Walking – the overlooked element of public transport travel

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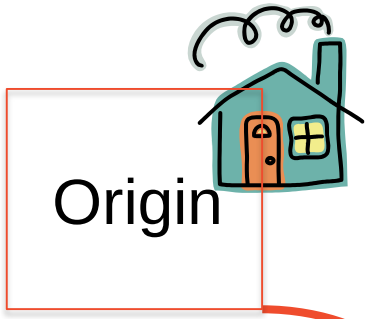
Source: https://www.itdp.org/what-we-do/eight-principles/

Outline

- The public transport trip
- Health and transport connections
- Lifestyle disease and transport
- Walking and public transport
  - Walking benefits
- The need for quantified evidence
- Justifying infrastructure
  - How interchange, normally thought of as bad can be good
- Policy needs to be evidence based
- What still needs to be done and future directions (and challenges)

The public transport trip

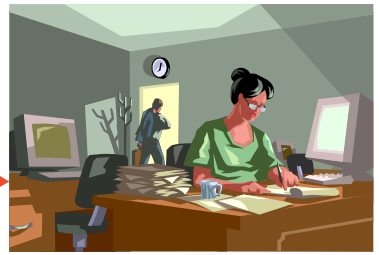


On -vehicle

Interchange

On -vehicle

Destinations



Involves a lot of walking!

The role of walking and public transport

- Walking is the primary mode of access to public transport
  - In Sydney: 90% for bus trips and 50% for train trips.
- Public transport users spend more time walking
  - Median of 19 minutes per day in US (Besser 2005)
  - 8-33 minutes extra due to public transport in NSW (Rissel et al 2012)

Source: chichester-march.org.uk

Source: deborahcolumn.blogspot.com

Health and transport connections

- Awareness of the many different connections between health and transport is not new
  - Safety
  - Transport emissions
  - Health impacts of sedentary behaviour an area of growing concern
    - Decline in more active transport modes
      - Walking
      - Cycling
    - Negative impacts of driving
- The role of walking to and from public transport is increasingly being recognised by public health although slowly (if at all) by transport policy
  - Why should transport pay for health benefits?

Source: designbuildsource.com.au

Lifestyle disease and transport

- Insufficient Physical activity and increase in travel are both concerns
  - Car travel works against meeting physical activity guidelines
  - Increasing travel by car exacerbates effect
- Policy approaches need to be three pronged
  - Reduce harms of driving
  - Reduce the daily travel by car
  - Increase active travel modes
- Benefits of healthier travel
  - Benefit individuals
  - Benefit society
    - Countries with high levels of non motorised travel have fewer fatalities and injuries per km

Capturing the importance of walking in new transport investments

- New projects require an evaluation of costs and benefits
- Better evidence on COSTS
  - The costs of building
  - The environmental costs
  - The costs of accidents
- Less good evidence on BENEFITS
  - Health benefits of public transport use
  - Including
    - Health benefits of public transport use
    - Health costs of car use
- Wider and less 'biased' cost benefit analysis would make
  - car based infrastructure 'less desirable'
  - public transport infrastructure 'more desirable'

Source: tetest.idea.gov.uk

Walking benefits of public transport use

- Investment appraisal for public transport projects
  - Doesn't include the benefits of walking as part of the overall trip
  - Over-reliance on time savings so
    - Walking to public transport stop a 'cost'
    - Walking at interchange a 'cost'
    - Walking at the destination a 'cost'
  - Includes the cost building a better environment
    - But not the benefits of more walking coming from a more walkable environment

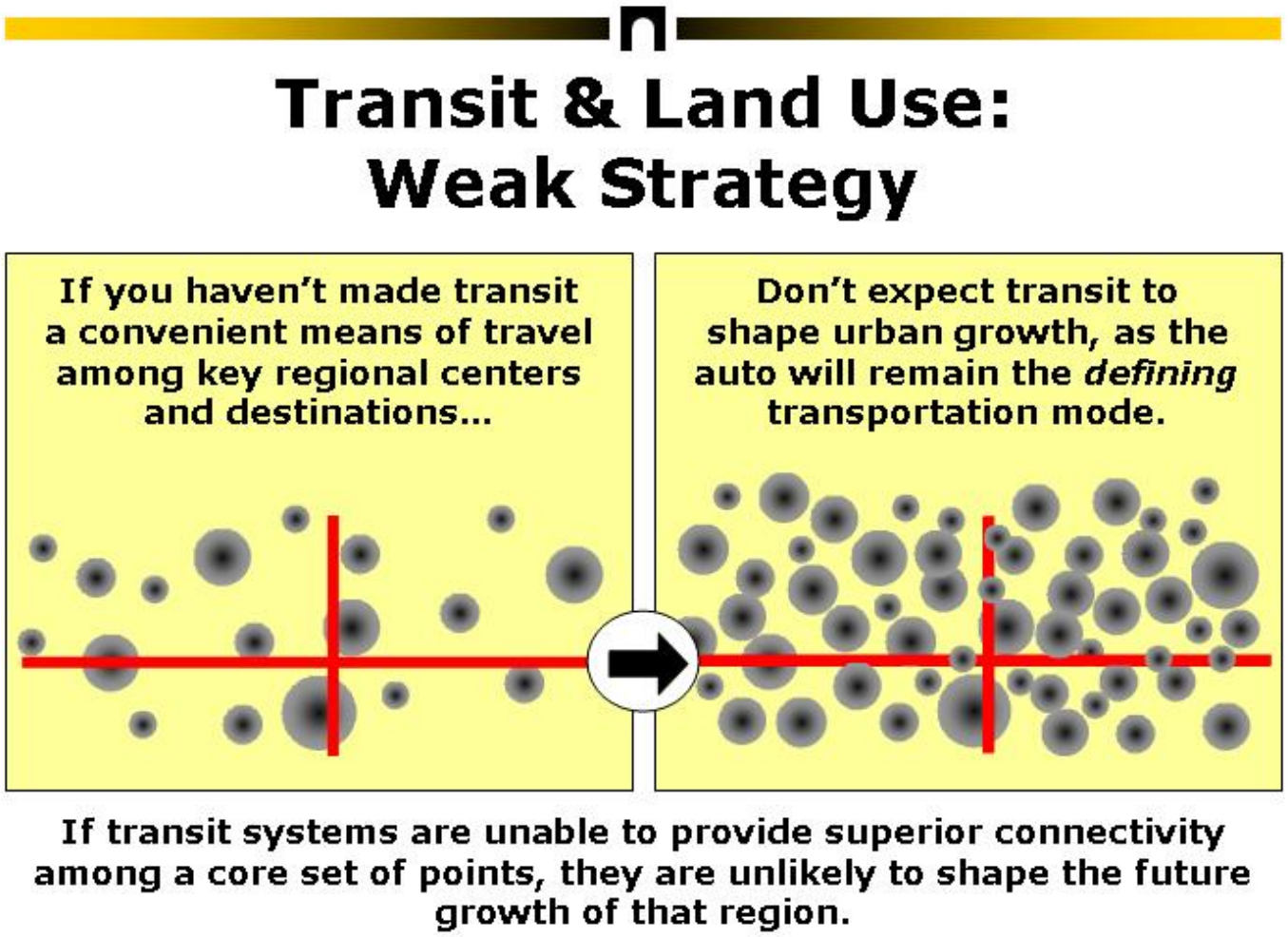
Justifying infrastructure solutions

- Good walking infrastructure
  - Adds to costs
  - But adds to benefits - these are often forgotten
- Walking infrastructure that positively impacts on determinants of walking is good value
  - Walkable environments – grid pattern built environment
  - Access to retail
  - Access to recreational spaces and activities
  - Access to a built environment with good aesthetics
  - Mixed used developments
- Cost Benefit evaluation 'rules'
  - do not capture all benefits eg amenity values of walkable neighbourhoods
  - Treat some aspects as interchange only as a cost

Impact on urban structure

- Public transport networks do influence land use structure and vice versa
  - eg proposed metro and the building up of densities around proposed stations
  - Developments can drive the need for new public transport links
- These need to be positively considered so that land use and public transport strategy reinforce each other

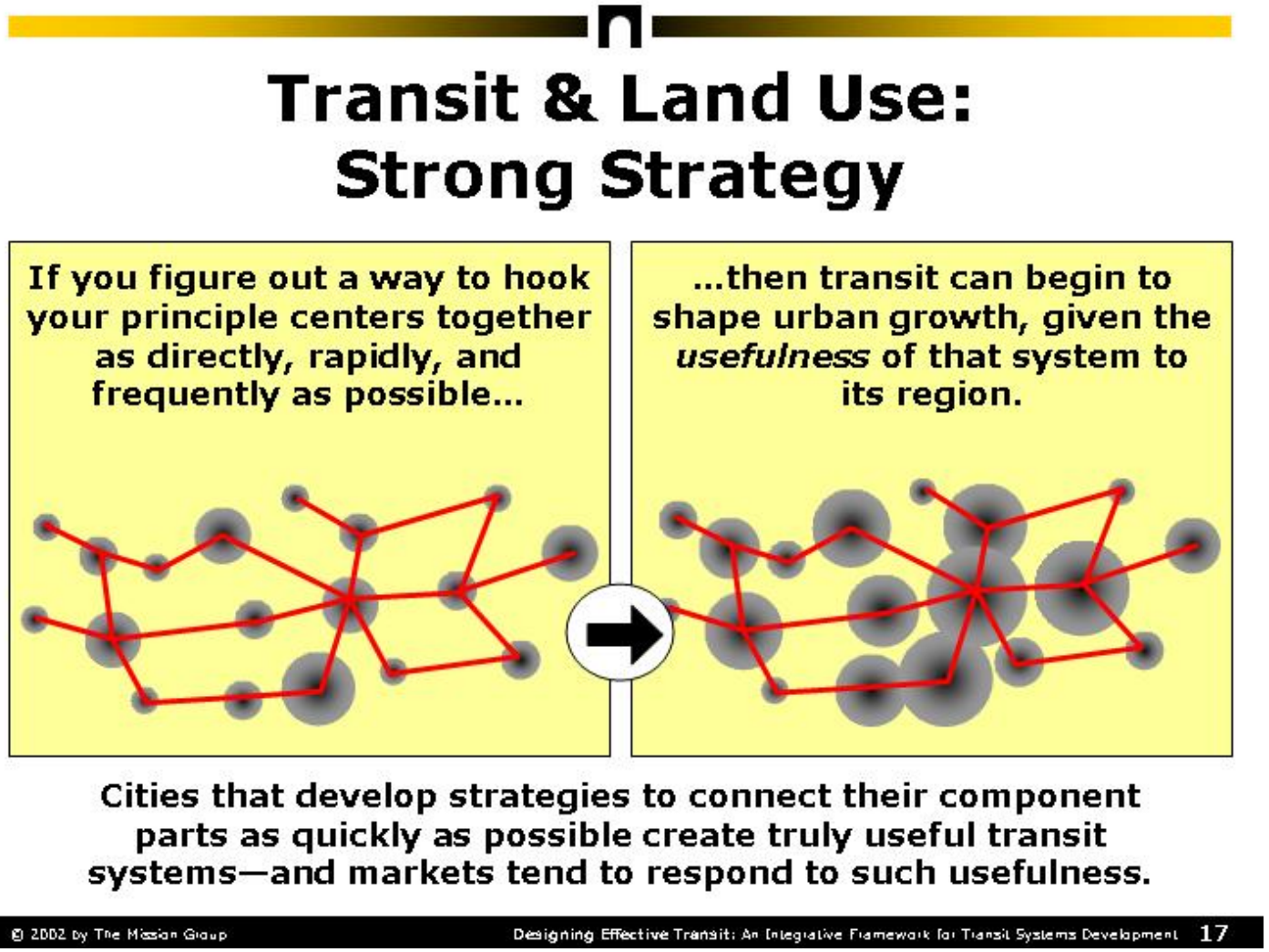
Impact on urban structure



Source:

David Hensher:
June 18-19 2008
BITRE Colloquium
Canberra

Impact on urban structure



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Public transport use

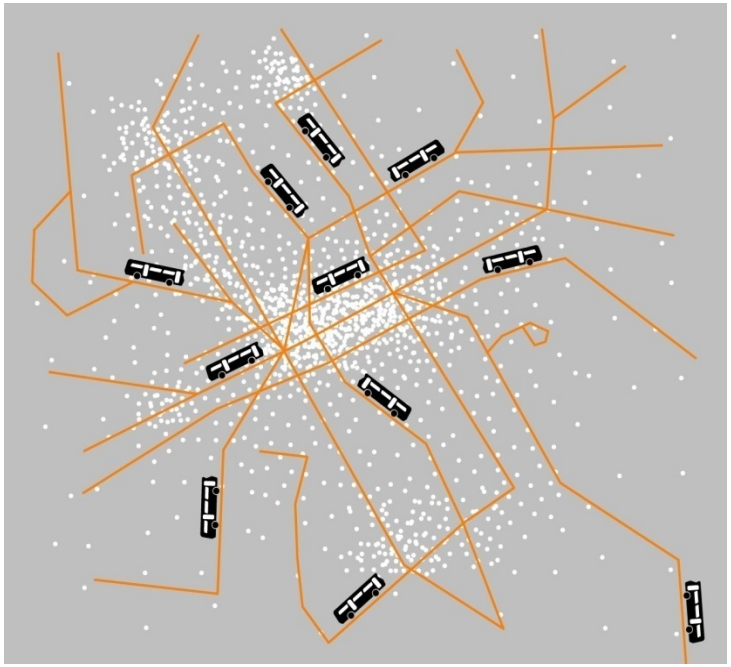
- Hong Kong has a 'habit' of good public transport use with significant numbers of choice travellers
- Other cities in the developed world are not so lucky!
- What makes people use public transport in those cities….push and pull measures
  - the 'forget the timetable' **frequency**
  - journey times
  - parking and other soft measures
  - type of public transport as we shall see……

Source: http://selc.com.au/living-in-sydney/

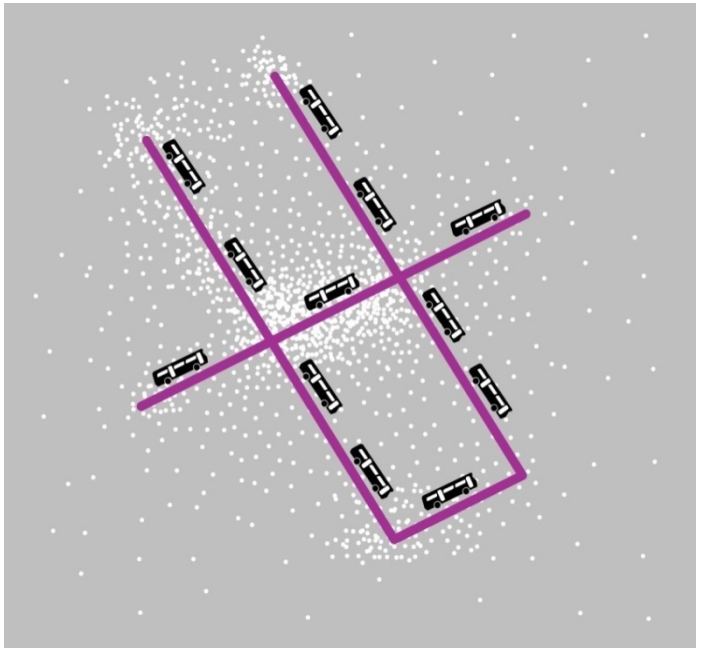
What sort of public transport?

– COVERAGE VERSUS FREQUENCY TRADE-OFF

Coverage



Frequency



… but when it's presented this way, they see why it's a tradeoff.

Source: Dr Jarrett Walker

What sort of public transport – relation to objectives

Objectives and frequency

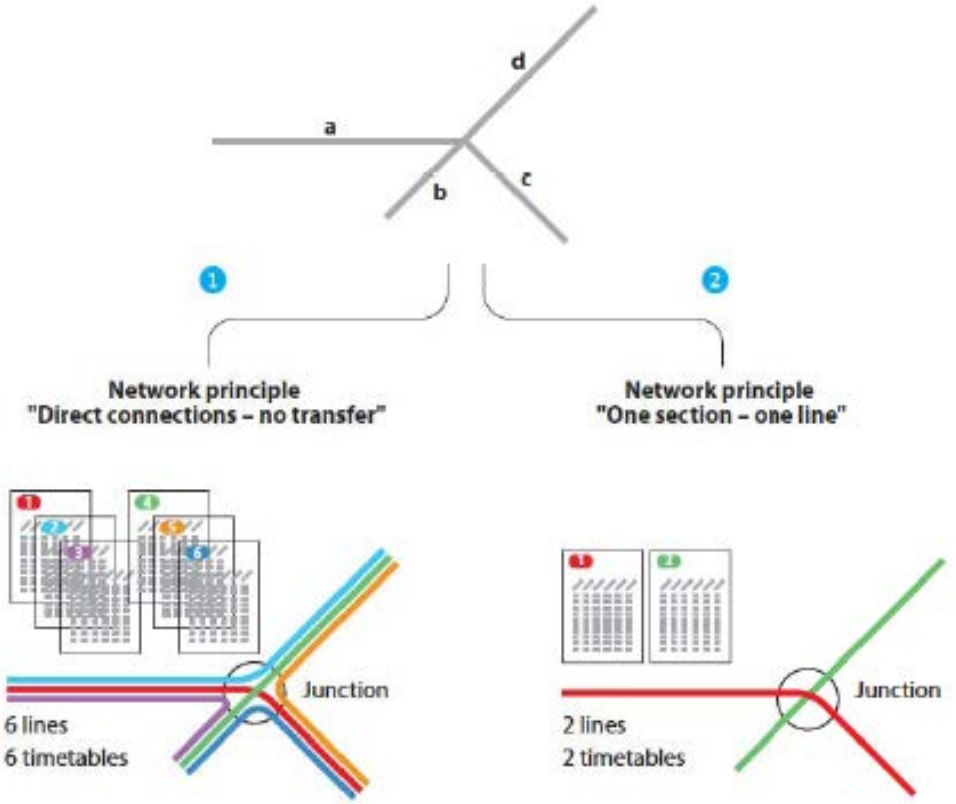
- Patronage growth
- Financial
  - Fare return
- Environmental impact reduction
  - from reduced private vehicle trips.
  - Reduced emissions.

Objectives and coverage

- Social Inclusion and redistributive aims
- "Equity" – getting some return from public funds

Network planning has a role

- Concentrate resources on corridors – and use timetable co-ordination to increase the frequency as density increases.
- One section-one line

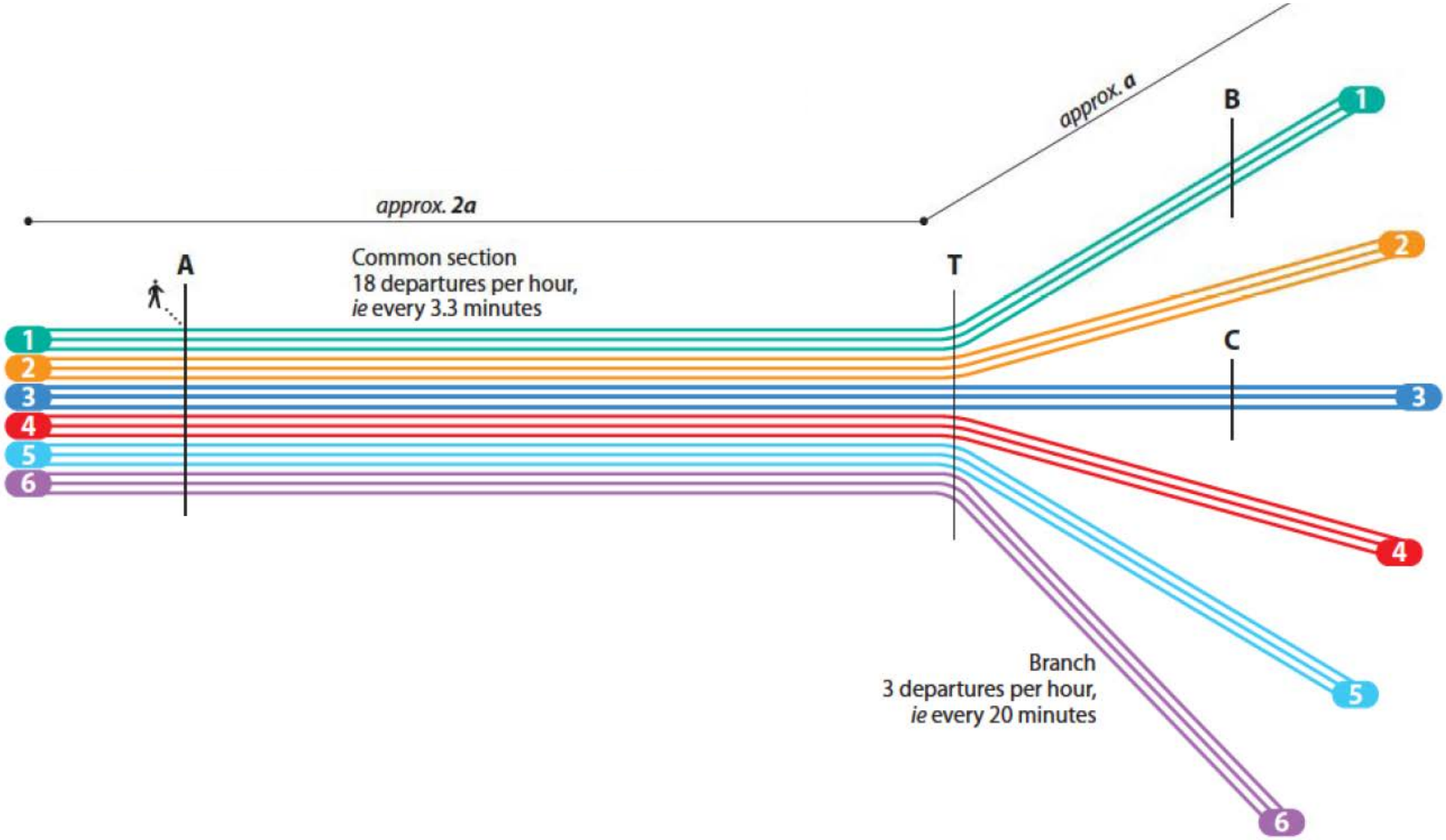


Source: Public Transport – planning the networks. Hitrans Best Practice Guide 2

Accept interchanges are needed

- Simple networks will need interchanges between
  - Lines operated by the same mode
  - Lines operated by different modes
- Accepting interchange means that services
  - do not need to concentrate on ‘direct journeys’ for all – allows greater coverage
  - Can concentrate on the best of the mode to be exploited in multi modal environments

Interchange can release resources



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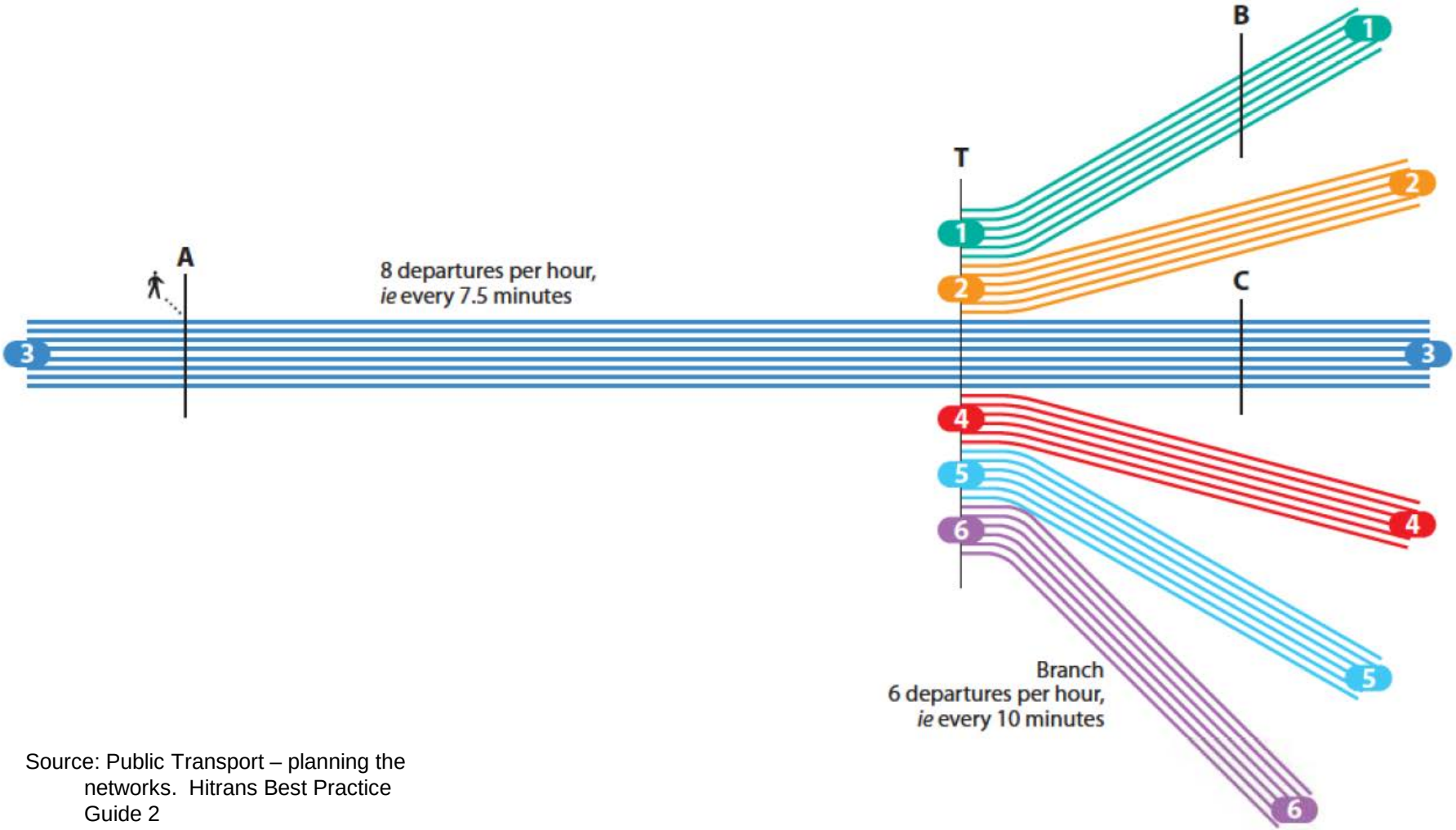


Source: Public Transport – planning the networks. Hitrans Best Practice Guide 2

Transfer and Interchange

- Minimise the cost of interchange
  - Ensure timetable co-ordination
  - Present route information accessibly
  - Remove fare penalties
  - Create short and easily understood interchanges
- Empirical evidence
  - Higher levels of transfer associated with higher public transport modal shares – the benefit of the network effect eg Arlanda, Sweden
- Should interchanges be large or distributed?
  - Useful to distribute interchange where possible
  - In the past 'large' was frowned upon because these tended to be complicated to navigate but the experience of Madrid….

A big interchange: Madrid programme

Madrid program hits gold…

- Planned for walkability
- Good interchange between modes
  - Increases the 'reach' of public transport
- Based on vision of putting interchange where necessary from a transport point of view
- Good design – indoor 'built environment'
- Created local environment through integrated shopping precinct
- ALL THE THINGS WHICH INCREASE WALKING!
- Throughput increased dramatically
- Opened in 2005, plans to double capacity put in place in 2014

Source: *www.eia-ngo.com*

Opportunities that don't look like opportunities……

- Using disruption to foster travel behaviour change
  - Sydney Olympics 2000 fostered intermodal travel
  - Fostered high levels of public transport use
- Use new investments in public transport to be the trigger for change
  - Light rail in Sydney's George Street is causing havoc with existing rail stations
  - Why not encourage an increase in walking through incentives and gaming. When 2 stations are close and one has to be closed – why not incentivise walking to the other?

More evidence is needed…

- To identify how to quantify disruption costs generally
  - Specifically in new investment provision
- Gamification gaining in interest in 'pushing' behaviour change
  - Experience in Singapore
  - Beat the street in the UK

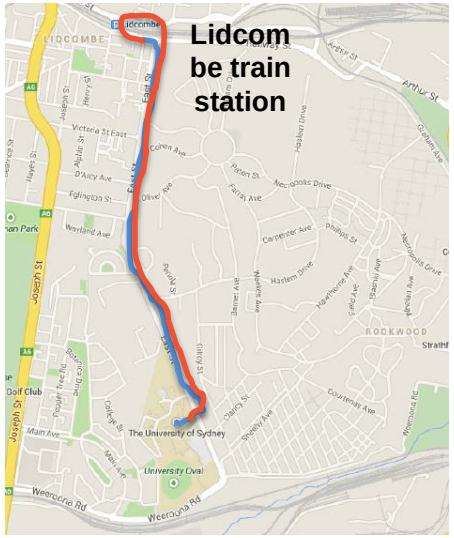
Cities

Gamification in transport interventions: Another way to improve travel behavioural change

More evidence and more understanding

- Needed on the quantification of health benefits
  - How impacted by environmental factors
  - How impacted by mode
- Project looking at standardised journey and task to examine
  - Environmental impact
  - Stress impacts

  But turned out to be too difficult and we had to re-think
- Future research also needs to focus on how to ameliorate emissions impacts on active travel
  - Built environment/green landscaping
  - Changes in traffic management eg prioritising pedestrians

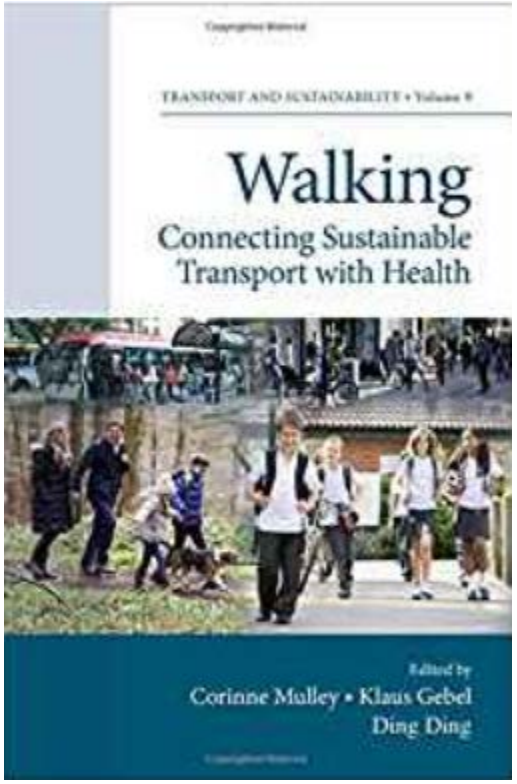


Policy needs to be evidenced based – Example from Sydney

- Obesity identified as a high priority by health practitioners and health policy makers
- Policy makers know that the physical activity targets are not met
  - Don't be a couch potato
  - Get of the bus/train one stop earlier and walk to your destination
- Unfortunately, the campaigns do not appear to be evidence based
  - understanding how and where people walk can provide evidence for potentially better policy

Providing the evidence for Sydney

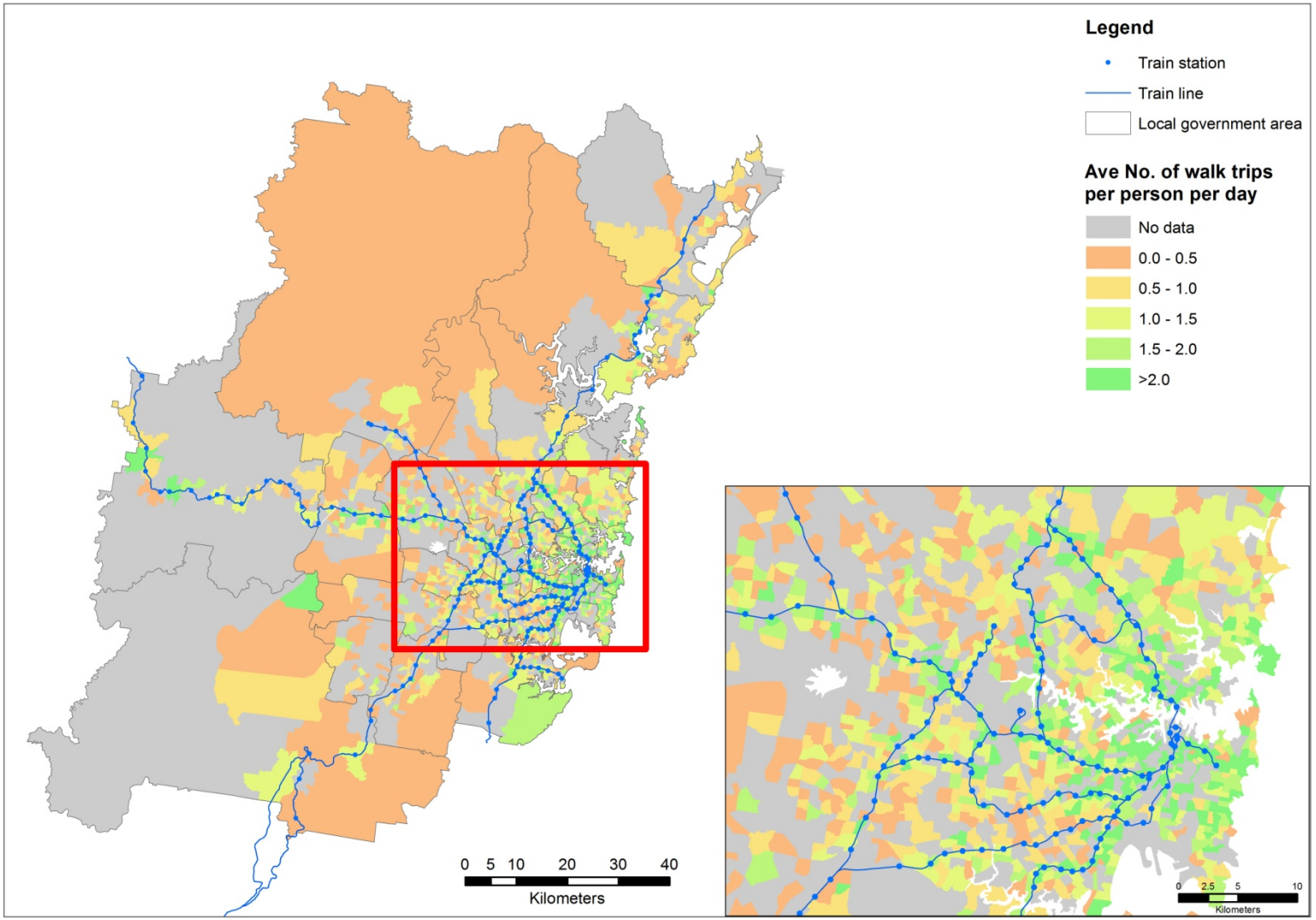
- So, how far do Sydneysiders walk ?
  - To public transport
  - To other activities
  - In total
- What would be the improvement in meeting physical activity targets if short trips were converted to walking?
  - Which short trips and by whom
- What are the determinants of these walking trips?



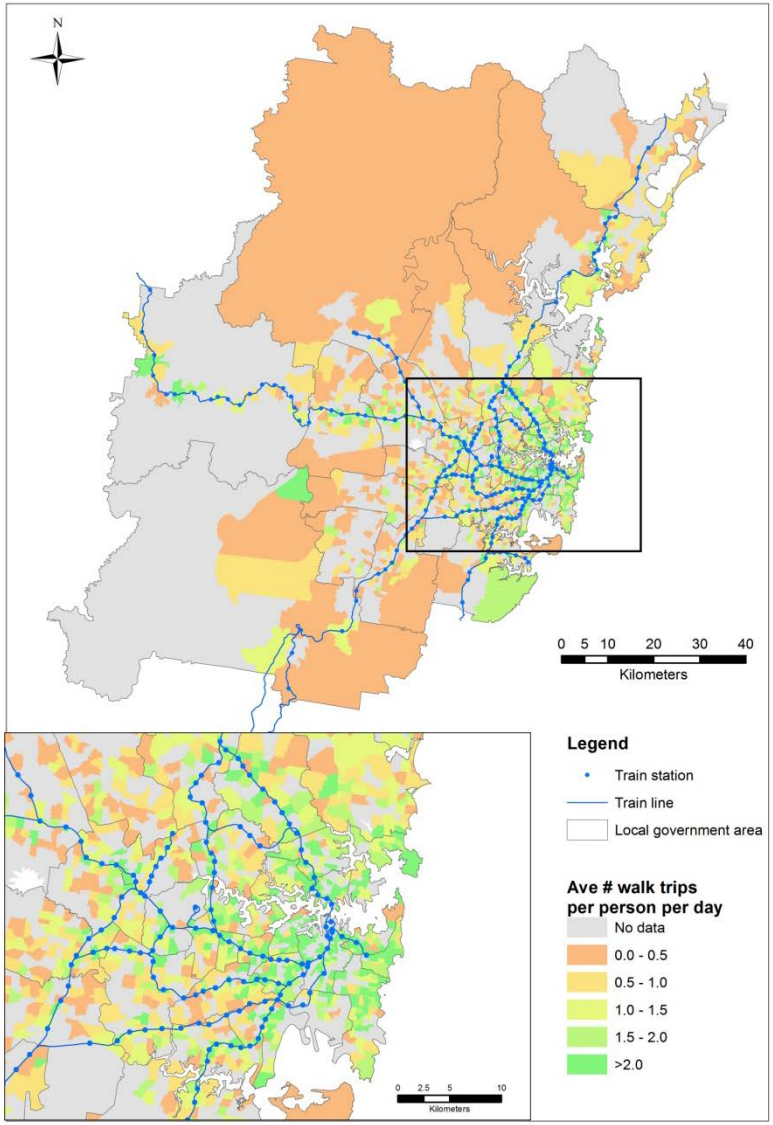
Data and Analysing Methods

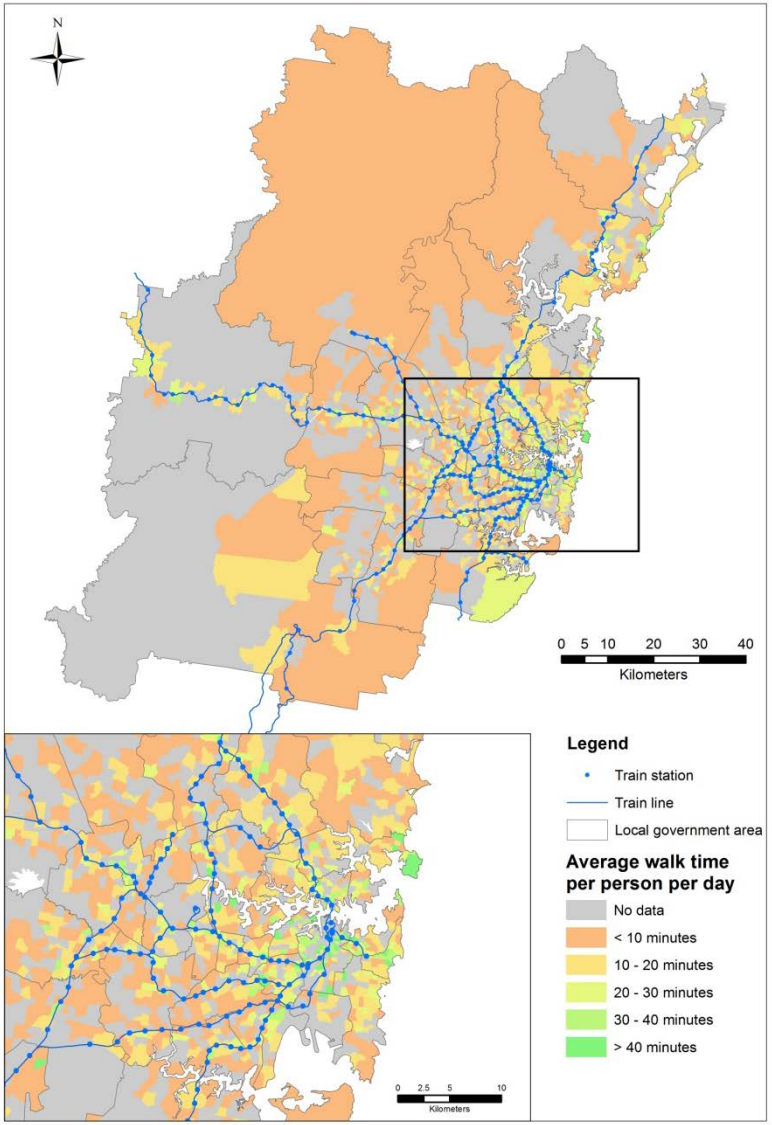
- *Sydney Household Travel Survey (2007/08 – 2009/10)*
  - 24-h travel diary for all household members
  - Supplemented with road network data (i.e., skim matrices) and GIS layers
- *Trip-based and tour-based analysis*
  - How much do Sydneysiders walk in terms of trip and time?
  - How much more people would be achieving the recommended physical activity if they walk instead of using motorised modes for walkable trip segments?
- *Modelling analysis*
  - What are the factors that influence the incidence of walking?
  - What are the main drivers of walking time?

Walk trips per person per day by residential location

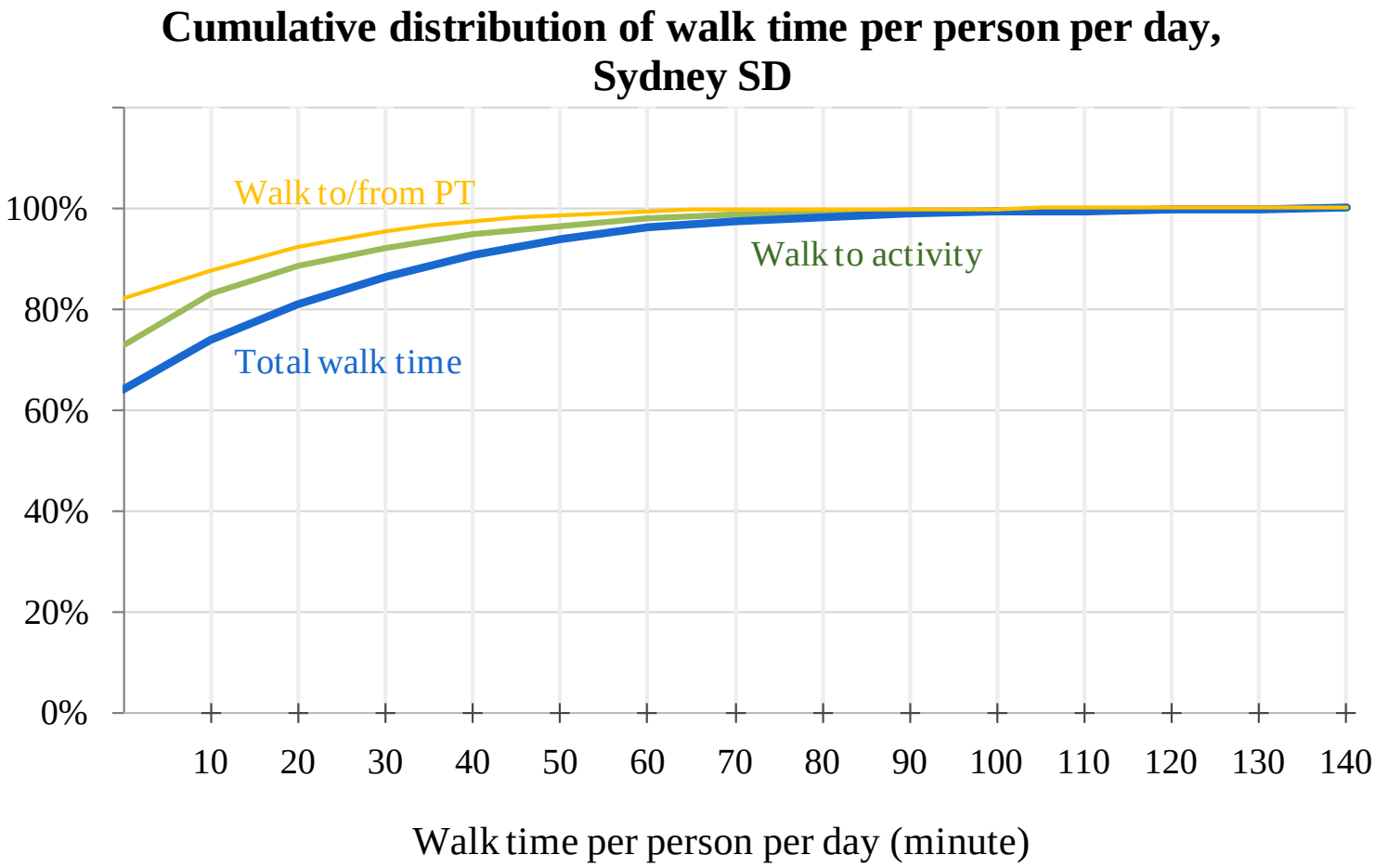


Average Walking per person per day: Trips vs. Time

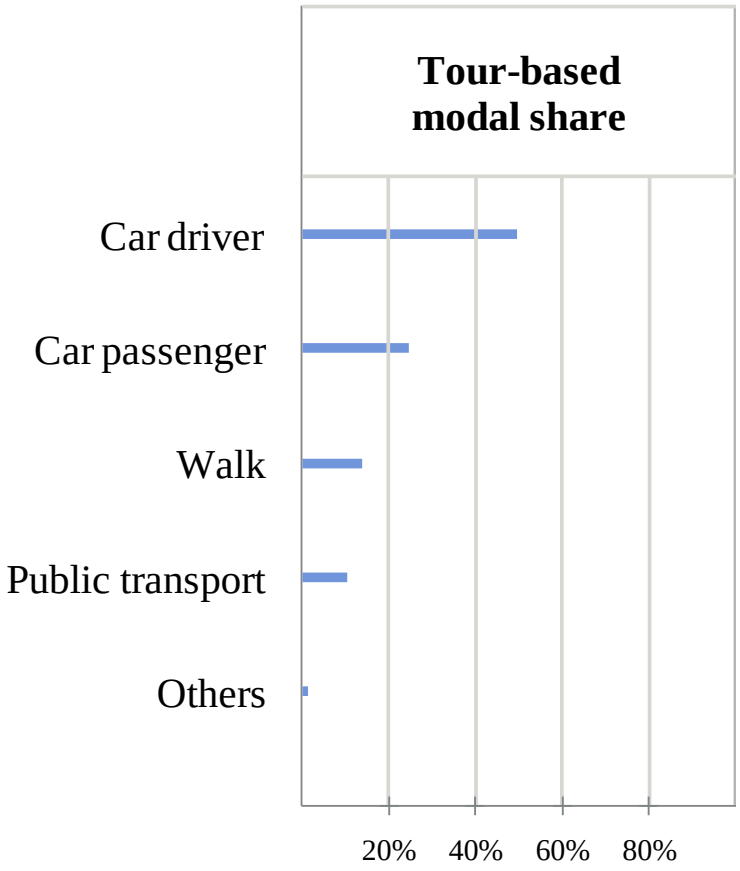




How much do Sydneysiders walk?



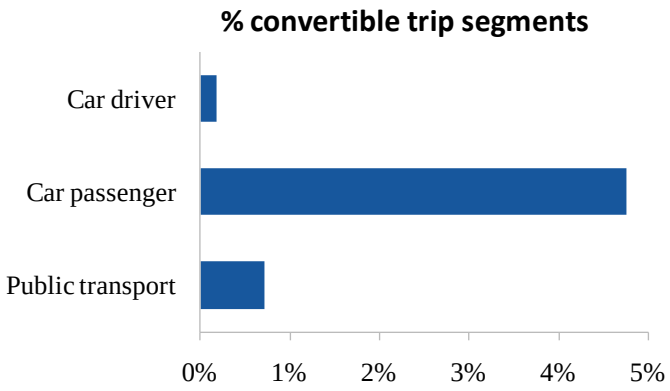
Why Sydneysiders walk very little?

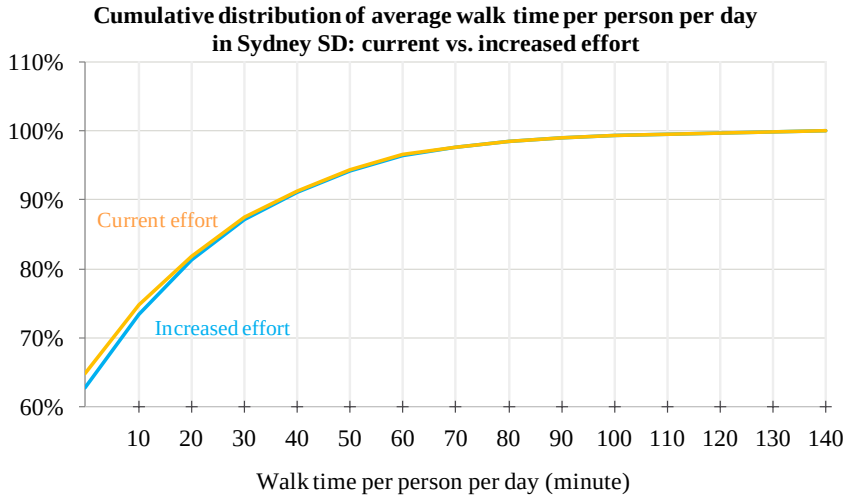


Can we increase walking by converting trips?

Convertible trip segment definition:

- Main mode is PT
  - Motorised trip segment that are within a walkable distance of 800 meters
  - Not a connecting trip segment (PT to PT)
- Main mode is Car
  - Motorised trip segment ≤ 800m
  - If car driver, must has an anchor poin





Modelling walking time

Double Hurdle Model: 2-stage decision process (i.e., hurdle)

- Whether or not a person walks on an observed day; and
- If walk, how long they walk

- In mathematic expression:
  - Binary probit model governing the walking decision ($d = 1$ or $d = 0$)

$$d_i^* = \boldsymbol{\alpha}' \boldsymbol{z_i} + v_i,\ v_i \sim \mathrm{N}[0,1]$$

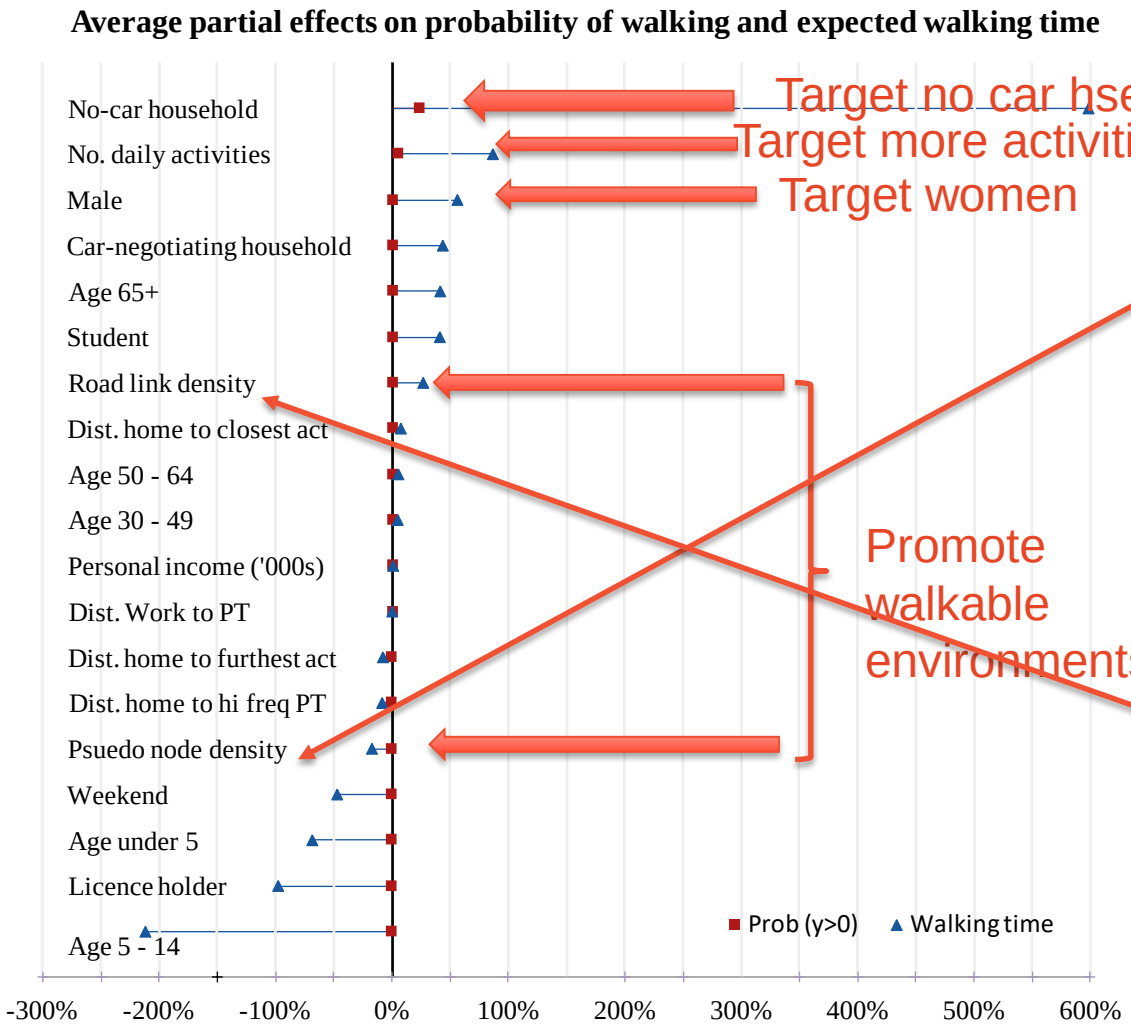
$$d_i = 1 \text{ if } d_i^* > 0$$

  - Regression model determining the walking time

$$y_i^* = \boldsymbol{\beta}' \boldsymbol{x_i} + \varepsilon_i, \varepsilon_i \sim N[0, \sigma_i\ ]; \begin{cases} y_i = y_i^* \text{ if } d_i^* > 0 \text{ and } y_i^* > 0 \\ y_i = 0 \text{ otherwise} \end{cases}$$

  - The model allows for non-normality and heteroscedasticity of the error terms

Modelling Results – Using the Partial Effects to target messages

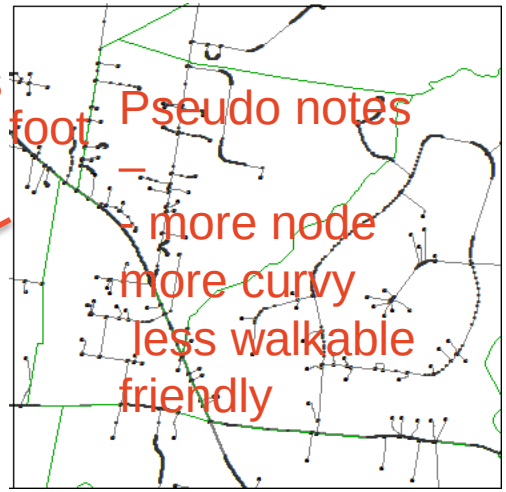


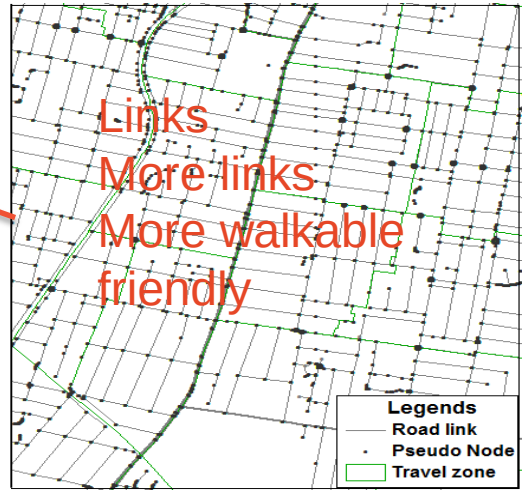
Target no car hseholds

Target more activities on foot

Target women

Promote walkable environments





Evidence based policy considerations

- If walking were the only physical activity in a typical day, a large proportion of Sydneysiders do not meet advisory physical activity targets
- Walking to access activities contributes more to total walking time than walking to/from motorised modes
- "Covering short distance trips on foot" may not be a good public health message but "doing more activities on feet" might be
- Friendly walking environment does associate with longer walking time so this has some policy implications for the built environment and planning

Overall Conclusions and future directions

- Cost benefit studies on public transport infrastructure should include health related benefits
  - Win-Win for transport and health
  - But questions left unanswered in relation to emissions and active travel
- More infrastructure
  - Encourages more use providing virtuous circle for health and transport
  - But must be 'good' in the elements which determine walking
  - Public transport is only as good as its weakest link….
- Policy should be evidence based
- Foster interest in academic community
  - To find synergies in transport and health
  - To support development of the evidence base

Source: sdx.com.au

– Any Questions?