

# Using Argumentation Within Sustainable Transport Communication

The road towards applied argumentation systems at scale

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# Simon Wells

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- ❖ Computer Scientist:  
argumentation (informal logic  
& computational), dialogue,  
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# Why Sustainable Transport?

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- ❖ Happenstance.
- ❖ MyWay EU Project: seamless integration of point-to-point sustainable transport services
- ❖ SUPERHUB EU Project: integrate existing behaviour change mechanisms into sustainable urban transport systems





# Aims

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- ❖ 1. Build an exemplar open & extensible applied argumentation system
  - ❖ Lots of people working on key elements of all stages of such a system, but very few systems in the wild (& none that are completely open)
  - ❖ [a] gather & analyse data from the problem domain (the corpus)
  - ❖ [b] construct a theoretical & applied framework for using the corpus
  - ❖ [c] Apply the system to effect lasting behaviour change at scale
- ❖ 2. Demonstrate that techniques from Argumentation Theory can align productively with Behaviour Change Theories to build effective behaviour management systems



# Background

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- ❖ Polluting emissions from most sectors are falling but transport related emissions have risen 36% since 1990
- ❖ Transport is a huge source of environmentally damaging emissions & pollutants (CO<sub>2</sub>, CO, NO, Ozone, Particulates, Toxics & Volatiles)
- ❖ Accounts for 40% of final energy consumption in the EU
- ❖ 73% of road passenger transport is individual cars (often with a lone occupier)
- ❖ In aggregate, individual travel habits have a large impact on the quality of the environment (particularly urban environments in which 54% of the worlds population now live)
- ❖ Reducing unsustainable travel behaviours is a normative policy goal in many developed world contexts



# Behaviour Change

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- ❖ Two popular theoretical models:
  - ❖ Fogg's Model of Persuasive Technology or "Captology"
  - ❖ Michie's COM-B Model
- ❖ Popular basic techniques:
  - ❖ Goal Setting+review | Monitoring+feedback | Comparison | Prompts+personalisation | Aiding/supporting decision making | Gamifying

# Fogg & Michie

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- ❖ Captology [fogg, 2003]:

- ❖ [M]otivation
- ❖ [A]bility (make behaviour easier / lower to target's level)
- ❖ [T]rigger
- ❖ (simultaneously)  $M + A + T \implies$  Behaviour more likely to occur

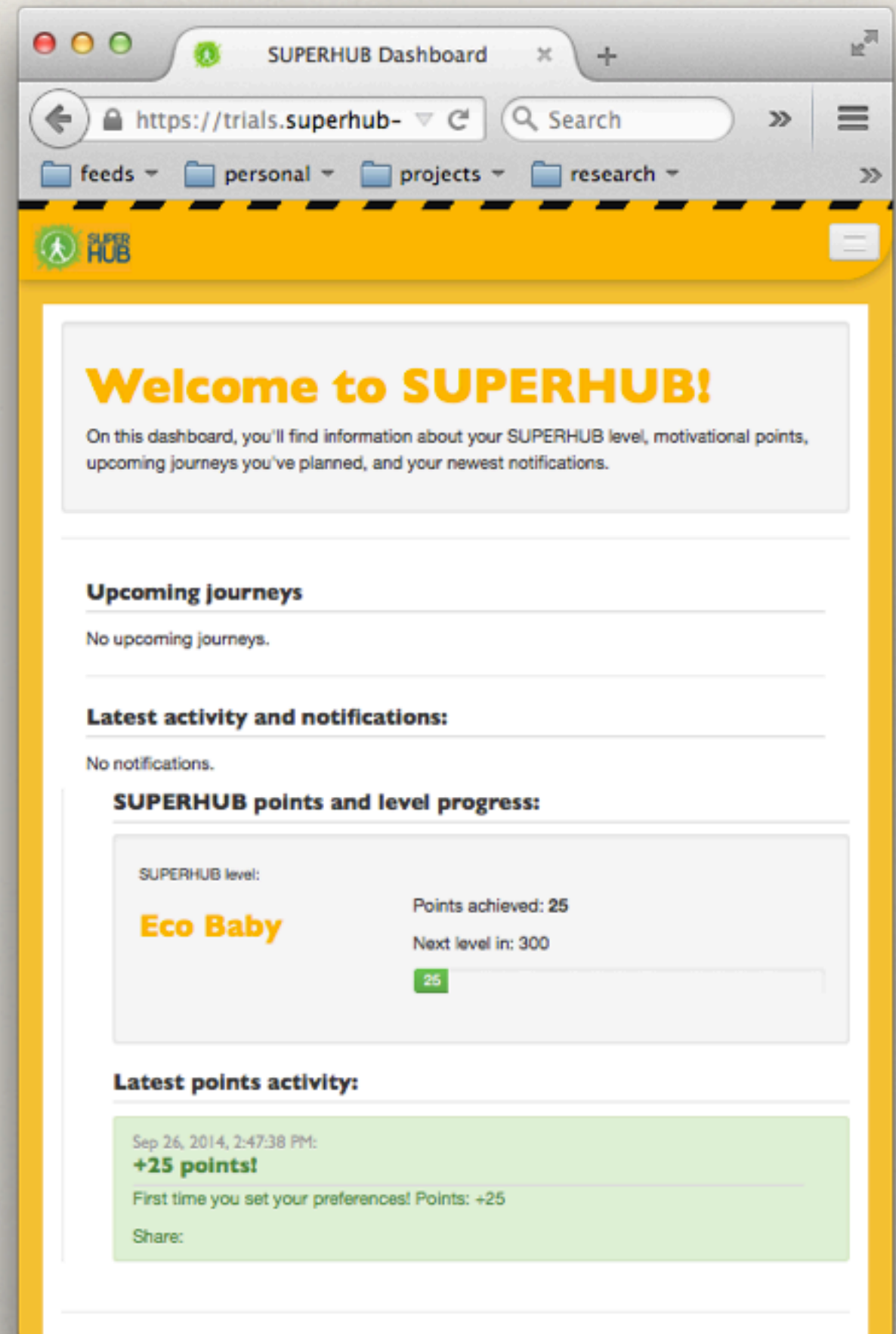
- ❖ COM-B [Michie, 2011]:

- ❖ [C]apability
- ❖ [O]ppportunity
- ❖ [M]otivation
- ❖  $C + O + M \implies$  Behaviour Change

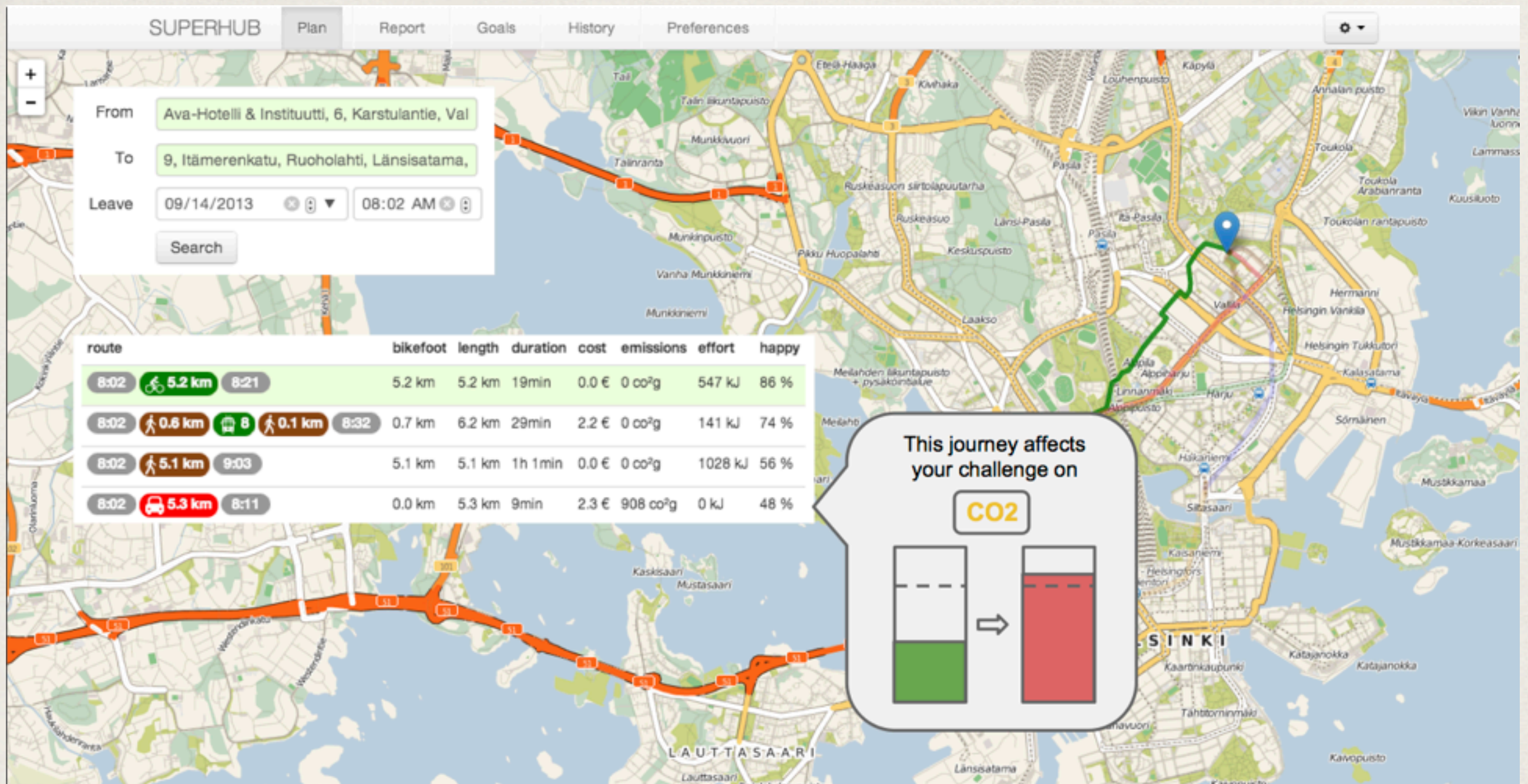


# Behaviour Change in SUPERHUB [gabrielli, 2014]

- ❖ Gamifying / Levelling / Achieving
  - ❖ Earn points for performing approved actions
  - ❖ Gain rewards for achieving certain statuses
  - ❖ Hope that this “Skinner box” approach leads to habitual change







- ❖ Feedback
  - ❖ Provide information about choices before they are made
  - ❖ Show how choices affect individual

Behaviour Change in  
**SUPERHUB**  
 [gabrielli, 2014]



# So What's The Problem?

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- ❖ Even if a person has the Capability & an Opportunity (or the Ability & a Trigger);
- ❖ If a person isn't particularly motivated then
  - ❖ behaviour change is less likely to be successful, &
- ❖ If behaviour change is successful then
  - ❖ it is less likely to be life-long / lasting / sustainable



# & How are we going to tackle it?

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- ❖ Informed choices are made in the presence of increased knowledge
- ❖ Dialogue is a good interaction mechanism for increasing a person's knowledge about the context of their behaviour
- ❖ Argument is a good way to structure information if it is related to justifying positions
- ❖ Assumption: For behaviour change to be sustainable, target must make informed choices about their behaviour



# Motivating Sustainable Behaviour Change

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- ❖ Current behaviour changes theories & techniques
  - ❖ Have rich psychological model of how behaviour changes
  - ❖ Techniques for achieving behaviour change are less well developed
    - ❖ Rudimentary forms of information-seeking / persuasion & use of incentives or coercive techniques



# Behaviour Change & Argumentation

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- ❖ Align well developed models of (1) interaction, (2) knowledge representation, & (3) reasoning from argumentation theory with the well developed models from behaviour change theory
- ❖ AIM:
  - ❖ [A] Use arguments to increase motivation
  - ❖ [B] Use dialogue to interact with users
  - ❖ [B] Adapt the rich range of argumentation schemes and dialogue models to work with behaviour change theories



# Building the Corpus

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- ❖ Many websites & “official” communications that aim to raise awareness of sustainable transport issues
- ❖ Kate had built a private research archive of sustainable transport related websites which provided the core
- ❖ Initial raw data collected in 2014-15 (ongoing)
- ❖ Currently incomplete - A “Living Resource”; When is a dataset complete...?



# Formatting & Handling Procedures

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- \* Git repository (currently shared on GitHub & also archived to FigShare for “releases”) containing:
  - \* Resource: UTF8 Plain Text File
  - \* Analysis: AML & AIF files
  - \* (optional) Annotated & Extended resource showing contextual placement of non-textual elements
  - \* (optional) Additional notes.txt about the resource
  - \* (optional) Screenshot of original resource in situ as PDF or PNG file at sufficient resolution for legibility
  - \* Metadata: UTF8 plain text file containing:
    - \* GUID - generated using a standard tool
    - \* Date & Time of Collection (ISO-8601 format)
    - \* Location of original resources (URL, URI, DOI)
  - \* Supplementary scripts: for generating metadata file, for converting everything into JSON for bulk loading into a document oriented DB (e.g. MongoDB or CouchDB)



# Best Practises

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- ❖ Hierarchy of optimal data reuse aspects:
  - ❖ Preserved in some format
  - ❖ Archived for long term
  - ❖ Accessible to others
  - ❖ Comprehensible by others
  - ❖ Discoverable & indexable
- ❖ Reproducible
- ❖ Trusted provenance
- ❖ Citable & trackable
- ❖ Usable by others
- ❖ Integrated
- ❖ Based on 10 habits of highly effective data [de Waard, 2014]



# Summary of Data so far

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- ❖ >60 resources from public-facing web-sites
- ❖ Recurring features:
  - ❖ Population segmented by transport type & messages directed accordingly (often also further assumptions about life-style).
  - ❖ Testimonials frequently used to personalise otherwise plain facts, e.g. “I am fed up of X & desire Y because Z” or “Since I started X I have seen benefits Y because Z”
  - ❖ Devils advocate - posing tougher questions “the bus will always run so does walking really save carbon?”
  - ❖ Incorporation of challenges interleaved with reasons: “why not try walking to work during ‘walk to work week’? It could save you money and you get fit!”
  - ❖ Longer discursive text supporting the briefer messages of the “advertising campaigns”
  - ❖ Positive or neutral tone is used. The tone is rarely negative, e.g. “here are 3 good reason to get out of your car and on your bike...”
  - ❖ Messages often couched in terms of shift of behaviour between modes (see above)
  - ❖ Negative communications reserved for the car (but only as individual private transport; sharing, pooling, taxis exempted)



# Conclusions

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- ❖ 1 step on a long path
- ❖ Many more resources to incorporate (& a lot of analysis to perform)
- ❖ A system, which uses the resources, to build
- ❖ An aligned model of behaviour and argumentation to build and validate



# References

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- ❖ [fogg, 2003] Fogg, B. J. “Persuasive Technology” Morgan Kauffman, 2003
- ❖ [gabrielli, 2014] Gabrielli *et al.* “Design Challenges in motivating change for sustainable urban mobility” Computers in Human Behavior 41, 2014
- ❖ [michie, 2011] Michie, S. & van Stralen, M. M. & West, R. “The Behaviour Change Wheel” Implementation Science 6(42), 2011