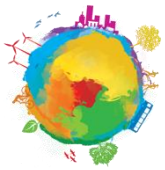

S
B
U
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T
E
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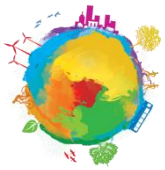
L

SUSTAINABLE *Order from Chaos*

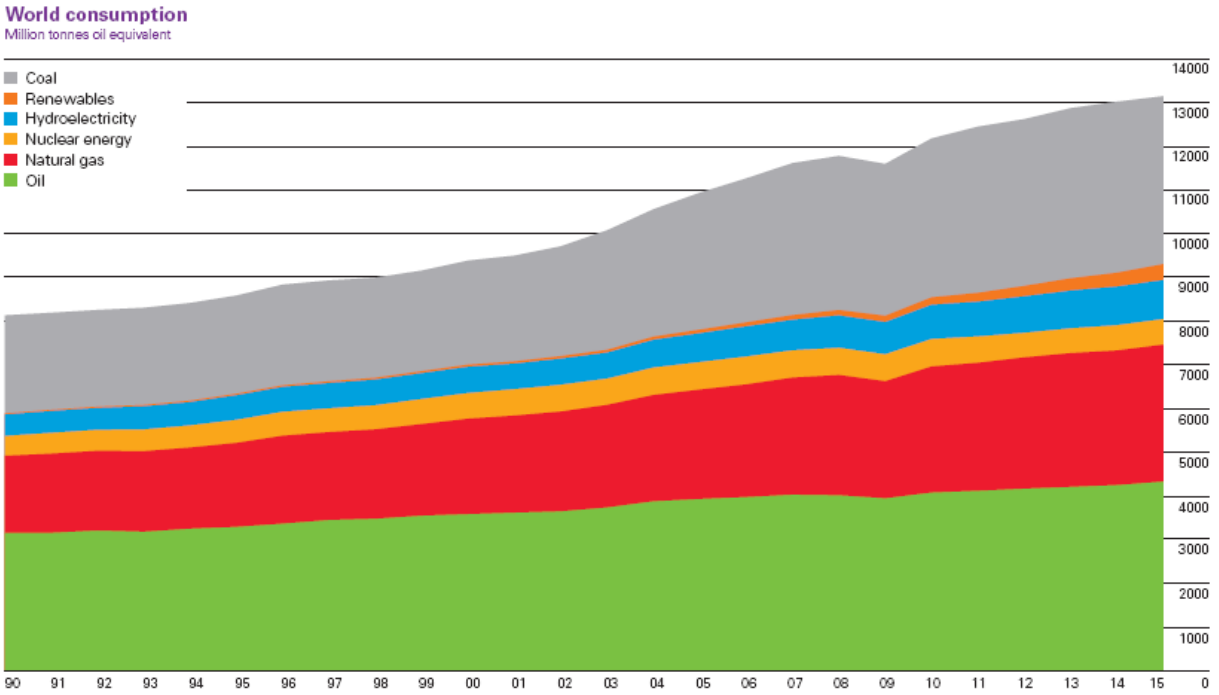


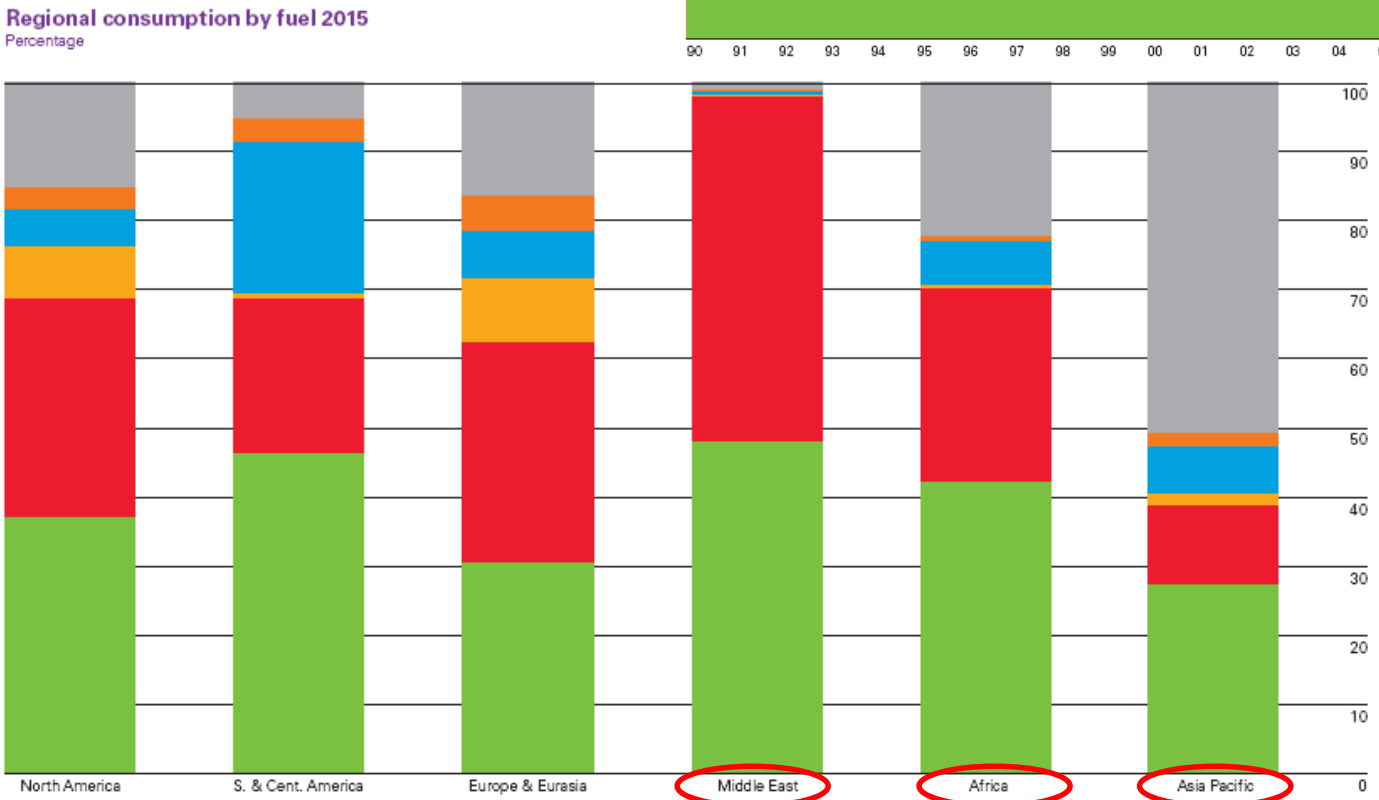
Turkiye

131.3 million TOE

336.3 million TCO2e

85.6% fossil fuel





Need for low-carbon economy

86% from fossil fuels

Least developed areas, High carbon dependancy

Factors driving growth of Carbon Emissions

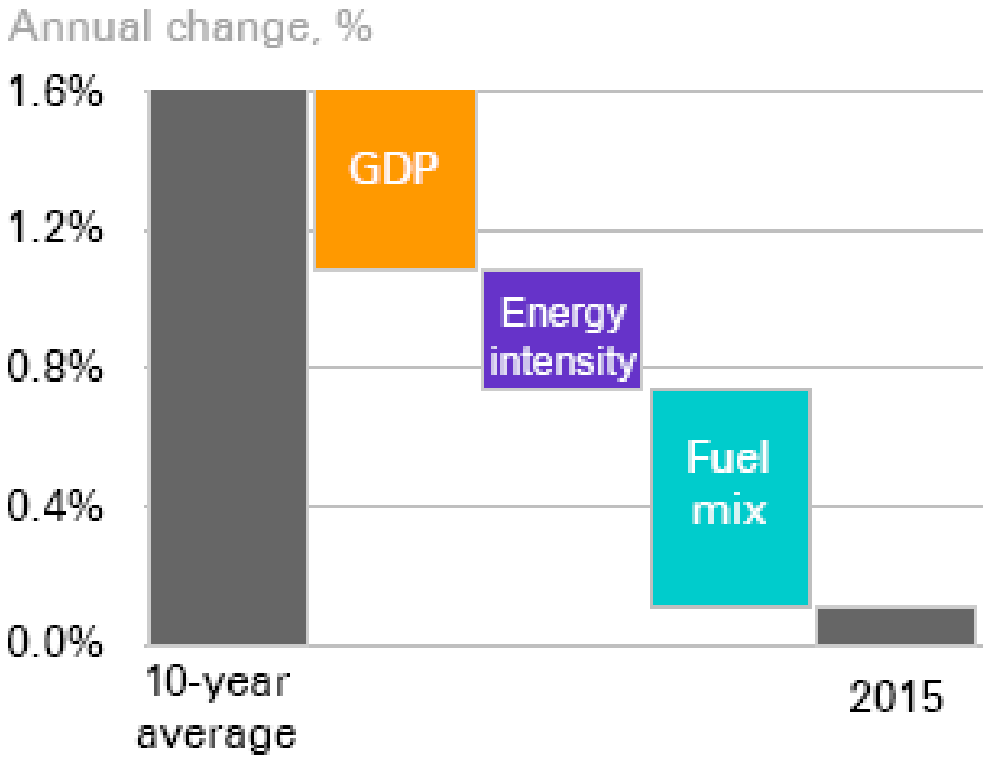


TABLE 1. POPULATION OF THE WORLD AND MAJOR AREAS, 2015, 2030, 2050 AND 2100, ACCORDING TO THE MEDIUM-VARIANT PROJECTION

Major area	*Population (millions)*			
	2015	*2030*	*2050*	*2100*
World	7 349	8 501	9 725	11 213
Africa	1 186	1 679	2 478	4 387
Asia	4 393	4 923	5 267	4 889
Europe	738	734	707	646
Latin America and the Caribbean	634	721	784	721
Northern America	358	396	433	500
Oceania	39	47	57	71

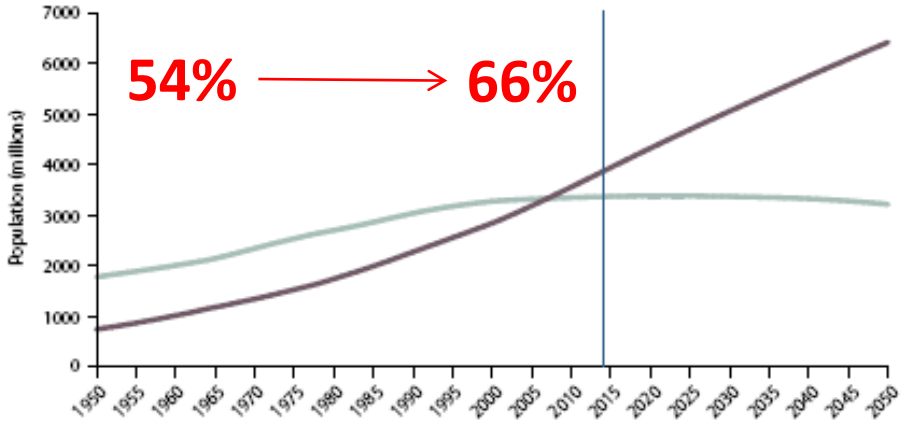
Source: United Nations, Department of Economic and Social Affairs, Population Division (2015). *World Population Prospects: The 2015 Revision*. New York: United Nations.

Turkey 78.7 87.7 95.8

Figure 2.

Urban and rural population of the world, 1950–2050

A majority of the world's population lives in urban areas



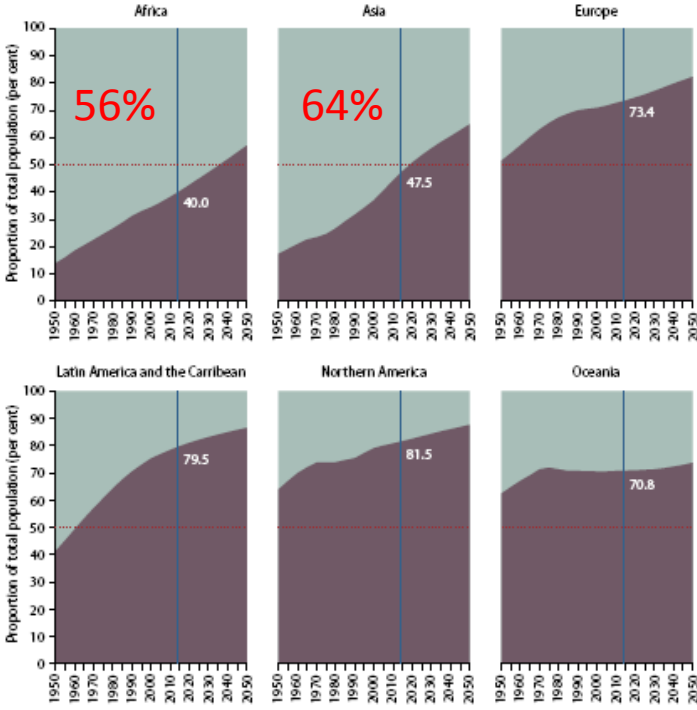
Urbanization has occurred in all major areas, yet Africa and Asia remain mostly rural

Turkiye

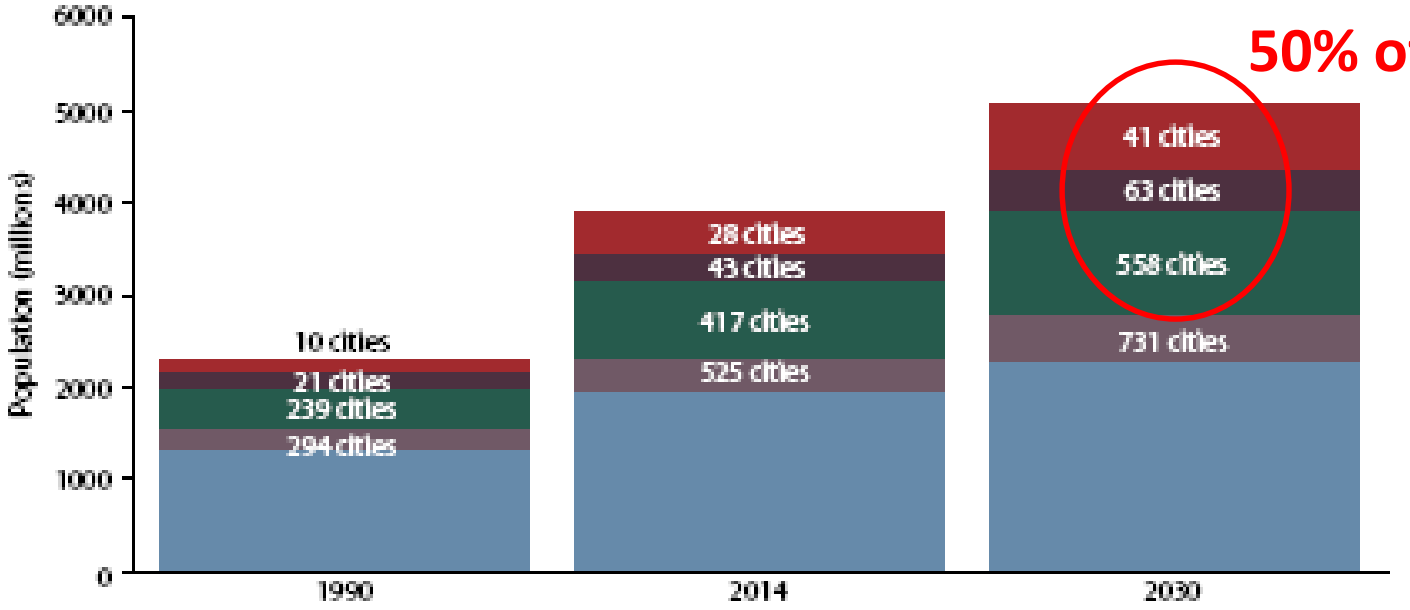
73% → 84%

Figure 3.

Urban and rural population as proportion of total population, by major areas, 1950–2050



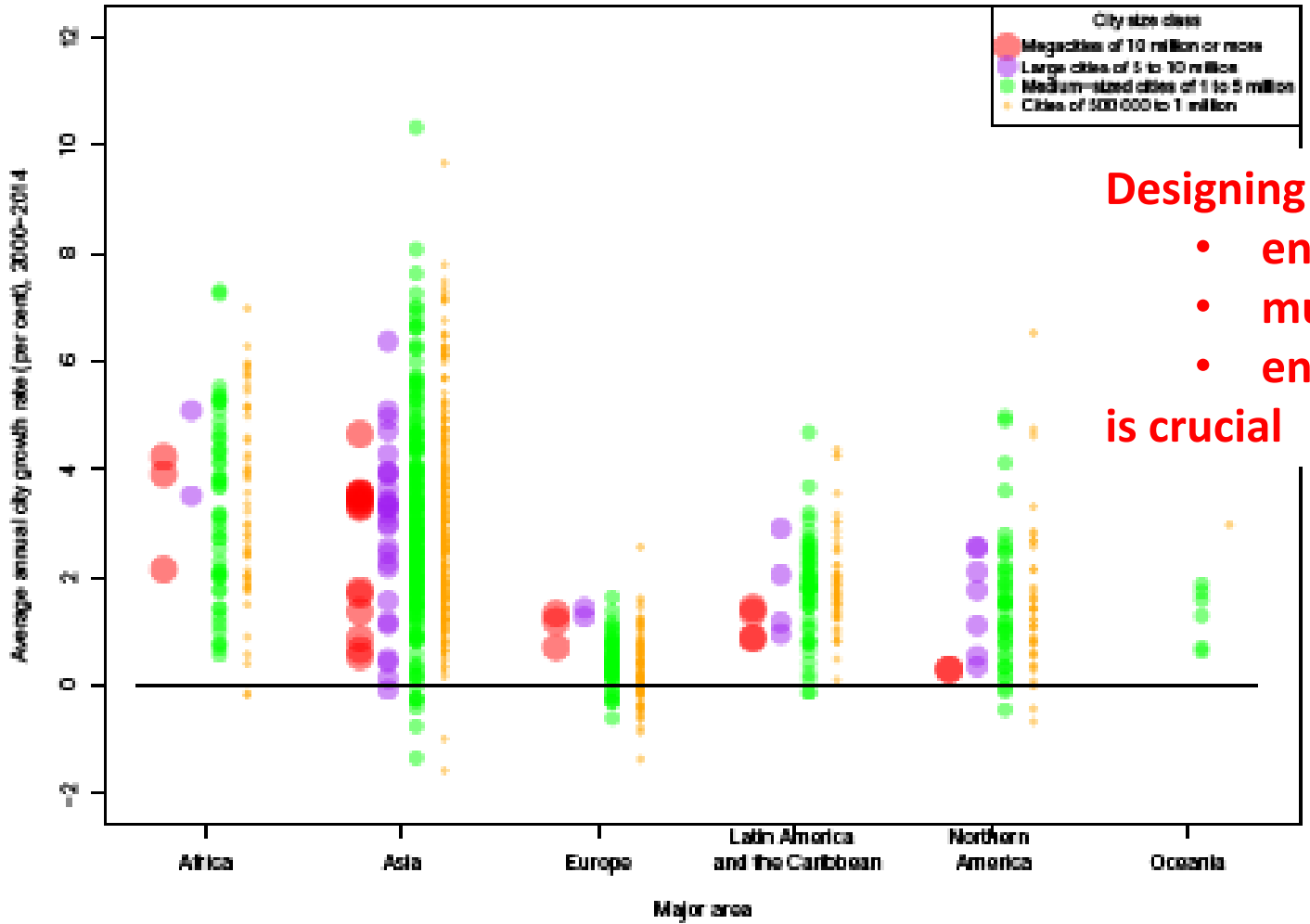
Global urban population growth is propelled by the growth of cities of all sizes



50% of world population

Least developed, highly fussel fuel dependant areas

The world's fastest growing cities are in Africa and Asia



Designing future's cities as

- **energy efficient,**
- **multi-comfort,**
- **environmental friendly**

is crucial

Turkiye

- Ranked #5 for natural gas, #13 for oil, #8 for coal (world energy sources, 2015)
- Lower import dependency (less than 25% of total produced locally-31 million TOE, 2014)
- Manage current account deficit (32,2 billion USD deficit - energy imports reached to 37,9 billion USD which is 18,3% of total imports, 2015)
- Security of supply, Use domestic sources (35% of final energy consumption for heating and cooling in buildings)

Energy Policy

Energy security and sustainable energy supply are among the main policy concerns of Turkey.

Turkey attributes significant importance to;

- Encouraging the energy production from renewable sources in a secure, economic and cost effective manner,
- Expanding the utilization of promising renewable resources
- Increasing the diversification of energy resources,
- **Taking significant steps to increase energy efficiency,**
- **Reducing greenhouse gas emissions,**
- Making use of waste products and protecting the environment,
- Developing the related mechanical and/or electro-mechanical manufacturing sector.

Turkiye (2015)

9.375.294 buildings, 22.668.488 dwellings

110.000 buildings, 750.000 dwellings

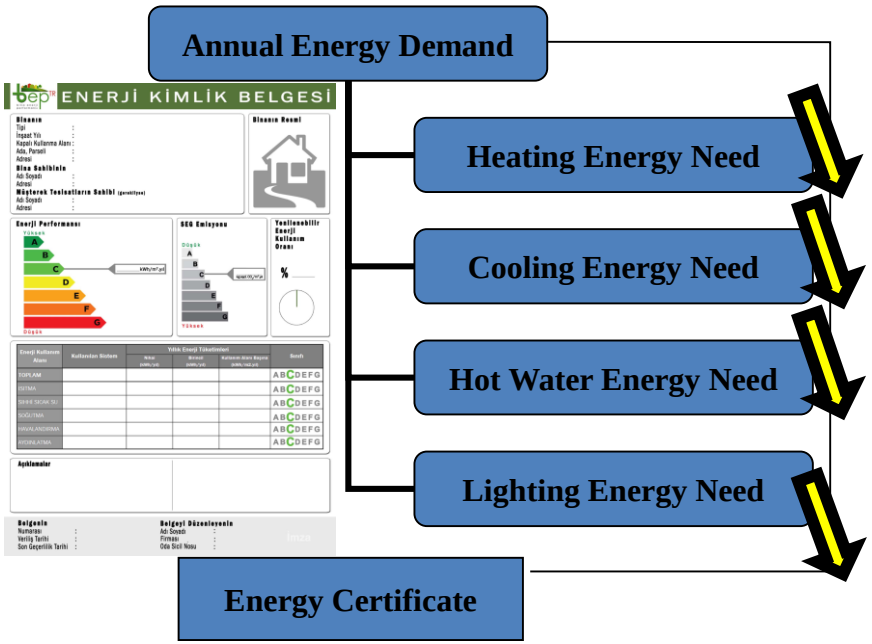
From 2,70 (2000) to 6,65 (2015) dwellings/building

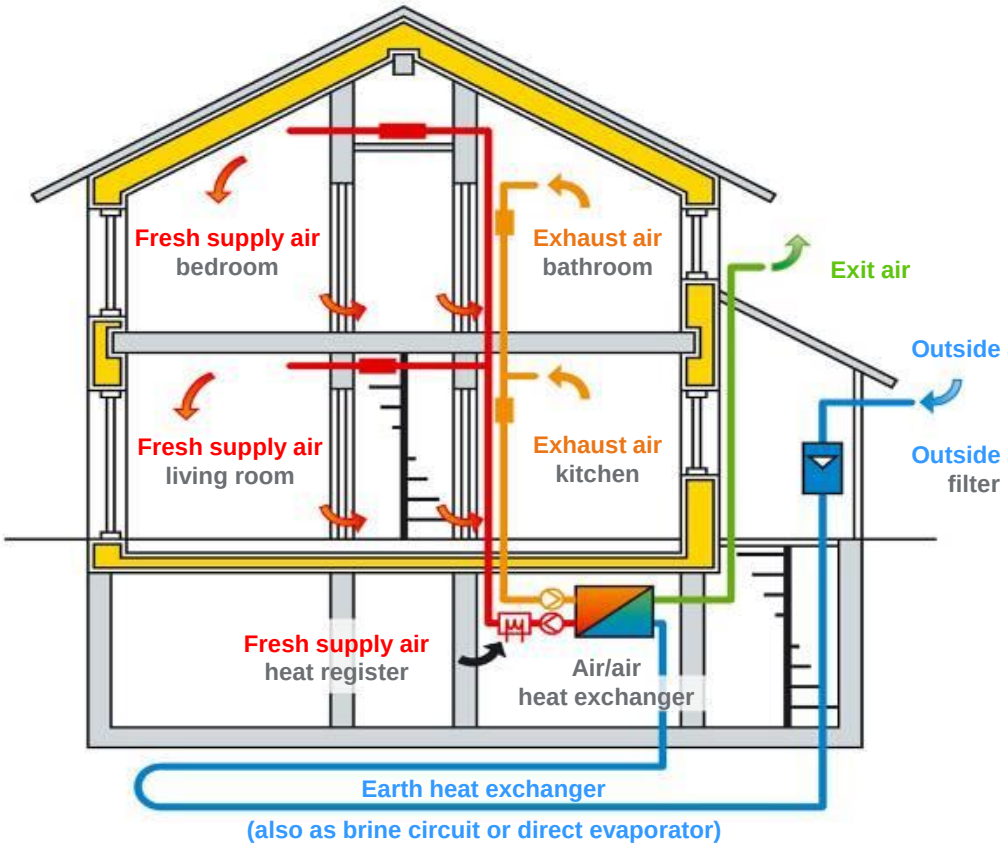
TS 825 Thermal Insulation Standards for Buildings, 2000

Optimistic Forecast –
13,9 % of total building stocks
28,5 % of house stocks
in convenience with **TS 825**

Demolition rate 1,5%

Energy Performance of Buildings Regulation, 2010

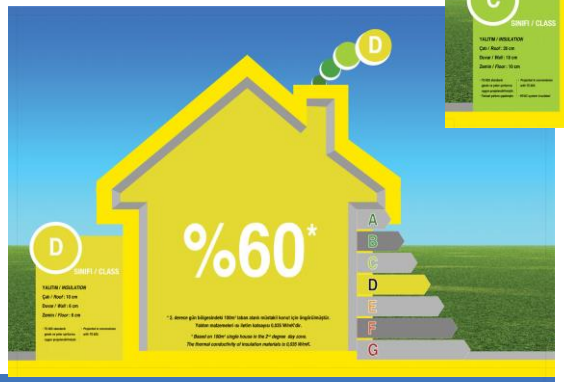




Certificates should be received by 2017...!


A
EN AZ / MIN.
%90*
A
SINIFI / CLASS
YALITIM / INSULATION
Çatı / Roof : 50 cm
Duvar / Wall : 35 cm
Zemin / Floor : 35 cm
A
B
C
D
E
F
G


C
%70*
C
SINIFI / CLASS
A
B
C
D
E
F
G


D
%60*
D
SINIFI / CLASS
A
B
C
D
E
F
G


G
G
SINIFI / CLASS
A
B
C
D
E
F
G


FINANCED BY CREDIT
FINANCED BY EFFICIENCY

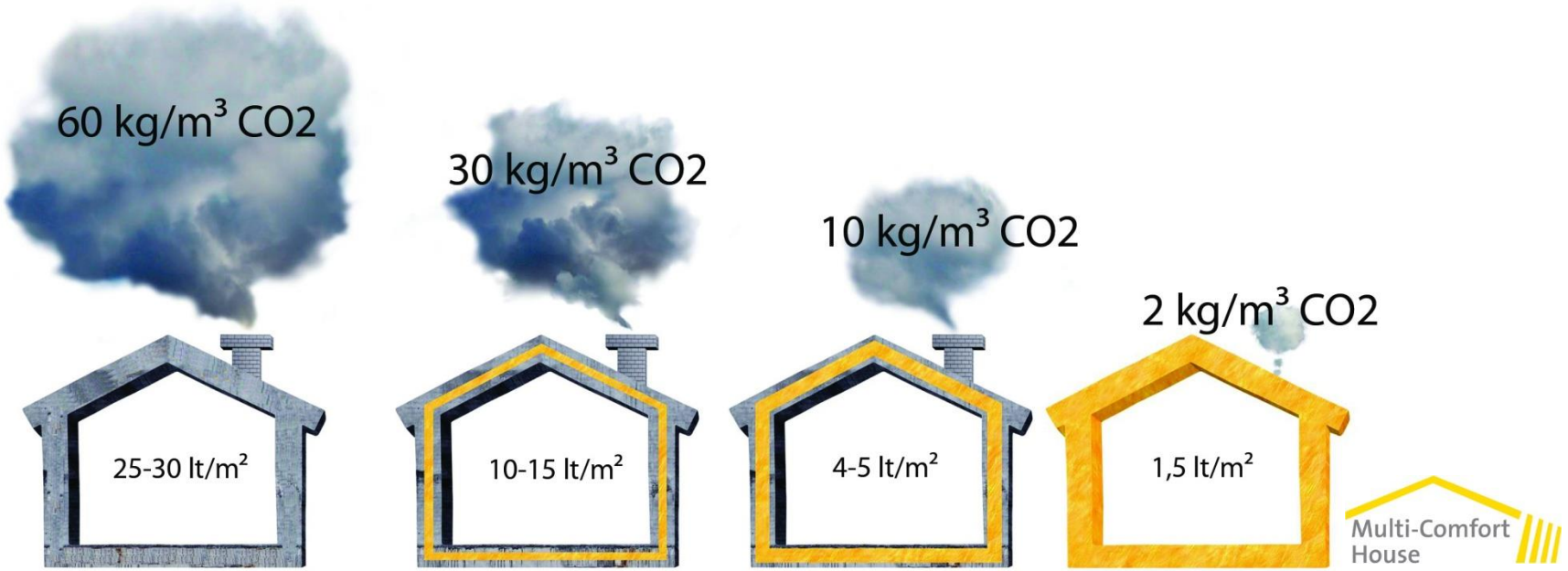
Energy Efficiency Strategy Document, 2012

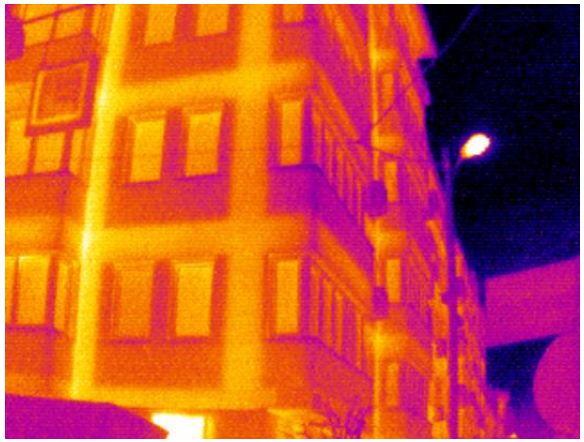
"Decreasing buildings' energy demands and carbon emissions; increasing the number of sustainable, environmentally friendly buildings that use renewable energy sources" has been set as the strategic objective for building industry. Actions for the first target "***Having thermal insulation and energy efficient heating systems providing the standards in force by 2023, in all third or higher class houses in adjacent metropolitan area which are excluded from urban transformation, and commercial and service buildings with 10.000 m^2 or higher total usage area.***" for this objective are as follows: Revising the current legislation in parallel to EU practices, Determination of maximum annual energy demand including the topics as heating, cooling and lighting depending on the construction of the buildings according to buildings' functions (i.e. hotel, hospital, residence, school, shopping mall), climatic conditions of the region, architectural design and current mandatory standards, with bringing the limitation of maximum energy needs for buildings, Determination of maximum CO_2 emission for buildings and not allowing new constructions that exceed these limits, Encouraging to get close to these limit values by improving existing buildings, Applying administrative sanctions as of 2017 for those who are above the minimum value defined in current legislation about carbon dioxide emission. Actions for the second target ***"Transforming at least one-fourth of building stocks in 2010 into sustainable buildings as of 2023"*** are as follows: Searching for sustainability quality for licensing commercial buildings, detached luxury housing and residences with 10.000 m^2 or higher usage area as of August 2013, Dissemination of this practice as of 2017 covering third or higher class houses, Asking for sustainability certification for buildings, Encouraging cogeneration and micro cogeneration renewable energy sources from renewable energy, central and regional heating and cooling, and heat pump systems in housing projects.

Energy Efficiency Directive, EU

On the other hand, with European Parliament's republished Energy Performance of Buildings Directive No: 2010/31/AB and 2012 Energy Efficiency Directive; a comparative methodology has been created for calculation of optimal cost level of minimum energy performance conditions, and improvement of energy performance of buildings within the European Union has been disseminated considering external climate, local conditions and cost efficiency. Main conditions within Energy Efficiency Directive are as follows; Energy performance certificate will be added to all building sales and rental ads, Audit systems will be created for heating and cooling systems or precautions will be taken which will show the same effect, All new buildings will be nearly zero-energy buildings (nZEB) as of 31st December 2020 (public buildings-as of 31st December 2018), minimum energy performance conditions will be defined for new buildings, big building renovations and replacement or improvement of building elements (heating and cooling systems, roofs, walls, etc.), National financial measures list will be prepared to improve buildings' energy efficiency, Energy performance certificate that has been given previously, will be hung somewhere visible in big commercial buildings larger than 500 m^2.

Energy Efficiency





Building Stock in Turkey

6 million TOE savings in 2023

54.97 million tons CO_2 reduction in 2017-2023 period

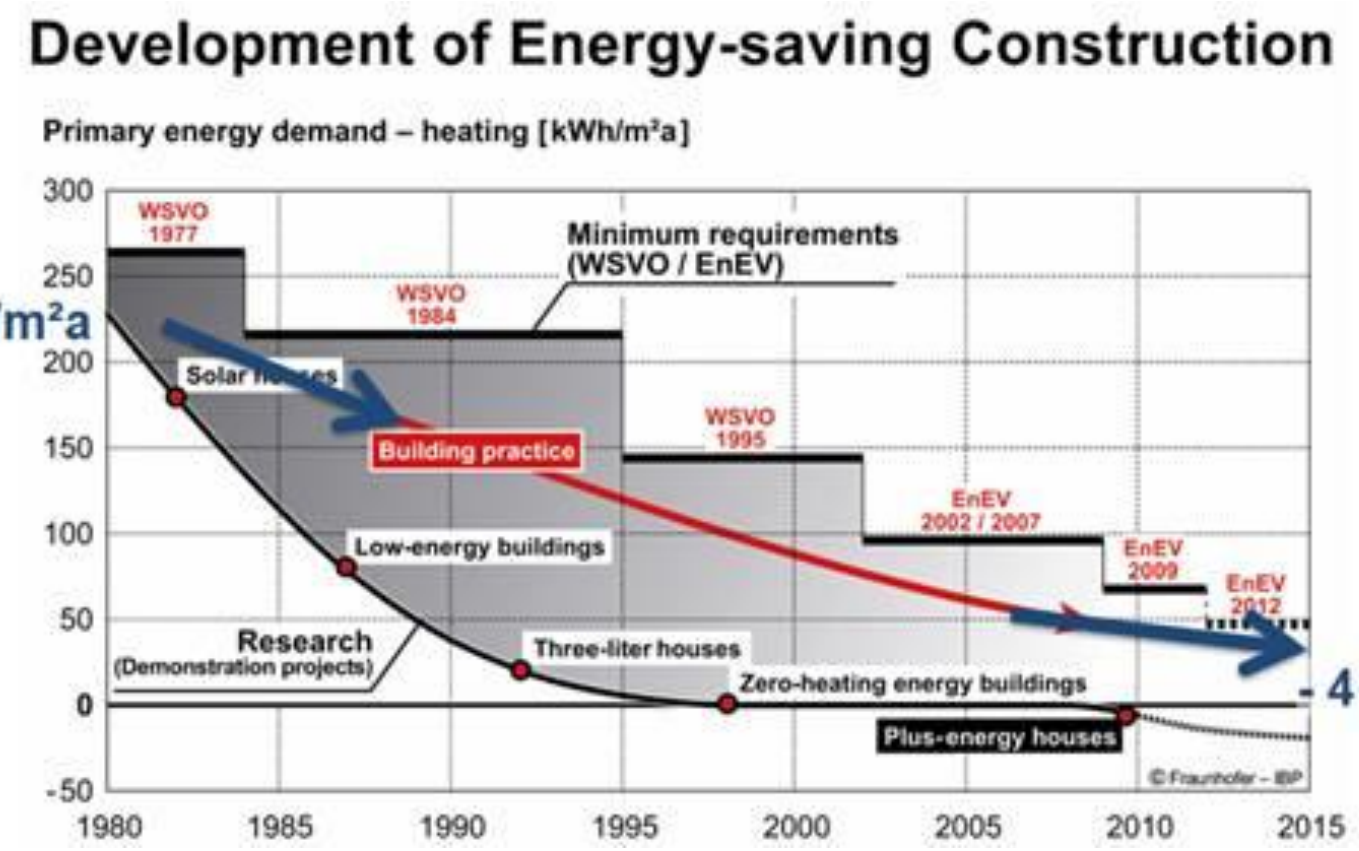
REPUBLIC OF TURKEY
INTENDED NATIONALLY DETERMINED CONTRIBUTION

Plans and policies to be implemented for this INDC

Buildings and Urban Transformation

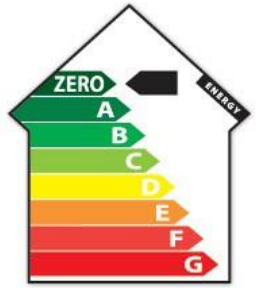
- Constructing new residential buildings and service buildings as energy efficient in accordance with the Energy Performance of Buildings Regulations
- Creating Energy Performance Certificates for new and existing buildings so as to control energy consumption and greenhouse gas emissions and to reduce energy consumption per square meter
- **Reducing the consumption of primary energy sources of new and existing buildings by means of design, technological equipment, building materials, development of channels that promote the use of renewable energy sources** (loans, tax reduction, etc.)
- Dissemination of Green Building, **passive energy, zero-energy house design** in order to minimize the energy demand and to ensure local production of energy

Development of Energy-saving Construction



- 8 kWh/m²a

- 4 kWh/m²a



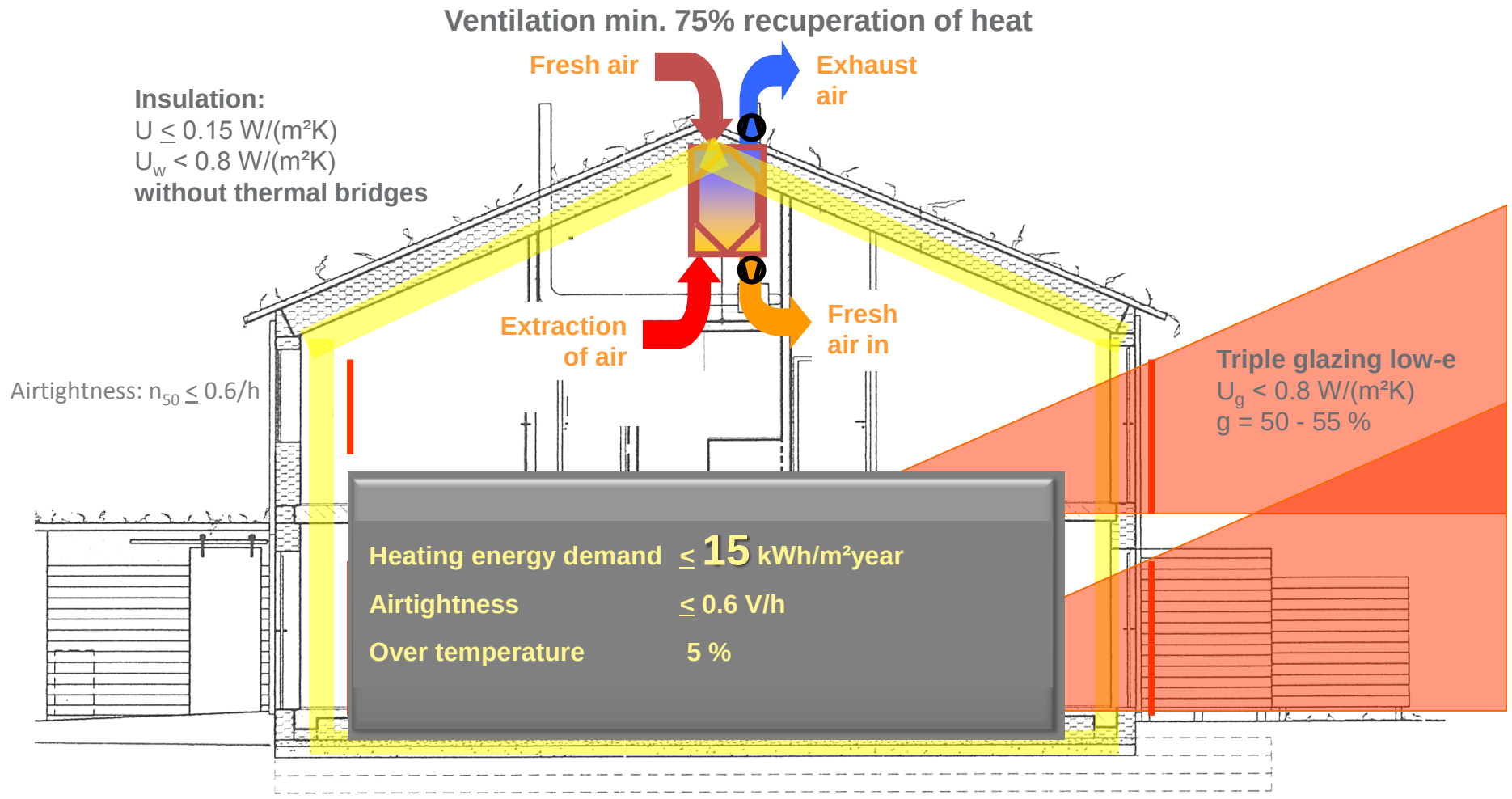
Very high energy performanc e

+

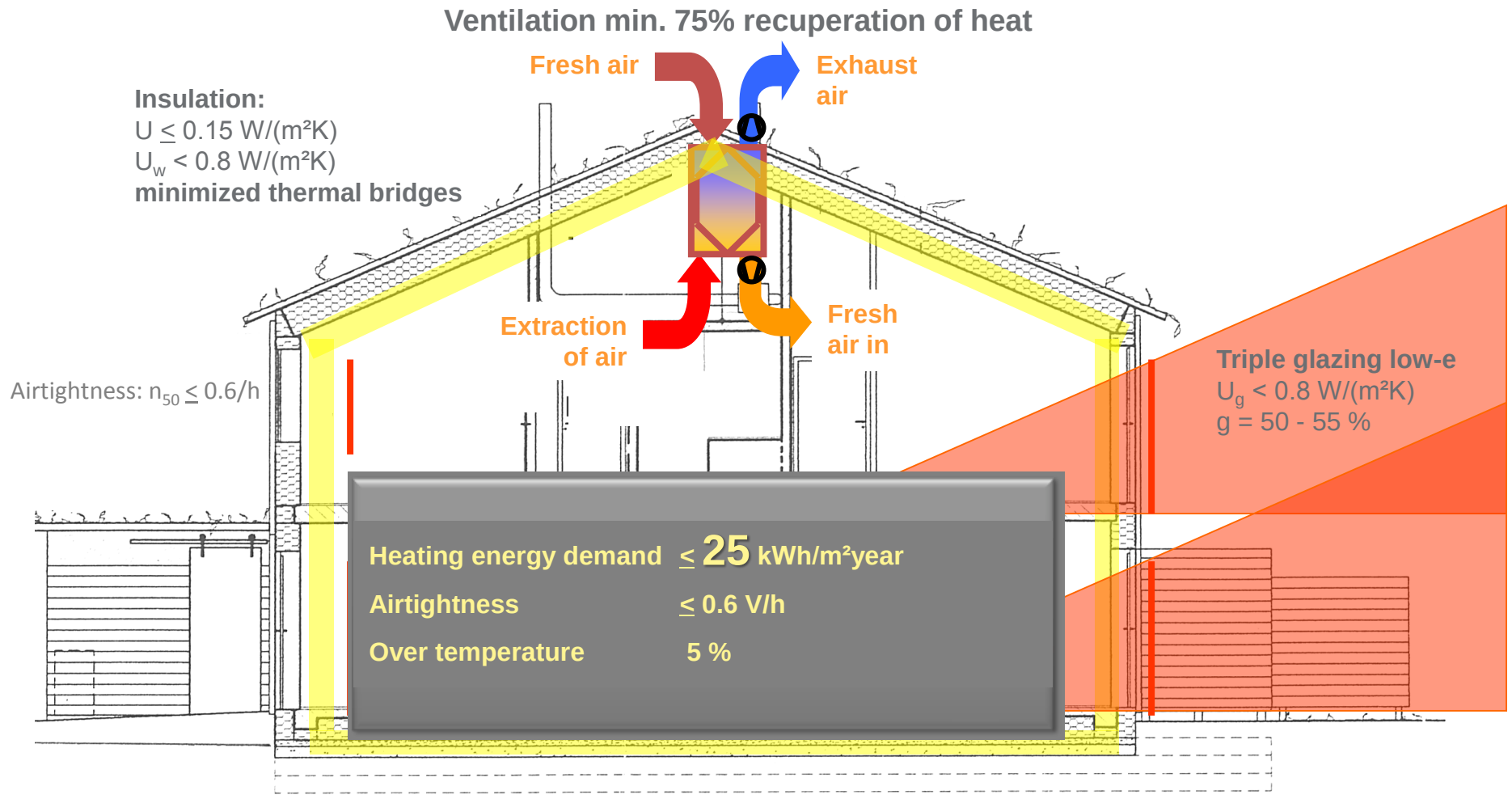
RES on-site or nearby

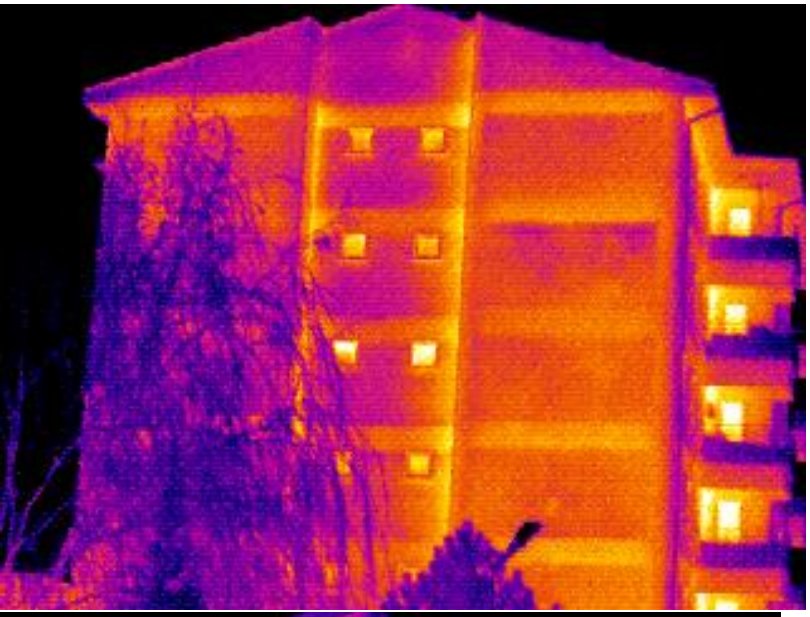
→ Nearly Zero Energy Building

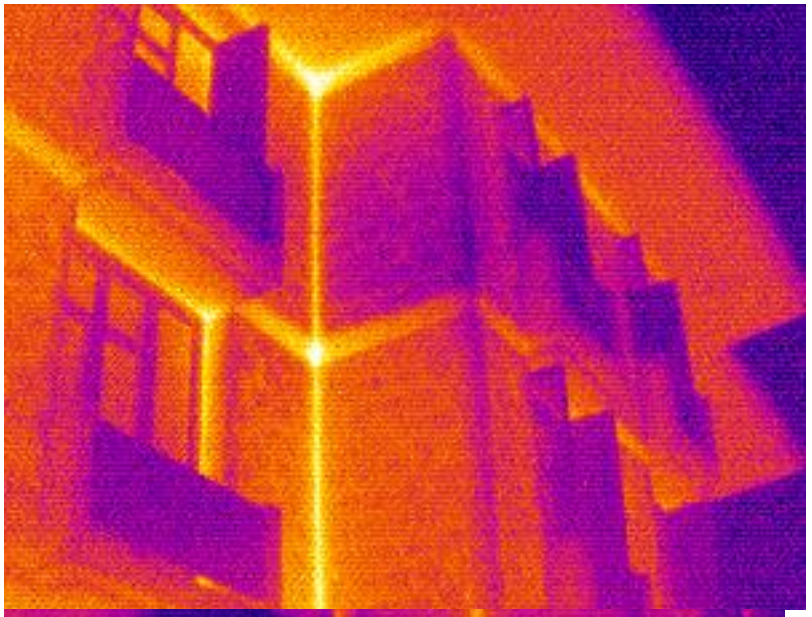
MCH Criteria - **moderate** climate, **new** residential building or similar usage

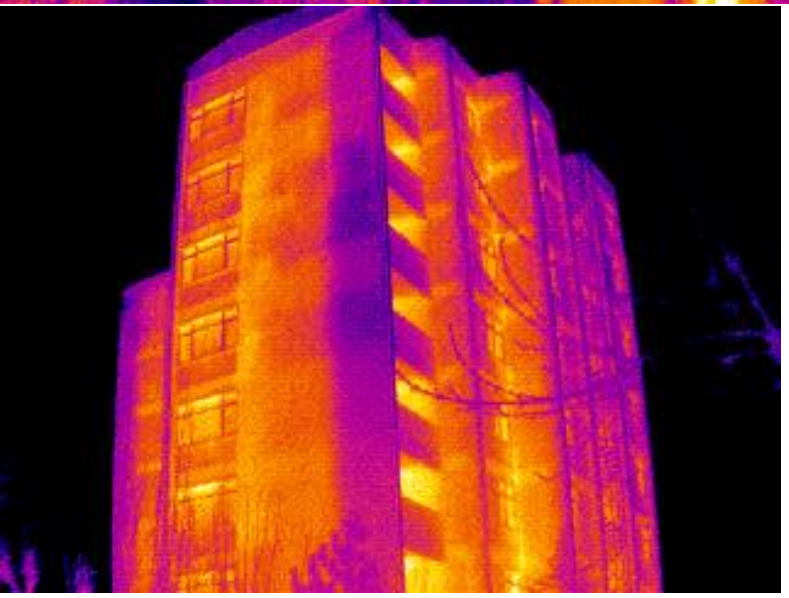


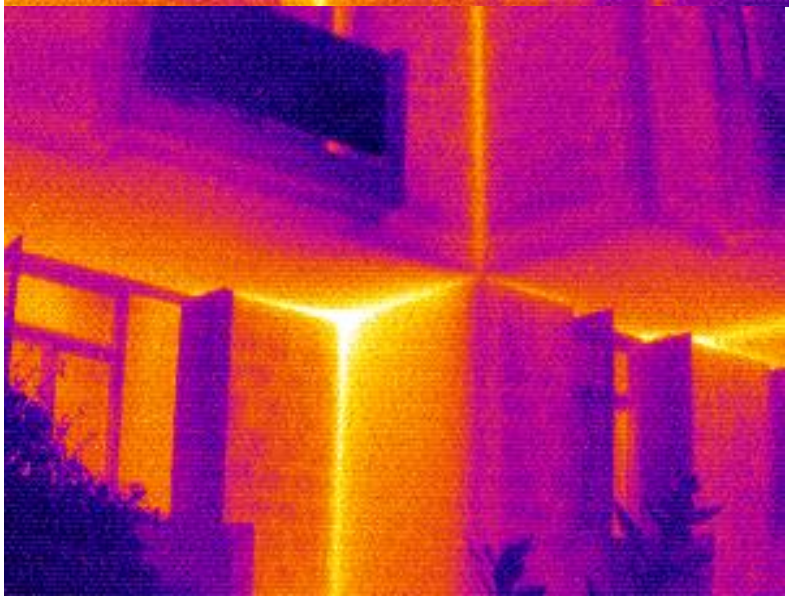
MCH Criteria - **moderate** climate, **renovation** residential building or similar usage




11,9°C
10
8
6
4
3,0°C


14,8°C
14
12
10
8
6,8°C


14,2°C
14
12
10
8
6
6,0°C

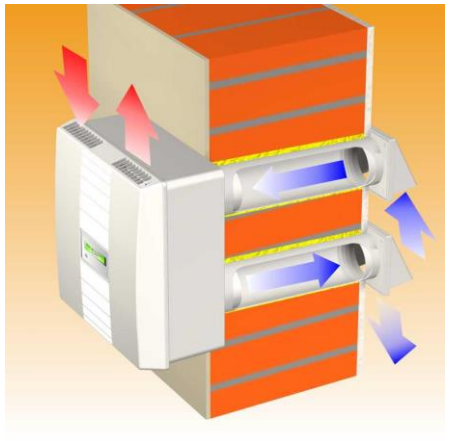

17,0°C
16
14
12
10
8,1°C

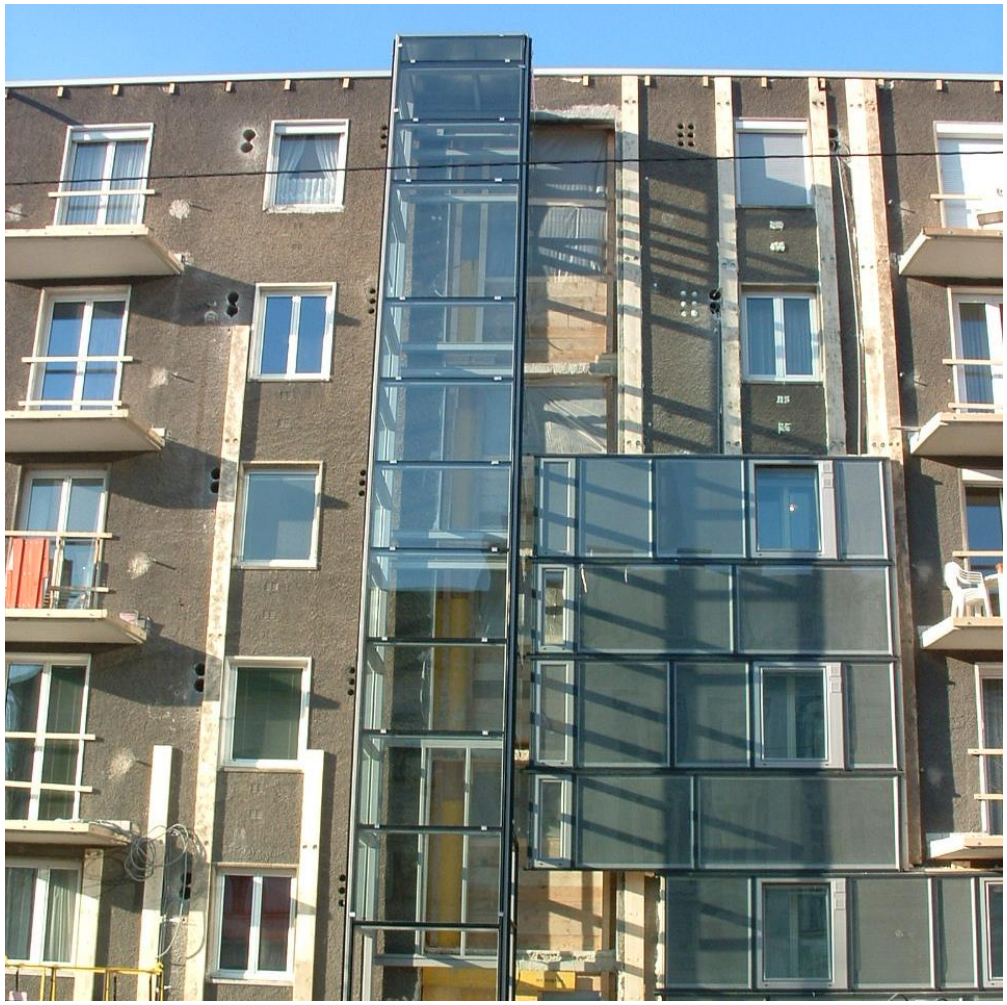
ENERGY EFFICIENT RENOVATION

IN BUILDING WITH 50 DWELLINGS

MECHANICAL VENTILATION

WITH HEAT RECOVERY

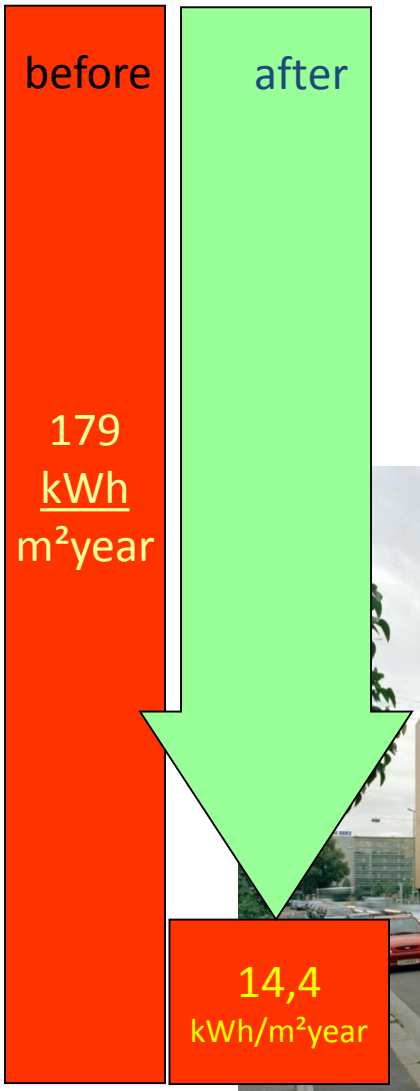


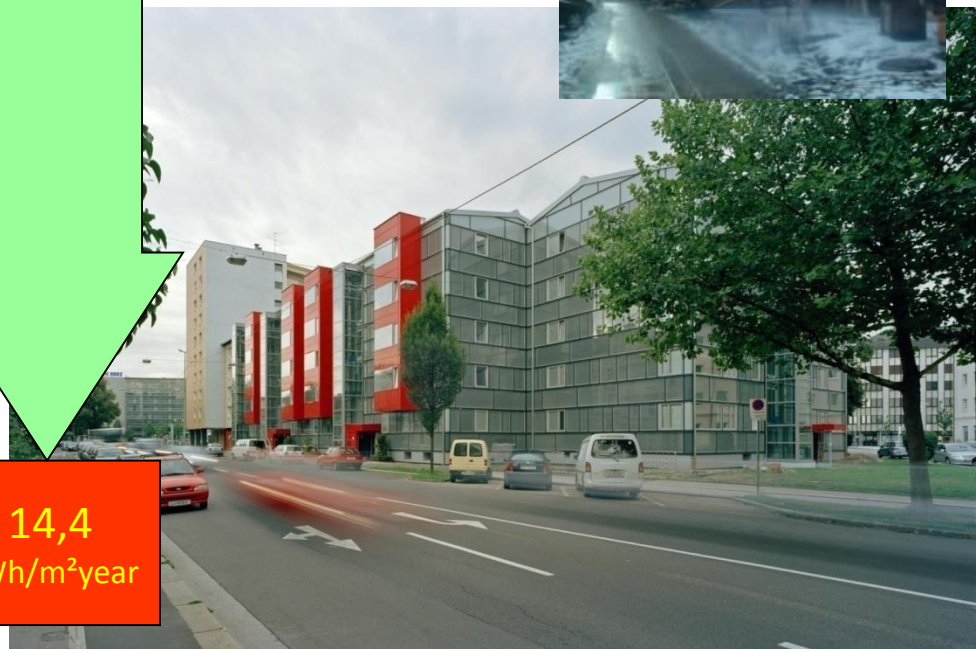


ENERGY EFFICIENT RENOVATION

IN BUILDING WITH 50 DWELLINGS

	Before	After
Heating Requirement	179 kWh/m²year	14,4 kWh/m²year
Monthly Heating Costs per Dwelling 59m²	€ 40,8	€ 4,73
Annual CO_2 Emission	160.000 kg	14.000 kg





ENERGY EFFICIENT RENOVATION IN SCHOOL

121
kWh
m²year

7,8
kWh/m²year

ENERGY EFFICIENT RENOVATION IN SCHOOL

Energieausweis für Nicht-Wohngebäude

gemäß ÖNORM H5055 und Richtlinie 2002/91/EG

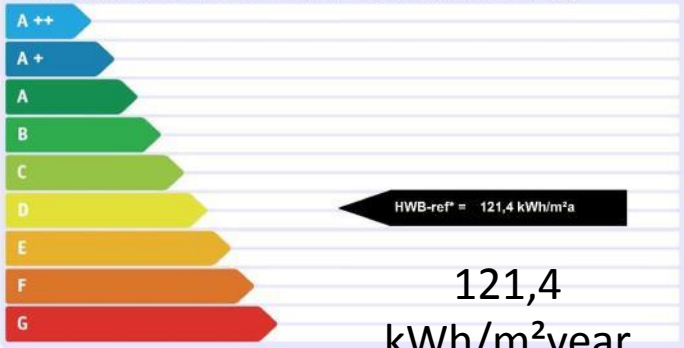
OIB Österreichisches Institut für Bautechnik

Gebäude VS St. Leonhard Bestand

Gebäudeart	Pflichtschule	**Erbaut im Jahr**	1964
Gebäudezone		**Katastralgemeinde**	Hart
Straße	St. Leonhard 11	**KG - Nummer**	77110
PLZ/Ort	9587 Riegersdorf	**Einlagezahl**	
		Grundstücksnr.	1008/2

EigentümerIn Marktgemeinde Arnoldstein
Gemeindeplatz 4
9601 Arnoldstein

SPEZIFISCHER HEIZWÄRMEBEDARF BEI 3400 HEIZGRADTAGEN (REFERENZKLIMA)



121,4 kWh/m²year

ERSTELLT

ErstellerIn	Pompenig	**Organisation**	energie:bewusst Kärnten
ErstellerIn-Nr.		**Ausstellungsdatum**	12.05.2009
GWR-Zahl		**Gültigkeitsdatum**	12.05.2019
Geschäftszahl			

Unterschrift _____

Dieser Energieausweis entspricht den Vorgaben der Richtlinie 6 "Energieeinsparung und Wärmeschutz" des Österreichischen Instituts für Bautechnik in Umsetzung der Richtlinie 2002/91/EG über die Gesamtenergieeffizienz von Gebäuden und des Energieausweis-Vorlage-Gesetzes (EAVG).

EA-01-2007-SW-a
EA-NWG
25.04.2007

GEQ von Zehentmayer Software GmbH www.geq.at
Version 2009,0313 REPEARL61 - Kärnten Projektnr. 163 12.05.2009 12:53

Bearbeiter Pompenig
Seite 1

Energieausweis für Nicht-Wohngebäude

gemäß ÖNORM H5055 und Richtlinie 2002/91/EG

OIB Österreichisches Institut für Bautechnik

Gebäude VS St. Leonhard saniert

Gebäudeart	Pflichtschule	**Erbaut im Jahr**	1964
Gebäudezone		**Katastralgemeinde**	Hart
Straße	St. Leonhard 11	**KG - Nummer**	77110
PLZ/Ort	9587 Riegersdorf	**Einlagezahl**	
		Grundstücksnr.	1008/2

EigentümerIn Marktgemeinde Arnoldstein
Gemeindeplatz 4
9601 Arnoldstein

SPEZIFISCHER HEIZWÄRMEBEDARF BEI 3400 HEIZGRADTAGEN (REFERENZKLIMA)

7,8 kWh/m²year

ERSTELLT

ErstellerIn	Pompenig	**Organisation**	energie:bewusst Kärnten
ErstellerIn-Nr.		**Ausstellungsdatum**	12.05.2009
GWR-Zahl		**Gültigkeitsdatum**	12.05.2019
Geschäftszahl			

Unterschrift _____

Dieser Energieausweis entspricht den Vorgaben der Richtlinie 6 "Energieeinsparung und Wärmeschutz" des Österreichischen Instituts für Bautechnik in Umsetzung der Richtlinie 2002/91/EG über die Gesamtenergieeffizienz von Gebäuden und des Energieausweis-Vorlage-Gesetzes (EAVG).

EA-01-2007-SW-a
EA-NWG
25.04.2007

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Version 2009,0313 REPEARL61 - Kärnten Projektnr. 164 12.05.2009 12:54

Bearbeiter Pompenig
Seite 1

ENERGY EFFICIENT RENOVATION

OF SHOPPING MALL

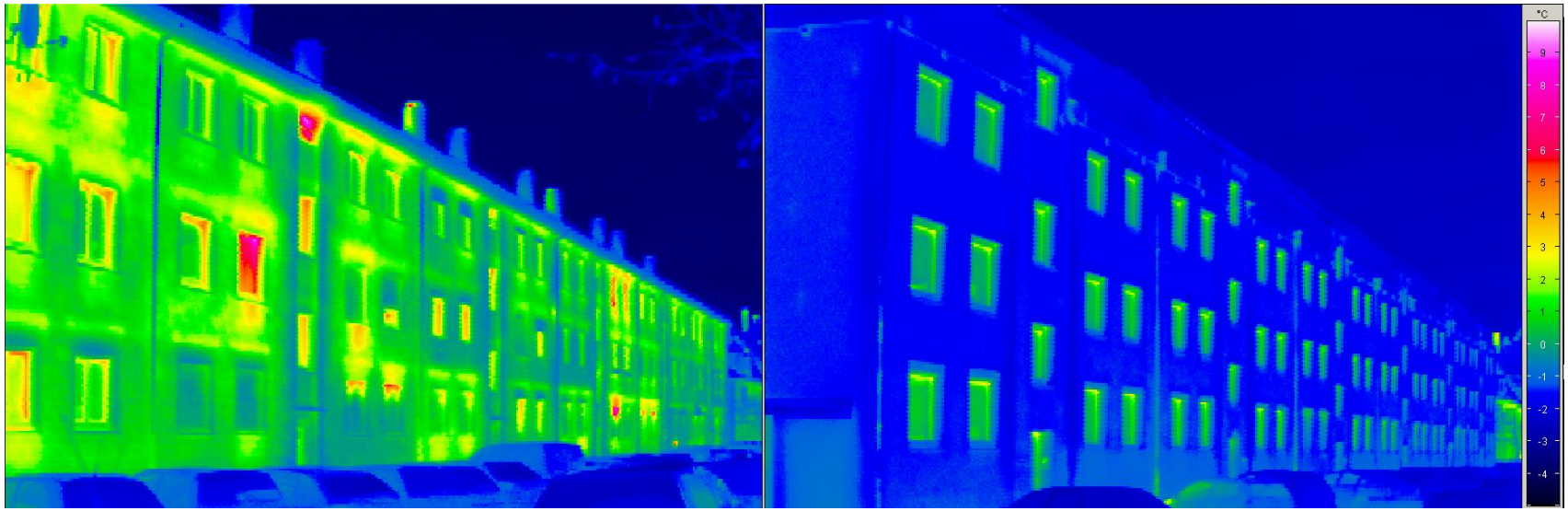
ENERGY EFFICIENT RENOVATION

OF SHOPPING MALL

	BEFORE	**AFTER**
Heating Requirement	App. 100 kWh / m^2year	52 kWh / m^2year
U-Wall	App. 1,2 W / m^2K	0,173 W / m^2K
U-Roof	App. 0,9 W / m^2K	0,135 W / m^2K
U-Window	App. 3,0 W / m^2K	1,2 W / m^2K
Heating Costs	5.500.- €/year (fuel-oil)	712,40 €/yıl (heat pump)
Heating Area	App.. 550 m^2	762 m^2
Heating & Cooling Costs / m^2		0,93 €/m^2a

ENERGY EFFICIENT RENOVATION

IN BUILDINGS (HEATING)



Before

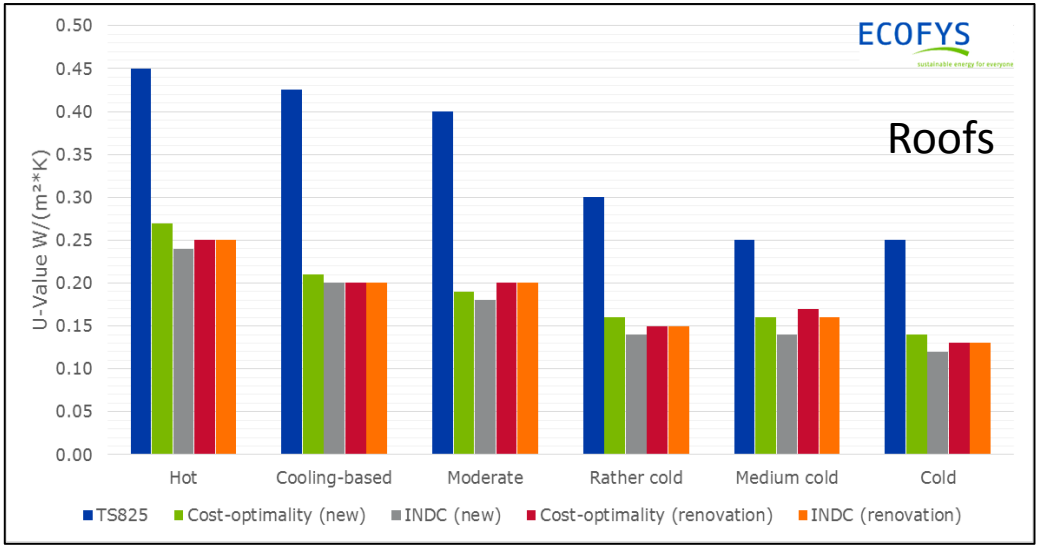
290 kWh/m²

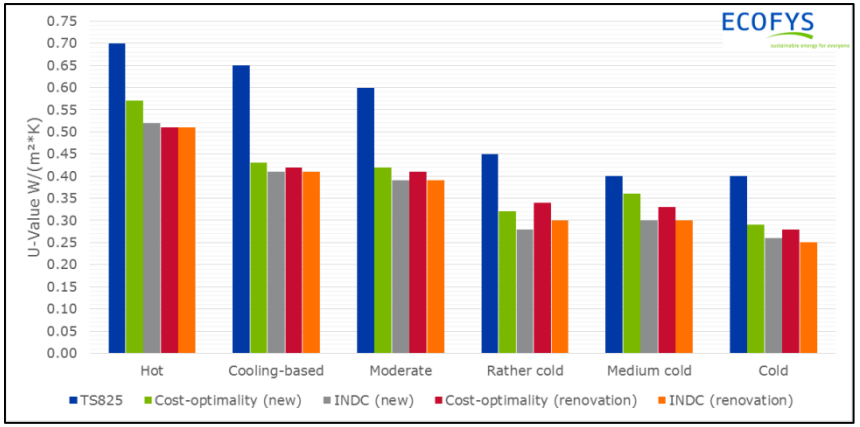
After

17 kWh/m²

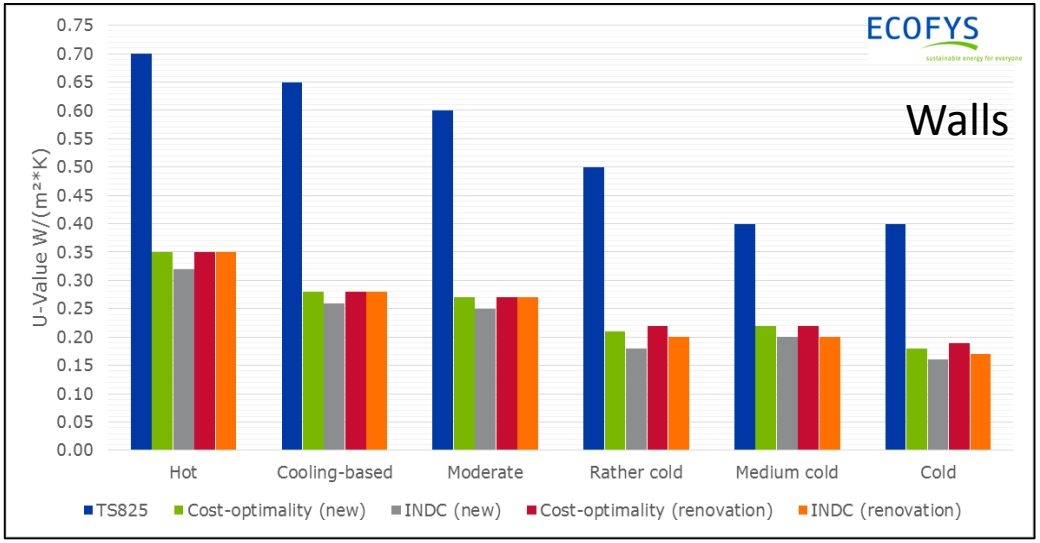
% 94

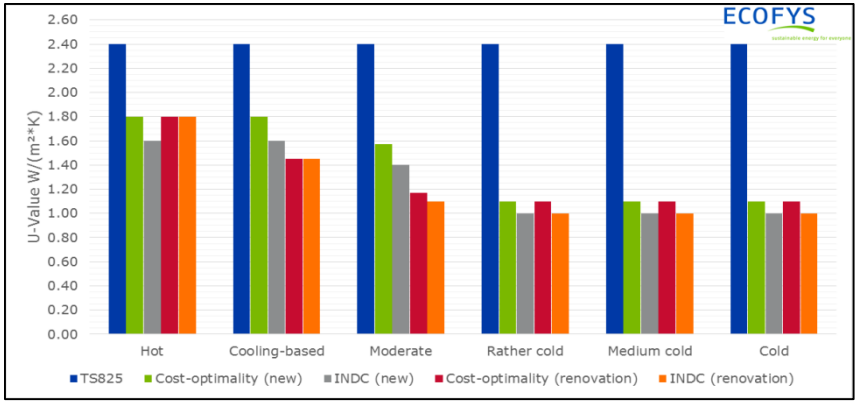
Conservation



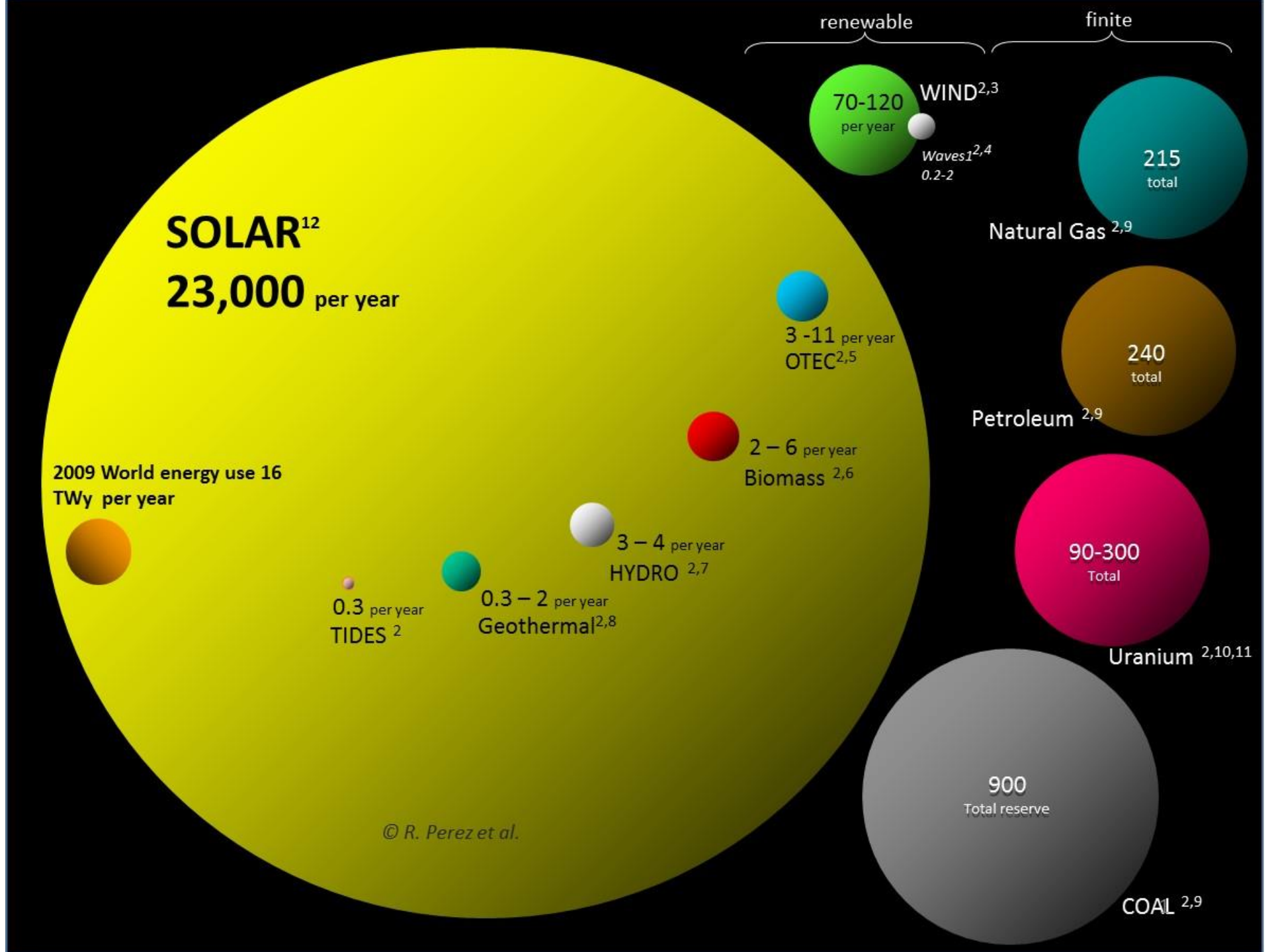


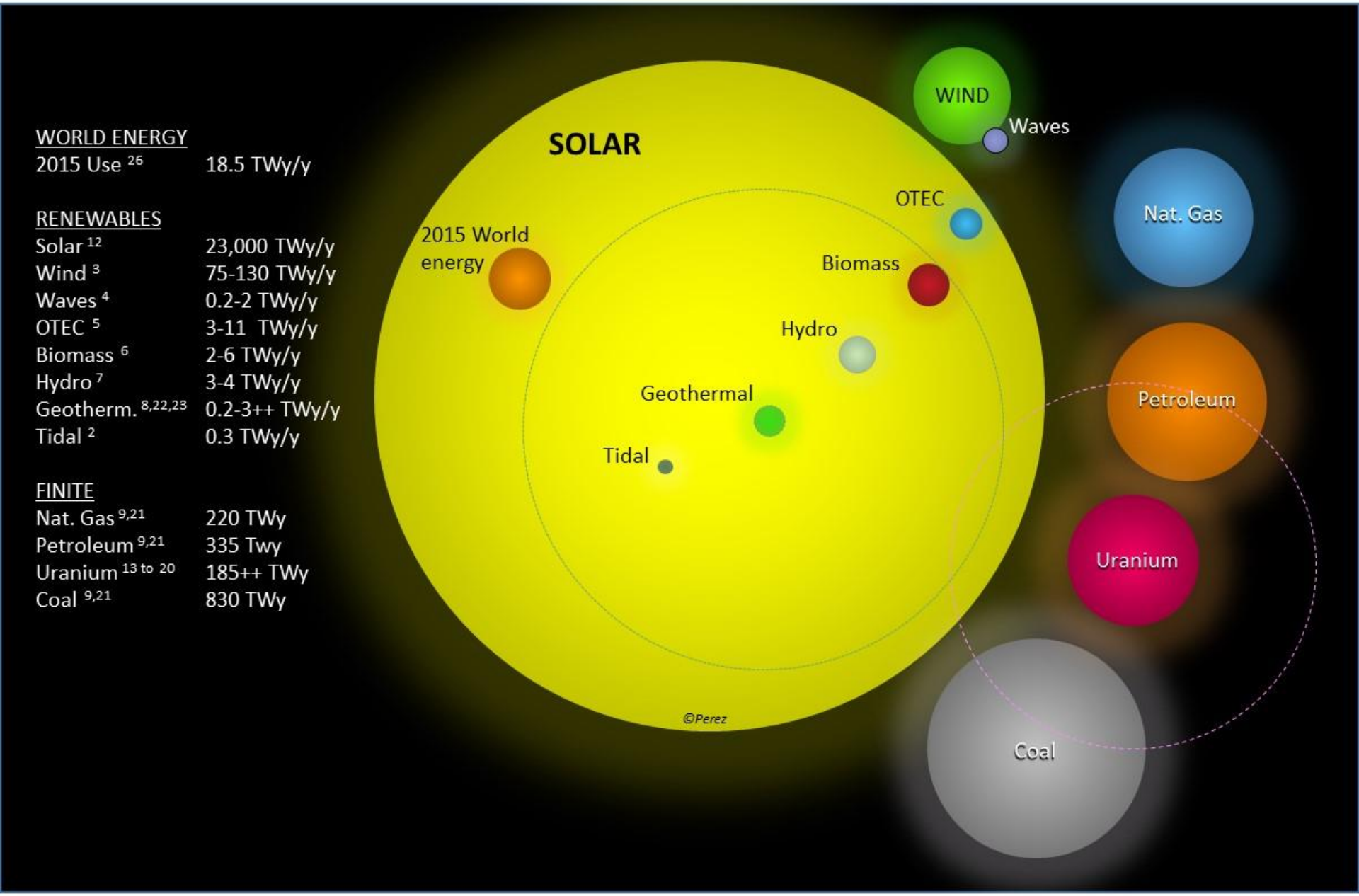
Floors





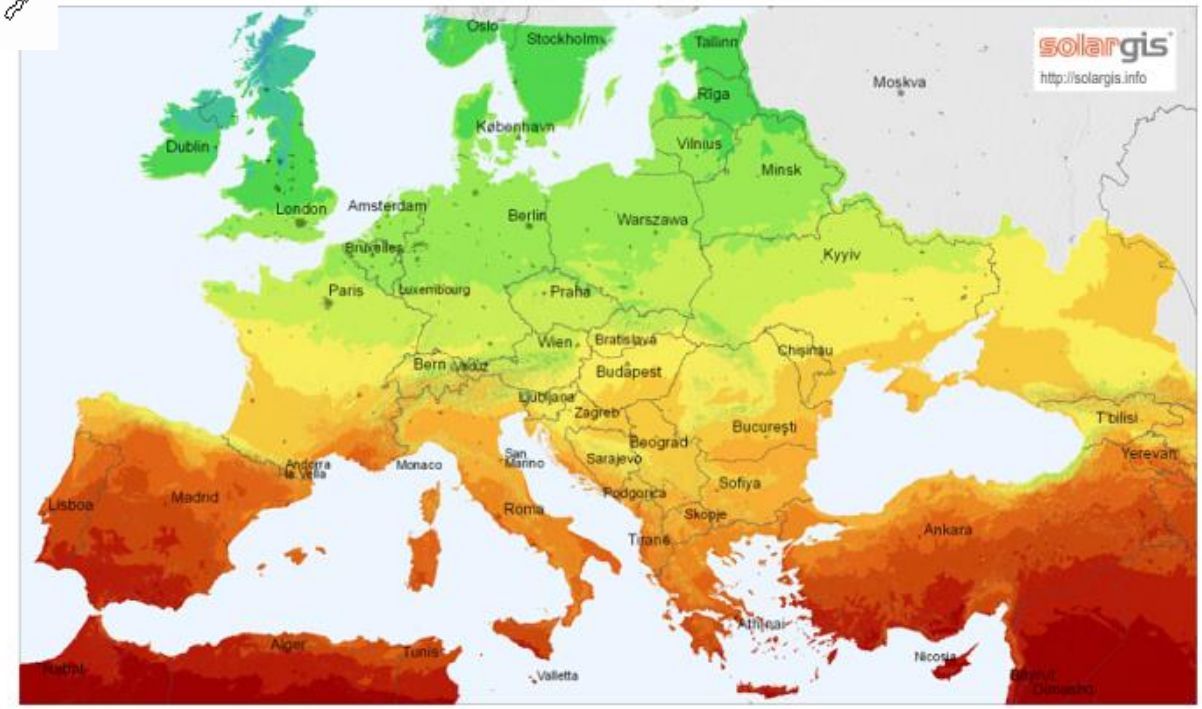
Windows

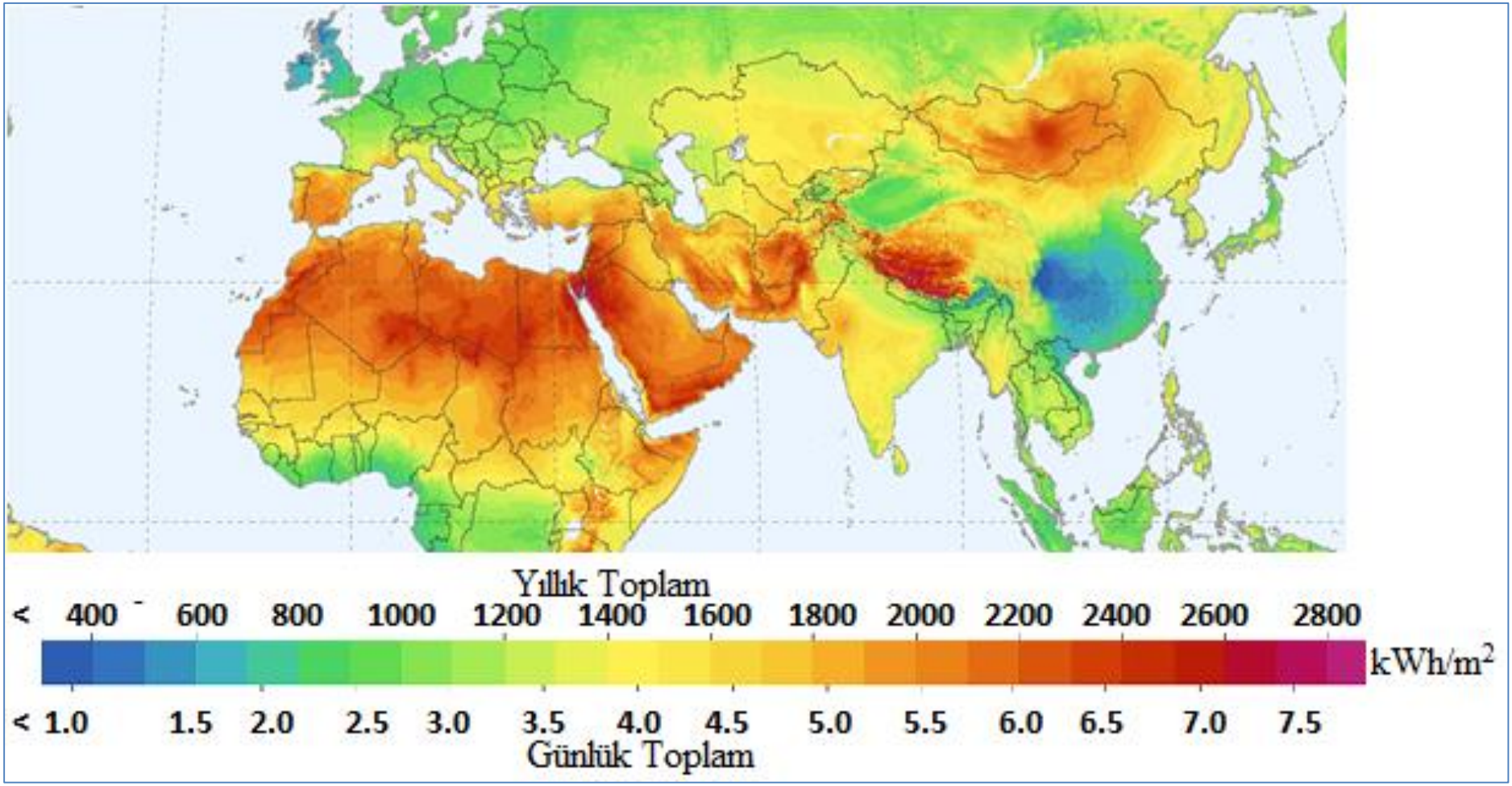

renewable
finite
70-120
per year
WIND[2,3]
Waves1[2,4]
0.2-2
215
total
Natural Gas [2,9]
SOLAR[12]
23,000 per year
3 -11 per year
OTEC[2,5]
240
total
Petroleum [2,9]
2 – 6 per year
Biomass [2,6]
2009 World energy use 16
TWy per year
3 – 4 per year
HYDRO [2,7]
90-300
Total
Uranium [2,10,11]
0.3 per year
TIDES [2]
0.3 – 2 per year
Geothermal[2,8]
900
Total reserve
© R. Perez et al.
COAL [2,9]


WORLD ENERGY
2015 Use [26] 18.5 TWy/y
RENEWABLES
Solar [12] 23,000 TWy/y
Wind [3] 75-130 TWy/y
Waves [4] 0.2-2 TWy/y
OTEC [5] 3-11 TWy/y
Biomass [6] 2-6 TWy/y
Hydro [7] 3-4 TWy/y
Geotherm. [8,22,23] 0.2-3++ TWy/y
Tidal [2] 0.3 TWy/y
FINITE
Nat. Gas [9,21] 220 TWy
Petroleum [9,21] 335 Twy
Uranium [13 to 20] 185++ TWy
Coal [9,21] 830 TWy
SOLAR
2015 World energy
WIND
Waves
OTEC
Biomass
Hydro
Geothermal
Tidal
Nat. Gas
Petroleum
Uranium
Coal
©Perez

obal horizontal irradiation

Europe




Yıllık Toplam
< 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800
kWh/m²
< 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5
Günlük Toplam

http://www.iea-pvps.org/index.php?id=4

Ongoing Tasks

Task 1: Strategic PV Analysis & Outreach

Task 8: Very large scale photovoltaic power generation systems in remote areas

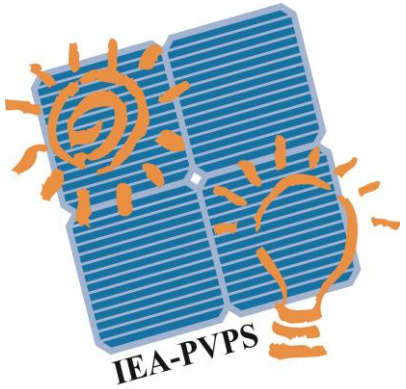
Task 9: Deploying PV Services for regional development

Task 12: PV environmental health and safety

Task 13: Performance and Reliability of Photovoltaic Systems

Task 14: High Penetration of PV Systems in Electricity Grids

Task 15: Accelerating BIPV



http://www.iea-shc.org/tasks-current

Current Research Projects (Tasks)

The following tasks are currently being worked on by Operating Agents of the IEA Solar Heating and Cooling Programme:

Task 57 - Solar Standards and Certification

Task 56 - Building Integrated Solar Envelope Systems for HVAC and Lighting

Task 55 - Towards the Integration of Large SHC Systems into District Heating and Cooling (DHC) Network

Task 54 - Price Reduction of Solar Thermal Systems

Task 53 - New Generation Solar Cooling and Heating Systems (PV or Solar Thermally Driven Systems)

Task 52 - Solar Energy and Energy Economics in Urban Environments

Task 51 - Solar Energy in Urban Planning

Task 46 - Solar Resource Assessment and Forecasting

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- **TASK 46** Güneş Enerjisi Kaynak Potansiyelinin Tespiti ve Tahmini
- **TASK 51** Güneş Enerjisi ve Şehirleşme
- **TASK 52** Güneşle Isıtma ve Enerji Ekonomisi
- **TASK 53** Yeni Nesil Güneşle Isıtma ve Soğutma Sistemleri
- **TASK 54** Güneş Isıl Sistemlerde Maliyetlerin Düşürülmesi
- **TASK 55** Güneş Isıtma ve Soğutma Teknolojilerinin Bölgesel Sistemlere Entegrasyonu
- **TASK 56** HVAC ve Aydınlatma Enerji İhtiyacı İçin Binayla Bütünleşik Güneş Enerjisi Sistemleri
- **TASK 57** Küresel Güneş Enerjisi Standardizasyonu ve Sertifikasyon

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- **TASK 1** Stratejik PV Analizi
- **TASK 8** Uzak Bölgelerde Büyük Ölçekli PV Güç Üretimi
- **TASK 9** Bölgesel Kalkınma için PV Hizmetlerinin Yaygınlaştırılması
- **TASK 12** PV Çevresel Sağlık ve Güvenlik
- **TASK 13** PV Sistemlerinin Performans ve Güvenilirliği
- **TASK 14** PV Sistemlerin Elektrik Şebekelerine Yüksek Katılımı
- **TASK 15** Binalarda Bütünleşik PV Geliştirme Çerçevesini Etkinleştirmek

In the National Energy Efficiency Action Plan Draft in which the existing EU Building Directive will be transferred to the National Legislation;
a total of 16.6 million savings on TOE and a total of 54.97 million tons of CO2 reduction are projected in the period of 2017-2023 by achieving
nearly zero energy buildings in all new buildings by 2021 and all public buildings by 2019 in Turkey and translating this initiative into service and housing industry.

Thank you for your attention...

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bayraktar@izocam.com.tr