

Enhancing Sustainability and Inclusiveness of Urban Passenger Transport in Asian Cities

Ms. Dorina Pojani

Senior Lecturer

School of Earth and Environmental Sciences

University of Queensland

Queensland, Australia

Mr. Kenneth Baar, Independent Public Policy Analyst



Background Report for the Regional Workshop on
Sustainable, Inclusive and Resilient Urban Passenger Transport:
Preparing for Post-Pandemic Mobility in Asia

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1 Introduction

This report provides an overview of the scholarly literature of the past decade discussing the passenger transport issues faced by Asian cities. The past half century has been marked by explosions of urbanization and motorization. A massive growth in wealth has been combined with urban impoverishment and inequality. In a world increasingly dominated by urban areas, including megacities with millions of inhabitants, daily transport matters have taken a center stage. Travel time and cost now play a key role in the lives of a major part of the Asian population. Within this reality, urban transport has introduced immense environmental, physical, and economic welfare problems. It now envelopes issues about how to design cities so that they are livable. The COVID-19 outbreak has compounded the crises.

The questions surrounding how to improve passenger transport and ameliorate its adverse impacts traverse a broad, complex, and daunting range of issues including (but not limited to):

- Institutional set-up, coordination, and planning of transport systems,
- Selecting and financing appropriate modes of public transport,
- Role and regulation of private paratransit,
- Disabling and enabling non-motorized travel (by foot and bicycle),
- Designing modes of mass transit,
- Imbalances between support for automobile travel and public transport,
- Poverty and inequities in transit priorities and outcomes,
- Protection of women from harassment,
- Needs of the elderly and people with disabilities,
- Environment and pollution, and
- Safety and security.

Numerous journals are dedicated to sustainable transport issues throughout the globe. Some focus specifically on transport issues in Asia. To place this discussion of the literature on transportation policy and urban travel in perspective, it is noted that scholarly literature in this area is heavily focused on larger cities and especially megacities, where the most serious problems are occurring. Generally, the literature does not address the transit issues faced by a majority of the population, which lives outside the larger cities (Pojani and Stead 2015).

Another qualification of this literature review is that even the most current literature, which is typically published a year or two after it is written and in turn possibly years after the research was conducted, is in the context of rapidly changing situations. Also, the literature does not take into account the impacts of the COVID-19 pandemic, which is now shaking our world, on urban transport.

The evolution and contour of urban travel issues in Asia has substantial commonalities and wide differences. A common conclusion is that notwithstanding increasing national concerns and efforts, often in developing Asian nations transport conditions are deteriorating rather than improving. However, some of the higher-income megacities have been relatively successful in developing and maintaining high-quality public transport systems.

In the past decades, especially in nations with rapidly developing economies, the pace of urbanization has outrun the ability and wealth of societies to resolve the urban travel issues that accompany such growth. The paradox has been that the path to the wealth enabled by the emergence of motorized transport has also been a path of strangulation, hardship, and impoverishment of the lower economic classes.

Pending transport calamity was widely anticipated decades ago (Owen, quoted in Dev and Yedla, 2015). Contemporary accounts detail a situation which, in developing countries is getting worse rather than better, despite the policy efforts and transport expenditures of the public sector (Parikesit and Susantono, 2013). Widespread congestion and perpetual traffic gridlock are now common in many cities, impacting urban life in a major way. Externalities include air pollution, noise, severe health hazards, lack of public and green space, and environmental degradation (Burgess, 2000; World Bank, 2015; Dev and Yedla, 2015, chapters by Singh, Sriraman, and Tiwari). This report is in two parts. The first part discusses the characteristics of urban Asia with respect to passenger transport. The second part outlines efforts to 'green' the passenger transport systems in Asian cities.

2 Enhancing sustainability and inclusiveness of passenger transport in Asian cities

2.1 A region of multi-modal travel

Asia is a region where multiple and widely diverse modes of transport each play a major role. Mass transit modes include trains, trams, Bus Rapid Transit, and ordinary busses. Commercial privately owned “paratransit” modes include multi-passenger small vans, two- and three-passenger *tuktuks*, one-passenger motorcycles, and non-motorized rickshaws. Owner-operated modes include automobiles, motorcycles, bicycles, and e-bikes. The motorized share of travel is rapidly increasing. Yet in some countries a substantial share of travel is on foot.

The distribution of travel modes in large cities greatly varies among nations. In China, Japan, and Republic of Korea a substantial portion of travel is on metro or buses. In Southeast Asia, a substantial portion of all travel is non-motorized, either by walking, bicycle, or non-motorized paratransit (Pojani 2020). In some countries this is the only affordable form of travel for the low-income population. Tiwari (2015) notes that in Indian megacities between 40 and 50 percent of travel is non-motorized and commonly is the only mode of travel that is feasible for low income households: In some cities, a substantial portion of travel is in small, privately owned vans and mini-buses. In Manila there are 75,000 franchised *jeepneys* (refurbished American vehicles left after the Second World War, which carry up to twenty passengers). Jeepneys follow fixed routes and must be licensed. The government has considered restrictions on the volume of jeepney travel for years; their use was shut down with the advent of the COVID-19 pandemic, and, as of July 2021, it is uncertain whether they will be permitted to return. In Jakarta there also about 45,000 *angkots* (minivans with a capacity for 12 to 15 seated passengers), which are privately owned. For many passengers they may be the only affordable option (Dewita, 2020). Another source notes the critical and valuable role that *angkots* perform in Indonesian transport (Joewono et al., 2015).

2.2 Extremely rapid urbanization

The story of urbanization of Asia is commonly known. Its speed has been remarkable, and in itself is enough to overwhelm the abilities of government to resolve transit problems. Asian patterns of urban growth may be contrasted with the experiences of

West European cities which grew at a slower rate in a period which preceded the introduction of the automobile, leaving them with decades, strong incentives, and sufficient resources to support the introduction of comprehensive mass transit systems.

Now, Asia has a substantial portion of the megacities in the world. Beijing, Manila, Mumbai, Seoul, and Shanghai each have over 20 million inhabitants. Delhi, Jakarta, and Tokyo have over 30 million inhabitants. In China six cities have more than ten million inhabitants and eighteen cities have over five million inhabitants. As of the first decade in this century, the Asian continent had 42 of the 50 densest cities in the world.

Furthermore, it is anticipated that exponential rates of growth will continue. For example, in 2015, India was projected to have an increase of 250 million urban dwellers by 2030 (Misra, 2015; Rode and Shankar, 2014). Lao PDR and Cambodia are experiencing 7.3% and 4.3% annual growth in population, respectively (Barbosa et al., 2018). In 2020 half of Indonesia's population lived in urban areas and it is predicted that the proportion will reach 60% by 2025. In Malaysia, 75% of the population lives in urban areas.

2.3 Construction of a world for automobility

For decades, extensive automobile production and usage and construction of highways to facilitate automobility have been considered as the route to progress in Asian cities (see Hansen and Nielson 2017). In China, support for the creation of a substantial auto industry that would provide for widespread domestic car use became part of the economic growth plan in the 1990s (Chen et al., 2020). Until that time, a vibrant and public culture, which was based on walking and cycling, prevailed (Gao and Kenworthy, 2017).

A book by Wang (2018). details the growth of the auto industry and auto use in China. The automobile industrial policy is credited with playing an important role in the growth of the economy. In response to the 2008 global recession, the Automobile Industry Adjustment and Revitalization Plan was adopted to carry out two car-consumption stimulus movements in 2009 and 2012. Private passenger car ownership grew from 790,000 in 1994 to 127 million in 2015. By 2015, there were over 2 million vehicles in 18 cities and over 3 million in 6 cities, including Beijing with 5.5 million (Quan and Xu, 2020).

Farther south, in Indonesia, under President Suharto - who governed for more than three decades and was determined to "modernize" and "westernize" the capital - many urban tramways and railway tracks were demolished or abandoned, while massive road corridors were constructed (Susilo and Joewono, 2017). The weight of support for road transit extended into the twenty-first century. In the mid-2000s, road investments made up to 75% of the total transport budget in the country and resulted in an increase of total road length (World Bank 2007). The current policy-makers are perpetuating a favoritism of road domination. Current policy is based on a capital-intensive road engineering approach focused on easing congestion for car drivers and mitigating concerns in the short-term rather than on future visioning (Susilo and Joewono 2017). One study on the Islamic Republic of Hong Kong paints a picture of a social fabric torn apart by the creation of an auto-dependent society. The author notes that vast informal settlements for the poor do not have public transit services while the middle-classes live in suburban estates, in which do not support the walking and socializing way of life of Traditional Islamic cities (Soltani, 2017). The devastating impacts of prioritizing automobile travel have been a common theme of the transport literature set in Asian cities. One study explains that support of automobile travel while reducing the safety of travel by walking or bicycle and reducing accessibility for poorer people (Stanley, 2018).

In class-stratified and status-conscious Asian societies, a strong symbolism is attached to automobility, in particular luxury car brands (Ashmore et al., 2018). Apart from national desires to support and stimulate automobile use, in some nations international assistance has played a substantial role, especially in past decades. Principal sources of aid and assistance have been the World Bank, the Asian Development Bank (ADB), and the Japan International Cooperation Agency (JICA). Their funding has largely been used for highways and roads (Wijaya et al. 2019). In 2007, the World Bank noted that about three-quarters of its assistance for transport was allocated to road transport (World Bank, 2007). While financial contributions to transport projects from the Asian Development Bank and the World Bank, between 2007 and 2012 averaged 7 billion (US) dollars annually, the \$1 billion a year contributed to both China and India represented under 2% of the total transport investment each country (Wijaya et al. 2019).

2.4 High densities, suburbanization, and traffic overload

By sheer virtue of the massive population growth in Asia, there has been exceptional increase in urban traffic loads, massive expansions in the size of cities, and consequentially growth in required travel distances. Concurrently, increasing

suburbanization has fostered rapid growth of individualized motorized travel. Commonly, the share of city land available to meet the new travel demand has been low. This ranges from 9% or less in Hanoi, Bangkok, and Jakarta to just over 16% in Tokyo, with Shanghai, Singapore, and Seoul laying between these limits. (In contrast, New York devotes 32% of its land area to roads.)

Suburbanization, which has become widespread, has taken various forms. It has been a route for the burgeoning middle class to escape the ills of central cities and obtain more living space. It has also been a source of cheap land for the corporate sector. At the same time, large peri-urban areas with illegal settlements have been created by poor households that cannot afford inner-city rents. Commonly poor suburban settlements lack infrastructure, public facilities and basic services, including public transport and adequate roads. In some nations cheap suburban land has been a source for massive housing developments (UN Habitat, 2014).

The juggernaut of rapid growth has led to a combination of clogged and expensive urban cores, dilapidated and deprived suburbs for the poor, and suburbs for the middle classes that rely on auto travel which clogs the roads of central cities (Barbosa et al., 2018). In some nations sprawl has been supported by land use restrictions and/or public land development programs, as well as massive road construction. Zoning policies that suppress permissible densities as a means of decongesting central cities have been blamed for inducing sprawl in some nations, such as India (Rathi 2017). In others, such as China, sprawl has been attributed to public accumulation of land and resale for development with agricultural land at low prices, added infrastructure and services (Gao and Kenworthy 2017).

2.5 Shift to motorized personal travel modes

Faced with increasing travel distances and less than adequate transit, substantial portions of the population in some countries have taken control of their transport options and solutions with inexpensive individualized motorized transit. In developing countries, two-wheelers account for most of the motorized fleet and the growth in their usage has been at far higher rates than cars. Motorcycles and e-bikes are now the predominant mode of travel in many cities.

In Viet Nam, 97% of motorized vehicles are two-wheelers, while in India the figure is more than 70% (Kamakate and Gordon, 2009). Delhi has around 6.6 million registered motorcycles; Bengaluru, a much smaller city, has around 5 million (Philip, cited in Wadud, 2020). And Karachi has around 2.7 million registered motorcycles (Ayub, 2017).

In Phnom Penh in 2011 the share of travel with private motorcycles was 64% with an additional 8% traveling in motorcycle taxis. Here, conventional buses were just introduced in 2014 for the first time. In Jakarta, starting in the late 1990s, private motorization, especially of motorcycles, exploded. By 2010, the car ownership level had increased to 25% and the motorcycle ownership level had increased to 72%. In 2012, more than half of the trips within the capital region were on motorcycles compared to only 14% in 2000. Meanwhile, bus ridership halved from 50% to 25% of the commuting trips (Susilo and Joewono, 2017). By 2020, 20 million motorcycles were registered in Jakarta (Resdiansyah, 2020).

In Viet Nam, by the mid-2010s, 95% of registered vehicles were motorcycles. At this point “[v]irtually every person 16 years or older owns a motorcycle” (Huynh and Gómez-Ibáñez, 2017:268). Hanoi and Ho Chi Minh City have experienced a corresponding decline in the share of travel by bicycle: from 61% in 1995 to less than 3% in 2008. Not only are motorcycles cheaper but they are often faster than other modes. For a 5-7 km trip - the most common travel distance in the two cities - a motorcycle typically takes 15-20 min, whereas a private car takes 25-30 min; buses take longer (Huynh and Gómez-Ibáñez 2017). One author explains how in Hanoi, a city with crowded narrow streets, motorcycles have an almost “addictive” power, providing maximum freedom and flexibility (Hansen 2017).

In China, a boom in e-bike production and use commenced in 2005. As of 2016, there were 220 million e-bikes in the country. A book by Zuev (2018) details the political, economic, and human facets associated with this boom. Now China is the world’s largest manufacturer, consumer and exporter of e-bikes with sales growing exponentially. As of the mid-2010s, it accounted for more than 90% of the global market in e-bikes, and there are 700 registered e-bike producers in the country. On the other hand, in other countries, such as Bangladesh motorcycle use has been much lower as it has been hampered by a lack of domestic production, high costs for imported motorcycles, high taxes and registration costs, and lower income levels (Wadud, 2020).

2.6 Environmental pollution

Emissions from cars, buses, and motorcycles have led to overwhelming levels of pollution and substantial adverse health impacts. These severe environmental impacts have been widely publicized and documented and have been a driving force for increased controls on the emissions from vehicles and on auto use and fuel pricing. Detailed studies have been conducted on overall air quality and the impacts of specific

modes of transport on air quality. In this report, discussion of this issue is limited to a few cursory comments and references. Much of the literature is highly technical, measuring the levels of pollution and/or projecting the impacts of proposed improvement to transit systems.

As of the mid-2000s, CO₂ emissions from road transport were increasing at a rate of 10% a year in the continent overall (Zegras 2007). Less than a decade later, an UNESCAP report (2013) stated that more than 80% of CO₂ emissions in the Asia-Pacific region were due to road transport. Emissions are exacerbated by old vehicles, poor vehicle maintenance, and low fuel quality (see also Timilsina and Shrestha 2009). Hanaoka (2013) outlining a series of measures to reduce pollution in Asian cities.

2.7 Declining travel speeds and accessibility

Average required travel distances and times in order to reach employment and complete other daily tasks have been increasing, reducing the feasibility of non-motorized travel. In the face of the urban transport crises, in some cities the public transit share of travel has been increasing while in others it has been declining (Parikesit and Susantono 2013). One work explains how suburbanization has made seamless travel on public transit more difficult (Pan and Sung, 2013).

Long commuting times and distances are the inevitable outcome of the large sizes of many Asian cities. At the same time, the lack of adequate public transit has driven automobile use to levels that saturate the space available for travel, which is small compared what is needed. Consequently travel speeds are reduced to a snail-like pace. Strangulation in traffic has become a common phenomenon, turning daily travel into a nightmare (Fan and Rama, 2017; Susilo and Joewono, 2017).

On a more positive note, in Hanoi and Ho Chi Minh City travel times have remained short despite the fact that distances are similar to cities of comparable size. The average trip length is 5-6 km while the average travel time is less than 20 min. Fewer than 10% of trips take more than a half hour. The modal share of car use has remained low while motorcycle use has become nearly universal; buses serve less than 10% of the trips. Most trips by motorcycle and bus are relatively short. However, the situation may be changing since major traffic jams are increasingly common. As more people embrace automobility, the two Vietnamese megacities may be reaching a tipping point beyond which congestion becomes extremely severe (Huynh and Gómez-Ibáñez, 2017).

2.8 Extreme hardship for the poor

While Asian countries have been experiencing remarkable economic growth, especially in large cities, in terms of transport needs and housing costs the outcome has been especially harsh for lower income groups. These groups cannot compete for desirable locations, are forced to live far from areas of employment and services, cannot afford to own an automobile, and can only travel on inadequate public transit systems. The resultant physical separation of residential areas from places of employment and services forces urban residents to spend increasing time and a substantial portion of their income on transport, with a growing dependency on private motorized transport and other car-centered mobility (UN Habitat, 2014; Barbosa et al., 2018).

A standard criticism of Asian transport policies has been that these are not aimed at serving the needs of the low income population, which principally relies on walking, non-motorized transit, and inexpensive types of motorized transit. While mega projects dominate transport planning, in some cities, a large proportion of population lives in slums. This group of people cannot afford personal motorized vehicles (cars and two-wheelers) for transportation, and even subsidized bus systems are also too expensive for them for daily travel (Tiwari, 2015).

A study of urban travel in Jakarta revealed that between 2000 and 2012, the average trip distance doubled to around 15 km, with a longer average for low income households (Susilo and Joewono, 2017). One author concludes that this outcome has occurred in the context of social and political spheres in which the concept of social exclusion has not had traction (Stanley, 2018). A focus on inclusion is critical at this point. One author notes that in a context where 'road space is becoming an increasingly scarce resource, ... the constrained rights of the urban poor include the right of the road but also the right to use the two-wheeler in free-flowing urban traffic' (Zuev, 2018:35-36).

2.9 Aging populations

Modernization, growth in wealth, and improvements in medical care have been accompanied by a large increase in the proportion of the Asian population that is elderly. At the same time increasing city sizes and suburbanization have made older adults increasingly dependent on public transport, which is commonly inadequate. At the same time, as the number of income-tax payers is declining, it is more difficult to increase support for publicly funded transport services. Additionally, since the mobility

level of elderly people usually decreases with age due to disability, transport-related social exclusion is becoming more serious in developed Asian countries/regions. One commentary warns that developed Asian countries may need to adjust their social systems in response to changes in the total population and the age structure within a short time period (Chikaraishi et al., (2018).

2.10 Sexual harassment and crime

Harassment of women on public transit is a major problem in Asian countries, as well as most of the rest of world. In 2017, one review noted that in surveys in Asia approximately half to two-thirds of participants report having experienced sexual harassment on public transport (Gekoski et al., 2017). Also, among women, the greatest concerns about pedestrian travel relate to safety. Due to fear of harassment, women and girls are influenced to reduce their use of public transport or move to more private modes of transportation including inexpensive para-transit that is for individual travelers.

Women-only transit services in order to curtail harassment of women are a growing trend worldwide. In several Asian developing countries, including India, Japan, Indonesia, and Malaysia, mass transit systems include separate coaches for women. A study by Shibata (2020) which surveyed women's views about the pros and cons of women-only cars in the Tokyo metro, reported a widespread divergence in views about their benefits. A substantial portion of the interviewees felt that surveillance cameras and increased police presence would be more effective tools in combatting harassment.

One report by ITDP (2017), sets out comprehensive strategies to reduce harassment, including: separate ticketing booths for women at all stations, particularly at stations with more congestion, the employment of female guides and staff at ticket booths, upgraded paratransit and walking facilities around stations, well-designed partitions between females and males inside buses, and dedicated seating/waiting areas near the entrances/exits of BRT stations. The study notes that booths should *not* be provided where women have to divert and travel extra distance to reach bus bays. In the evening/night time, proper lighting should be provided, and stations should be staffed with security officers.

2.11 Accessibility for women and people with disabilities

Accessibility is a major issue in urban transport taking into account the increasing shares of the population that are elderly and have disabilities. Women, in particular

mothers of small children, have special needs too. The implementation of accessibility measures - apart from being deterred by the usual cost issues - is plagued by a lack of knowledge about such requirements, failures to enforce existing standards, and failures to obtain input from special-needs groups in the planning process. Commonly public officials are not aware of how much impact a little attention to detail in implementation of public infrastructure can make in terms of the impact on the lives of people with limited mobility, vision, hearing, and other impairments. Too often the perception is that making urban transport accessible will be costly and not as important in light of the many other development priorities relevant for economic growth.

However, as many examples of projects have shown, there is no appreciable difference in cost between streetscapes that are fully accessible and those that are not; the difference is that of consistent attention and supervision (Babinard et al., 2012). The UN Convention on the Rights of Persons with Disabilities (CPRD) which went into force in 2008 and has been ratified by 182 nations to date, brings new force to consideration in transit planning of the needs of persons with disabilities. Participating nations must develop plans to make public facilities and services accessible, with progressive upgrades to their plans. Countries must submit new reports on their efforts every four years.

2.12 Toward new paradigms in passenger transport

Over the past few decades, there has been a dramatic ideological shift in transit advocacy and public policy direction from support of auto travel through massive road construction to a recognition that the automobiles and motorcycles are the cause of road gridlock and major environmental problems. Almost every country has been undertaking substantial efforts to develop mass transit and reduce automobile travel. China has led the way by investing enormous sums in the development of mass transit (Guo and Kenworthy 2017; Chen et al., 2020). Jakarta is now undertaking massive efforts to expand its mass transit system, including the construction of commuter rail and light rail system and expansion of its BRT system (Resdiansyah 2021). Viet Nam's two major cities, Hanoi and Ho Chi Minh City, have also invested significant resources in building public transport infrastructure. In the last decade, Ho Chi Minh City has invested more than 5% of its annual GDP to this purpose (Huynh and Gómez-Ibáñez 2017).

In India, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was introduced by the national government in 2005. This mission had one of the initiatives

that gave a start to Bus Rapid Transit in Indian cities (Rathi 2017). Similarly, Indonesia adopted in 2009 a Transportation Act which requires that all cities with a population over half a million develop mass transit systems, including large-capacity buses, segregated lanes, specific routes that do not overlap with existing routes, and feeder services (Susilo and Joewono 2017).

International financial assistance has played a critical role in transit planning and development in some nations in Asia. In recent decades, the amount of assistance from Japan has been much higher than from other donors. The bulk of its assistance has been provided to higher income countries. In addition, international technical direction and assistance has played a major role. Provision of financial assistance has been interwoven with the provision of technical assistance. A common complaint is that international development agencies and their strategies are not aligned with national governments' development goals. Instead, national governments are often trying to align its goals with the donors' preferred areas (Wijaya et al., 2019).

Even if not dependent on financial support for the implementation of transport plans, local experts are often highly dependent on foreign expertise for the preparation of plans. The development of transportation master plans has become widespread. Developed countries have played a major role in providing technical assistance in the preparation of these plans (Wijaya et al., 2019). A book by Pojani (2020) is devoted to the issues of technical assistance and policy transfer in transport planning in Southeast Asian capital cities. The author concludes that knowledge abounds, while the problem is implementation Pojani (2020).

The next section delves more in detail into the efforts to achieve more sustainable transport in Asian cities.

3 Greening passenger transport in Asian cities

In Asia, a myriad transport modes compete for urban space which is precious. Local and national discourses and policies to 'green' urban transport revolve around the forms of mass transit that should be developed and how these should be planned. Other issues include whether and how existing forms of paratransit should be treated: should they be curbed, left in place, or supported? Debates abound over the allocation of scarce funds among various modes of transport. The notion of limiting auto use has also moved up in the policy agenda, as noted.

3.1 Institutional set up for developing 'green' transport plan

The formulation and implementation of transport policies is difficult even under the best of circumstances. The literature about transport in a substantial portion of the Asian nations reports that dysfunctional public institutional arrangements undermine efforts to bring about workable and rational approaches for addressing transport issues (see Stead and Pojani 2017). Most commentators indicate that the power over the various facets in transport plans is commonly dispersed among numerous agencies, which do not operate in a coordinated fashion. Even within metropolitan areas, power over transit planning is widely dispersed (Parikesit and Susantono 2013). While the following types of commentaries address transport planning, they point to deep seated issues about how governments operate, which are extremely difficult to overcome, including: institutional fragmentation; low levels of institutional coordination; limited planning capacity; lack of public participation; restricted scope for land use and transport integration; fragmentation of responsibility among many agencies leaving no entity with prime responsibility; lack of national guidance; inertia and aversion to making any decisions (Huynh and Gómez-Ibáñez 2017; Rathi 2017; Sriraman, 2015; Sridhar et al., 2020; Babalik-Sutcliffe, 2017; Susilo and Joewono, 2017).

Some commentaries highlight the need for strong political leaders to overcome institutional roadblocks. For example, the Mayor of Seoul and the Governor of Jakarta have played a critical role in removing roadblocks to implementation of major transport projects (Matsumoto 2007). On the other hand, others note that reliance on a particular individual leads to a risk of discontinuation and conflicts with stakeholders (Wu and Pojani, 2016). Another commentary catalogs a host of problems associated with the formulation of the components of transport plans, apart from institutional issues. These involve deficiencies in the quality of planning, based on deficient data and analyses that deal with issues in sectoral or partial way (Sridhar et al., 2020). Often, there is a lack of overall assessments of the consequences of projects. In addition, transport planning is biased towards big ticket items, when low cost solutions may

yield a better return on investment. Also, urban transport projects are increasingly being executed through complex public-private partnerships, whose transparency and accountability are questionable (Sridhar et al., 2020).

3.2 Restrictions on automobiles and parking

Some Asian cities have undertaken strategies to reduce auto travel and better manage car parking (see Pojani et al., 2020, chapters by Liu and Guo, Kato and Kobayakawa, Furlan, Barter, Chalermpong and Ratanawaraha). For example, Singapore - one of the leaders in this space - has adopted a multipronged strategy to reduce automobile use, in addition to constructing an extensive mass transit system. The strategy includes quotas on the number of new cars that can be purchased, substantial taxes on the purchase and annual license of cars, congestion pricing, and cheap mass transit tickets (compared to local incomes and other Asian nations). For a detailed description of these measures see Diao (2020). Shanghai has adopted vehicle-license-restriction policies. Since 1994, Shanghai has instituted a local vehicle-license auction. Only with this license can a car be driven into the Shanghai inner city. Suburban cars are forbidden from entering the core, and cars with nonlocal licenses are forbidden from driving on the elevated expressway network in the central urban area during peak hours.

Sometimes outcomes of transport policies differ greatly from intuitive expectations. For example, Jakarta provided priority on its roads for high occupancy vehicles (HOV) in order to reduce auto traffic. This led to the widespread emergence of “jockey” services for a fee, which even included children. When the city suspended the program there was no change in auto usage; instead, there was a sudden surge in the volume of bus passengers who were no longer sought by car drivers (Paundra et al., 2021).

3.3 Reducing fossil fuel subsidies

Countries with highest transport oil subsidies globally are all in Asia: Indonesia (US\$17 bn), Saudi Arabia (14 bn US\$), and the Islamic Republic of Iran (13 bn US\$). Several other countries in Asia and the Pacific, such as Malaysia, Kazakhstan, Azerbaijan, Turkmenistan, Uzbekistan, Sri Lanka, and Brunei Darussalam, also provide significant subsidies (IEA 2017; IEA 2020). While subsidies aim at reducing the price of fuel in order to make it more affordable for the poor, they also distort the market and sometimes even increase fuel consumption. The reality is that subsidies help a car-owning wealthy minority more than the poor (UNESCAP 2019a). Moreover, the environmental costs of these subsidies (e.g., increased air pollution due to more driving) far outweigh any social benefits (UNESCAP 2018b). And transport fuel subsidies consume scarce government funds which would be used in other priority sectors such health care and

education. Therefore, there is a strong case across countries for fossil fuel subsidy reform. Reducing petrol and diesel subsidies will lead to increases in the prices of those fuels, thus reducing car and motorcycle use and/or encouraging motorists to switch to electric vehicles.

3.4 Embracing Universal Design

Among the various urban planning and design concepts that aim to be inclusive of the needs of the largest range of users (women, older adults, and people with disabilities), Universal Design has become the most popular – at least in theory, if not in practice. Its application is rarely, if ever, mandated in the cities of the Asia-Pacific region. At most, built environments rely on ‘minimum accessibility’ standards. At its core, Universal Design promotes the idea of usable built environments for all people, not just a minority group. By applying Universal Design to the early design of built environments, barriers can be avoided and people’s participation in society maximized. The seven Principles of Universal Design which can help guide designers in the application of this concept are (1) Equitable use; (2) Flexibility in use; (3) Simple and intuitive use; (4) Perceptible information; (5) Tolerance for error; (6) Low physical effort; and (7) Size and space for approach. Internationally, Universal Design has been called for in the United Nations Convention on the Rights of Persons with Disabilities. In the future, Universal Design should become an integral part of all transport plans.

3.5 Planning, preserving, and developing mass transit options

As noted, mass transit options include conventional buses, BRT, and rail transit. Many surveys and studies have been conducted on how these modes can capture an increasing share of urban travel and what factors guide travelers preferences. Comfort, speed, reliability, and especially safety are the most critical factor among all groups (Mayo and Taboada, 2020; Ashmore et al. 2019). While the costs of developing mass transit systems are rising, new opportunities in realizing the alternatives have emerged from the use of cell phones and internet apps. Besides informing about public mass transit schedules and connections they can provide critical information about car-sharing, ride-hailing, and delivery services at little or no cost to governments.

3.5.1 Conventional bus systems

While conventional bus systems are the main transit providers in most cities, there is a dearth of literature on issues related to their operation and use, apart from the literature on BRT. Typically, service is provided by private companies with exclusive rights to routes based on tendering. However, caught between the objective of keeping fares affordable to low-income users and inadequate or non-existing subsidies, the systems are deteriorating. The following types of issues and problems

are common in bus systems: 1) poor enforcement and lack of capacity to exercise legal authority, 2) incomplete networks necessitating multiple transfers, 3) lack of dedicated bus lanes, 4) delayed modernization, 5) inefficient fare collection, and 6) bus size inflexibility vis-à-vis varying needs (Parakesit and Susantono, 2013). In turn, travelers are switching to motorcycles and automobile travel.

One commentary sets forth numerous recommendations for bus reform in Asian cities, based on existing experiences (Parakesit and Susantono, 2013). Some cities are using quality licensing when tendering or franchising routes. In Jakarta, the introduction of air-conditioned buses and an increase in the fleet size triggered a steady increase in the public transport use. This was achieved by inviting private operators to provide high-end services with unregulated tariffs (Parakesit and Susantono, 2013). But in other countries, such as India, the unregulated operation of private buses, particularly with regard to the allocation of routes and schedules, has spawned excessive competition, and as a result, the financial performance of public transport and the quality of service have deteriorated (Sriraman, 2015).

3.5.2 Bus Rapid Transit (BRT)

Bus Rapid Transit (BRT) is an emerging form of mass transit; it is still only a few decades old. The term BRT is used to cover a wide range of systems which vary widely in character and the levels of service and depth of amenities that they provide. Most operate in exclusive rights of way. The aspiration is to emulate Light Rail Transit (LRT). BRT stations range from enhanced shelters to large transit centers. A list of characteristics of BRT includes: segregated busways, distinctive easy-to-board vehicles, rapid boarding and alighting; marketing identity, attractive stations and bus stops, clean, secure and comfortable stations and terminals, off-vehicle fare collection, efficient pre-board fare collection, use of ITS technologies, signage and real-time information displays, prioritization at intersections, frequent, all-day service, excellence in customer service, effective licensing and regulatory regimes, modal integration at stations and terminals, and clean fuels (Ernst, 2005).

BRT is widely acclaimed as a moderate cost solution to transport problems. It is commonly seen as an economically feasible approach in contrast to the common situation when rail construction is economically infeasible. For example, studies prepared in the early 2000s indicated that the costs of BRT systems ranged from \$1 to \$15 million USD/km, compared to a cost of \$50 to \$200/ km for rail systems (Matsumoto, 2007). A more recent analysis reports that the construction of BRT systems cost one twentieth to one fifth as much an LRT system, and are ten to a hundred times cheaper to realize than a metro system (Wirasinghe et al., 2013). The lower investments and operational costs also mean lower ticket prices, which makes BRT systems attractive to consumers (Wijaya et al, 2019). BRT is more cost-effective in intermediate size cities, where the bulk of future population growth is anticipated.

BRT was first introduced in Latin America in the 1970s. The creation of extensive BRT systems in Curitiba in 1974 and Bogota in 2000 (TransMilenio) was widely publicized and hailed around the world as an innovative and successful way of meeting the needs of lower income megacities. Starting in 2004, BRT was introduced in Asian cities including Beijing, Jakarta, and Seoul, and has now spread to 44 cities (Table 1). The mayors of Jakarta and Seoul became vigorous advocates for the introduction of BRT systems (Matsumoto, 2007). Also, international organizations have played a critical role in building support for BRT.

Apart from design and financing issues, successful development of BRT systems depends on political factors. BRT systems are an attractive alternative for elected officials. They can be built relatively fast and be incrementally expanded, as they make use of the existing road infrastructure with only minor adaptations. Moreover, the fast implementation is attractive for political leaders as it can be realized within a single term of office, with relatively low investments (Hidalgo and Gutiérrez 2013).

Table 1. BRT systems in Asia.

<i>Countries</i>	<i>Passengers per day</i>	<i>Number of cities</i>	<i>Length (km)</i>
China	4,375,250	20	672
India	497,411	9	228
Indonesia	46,467	1	251
Iran (I. R. of)	2,135,000	3	165
Japan	9,100	2	29
Malaysia	N. A	1	5
Pakistan	305,000	2	50
Republic of Korea	400,000	1	115
Thailand	15,000	1	15
Viet Nam	8,000	1	15

Source: <https://brtdata.org/location/asia>

Now BRT lines in Asia carry about 10 million passengers a day, which is still a small portion of overall travel in larger cities. But in some cities BRT does play a major role. For example, Teheran's BRT system carries 2 million passengers per day. In China, in ten cities the daily passenger load is over 200,000 riders, with daily passenger totals of over 600,000 in two cities. (To place the scale of BRT in Asia in perspective, it is noted that in Latin America the volume of BRT travel is double that of Asia; however, BRT travel in the rest of world is much lower than in Asia.)

Study and documentation of experiences with BRT is extensive, including overall comparative analysis, in-depth surveys of experiences on individual BRT lines, analyses and critiques of the design of BRT systems, surveys of users, comparative analyses, studies of the impact of BRT systems on neighboring property values, and guides on

how to develop BRT systems (see Schwanen, 2017). A guide on how to design BRT systems was prepared by Wright and Hook (2007). Data on BRT systems around the world is published on a Global BRT data website (<https://brtdata.org>). A review of the literature about BRT and its evolution in Asia, by Deng and Nelson (2010), provides valuable background.

As well as being marked with successes, the implementation of BRT has commonly been a story of inadequate design and some failures (Nguyen and Pojani 2018). Criticisms seem typical of BRT systems worldwide, and may have repercussion on current and (future) demand of the service (Wirasinghe et al., 2013; Paundra et al., 2021). Studies emphasize that the land-use development around BRT stations is of critical importance, requiring careful planning of access, coordination with other modes of transit, and consideration of a host of design issues. In order to overcome political obstacles, often BRT stations have been sited on land in highway medians that is already publicly owned, with inadequate attention to public access.

Much of the published research has been about the widely touted BRT system in Jakarta (known as TransJakarta). A book by Wijaya and Imran (2019) contains detailed case studies about introduction of BRT systems in Bandung and Surabaya, Indonesia, which each have a metropolitan area population of about 10 million. A very recent study discusses the specific traffic impacts of a BRT system in Johor Bahru, Malaysia, with detailed statistics on ridership (Hassan et al., 2021). Commentaries by Ernst (2010) and Kogdenko (2011) concluded that the introduction of BRT in Indonesia demonstrated an increased interest of the government in public transit issues and succeeded at significantly reducing travel times on most corridors.

Criticisms of BRT systems have included: substantial design flaws, failures to address the problem of being caught in congestion; mixed-traffic incursion on some sections of the BRT lanes, inadequate supply of CNG fuel for the buses, delays at key intersections, as well as overcrowding resulting from a low fare structure and under-sizing of the infrastructure. In one survey, passengers considered TransJakarta's services as poor, especially in terms of infrastructure and the conditions of the bus, and very few cited comfort or accessibility as their main reasons for using the BRT service (Sayeg 2015).

One study explains why efforts to implement an extensive BRT network failed in Bangkok. The authors conclude that, in large part, the project was curtailed by the weak and discontinued political leadership and the failure to manage competing modes, the primary of which is the automobile (Wu and Pojani, 2016). Also, there are numerous studies on the BRT systems of particular cities in India. A study by Kathuria et al. (2016) contains comparative data on several systems.

A study of the BRT system in Istanbul by Babalik- Sutcliffe and Cengiz (2015) recounts the successes and difficulties, which carries 1.2 million passengers per day and provides 24-h, fast, and frequent service. The authors explain that, in a sense, the Istanbul's Metrobus has been *too* successful and is no longer adequate to meet the demand. Now there are suggestions that the BRT capacity is inadequate, and the system should be upgraded to LRT. A study of BRT in Teheran simulates what outcomes would occur in terms time gained by BRT passengers and auto uses and pollution if designated lines were provided that enhanced the exclusivity on routes. Different features were modelled including busway length, bus headway, number of stations, actuated traffic signals, and bus preemption. The study includes numerous references to similar types of simulations (Abbasi et al., 2020).

While some BRT systems in Asia have been successful in reducing travel times or increasing the comfort of passengers, they have not significantly reduced auto travel. For example, in 2012, TransJakarta post evaluation surveys by the United Nations Environment Program (UNEP) asked passengers about their alternative mode if the BRT did not exist. The findings suggested that most of the BRT passengers had shifted from the conventional bus system and there was no significant modal shift by private car drivers and motorcycle riders (Angelina and Louen, 2017). In some cities the introduction of a BRT system has been stiffly opposed by paratransit operators and there have been political battles over whether it should be introduced (Wijaya et al., 2019). One study, concludes that greater understanding of local contextual and political issues and consideration of the impacts of BRT on low income transit providers is needed (Wijaya et al., 2019).

Some have questioned whether BRT was actually the best available concept for Asian cities, in particular megacities. One wonders what the results might have been for people's mobility had that money been spent on recognizing the existing public transport infrastructure and making it more efficient. Such situations suggest an approach that is targeted less on the hard infrastructure of a BRT and more towards a softer but smart solution that takes the assets of a city and leverages these (Wijaya and Imran 2019). Some critics note that dedicated busways reduce the already limited road capacity, especially when implemented in existing road networks. In terms of comfort, BRT systems are often overcrowded, more so than traditional rail-based transportation systems (Wirasinghe et al., 2013). Over-crowding in general leads to users' dissatisfaction, as reduces the service quality, increases discomfort, and causes delays.

These criticisms of BRT systems are a challenge for city governments. One study concludes that it is not surprising to see BRT systems recording impressive indicators in just one or two corridors; the authors question whether operating extensive BRT network in developing megacities in Asia as the principal public transport mode is technically viable and strategically desirable (Morichi and Acharya 2013).

3.5.3 Metro and Light Rail Transit (LRT)

There are at least sixty metro and subway systems in Asia, not including Japan. In China alone, between 1990 and 2020, the number of cities with a metro system grew from three to over forty. This staggering growth has been illustrated by Peter Dvorak in a mesmerizing graphic (see O'Donnell 2017). Extensive metro lines are now under construction in Hanoi, Ho Chi Minh City, and Jakarta (one line is already in operation). For full a list of rail projects throughout Asia, indicating track length and number of stops see Zhang and Feng (2018).

In some cities the ratio of daily ridership on heavy rail is substantial relative to the population. For example, in Beijing daily ridership is 9 million out of a population of 22 million; in Shanghai it is nearly 7 million out of a population of 26.5 million.

Rail transit contends with the competing facets of high costs and high benefits (in terms of travel time and speed). Apart from costs, other major barriers to the successful implementation of metro and LRT systems include insufficient institutional capacities and lack of inter-agency collaboration. One study noted a high rate of large cost overruns and overestimates of passenger travel associated with rail transit projects – in Asia and elsewhere. The authors concluded that the majority of rail transit projects have significantly underestimated their construction costs. For 58 rail projects examined, average cost escalation was as high as 45%. Partly this is because rail transit requires a long implementation time. Another reason is the prevailing political bias in favor of rail transit investments (Flyvbjerg et al., 2004). Another study concluded that passenger forecasts used in rail development were “highly, systematically and significantly misleading”, while the potential large financial risks of such projects were normally ignored or underplayed in the decision-making process (Deng and Nelson, 2010:92).

Morichi and Acharya (2013) point out that the bias against rail systems (and in favor of BRT) is misplaced because it is grounded on presumptions that fares will not cover operating costs. This is based on the experiences of European cities, while Asian systems have been self-supporting or close to a breakeven level. While rail networks should be developed before urbanization, such investments are typically delayed in the framework of rapid urbanization leading to increased costs and difficulties in land acquisition (Zhang and Feng, 2018). Some authors criticizes public failures to capture some of the increased values associated with rail development, through property or income taxes (Huynh and Gómez-Ibáñez 2017:276).

Other works note that land value capture schemes in China have recovered costs or even profited from rail projects. Zhang and Feng (2018) suggest that Transit Integrated Development (TID) is a more appropriate characterization of development along rails

in Asia (as opposed to Transit Oriented Development or TOD which is now a world renown concept). A common strategy has been to build rail and metro systems into undeveloped areas and then develop the surrounding area. Often the rail station itself incorporates offices, retail, and even housing. TID has used a variety of planning strategies in conjunction with rail development. "Differentiated" density, provides for density bonuses for an area within a specified distance from a transit station equal to a percentage of the allowable density in the area (as opposed to absolute density criteria.). Other facets of such plans include extended pedestrian infrastructure, including weather protected passages and passages through buildings, and accompanying developments of commercial centers.

Zhang and Deng (2018) describe TID projects in Hong Kong, China, and Singapore. In the case of Hong Kong, China the Mass Transit Railway Corporation (MTRC) obtained development rights from the government based on no rail valuations and in turn leased or sold these rights based on market values reflecting their transit-related values. The MTRC was able to fully finance the construction and operation of its system through these mechanisms. The goal of Singapore's current plan is to double its rail network by 2030, so that eight in ten homes would be within a ten-minute walk of a metro station. The development has been in conjunction with the development of self-sufficient towns.

In regard to setting fares, in some successful systems such as Shanghai, Tokyo, and Seoul, the fare-setting strategy has now shifted from affordability to service quality. In the early stage, affordability was important, but the evidence suggests that users are willing to accept higher fares for better service (Parikesit and Susantono, 2013).

3.6 Developing policy for modes of travel other than mass transit and autos

Historically, pedestrian travel and individualized non-motorized and motorized vehicles and small paratransit have been the dominant form of travel in Asian cities. In particular, low-income groups are dependent on these modes (UN Habitat 2014). Yet, planning for such transport has been largely ignored, and progressive damage has occurred to the continuity of the non-motorized network. This has only exacerbated transport problems in poorer Asian cities, accelerating the use of motorized transit, lengthening routes for the same trip, escalating the burdens on public transit, and increasing social exclusion (Ahmad and Puppim de Oliveira, 2016; Tiwari 2015). Often micromobility modes are seen as an impediment to auto use and bus and rail transit and have at times been repressed. In contrast, the transport literature commonly views support for non-motorized and low-cost motorized transport as critical for low-income groups and a valuable adjunct to mass transit.

3.6.1 Pedestrians

Transport planners have repeatedly noted and have been highly critical of the loss and degradation of the most basic form of travel: walking, which is free and therefore affordable for all. Apart from causing stifling pollution, the creation of space for motorized transit has often led to the disappearance or reduction of passable space for pedestrians (Roño 2013). The deterioration of pedestrian infrastructure forces to people to use other forms of transit for trips within a walkable distance (Mateo-Babiano, 2015). Another common critique has been a failure to take into account pedestrian access to mass transit. Numerous studies have been published on the specific design factors in cities that impact pedestrian travel and use of spaces on foot in urban Asia (see, for example, Bivina and Parida, 2020; Wu et al., 2020) and in the rest of the world.

3.6.2 Bicycles

Throughout Asia there has been a steep drop in bicycle use as motorized traffic has overwhelmed road space and created a dangerous environment for bicycle travel. In Chinese cities, the decline in the use of conventional bicycles has been followed by the emergence of widespread usage of e-bikes, with e-bike sales in the range of 30 million per year (Fishman and Chery, 2016). One of the few studies on transport in small cities, also found widespread use of e-bikes with minimal use of buses (Hu et al., 2021). This trend has not spread to other Asian countries. E-bike usage is feasible in China due to extensive bicycling infrastructure. Their growth has been accompanied by the spread of docked and dockless bikesharing. Notably, a majority of e-bike users are former bus or bicycle riders rather than former car drivers (Grutter and Kim, 2019).

E-bikes have lower speeds and less cargo-carrying capacity than motorcycles. Typically e-bikes in China are comparable in size to small motorcycles which are widely used in other parts of Asia. There has even been discussion about whether e-bikes should fall into the motorized or non-motorized category. In large cities, e-bikes have become a major transport mode even among car owners. In addition, a report by the Asian Development Bank (2009) contains an in-depth discussion of e-bike's production processes, technology, and influence on motorization.

The story of e-bikes in China has been recounted in detail in a book by Zuev (2018) and an article by Gu et al. (2021). In China, the pros and cons of e-bike use have been widely debated. (Lin et al, 2018) On the one hand, e-bikes are seen as "silent killers" with unpredictable trajectories that disrupt traffic flows and cause traffic accidents (Zuev 2018). This discourse is promulgated by pedestrians, users of non-motorized bicycles, and auto users. The former two groups, in particular, see e-bikes as a danger. However, available data does not support the conclusion that e-bikes are less safe than conventional bicycles (Zuev 2018). Advocates of their use maintain that they are an

affordable, efficient and environmentally friendly form of transport. They are particularly useful for access to transit stations. From an environmental perspective. Also, they provide a route for the entry of the poor into the economic life of cities (Zuev, 2018). Zuev (2018) recommends the creation of dedicated e-bike infrastructure, such as low-speed and low-conflict rights-of-way and secure parking, to feed high-capacity public transport systems.

3.6.3 Motorcycles

While motorcycles are seen as a solution by much of the population, they are also seen as a source of transport problems, including pollution and accidents. Critics point to the high levels of pollution that they cause. Another criticism is that they are usually parked and, in rush hours, even driven on the sidewalks, to the detriment of pedestrians and cyclists (see Leather et al. 2011). On the other hand, motorcycle users like this mode because is cheap and fast (see Dahlan and Fraszczyk, 2021). To deal with the issue of emissions, motorcycles with small engines are often exempt from special permit and license requirements. Moreover, transportation experts have pointed out that the problems would be much worse if travelers were using cars.

While motorcycles have dominated travel in much of urban Asia, explosive growth in auto use is anticipated as incomes levels increase. Given that a car needs at least four times as much road space as a motorcycle, a huge amount of extra road network would be needed if a significant proportion of the population switched from motorcycles to private cars. In some cities, the street networks are dominated by narrow alleys which are hard to serve with public transport. In this context, motorcycles can hardly be considered as a nuisance; in fact they may be more attractive than one may expect. Huynh and Gómez-Ibáñez (2017) suggest that in such situations It may be wise to give both buses and motorcycles priority over cars in the allocation of street space.

3.6.4 Paratransit

The term of paratransit is used to describe transportation modes that range from non-motorized rickshaws and motorbikes to midi vans. Paratransit is often defined interchangeably with informal transport. Naming varies by country. Paratransit vehicles are variably called taxis, shared taxis, minibuses, rickshaws, jeepneys, samlors, trishaws, angkots, tuktuks, and others. For a review of literature on paratransit in Asia see Phun and Yai (2016).

In most cases, these vehicles offer efficient service (sometimes door-to-door) between points that are not served or are inefficiently served by public transit. In some cities, paratransit serves a substantial portion of urban travel. For example, a JICA report indicates that 42% of individuals traveling to Manila use jeepneys (Fillone and Mateo-

Babiano, 2018). Peters and Bhusal (2020:165) observe that paratransit operators, unlike public agencies, can respond quickly to changing conditions and new demand.

While paratransit systems do cause traffic and environmental issues, they also serve as a personalized and flexible public transport mode, highly responsive to passenger demand, especially in poorer Asian countries. In the latter, the paratransit service is indispensable given the lack of adequate mass transit systems. Paratransit can navigate narrow alleys and dead-end streets or walkways, which are impenetrable by formal transport. Also, it offers a convenient transport option for vulnerable groups such as women, children, and the elderly, and it addresses the first mile/last mile access issue, which is key to the success of mass transit. Finally, paratransit provides a significant source of employment for the poor. It has been estimated that there are 10 million rickshaw drivers in India. Bangladesh has 2 million rickshaw drivers with 280,000-400,000 operating in Dhaka (Phun and Yai 2016).

However, for decades, support for paratransit use has been undercut by the political influence of the automobile and road lobbies, as well as affluent drivers who like to sustain a car-oriented lifestyle. These groups often push for curbs on paratransit use. Rickshaws have been often blamed as severely contributing to traffic congestion because they are slow moving (Phun and Yai 2016). In addition, the motorized paratransit sector is often blamed for high levels of air-polluting emissions in Asian developing cities. Paratransit vehicles tend to be ill-equipped, second-hand imports in poor condition.

Recent studies have focused more on the sustainability of paratransit, its integration of public transport, and its harmonization with the overall public transport system (Phun and Yai, 2016; Tiwari, 2015). Motorcycle taxi services are already increasing in popularity, especially with the availability of cell-phone apps to access their service. They are inexpensive and can take alternative routes following narrow streets or even pass through the narrow space between the road lanes packed with crawling four-wheelers.

The paratransit fleet is gradually electrifying – although this necessitates the construction of supporting infrastructure (e.g., charging facilities), provision of maintenance services, and financing schemes to cover the initial costs of e-vehicles. In Nepal, the government has mandated and supported the electrification of paratransit in the Kathmandu valley. In the Philippines, the Asian Development Bank (ADB) is working with the government to promote the adoption of e-trikes in cities. And recently, the operation of e-jeepneys in Manila has been considered by a group of utility vehicle operators in the Philippines (Phun and Yai, 2016); a study by Agaton et al. (2019) provides cost-benefit projections associated with alternate investment and regulatory options.

4 Conclusion: Planning for the future

In the literature on transport planning in Asia (and the rest of world) the following key points are repeatedly emphasized:

1. Public policies have failed to support paratransit, which is seen as a low-status mode. This bias is very deleterious to the welfare of low-income groups. Also, it constitutes a massive failure to realize benefits with minimal public fiscal investments.
2. Mass transit, especially rail transit, is an unsafe space for women. Sexual harassment, pickpocketing, and other crimes and misdemeanors are common. Major efforts should be made to address these problems.
3. In addition to women and the poor, transport systems should address the needs of people with disabilities and the needs to older adults. Regular audits should be conducted for this purpose.
4. Pedestrian and bicycle travel should be supported rather than being reduced by the development of space for other travel modes (in particular cars).
5. Governmental organizations involved in transportation planning, land-use development, and transit operations should be consolidated.
6. The potential for electrification of bicycles, motorcycles, and paratransit should be explored.
7. Additional research on conventional bus services and travel (in addition to research about BRT) is needed.
8. There is a virtual void in research on transport issues in moderate sized and smaller cities (e.g., one million and under) although a substantial portion of the population lives in these cities. Possibly very beneficial improvements in transport may introduced in these cities without the daunting costs and complexities associated with implementing improvements in larger cities and megacities.

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