Climate Change, Transport and Negative Feedback

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Poor have to increase energy consumption

Rich and middle class must reduce energy consumption
Transport and CO2 – Delhi 2030
(In collaboration with London School of Hygiene and Tropical Medicine)

CO2 emissions: tonnes per person

- 2010
- BAU
- Lower Carbon Driving
- Active Travel
- Combination

Woodcock et al., Lancet
Evidence from 4 continents

At the design level, design of road infrastructure (road cross section, carriageway width, intersection design), facilities for pedestrians, bicycles and public transport users influence the behaviour of road users.................................................................(Tiwari, G. 2012, India)

We can best improve global health by making sure that walking, bicycling and use of public transport are the dominant modes of travel for people in urban areas. This will only be possible if we strive to make our towns and cities safe and pleasant environments and that people perceive walking and cycling and their urban environment more generally to be safe.................................................................(Roberts, I. 2012, UK)

There is an urgent need for the linking-up of transport planning and urban design, public health and transport safety, well-being and the built environment...(Risom, J. 2012, Denmark)
Evidence from 4 continents

From that viewpoint, pedestrian flow spaces should be designed first according to human environmental needs such as safety perception; later, vehicles should be incorporated, as well as other means of transportation, but subordinated to the environmental experience of pedestrians…………………………………………………………(Vargas, M. 2012, Chile)

Evidence from India, South Africa, South America, North America and Europe indicates that both children and adults are concerned about traffic safety and crime on the streets and in public transport facilities. This influences their decision whether to walk, bicycle or use public transport………………………………………………………………………………(Appleyard, B. 2012, USA)

Integrated urban planning is needed to better address crime and violence, and to create communities that support active transportation and therefore reduce driving and climate change…. (Cohen, L. 2012, USA)
Studies performed in various European and North American countries clearly show that personal safety is a determinant factor in a person’s decision whether or not to use public transport........(Cardia, C. 2012, Italy)

Many transportation policies aimed at motorised vehicles fail to pay attention to their impacts on poverty and social exclusion. They neglect the access and transportation demands of the more economically disadvantaged groups of society, who rely mostly on public transportation, walking, and cycling...........(Villaveces, A. 2012, Colombia)

it is clear from the child independent and scholar travel data that if walking is to be promoted amongst children, safer environments are required. There is no reason to believe that the same would not apply to encouraging adult pedestrians as well...(Behrens, R. 2012, South Africa)
DOOR TO DOOR TRIP TIMES

**3 KM**
- ELEVATED/UNDERGRND PT
- SURFACE PT
- CAR
- BICYCLE
- WALK

**6 KM**
- ELEVATED UNDERGRND PT
- SURFACE PT
- CAR
- BICYCLE

**12 KM**
- ELEVATED UNDERGRND PT
- SURFACE PT
- CAR

**24 KM**
- ELEVATED UNDERGRND PT
- SURFACE PT
- CAR

- Walking to station/veh
- Journey in vehicle
- Waiting at station
- Congestion (car)
- One change
- Walking in station - in
- Walking in station - out
- Walking to destination
Life cycle emissions – rail modes

Life cycle emissions – road modes

Onroad Modes - Greenhouse Gas Emissions (g CO₂e) per Passenger-Mile-Traveled

- Sedan: 232 g CO₂e
- SUV: 275 g CO₂e
- Pickup: 327 g CO₂e
- Bus (Off-Peak): 475 g CO₂e
- Bus (Peak): 59 g CO₂e

LIFE CYCLE COSTS

CO2 emissions (g/PKM)

Source: TERI, 2013
CO2 and roads

20th CENTURY SOLUTIONS:
- One way streets?

“One-way streets reflect the dominance of the car and the failed go-faster policies of the traffic engineers. As we begin to realise that walking and cycling should be the dominant forms of transport, the one-way street should be consigned to the dustbin of history.”

Peter Murray, Head of the New London Architecture Centre,
- Underground trains seen as a major solution during cold war as nuclear shelters
- Surface transport less energy consuming
- Underground or elevated transit does not reduce congestion, provides extra supply > CO2↑
- CO2 ≈ road area + distance of travel

Solutions contractor driven
Not people driven
WHO estimates for road traffic fatalities per 100,000 persons for 178 countries

Factor of 4

Average RTI fatality rates per 100,000 persons for 1,972 US cities

Years 2004-2008, population > 20,000 persons
Location of fatal crashes on different road widths in US cities selected randomly for low and high crash rates
Location of fatal crashes, junction or mid-block, US cities selected randomly for low and high crash rates
Proportion of fatalities on roads with different total lanes available in Chicago (low fatality rate) and Dallas (high fatality rate)
Proportion of fatalities on roads with different classifications, Chicago (low fatality rate) and Dallas (high fatality rate)
Proportion of fatalities at junctions or midblock in Chicago (low fatality rate) and Dallas (high fatality rate)
Transportation and Placemaking
Norman Garrick

Chance of being Killed 50% Higher

versus

Odds of Dying in a Road Accident based on Intersection Density

Street network, safety and sustainability in 24 medium sized California cities
Intersection density, walking, bicycling and transit use

Source: N. Garrick
Possibilities to reduce CO₂ emissions from road traffic for urban planners seem limited: a restriction of space dedicated to traffic and a change of transport means for commuting represent leverage points.


The results suggest that public transport users could achieve dramatic savings on their commute if the density of that network was increased considerably.


Current urban policy, which relies predominantly on ambitious and expensive programmes of transport infrastructure provision must be rethought in Beijing.


High speed systems will further encourage sprawl and greater energy consumption, and hence, Public Transit (PT), even if the commercial speed is rather low, is probably the only way to improve urban accessibility and urban attractiveness in a sustainable way.

Safe roads a precondition for the future low CO2 city

- Children, elderly, walking speed ~ 0.8 m/s
- Pedestrian green phase < 30 s
- Therefore, motorised lanes < (30 X 0.8) = < 24 m

- Shops and/or street vendors by design
- City blocks ~ 800 m square
- Maintain urban average speeds at 15 km/h
- Public transit on surface
Safe roads a precondition for the future
low CO2 city

- Fatality rate not solely determined by road & vehicle design, enforcement, income levels or city size

- RTI fatality rates can vary by a factor of 3-5 among cities of similar size and income

- City street structure and urban form - significant effect on RTI fatality rates

- Cities with a higher proportion of wide streets and low density road networks appear to have a much higher RTI fatality rate

- Urban safety a necessary condition for control of global warming