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Travel demand management policies: A case study of Singapore and transferability potentials for Hanoi

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ABSTRACT

This research study investigates the travel demand management (TDM) strategies and solutions and associated policies through a case study of Singapore to gain knowledge and experiences, and to evaluate the potentials for policy transfer in TDM from Singapore to Hanoi, the Capital of Vietnam. The research follows a qualitative approach that critically analyzes policies from international perspectives for lesson-drawing. The ideas generated in the literature review are reinforced by the case study of Singapore that examines relevant issues to acquire insights into policy transfer initiatives in TDM. The research identifies considerable differences between Singapore and Hanoi with respect to the development objectives, social and political settings and the governance structure of the city in general, and in transport sector in particular. The results show that there are critical political, institutional, physical and social constraints on policy transfer from Singapore to Hanoi. Given the stated critical constraints, it could be premature to conduct transfer of TDM policies from Singapore to Hanoi for the time being, but the findings from the case study have significant policy implications to Hanoi, and lesson-drawing is highly valuable and attainable. An initial screening was conducted to evaluate the applicability of policies used in Singapore as a starting point to develop a comprehensive TDM framework for Hanoi. The findings of the case study in critical contextual constraints for policy transfer should be useful in developing a roadmap for the transfer of TDM policies to a growing city like Hanoi.

1. Introduction

Road traffic congestion is a critical challenge in many major cities across the world. As congestion is the result of an imbalance between “supply” and “demand”. Congestion mitigation solutions can be divided into two categories: supply-side and demand-side strategies. Supply-side strategies include investments in new transportation infrastructure, such as road network extensions to accommodate travel demand. Previous experiences (Broaddus et al., 2009; Asian Development Bank, 2017) suggest that investing in transportation infrastructure to handle the ever-increasing number of private vehicles would not sufficiently alleviate the congestion problem in the long run. As more road space is taken up by private automobiles the performance of public transportation will suffer, and non-motorized traffic will be forced out (Broaddus et al., 2009). Demand-side strategies, on the other hand, employ a variety of tools to manage travel demand in accordance with

the capacity of available facilities. In other words, travel demand management focuses on maintaining a balance between the supply (capacity) of the transport system and the demand for travel, thus it provides high potential for reducing traffic congestion, improving environmental conditions, and increasing traffic safety for sustainable urban growth. Many successful cities have alleviated traffic congestion by promoting travel demand management, which reduces demand for travel by private vehicles and encourages non-motorized transport or transit use (Suzuki et al., 2013).

Cities in developing countries often face rapid urbanization and motorization process resulting in many negative externalities (Diao, 2019; Dirgahayani and Sutanto, 2020). Given the constrained living space and limited financial resources, it is not feasible to meet the increased demand via purely investment in the transport infrastructure. Developing nations can avoid most of the urban transport problems through better policies and planning practices that use TDM to maintain

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a balanced and efficient transportation system. Investment in alternative modes of transportation and TDM initiatives is usually significantly more cost-effective than continuing public investments in growing road and parking facilities, therefore TDM should be a vital and strategic solution for cities in developing countries to alleviate traffic congestion (Schreffler et al., 2012; Federal Highway Administration, 2012). TDM for a city necessitates tremendous effort for developing TDM policies and integrating them into the goals, objectives, and strategies of the transportation sector at the metropolitan level. Such TDM systems mobilize city-wide resources to coordinate planning issues, land use management, urban design, and parking provisions, all of which have significant social and economic consequences. To create a successful TDM program, proper policies must be designed at all levels, from strategy to implementation, to coordinate efforts from multiple jurisdictions and organizations toward development objectives while allowing for flexible intervention adaptable to local conditions (Carran-Fletcher et al., 2020).

Hanoi, Vietnam's capital city, has been plagued by severe traffic congestion, pollution, and traffic safety issues in recent years (Ng and Phung, 2021). The city has made substantial efforts to address the issues, nevertheless, the majority of the implemented remedies are supply-side focused, addressing the symptom rather than the cause of the problem. The initiatives to alleviate traffic congestion are only transitory, fragmented, and limited in scope. There is a lack of a comprehensive framework that coordinates sustainable policies, strategies, and solutions to manage travel demand for dealing with urban transportation problems (Chu and Thi, 2017; Quyen et al., 2019; Toan and Dong, 2020; Vuong et al., 2021). Political will and support are present, but institutional competence and coordination are lacking. As a result, it's necessary to look into TDM policies from a global perspective in order to draw well-fitting lessons. Singapore is known around the world for its innovative transportation policies and successful policy interventions that have resulted in a more sustainable transportation system. Singapore is a standout example of a city that is proactive in managing travel demand, attracting special attention from policymakers and experts. Singapore's government has been actively adopting new policies and adjusting existing ones to shape individual travel behavior and manage mobility demands (Diao, 2019). Thus, understanding Singapore's experiences as best practice in TDM has significant policy implications for Hanoi.

There is no common set of TDM policies that could be applied to every city, given significant underlying differences in political, economic, physical, and social contexts amongst cities. The purpose of this research study is to investigate TDM strategies and solutions as well as policies that have been effectively implemented in Singapore in order to gain in-depth knowledge and experience in TDM, as well as to assess the transferability potentials for Hanoi, Vietnam's capital. The case study's findings are likely to serve as a helpful resource for decision-makers, planners, and practitioners interested in transferring the Singapore's experiences. The study uses a qualitative technique to find the underlying phenomenon by critically reviewing key materials on policies from international perspectives. The case study of Singapore, which explores a set of specific issues under the impetus of acquiring insights into policy transfer activities in TDM, reinforces the views established in the literature review.

This remaining paper is structured as follows: Section 2 briefly overviews previous studies on TDM strategies and solutions, and the policies on TDM, and pertinent issues in policy transfer. Section 3 analyses Singapore approach in land transport and TDM policies. Section 4 analyzes the significance of Singapore's experience and develops a comprehensive TDM framework for Hanoi. Finally, Section 5 summarizes the results from this research.

2. Literature review

2.1. TDM definitions

Factors that affect travel demands include demographics, economic activity, the quality and availability of transport options, land use patterns, cost of travel, and demand management strategies (Litman, 2013). Travel demand management (TDM) is defined as strategies to maximize system efficiency of urban transport by discouraging the use of private transport and promoting more effective, healthy and environmentally friendly modes of transport, including public transport and non-motorized transport (NMT) (Broaddus et al., 2009; Toan, 2018; Carran-Fletcher et al., 2020). TDM regulates travel demand by influencing people's travel behavior and providing options to reduce the need for travel, or reduce the number of vehicles. TDM has the potential to deliver an array of benefits across a range of economic, environmental and social objectives such as reducing congestion, saving travel costs, reducing accidents and pollution (Federal Highway Administration, 2012). TDM is essential in development of a long-term congestion-avoidance strategy that focuses on the root of the congestion problem to handle travel demands in a sustainable manner.

The topic of TDM has been widely investigated by many researchers in different contexts (Diao, 2019). The term "TDM" has its origins in the United States in the 1970 s and 1980 s. Today, TDM is a popular concept which has been widely adopted across the world (Marshall and Banister, 2000; Federal Highway Administration, 2004; Santos et al., 2010; Metz, 2018) with varied degrees of effectiveness. In Singapore, the idea of TDM has been around since the mid-1960 s (Fan et al., 1992) while it was recognized early in the early 1970 s that policies were required to curb the growth of automobiles and to limit their use, particularly in the city core. The congestion pricing (Menon et al., 1993; Olszewski et al., 1996) was first pilot-tested in Singapore (1975), then trialed in Hong Kong (1983), and implemented in London (2003) and Stockholm (2006) later on (Galante and Spina, 2014).

There is a broad array of TDM strategies that work out policies to achieve TDM objectives. Broaddus et al. (2009) and Galante and Spina (2014) classified TDM strategies into two main groups: incentives (pull options) that improve travel options like public transport and NMT, and disincentives (push options) that make driving less attractive through economic measures such as high taxes and fees, congestion pricing, and parking management. Carran-Fletcher et al., (2020) classified the TDM strategies into four categories: improved transportation options, financial incentives, land use planning, and outreach and implementation programs. TDM strategies use various tools (instruments) to derive TDM measures (solutions). There is a broad range of TDM measures, which can be categorized into: (i) measures that improve mobility options (public transport, active transport modes, ride sharing); (ii) economic measures (congestion pricing, tax increases, parking management); and (iii) smart growth and land-use policies (transit-oriented development, urban compact, integrated transportation planning) (Broaddus et al., 2009). It is worth noting that many of these metrics can be further divided into subcategories depending on their intended use.

Although "pull" and "push" are two distinct strategies, they are usually used together in practice. The measures typically reinforce each other, thus, in order to produce good overall impacts, it is necessary to develop a comprehensive TDM strategy that deploys a set of appropriate measures, including "pull" and "push" leverages (Broaddus et al., 2009; Asian Development Bank, 2017) introduced a comprehensive strategy model of TDM that deployed a three-legged approach: improvement of mobility options, implementation of economic incentives, and enforcement of smart growth – land use policy (Fig. 1).

2.2. Review of previous research on policies on TDM

Policies are governing tools or interventions used by governments to promote specific policies in order to attain a predetermined set of

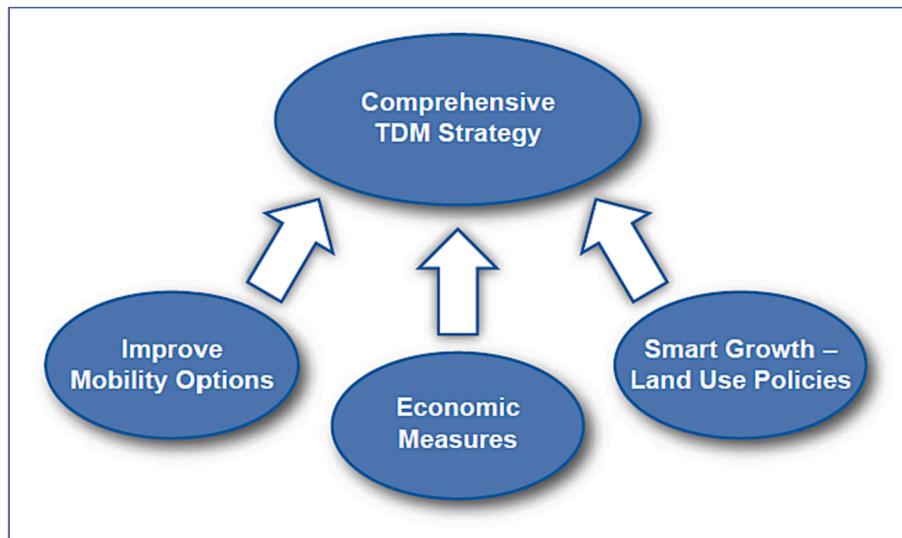


Fig. 1. Three-legged approach for successful TDM ().
Source: Broaddus et al., 2009

objectives. A policy instrument serves as a bridge between policy formulation and policy implementation (UN-HABITAT, 1995; Ali, 2013). Having clear and realistic objectives is the key to policy success, since policies without clear objectives may lose their way in the long run. Other prerequisites to success of demand management policies include political will and support, strong leadership to coordinate efforts from various jurisdictions and organizations, integrated transport strategies, institutional capacity, and public acceptance (Carran-Fletcher et al., 2020). As a result, for a large TDM program that involves packages of policies of several levels, clear objectives with appropriate strategies and intervention from an integrated set of policies are critical.

UN-HABITAT (1995) classified the policy mechanisms for TDM into economic, regulatory and physical categories. Economic instruments are essentially market-based interventions that influence the travel behavior using price incentives or disincentives such as fiscal measures (import taxes, fees, etc. on vehicle ownership, fuel taxes, congestion pricing), or the choice of transport mode (parking fees, parking management). Regulatory measures influence the operations of the transport sector using laws and regulations such as area license schemes, parking controls, and public transport promotions. Physical measures include measures that promote development of physical infrastructures for public transport, walking and cycling (Santos et al., 2010) or measures that induce conscious reduction of road capacity in order to reduce traffic volume such as reduced carriageway widths, traffic calming, road humps. Other measures include staggering of work hours, ride – sharing/carpooling, intelligent vehicle systems and enhanced telecommunication systems. In essence, these measures are traffic management tools to control vehicles when they are already on the roads.

Table 1 listed a number of selected studies on TDM policies. In general, the previous literatures show that demand management policies can play a vital role in making urban transport to be more efficient.

The following lessons can be drawn from reviewing previous works on TDM policies:

- a) No single measure can be effective if used in isolation. Combination of the measures can provide the synergetic effect (Santos et al., 2010; Habibian and Kermanshah, 2013; Carran-Fletcher et al., 2020).
- b) The most effective demand-side techniques are financial incentives and disincentives. Financial disincentives, on the other hand, should be used in tandem with financial incentives to promote strict enforcement (Federal Highway Administration, 2004).

Table 1
Selected research on TDM policies.

Study	City/Country	TDM policies
Giuliano, 1992	USA	High occupancy vehicle lane; employer-based ride sharing market; alternative work hours; parking policy.
Menon et al., 1993; Olszewski et al., 1996	Singapore	Singapore road pricing system.
Seik, 1998	Singapore	Vehicle quota system
Finke and Schreffler, 2004	Various countries in Europe	Mobility strategies for the next decades (MOST) to aid the implementing “mobility management” projects
Dorsey, 2005	USA	Park and Ride
Taniguchi et al., 2007	Japan	Travel feedback programs
Kasipillai and Chan, 2008	Malaysia	Road tax, congestion charge, car taxation, national road pricing
Xing et al., 2010	USA	Toll discount during off-peak hours
Shaheen et al., 2010	Various countries in Europe, USA, and Asia	Bike sharing to attract people to use bikes
Currie et al., 2014	UK	Public transport service enhancements, official monitoring data
Vanoutrive, 2019	Belgium	Share of the workforce with flexible working hours
Seik, 2000	Singapore	Electronic road pricing
Bao et al., 2020	Beijing, China	Car ownership restriction, car use restriction, priority development of public transportation, bus and subway fees reduction
Dirgahayani and Sutanto, 2020	Bandung, Indonesia	Development of public transportation

- c) Demand management policies should be part of a broader package of transportation policies that includes capital investment and institutional strengthening (Federal Highway Administration, 2004; Schreffler et al., 2012; Asian Development Bank, 2017).
- d) Only those instruments that are likely to be effective in attaining predefined objectives should be examined. The selected instruments should be politically acceptable and implementable at a reasonable cost (UN-HABITAT, 1995).

It is noted that selection of relevant TDM policies for implementation

should be a subject of the country's initial socio-economic conditions and the development context (UN-Habitat, 1995), including but not limited to economic growth, GDP/head, population density, land scarcity, availability of public transport, transport issues (traffic congestion, traffic safety, pollution), the existing enforced policies (economic instruments, regulatory measures, physical restraints), and in particular the government motivation in TDM. Since the social, economic, political and physical conditions vary from city to city, there may be no ready-made universal set of policies that can be applied to travel demand management, cities should select policy instruments that are most potentially effective, especially those are in alleviating traffic congestion. Cities in developing countries often face rapid growth of urbanization and motorization, and suffers severe traffic congestion, safety, pollution, and social exclusion (Santos et al., 2010), thus TDM has been considered particularly appropriate in developing countries to overcome their urban transport problems (Broaddus et al., 2009). Since the problems are mostly critical, no single economic, regulatory or physical measures can do the job, an integrated approach is required, and a coherent policy may include a combination of measures (Cracknell, 2000). A gradualist, rather than radical, approach to progressively introduce restraints, while at the same time improving public transport services, is likely to be more successful.

2.3. Issues on policy transfer in TDM

Many cities lack the necessary competence to address complicated urban transportation problems, and they tend to seek for information and experiences from other cities (Marsden and Stead, 2011). Policy transfer refer to "a process in which knowledge about policies and institutional arrangements in one time or place is used in the development of policies, administrative arrangements and institutions in another time or place" (Dolowitz and Marsh, 1996). Policy transfer aims to make sense of the cross-cultural transfer of policy expertise in a specific sector from different countries (Evans, 2009a). In the field of transportation, policy transfer from city to city has been quite active (Marsden et al., 2011). Policy transfer has become more common in recent years, thanks to technology advancements that enable communication between policymakers simpler. Policy transfer in the transportation sector can be highly politicized as part of a process for introducing new ideas that aims to explain favored solutions. The most widely utilized framework for analyzing the policy transfer process comes from Dolowitz and Marsh (2000) and Ison et al. (2011). The framework is organized around a set of critical questions:

Why transfer? Policy transfer is often motivated by discontent with existing policies, which occurs when there is evidence that continuing with the current policies would result in a policy failure. Marsden et al., 2011 identified six motivations for policy transfer, the most important of which were strategic need (policy failure) and curiosity.

Who is involved? Dolowitz and Marsh (1996) identified a number of actors who may be involved in the policy transfer process, among which the politicians and officials are the primary protagonists in inciting the search for new ideas, while policy specialists legitimize the search for new policies, and academics study for appropriate strategies and solutions.

What is transferred? Dolowitz and Marsh (2000) identified eight categories in cross-national policy transfer: policy goals, policy content, policy instruments, policy programs, institutions, ideologies, ideas and attitudes and negative lessons. Cognitive elements (ideologies, ideas and attitudes) are much easier to transfer (Canitez, 2020), whereas policy instruments and programs are significantly more difficult, especially where there exist vastly different social and economic conditions, institutional and political arrangements between the "borrower" and the "lender". As a result, policies are only partially transferred in most cases.

From where are lessons drawn? Policy transfer can take place at the local, national, or international level. When it comes to cross-national transfer, it's reasonable to look into how other countries have dealt

with similar situations in order to draw lessons (Marsden and Stead, 2011). A multitude of factors, including language, culture, political and institutional environments, as well as geographical and economic structures, may hinder the propensity for cross-national transfer.

Degrees of transfer? Transfer can be either copying, emulation, mixtures, or inspiration. Copying entails a complete transfer of all policy elements; emulation entails a transfer of the policy's ideas; mixtures entail a mix of several policy elements from different countries; and inspiration entails a policy change that is inspired but the final results do not actually reflect the original idea (Dolowitz and Marsh, 2000; Marsden and Stead, 2011).

Constraints on transfer? Common (1999) identified a number of prerequisites that have a significant impact on policy transferability potential: (i) perceived advantage of the innovation over the superseded idea; (ii) compatibility, which refers to the degree to which an innovation is integrated with existing policy values; and (iii) complexity, which refers to the perceived level of difficulty of the innovation. Marsden and Stead (2011) identified institutional structure and processes a critical constraint. Transnational differences, both formal (laws, regulations) and informal (custom, language), can function as significant hurdles to policy implementation.

Strategies on transfer? Marsden and Stead (2011) have suggested transport is similar to other areas in terms of the main aspects and influences on policy transfer. DussaugeLaguna (2019) suggested two main sets of strategies to support policy transfer, which are policy building and policy institutionalization. The first one has been well used by policy actors, aiming at setting the proper technical basis of the policy transfer process, such as conceptualization strategy, professionalization strategy, fine-tuning strategy and persuasion strategy. The second set of strategies can be grouped into four, which are codification strategy, political deactivation strategy, marketing strategy and international legitimization strategy.

Stages of policy transfer? Evans (2009b) classified the policy transfer process into three broad stages, including pre-decision policy-oriented learning, decision processes and post decision policy-oriented learning. The 1st stage consists of identification of the public policy problems, which searches for ideas and contact with potential agents of transfer. The 2nd stage (policy formulation) involves reception and emergence of a policy transfer network, cognitive mobilization and evaluation of options, and the 3rd stage involves implementation, monitoring and evaluation, and the ongoing processes of policy learning. Nevertheless, the policy transfer process may be complicated depending on critical factors such as what policies to be transferred, degree of transfer, and what are the constraints (Dolowitz and Marsh, 2000).

Motivation of the research: The literature review shows that case studies are the most common method for studying policy transfer. A case study focuses on a detailed analysis of unique conditions and occurrences in order to acquire insight into the topics being examined. Many case studies on transport policy transfer have been conducted, however the most of them are decades old and were conducted in high-income countries (Ison et al., 2011; Marsden and Stead, 2011). The question of whether techniques and policies that have been successful in a rich country can be replicated in a developing one is crucial.

Singapore has gained international recognition for its successful implementation of a comprehensive set of land transport policies to balance growth in transportation demand and achieve high transport efficiency (Lam and Toan, 2006). The transport condition and development context in Singapore varies greatly from that in Hanoi, and these contextual variations may present considerable barriers to policy transfer. However, there are some common characteristics of urban transportation problems in terms of the elements that create them and how these characteristics affect urban life (Attard and Enoch, 2011). As a densely populated country with a history of similar urban transportation issues, Singapore's effectiveness in managing travel demand may give useful lessons for Hanoi. Despite the fact that Singapore has pioneered numerous innovative transportation programs, a

comprehensive examination of Singapore's approach to travel demand management is still lacking (Diao, 2019). In Vietnam, there have been only limited number of research (Hiep et al., 2012; Loi et al., 2014; Japan International Cooperation Agency, 2020) that specifically addressed TDM issue, however, none of them address the issue of policy transfer in the transport sector.

This research study investigates the policies on TDM through the case study of Singapore and potentials for policy transferability from Singapore to Hanoi. The case study serves to find elements that center around crucial issues on transferability potentials, gain insight into lesson-drawing, and design a comprehensive TDM for Hanoi as based on the critical review and analyses of TDM strategies and solutions in Singapore.

3. Policies on travel demand management in Singapore

3.1. Singapore in brief

Singapore has a land area of 719 sq.km, a total population of 5,685,800 people (2020), a population density of 7,910 sq.km, and a per capita GDP of 82,503 S\$ (2020). Singapore has 565,033 cars, 15,678 taxis, 141,403 motorcycles and scooters, and 19,251 buses in its vehicle population (2020). The average daily public transportation ridership is 5,556,000 trips in 2020, with bus, mass rail transit (MRT), light rail transit (LRT), and taxi accounting for 2,878,000, 2,023,000, 139,000, and 516,000 trips per day, respectively (Department of Statistics Singapore, 2021). Private vehicles have a low mode share in Singapore. For example, in 2016, vehicles accounted for 27 % of all journeys, whereas buses accounted for 22 %, MRT and LRT accounted for 18 %, and active mobility modes accounted for 17 % (Carran-Fletcher et al., 2020).

Since its founding, long-term sustainability has been a guiding principle in Singapore's development policies. In general, transport policies in Singapore are characterized by three features, including smartness, inclusiveness, and greenness (Diao, 2019). For example, the "2030 Agenda for Sustainable Development" (Ministry of Foreign Affairs, 2018) contains 17 sustainable development goals, including Goal 11 "Sustainable city and communities," which comprises following four sustainable transportation objectives: (i) integrated land use planning; (ii) transit-oriented development and planning; (iii) promoting public transport; (iv) walking and cycling plan; (v) inclusive transport; and (vi) green transport. As a city-state with limited land, high urban density, and changing demographics, Singapore's development strategy focuses on sound and dynamic urban governance, combined with integrated long-term planning to ensure sufficient land for sustainable growth. Because transportation affects so many aspects of economic and social life, transport policies must be formulated in cognizance of the overall development goals.

3.2. Singapore's land transport policies

Singapore became an independent republic in 1965. At that time, the city state was lack of planning and overcrowded. Assisted by the UN, Singapore designed the first concept plan, which provides the foundation to guide country's physical development for the next 20 years. Though the concept has been subsequently revised, the core framework and principles remain unchanged. In a holistic governance management structure, the transport agencies in Singapore work closely with relevant entities in land use (Ministry of National Development, Urban Redevelopment Authority, Housing and Development Board) and the environment (Ministry of Environment and Water Resources, National Environment Agency) (Loh, 2007). The Land Transport Authority (LTA), a statutory board under the Ministry of Transport that spearheads the development of land transport, in particular all urban land transport modes' planning, designing, building, and maintaining in Singapore. LTA published a "White Paper" in 1996 that outlined the transportation

goal for a world-class transportation system (Lew and Choi, 2015). Four primary policies were included in the White Paper, which presented an integrated and holistic approach:

- (1). Integrating land use, town and transport planning to reduce the people need for travel.
- (2). Developing a comprehensive road network and applying technology to maximize its use.
- (3). Managing demand of road usage through ownership and usage measures.
- (4). Improving public transport to attract more commuters to use public transport.

This approach is also known as a multipronged-integrated approach (Chin and Foong, 2005; Lam and Toan, 2006) that attempts to establish a comprehensive transport development strategy that responds to traffic congestion in both directions: increasing "supply" and decreasing "demand", with greater emphasis on managing travel demand. Policy (2) is concerned with the supply side, whereas policies (1) and (3) are concerned with the demand side, and policy (4) is concerned with both supply and demand. The approach indicates full integration of policies: (i) land use planning and transportation policies are aligned with economic, social, and environmental development objectives; (ii) integration of multiple modes of transportation; and (iii) collaboration among all key institutions and policymakers (Santos et al., 2010; Habibian and Kermanshah, 2011). This policy integration indicates that Singapore's TDM experiences can be examined holistically. The demand-side policies (1), (3), and (4) in TDM are discussed in detail in the next section.

3.3. Detailed analysis on land transport policies

3.3.1. Integrating land use, town and transport planning to reduce the people need for travel

Singapore is regarded as a leading example of successful integration of land use and transport planning for long-term transport development (Diao, 2019). The long-term land use and transport Plan (Concept Plan) in Singapore directs the country's overall physical development over a 40–50-year planning horizon. To accommodate anticipated population and economic growth, the Plan was developed in consultation with land use authorities and the LTA. The plan is detailed in the Master Plan, which includes early physical planning for developments as well as transportation network solutions for the next 10–15 years (Toan and Dong, 2020). As stated in Section 3.1, the "2030 Agenda for Sustainable Development" highlights the importance of the transit-oriented development (TOD) concept that includes a set of viable options for creating sustainable urban futures. TOD can be viewed as a "hardware" solution - a physical design that promotes transit ridership and non-motorized incentives, whereas TDM measures are considered as "software" solutions such as congestion pricing and parking controls to discourage automobile usage. Combining transit incentives with automobile disincentives can yield synergistic outcomes, including higher ridership gains (Suzuki et al., 2013, Toan, 2021). In particular, TOD concept promotes the integration between land use, town and transport planning to reduce the people need for travel and increase public transportation ridership at the municipal level (Diao, 2019). To promote TOD concept, the Singapore's Urban Design Guidelines include physical integration between transportation nodes and surrounding developments at the local level. In the downtown areas, transit stations have mostly been transformed into integrated transport hubs where diverse transit systems (MRT, LRT, and buses) connect, allowing for seamless transfers across modes of transportation.

To obtain a synergetic effect, the stated TDM measures are substantially subordinated by supply-side improvement measures. Although the whole island has a well-integrated and comprehensive network of streets and highways, new roads are still constructed to provide better connectivity to newly established areas. Nowadays, the

Singapore's road network connects all corners of the island with more than 9,500 lane-km of roads and expressways. The extensive road-rail-bus network currently serves over 7 million commuters each day. This comprehensive land transport network continues to grow and improve to make commuting more efficient and enjoyable (Land Transport Authority, 2022a).

3.3.2. Managing demand of road usage through ownership and usage measures

Between 1962 and 1973, the average annual growth rate of motorized vehicles in Singapore was 8.8 % (Chew, 2016). Because more road space could not be added due to land constraints, it was anticipated that congestion in the city center would reach an unacceptable level if the vehicle growth rate stayed constant. The State and City Planning (SCP) department advocated for policies to limit car ownership and use. Since the 1970s Singapore has gradually introduced a range of car ownership and usage restraint policies (Poon, 2016). Import duties (ID), additional registration fees (ARF), and road taxes are the most common budgetary restraints on vehicle ownership. These fiscal policies were successful in curbing the growth in automobile ownership while also obtaining significant resources to spend in transportation infrastructure. Despite the fact that automobile ownership has become prohibitively expensive, Singapore saw a substantial increase in car population from 1977 to 1990, prompting the Vehicle Quota System (Table 2) to be implemented as a restraint tool (Carran-Fletcher et al., 2020).

The Vehicle Quota System (VQS), began in May 1990, was a powerful method to curb vehicle growth. To maintain a maximum annual growth rate of automobiles of 3 %, the government mandated the introduction of an annual limit for new car purchases (Toan 2018; Carran-Fletcher et al., 2020). Anyone interested in purchasing a motorized vehicle must first place a bid for a Certificate of Entitlement (COE), with a percentage allotted to each vehicle category. The COE pricing were established through a market system involving supply and demand (Lam and Toan, 2006). The COE is valid for ten years from the date of registration. If the vehicle owner wants to extend the COE after the due date, he must pay the revised bid price. The VQS, in combination with tax and charge, has raised the price to the point where only those with the greatest desire to pay can purchase a car. The VQS is a policy tool that allows the government to exert complete control over the expansion of the vehicle population in order to keep it in line with the capacity of the road network. The yearly vehicle growth rate declined significantly from 12 % between 1975 and 1990 to 3 % between 1990 and 2005, 0.5–1.5 % between 2005 and 2015, and barely 0.25 % between 2015 and 2018

Table 2

Major transport policies in Singapore (Source: Chew, 2016; Ministry of Foreign Affairs, 2018; Land Transport Authority, 2021).

Time	Policy
1950s	90 % of the Singaporean people depended on public transport. Plagued transport system with frequent bus strikes and serious traffic congestion.
1967	State and City Planning (SCP): Introduction of policies to limit car ownership and use.
1971	1971 Concept Plan formulation. Construction of the Mass Rapid Transit (MRT) system.
1972	Introduction of tax measures to control car population growth.
1975	Introduction of Area Licensing Scheme (ALS).
1982	Decision to construct the MRT system after 10-year debate.
1990	Implementation of Vehicle Quota System (VQS) to control the growth of vehicles.
1998	Electronic Road Pricing (ERP) that replaced the ALS
2008	Public Transport@SG portal launched to provide comprehensive public transport information for commuters.
2012	Introduction of National Cycling Plan (NCP).
2014	Announcement of Car-lite Vision.
2016	Reconfigure the North-South Corridor to include dedicated bus lanes and cycling and walking paths.
2018	Singapore's approach to the 2030 Agenda: Sustainable development goals, including sustainable transport.

(Carran-Fletcher et al., 2020).

Congestion pricing creates a disincentive by levying costs on cars that cause congestion at specific locations and times, encouraging travelers to change their travel time, route, and mode to avoid congestion. Congestion pricing is the most effective tool for internalizing the costs of externalities imposed on society by cars. In Singapore, congestion pricing was first implemented through the Area License Scheme (cordon pricing), which was later superseded by Electronic Road Pricing.

Singapore's Area License Scheme (ALS) is one of the most successful of its kind in the world. The Scheme was adopted in June 1975 with the objective of discouraging automobiles from accessing the crowded core area during the morning rush hour in order to relieve traffic congestion and promote accessibility and mobility in the Central Business Districts (CBDs). The Scheme required the purchase of a license to enter the 710-hectare Restricted Zone (RZ) in the city center between the hours of 7.30 and 9.30 a.m., Monday through Saturday (Toan, 2018). The scheme was controlled by a parking policy that supplied 20,000 parking places within the RZ, with prices increasing as the amount of time spent parked rose. The ALS was a huge success in terms of reducing traffic congestion. During peak hours, traffic flow reduced by 40 %, the number of cars in the CBDs decreased by 70 %, and the average speed inside the RZ climbed from 26 to 35 km/h, compared to 15–20 km/h before the Scheme. The Scheme was easy to operate and comprehend, on the other hand, had minor side effects: (i) traffic flow rose before and after the restricted hours; and (ii) new "escape corridors" created around the CBDs as commuters avoided the CBDs and sought alternative routes on the ring roads (Lam and Toan, 2006). It is labor-intensive, and the task of enforcing is tedious for those involved (Fan et al., 1992).

Electronic Road Pricing (ERP) ERP was first used in September 1998 to replace the ALS, and later it was expanded to bottlenecks on expressways and important routes with significant traffic congestion. ERP, unlike the manual ALS, is technologically sound, allowing for temporal and spatially variable charges to reflect the true cost of cars. The system was adaptable since costs varied by location, vehicle type, and time of day to manage traffic conditions and congestion throughout the day: charges were raised during peak periods and against large cars that take up more space. The initiative has been very successful since motorists receive a direct pricing signal about the trip's externalities. Although there were some negative commercial effects at first, these were mitigated by improved public transportation options to the city center (Poon, 2016). Ever since the ERP was implemented in 1998, the government has streamlined the car tax system in order to achieve a healthy balance between ownership and usage restraint measures (Lew and Choi, 2015).

3.3.3. Improvement of public transport, walking and cycling

Public transport is the backbone of Singapore's land transport system. The primary goal in land transport policies is to offer the public with a diverse selection of qualified public transportation options to meet travel demand. The government is responsible for capital investments in new infrastructure, equipment, and rolling stock, but the operating firms are responsible for all running expenditures (Lam and Toan, 2006). Physically and institutionally, the different public transportation modes (MRT, LRT, buses) are fully integrated into a multi-modal transit system. The 2030 Agenda for Sustainable Development targets for public transportation to account for 75 % of peak-hour journeys by 2030, and 85 % by 2050. To achieve this, Singapore's rail network will be expanded to 360 km by 2030, allowing eight out of ten households to be within ten minutes of a railway station and 85 % transit journeys of less than 20 km to be completed in 60 min (Ministry of Foreign Affairs, 2018).

Despite significant efforts to develop integrated public transport and the implementation of robust policies to deal with rising travel demand, urban mobility issues remain a concern. For example, despite stringent automobile-restrictive policies, Singapore's car usage remains high for a variety of reasons: (i) due to high ownership costs, automobile owners

tend to maximize their car utilization by driving as much as possible; (ii) traffic congestion in Singapore has been largely avoided as a result of proactive initiatives such as the VQS and ERP, making driving a convenient mode of transportation; and (iii) having plenty of parking places in the city center encourage people to drive. These factors pose challenges to change the mindsets and drivers' behavior in order to execute initiatives that favor public transportation, cycling, and walking (Chew, 2016).

Walking and cycling, unlike motorized transportation, can be an excellent option for short-distance travels. Walking and cycling are desirable modes for first-and-last miles (FLM) for long-distance travel from the perspective of transportation planning. As a result of the integration of public transportation with walking and cycling facilities, more people will use public transportation. Significant improvements have been undertaken to meet the increased demand, including dedicated cycling paths and bicycle parking facilities (Land Transport Authority, 2021). "Walk Cycle Ride SG" is a vision that encourages people to walk, cycle, and take public transportation. To accomplish this objective, developers must guarantee that their designs fit the demands of pedestrians and cyclists, as well as providing covered walkways to transit stations and neighborhood amenities, according to a Walking and Cycling Plan (WCP). The National Cycling Plan (NCP) was created in 2010 with the goal of making cycling an integral part of Singapore's transportation system by creating integrated cycling path networks to make commuting cycling easier (Diao, 2019). The amended NCP (2013) (Land Transport Authority, 2013) sets lofty goals, such as providing an integrated intra-town networks with NParks' Park Connector Networks (PCNs) to give cyclists a comprehensive island-wide cycling path network that will reach over 700 km in length after 15 years.

3.3.4. Conclusions

The preceding section examines the primary transport policies that Singapore has used to manage travel demand so far. Singapore has established itself as one of a small number of proactive cities in managing travel demand, and is a case study of particular interest to policy transfer scholars. The following insights can be extracted from the case study of Singapore while analyzing policy tools in TDM:

Comprehensive strategies. Singapore's experience demonstrates the importance of developing a comprehensive TDM strategy in order to maximize TDM effectiveness. The strategy takes a multifaceted, holistic approach that employs a three-legged TDM model (Fig. 1) that includes available transportation options, economic incentives, and smart growth - land use policies. The strategy used both supply-side and demand-side options, push and pull incentives, ownership and usage restraints. The strategy takes into account a diverse range of policies, including planning, regulatory, economic, and technological measures. An array of measures is used to develop the strategy and instruments, which are then integrated to gain synergistic effects.

Integrated approach. Integration is the key to success in Singapore. Integration can be seen in a variety of ways, including between distinct government objectives, land use and transportation policies, different modes of transport, and between institutions in the implementation of TDM measures. All of the measures are part of a larger strategy and are closely coordinated to achieve synergistic effects. Integration of policies is required to overcome potential implementation challenges, which are mainly related to financial, public acceptance, and social equity (Santos et al., 2010).

Availability of alternative options. The lessons learned in Singapore suggest that a complete TDM strategy must include a number of enjoyable travel options so that travelers can choose the most efficient mode for their journey. For example, if only good public transportation is available, there will be little modal shift if driving remains a handy choice. Drivers, on the other hand, would not adopt public transport if solely push methods were used without a viable alternative mode of transportation. As a result, for synergic benefits, the pull and push measures must be used in tandem. Singapore's experience shows that,

while vehicle restraint policies are rarely popular and usually criticized, they can be acceptable if they are part of a greater transport package and people who are affected are given with appropriate alternative modes of transportation (Fan et al., 1992).

MRT-oriented new town development. Singapore follows the MRT-oriented new town development guideline in its city plan. It ensures that public transportation is the main transportation mode (Meng et al., 2016). All new towns are well connected by MRT network, while other public transport services provide smooth connections from door to MRT stations. To achieve the vision of people-center transportation development, the government is planning and implementing numbers transportation project. The target by 2030 is to make sure that 8 in 10 households can get the nearest train station within 10 min by walking (Land Transport Authority, 2022b). These actions have achieved significant results in TDM, wherein public transport mode share in Singapore remains high at 57.7 % in 2020 (Statistics Singapore, 2021).

Acceptable economic measures. Economic incentives and disincentives (taxes, fees, congestion pricing) have been widely used in Singapore as economic levers. One of the most effective components of a comprehensive TDM strategy is economic measures. However, economic measures frequently face pushback from legislators and opposition from drivers, necessitating the removal of some obstacles in order to obtain public acceptance and compliance. In Singapore, the goal of road pricing is made clear to the public, and the funds collected would be used to improve the system (UN-Habitat, 1995), while the car tax structure is streamlined to earn public confidence that the ERP was introduced solely to reduce congestion.

Strong governance structure. As a city state, Singapore's government is administered by an authoritarian single-level governance structure. This structure has made TDM policy implementation aggressive, but also inventive, cohesive, and feasible (Carran-Fletcher et al., 2020). This single-tier governance structure reduces the majority of the complexity that would arise from many tiers of authorities, as well as potential misalignments between central and local interactions, and allows for better coordination among linked organizations.

Social acceptability. McKinsey has recently carried out a comprehensive assessment (McKinsey Report, 2020) of the public perception on transport systems of 24 cities world-wide and reported that Singapore's residents were the most satisfied on many of the analyzed aspects, as compared to global residents: there were more than 80 % being satisfied with the overall situation in public transport and 71 % in private transport. Singapore's residents greatly appreciate their transport system and how it has evolved over the recent years, as compared to residents globally (Singapore Business Review, 2018).

Apart from technical aspects, public acceptance is an important feature that contributes to the success of the Singapore's land transport policies and schemes: Singapore's citizens are generally literate, well-informed and law-abiding citizens (Seik, 1997). They play an important role in contributing fresh perspectives toward the planning process, and in initiating and implementing schemes. There have been many dialogues between the Government and its citizens, and adjustments have been made to suit people's needs and prevailing circumstances. Such perspectives in the policies are essential in getting social acceptability. The Singapore Government observes that the right to travel is a basic human right, thus the land transport policies always provide various reasonable and affordable options to travelers. In particular, Singapore's TDM experience shows that even though traffic restraint policies are usually subject to criticism, they can work and be acceptable if they are marketed as part of an overall transportation package (Fan et al., 1992).

Singapore indicates that traffic congestion may be avoided and that no single action can assist to alleviate the situation. Apart from governmental will and backing, public acceptability, and institutional competency, Singapore's comprehensive and integrated TDM framework has made it one of the most successful TDM success stories, from which cities around the world can learn. However, it's unlikely that

Singapore’s remedies will be easily transferable as a whole to other locations.

4. Implications of Singapore’s policies to Hanoi

4.1. Hanoi transport situations

Hanoi has a population of 7.3 million people (2018) and a density of 2,239 inhabitants per sqkm (Ng and Phung, 2021). Only 9.38 % of urban land is used for transport purposes (2020). Travel demand has been rapidly expanding as a result of increased urbanization and motorization, with an average annual growth rate of 10.2 % in recent years. Motorcycles account for 64.4 % of trips, whereas buses account for 12.2 %, bicycles account for 18.5 %, railways account for 2.1 %, and automobiles account for 2.2 % (Japan International Cooperation Agency, 2020). Most urban public transport is road based with bus and taxi being the main modes of public transport. The city railway system was established only a few years ago. Cycling accounts for a significant portion of trips (18.5 %), however it is primarily used by secondary school students. Despite being a main mode of public transportation, bus operation is significantly hampered by severe and widespread network congestion. Some first bus rapid transit (BRT) lines have been operational recently, but due to a lack of modal integration and inadequate accessibility, the operation is inefficient (Toan and Dong, 2020; Hoang-Tung et al., 2021). In recent years, public transportation ridership (1.6 million daily bus users in 2018) appears to have declined, while motorcycles continue to be the most popular mode of transportation for commuting and getting around, as they do in many other developing countries (Farda and Balijepalli, 2018; Ng and Phung, 2021).

Traffic congestion in cities is becoming increasingly severe due to the rapid development of private vehicles, limited public transportation, and poor demand management. Although the public transportation infrastructure development has been prioritized, the travel demand growth rate has always been higher than that of transport infrastructure. The public transport mode share has dropped to 10 % in 2015, continued the decreasing trend until 2018 (Ngoc et al., 2022). The dominant use of motorbikes results in massive congestion issues and delays to buses. Alternative work arrangements, school-based travel reduction, car-sharing, cyclo prohibition, truck prohibition, and other reactive short-term and fragmented measures have been used to combat congestion so far (Hiep et al., 2012; Toan, 2018). These seem to be piece-meal solutions intended to deal with the congestion phenomenon, not to tackle the problem at its root. There is no transportation policy that formally tackles the management of travel demand, and the topic is under-researched in the country. Given its lack of domestic experience, the city is actively looking for policy lessons from other cities that have innovated. Singapore’s expertise in dealing with high travel demand has been widely acknowledged, thus it could serve as an inspiration for Hanoi.

In brief, urban transportation sector in Hanoi has the following characteristics: (i) being supply-side focused (ii) lack of integration, which includes a lack of integrated planning concept, physical integration, and institutional coordination; (iii) ambitious goals; (iv) multi-level governance structure, and (v) limited institutional ability. These characteristics may create a problem for transferring policies from Singapore to Hanoi, and they will be discussed more in the following section.

4.2. Significance of Singapore’s experiences in TDM

Singapore and Hanoi are both in South-East Asia. Both cities face critical urban issues such as land scarcity and high population density. In the 1970 s, Singapore faced tremendous population and traffic expansion, as well as social and economic obstacles. Today, Hanoi faces comparable urban transportation issues as Singapore did 40 years ago or so: Due to the land limitation, Singapore’s road network expansion

potential is limited, and the transportation infrastructure has been unable to keep up with the increase in demand for motorized vehicles. As a result, the country endured significant traffic congestion in urban areas, as well as inefficient and unreliable bus services (Lew and Choi, 2015). Early on, it was recognized that Singapore needed regulations to slow the expansion of vehicles and limit their use, as well as high-quality public transportation and institutional reform in the transportation sector. Nonetheless, Hanoi differs greatly from Singapore in terms of development objectives, social and political context, and city governance structure in general, and the transport sector in particular. Political, institutional, social, and economic differences between cities make it difficult to transfer an urban transportation strategy or set of policies, particularly between developed and developing countries (Canitez, 2020). The following constraints on the transferability potential of TDM policies in TDM from Singapore to Hanoi have been identified after a critical review of such conditions.

4.2.1. Critical constraints for policy transfer

A brief overview of the critical constraints is listed in Table 3.

Political constraints: elected politicians, political parties, and pressure groups are the most common types of political actors involved in the policy transfer process. Because a policy instrument is an instrument used by a political authority to attain policy objectives, it is critical to ensure political approval of the policies. Policy transfer success necessitates strong political leadership and dedication, as well as a high level of political stability (Timms, 2011). In the long run, it may be difficult to assume a constant engagement in policy transfer in the face of political instability or conflict. Even if a lesson or policy is very desirable, it may fail to be implemented if it does not fit into an already crowded set of policies. Apart from that, there should be no considerable misalignment in policy practices between the lender and the borrower due to cross-national cultural misconceptions (Rose, 2004).

Hanoi’s development goals (Decision 519/QĐ-TTg, 2016) reflect a supply-side approach that focuses solely on the construction of new transportation infrastructure and the rehabilitation of existing infrastructure, with no official concept of demand management. Given that

Table 3
Overview of the critical constraints.

<p>Political constraints</p> <p>Is there a strong leadership to support the policies?</p>	<p>Singapore: The Land Transport Authority in Singapore is the main stakeholder to manage traffic demand for road usage.</p> <p>Hanoi: There is no official concept of demand management.</p>
<p>Institutional constraints</p> <p>Is there a clear structure setting between the policy lender and policy borrower?</p>	<p>Singapore: has a single-level tier of governance.</p> <p>Hanoi: is governed by a multi-layer administrative.</p>
<p>Physical constraints</p> <p>Is current infrastructure well integrated with land use?</p>	<p>Singapore: starting earlier to restrain demand growth, the current infrastructure can satisfy the current demand.</p> <p>Hanoi: the design of satellite cities makes the current demand control very difficult. The lack of land resources cannot meet the infrastructure development requirements.</p>
<p>Social constraints</p> <p>Is social dimension having a strong influence on formulation of transport policies?</p>	<p>Singapore: social acceptability is a crucial requirement in formulating land transport policies. The policies equally consider the economic, social and environmental dimensions in an integrated manner.</p> <p>Hanoi: the social dimension has a poor relation to transport research and policy formulation. Lack of clear concept, public awareness and support is the main reason why efficient travel demand management policies have been rarely implemented.</p>

politicians are more concerned with political ideals than technical aspects of strategies and solutions (Rose, 2004), the Hanoi authority is unlikely to examine a broader range of TDM policies and solutions. An example is Singapore's VQS Scheme, which is a well-known public policy initiative aimed at limiting car ownership (Lew and Choi, 2015). In Hanoi, efforts have been made to limit the use of private vehicles, such as motorcycles and cars, but the issue is complicated: many recommendations were politically contentious because competent public transportation alternatives are lacking. In fact, evidence suggests that the number of cars in Hanoi has dramatically increased in recent years.

Institutional constraints: the comparability of institutional settings between the policy lender and policy borrower is especially important since institutions handle the operation of policies (Ison et al., 2011; Canitez, 2020). Institutional learning cultures, according to Marsden et al. (2011), are a vital component for success: the readier a city is to seek out new ideas and dedicate resources to the process, the more likely policy transfer will be effective. Canitez (2020) discussed three tiers of institutions in an institutional framework for policy transfer between lending and borrowing cities: the first level consists of unstructured cognitive elements (ideologies, ideas, and attitudes are elements), the second level is concerned with formal elements (policy goals, policy objectives, and policies), and the third level is concerned with governance structures.

Unlike Singapore, which has a single-level tier of governance, Hanoi is governed by a multi-layer administrative system from the metropolitan to district levels, with a centralized administrative model that follows a top-down mechanism for decision-making. The Department of Transport (DoT) is responsible for implementing urban transport policy under the Hanoi People Committee (HPC), with guidance from the Ministry of Transport (MOT) and coordination from the Hanoi Authority for Planning and Investment (HAPI), the Department of Natural Resources, and the Hanoi Authority for Urban Planning and Architecture (HAUPA), among others. However, inside the hierarchical system, authorization overlaps and the governance structure is fragmented. In transport sector, the institutional structures are weak and under staffed. Lack of technical capability, as well as poor jurisdictional and operational coordination, are further institutional flaws. As a result, the DoT has only offered limited inputs and resources in development and implementation of policies for Hanoi transportation sector (Phin and Dotson, 2013).

Physical constraints: integration of land use and transportation is a key component of land transport policies. Unlike freshly established metropolises, which can exercise with the physical arrangement of technical/social infrastructures using formative patterns, existing cities are tremendously constrained by the presence of existing infrastructures, limiting land use policy options to a marginal level. Hanoi and Singapore are both extant cities, yet, while Singapore recognized the need for TDM in the early 1970s and enacted measures to consistently restrain demand growth, Hanoi has shown a great deal of reluctance. Unlike Singapore as an island city with well-defined boundaries, Hanoi has numerous contacts with "satellite" cities and provinces, thus controlling inbound and outbound travel demand is extremely difficult. As previously noted, a key transportation planning document, Decision 519/QĐ-TTg, which guides Hanoi transportation planning up to 2030 with a vision to 2050, focuses heavily on the development of new highways. The Decision's Master Plan aspires for a 20–26 % transport land over the urban land area. However, given the significant land constraints, the aim is exceedingly extremely unlikely to be met. In actuality, many public transport infrastructure development proposals have been shelved due to prohibitively expensive land acquisition in the city's core. The historical ancient streets of Hanoi, in particular, are protected by the UNESCO World Heritage Committee due to their architectural and historic significance, making development in the areas extremely politically contentious.

Social constraints: Implementation of land transport policies may positively or negatively influence the preferences, well-being, behavior

or perception of individuals, groups, and society (Geurs et al., 2009). Social impacts of transport policies include social equity, human health, community livability and cohesion, historic and cultural resources, etc. As stated earlier, social acceptability is a crucial requirement in establishing transport policies, and public acceptance is an important feature that contributes toward the success of Singapore's land transport policies and schemes. Singapore's land transport policies equally consider the economic, social and environmental dimensions of the sector in an integrated manner. This is reflected by the high rate of satisfaction over a wide range of social indications, including the overall satisfaction of transport system, safety, convenience, affordability, community livability, and quality of services for disabled people, etc. (McKinsey Report, 2020).

Hanoi has a dominant share of road transportation, inadequate transport infrastructure, and limited public transport (Huu and Ngoc, 2021). Motorcycles are the most prevalent means of transport, whilst car usage and ownership have also been on the rise recently (Global Future Cities Programme, 2021). With the high rate of urbanization and motorization, social segregation becomes a great concern since the gap between high income and highly mobilized citizens and others tends to grow. Large-scale investments have been made in the road transport infrastructure in recent years and they provide significant economic and social benefits. However, since urban transport becomes heavily congested it is critical to address the congestion problem with demand management programs. Unfortunately, Hanoi has no clear and official concept of demand management yet. Furthermore, while both the economic and environmental dimensions have a strong influence on transport policies, the social dimension has a poor relation to transport research and policy formulation (Global Future Cities Programme, 2021). Lack of clear concept, public awareness and support is the main reason why efficient travel demand management policies have been rarely implemented so far, except reactive short-term and isolated traffic management solutions (Toan, 2018). However, the situation is starting to change: there has been some movement towards a greater understanding of the social aspects of transport, and the Vietnamese Government is showing a strong commitment toward an equal and inclusive society in line with the long-term development strategy of the country (Aus4Transport, 2021).

Other elements, such as cross-national variations, both formal (laws, rules, regulations) and informal (culture, custom, language), should not be overlooked in addition to political, institutional, and physical barriers that impede the effectiveness of the transferability potential. Hanoi is a motorcycle-dependent city (Ng and Phung, 2021), whereas Singapore has established a plethora of sustainable transportation options with significant public transit ridership, and changing people's travel habits is difficult. Nevertheless, the presence of policy transfer hurdles does not preclude the need for lesson-drawing for new ideas. Understanding how policies are implemented in various situations, as well as the nature of the differences, is critical to determining how flexible policies should be.

A policy transfer continuum was suggested by Dolowitz and Marsh (2000) as a heuristic instrument (Fig. 2) to describe policy transfer processes. On the left extremity of the continuum, the "lesson drawing" reflects flawless rationality, while on the right, the "coercive transfer" depicts the direct imposition of a program or policy by governmental force. Voluntary transfer is a type of transfer that falls somewhere between the two.

Although the notion of the continuum is apparent, Dolowitz and Marsh (2000) argue that the lesson-drawing leftmost of the continuum constitutes a logical response to a perceived policy transfer process. The lesson-drawing process begins with a thorough examination of current policies or programs in the lender city and concludes with a forecast of what might happen in the borrower city in the future. Despite the fact that the lesson-drawing is considered to be "perfectly rational" it is rationally limited due to inadequate data and imperfect perception or appraisal of the "actual" situation. When governments take lessons from other countries, the underlying premise is that policies that have proven

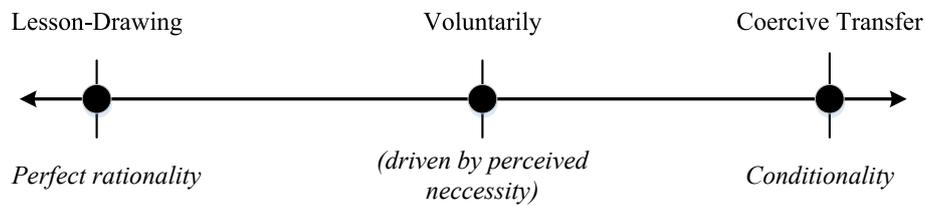


Fig. 2. From lesson-drawing to coercive transfer.

successful in one country will also be successful in their own. This isn't always the case, however. Three factors may contribute to policy failure: (i) uninformed transfer, in which the borrower lacks sufficient knowledge of the policy and how it operates in the lender country; (ii) incomplete transfer, in which key elements that made the policy successful in the lender country are not transferred, even though the transfer has occurred; and (iii) inappropriate transfer, which occurs when disparities in political, economic, and social circumstances are ignored.

4.2.2. Significance of Singapore's experiences

Understanding Singapore's experiences with travel demand management has significant policy implications for other cities. The TDM framework should be viewed from an integrated perspective, as shown by Singapore's experiences: in order to achieve synergistic effects, a comprehensive transport development strategy that coordinates various policies and mobilizes efforts from various jurisdictions and organizations is required. The concept addresses traffic congestion from both sides: boosting "supply" and decreasing "demand," with a focus on measures that control travel demand. To reduce car dependency, the technique uses both pull incentives and push disincentives. Integrated land use and transportation planning, transit-oriented development, boosting public transportation, improving walking and cycling, and regulating demand through ownership and usage limits are some of the strategy's highlights. To ensure good enforcement and compliance, there must be a high level of political will and support, institutional capability, and public acceptance.

There will be no common set of policy tools that can be applied to other cities because the development context and political conditions change from city to city (UN-HABITAT, 1995). Nevertheless, given the similarity in land constraint, high population density, and rapid economic expansion, the Singapore approach for managing travel demand might be particularly effective for Asian cities. Many of Singapore's unique solutions have been adopted by other cities, resulting in positive outcomes (Diao, 2019).

4.2.3. Relevance of the policies

Given the stated significant constraints, transferring TDM policies from Singapore to Hanoi may be premature for the time being. Rather, it should be important to assess the applicability of policies used in Singapore that may be amendable for Hanoi. An initial screening of good practices and policies was conducted and the results are summarized in Table 4. The scanning begins with the major policies (policy formulation), which are further elaborated with individual policies (policies) divided into categories such as planning (P), economic (E), regulatory (R), and technology (T). The relevancy is classified into Low, Medium, and High levels.

It is noted that the relevancy assessment is merely indicative, based on a study of the transferability considerations outlined in the previous section. The initial screening aims to gain insight into Singapore's experiences in order to help construct TDM framework in following Section 4.3.

4.3. Development of a comprehensive TDM framework for Hanoi

An examination of Singapore's TDM experiences permits for the

Table 4

Relevance of specified policy formulations and policies (P: Planning; E: Economic; R: Regulatory; T: Technological).

Policy formulation	Policy instrument	Type of policy instrument	Relevancy
<i>(1) Integrating land use, town and transport planning to reduce the people need for travel.</i>			
1.1	Land use and transport integration	P	Medium-High
1.2	Transit-oriented development (TOD)	P	High
1.3	Physical integration between transport nodes and surrounding developments	P	High
1.4	Urban HUBs	P	Medium-High
<i>(2) Managing demand of road usage through ownership and usage measures</i>			
2.1	Fiscal measures (taxes, fees, levies)	E	Low
2.2	Area Licensing Scheme (ALS)	R + E	Low
2.3	Vehicle Quota System (VQS)	R + E	Low
2.4	Electronic Road Pricing (ERP)	E	Low
2.5	Parking control	R + E	Medium
<i>(3) Improvement of public transport, walking and cycling</i>			
3.1	Integration of MRT, LRT, and buses	P + R	High
3.2	Public transport subsidies	E	High
3.3	Walking and Cycling Plan (WCP)	P	High
3.4	National Cycling Plan (NCP)	P	High
3.5	Car-lite Vision	P + R + T	Low

development of a comprehensive TDM framework for Hanoi, as shown in Fig. 3. The TDM framework should be viewed as a whole, with TDM strategies and solutions tightly integrated with Hanoi land transportation development strategies and planning up to the year 2030, and vision up to the year 2050 that are stipulated in Decision 519/QĐ-TTg (2016). The following are the key attributes of the framework:

- Transport development goal: sustainable development.
- The overall objectives: (i) congestion mitigation; (ii) cost saving; (iii) safety enhancement; and (iv) environmental pollution mitigation.
- The TDM framework has a three-legged approach, with three elements: enhancing mobility options, economic measures, and smart growth - land use policy, each of which correlates to different sorts of TDM policy interventions.

The TDM framework should be holistic and integrated. It deploys both pull incentives and push disincentives. Pull incentives involve various mobility options, including development of the new transit facilities (MRT, LRT, and bus rapid transit, BRT), improvement of the public transport services, and active modes (walking and cycling). The push disincentives include economic measures to regulate the use of private transport using fiscal measures such as taxes, fees, and levies, etc. Parking pricing and management can be an efficient disincentive tool to encourage people to use alternative modes of transportation. In the long run, ownership restraint or usage restraint measures, such as those implemented in Singapore, can be considered for incremental implementation. Finally, the smart growth - land use strategy combines

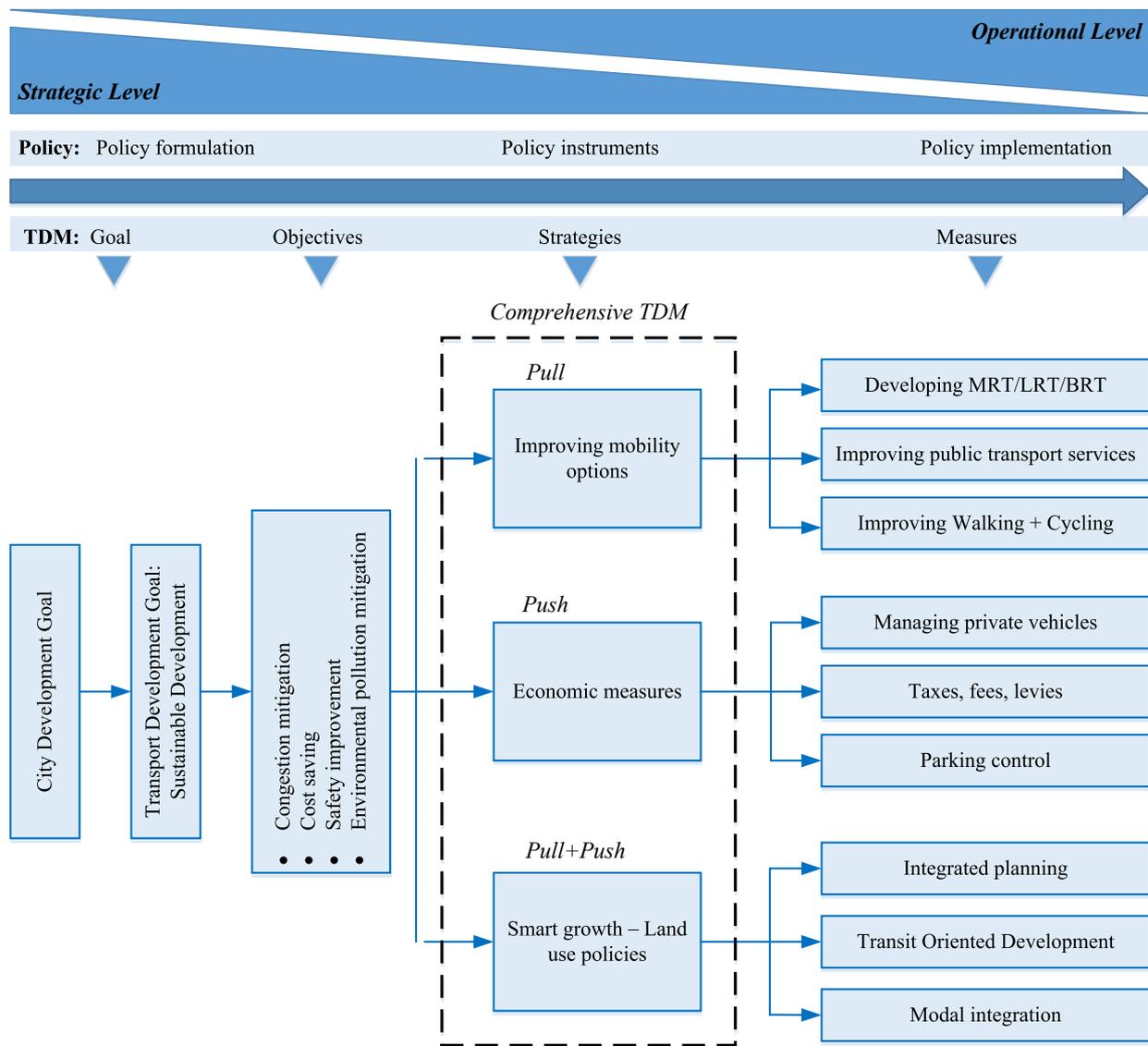


Fig. 3. Proposed comprehensive TDM framework for Hanoi.

the push and pull forces leverage. In the comprehensive TDM framework, TDM policies should be an integral part of a comprehensive transport policy package that deal with both supply-side strategies that enhances the capacity of transport systems and demand side that makes the transport system more productive.

The Hanoi Master Transport Plan up to 2030, based on Decision 519/Q-TTg prioritizes public transportation, including 8 new urban railways with a total length of 318 km, 3 monorails, and 8 BRT lines. Because the Plan focuses on the supply side, it is critical that, while encouraging public transportation, the TDM framework also maintains a proper balance between supply-side and demand-side strategies. Despite the fact that the idea of transit-oriented development (TOD) was not stated in the Decision, it should be incorporated in the TDM framework as a key element of the “smart growth – land use policy” strategy (Rojas Lopez et al., 2020), alongside integrated planning and modal integration. The inclusion of TOD in the TDM framework will substantially promote the public transport ridership and offer tremendous opportunities for guiding Hanoi urban growth in a sustainable manner.

5. Coordinating with transport planning

To guarantee that resources are used efficiently, it is critical to have a

TDM strategy that is completely coordinated with regional and metropolitan transportation planning. To ensure that TDM is integrated into urban transportation planning, it is critical that the TDM framework is considered at all phases of the planning process, from policy formation to instrumentation and implementation. TDM goals and strategies, in particular, should be developed in conjunction with the broader transportation development objectives (Schreffler et al., 2012; Carran-Fletcher et al., 2020), and the city’s development objectives must be in sync with the transportation development goals. For integrating TDM into the transportation planning process, the following activities are recommended:

- (i) Policy formulation: create primary policies to guarantee that TDM objectives are in line with the transportation sector’s overall development goals and objectives, as well as the city’s development goals and objectives. This step’s policies are primarily strategic in nature.
- (ii) Policy instruments: develop specific objectives-driven strategies and programs. In a comprehensive TDM framework, the strategies should strike a balance between supply-side and demand-side alternatives, as well as pull incentives and push disincentives. To subordinate the framework, the primary policies

formulated in policy formulation should be elaborated by policies.

- (iii) Policy implementation: devise measures for implementing policies and initiatives. Develop each plan with specific measures and policies that correspond to the level of TDM implementation. In some circumstances, further policy elaboration at this level may be required.

6. Coordinating transport sector policies with city's development goal and strategies

Because demand for travel in particular is largely a derived demand, urban transport should be strategically viewed as an integral component of the city economy and of the city's development strategy. The implications of transportation being a derived demand are not limited to the physical dimension, but they also have significant implications for the development of social sector policies, as well as for institutional and financial planning (Gwilliam, 2002). As a result, urban transportation policies must be integrated with other sector developments in order to achieve the city's development goals, not only at the activity planning level, but also in municipal financial arrangements. Because no single policy can provide a full solution to the transportation-related challenges of urban growth, specific features of each policy can be promoted as solid components of overall transportation strategies inside the urban development strategies.

The need to integrate policies within the transport sector as well as between transport and other dimensions of urban development necessitates the creation of institutions that reduce operational and jurisdictional barriers to policy integration. Given the overlapping governance and limited institutional capacity, the Hanoi transport sector needs to restructure its governance structure as well as enhance its capability via institutional strengthening and reforming to remove institutional impediments to successful policy integration.

7. Conclusions

Cities in developing countries are frequently challenged with rapid economic growth, urbanization, and motorization, as well as the negative externalities that accompany these processes. Given the limited living area and financial resources available to invest in transportation infrastructure, it is not possible to meet the ever-increasing demand solely through supply-side strategies. TDM is particularly well suited to cities in developing nations because of its low cost and numerous benefits. To ensure a successful TDM program, the establishment of clear objectives and strategies and the proper supporting policy intervention, from policy formulation to instruments and implementation, are prerequisite. However, in Hanoi, issues of TDM in general and TDM policies in particular remain understudied.

Through a case study, this paper investigates policies for TDM in Singapore and the potentials for policy transfer to Hanoi. Critical contextual constraints for policy transfer have been identified, and it is concluded that it may be premature to mandate a significant transfer of TDM policies from Singapore to Hanoi at this time, but the findings from the case study have significant policy implications for Hanoi, and lesson-drawing is highly valuable and attainable. The case study's findings are likely to serve as a significant resource for decision-makers, planners, and practitioners in developing a more methodical roadmap for policy transfer from Singapore to Hanoi in future.

Singapore's experience shows that developing a comprehensive TDM plan that includes a set of viable options is critical for achieving synergistic effects. A comprehensive TDM framework was proposed for Hanoi with insights gained from examination of Singapore's TDM experiences. The framework comprises of improving mobility option, economic measures, and smart growth - land use policy and deploys both pull" and "push" levers. It is closely integrated into the city transport sector development policies and transport planning process toward the sector

development objectives as well as the city's development goals.

It is important to note that the two countries are in different stages of development. Singapore is well advanced while Hanoi development contexts and problems are like Singapore 40 years ago or so. Singapore introduces different strategies at different stage of developments, and is very flexible in making changes to adapt to the needs of its society. The contextual differences between the two cities necessitates a careful examination of Singapore transport policies that can be amendable for Hanoi, and a capability of foreseeing the city's needs and problems at different development stages in policy learning. To set up a realistic timeline reach the ideal TDM implementation, the priority should focus on studying appropriate political and intuitional frameworks and necessary arrangements for the cross-national policy transfer from Singapore to Hanoi. With the clear goal and objectives, the relevant "pull" and "push" strategies and measures can be implemented. This is a long-term progress and should be executed in a progressive manner.

Although the comparisons conducted in this study provide insightful information, there are still some limitations which can be carried out for further investigation. First, this study uses qualitative research method, which by nature contains subjectivity. It is expected to set up multi-criteria evaluation framework to include quantitative method to investigate the transferability of the policy. Second, the proposed framework and the measurement of the relevancy are based on authors' knowledge and experience in the field, which needs further validation.

CRedit authorship contribution statement

Trinh Dinh Toan: Conceptualization, Methodology, Writing – original draft. **Soi Hoi Lam:** . **Meng Meng:** . **Yiik Diew Wong:** .

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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