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Travel Behaviour aspects for sustainable mobility planning and policy

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Structure of the Presentation

1. SUMP and Travel Behaviour Change (TBC)
2. Theory of TBC
3. Policy Drivers of TBC
4. Case Studies of User Response
5. Push– and Pull– measures of TBC
6. Mobility Management for a Voluntary TBC
7. Resilient Travel Behaviour

SUMP and Travel Behaviour Change (TBC)

SIMPLA–project.eu: SUMP – SECAP interface

- SUMPs should contain different scenarios of envisaged sustainable modal shifts, in other words, alternative levels of TBC
- SUMPs should consider both short-time travel choices and long-time home-work location choices, in other words, integrate transport and land use planning
- Many travel–related costs (disbenefits) are external to the users themselves and are a burden of the society. SUMPs should consider measures of cost internalization, leading to TBC
- SUMPs should comprise Mobility Management (MM) measures facilitating Voluntary Travel Behaviour Change (VTBC)

How People Shift to Sustainable Modes

Conventional view

- People are conscious, constantly revising travel decisions based on rational cost optimization while comparing trip-related characteristics
- People manifest a repetitive habitual behaviour, requiring less effort to cope with everyday routines

New view

- Catalysts for modal behaviour changes are major disruptions of everyday life
  - External big events: Olympic Games and their legacy (Athens: urban rail infrastructure)
  - Discontinuous household events, such as
    - Residential relocation
    - Job change and new work location
    - Broken down car
    - Household shrinkage and loosening of hh constraints
  - Physical ability to use sustainable modes is a *necessary* precondition of TBC, e.g.
    - SUMP integrated planning (first: good PT accessibility provision, then: development of residential and employment poles around PT interchanges)
    - Car sharing availability (incl. driving license holding, club registration, aptitude for online booking, parking space availability). SUMP indicators for MaaS alternatives are no. of shared cars, annual shared car-kms etc.
  - Willingness to change is a *sufficient* condition dependent on tangible benefits arising from the alternative modal usage

Travel Behaviour Dimensions (Choice Hierarchy)

Travel demand is derived from out-of-home activity execution. Travel behaviour is a dynamic process with short- and long-time variability, whereas travel choices are interdependent

- Long-run mobility decisions
  - Employment location choice
  - Residential location choice

  [SECAP – SUMP integrated land use – transport planning incl. planning permits, parking requirements, PT accessibility etc.]

- Mid-run mobility decision
  - Car ownership choice (car owners/CO, non-car owners/NCO)

- Short-run travel decisions
  - Mode choice (push– & pull measures targeting CO)
  - Destination choice (mixed land uses: trip shortening)
  - Time-of-day choice (flex worktime: peak traffic flattening)
  - Frequency choice (dense & mixed land uses: trip consolidation)
    (telecommuting, -conferencing : trip suppression)

Key Problem, Enabler and Question

- Key problem:

  Among three large economy sectors producing greenhouse gases (energy, industry, transport), it is the transport sector where the progress in reducing emissions is the least successful

- Key enabler:

  Big data advancement enables better knowledge of travel behaviour, whereas modern communication technologies enable new MaaS modes (e.g. car sharing/ car pooling schemes)

- Key question:

  Which are the policy drivers for a sustainable travel behaviour change (TBC) ?

Drivers of Modal Behaviour – Case Study

- Drivers:
  1. Sociodemographic characteristics constraining or enabling modal choices, e.g. age, gender, income/car ownership, life cycle stage (households with pre-school/ young school children…)
  2. Trip–related characteristics or segments, e.g. trip purpose, travel distance, weather conditions
  3. Level-Of-Service (LOS) characteristics, e.g. transfer inconvenience, travel time (in-vehicle, wait, walk, parking search time), travel cost (vehicle operating cost, PT fare, parking fees, tolls, taxi flag & timefare)
- Case study: Athens Metro Development Study (2000)

  Modal choice model variables /segments
  1. Northern / southern high-income suburbs
  2. a) Trip purpose segments: HBW, HBE, HBS, HBO, NHB

     b) Car ownership status: CO, NCO
  3. Generalised Cost, e.g. for Public Transport

     $GC = INVT_{ij} + 1{,}8 * WALK_{ij} + WAIT_{ij} + 10{,}4 * TRANSFER_{ij} + FARE_{ij}$

User Response – Elasticities of PT Demand

- By impact factor
  - Increasing fare level decreases PT demand
  - Increasing service level (PT service-kms) increases PT demand
  - Increasing car usage cost (e.g. fuel price) increases PT demand (cross-elasticity)
  - Disposable income -disentangled from car ownership effect- is expected to increase travel demand

- By trip purpose
  - Demand elasticities for discretionary activities (shopping, leisure) are higher than for rigid activities (work, education)

- By time scale
  - Short-run (1-2 year) elasticities of travel demand are lower than long-run (> 10 year) elasticities

- By income / car ownerships status
  - High income /CO class is less price–sensitive than low income/NCO segment

Value of Time (VoT) Disbenefits – Stated Choice (SC) Case Study

- Assess value and relative importance of LOS characteristics by
  - Trip purpose (work, education, social/leisure, other)
  - Car ownership status (CO/ NCO)
  - Income class

- LOS characteristics of Metro, Bus, Car alternatives in Athens
  - Value of In-Vehicle Time (INVT) across trip purposes, CO status, income and modes = 39% of hourly Gross Wage Rate/ GWR
  - VoT increasing with income
  - VoT for social /leisure surprisingly higher than for work(38% vs. 36% of GWR)
  - Walking time almost twice valued than INVT
  - Waiting time is not perceived as more onerous than INVT
  - 10 min of INVT compensate 1 PT transfer

- London SC survey: a real-time PT information system compensates 2 min. of INVT reduction

Push– and Pull Measures of TBC

- Push measures are mostly coercive, regulatory instruments pushing people away from car use, e.g. Limited Traffic Zones or car-free zones, parking control (max. parking requirements, less parking lots, high parking fees), fuel taxation and other fiscal disincentives (congestion charging, road pricing)

- Pull measures are instruments attracting people to sustainable modes, e.g.
  - High cost, hard measures as PT/ cycling/ pedestrian infrastructure improvements (SUMP indicators: urban rail or cycle-lane kms)
  - Financial incentives as lower PT fares (through subsidisation)
  - Improved PT service quality (SUMP indicator: vehicle-kms), seat availability & comfort, seamless travel, increased reliability
  - Organization and coordination schemes (car/ bike-sharing, car pooling)
  - Mass campaigns for awareness – raising (European Mobility Week)
  - Individualized marketing, mobility coaching, Personal Travel Planning

- Reallocation of road space e.g. for exclusive bus lanes (SUMP indicator: lane-kms) is both a stick (slowing down car traffic) and a carrot (speeding up bus traffic)

- What is needed is a balanced mix of cost-effective push– and pull– measures.

Traveller Satisfaction Surveys

- Intersubjective measurement of the perceived quality of sustainable modes following EN 13816

- Items
  - Service time & opening hours
  - Vehicle and infrastructure features
  - Service reliability & availability
  - Traveler information
  - Perception of safety & security
  - Cleanliness
  - Social behaviour of the operating workforce etc.

- Measurement along a scale (e.g. 1 to 10) pertains to:
  - Item score (satisfaction) e.g. every year
  - Item relative weight (importance) e.g. every 5 years

Mobility Management (MM) for a Voluntary TBC

- MM aim
  - Reduce car use by modifying the habits and behaviour of travellers

- Soft, low-cost MM measures complement and amplify the effectiveness of hard policy measures. Hard measures lock-in over time the benefits of soft measures

- MM contains soft policy measures, such as
  - Communication and mobility marketing
  - Organization of on-demand mobility services (car/bike sharing, car pooling, demand responsive transit)
  - Real–time information telematics and intermodal services
  - Tele-working, -shopping, -conferencing (-> reducing business travel)
  - Site plans

- Site plans
  - Company travel plans (employees, visitors): the example of Athens International Airport
  - School travel plans
  - Mobility plans for big events (combined PT travel & venue pass)
  - Destination travel plans for resorts

Personal Travel Planning (PTP) for VTBC

- Individualized travel marketing
  - Delivers targeted information and incentives to travellers to help them make sustainable travel choices, based on existing infrastructure
  - Provides location–based information on activity opportunities to discourage unnecessary or long-distance travel

- Personalized information and advice is tailored to each individual's home location and personal interests

- Personal travel planning complements collective promotional campaigns (e.g. European Mobility Week)

- PTP evaluation
  - SUMP indicator: no. of information requests by travellers
  - Pre-and post-intervention travel surveys to measure the enduring effect of VTBC measures

Resilient Travel Behaviour – Case Study

- EU H2020 project RESOLUTE (resolute-eu.org) contains an Athens Metro pilot
- Aimed is
  - The assessment of user's resilience in terms of travel behaviour after a metro attack
  - The development of a strategy for the strengthening of travelers' resilience
- N.Y. 9/11 and London Metro attack 7/2005: 6% traffic reduction after attack.
  Madrid 3/2004 and Tokyo saving 3/1995: no ridership reduction. Athens?
- Willingness–To–Accept (WTA) risk valuation of Athens population via Stated Choice experiment
- Captive riders are more captive to risk than choice riders, who consider metro as more insecure after an assumed metro attack
- Commuters have a higher WTA–risk than discretionary metro travellers
- Persistent travel behaviour change away from metro use is lower in the long-term (6 months later) than in the mid-term (1 month after the attack)

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Thank you!

Questions welcome

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