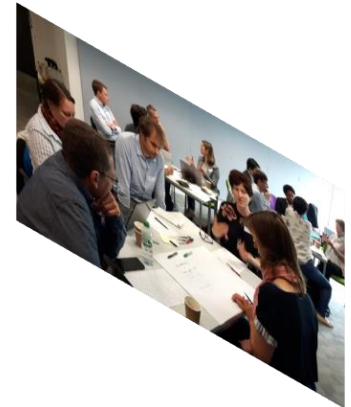
User

Transition Pathway Explorer (user-centric web-interface)

The framework
(co-creation, stakeholder, open-source)



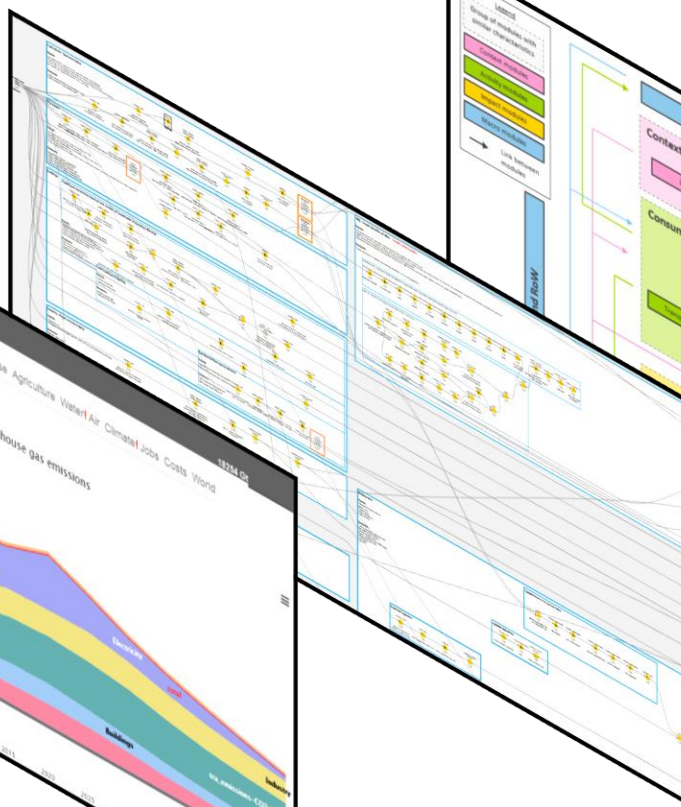
User

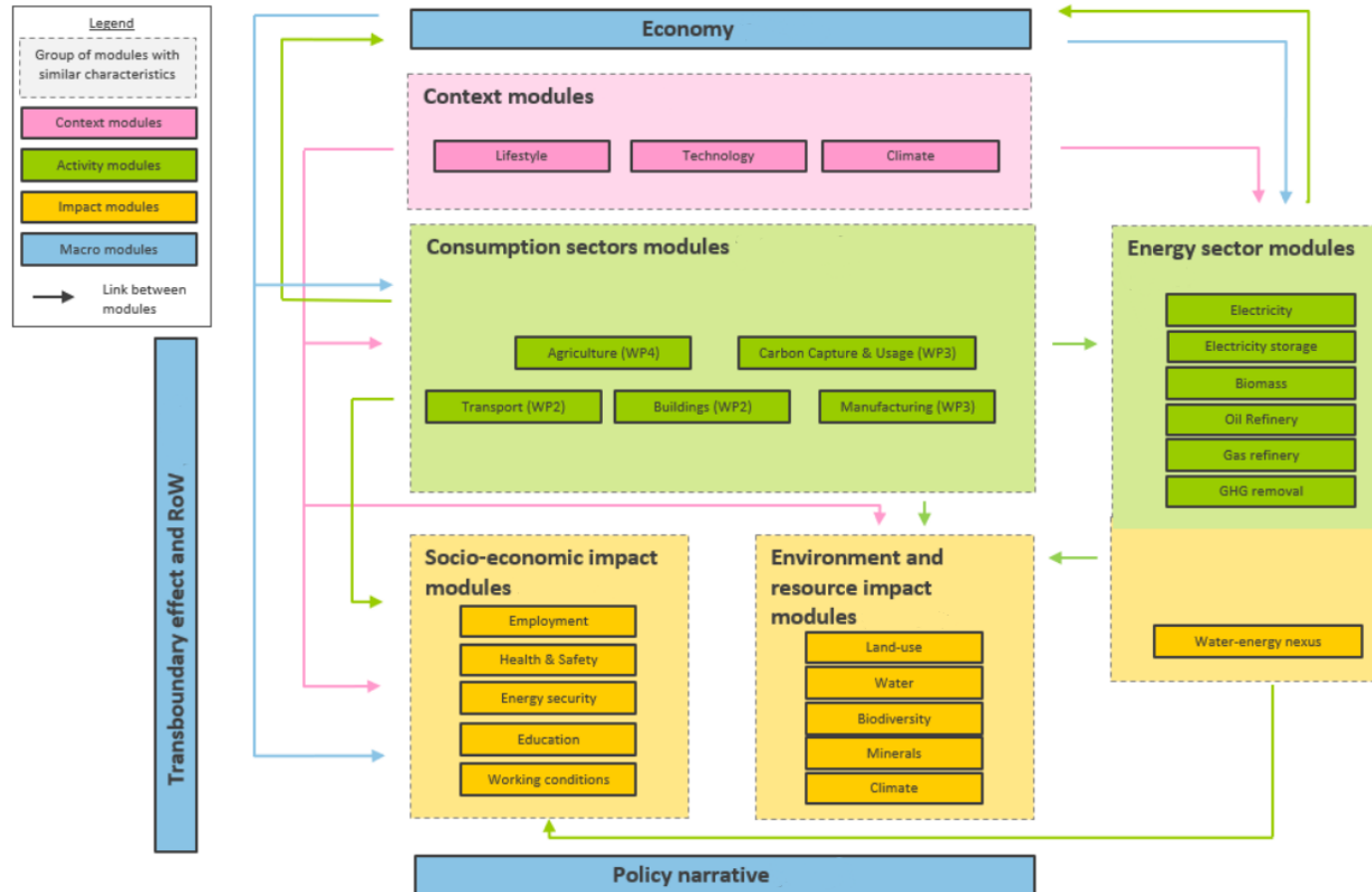


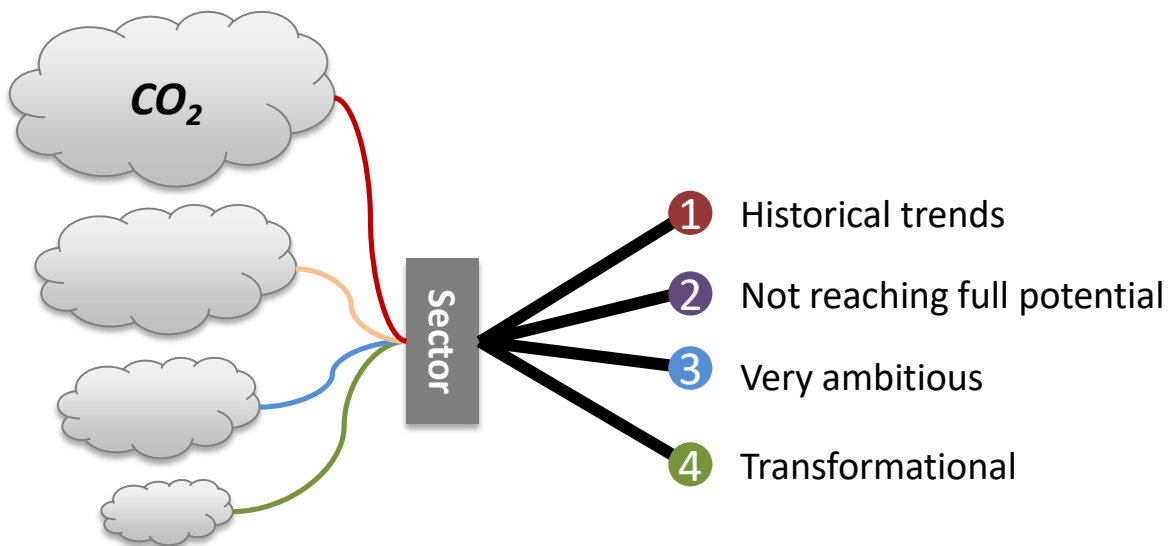
Transition Pathway Explorer
(user-centric web-interface)

EUCalc-model
(granular, multi-sector, 29 countries)

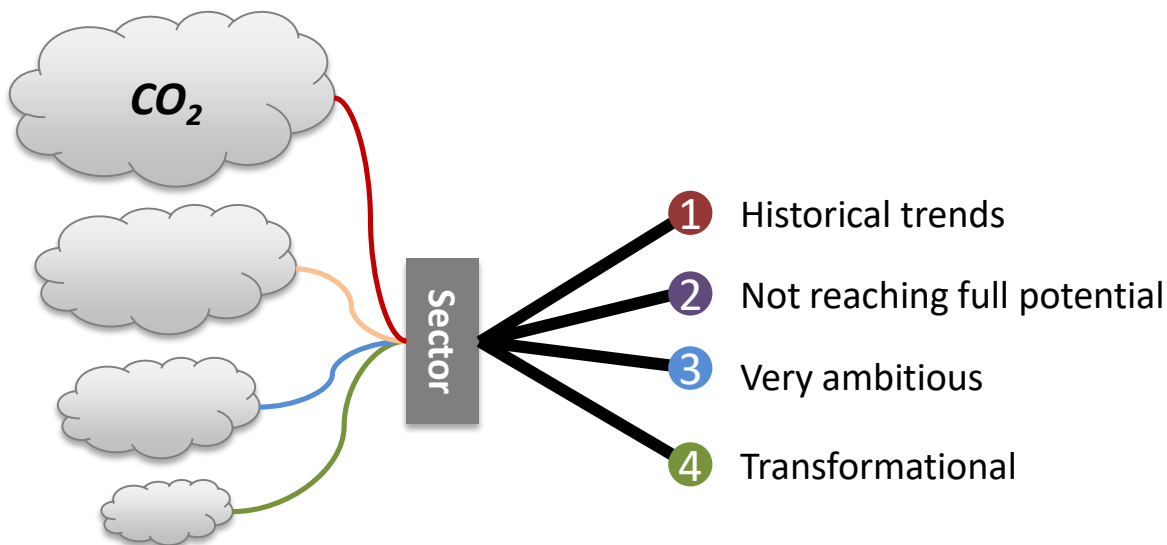
The framework
(co-creation, stakeholder, open-source)







- **Levers & ambition levels**
- Consultation workshops
- Open source/transparent
- Transboundary



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- Consultation workshops
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Level 1	Level 2	Level 3	Level 4
Projections of historical trends	Intermediate scenario , more ambitious than a projection of historical trends but not reaching the full potential of available solutions	Very ambitious but realistic scenario, given the current technology evolutions and the best practices observed in some geographical areas	Transformational and requires some additional breakthrough or efforts such as important costs reduction for some technologies, very fast and extended deployment of infrastructures, major technological advances, strong societal changes, etc.
No TRL below 9	No TRL below 9	No TRL below 7	No TRL below 5

Consultation workshop on lifestyles (Brighton 2017)

INN•**PATHS**



Motivated expert

Living Well Within Limits [LiLi]

170+ participants in 9 consultation workshops

+1000 stakeholders mapped

Schiphol

DareDisrupt



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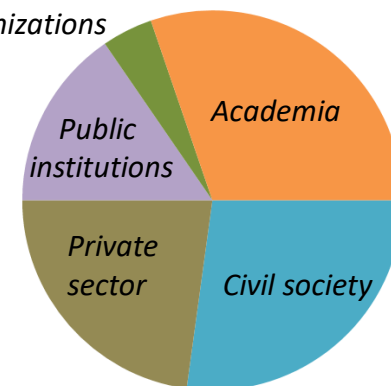
DareDisrupt

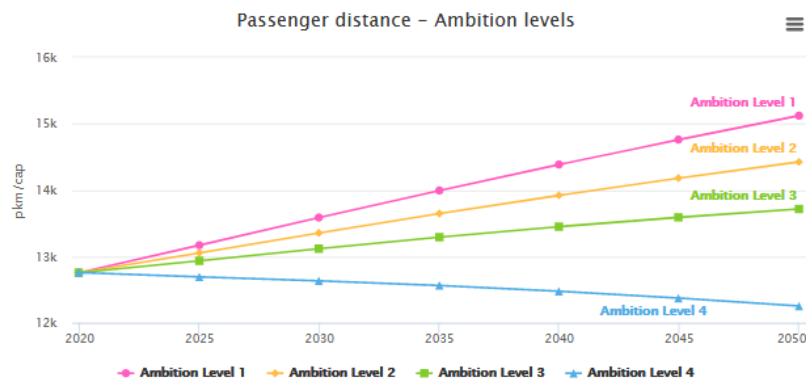


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Participation breakdown

International organizations





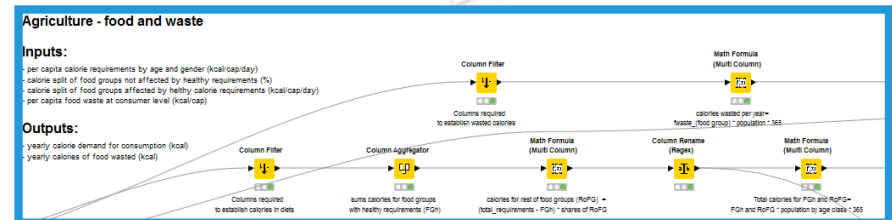
The transport sector represented circa 33% of primary energy needs in Europe in 2015 and contributed 25.8% of total EU-28 greenhouse gas emissions. Without the implementation of extensive and sustained mitigation, transport emissions could increase at a faster rate than emissions from the other energy end-use sectors. The transport sector is recognized as particularly difficult to decarbonize given the investment costs needed to build low-emissions transport systems or the slow turnover of stock and infrastructure. Accordingly, a shift towards demand-side solutions for mitigating climate change is now gaining traction.

The demand for passenger travel is controlled by the amount of time a person spends traveling and the average speed of transportation systems. There are three major activities that compose most of the time spent travelling; to go to work/study (depending on the age class), for recreation and social activities, and to access services like shopping or medical care. Growth in wealth is usually related to more time spent on travelling for leisure and social activities. The best opportunities to reduce travel demand therefore emerge by lowering the need to travel for work/study purposes (e.g. via teleworking or home-based work) and to access services (e.g. via automation or tele-medicine).

• Ambition Level 1

Growth in travel distance per person continues to follow current trend mostly due to longer travel time dedicated to leisure activities, with time spent to go to work/study and access services also remaining unchanged.

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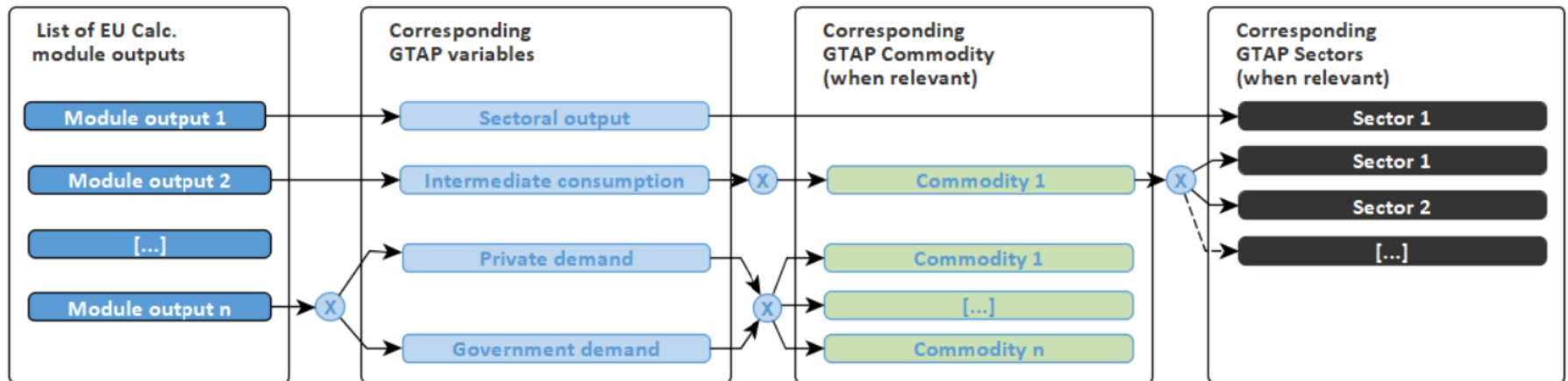


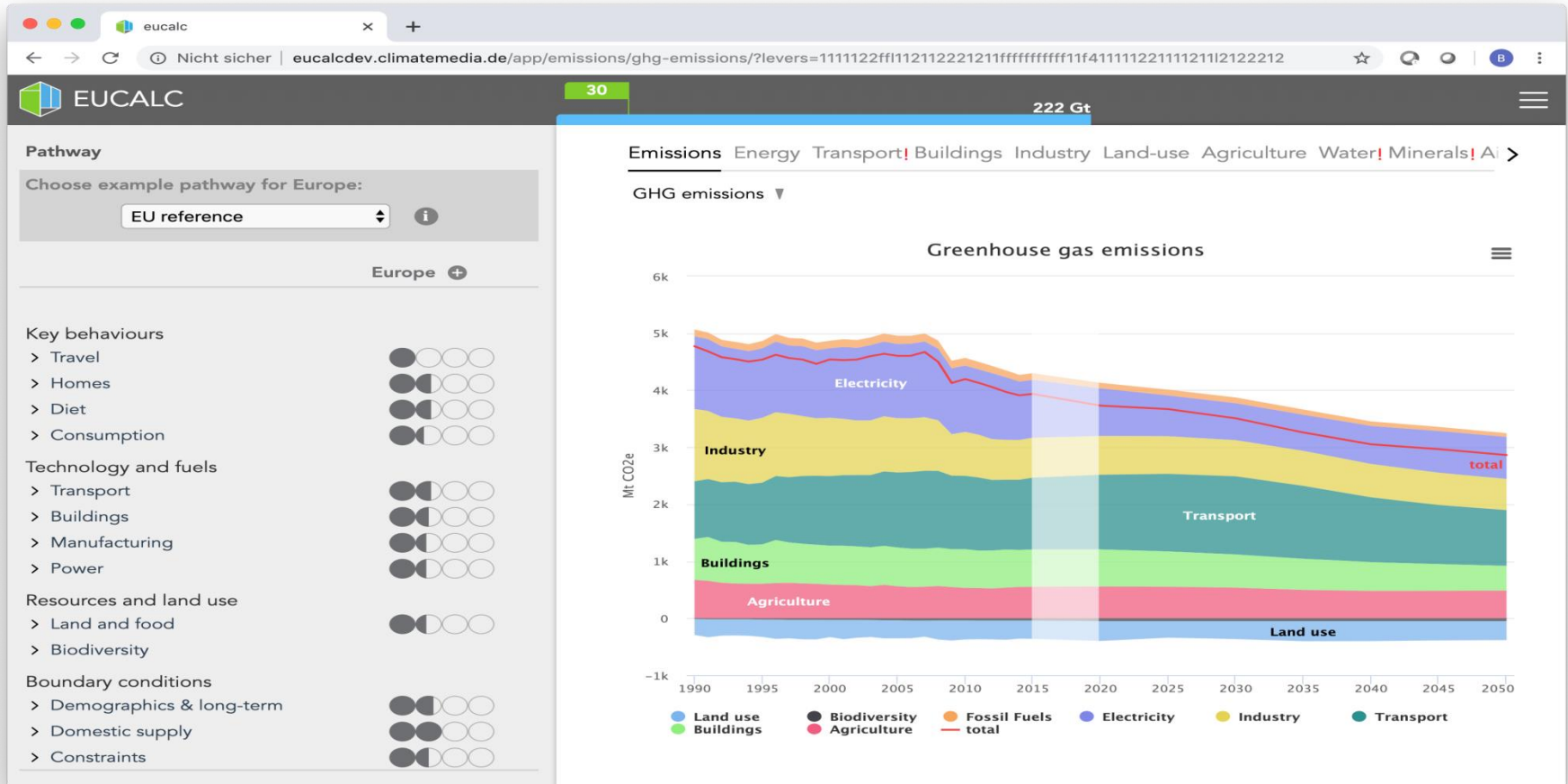
Documentation

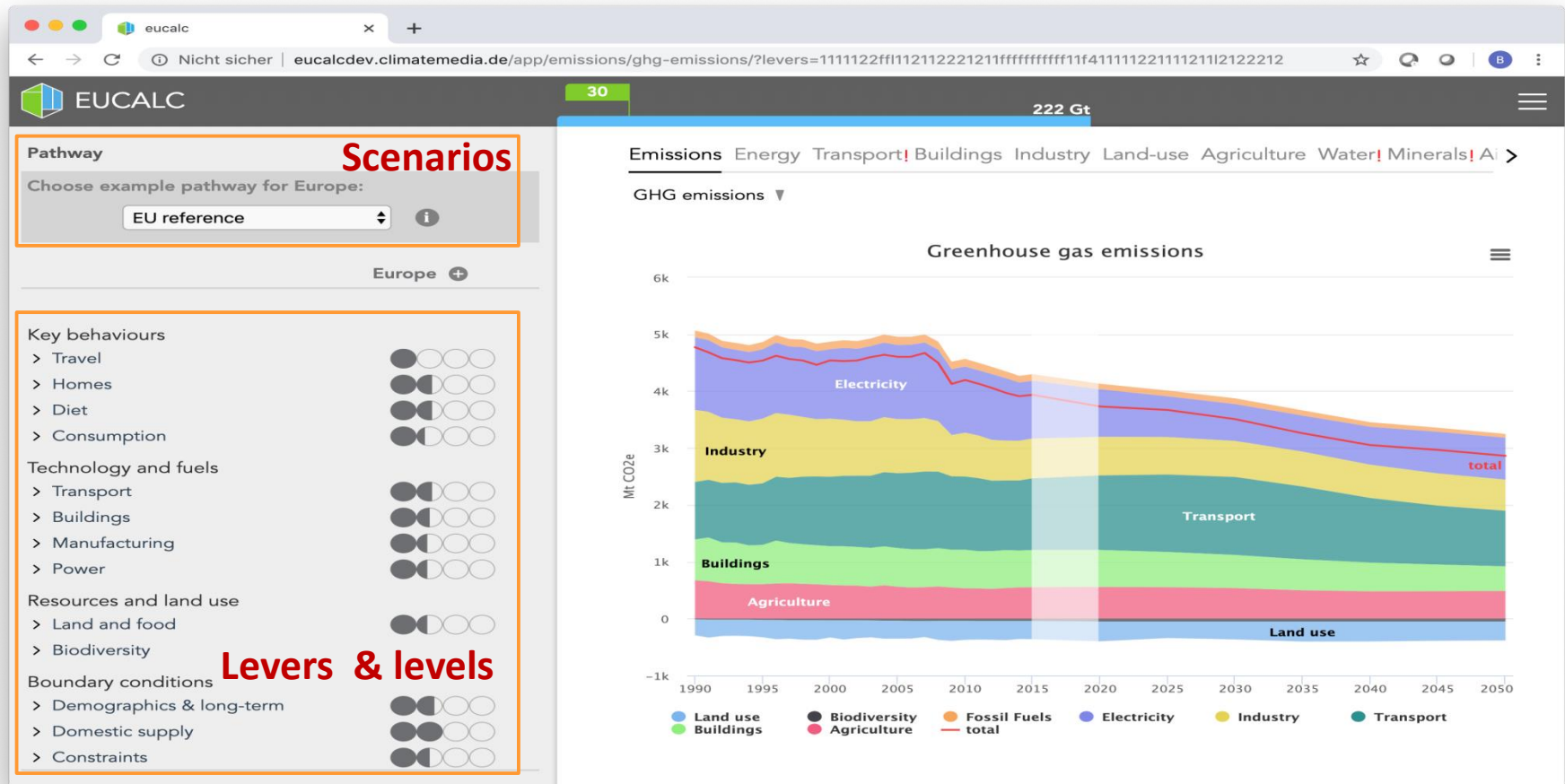
Source code

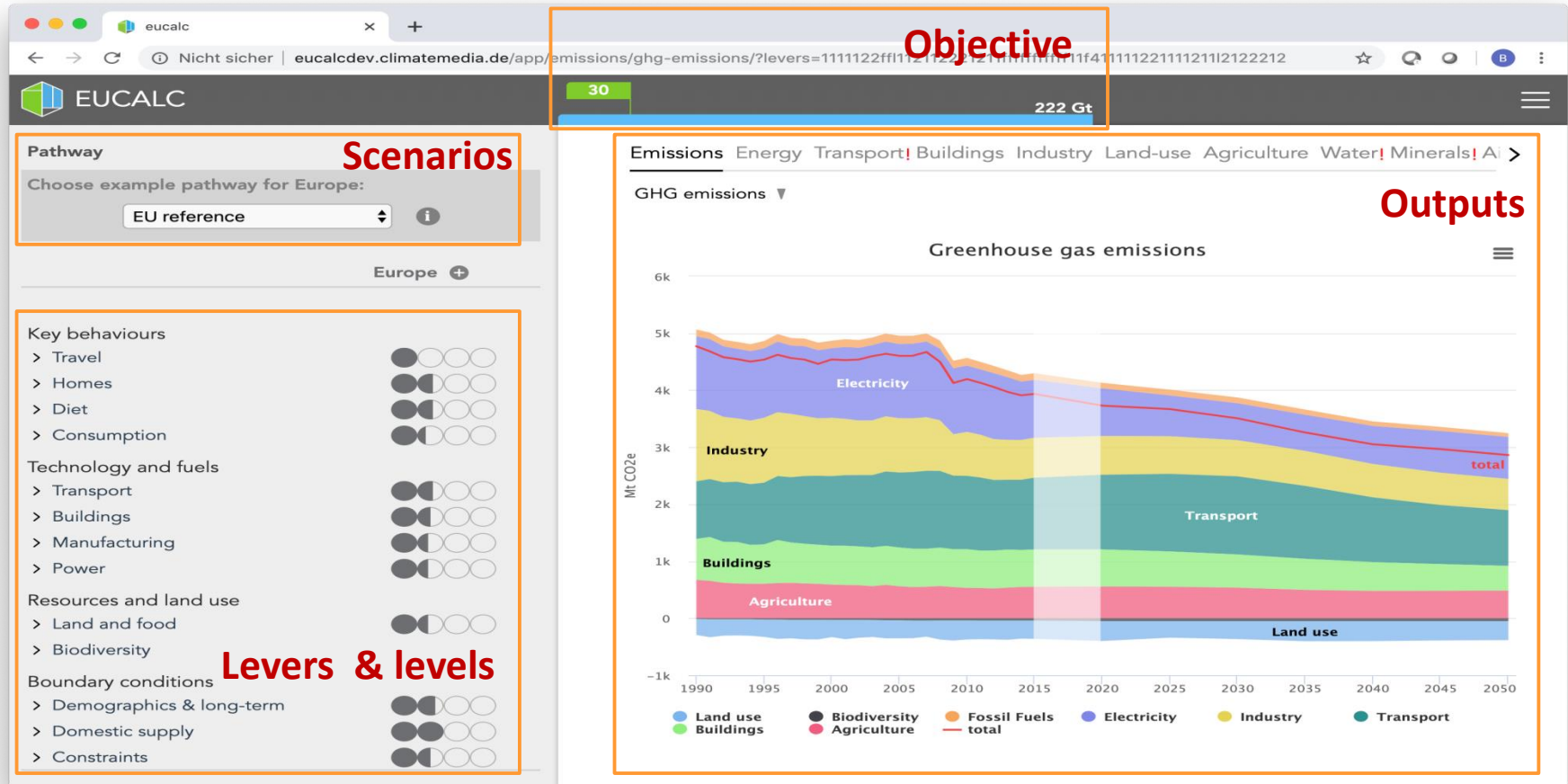
- EUCalc outputs from pre-defined scenarios (consistency)
- Interfaced to GTAP via aggregation
- Constitute in effect a “European” perturbation to the world
- Perturbation resolved by GTAP

- Levers & ambition levels
- Consultation workshops
- Open source/transparent
- **Transboundary**





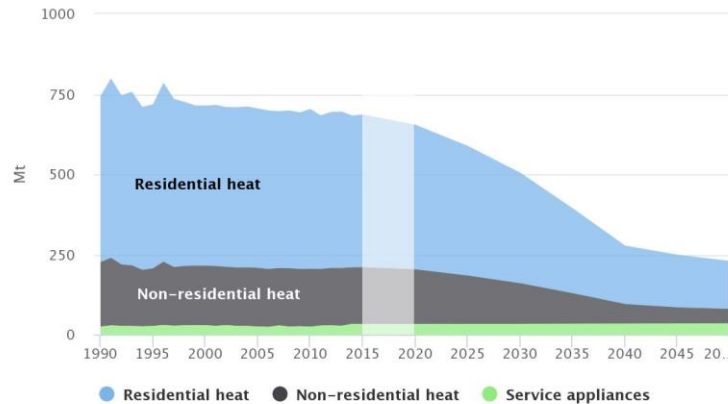




Demonstration

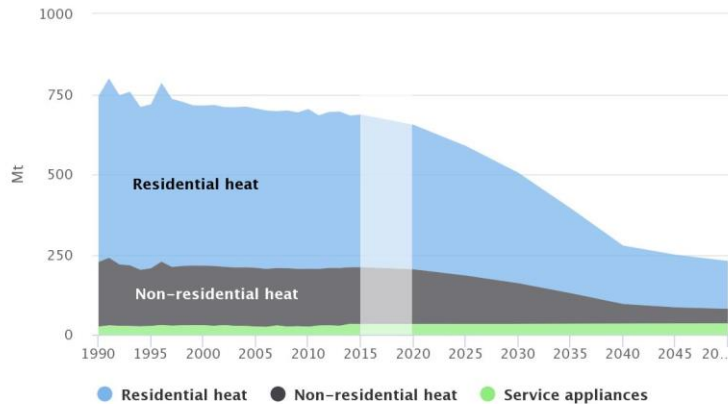
<http://tool.european-calculator.eu>

GHG emissions per use



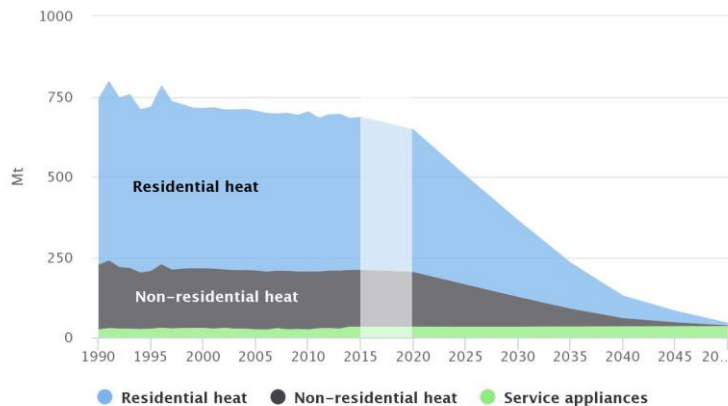
- Renovation rate is 3% p.a.
- Demolition rate is 1% p.a.
- 30% of the renovations are medium and 70% deep.
- 30% of new buildings are medium efficient, 70% are highly-efficient.

GHG emissions per use



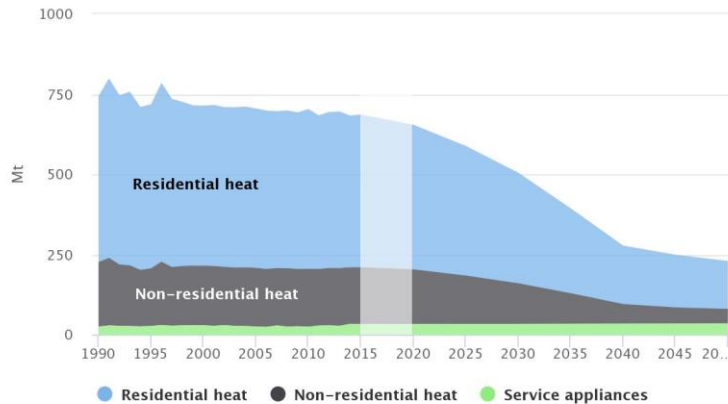
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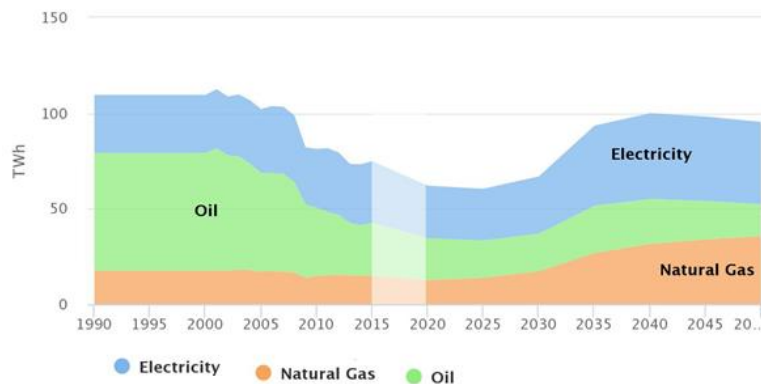
- Fossil fuel phase-out for heat : gas -95%; coal -95%; oil -95% in 2050.
- Substitution by heat pumps (60%), biomass (20%), solar (12%), geothermal (4%), biogas (2%), and biofuel (2%).

GHG emissions per use



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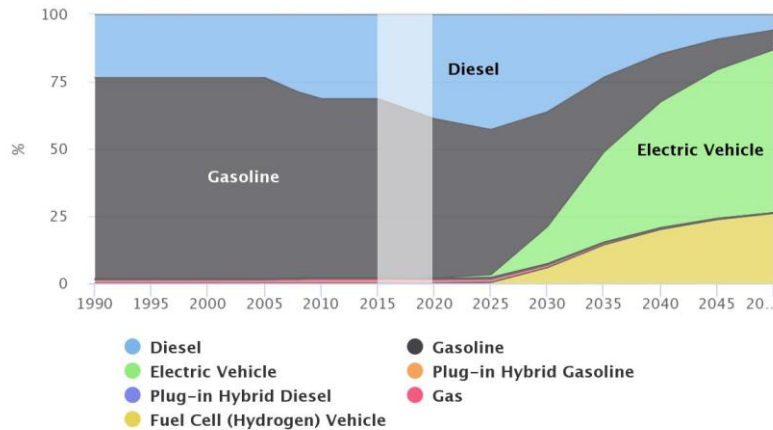
Energy demand for glass production



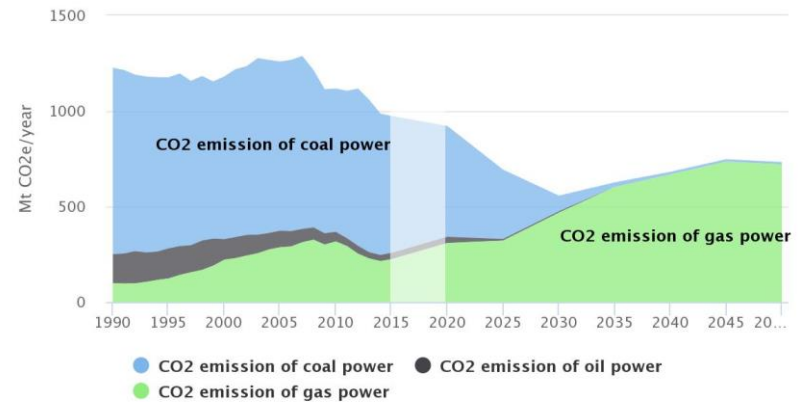
Rebounds in manufacturing (2050 vs 2020) due to building renovation:

- Cement +18%
- Glass +33%
- Lime +66%

Cars technology share

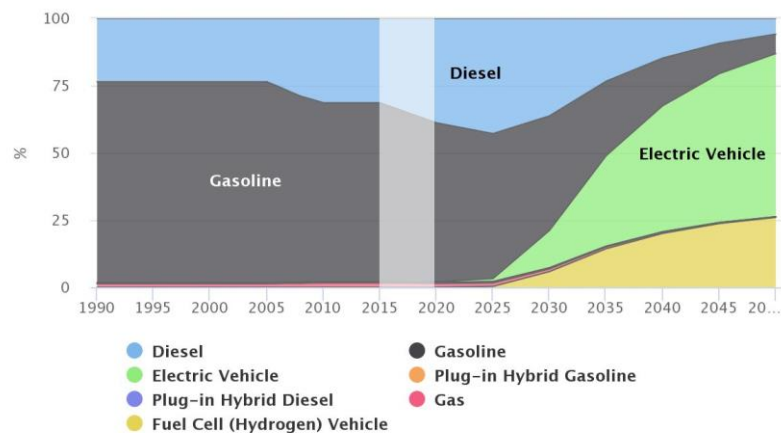


GHG emissions from electricity generation per technology (scope 1)

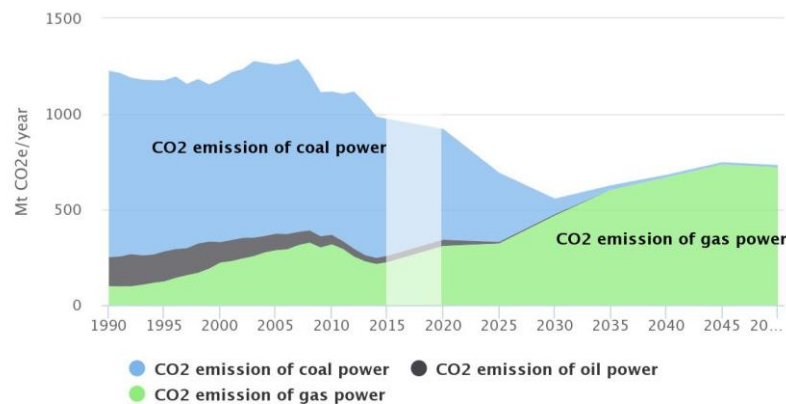


- Electrification of transport without shift to renewables leads to rebound emissions in power (even with coal phase-out by 2030).
- Decarbonisation pathways need to be defined as concerted across sectors.

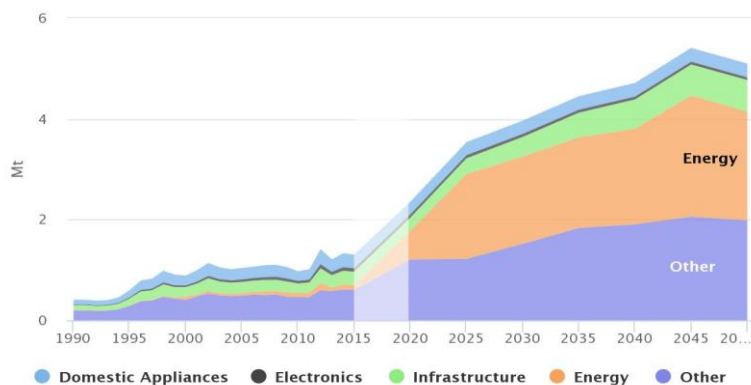
Cars technology share



GHG emissions from electricity generation per technology (scope 1)

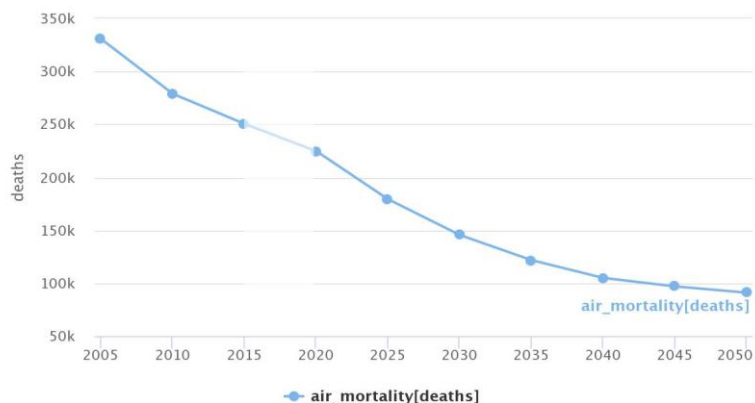


European copper demands by sector



- “Downstream” implication on minerals by scaling-up renewable energy.
- Very-high but isolated ambition increases the chances of rebound effects.

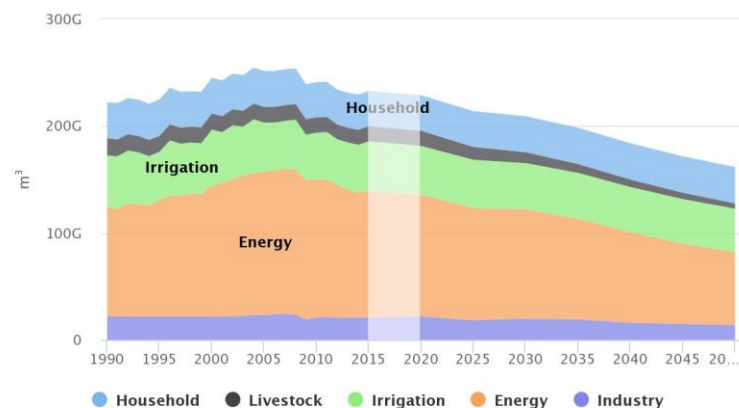
Deaths due to particulate matter (PM2.5) in the air



Reductions of excess deaths in due to PM2.5 compared to 2015

2050 (EUREF)	2050 (Ambitious)
-45%	-64%

Withdrawal per sector

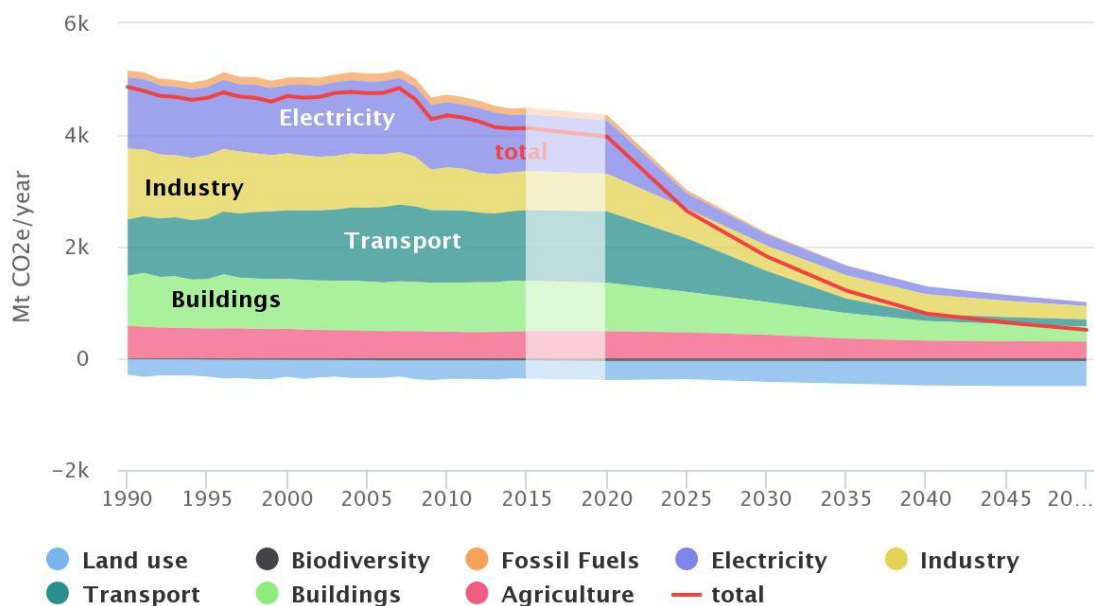


Still to come:

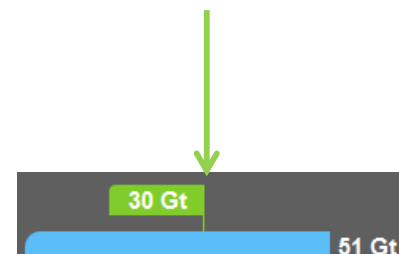
- Employment
- Transboundary effects

Scenario of maximum technological ambition **without** changes in Lifestyles

Greenhouse gas emissions



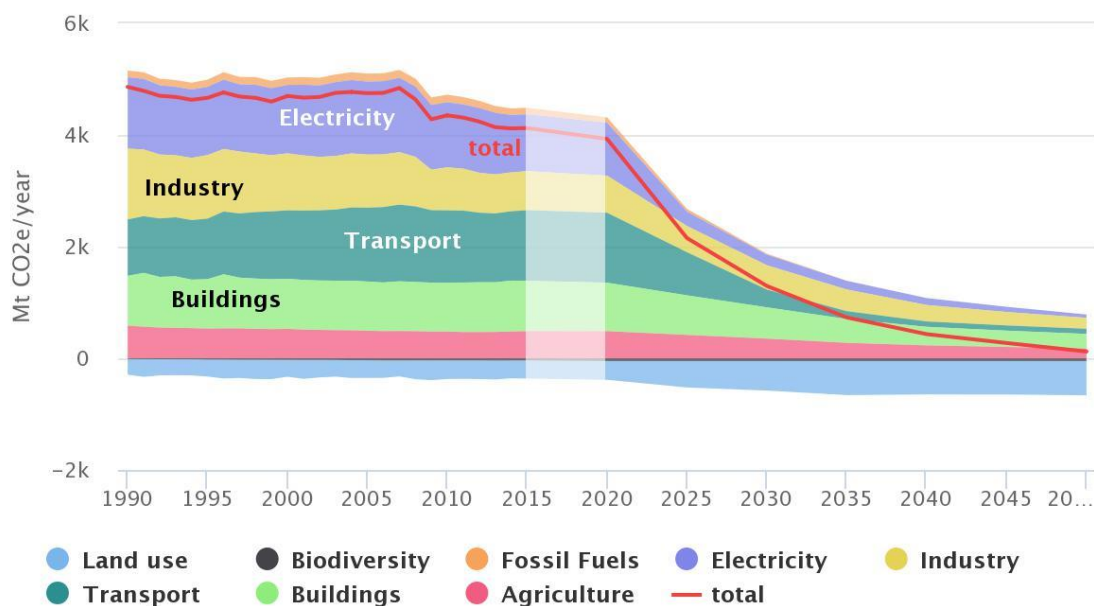
GHG budget for EU to stay below 1.5 degrees.



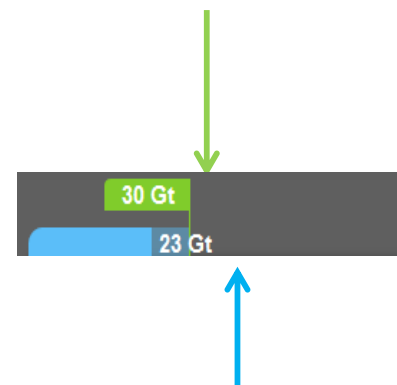
GHG emissions from the EU until 2050.

Scenario of maximum technological ambition **with** changes in Lifestyles

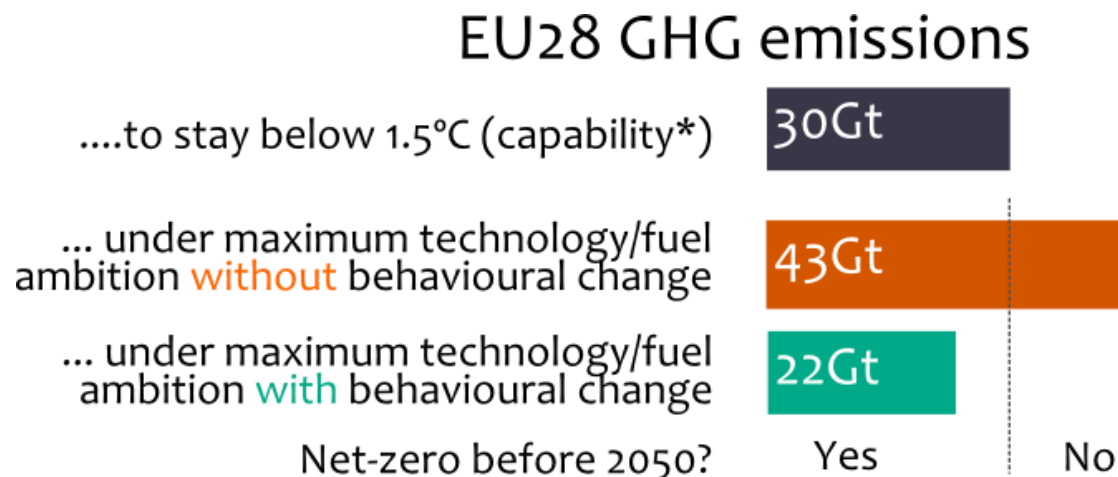
Greenhouse gas emissions



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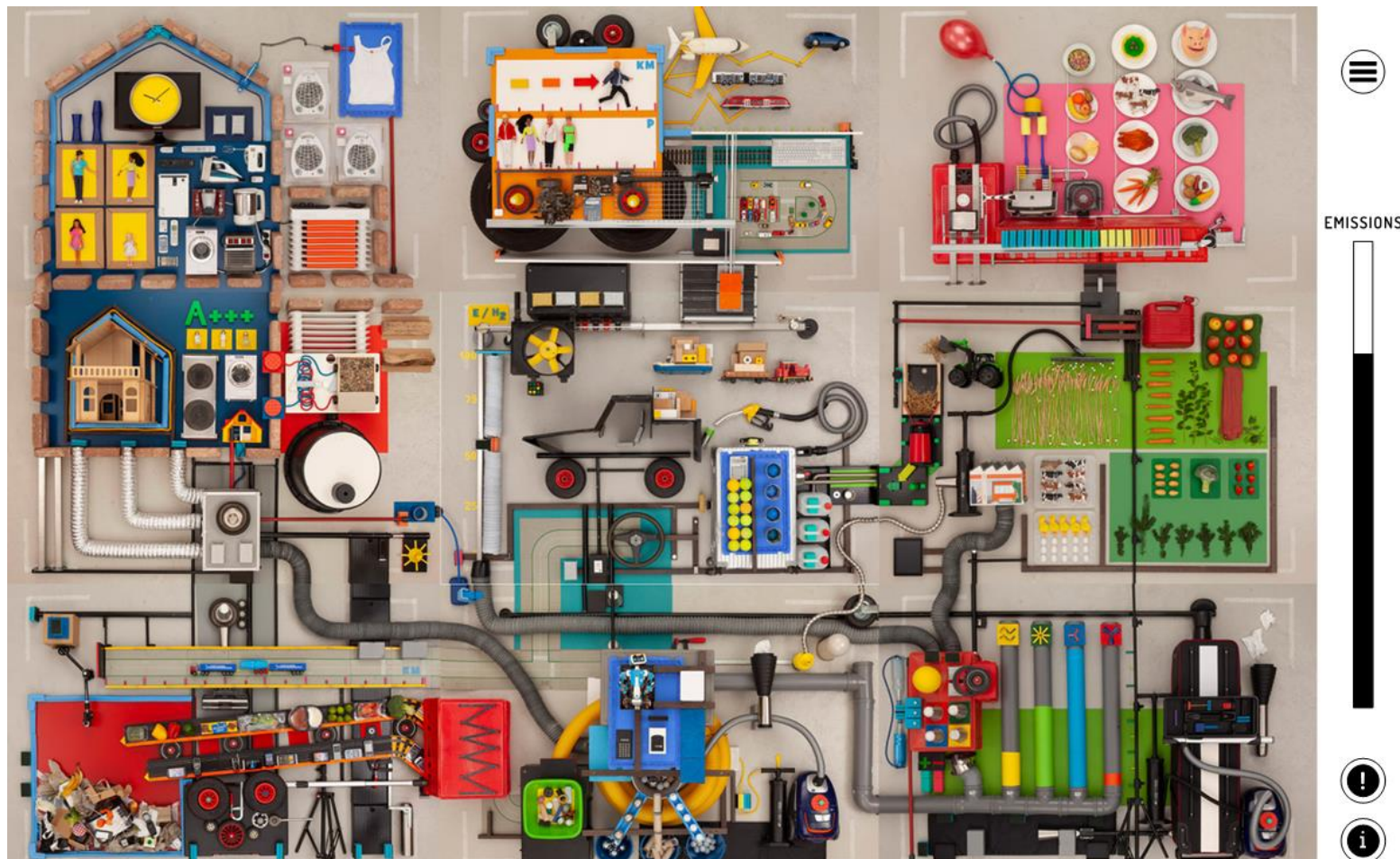


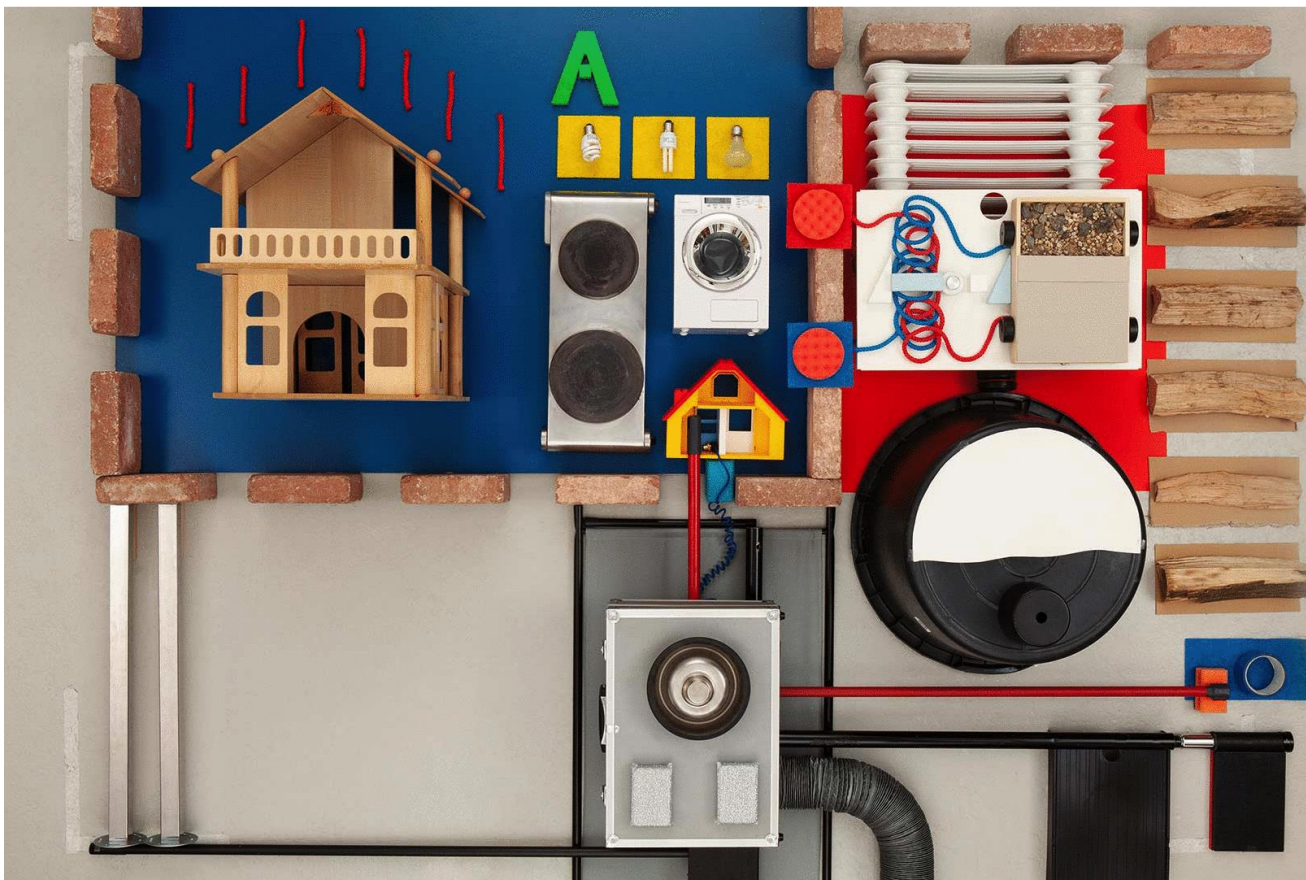
GHG emissions from the EU until 2050.



- Changes in lifestyles are crucial but not sufficient for reaching net-zero.
- They are complementary in easing some of the technological efforts needed but not a solution in itself.









Explore sustainable European futures

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EUCalculator project: <http://www.european-calculator.eu>

Transition Pathway Explorer: <http://tool.european-calculator.eu>
