

International and domestic experience in building sustainable urban transport criteria

Phan Duc Hoang^{1*}

¹ Lecturer, M.Sc, Hanoi University of Architecture

KEYWORDS

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Set of criteria for sustainable urban transport development
Sustainable urban transport development
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ABSTRACT

The article provides some terms about Criteria, indicators, and indices, which are the pillars when building a set of criteria. The article also presents some experiences in building sustainable urban transport criteria by synthesizing some international criteria sets such as: German International Cooperation Agency (GIZ), US criteria, Singapore criteria, China criteria, and some criteria compiled by domestic urban transport researchers and briefly introduced some methods for developing criteria. Based on domestic and international experiences, the article evaluates and draws some issues about the group of criteria, the number of criteria in each group of criteria and about the component criteria. The contents synthesized in the article will contribute to the scientific basis for research on the field of sustainable urban transport development in Vietnam.

1. Introduction

Urban transport is an important part of the urban development infrastructure, acting as a skeleton, connecting all technical and social infrastructure works in the city, creating unity and connection between areas while helping residents move easily and connect with basic services such as schools, hospitals, work and entertainment.... The urban road network is the main factor of urban transport, linking functions, creating structure and a solid corridor in urban development, acting as one of the main pillars and the lifeblood of the city. Urban road network management helps ensure sustainable urban transport development, contributing to creating a better living environment for people and sustainable urban development.

In order for the management to be convenient, it is necessary to have a set of criteria suitable for the development of each locality. The set of criteria helps managers and professionals to have effective policy orientation and planning. Measuring and monitoring the development progress and Balancing growth and environmental protection... That is an important thing in modern urban management and planning.

Within the framework of the article, in the context of Vietnamese cities in the process of strong urbanization. The author refers to the criteria for sustainable urban transport development in the world and Vietnam, thereby synthesizing experiences that can be applied to the work of building criteria for the subject of "urban transport" in Vietnam.

To evaluate and propose a sustainable urban transport system to contribute to management. Some international organizations and scientists have proposed a set of criteria for sustainable urban transport development such as the International Transport Organization, Sweden, Singapore, etc., considering it as a management tool. With that requirement, in our country, some experts have also proposed a set of criteria to suit the conditions of Vietnamese cities.

To better understand the criteria set, please clarify the following concepts:

Criteria:

According to the Vietnamese dictionary, it is a noun that refers to the factors, criteria or conditions used to evaluate, classify or select a certain object. Criteria are often determined based on specific factors, which can be quantitative or qualitative, and play an important role in ensuring objectivity and fairness in the decision-making process [[1]].

According to Wiktionary, it is a property, a sign to distinguish an object, a concept, to criticize in order to evaluate [[2]].

According to the Dictionary of Linguistics, criteria are properties and signs as a basis for recognizing and classifying a thing or concept [[3]].

Usually, the criteria are qualitative, but the closer to quantitative, the better. However, not all criteria are quantitative criteria, so they may be qualitative, but the trend is to move towards quantitative.

Quota: According to the dictionary of linguistics, it is the level of expression of a characteristic, a function [[4]].

Indicators: According to the dictionary of linguistics, it is a number that expresses the fluctuation of a phenomenon [[5]].

2. Experience in developing criteria from relevant sets of criteria

2.1. Research in the world

In the world, many sets of criteria for sustainable urban transport development have been established. In this article, we would like to introduce some typical sets of criteria such as those of GIZ (Federal Republic of Germany), the United States, China, Singapore, etc.

2.1.1. GIZ (Federal Republic of Germany) Sustainable Urban Transport Criteria

The German Development Cooperation Agency (GIZ), as a Federal State-owned organization, has been active in the field of International

*Corresponding author: hoangpd@hau.edu.vn

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Cooperation for more than 40 years. GIZ offers its partners regional knowledge, in-depth expertise and proven organizational management know-how aimed at sustainable development worldwide. GIZ projects are initiated mostly by the German Federal Ministry for Economic Cooperation and Development (BMZ), but also by other Federal ministries and agencies as well as by public and private organizations at home and abroad. The project “Sustainable Urban Transport Project (SUTP), (2003), implemented by the German International Cooperation Agency (GIZ), has proposed a set of criteria for sustainable urban transport development consisting of 10 criteria. [[6]]

- Planning for high-density and human-scale cities

Plan dense cities by designing mixed-use neighborhoods with car-free schools, stores, and housing, and living areas with urban plazas, traffic-mitigated infrastructure, and human-scale transportation modes.

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- Developing cities towards public transport

By developing cities that are transit-oriented, urban connectivity will be enhanced and detours will be reduced, while ensuring land value recovery around public transport routes.

- Optimizing road networks and usage

Optimize the road network by ensuring compliance and enforcement of traffic rules. To make people aware of how the road network is cared for and to clearly see how they can best benefit from the local road network and use it in a sustainable way.

- Encourage walking and cycling

Develop comprehensive walking and cycling concepts with high-quality street design standards for sidewalks, bikeways and complete streets.

- Implement public transport improvements

Ensure high quality of service in public transport based on performance indicators and establish public transport associations to integrate schedules, fares and tickets. Options include improving bus, BRT, train and metro services.

- Control the use of personal vehicles

In addition to controlling the use of private vehicles, try to involve the private sector in sustainable transport activities in the city to benefit the people. Support the private sector to encourage workers to commute by bicycle or public transport. The key to controlling vehicle use is to provide high-performance public transport networks.

- Parking Management

Implement management through parking regulations, maximum parking requirements, and other approaches such as parking time limits, permitting or setting parking fees, and clearly marking parking spaces on the street. When managing parking and enforcing parking rules, ensure that adequate information is always provided to urban residents.

- Increase the use of clean fuel vehicles

Clean fuel vehicles are key to a sustainable urban transport

system. While vehicle scrappage or retrofit programs can help promote clean vehicles and low-emission zones, clean fuel policies can also be focused on promoting cleaner vehicles, including electric vehicles.

- Inform the people about the solutions

Sustainable urban transport is the type of transport that best serves the travel needs of people, so it is necessary to provide full information to people and stakeholders.

- Approach challenges holistically

A sustainable urban transport system in a city will require a wide range of stakeholders, support, time and budget. A stakeholder engagement process is needed to assess and discuss measures, so that a comprehensive sustainable urban mobility plan can be developed and communicated, integrating transport into climate change action plans.

2.1.2. Christopher 's Sustainable Urban Transport Criteria Kennedy (United States)

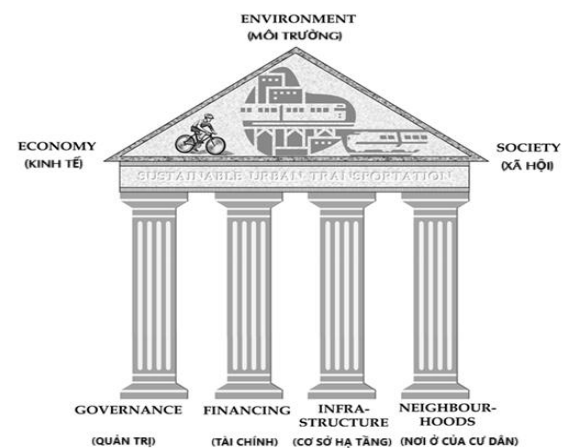


Figure 1. Four pillars of sustainable urban transport.

According to research by (Christopher) Kennedy, Eric Miller, Amer Shalaby, Heather Maclean and Jesse Coleman, 2005). The pressure to develop a sustainable transport system is especially intense in urban areas. The process towards sustainable urban transport is based on three aspects: Economic, Social and Environmental, in which it is necessary to consider the contents of four essential pillars or four groups of criteria [[7]].

(1) Governance. Establish effective agencies to develop integrated land use and transportation planning.

(2) Financing. Create equitable, efficient and stable funding mechanisms.

(3) Infrastructure. Strategic investment in key infrastructure.

(4) Neighbour - hoods. Residents' residence is closely connected to the road network.

Illustrating the progression towards Sustainable Urban Transport schematically, with the classic triangle of Economic, Social and Environmental sustainability supported by the four 'Pillars' of sustainable urban development.

2.1.3. Mathew 's Sustainable Urban Transport Criteria Carmona – United States

Mathew 's View Carmona of the United States on Sustainable Development Management of Urban Transport includes 03 areas: *Supply Management*; *Demand Management*; *Land Use Management*. Each area will include a number of criteria contributing to sustainable urban transport as shown in Table 1 [[8]].

Table 1. Management areas to ensure sustainable development of urban transport systems.

No	Criteria group	Criteria
1	Land use management (06 Criteria)	Growth Management
2		Planning and zoning
3		Divergence/Completion
4		Urban design
5		Multi-function/mixed
6		Density
1	Supply Management (07 Criteria)	Intelligent transportation system
2		Transit Vehicles and Services
3		System Operation
4		Multi-Model Vehicles and Services
5		Traffic Engineering
6		Bike path/walking path
7		Highway capacity
1	Demand management (Motorized and non-motorized transport as well as financial resources) (05 Criteria)	Alternative plan
2		Price
3		Alternative model
4		Alternative Work Location
5		Employer Support Program

2.1.4. China's Sustainable Urban Transport Criteria

According to the research work “Sustainable Transport Data Collection and Application: China Urban Transport Database” by (Tian Jiang et al, 2013), belongs to the China Sustainable Urban Transport Research Center, Academy of Transport Sciences, Ministry of Transport of China. The work is published in the journal “Mathematical Problems in Engineering”, has proposed the China Sustainable Urban Transport Criteria System, including: 06 main criteria groups and 26 component criteria. as shown in Table 2 [[9]].

The criteria system is based on the “China Urban Transport Database (CUTD)” system, which is the first comprehensive urban transport database in China, with various types of data such as urban transport network, infrastructure, personal travel, public transport and pedestrian data. The data sources of CUTD include GIS urban network maps, traffic control feedback, traffic monitoring systems, public transport operations, etc.

Table 2. Evaluation criteria for Sustainable Urban Transport.

No	Criteria group	Criteria
1	I. Transport function (08 Criteria)	Road network density (km/km ²)
2		Average commute time for residents (minutes)
3		Average commute time for residents (minutes)
4		Travel time by public transport (minutes)
5		Average speed on main road (km/h)
6		Coverage rate within 300 m radius of public transport station (%)
7		Public transport network density (km/km ²)
8		Port supply and demand ratio (%)
1	II. Economics and finance (06 Criteria)	Infrastructure investment/GDP (%)
2		Share of public transport investment (%)
3		Share of financial aid (%)
4		Average annual growth rate of urban transport investment (%)
5		Affordability of public transport (%)
6		Household travel expenses (%)
1	III. Fairness and safety (06 Criteria)	Pedestrian area per capita (m ² /person)
2		Public and non-motorized transport ratio (%)
3		Percentage of villages with public transport services (%)
4		Number of fatalities in accidents per 10,000 vehicles (people/10,000 vehicles)
5		Annual growth rate of serious accidents (%)
6		Economic loss due to accident (RMB/vehicle)
1	IV. Energy consumption (03 Criteria)	Fuel consumption per vehicle (liters/vehicle)
2		Land grabbers (%)
3		Number of tourists/road area (people/m ²)
1	V. Environmental impact (03 Criteria)	Pollutant emissions per vehicle (grams/vehicle)
2		Share of traffic pollution (%)
3		Number of tourists/road area (people/m ²)
1	VI. Management capacity (01 Criteria)	Urban traffic management capacity

2.1.5. Singapore's Sustainable Urban Transport Criteria

According to research by Dr. Habibur Rahman and Hoong Chor Chin was published in the OIDA International Journal of Sustainable

Development (OIDA International Journal of Sustainable Development, 2011). A group of scientists has proposed criteria for assessing the sustainability of Singapore's urban transport as shown in Table 3 below [[10]].

2.2. Research in Vietnam

2.2.1. Criteria set of Associate Professor, Dr. Nguyen Hong Tien

At the Sustainable Development Conference in 2008, Associate Professor, Dr. Nguyen Hong Tien mentioned “*Urban transport development is the development of a synchronous transport system, with a reasonable structure of vehicle use (prioritizing the development of public transport), modern, civilized, capable of meeting the travel needs of all people quickly, conveniently, safely with reasonable transport fares and on the basis of environmental protection*”.

At the same time, Associate Professor, Dr. Nguyen Hong Tien also proposed some criteria for sustainable urban transport development as shown in Table 4.

Table 3. Groups of criteria and indicators for sustainable urban transport development.

No	Opinion	Sustainability Criteria Groups	Sustainability indicators
1	I. Customers	1. User satisfaction and social engagement	a) Accessibility, connectivity and travel time*
2			b) Affordability*
3			c) Level of service and comfort*
4			d) Enhanced safety*
5			e) Social equity and engagement*
6			f) Enhanced security*
7			g) Employment growth*
8		2. Environmental protection	a) Impact on the global environment
9			b) Impact on local air pollution*
10			c) Noise control*
11			d) Sustainable waste management
12			e) Sustainable energy consumption
1	II. Finance	1. Revenue and economic growth	a) Increase revenue
2			b) Managing travel and mobility needs
3		2. Effective cost management	a) Effective cost distribution and cost control
4			b) Save on external costs

1	III. Internal procedures	1. Institutional efficiency	a) Scope and institutional capacity
2			b) Integration and effectiveness of organizations
3		2. Construction environment and land use	a) Integration of land use and transport
4			b) Management and quality of transport infrastructure
5			c) Parking management*
6		3. Management of transportation methods	a) Promote public transport*
7			b) Control of personal vehicles
8			c) Facilitate non-motorized transport*
9			d) Integration between passenger modes*
10			e) Efficiency of commercial freight transport
11			f) Promote green vehicles
12			g) Promote car sharing activities *
13		4. Deploy smart technologies	a) Vehicle emission standards
14			b) Fuel standards
15			c) Collect electronic ticket money
16			d) Electronic road pricing
17			e) Smart infrastructure technology
18			f) Smart car technology
19			g) Advanced travel information*
20			h) Management of blockages and incidents
1	IV. Learning and development	1. User behavior, response and adaptation	a) Awareness and education*
2			b) Skills development and training
3			c) Law and enforcement*
4			d) Public participation*
5			e) Leadership and political motivation
6			f) Adapting to changing demographics and expectations*
7		2. Research and innovation	a) New innovations and practices
8			b) Research and development

Note: Asterisks (*) denote criteria that have a primary user experience.

Table 4. Table of criteria for sustainable urban transport development [[11]].

Criteria for sustainable urban transport development			
1	- Land ratio for traffic	5	- Environmental indicators
2	- Urban transport network density	6	- Types of vehicles according to urban scale
3	- Time cost for a trip	7	- Average walking time cost
4	- Road quality assessment criteria	8	- Technical specifications of public transport

2.2.2. Criteria set of Assoc.Prof.Dr. Luu Duc Hai

Associate Professor, Dr. Luu Duc Hai has developed a set of criteria and indicators for sustainable urban transport planning for special and type I cities, including 3 groups of criteria: Economic - Social and Environmental. The Economic criteria group has 18 indicators divided into 6 contents; The Social criteria group has 13 indicators divided into 3 contents; The Environmental criteria group has 24 indicators divided into contents. The system of criteria for evaluating sustainable urban transport development is summarized as in Table 5 below [[12]].

Table 5. Transport criteria framework towards sustainable development.

No	Criteria group	Criteria
1.	Economy (6 contents)	Traffic density
2.		Mean of transportation
3.		Modernity and convenience of the system
4.		System efficiency
5.		Land use
6.		Finance for transportation
7.	Society (3 contents)	Traffic jam
8.		Access and social equity in transport
9.		Traffic accident
10.	Environment (3 contents)	Air quality
11.		Quality of motor vehicles
12.		Noise

2.2.3. Criteria set in the thesis of Dr. Vu Anh

In the PhD thesis "Research on planning the public transport system of Hanoi city according to the goal of sustainable development" by Dr. Vu Anh of Hanoi University of Architecture completed in 2012, proposed a framework of criteria for sustainable urban transport

development with 3 groups of Economy, Society, Environment with 15 specific criteria as shown in Table 6 [[13]].

Table 6. Framework of criteria for sustainable urban transport development.

No	Criteria group	Criteria
1	Economy (6 criteria)	Urban transport development planning is consistent with urban spatial and structural planning.
2		Reasonable land ratio for transportation
3		Building synchronous transport infrastructure
4		Modern and convenient urban transport system, meeting current and future needs
5		Building an urban transport development strategy with a reasonable development structure
6		Using modern scientific and technical advances in investment, construction, organization, management and exploitation.
7	Society (5 criteria)	Urban transport meets the travel needs of all people in society.
8		Urban transport is suitable for the income of urban people.
9		Reduce accidents and traffic congestion.
10		Improve people's education level and increase community participation in urban transport planning and exploitation
11		Strengthening the role of government in urban traffic management
12	Environment (4 criteria)	Integration of Urban Transport Planning with Urban Environmental Planning
13		Management of vehicles and vehicle emissions
14		Combining construction of transport infrastructure with environmental protection
15		Increase the use of environmentally friendly vehicles

2.2.4. Criteria set of Dr. Than Dinh Vinh and colleagues

The research conducted by the group of authors consolidates and proposes the application of 25 criteria based on 5 groups, including: (1) Urban Planning; (2) Transportation Modes; (3) Urban Environment; (4) Science and Technology; (5) Urban Traffic Demand Management. These 5 groups of criteria revolve around the 3 main factors of sustainable economy, sustainable society, and sustainable environment, as shown in Table 7 below [[14]**Error! Reference source not found.**].

Table 7. Urban Transportation Criteria Towards Sustainable Development in Vietnam.

No.	Group of Criteria	Unit
Criteria group 1: Urban Planning		
QH.01	Public transportation density / urban land area	Km/km ²
QH.02	Bicycle and pedestrian route density / urban land	Km/km ²
QH.03	Motorized road network density / urban land area	Km/km ²
QH.04	Traffic intersection density	Intersections/km ²
QH.05	Ratio of traffic land area / urban land area	%
QH.06	Ratio of bicycle and pedestrian traffic land area / urban land area	%
QH.07	Traffic land area per capita	m ² /person
QH.08	Bicycle and pedestrian traffic land area per capita	m ² /person
Group 2: Transportation Modes		
PT.01	Average car ownership per capita	Cars/1000 people
PT.02	Average bicycle ownership per capita	Bicycles/1000 people
PT.03	Proportion of trips using public transportation	%
PT.04	Proportion of trips using bicycles and walking	%
Criteria group 3: Urban Environment		
MT.01	Ecological footprint in transportation	Gha
MT.02	Ratio of green space on road networks / total road network area	%
MT.03	Proportion of vehicles using clean energy	%
MT.04	Proportion of renewable energy technology used in lighting	%
Criteria group 4: Science and Technology		
CN.01	Use of technology in traffic network planning (Software, simulation models, calculations, etc.)	Yes/No
CN.02	Use of intelligent transportation technology in managing and operating road networks	Yes/No
CN.03	Proportion of environmentally friendly technologies and recycled materials used in road network construction	%
Criteria group 5: Urban Traffic Demand Management		
QL.01	Management of vehicles and emissions from transportation	Yes/No
QL.02	Strategy for developing urban transportation with a reasonable vehicle structure	Yes/No
QL.03	Use of integrated tickets for public transportation	Yes/No
QL.04	Policy development on congestion fee	Yes/No
QL.05	Policy development on parking fees	Yes/No
QL.06	Policy on subsidies for clean fuel prices	Yes/No

3. Some research methods and criteria development

3.1. Research Methodology

3.1.1. Data collection

Conduct a field survey of the city:

Surveying the traffic situation on the street, identifying bottlenecks in traffic, and assessing by sense on the ground.

Collect socio-economic statistics, maps of current land use status, construction status, and related planning maps. learn about the current situation of the traffic system as well as the current situation of urban road management through working with the City Urban Management Department and public service units.

3.1.2. Aggregate Analysis

Collect documents and information on issues of urban road management in a number of cities of the country and of Vietnam.

Analyze and synthesize scientific bases to perfect the methodology.

Analyze, compare, inherit and select practical experiences and results of previous research related to urban road management.

3.1.3. Inheritance method

Urban road management in the direction of sustainable urban transport is a new issue and connects many fields, so it is necessary to

selectively study and inherit foreign research topics and domestic studies related to sustainable cities. From there, it helps research to approach new issues in the set of criteria more quickly and avoid duplication.

3.2. Some Methods for Developing a Set of Criteria [[15][14]]

3.2.1. Normalization Method

Regarding normalization, the primary choice among composite indicators is to apply Min-Max normalization (Rescaling), which is considered the most useful. The Z-score method is less commonly used, and the third normalization method is based on classification scales and distance from a reference point. Normalization methods have certain limitations, particularly their dependence on extreme values or the opinions of stakeholders, making them less reliable.

3.2.2. Weighted Approach

This method is classified into three main groups: equal weighting, expert-based weighting, and statistically-based weighting. Although this method offers simplicity, its utility diminishes when dealing with correlated data points or when the evaluation timeline is extended. The method involving the opinions of multiple experts from different backgrounds presents challenges in managing larger datasets with these participatory methods, while these statistical techniques require feasibility checks.

3.2.3. Aggregation Method

Aggregation methods can be classified into three main types: compensatory methods, partially compensatory methods, and non-compensatory methods. In aggregation methods, linear aggregation measures and simple additive rules are considered among the most widely applied techniques. These methods essentially allocate content to indicators in proportion to their assigned weights, maintaining a constant level of compensation.

3.3. Steps to study the set of criteria

The main steps are to develop and apply a set of evaluation criteria in practice, starting with determining the objectives, scope and objects of application of the set of criteria. After that, collect practical data and refer to the set of criteria that have been effectively applied to ensure feasibility and appropriateness. The next stage is to evaluate the data, determine the method of building the set of criteria and build specific groups of criteria. The process also includes consultation with stakeholders to ensure objectivity and inclusiveness. Finally, the set of criteria is finalized, applied in practice and adjusted as necessary to improve the efficiency of use. These steps play an important role in ensuring the transparency, science and appropriateness of the evaluation criteria in management and development.

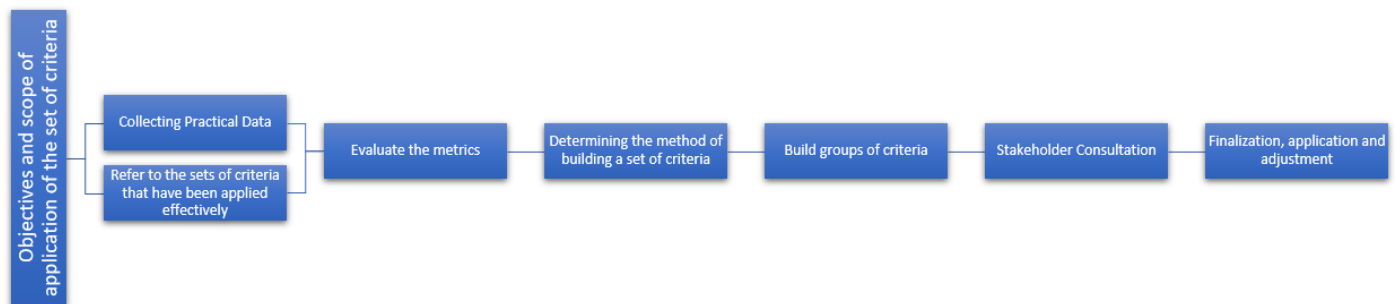


Figure 2. Steps to study the set of criteria.

4. Results and discussion

Currently, around the world, each mode of transportation, such as sustainable urban transport, smart transportation, green transportation, etc., is being studied by scientists to identify criteria that serve as the basis for guiding the planning and development of transportation systems. Each country, due to its unique economic, social, and natural conditions, as well as the living conditions of its urban residents, establishes its own set of criteria for sustainable urban transportation. Vietnamese scientists have also conducted research and proposed several criteria based on domestic conditions. Associate Professor Dr. Nguyen Hong Tien provided several criteria for

sustainable urban transportation; Associate Professor Dr. Lưu Đức Hải published a set of indicators and criteria for sustainable urban transportation planning for special and first-tier cities in Vietnam; and Dr. Than Dinh Vinh and colleagues have researched and proposed urban transportation criteria aimed at sustainable development in Vietnam, among others.

During the research process, the author reviewed numerous sets of criteria from various countries. However, it is not possible to introduce all of them, so only a few sets of criteria will be highlighted. Through this research, it has been shown that due to the differing conditions and requirements of each country, the framework and number of criteria also vary. For example, the set of criteria for

sustainable urban transportation by Christopher Kennedy (USA) is based on the three pillars of sustainable urban development: Economy - Society - Environment, but it delves into four groups of criteria: Governance - Finance - Infrastructure, and Resident Living. Meanwhile, the set of criteria from China is divided into six groups: Transport Function - Economic and Financial Group - Equity and Safety Group - Energy Consumption Group - Environmental Impact Group - Management Capacity Group, etc.

New contributions when synthesizing experiences

Contributing to the orientation to propose urban traffic criteria for sustainable development suitable for local (urban) research.

When proposing criteria available to localities: Inherit the existing criteria but flexibly adjust them to suit the conditions of urban development, institutions, culture and traffic behavior of Vietnam.

Inheriting experience helps the proposed criteria have more scientific and accurate evaluation indicators.

Scientific value

Contributing to the development of theories associated with the practice of sustainable urban traffic management in Vietnam.

Contributing to supplementing and enriching scientific theories on urban transport development in the direction of sustainability – a relatively new field in Vietnam.

Summarizing experiences to create favorable conditions for the development of integrated research directions between economy – environment – society applied in practice to the field of urban transport for sustainable development in Vietnam.

Research on the set of criteria for sustainable urban transport development is an important issue because it is a tool to evaluate urban transport planning and management, so many international experts have researched and proposed. For our country, through research, the proposed criteria are not many, but they are important proposals and ideas that open up for future development.

About the criteria group

The criteria for sustainable urban transport development are all linked to sustainable urban development, so they are all based on three important foundations: *Economy - Society and Environment*. These can also be considered as the criteria groups of the Criteria Set.

The common point of the Criteria Sets is that they are all based on the balance between 3 aspects: Economy, society, environment to set out criteria for developing a sustainable, comprehensive, and effective urban transport system.

About the number of criteria in each group of criteria

The views of scientists in the world and in the country show that there are common criteria and there are criteria that in different conditions will have different criteria.

About the criteria

In each set of criteria, depending on the purpose, requirements and different conditions, the author chooses whether the criteria will be qualitative or quantitative.

5. Conclusion

It is necessary to develop a set of criteria to evaluate sustainable urban transport development. These criteria must directly or indirectly reflect the main characteristics of sustainable development, which are economic, social and environmental.

The development of a set of criteria can be applied as a tool for managing, monitoring, and evaluating the effectiveness of traffic management in a specific urban area. When linked to the specific conditions of that city, it will help the city gradually develop a more modern and sustainable urban transportation system. Regarding the current state of transportation development in Vietnamese cities, the "management" factor plays an important role. Therefore, when developing a set of "sustainable urban transportation" criteria for a specific city, it is necessary to integrate "management" along with the three pillars of sustainable development: Economy - Society - Environment. This research direction can be expanded to other cities to compare and adjust the criteria to suit different local conditions.

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