Creating the conditions for large scale retrofit to drive down CO_2 emissions

14th March 2012

Chris Jofeh

Key messages of this talk

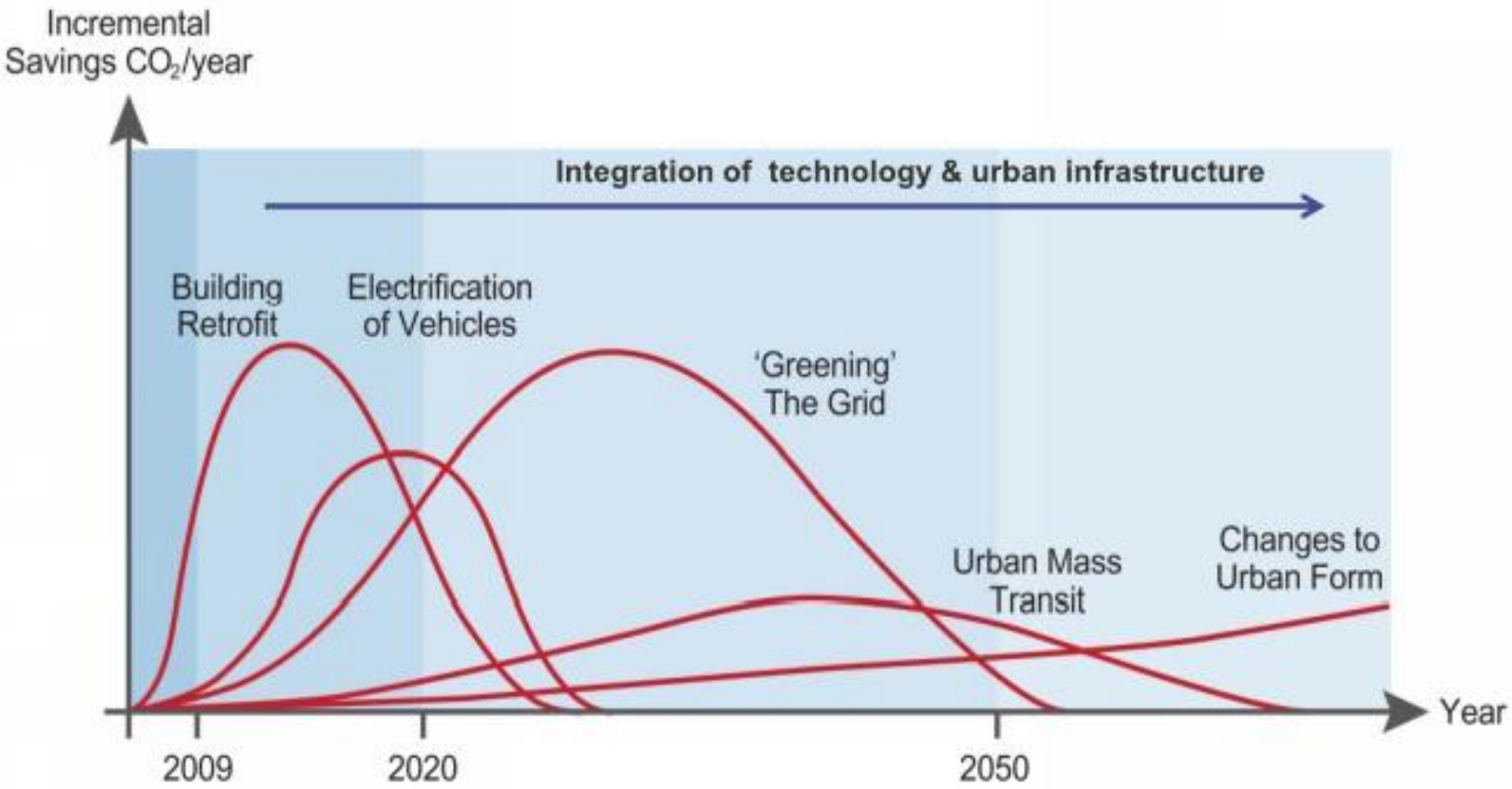
- To achieve 3% year on year reductions in GHG emissions from Welsh buildings requires work at very large scale
- Procurement at very large scale can produce significant economies
- We can learn from the experience of cities around the world in governance, financing and procurement
- It is an essential component of the strategy that energy-efficient buildings become worth more than energy-inefficient ones.

Structure of this talk

- UK pathway to 2050
- Wales's progress so far
- World Economic Forum
- World cities
- UK cities
- Economies of scale
- Wales domestic retrofit
- Small Welsh towns

UK – big picture

National target – 80% reduction in greenhouse gas emissions by 2050 (1990 baseline)



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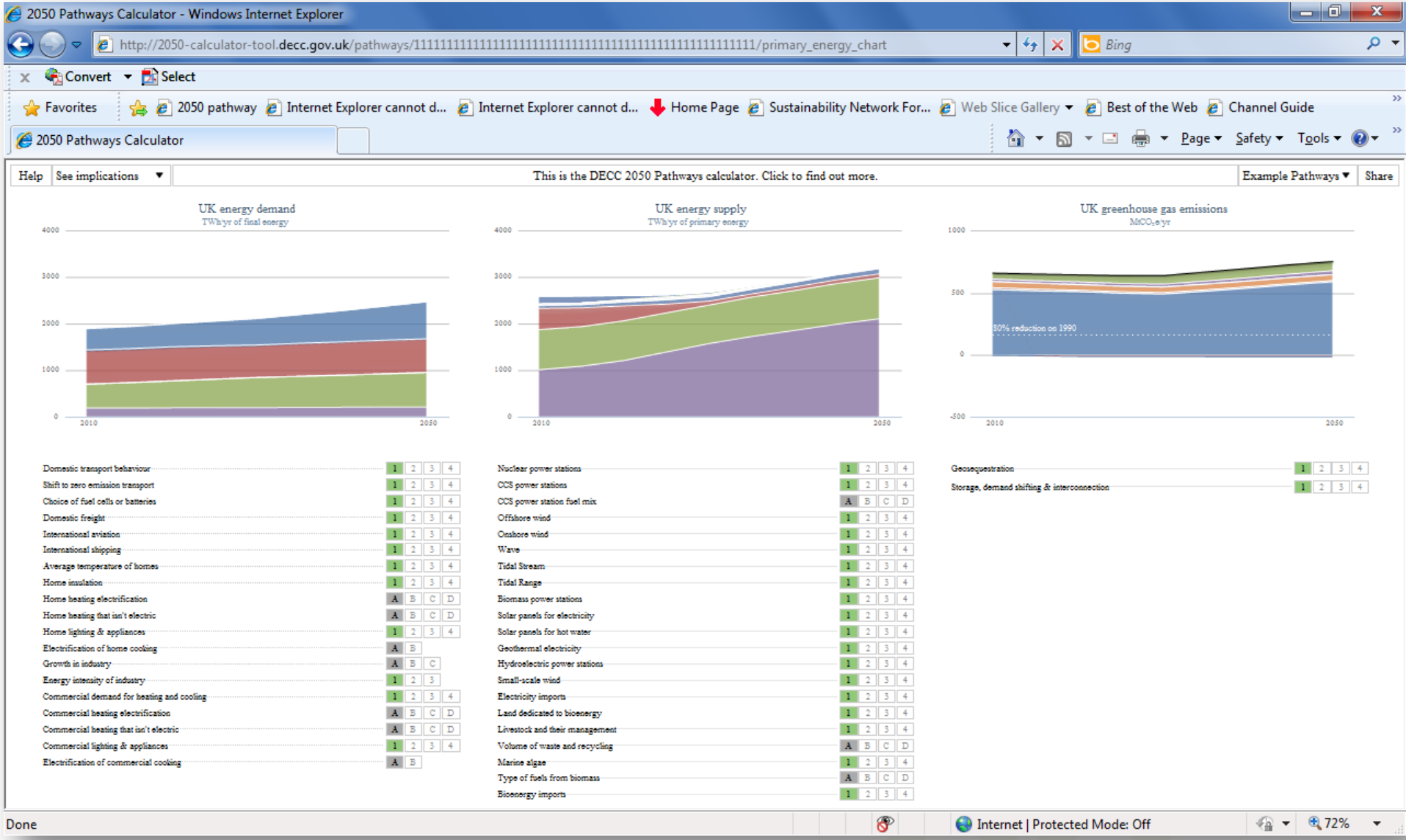
UK – where and when will carbon savings occur?



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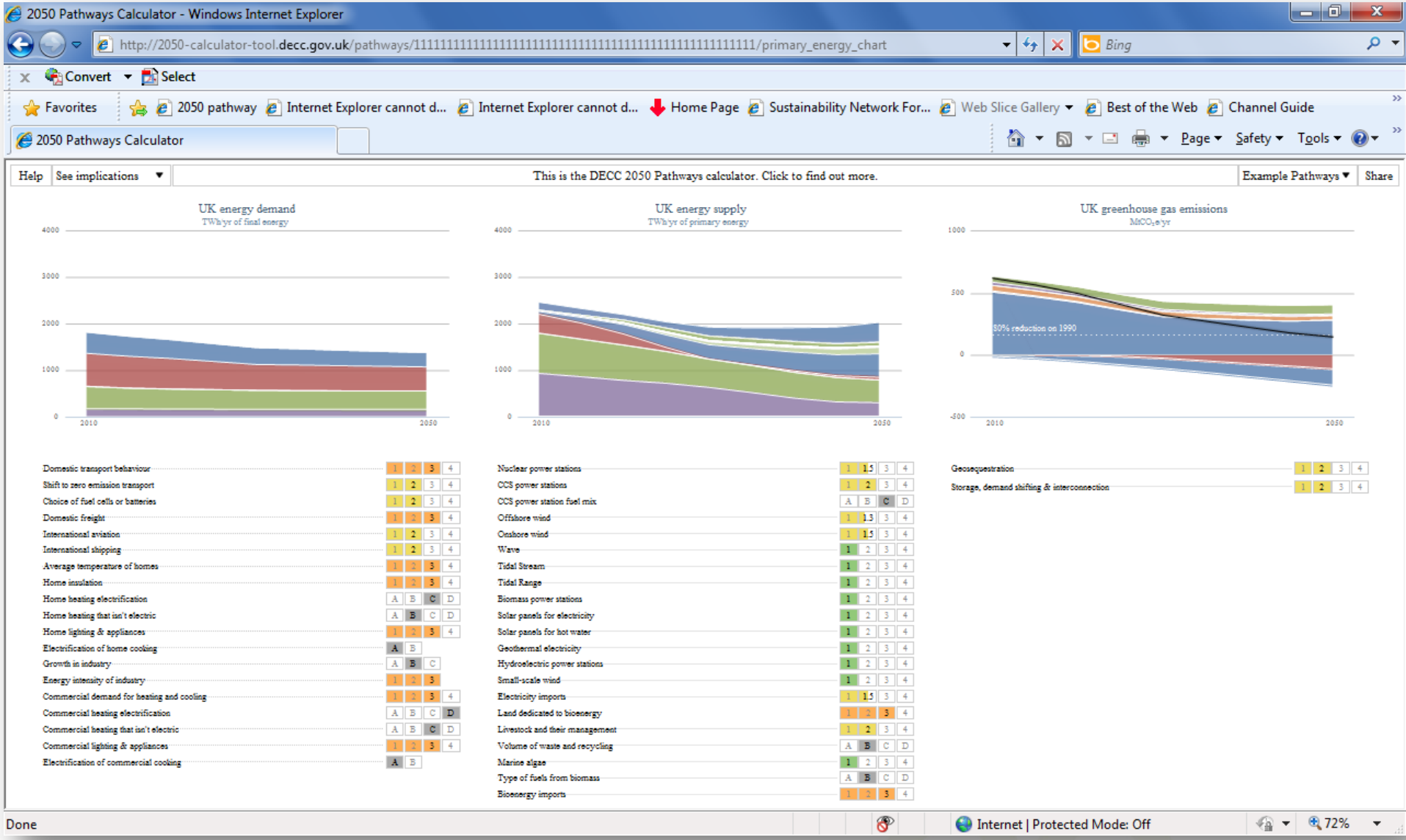

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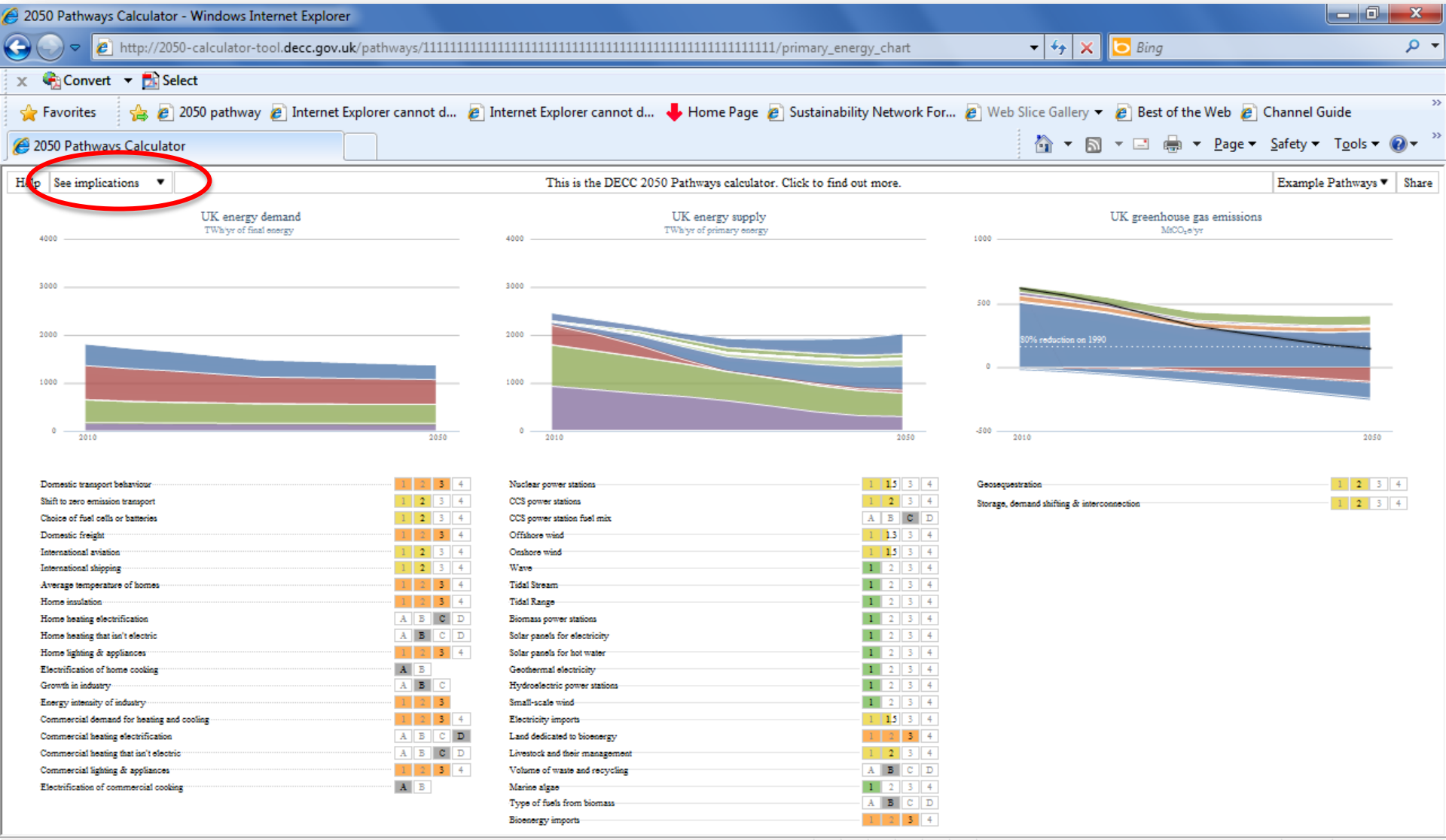
DECC 2050 pathways – carbon capture and storage; bio energy



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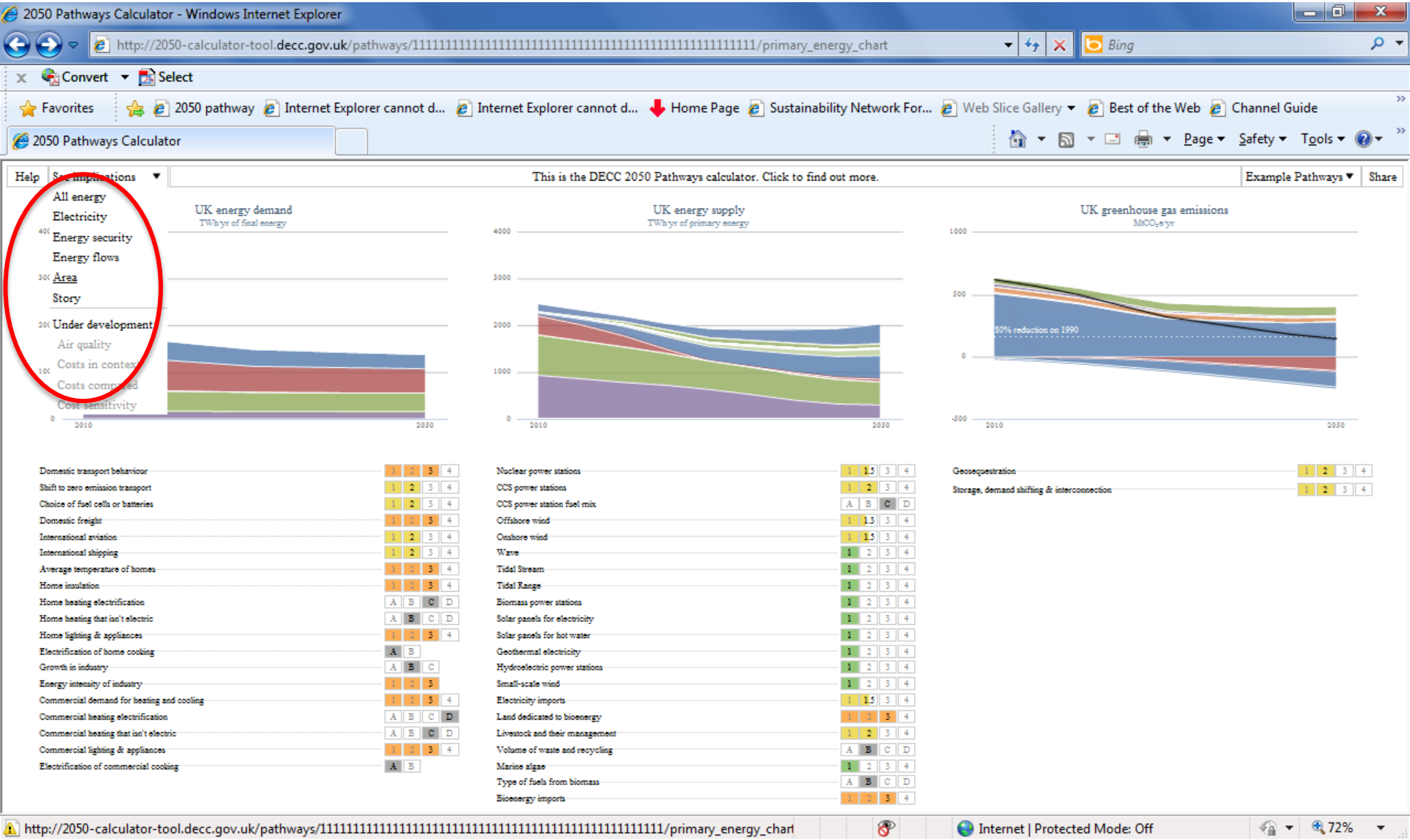
DECC 2050 pathways - implications



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DECC 2050 pathways – implications - area

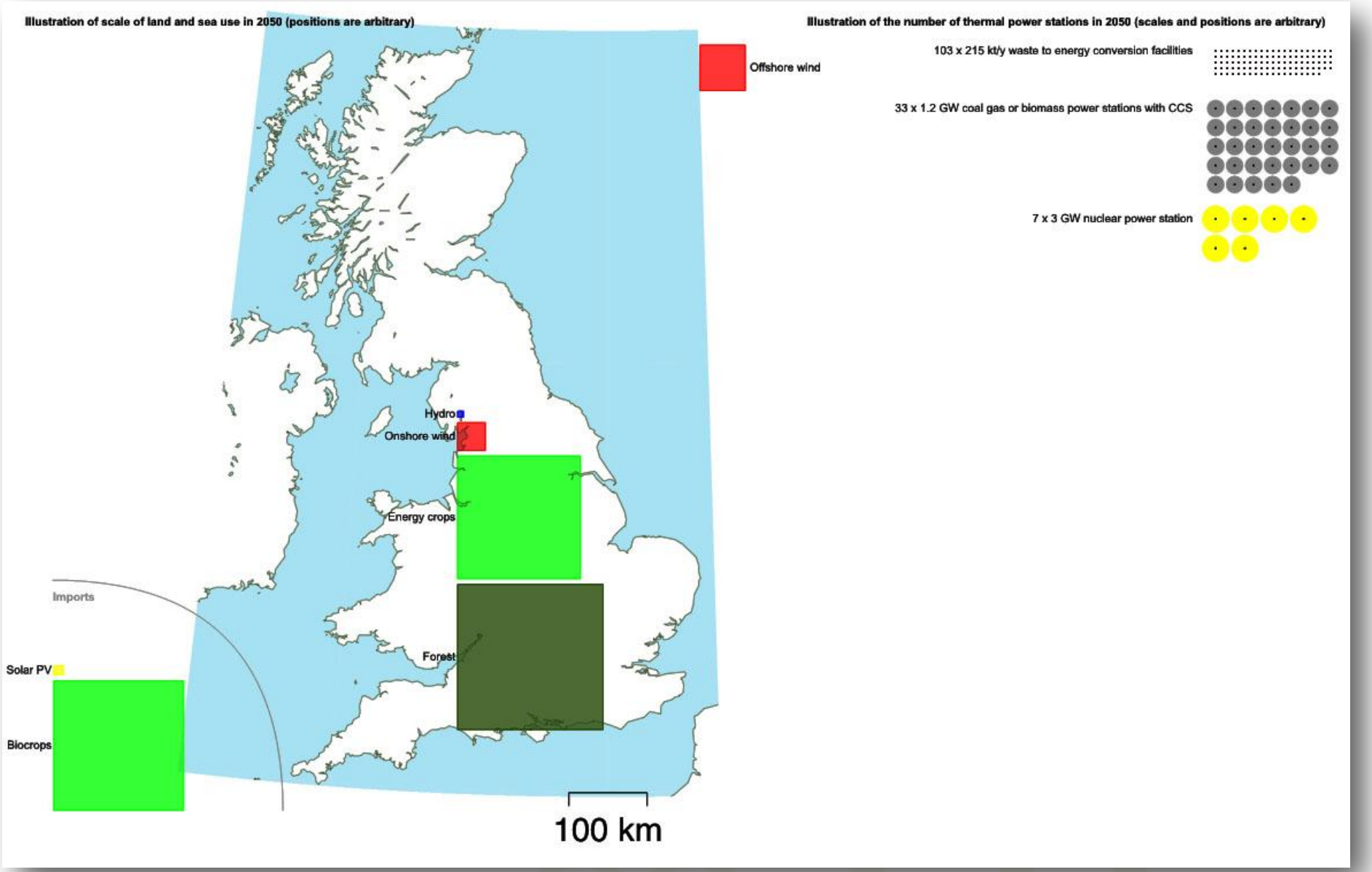
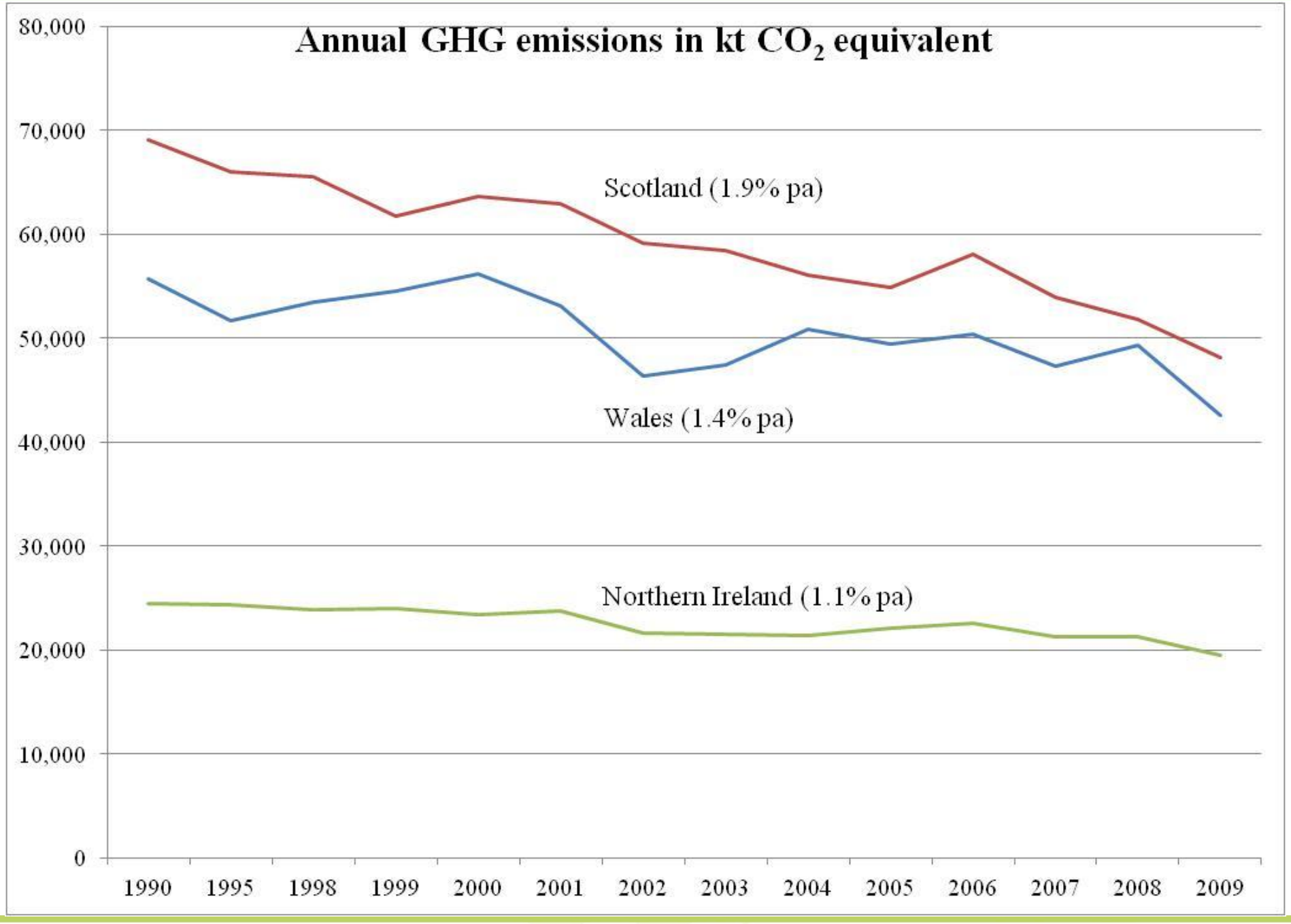


Illustration of scale of land and sea use in 2050 (positions are arbitrary)
Offshore wind
Hydro
Onshore wind
Energy crops
Imports
Forest
Solar PV
Biocrops
100 km
Illustration of the number of thermal power stations in 2050 (scales and positions are arbitrary)
103 x 215 kt/y waste to energy conversion facilities
33 x 1.2 GW coal gas or biomass power stations with CCS
7 x 3 GW nuclear power station


Annual GHG emissions in kt CO_2 equivalent
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Scotland (1.9% pa)
Wales (1.4% pa)
Northern Ireland (1.1% pa)
1990
1995
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009

World Economic Forum

Retrofit Finance & Investing Project

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

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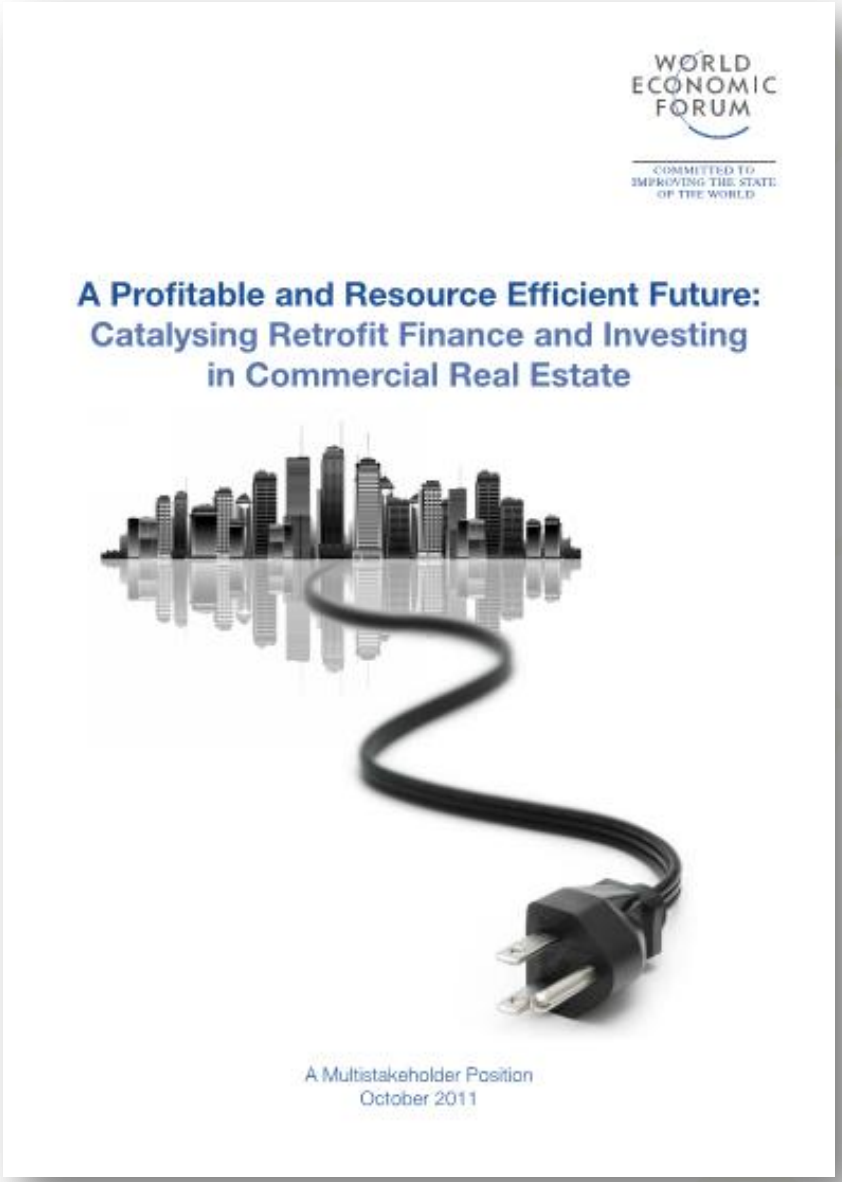


Help make building retrofits a scalable endeavour

- Research in Germany, China, Japan, US, UK, and Australia
- Recommendations for policy-makers to stimulate energy efficiency investments in existing commercial buildings

Project Chair

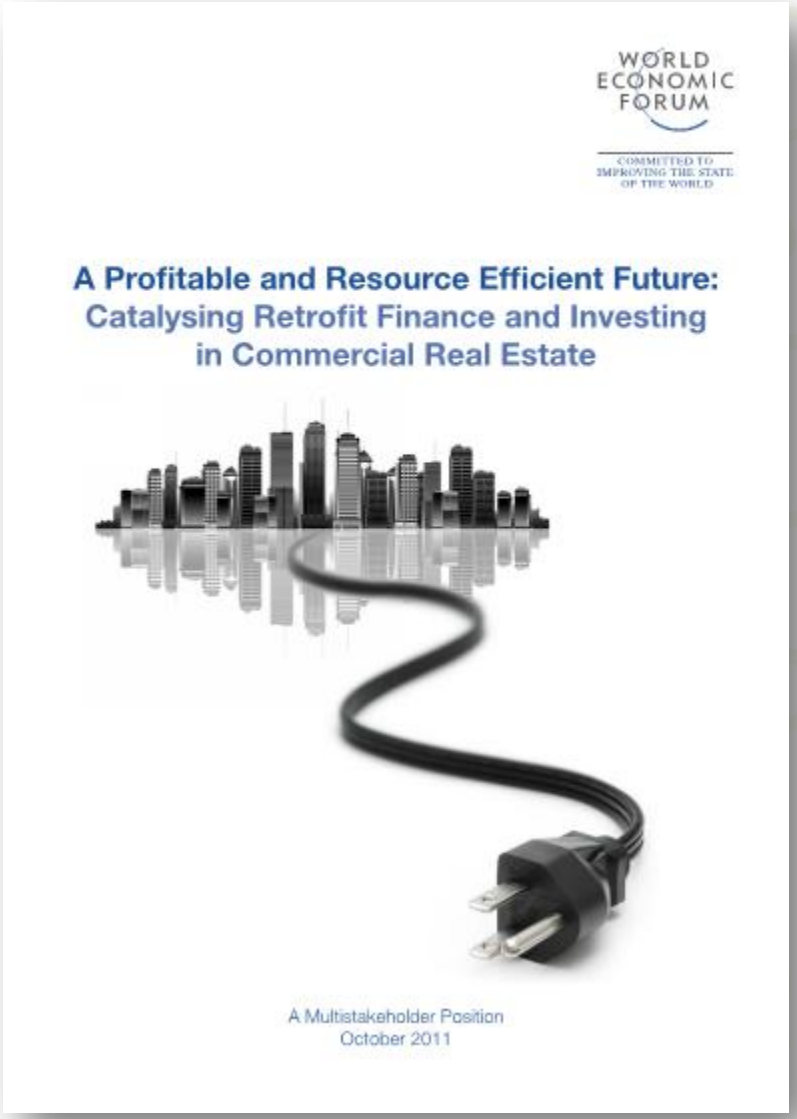
Initial Project Concept and Presentation in Davos, Switzerland

Colin Dyer, Jones Lang LaSalle

Steering Board

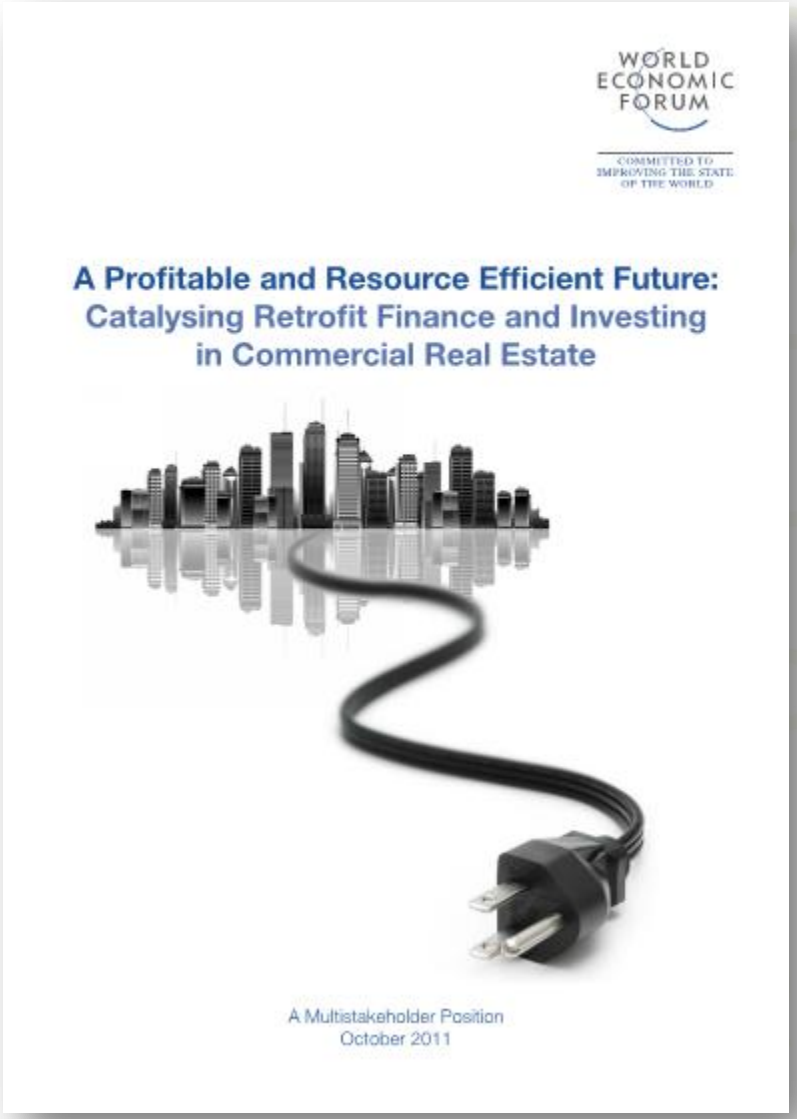
Overall project direction and decision-making

Allianz
Arup
BASF
Citi
Deutsche Bank
GE
Greenprint Foundation
Hirco
Jones Lang LaSalle
Marsh McLennan
Siemens
Skanska
Urban Land Institute
US Department of Energy
US Green Building Council
UNEP Finance Initiative



Key observations:

- Retrofit markets for commercial buildings are in their infancy with indications of growing demand.
- Building owners will rarely make retrofitting a priority unless government makes it a priority and businesses see it as providing a clear return on investment.
- Government holds power as the single greatest catalyst to spark demand and provide structure for all stakeholders to participate.

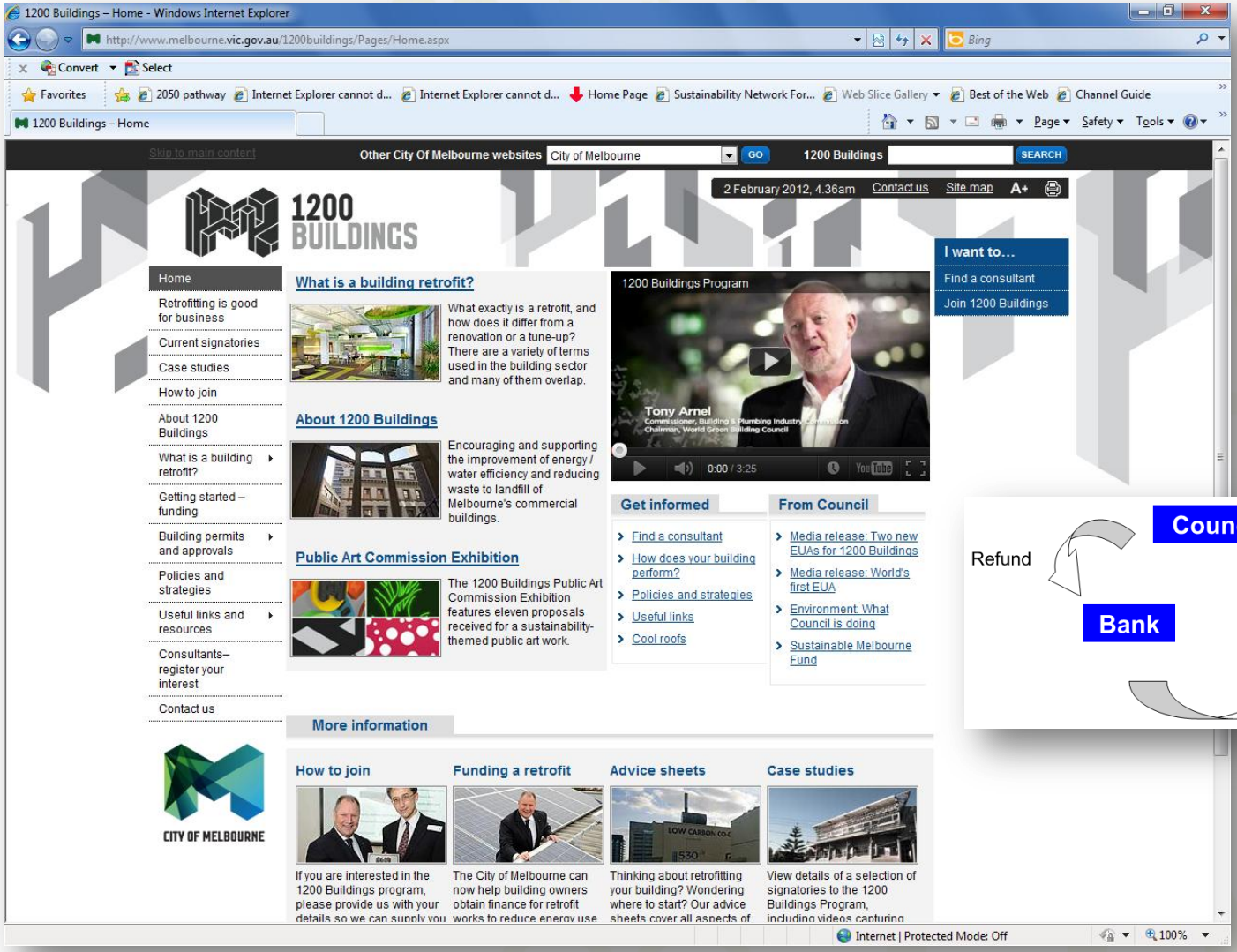


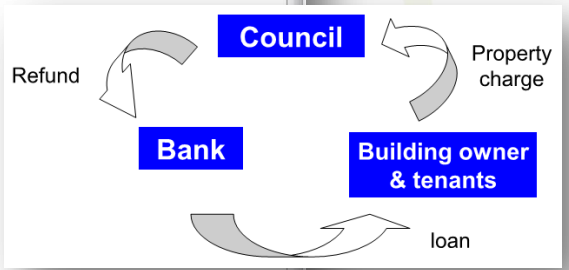
Foundational Recommendations to Enable a Market

- Establish a centralized database
- Require mandatory disclosure of utility consumption
- Establish a standard asset efficiency rating system

World cities

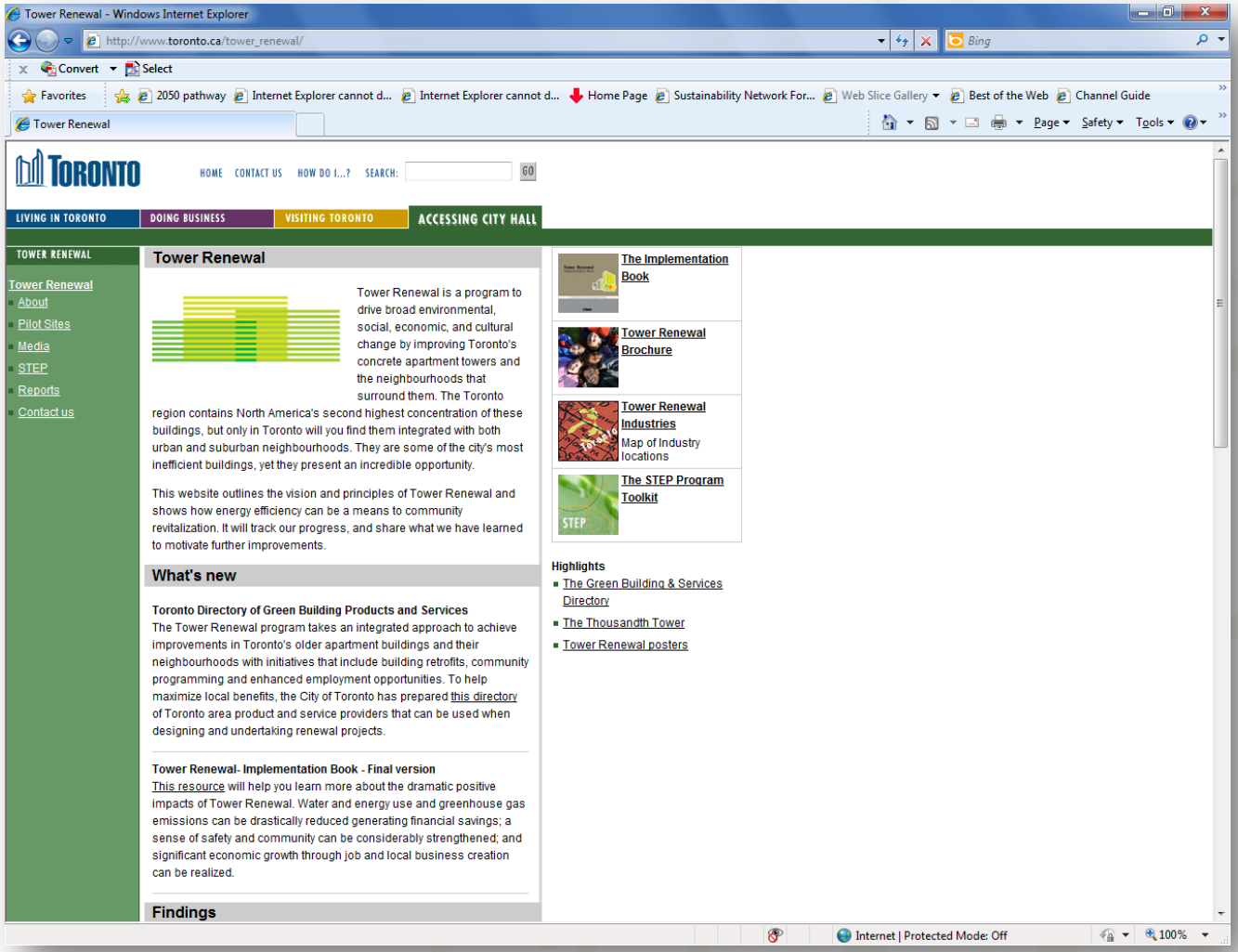
City of Melbourne – 1200 Buildings





Wilshire Center Business Improvement District, Los Angeles, California - 1100 buildings

Mayor's Tower Renewal Project, Toronto – over 1000 buildings



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Commercial property – the link between sustainability and value

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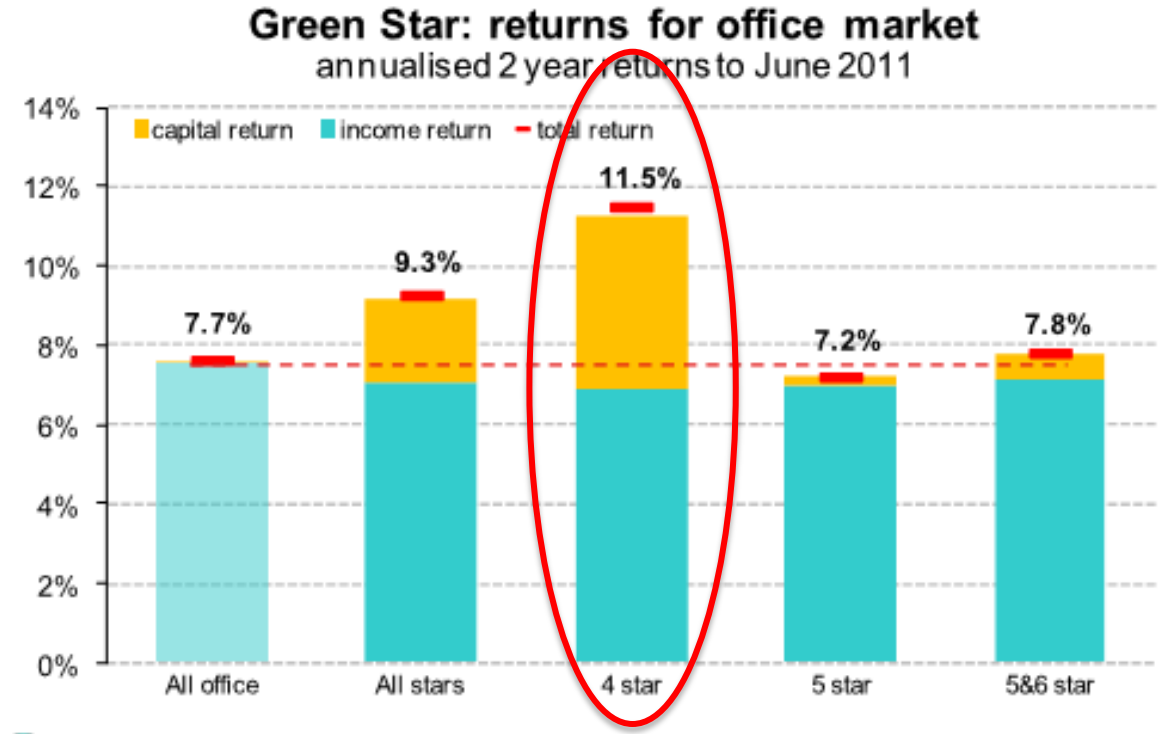
Returns for Green Star rated buildings

Green Star rated buildings deliver higher returns than non-rated buildings



Source: GBCA & IPD Research.

- The return spread between Green Star rated and all office buildings is c160bps.
- The outperformance of 4 Star rated buildings to 5 & 6 Star may reflect: a) a lower construction cost; hence its payback profile will be shorter; or b) a more robust tenancy profile especially when market conditions are sluggish.

Portfolio Greenness and the Financial Performance of REITs

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October 2011

There is an increasing body of evidence on the financial performance of "green" commercial properties, but not much is known about the implications of investments in such buildings for property companies. This paper investigates the effects of the energy efficiency and sustainability of commercial properties on the operating and stock performance of a sample of US REITs, providing insight into the net benefits of "green" buildings. We match data on LEED and Energy Star certified buildings with detailed information on REIT portfolios and calculate the share of "green" properties for each REIT over the 2000-2011 period. In order to control for the endogeneity between environmental and financial performance, we use two instrumental variables – locational greenness and local environmental government policies. We estimate a two-stage regression model and document that the greenness of REITs is positively related to three measures of operating performance – return on assets, return on equity and the ratio of funds from operations to total revenue. We also document that there is no significant relationship between the greenness of property portfolios and abnormal stock returns, suggesting that stock prices already reflect the higher cash flows deriving from investments in more efficient properties. However, REITs with a higher fraction of "green" properties display lower market betas, which may be related to their reduced exposure to shocks in energy prices and environmental legislation.

JEL Codes: G51, M14, D92

Keywords: Energy Efficiency, Real Estate, REITs, LEED, Energy Star, Financial Performance

Financial support for this research was provided by ECCE, the European Centre for Corporate Engagement, and METEOR, the graduate school of Maastricht University's School of Business and Economics. Kok is supported by a VENI grant from the Dutch Science Foundation (NWO).

Portfolio 'greenness'

→Improved operating performance

→ Reduced risk

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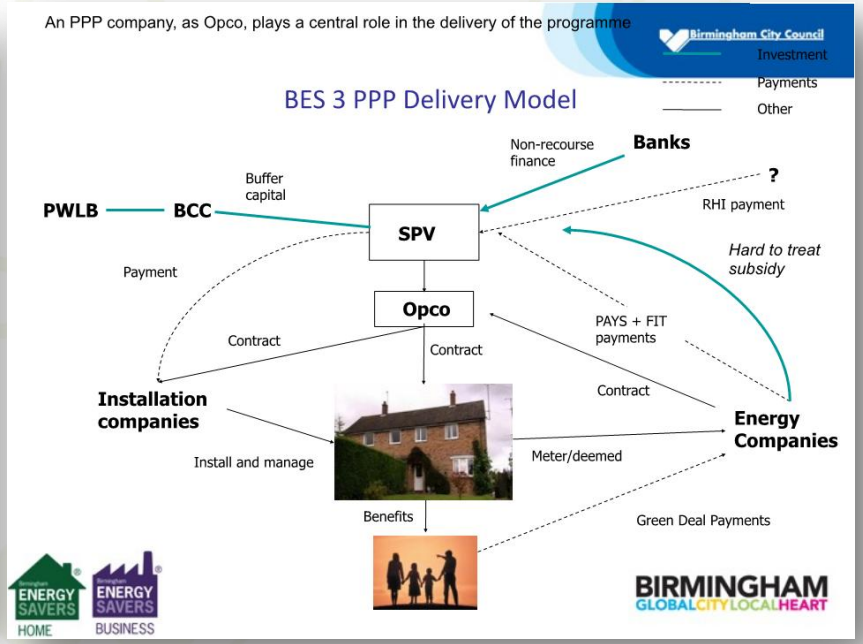
UK cities

National target – 80% reduction in greenhouse gas emissions by 2050 (1990 baseline)

Birmingham Energy Savers



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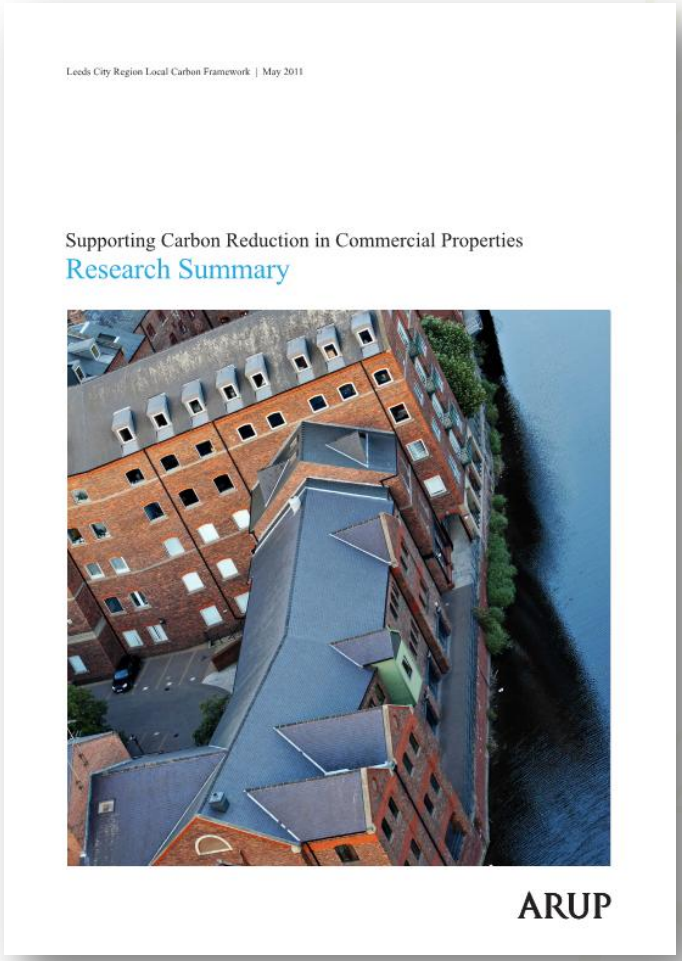
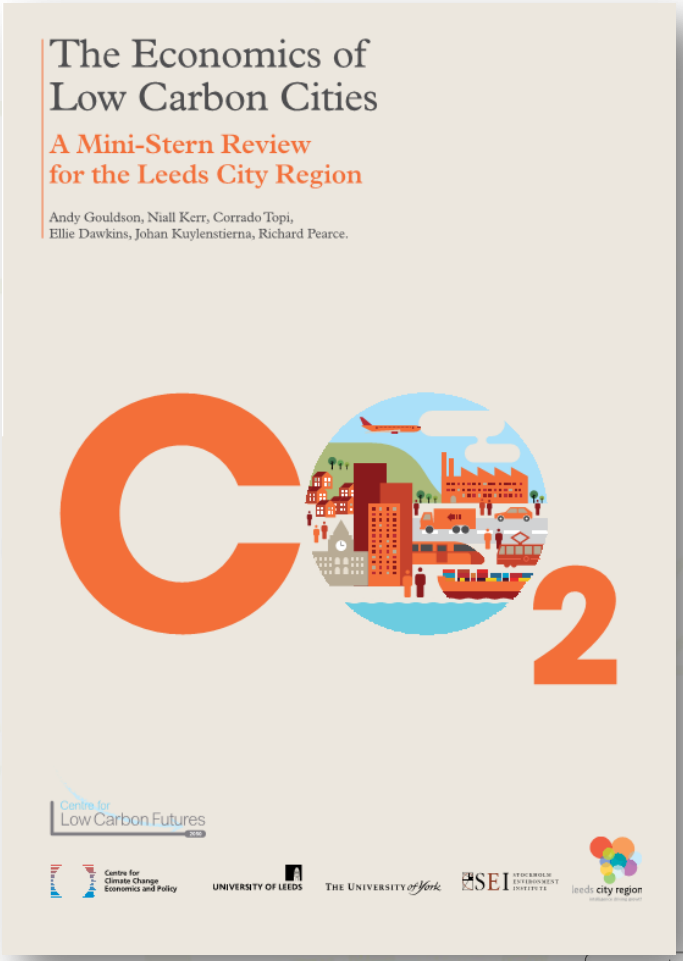
Leeds City Region





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Leeds City Region
46 domestic interventions

Main Findings
The Domestic Sector

Cost effective opportunities

- There are £1.1 billion worth of cost-effective, energy efficient and low carbon investment opportunities available in the domestic sector in the Leeds City Region.
- Exploiting these would generate annual savings of £400 million a year.
- At commercial rates, these investments would pay for themselves in under 3 years, whilst generating annual savings for the lifetime of the measures.
- If exploited, these investments would reduce Leeds City Region carbon emissions by 3.8% by 2022, compared to 1990.

Cost neutral opportunities

- There are £3.6 billion of cost-neutral, energy efficient and low carbon investment opportunities available in the domestic sector in the Leeds City Region.
- Exploiting these would generate annual savings of £556 million a year.
- At commercial rates, these investments would pay for themselves in 6.4 years, whilst generating annual savings for the lifetime of the measures.
- These investments would reduce Leeds City Region carbon emissions by 5.3% by 2022, compared to 1990.

Table 7: League Table of the Most Cost Effective Measures for the Domestic Sector

Central business case £/TCO2

1	Mini wind turbines (5kW) with FiT	-457
2	Biomass boilers with RHI	-325
3	Electronic products	-245
4	Information and communication technology products	-244
5	Integrated digital TVs	-228
6	Reduced standby consumption	-228
7	Reduce heating for washing machines	-209
8	A++ rated cold appliances	-180
9	A rated ovens	-175
10	Biomass district heating with RHI	-155
11	Efficient lighting	-153
12	A-rated condensing boiler	-145
13	Insulate primary pipework	-132
14	Glazing – old double to new double	-123
15	Uninsulated cylinder to high performance	-122
16	Glazing – single to new	-120
17	Insulated doors	-118
18	Reduce household heating by 1°C	-111
19	Induction hobs	-110
20	Loft insulation 0 - 270mm	-79
21	Pre '76 cavity wall insulation	-73
22	Improve airtightness	-71

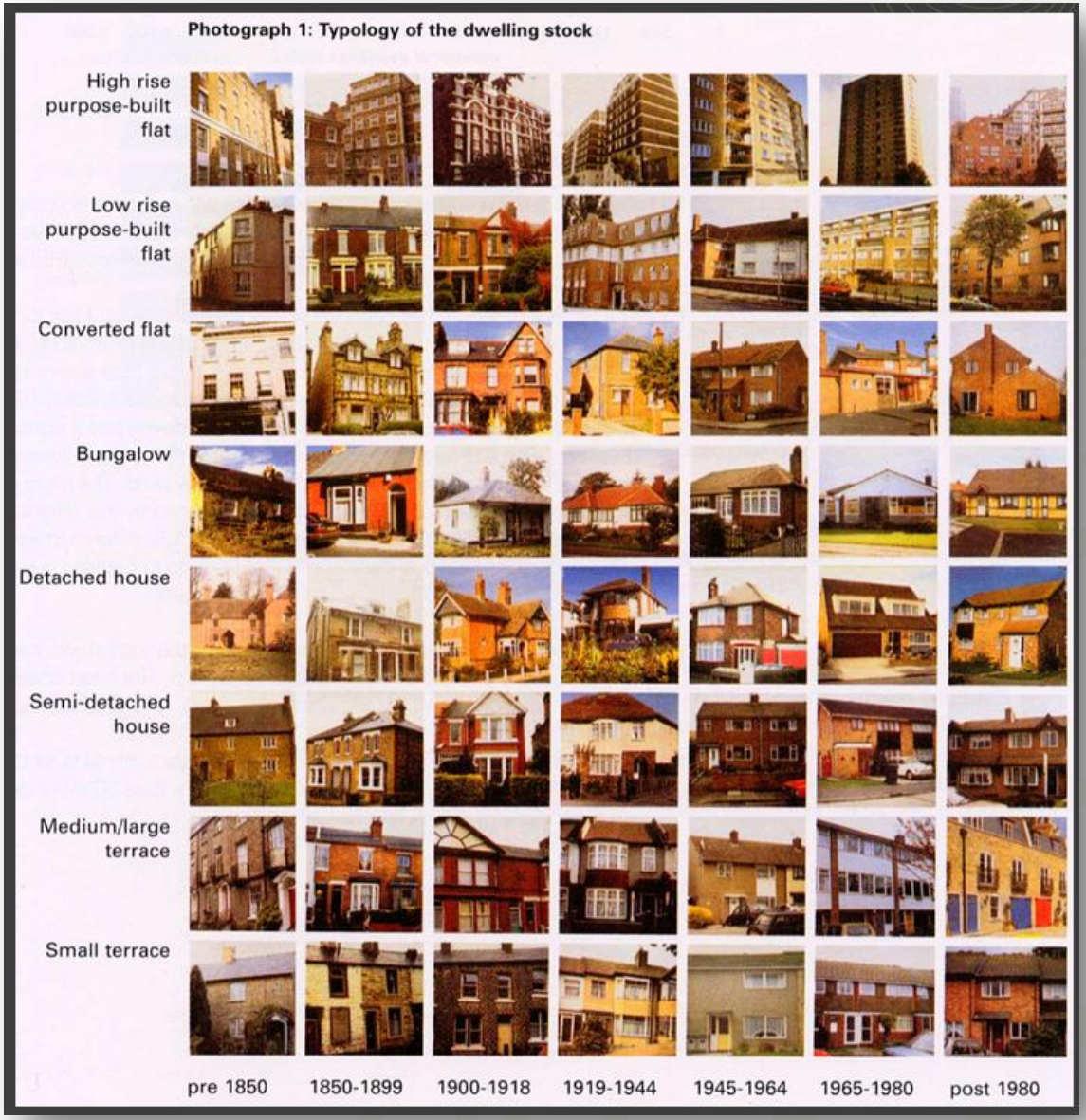
FiT = Feed in Tarriff. RHI = Renewable Heat Incentive. Correct as at 1/1/2012

Cost effective
Cost neutral

Discussion

There are numerous opportunities for reducing the energy use and carbon footprints of households within the Leeds City Region. This could be done through investments in the fabric of the built environment (i.e. through loft and wall insulation, double glazing), through investments in more energy efficient appliances (computers, TVs, fridges, freezers etc) or through changes in behaviour (turning off appliances, turning down thermostats etc). The league tables of the most cost and carbon effective measures are included in Table 7.

23	DIY floor insulation (susp. timber floors)	-70
24	Loft insulation 25 - 270mm	-69
25	Loft insulation 50 - 270mm	-59
26	76-83 cavity wall insulation	-56
27	A+ rated wet appliances	-54
28	Loft insulation 75 - 270mm	-52
29	Post '83 cavity wall insulation	-30
30	Turn unnecessary lighting off	-28
31	Installed floor insulation (susp timber frames)	-25
32	Loft insulation 100 - 270mm	-8
33	Glazing (to best practice)	-4
34	Ground source heat pump with RHI	2
35	Solid wall insulation	9
36	Loft insulation 125 - 270mm	11
37	Loft insulation 150 - 270mm	59
38	Room thermostat to control heating	59
39	Paper type solid wall insulation	76
40	Modestly insulated cylinder to high performance	90
41	Thermostatic radiator valves	135
42	Photovoltaic generation with FiT	180
43	Air source heat pump with RHI	340
44	Micro wind turbines (1kW) with FiT	639
45	Hot water cylinder 'stat	671
46	Solar water heating with RHI	1173



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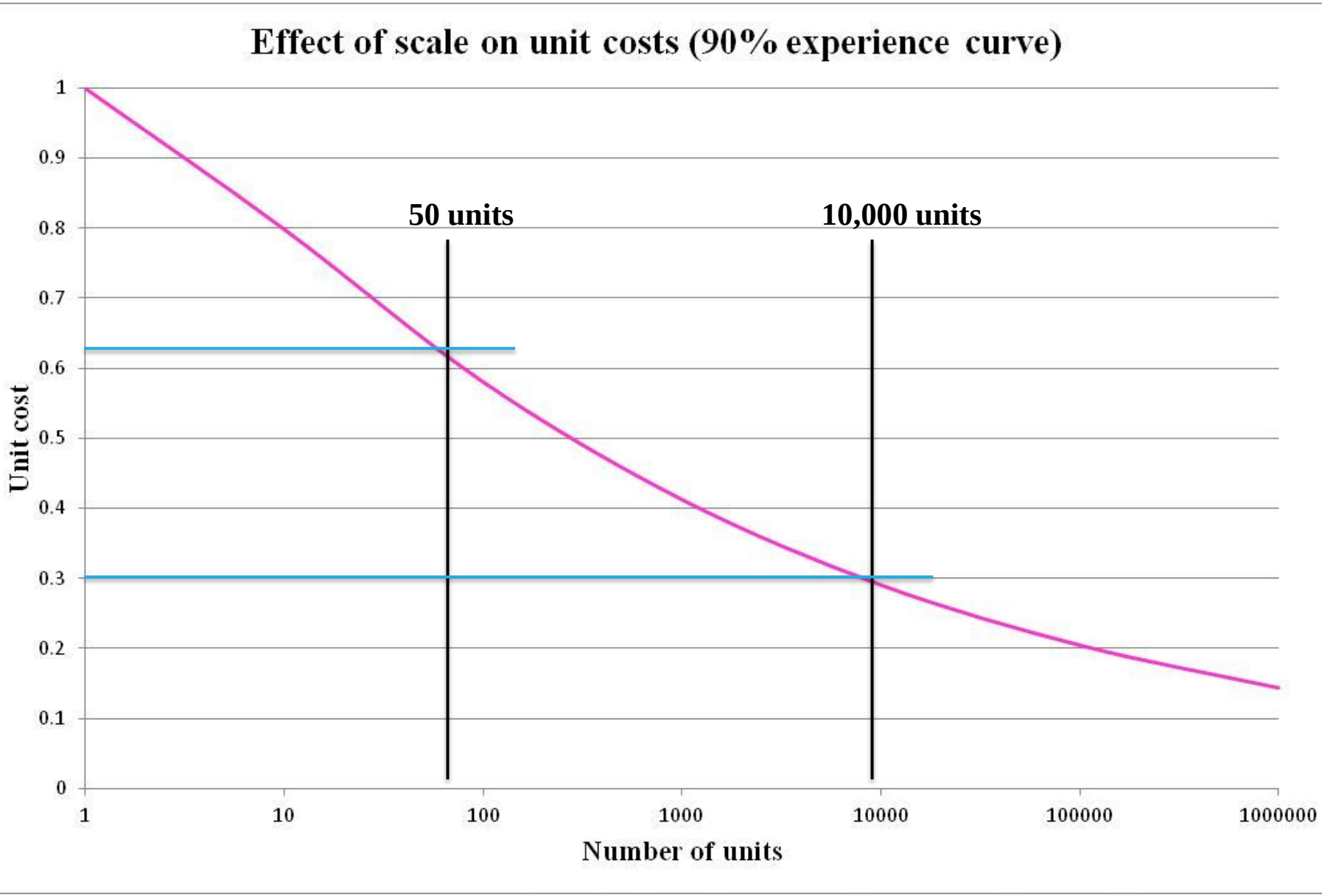
Domestic building typologies (by bre)

Pick and Mix

Gok Wan



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Reducing the GHG emissions from 1.25 million dwellings in Wales

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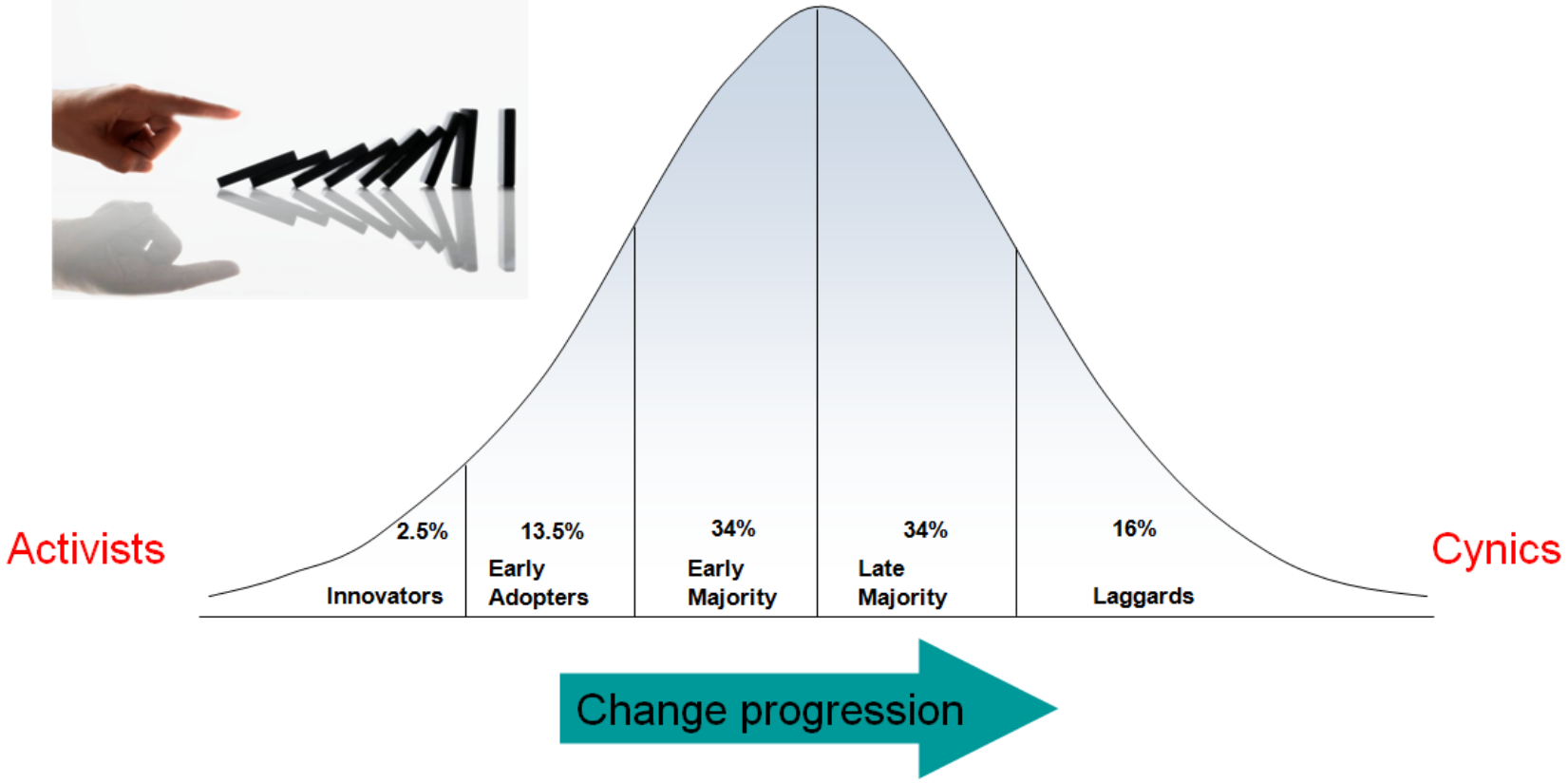
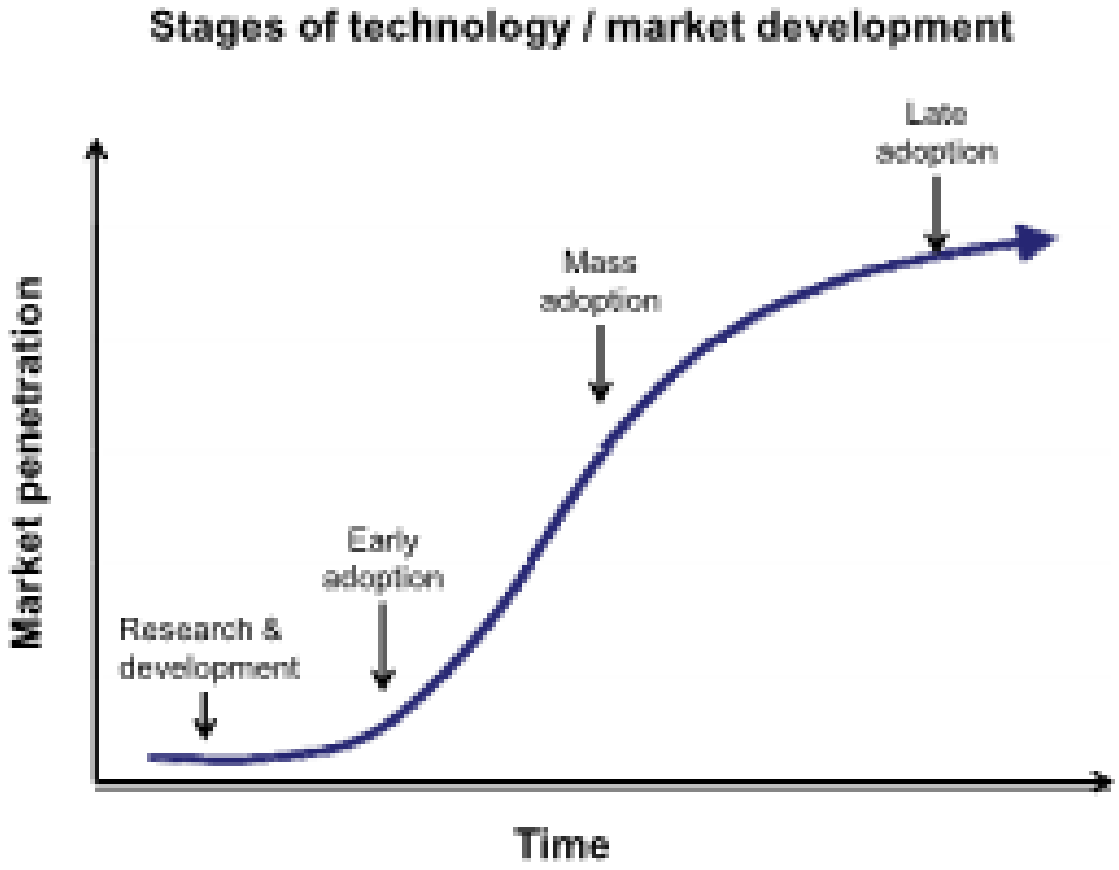
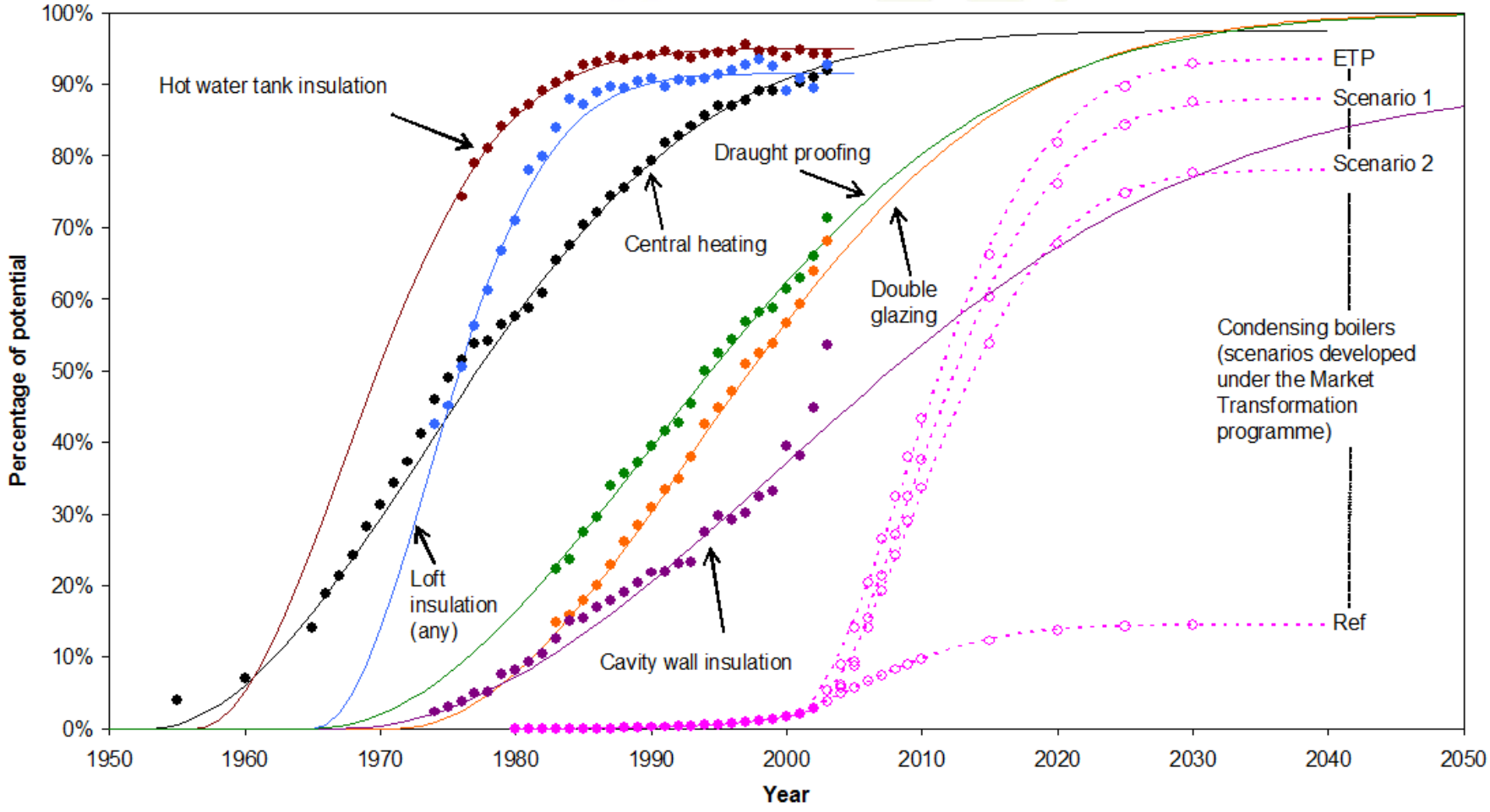


Different people adopt change in different ways



The classic S-curve for technology development -four main stages of market development



bre: Market penetration of home energy-efficiency related measures

Wales domestic retrofit

- 1.25million dwellings
- Procure at scale over 20 years
- 62,500 dwellings per year
- £5k/dwelling to upgrade, repayable over 20 years
- £6.25 billion cost
- 20 years → £313million/year
- ~0.7% of Wales's GVA

C40 Cities

CLINTON FOUNDATION | CLINTON CLIMATE INITIATIVE

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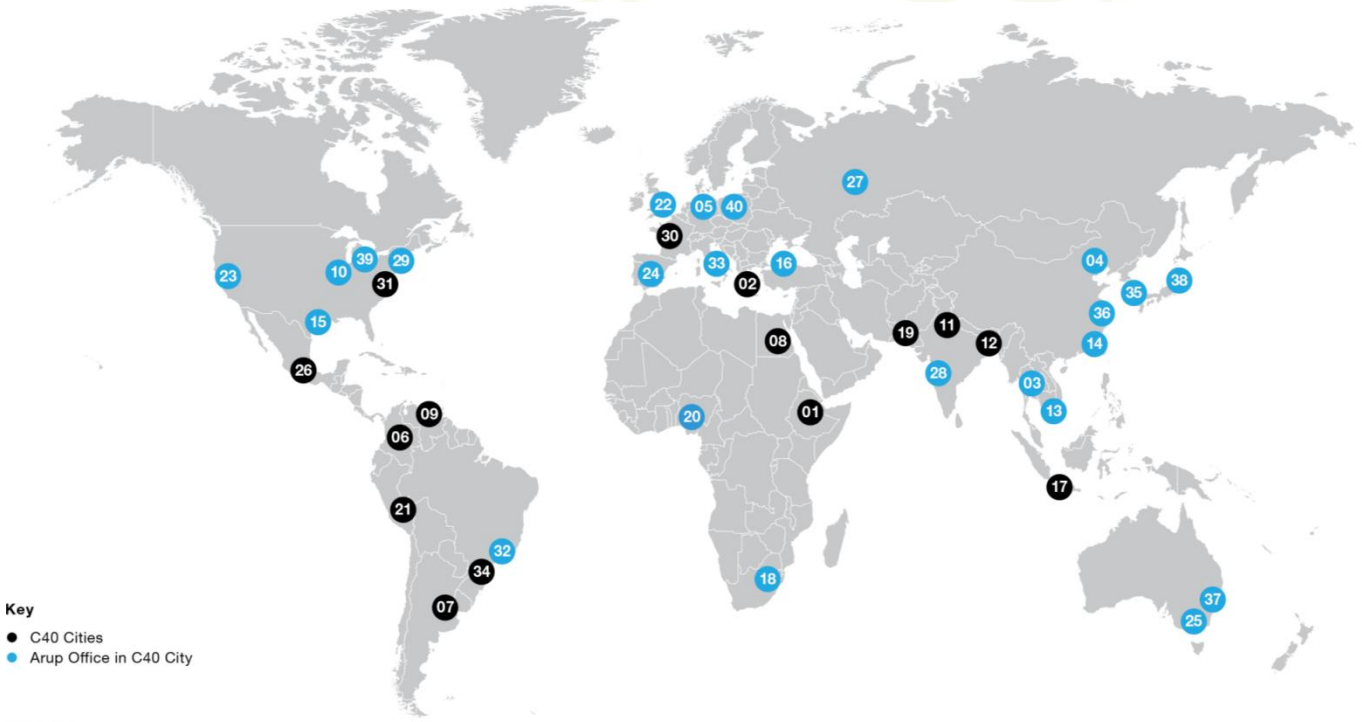
40 cities | 297 million residents | 4,734 climate actions



C40 Cities

01 Addis Ababa	11 Delhi NCT	21 Lima	31 Philadelphia
02 Athens	12 Dhaka	22 London	32 Rio De Janeiro
03 Bangkok	13 Ho Chi Minh City	23 Los Angeles	33 Rome
04 Beijing	14 Hong Kong	24 Madrid	34 Säu Paulo
05 Berlin	15 Houston	25 Melbourne	35 Seoul
06 Bogota	16 Istanbul	26 Mexico City	36 Shanghai
07 Buenos Aires	17 Jakarta	27 Moscow	37 Sydney
08 Cairo	18 Johannesburg	28 Mumbai	38 Tokyo
09 Caracas	19 Karachi	29 New York	39 Toronto
10 Chicago	20 Lagos	30 Paris	40 Warsaw

Climate Action in Megacities:

C40 Cities Baseline and Opportunities

Version 1.0 June 2011

40 cities
297 million residents
4,734 climate actions

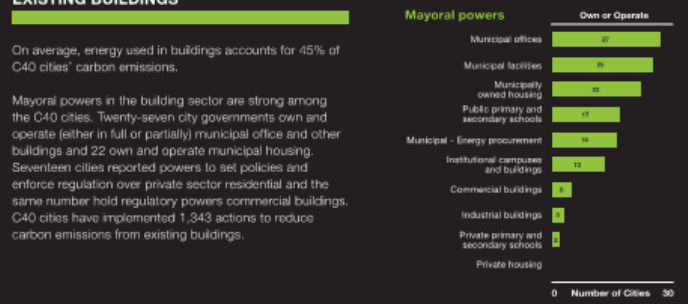
ARUP

C40 CITIES
CLIMATE LEADERSHIP GROUP

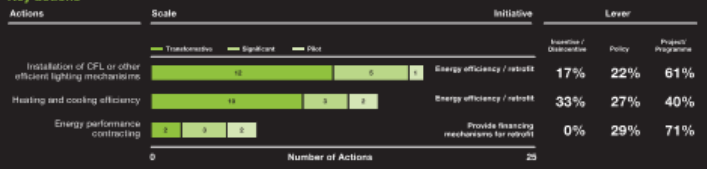
EXISTING BUILDINGS

On average, energy used in buildings accounts for 45% of C40 cities' carbon emissions.

Mayoral powers in the building sector are strong among the C40 cities. Twenty-seven city governments own and operate (either in full or partially) municipal office and other buildings and 22 own and operate municipal housing. Seventeen cities reported powers to set policies and enforce regulation over private sector residential and the same number hold regulatory powers commercial buildings. C40 cities have implemented 1,343 actions to reduce carbon emissions from existing buildings.



Key actions

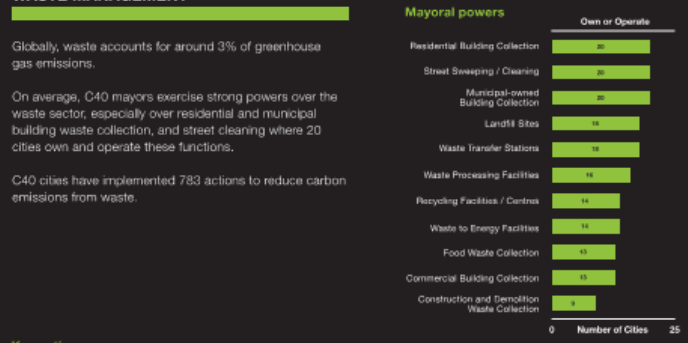


WASTE MANAGEMENT

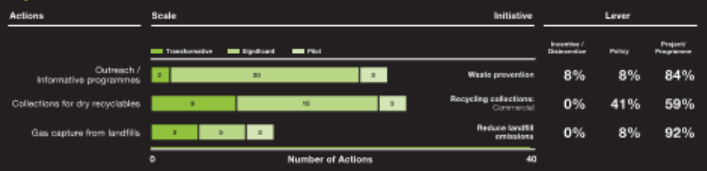
Globally, waste accounts for around 3% of greenhouse gas emissions.

On average, C40 mayors exercise strong powers over the waste sector, especially over residential and municipal building waste collection, and street cleaning where 20 cities own and operate these functions.

C40 cities have implemented 783 actions to reduce carbon emissions from waste.



Key actions



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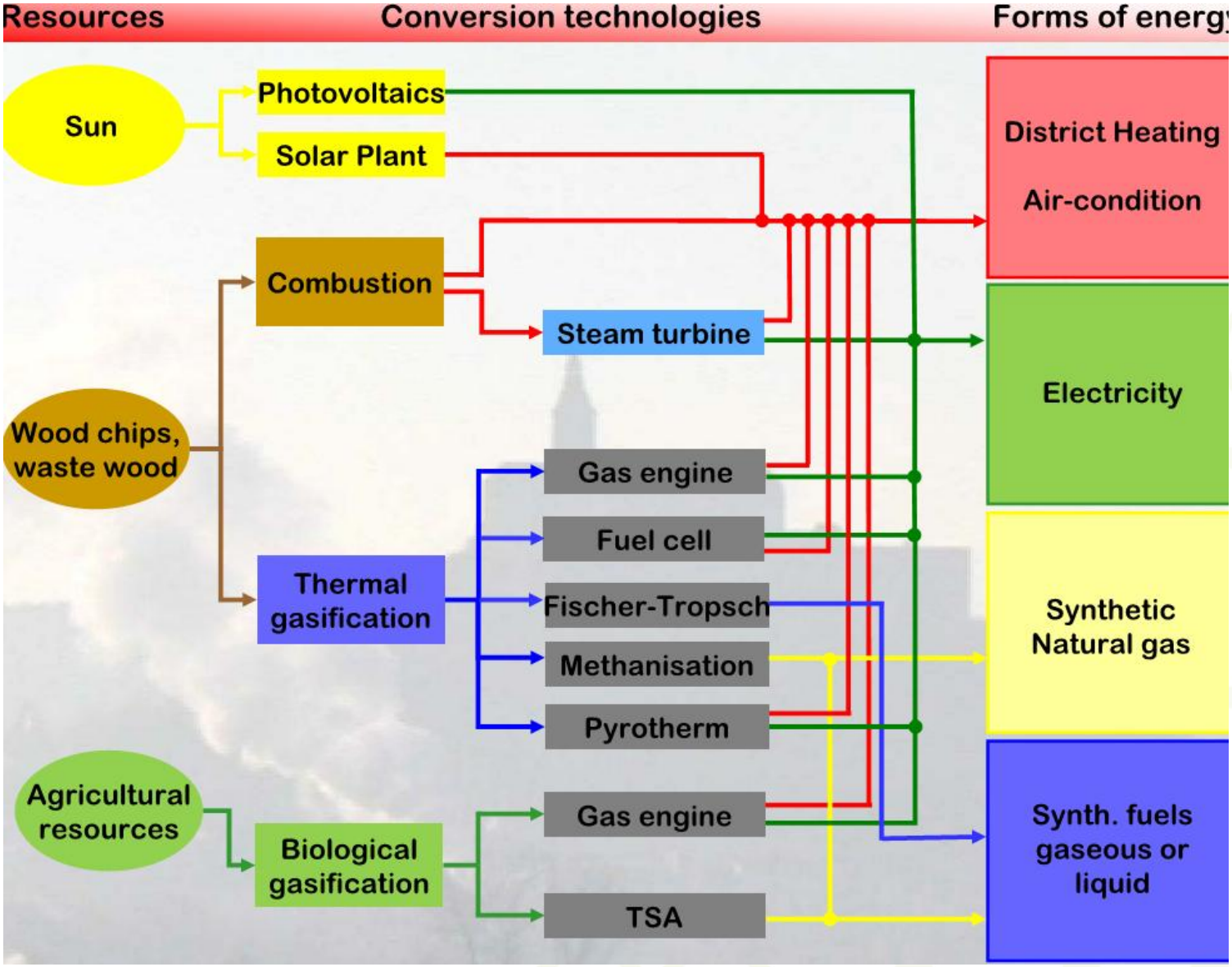
C40 cities – mayoral powers and actions

Güssing, Austria

Rhuddlan, Denbighshire
Cowbridge, Vale of Glamorgan

History

- 50 years alongside the iron curtain to Hungary
- no industry
- high rate of unemployment
- 70% commuters
- high rate of migration
- small structured agriculture
- bad traffic infrastructure



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The added value

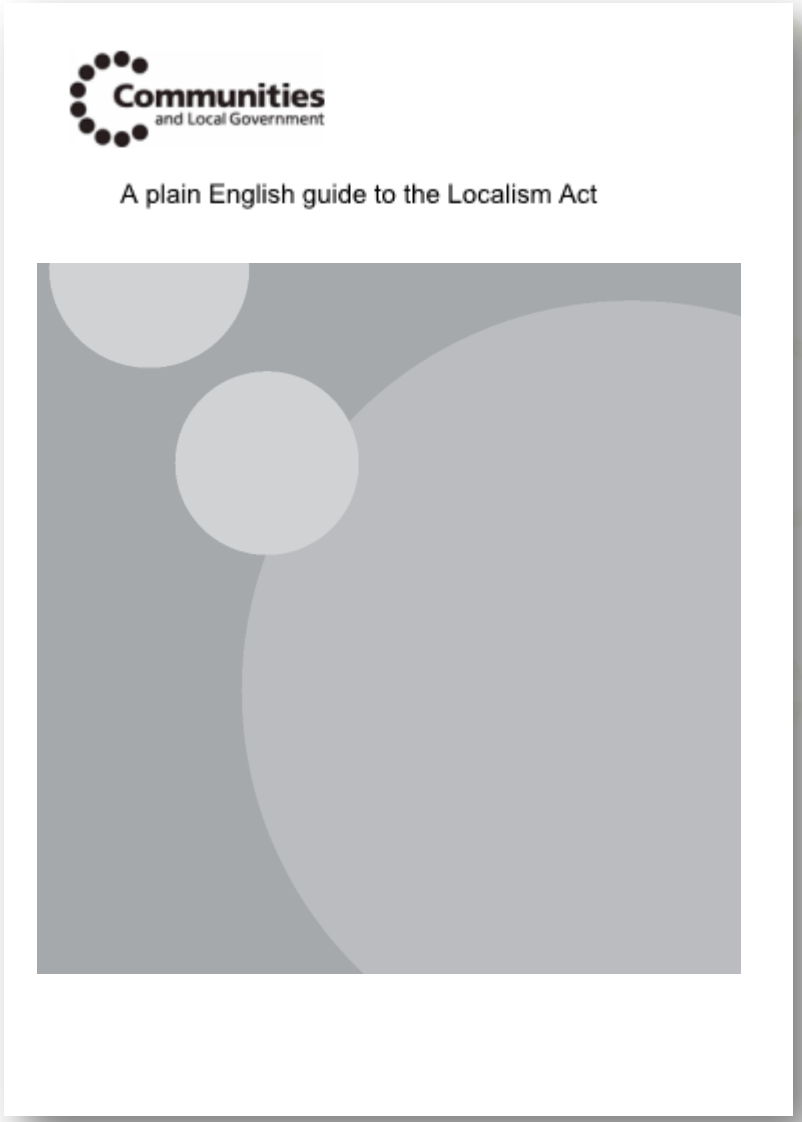
for the town of Güssing

- More than 50 new companies
- More than 1.100 new jobs netting € 9 Mio. a year
- Total sales volume of energy € 13 Mio. a year
- Total wood consumption 44.000 tons a year

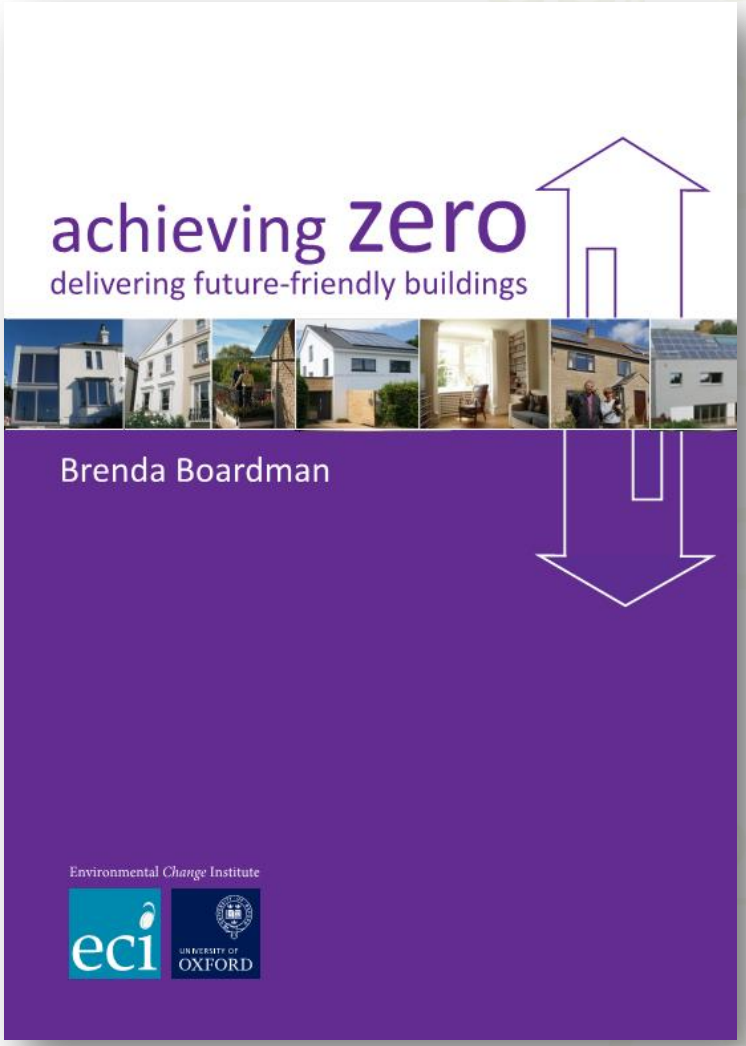
for the district of Güssing

- 45% self sufficiency netting *18 Mio. EURO*
- Potential in case of 100% self sufficiency *37 Mio. EURO*

Güssing 20. November 2009

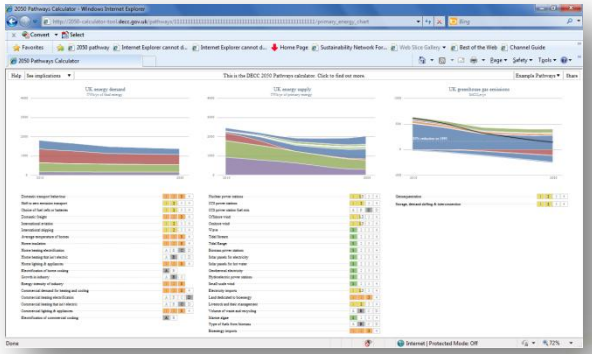


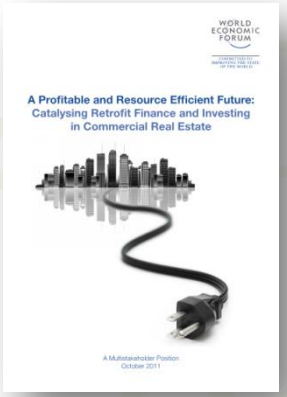
- The general power of competence for local authorities
- The community right to build

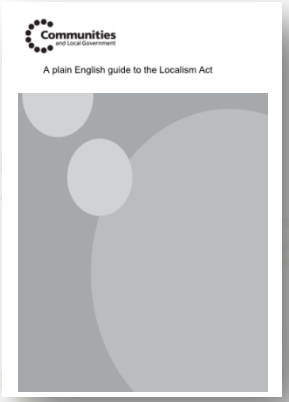


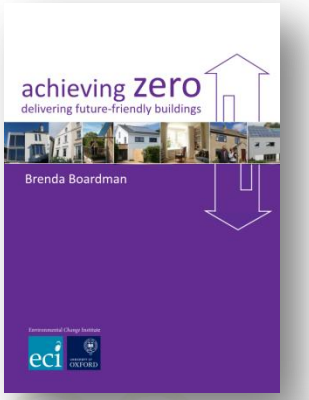
	Property owner Theoretical energy use: mainly gas	**Occupant** Actual energy use: includes all electricity
Residential	**Minimum standards based on EPC** 82% of all energy in 2009	**Personal carbon allowances** 100% of all energy
Business	**Minimum standards based on EPC** 69% of all energy in 2009	**Display energy certificates** 100% of all energy

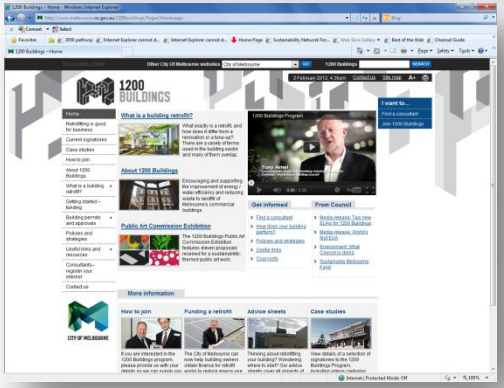
It is an essential component of the strategy that energy-efficient buildings become worth more than energy-inefficient ones.

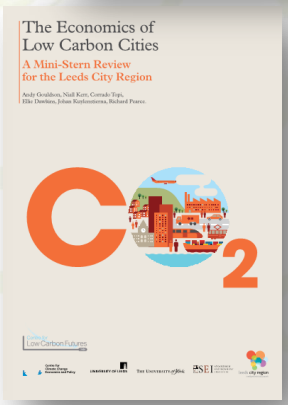


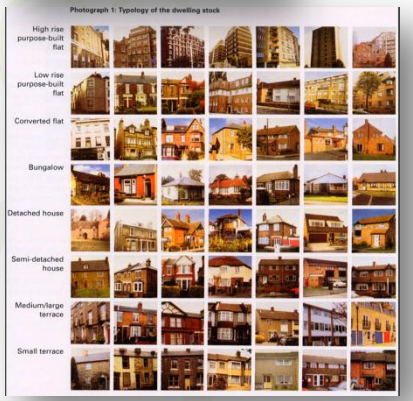


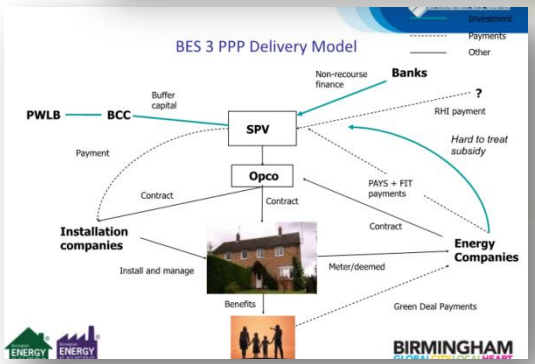


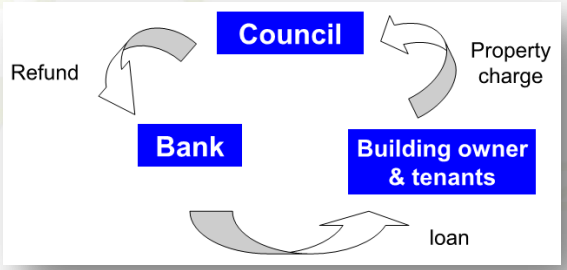


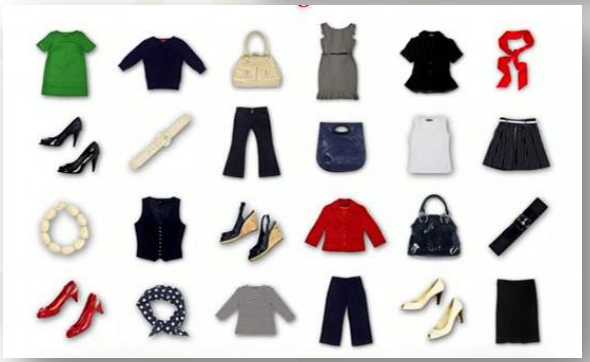












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Thank you.

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