

Appraising the risk of climate change

A European overview



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 - ▶ Implications for the building sector
 - ▶ Implications for policy-makers



Background

Climate change risks:

- ▶ fuel prices
- ▶ insurance costs
- ▶ comfort conditions and user satisfaction
- ▶ Obsolescence of assets and envelope characteristics

=> Affect asset value and operational costs

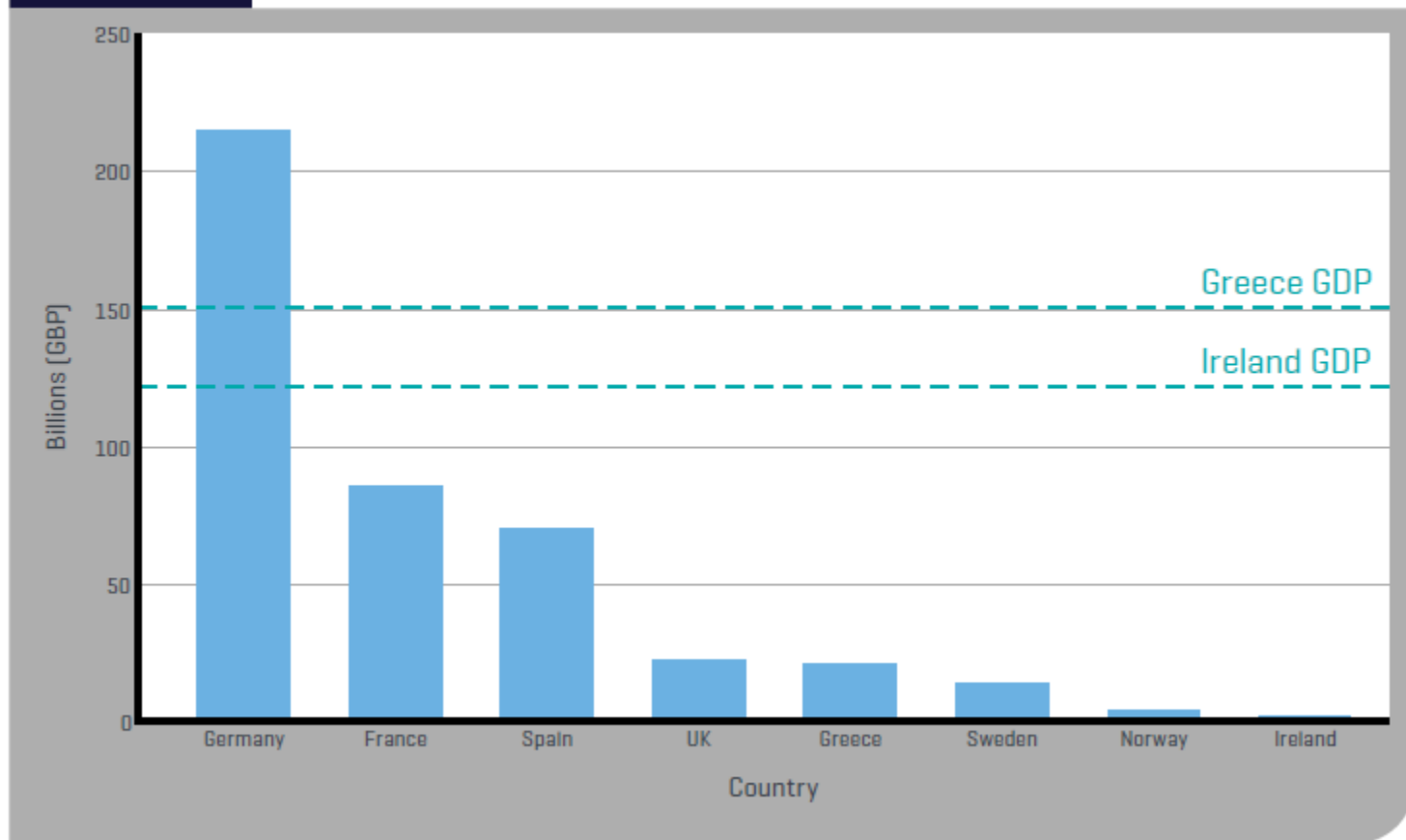
Mitigation strategies, future-proofing and building resilience



Cost of climate change

Figure 1

Breakdown of cumulative climatic cost per country (billion GBP)



Source: Sturgis Carbon Profiling LLP, with additional data from the World Bank (2012)

Climatic Risk Toolkit:
The impact of climate change
in the Non-Domestic Real Estate
sector of eight European countries

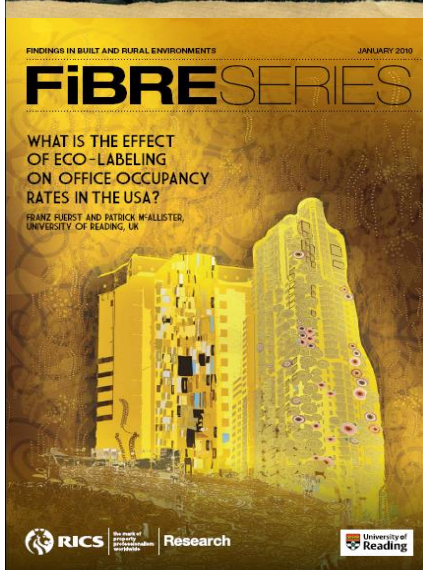
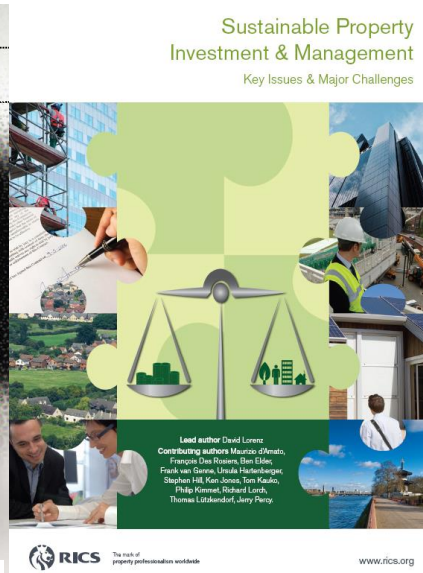
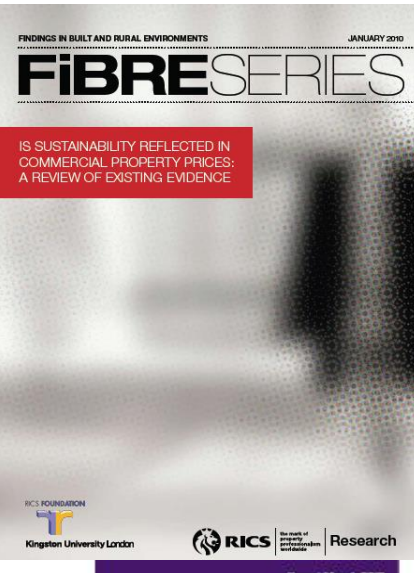
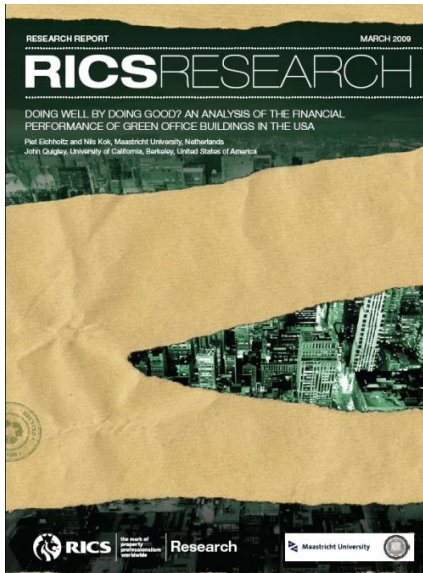
RICS RESEARCH

Non-domestic Real Estate Climate Change Model

Quantifying the sensitivity of carbon emissions and
operating costs to regional climatic impacts.

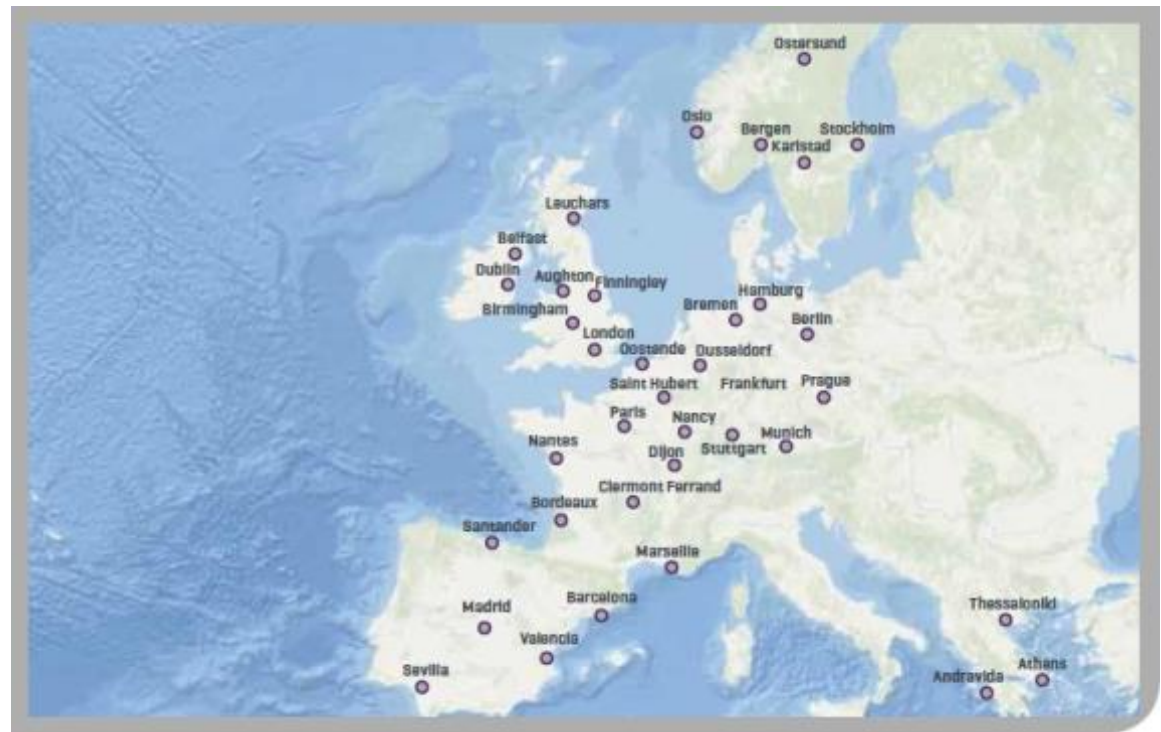


RICS research



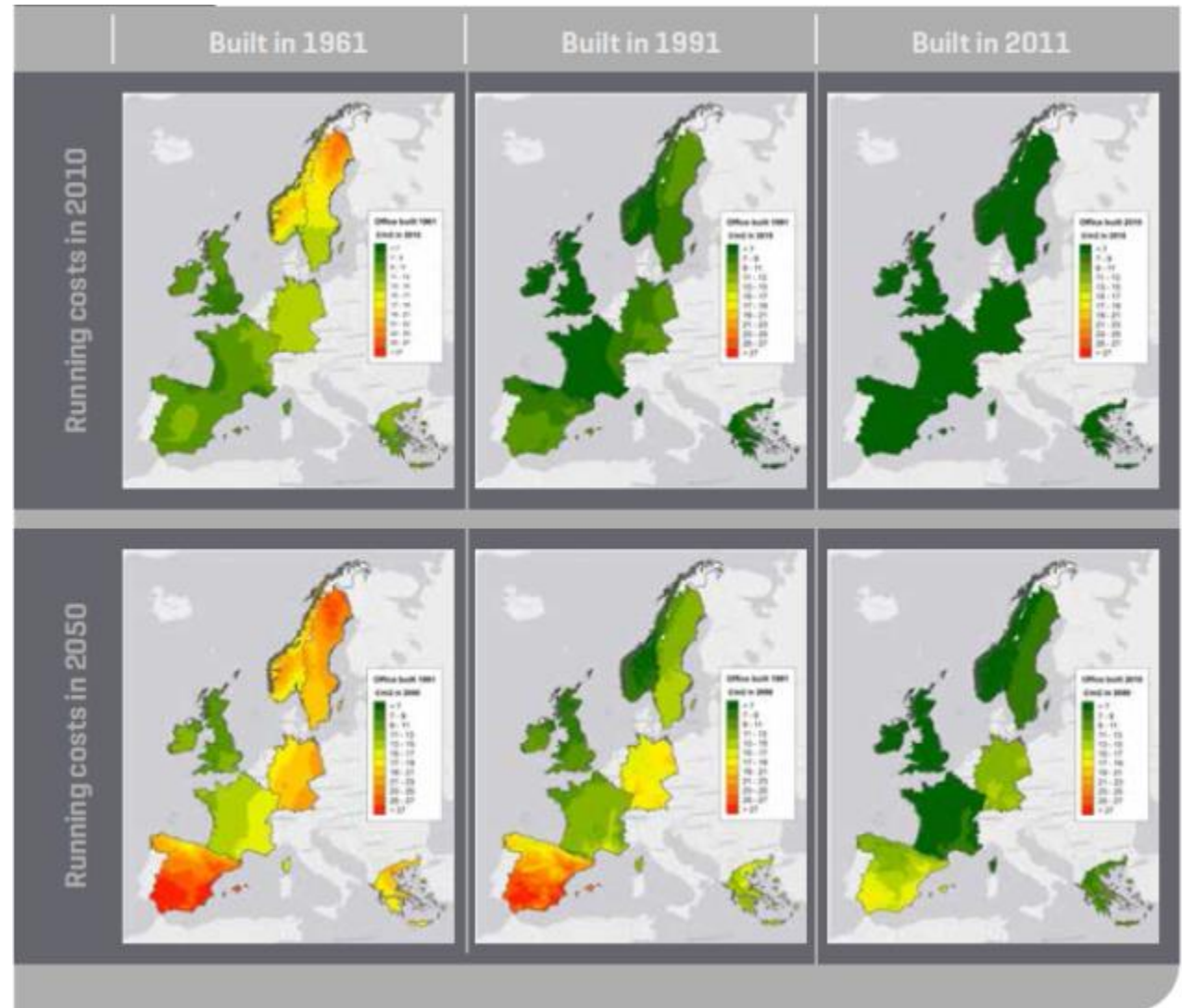
Predictions are based on building performance simulations (Energy Plus)

- Environmental Conditions
- Building Characteristics (geometry, envelope, occupancy, M&E)
- Sample and simulation
- Regression and building adaptability



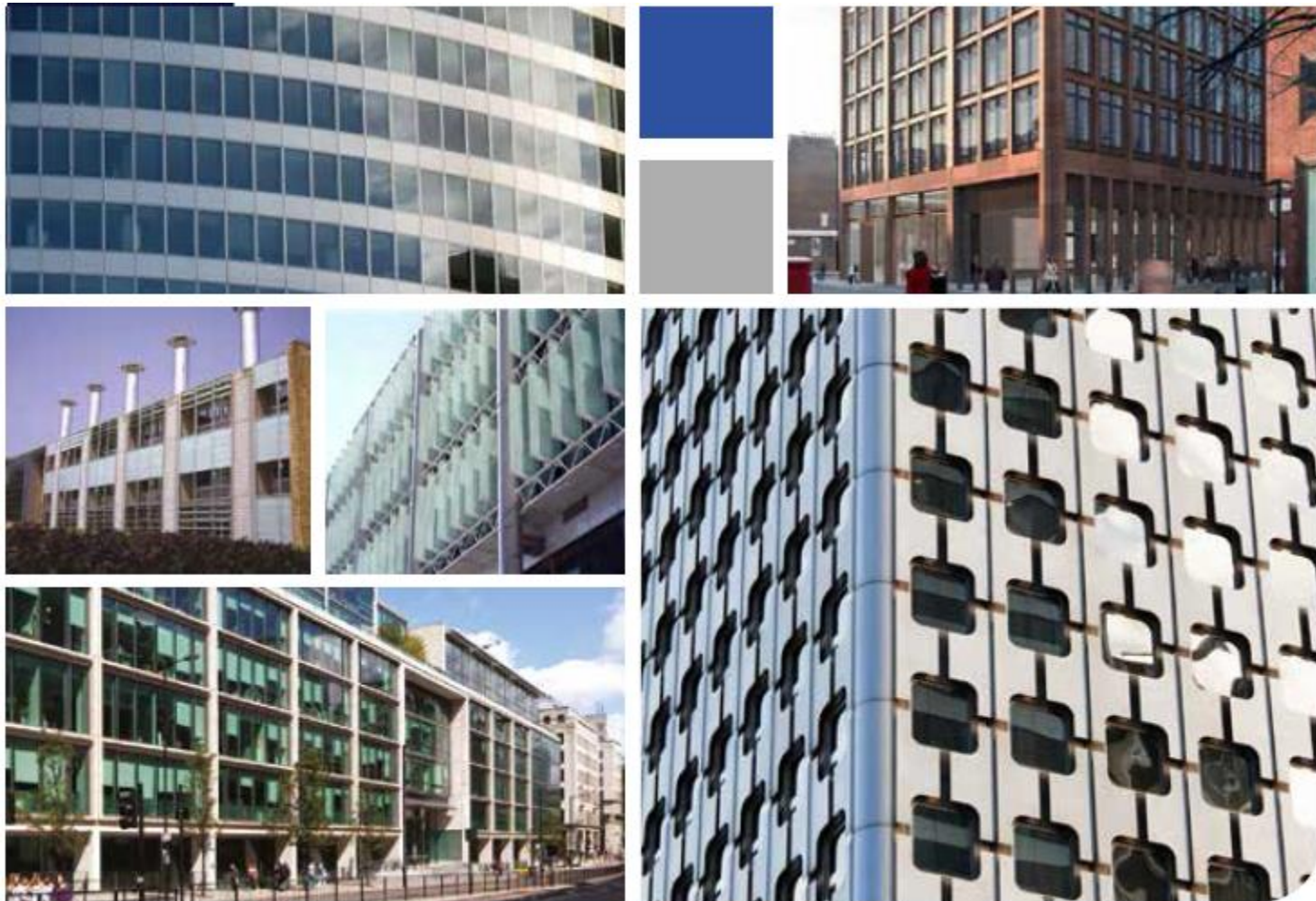
Findings – risks based on building characteristics

Present and future energy costs of buildings at different ages.



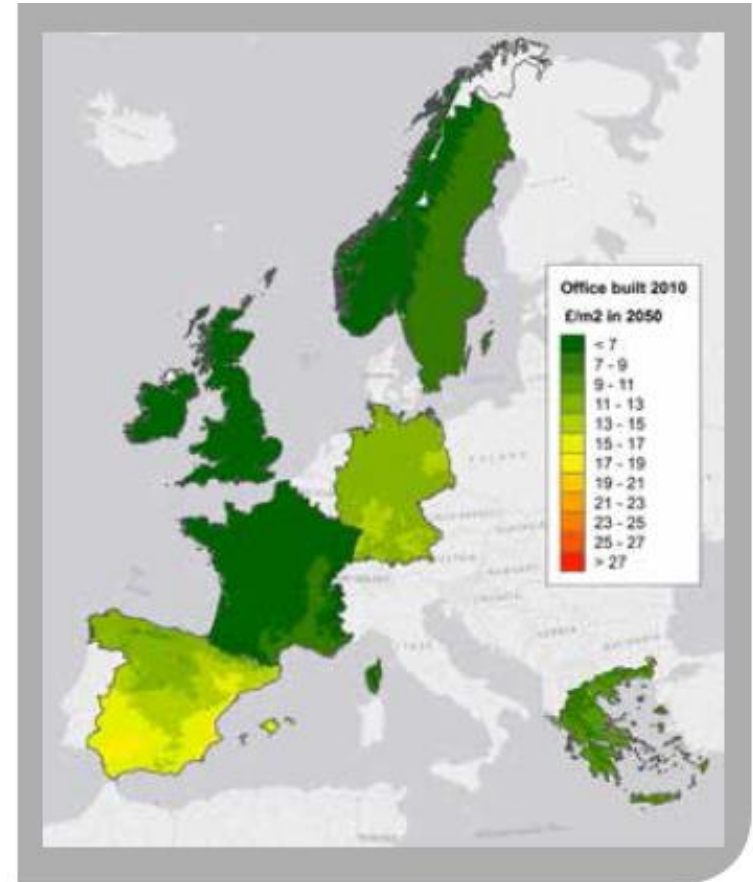
Findings – risks based on building characteristics

- Different glazing ratios



Findings – risks based on building characteristics

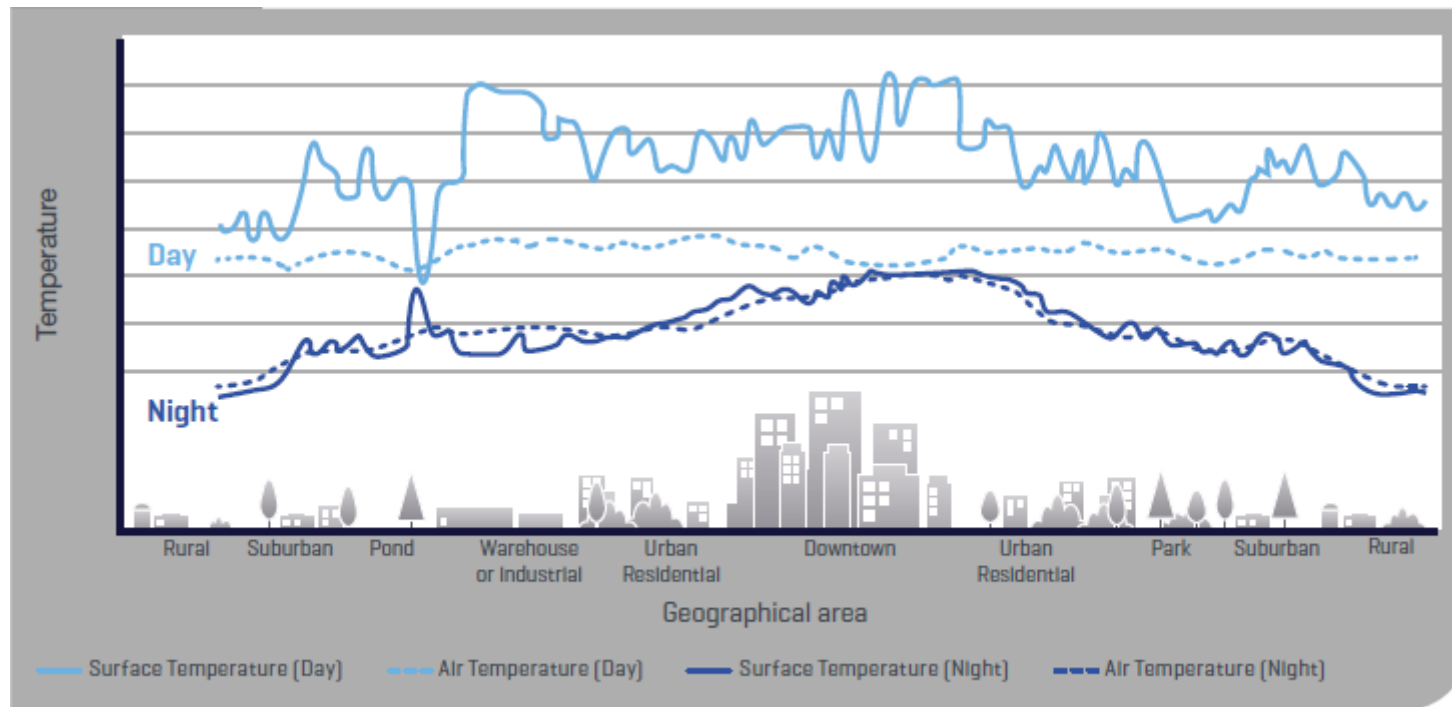
- ▶ Airtightness, ventilation and overheating
- ▶ Assets at risk: buildings with high airtightness and lack of suitable ventilation



New air conditioned office buildings. Energy costs per square meter in 2050

Findings – risks based on building characteristics

- Urban related factors – heat islands



Source: DEFRA

Urban Heat Island Temperature fluctuation over different land use areas

Findings – region based risks: where to invest?

- ▶ Vulnerability to climate change
 - ▶ Temperature change
 - ▶ Extreme weather conditions
 - ▶ Droughts
 - ▶ Rising sea levels



Vulnerability

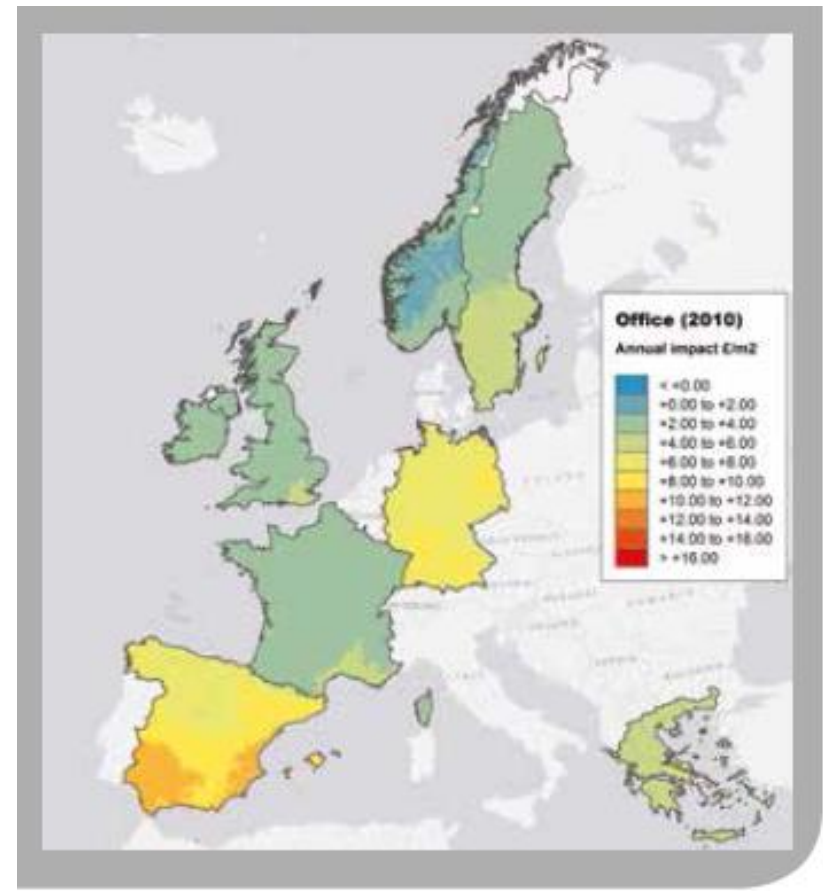
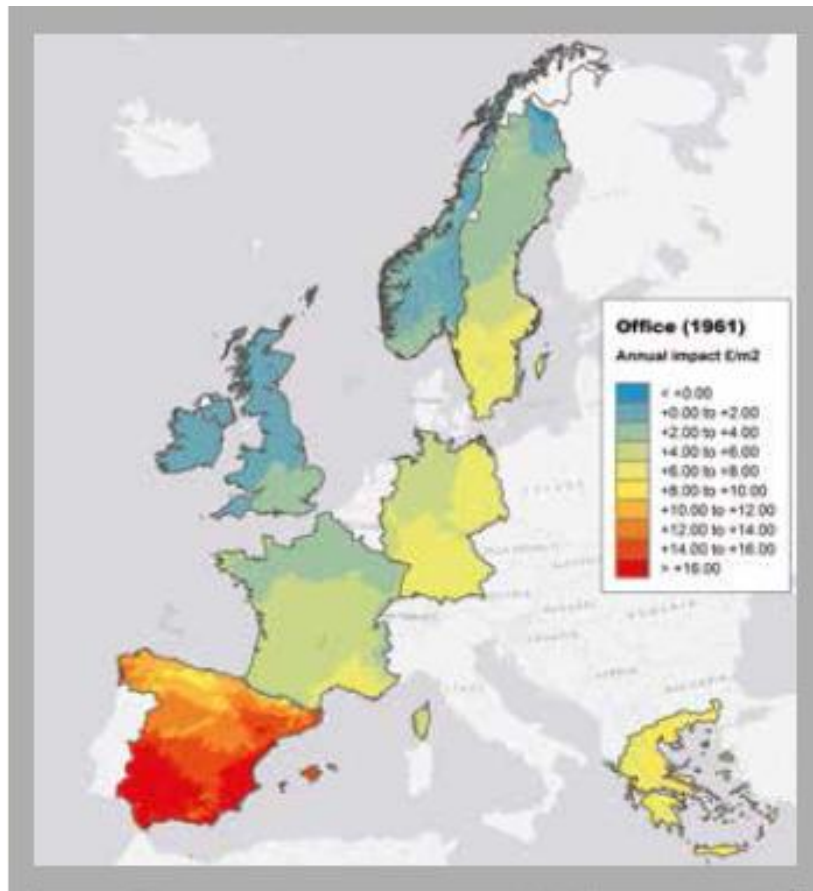


*Integrated Sensitivity and Response Capacity

		Degree of (IS&RC)*				
		1	2	3	4	5
Intensity of Hazard	1	11	12	13	14	15
	2	21	22	23	24	25
	3	31	32	33	34	35
	4	41	42	43	44	45
	5	51	52	53	54	55

Source: Original from European Union (2013). Format modified by Author/
Sturgis Carbon Profiling LLP

Findings – the cost of climate change



Impact of climate change: air conditioned offices built in 1961 and 2010.
Predicted variations on energy bills in 2050.

Findings – indicative cost per country

Table 1

**Cost of Climate Change: Extra annual cost and cumulative cost in 40 years
– Comparison with GDP and per capita**

Country	TOTAL NIA ¹ (office, hospital, retail, education)	Extra cost of climate change ²	Cumulative cost in 40 years ²	GDP ³	% GDP annual ^{4,5}	Extra cost per capita ^{4,5}
	m ²	million GBP per year	million GBP	million GBP per year		GBP per year
Sweden	111,100,000	18.98	15,600	312,000	5.0%	2.06
Norway	74,070,000	6.24	5,100	297,000	1.7%	1.22
Germany	1,110,700,000	271.77	222,800	2,040,000	10.9%	3.31
Ireland	32,770,000	3.86	3,200	125,000	2.5%	0.86
France	718,000,000	109.14	89,500	1,554,000	5.8%	1.70
Spain	236,100,000	89.87	73,700	802,000	9.2%	1.96
Greece	100,160,000	27.38	22,500	148,000	15.2%	2.45
UK	310,000,000	29.48	24,200	1,448,000	1.7%	0.48
Total	2,692,900,000	556.70	456,500	6,726,000	6.8%	1.96

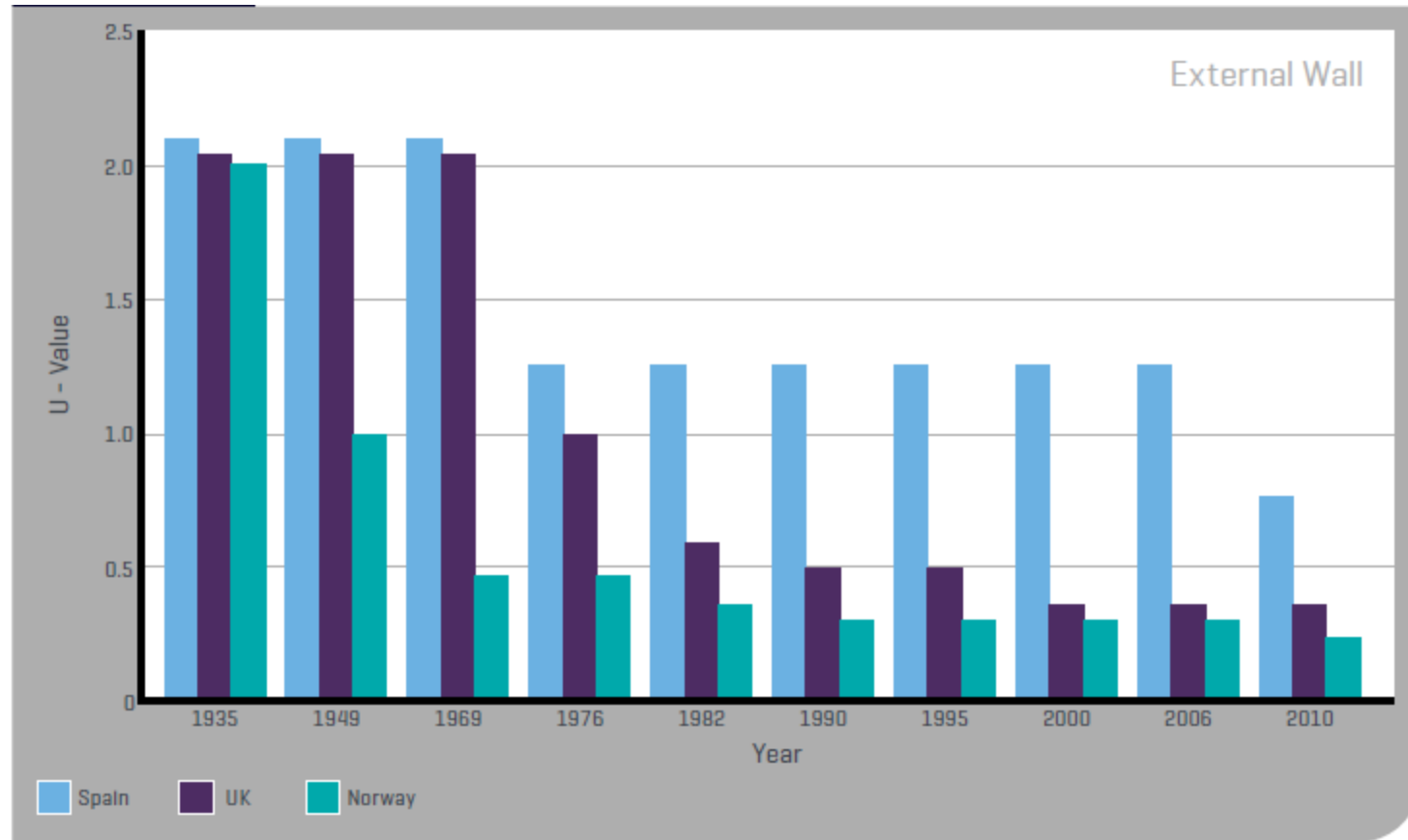
Source: ¹BPIE (2014) ²Sturgis Carbon Profiling LLP ³World Bank (2012) ⁴European Union (2014) ⁵Statistics Norway (2014)

Implications for the building sector

- ▶ Buildings in south and central Europe will be at higher climatic risk
- ▶ The retail sector will face particularly high energy bills
- ▶ Newer buildings generally perform better than older ones, but ventilation strategies will need to be adapted to dissipate more heat
- ▶ Despite of lower energy demand, bills will increase for most buildings due to higher energy prices



Policy relevance

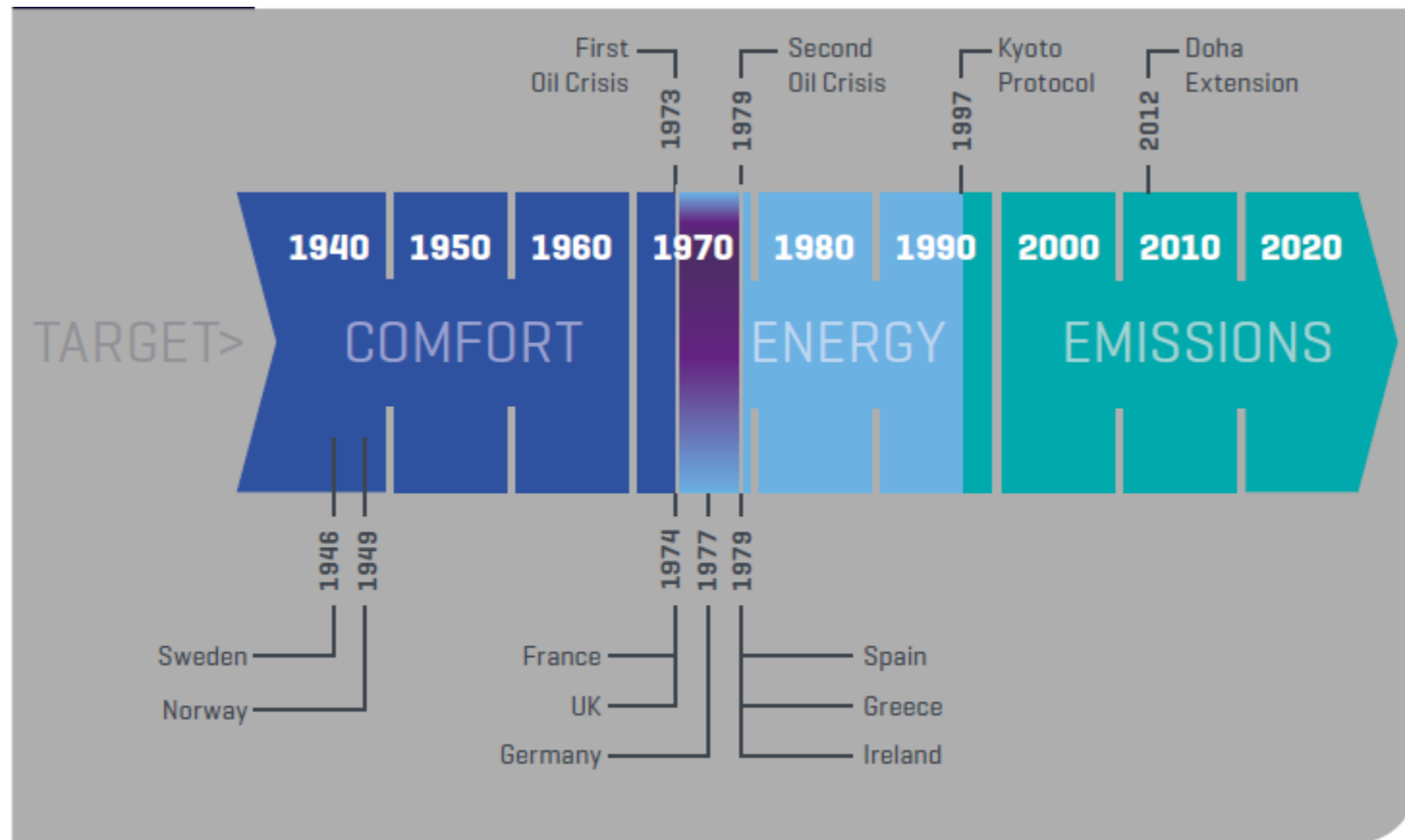


Source: Sturgis Carbon Profiling LLP

- National building regulation: historic evolution of minimum thermal requirements for external walls

Policy relevance

- Implementation of building regulations



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