Strategic Approach

Strategic Approach to foster Energy Efficiency in Residential Buildings for different climates

Wuppertal Institute for Climate, Environment and Energy

Christopher Moore | Beijing, 02.04.2013

Status Quo

- Buildings account for almost 30% of global CO_2 emissions
- Large savings in energy use (75% or higher) are possible
- Conventional new buildings in OECD countries save 50 % energy compared to stock
- Improving buildings and appliance energy efficiency has up to 80% - 90 %saving potentials

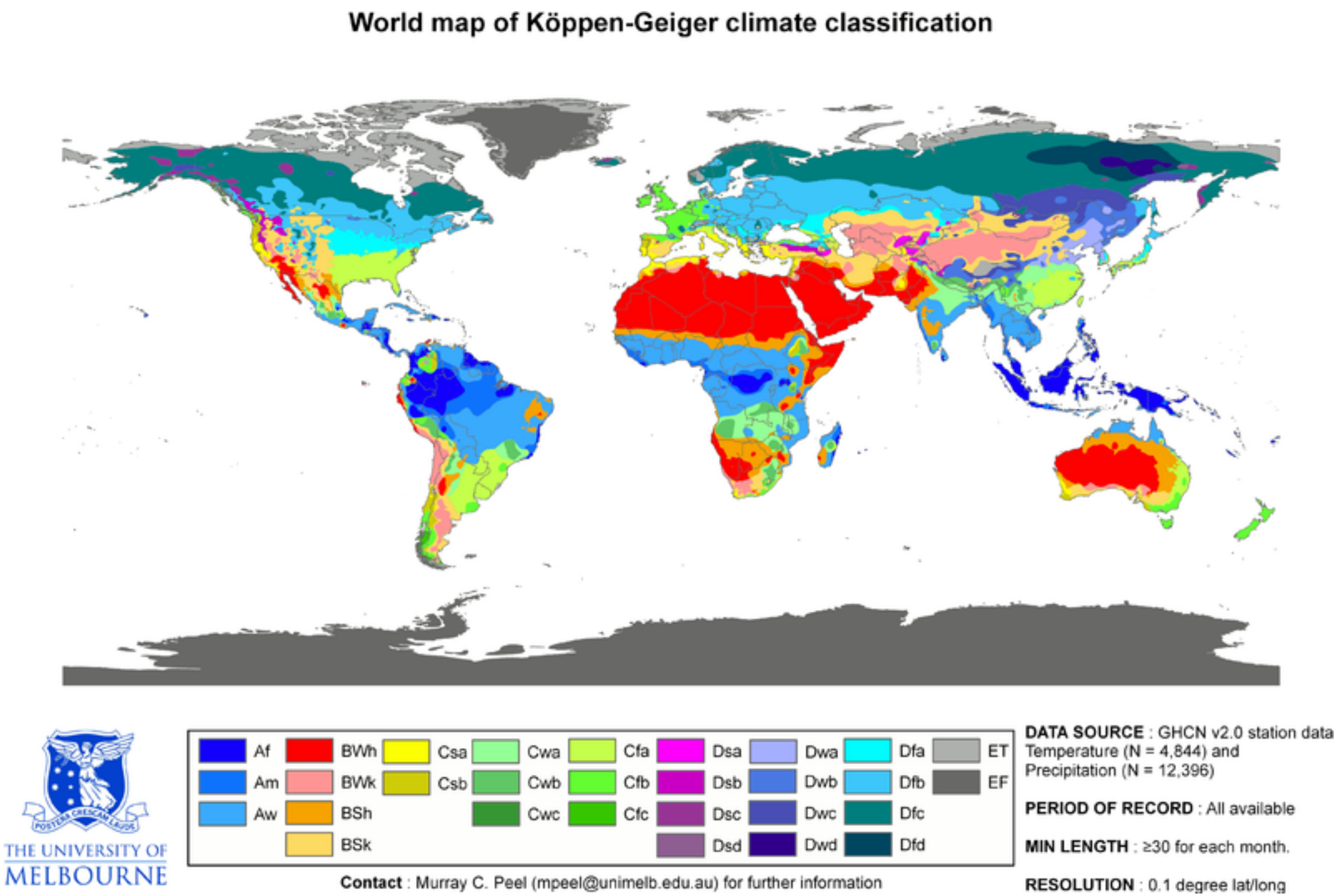
Is a Strategic Approach needed?

- No worldwide consistent standard for primary thermal energy consumption
  - A general definition for low-energy buildings does not exist
  - Numerous definitions of net or nearly Zero Energy Buildings
- No defintion that takes into account various levels of ambition
- Target definitions are often not clear

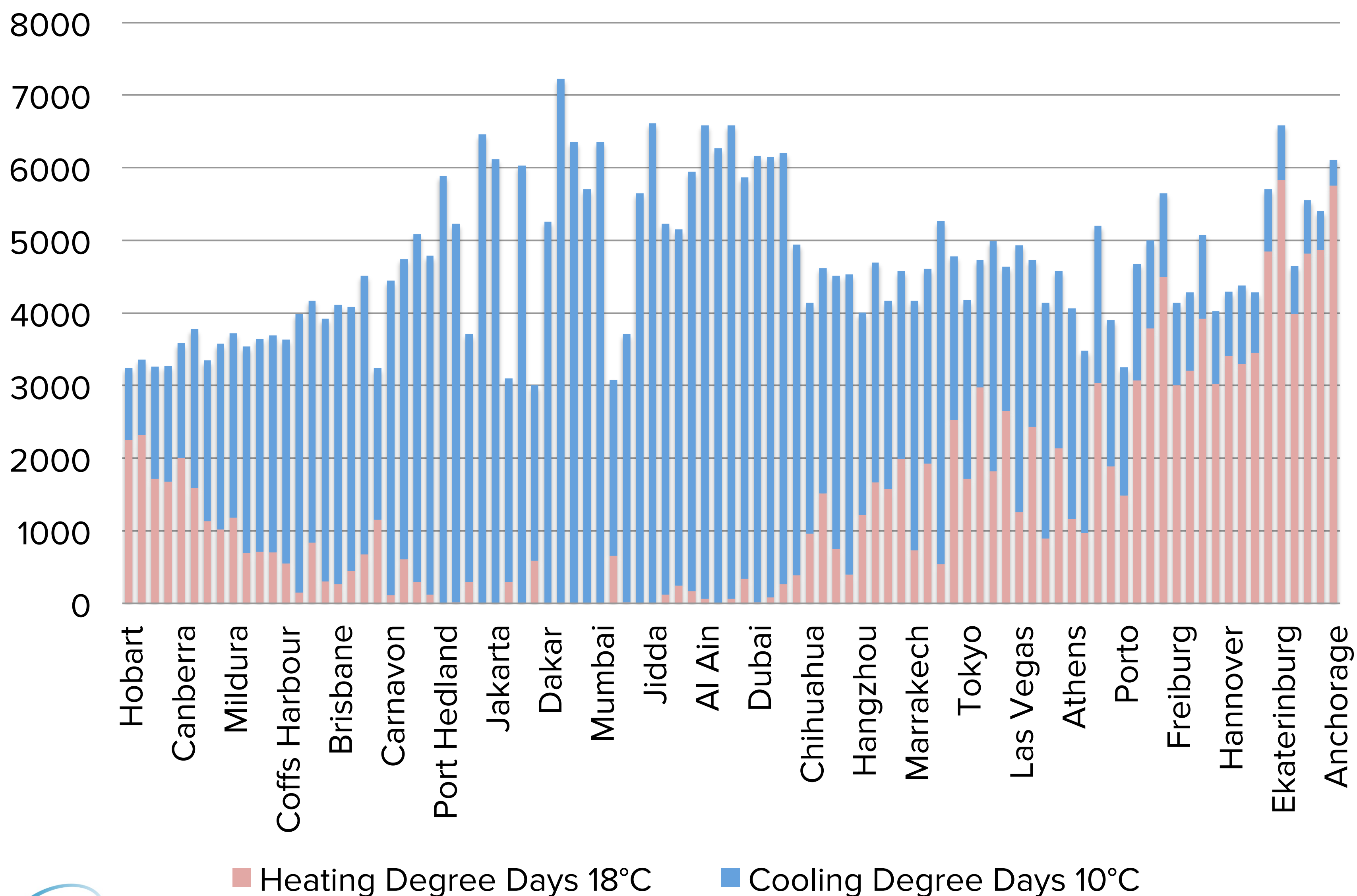
Hypothesis

"Highly energy efficient buildings need a strategic approach of integrated design, combining different design options in an intelligent way to achieve higher energy savings at lower investment costs"

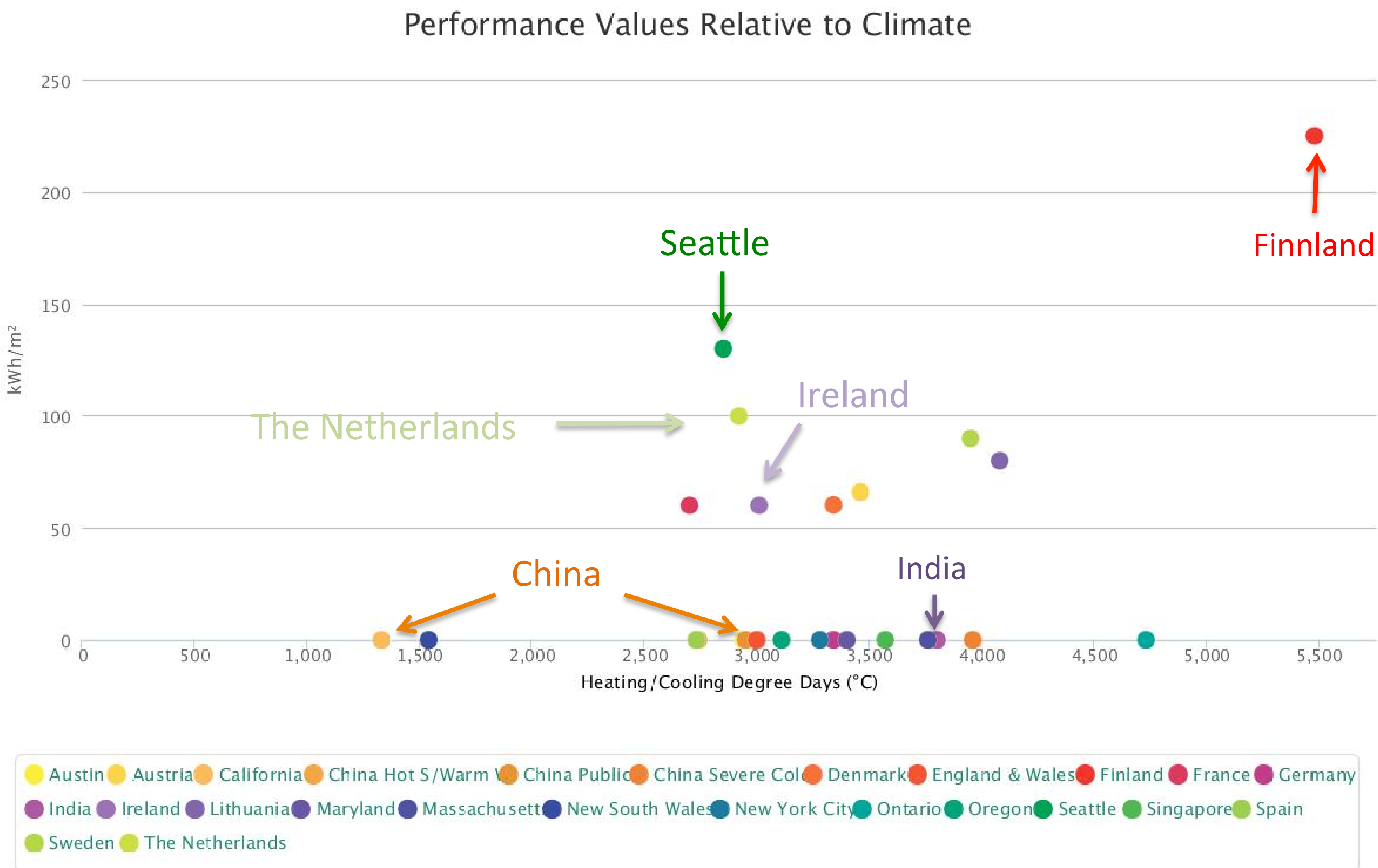
Climate Zones



Comparison of Degree Days



Performance relative to climate



Source: GBPN 2013

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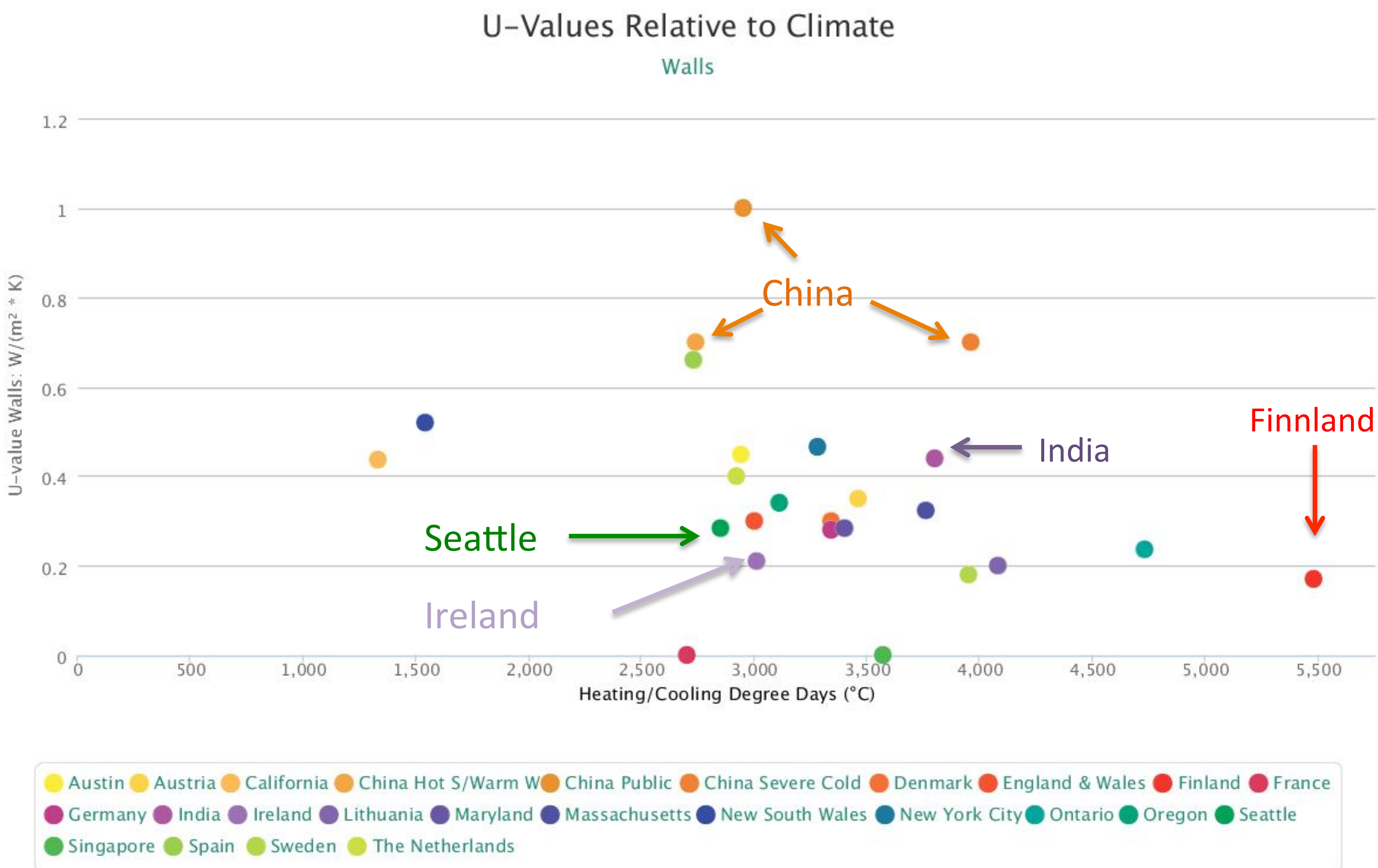
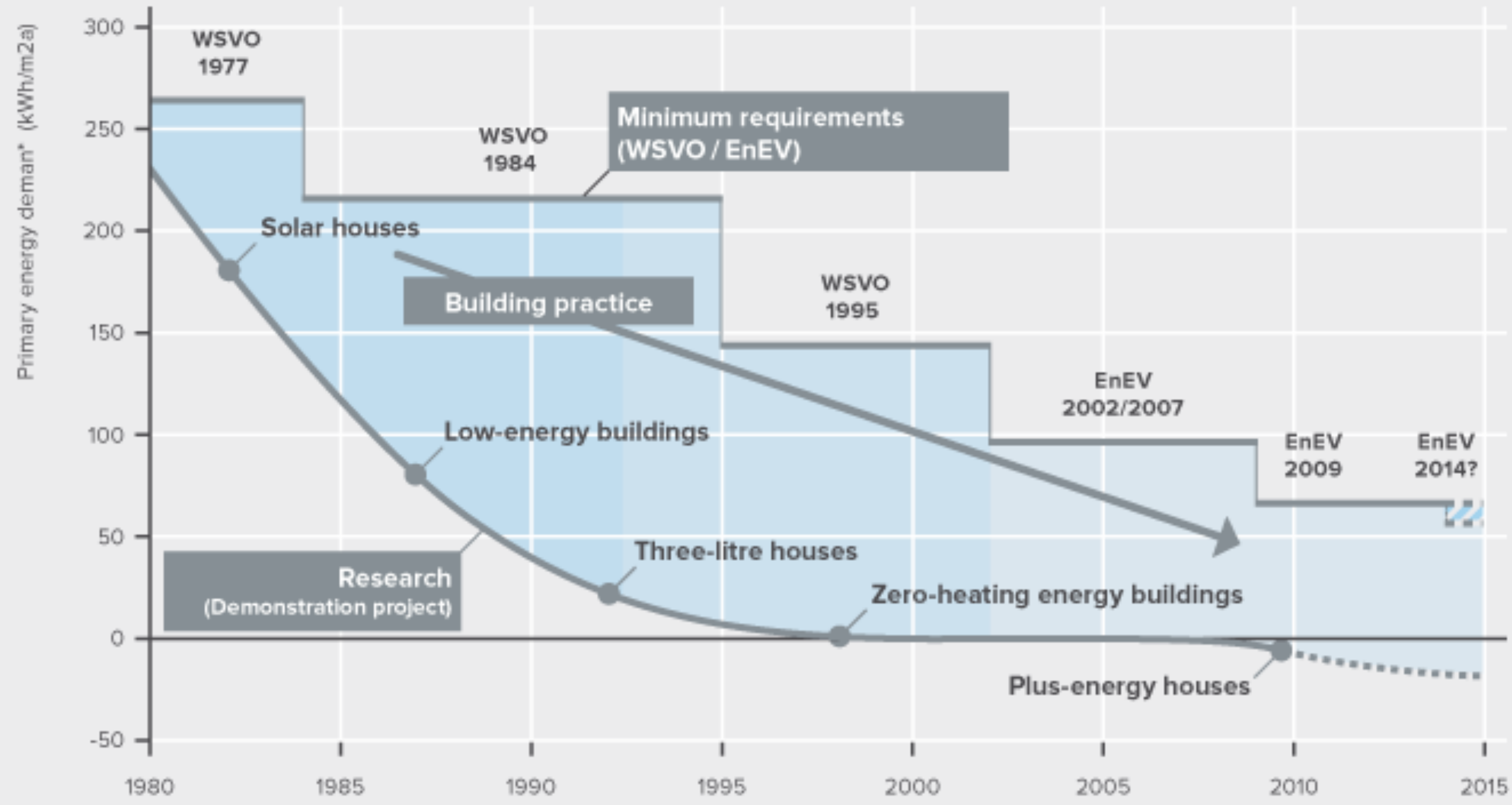
U-Values relative to climate



Source: GBPN 2013

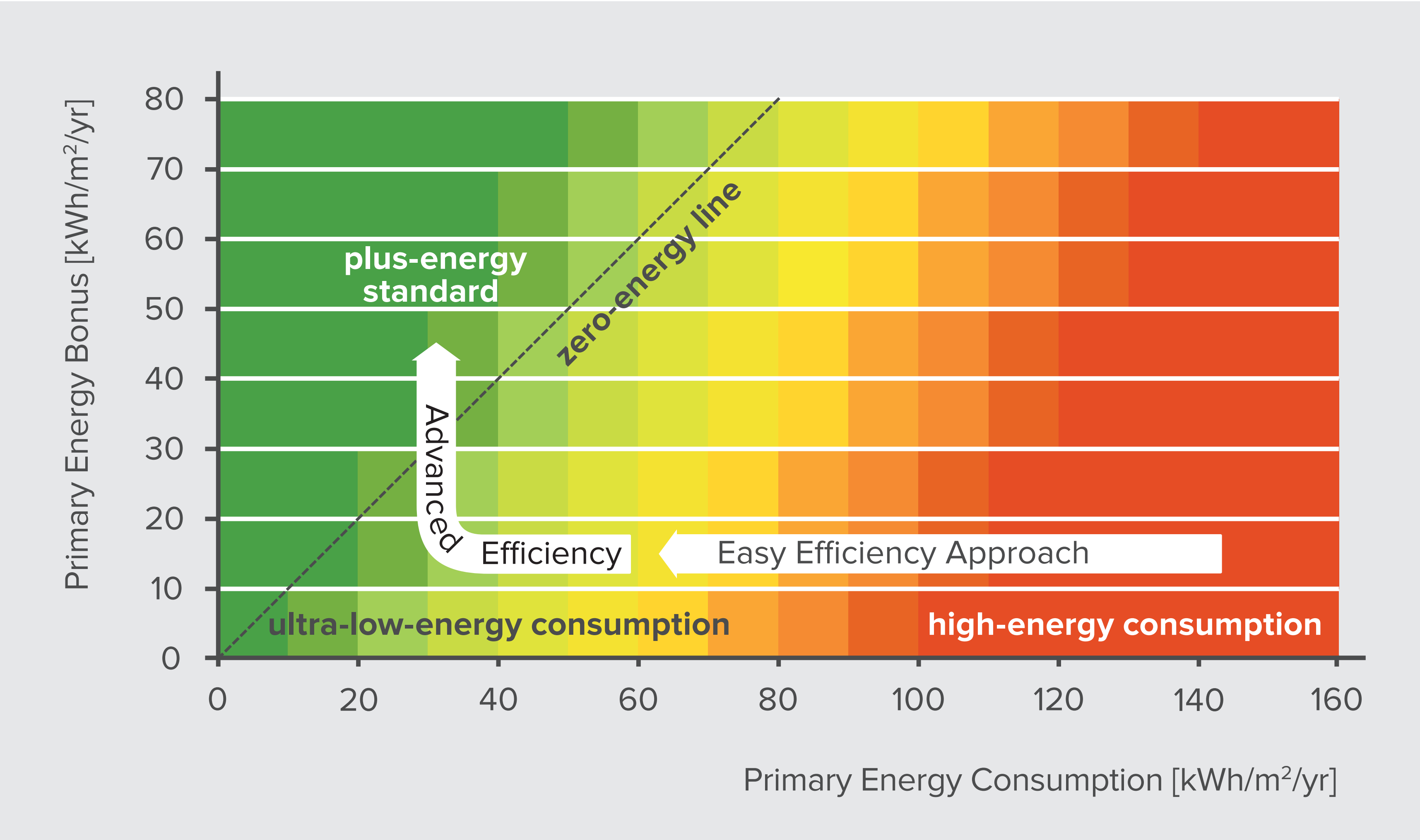
Minimum Energy Performance Standards

Case study: new buildings in Germany

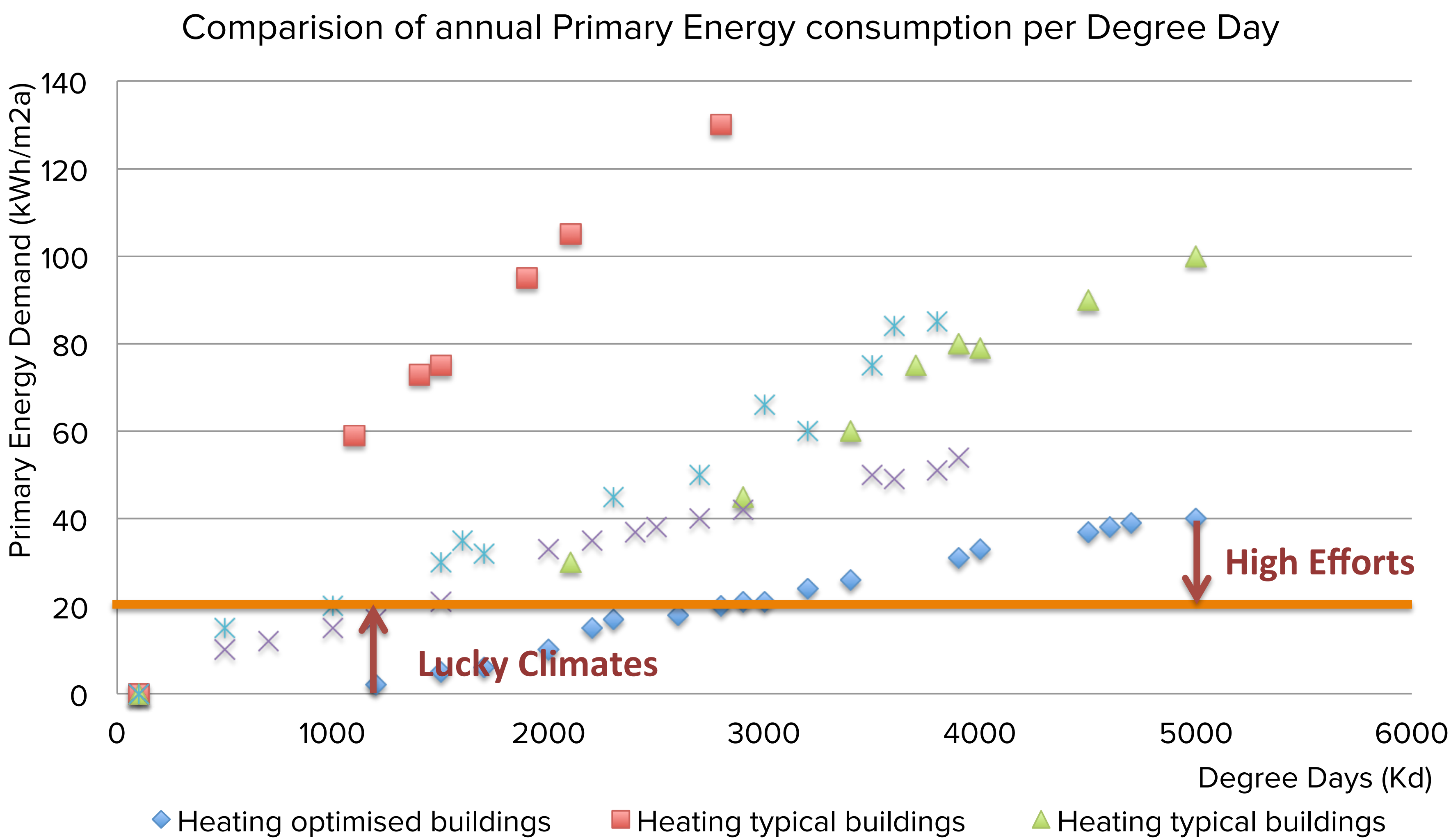


Note:
Primary energy demand incluing heating, hot water and auxiliary energy (kWh/m2a)

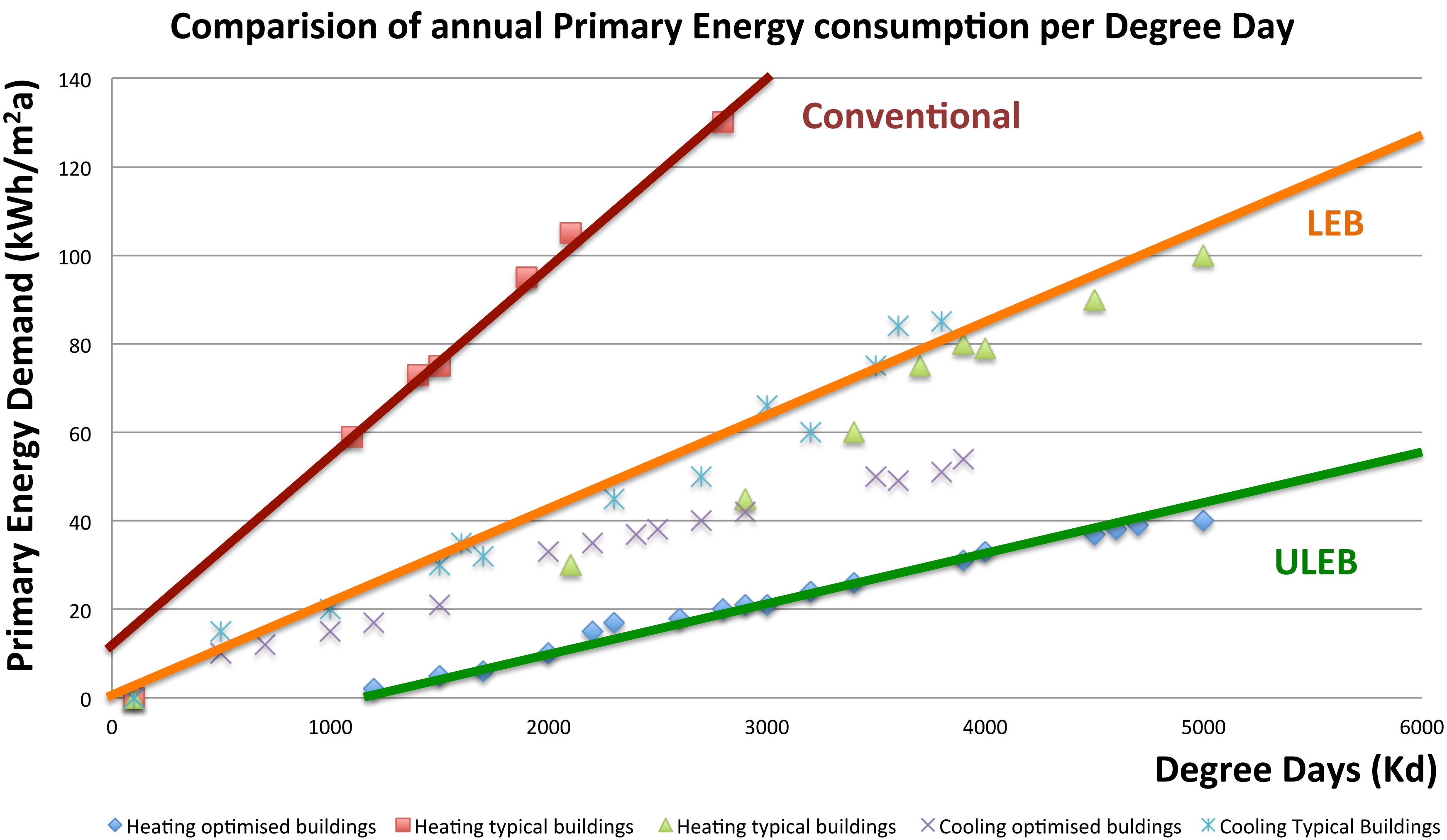
The path to energy efficiency



Primary Energy per Degree Day



Primary Energy per Degree Day



Low Energy Building (LEB)

Compared to conventional new buildings, LEBs have:

- Energy saving potential of 40 to 60 %
- Low or no extra capital costs
- Lower lifetime costs
- Increased thermal comfort
- Enhanced indoor air quality

Ultra low Energy Building (ULEB)

Compared to conventional new buildings, ULEBs have:

- Energy saving potential of 60 to at least 80 % (and in many cases up to 90%)
- High levels of insulation
- Slightly higher or low extra capital costs
- Lower utility costs
- Lower lifetime costs
- Increased thermal comfort
- Enhanced indoor air quality

Source: BigEE

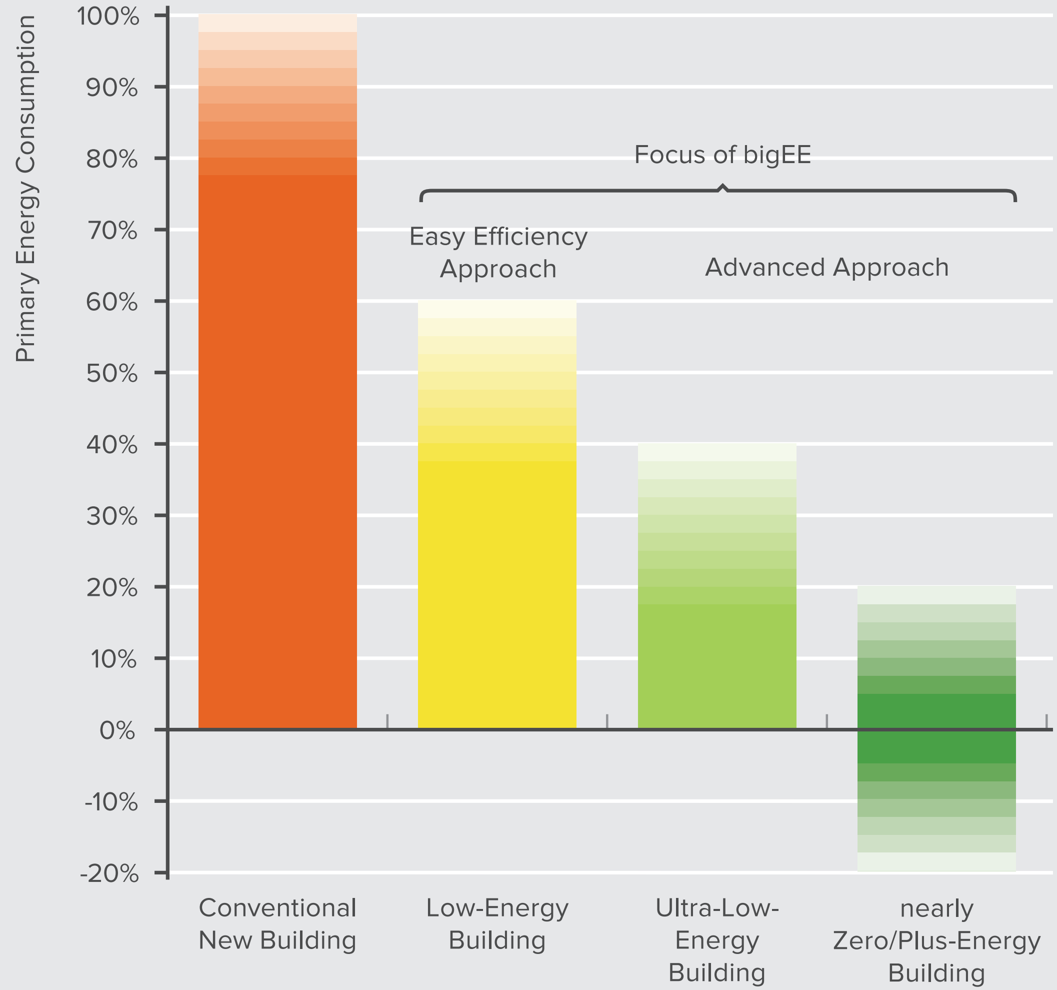
(nearly) Zero Energy and Plus Energy Building

Compared to new buildings, nZEBs and PEBs have:

- Energy saving potential of up to and over 100% respectively
- High levels of insulation
- Slightly higher extra capital costst
- Lower utility costs
- Lower lifetime costs
- Increased thermal comfort
- Better indoor air quality
- Renewable energy to cover energy consumption

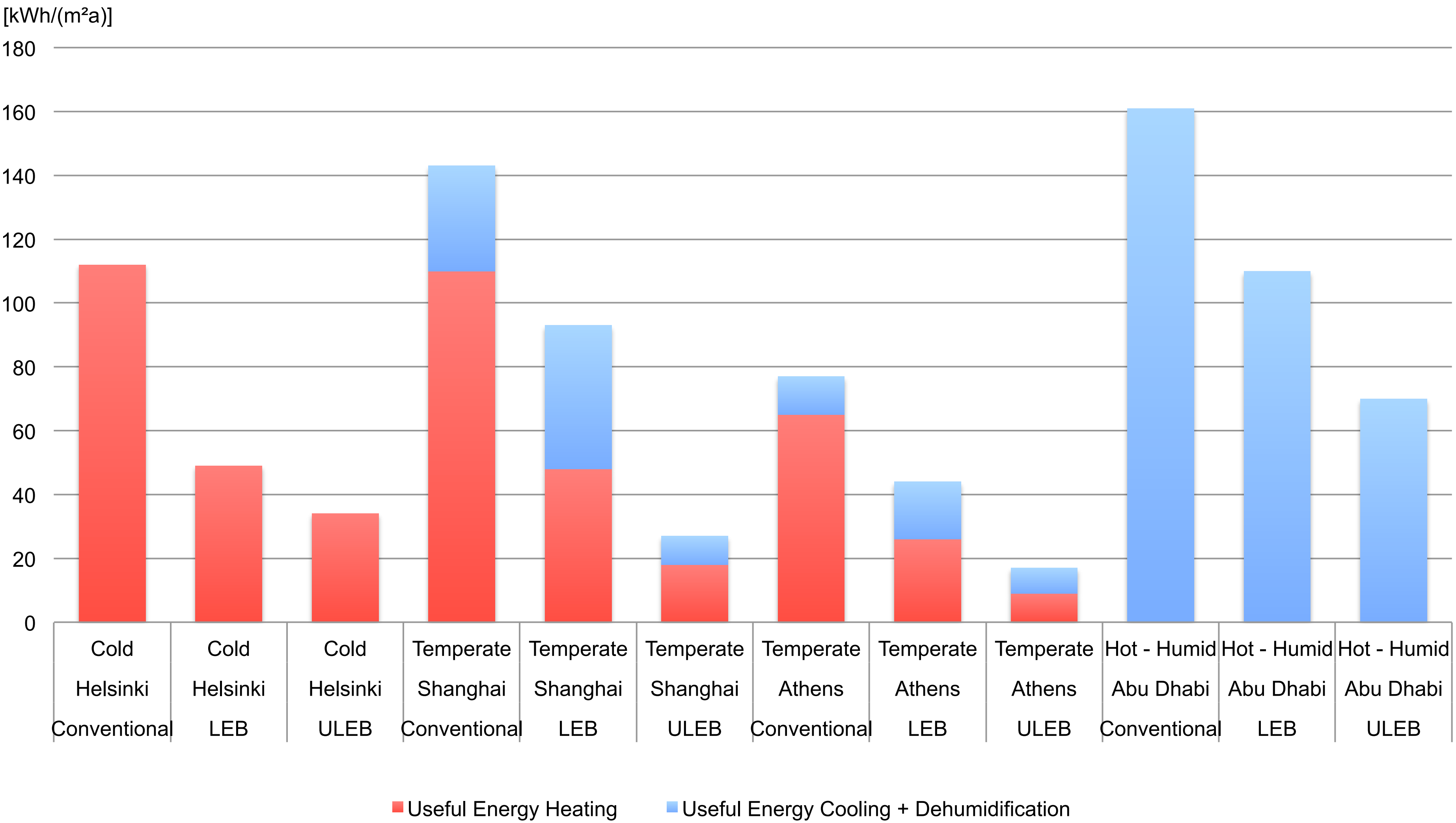
Source: BigEE

The steps to energy efficiency



Simulation results of buildings

(useful energy; simulations by ECOFYS and Wuppertal Institute)



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Energy Consumption Levels

	Cold	Temperate	Hot and Humid	Hot and Arid
	e.g. Qinghai	e.g. Beijing/Shanghai	e.g. Shenzhen	
	$kWh/m^2_{TFA}yr$	$kWh/m^2_{TFA}yr$	$kWh/m^2_{TFA}yr$	$kWh/m^2_{TFA}yr$
LEB	40 – 80	40 – 80	100 – 150	50 – 100
ULEB	20 – 40	20 – 40	50 – 100	25 – 50
nZEB	0 – 20	0 – 20	0 – 50	0 – 25
PEB	++	++	++	++

(TFA: Treated floor area)

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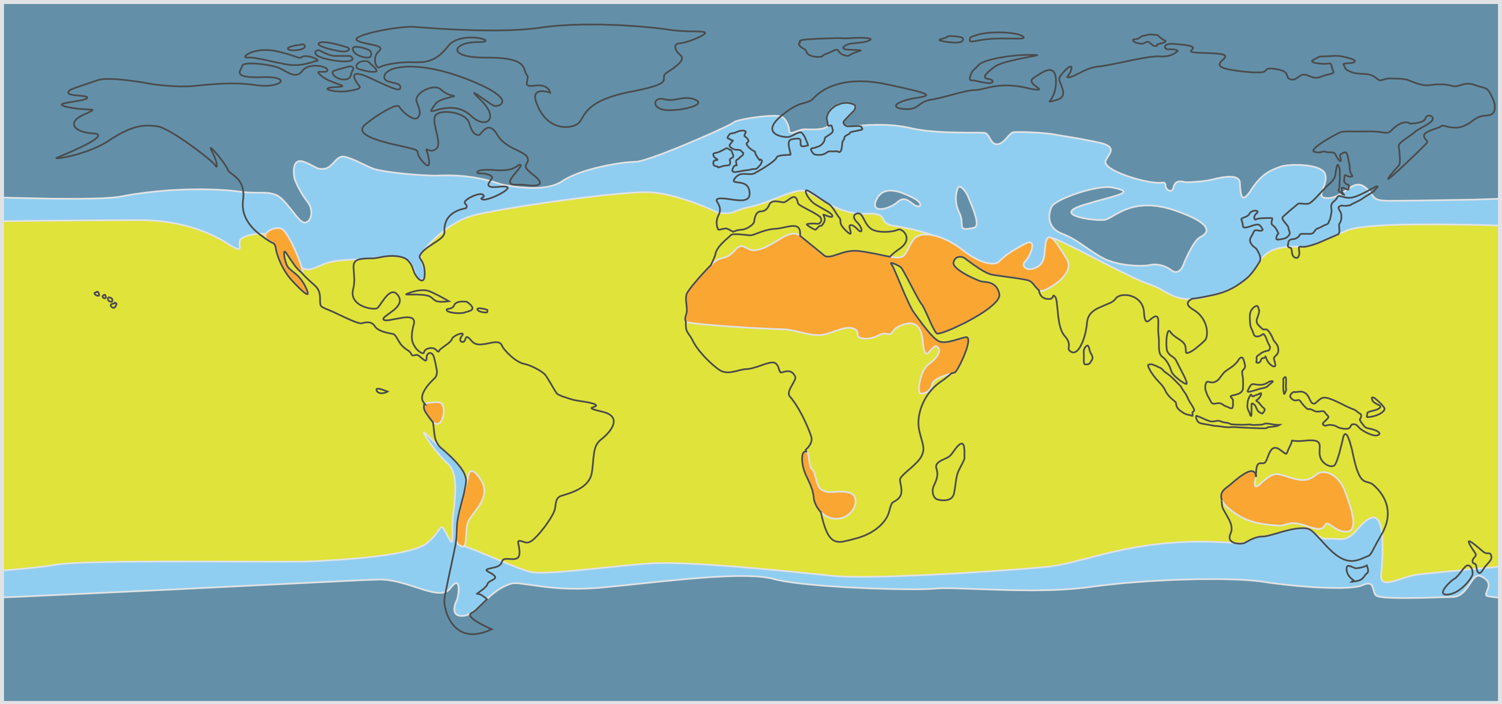
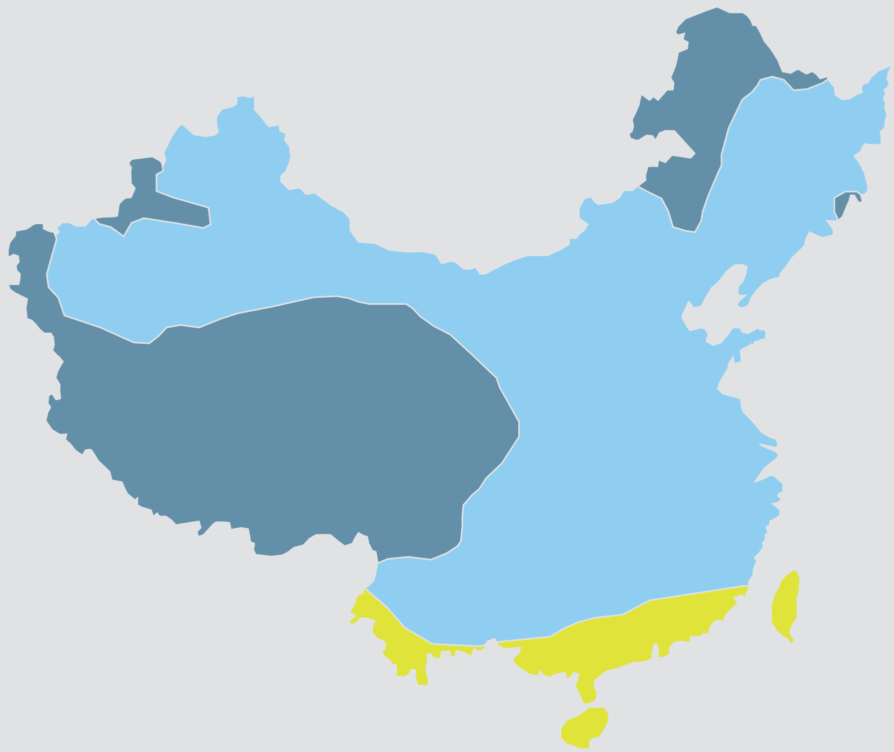


Climate	LEB	ULEB	nZEB	PEB
Cold	80-40 kWh/m$^2_{TFA}$yr	40-20 kWh/m$^2_{TFA}$yr	20-0 kWh/m$^2_{TFA}$yr	++
Temperate	80-40 kWh/m$^2_{TFA}$yr	40-20 kWh/m$^2_{TFA}$yr	20-0 kWh/m$^2_{TFA}$yr	++
Hot and Humid	150-100 kWh/m$^2_{TFA}$yr	100-50 kWh/m$^2_{TFA}$yr	50-0 kWh/m$^2_{TFA}$yr	++
Hot and Arid	100-50 kWh/m$^2_{TFA}$yr	50-25 kWh/m$^2_{TFA}$yr	25-0 kWh/m$^2_{TFA}$yr	++

bigEE Climate Zones for China



Climate	Region	LEB	ULEB	nZEB	PEB
Cold	(e.g. Qinghai)	80-40 $kWh/m^2_{TFA}yr$	40-20 $kWh/m^2_{TFA}yr$	20-0 $kWh/m^2_{TFA}yr$	++
Temperate	(e.g. Beijing, Shanghai)	80-40 $kWh/m^2_{TFA}yr$	40-20 $kWh/m^2_{TFA}yr$	20-0 $kWh/m^2_{TFA}yr$	++
Hot and Humid	(e.g. Shenzhen)	150-100 $kWh/m^2_{TFA}yr$	100-50 $kWh/m^2_{TFA}yr$	50-0 $kWh/m^2_{TFA}yr$	++
Hot and Arid	n.a.	100-50 $kWh/m^2_{TFA}yr$	50-25 $kWh/m^2_{TFA}yr$	25-0 $kWh/m^2_{TFA}yr$	++

The Strategic Approach

First worldwide consistent approach to defining Low-Energy and Ultra-Low-Energy Buildings in different climate zones

- Easy to Define
- Absolute Target Values
- Covering 4 Climate Zones (more to come)
- 4 different types of conditioning
- Numerous Types of Buildings

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Your guide to energy efficiency in buildings.

Start now

bigee.net

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