Sustainable Urban Design Co-Benefits – Role of EST in Air Pollution Reduction Climate Change Mitigation

Dr Karlson 'Charlie' Hargroves, Senior Research Fellow, Curtin University Sustainability Policy Institute, Perth, Australia

Presentation based on report by Karlson Hargroves, Daniel Conley, Luke Spajic, Lauren Gallina, and Peter Newman.

Asia's Trend of Motorization

- Over the last two decades, vehicle numbers have doubled every 5 to 7 years in Asia (ADB,2018).
- 80 percent of air pollution in Asia can be attributed to the transport sector (ADB, 2018).
- It is estimated that in 2006, Asia produced approximately 19 percent of global transport emissions (ADB, 2018).
- Based on current trends, it is further estimated that Asia will produce 31 percent of global transport emissions by 2030 (ABD, 2018).
- An estimated 2-5 percent of GDP of Asian countries is lost as a result of traffic congestion (ADB, 2015).

The Impact of Motorisation on Health

- According to the World Health Organisation approximately 3 million deaths were attributable to ambient outdoor air pollution, and that 87 percent occurred in low and middle-income countries (2016).
- More precisely, 59 percent of the 4.2 million deaths global deaths in 2015 attributable to particulate mater of 2.5 microns occurred in South and East Asia (Cohen *et al*, 2015).
- Additionally, 90 percent of global road fatalities occur in low and middle-income countries (WHO, 2015).
- Increasing access to non-motorised modes of transit such as cycling and walking has a two-fold benefit to citizens; reduced levels of and pollution and promoting physical activity.

Achieving Sustainable Urban Design and Development for Asian Cities

- It is estimated by the United Nations that an additional 2.5 billion people will live in cities by 2050, with 90 percent living in Asian and African cities (UN, 2018).
- The integration of land use and transport planning is crucial to curbing urban sprawl that has occurred in many cities as a result of a reliance on private motorised vehicles.
- Urban regeneration, encompassing the revitalisation of urban areas in denser, transit-oriented form will also have a role to play.
- Focusing on creating station precents with the private sector attracts new sources of capital, increases population density within transit catchments, consequently increasing accessbility and ridership.

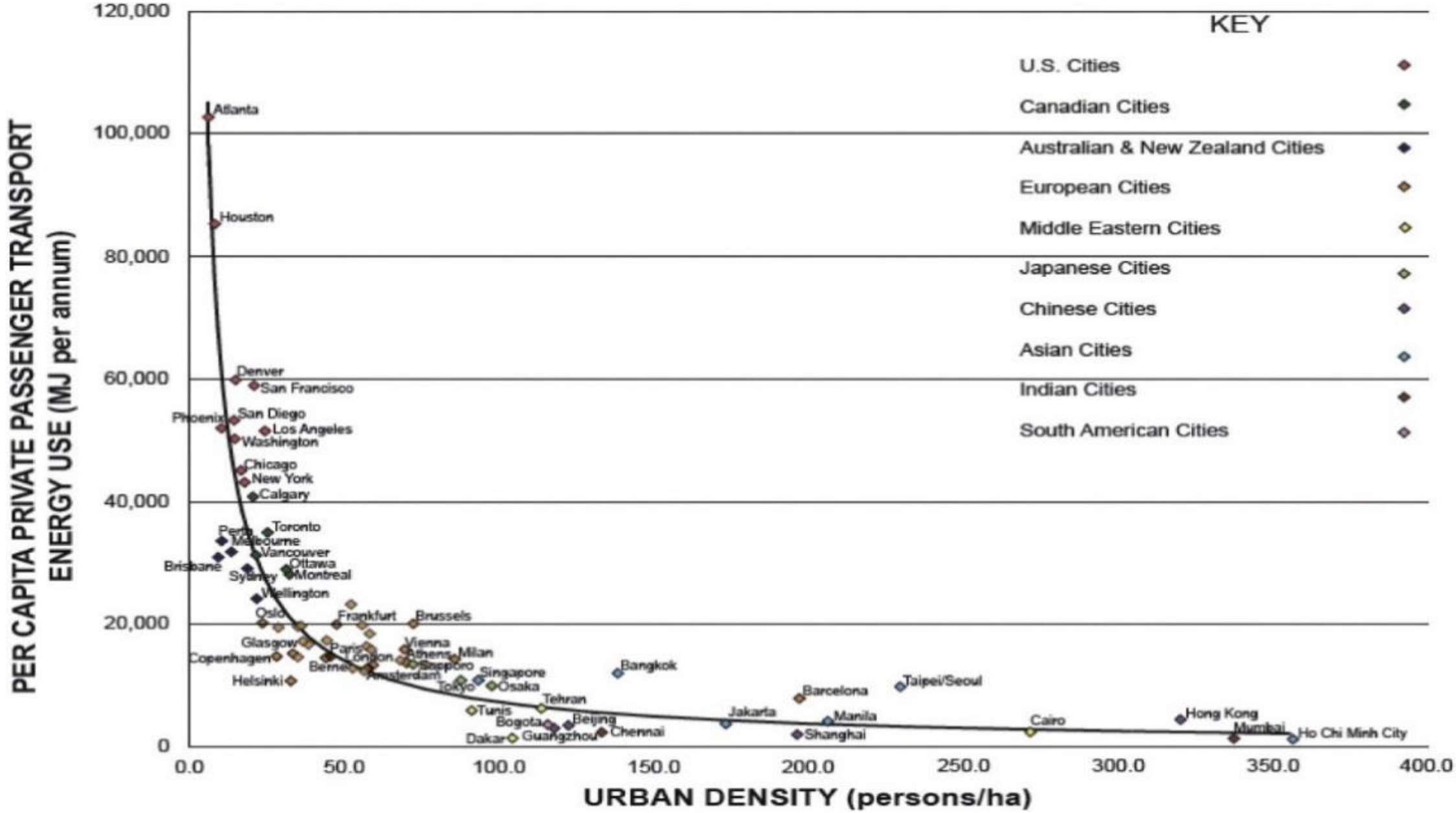

Figure 1: Impact of Urban Density of Per Capita Private Transport Energy Use

Source: Newman and Kenworthy, 2015

The Importance of Forming Partnerships between the Public and Private Sectors

- An estimated $26 trillion is required between 2016 and 2030 in Developing Asia to implement vital infrastructure to maintain growth, combat poverty and mitigate climate change (ABD, 2017).
- $8.4 trillion will required for transport infrastructure (ABD,2017).
- Joint developments have been successful in cities such as Tokyo, Japan where their commuter train network is privately financed and operated in partnership with the Government who provide regulatory oversight and support for innovation (World Bank, 2000).
- An industry engaged co-creational approach is needed to incentivise private investment in public infrastructure. Rail-based transit systems are an attractive transit mode due to their station centric locations.

The Co-Benefits of Sustainable Urban Design

- Decreasing dependency on fossil fuels particularly in the transport sector will result in a number of positive outcomes such as a reduction in levels of ambient air pollution.
- Consequently, a reduction in levels of ambient air pollution, increasing access to efficient transportation and maximising land use potential will produce a number of Co-benefits:
  - A reduction of negative health impacts i.e. chest infections and cardiovascular diseases
  - Increased physical activity
  - Reduced road-based accidents
  - Increasing climate resilience
  - Reducing the urban heat island effect
  - Increasing economic activity and innovation
  - Reducing social inequality

Case Study: ‘Trackless Tram’ in ZhuZhou, Hunan Province, People’s Republic of China

Figure 2: The Trackless Tram in ZhuZhou, The People’s Republic of China

Source: Compliments of CRRC

- The Trackless Tram is capable of carrying between 300 to 500 passengers, depending on the number of carriages that are used (3 or 5), and is capable of travelling at 70km/hour on road surfaces.
- The Trackless Tram is powered by lithium-titanate batteries that are located on the roof of the carriages. The batteries have a 25 year lifespan, charge faster than lithium-ion and perform better in cold conditions.
- The capacity of the Trackless Tram and the fully electric nature means that coupled with renewable energy such as solar power at stations for charging, there is a likelihood of substantially reducing the amount of private motorized vehicles travelling down a particular corridor, reducing greenhouse gases and air pollution.
- The Trackless Tram uses guided autonomous ‘rail’ technology to navigate along a corridor based on GPS and other positioning technologies to detect obstructions such as other vehicles and pedestrians.
- By combining these features, the trackless tram achieves 3-4 times lower costs that light rail (Bodhi Alliance and EDAB Consulting, 2017).

International Trackless Tram Research Alliance (ITTRA)

1. To create an alliance of parties interested in Trackless Tram projects to facilitate sharing, capacity building, and advocacy.
2. To research best practices and methodologies to inform innovative financing, business case development and implementation of projects that harness entrepreneurial approaches.
3. To leverage research funding to explore the potential for Trackless Trams to be the catalyst for integrated land development and transit service projects, facilitate aggregated buying, and explore opportunities for local assembly, servicing and support.

International Trackless Tram Research Alliance (ITTRA)

- Provision of succinct updates and critical materials and case studies on advances in Trackless Tram System innovations and implementation, including the implementation of the Transit Activated Corridor approach.
- Opportunity to collaborate on joint research projects to explore the implementation of Trackless Tram Systems (with ITTRA providing a central repository for the creation of new knowledge and experience in this area).
- Access to speakers, training sessions, and advice on Trackless Tram System technologies, implementation strategies, and innovative financing mechanisms based on land value creation.
- Invitation to participate in study tours to visit Trackless Tram System manufactures and demonstration projects.

To Join ITTRA please talk to the Delegation from the Curtin University Sustainability Polity Institute.

Conclusions and Recommendations

- Measure and identify pollution sources
- Facilitate land use and transit integration
- Facilitate collaboration with the private sector
- Encourage walking and cycling
- Involve communities at all stages of urban design and planning
- Transition to cleaner fuel sources
- Implement Transport Demand Management strategies
- Consider the benefit of and the role that emerging technologies can play

Thank you