Flexible buildings in the energy future of 2040: Paris Agreement Compatible scenario

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Paris Agreement Compatible Scenarios for Energy Infrastructure

The Future is Flexibility: In-Person Expert Workshop
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CAN
CLIMATE ACTION NETWORK
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PAC Paris Agreement Compatible Scenarios for Energy Infrastructure

We are fighting dangerous climate change, following scientific findings

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Over 180 member organisations active in 38 European countries, representing over 1.700 NGOs and more than 40 million citizens, CAN Europe promotes sustainable climate, energy and development policies throughout Europe

Why we need ambitious, cross-sectoral and detailed +1.5 C pathways

Energy demand reduction with higher RES deployment are major drivers of most pathways to climate-neutrality

Analysis of 1 000 reports for 36 scenarios, a reduction in final energy demand of 21-42% by 2040 compared to 2019. Beyond 2040, a continued trend in demand reduction in most scenarios.

Source: European Scientific Advisory Board on Climate, 2023

What?

The Paris Agreement Compatible (PAC) Scenario work constructs a European-wide energy scenario aligned with the Paris Agreement's objective to limit global warming to 1.5°C and embodies the policy demands of civil society.

CAN Europe with RGI, EEB, REN21 as partners **advances and deepens work at the EU27 level as well as disaggregates the EU-level scenario into the national level**, with national experts and member organisations, using an open source software (**Pathways Explorer**).

Aim and objectives

- At least 65% GHG emissions reductions on 1990 levels by 2030

Phasing in:

- A 2030 renewable energy target of ~50% in final energy consumption
- A 2030 energy efficiency target of at least 20% for 2030 (compared to the 2020 Reference Scenario)

Phasing out:

- Coal phase out (2030)
- EU-wide phase out for sale of Internal Combustion Engine (ICE) cars, no later than 2035
- Gas phase out by 2035
- Fossil oil products by 2040
- Possible *without* nuclear (2040)

Framework

- **Shift/transition towards a much more flexible, two-directional energy system**
- **Integration at local/municipal and urban planning levels, and for various policy and market mechanisms, as well as present/new actors**

https://climate-advisory-board.europa.eu/reports-and-publications/scientific-advice-for-the-determination-of-an-eu-wide-2040/esabcc_advice_eu_2040_target.pdf/@@display-file/file

Use the future in the present

An imperative to think of the future of energy and the built environment, in an integrated manner, also with a view to nature and biodiversity

An element of futures literacy is to use the future to think of the present, in a non-linear mode

Futures literacy as a skill has great potential for every person, organisation and sector to improve their understanding of their ability to change the future (Miller 2014; 2018)

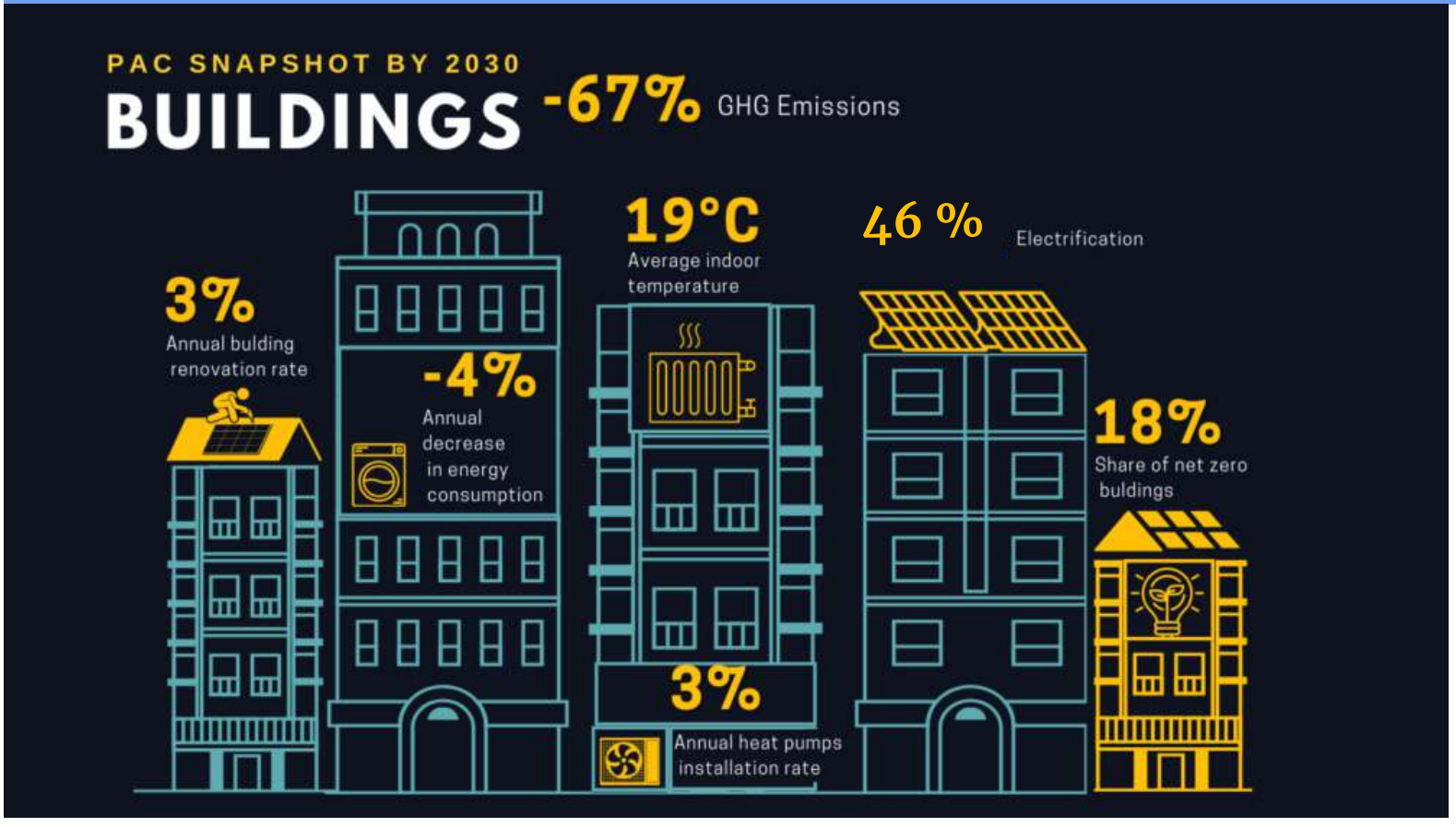
An imaginative aspect concerns critical thinking beyond first- or second-order effects of systems change, as **systems literacy**

Futures literacy is **an ability to look at the world, and understand how it will change in the future**

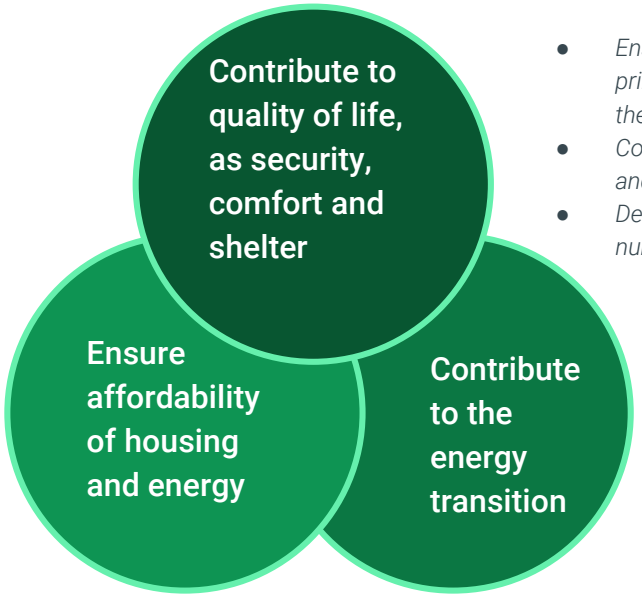
"More than ever, we need buildings that can bend to whatever the future brings."

Read more: https://en.unesco.org/futuresliteracy/about

Flexible energy system: role of buildings (EU27)



Plausible functions of buildings in 2040



- *Ensure traditional primary functions for their residents*
- *Contribute to urban and rural liveability*
- *Defined through a number of criteria*

- *Low energy bills for households*
- *Low energy bills for commercial and industrial users*

- ***Contribute to a far more flexible, well-functioning grid***
- ***Contribute to electricity generation: heat pumps, solar photovoltaics, EV charging stations, e-bikes***
- ***Ensure energy efficiency (renovations)***
- ***Interact with renewable district heating networks***

EU27 as a SUM

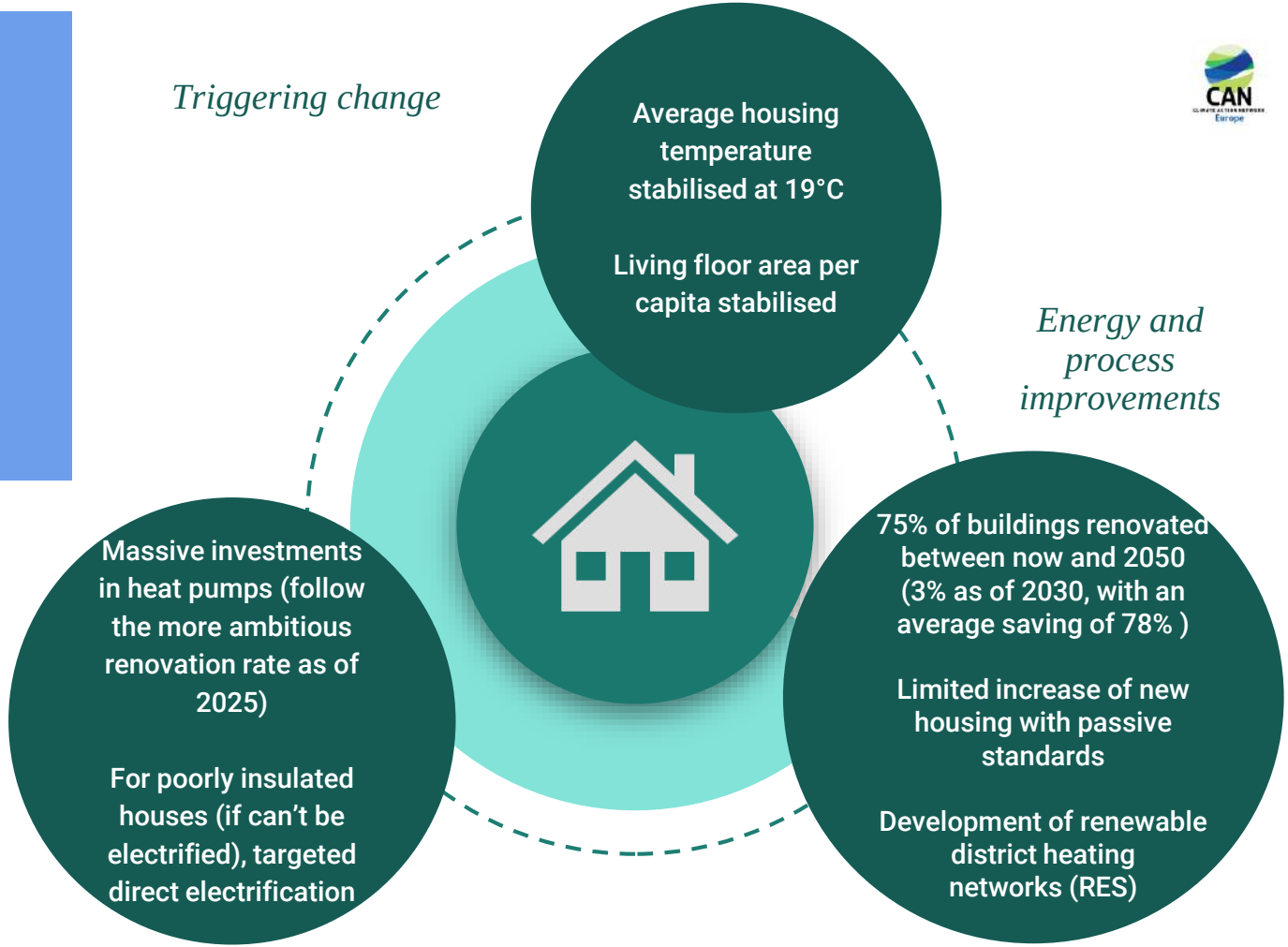
Sector	KPIs	Pathway		
		2015	2030	2040
Buildings	Total GHG [MtCO2e]	480.4	149.5	4.3
	Renovation rate [% of stock per year]	1	3	3
	Renovation depth [avg KWh/m²]	94.8	68.0	48.0
	Electricity [% of final energy]	34	46	57
	District heating [% of final energy]	9	17	24

Major reduction in GHG emissions of EU buildings through:

1. Gradual increase of renovation rate (at 3% in 2030)
2. Renovations drastically reduce the energy consumption
3. Tripling of district heating networks, and their conversion to become RES-based
4. Electrification of buildings - Fossil fuel phase out

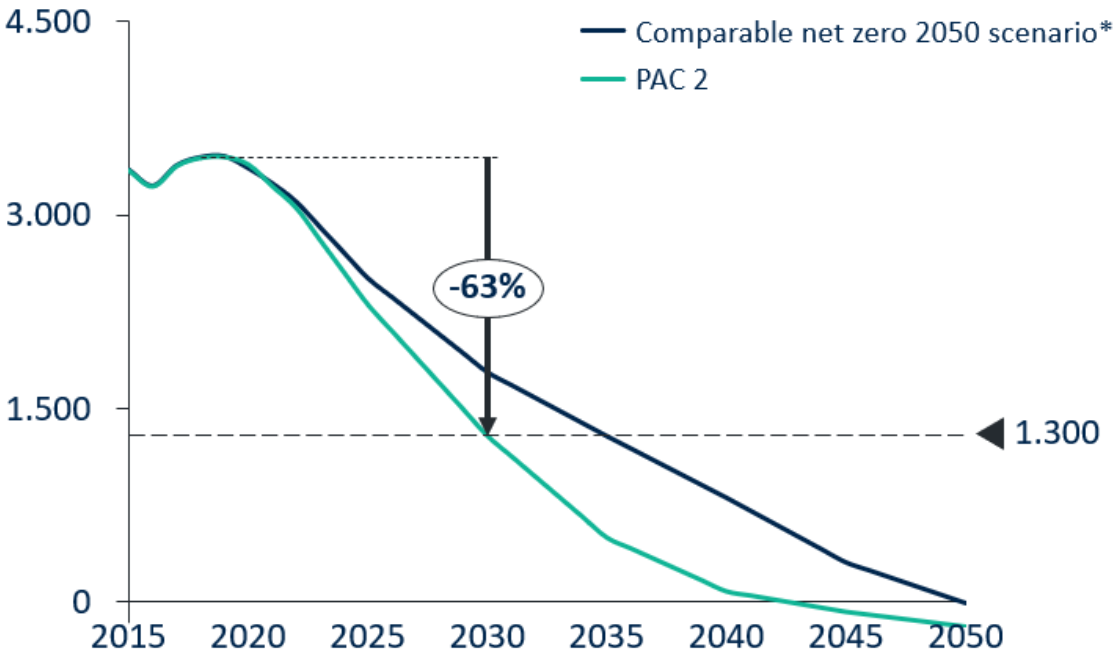
Contribution of buildings to reduce energy demand

Buildings, as an elemental and integral pillar, assisting in triggering changes in our lifestyle, made possible by an evolution in social patterns and transformations of the collective organization.



Net zero can be achieved in 2040, but implies quick and ambitious policies

GHG emissions trajectory [$MtCO_2e$]



Key messages:

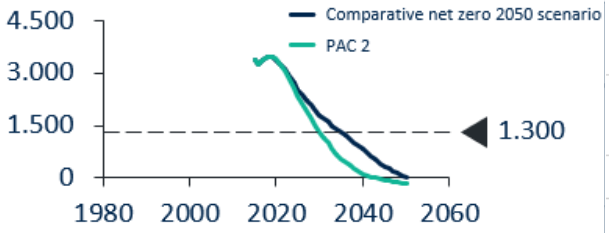
1. Net zero can be achieved in 2040, by means of ambition measures described in this analysis
2. This implies a strong and quick diminution of emissions ➔ around -65% in 2030 (vs 2015)

PAC 2.0 GHG emission reduction levels in 2030 compared to 1990 is ~73%, according to GHG inventory scope under UNFCCC

* The comparison scenario has been computed with similar but less ambitious assumptions, to show the impact of moving the net zero target from a decade

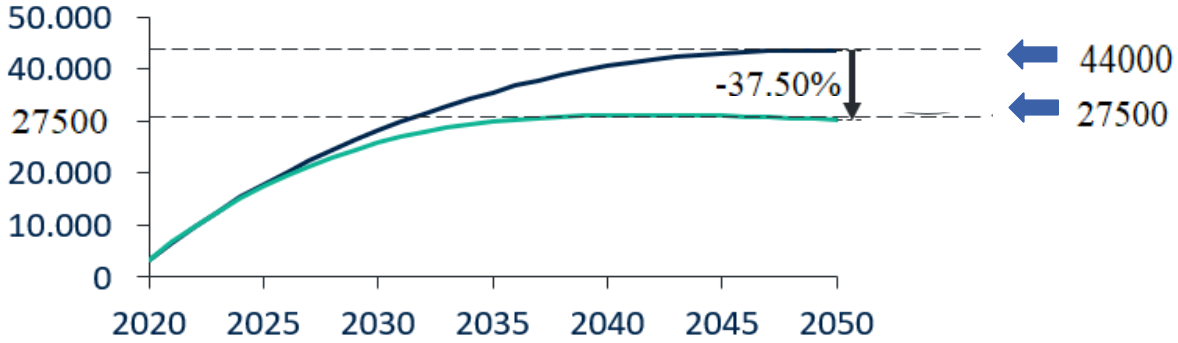
Advancing the target by 10 years has a big impact on the EU's global carbon budget

GHG emissions trajectory [$MtCO_2e$]



Global carbon budget for 1.5C	~500 GtCO2
Share of total population living in EU27	~5.5%
EU carbon budget	27.5 Gt CO2
PAC 2.0 carbon budget (2020-2050)	27.5 Gt CO2

Cumulative GHG emissions (2020-2050) [$MtCO_2e$]



As an historical emitter and a richer continent, Europe has a responsibility and a strategic interest to set a credible path to 1.5°C. This requires:

- to advance the net zero target to 2040 to be more in line with Europe's fair carbon budget
- A fast and ambitious ramp-up in measures (briefly described in the document)

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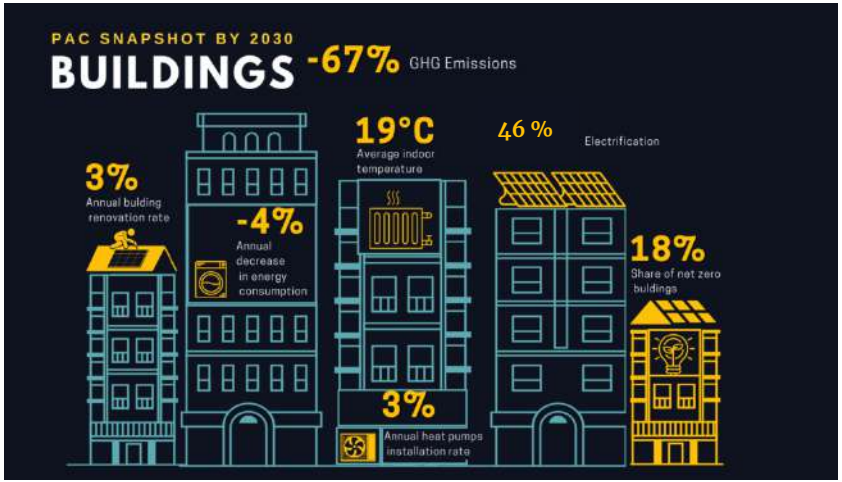
Flexible buildings in a flexible energy system

Flexible buildings

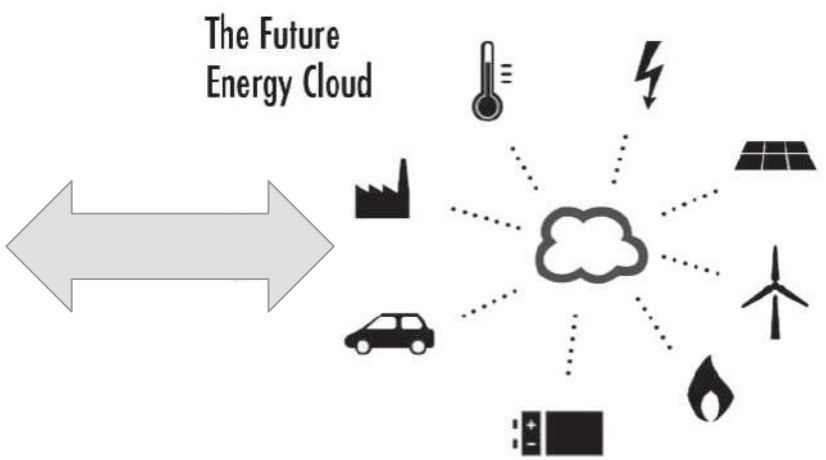


Contribution of buildings through energy efficiency, integration of heat pumps, and renewable district heating, as well as energy generation through heat-pumps and solar PV are a main driver

Increase in and deeper renovations, more heat pumps
Stable indoor temperature (19 C)

Fig 1. PAC project.

Variable energy supply and flexible energy system

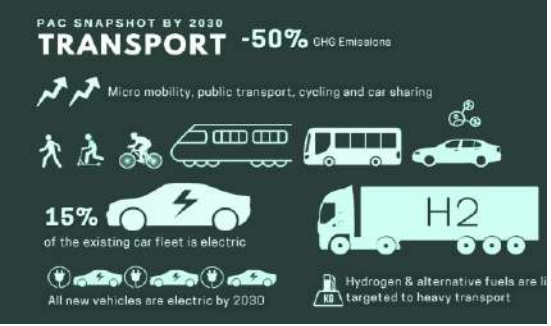


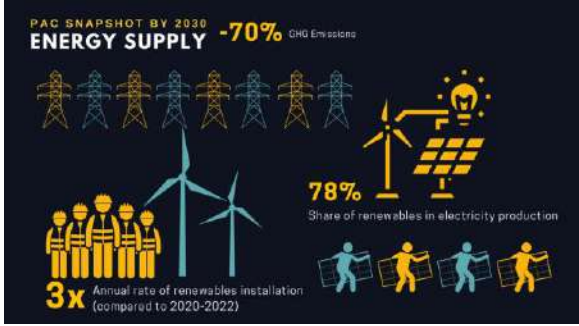
Energy supply: **RES x Flexibility x Grid infrastructure**
…reducing demand dramatically within sectoral pathways.

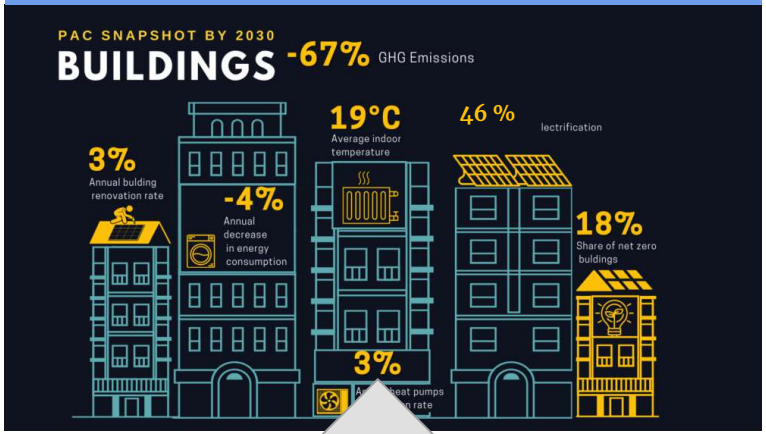
Also note: PyPSA - Python for Power System Analysis, as a modelling tool for infrastructural analysis

Fig 2. Neo-Carbon Energy project

Flexibility in the energy transition

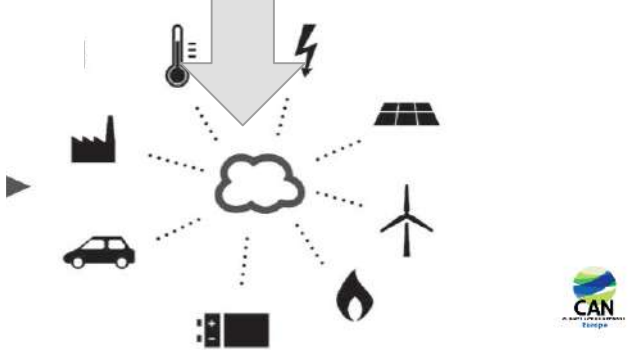


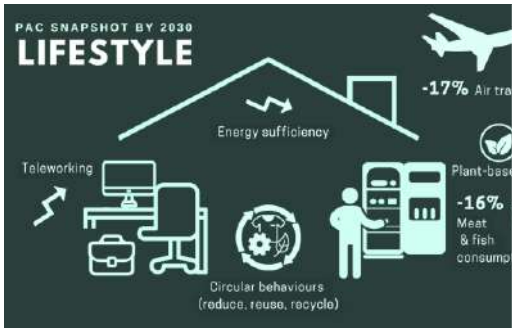


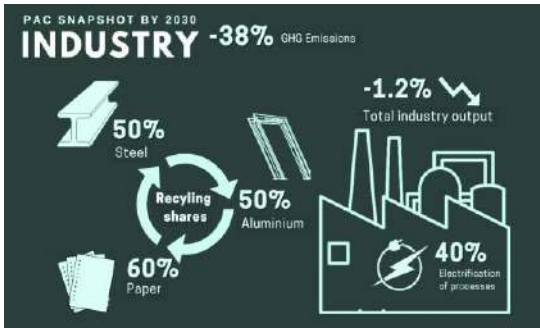


- **Important changes in social patterns and societal organization towards frugality, circularity and sobriety help reduce demand**
- **Renewable power production (100% RES), a highly flexible energy system, energy efficiency, technological progress, process improvements**

1. Need to focus on creating enabling ***infrastructural and their institutional frameworks***
2. Widening ***our options and flexibility*** as key enablers for buildings to contribute.







To conclude: Advancing the contribution of buildings

1. **Anticipate, align and activate the role of flexible buildings** in a flexible, future energy system for liveability and resilience.

   All sectors - buildings, transport, energy supply etc. - have an integrated role to assist sustainable lifestyles - especially in times of crises.

2. Already identified **measures on buildings**:

   a. Secure adequate national long-term planning
   b. Ensure the pioneer role of new buildings
   c. Exploit wholly Energy Performance Certificates
   d. Raise the ambition on Minimum Energy Performance Standards
   e. Strengthen the deep renovation definition, in a limited amount of steps
   f. Harness smart meters fully.

3. What specific measures to **advance role of flexible buildings, and related (new) actors in a far more flexible energy system**? **Gaps**?

More reading: https://caneurope.org/content/uploads/2022/05/CAN-Europe-position-on-the-Energy-Performance-of-Buildings-Directive-recast-proposal.pdf

Thank you for your attention!

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