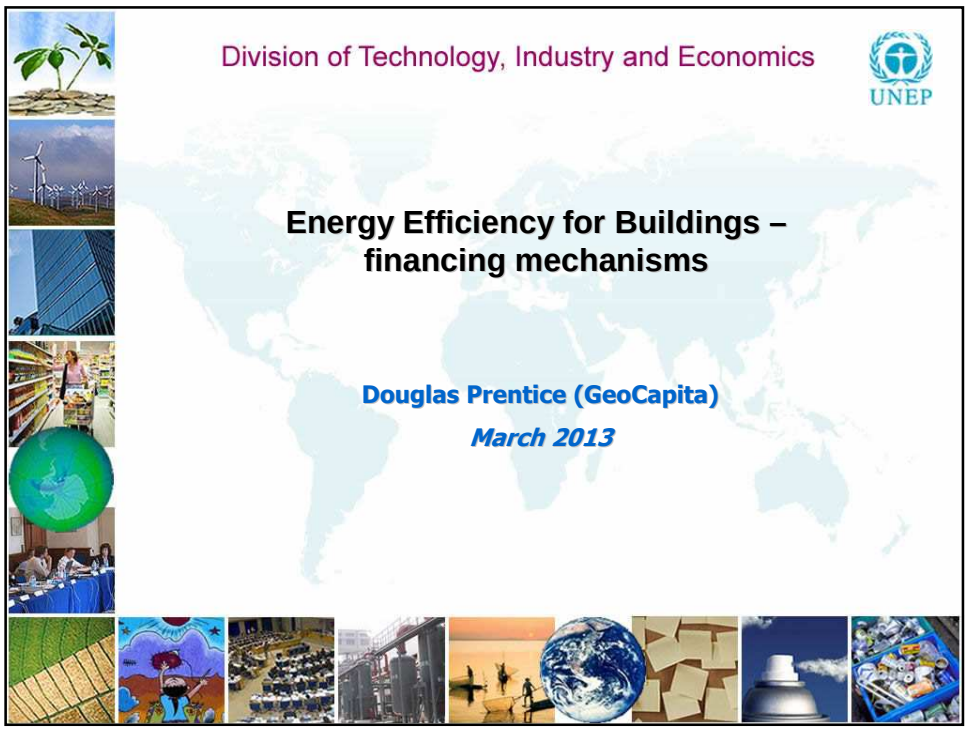

Division of Technology, Industry and Economics

UNEP

Energy Efficiency for Buildings – financing mechanisms

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Background

UNEP

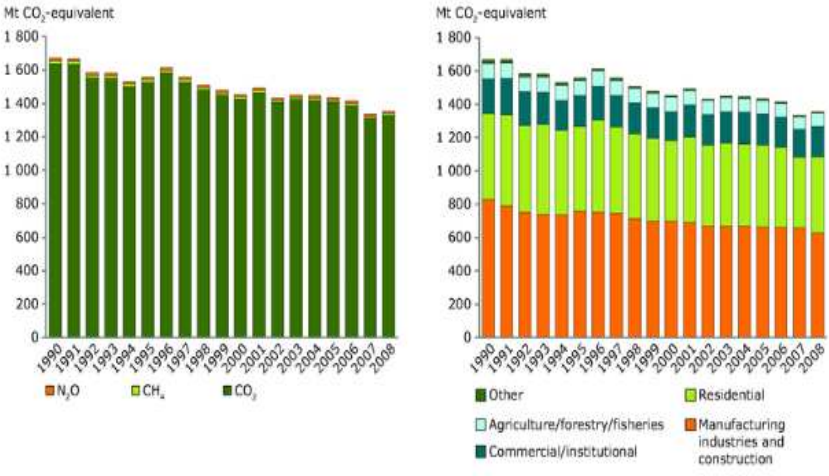
- construction approx 10% of global GDP (USD7.5 trillion) , employs 111 million people
- construction, renovation, and maintenance together contribute up to 40% of countries' GDP and on av 10% of country-level employment
- 40% of global energy consumption (60% of electricity), 25% of global water, 40% of global resources, one third of GHG emissions
- inefficient buildings stock worldwide, represent significant energy saving opportunities because their performance level is frequently far below current efficiency potentials.
- key sector for GHG reduction (to double in 20 years)
- energy consumption in buildings can be reduced by 30 to 80% using proven and commercially available technologies.
- key is finance

Objectives

- OBJECTIVE: how to stabilize atmospheric GHG concentrations below (say) 450ppm CO_2e.
- Energy efficiency in buildings offers a great opportunity for developed & developing countries to cooperate in achieving common but differentiated action to realize significant GHG reductions.

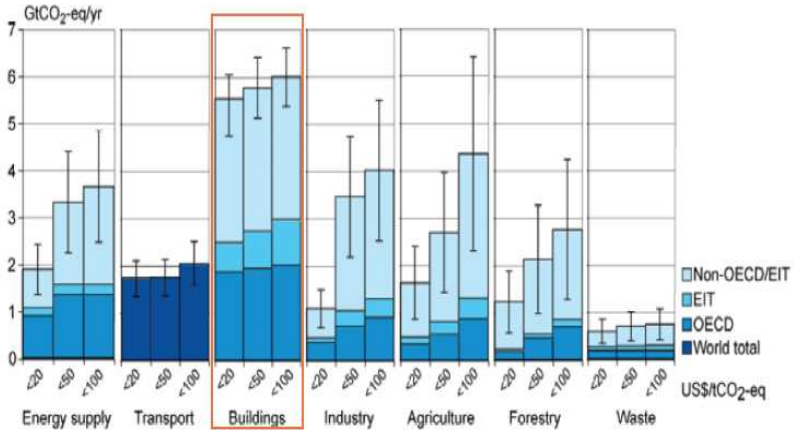
Energy Intensity
= kWh/m²/year
= kWh/o/year
Carbon Intensity
= kgCO_2e/m²/year
= kgCO_2e/o/year

GHG emission from energy use per sector and per gas, 1990–2008



Estimated economic mitigation potential by sector and region

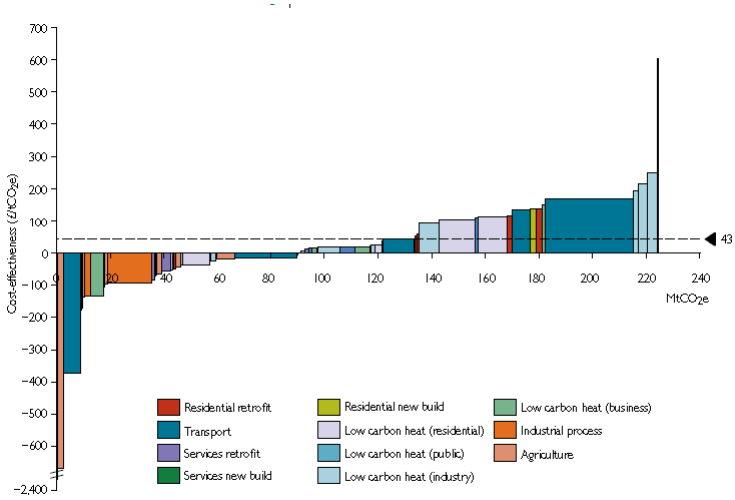
(using technologies and practices expected to be available in 2030)



Possible financing schemes for energy efficient newbuild and retrofit

1. Carbon Trading as a financing mechanism
2. IFI Funding
3. Central Government support schemes
4. Local Government support schemes
5. Green Housing Bonds
6. Mortgage Lenders
7. Social/Environmental Impact Investors
8. Private Developer/contractor financed schemes
9. PPP Concessions
10. MHOS/Self-Build Groups
11. ESCO
12. Crowd Funding
13. Community led finance
14. Microfinance
15. Hybrid schemes

Marginal abatement cost curve of the total potential abatement identified in the non-traded sector, 2020 (MtCO2e)



Current technology portfolio for low carbon heat

Building-level technologies

Biomass boilers – These work like conventional boilers, but instead of using natural gas or heating oil they burn biomass, such as wood pellets, to produce the heat used to provide heating and hot water.

Electrical resistance heating – This converts electrical energy directly into heat. It can also be used as secondary back-up heating or with a storage system which takes advantage of cheaper electricity, sold during low demand periods such as overnight.

Heat pumps – These use electricity to leverage ambient heat from the air or ground (or in some cases from water), using a compressor just like a fridge. This allows heat pumps to work at efficiencies far higher than even the best gas boilers, typically producing three units of heat for every unit of electricity. Heat pumps can either directly heat the air inside a building or heat up water for central heating and hot water systems. Some heat pumps can also be operated in reverse cycle mode to provide cooling. Heat pumps perform better in houses with low temperature heat emitters.[42]

Micro-combined heat and power (CHP) – CHP is described below and, in the form of micro-CHP, can be used as an alternative to boilers to provide heat and electricity at building level.

Solar thermal hot water – For buildings with sufficient south-facing roof space, solar panels can be fitted and connected to a water tank to provide hot water. This will not usually be sufficient to meet all of a building's hot water needs year round, but it can be an effective, low carbon way to supplement other sources of water heating.

Network-level technologies

Combined heat and power (CHP) – Technologies that generate both heat and electricity are collectively known as CHP. These can use a range of fuels (not necessarily low carbon) including biomass, wastes and bioliquids. At present, CHP is most commonly used by industry to provide heat and electricity for large sites. It can also be used to provide a source of heat for heating networks.

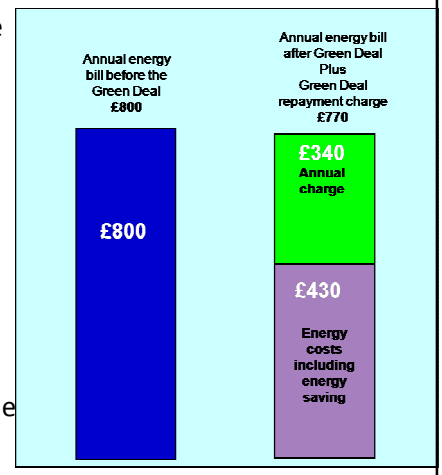
Gas grid biomethane injection – Sustainable biomass and wastes can be converted to gas and upgraded to biomethane, a gas that can directly replace or blend with natural gas in the grid and is compatible with existing boilers. This could be done at a large scale, or in smaller areas of the grid ringfenced for this purpose.

Heating networks – Heat can be generated by commercial-scale low carbon heat installations such as heat pumps or biomass boilers, or using low-grade heat generated in thermal power stations. Heat exchangers then transfer the heat into buildings via a network of steam/hot water pipes to provide space heating and hot water.

Central Gov. Finance: The UK Golden Rule

- The golden rule is the principle which limits the amount of green deal finance that a provider can attach to the likely energy bill savings from the measures installed.

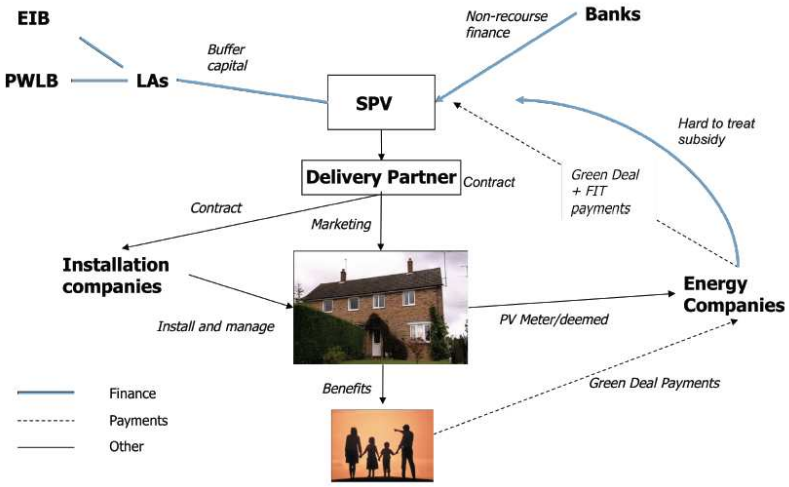
- Protects consumers against higher energy bills & investors from a higher risk of default on the loan.



NPV of UK Govt policies

Policy (positive = benefit)	Net present value (£ million)	Cost effectiveness (£/tCO$_2$e non-traded)
Transport		
8% of transport fuel from renewable sources by 2020	820	0
EU new car average fuel efficiency standards – CO$_2$ mid-term target (130gCO$_2$/km)	14,310	−136
Additional impact of further new car efficiency improvements to 95g/km	−13,870	118
EU new van CO$_2$ regulations	1,440	−6
Low carbon emissions buses	1,400	−73
EU new car complementary measures	−2,380	108
Local Sustainable Transport Fund (LSTF)	1,810	−224
HGV low rolling resistance tyres	1,540	−110
Industry-led action to improve HGV efficiencies	2,330	−122
Rail electrification	2,880	−202
Energy efficiency policies		
Renewable Heat Incentive (RHI)[k]	2,450	26
Carbon Reduction Commitment	2,750	−71
Climate Change Agreements (CCAs)[l]	n/a	n/a
Community Energy Saving Programme	170	−90
Carbon Emissions Reduction Target (CERT)	14,870	−163
CERT extension	9,830	−118
Energy Company Obligation (ECO) and Domestic Green Deal	6,490	−20
Non-Domestic Green Deal	2,140	−74
Building Regulations 2010 Part L	20,380	−74
Zero Carbon Homes	−660	68
Smart Metering (households)[M]	5,200	−304
Smart Metering (SME's)[N]	2,280	−211
Energy Performance of Buildings Directive	−380	85
Products Policy (Tranche 1)	10,140	n/a
Products Policy (Tranche 2)	5,500	n/a
Carbon Trust[o]	1,240	−181[p]
Agriculture		
Voluntary Action Plan (England only)	7,570	−181

Local Government led finance



Broad classification of community projects finance

Model	1 For Profit	2 Profit and non-profit distributing	3 Non-profit distributing	4 Community benefit
Description	local developments providing opportunities for local private investors and 'small' investors nationally	joint venture arrangements between private and non-profit distributing companies	developments by non-profit distributing bodies on behalf of all people in a community	'community benefit' arrangements with private commercial developers
Developer	E.g.: co-ops, farmers, other rural businesses	E.g.: private landowners and local development trusts	E.g.: local development trusts, community interest co-ops	E.g.: wind farm community benefit payments
Ownership	Individuals, profit distributing companies and co-ops	Special purpose vehicles (joint) or Two separate companies, private and community	Community group	Developer
Legal basis	Companies ltd by shares; Industrial and Provident Society with profit distribution	Companies ltd by shares with both partners owning shares; or separate companies ltd by shares, one owned by community group	Typically company limited by guarantee with trading subsidiary limited by shares	Payments usually to an existing community trust or one established for purpose
Main beneficiaries	Private individuals	Both private individuals and community groups	Community groups and wider community	Wider community

Summary – strengths and weaknesses of community models

MODEL	WEAKNESSES	STRENGTHS
1 For Profit	• No physical asset owned by community • Not for benefit of wider community • Private, investor benefit	• Not reliant on public funds (although tax relief aids attractiveness) • Encourages local support for renewable and green energy
2 Profit /Non Profit (a) Joint venture with partnership in development	• Need either a separate Priority Partnership Area (PPA) or separate grid connection agreement • Legal documents can be more complex for community in securing separate loan agreement	• Some grant currently available for pre-development and capital • Community control own asset • Community sense of ownership • Capacity building in community • Lease of land can be used as security for a bank loan • Community secure if other partners sell to big developer/go into administration
(b) Joint venture with ownership in shares	• Community is often minority partner with little control • Access to equity more difficult • If project or partner folds community is left with no return for their involvement	• Access to grant in Highlands & Islands for pre-development • Ease of legalities • Operational and maintenance risk spread over more turbines
3. Non-profit distributing	• Dependant on public grant	• Builds community knowledge and capacity • Benefits wider community • Linked directly to community needs • Strengthens community organisations
4. Community Benefit	• Generally limited sums available (with one exception) • May be little engagement by community • No community asset	• No need for detailed community involvement – minimal volunteer effort required • Some funding available for community 'good causes'

Hybrid Public, Private and Community model