

Urban Planning Policy, Health and Wellbeing

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Overview

- Health and wellbeing in the context of urban transport planning
- Current framework for measuring health and wellbeing impacts
- An accessibility-based framework for health and wellbeing
- Recent research

Health and wellbeing in the context of urban and transport planning

Health and wellbeing

Health (as defined by the World Health Organization, 1948):

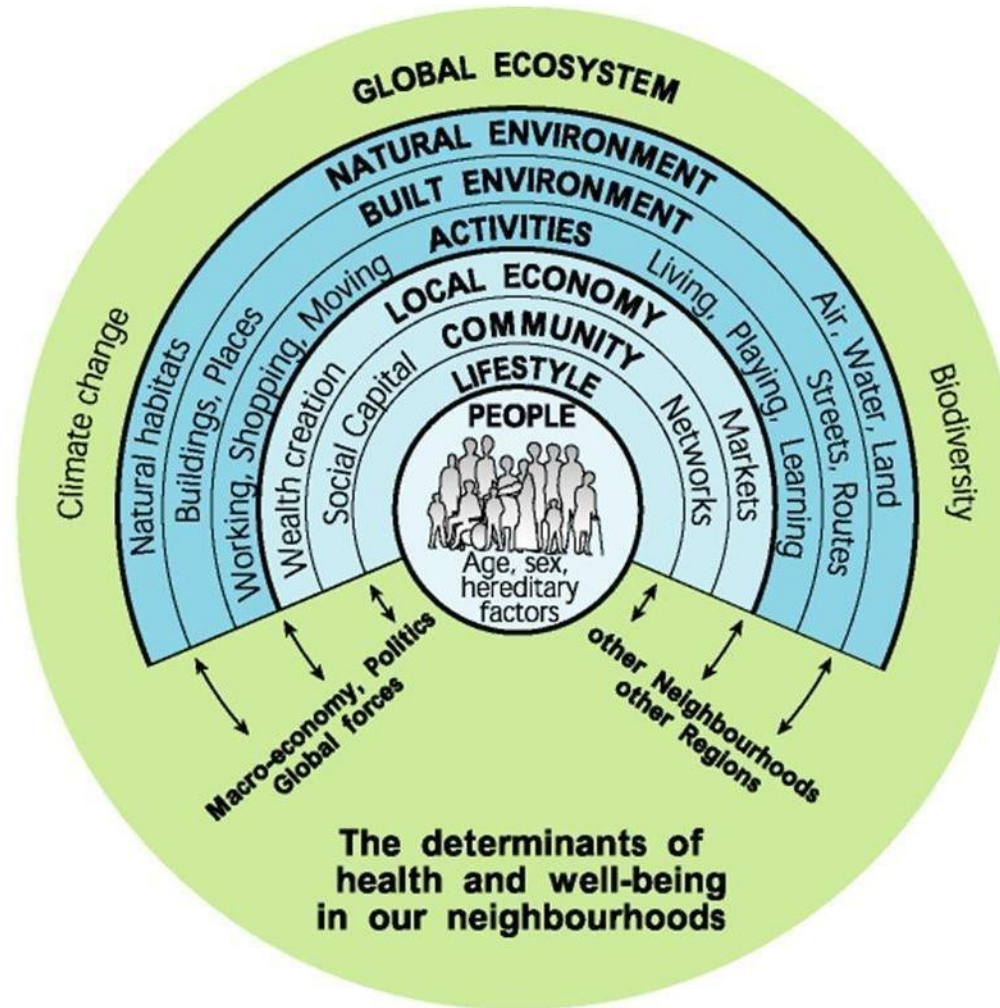
“a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity.”

Wellbeing (Government Office for Science 2008):

refers to the emotional and psychological state as well as the ability to function socially, cope well with difficulties, develop potential, work productively and creatively, build strong and positive relationships with others and contribute to the community

The role of transport

Effects of urban and transport planning on health and wellbeing



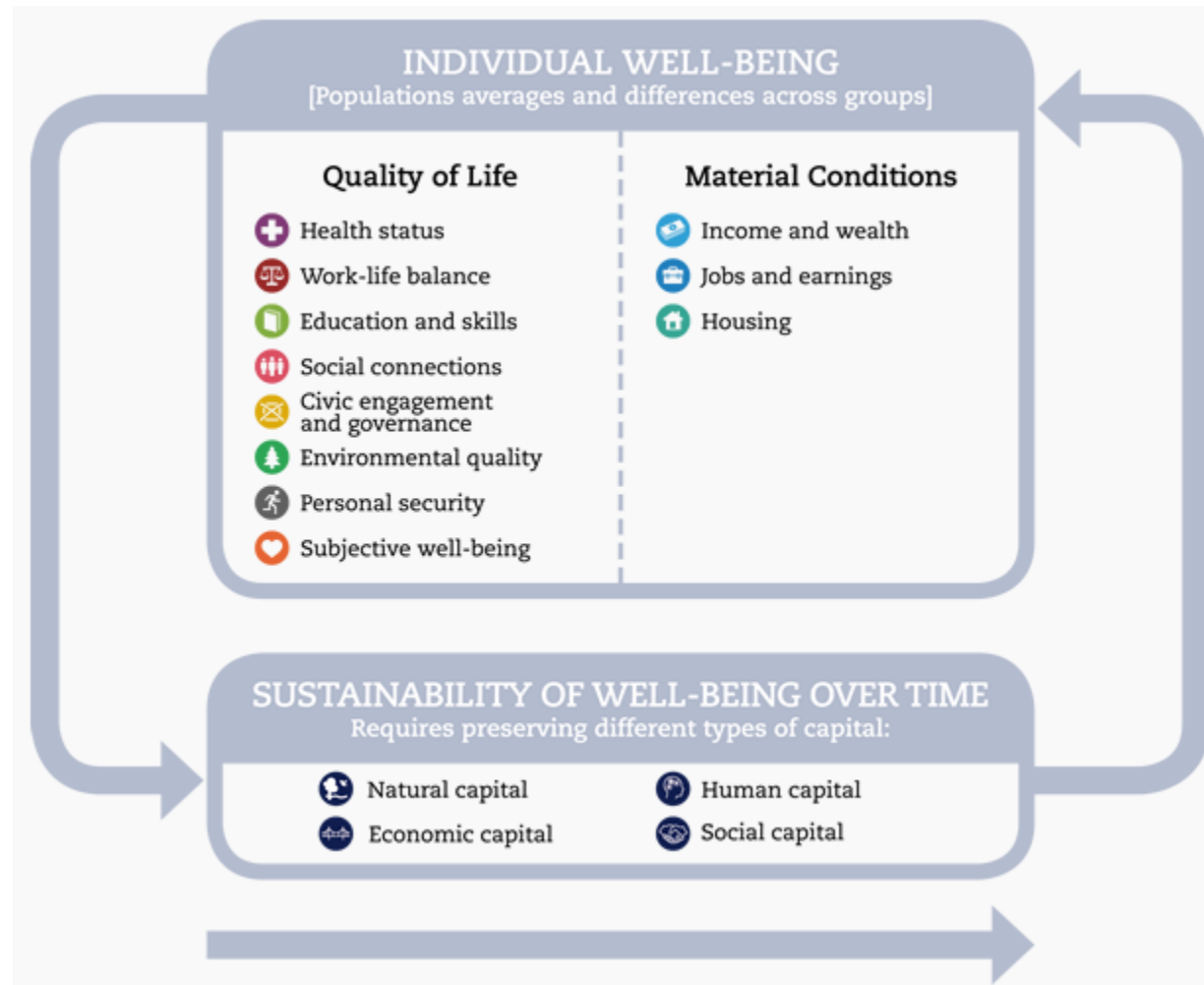
Barton, H., Grant, M., 2006. A health map for the local human habitat. *The Journal of the Royal Society for the Promotion of Health*, 126(6), pp. 252-253.

Subjective wellbeing

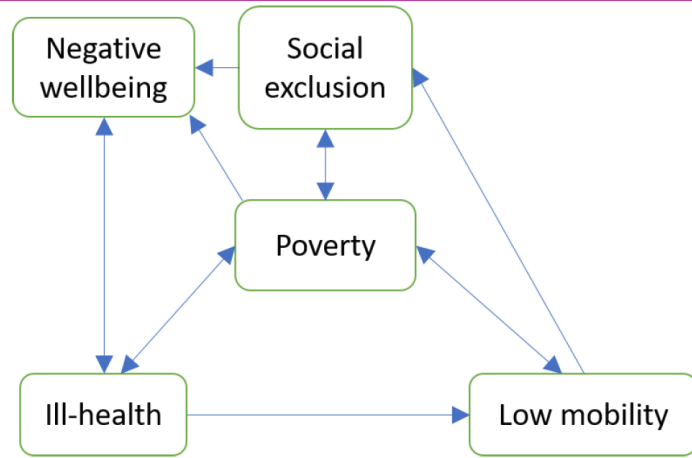
| Three Types of Happiness | Examples | Causes |
|---------------------------------|---|---|
| Life Satisfaction | <ul style="list-style-type: none">• I think my life is great• I am satisfied with my job | <ul style="list-style-type: none">• A good income• Achieving one's goals• High self-esteem |
| Positive Feelings | <ul style="list-style-type: none">• Enjoying life• Loving others | <ul style="list-style-type: none">• Supportive friends• Interesting work• Extroverted personality |
| Low Negative Feelings | <ul style="list-style-type: none">• Few chronic worries• Rarely sad or angry | <ul style="list-style-type: none">• Low neuroticism• One's goals are in harmony• A positive outlook |

<https://nobaproject.com/modules/happiness-the-science-of-subjective-well-being>

Measuring overall wellbeing

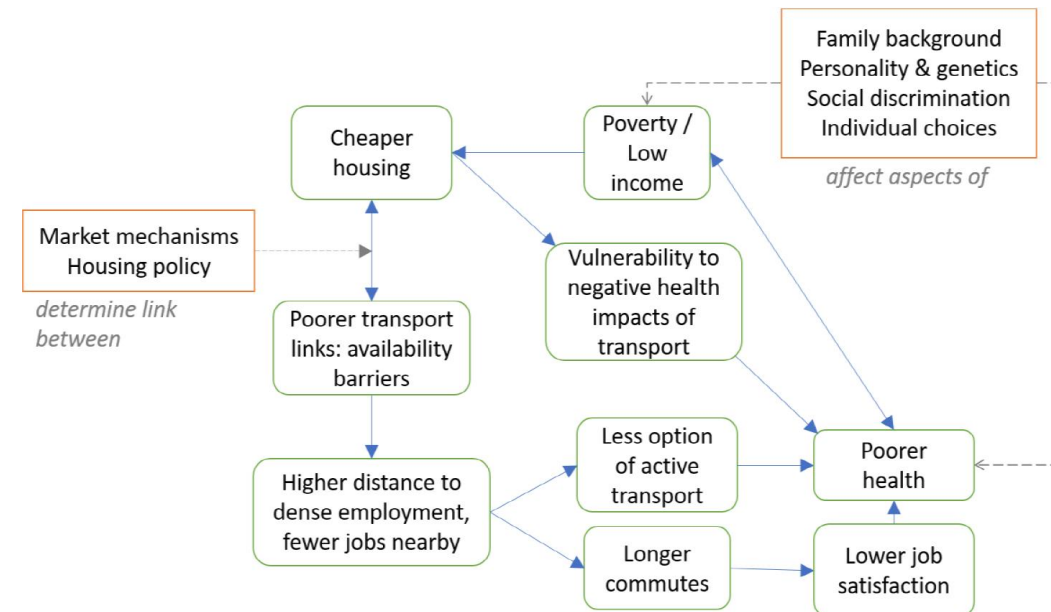


Transport, housing, health, poverty



Mobility, wellbeing, health and poverty

Transport, housing, health and poverty



Current framework for measuring health and wellbeing impacts

Health and wellbeing impacts

- Current state-of-the-practice models typically consider
 - Emissions and air quality impacts on health
 - Health impacts of active modes of travel
 - Impacts to health and life of reductions in road accidents
- And less typically
 - Noise pollution
 - Access to Green Space
- Do not consider
 - Stress due to travel conditions e.g. crowding, safety, impacts on physical and mental health
 - Quality of life arising from accessibility/prosperity (addressed to a limited extent)

Two broad approaches

Comparative Risk Assessment

- systematic evaluation of the changes in population health which result from modifying the population distribution of exposure to a risk factor or a group of risk factors
- Burden of Disease (or any measure of population health or disease) can be classified based on: 1) Outcome or disease type 2) Risk factors that cause disease
- More common approach
- Accounts for uncertainty

Direct estimation

- Directly model (using regression techniques) the link between built environment and transport system characteristics and health outcomes without assessing exposure risk
- Challenging to develop models of 'causality'
- But if feasible can be more direct in measuring health impacts of alternative policies

Exposures and Outcomes

- Exposures
 - Emissions (PM and other carcinogenic pollutants)
 - UV-A/UV-B (Ozone layer)
 - Ozone air pollution
 - Traffic accidents
 - Noise pollution
 - Pathogens and diseases
 - Conditions of personal safety risk
 - Crowded and stressful conditions
- Changes in travel behaviour
- **Changes in accessibility**
- Physical health outcomes
 - Non-communicable diseases due to cardiovascular health conditions, bronchial asthma, cancers etc
 - Communicable diseases e.g. flu and other viruses
- Loss of life or physical disabilities due to traffic accidents
- **Stress and related mental and physical health conditions**
- **Quality of life based on access to opportunities (economic, leisure, social)**

Quantification of impacts

VOLY (Value of a Life Year):

Monetary value of a statistical life year, values the impact of risks to the length of life.

QUALY (Quality Adjusted Life Year):

Values changes in health-related quality of life and length of life.

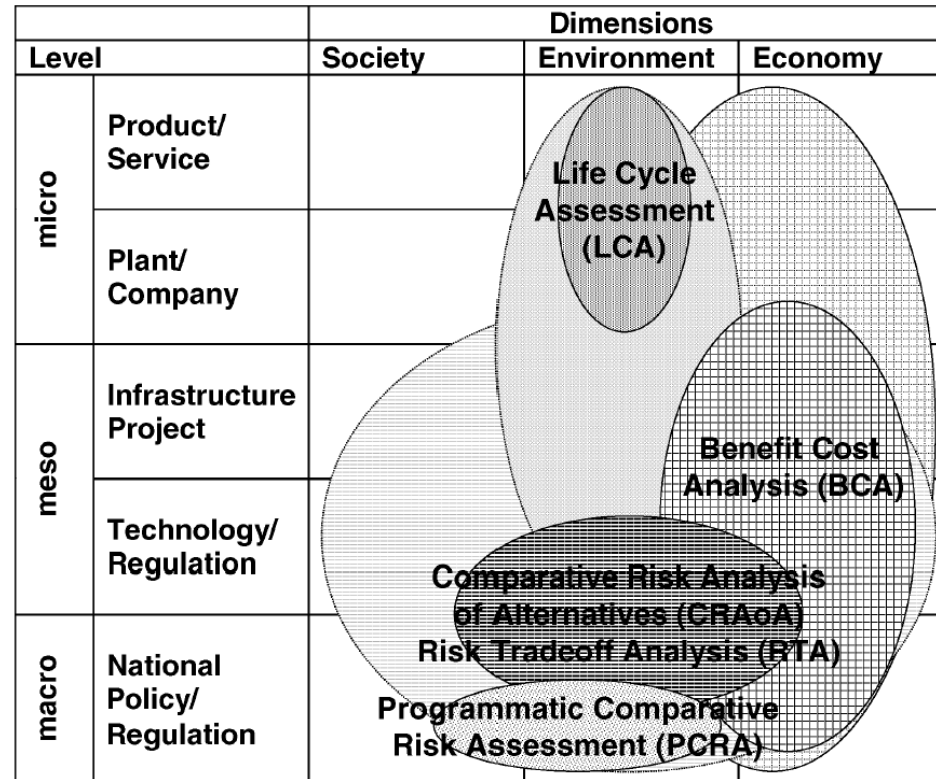
DALYs (Disability Adjusted Life Years):

One DALY represents the loss of the equivalent of one year of full health. DALYs for a disease or health condition are the sum of the years of life lost to due to premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population.

Going beyond HIA...

- UK transport policy has been aware of the importance of a people-centric focus for several decades
 - Social Exclusion Unit (2003) report identified the important links between unequal mobility and inability to access jobs, education, training, healthcare, affordable food and leisure opportunities
- However, there has never been a direct **link between transport investments/policies, changes in accessibility, and the quantification of their wellbeing impact** through the transport appraisal process
- Instead there has been a broader push towards what is known as a ‘people-centred’ or ‘human-centred’ approach to transport policy, where qualitative assessments are made of the intangible impacts of transport policy... environment and accessibility being the primary dimensions of impact
- Which would work if the transport appraisal process was not heavily dependent on the Benefit-Cost-Ratio and the CBA process
- But even apart from the need to improve/revise the transport appraisal process to account for intangible impacts that are hard to quantify, there are significant challenges in linking travel demand models to health and wellbeing

Toolkits available for appraisal



Source: Hofstetter et al (2002), Risk Analysis 22(5)

An accessibility-based framework for health and wellbeing

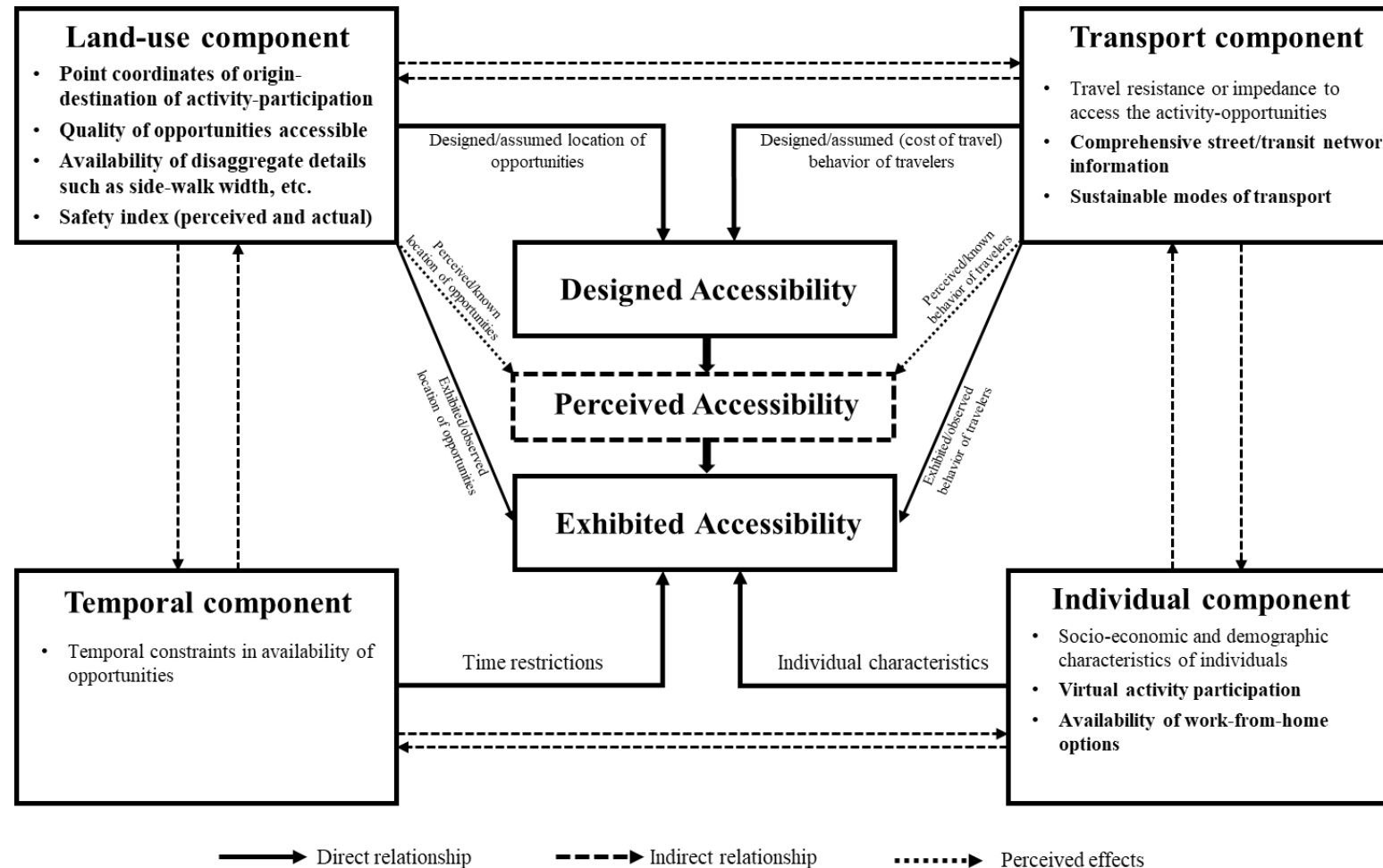
Transport objectives from the health & wellbeing angle (1)

1. Reducing road accidents: direct hazard, and impact travel behaviour
2. Promoting healthy lifestyles: encouraging walking, cycling and physically active lifestyles, to combat heart disease, diabetes, depression
3. Social cohesion and social capital: strong link between mental wellbeing and social support
4. Access to affordable and quality housing: good quality housing (space, warmth, light) are important for health

Transport objectives from the health & wellbeing angle (2)

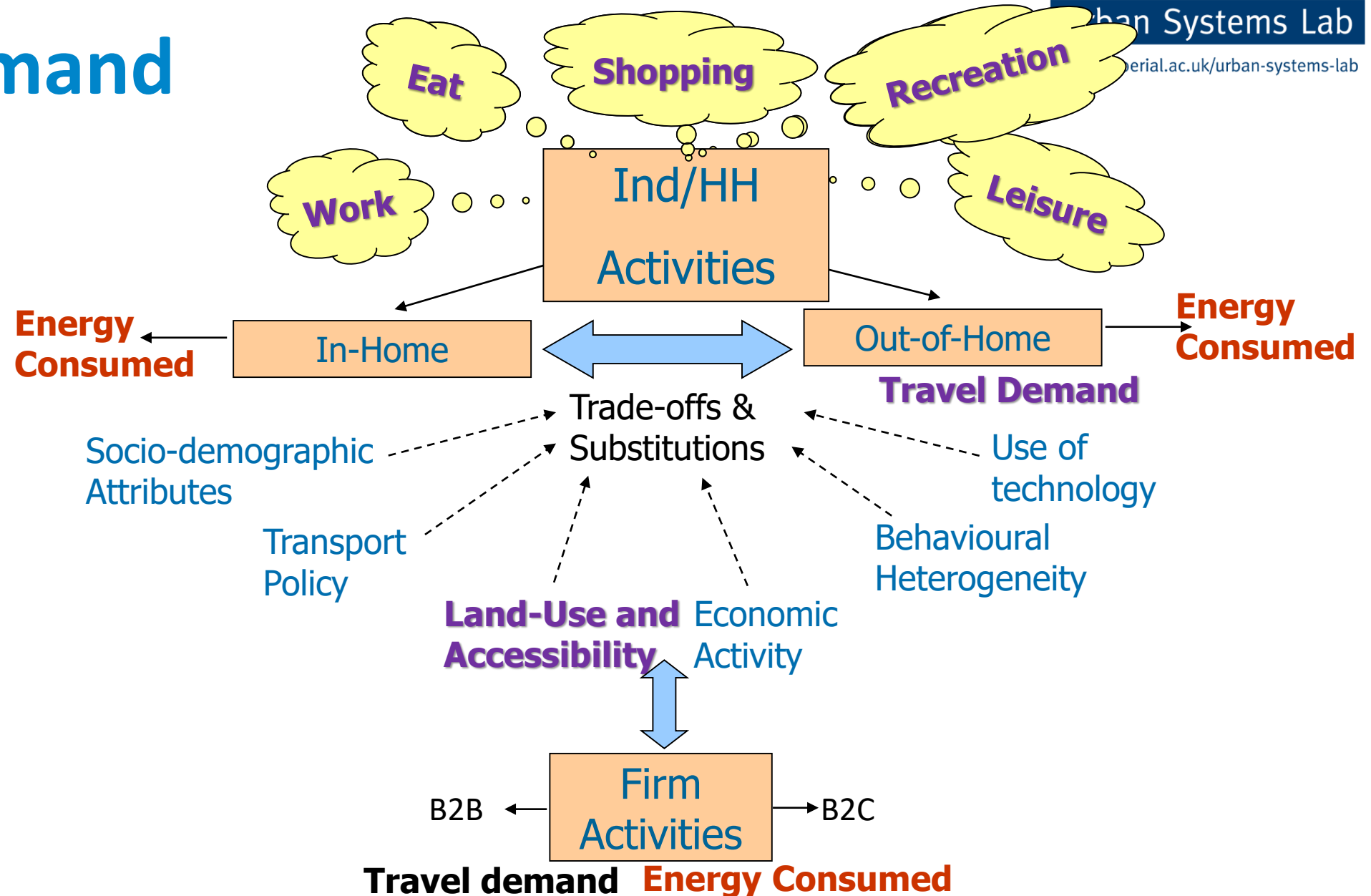
5. Access to education, cultural, leisure, health and retail facilities: access to open space (physical activity, restorative), healthy food, quality healthcare, self improvement, stimulation... impacts mental/physical health
6. Access to employment opportunities: unemployment leads to increased levels of stress, physical and mental illness
7. Promoting good air quality: reduce direct health impacts (asthma, lung and heart disease), reduce climate change and related hazards

There is a need for an accessibility-based framework

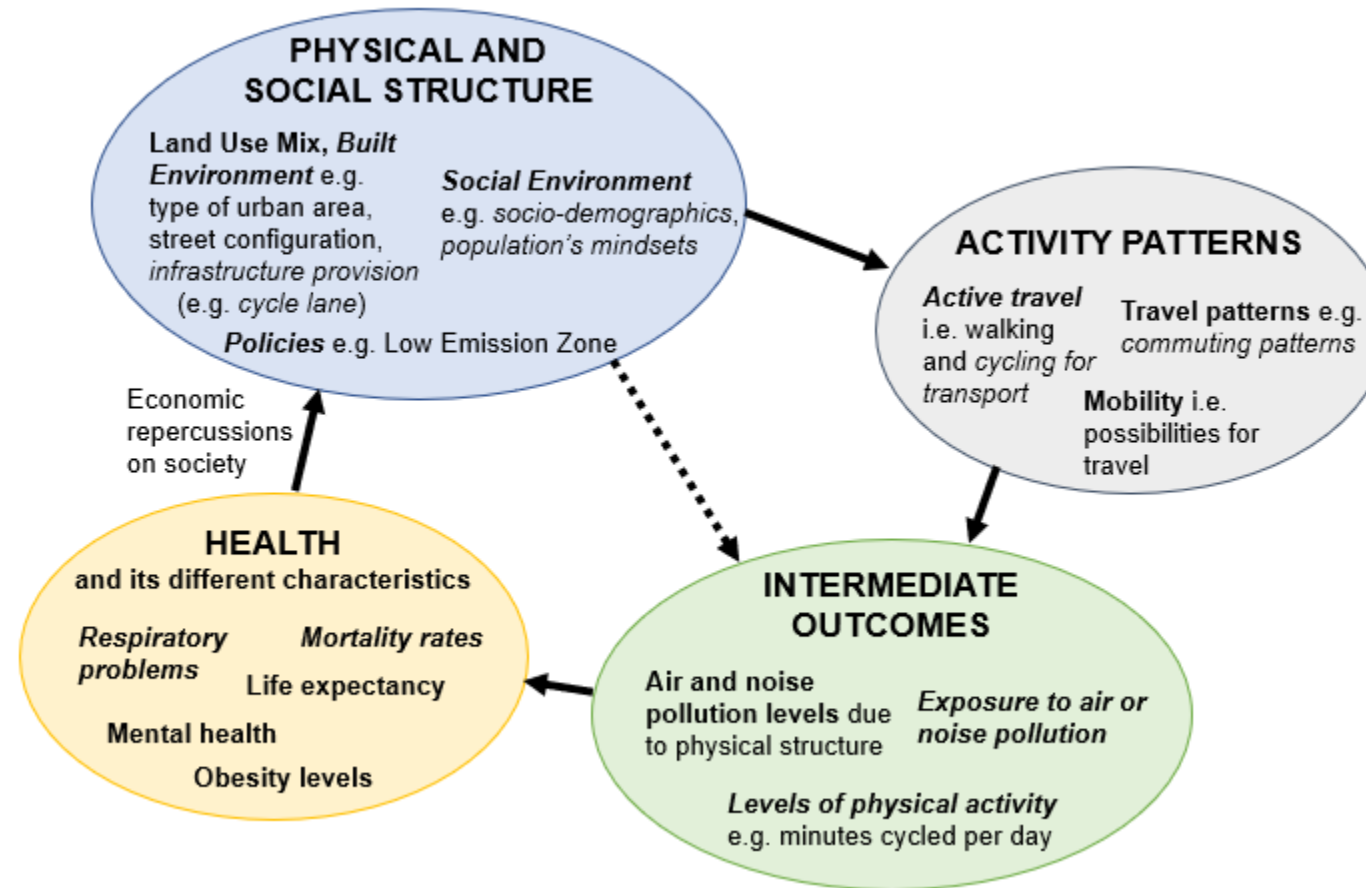


Activity-based models of travel demand

- Generate and schedule physical and virtual activities; different modalities of activity participation
- Link between consumption activities and production activities → urban freight implications



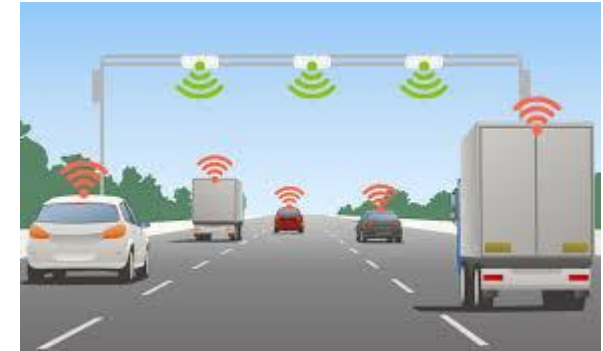
Activity-based LUT models



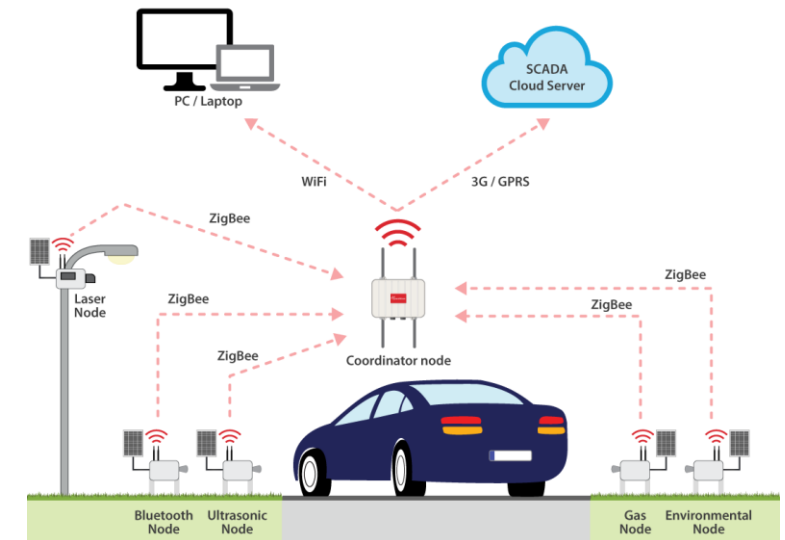
Simplified diagram of urban systems and their different aspects.

Emerging data landscape

- Information and mobile communication technologies
 - **Location/mobility: Mobile phone traces, GPS traces, accelerometer data**
 - **Digital footprints: Twitter feeds, credit card use data, mobile phone use data, public transport use data (e.g. Oyster data in London), mobile phone app data (e.g. Strava)**
- Pervasive sensing
 - **Next generation traffic counters (Bluetooth, Zigbee)**
 - **Cameras + LiDAR**
- Enhanced surveys (**life course, VR-stated response...**)
- Transport operations data
 - PT operators, Uber, Bike sharing data, EV charging infrastructure etc



Source: IntelligentTransport.com

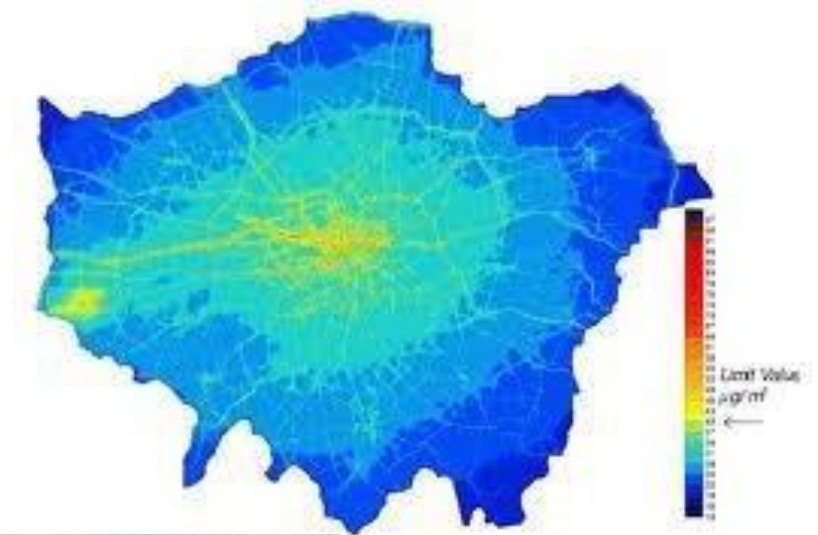


Source: Libelium World

Recent research

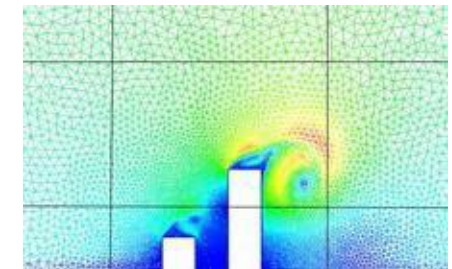
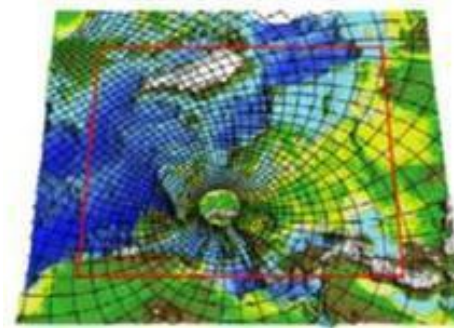
High density sensor network system for air quality studies at Heathrow airport

- **Vision**
 - Demonstrate the capability of low-cost sensor networks for air quality monitoring and modelling at large industrial and commercial sites
- **Implementation**
 - Deploy wireless sensor network, comprising fixed and mobile air quality sensors
 - Integrate high resolution monitoring with activity simulation and emission models
 - Develop decision support models policy analysis and design
- **Application**
 - Case study application at London Heathrow



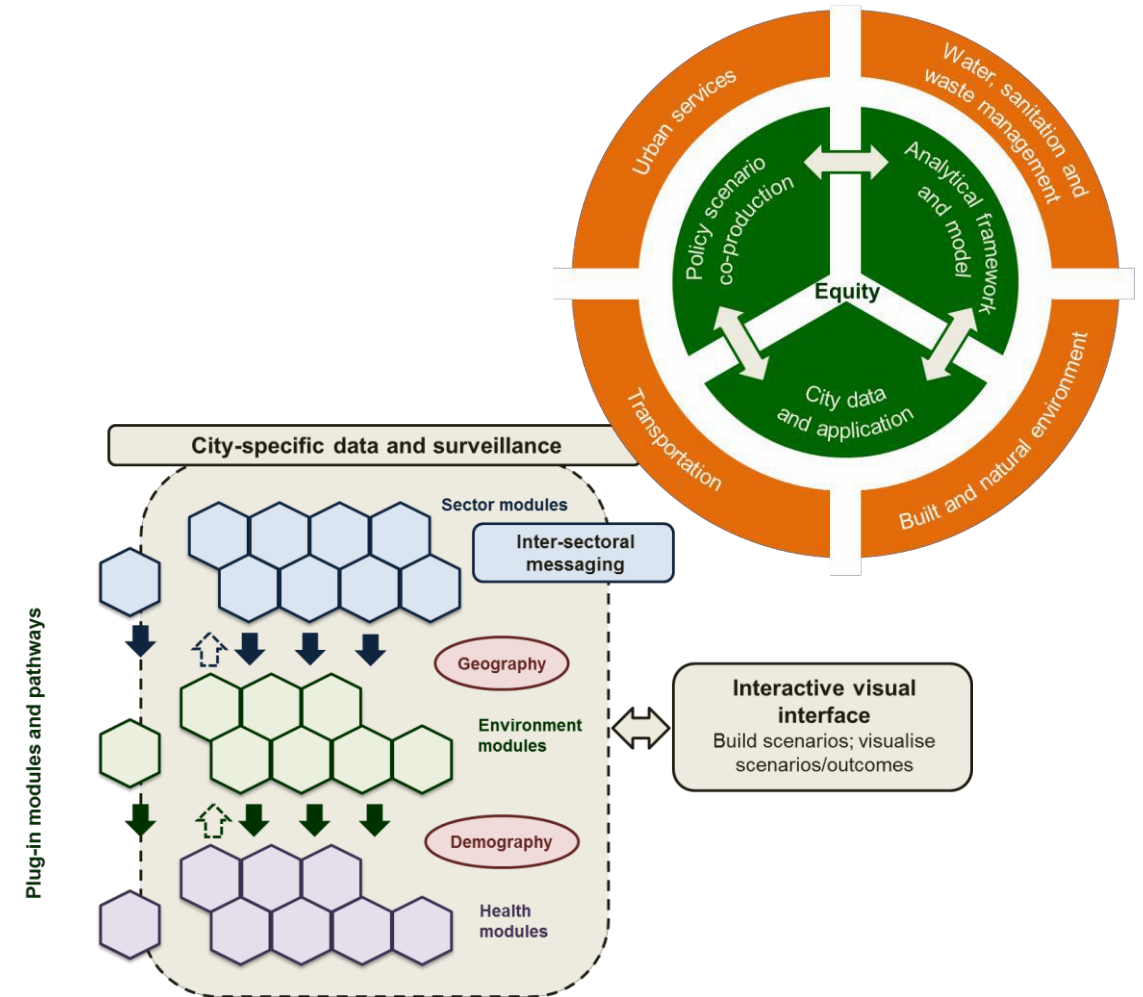
Managing air quality for green inner cities

- **Vision**
 - Develop an integrated suite of models and associated decision support tools to support the city-scale design to address poor air quality
- **Implementation**
 - Framework consistently combines:
 - » Fixed and mobile outdoor and indoor air quality sensors
 - » Pollutant emission and dispersion models
 - » Traffic, transport and land use models
 - » Planning, design and decision support tools
- **Application**
 - Case study applications at London and Cambridge



Pathways to equitable healthy cities

- **Vision**
 - Investigate how formal and informal urban developments can enhance the health and wellbeing of their inhabitants
 - Go beyond purely descriptive research to work that proposes, and may test, potential solutions
- **Implementation**
 - Co-produce a set of actionable policy scenarios with potential impacts on health and health inequality
 - Build analytical framework and adapt to data in focus cities
 - Apply for quantitative evaluation of scenarios in focus cities
- **Application**
 - Case study applications at London, Beijing, Vancouver, Tehran, Dhaka and Acara

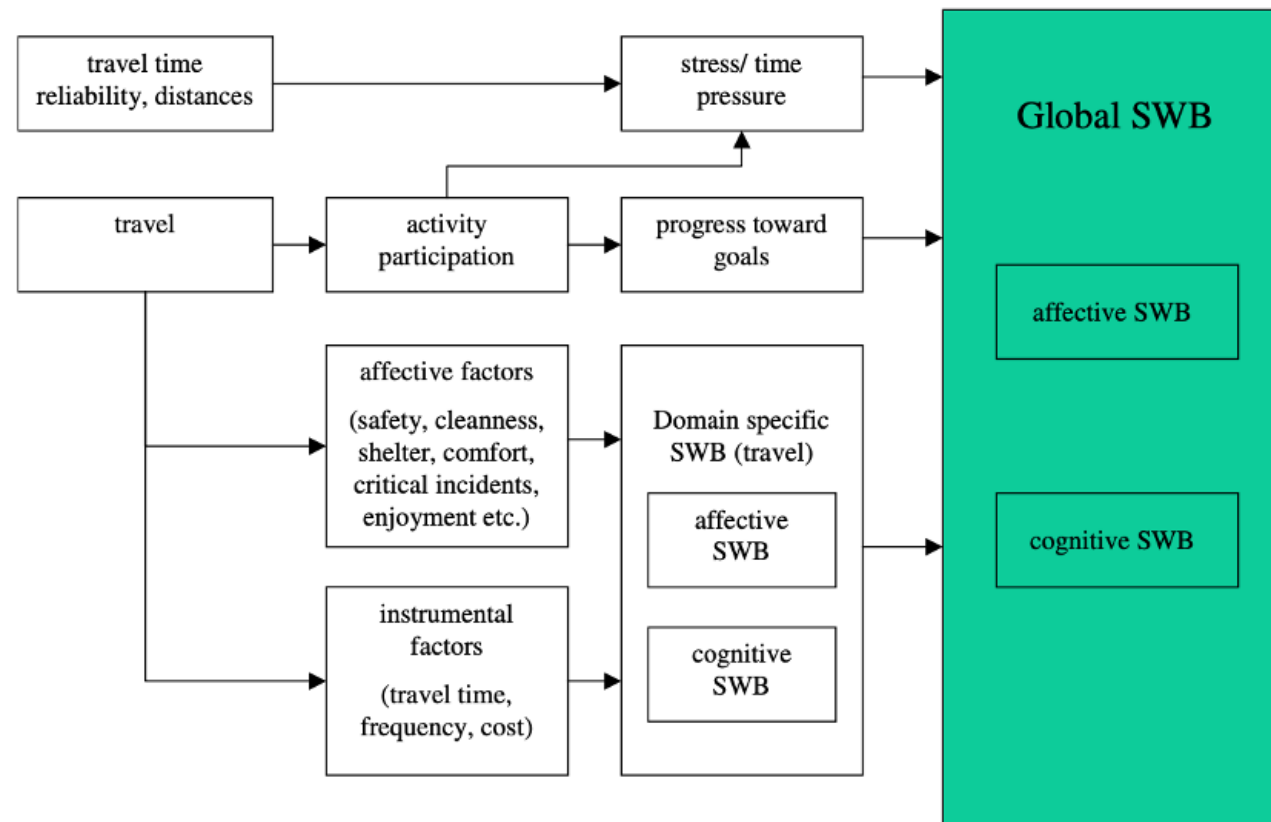


Travel mode use, shift and wellbeing

- Abou-Zeid (2009)
 - Commute satisfaction through social comparison
 - SWB accounts for the social aspect in assessing the wellbeing impacts of transport
- Ettema et al (2016)
 - Travel satisfaction by mode: active travel modes could generate higher levels of satisfaction through offering the right amount of stimulation, improved mood from physical activity, and autonomy to people who cannot drive
 - Initial 'affective' response (attitudes, feelings) to a new mode may change when a new mode is used repeatedly... dynamics of wellbeing

Subjective wellbeing as the focus of travel demand models? (1)

- Ettema et al (2010)... cognitive and emotional wellbeing (rather than satisfaction/random utility) drives travel behaviour



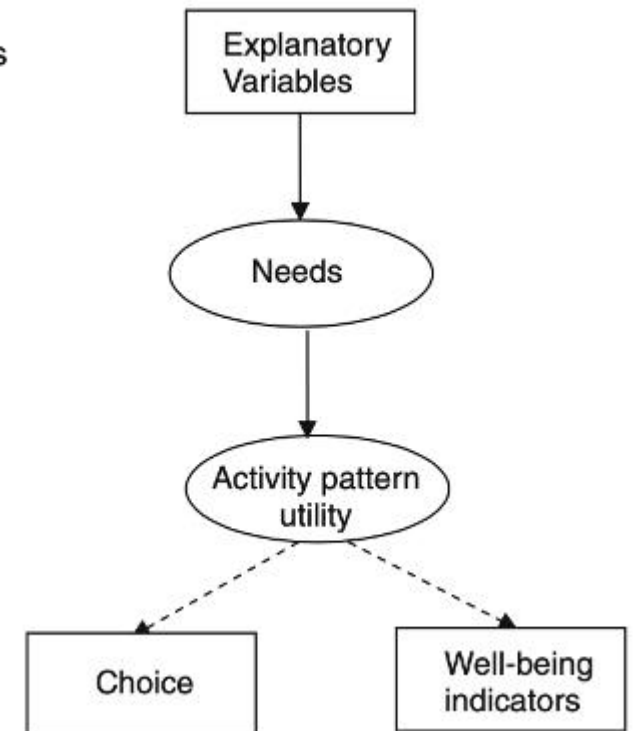
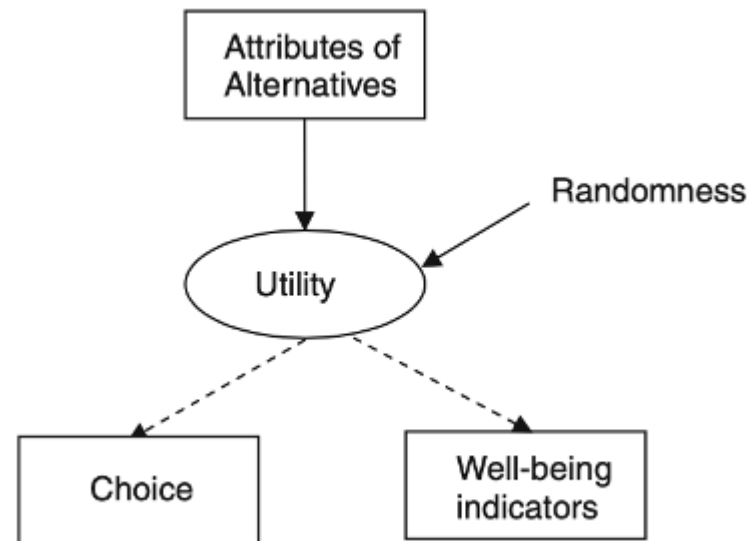
Subjective wellbeing as the focus of travel demand models? (2)

- Abou-Zeid and Ben-Akiva (2012)

Assuming that well-being is the ultimate goal of activity patterns which are driven by needs, two extensions of activity pattern models is built:

The first extension consists of the use of well-being measures as indicators of the utility of activity patterns (in addition to the usual choice indicators) within a random utility modelling framework.

The second extension models conceptually the behavioural process of activity generation based on needs satisfaction.



Why is this important for developing countries?

- Exposures
 - Emissions (PM and other carcinogenic pollutants)
 - UV-A/UV-B (Ozone layer)
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Questions?

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