

Will electric vehicles make a difference?

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Atmospheric carbon

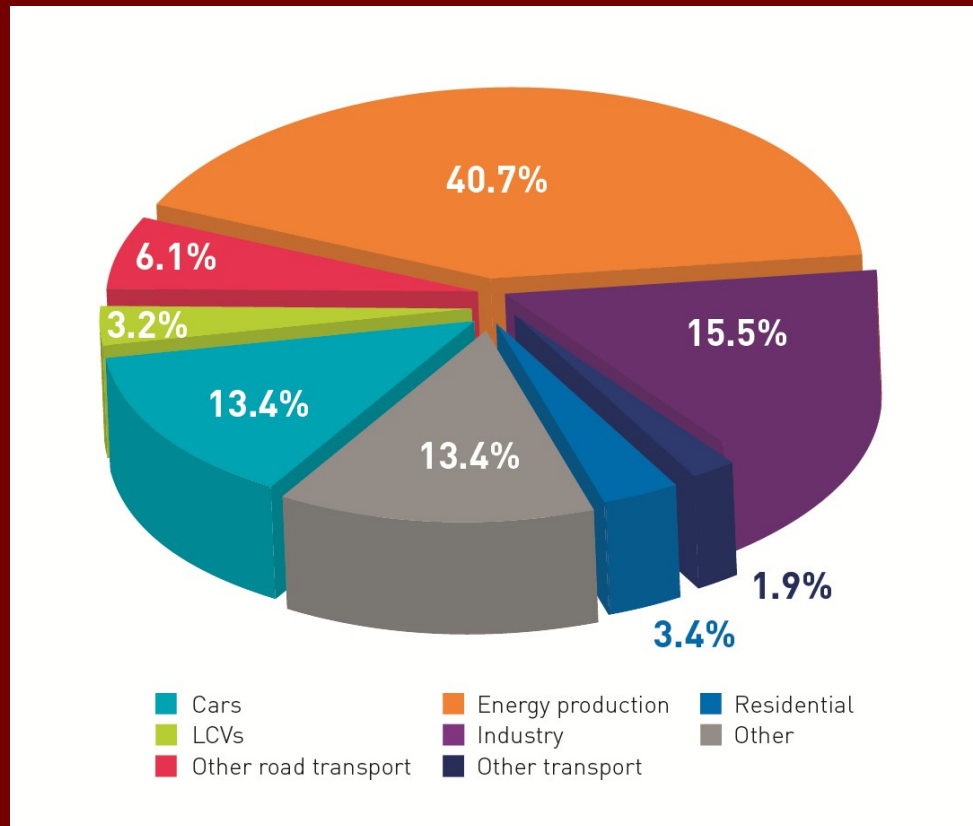
- Road transport and carbon emissions
 - Road transport responsible for circa 20% EU CO₂ emissions per annum
 - In the US road transport accounts for over 25%
 - Cars responsible for circa 12% EU CO₂ emissions per annum
 - Emissions grew by 23% from 1990 to 2010
 - The ONLY major sector in the EU where emissions are still growing

Atmospheric carbon

■ Share of total CO2 emissions by category, UK, 2012.

In the case of the UK, cars account for a higher proportion of CO2 emissions than the EU average

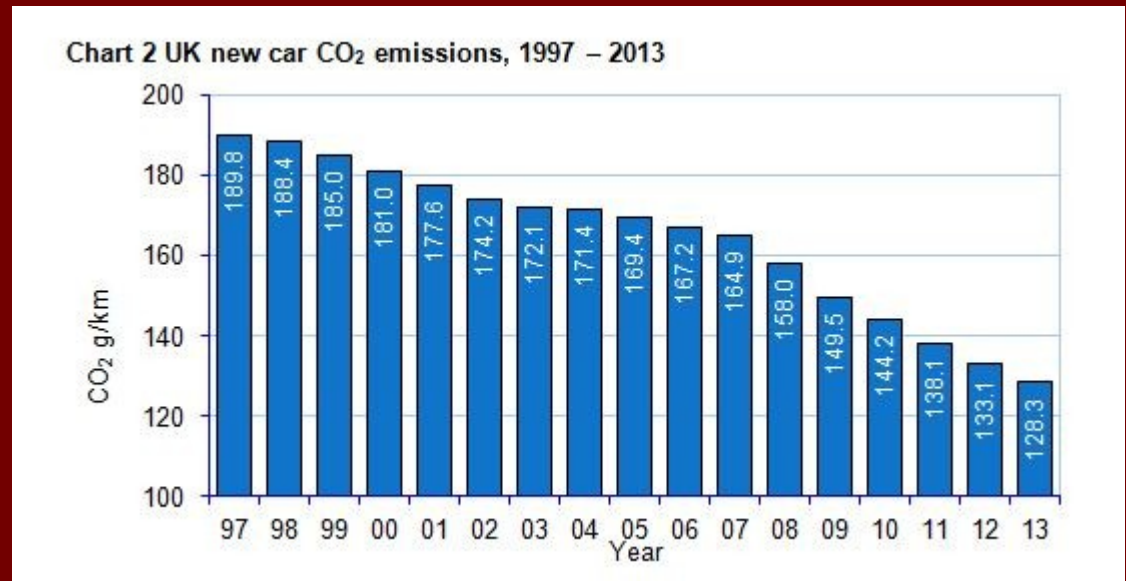
Note also the high share accounted by energy production 40.7%



Atmospheric carbon

■ Road transport and carbon emissions

The official picture may look moderately promising... A 31% drop in new car emissions since 1997

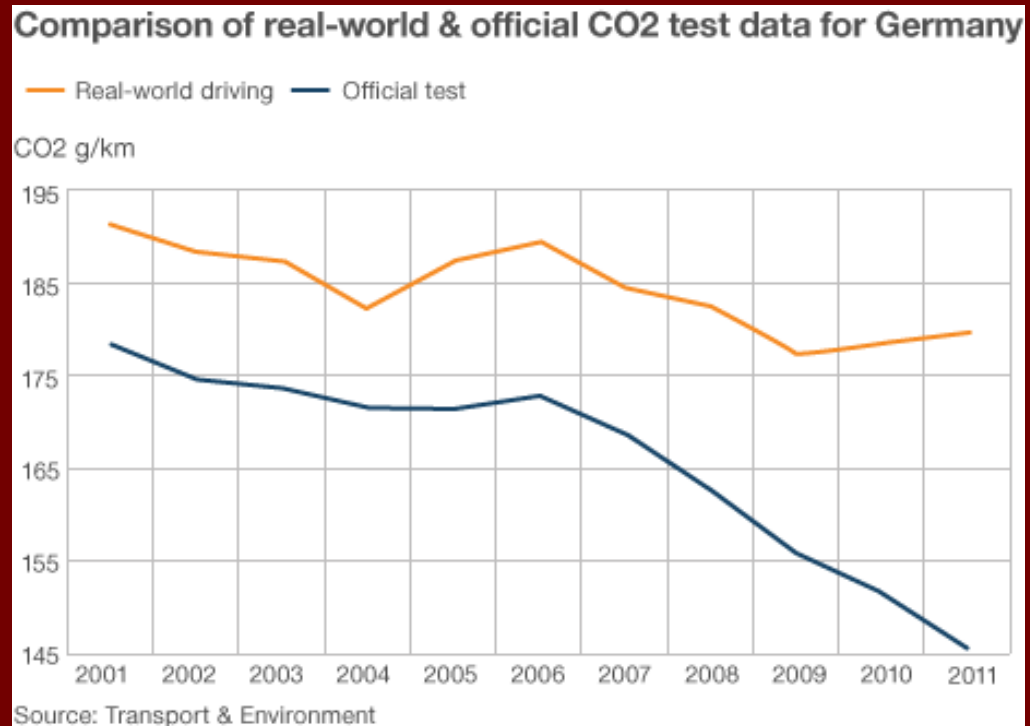


Atmospheric carbon

■ Road transport and carbon emissions

BUT there is a growing gap between real world emissions and those achieved on the test cycle

Typically in the range 15% to 35% more in real world than in official test cycle



Atmospheric carbon

- And need to consider how long to penetrate the total stock of cars in use
- EU in 2010 had about 239 million cars and light vans in use
 - 13.3 million new registrations
 - Stock = circa 17 years of registrations
 - So 2020 targets would not penetrate the entire fleet until 2037

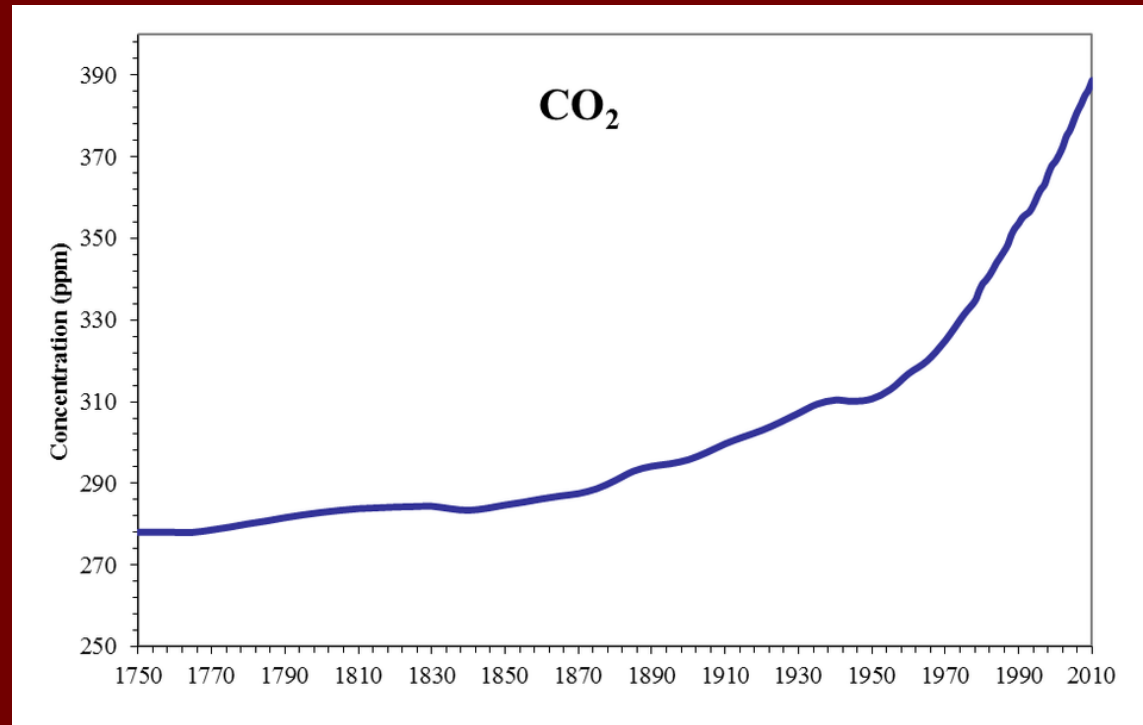
Atmospheric carbon

■ The 450ppm threshold

CO₂ growing at about 2.5ppm per annum

In May 2013 the level of 400ppm was breached

At the current rate, the critical threshold of 450ppm will be reached in 2034



Electric vehicles

- Electric vehicles widely seen as offering a pathway to low carbon mobility
 - Wide range of incentives and support offered in many EU states
 - Purchase cost assistance; low or zero road tax; low or zero company car tax; entry into low emissions zones; use of bus lanes; preferential parking; free recharging; free / subsidised recharger installation at home; etc.

Electric vehicles

- BUT penetration rates are still very low both for BEVs and HEVs
 - 2012 sales in the EU = 19,214 units
 - About double sales in 2011
 - BUT only 0.16% of total new car sales
 - (see <http://www.theicct.org/european-vehicle-market-statistics-2013>)
 - 1st half 2014 = 0.3% German new car sales

Electric Vehicles

"We're not in a situation where the market has followed our forecasts."

Chief Performance Officer Jerome Stoll, Renault, 2014.

Electric vehicles

- Actual contribution of BEVs to carbon reduction is modest, see:
 - Hawkins, T.R.; Singh, B.; Majeau-Bettez, G. and Strømman, A.H. (2012) Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles, *Journal of Industrial Ecology*, DOI: 10.1111/j.1530-9290.2012.00532.x.

Electric vehicles

- Main conclusions for BEV:
 - On Euro energy mix and 150,000 km:
 - 10% to 24% decrease in global warming potential (GWP) compared with petrol and diesel
 - BUT significant increases in human toxicity, freshwater eco-toxicity, freshwater eutrophication, and metal depletion impacts
 - 200,000 km improves EVs but note is beyond their current design life

Electric vehicles

- Porsche 918 spyder hybrid
 - List price £657,400 in the UK
 - 70 g/km CO2
- Porsche Cayenne 3.6 V6
 - List price £42,990
 - 263 g/km CO2
 - Sales circa 90,000

- Is this car going to save the planet?



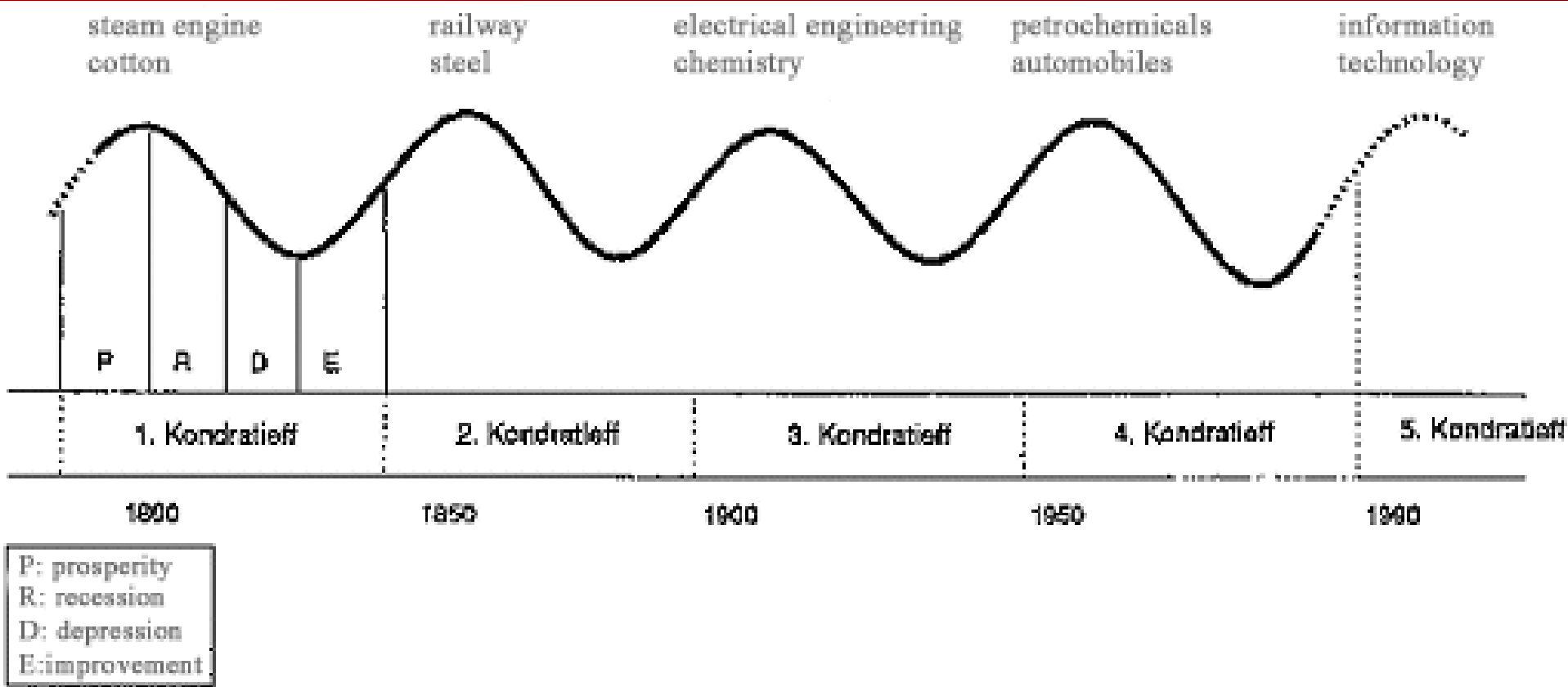
Transitions and temporality

- What do previous studies of technology permeating society tell us?
 - About the rate of uptake...
 - About the wider impact...
 - About the demise of previous generations of technology
- Three key problems
 - The time taken; the specifics of sustainability transitions; and spatial extension

Transitions and temporality

- Socio-technical transitions theory has roots in long wave theory
 - Fundamentally an economic theory of long run growth and decline
 - Kondratiev cycles of 40-60 years
 - Schumpeter cycles of 50-60 years
 - Each wave 'powered' by a new cluster of technologies
 - Returns to capital; productivity growth

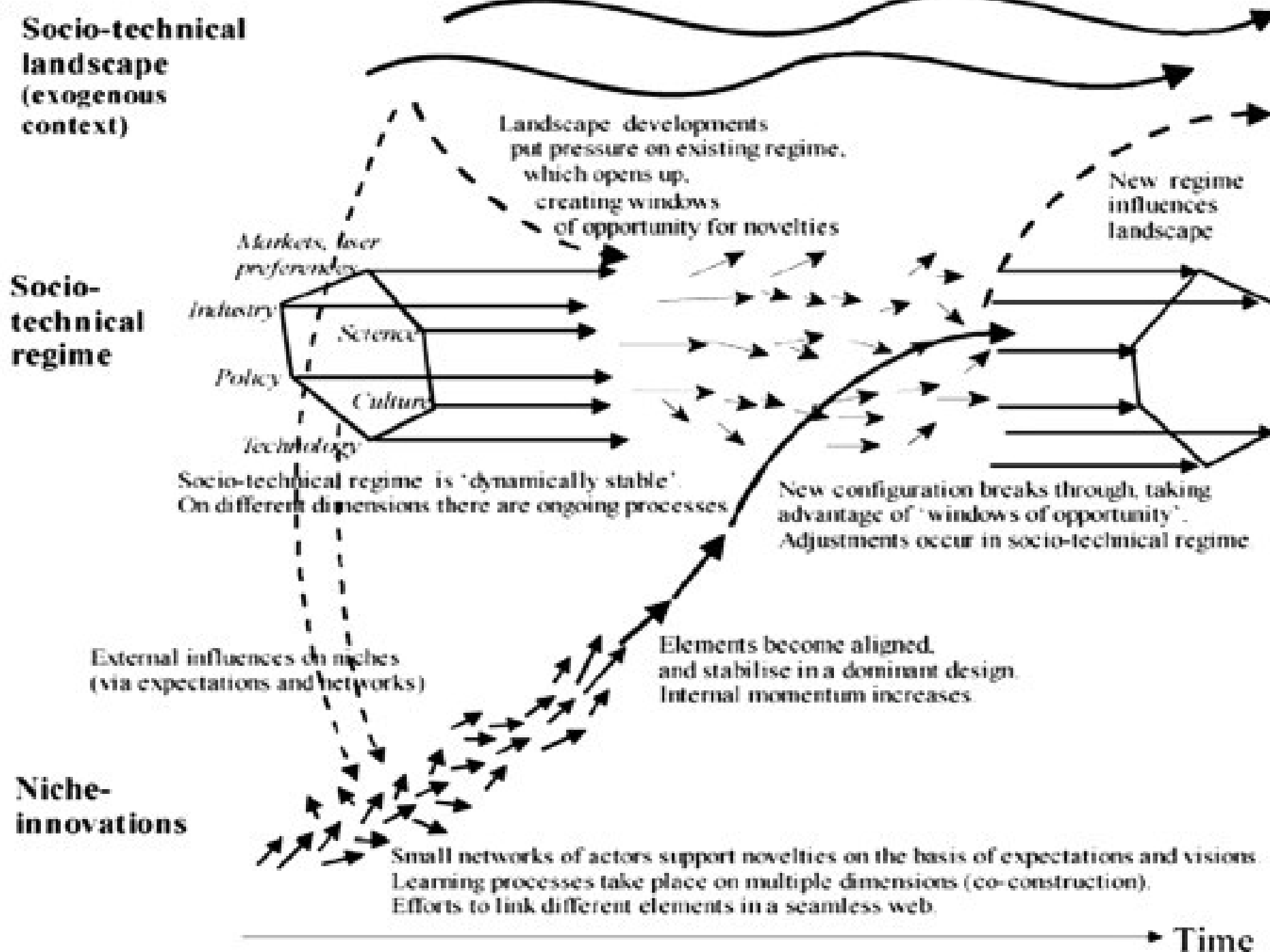
Kondratiev cycles in long historic view



Source: <http://www.globalresearch.ca/nikolai-kondratiev-s-long-wave-the-mirror-of-the-global-economic-crisis/11161>

Transitions and temporality

- The 'growth' phase of the S curve lasts around 25 years
 - Modest market share
 - Exponential expansion circa 15 years
 - Plateau at high level of market penetration
 - Dominant technology position
- S curve concept lies at the heart of transitions theory



Transitions and temporality

- BUT transitions theory when applied to historical examples unfolds over decades
 - Existing regime difficult to displace
 - Social practices; attitudes; spatial structures all act as constraints to change
 - Sequential regime shift over space
 - Global economy does not change in synchronisation

Conclusions

- Whatever the merits of electric vehicles, they are not related to carbon emissions reductions
 - Note policy shift towards 'urban air quality'
 - Note also demise of Better Place despite logic of renewable energy
 - Note the rise of the electric 2-wheel market

Conclusions

- BEVs make sense in the context of a different vision for society
 - REDUCED DEMAND: Car sharing and reduced vehicle-derived mobility
 - REDUCED CARBON: Renewable energy
 - REDUCED MATERIALS: Materials stewardship and circular production systems
- Very different product, industry and form of mobility contemporary BEVs