

Climate Change Mitigation 2022

Synergies with sustainable development: insights from the IPCC WGIII report



ipcc

INTERGOVERNMENTAL PANEL ON climate change

Climate Change 2022 Mitigation of Climate Change



WGIII

Working Group III contribution to the
Sixth Assessment Report of the
Intergovernmental Panel on Climate Change



New framework in ^{ipcc} AR6:

Shift from co-benefits
focus to **synergies**
and trade-offs with
SDGs

Earlier: co-benefits, multiple
impacts



Accelerated climate action is
critical to sustainable development

Accelerated and equitable climate action is critical to sustainable development

The SDGs can be used as a basis for evaluating climate action in the context of sustainable development

[Charlie Chesvick/IStock.com]



Synergies and trade-offs are highly context dependent

- development context incl inequalities
- climate justice
- means of implementation
- scale
- intra- and inter-sectoral interactions
- cooperation between countries and regions
- the sequencing, timing and stringency of mitigation actions
- governance, policy design

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Synergies and trade-offs between sectoral and system mitigation options and the SDGs

Numerous synergies found in:

- ❖ energy efficiency
- ❖ renewable energy
- ❖ urban planning with more green spaces
- ❖ active mobility
- ❖ demand side mitigation
 - ❖ including shifts to balanced, sustainable healthy diets

Mitigation options have synergies with many Sustainable Development Goals, but some options can also have trade-offs. The synergies and trade-offs vary dependent on context and scale.

Sectoral and system mitigation options	Relation with Sustainable Development Goals																	Chapter source
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Energy systems																		Sections 6.4.2, 6.7.7 Sections 6.4.2, 6.7.7 Sections 6.4.2, 12.5, Box 6.1 Section 6.4.2 Section 6.4.2 Section 6.4.2, Figure 6.18 Section 6.4.2, 6.7.7
Wind energy																		
Solar energy																		
Bioenergy																		
Hydropower																		
Geothermal energy																		
Nuclear power																		
Carbon capture and storage (CCS)																		
Agriculture, Forestry and Other Land Use (AFOLU)																		
Carbon sequestration in agriculture ¹																		
Reduce CH ₄ and N ₂ O emission in agriculture																		
Reduced conversion of forests and other ecosystems ²																		
Ecosystem restoration, reforestation, afforestation																		
Improved sustainable forest management																		
Reduce food loss and food waste																		
Shift to balanced, sustainable healthy diets																		
Renewables supply ³																		
Urban systems																		
Urban land use and spatial planning																		
Electrification of the urban energy system																		
District heating and cooling networks																		
Urban green and blue infrastructure																		
Waste prevention, minimization and management																		
Integrating sectors, strategies and innovations																		
Buildings																		
Demand-side management																		
Highly energy efficient building envelope																		
Efficient heating, ventilation and air conditioning (HVAC)																		
Efficient appliances																		
Building design and performance																		
On-site and nearby production and use of renewables																		
Change in construction methods and circular economy																		
Change in construction materials																		
Transport																		
Fuel efficiency – light duty vehicle																		
Electric light duty vehicles																		
Shift to public transport																		
Shift to bikes, eikes and non motorized transport																		
Fuel efficiency – heavy duty vehicle																		
Fuel shift (including electricity) – heavy duty vehicle																		
Shipping efficiency, logistics optimization, new fuels																		
Aviation – energy efficiency, new fuels																		
Biofuels																		
Industry																		
Energy efficiency																		
Material efficiency and demand reduction																		
Circular material flows																		
Electrification																		
CCS and carbon capture and utilisation (CCU)																		

Type of relations: Synergies, Trade-offs, Both synergies and trade-offs¹, Blanks represent no assessment²

Confidence level: High confidence, Medium confidence, Low confidence

Related Sustainable Development Goals: 1 No poverty, 2 Zero hunger, 3 Good health and wellbeing, 4 Quality education, 5 Gender equality, 6 Clean water and sanitation, 7 Affordable and clean energy, 8 Decent work and economic growth, 9 Industry, innovation and infrastructure, 10 Reduced inequalities, 11 Sustainable cities and communities, 12 Responsible consumption and production, 13 Climate action, 14 Life below water, 15 Life on land, 16 Peace, justice and strong institutions, 17 Partnership for the goals

¹Salt carbon management in cropland and grasslands, agroforestry, biochar
²Deforestation, loss and degradation of peatlands and coastal wetlands
³Timber, biomass, agri feedstocks
⁴Lower of the two confidence levels has been reported
⁵Not assessed due to limited literature



Examples for co-benefits in AR6 WGIII

- ❑ Low-emission energy sector transitions can advance:
 - ❑ energy access, air and water pollution, health, energy security, water security, food security, economic prosperity, international competitiveness, and employment
- ❑ The economic benefits on human health from air quality improvement arising from mitigation action **can be of the same order of magnitude as mitigation costs, and potentially even larger**
- ❑ transport sector:
 - ❑ **air quality improvements, health benefits (active transport), equitable access to transportation services, reduced congestion, and reduced material demand**
- ❑ Demand and services:
 - ❑ 'Sustainable healthy diets' promote all dimensions of individuals' health and wellbeing; have low environmental pressure and impact; are accessible, affordable, safe and equitable
- ❑ Buildings:
 - ❑ significant global transition from coal and biomass use in buildings towards modern energy carriers and efficient conversion technologies has led to **significant gains in health and well-being outcomes in developing regions.**



Examples for co-benefits in AR6 WGIII

- ❑ Just transition policies can enhance **job creation, macro-economic stability, economic growth, and public health and welfare**
- ❑ Urban:
 - ❑ enhance resilience against climate change impacts
 - ❑ contributing to social equity, public health, and human well-being
 - ❑ Urban mitigation actions that facilitate economic decoupling can have positive impacts on employment and local economic competitiveness

Mitigation options in buildings

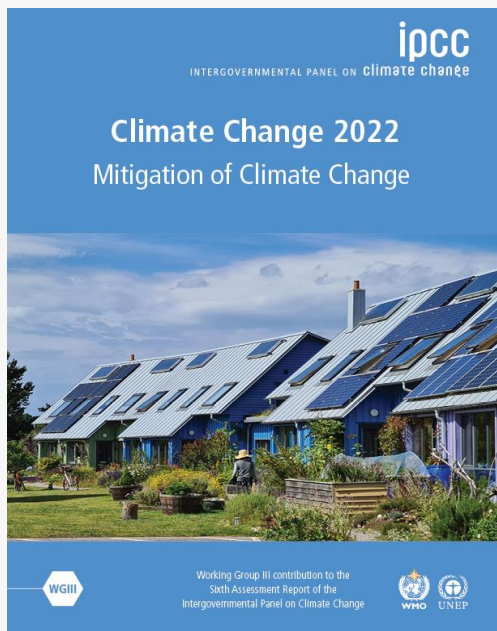
Buildings

Relation with Sustainable Development Goals

	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17
Demand-side management	+	+	+			+	+	•	•	+	+					
Highly energy efficient building envelope	•	+	•	+		+	+	•	•	•	+	+			+	-
Efficient heating, ventilation and air conditioning (HVAC)	•	+	+			+	+	•	•	•	+	+				
Efficient appliances	•	+	+	+	+	+	+	•	-	•	+	•		+		
Building design and performance	+	+	+			+	+	•	-	+	+	+		+	+	
On-site and nearby production and use of renewables	•	•	+	+	+	•	•	•	•	•	+	+		+	+	+
Change in construction methods and circular economy			+			•	+	•	+		+	+				+
Change in construction materials			•			•	+	•	+		+	+		-		+



Net zero energy buildings are feasible in all climates and are economic for almost all building types, both for new and retrofit



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Advances Toward a Net-Zero Global Building Sector

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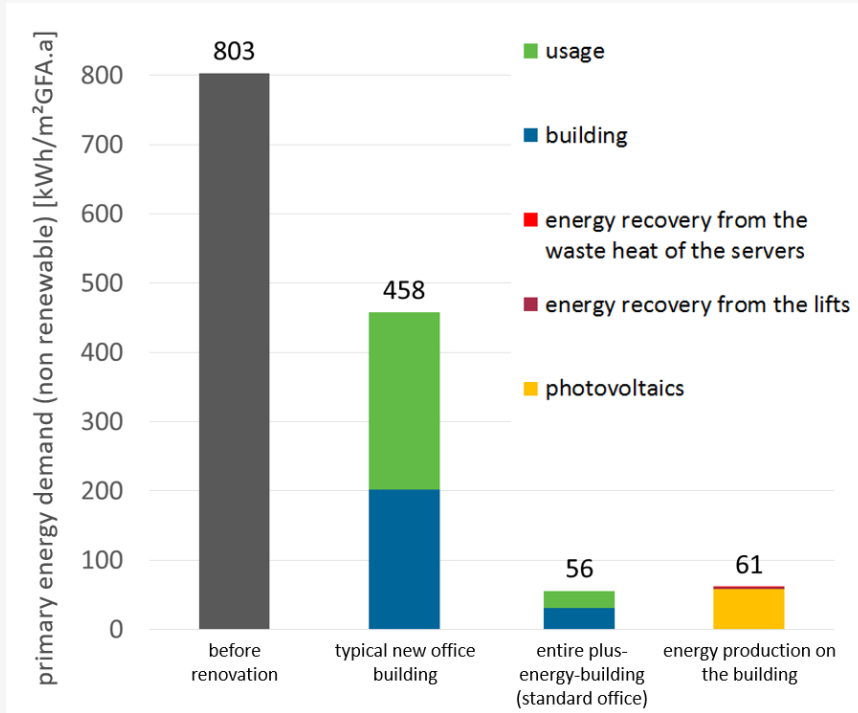


forrás: Klemens Schlögl, Schöber & Pöll, Austrian World Summit 2018, Vienna, May 2018

Energy plus (Enerphit) retrofit of the Vienna Technical University tower



Schöberl & Pöll GmbH
BAUPHYSIK und FORSCHUNG



Source: Klemens Schlögl, Schöberl & Pöll, Austrian World Summit 2018, Vienna, May 2018



HILLTOP COMMUNITY HEALTH PASSIVE HOUSE RETROFIT

DOCTORS AT THE HILLTOP COMMUNITY HEALTHCARE CENTER HAD PRACTICED FROM A DOUBLE-WIDE TRAILER FOR NEARLY 10 YEARS. THE SIZE OF THE MECHANICAL SYSTEM WAS REDUCED BY 50% DUE TO IMPROVEMENTS IN THE BUILDING ENVELOPE, SAVING A SIGNIFICANT AMOUNT OF CONSTRUCTION COST AND FUTURE ENERGY COSTS. THE INTERIORS WERE DESIGNED WITH A COMBINATION OF NEW AND SALVAGED FURNISHINGS

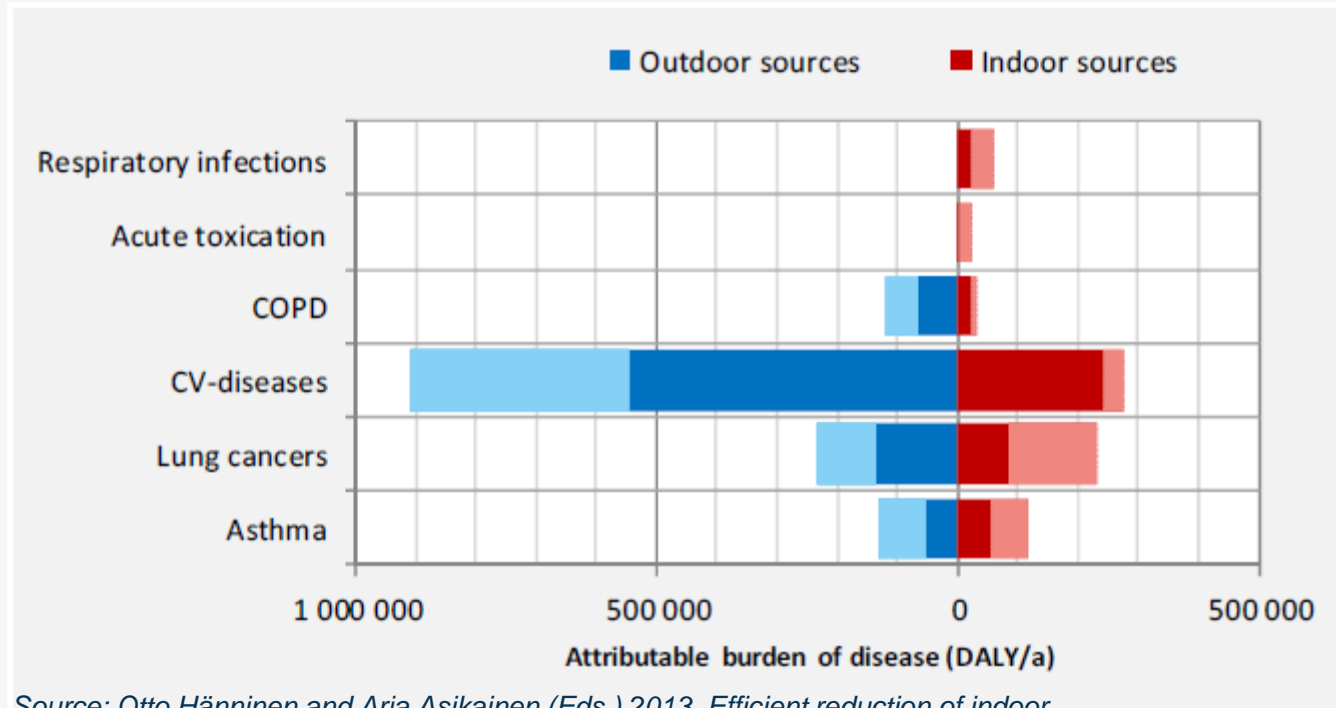






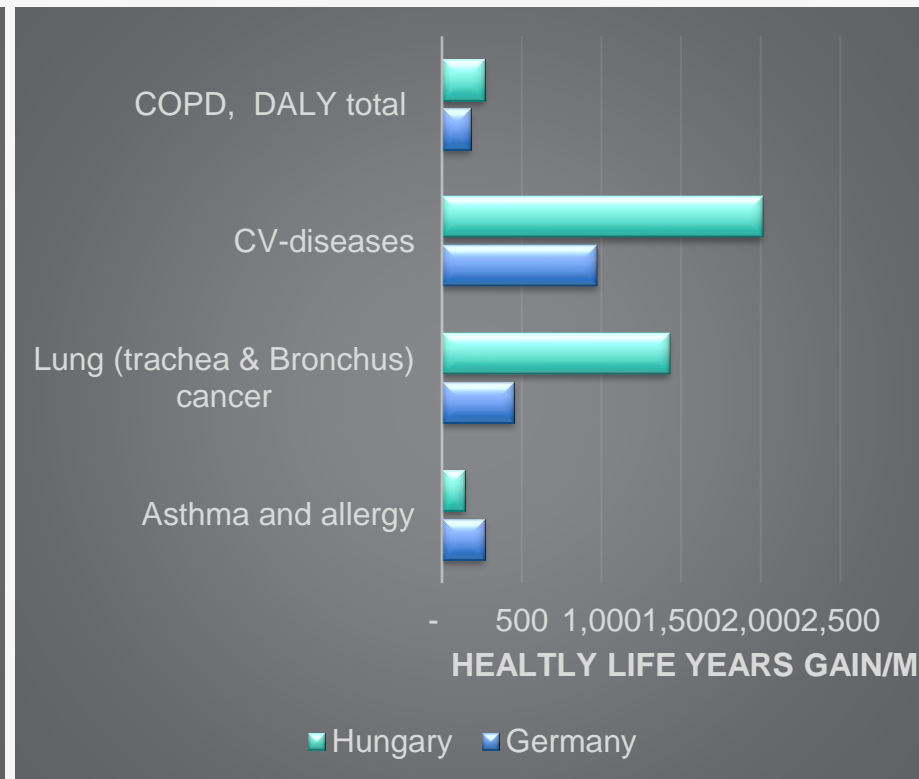
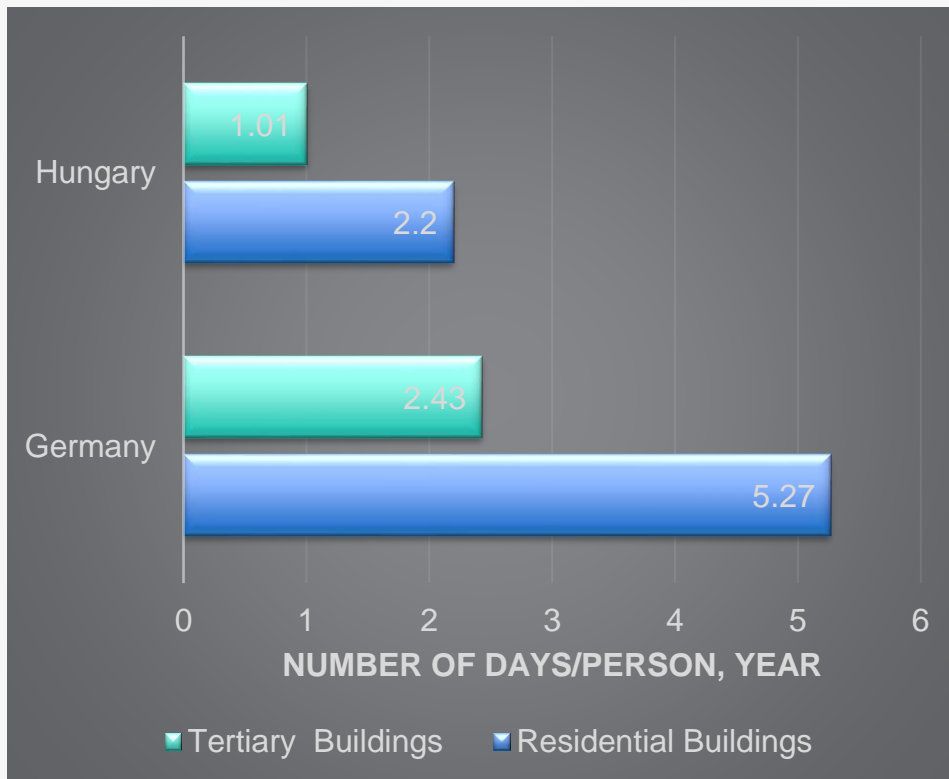
Burden of disease in the EU due to indoor and outdoor air pollution

light shaded bar segments are preventable by high-efficiency buildings with ventilation systems



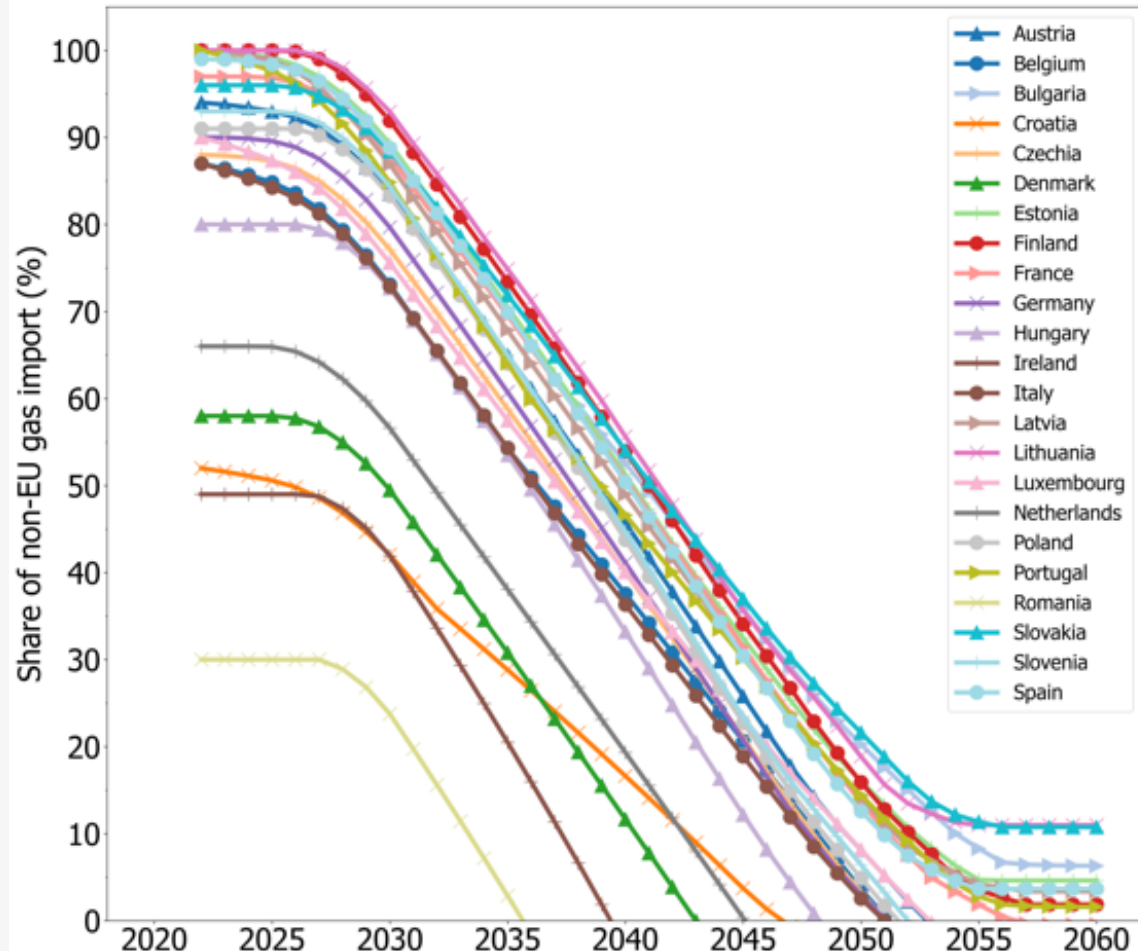
Source: Otto Hänninen and Arja Asikainen (Eds.) 2013. *Efficient reduction of indoor exposures Health benefits from optimizing ventilation, filtration and indoor source controls*

Active days and healthy life years gain from transitioning to net zero buildings



Source: Chatterjee, S., & Ürge-Vorsatz, D. (2021). Measuring the productivity impacts of energy-efficiency: The case of high-efficiency buildings. *Journal of Cleaner Production*, 318, 128535. doi.org/10.1016/j.jclepro.2021.128535

b Change in non-EU NG dependency



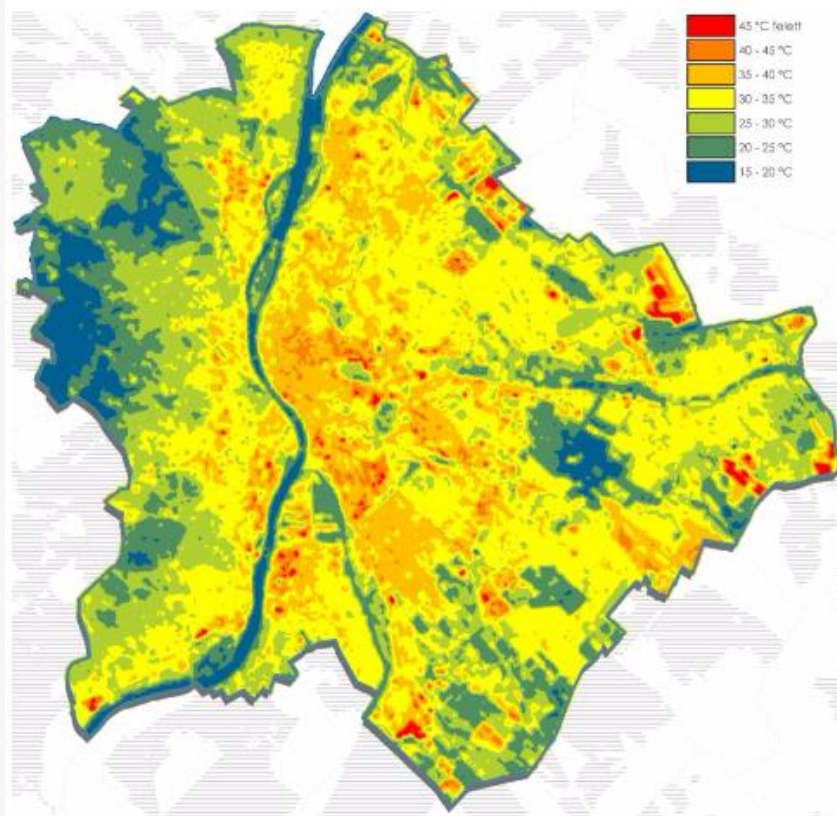
Source: own research, unpublished



Vernacular and energy efficient architecture reduces emissions and resilience against heat stress

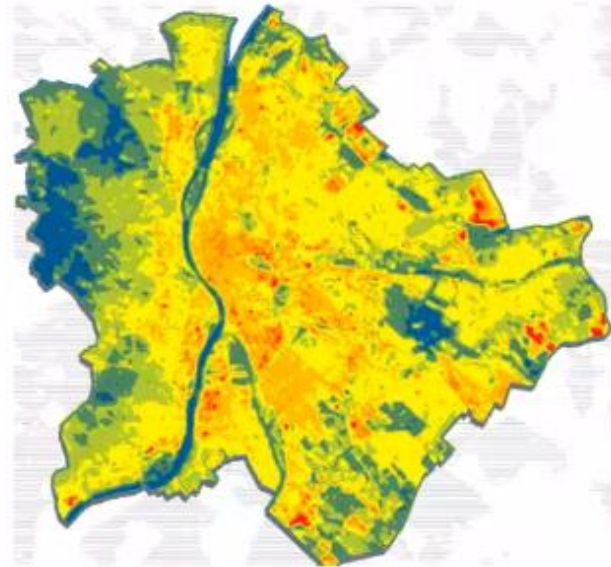


**Land surface
temperature, Aug
31, 2016, 11am –
12am**



Budapest felszínhőmérséklet térképe 2016 aug. 31-én 11:00 és 12:00 között zavartalan napfényes időszakban (forrás: Budapest Zöldinfrastruktúra Konceptiójának helyzetelemzése)

Foliage intensity correlates strongly with surface temperature




Zöldfelület-intenzitás 2015 (%)



Felszínőmérséklet



- 
- ❑ Capturing and storing carbon by living biomass and soils
 - ❑ Providing shading and cooling by foliage
 - ❑ Improving well-being and mental health
 - ❑ Globally, urban trees store approximately 7.4 billion tonnes of carbon, and sequester approximately 217 million tonnes of carbon annually
 - ❑ *“green and blue infrastructure reduce the urban heat island (UHI) effect and heat stress, reduce stormwater runoff, improve air quality, and improve the mental and physical health of urban dwellers, while also provide benefits to climate adaptation”*





**“ The evidence is clear:
The right choices of
mitigation response
measures can
enhance sustainable
development and
with right policies
can minimise trade-
offs**

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Thank you

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www.ipcc.ch/report/sixth-assessment-report-working-group-3/

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