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International practices of promoting energy-efficient and carbon-neutral buildings and neighborhoods

WHY CARBON NEUTRAL BUILDINGS

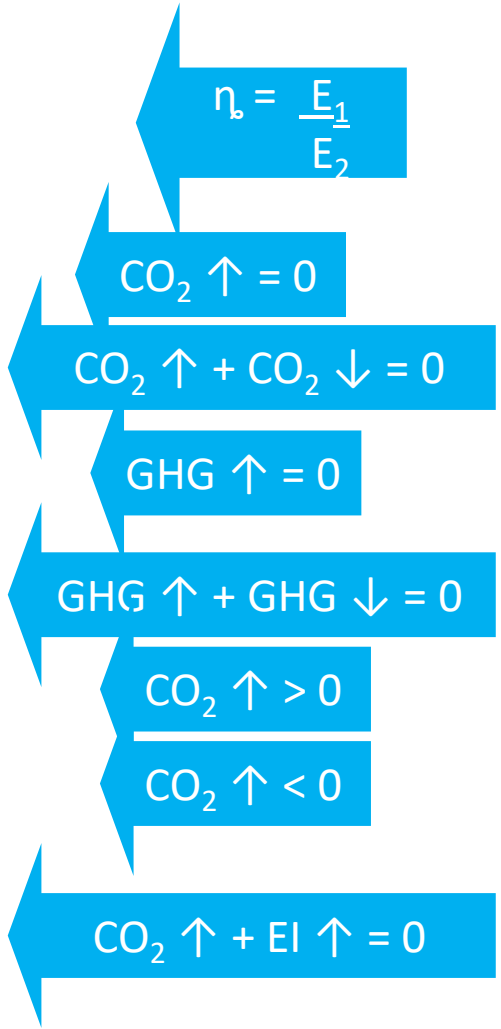
Dr. Romanas Savickas

WHY CARBON NEUTRAL BUILDINGS

WHAT IS OUR TARGET FOR BUILDINGS AND NEIGHBOURHOODS – ENERGY EFFICIENCY OR CARBON NEUTRALITY?

Net Zero VS Carbon Neutral VS Carbon Negative VC Climate Positive

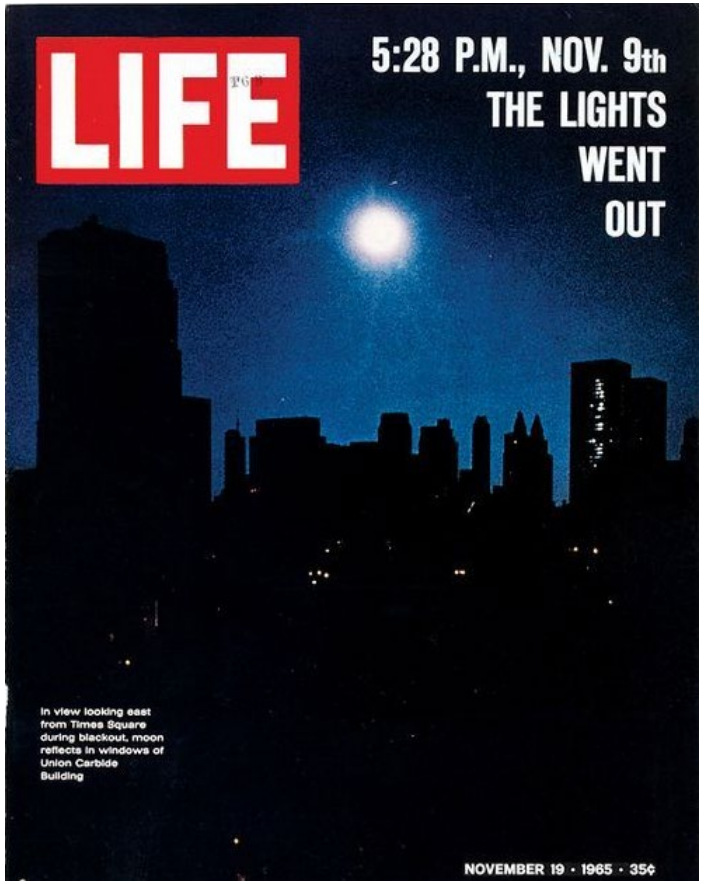
- **Carbon Neutral** means that any CO_2 **released** into the atmosphere from activities is balanced by an equivalent amount being **removed**.
- **Net-Zero carbon emissions** mean that an activity **releases net-zero carbon emissions** into the atmosphere.
- **Net zero** refers to **all greenhouse gases** being emitted into the atmosphere, such as methane (CH_4), nitrous oxide (N_2O) and other hydrofluorocarbons.
- **Net-Zero emissions balance** the whole amount of greenhouse gas (GHG) released and the amount removed from the atmosphere.
- **Climate Positive** means that activity goes beyond achieving net-zero carbon emissions to create an environmental benefit by **removing additional carbon dioxide** from the atmosphere.
- **Carbon negative** means the same thing as "**climate positive**."
- **Carbon positive** is how organizations describe climate positive and carbon negative. It's mainly a marketing term, and understandably confusing–we generally avoid it.
- **Climate Neutral** refers to reducing **all GHG to the point of zero** while eliminating **all other negative environmental impacts (EI)** that activities may cause.



WHY CARBON NEUTRAL BUILDINGS

ENERGY SECURITY

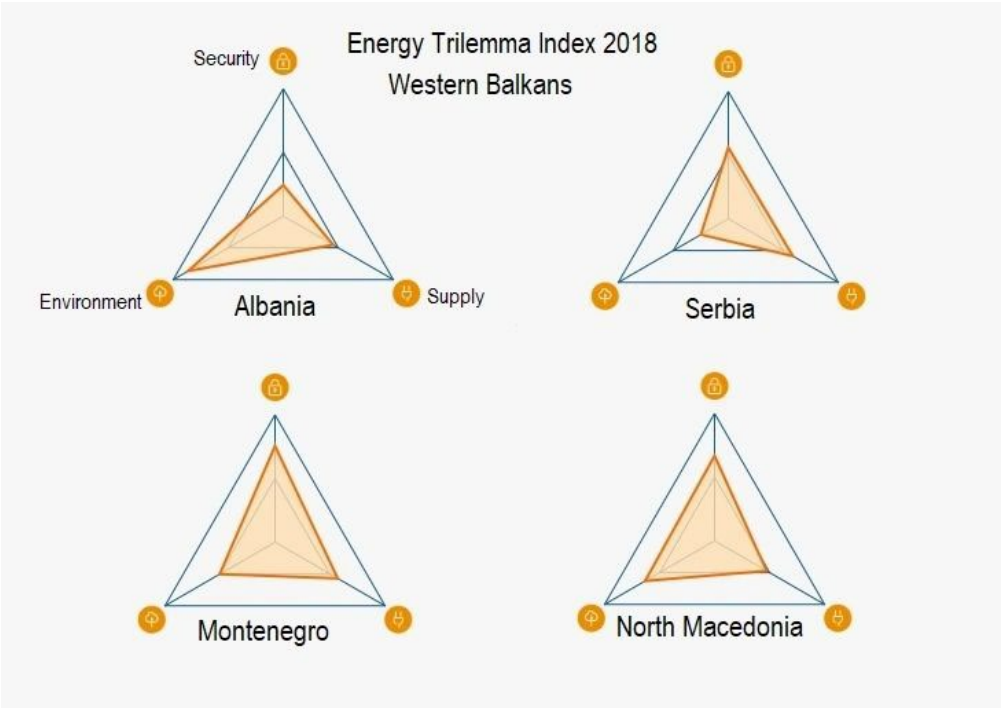
- Past experience with a **Power Outages** indicate some of the knock-on effects.
- **1973 oil crisis** in Denmark caused Denmark and Copenhagen to rethink their National Energy security (import, production, consumption), transportation and other priorities;
- The New York City's ("**Northeast blackout**") blackout of **2003** lasted 28 hours and halted mass transport, surface vehicles due to signalling outages, and water supply. It affected 45 million people in eight U.S. States.
- **Energy Security** is one of the Key Parameters for buildings and neighbourhoods;



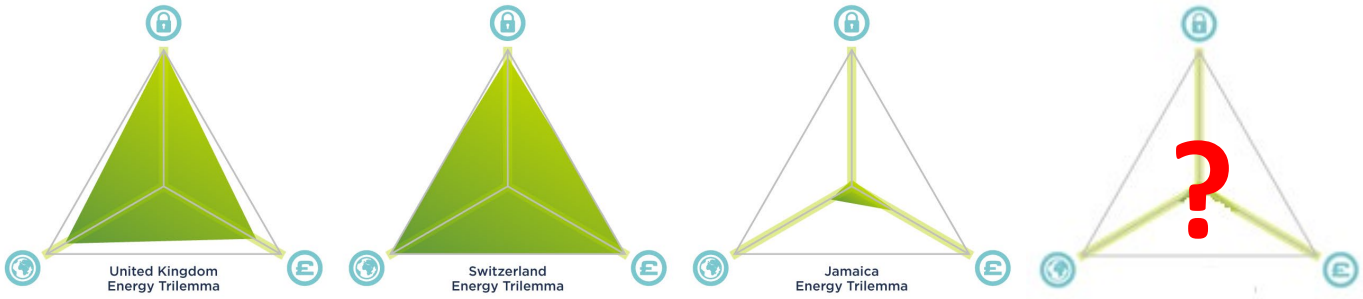
WHY CARBON NEUTRAL BUILDINGS

ENERGY TRILEMA

- Energy **Security**;
- Affordability and **access**;
- **Environmental** Sustainability;



Future Energy Trilema Index



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STARTING POINT – NET ZER ARCHITECTURE

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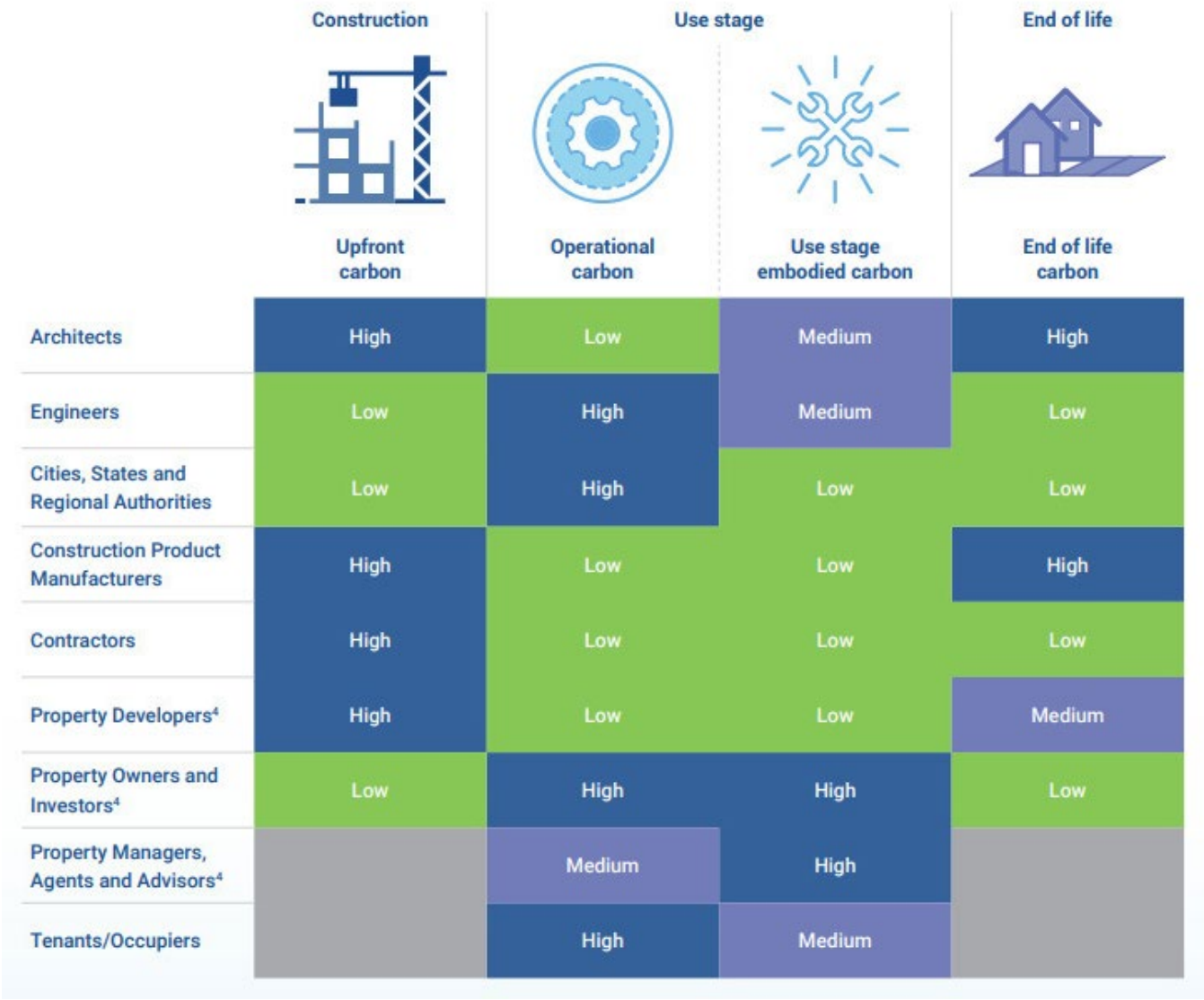
WHY CARBON NEUTRAL BUILDINGS

LIFE CYCLE APROACH

Influence of the stakeholders across the building lifecycle:

- Upfront Carbon;
- Operational Carbon;
- Use Stage Emboddied Carbon;
- End of Life Carbon;



	Construction	Use stage		End of life
	Upfront carbon	Operational carbon	Use stage embodied carbon	End of life carbon
Architects	High	Low	Medium	High
Engineers	Low	High	Medium	Low
Cities, States and Regional Authorities	Low	High	Low	Low
Construction Product Manufacturers	High	Low	Low	High
Contractors	High	Low	Low	Low
Property Developers[4]	High	Low	Low	Medium
Property Owners and Investors[4]	Low	High	High	Low
Property Managers, Agents and Advisors[4]		Medium	High	
Tenants/Occupiers		High	Medium	

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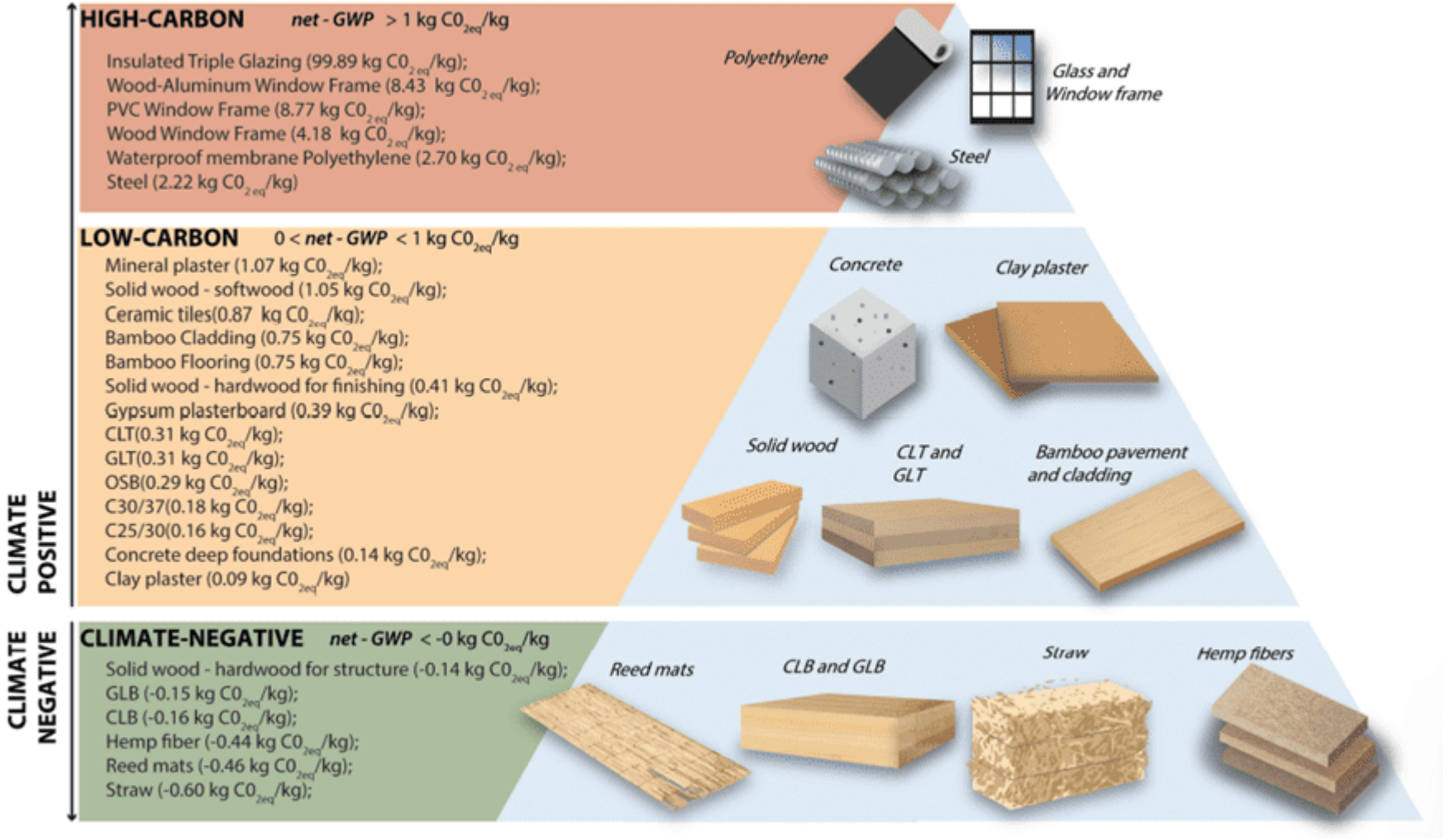
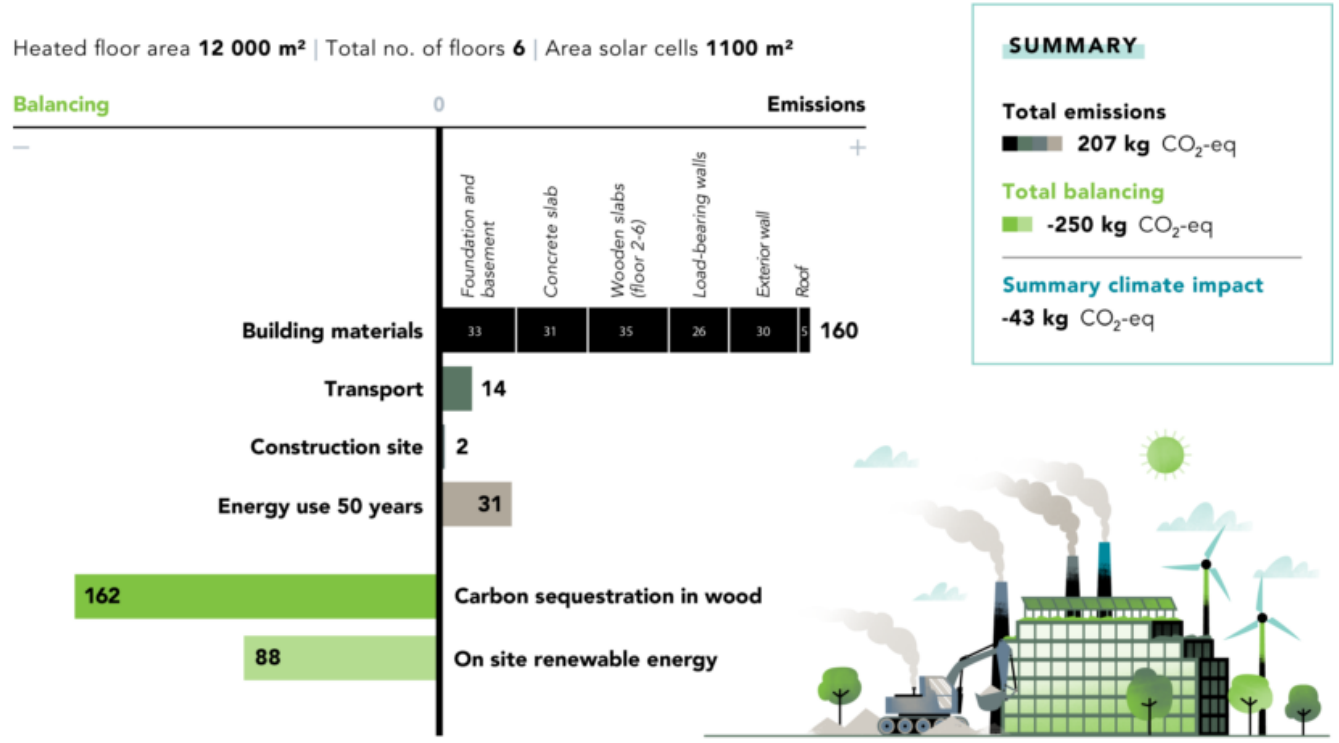


WHY CARBON NEUTRAL BUILDINGS

Climate Declaration



https://whitearkitekter.com/carbon-neutral-buildings-creating-value-through-architecture/

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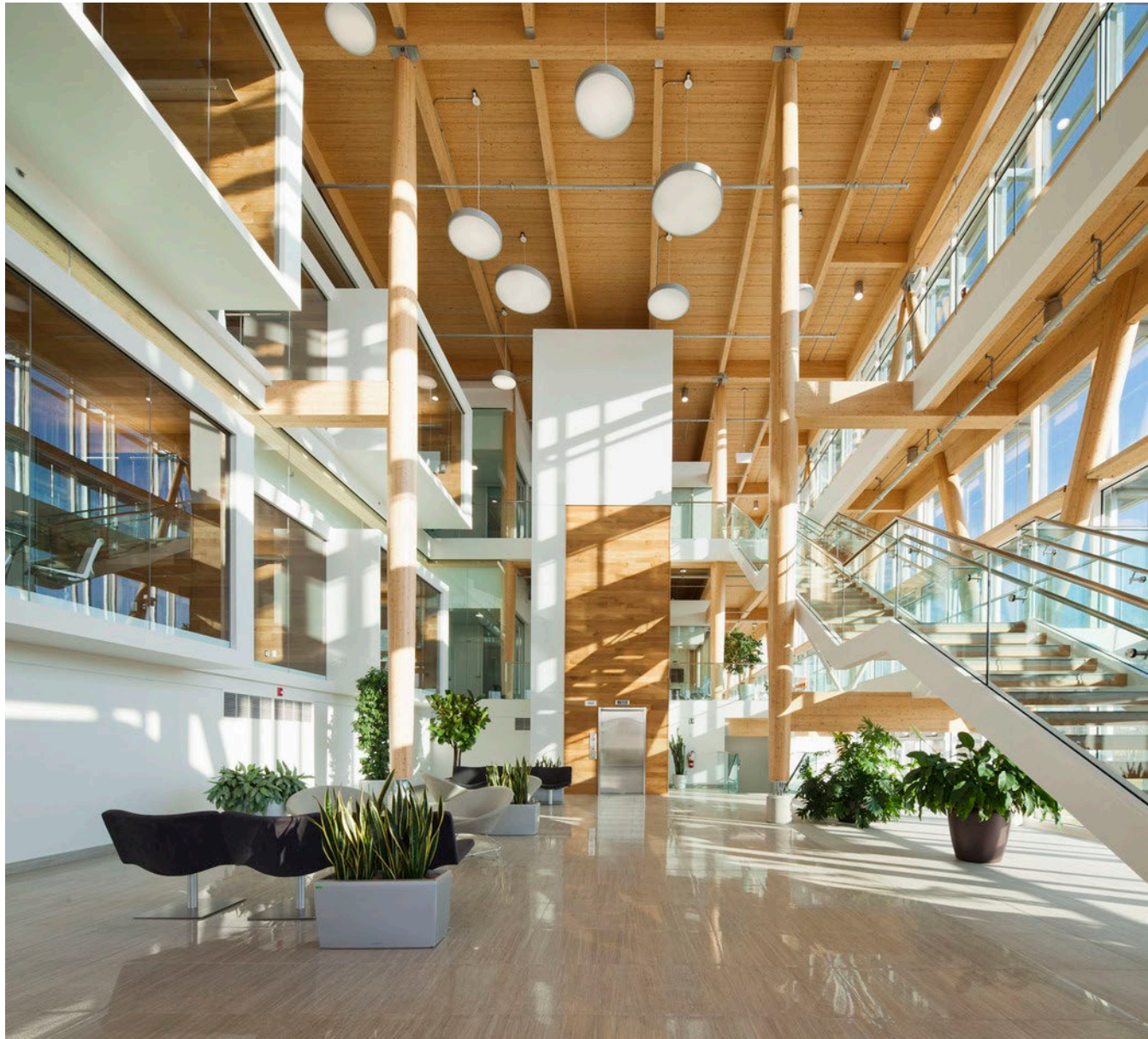
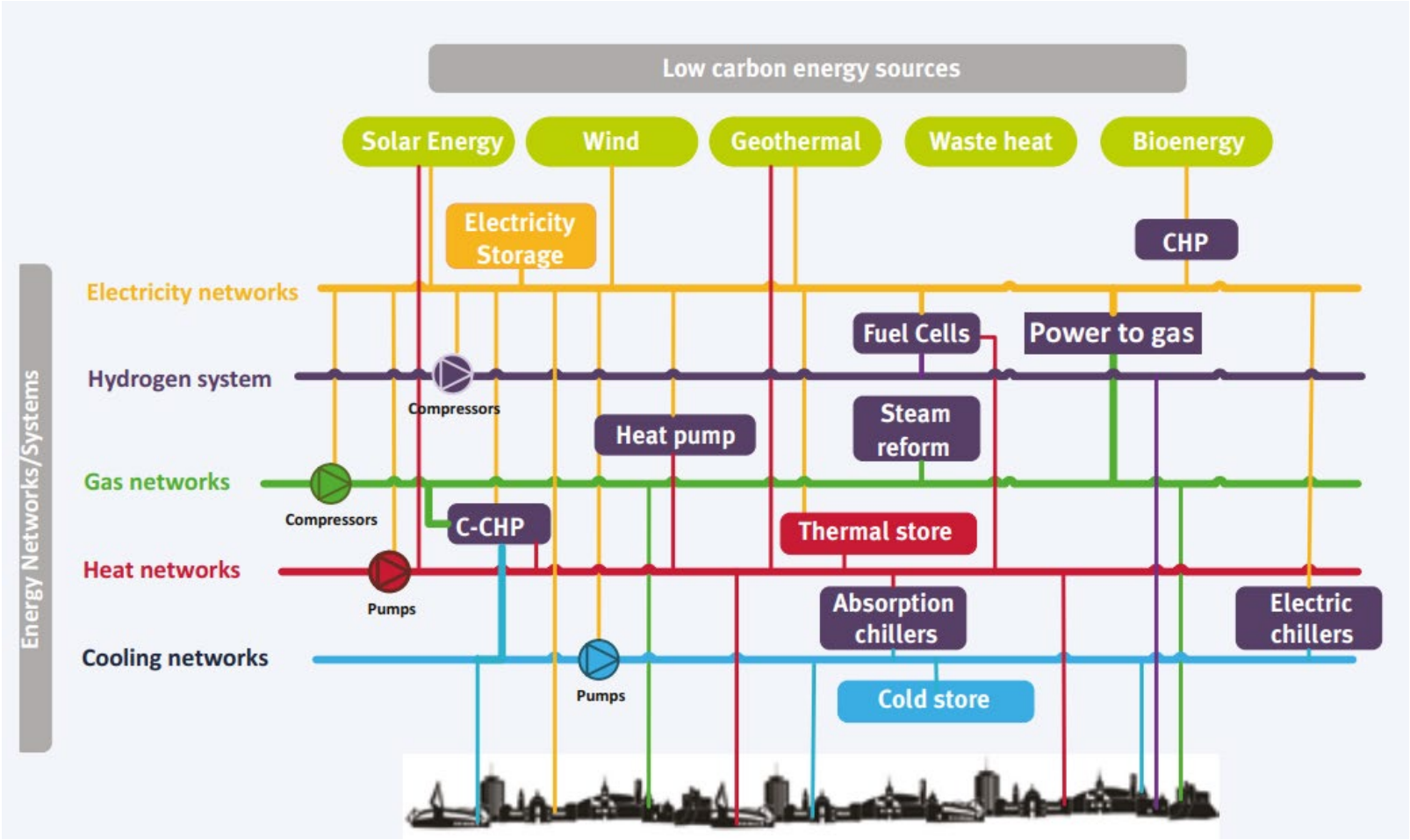


WHY CARBON NEUTRAL BUILDINGS

INTEGRATED ENERGY SYSTEMS



WHY CARBON NEUTRAL BUILDINGS

INTEGRATION OF ENERGY SYSTEMS AT DIFFERENT SCALES

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CONCLUSIONS

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WHY CARBON NEUTRAL BUILDINGS

Design strategies for achieving Net Zero Carbon Buildings

- Set **clear goals** (Zero Carbo? Climate Positive? Etc.?);
- Make use of what is **already there**;
- **Avoid fossil energy** use altogether and minimise operational energy consumption;
- Minimise **embodied carbon** both **upfront**, during **life-cycle**, and **demolition** stage;
- Choose **materials** and **energy sources** that have a low climate impact;
- Make use of Integrated Energy systems and Synergy between Buildings Energy Efficiency and Integrated Energy Systems;
- Achieve carbon reductions by exporting surplus energy (**Consumers and Prosumers**) or with carbon sequestration;
- **Offset** the remaining emissions;

THANK YOU

Dr. Romanas Savickas
romanas.savickas@un.org

https://www.linkedin.com/in/romanassavickas/

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