



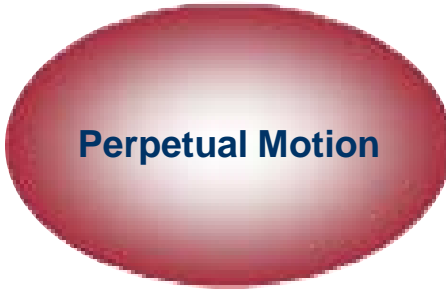
FORESIGHT

Intelligent Infrastructure
Futures
The Scenarios –
Towards 2055

OFFICE OF SCIENCE AND TECHNOLOGY

Overview of the Intelligent Infrastructure Systems Scenarios

Accepting of Intelligent Infrastructure



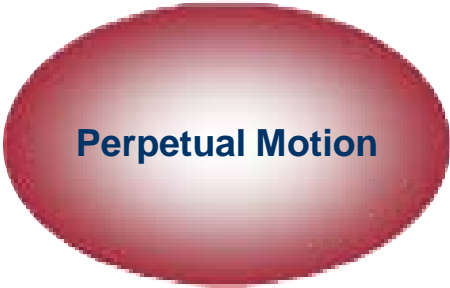
**High Impact
Transport**

**Low impact
Transport**



Resistant to Intelligent Infrastructure

Accepting of Intelligent Infrastructure



Perpetual Motion

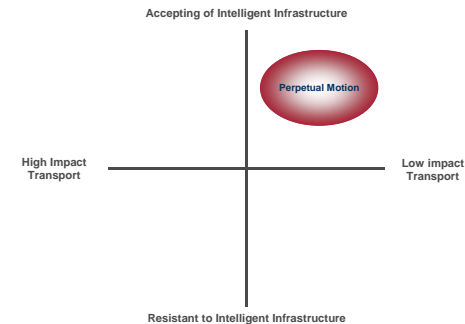
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Resistant to Intelligent Infrastructure

Overview

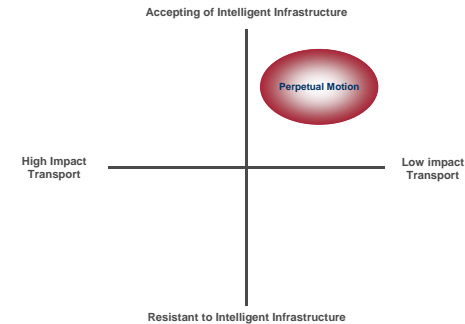
- Instant communication and continued globalisation have fuelled strong economic growth in a highly competitive environment.
- Consumption is high; demand for travel remains strong
- New cleaner fuel technologies are increasingly popular; road use causes less damage - even though volumes and speed of traffic remain high
- Aviation - which still relies on carbon fuels - is expensive and increasingly replaced by telepresencing and rapid train travel
- Increased nuclear capacity, switch to hydrogen economy



Perpetual Motion

Economic Performance

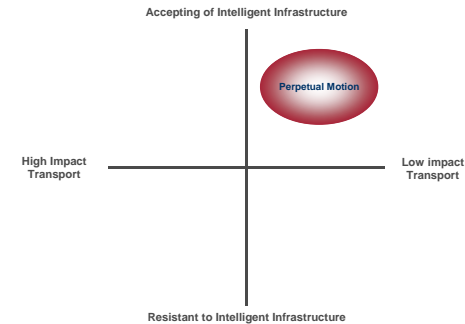
- Global economic growth in a highly connected and competitive world, fuelled by a pervasive 'work hard, play hard' ethos
- Work is both intense and intensive: the 24/7 society is here for everyone - even (especially!) low paid service workers
- In the UK and Europe high levels of affluence and constant technological innovation have combined to create rampant consumerism
- Much activity is concentrated in urban hubs, but older, higher earners tend to move to rural areas and use technology to remain connected
- ...causing some to worry over the long term viability of urban centres
- Growing home working and telepresencing have not reduced levels of travel



Perpetual Motion

Environmental Performance

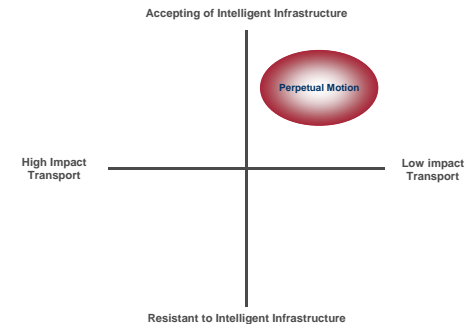
- Increased nuclear capacity and development of renewable energy sources have reduced dependence on carbon-based fuels
- The extensive deployment of hydrogen fuel cells in cars means that road use causes less environmental damage and environmental curbs on car use are unnecessary
- ...although the constant volume and speed of traffic - particularly in urban areas - create noise and stressful physical spaces
- Aviation remains carbon intensive and higher impact
- To some extent, society has tricked itself into thinking there is no environmental crisis - but continued consumption means Europe's environmental footprint is unsustainable



Perpetual Motion

Social Parameters

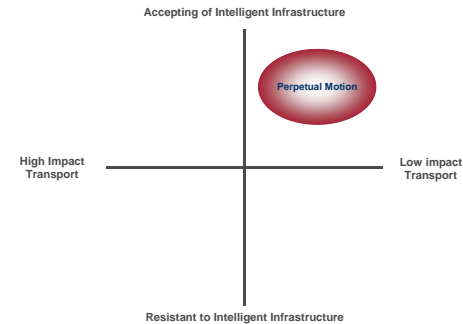
- This is the technology from birth generation - who are happy with ID cards, pervasive computing and always on technology
- High levels of empowerment, with many individuals able to take control of their own education and careers - so many thrive
- Lower paid service sector workers earn well but are forced to work long and anti-social hours. Many of these posts are filled by short stay economic tourists
- Growing acceptance of performance enhancing drugs to aid individual competitiveness
- ...and prescription and non-prescription drugs to combat stress - a major challenge in this society
- A growing sense of the need to stop and smell the roses - and to invite the family along...



Perpetual Motion

Transport activity

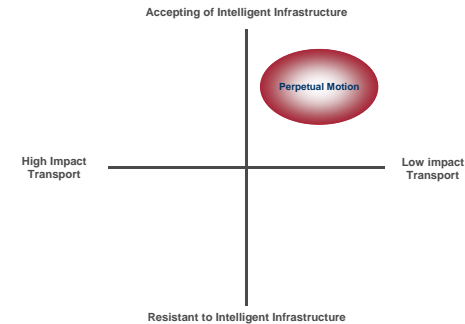
- Modes are highly interconnected; travel systems are highly adaptive
- On-board driver assistance is used to support and enhance decision making
- Automated highway systems and new energy sources mean greatly increased traffic volume, traffic speed and distance travelled on the roads
- The rail network is expanding - with the bulk of new investment going into long distance travel. Short journeys are dominated by light rail systems, taxibuses and car trains
- Air travel is severely curbed to meet CO₂ obligations and only used for business travel
- Recreational travel is popular. Long haul journeys tend to be by train or night rider



Perpetual Motion

Health impacts

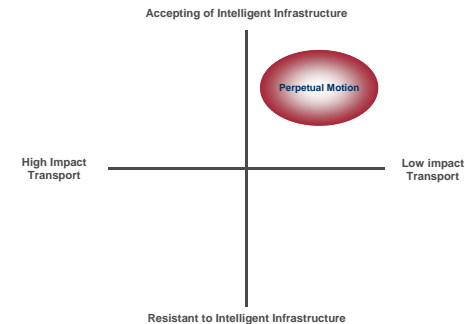
- Economic growth drives health improvement but masks significant inequalities
- Access to goods and services is excellent for most people but poor for disadvantaged groups
- Few opportunities for physical activity; high obesity levels continue to rise
- In-vehicle safety highly developed but at the cost of increased danger for pedestrians and cyclists
- Cleaner and quieter vehicles, but increased traffic volumes have offset some of the gains, with continued air and noise pollution in urban areas
- High stress environment with limited opportunities to escape to the few remaining peaceful rural areas
- Hypermobility weakens social networks



Perpetual Motion

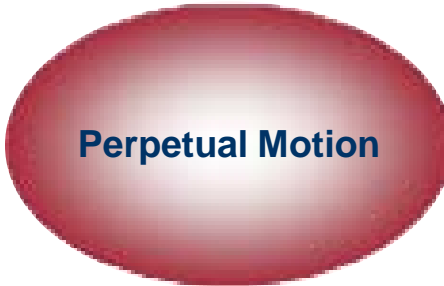
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Perpetual Motion

Accepting of Intelligent Infrastructure



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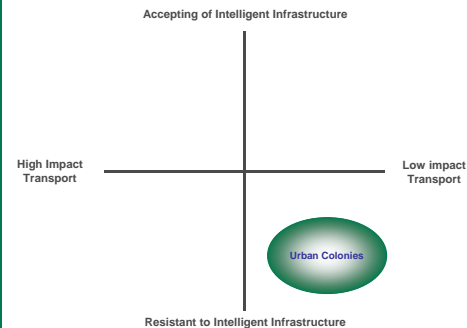


Urban Colonies

Resistant to Intelligent Infrastructure

Overview

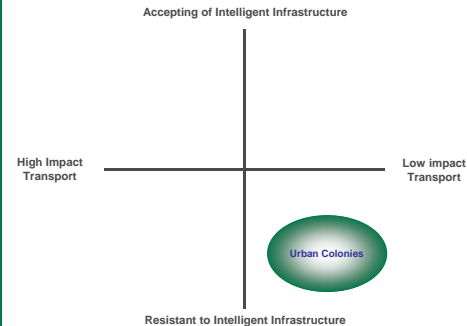
- The drive for economic advantage - coupled with the need to change lifestyles in order to reduce emissions - has led to an urban renaissance
- Population, housing density and employment in the big cities are rising faster than before
- Planning policies, technology development and investment are primarily focussed on minimising environmental impact. Cities are more compact
- Transport is permitted only if green and clean. Car use is restricted. Public transport - electric, low energy - is widely used
- Travel within cities is efficient - integration of wider infrastructure systems is poor
- Rural areas have become more isolated, effectively acting as food and bio-fuel providers for the cities



Urban Colonies

Economic Performance

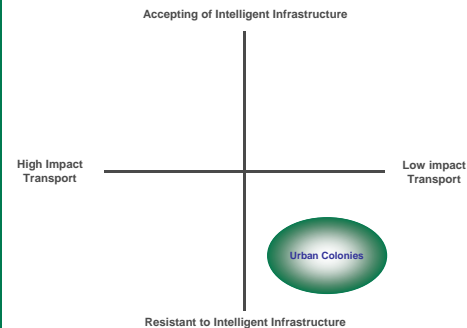
- Most economic value resides in knowledge hubs within cities which attract the best people to learn and work
- Cities compete for human resources on the basis of quality of life, cultural assets and education
- Sustainability and long termism are key guiding principles for success. Business - with its historically short termist approach - is viewed with scepticism
- Higher consumption of services, but lower consumption of goods - people value things which are well made and which last.
- There has been a shift towards local production - the UK agricultural sector is a key strategic resource and stronger and more diverse than for a century



Urban Colonies

Environmental Performance

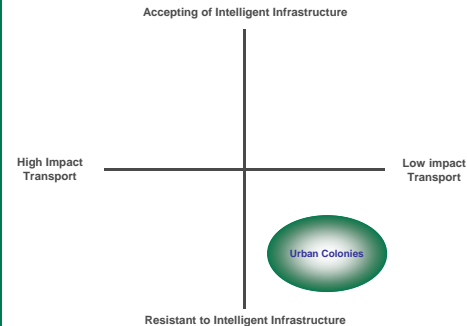
- The main aims of policy are to reduce energy consumption and eliminate waste
- Energy supply is distributed. Microgrids generate over 50% of household electricity in the cities
- New housing is built on top of existing developments or on brownfield sites. City edges are protected. All developments are mixed use
- Consumers are taxed on the resources they use up rather than what they spend or what they earn. Sustainable consumerism - reduced packaging, energy efficient processes - has risen
- Everything either gets recycled or returned, clean, to earth or water
- Electric vehicles and biofuels are common



Urban Colonies

Social Parameters

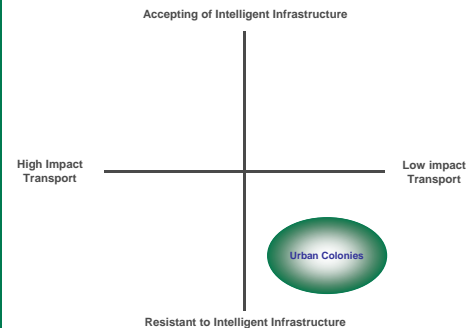
- Close proximity of living means policies to ensure social equity are hugely important
- Public policy is focussed on mobility rights; transport systems are designed to be accessible for everyone
- Free migration of people across Europe; the UK is an attractive location
- Cities have strong identities and offer a stronger sense of community; people are more compassionate.
- On street crime has stabilised. White collar crime is endemic.
- There is an uneasy divide between rural and urban areas



Urban Colonies

Transport activities

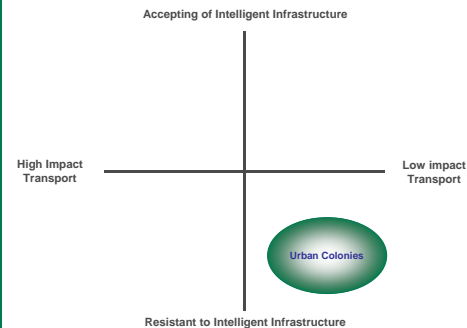
- Different systems are controlled by different organisations - integration of transport modes is poor
- People travel less - and only if transport is clean and green. The average journey is much shorter
- Walking and cycling have increased; public transport systems are based on light rail and electric vehicles
- Private vehicles utilise renewable energy and biofuels
- Long distance travel is harder, more expensive and less common than it was; speed is less important than energy conservation
- Aviation is financially and environmentally costly - and used sparingly



Urban Colonies

Health impacts

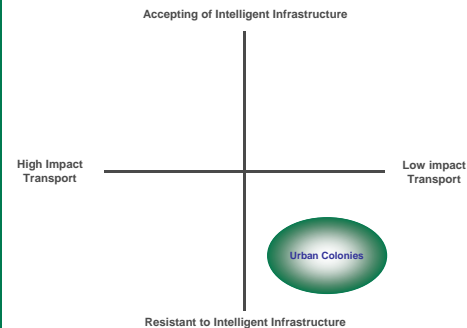
- Physical activity through active travel has resulted in a healthier, less obese population
- Localisation provides convenient access to goods and services for urban population, but access is poor for those in rural areas
- Clean and pleasant environment with low levels of pollution
- Prominence given to active travel modes has improved road safety and reduced transport deaths and injuries
- Strong local social networks promote healthy communities
- Reductions in health and social inequalities in urban areas but persistent rural deprivation and isolation



Urban Colonies

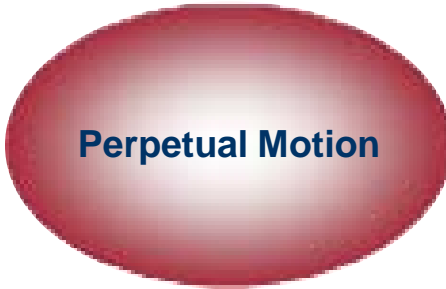
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Urban Colonies

Accepting of Intelligent Infrastructure



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Resistant to Intelligent Infrastructure

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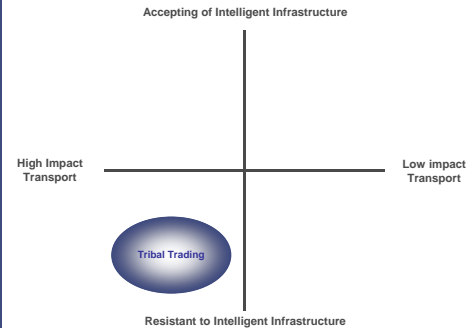
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Resistant to Intelligent Infrastructure

Overview

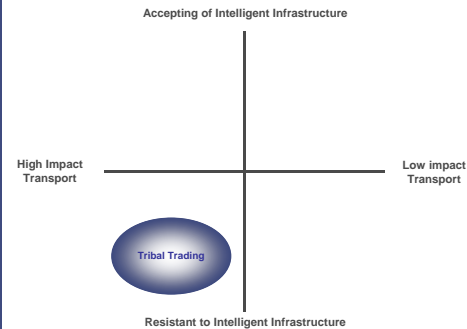
- The world has been through a sharp and savage oil shock
- The global economic system is severely damaged; infrastructure is falling into disrepair
- For many, the world has shrunk to their own communities
- Local food production and services have increased
- There is very little long distance travel
- Local transport is mainly by bike or by horse



Tribal Trading

Economic Performance

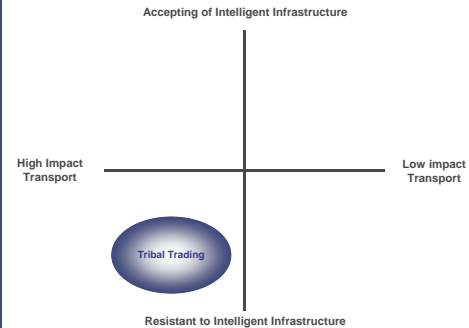
- The collapse of the global economic system destroyed millions of jobs - they have never been recovered
- High levels of employment now in local food production and distribution
- Barter - of goods and services - is an increasingly important form of trading with its own basket of currencies
- Regions with diverse skills and strong local culture do reasonably well
- Work is - inevitably - closer to home
- There is little money for investment; innovation comes out of necessity



Tribal Trading

Environmental Performance

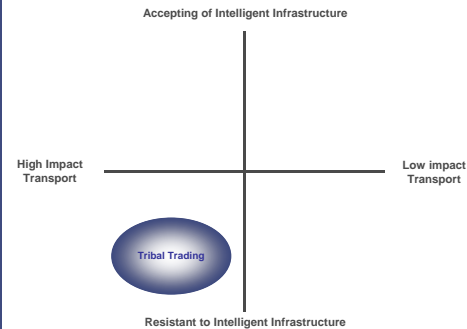
- Huge increase in distributed power generation using sun, wind and water - regions with access to natural resources are better off
- Some - but limited - contribution to the national grid
- No nuclear power - government failed to invest in it when it could afford to
- Carbon emissions have gone down
- Buildings are highly energy efficient
- Extensive re-use and recycling of products waste is minimal



Tribal Trading

Social Parameters

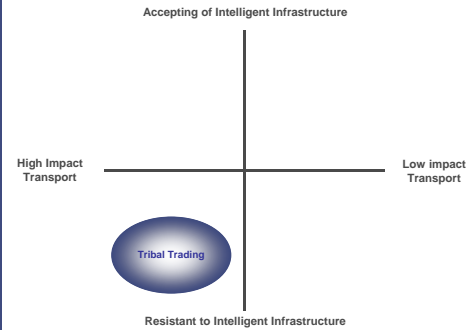
- This is a low trust environment with groups of tight knit communities that are wary of outsiders
- There is a strong spirit of self help - people rely on each other for practical support
- Communities with a history of pulling together in the face of adversity tend to do better; those that don't find it hard to build social cohesion
- Big cities are heavily policed; towns and rural communities feel safer
- More physical work and less indulgent lifestyles mean that people are fitter and healthier



Tribal Trading

Transport activities

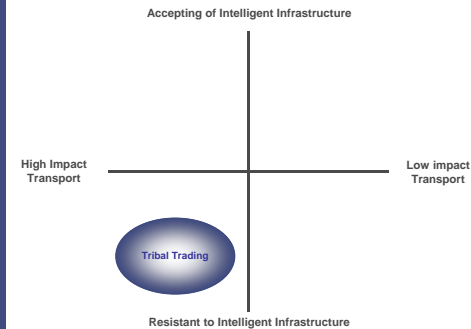
- Energy efficiency matters more than speed
- Low value freight is moved by water; high value freight by rail
- Cross (regional) border travel incurs a tariff - a major source of income for some
- What cars remain are powered by steam and are mainly used for commercial purposes
- Regions with access to renewable power and good storage devices are able to run limited public transportation systems
- Local transport is mainly by human power or by horse



Tribal Trading

Health impacts

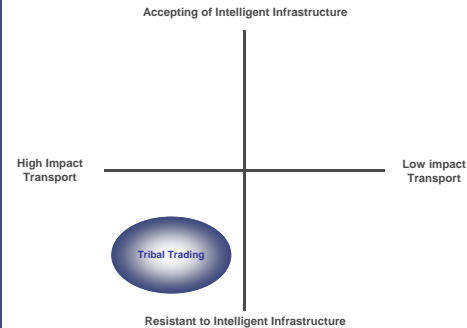
- Declining health across society, at its worst in deprived groups, with widening inequalities
- People lead active lifestyles, with high levels of physical activity and low levels of obesity; without this health status would be even lower
- Violent society with increases in both deliberate and unintentional injuries
- Poor access to goods and services, especially for people with mobility problems
- Extreme weather is common and communicable diseases are increasing
- Environmental degradation leads to problems such as threats to water security
- Poor healthcare services with limited resources and capacity



Tribal Trading

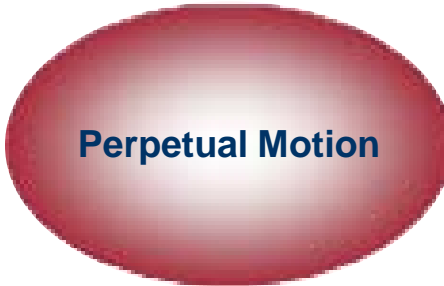
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Good Intentions

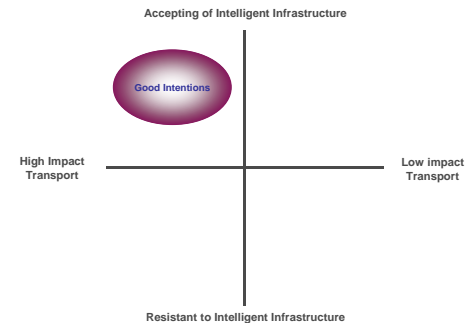
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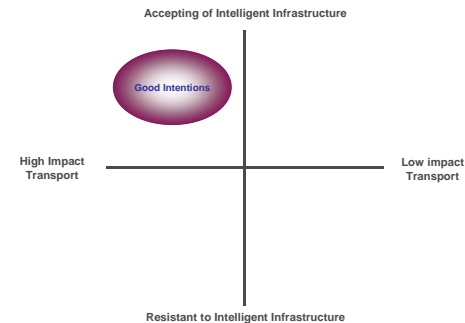
- Following decades of inactivity over global warming, governments have been forced to act to prevent further carbon emissions
- People's lifestyles are determined by a strict and enforced scheme of carbon consumption control
- Biofuel is the primary alternative form of energy
- Cars are lighter, smaller and more fuel efficient, Traffic volumes have fallen and mass transportation is used more widely
- Businesses have adopted energy-efficient practices; distribution and logistics is highly sophisticated
- There remain major concerns about whether the world has done enough to avert a major crisis



Good Intentions

Economic Performance

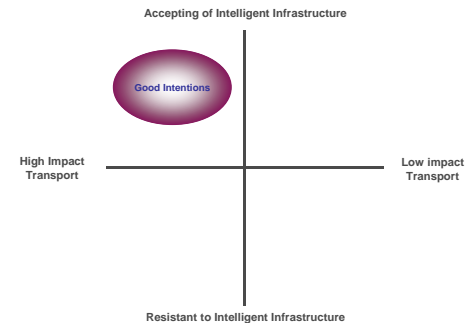
- High levels of employment, investment and innovation
- More homeworking for knowledge workers
- GDP growth is continuing despite less travel - leading some commentators to suggest that these two indicators have been decoupled
- There has been significant redistribution of wealth as a result of the new tax regime - which is based on resources consumed rather than money earned or goods and services purchased - and the market for carbon credits
- The greatest opportunities lie in the cities; rural areas offer employment, but little chance of development



Good Intentions

Environmental Performance

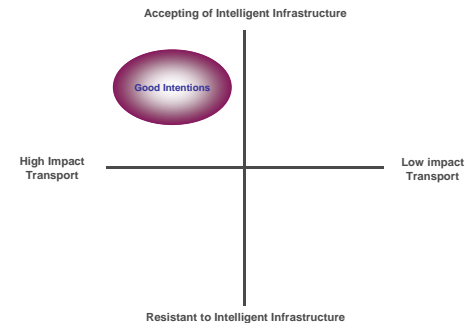
- Governments across the world are collaborating on policies to reduce the global impact of travel
- The G10's International Contraction and Convergence Agreement has successfully resulted in a reduction in emissions
- ...but carbon levels in the atmosphere are still rising and many commentators are worried that not enough has been done
- Governments have been forced to respond with schemes such as the UK's Carbon Entitlements programme - which has been introduced to ration travel
- The icecaps are shrinking and global weather patterns are unpredictable; environmentalists believe that the world is moving into unknown territory



Good Intentions

Social Parameters

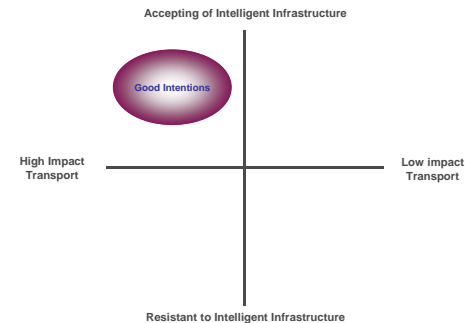
- Society sees government's approach as 'too much, too late' - and despite some early disruptions and widespread (violent) protest, now accepts the need to act
- Carbon entitlements (CEs) have become a second currency. Many cash poor are CE rich - and willing to trade with those who are cash rich and CE poor...
- Many middle income families have changed their lifestyles significantly, travelling and consuming less
- High carbon users (air passengers, for example) are villified by society



Good Intentions

Transport activities

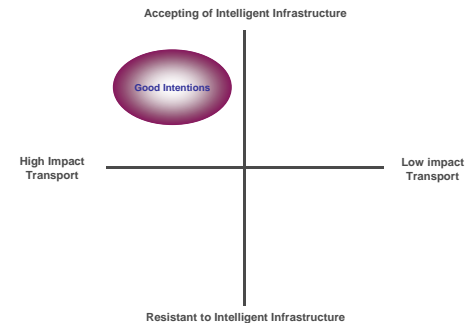
- Unrestricted personal mobility is now a distant memory. Two car families are in decline
- The renaissance in home working has created a strong demand for local low carbon transport infrastructure. Biofuel buses are popular
- In car technology shows the economic and environmental cost of each journey. Road use is charged on a pay as you drive basis
- Real time dynamic traffic management systems direct vehicles via the lowest impact route
- The growing number of bus and rail commuters are willing to suffer long journey times to save carbon entitlements. Trains are environmentally friendly but the network is stretched to capacity
- Air transport is heavily taxed and restricted



Good Intentions

Health impacts

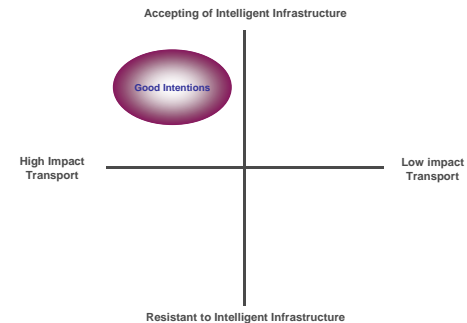
- Marked reductions in socio-economic inequalities (globally as well as locally) with consequent health benefits
- Reduced vehicle speeds, coupled with technology, have led to lower levels of traffic injuries
- Growth in active travel has increased levels of physical activity, although this has been partially offset by increased (sedentary) home working
- Extreme weather has significant impacts on health, exacerbated by carbon constraints on energy for adapting to it through heating or cooling
- Rural areas face an uncertain future



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