The importance of fast measures

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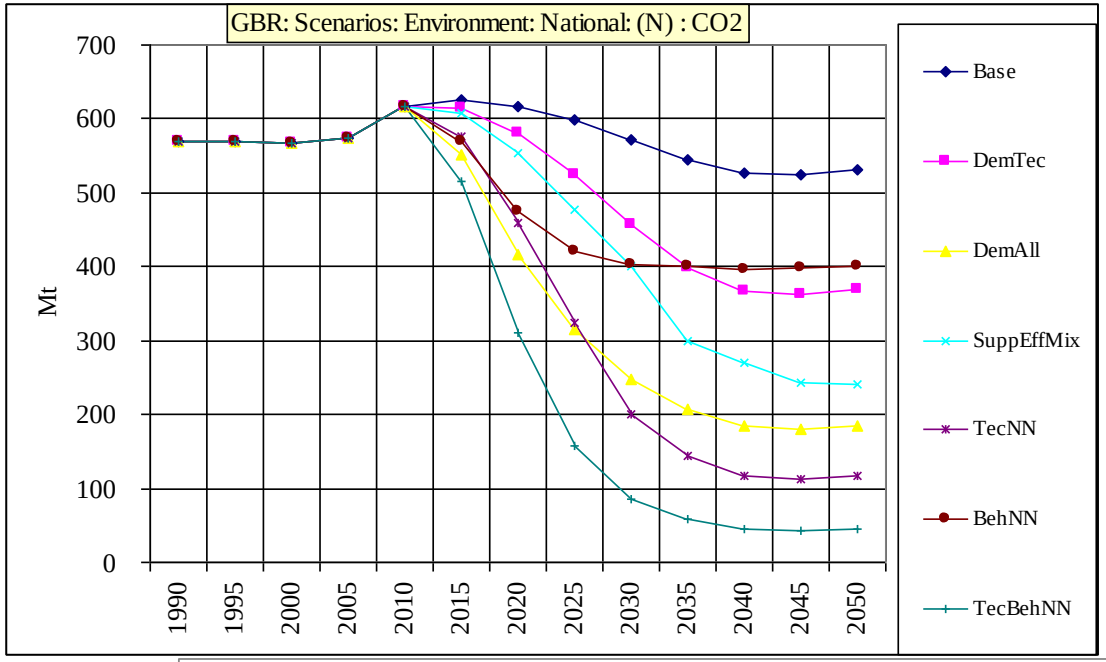
Policy measures: physical measures and rate of change

Size of effect, rate of effect and cost

Class	Examples of measures	Rate yrs
Behaviour	Effective comfort temperature in buildings	10
	Passenger transport demand management	20
	Aviation transport demand management	15
	Passenger mode; from car to bus/rail	20
	Freight mode; from truck to rail	25
	Downsizing cars	15
	Speed reductions on motorways, aircraft	5
Demand management	Transport load factor	20
	Demand management in transport	30
	Building insulation and ventilation control	40
	Demand management in non-residential sectors	30
Fuel mix	End use shift to electric vehicles, CHP, renewables	35
	Supply shift to CHP and renewables	40
Efficiency	Improved efficiency of boilers, heat pumps, etc	35

The importance of speedy measures - avoid tipping points

Chart shows UK national CO2 as a proxy for fossil fuel consumption

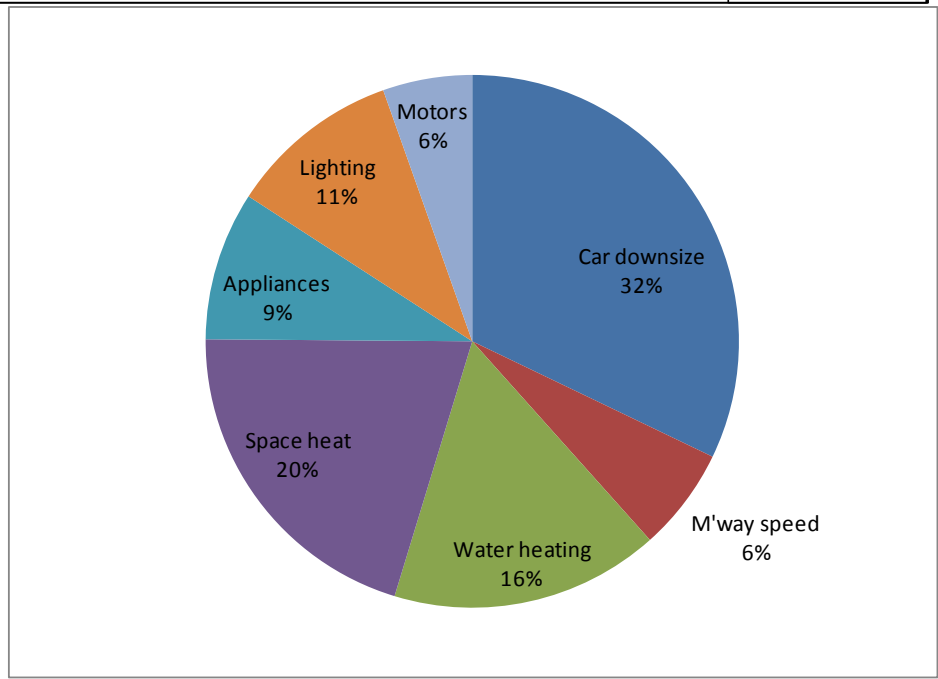


Demand measures:

Reduce all upstream energy

Some cause rapid reduction with large effect on energy, carbon emission and warming integrated over years, therefore enhance security

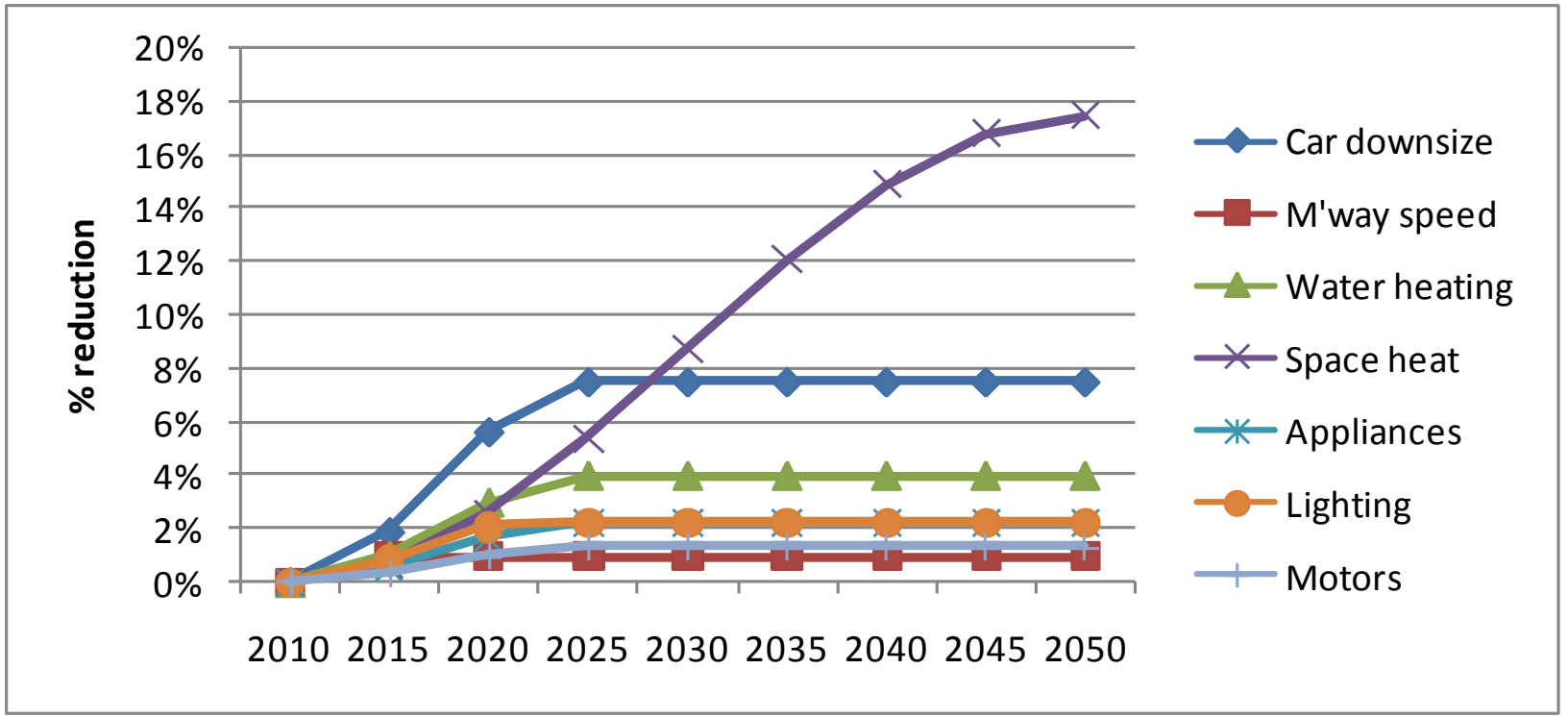
Chart illustrates integrated global warming reduction 2010-2030



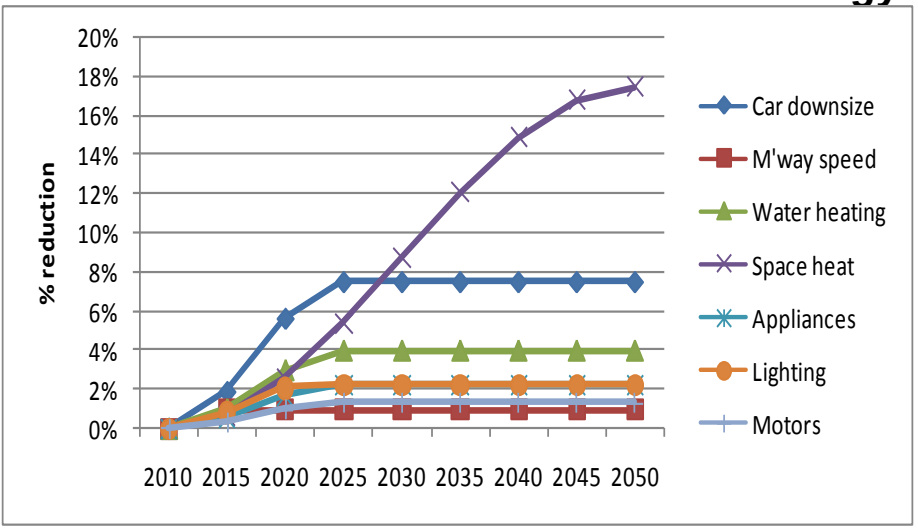
Fast measures

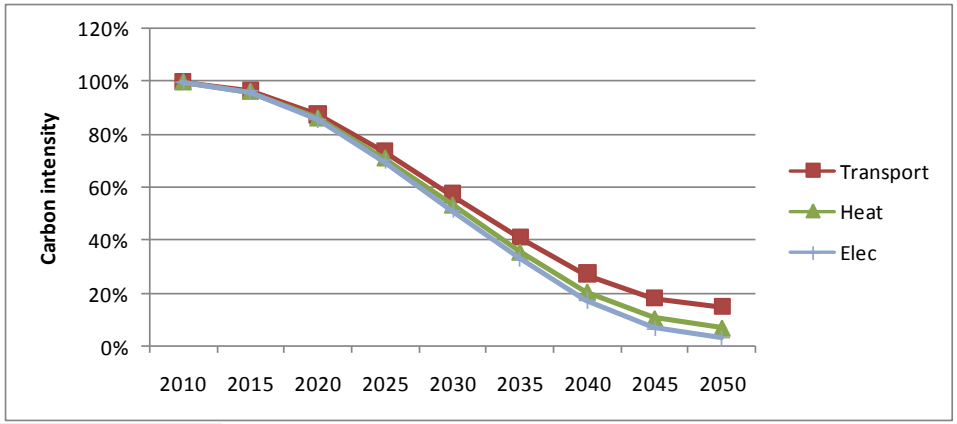
	UK Carbon %	Measure	Measures Reduction %	UK Reduction %	Yrs
Transport	15%	Car downsize	50%	8%	15
	24%	M'way speed	4%	1%	5
Heat	8%	Water heating	50%	4%	15
	25%	Space heat	70%	18%	40
Electricity	5%	Appliances	50%	2%	15
	5%	Lighting	50%	2%	12
	3%	Motors	50%	1%	15

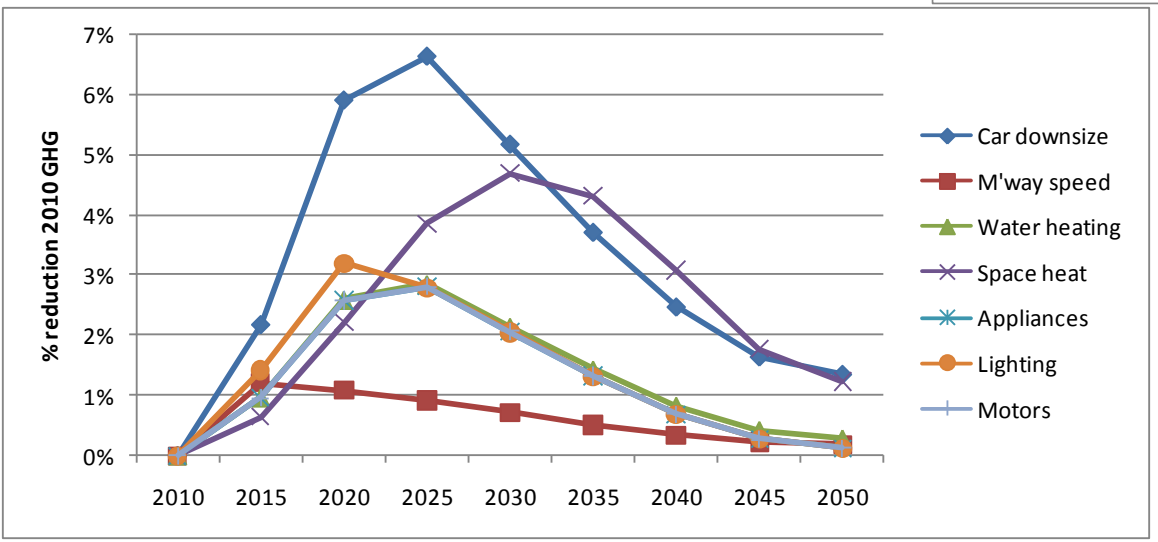
Fast measures: Demand management energy savings profiles



Fast measures: Energy and carbon savings profiles





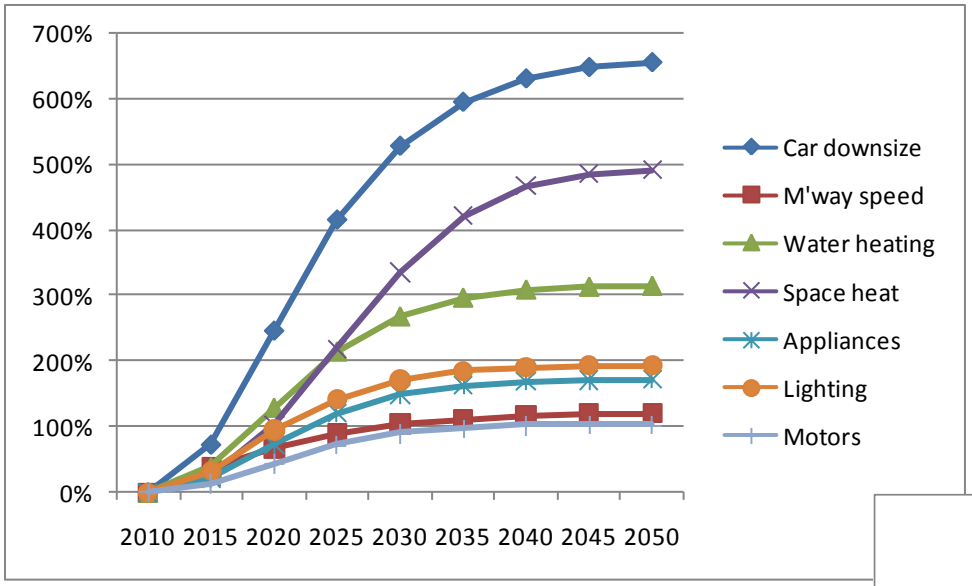


Fast measures: total reduction in global warming method

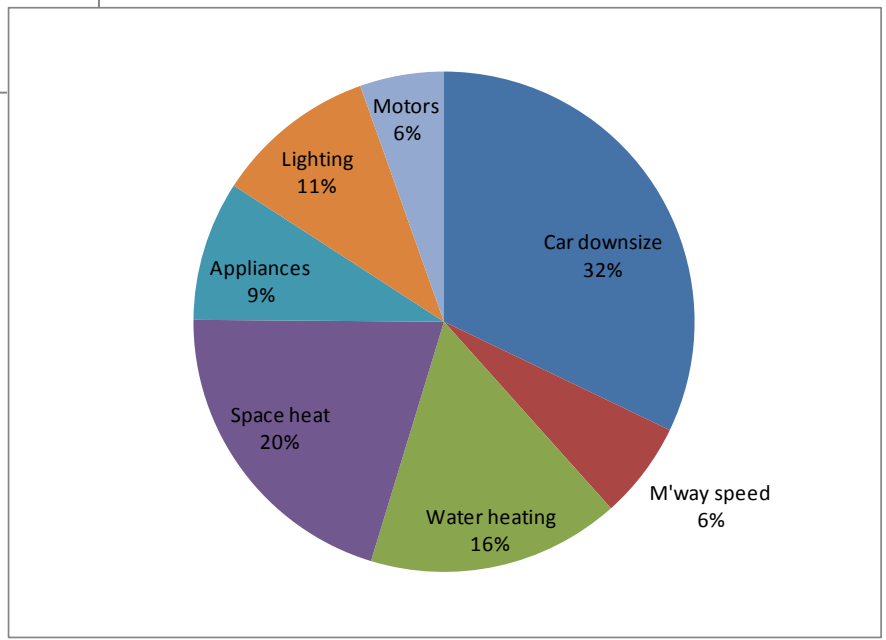
- Calculate the total reduction in global warming over a period (e.g. 2010 to 2050).
- Multiply the reduction in atmospheric carbon by an index of global warming.
- This index should include:
  - An index of the radiative forcing of the emitted greenhouse gas for each year which should account for the residence times of GHG; CO2 which has a long residence time (e.g. compared to methane) such that in this analysis a negligible fraction of the CO2 is assumed to be removed from the atmosphere before 2050 – i.e. the residence index (***Ir***) is taken as 1.
  - An index, ***If***, to account for positive feedback functions such as snow melt which will accelerate GW -– the tipping point phenomenon – and which will increase the importance of early reductions; this index, ***If***, is taken as 1.
  - In this simple analysis the combined index (***Ic***) is taken as 1 (= ***Ir*** x ***If***) which probably leads to an underestimate of the importance of early reductions. We then multiply the carbon reduction in any year by the combined index, and cumulate across the years to estimate total GW reduction of the measures, this is shown in the next Figure.

Fast measures: Demand management integrated CO2 reduction 2010-2030

Demand management global warming reductions cumulated from 2010



Demand management integrated
GW reduction 2010-2030



Fast measures: Implications

- The implication of this analysis for global warming mitigation are plain: early reductions are important.
- Two behavioural demand measures, downsizing and speed, might account for more than 30% of total carbon emission and global warming reduction during the critical transition period to very low carbon emissions. This simple illustrative analysis may well underestimate the importance of fast measures on carbon reductions (because system marginal analysis was not done) and on climate change (because tipping points etc. not accounted for.)
- Implications for the economic analysis of measures.
- Marginal Abatement Costs (MAC) are often calculated as (Total Annuitised Cost / Total Emissions Abated). But if the indicator were to be Global Warming (2010-2050) and Mitigation Costs (GWMC_2010-2050) then the ordering of measures by cost-effectiveness could change substantially, and thence, possibly, policy implications.
- Note that all such marginal cost curves, including MACs and GWMCs, can be misleading because measures are often synergistic and so cannot be independently costed and summed.)
- This analytic approach may have application to impacts on other environmental systems that have analogous properties; where the total integrated impact is important, and where there are positive feedbacks, or non-linear responses, or thresholds. For example, acid emission, deposition and impact.