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nZEB - near Zero Energy Buildings - Myths, Reality & Prospects

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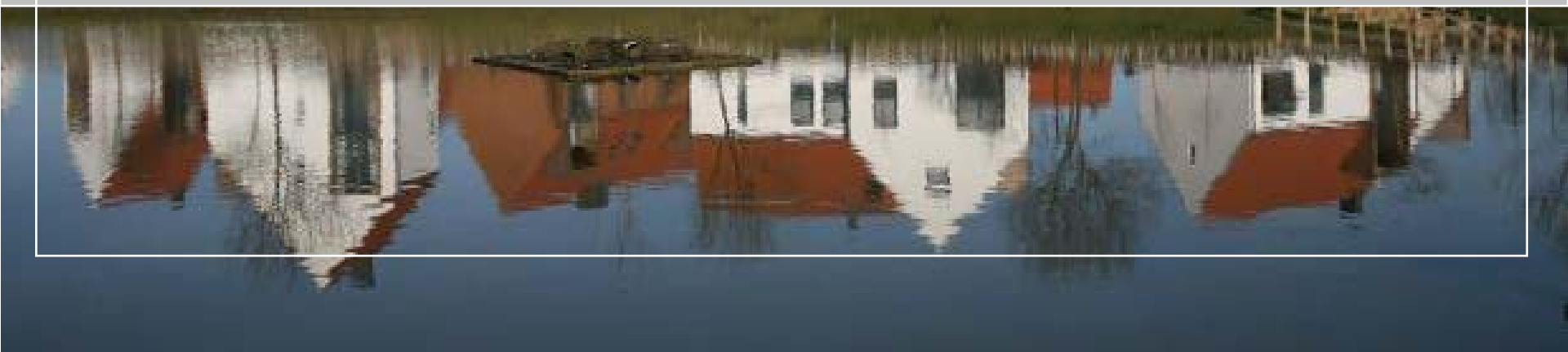
LBCP



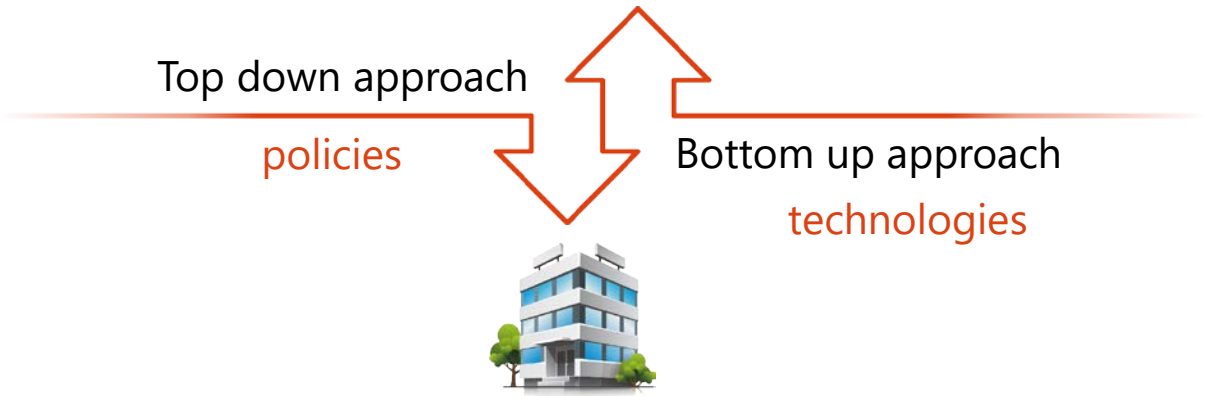
nZEB as
building performance regulation

REGULATIONS

how did we ended with the nZEB concept ?

2007	by 2020	20% increase in energy efficiency (from 1990 levels) 20% share of energy from renewables 20% cut in greenhouse gas emissions
2014	by 2030	40% increase in energy efficiency (from 1990 levels) 32% share of energy from renewables 40% cut in greenhouse gas emissions
2018	by 2050	Climate-neutral economy: 80%-zero green house emissions

Building sector



Myths: Defining ‘nZEB’

It is the plan for the buildings of the future

It is the framework for constructing our buildings now

The option for building a new / renovating an existing is supported by states

With few exceptions, either you construct it as nZEB or not constructing it at all

The target is the energy performance of buildings

The target is a specific energy / gas emission reduction in the building sector by ‘30/40/50

Accuracy is not that important as long as we develop better than before buildings

Accuracy is very important to avoid more strict regulations

Agreement on what types of energy consumption is taken into account

Most countries follow a similar approach, others consider all types

A common methodological framework based on the same standards.

Often different methodological approaches based even on withdrawn standards.

Safe assumptions & simplifications based on existing knowledge

In many regulations / in some standards, assumptions, not in line with recent knowledge

The framework leads to safe estimation of future & present energy consumption

The ‘performance gap’

It will provide the same results in the future regardless of development in other sectors

In most countries the energy mix will change the calculated energy performance often

nZEBs are cost-optimal systems

Maybe cost-effective but not cost-optimal. In state’s regulations we had the cost-optimal target

2 years before the nZEB : The top-down approach & onsite RES affects costs

Reality: Defining ‘nZEB’

Different definitions for each country, or even regions within the same country

Ranking based on A single value of primary energy consumption
Reference Building

Very wide range of requirements

Austria	**160**	kWh/m²	(as by 2019)
Belgium	30-60	kWh/m²	
Croatia	33-40	kWh/m²	
Cyprus	100	kWh/m²	
Denmark	**20**	kWh/m²	
France	40-65	kWh/m²	
Latvia	95	kWh/m²	

....

Comparative approach
Germany , Czech Republic, Italy, Lithuania, Luxembourg, Spain, Greece

Different energy uses considered

Different conversion factors for Primary Energy What happens if all national electricity production is 100% from RES?

All buildings are nZEBs?

Additional work is needed in the environmental performance Increased embodied energy

EN **Standards** have been withdrawn / updated / developed to support the increased accuracy needs of nZEB but still what we design is not always what we get…

The energy performance gap

Usually attributed to user's behavior, but…

our assumptions even on relatively simple problems are sometimes questionable

Thermal bridges

One of the few standards (published in '90s based on thermal insulation requirements of the time) that have not been updated since they are considered as a problem already solved?

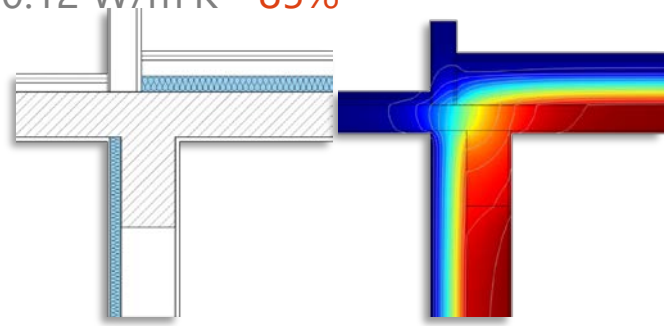
Actual thermal bridge flows can differ even by 200% compared to the standards, if current thermal insulation requirements are taken into account.

Example of **linear thermal transmittance** at the junction between a flat roof and a wall

Actual value 0.69 W/m·K

Tabulated value in Greece: 0.90 W/m·K +30%

Tabulated value in Cyprus: 0.12 W/m·K -85%



Linear Thermal Transmittance

Thermal insulation thickness in wall	Thermal insulation thickness in roof				
	0.05	0.06	0.07	0.08	0.10
0.02	0.39	0.40	0.41	0.41	0.41
0.03	0.53	0.54	0.55	0.55	0.56
0.04	0.60	0.61	0.62	0.63	0.63
0.05	0.63	0.65	0.66	0.67	0.67
0.06	0.65	0.67	0.68	0.68	0.69
0.07	0.65	0.67	0.68	0.69	0.70
0.08	0.65	0.66	0.68	0.69	0.70
0.10	0.62	0.64	0.65	0.66	0.67

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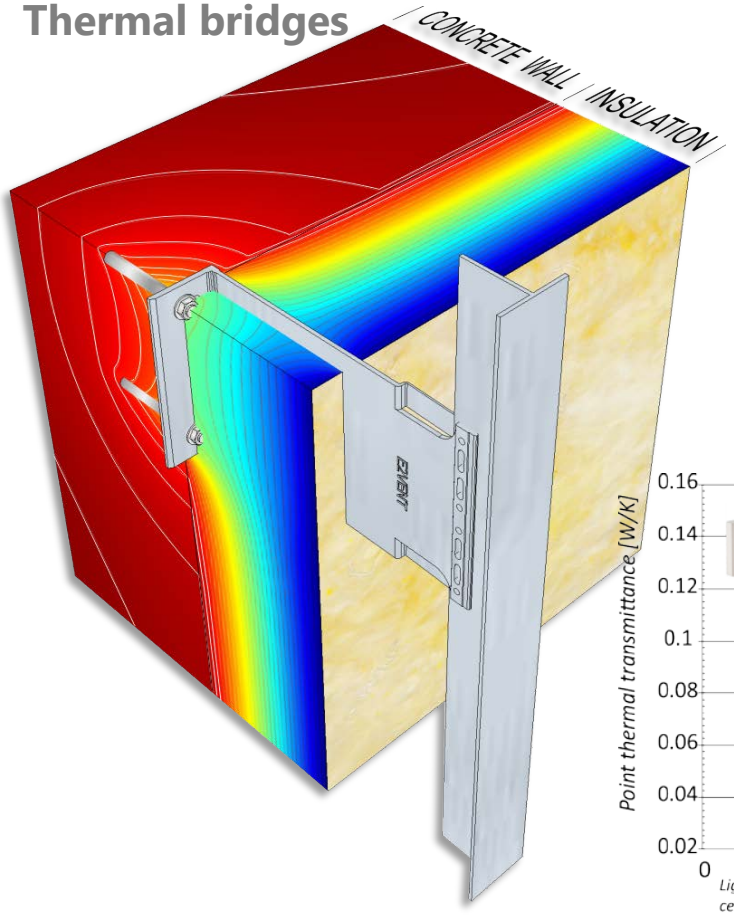
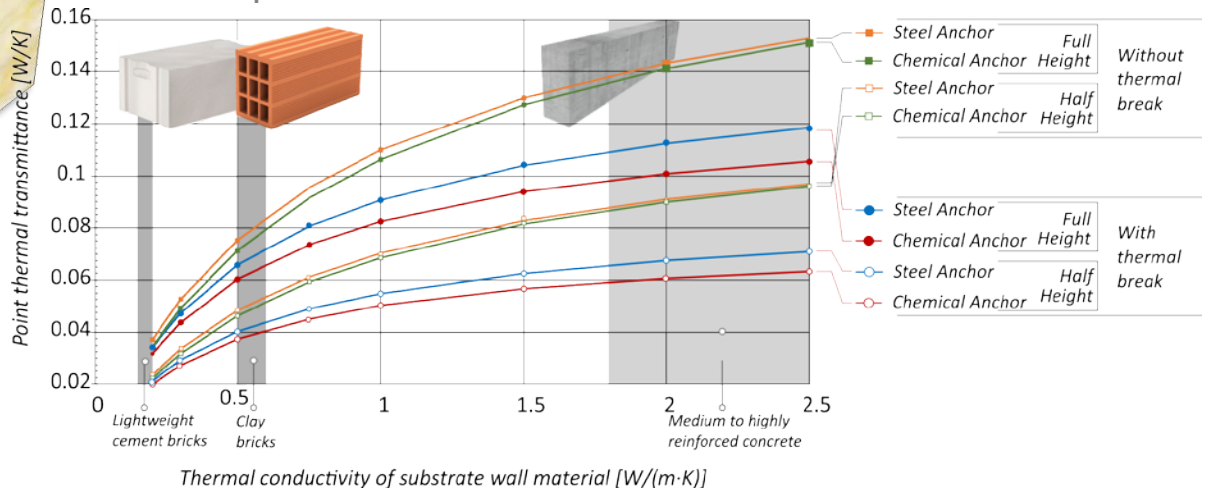
The energy performance gap

Thermal bridges



Point thermal bridges are usually not treated at all since their magnitude is negligible on conventional facades.

But we usually overlook the fact that cladding systems that are popular in renovation projects are not conventional facades (estimation error: even 50% actual thermal transmittance reduction in well-insulated envelopes.)



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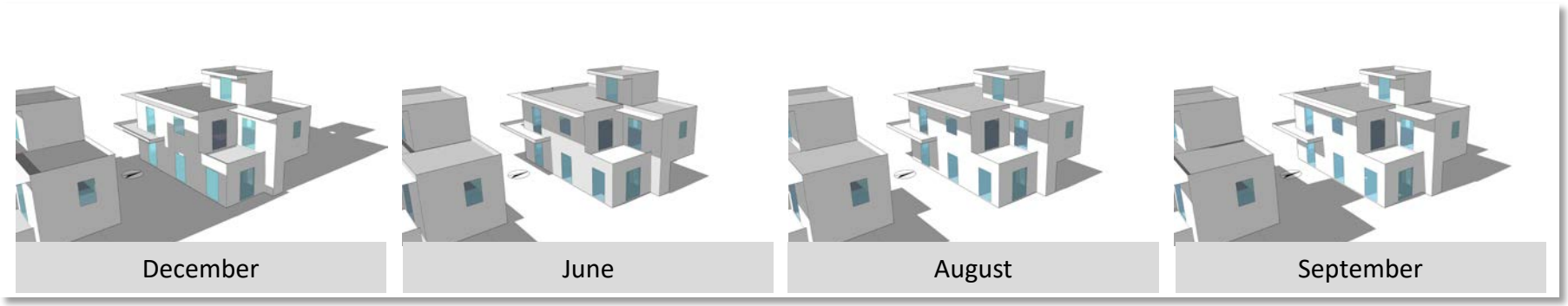
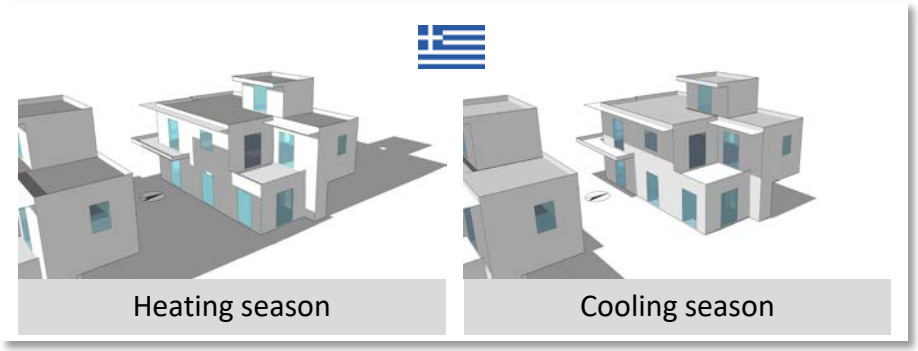
The energy performance gap

Shading Solar radiation dominates energy performance in south Europe but is still poorly treated!





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The energy performance gap

Integration of RES

In many countries, integration of RES is limited to electricity production, neglecting façade overheating due to heat emittance

Climate change

Most climatic data used in national regulations are the same ones used when energy efficiency regulations initiated (2000).

They have been developed (good scenario) based on data collected over previous (then) decades (late 80's ?).

We design buildings to operate in 2050's climate, based on 60 year old climate data!


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The Never-Ending Summer

Is Germany's Heat Wave a Preview of the Future?

Germany is currently experiencing a state of meteorological emergency. Although many are enjoying the scorching summer, the heat wave has left others with health problems and also led to a drought. Is this a preview of how climate change may soon change our lives? *By DER SPIEGEL Staff*

+ measurements taken outside the urban environment where most building are located

+ can we really fight climate change without taking it into account in our assumptions?

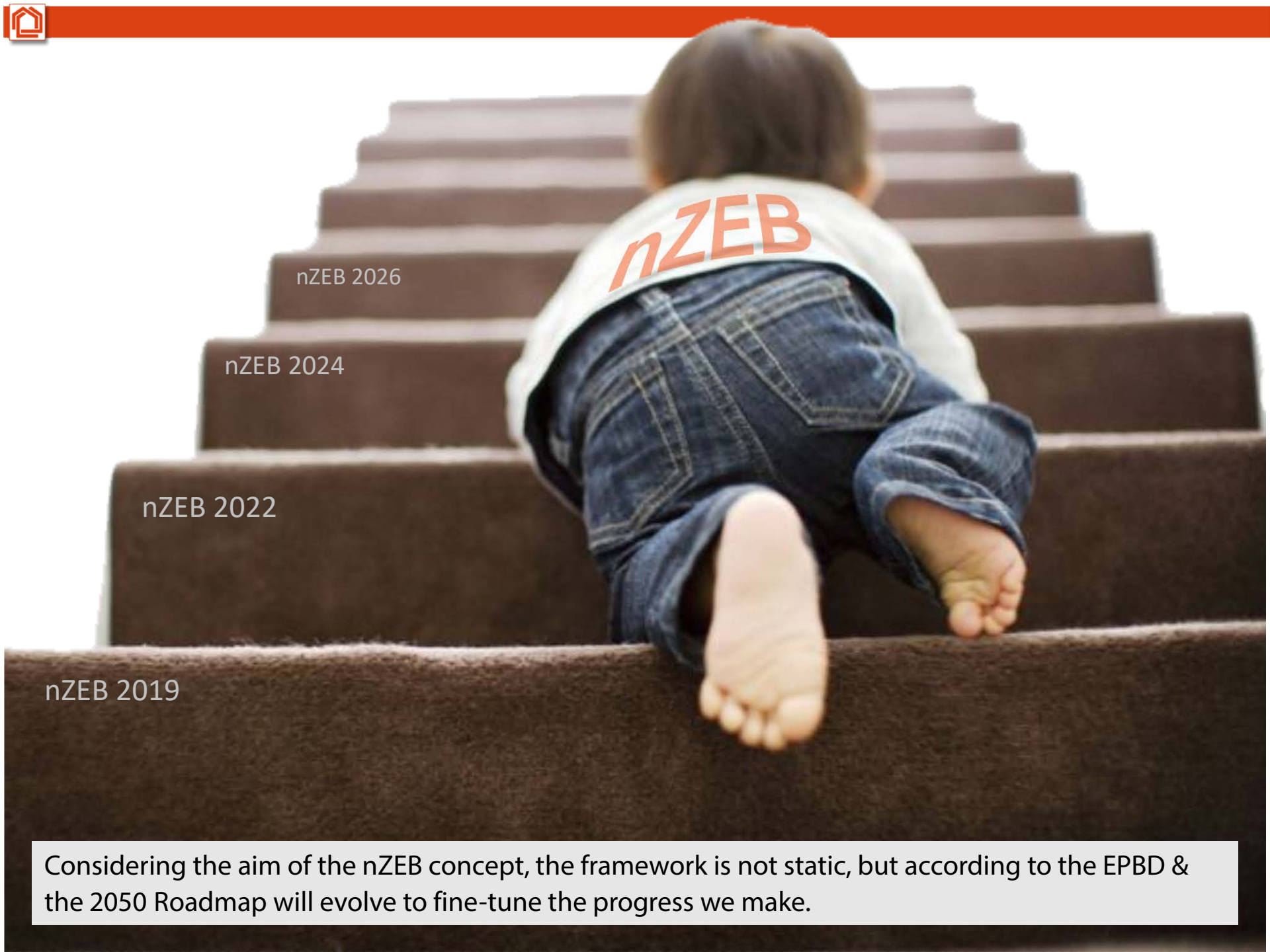
+ climate change has already altered / introduced cooling needs in many regions that still not consider cooling

General comments

- Some countries have already started to upgrade their regulations by adopting new standards and by optimizing their tools to reflect specific problems they have recognized in previous performance frameworks. The motive is not only international agreements but energy security and self-sufficiency.
- There is a strong need for knowledge / education / good practice guides (stakeholders – building professionals – university students: there is knowledge beyond standards)
- The key for the success of nZEBS lies in synergies within the same community (ZERO+) (RES integration / Energy management potential / Smart neighborhood)
- nZEBs have limited operational energy but increased embodied energy. Next to come is environmental efficiency.

All of the above are **policy**-related factors

Surprisingly, public opinion is more prepared than some governments believe



Considering the aim of the nZEB concept, the framework is not static, but according to the EPBD & the 2050 Roadmap will evolve to fine-tune the progress we make.