



UNIVERSITY OF
CAMBRIDGE

Stiftung Baukultur Schweiz
Fondation Culture du bâti Suisse
Fondazione Cultura della
costruzione Svizzera



Baukultur und Nachhaltigkeit



Franz Fuerst, University of Cambridge

Tagung 2025 – Baukultur und Rendite
12. November 2025

Climate-Resilient Regional Building Traditions

- Regionally rooted building culture integrating climate, craft and social use
- Passive climate responses: windcatchers, Alpine chalets, mud buildings, shaded facades
- Low-emission natural materials can reduce VOC exposure



Source: Getty Images, Swiss Open Air Museum, BBC, 2025

Leveraging Local Lessons: Baukultur & Decarbonisation

Key challenge: to be relevant for future decarbonisation efforts Baukultur and regional building should be:

-scalable

-open to technology

-flexible & adaptable

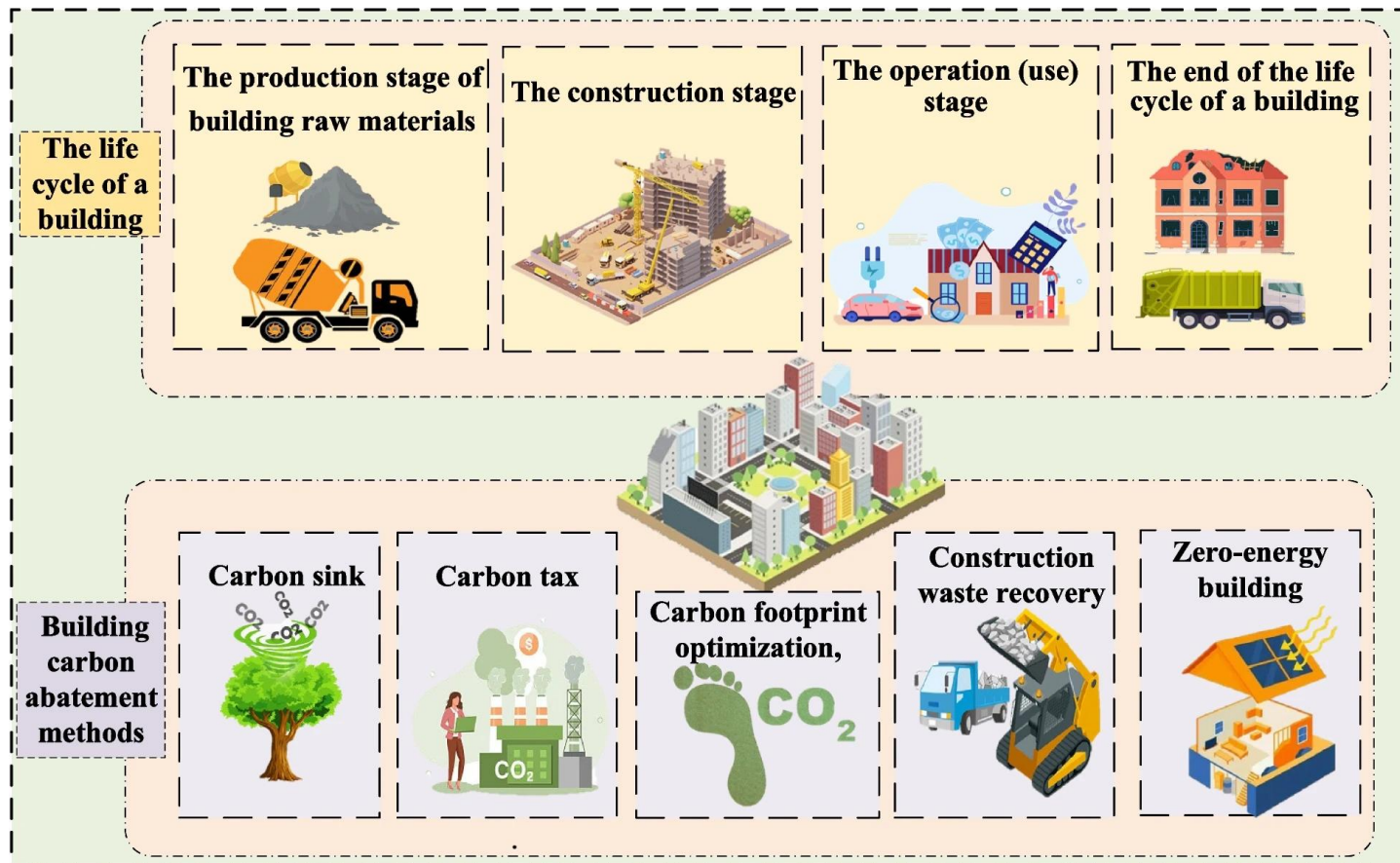
Example: TECLA,
3D-printed 60sqm
clay home



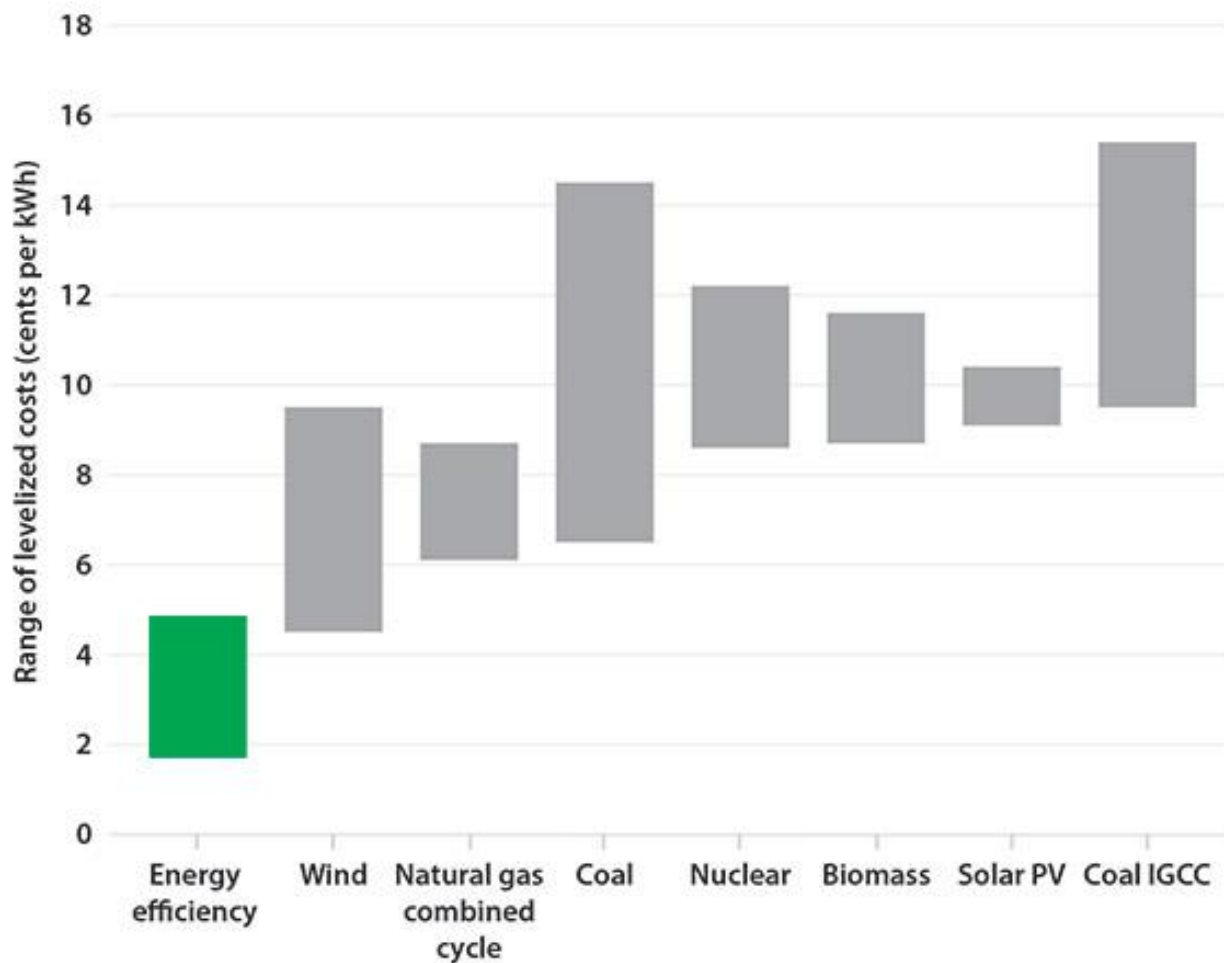
Baukultur: Heritage Buildings and Beyond

Most important lessons from Baukultur are abstract and can be applied to any type of construction and building type

Examples include LCA and building carbon abatement methods



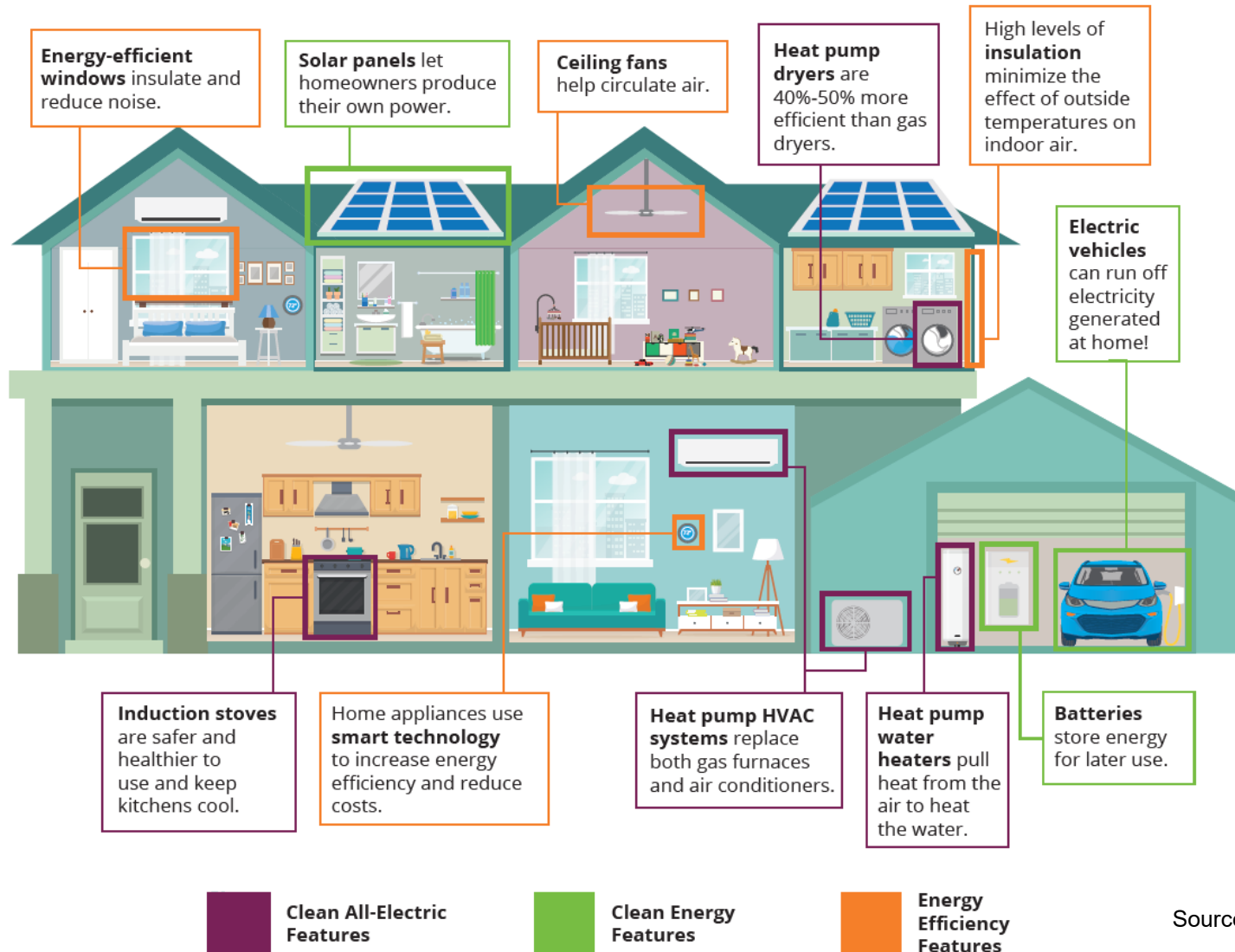
Cost of saving energy vs. generating energy



Source: ACEEE, 2014

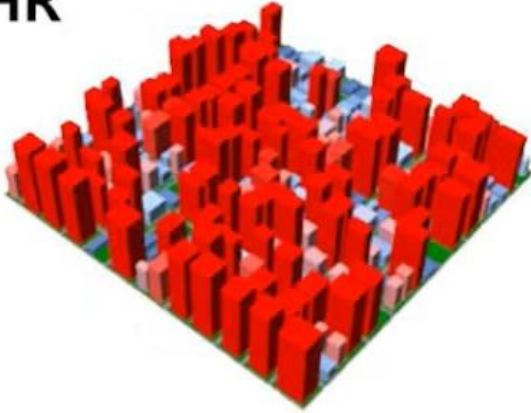
Should We Ignore Buildings on the Way to Net Zero?

“Fabric First” vs. “Building Electrification”

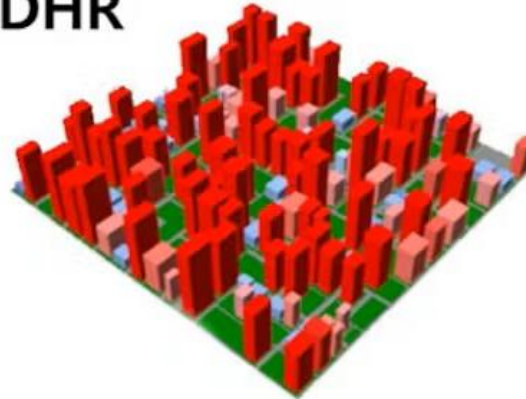


Are High Density – Low Rise Cities Best for Cutting Carbon Emissions?

HDHR



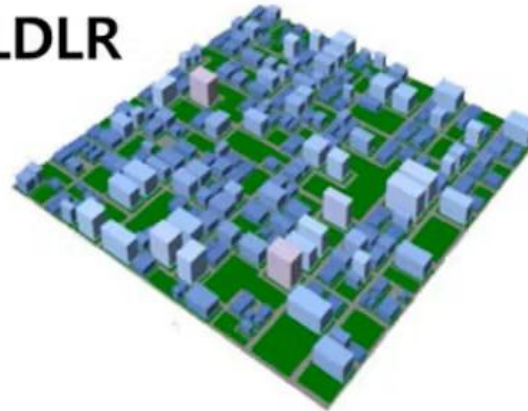
LDHR



HDLR



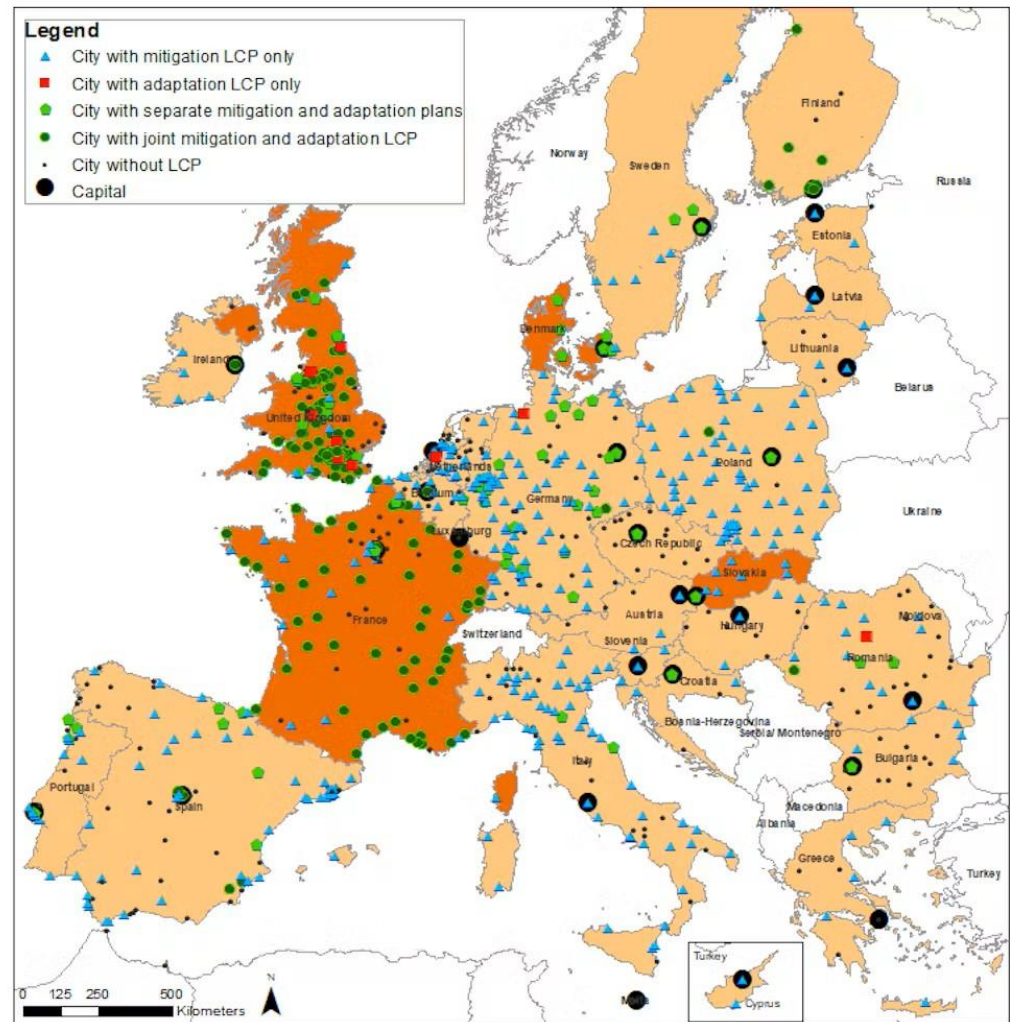
LDLR



High-density low-rise cities, such as Paris more environmentally friendly than high-density high-rise cities, such as New York (average increase in whole life-cycle carbon emissions between HDHR and HDLR) 142%.

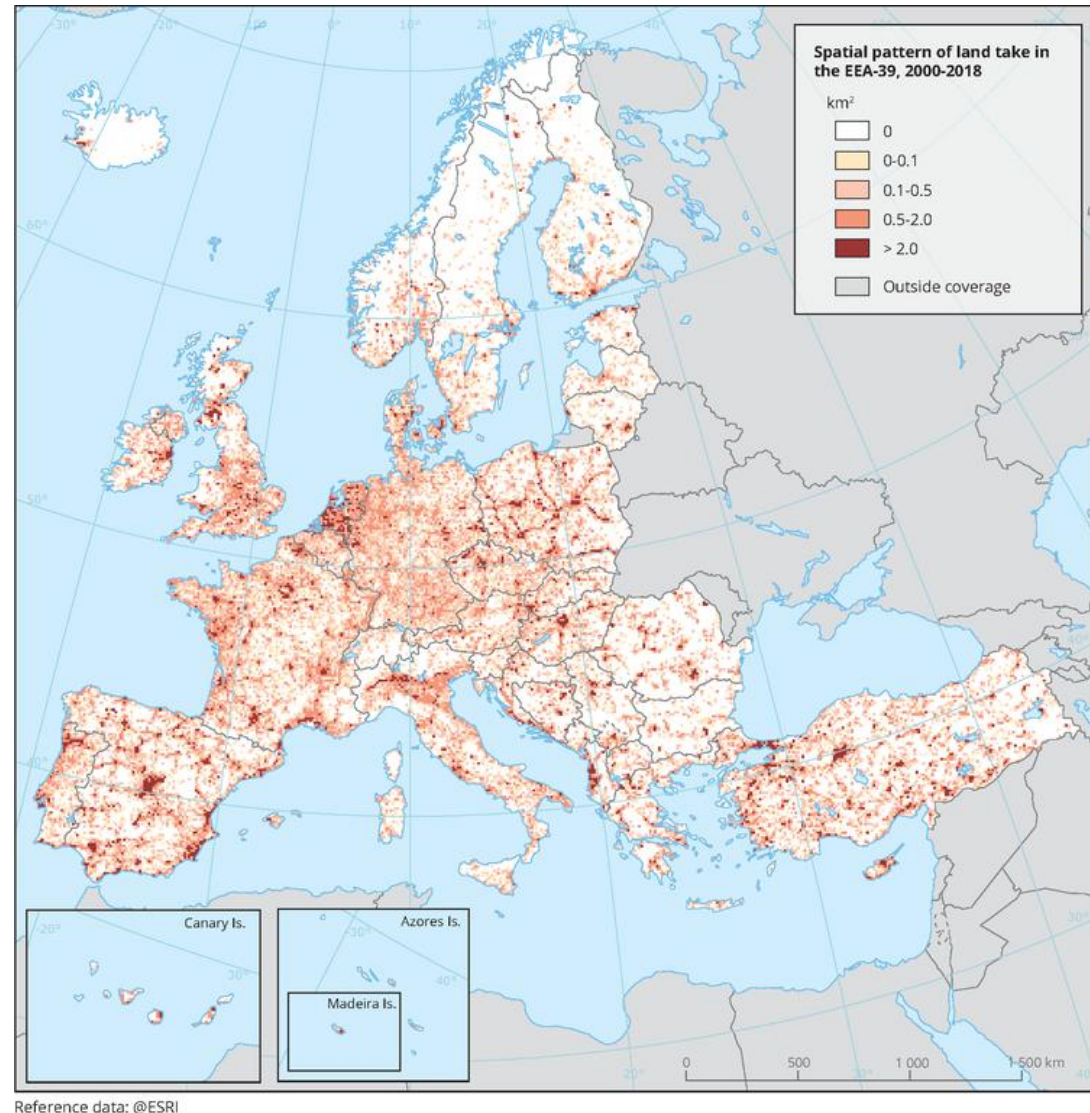
Baukultur's Local Focus Aligns Well With Climate Action

66% of EU cities have a mitigation or adaptation plan in place. Top countries: Poland – where 97% of cities, Germany (81%), Ireland (80%), Finland (78%) and Sweden (77%).



Baukultur and Land Stewardship

- Land take as a result of urban sprawl and increasing concern for resource use, biodiversity & GHG. Map shows high-res Copernicus Corine Land Cover data 2000-2018, areas converted to urban and/or built-up areas.



Baukultur: Longer Building Life Cycles -> Lower GHG Emissions

- Future-proofing our building stock also means increased longevity of buildings
- Counteracting the accelerated shortening of building life cycles as a key strategy
- Ghorbany & Hu (2024): increasing building lifespan to 80 years with a 20% reduction in building sizes can decrease carbon emissions to 33% of current value.

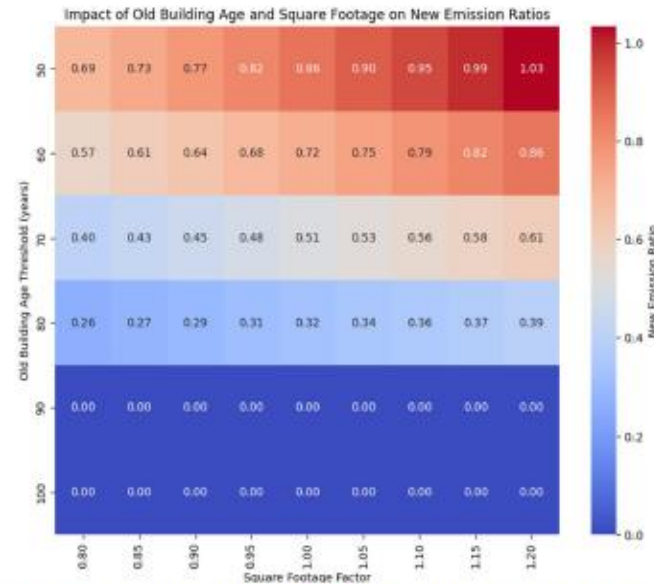


Figure 7. The heatmap of the new emission ratio for different building areas and age thresholds.

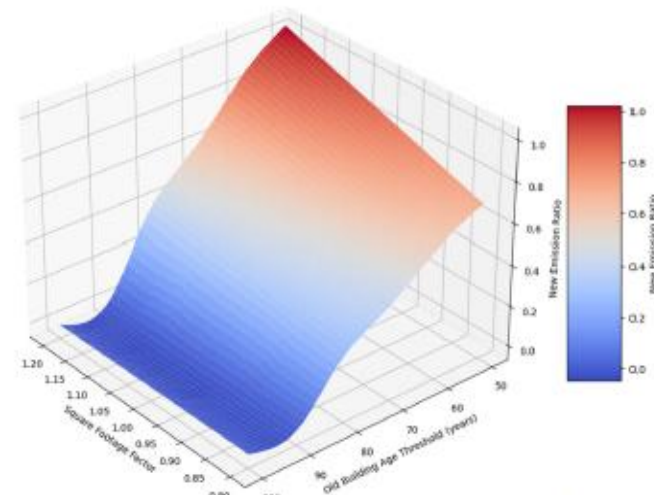


Figure 8. The emission changes sensitivity analysis for different areas and ages 3D visualization.

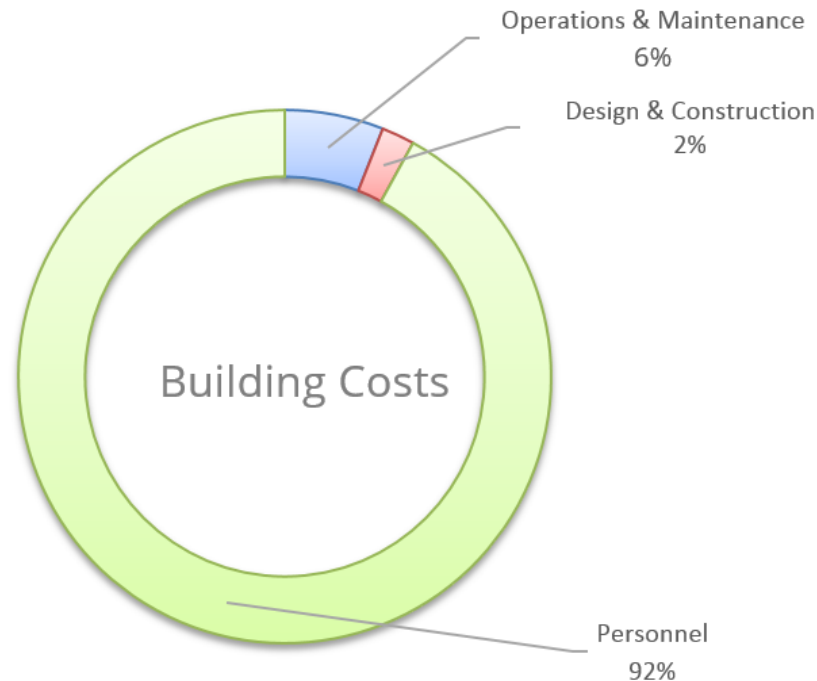
Health Effects of Traditional Design

- Cross-ventilation and thermal mass reduce heat and moisture stress
- Timber, stone, lime render often emit fewer VOCs than some synthetics
- Bioclimatic adaptation can stabilise temperatures and improve comfort



Why Are Health & Well-Being Important for Real Estate Investors?

- The “3-30-300” Rule of Thumb: for every \$3 spent on utilities, a typical company will spend \$30 on rent and \$300 on employee salaries etc.
- This makes the ‘human factor’ a far bigger lever than the other two.



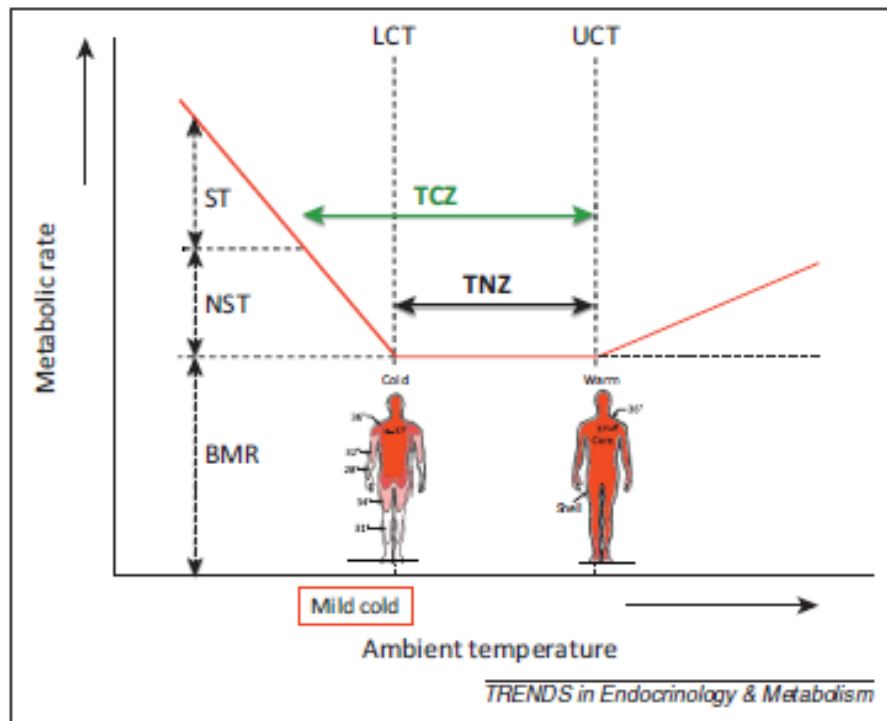
What is a 'Healthy Building'?



1. Daylight in regularly occupied spaces
2. Tobacco-free rooftop garden and outdoor space
3. Break area with hygiene signage and enhanced cleaning
4. Fruit and vegetable garden
5. Bathrooms with hand hygiene signage and PPE
6. Flexible multi-purpose room and views of nature
7. Tobacco-free indoor space
8. Meditation and yoga studio
9. Open and visible stair with enhanced cleaning
10. Biophilia / indoor greenery
11. PPE and sanitation stations
12. Gym facility plus showers and lockers
13. Health and wellness certification plaque
14. Covered and secure bike parking
15. Views of nature
16. Enhanced IAQ and operable windows

Link between Thermal Comfort and Body Weight

Energy efficiency and obesity: van Marken, Lichtenbelt et al (2014). Cold exposure and energy expenditure



- Thermo-neutral zone (TNZ) basal energy expenditure
- Thermal comfort zone (TCZ)
- Nonshivering thermogenesis (NST)
- Shivering thermogenesis (ST) take place.
- Lower & Upper critical temperature (LCT, UCT) > increased energy expenditure

Commercial RE Markets and Healthy Building Certifications



Research article

Indoor and outdoor health factors in the pricing of commercial real estate: A hedonic analysis of U.S. office buildings

Katharina Minkow^{*}, Franz Fuerst[✉]

University of Cambridge, Department of Land Economy, 17 Mill Lane, Cambridge, CB2 1RX, United Kingdom

ARTICLE INFO

Keywords:

Healthy buildings
Green buildings
Voluntary certification schemes
Office rents
Air pollution
Accessibility to health services
Walkability

ABSTRACT

Research on the connection between occupant health and the financial performance of commercial buildings is scarce. This study tests the willingness to pay for health-promoting features and estimates the relative contribution of indoor and outdoor features. For this purpose, a hedonic framework is applied to assess the effect of different attributes on prices. Based on a proprietary, assembled dataset of physical and financial characteristics, a sample of health-certified U.S. office buildings is compared to a large sample of non-certified buildings in the same markets. Potential biases are mitigated by statistical methods such as panel data estimation and propensity score matching. Health-certified offices are found to achieve a rental premium of 4–6 % on average, across model specifications. In addition, proximity to health services and an encouraging environment for active transport modes of commuting tend to increase office rents while outdoor air quality and hospital quality ratings yield mixed results. Comparing the individual price effects of indoor and outdoor health-related features shows that higher active commuting scores or walkability have the strongest positive association with office rents. Overall, both indoor and outdoor health-related features are found to drive rental rates, but it appears that neighborhood characteristics exert a larger cumulative impact on rent than building health certification. Our findings suggest that health aspects of the built environment, although not widely monitored or tracked by owners or tenants, are nonetheless valued and reflected in pricing within the analyzed office markets.

1. Introduction

It is estimated that the population of developed countries spends approximately 90 % of its time indoors (Klepeis et al., 2001). Prolonged exposure to air pollution, noise, artificial lighting, uncomfortable climatic conditions, sedentary occupation or toxic materials can give rise to or exacerbate a number of health conditions such as respiratory or cardiovascular conditions as well as impair cognitive function and well-being (e.g. Durán et al., 2021; Fang et al., 2004; Haapakangas et al.,

reported 20,905 certified and 13,755 registered projects in 111 countries (International WELL Building Institute, 2022), whereas Fitwel listed 1,250 certified and 3,390 registered projects in 55 countries (Fitwel, 2022).

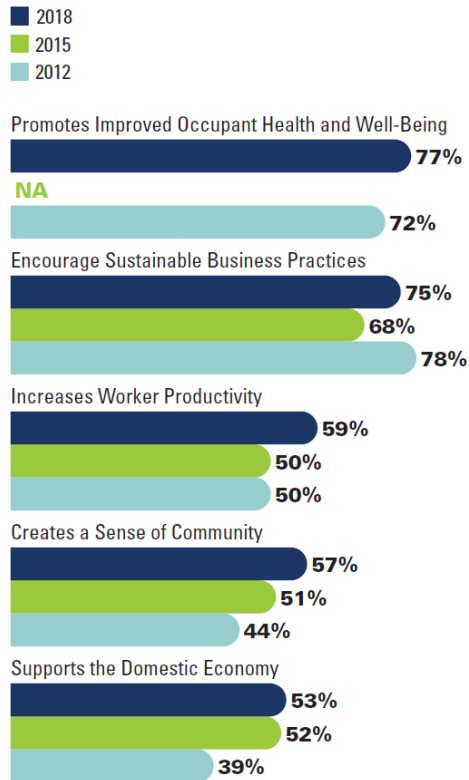
Previous research has mainly focused on the interactions between buildings and health or well-being. Moreover, a large number of studies has analyzed the financial performance of green buildings (e.g. Eichholtz et al., 2010; Fuerst and McAllister, 2011a, 2011b; Robinson et al., 2017). However, research on the nexus between health-promoting fea-

Health & Well-being Building Certificates

Top Social Reasons for Building Green

(By Percentage of Global Respondents Rating Each Reason as Important)

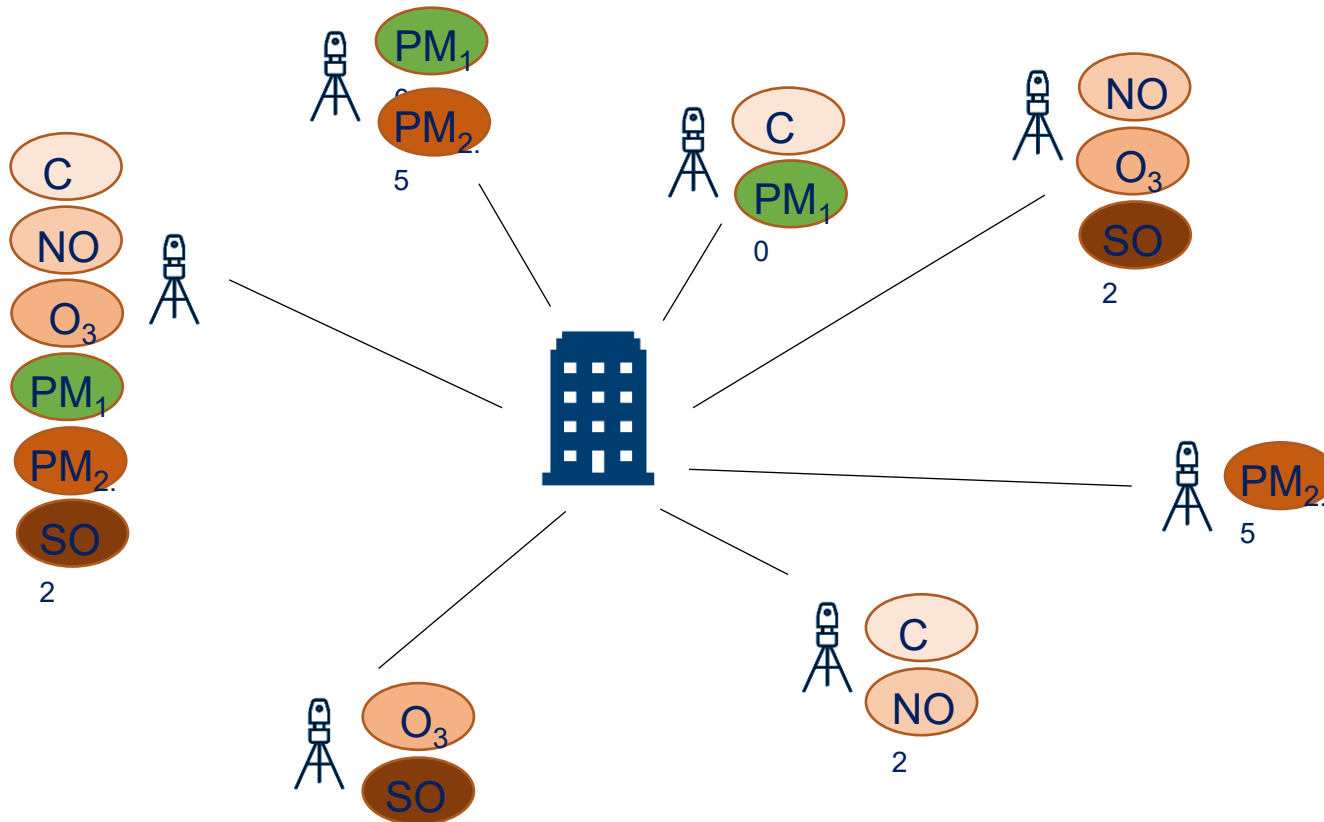
Dodge Data & Analytics, 2018



- Health & well-being increasingly integrated in sustainability ratings but no standard data and definitions
- As of 2021, WELL encompassed 4,504 projects (644 million sq.ft. in 63 countries). Fitwel had 480 certifications and 1550 registered
- Research needs to highlight trade-offs rather than pursuing an additive approach to sustainability



Air Quality: our Data Strategy



- For each building, identify nearest monitoring station for each of the 6 major air pollutants based on the national air quality database of U.S. EPA
- For each building, determine mean AQI per air pollutant by inverse distance weighting
- For each building, calculate overall AQI based on **highest** mean AQI value among 6 pollutants

WalkScore

Walk Score
88

New York is Very Walkable

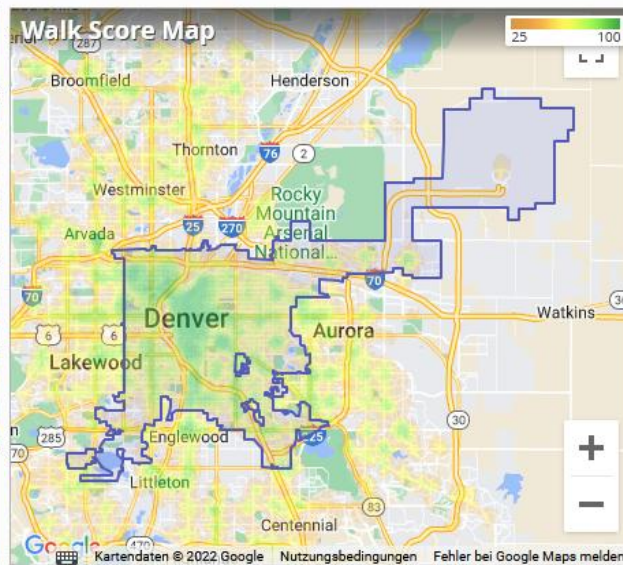
Most errands can be accomplished on foot.



Walk Score
61

Denver is Somewhat Walkable

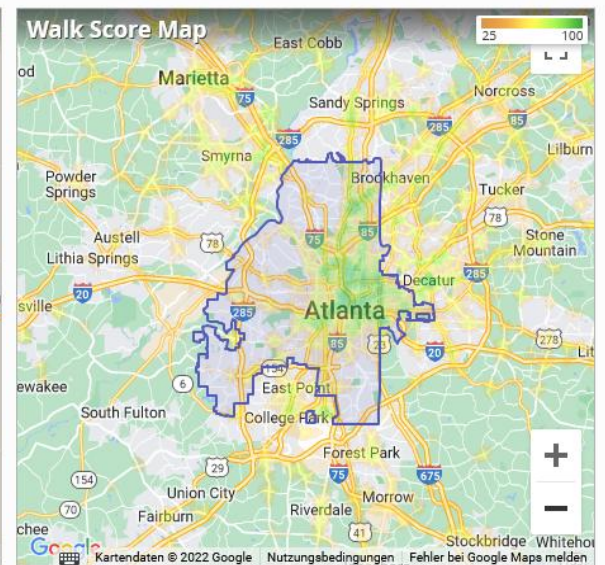
Some errands can be accomplished on foot.



Walk Score
48

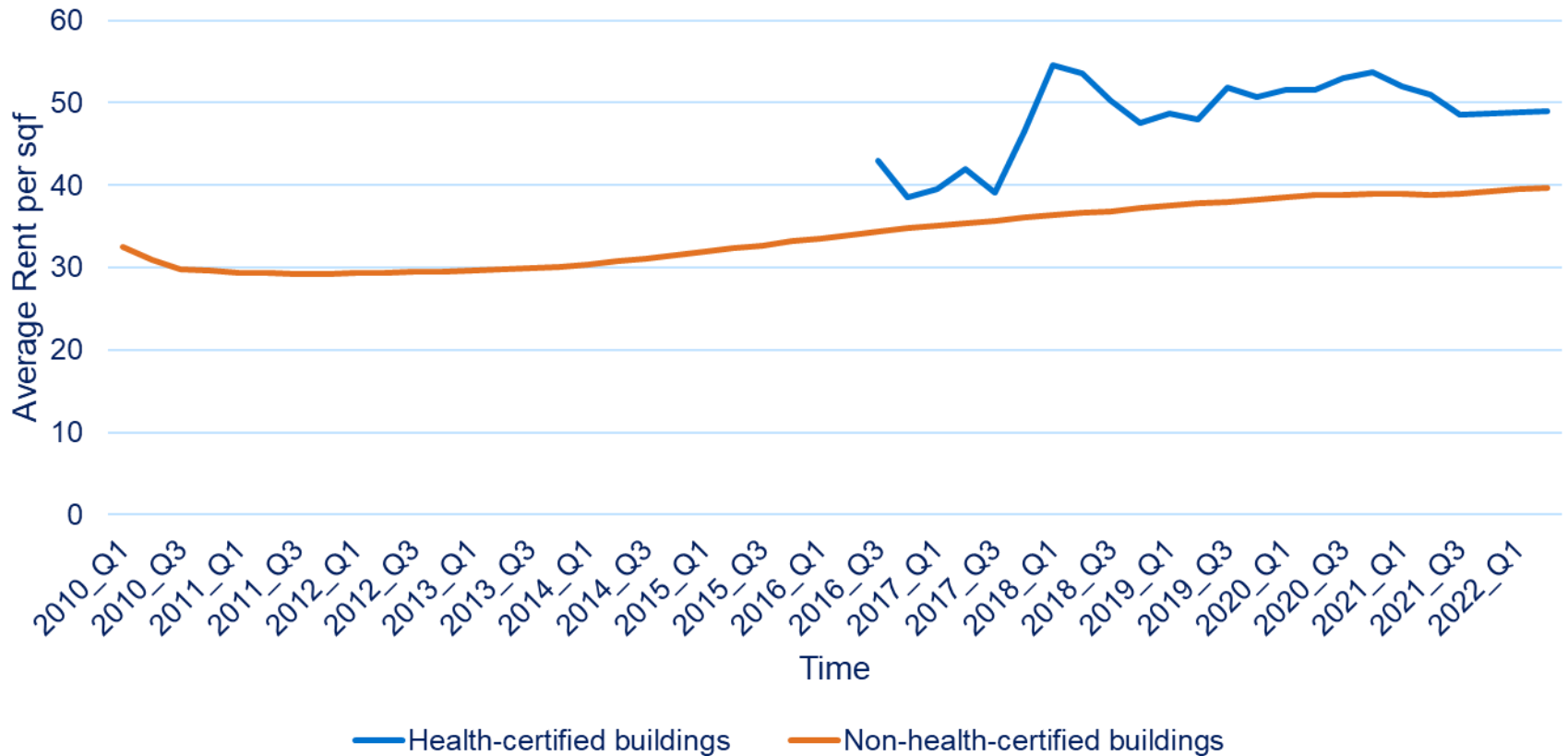
Atlanta is a Car-Dependent city

Most errands require a car.



Source: Maps by Google and Walk Score (2022). *Walk Score*. https://www.walkscore.com/NY/New_York; <https://www.walkscore.com/CO/Denver>; <https://www.walkscore.com/GA/Atlanta>

Average Rent Comparison of Health-certified and Non-health-certified Buildings



Key Results

- Our US study of health certified office buildings indicates office buildings with a healthy building certification associated with a significant rental premium
- Impact of air quality level on rents as expected
- Distance to nearest hospital is negatively associated with office rents but quality rating of nearest hospital does not show the expected sign
- Real estate assets in walkable neighbourhoods command a rental premium (even after controlling for submarkets)

Multiple Natural Hazards and Rental Properties in Switzerland

- Hedonic price analysis linking rental transactions to flood, debris-flow, and landslide hazards
- Nationwide dataset of leases matched with high-resolution hazard maps
- Key result: statistically significant rental discounts for properties exposed to multiple hazards
- Effects are strongest for high-frequency flood and debris-flow risks



Climate Change & House Prices in the Swiss Alps

- Sample: 303 municipalities, 38 ski areas (2001–2019)
- House prices in ski resorts depreciate 3.6–6.0% per +1°C mean winter temperature
- No significant effect in non-ski municipalities
- Major resorts: ~0.2–0.33% lower annual appreciation per +1°C
- Market value shifts from lower-elevation to higher-elevation resorts

Conclusion: higher and colder ski resorts experienced greater price increases than lower and warmer resorts.

Climate Risk Management 49 (2025) 100728



Contents lists available at ScienceDirect

Climate Risk Management

journal homepage: www.elsevier.com/locate/crm



All downhill from here? Climate change and house prices in the Swiss Alps

Floris Jan Blok^{*}, Franz Fuerst

Department of Land Economy, University of Cambridge, 17 Mill Lane, Cambridge CB2 1RQ, UK

ARTICLE INFO

Keywords:
Climate change
Real estate investment
Ski tourism
Regional economy
Swiss Alps

ABSTRACT

This paper investigates the relationship between climate (change) and house price development in the Swiss Alps, testing the hypothesis that house-buyers in ski resorts switch from lower-lying, less snow-secure resorts to high-altitude areas with reliable snow cover. The analysis employs a sample of 303 Swiss municipalities across 38 different ski areas from 2001 to 2019. Regressions of municipal-level house price changes on altitude, temperature, and snow cover changes reveal that house prices in ski resorts have depreciated by 3.6–6.0 % per degree Celsius mean winter temperature over the 10-year period. Temperature emerged as a better predictor of house price change than altitude. For municipalities outside ski areas, this relationship between climatic variables and price appreciation does not hold. Perhaps surprisingly, no significant direct link between changes in snow cover and house prices is found. The results suggest that secondary and lower-lying ski areas have experienced relative losses in real estate asset values, possibly transmitted by changing local economic conditions.

1. Introduction

Whether the expected effects of climate change are capitalized into real estate is still an open question. Studies from coastal areas exposed to sea level rise (SLR) find mixed results: Murfin and Spiegel (2020) and Fuerst and Warren-Myers (2021) find no evidence that differences in time until inundation result in price differences between coastal properties. When accounting for heterogeneous climate change beliefs however, multiple studies find that SLR is priced into real estate only if enough people in the area are concerned about it (Bakkensen and Barrage, 2022; Baldauf et al., 2020; Bernstein et al., 2019; Giglio et al., 2021).

Two major challenges complicate the price-estimation of SLR – and the effects of climate change more generally – in real estate. Firstly, current climate risks such as flooding are highly correlated with increased future risk levels. Secondly, pricing future effects is sensitive to the choice of discount rate. A small strand of recent literature has therefore taken a different approach, and instead studies if climate change exposure affects the return on real estate (Keenan et al., 2018; Keys and Mulder, 2020; McAlpine and Porter, 2018; Tyndall, 2023). Results are more consistent here and higher relative elevation is associated with a higher rate of appreciation in low-lying coastal areas in the US, implying substantial price differences should emerge over time between SLR-exposed and unexposed properties.

This study investigates whether the same holds true in the Swiss Alps, where homes face no threat from SLR, but climate change reduces the ability to practice winter sports, especially at lower altitudes (François et al., 2023; Marty et al., 2017; Spandre et al.,

^{*} Corresponding author.

E-mail address: fjb49@cam.ac.uk (F.J. Blok).

<https://doi.org/10.1016/j.crm.2025.100728>

Received 24 January 2025; Received in revised form 10 June 2025; Accepted 11 July 2025

Available online 13 July 2025

2212-0963/© 2025 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

What does all this mean for Baukultur?

- The economic case for buildings with high Baukultur, sustainability and health credentials relies on **market forces** recognising the value of benefits to users and society
- Empirical evidence supports the proposition of higher asset values, rents, occupancy rates and lower risk for high-quality buildings
- Best practices and local knowledge can be derived from Baukultur for larger benefits . Alliances (e.g. Davos Alliance) helpful for transmission. Regulations (building codes, EE codes such as MEES UK) can provide further embedding of Baukultur into the 'DNA' of construction practices
- Finally: Despite some difficult trade-offs in the scaling up process, Baukultur and green/healthy building business case are largely aligned

Thank you!

Contact details:

Franz Fuerst

Professor of Real Estate and Urban Economics

University of Cambridge

Department of Land Economy

19 Silver Street

Cambridge, CB3 9EP

Email: ff274@cam.ac.uk