Cities of the future
Sustainable transport
A systems view
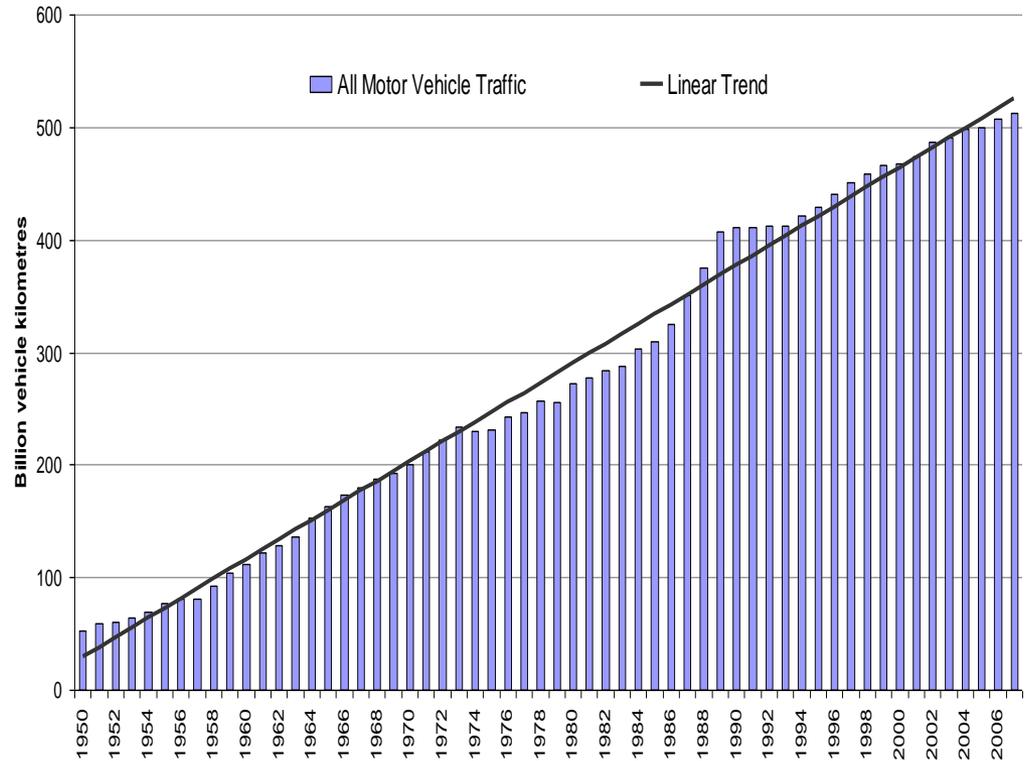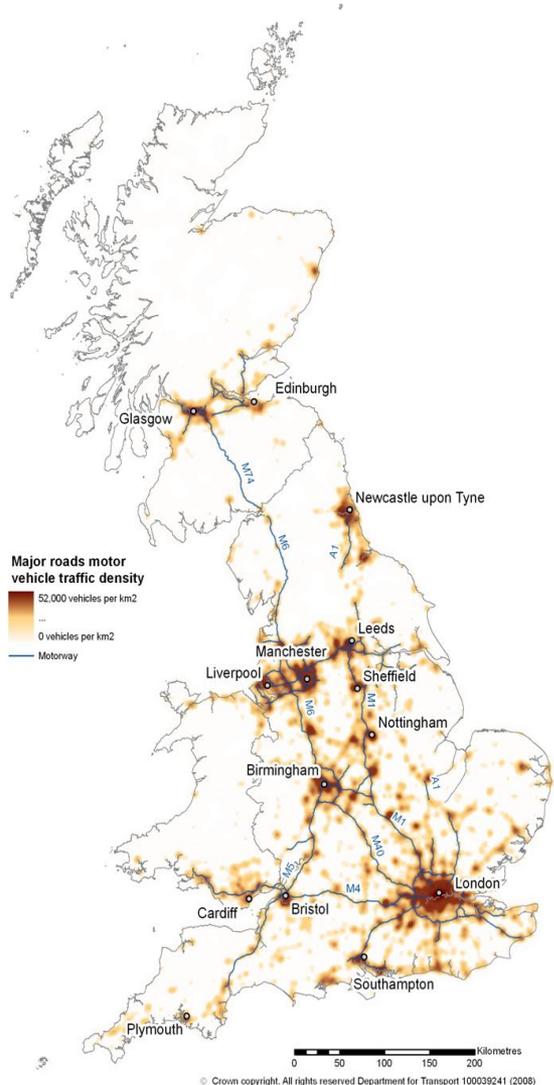
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The challenge – traffic growth

High density of traffic associated with high population densities and large urban areas

New carbon analysis provides critical insights

Car driver: Total trips and estimated CO_2 emissions by trip length, 2006

Investing in cleaner vehicle technologies

And air…..

And rail…..

Opportunities for vehicle improvement

- Internal Combustion Engine efficiency

- Electric motors

- Smart electricity usage
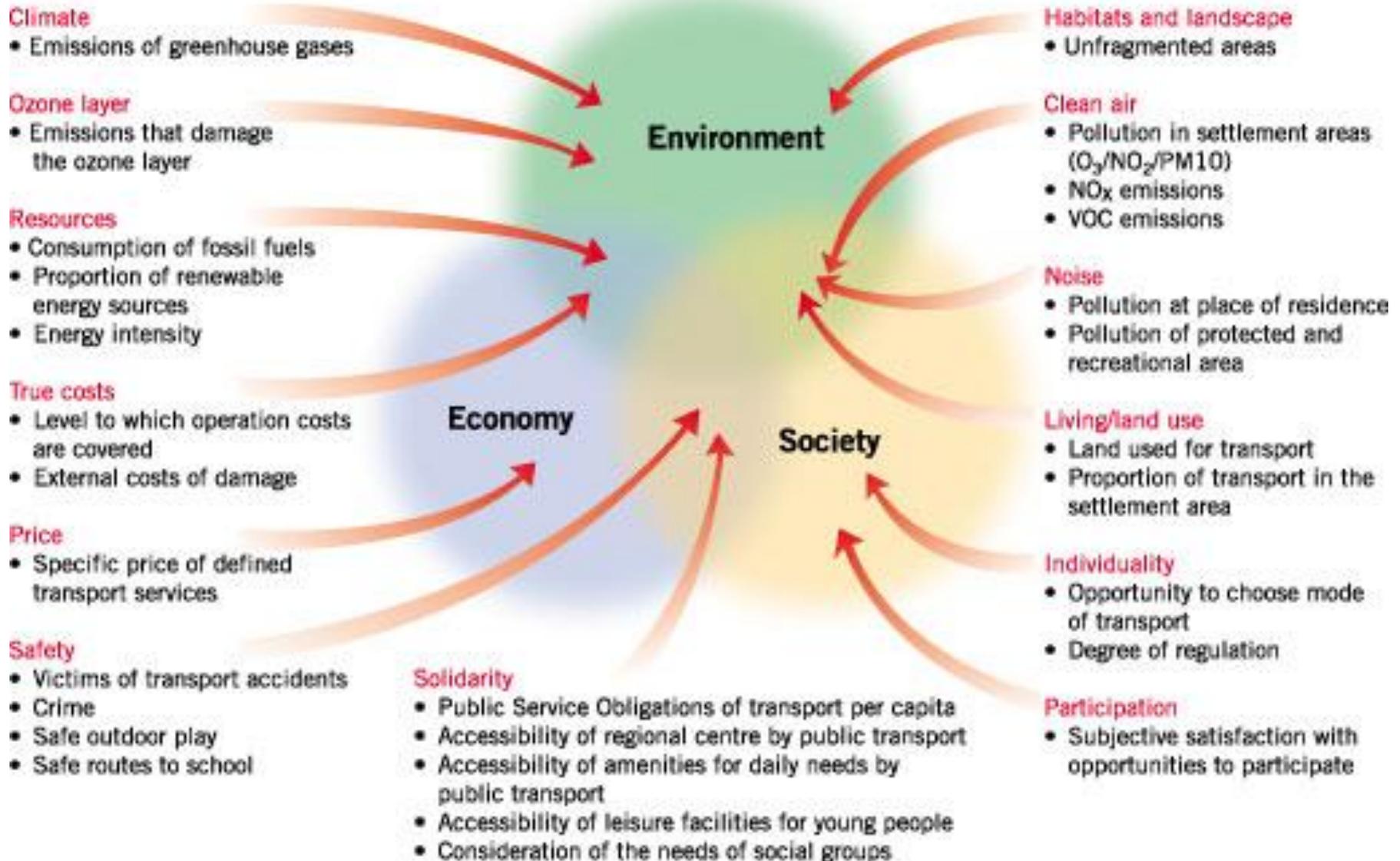
- Smart combinations

Human factors

- Real-time energy cost information

- Collaboration in journeys

- Modal shift
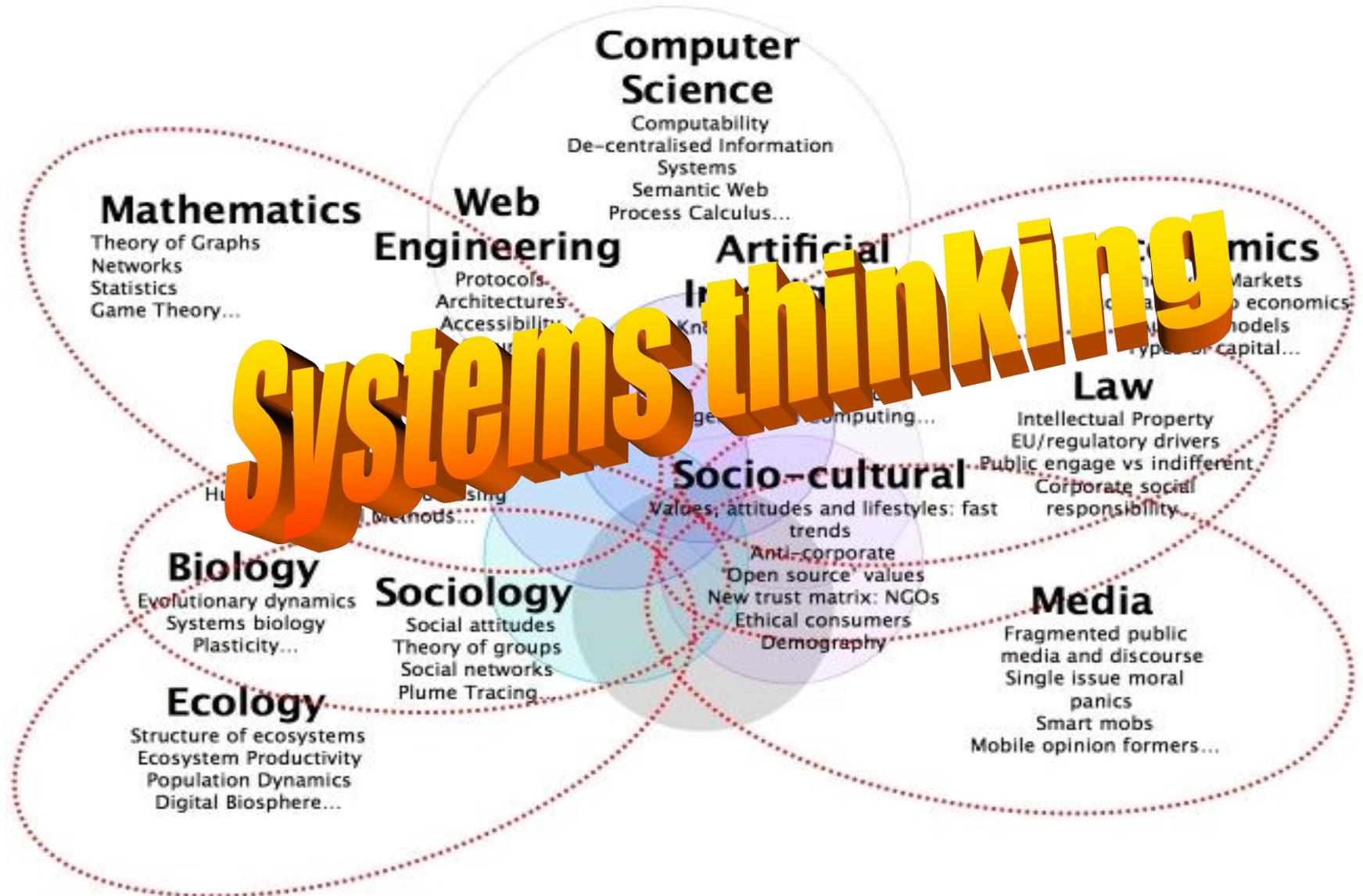
- Pricing and taxation

Opportunities for supply chain improvement

- Minimum energy manufacturing

- Smart logistics and distribution

- Improved raw material refining

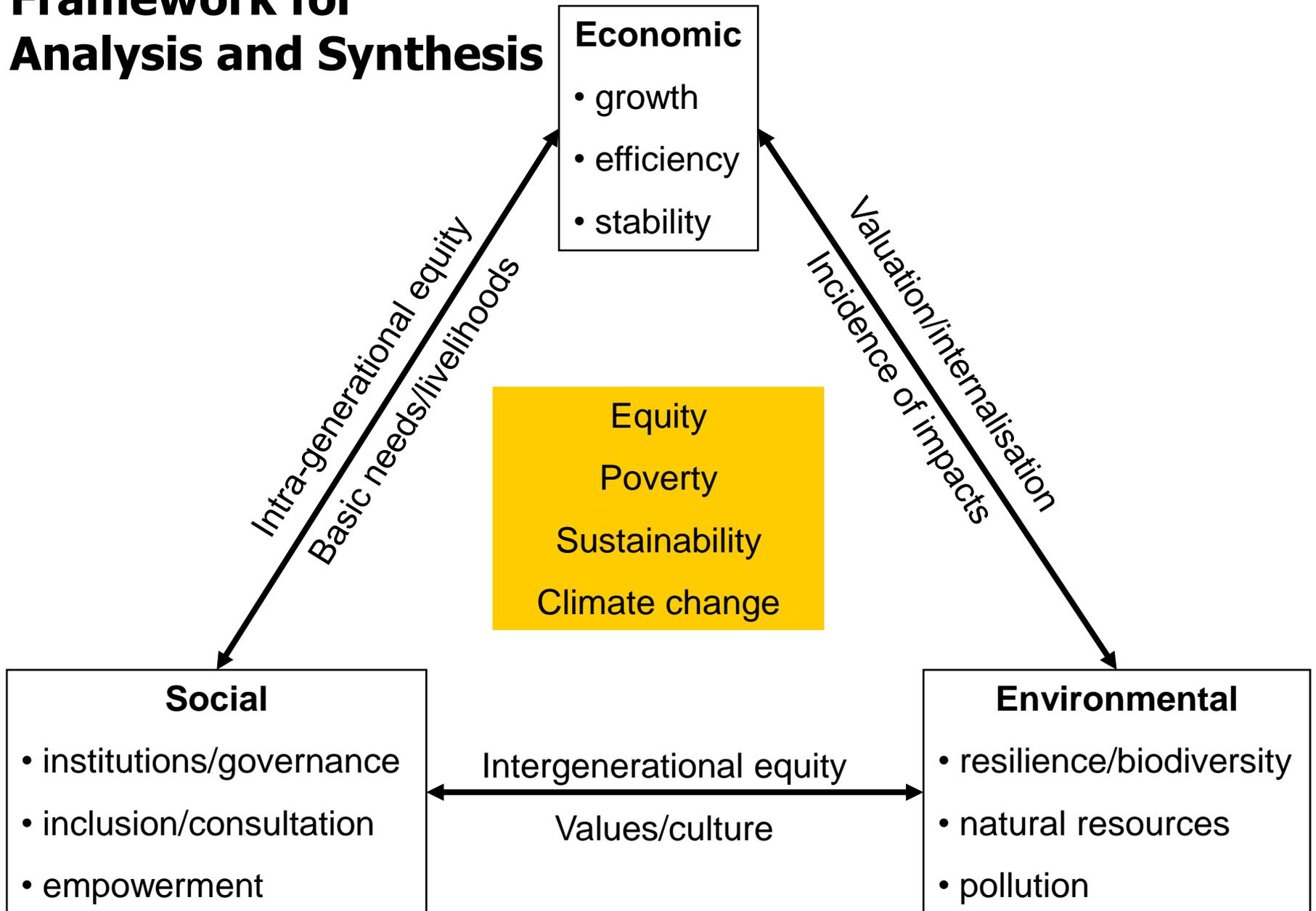- In service vehicle health management

Sustainable Transport context

Climate
- Emissions of greenhouse gases

Ozone layer
- Emissions that damage the ozone layer

Resources
- Consumption of fossil fuels
- Proportion of renewable energy sources
- Energy intensity

True costs
- Level to which operation costs are covered
- External costs of damage

Price
- Specific price of defined transport services

Safety
- Victims of transport accidents
- Crime
- Safe outdoor play
- Safe routes to school

Habitats and landscape
- Unfragmented areas

Clean air
- Pollution in settlement areas $(O_3/NO_2/PM10)$
- NO_X emissions
- VOC emissions

Noise
- Pollution at place of residence
- Pollution of protected and recreational area

Living/land use
- Land used for transport
- Proportion of transport in the settlement area

Individuality
- Opportunity to choose mode of transport
- Degree of regulation

Participation
- Subjective satisfaction with opportunities to participate

Environment

Economy

Society

Solidarity
- Public Service Obligations of transport per capita
- Accessibility of regional centre by public transport
- Accessibility of amenities for daily needs by public transport
- Accessibility of leisure facilities for young people
- Consideration of the needs of social groups

Web science and Society

Framework for Analysis and Synthesis

Economic
- growth
- efficiency
- stability

Intra-generational equity

Basic needs/livelihoods

Valuation/internalisation

Incidence of impacts

Equity

Poverty

Sustainability

Climate change

Social
- institutions/governance
- inclusion/consultation
- empowerment

Intergenerational equity

Values/culture

Environmental
- resilience/biodiversity
- natural resources
- pollution

Research areas

- Systems thinking
- Complexity analysis
- Game theory
- Pattern analysis,
- Probabilistic methods,
- Non-linear dynamics
- The application of methods from statistical physics to the analysis of complex systems
- Synthetic environments – serious games

Typical Research Questions

- What are the systems improvements to achieve GHG savings.

- Should we reduce personal consumption

- Should we make logistics more effective

- What critical leapfrog innovations might be necessary or essential

- Can we model and analyse and make useful predictions of any of this with current methods?

Provocation

- Does trustworthy analytic evidence always lead to better decisions
- How should we educate decision makers in the use of analytic evidence and use of opinion
- How often do we review a policy making process with respect to use of evidence and whether it was trusted
- Will the complexity of policy decisions in the future make evidence gathering too expensive and take too long

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