Concept of Sustainable Urban Mobility

Dr. Narayana Srikanthreddy
Arun Kumar Pipersenia

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CHAPTER 1

THE URBAN MOBILITY CHALLENGE

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ABSTRACT:

Urban mobility is a critical challenge facing cities around the world. As urban populations continue to grow, the demand for efficient and sustainable transportation options has become increasingly urgent. However, the existing infrastructure, planning, and policies for urban mobility are struggling to keep up with the rapid pace of urbanization, resulting in a range of challenges that cities must address. This paperexamines the urban mobility challenge and highlights key issues that cities face in achieving efficient, sustainable, and inclusive transportation systems. First, the issue of congestion and traffic gridlock is a major obstacle to urban mobility. Increasing numbers of vehicles on the road, inadequate public transportation options, and limited infrastructure for active transportation such as walking and cycling have led to chronic traffic congestion in many cities, resulting in lost time, increased pollution, and reduced quality of life. Second, the environmental impact of urban mobility is a pressing concern.

KEYWORDS:

Congestion, Environmental Impact, Sustainability, Traffic Gridlock, Transportation.

INTRODUCTION

Hyper-mobility the notion that more travel at faster speeds covering longer distances generates greater economic prosperity seems to be a distinguishing feature of urban areas, where more than half of the world's population currently reside. By 2005, approximately 7.5 billion trips were made each day in cities worldwide.1 In 2050, there may be three to four times as many passenger-kilometres travelled as in the year 2000, infrastructure and energy prices permitting.2 Freight movement could also rise more than threefold during the same period.3 Mobility flows have become a key dynamic of urbanization, with the associated infrastructure invariably consti- tuting the backbone of urban form. Yet, despite the increasing level of urban mobility worldwide, access to places, activities and services has become in- creasingly difficult. Not only is it less convenient – in terms of time, cost and comfort to access loca- tions in cities, but the very process of moving around in cities generates a number of negative externalities. Accordingly, many of the world's cities face a un- precedented accessibility crisis, and are characterized by unsustainable mobility systems.

This report examines the state of urban mobility in different parts of the world. It explores the linkages between urban form and mobility systems, with a view to determining the essential conditions for promoting the sustainable movement of people and goods in urban settings. This introductory reviews key issues and concerns of urban mobility and provides a framework for the

content of the rest of the report. It outlines development trends impacting on urban mobility and then discusses urban mobility issues of the twenty-first century, including the challenges of fostering sustainable mobility[1].

Current urbanization patterns are causing un- precedented challenges to urban mobility systems, particularly in developing countries. While these areas accounted for less than 40 per cent of the global population growth in the early 1970s, this share has now increased to 86 per cent, and is projected to increase to more than 100 per cent within the next 15 years, as the world's rural population starts to contract. What is perhaps even more striking is the regional patterns of urban population growth. An increasing share of this growth is projected to occur in Africa (19 per cent of total annual growth today, compared to 43 per cent in 2045), while the combined annual urban popula- tion increase in developed countries, China, Latin America and the Caribbean is projected to decrease from 46 per cent of the total today to 11 per cent in 2045. Thus, it is the world's poorest regions that will experience the greatest urban population increase. These are the regions that will face the greatest challenges in terms of coping with increasing demands for improved transport infrastructure. In fact, projections indicate that Africa will account for less than 5 per cent of the global investments in trans- port infrastructure during the next few decades.

A major point of departure for this report is that sustainable mobility extends beyond technicalities of increasing speed and improving the effective- ness and efficiency of transport systems, to include demand-oriented measures (e.g. promoting walking and cycling, and reducing the need to travel), with the latter representing a pivotal factor in achieving relevant progress. It suggests that the prevailing challenges of urban mobility are consequences of the preoccupation with the means of mobility rather than its end – which is the realization of accessibility. This first of the report starts with a discussion of the need to focus on access as the basis for urban mobility planning. it urges urban planners and decision-makers to move away from a 'transport bias' in urban mobility planning, towards a focus on the human right to equi access to opportunities. this is followed by a brief analysis of global condi- tions and trends with respect to the urban movement of people and goods. the last part of the provides a brief discussion of the social, environ- mental, economic and institutional dimensions of sus- tainability in urban mobility systems[2].

Despite the increasing level of urban mobility worldwide, access to places, activities and services has become increasingly difficult. Sustainable mobility extends beyond technicalities of increasing speed and improving the effectiveness and efficiency of transport systems, to include demand-oriented measures. While the speed and efficiency of travel are important, more critical however, is the ease of reaching those destinations in terms of proximity, convenience as well as positive externalities.

DISCUSSION

Accessibility is at the Core of Urban Mobility: In directing attention beyond transport and mobility, and giving prominence to the aspect of accessi- bility, this report calls for a paradigm shift in trans- port policy. This alternative approach emphasizes the need to reduce the global preoccupation on mobility enhancement and infrastructure expansion. This kind of transportation planning has been implicated in problems of environmental degradation and social isolation. However, most fundamentally, a focus on mobility as a transportation-policy goal neglects the

consensus view that the vast majority of trips are not taken for the sake of movement per se, but in order to reach destinations, or more broadly, to meet needs[3].

While the speed and efficiency of travel are important, more critical however, is the ease of reaching those destinations in terms of proximity, convenience as well as positive externalities. Trans- port and mobility as derived demands are treated as means for enabling people to access other people and places. Reducing the need for such demands and minimizing travel time also entails optimizing the value of being at the destination. Mobility is thus properly viewed as a means to the greater end of accessibility. Nonetheless, it is not the only means to this end: accessibility can be enhanced through proximity, as well as electronic connectivity. As a result, enhancing accessibility places human and spatial dimensions at the core of sustainable mobility. This focus on accessibility emphasizes the needfor a holistic and integrated approach to sustainable urban mobility. It establishes a link between urban form (in terms of shape, structure, function as well as demographics) and urban transportation systems. Particular attention is given to the urban form's potential to support the increased proximity of places and functions, thus minimizing the need for extended movement. Land-use planning ensures the proximity and compactness of locations, and diversifies func- tions, so as to cater to a variety of needs.

The accessibility focus for sustainable mobility also entails paying due consideration to the built form of the city, particularly the optimization of urban density and the fostering of a sense of place. The combination of high-density settlements, strong sense of place and mixed-used functions not only minimize the need for extended movement, but also enhance economies of agglomeration and encourage non- motorized mobility. Furthermore, appropriate design and layout of streets and neighbourhoods, proper allowance for building configuration and density, and streamlined arrangement of arterial streets and roads, should also be taken into account. The backbone of accessibility-based urban mobility is public transport, particularly high-capacity public transport systems that are well integrated in a multi- nodal arrangement[4].

The bottom line for accessibility is not the hardware; rather it is the quality and efficiency of reaching destinations whose distances are reduced. Equally important is the affordability and inclusive- ness in using the provided facilities. Sustainable mobility is thus determined by the degree to which the city as a whole is accessible to all its residents, including low-income earners, the elderly, the young, the disabled, as well as women with children. Furthermore, transport interventions should be explicitly targeted to prevent negative outcomes. By permitting high levels of innovative services and giving priority to public and non-motorized transport, the need for private cars is reduced. Strategies to change public attitudes and encourage sustainable forms of mobility thus have a key role to play[5].

This alternative approach also brings to the fore the human rights dimension of sustainable mobility: 'the right to mobility is universal to all human beings, and is essential for the effective practical realisation of most other basic human rights'.4 Beyond the policy implications of such a profound acknowledgement, the observation also has an important bearing on this report. Recognizing mobility as an entitlement i.e. to access destinations, functions or services implies a focus on people, and underscores the need to pay attention to the obstacles that prevent them from reaching destinations. Consequently, mobility is not only a matter of developing transport infrastruc- ture and services, but also of overcoming the social, economic, political and physical constraints to movement. These constraints are influenced by factors such as: class, gender relations, poverty, physical disabilities, affordability, etc. Mobility is thus about granting access

to opportunities and em- powering people to fully exercise their human rights. Thus, associating sustainable mobility with human rights takes it beyond the realm of func- tionality and economic justification. Instead it places the issue at the same level as other essential elements required for the full realization of human rights. Indeed, there is a general consensus that all the political, social, cultural and economic rights cannot be realized without the component of accessibility and thus equi mobility. The underlying premise within a human rights perspective is that mobility is not simply about reaching destinations; in the final analysis, it is about accessing opportunities. In this regard and acknowledging that access is a tacit right that all human beings are entitled to there is a need to ensure that any constraints to enjoying this fundamental entitlement are removed[6].This report illustrates the contextual circumstances of urban mobility challenges, which have restricted access to cities by various social groups. Working towards sustainable mobility, renewed efforts within and between governments, are essential in ensuring that solutions are inclusive, participatory, and that all budgetary and resource implications meet the needs of all citizens.

The Transport Bias of Mobility

In many cities of the world, the equation of 'mobility' with 'transportation' has fostered a tendency towards increasing motorization, and a propensity to expand the network of urban roads. Highway structures, including viaducts and flyovers, tunnels and foot-bridges have become standard features of the modern city and urban landscape. Encouraging this whole process is the excessive sectorization of transportation planning and management. Apart from causing a spiral of negative externalities, this approach further distorts the urban form and severely undermines the environmental, social and economic sustainability of cities. A major missing link which this report underscores is that sustainable mobility entails and indeed requires a closer connection between transport and land-use planning.Globally, the transport bias of urban mobility is demonstrated by the dominance of motorization, and particularly private motor vehicles as the preferred means of mobility. In 2010, there were more than 1 billion motor vehicles worldwide excluding two- wheelers. Based on data from 2005, nearly half of all urban trips were made by private motorized modes, a that continues to climb. By 2010, developed countries had, on average, ten times as many motor vehicles excluding two-wheelers per capita as developing ones.

Meteoric increases in the number of motor vehicles in developing countries mean that a redistribution of the 'global travel pie' is unfolding. By 2035, the number of light-duty motor vehicles cars, sports utility vehicles (SUVs), light trucks and mini-vans is projected to reach nearly 1.6 billion (1.2). The majority of these will be found in developing countries, especially China, India and other Asian countries. China alone is projected to have approximately 350 million private cars by 2035, nearly ten times as many as they had in 2008.8 In some rapidly emerging economies such as India, the number of cars, trucks, and motorized two-wheelers on city streets is growing at a rate of more than 20 per cent annually. Mexico City's car population is increasing faster than its human population two new cars enter into circulation every time a child is born. In India, private vehicle growth exceeds population gains by a factor of three. The extent of global motorization is a major cause for the increasing trends in energy use and carbon emissions worldwide. This has fuelled low- density development and sprawling urban forms, which have gradually increased the dependence on motorized transport. Furthermore, government policies in the United States (US) have contributed towards shaping car-dependent settlement patterns. Following the Second World War, the US govern- ment invested heavily in

high-capacity highways and freeways and subsidized home mortgages, while most of its European counterparts channelled funds into development of urban rail systems, and social and market-rate housing near public transport stops. Mobility is not only a matter of developing transport infrastructure and services, but also of overcoming the social, economic, political and physical constraints to movement. In many cities of the world, the equation of 'mobility' with 'transportation' has fostered a tendency towards increasing motorization, and a propensity to expand the network of urban roads. Another feature of the transport bias has been heavy investments in infrastructure[7].

However, global motorization explains only part of the increasing energy use and greenhouse gas emissions worldwide. Other contributing factors relate to economic growth and rising incomes, especially in developing countries. From 2002 to 2007, China's per capita incomes almost doubled, and car ownership nearly tripled. Car dependency is also served by a cultural and commercial system, which promotes the car as a symbol of status and personal freedom. Therefore, many developing countries perceive motorization as a condition for development. Conversely, evidence from an analysis of the relationship between car use and gross domestic product (GDP) per capita levels between 1970 and 2008 in eight developed countries shows that travel distances by cars may have peaked and that further increases in GDP per capita are unlikely to lead to increased travel distances. Another recent study found that the annual increase in car use per capita in developed countries fell from 4.2 per cent in the 1960s, to 2.3 per cent in the 1990s, to 0.5 per cent from 2000 to 2010.15 Saturation occurs partly because the amount of additional wealth that people choose to spend on travel is reduced when incomes reach a certain point. In the US, for instance, households earning US$50,000 per year averaged more kilometres of vehicle travel in 2009 than households with twice as much annual income. Moreover, factors such as shrinking city sizes and lifestyle changes are contributing to levelling off of car ownership and usage in developed countries. Furthermore, increasingly ageing populations further contribute to the stabilization of motorization rates.

In many transitional countries, the shift to capitalist economies has been accompanied by an explosive growth in the number of freight vehicles, particularly trucks. From 1993 to 2009, truck traffic grew by 165 per cent in Poland, 213 per cent in Croatia, and 247 per cent in the Czech Republic. Many trucks are old and are kept running for longer than the manufacturer's estimated lifetime, aggravating energy requirements, local environ- mental problems and carbon emissions. In Asia's rapidly industrializing cities, globalization and consumerism have given rise to a wide variety of freight-carrying modes trucks, pickup vans, trailers, ropeways and railways that coexist with non- motorized modes such as cycle rickshaws, animal- powered carts and head-loading. For every truck in Delhi, India, there are about five feeder informal motorized goods vehicles, five non-motorized vehicles and five to ten head-loaders [8].

Another feature of the transport bias has been heavy investments in infrastructure. In China, for example, the total length of urban roads more than doubled in the 13-year period between 1990 and 2003. During the same period, the total area allocated to roads more than tripled. Similarly, in Nairobi, Kenya, a total of 143 kilometres of urban roads was either newly constructed or rehabilitated for a total cost of US$537.8 million between 2008 and 2012.23 This is a substantial amount for a young African economy, and was invested mainly to increase traffic flows and to enable faster mobility. In European countries, road infrastructure accounted for more than two-thirds of infrastructure investments in the transport sector between 1995 and 2010.

The global expansion of mobility encompasses great innovations that have linked transportation with intelligent communication systems, transforming the way in which people organize their travel and communication considerably. The interplay of these systems has redefined the core of social interaction and urban life. Accordingly, the evolving trans- port system of the last century is firmly rooted in a number of key components including motorized modes, oil industry, consumerist lifestyles, global procurement of oil, spatial and infrastructure plan- ning, urban and street design and societal values that embrace mobility as part of what constitutes high quality of life standards.

Some of the forces promoting the transport bias

The rapid motorization of many of the world's cities is further compounded by expanding globalization, rising trade flows and incomes, leading to an enhanced demand for personal mobility. In many parts of the world, and particularly in developing countries, the private car has become a status symbol, depicting affluence and success in life. A prime example is the largely unregulated large-scale importation of used vehicles to developing countries. Evidence suggests that over 80 per cent of the vehicle stock in Peru was originally imported as used vehicles from the US or Japan.26 Similarly, in many African countries, import-liberalization policies introduced during the 1990s made it easier and cheaper for households to buy second-hand vehicles imported from overseas.

A number of influential converging factors such as economic policies that maintain fuel subsidies and planning practices that incentivize suburban residential developments, large malls and retail centres with extensive parking all play a role in increasing motorization. The suburban development that supported the car culture allowed people to live in low-density residential areas that, although requiring a longer commute, were cheaper in terms of land prices. Some examples include the rise of new 'urban villages' such as Mahindra World City in Chennai (India), Gurgaon satellite town near Delhi (India) and Tlajomulco in the urban agglomeration of Guadalajara (Mexico). Similarly, in Metro Manila, the Philippines, new settlements described as 'exurbia' have emerged during the last two decades, including Bulacan, Pampanga, Rizal, Quezon, Cavite, Laguna and Batangas, all of which have been converted into gated communities and sustained by dependence on car-based transportation.27 It should also be mentioned that between 1970 and 1990, Los Angeles, US, sprawled an additional 1020 square kilo- metres, during which time the population increased by 3.1 million residents Such planning choices ensured that the car became an essential part of most people's trans- portation needs. In many instances, governments at all levels have also accelerated sprawl by building more roads to the urban fringe. For example, despite having only 10 per cent more freeway kilometres, Chicago has more than twice as many residents as Houston. The increasing trend to build more roads in Houston has encouraged development to shift to newer areas, with minimal bus service. This has reinforced the vicious circle of car dependency, where the new roads develop their own congestion problems. In 1999 alone, Houstonians lost 36 hours per person as a result of traffic congestion, more than commuters in all but three other American cities (Los Angeles, San Francisco and Dallas).

The fragmentation and sectoralization of the management of urban development in many parts of the world is also reinforcing the dominance of the traditional 'transport bias' in urban mobility systems. Much has been documented about the proliferation of institutions in both developed and developing countries. the poor linkage between land-use and transport planning has encouraged

the tendency towards increased transport investments. The latter delivers immediate visible infrastructural outputs with direct outcomes and impacts benefiting a range of interests and having higher political pay-off, at least in the short run.

Beyond the strategic and economic dynamics within countries, global forces in much of the. The fragmentation and sectoralization of the management of urban development in many parts of the world is also reinforcing the dominance of the traditional 'transport bias' in urban mobility systems. The 'Fordist' pattern of accumulation which prevailed after the Second World War – promoted a distinct spatial urban landscape and system of governance, which was hierarchical and highly fragmented second half of the twentieth century fostered a spatial pattern that provided a justification for the traditional transport bias of urban mobility systems. The 'Fordist' pattern of accumulation which prevailed after the Second World War promoted a distinct spatial urban landscape and system of governance, which was hierarchical and highly fragmented. The core–periphery delineation was replicated across all levels, with a set of cities acquiring the status of global centres for driving the system of globalization. At the city level, the centrality of manufacturing and trading was facilitated through spatial segregation and by maximizing the economies of urbanization. Towards the last quarter of the twentieth century, greenfield land, suburban housing and urban infrastructural investments became the avenues for illicit wealth generation that caused the global financial crisis. In many parts of Europe, the US and Latin America there are swaths of real estate spread out in the suburban areas and exurban regions that were part of such schemes.

The highways and boulevards leading to these sites further enhanced the motorization trend. It has been estimated that between 1950 and 2005, raw material extraction biomass, fossil-energy carriers, ores and industrial minerals, construction minerals increased from 10 to 60 billion metric tonnes, excluding water and land resources. The most significant increase came from the extraction of construction materials and ores/industrial minerals. In 1900, biomass accounted for almost 75 per cent of total material use; however its share had dropped to only one-third by 2005, indicating that the global economy has gradually reduced its dependence on renewable materials (i.e. biomass) and increased its dependence on finite mineral resources, which cannot be replaced. While demand was increasing, for a long time prices were also declining, thus encouraging increased dependence on the finite resources, including, in this case, motorization as the dominant mode of mobility.

Trends and Conditions in Transport-Oriented Mobility Systems

This section provides an overview of global trends and conditions, with transport as the main focus of improving mobility and enabling access. It examines formal and informal modes of transport, including walking and cycling. Furthermore, the implications of rapid motorization on economic performance and social equity in cities are discussed. An overview of the alternative to transport-oriented mobility will be provided in s 5 to 8; specifically, the components of an accessibility-based sustainable mobility.

Varying but declining dominance of public transport

In 2005, 16 per cent of all trips in urban areas worldwide were by some form of public transport (i.e. formal, institutionally recognized services, such as buses and rail-based public transport). The role of public transport in individual cities varies widely, accounting for 45 per cent of urban trips in some cities of Eastern Europe and Asia, 10 to 20 per cent in much of Western Europe and

Latin America, and less than 5 per cent in North America and Sub- Saharan Africa. In 2001, more than half of all mechanized trips (i.e. excluding walking) in Hong Kong and Eastern European cities (such as Bucharest, Romania; Moscow, Russia; and Warsaw, Poland) were by public transport, compared to an average of about 25 per cent for Western European cities, and less than 10 per cent in the high-income, car-oriented cities of Dubai (United Arab Emirates), Melbourne (Australia) and Chicago (US). However even within Western Europe, the role of public transport varies sharply, capturing more than a third of all mechanized trips in rail-served cities such as Berlin (Germany), Helsinki (Finland), Lisbon (Portugal) and Vienna (Austria) and fewer than 10 per cent of mechanized trips in European cities such as Ghent (Belgium), Lille (France) and Glasgow (UK)[9].

In cities of developing countries, the role of public transport varies markedly, particularly among African cities. Only a handful of Sub-Saharan Africa cities (such as Addis Ababa, Ethiopia; Abidjan, Côte d'Ivoire; and Ouagadougou, Burkina Faso) have developed public transport systems, including formal buses and informal shared taxis, and rail-based modes. In Egypt for example, Cairo's metro has been operational and expanding since 1987. Similarly, a modern light rail system in Tunis, Tunisia, has been successfully operating since the early 1990s. In Cairo, public transport (formal and informal) accounts for more than 75 per cent of daily motorized trips. In South-Eastern Asia, conventional 50-passenger buses are the workhorse of the public transport networks of most cities. In Bangkok, Thailand, 50 per cent of passenger trips are by bus, rising to 75 per cent during peak hours. In Eastern Asia, buses serve slightly larger shares of mechanized trips than metros in Taipei, China (14.4 versus 12.9 per cent) and Shanghai, China (12.9 per cent versus 5.7 per cent); whereas metros are more dominant in Hong Kong, China (35.5 per cent of mechanized trips); Seoul, Republic of Korea (34.8 per cent); and greater Tokyo, Japan (57 per cent). Throughout Latin America, buses dominate, even in rail-served cities such as São Paulo (Brazil), Santiago (Chile) and Buenos Aires (Argentina). As noted in the world's most extensive bus rapid transit (BRT) networks are currently found in Latin America, where a total of 18 cities currently have some form of BRT system.

Despite growing concerns over energy supplies, climate change and access for the poor, public transport's modal share of trips is expected to decline over the next decade in all world regions. If recent trends continue, the number of trips made by public transport will increase by around 30 per cent between 2005 and 2025, an estimate that is far less than the 80 per cent growth in trips by private motorized vehicles over the same period. In recent years, public transport's downward spiral has been most pronounced in Eastern Europe. The transition to capitalist economies has brought with it substantial public transport services cuts and disinvestments the same kind of vicious cycle that has marginalized public transport in more advanced economies.The declining market share of trips served by public transport is cause for concern since they are the most efficient forms of motorized mobility, particularly for low-income earners. The low and decreasing role of public transport renders it even more complicated to foster an effective linkage between land-use and transport planning. More effort is devoted to control and regulation of the private and informal sector operators whose main motivation is increasing profit[10].

Informality

Worldwide, the informal transport sector provides much-needed and much-valued mobility, particu- larly for the poor. The lack of affordable and accessible public transport systems in developing countries has led to the proliferation of informal operators, such as private microbus

and minibus services. These modes help fill service gaps but can also worsen traffic congestion and air quality. In some settings, informal carriers are the only forms of public transport available. In India, for example, only about 100 of the more than 5000 cities and towns have formal public transport systems. Accordingly, conventional public transport has been replaced by more ubi- quitous but less affordable paratransit such as motorcycle taxis, rickshaws, jeepneys and jitneys. Since cities in poorer countries seldom have the institutional and financial capacity to increase and sustain public transport systems – and private firms typically lack the capital and incentive to provide comprehensive transport systems – small, private and informal systems prevail. Like many market-based solutions, they provide a service that must be filled, but not without compromises to the environment and lack of service to those who are marginalized or live in less profit-rich locations. These are called informal public transport or paratransit, because they serve the public and are essentially providing a public good.

CONCLUSION

The challenges of urban mobility are multifaceted and complex. Issues such as congestion, environmental impact, equity, and rapid technological advancements present significant hurdles that cities must overcome to achieve efficient, sustainable, and inclusive transportation systems. Addressing these challenges requires collaborative efforts among policymakers, urban planners, transportation providers, and community stakeholders. Efforts to reduce congestion and traffic gridlock may involve implementing smart traffic management systems, expanding public transportation options, and promoting active transportation modes. Mitigating the environmental impact of urban mobility may require transitioning to low-emission and electric vehicles, improving infrastructure for sustainable transportation, and promoting multi-modal transportation options. Equity and accessibility in urban mobility can be achieved by ensuring that transportation options are affordable, reliable, and accessible to all members of the community, regardless of income, age, or ability. This may involve targeted interventions in underserved communities, improving transportation options for vulnerable populations, and promoting social inclusion through transportation policies and initiatives.

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CHAPTER 2

A BRIEF EXPLANATION ON NON-MOTORIZED TRANSPORT

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ABSTRACT:

Non-motorized transport (NMT) refers to the use of human-powered modes of transportation such as walking, cycling, and the use of non-motorized wheeled vehicles such as skateboards, scooters, and wheelchairs for commuting, recreation, and other purposes. NMT is gaining increasing attention as a sustainable and healthy form of transportation that offers numerous benefits to individuals, communities, and the environment. The challenges and barriers to NMT adoption are also discussed, including safety concerns, inadequate infrastructure, lack of policy support, and cultural perceptions towards NMT. The abstract explores strategies to promote NMT, such as developing NMT-friendly infrastructure, implementing supportive policies and regulations, promoting awareness and behavior change, and fostering multi-sectorial collaborations.

KEYWORDS:

Bicycles, Cycling, Pedestrian, Skateboarding, Transport, Walking.

INTRODUCTION

When public transit is insufficient and incomes are low, non-motorized transportation is often the predominant means of urban movement. The two primary forms of urban non-motorized transportation, walking and bicycling, accounted for around 37% of trips done in cities throughout the globe in 2005. Walking is the primary form of transportation for extremely short distances in both industrialized and developing nations. Walking has a very high potential modal share. Walking makes about 30-35 percent of all journeys in African cities. Evidence suggests that non-motorized transport is a significant factor in poorer and smaller cities, accounting for as much as 90% of all person-trips. In addition, in densely populated urban centers, non-motorized transport provides access to places that motorized modes cannot reach and is frequently the fastest way to get around. The share is much higher in Dakar (Senegal) and Douala (Cameroon), at over 60%. More over half of all passenger and cargo movements take place on foot, bicycles, or rickshaws in South Asia's densest, busiest cities.

When the weather and geography allow it, walking is often the poorest people's sole means of transportation. Many individuals in underdeveloped nations "captive walk," that is, they walk because they cannot afford to use another kind of transportation. For them, being able to satisfy their daily requirements requires a well-connected and secure pedestrian environment. Walking has a huge influence on poverty since it is the least expensive means of transportation and helps the very poor lower their daily costs. The most obvious signover the next ten years, public

transportation is anticipated to lose ground as a mode of travel in all parts of the globe. Since public transportation is the most effective mode of motorized transportation, especially for low-income individuals, it is a matter for worry. The unofficial transportation industry offers much-needed (and highly-appreciated) movement to people all throughout the world, especially the impoverished. When public transit is insufficient and incomes are low, non-motorized transportation is often the predominant means of urban movement. Many individuals in underdeveloped nations "captive walk," that is, they walk because they cannot afford to use another kind of transportation. The existence of slums and squatter populations is a key indicator of poverty in many cities, especially in developing nations, as is the disconnect between land-use planning and transportation infrastructure. In these slums, there is extremely little room for mobility, which limits the options for the urban poor to find work and money. The impacted population is thereby compelled to limit their travel to necessary journeys linked to employment, education, and shopping.

The promotion of walking and cycling is essential in the development of transportation policy that represent sustainable mobility. The bicycle provides a reasonably cheap way to improve the accessibility of the poor and is by far the most energy-efficient mode of passenger transportation. Bicycles are often utilized in industrialized nations as a stepping stone to public transportation systems. Bicycles have historically played a significant role in Chinese cities; the Netherlands is a well-known example, where bicycles account for more than 40% of journeys in certain towns.51 The largest non-motorized transport shares are found in smaller Chinese cities, ranging from 70% to 80%[1], [2].

Dangerous and congested roads, as well as the lack of protected lanes, have discouraged cycling in many African cities.54 However, bicycles can be an important source of economic livelihoods, as evidenced in Kisumu, Kenya, where bicycle-taxis (bodaboda) ferry commuters across town for half the price of a matatu ride, or in Bukoba, Tahiti.Cycle rickshaws, which mostly carry women and children, are used as "mass transportation" in Bangladesh, India, Pakistan, and Sri Lanka. Around 40% of school excursions in Dhaka, Bangladesh, include riding in a rickshaw.56 Additionally, rickshaw driving often provides an entrance point into the labor market for unskilled rural migrants to South Asian cities. Despite the fact that 2.5 million people in Dhaka, or 20% of the population, rely on driving rickshaws for their livelihood in some way, rickshaws are prohibited from the city's major thoroughfares because they slow down motorized traffic and, in the opinion of some public officials, harm the city's reputation as a modern metropolis.

Congested Roads

A significant barrier to access in cities is traffic congestion, an unfavorable by-product of the increasing use of mobility in urban areas across the globe. Drivers in Moscow, Russia, reported an average daily delay of two and a half hours.59 With a 24 percent annual growth rate in the number of registered motor vehicles, traffic conditions are deteriorating most rapidly in Beijing, China.60 In mid-2010, a "epic" 100-kilometer, nine-day traffic jam was reported in China's Heibei Province - along a major highway.

The quality of life in cities, the use of fossil fuels, air pollution, and economic development and wealth are all significantly impacted by congestion. According to World Bank studies from the 1990s, traffic congestion reduced cities' GDP by about 3-6%, with the higher value mainly affecting rapidly expanding cities (such as those that rely on just-in-time manufacturing and

inventorying as well as other time-sensitive activities)63. Time lost due to traffic congestion is estimated to cost the equivalent of 2% of GDP in Europe and 2-5% of GDP in Asia64.

A key indicator of the disconnect between land-use planning and transportation systems is traffic congestion. It not only highlights the shortcomings of a mobility bias that is transport-oriented, but it also illustrates how well a city's land-use policies work. The increased demand for motorized mobility combined with limited road capacity helps to explain why traffic is becoming worse. In general, cities in developing nations devote a smaller percentage of their total land area to streets than do cities in developed nations.67 In India, the 1990s saw an annual growth rate in traffic of roughly 5% in Mumbai, 7% in Chennai, and 10% in Delhi. None of these cities, however, has increased the number of roads they have by even 1% yearly.

The inadequate amount and form of road infrastructure is often linked to fast population increase in the majority of emerging nation cities. Comparatively to cities of a comparable size in industrialized countries, Nairobi, Kenya, which has a population of around 3.5 million, lacks collector streets and main thoroughfares to handle traffic needs. The majority of the city's arterials are radial, and the lack of circumferential roads funnels many peripheral trips into the CBD, having a significant impact on traffic flows69. Central Bangkok, Thailand, has a fishbone street pattern, with narrow local streets that direct the majority of motorized trips onto congested thoroughfares. The lack of numerous collector-distributor roads has made traffic flow patterns less effective.

DISCUSSION

Road congestion in developing nations is made worse by excessive allowances for local access or other encroachments into the lane. The most frequent types of invasion are brought on by informal transportation providers and street vendors working together to obstruct traffic flow. Street sellers take up around a third of the road space in busy towns in Sub-Saharan Africa.71 Another issue connected to congestion is the lack of traffic control in many developing nations. In Lebanon, traffic congestion is made worse by insufficient road signage, a failure to manage scarce parking spaces, and a culture of aggressive, unruly driving. Freight movements can also exacerbate congestion. Phnom Penh, Cambodia, has 864 kilometers of roads but only 36 traffic signals. The majority of developing nations lack essential infrastructure for the transit of commodities, including freight terminals, warehouses, parking and staging spaces, freight-forwarding centers, and other logistical requirements. Few cities in poor nations particularly plan for freight movements; as a result, unplanned, dysfunctional arrangements of urban logistics are often the norm. Heavy trucks contribute to (and suffer from) poor-quality roads because wear-and-tear exponentially rises with the dead-axle weight of a vehicle (e.g. one heavily loaded truck can inflict as much road damage as 10,000 passing cars). One example is Lomé, Togo, where the lack of a bypass road around the city forces trucks to leave the port and head directly into the core of the city[3], [4].

Urban Mobility's Sustainability Problems

A sustainable urban mobility system is one that meets present-day urban mobility needs without jeopardizing the ability of future generations to meet their own needs, according to the seminal Brundtland Report of 1987.76 The concept of sustainability in urban mobility has expanded beyond a focus on ecology and the natural environment to also include social, economic, and institutional dimensions. Additionally, it has evolved beyond the focus on flows and mobility in

urban environments to include ways to improve closeness in space. Urban regions must adopt a comprehensive and integrated strategy to land use, transportation, and investment if they are to become socially, ecologically, and economically viable.

Accordingly, the study and analysis of urban mobility in this paper takes into account the social, environmental, economic, and institutional dimensions the four pillars of sustainability. Given the significant synergies and mutual advantages, they are neither independent nor isolated. By implementing taxation measures that help preserve energy, for example, seeking economic sustainability may also assist the environment. While regulatory and fiscal instruments can be used to promote urban sustainability, as previously mentioned, the most effective mechanism is the effective utilization of the planning process. In the early 2000s, Japan gradually reduced ownership taxes on fuel-efficient vehicles by 25 to 50% and imposed higher charges on large-engine vehicles, including vehicles that were more than ten years old.

Combining Planning for Land Use and Transportation

The ability to move around urban area is the ultimate purpose of mobility, as was mentioned in the sections above. The ease and convenience of reaching sites depends heavily on relationships between them as well as on the conveniences and obstacles that exist between them. The planning of urban space is the first step in creating a sustainable transportation system. The major goal is to lessen the requirement for mobility by cutting down on the number of trips and distance traveled. As a consequence, urban density is maximized and urban space usefulness is improved. Moving the focus from transportation to people and places is necessary for sustainability. In terms of operations, it continues to push for the innovation of transit systems and even other forms of communication, while putting a focus on simplifying space use in its interactions with people.Urban sprawl, which can be seen in most modern cities, was caused by ignoring the relationship between land use and transportation. In developed nations, the urban land area has doubled since the Second World War, whereas in developing nations, it has increased by a factor of five.79 From 1995 to 2005, 85% of the 78 largest cities in developed nations saw faster growth in their suburban areas than in their urban cores.80 In Europe, studies of land-cover changes show that cities in Estonia, Latvia, Croatia, Slovakia, Poland, Hungary, and Bulgaria are experiencing the fastest growth[2].

Urban sprawl in many developing nations consists of two primary, opposing patterns of development in the same metropolis. Large peri-urban zones with unlawful and unauthorized land use practices describe the first. This is coupled with a dearth of infrastructure, public amenities, and basic services. Additionally, there is often a lack of or insufficient access to public transportation. The second is a kind of "suburban sprawl" in which highly prized business and retail complexes and residential areas for high- and middle-income groups are well linked by private motorized cars rather than by public transportation.Without legislative restrictions and long-term urban planning, sprawl is likely to pick up speed. Spread-out expansion patterns not only increase reliance on personal vehicles but also deplete farms and open space, endanger estuaries and natural habitats, and place a heavy financial strain on local governments due to the high expenses of extending urban infrastructure and services.

Planning for land use also requires considering the various degrees of urban transportation. It moves down to the neighborhood and street level from the regional and metropolitan levels through the connections between cities. Mobility systems are greatly affected by the urban form, which may either result from a randomly placed process of situating communities and activity or

from a well planned intervention. Similarly, the layout of streets and neighborhood blocks influences a neighborhood's accessibility and fosters a feeling of place. Walking and biking may be encouraged or discouraged by the street's physical design. The layout of streets, the size of blocks, and the proximity of buildings to streets, stations, and major locations are all important factors in sustainable mobility.

One of the elements that affects the degree of connectivity within urban areas is the portion of urban land that is designated for roadways. How well the city's roadways are designed to accommodate the different types of transportation is another important consideration. According to a study, many cities in developing nations have low proportions of urban land set aside for streets, such as 6.1% in Bangui (Central African Republic), 6.1% in Yerevan (Armenia), 11.1% in Accra (Ghana), and 12.3% in Ouagadougou (Burkina Faso). This is true despite the fact that these cities are urbanizing quickly, a trend that is expected to affect their mobility and, ultimately, access levels. The same research discovered that developed cities had much greater percentages of land set aside for streets, with an average percentage of 29%.83 The relationship between urban land set aside for streets and the design of accessible cities is further examined.

Since the 1970s, land-use and transportation planning have been required and to some degree handled. However, implementing integrated land-use and transportation planning in real-world situations continues to be difficult, as does coping with pre-existing land-use patterns and transportation infrastructure that are often immovable, especially in older middle-sized or big cities. Therefore, it is necessary to focus study on such real-world problems. The tenets and concepts of sustainability may be put into practice while making such important choices for people and environments[1].

Social Aspects

Urban transportation is socially sustainable when mobility advantages are fairly and evenly dispersed, with little to no access disparities to transportation infrastructure and services based on factors such as income, social status, and physical characteristics (such as gender, ethnicity, age, or disabilities). Social sustainability is based on the accessibility concept, which states that all groups should have equal access to fundamental commodities, services, and activities including employment, education, health care, shopping, and socializing in order to support civic engagement. It acknowledges the crucial role that accessibility and mobility play in properly exercising human rights.

The cost of transportation options is a crucial component of accessibility, as was already mentioned. Affordable transportation enables everyone, including those on modest incomes, to access essential services and activities (such as healthcare, shopping, education, employment, and social activities) without straining their wallets. The accessibility of dependable and reasonably priced public transportation services may make a big difference in whether or not urban residents in developing nations are able to participate in the city's social and economic life. The urban poor are unable to escape the constraints of intergenerational poverty due to unaffordable mobility. Exorbitant public transportation costs also divert funds away from other necessities including food, healthcare, education, and housing.

Travelers often have to provide huge, perhaps astronomical portions of their money to private, sometimes unregulated paratransit operators in areas where governments are unable to build and support public transportation systems. Informal businesses always charge more per mile traveled

than those that are financially subsidized by the government, setting pricing at whatever the market will bear. To reach a metro terminal that offers inexpensive connections to the city and job opportunities, residents of the poor informal housing settlements on the outskirts of Mexico City sometimes take two to three separate collectivos (shared-ride taxis and microbuses). Travel can consume 25% or more of daily wages.85 Time costs can also be exorbitant: 20% of workers in Mexico City spend more time than they earn. Disability, age, and gender are additional factors in social sustainability. In many parts of the world, women are more likely than men to walk for nearly all trips, with 87 percent of women walking compared to 57 percent of men doing so in Bamako (Mali), 83 percent walking compared to 63 percent in Chennai (India), and 59 percent walking compared to 39 percent in Chengdu (China). In addition, women frequently plan complex trip chains, such as taking kids to school followed by shopping and other errands, in order to complete traditional f Lack of sidewalks and safe crosswalks, sexual harassment on packed buses, and security hazards from poorly lit streets and transit stops are some other transportation-related challenges.

The Americans with Disabilities Act in the US is one example of a law that guarantees equal and full access to public amenities including roads, rail-based public transportation, and buses for the elderly and handicapped in many industrialized nations. Few developing nations provide this kind of protection or create roads and transportation infrastructure that make it possible for the elderly and disabled to travel. A group that is even more at risk of transportation disadvantage is young people. School-age children and teens often travel long distances and through crowded hallways to get to their schools in Sub-Saharan Africa, putting them at risk for accidents and experiencing a variety of challenges and deprived conditions.

A high-quality urban transportation system must include safety. It covers both the safety of the infrastructure and the rolling stock as well as the security of the public while using the system (such as when going from their house to the bus stop). The number of traffic accidents has exploded worldwide. Around 1.2 million individuals worldwide lose their lives in traffic accidents every year, and another 20 to 50 million are injured.90 Up to 3% of GDP is lost to the economic expenses of traffic accidents. Despite only having 33% of the world's motor vehicles, developing nations account for the great majority (more than 90%) of road traffic accident fatalities. The gap between developing and industrialized nations' standards of road safety is growing. Road accident deaths decreased in affluent nations in the second half of the 20th century, while they drastically increased elsewhere for example, by 300 percent in Africa from 1980 to 2000. In low-income countries, traffic fatalities are forecast to more than quadruple between 2005 and 2030, whereas they are predicted to decline in richer ones. Rising road traffic collisions and deaths are attributed to a number of causes, including rapid urbanization, a greater dependence on motorized transportation to carry people and products, widening wealth gaps, and slack enforcement of traffic regulations[5].

Aspects of the environment

The dependence of the urban transportation industry on the non-renewable fossil fuel to power private motor cars is the foundation of many of its environmental problems. From 45.4 percent in 1973 to 61.5 percent in 2010, the transportation sector accounted for a majority of the world's oil consumption, and it is anticipated that this trend would continue (1.5). Conventional oil is more abundant than it has ever been, but because to fast motorization, many analysts feel it is doubtful that this energy supply will continue through the middle of the century. Prices for transportation

fuels grow as demand rises.98 End users must adjust to an increase in the cost of gasoline and diesel for motorized transportation.

Global warming and increasing greenhouse gas emissions highlight how urgent it is to wean the transportation industry off of its reliance on oil and automobility. Road transportation is responsible for 75% of all greenhouse gas emissions in the transportation sector globally.99 Global carbon dioxide (CO2) emissions from driving might increase by three times by 2050 compared to 2010.100 However, there are significant regional differences in the footprint of the trans- port sector, which accounts for 11% of greenhouse gas emissions in Shanghai and Beijing (China), 20% in New York City (US) and London (UK), 35% in Rio de Janeiro (Brazil) and Mexico City, 45% in Houston and Atlanta (US), and 60% in So Paulo (Brazil). Even in cities with comparable GDPs, levels of energy consumption for transportation vary greatly depending on urban layout, financial and taxing policies, and the effectiveness and affordability of alternative modes. CO2 emissions from transportation decrease as cities get smaller and denser.

For instance, despite having metropolitan areas that are more than four times denser than those of Australia, Austria produces just 60% as much CO2 per person as Australia does.102 Another crucial aspect is mode share: when more journeys are made on non-motorized and public transportation, energy consumption levels decline. In comparison to Japan and Germany, the US's per-capita energy consumption in the transportation sector was more than three times greater in 2007.103 This is partially explained by the modal share in these nations; for instance, public transportation accounts for 40% of all urban motorized trips in Japan, compared to just 4% in the US.104 Indeed, public transportation (bus, train, and trams) produces roughly a twelveth as much greenhouse gas emissions per passenger as a vehicle. The urban transportation industry also contributes significantly to air and noise pollution, which has detrimental effects on public health. Asthma and other respiratory disorders may be brought on by prolonged, recurrent exposure to high amounts of ozone and particles and can also impair lung function[6].

Economic Aspects

When resources are employed and allocated effectively to maximize the advantages and reduce the external costs of mobility, the urban transportation industry is economically viable. This protects investments made in the upkeep of transportation assets and infrastructure. Investments that are converted into roads, trains, and pedestrian and bicycle lanes boost employment, promote company growth, and boost GDP. Cost-effective transportation infrastructure is increasingly judged on its ability to attract loans and private investors, or if it is "bankable."Infrastructure for urban transportation is costly. In rising economies, it may account for a significant portion of the government budget. A $5 billion metro line is now being built in Ho Chi Minh City, Vietnam, while a new ring road in Jakarta, Indonesia, is anticipated to cost a comparable amount.106 It remains a significant task to develop trustworthy and equitable finance programs for trans- port infrastructure that recognize and reward effective and sustainable behavior.

Finances for public transportation are often severely constrained. Public subsidies are a staple of public transportation systems almost everywhere. Cities that pay for public transportation operations may be under heavy financial strain. Experience has shown that operational subsidies are often utilized to pay for increased worker salaries and benefit plans without corresponding advances in public transportation services.107 Cities in underdeveloped nations that lack sufficient budgetary resources eventually turn to operators in the informal sector to fill the gaps.

Lower-income communities run the danger of having to repay loans with depreciated local currency if they borrow money in foreign currency to develop transportation infrastructure.

Paying for continuing road upkeep and growth is another financial issue that cities confront on a global scale. Fuel taxes are often the main source of revenue for constructing new roads. However, such earnings have decreased in wealthy nations due to improved fuel efficiency and travel saturation. For instance, France's gains in fuel efficiency, which lowered average diesel vehicle CO2 emissions from 160 to 130 grams per kilometer, also significantly reduced government income.108 It has been suggested that taxes be changed to be based on kilometers traveled, which is now feasible thanks to advancements in technology like global positioning systems (GPS) and radio frequency identification devices[7], [8].

Dimensions of institutions and governance

It takes strong institutional and regulatory frameworks as well as supportive and nurturing governance to bring ideas and plans for sustainable urban transportation to life. In developing nations, it is sometimes difficult to plan, anticipate, foresee, conserve rights-of-way, construct, operate, and maintain infrastructure in order to manage and react to the growing demand for urban mobility. The advancement of sustainable urban transportation is hampered by a lack of adequate institutional capacity, whether in the form of a talent pool of trained and educated civil servants or a transparent and largely corruption-free procurement process.

Coordination of urban transportation services is hampered by institutional fragmentation.109 It often results in uni-sectoral activities and lost opportunities, such as the inability to locate new housing developments close to BRT stations, when urban sector duties are divided into many organizations, each with its own boards, employees, funds, and by-laws. Uncoordinated bus and train timetables, numerous fare payments (which raise user prices), and poorly integrated facility designs may all result from having too many public transportation service providers. Additionally, overgrown bureaucracy are infamous for wasting and holding up the implementation of urban transportation projects.The low participation of residents and diverse community interests in the planning and construction of urban transportation systems and services is another institutional gap. More inclusive, open, and democratic decision-making is required. Non-governmental organizations (NGOs) and civil society are given more voice and credibility when decision-making is decentralized.

Strategic planning and coordination skills are severely lacking in many cities across the globe, especially in developing nations. Institutions seldom have the time or resources to increase transportation infrastructure quickly enough to meet demand for travel. A well-managed transport authority that establishes precise and quantifiable goals and carefully evaluates the use of money in a transparent and accountable way is necessary in order to promote sustainable mobility programs or adopt effective pricing systems. The methods for coordinating multi-sectoral planning are often either ineffective or nonexistent. Given the variety of players, levels, and organizations involved, it is crucial to comprehend the relationship between land-use and urban transport planning[7], [8].

CONCLUSION

This has given a general overview of the implications of the rapidly urbanizing world, hypermobility, and the climatic and health risks of car-dependent cities, all of which are

inextricably intertwined. The structural underpinnings of today's urban transportation networks were developed throughout the last century in environments when resources were cheap, urban populations were low, and communication options were constrained. The worldwide trends covered in this article provide dangers and uncertainties, but they also present unheard-of potential for enhancing sustainable urban transportation. Cities should be more compact, support diversified land uses, and give priority to sustainable forms of transportation including public and non-motorized transportation in order to become more sustainable. Additionally, urban mobility networks must be inclusive and provide possibilities for everyone to move about. In order to construct and retrofit cities to better accommodate sustainable modes, improved urban planning will be essential. The greatest chance of raising the modal shares of sustainable modes of transportation is in compact, mixed-use communities with excellent pedestrian and bicycle infrastructure and regulatory measures that charge the full social cost of using private motorized cars. The way that trans- port users see transportation and its relationship to the city also has to change. The need that government institutions and planning procedures prioritize accessibility over mobility is particularly important. Additionally, policies that promote sustainable urban mobility must to include the institutional, social, environmental, and economic aspects of sustainability. This necessitates a framework for planning, designing, and delivering urban transportation systems and services that is more comprehensive and inclusive. Consequently, the existence of a supporting governance and regulatory framework is necessary for translating aspirations and plans for the future of sustainable urban transportation.

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CHAPTER 3

STATE OF URBAN PASSENGER TRANSPORT

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ABSTRACT:

Urban passenger transport plays a crucial role in shaping the sustainability, livability, and accessibility of cities around the world. As urban populations continue to grow, the demand for efficient, safe, and sustainable transportation solutions becomes increasingly important. This abstract provides an overview of the current state of urban passenger transport, including its challenges and potential opportunities for improvement. The abstract begins by highlighting the significance of urban passenger transport in the context of urbanization and its impact on social, economic, and environmental aspects of cities. It emphasizes the need for sustainable and integrated transport systems that cater to the diverse mobility needs of urban residents, including public transportation, shared mobility, active transportation, and emerging technologies such as autonomous vehicles and electric mobility.

KEYWORDS:

Buses, Commuting, Light Rail, Mass Transit, Public Transportation, Subways.

INTRODUCTION

The capacity of individuals to travel within cities in order to access facilities, services, and employment is a crucial driver of sustainability in a society that is mostly urban. In fact, having access to economical, secure, and environmentally friendly modes of transportation is essential for urban residents' welfare as well as for the healthy operation and success of cities. Although there has been progress in this area, there are still many obstacles to overcome before cities all over the globe can increase the accessibility of sustainable transportation. While the majority of the urban transportation concerns are being borne disproportionately by developing nations, affluent countries also confront a variety of challenges that are now made worse by currents of global financial turmoil.

This is a general overview of the situation of urban passenger transportation across the world, concentrating on four important modes of transportation: non-motorized transportation (NMT), official public transportation (PTA), unofficial (motorized) transportation, and private motorized transportation. Given its distinctive, essential, yet sometimes ignored significance, the transportation of goods in urban settings is described in section. The four passenger transport options are discussed here in the context of established and emerging nations, highlighting the wide range of trends and circumstances and, therefore, accessibility. Prior to a more thorough examination of the effects of these trends [1].

The focus on NMT in developing nations and the rising interest in these modes in rich nations are both highlighted in this assessment. The significance of formal public transportation varies across and/or within cities in industrialized and developing nations. Although it only plays a small part in wealthy nations, informal transport is discovered to be the primary means of transportation in developing nations, even to the point where in some of them it is being incorporated into the regular public transportation system. Following that, both the patterns of dependency on this mode in rich nations and the massive development in private motorized transport in many developing countries are reviewed. Importantly, the emphasizes the successes of cities that have invested in intermodality and takes into account the vital importance of integration across various forms of transportation in cities.

Land-use and urban planning choices made at the neighborhood, municipal, and regional levels have had a direct impact on the trends and circumstances of urban transportation detailed here (5), leading to specific urban forms and functionalities that either impede or promote accessibility. The evolution of urban shape and usefulness has been specifically impacted by transportation investments and legislation, which has had an effect on accessibility to mobility. Thus, a significant element influencing accessibility in cities in terms of both physical and economic factors is the connection between the growth of urban spatial patterns and transportation[2], [3].

DISCUSSION

The trends and circumstances surrounding NMT globally are discussed in this part, along with the advantages and difficulties that come with it. Walking and biking are the two most popular NMT modalities worldwide. However, despite the fact that pedestrians and cyclists together account for a significant portion of traffic accident casualties, the demands of NMT users are often overlooked. The majority of cities lack specialized infrastructure, and despite the fact that several European towns have undergone renovations to make them more bicycle and pedestrian friendly, NMT users often navigate challenging urban surroundings. Even though there are bicycle lanes in London, UK, several bikers are murdered by turning lorries each year[4].

The developing world

In most cities of developing nations, especially in Africa and Asia, NMT serves as the primary means of transportation (2.1). For instance, walking and cycling account for 70% of trips in Dakar, Senegal, whereas they account for 60% of journeys in Douala, Cameroon. In Chinese cities, for example, the combined average share of walking and cycling is 65%.1 Beijing, on the other hand, has a combined modal share of walking and cycling of 53%. About a third of all travels in Indian cities like Ahmedabad, Bangalore, Delhi, and Mumbai are made by walking and cycling. Walking and cycling account for more than one-third of trips in some Latin American cities, including Santiago, Chile (37%), Rio de Janeiro, Brazil (37%), and Guadalajara, Mexico (39%), but they are less common in others, including Buenos Aires, Argentina (9%) La Paz, Bolivia (10%), and Caracas, Venezuela (18%).

In cities in underdeveloped nations, walking is the primary mode of transportation. Since most pedestrians are from lower socioeconomic groups, this is primarily due to a lack of accessible and affordable alternatives. In Santiago, Chile, NMT provides a modal share of over 50% for low-income groups, compared to only 10% for high-income groups. In Nairobi, Kenya, most

slum dwellers walk because they cannot afford motorized transport. On average, walking makes up a sizeable portion of total travel time.

Many city people in developing nations, particularly in Asia, rely on cycling to meet their transportation demands. With an estimated 600 million bicycles, mainland China has a much higher bicycle ownership rate than other Asian nations. In India, household bicycle ownership rates are high in cities like Delhi (38%), Ahmedabad (54%), and Chandigarh (63%). This is reflected in the relatively higher modal share of cycling in these cities, which is Delhi (12%) and Ahmedabad (14%) respectively. However, the modal share of cycling is much lower in some Asian nations with relatively higher incomes, such as Singapore (1.6% of work trips), the Republic of Korea (1.2%), and Hong Kong SAR (0.5%). In recent years, cycling has decreased in some Asian cities. This has been ascribed to increasing affluence and the accompanying motorization as well as shifting societal perspectives, which still prefer to perceive cycling as a form of transportation for the underprivileged. A prime example is India, where bicycle modal shares fell from 30% in 1994 to 11% in 200812. Numbers also fell in China, especially in major cities.

Cycling is rather infrequent in African cities, making up less than 3% of all journeys in major cities including Bamako (Mali), Dakar (Senegal), Harare (Zimbabwe), Nairobi (Kenya), and Niamey (Niger). In Latin America, cycling accounts for only a small portion of all transportation trips, with bicycle use being more prevalent in smaller and secondary cities than in larger ones, such as Morogoro (Tanzania) and Eldoret (Kenya), where it accounts for 23% and 11% of total trips, respectively. For instance, whereas the modal share in Curico, Chile, is 9%, the average share for all of Chile is less than 2%.

A common mode of urban transportation in Asia, particularly in Cambodia, Indonesia, Myanmar, Thailand, the Philippines, and Viet Nam, is the three-wheeled rickshaw. In Metro Manila (the Philippines), these vehicles are called pedicabs (padyak) and are able to maneuver in confined spaces that jeepneys, which are essentially converted jeep taxis, and buses cannot. Pedicabs, or becaks, account for 33% of all trips in Bandung, Indonesia.16 In contrast, cycle rickshaws are uncommon in Africa, though they did exist in Kigali, Rwanda, and Bujumbura, Burundi, in the 1990s.17 The use of tricycles, however, has been met with conflicting reactions from local government officials in a number of Asian nations. The use of tricycles in Viet Nam was outlawed in 2008, while becaks were outlawed in Jakarta (Indonesia) in the 1970s for being outmoded, unsafe, and obstructing traffic flow. In Mandalay (Myanmar), use in the central business district is only permitted during daylight hours. In contrast, Udon Thani (Thailand) is actively promoting cycle rickshaws as an alternative to cars[2], [5].

Developed Nations

The percentage of non-motorized travels varies substantially across industrialized nations, with walking and bicycling accounting for more than 20% of daily trips in most European nations and less than an eighth in car-dependent nations like Australia, Canada, and the US. While fewer than 1% of trips are made by foot in Australia, Canada, and the US, this percentage is greater in European nations.Western Europe has a high rate of bicycle ownership, particularly in the Netherlands, Germany, and Denmark. This has been ascribed to land-use and trans-portation regulations that have been implemented in these nations since the middle of the 1970s that favor NMT and public transportation options over motorized transportation. Other European nations like Hungary and France, as well as the US and Canada, have lower bicycle to population ratios.

While in Europe cycling is a major mode of transportation for utilitarian reasons, it is mostly used for enjoyment and fitness in the US. The rising popularity of three-wheeled pedicabs in developed countries cities has been a recent trend with regard to NMT. For example, it has been projected that these pedicabs make 1 million journeys annually in London (UK) and 250,000 trips annually in Berlin (Germany).22 Nevertheless, this method of transportation is still insignificant in the cities of wealthy nations.

Facilities for non-motorized transportation

Cities in poorer nations often have subpar NMT infrastructure. Walking is dangerous in these countries due to inadequate lighting, the lack of footpaths, and overcrowding. Additionally, there is little enforcement of speed limits, which does little to slow down high traffic speeds. Dedicated corridors are largely absent, and where they do exist, they are frequently in danger of being encroached upon for commercial purposes or used for the perpetual widening of motorized carriageways. Low cycling rates are caused by the risks posed by fast cars in the absence of segregated NMT infrastructure. The overall lack of development and upkeep of NMT facilities in cities in poor nations is essentially a financial issue. Since these facilities are not seen as "revenue-generating," private investors and foreign loan organizations are not eager to fund such expenditures. Furthermore, the costs of such NMT facilities are frequently thought to be outside the financial means of cities. However, as will be discussed later in this report, this has the effect of directing public spending toward the construction of infrastructure for the relatively small group of people who can afford to own a private vehicle, thereby subsidizing the wealthiest road users.

There are few segregated infrastructure projects for NMT in Africa. In Kampala (Uganda), more than 60% of road networks lack pathways that are divided from motorized traffic, whereas in Nairobi (Kenya), 95% of roads have substantial pedestrian flows but only 20% have pedestrian footpaths. NMT space is not effectively safeguarded in Lagos (Nigeria). There are few outliers, however, such Ouagadougou (Burkina Faso), where dedicated lanes were constructed in the 1980s. Unfortunately, the expansion of fast motorbikes has rendered these routes dangerous.

Most Asian cities' NMT infrastructure is in a similar state of disrepair. Only 2.2 percent of the transportation-related projects authorized by India's Jawaharlal Nehru National Urban Renewal Mission were pedestrian infrastructure-focused. Delhi (India) has few pavements, and those that do exist are often impassable. In comparison, certain Chinese cities have great cycling infrastructure. Electric bikes have recently taken over these areas, nevertheless. It has also been stated that in Chinese cities, sidewalks are being removed or made smaller to make room for additional automobile lanes.

Some Latin American cities' NMT infrastructure is likewise in disrepair. For example, in Cali, Colombia, sidewalks are in terrible condition, barely big enough for one person, obstructed by construction debris, parked cars, or shady sellers, and contain exposed sewers. Lack of illumination promotes pedestrian usage of automobile lanes and increases fear of muggings, while car access ramps often discriminate against the handicapped, those wearing high-heeled shoes, and parents using strollers (mainly women). Additionally, 30% of roads are unpaved, exposing bicycles and pedestrians to mud, dust, and air pollution. Nevertheless, several developing nations have seen positive improvements to NMT infrastructure. The Republic of Korea's Bicycle Master Plan aims to build 30,000 kilometers of bike-ways (primarily for recreational purposes) and increase the modal share of cycling to 10% by the year 2020. For

instance, Bogotá's CicloRuta, a 340-kilometer bicycle path connected to BRT routes, parks, and community centers, has achieved notable successes and led to a doubling of the population's use of bicycles between 2000 and 2007.34 With over 90,000 and 40,000 bikes, respectively, the Chinese cities of Wuhan and Hangzhou have the biggest bike sharing programs in the world[6], [7].

In industrialized nations, pedestrian infrastructure has dramatically improved in recent years as a result of significant investments made in pedestrian zones and designated lanes by many Western European towns. The infrastructure for walking and cycling has been greatly improved in Germany and the Netherlands, with the number of bike paths and lanes more than doubling in the Netherlands and tripling in Germany between the late 1970s and the mid-1990s. In comparison, the US has made very little expenditures to enhance the infrastructure for biking and walking. The integration of NMT and motorized mobility via urban planning to improve the safety and quality of street space for walkers and cyclists has become a more crucial strategy in Western Europe. In many cities in the UK, Denmark, Sweden, Germany, and the Netherlands, neighborhood streets have been redesigned to create "home zones" accessible to cars, cyclists, and pedestrians on an equal footing. As a result, it is clear that the advantages of increasing NMT use far outweigh the associated costs.

For example, incycle paths and abutting sidewalks make up the core of the town layout of Houten, a new town in the Netherlands built in the early 1970s. The town is made up of a multitude of neighborhoods that are all linked to the nearby town center and train station via tree-like networks of direct cycling lanes. Each neighborhood has an access road from the ring road that rings the town that cars may use to arrive. As soon as access roads approach the neighborhood, they are divided into separate lanes, keeping the number of cars there low and accommodating the demands of regular, human-powered road users of all ages. While motorists traveling from one neighborhood to another or from a residential area to the town center must turn back to the ring road on the border of town, streets are structured to keep speeds low (30 kph or less). As a consequence, cycling and walking account for a bigger portion of the modal split inside the town since the bike path is almost always shorter than the motorized one.

The total benefit-cost ratio of expanding bicycle infrastructure was calculated to be 1.5:1 in Amsterdam (the Netherlands), compared to 20:1 and 7:1 in Delhi (India) and Bogotá (Colombia), respectively.As opposed to other forms of urban transportation, NMT does not depend on fossil fuels, which significantly lowers energy consumption, greenhouse gas emissions, and pollution (air, water, and noise). Additionally, since NMT uses substantially less parking and road space, it makes it possible to preserve open areas and natural ecosystems. Additionally, the daily physical activity needed for a healthy lifestyle may be directly provided by walking and cycling. Where motorization encroaches on the percentage of NMT in metropolitan areas, negative health effects have been noted.Additionally, and this is significant, the flow of passengers via the NMT helps urban dwellers who areincreasing NMT usage, improving the beauty of urban landscapes, and promoting the social function of public spaces.

In most cities throughout the world, bikers and pedestrians are disadvantageous due to competition for space, speed, and infrastructure. Despite being a crucial feeder service that supports and enhances public transportation, NMT is rarely integrated with it and receives little media attention. Without the necessary infrastructure, a hostile environment with higher rates of fatal accidents and a general decline in cycling results. The majority of NMT users, at least in

developing nations, are captive low-income consumers who are forced to use NMT owing to a lack of accessible alternatives, which amplifies the downward trend. Because NMT is associated with poverty, there is social stigma associated with using it.

Non-motorized transportation's effects

The employment of NMT in cities results in a variety of social, economic, and environmental advantages (2.1); in fact, the available data consistently oping-country cities. For instance, rickshaw pulling provides a living for 20% of the population in Dhaka, Bangladesh, whereas Kolkata, Chennai, Delhi, and Hyderabad in India have recorded rickshaw pulling rates of 5–10%. This kind of income is crucial in smaller areas with little public transportation options and congested roadways. NMT is nonetheless restricted in a number of ways even if it produces huge advantages in cities. The risk of injury is perhaps the most important factor, with pedestrians and cyclists making up more than 27% of those killed in road traffic accidents globally and a third in low- and middle-income countries.44 Vulnerability is highlighted in some regions, such as Africa, where 38% of those killed in traffic accidents are pedestrians.

NMT also has to deal with being overlooked in urban planning and investments, which is difficult since there is a lack of reliable data and information. In many developing nations, the funding of major projects, metro systems, and BRT systems tends to be preferred. Pedestrians and cyclists may therefore be easily disregarded in planning at the cost of motorized transport since statistics on NMT are also often under-presented in transport data, resulting in low planning priority.Related to the aforementioned, NMT's poor reputation in the public eye, particularly in developing nations, contributes to its neglect in planning. Among users, the stigma of poverty causes many to switch to motorized transport as their wages increase. For the government, technology and motorized transportation represent growth and modernity. Thus, NMT promotion could not be seen as consistent with advancement.

Official Public Transportation

This section examines worldwide public transportation trends and situations. The emphasis of the debate is on services that may be categorized as formal based on how they are set up or run to maintain a certain degree of quality, service, routes, hours, and pricing structures. In 3, high-capacity public transportation systems by bus and rail that have the potential to significantly improve urban accessibility in both developed and developing nations are investigated in more depth. Informal transportation is discussed separately later in section.Overall, the stagnation and decline of public transportation in certain industrialized cities and its rise in others are highlighted, along with the effects of limited financial inputs. The advantages of public transportation in terms of the environment, society, and economy are examined, as well as the advantages and difficulties of luring more affluent passengers to it.

Developing world

Few effective formal public transport networks still exist, and the modal share of public transportation has dropped or stagnated in the majority of developing nation cities. Public transportation is often run by an increasing number of self-starters or small- to medium-sized businesses, but with little financial backing from the general public. These cities' public transportation has been characterized by lax regulation, a lack of availability, low quality, and a majority of operators from the unregulated sector. Occasionally, further formalization takes place

as a result of aid-financing agreements, such as trust funds that guarantee credit lines for the purchase of vehicles, as in Dakar (Senegal), Johannesburg (South Africa), and Lagos (Nigeria).

However, some hopeful patterns have been seen. A number of African cities, including Dar es Salaam (Tanzania), Accra (Ghana), and Kampala (Uganda), have BRT lines under construction or planned. BRT systems have been deployed in Lagos (Nigeria) and Johannesburg (South Africa), providing significant advantages for locals. North Africa is seeing an increase in the availability of public transportation options, including light rail and tram systems in Cairo, Casablanca, Rabat, Algiers, and Tunis. The population of Cairo, Egypt, and Dubai, United Arab Emirates, are already served by metro systems.50 Perhaps more concerning are China's expanding investments in metro and BRT systems, which serve millions of passengers in metropolitan regions.

While the private sector is becoming more significant in places like Montevideo (Uruguay), Bogotá (Colombia), and Rio de Janeiro (Brazil), Latin America has comparatively well-structured public transportation with better structures in planning and administration. In Brazil, Chile, Ecuador, Peru, and Venezuela, an increasing number of urban BRT systems have greatly increased public transportation options. Depending on the context-specific nature of transportation possibilities and difficulties, several modes of transportation exist in developing nation cities in addition to the mainstream official public transport services. Many cities in underdeveloped nations are also served by waterborne transportation. The Chao Phraya express-boat company in Bangkok, Thailand, transports 11 million passengers each year.52 In Colombia, Medellin's aerial cable car (Metrocables) moves up to 3000 passengers per hour and has been hailed as an innovative and high-impact solution that has significantly improved access to public transport for residents of informal settlements built on former military bases[8].

Developed countries

The market share of official public transportation is being maintained or expanded in the majority of developed cities. Despite expanding automobile ownership and suburban development in North America and Western Europe, the yearly number of passengers using public transportation has been rising since the 1960s and 1970s.54 The disparities between and within cities (or nations), as well as the slow expansion of public transportation in comparison to other means of transportation, are still hidden by this overall rise.

From highs of 237 trips per person per year in Switzerland to lows of 24 trips per person per year in the United States, public transportation usage varies significantly by country.55 Although the number of people using public transportation in North America is slowly increasing, particularly in cities like Portland, Oregon, and Toronto, Edmonton, and Vancouver in Canada, where investments have been made in public transportation,56 the modal share of public transportation is still small compared to that of European nations. Public transportation accounts for a significant share of daily journeys in European cities like Vienna (Austria) and Helsinki (Finland), but not nearly as much in Melbourne (Australia) and Chicago (US). Despite challenges for women, children, and the elderly, public transportation has seen an overall significant fall in significance and is now more popular, particularly for quick excursions inside cities. For instance, 96% of Vienna's people live within walking distance of a public transportation station, the city routinely receives good marks for its quality of life, and formal public transportation usage is high.

In Europe, there are 189 light rail and tramways that carry billion people a year, compared to 45 metro systems that carry 9.9 billion.58 In developed cities, particularly in France, Spain, Portugal, and the UK, but also in North America and Australia, tram usage is seeing a renaissance. Globally, there were 400 cities with tram systems in 2011 (up from 300 in 1980), and an additional 100 systems were being built or planned.59 Despite the negative impacts of the fall of communism on public transport services and usage, the use of public transportation is still significantly greater in Eastern European nations than it is in the rest of Europe. However, in the midst of urban expansion and fast motorization, the extensive rail and trolleybus networks built by the centralized communist economy have mostly been neglected and crumbled.

Since the 1980s, there has been no worldwide transition from publicly owned to a privately owned, market-driven approach in terms of the regulatory components of public transportation supply. Public authorities now manage public transportation rather than organizing or providing it since there has been a separation of the organizer, operator, and infrastructure duties. For instance, there has been a major push for the deregulation of the transportation industry in the European Union (EU).

The deregulation of the public transportation sector in the UK where private operators now account for more than 80% of bus services outside of London was one of the initial experiences that would subsequently affect the rest of Europe and resulted in both advancements and losses. Even while there have been significant gains in the growth of public transportation, the overall picture remains disjointed, with differences in service across regions, nations, and capitals and non-capital cities. There are limited statistics on public transport operations in cities of developing countries, making comparison difficult[9].

CONCLUSION

Urban passenger transport is a critical component of modern cities, and its sustainable development is crucial for creating livable, accessible, and environmentally friendly urban areas. The challenges faced by urban passenger transport, such as congestion, pollution, and accessibility issues, require innovative solutions that promote integrated and multi-modal transportation systems. This includes investing in public transportation, promoting shared mobility options, encouraging active transportation modes, and embracing emerging technologies such as autonomous vehicles and electric mobility. Efforts to improve urban passenger transport must also prioritize equity, ensuring that transportation options are accessible and affordable for all residents, regardless of income, age, or ability. This may involve improving public transportation coverage in underserved areas, implementing fare policies that promote affordability, and enhancing accessibility features in transportation infrastructure and vehicles. Furthermore, collaboration between government, policymakers, urban planners, transportation operators, and other stakeholders is essential in shaping the future of urban passenger transport. This includes promoting sustainable policies, regulations, and incentives that prioritize sustainability, innovation, and social equity.

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CHAPTER 4

A BRIEF DISCUSSION ON INFRASTRUCTURE FOR PUBLIC TRANSPORT

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ABSTRACT:

Public transport plays a crucial role in shaping modern cities, providing accessible and sustainable mobility options for millions of people worldwide. The efficiency and effectiveness of public transport systems depend heavily on the quality and functionality of their infrastructure. This abstract highlights the key elements of infrastructure that contribute to a successful public transport system and their impact on urban mobility. The first element of public transport infrastructure is the physical network, including roads, rails, and stations. Well-designed and properly maintained infrastructure can optimize the flow of public transport, reducing travel times, and increasing operational efficiency. Dedicated lanes and priority signals for buses, trams, or light rail systems can significantly enhance the reliability and attractiveness of public transport, encouraging more people to choose it as their preferred mode of transportation.

KEYWORDS:

Bus Stops, Commuter Rail Stations, Interchanges, Passenger, Rail Tracks.

INTRODUCTION

Public transportation hasn't received enough investment on a global scale. Urban public transportation infrastructure is often inadequate and in bad shape in developing nations. The quality of service as well as the health and safety of passengers are put at risk due to the current infrastructure's frequent neglect and inadequate upkeep. Along with policies of liberalization and economic reform in certain emerging nations, formerly subsidized public transportation services have either been reduced in scope or eliminated. Due in major part to structural adjustment efforts, publicly owned and operated public transportation systems in Africa were dismantled in the 1990s, which resulted in years of neglect and the domination of illegal transportation methods[1].

Urban public transportation service investments may be too exorbitant for developing nations to afford, as is the case with rail-based transportation, which costs millions of dollars each kilometer. Additionally, in developing nations for instance, the situation of Africa in 2.7, investment on highways for private motorized transport is still far larger than spending on specialized public transportation infrastructure. Although this strategy is steadily evolving in favor of investments in more socially sustainable means of transportation, a large portion of the international development aid that poor nations have received has centered on constructing roads.

Cities in some significant developing countries, including South Africa and Brazil, have public transportation infrastructure that is considerably superior. It has been highlighted that bus transportation options have expanded in most Indian urban regions as a consequence of steps made under the Jawaharlal Nehru National Urban Renewal Mission, but the services are still unreliable, time-consuming, and congested. Cities like Johannesburg (World Cup, 2010), Beijing (Olympics, 2008), Shanghai (World Expo, 2010), Delhi (Commonwealth Games, 2010), and Rio de Janeiro (World Cup, 2014) have all seen significant public transportation developments as a result of hosting international events.

On the other hand, improvements in services and investments have been made in many developed country cities, increasingly via public-private partnerships. The average investment throughout the 1990s stayed between 0.45 and 0.5% of urban area GDP, with Madrid (Spain), Lisbon (Portugal), London (UK), Berlin (Germany), Vienna (Austria), Oslo (Norway), Prague (Czech Republic), and Lille (France) having the highest amounts.70 High-income Asian nations, notably Singapore, Tokyo (Japan), and Hong Kong (China), saw continued investment.

Formal public transportation's effects

Public transportation networks are a necessary component of the sustainable city of the twenty-first century and have a considerable beneficial impact on the economic, environmental, and social fabric of urban life. This kind of transportation may carry more people while using fewer cars, less energy, and less space. Lower emissions of airborne pollutants and greenhouse gases are not among the beneficial environmental effects.Investments in public transportation have a positive impact on the economy by generating both direct jobs and indirect support for industries like construction and manufacturing. 36,000 local employment are supported by a $1 billion investment in public transportation in the US.72 People who commute by public transportation claim that they would not continue in their present occupations or would make less money without such services. They also work more days per year than those who do not have access to such services. According to a UK Government research, 13% of respondents said they experienced transportation issues that prevented them from applying for a certain job in the preceding year. A considerable economic gain may also result from a mode change to public transportation. In the US, it has been calculated that the yearly economic savings to consumers would be greater by around US$112 billion than the cost of policies to support such a transition[2].

Subsidized investments in public transportation may have a significant impact. Subsidized student and school-child travel (such as low-cost student tickets in Western Europe) may ensure profits on unprofitable routes, as in Germany's example. Numerous institutions in the US provide reduced-price tickets. In this fashion, the University of Utah receives 45,000 weekly riders from Salt Lake City's TRAX light rail system, or 33% of all visitors to the university.Public transportation is essential to social inclusion for the underprivileged since it increases access to employment, education, health care, and other resources. Furthermore, by enhancing the amount and quality of interpersonal encounters, public transit also promotes community cohesiveness. Public transportation gives young people a way to travel freely, and in certain situations, this might put off their desire or necessity to operate private motor cars.

Given that most journeys have ties to walking or cycling, using public transportation likely to improve physical activity.79 Users almost reach the recommended 22 minutes of moderate physical activity every day, walking approximately three times as much as persons who depend

on personal vehicles.80 The mortality rate for passengers of public transportation is likewise roughly one-tenth that of automobile occupants, and compared to private vehicles, public transportation results in less than half the number of fatalities per passenger kilometer[3].

One major obstacle is the lack of enough financial resources for the provision of public transportation services. Frequently, only a small portion of the required upgrades may be carried out using public funds. Both the quality and quantity of services are affected by this. Maintaining current public transportation users while attracting new ones becomes extremely challenging in such situations. If public transportation does not double its modal share, many cities risk coming to a standstill due to projected population expansion, automobile travel, and limited road capacity. Congestion must be turned into transit users in order to reduce reliance on personal vehicles. However, providing high-quality services is a necessary first step in boosting such ridership since customers appreciate features like connection and service coordination, while flexibility and trip-chaining are also significant, especially for women.82 Convenience, comfort, security, and status are regarded more highly than what would be implied by a traditional emphasis on quantitative considerations like speed and price.83 Thus, concentrating efforts on enhancing service quality may be even more successful than doing away with public transportation fees.

One way to partially subsidize these social goals is via concession fares. The whole cost of the public transportation system is funded under zero-fare systems. The most evident effect is that people are more inclined to utilize public transportation, as has been the case in Hasselt, a small city in Belgium. The passenger does not directly pay for the journey. Melbourne, Australia, has a similar system in place that is related to tourism. Zero-fare public transportation for all 420,000 residents of Tallinn, Estonia, on all city-run services beginning on January 1, 2013, is anticipated to considerably boost usage. However, significant capital expenditure would be needed to fulfill the drastically increasing demand in big systems. If money were utilized to boost service standards instead, maybe it would be possible to draw in more customers while keeping revenue from current ones. The revenue from more customers may then at least partly cover the expenses of the enhanced service.

Sources: Royal Institute of Technology, 2012; van Goeverden et al., 2006; Brown et al., 2001. Demand-based schedules and prices, semi-fixed routes, and unrestricted stopping spots. The City of Nairobi (Kenya) has the largest per capita usage of informal transportation in the whole world, with matatu mini-buses accounting for 662 trips per resident year, 75% of trips on public transportation, and 36% of traffic volumes. 90% of the market is served by minibuses in Harare, Zimbabwe. In Greater Cairo, Egypt, informal shared taxis raised their modal share (of motorized journeys) from 6% in 1987 to 37% in 2001, and this has subsequently climbed even more. In Algiers, Algeria, taxis and minibuses account for 56% of motorized trips [4].

Danfos, midi-buses that provide regular, economical services but are marked by crowded and aggressive driving, have taken over the function of transportation in Lagos (Nigeria), where the public-sector bus business collapsed due to low rates and unsustainable subsidies.89 Motorbike taxis are a rapidly expanding informal mode, making up one-fourth of all journeys in Cotonou (Benin) with 60,000 of them.90 In Kampala, it is obvious how important it is to improve accessible mobility in cities by extending public transportation options. Public transportation usage may be encouraged through urban planning and land-use rules, as well as transportation demand and monetary incentives. However, authorities in many cities do not have the

institutional ability or resources needed to coordinate land use and transportation planning in order to produce such a modal change.

DISCUSSION

Small-vehicle, low-performance services are provided by the informal sector, which is a phrase used to describe unregulated employment and small-scale economic activity. These services cover the gap between traditional 50-passenger buses and official taxis.85 This section looks at informal transportation throughout the world to show how prevalent it is in underdeveloped nations. In many of the world's poorest cities, informal transportation is sometimes the only practical option. Even while it offers the urban poor enormous advantages, informal transportation makes a major contribution to traffic jams, air and noise pollution, and accidents. Along with the associated expenses, the function of informal transportation in enhancing formal transportation and producing larger societal benefits is taken into account.

The developing world

Cities in developing countries sometimes account for more than half of all transportation, and inhabitants of Uganda frequently use boda boda motorcycle taxis despite the fact that their prices are four to six times higher than those of ordinary taxis. An important factor encouraging participation into this industry is the reduced capital expenditures needed from operators of informal transportation services[5]. In many Asian cities, formal public transportation is often lacking. By the year 2000, there were about 5000 unlicensed taxis operating in Istanbul, Turkey.92 Public transportation in Sana'a, Yemen, is nearly completely provided by impromptu vehicles that are sometimes rickety and badly maintained, creating problems for the city's congestion, health, and safety.93 In Thailand and Indonesia, minibuses and microbuses handle 5 to 10 percent of all journeys. In the Philippines, up to half of all travels are taken by unofficial vehicles, mostly the vibrant jeepneys (modified US army jeeps).94 In Jakarta, Indonesia, motorcycle taxis (ojeks) cover larger distances whereas NMT is only available for short-distance excursions. Bajas, which are three-wheeled hybrid motor-taxis that provide comfort more equivalent to a private automobile, can accommodate up to eight people. Microlets and minibuses may accommodate 10 to 25 passengers. In recent years, auto-rickshaw use has rapidly increased in several African and Asian cities.

In the majority of Latin America, informal transportation predominates, with the rise of vans and minibuses fueled by reduced import tariffs and the difficulty of public transportation to keep up with demand for transportation between ports. In the 1990s, a deluge of 10 to 15 passenger vans drove out pirate buses in Rio de Janeiro, while in So Paulo today, an estimated 15,000 illegal vans are in circulation. the usage of unlicensed vehicles in Brazil is also associated with what Brazilians regard as onerous and intrusive registration requirements. Around 30,000 pirate taxis operate in Santiago, Chile. Private station-wagons, often known as robots, steal passengers from public operators in Kingston, Jamaica, by outpacing buses. about half of the minibus drivers in Mexico City operate without valid licenses or insurance. Smaller door-to-door companies focus on distant markets. For example, in Bogotá, Colombia, tricimobiles in outlying informal settlements provide low-cost, one- to two-kilometer excursions for less than $0.50 each.98 However, due to the fast motorization, informal carriers are increasingly seen as one of the main causes of the rising traffic congestion. In emerging nations, informal transport providers cater to middle-class clients seeking for convenience (such as door-to-door, taxi-like services) as well as low-income markets.99 In Uzbekistan, the Kyrgyz Republic, and Brazilian cities, where polls

reveal that the poor are prepared to pay more for superior services, low-income customers also prioritize service quality.100 In addition, there are no age or gender variations in the usage of informal transportation in cities, with minibuses often servicing male passengers on longer journeys and bigger volume excursions. Younger clients are often served by motorcycle taxis. In Bangkok, Thailand, riders in motorbike taxis make up over two-thirds of the population[6].

In general, as cities in developing nations get richer, the importance of informal transit seems to be declining. For instance, there is an inverse relationship between local GDP per capita levels and the market share of informal transport in nine cities in Sub-Saharan Africa. Because of the inverse link between affluence and informal transportation, governmental authorities may decide to outlaw it in an effort to project a more contemporary image.Contrary to professional services, informal transportation is not nearly as vertically structured. The service is often offered by lone owner-operators, and the industry is typically kept together in a loose horizontal manner by relationships between individuals and between operators as well as by camaraderie among stakeholders.

With regard to informal transportation, certain developing nations make an effort to control market access, vehicle and driver fitness, and service methods. For instance, the Ministry of Transport in Nairobi, Kenya, mandated that all seats in minibuses have seatbelts, whereas standing is no longer allowed on bigger buses.102 Although over 40% of the plates are fake, red plates identify Beirut, Lebanon's 55,000 legally operating shared-ride taxis.103 However, there are many ways to get around these laws, and their application is often hampered. Governments therefore accept the self-regulation and self-policing of informal transportation in many of the world's poorest nations. In fact, many informal operators often create route associations to reduce socially harmful behavior, boost ridership, and boost profitability. In emerging nations, informal transportation providers cater to middle-class clients seeking convenience (such as door-to-door, taxi-like services) as well as low-income markets[7].

Public transportation has also been subject to deliberate re-regulation in several emerging nations. The municipal government of Kingston, Jamaica, opened the market to private service providers in the 1990s in response to failing public bus services, only to be confronted with a flood of unlicensed minibus operators who flagrantly disobeyed traffic laws. As a result, a single government-controlled bus business was reinstated, however there are still unlicensed minibuses on the road. Re-regulation also followed the deterioration of private paratransit services in Dakar, Senegal. An organizational body was established with funding from international development aid in order to modernize the minibus fleet and provide private enterprises strictly regulated concessions. In Nairobi, Kenya, matatu minibuses are being phased out of the central business area in favor of bigger vehicles (25 seats or more), driven by larger, more tightly controlled owner-driver ‘societies'.

Developed nations

There are informal transport services in many cities of industrialized nations, often serving as niche markets for immigrants from nations with a history of informal travel. Some lower-income families with cars additionally add to their income by engaging in "under the radar" activity.104 Unauthorized, illegal limousine operators may kidnap unwary travelers arriving at airports. Informal services flourish in Miami and New York (US), especially in regions with dense neighbourhoods of individuals from similar cultural origins, large levels of immigrants, and non-native speakers, as trustworthy and familiar alternatives to municipal services. On the streets of

Manhattan and Brooklyn, there are said to be about 5000 illegal vans and private vehicles.105 Other instances are the "black cabs" of Belfast (UK) and the "little Cuba cabs" of Miami (US) that operate in underprivileged areas that are often overlooked by licensed drivers.

Following the dissolution and deterioration of state-run public transport firms in Eastern Europe in the 1990s, informal transport started to assume a more significant role. For instance, ten-seat minivans known as furgons became a popular mode of transportation in Tirana, Albania, in 1999, even outpacing the usage of official buses on several inner-city routes. Despite being prohibited in the inner city, such transportation is nonetheless quite important in the Tirana metropolitan area, making about 14% of all journeys.

Effects of unofficial transportation

In most poor nations, where official public transportation is few or nonexistent, paratransit has clear service benefits and is sometimes the only trustworthy option. Paratransit is more frequent with fewer passengers per vehicle, which decreases waiting times. It is also more flexible and adaptable since it offers door-to-door service. Small cars are well adapted for lower density environments, fulfilling polycentric journey patterns, and acting as complements to trunk-line services provided by big vehicles. They are speedier, often provide a smoother ride, and typically penetrate the tiny streets of affordable neighborhoods and better navigate clogged traffic. Due to increased load factors, vehicles used for informal transportation may also be more energy efficient. Minibuses in Abidjan, Côte d'Ivoire, utilize on average 12% less fuel per passenger journey than regular buses. The fact that paratransit is financially rewarding is its main draw. Profit-driven operators react rapidly to market shifts and cut expenses. They may cut per-seat expenses to the point of becoming competitive with bigger businesses by grouping into route associations and cooperatives.108 Data from minibus operations in Abidjan, Côte d'Ivoire, Dakar, Senegal, and Douala, Cameroon, show significant profit margins, with farebox receipts surpassing operational expenses by 17–96%.109 In Johannesburg (South Africa), it is estimated that official public transportation costs 13 times more to operate each passenger than does informal transportation.

Importantly, the informal sector which accounts for an estimated 15% of all work in developing countries is a crucial entry point for many new immigrants. Bangladesh's Dhaka has a close to 30% rate. Motorcycle taxis alone provide 60,000 employment in Cotonou, Benin (with just under 1 million residents), most of them are for young males. Touts, changers (who give out tiny change), and a group of people that clean, maintain, repair, and construct informal carriers are examples of indirect employment that is important. In Bangkok (Thailand), Jakarta (Indonesia), and Yola (Nigeria), the majority of motorcycle taxi drivers are rural migrants without prior urban employment. The informal transport industry confronts a variety of challenges while being essential to the movement of many urban people. Accessing commercial lines of credit is a major issue for operators. Banks in the Caribbean and Sub-Saharan Africa are hesitant to provide credit to unofficial business owners. If they do, the repayment periods are usually short (three years or less) and the interest rates are often high (40 percent or more monthly). Some business owners who are unable to secure credit via official channels resort to street lenders, spending the majority of their daily income to creditors and seldom being able to get out of debt. Few people are able to escape poverty since car leasing operators often pay vehicle owners half or more of their daily income.

Safety is an extra difficulty, since mismatched cars, insufficient driver training, and shoddy maintenance all contribute to accidents. Around 10% of incidents in Abidjan, Côte d'Ivoire, involve minibuses (ghakas), while 25% include shared taxis. Shared taxis are said to be responsible for 90% of traffic accidents in Yopougon, Côte d'Ivoire, and almost all of the fatalities that result from them.117 During the 1990s, paratransit-related violence claimed the lives of more than 2000 drivers, attendants, and passengers in South Africa, according to government. Informal operators seldom insure cars (or passengers), which worsens the effects of accidents. Due to their use of two-stroke engines, high oil mixes, low-grade fuels, and poorly maintained engines, paratransit vehicles are major air pollutants. Tuk-tuk three-wheelers still use two-stroke motors in Cambodia and Laos. Most two-stroke engines in Thailand have been replaced with less loud, cleaner four-stroke engines, and some towns have begun experimenting with solar panel propulsion. Motorcycle taxis across most of Sub-Saharan Africa emit from both their two-stroke engines and the excessive usage of oil as a lubricant.

Users of informal transportation may encounter prejudice and harassment if there is no institutional control. Women in Malawi and South Africa report experiencing high levels of verbal abuse and rape terror. Expectations that women ride side-by-side in motorcycle taxis might seriously compromise their safety. Women often pay higher prices in the Middle East because to cultural prohibitions on negotiating with male drivers. Middle Eastern women pay more than males since minibus routes prioritize making connections to places of employment over home travel and require payment at each mode change. Young customers are also at risk. Some dala dala minibuses in Dar es Salaam (Tanzania) forbid children from boarding during peak hours since government concessionary charges are seen as impolite. The unofficial transportation industry typically has a high level of corruption. Since the majority of service providers lack a complete license, they often have to pay bribes. Minibus drivers' payments to police officials in Dakar, Senegal, account for 5% of all operational expenses. Bangkok's win motorbike taxi drivers in Thailand complain about payments made as security to military and police personnel[8]. Abuse of the labor market, as seen by a disregard for minimum wages, age restrictions, work-hour limitations, and inadequate or nonexistent insurance, etc., is another effect of lax regulatory supervision. In addition to having few alternative job opportunities, informal laborers are often in debt to vehicle owners who charge excessive rent or provide high-interest loans.

Private Motorized Transport

The development and growth of cities all over the globe were significantly impacted by the expansion of private motorized transportation throughout the twentieth century. The rapidly expanding cities of emerging countries are increasingly following the routes formerly mapped out in affluent nations. The usage of private motor vehicles and the availability of related infrastructure across the world are examined in this section. While analyzing the benefits of private motorization, the externalities related to private motor vehicles are taken into account.

There were 825 million passenger automobiles on the road worldwide in 2010. Only 30% of these were in emerging nations, mostly in Asia, while over 70% were in developed including transitional) nations. It is anticipated that there will be close to 1.6 billion light-duty motor vehicles cars, SUVs, light trucks, and minivans on the road by 2035 and more than 2.1 billion by 2050. Africa has the lowest ownership rates, with just 3% of all passenger automobiles owned worldwide. However, as said, the growth rates of motorization are larger in emerging nations[9].

Annual new automobile sales climbed from 39 million in the 1990s to roughly 63 million in 2012 on a global scale. Asia became the market leader in new-car sales in 2012, making up 40% of all worldwide sales, thanks to a consistent increase in new-car sales from approximately 7 million in the 1990s to over 25 million in 2012. It is anticipated that the rapidly expanding economies of South America and Asia will continue to fuel enormous future growth in new-car sales. It should be emphasized that the majority of newly registered automobiles in many developing nations are used imports from industrialized nations rather than brand-new vehicles.127 Thus, statistics on new-car sales constitute a faulty foundation for discussions on the extent of motorization in these nations.

CONCLUSION

To guarantee that public transportation infrastructure projects are implemented successfully, it is stressed the need of cooperation between a variety of stakeholders, including governmental organizations, transportation providers, and urban planners. The abstract concludes by emphasizing the crucial part that well-designed and well-maintained infrastructure play in delivering effective, dependable, and environmentally friendly public transportation services. It highlights the need of strategic planning, environmentally friendly procedures, and stakeholder cooperation to overcome obstacles and build a comprehensive public transportation system that can accommodate the demands of expanding metropolitan populations.

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CHAPTER 5

IMPACTS OF PRIVATE MOTORIZED TRANSPORT

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ABSTRACT:

Private motorized transport, including cars, motorcycles, and other vehicles, has become a ubiquitous mode of transportation in many countries, with significant impacts on society, economy, and the environment. This abstract provides an overview of the impacts of private motorized transport and highlights key issues related to its use. The impacts of private motorized transport can be broadly categorized into three main areas: social, economic, and environmental. Socially, private motorized transport has led to changes in urban planning and development, including the proliferation of suburban sprawl and the decline of public transportation in some areas. It has also influenced social behaviors and patterns, such as increased dependence on cars for daily commuting and reduced opportunities for physical activity, leading to potential health issues.

KEYWORDS:

Air Pollution, Car Accidents, Congestion, Fuel Consumption, Greenhouse Gas Emissions, Noise Pollution.

INTRODUCTION

Early in the 20th century, the US saw the emergence of the phenomenon of vehicle ownership. After 1920, the middle classes had easy access to cars, and by the 1950s, there was an average of one car per family.Since urban sprawl and the growth of low-density suburban settlements were made possible, this had a huge impact on the spatial structure of cities in most of North America.Land-use dispersion became a key aspect of urbanization in the US, along with increasing vehicle reliance, as part of a government initiative to offer inexpensive housing.130 Other industrialized nations increased their motorization much later, but due to larger population densities in Europe and Japan, public transportation remained to be crucial. In fact, compared to the US, European nations have far lower per-capita private automobile travel lengths and trip numbers[1].

Numerous European nations, including Germany, France, Italy, and Japan, have seen a decline in the growth rates of automobile ownership since 1990. The rise of vehicle ownership and per capita income have been shown to have a nonlinear connection, with vehicle ownership growing slowly at lower per capita income levels, quicker at medium and higher income levels, and reaching saturation at the highest income levels.There is data that suggests travel lengths in nations with high rates of automobile ownership may have peaked, making it unlikely that future gains in GDP would result in longer travel distances.In wealthy nations, there is an increasing desire for alternate means of transportation due to elements including rising fuel costs, an aging

population, better travel alternatives, and health and environmental concerns. Car ownership rates quadrupled in transitioning economies in under ten years (1990–2000), as a result of the end of socialism and the ensuing market liberalization. In addition, these nations have seen a decline in the usage of public transportation, notably as a result of Due to government subsidies and the dissolution of state-owned operators, motorized two-wheelers account for a significant fraction of motor vehicles in emerging nations, notably in Asia. Not unexpectedly, suburban sprawl patterns have also become prevalent in former communist nations, marking a change from the formerly densely populated metropolitan centers reliant on public transportation. Variations in motorized vehicle travel lengths in the US show how certain urban types influence travel behavior. Residents of low-density sprawling cities traveled farther in 2007, as evidenced by Atlanta's (48 vehicle kilometers per capita per day), Houston's (61 kilometers), and Jacksonville's (54 kilometers) figures; in contrast, those residing in more compact cities, like New York (27 kilometers) and New Orleans (24 kilometers), traveled shorter distances. This research goes into additional information about the connection between urban form, land use patterns, and private motorized mobility[2], [3].

Developing countries

The percentage of people who possess a car in developing nations is still much lower than in developed nations. Ownership statistics, however, may not always reflect the rapid increases in motor vehicle ownership in emerging nations. The average yearly growth rate of motor vehicle ownership is larger in developing economies than it is in the majority of industrialized economies. Given their lower GDPs and often compact urban forms, the levels of motorization in quickly growing cities of developing nations are already greater than anticipated.138 The potential for additional motorization is significant given that emerging nations will continue to experience the majority of the world's population increase and urbanization.139 In emerging nations, motorized two-wheelers make for a significant fraction of motor vehicles, notably in Asia, which is home to 75% of the world's two-wheelers, of which China and India account for 50% and 20%, respectively. Around 350 million two- and three-wheelers were reportedly in use globally in 2005. However, this is the personal transportation segment that is growing the quickest globally. According to a recent study, overall motorcycle sales might exceed 114 million units in 2013, up from 39 million in 2003 and 79 million in 2008.

The majority of these, almost 80%, are sold in Asian nations (55% in China alone), while the Middle East and Africa are reporting the greatest rates of growth in sales.141 Thus, it is anticipated that by 2050, there will be 850 million motorized two- and three-wheelers worldwide (2.10). As a result, even if the percentage of automobile ownership is low (2.3) in many emerging nations in Asia, the rate of motorization may be substantially greater. The number of motorbikes per capita surpasses that of vehicles (2.13) in places like Ho Chi Minh City (Vietnam), Jakarta (Indonesia), Chennai and Mumbai (India), and Guangzhou and Shanghai (China). Motorization levels in Asian nations are drastically altered by the introduction of two- and three-wheelers, bringing them up to line with affluent nations. Numerous government measures to limit the number of two- and three-wheelers in Asian cities have been introduced as a consequence of their rapid and sometimes uncontrollable rise. The price, fuel efficiency, and maneuverability of two- and three-wheelers are still expected to make them a popular choice for poor and middle class inhabitants of Asian cities, especially given the limited availability to public transportation. throughout comparison, the ratio of motorbikes to vehicles is still low

throughout Latin America and Africa. Although two- and three-wheeler ownership rates are now fairly low in African cities, their significance is anticipated to grow in the next years[4], [5].

DISCUSSION

Infrastructure for personal motor vehicles: The availability of parking and road space for automobiles varies significantly around the globe, in part due to the various policies that cities have enacted regarding private motorized mobility. Less than 1 metre of road is present for every person in the majority of African and Asian cities. Cities in Latin America including Curitiba, Bogotá, and So Paulo have somewhat longer roads per resident. Even yet, the average length of a road in a city in a developing nation is still far less than the average in the US (6.5 meters) and Australia (8.1 meters). Increasing the amount of road space available for motorized transportation has therefore been a major goal of urban trans- port projects in many emerging nations. However, new road construction often results in increased traffic. It is necessary to shift away from just forecasting motorization development in order to build out new infrastructure and instead focus on demand management within the context of a broader sustainability plan.

In terms of parking availability, cities like Shanghai (China), Bogotá (Colombia), and Chennai (India) have fewer than ten parking spaces for every 1000 jobs in their central business districts. Other cities, including Kuala Lumpur in Malaysia, Bangkok in Thailand, and Harare in Zimbabwe, have central business districts with parking spaces equivalent to those in wealthier countries like Canada and Western Europe. China, which is at one extreme, and Riyadh, Saudi Arabia, which is at the other extreme, both have more parking spaces than jobs.Parking accessibility is essential for destination accessibility and, as a result, has a significant role in determining modal choice in urban environments. If included in the entire citywide transportation plan, control over parking availability, duration, and pricing may therefore be useful in reducing the usage of private vehicles.144 To prevent unauthorized parking, complementary traffic enforcement measures could be required[6].

The allocation of road space is diverse even in wealthy nations. The cities in Australia, New Zealand, the United States, and Canada have the most road space per person, with each having more than 5 meters of road per person. Western Europe has 3 meters of roads per person on average, but Eastern Europe has even less. In comparison to other wealthy nations, Eastern Europe has substantially less parking spaces available. Western Europe has roughly three times as many motorways per person than Eastern Europe. In general, Europe has less infrastructure for private motorized transportation than North America and Australia, both in terms of the length of the roads and freeways and the number of parking places.

The individual freedom it provides at a price that is becoming more and more reasonable for a rising number of people has been a key factor in the rise of private motorized transportation across the globe. The private automobile remains a popular mode of transportation in cities due to its perceived benefits of comfort, privacy, and prestige. In addition, the private motorized transport sector generates a wide range of economic benefits, such as significant investments in urban areas (road construction), indirect employment in infrastructure and services (fuel stations, maintenance, second-hand markets, policing, and emergency services), and direct employment in manufacturing.About 5% of the entire worldwide workforce is employed by the automobile sector. However, growing motorization in cities has a wide variety of externalities. These outweigh the advantages of this mode of transportation when combined. One of the biggest effects of private motorized transportation is on the environment since it is so reliant on oil. The

health and safety of urban residents are also impacted by increased usage of private motorized transportation [7].

Another externality of private motorized transportation is traffic congestion, which has a substantial negative impact on economic efficiency since it affects production and results in wasted time. Canada's national congestion costs are as high as US$4.5 billion148, of which Greater Toronto (43%), Montreal (21%), and Vancouver (17%), the country's three major metropolitan areas, account for 80%.149 Urban Americans in the US traveled 5.5 billion hours longer and bought an additional 11 billion liters of gasoline in 2011, which resulted in congestion-related expenses of US$121 billion.150 The cost of congestion in Australia's eight largest cities in 2005 was US$7.1 billion,151 made up of charges for personal time (37%) and business time (38%) as well as additional vehicle operating costs (13%) and increased air population (12%). The instance of Cairo, which costs Egypt up to 4% of its GDP, further illustrates the enormous economic effect of traffic congestion. Some of the richest citizens of So Paulo, Brazil, have taken to routinely using helicopters to avoid traffic bottlenecks.

In cities, not everyone has had access to motorized transportation; factors including gender, age, handicap, and poverty may make a difference. Additionally, travel by private motorized transport is considerably less important for women in developing countries since it is only available to a limited number of high-income (typically male) workers. But things are changing, especially in developing nations like China, India, and Brazil, where more middle-class women are buying and operating automobiles. In Russia, where owning a vehicle is a major status symbol, the proportion of female drivers rose by 50% between 2000 and 2006.Similar patterns have been seen in Mumbai, India, where traditional male-dominated gender roles in automobile buying choices are changing as women earn greater earnings. Differentiated access to opportunities is a result of gender inequalities in the use of motorized transportation[8].

Transportation Intermodality in City

Given that urban journeys often include a mix of many modes of transportation, the four modes of urban transportation addressed in this article are quite complimentary to one another. An essential requirement for enabling multi-modal trips, and implicitly also urban accessibility, is modal integration, or the coordination of transportation infrastructure, services, facilities, and spatial configuration to enable seamless links between at least two different modes, thereby facilitating trip-chaining. Spatial, network, fare, information, and institutional integration are strategies that make this possible and enable seamless transitions between various urban transportation modes. If public transportation wants to expand its modal share, it is crucial to make transfers between other modes and public transportation simple.

Although initiatives meant to improve integration differ across nations, intermodality is regarded as being crucial for enabling accessibility in cities. Western European cities have led the way in promoting modal integration, particularly between public and non-motorized transportation. Cycling considerably expands the reach of public transportation stops beyond walking distance, and having access to public transportation enables cyclists to undertake longer excursions.159 Bicyclists and passengers of public transportation may easily switch between modes of transportation thanks to Germany's 70 bike stations that are situated at railway stations. There are 24,000 bike parking places accessible at public transportation hubs in Berlin alone. There are now bike parking facilities at every metro and express interurban rail stop on the outskirts of the city. In the Netherlands, where 35% of train passengers commute by bike to and from railway

stations, all major train stations provide guarded bike storage areas as well as complimentary services (maintenance and repair).161 Train passengers in the UK have the option of purchasing a discounted bus ticket (PLUSBUS) that allows for a simple transition to buses[9].

Cities in North America have also seen a rise in facilities meant to combine cycling with public transportation, with bike parking spaces rising by 26% and 67%, respectively, between 2006 and 2008 in the US and Canada. Examples worth mentioning are Vancouver, where TransLink helps to integrate public transportation with bicycles, and the San Francisco Bay Area, where the Bay Area Rapid Transit (BART) system offers bike parking at almost all 43 stations. Between 1999 and 2009, TransLink, Vancouver's multimodal transportation authority, invested more than $12 million USD on this integration. Cities in poorer countries have only lightly considered modal integration. However, while not being intended to do so, impromptu and non-motorized means of transportation fill in significant gaps for other modes of transportation. Peseros vans, shared-ride taxis, and group minibuses in Mexico City link the metro with outlying stations in place of the ineffective public bus system without any financial support.

Cities in Asia and Latin America are starting to make some strides in modal integration. The integration of the city's bike lanes and bike sharing program with Guangzhou's BRT system, which transports 800,000 people each day, dramatically improves physical accessibility to public transportation services in China. So Paulo, Curitiba, Bogotá, Santiago, all in Brazil, Bogotá, Colombia, have all made steps to enhance integration between public and non-motorized transport.Cycling has been included into many of the efforts made so far in communities to promote intermodality between non-motorized and public transportation. But it has also been underlined how useful walking is as a feeder for public transportation networks.166 this also holds true for developing nations, as the majority of journeys made by public transportation require walking at both ends of the journey. For instance, a study of access trips for the Delhi Metro in India found that typically between 40% and 60% of customers walk to the stations.

Motorolight RAIL, BRT, AND Metro

The primary high-capacity transportation options metro, light rail, and BRT are reviewed in this, along with worldwide circumstances, trends, and obstacles. These public transportation options provide competitive alternatives to private motor cars and solutions for enhancing urban mobility, quality of life, and the environment in both developed and developing nations. Smooth travel inside and between cities is made possible by an effective system, and this is crucial for the operation and development of cities. Metros, light rail, and BRTs are ideal for major thoroughfares in cities as well as for use in more extensive, integrated public transportation networks. Urban form may be strategically shaped by high-capacity public transportation networks, which encourage denser populations as well as diverse and accessible land use. With fewer journeys requiring private motorized transportation, such modes might result in less miles driven by automobiles and motorbikes, reducing harmful externalities including air pollution, traffic accidents, inactivity, noise, and greenhouse gas emissions. Additionally, they play a crucial role in the creation of employment as well as in granting vulnerable and low-income groups with inclusive access.

In the discussion of urban planning, there are a variety of viewpoints about brt, light rail, and metro, as well as arguments for and against each mode. These three modalities are examined in this, demonstrating the need of doing thorough analyses that take into account all relevant advantages and disadvantages of high-capacity public transportation systems before deployment.

a summary of current global circumstances and trends is also provided, along with certain issues, such as those related to service quality, integration, financing, and institutions. the conclusion includes important policy suggestions.

Main Characteristics of Metro, Light Rail and BRT Systems

In medium- to high-demand corridors, rapid, comfortable, and affordable urban transit is what metro, light rail, and BRT are all designed to provide. When compared to unsegregated road-based modes of transportation like buses, taxis, and paratransit, these means of public transportation, which employ particular fixed or exclusive and separated tracks, have a higher operational capacity and performance. In theory, the implementation of metro, light rail, and/or BRT can result in significant advantages for a city. For example, it can increase the level of city-center activity, thereby enhancing agglomeration economies, which are essential for the prosperity of urban areas, and it can lessen traffic congestion, which would then result in a number of additional economic and environmental advantages. These modalities increase the urban poor's access to opportunities and services in places where they are prevalent in a variety of ways.

Metro

Metro is a high-capacity, frequently-operated urban electric transportation system that uses rail lines.5 Metros are built for operations utilizing tunnels, viaducts, or at surface levels, but with physically distinct infrastructure, independent from other cars, roadways, or pedestrian traffic. The metro system is also referred to as the underground, tube, subway, fast rail, or metropolitan train in different regions of the globe. More than 30,000 people may be carried by metros per hour in one direction.

Since the first subterranean train opened in London in 1863, metros have been a significant type of public transportation all over the world. Although metro systems are the most costly urban public transportation option, they are essential components of highly developed transportation systems because to their large capacity and greatest performance (in terms of speed and number of people transported). As a result, metro systems are very expensive to build and are often chosen as the best alternative in major cities when the demand supports the high capital cost.

Rail Transit

Light rail is an electric rail-borne mode of transportation that may be built out gradually to enhance capacity and speed. Light rail systems normally operate at the surface level with overhead electrical hookups and may have high or low platform loading as well as multi- or single-car trains thanks to the availability of unique right-of-way lanes. At road intersections, segregation is often implemented or light rail is given precedence in order to boost speed and service dependability. The term "light rail" is used to refer to any system whose function and efficiency fall somewhere between that of a regular bus service and that of a metro. As a result, light rail systems are adaptable and scalable. Light rail systems originated from the "streetcars," "trolleycars," or "tramways" that were initially horse-drawn carts in the second part of the nineteenth century. Around 1900, with the introduction of electricity, tramways gained enormous popularity, and many big developed-country cities as well as a select few in developing-country cities installed tram systems. Many trams were withdrawn from cities during the Second World War, but many of them were subsequently updated and reintroduced in the latter half of the 20th

century as a middle-ground, adaptable, and less expensive form of public transportation. Light rail systems are often located in rich cities and next to affluent areas due to their comparatively high cost.

Rapid transit buses

BRT is a bus-based method of public transportation that runs on exclusive right-of-way lanes at street level; however, in certain instances, grade separation at junctions in crowded city centers is provided via underpasses or tunnels.14 The phrase "BRT" was first used in the US15, and the first extensive BRT development was put into place in Curitiba, Brazil, in 1982.16 BRT is also known as a "high-quality bus system," "high-capacity bus system," "surface metro," "express bus system," and "busway system." Although the specifics may differ from nation to nation, the fundamental idea is the same: a high-quality, customer-oriented public transportation system that is quick, safe, comfortable, dependable, and economical. The finest BRT systems flexibly integrate information technology, bus services, busways, and stations into a cohesive system with a distinct character.18 BRT capital costs are 4–20 times cheaper than light rail systems and 10–100 times lower than metro systems with comparable capacity and service levels, depending on the exact system design.

Low noise, low emissions of air pollutants, including greenhouse gases, and excellent dependability are all characteristics of metro and light rail systems. Additionally, metro systems avoid using the surface's limited road area, delivering a continuously dependable and high-quality service. However, because to their limited flexibility, metro and light rail systems need bus or intermediary public transportation feeder services for last-kilometer connection. Additionally, in order to permit faster travel times, metros often have a greater distance between stations than light rail and BRT. While this expedites long-distance travel, passengers must travel further to reach stations as a result.

Capacity, commercial speed, and affordability are the three main factors to consider when assessing high-capacity public transportation systems. According to 3.1, BRT can provide high-capacity services for a fraction of the initial cost of light rail systems and metros, respectively. Although BRT and light rail systems typically produce slower commercial speeds than metros, certain BRT systems may surpass light rail in terms of speed (when employing express services or completely segregated facilities in expressways). The average capacity of elevated and subterranean metro systems is comparable, but it's crucial to keep in mind that their initial construction costs differ significantly. The different transport modalities' construction and operation expenses are covered in further depth.

CONCLUSION

The 'holy grail' of the twenty-first century metropolis may be 'accessibility'. However, the mobility patterns and circumstances described here show that cities continue to be out of reach for a sizable portion of metropolitan people, either physically or economically. In consequence, these restrictions limit urban residents' access to opportunities, which has an impact on their general well-being and advancement. Public transportation has the greatest potential to improve accessibility in urban areas, but it is either nonexistent or on the decline in the majority of developing nations, and advances in industrialized nations are not on the scale needed to reach sustainability goals. It is necessary to create a new business strategy for financing public transportation. Public transportation must always be accessible and inexpensive, but to increase

cost recovery, a new commercial paradigm is required that combines the social aspect of providing a public service with efficiency and business savvy. It takes a strong customer focus to transform captive riders (passengers) into customers and choice riders, making public transportation a lifestyle option. NMT is often overlooked and given low priority in urban mobility planning and investments, both in developed and developing nations, in spite of the many advantages it brings to users and society at large. Most people who choose this form of transportation do so because of a lack of options, making it the primary and often the only available method of transportation for the majority of citizens in developing nation cities. However, NMT circumstances are quite unfriendly in the majority of cities. Planning and designing for accessible mobility in cities includes investing in NMT to increase the safety and security of biking and walking. Planning and investment decisions abroad may benefit from the innovative experiences of cities in rich and developing nations that have elevated NMT as a basis for urban sustainability. The constant rise in the percentage of private motorized transportation is perhaps one of the most concerning developments, which poses a serious danger to urban accessibility. Developing nations are experiencing extremely high motorization rates, which are further supported by policies, actions, and investments that favor private motorized transportation over non-motorized and public transport modes, nearly 60 years after the private car solidified its status as the icon of the 20th century. While motorization rates in industrialized nations have essentially reached saturation levels, many of their cities are still suffering the effects of land-use and urban planning decisions that encouraged vehicle dependence and urban sprawl. Even if private motorized transportation does serve an essential purpose within the context of urban transportation as a whole, when it predominates, its externalities compromise the core sustainability requirements in urban areas. Therefore, taking action to facilitate changes to more sustainable modes via intentional and targeted policies and investments is necessary to address the larger welfare problems around equitable access to mobility.

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CHAPTER 6

NATIONAL POLICIES TOWARD HIGH-CAPACITY PUBLIC TRANSPORT IN DEVELOPING COUNTRIES

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ABSTRACT:

High capacity public transport systems, such as metro railways and bus rapid transit (BRT) systems, have gained significant attention in developing countries as a means to address urban transportation challenges. This paper examines national policies toward high capacity public transport in developing countries, analyzing their key features, challenges, and impacts. Drawing on a review of existing literature, policy documents, and case studies, this paper identifies common trends and patterns in national policies toward high capacity public transport in developing countries. The analysis reveals that national policies toward high capacity public transport in developing countries are often driven by a combination of factors, including the need to address increasing urbanization, congestion, air pollution, and social equity concerns. These policies typically emphasize the development of integrated and sustainable transport systems, with an emphasis on the expansion of mass transit networks, improved accessibility, and affordability. In addition, national policies often include provisions for technology transfer, capacity building, and local content requirements to stimulate domestic industries and create local jobs.

KEYWORDS:

Developing Countries, High Capacity Public Transport, National Policies, Public Transportation, Transportation Policies, Urban Mobility.

INTRODUCTION

In cities in industrialized nations, the expansion of urban infrastructure has naturally included rail-based public transportation networks. However, owing to institutional and budgetary limitations, cities in underdeveloped nations have failed in this area. However, during the last 15 years, a number of cities in developing nations have begun to construct BRT systems, and some have even begun or extended light rail and metro systems. To serve the vast amount of the population that increasingly lives in cities, national governments are now co-financing public transportation infrastructure, taking into account issues like energy security, economic efficiency, and climate change. This section gives instances of national policies that encourage high-capacity urban public transportation networks from a few chosen emerging nations[1].

China

The 'public trans- port city' project was launched in 2011 by the Chinese government via the Ministry of Transport to enhance the quality of urban public transportation and reduce traffic

congestion in Chinese cities. The demonstration projects, which are funded by the Ministry of Transportation and will be implemented in 30 chosen locations, will focus on building public transportation hubs, implementing "intelligent transport systems," and improving energy efficiency and reducing emissions in public transportation. The national government will give additional funding assistance for the demonstration projects, and provincial governments will contribute as well.

Several Chinese cities have begun building or expanding their public transportation networks in the form of metro, light rail, and BRT systems as a consequence of the government backing. For instance, Beijing is carrying on a fairly ambitious rail development program. The Beijing metro system became the longest metro network in the world in 2012 when it had 16 lines, 442 kilometers of track length, and 251 stations.708 kilometers of track are expected to be operational by 2015 and 1050 kilometers by 2020, according to expansion plans.

Hong Kong, Tianjin, Shanghai, Guangzhou, Dalian, Wuhan, Shenzhen, Chongqing, Nanjing, Shenyang, Chengdu, Guangfo, Xi'an, Suzhou, Kunming, and Hangzhou are among the other Chinese cities that are extending their metro systems. In addition, there are 22 cities where development is either being planned or is awaiting permission, in addition to the 18 cities that already have metro and light rail systems under construction. By 2012, there were 15 BRT systems in service in Chinese cities, while an additional 11 were either being built or were in the planning stages[2], [3].

India

The Jawaharlal Nehru National Urban Renewal Mission (JnNURM) was established by the Indian government in 2005 with a US$20 billion budget to develop urban infrastructure and provide essential services to the urban poor in 65 cities. The sixth five-year plan, which is planned to be implemented in 2013, will include a renewal of the program. The metro systems in the cities of Kolkata, Chennai, Delhi, and Bangalore are now in use thanks to support from the federal, state, and municipal governments in terms of both money and technical expertise. As a result of Delhi's success, metro systems are being built in six more Indian cities, while eleven further cities have metro systems that are in different stages of design. There are now 145 stations along 193 kilometers of metro rails in Delhi, where metro operations started in 2002. Plans for expansion include for the construction of an additional 139 planned and 140 authorized kilometers, for a total network length of 472 kilometers, by the year 2021. Busways exist in Delhi, Pune, and Jaipur in addition to the several metro systems now being built, and Ahmedabad has a fully functioning BRT system (75 kilometers in length, with an additional 80 kilometers either under construction or planned). The cities of Rajkot, Surat, Indore, Hyderabad, Pimpri-Chinchwad, Visakapatnam, and Bhopal are also presently implementing BRT systems. Eight more cities are preparing to implement BRT systems[4].

Brazil

The Brazilian government is in charge of encouraging advancements in public urban transportation. As a consequence, each city with 20,000 or more residents (about 1600 localities) must create a mobility master plan that is related to its urban development objectives. Public transit and non-motorized mobility are given precedence over private motorized transportation under the National Policy on Urban Mobility. Additionally, it aims to restrict or limit the usage of motor vehicles in a certain region or at a certain time. The strategy also calls for the

implementation of emission regulations for air pollutants as well as the establishment of congestion and pollution charges.

In advance of the 2014 FIFA World Cup and the 2016 Summer Olympics, the federal government established two programs, "Pro-transporte" and "Growth Acceleration Program," to boost investments in public transportation. BRT lanes are part of projects in nine out of the twelve cities hosting World Cup games, including Rio de Janeiro and Belo Horizonte. Light rail systems like monorails and trams are being developed in four cities, including So Paulo and Brasilia, with the adoption of the same in another five. Belo Horizonte, Brasilia, Porto Alegre, Fortaleza, Recife, Rio de Janeiro, So Paulo, and Teresina are the eight cities that now have metro systems[5].

Thirty-one cities in Brazil now have BRT systems or bus ways, with a combined length of 696 kilobits, which were inspired by the bus lanes put in place in Curitiba in the 1970s. The majority of Brazil's busway corridors need restoration, and BRT systems provide a way to improve public transportation productivity while resolving issues brought on by many overlaid radial lines that converge at city center terminals. Some portions of existing busways are now being upgraded to BRT standards in a number of cities, including Belo Horizonte, Porto Alegre, Salvador, Brasilia, and Belém.

Mexico

The PROTRAM (Federal Support Programme for Public Transport) was established by the Mexican government in 2008 with the goals of increasing urban transportation effectiveness and lowering greenhouse gas emissions. 11 BRT systems and 1 suburban rail system have received financial assistance from PROTRAM to far. This initiative, which offers grants and credits, is designated to support further pipeline construction in 34 locations. Mexico's main city, Mexico City, has a metro system. The cities of Guadalajara and Monterrey have light rail systems. León, Mexico City, Guadalajara, Ecatepec, and Monterrey all have BRT systems[6].

Kenya

The Integrated National Transport Policy, introduced by the Kenyan government in 2009, aims to provide suitable institutional and regulatory frameworks to coordinate and unify the administration and delivery of passenger transport services. The creation of autonomous entities to oversee urban passenger transport services and operations is one of the policy proposals. The strategy also aims to increase the usage of high-capacity public transportation by building a railroad network across Nairobi and the surrounding area. As a result, the government inaugurated the Syokimau Railway station in Nairobi's suburbs in 2012. The 18-kilometer train ride to the city center from this station has cut the trip time in half. In order to improve the city commuter train service, officials have also made sure that the railway is connected with other modes by introducing last-mile connection buses.

The transport strategy also includes provisions for bus lanes, promoting high-occupancy public transportation vehicles via financial incentives, and discouraging the use of private motor cars once the public transportation system is operating well. In order to aid in the construction of certain high-capacity public transportation corridors, the Kenyan government created the National Urban Transport Improvement Project (NUTRIP) in 2012. This initiative was financed by the World Bank.

Morocco

The Moroccan government has set out to reform the transportation industry along three main axes: enhancing the sector's governance; enhancing the effectiveness and expanding the supply of infrastructure and services related to urban transportation; and enhancing the sustainability of urban transportation from an environmental and social standpoint.28 Light rail projects have received significant funding in the cities of Casablanca and Rabat-Salé. The 44 trams that make up the 2011-commissioned tramway route between Rabat and Salé are planned to carry 180,000 passengers per day. The dual-line tramway network is 19.5 kilometers long and has 31 stops that are separated by half a kilometer. For the 74 trams needed to operate the 31-kilometer, Y-shaped network in Casablanca, the tramway development business bought them in 2012. There are 48 stations along the route, and 255,000 people are anticipated per day[7].

Nigeria

Nigeria's 2010 National Transport Policy aims to strengthen the infrastructural and administrative framework for providing public transportation services, as well as to create an effective, self-sufficient, and dependable public transportation system. It also strives to increase the capacity of the current infrastructure by maintaining roads properly and managing traffic effectively. It also asks for a significant increase of urban infrastructure, with a focus on infrastructure for public transportation, such as railroads and express bus lanes. The policy calls for the implementation of a high-capacity bus-based transportation system that will fit within the confines of the current infrastructure. In Lagos, where a BRT is being implemented, there are already designated bus lines. Additionally, the program seeks to encourage private sector involvement in urban public transportation and, over time, to roll out fast rail systems in the nation's largest cities. Each large city will form a self-governing organization called the Municipal Transportation Agency to improve the effectiveness of operations and administration of the urban transportation system. These agencies' responsibilities will include, among other things, regulating, planning, developing, and maintaining urban transportation infrastructure facilities[3].

South Africa

The Public Transport Strategy in South Africa intends to enhance public transportation by creating an integrated fast public transport network made up of a comprehensive set of quick rail and road corridors. By 2020, most city inhabitants should only be 500 meters away from a BRT station, according to the government's plan to connect various metropolitan areas via BRT.32 Through public-private partnerships, communities create and maintain the necessary infrastructure for the operation of the BRT networks, including bus stops, depots, control centers, and a fare collecting system. Contrarily, private operators engage people, own and control the buses, and provide services under a long-term contract.

Since 2009, parts of the Rea Vaya BRT have been introduced around Johannesburg. Notably, the first trunk line connecting Thokoza Park in Soweto with Ellis Park in Doornfontein has been finished. The Rea Vaya line will eventually encompass 330 kilometers, enabling more than 80% of Johannesburg inhabitants to board a bus within 500 meters of a BRT stop.33 In addition to Cape Town's MyCiTi BRT system and Tshwane's Tshwane BRT, which will span around 80 kilometers of bus lines, there are BRT systems in Johannesburg, Cape Town, and Tshwane as well. The Gautrain, the first high-speed passenger rail line in South Africa, was put into

operation by the Gauteng Provincial Government and connects Johannesburg and Pretoria with OR Tambo International Airport. The 80-kilometer high-speed passenger railway network consists of two tracks: a north-south line between Pretoria and Hatfield, Johannesburg, and an east-west line from Sandton to the airport. Most of the ten stations along these two routes are served by a network of feeder buses.

DISCUSSION

Metro Systems around the World: Trends and Conditions: The international market for railroad infrastructure and equipment has been increasing at 3.2% yearly as a result of government stimulus programs implemented in the aftermath of the global financial crisis, and is expected to increase at a rate of around 2.7% annually through 2017. Spending on metro rail networks should increase much more quickly, potentially by 6–8%. the expansion of metro rail networks globally, measured by the number of cities having operating networks. Around the globe, there were 40 cities having metro systems as of 1970. Over the next four decades, this number rapidly increased. An overview of the development of metros across the globe shows that there are now 187 cities having a metro system as a component of their public transportation system. The significance of metros in enabling movement, especially in big metropolitan regions outside of city bounds, is shown by the fast growth of rail-based systems. Metros are significant because people who live in remote areas must travel great distances to job centers and other activity hubs, and they are less likely to be congested than motorways.

With 8.5 million, 6.9 million, and 6.7 million people per day, respectively, Tokyo (Japan), Seoul (Republic of Korea), and Beijing (China) are the biggest or most utilized metro systems in the world. In Shanghai, China, the extension of the city's subway has been given top priority with the opening of six additional lines in 2010 and a planned four-fold increase of the current 423 kilometres of track length by 2020.41 In 2007, the city's metro accounted for 13% of its total public transport; and with the opening of six additional lines in 2010, the city's metro will account for nearly 80% of all motorized trips.40 In Tokyo, Japan, the modal share of public transport is nearly 80%. Many cities in emerging nations, especially in China, have been able to quickly build their metro networks. For instance, the most people in China utilize public transportation in Beijing, which has one of the two most advanced subway systems in the whole nation.42 Since 2005, Beijing has dedicated 30% of its public development budget to its public transportation system, including its metro. Although Beijing has a robust public transportation system by Chinese standards, its people do not use it as often as those of neighboring cities like Seoul (Republic of Korea) and Tokyo (Japan). As a consequence, one of the government's most pressing problems continues to be the production of air pollutants from mobile sources[2].

The overall track length of Cairo, Egypt's metro system has developed significantly since its 1987 inception, and it presently totals 90 kilometers.43 Additionally, the metro's modal share of all trips has steadily climbed from 6% immediately after the system's introduction to 17% in 2001. Due in part to its reasonably priced tickets, the metro's overall use has increased from 2 million per day in 2001 to more over 3 million in 2012.44 A study of metro systems throughout the globe indicates several tendencies. First off, the population density in most of these cities is quite high. For instance, Tokyo's metro has the most users worldwide and is situated in the region with the biggest urban population in the world (around 37 million people)45. Similar to New York and Mexico City, which each have an estimated population of over 20 million, these large metropolitan agglomerations have metro systems that handle 4.5 million people each day.

Large cities also imply that they are often the most financially stable, since tiny towns lack the economies of scale required to build and run metros.

Second, metropolitan centers with metro systems have often developed beyond of their predetermined bounds, absorbing neighboring regions, nearby towns, and sometimes whole provinces. For instance, communities in two states have been encroached upon by Mexico City. In China, Shanghai encompasses a mega-urban region covering an area of over 6340 square kilometers, and the Beijing mega-urban region spans over 16,870 square kilometers.47 This suggests that the governance of metro systems has to go beyond the traditional city limits. Tokyo (Japan), which has the largest metro system in the world, has 75% of its estimated 37.2 million population living in suburban areas. In terms of efficiency, construction and operating costs, metropolitization of neighboring districts, municipalities, and cities via cross-boundary institutions provides substantial advantages, including fostering economic synergies among newly linked regions.

Third, many of the cities having metro systems are either the largest cities or the capital cities of the nations in which they are located. 9 of the 16 cities with the biggest metro systems in the world (3.4) and 27% of all cities with metros are capital cities. The remaining are large cities. For example, in China, Japan, and Germany, in addition to the capital cities, 15, 12, and 18 cities, respectively, have metro systems. The amount of money a country invests on metro networks depends on whether it is the national capital or another important city. This is so that they may control the system of settlements and carry out important administrative, commercial, diplomatic, financial, and industrial tasks, in addition to producing more income. Capitals and other major cities need a competent and integrated public transportation infrastructure, including metros, to carry out these responsibilities.

Worldwide Light Rail Systems: Trends and Conditions

Light rail is a flexible idea that originated with the horse-drawn rail carts of the nineteenth century48. Its re-emergence as a viable alternative to buses and vehicles as a form of transportation was brought on by its ability to reduce traffic and promote mobility in metropolitan areas. Urban regions with metro systems have often developed or expanded above their predetermined bounds, absorbing surrounding territories, neighboring towns, and sometimes whole provinces. Top ten tram and light rail systems according to ridership. Both industrialized and developing nations now have a large number of light rail lines. Light rail systems have been notably noticeable in the UK, France, Spain, Portugal, and Italy among European nations. These nations have effectively raised the level of service and increased the system's reputation while keeping costs down. As a result, during the last 20 years, numerous cities in Latin America, Asia, and Africa have reintroduced light rail systems. Approximately 400 light rail and tram systems were operational in 2013; new systems are being built in an additional 60 locations.

There are a significant number of light rail systems in Western Europe (170 systems) and the US (more than 30 systems), with another 200 light rail systems either under construction or in different stages of development. There are also a lot of light rail networks in nations in Eastern Europe and Central Asia. Light rail systems' rising popularity may be due to their capability to offer large transportation capacity without the cost and density required for metro systems.50 Several African nations, including Algeria, Egypt, and Tunisia, have established light rail systems. The tramway opened for business in Algiers (Algeria) in 2010. Between 150,000 and

185,000 people per day are anticipated to use the tramway once it is finished and fully operational.51 The Oran tramway was also inaugurated in May 2013. With a length of 18.7 km and a daily capacity of 90,000 people, the Oran tramway is one of several light rail projects in various African nations. For instance, a 34-kilometer light rail project is being implemented in Addis Abeba, Ethiopia.53 Additionally, construction of a 28-kilometer light rail system between Curepipe and St. Louis, Mauritius, is set to begin in 2014.

Globally, the predominance of the private vehicle and aging or outmoded infrastructure provide challenges for light rail systems. As a consequence, transportation authorities in many cities are renovating or building brand-new light rail infrastructure. Growing environmental awareness and rising gasoline prices are also encouraging more individuals to use public transportation. As a key component of their revitalization initiatives, numerous European towns have overhauled or added new light rail and tram networks during the last 20 years. For instance, 24 French towns, including Nantes, Grenoble, Bordeaux, Clermont-Ferrand, and Marseille, are undergoing major urban renewal projects. Other cities are making progress with their planning, including Lille, Lyon, Caen, Brest, Nancy, and Toulon. Even towns without light rail, like Astana, Kazakhstan, have advanced phases with plans for the deployment of light rail.55 The tram networks in France are anticipated to have a total track length of 610 kilometers by 2015.

There is a clear growth of tram networks in various European towns. According to a research, there were 488 kilometers of development underway in 40 towns and municipalities throughout the 15 EU nations in 2009. An additional 1086 kilometers of network enhancements were proposed by 55 cities and municipalities, including 268 kilometers for new systems and 818 kilometers for extensions.In addition to being environmentally friendly and technologically advanced, light rail systems are also seen as emblems of national pride. Mayors from French cities like Mulhouse, headed by Samuel-Weis, have stated: "We wanted a tram that drew attention to itself, as a symbol of economic vigor, environmental consciousness, and municipal progress - transportation as an integrated cultural idea.

Worldwide BRT Systems: Trends and Conditions

BRT is a relatively new phenomenon when compared to metro and light rail systems, with the first busway being completed in Curitiba (Brazil) in the early 1970s59. Nevertheless, bus priority policies were in place for years previous to the establishment of the Curitiba BRT system. Since then, the use of BRT systems has grown significantly across the globe. 156 cities have BRT and bus lines as of the middle of 2013, the majority of them having been put into place in the previous ten years. A comparison of the development and effectiveness of BRT and metro systems is impossible since they are both quick public transportation systems. Asia (27%) and Latin America and the Caribbean (6.4%) have the highest concentrations of BRT systems, respectively (3.6 and 3.5). Only 23% of the ridership of metro systems use BRT, which averages 25.7 million people daily. But when it comes to system lengths, BRT systems encompass a total of The world's biggest BRT systems those with daily ridership of more than 300,000 are included. In terms of their total track length and daily demand, BRT systems are not yet comparable to metro systems; the longest metro system (Beijing) is 3.3 times longer than the longest BRT system (Jakarta), and the most popular (in terms of daily ridership) (London) transports four times as many people as the most used BRT system (So Paulo). The TransMilenio BRT in Bogotá, Colombia, offers quick and dependable transportation for more than 1.8 million people each day while also easing traffic congestion.62 Travel time has

decreased by 34% and road deaths have decreased by 88%. When compared to eight other Brazilian cities of comparable size, Curitiba consumes 30% less fuel per capita. In Curitiba (Brazil), 70% of commuters utilize the BRT to go to work, resulting in a reduction of 27 million vehicle trips annually. This aids in achieving environmental objectives related to air quality. BRT has the potential to boost total public transportation usage by improving the accessibility, affordability, and customer-friendliness of high-capacity public transportation. More than 1.3 million people use the BRT in Curitiba every day, yet commuters spend far less than the national average only 10% of their incomeon transportation. African cities have recently made incredible progress in implementing BRT into their public transportation networks. In 2008, Lagos (Nigeria) opened a BRT 'light' corridor a high-quality system that is inexpensive in the local setting and maintains as many of the coveted BRT attributes as feasible. This was the city's first major investment in public transportation. A 22-kilometer route, 26 terminals, and 220 high-capacity buses were included in the system's first launch, and 60,000 people were expected to utilize it each day. By 2010, it was transporting 220,000 people each day, with the first 21 months of operation accounting for more than 100 million person-trips. The 'light' variant of BRT reduces expenses by half (about US$2.75 million per kilometer), but capacity is still constrained due to the use of kerb-aligned busways rather than median-aligned busways and the absence of a separate busway throughout the whole route. As a result, the BRT system's total speed (and capacity) is decreased. Additionally, commuters may now enjoy safe, dependable, and clean transportation while cutting their travel and waiting times by 40% and 35%, respectively. The development of 1000 new direct jobs and more than 500,000 new indirect jobs are two additional substantial socioeconomic advantages. Local business owners are capable of operating prosperous public transportation networks, as the Lagos BRT has shown[8].

The leadership and political commitment at all levels of government, a competent, strategic public transport authority (LAMATA), a focus on user demands, and deliverability within a budget and program are all factors that contributed to the success of the Lagos BRT. A community participation campaign that gave residents confidence that the BRT 'light' system is a project they developed, owned, and utilized was essential to the Lagos BRT's success. Given that Lagos citizens had limited experience with organized public transportation, this kind of participation was essential. The community involvement attempted to allay citizens' doubts and suspicions about the project's goals and intentions since there is a history of poor delivery of transportation upgrades and because previous systems intended to guarantee that profit was channeled to the already wealthy.69

Three South African cities (Johannesburg, Cape Town, and Port Elizabeth) all started BRT lines as a result of the 2010 World Cup. The Johannesburg Rea Vaya system, which opened in 2009, was the continent's first fully operational BRT line. Its 22-kilometer route costs US$5.5 million per kilometer, travels at 25 kph, and carries 16,000 riders each day. The first phase, which was finished in 2011, has 122 kilometers of busways and transported 434,000 people each day. For 80,000 passengers per day, the Rea Vaya BRT in Johannesburg connects the central business district with Braamfontein and Soweto, reducing traffic congestion on that route in the process.71 In terms of employment, the Rea Vaya has generated more than 800 permanent jobs and about 6840 temporary construction jobs.72 About 350 of these workers were hired from among the taxi drivers who were impacted by the launch and expansion. Pre-paid tickets, level boarding for complete accessibility, several stopping bays, and weather-protected stations were all incorporated. Additionally, local artists have been hired and the stations have been created

with the surrounding urban environment in mind. In addition to the aforementioned South African cities, other BRT plans are being built in Lagos, Nigeria. Similar to this, other African cities are also spending money on reliable, effective, and environmentally friendly transportation. Accra in Ghana, Kampala in Uganda, Dar es Salaam in Tanzania, Nairobi in Kenya, and a number of South African cities (Bloemfontein, Durban, East London, Pretoria, Ekurhuleni, Polokwane, and Rustenburg) are among them. This exemplifies the trend toward high-tech BRT systems from unorganized public transportation systems.

CONCLUSION

In light of the complicated issues surrounding urban transportation, national strategies toward high capacity public transit in emerging nations are critical. These regulations support economic development and social fairness by enhancing the accessibility, affordability, and sustainability of transportation networks. But obstacles to policy implementation include budgetary limitations, problems with institutions and governance, social and political difficulties, and cooperation among stakeholders. Despite these obstacles, high capacity public transport programs have good effects that are clear, such as greater mobility, less traffic and air pollution, more job possibilities, and better social justice. Additionally, innovation and economic growth may be supported through the expansion of indigenous industries and technology transfer. Tackling the issues needs multifaceted strategies, including suitable financial sources, strong regulatory frameworks, capacity development, stakeholder involvement, and tackling social and political difficulties, in order to guarantee effective policy implementation. Additionally, encouraging coordinated planning and use of resources across all forms of transportation, including unofficial transportation networks, may increase the efficacy of these regulations.

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CHAPTER 7

MAIN CHALLENGES FACING HIGH-CAPACITY PUBLIC TRANSPORT SYSTEMS

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ABSTRACT:

High capacity public transport systems play a crucial role in addressing urban mobility challenges by providing efficient and sustainable transportation options for large numbers of passengers. However, these systems also face various challenges that hinder their effectiveness and sustainability. This abstract aims to highlight some of the main challenges facing high capacity public transport systems. One of the primary challenges is the increasing demand for high capacity public transport systems due to rapid urbanization and population growth. As cities continue to expand, the pressure on public transport systems to accommodate larger numbers of passengers becomes more significant. Meeting this demand requires substantial investments in infrastructure, rolling stock, and operational capacity, which may be constrained by limited financial resources and land availability. Another challenge is the integration and interoperability of different modes of public transport within a high capacity system. Many cities rely on a combination of bus, metro, tram, and rail systems to meet the diverse needs of their populations. Ensuring seamless connectivity and coordination among these modes can be complex, requiring advanced planning, scheduling, and ticketing systems, as well as cooperation among different transport operators and agencies.

KEYWORDS:

Accessibility, Capacity Constraints, Congestion, Funding, Financing.

INTRODUCTION

High-capacity public transportation networks continue to encounter a variety of difficulties despite their development, particularly in developing nations. Some of the major issues are covered in this part, such as integration inside the public transportation system, with other modes of transportation, and with the urban form, service quality, finances, and institutions.

Integration into the system of public transportation

Three layers of integration take place: the physical, operational, and fare. Physical integration, which often includes transfer facilities and terminals, enables direct connections from one service to another. Operational integration involves coordinating schedules and frequencies to ensure service reliability and reasonable wait times. Fare integration comprises free or inexpensive transfers, often made possible by cutting-edge ticketing systems. The creation of information systems to coordinate services and provide users information is necessary for effective integration[1].

The majority of cities in developed nations have achieved advanced integration at all three levels, either through the consolidation of multiple public transportation authorities (such as the Land Transport Authority of Singapore or the Transport for London, UK) or the coordination of numerous agencies (such as the Consorcio de Transportes de Madrid, Spain, or STIF in Paris, France). While most metro, light rail, and BRT systems in developed nations have begun to connect with the rest of the public transportation system, this is not the case in developing countries. When separate lines are not linked with one another, as is the case with the metro in Bangkok, the light rail in Manila, and the BRT in Quito, commuters must pay extra tickets and travel great distances to connect between stations. This has proven to be a significant barrier to system use. High-capacity public transportation systems have been effectively integrated with the rest of the city's public transportation networks in a few significant cities. Including additional transportation system components in the integration.

Along with the integration of public transportation components, it's essential to provide enough connection to other urban transportation options including automobiles, motorcycles, taxis, bicycles, walking, and bicycling. These links serve as feeder services for public transportation networks, enabling door-to-door communication and extending the reach of the network. The most frequent method of accessing public transportation is often walking, which needs a suitable environment with sheltered, well-lit, signalized, and paved pathways. The requirements of the most vulnerable users children, the elderly, and those with disabilities should be taken into account throughout design. It's critical to design these areas in accordance with best standards, but possibly even more crucial is to maintain them clear of encroachments and tidy. Although managing sidewalks is often beyond the purview of public transportation agencies, effective cooperation with the relevant organizations is essential to guaranteeing the security and comfort of passengers using public transportation who are going to and from the stations[2].

For instance, Singapore has sufficient facilities for pedestrians. There are 491 overhead bridges, 54 pedestrian underpasses, 26 footbridges, 24 kilometers of covered linkways, and 98,400 streetlights, according to a list of pedestrian facilities in Singapore. These all provide a comfortable and safe strolling atmosphere that is unmatched in other Asian cities. Infrastructure and secure parking are two integration components that cyclists need. In order to safeguard both cyclists and pedestrians, bike movement should be kept as far away from both the walking and driving environments as is practical.

Additionally, bike lanes should be sufficiently broad to enable bicycle movement, with significant separation from bus or automobile traffic, and/or provide sufficient bike parking at stations. It is advised to park safely at the integration point in systems of public transportation with large capacity. Taxis, unofficial transportation options, and parking facilities for cars are other ways to offer last-kilometer connection. In order to transport passengers to and from the train station in Nairobi, the Kenya Railways Corporation introduced last-mile connection buses in 2013.Passengers are picked up from the surrounding regions by last-mile connection shuttle services, who then deliver them to the Syokimau Railway Station and drop them off at different locations within the city center. The Corporation has hired a commercial company to offer bus connections for rail transportation passengers within the city center for this reason.Ample space is required for these devices at key integration sites, notably those on the outskirts of cities. This is done to make sure that a variety of users may use the public transportation system and prevent them from driving to the city center.

DISCUSSION

Integration with the built environment: High-capacity public transportation networks may provide compact, pedestrian- and public-transportation-friendly surroundings that are integrated into the surrounding region when paired with compatible land-use and zoning rules. Many cities, like Copenhagen (Denmark), Singapore, and Curitiba (Brazil), have been successful in implementing effective public transportation systems and creating urban environments that are extremely favorable to using them.78 Public transportation and urban form coexist in these cities, either via flexible public transportation alternatives that are appropriate for low-density urban growth or through mixed-use, accessible, compact development that is ideal for public transportation also known as transit-oriented development.

Singapore is designed to be a small city focused on public transportation, with high-density residential and commercial projects centered on transportation hubs. This makes public transportation more easily accessible. All types of public transportation are often accessible to the general public and reasonably priced, which contributes to growing use of public transportation and a decrease in the use of private automobiles, despite the fact that public bus and rail services are offered on a commercial basis. Both the public transportation system and the city are effective when they are properly integrated with the built environment. Ridership on public transportation is increased by high density and private automobile ownership and usage restrictions, whereas mixed-use, densely populated metropolitan environments are made more accessible by public transportation. As a result, shorter journeys may be made by bicycle or on foot. As a consequence, there are fewer car miles driven, resulting in reduced transportation emissions and fewer traffic accidents[3].

The level of service

The user's perception of the many components that make up service quality includes factors including travel time, dependability, safety and security, comfort, and user information. Door-to-door connection, going to the station, waiting for the service, riding on board, changing services, and walking to the ultimate destination all contribute to the total journey time. Regarding the service's arrival and the amount of time spent traveling on board, reliability is important. Safety ensures that the trains and buses are kept in good condition and that the passengers won't be exposed to incidents that might have been avoided.

Passengers should assume that they won't be the victims of theft or terrorism while traveling for security reasons. Comfort is related to a number of features, but mostly to the amount of available space, or occupancy. User information is provided in a variety of ways to help the user navigate the system and stay informed of updates and any problems. The world's most cutting-edge public transportation systems take into account all these aspects of quality to provide a very appealing alternative to driving a vehicle or a motorbike. The initial and end legs of the journey i.e., walking to and from the station may not be included in many modern systems in developing nations' high-quality services. The crucial component of inclusive public transportation systems known as "universal design"is often disregarded.

Reliability has been included into key performance indicator measurements in industrialized cities. However, dependability is seldom tested and hence is not controlled in emerging cities. In emerging cities, light rail and BRT systems often see train or bus "bunching" (i.e., two or three cars arriving at the stage at once and spaces between vehicles). This lowers the systems' capacity

and results in certain cars having high occupancy levels while others have extra room. Advanced control systems might be used to provide the drivers real-time information and so lessen bunching.

When evaluating comfort, occupancy levels are the key factor. Notably, occupancy standards tend to vary across industrialized and developing nations: four to five occupants per square meter and six to seven occupants per square meter, respectively. Instead of user approval or cultural concerns, this is often a consequence of financial reasons. Higher occupancy regulations result in a reduction in the number of cars, drivers, and infrastructure needs. Additionally, it indicates that peak flow capacity has been inflated[3]. As a consequence, numerous systems may see a decline in popular support. For example, studies of users of the metro systems in So Paulo (Brazil), Manila (the Philippines), and Bogotá (Colombia) show that the biggest customer complaint is overcrowding in trains, buses, and stations. These polls show that the approved occupancy norms, regardless of the public transportation mode, are not accepted by users and should be amended. This is significant when looking at public transportation as a substitute for driving a private car. Long-term, high occupancy criteria can lead to a rise in the use of motorbikes and automobiles as a consequence of rising consumer prices. User information systems, which comprise both static and dynamic data, are very helpful for first-time users, guests, and regular users who take infrequent journeys. Modern systems include audio and video announcements for the hearing and visually handicapped, as well as real-time information on service arrivals. This kind of information is progressively becoming accessible on portable devices thanks to the development of smart wireless technologies[4].

Finance

Financial accessibility is necessary for effective urban transportation networks. On the other hand, a lack of funding may limit the ability of the appropriate authorities to establish environmentally friendly, high-capacity public transportation solutions. With regard to urban transportation systems, the concerns that are covered in the paragraphs are looked at in further depth. Projects using public transportation have financial concerns.Large sums of money are needed for the development and upkeep of metro, light rail, or BRT systems. One problem that both industrialized and developing nations have is the propensity to overestimate demand and underestimate time and expense throughout the decision-making process, which results in expensive overruns for both. In the event of overestimating demand, 84 percent of rail projects and 50 percent of road projects have been linked to mistakes higher than 120 percent. The average cost escalation for rail, fixed link, and road has been calculated at 45, 34, and 21 percent, respectively.82 Strong institutions and assessment processes are needed for this problem, as well as significantly better project preparation procedures, to guarantee more accurate data is available for use in decision-making.

Money sources

Local, regional, and federal governments must contribute to the funding for capital improvements in high-capacity public transportation. Several nations have created co-financing initiatives for capital expenditures in public transportation, often with the aid of multilateral development banks and global technical assistance initiatives. The major multilateral development banks, including the World Bank, African Development Bank, Asian Development Bank, Development Bank of Latin America, European Bank for Reconstruction and Development, European Investment Bank, Inter-American Development Bank, and Islamic

Development Bank, made a US$175 billion pledge to support sustainable transportation between 2012 and 2022 during the Rio+20 Conference.83 This money will be used to support all environmentally friendly modes of transportation, including as train travel, inland waterways, bicycle and pedestrian infrastructure, public transportation, and road safety. The climate change financial mechanisms are additional international funding sources, however they are often insignificant in comparison to the financing requirements. The significance of cities for national productivity, as well as national energy security and environmental goals, are the driving forces behind the national governments' interest in public transportation. Equity, increased access, and opportunity for low-income and vulnerable populations living in metropolitan areas are additional factors that should be taken into account. To maximize the advantages of such expenditures and prevent cost overruns, it is also crucial to establish effective assessment mechanisms. To finance the development and operation of public transportation systems outside of fare-box earnings, local authorities need creative financing options in addition to payments from other levels of government.86 We go through a few possible sources of money in further detail.

Grants for public transportation

The topic of subsidies is another crucial element of finance. Public transportation subsidies are effective and socially beneficial, since it has various positive externalities (air quality, climate change, road safety, physical activity), according to the research on transport economics. Therefore, it is socially beneficial to provide subsidies to operators to encourage them to cut their current prices and/or increase their current frequencies.87 The "Mohring effect," which shows that subsidies enhance ridership and ridership rise engenders greater service frequencies, reduces the average waiting times at public transportation stations. This impact is responsible for the bulk of the social benefits. Because riders benefit from scale efficiencies, subsidies may thus be appropriate. However, for subsidies to be directed toward service improvements and meeting the needs of vulnerable groups (poor income, elderly, and disabled), they must be managed effectively. Unmanaged subsidies may lead to inefficiencies, including high maintenance costs, a high operator and driver population, and unnecessary overhead[5].

Institutions

Multiple organizations and governmental levels are involved in urban transportation, however these entities are not always properly coordinated. Lack of coordination causes a number of problems, including a lack of integration between elements of public transportation, other modes of transportation, and the built environment. In many cases, the organizations in charge of metros, light rail, or BRTs are exclusively in charge of their own mode, with little to no coordination with other elements of the urban transportation system. The absence of technical and administrative capability is a second institutional problem. Many organizations in developing nations struggle to keep skilled workers on staff to design, carry out, and oversee the complexity of public transportation projects. Through training and professional development programs, the technical capability must be urgently upgraded. We talk more about the institutional and governing aspects of sustainable urban transportation networks. Through direct interactions with peer institutions and benchmarking, there are significant chances to improve technical and management capability. Examples of some of these initiatives include:

A group of medium-sized metro systems from around the world, including Bangkok (Thailand), Barcelona (Spain), Buenos Aires (Argentina), Brussels (Belgium), Delhi (India), Istanbul

(Turkey), Lisbon (Portugal), Montréal (Canada), Naples (Italy), Newcastle (UK), Rio de Janeiro (Brazil), Singapore, Toronto (Canada), and Sydney (Australia), comprise the international benchmarking program known as Nova. Building measures to develop metro best practices, providing comparison data to the metro board and the government, introducing a system of management measures, and identifying priority areas for improvement are the four major goals of Nova[6].

A group of major metro systems from around the world, including Beijing (China), Berlin (Germany), Guangzhou (China), Hong Kong (China), London (UK), Madrid (Spain), Mexico City (Mexico), Moscow (Russia), New York (US), Paris (France), Santiago (Chile), So Paulo (Brazil), Shanghai (China), and Taipei (China), comprise the international benchmarking program CoMET. CoMET has the same four major goals as Nova: develop methods to create metro best practices; provide comparative data to the metro board and the government; construct a system of management measures; and identify priority areas for development. The International Bus Benchmarking Group (IBBG) is a program for benchmarking urban bus operations made formed by medium and large bus organizations from around the world, including Barcelona, Belgium, Brussels, Ireland, London, Portugal, Lisbon, New York, Singapore, Sydney, Australia, and Vancouver, Canada. IBBG was founded in 2004 to provide a private platform for members' companies to learn from one another, compare performance, exchange experiences, and find best practices. To promote, consolidate, and strengthen BRT and integrated transportation systems so that they serve as models for future mobility in Latin America and the rest of the world, and to effectively improve the quality of urban life, is the mission of SIBRT. Additional exchanges are arranged by professional organizations as Associaço Nacional de Transportes Pblicos (Brazil), American Public Transportation Association (US), Canadian Urban Transit Association (Canada), and International Association of Public Transport (global)[7], [8].

CONCLUSION

This has provided empirical evidence on global trends, circumstances, and issues relating to the function of high-capacity public transportation networks. When it comes to enabling more effective urban transportation networks and sustainable urban growth patterns, these systems play significant social, economic, and environmental responsibilities. These big and dense urban agglomera- tions are the best places for such high-capacity public transportation systems, which are crucial components of integrated public transportation networks. As a result, they need to be created to provide a cost-effective substitute for motorbikes and personal vehicles. A daily average of 112 million people use metro systems worldwide. Asian cities account for 46% of the world's riders, with European cities coming in second with 34%. Only two African cities have metro systems as of 2013. Despite the fact that there are around 400 light rail and tram systems operating globally, the number of riders on these systems is substantially smaller. Although the two light rail systems with the most users are both in Asia, the majority of these are situated in Europe and the US. Around the globe, 156 cities have BRT systems as of the middle of 2013. Less than 25% of metro systems' daily ridership, or roughly 26 million people, is carried by BRT. The majority of BRT systems are found in developing nations, mainly in Asia and Latin America and the Caribbean. The features of the metro, light rail, and BRT systems vary, and each has advantages and disadvantages. This paper urges an early assessment of the advantages and disadvantages of high-capacity public transportation systems before their installation. Additionally, it's crucial to steer clear of never-ending conversations about alternatives since the

worst case scenario is "to-do-nothing." An adequate knowledge of the needs and attitudes of its prospective customers is a key factor in the effective implementation of high-capacity public transportation systems. Metro, light rail, and BRT systems must be planned and deployed in a way that satisfies the expectations of prospective users in order to secure maximum ridership.

For public transportation systems to be effective and sustainable, integration is crucial. The most effective systems are those that have route integration, integration with other public transportation systems, integration with private motorized transportation (such as by encouraging private car owners to park outside the city center and use public transportation for some of their daily commute), integration with non-motorized modes (such as by providing easy access for pedestrians and/or bicycle parking and allowing bicycles onto public transportation vehicles), and integration with other transportation modes.

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CHAPTER 8

A BRIEF DISCUSSION ON URBAN GOODS TRANSPORT

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ABSTRACT:

Urban goods transport, or freight transportation in urban areas, is a critical component of modern cities' functioning. It involves the movement of goods, products, and materials within and between urban areas, supporting economic activities such as trade, commerce, and manufacturing. However, the rapid growth of urban populations, increasing urbanization, and changing consumer behavior have led to significant challenges in urban goods transport, including congestion, air pollution, noise pollution, and inefficient use of resources. An overview of the current state of urban goods transport, including its challenges and potential solutions. It highlights the need for sustainable and efficient urban goods transport systems that can meet the demands of growing urban populations while mitigating their negative impacts on the environment, public health, and quality of life. The abstract discusses various strategies that cities and stakeholders can implement to address these challenges, including the use of alternative modes of transportation such as electric vehicles, bicycles, and drones, as well as the adoption of smart logistics and data-driven decision-making.

KEYWORDS:

Cargo Delivery, City Logistics, Distribution Centers, E-commerce. Freight Transport.

INTRODUCTION

Urban freight distribution, commonly referred to as urban goods movement, encompasses a wide range of operations that provide an appropriate level of service for various urban supply chains. Cities have traditionally played a significant role in the production and consumption of products, but most of these activities took place close to critical transportation hubs with little freight entering the city itself. A growth in the demand for urban goods transit in cities is associated with functional specialization of cities, the global division of production, the establishment of intermodal terminals, the expansion of service industries, global consumerism, as well as rising standards of living. This is characterized by a greater volume of freight shipments arriving from, going to, or passing through metropolitan regions, as well as a higher frequency of delivery. In many major cities, the magnitude, intensity, and complexity of urban goods transit need extra types of administration and organization, which falls within the purview of city logistics. City logistics deals with ways to facilitate the movement of products in urban areas while reducing their negative effects on the environment and society.

The increasing demands placed on regional and metropolitan environments by global supply chains often result in the need for city logistics.1 Urban goods transportation is sometimes

referred to as the "last mile" along a supply chain since the majority of the items consumed in cities come from outside places. Thus, the goal of urban goods transportation is to create a seamless link between the final mile of urban freight distribution and the regional or global domains of freight transit. While long-distance goods transportation is favored by maritime shipping, air cargo, and rail, the vehicle particularly the truckremains the dominant urban mode because it is thought to be best suited to serve specific origins and destinations within the intricate urban grid of streets and highways. This last mile necessitates a change to new distribution tactics that are more suited to an urban setting, which often leads to congestion, delays, and extra expenses that are proportionally larger than the relevant distance.

Without giving the importance of goods transportation full attention, the sustainability of cities cannot be examined. Urban freight distribution emphasizes the physical and administrative tasks required to support all of the above, even if a city may be seen as an economic, social, political, and cultural entity. Urban transport policy-makers have, however, mostly ignored urban freight distribution in favor of passenger transportation. However, it is crucial for the social and economic well-being of metropolitan regions and has broad ramifications for the environment, transportation systems, and general mobility patterns. Additionally, the industry must deal with issues including traffic, parking for deliveries, and reverse logistics (such as recycling and waste collection).

Thus, this examines the patterns and circumstances of commodities transportation in metropolitan settings, including both official and informal modes. It describes the vital role that goods transportation plays in urban life and highlights the externalities that are produced by the industry. The development of goods transit procedures, in both industrialized and developing nations, reveals regional differences and commonalities. Importantly, the demonstrates the precise ways in which the urban setting shapes and influences the flow of products[1].

DISCUSSION

When it comes to cities and their inhabitants, urban goods transportation refers to the whole collection of operations that make sure their material needs are met. The city is emphasized as a location for the creation, distribution, and consumption of tangible things, as well as the management of trash produced as a result of these activities.Cities have always had to create provisions for delivering and storing products for their inhabitants. Commercial districts, particularly warehouses, often abutted infrastructure like ports and major thoroughfares. The placement of operations supporting urban freight distribution was made more flexible by the industrial revolution and subsequent suburbanization. Rail yards and highway intersections were among them. The intensity and diversity of urban goods transit services developed, which naturally made the issue more complicated. As a result, the significance of commodities transportation became increasingly apparent, and coordinated strategies that eventually gave rise to city logistics were established[2].

While the functions of production (such as manufacturing) and consumption (such as retailing) still play a significant role in the movement of goods through cities, globalization has allowed the distribution sector to become a more pervasive feature of the urban landscape, with facilities like terminals and distribution centers. City logistics have seen considerable changes, especially with the idea of lean management, where demand-based supply chain management has made it possible to manage stocks better and use less storage space. In these situations, the majority of

the inventory is in transit, employing terminals and transport modes as "mobile warehouses," taking up precious urban space via either land usage or vehicle circulation.

Since cities in these regions were more limited by the scarcity of accessible land and had long-standing traditions of urban planning, the majority of the early city logistics initiatives were carried out in Japan and Western Europe4 (such as Germany, France, Belgium, Netherlands, Luxembourg, and the UK). The strategy was subsequently replicated elsewhere in the globe as more people realized that the metropolitan region should also be taken into account when making freight planning decisions. The emphasis on urban goods transport is still constrained despite an increase in worldwide awareness, in part because of an ongoing bias in urban design with regard to freight concerns (4.1). Intermodal transportation, which has greatly increased the capacity and effectiveness of transferring freight across modes including sea, rail, and road, is a significant technical advancement. A load unit that can be handled almost anywhere and by a variety of modes has been made possible by containerization, which is of particular relevance.5 More recently, the use of new information and communication technologies for improving the overall management of freight distribution has drawn attention.

Urban goods transport components

Many different economic sectors, including grocery shops, retail, restaurants, office supplies, raw materials and components (for manufacturing), building materials, and trash, are served by the hundreds of supply chains that service a metropolis. Depending on the situation, goods transportation makes up 10 to 15% of vehicle equivalent kilometers driven in metropolitan areas, 2 to 5% of the labor force employed there, and 3-5% of the land used there. Approximately 20 to 25 percent of truck kilometers in urban areas are devoted to moving freight outside, 40 to 50 percent are devoted to moving freight inside, and the remaining percent both originates in and is delivered within the city. The three primary elements of city logistics are the means of transport, the infrastructure supporting the flows of freight, and the activities involved in organizing and managing these flows. Subcomponents of each component each have unique properties and limitations. As an example, distribution centers, highways, and transportation hubs are infrastructural subcomponents of city logistics. The same holds true for the operational sub-components of scheduling, routing, parking, and loading/unloading[3].

Although trucks continue to be the predominant form of transportation for city logistics, they are nonetheless subject to environmental externalities and traffic congestion. This is true despite parking and unloading (or loading) challenges at the final delivery locations, as well as the dominance that road infrastructure has on urban land use. In an increasing number of metropolitan locations, the equilibrium in the relative significance of the subcomponents shown looks to be unsustainable. Therefore, a rebalancing where alternative modes (like electric cars) and infrastructure (like local freight terminals), enhanced by innovative kinds of operations, would play a more important role, would provide a significant challenge for city logistics. It goes without saying that each city will experience this adjustment differently.

City logistics, as a last-mile distributional strategy, may take on a variety of shapes, depending on the involved supply chains and the urban environment. It includes two basic functional groups, the first pertaining to distribution linked to consumers, and the second to distribution related to producers. Consumer-related distribution includes independent retailing, chain retailing, food delivery, package and home deliveries, while producer-related distribution

includes construction sites, garbage collection and disposal, industrial and terminal haulage participants and interests in urban goods transportation

Private and common carriers are two categories of players that may handle freight commercially. For private carriage, cargo owners (manufacturers or merchants) operate their own fleet and employ their own personnel, or they outsource the work to an independent carrier with its own fleet of vehicles. A common carrier would often aggregate the cargo and delivery of its customers and offer its services to any client on a contractual basis. The function of common and private carriers in the movement of urban products varies significantly geographically. While private and common carriers often account for an equal amount of urban deliveries in affluent nations, private carriers typically predominate in developing ones. This is indicative of a poorly established urban freight distribution business, which is partially filled by an unofficial sector employing both motorized and non-motorized methods.

A variety of manufacturing operations are included in the global production network, most of which are arranged by multinational businesses looking for competitive advantages. This is related to an increase in international commerce, as cities take on the role of manufacturing hubs for components and completed items destined for markets throughout the world. The interface used to contact the global distribution network is an intermodal terminal. This network serves worldwide intermodal terminals that are connected by modalities including rail and trucks for shorter distances and marine shipping and air freight for longer distances. Cities serve as distribution nodes in this framework thanks to their significant port, airport, and rail terminal infrastructure. In many cases, a city will serve as a hub for a regional system of freight distribution, suggesting that the geographical impact of freight distribution will be much more than that which is justified by the degree of urban consumption[4].

Since cities' primary role from a material perspective is to serve as locations of ultimate consumption, the global urban network reflects the intensity of material consumption. Urban freight distribution demands a rising degree of organization and management due to the large number of players and supply chain involved. Given that cities are extremely confined regions with a certain amount of space available for circulation, delivery, and storage, this is especially troublesome. However, there are still noticeable variations between cities in affluent and developing nations, notably in terms of freight movements.

In terms of the parties involved in the commercial transportation of goods in urban areas, there are four main groups that can be identified as influencing the distribution of urban freight: cargo owners (such as retailers, manufacturers, and wholesalers), residents, distributors (mostly carriers, third-party logistics providers, and freight forwarders), and planners and regulators. Relationships between cargo owners, who provide commodities to residents, and distributors, who act on the cargo owners' behalf, are especially crucial as cargo owners and distributors work to meet consumers' requirements. With the multifaceted goal of pleasing their constituents as well as commercial, transit, and distribution interests, planners and regulators attempt to establish regulations that govern how urban freight distribution occurs. While there may be inherent tensions between stakeholders, under normal circumstances interactions between them tend to be on the neutral side. Each stakeholder has its own goals. However, the relationships between stakeholders are likely to shift when a city logistics crisis arises that calls for action from either a public or private stakeholder, which might result in four distinct outcomes:

Conflicts. Conflicts between stakeholders are frequent as a result of the limited area, as well as the density and complexity of the urban environment. Urban freight distribution projects impose externalities on local communities, and disputes result when people, planners, and regulators find these externalities to be unacceptable. Sometimes disagreements over particular concerns between homeowners and planners result in NIMBY (not-in-my-backyard) reactions. A development project, such as a new distribution center, is sought to be stopped, and a freight activity, such as access to a business area, is intended to be more carefully regulated[5].

Cooperation: Usually accomplished by changing a project's design or operating modes to include more mitigation methods. The present capacity should be utilised and shared more logically, it is generally accepted. Examples of how private ambitions and public interests may coexist include public-private cooperation.

Competition

Competition. Regular interactions between private shippers and freight forwarders as they compete for the use of metropolitan space and amenities. In order to maintain and gain new clients for their freight distribution services, freight forwarders compete. Within the parameters of the land-use zoning structure, residential and commercial developers are also vying for real estate projects.

Coopetition: a particular kind of cooperation between private stakeholders, especially when a stakeholder cannot resolve a problem on their own or is propelled to do so by law. Freight forwarders could participate in joint operations even though they might compete with one another for acquiring and keeping clients. Urban distribution centers and other shared facilities, as well as deliveries (such as shippers pooling their demands to bargain for better terms with a freight forwarder), are especially prone to co-operation in activities connected to the consolidation of urban freight distribution[6].

Urban Goods Transport Trends and Conditions

Cities are places of production, distribution, and consumption all at once. Growing levels of production and consumption in cities are reflected in the expansion of global commerce. Although specifics are hard to come by, it may be inferred that metropolitan areas are where the majority of global commerce either originates, passes through, or is destined. Gateway cities are hubs that interface with global economic processes, primarily via ports and airport terminals. The concomitant rise in worldwide distribution has strengthened their position in this regard. The city is also becoming more globally diverse. Some cities, including London, UK; New York, US; Paris, France; and Tokyo, Japan, have a declared tertiary function (finance, administration, culture), implying that consumption accounts for the majority of the total goods handled while the functions of production and distribution play a more minor role.

As industrial hubs where production now accounts for the lion's share of commodities flows, other cities (such as Bangkok, Thailand; Busan, Republic of Korea; Guangzhou and Cooperation Shanghai, China) have developed. With the increased usage of containers and the expansion of long-distance commerce, a number of cities serve as middlemen for the commodities flowing to significant market regions. For instance, gateway cities often serve as a point of transit and distribution for freight to serve interior locations, meeting the material needs of whole regions. These are crucial to the health or urban economics of a city. Urban freight activities assist supply

chains in urban areas, and as previously said, there is a definite correlation between these operations and the economic growth of cities. The next column also identifies major areas of divergence between developed and developing nations with regard to urban goods mobility, as determined, among other things, by the degree of economic development priorities[7].

It is not unexpected that cities in industrialized nations with high standards of life are managing with a high intensity of urban goods transit. The material intensiveness of urban freight distribution relies on local economic, physical, and cultural variables. According to data from Europe, a high-income city produces roughly one delivery or pickup per job per week, 300 to 400 truck trips for every 1000 people per day, and 30 to 50 tonnes of products for each individual per year.However, because of regional differences and the role that cities play in the transportation of goods throughout the world, circumstances may vary greatly. For instance, Los Angeles, a gateway city to North America, is primarily concerned with air pollution and thus targets truck transport associated with port terminals and large distribution centers. Chicago, on the other hand, has been preoccupied with maintaining its role as an important rail hub for North America, and is thus primarily concerned with rail freight transport between the numerous rail terminals and large distribution centers located within its metropolitan area, many of which are serviced by trucks.

Urban commodities transportation takes happen under a remarkable variety of circumstances in emerging nations. Numerous economic sectors are highly integrated with global economic processes and the freight distribution that goes along with them. Therefore, it is not unexpected to discover cutting-edge transportation infrastructure in emerging nations, including port terminals, airports, and distribution centers. Due to the utilization of the same modalities, technology, and management strategies as developed nations, this component of city logistics is comparable to those of those nations. An informal sector, which may depend on less sophisticated means and management practices, is also highly active in meeting the demands of lower-income groups in addition to the official sector for the transportation of commodities. Motorized vehicles like two-wheelers and, more importantly, non-motorized modes of goods transportation may be among them. While certain essential consumer items (such as clothing, electronics, batteries, etc.) enter a nation through legal supply chains, the vast majority do so via shady distribution networks. In poor nations, the informal sector offers vital municipal logistical services, but since it is often more labor-intensive, the danger of damage, theft, or injury is higher.

Age and gender are other factors that influence the distinctions between formal and informal activities. Males are more likely to work in formal types of transportation than females, such as delivery truck drivers, while females are more likely to work in retail, which deals with the last aspect of city logistics. The transportation of household necessities like fuel, water, food, and many other petty trades is primarily the responsibility of women in the least-developed countries.12 However, for the urban poor and other lower-income groups, urban goods transport can also be a source of income, albeit one that is risky. Before they reach driving age, informal freight distribution is a frequent source of revenue for kids and teens.

Conditions and priorities in emerging nations significantly differ from those in wealthy ones. For instance, Mexico City, where both official and informal forms of city logistics exist, is dealing with a complicated combination of urban expansion, growing consumption levels, congestion, and environmental externalities. Shanghai has grown to be the biggest cargo port in the world,

with cutting-edge logistical capabilities, thanks to its role as a significant transportation hub supporting China's export-oriented economic plans. This draws attention to the disparity between the metropolitan logistics of China's contemporary coastal cities and a rural area that is far less linked. Motorized tricycles handle around 60% of the intra-city freight traffic in Delhi, India, and can carry as much as a 5-tonne truck in a day via several journeys for tiny cargoes needing frequent delivery stops. In addition to courier services, auto-rickshaws, vans, and tricycles are increasingly utilized to carry groceries, furniture, electronics, etc. Longer distances are covered by bigger informal carriers such shared taxis, minibuses, and light vans. Trip-chains across the majority of South Asia feature intermodal connections at railroad stations, bus terminals, distribution hubs, etc. between small vehicles and big load transporters. The minimal money made by local goods carriers, notwithstanding their effectiveness and affordability, discourages investment in more effective vehicles. Therefore, access to financing may play a significant role in emerging countries' efforts to improve city logistics. Due to its low cost and accessibility, non-motorized transport is also widely utilized for the transportation of commodities in African cities. About 200,000 tiffin lunch boxes are delivered everyday in Mumbai, India, using a variety of non-motorized methods, providing work for those engaged. Three-wheel platform rickshaws (gudrum matatu in Dar es Salaam, Tanzania), garbage cart pushers (kayabola in Accra, Ghana), and animal-drawn carts for rubbish collection, hauling scrap metal, and coal delivery are examples of NMT for commodities in African cities.

Transport of Goods inan Urban Setting

Since goods transportation networks are often unique to particular urban built environments, it follows that no two cities are comparable in terms of the nature and difficulties of their respective city logistics. Along with more general elements like geographic settings, history, degrees of economic growth, and governmental regulations, the urban environment has a particular impact on trends in urban goods transit. Urban density and patterns of commodities transportation are intimately related. Cities in underdeveloped nations often have greater densities than cities in developed nations, but as wealth levels in affluent nations rise, so does the amount of freight produced per unit of density. High absolute consumption levels are associated with high density locations, however meeting these requirements effectively is not without difficulties. High densities are often recommended as sustainable urban development objectives, therefore this tends to be contradictory. However, if mass transit (i.e., public transportation) is not effectively supplied, large urban density may also cause congestion. However, high density offers more chances to combine deliveries and employ different modalities[8].

Transport of products is also impacted by the distribution of density in relation to street design or urban spatial structure. Numerous pre-motorized metropolitan areas feature a roadway configuration that is unsuitable for the transportation of goods, with curvy, narrow streets. A grid-like street plan with motorized traffic offers an effective environment for urban deliveries up to a certain density level, but it has drawbacks such high energy use, noise, and pollution emissions. The arrangement of economic activities which may be centralized, decentralized, clustered, or dispersed relates to the urban land-use pattern and has an effect on how commodities are transported. Due to the difficulty in balancing sources and destinations in urban interactions, a decentralized and scattered land-use structure is therefore linked to an unorganized urban goods transit system. For example, transporting the same amount of commodities requires more stops and longer journeys in a decentralized and scattered land-use environment than it does in a centralized and clustered one.

Urban goods transport patterns may also be influenced by the magnitude of the city in terms of population numbers. Despite the lack of a systematic technique to conduct such an evaluation, actual data from the US shows that congestion becomes a recurrent problem after a population barrier of roughly 1 million people is crossed. Applying this threshold to a variety of cities around the world is problematic because each city has specific local conditions that affect the nature and intensity of congestion, such as the share of public-transport use and land-use density. This obviously concerns cities with a high level of motorization. With a population of over a million, Antwerp (Belgium) would seem to be well under the con- gestion threshold, but this ignores the fact that it is a major port city in Europe. The metropolitan region has far more truck-based freight traffic than any other city of comparable size, especially on the ring highways.

In urban regions that are hubs for global material movements and include a variety of stakeholders, the land utilized for freight infrastructure may be very vast. However, the size or level of consumption in a city are not always correlated with the quantity of land used for freight. While some cities, like Dalian and Ningbo in China, concentrate on production, such as export-oriented economic development zones, other cities, like Singapore, Dubai in the United Arab Emirates, Los Angeles in the United States, and Panama City in Panama, serve as major hubs or gateways that oversee regional systems of freight circulation. Intermodal terminals and distribution centers are common examples of automated, extremely capital demanding freight infrastructure. The sections highlight how new types of dislocation in terms of terminal and distribution facilities have occurred inside metropolitan areas as a result of these facilities' increasing land use. The propensity of these facilities to spatially de-concentrate in places with high land pressure is also discussed in the debate.

CONCLUSION

In conclusion, urban goods transportation is crucial to the operation of contemporary cities, fostering economic activity but also creating major difficulties. Urban goods transportation problems including congestion, air pollution, noise pollution, and resource inefficiency have been brought on by the fast development of urban populations, growing urbanization, and changing consumer behavior. There may be some ways to overcome these difficulties, however. These include adopting smart logistics and data-driven decision-making, as well as the usage of alternate mobility methods including electric cars, bicycles, and drones. For the development of sustainable urban goods transport networks, cooperation and coordination among stakeholders, including local governments, companies, transportation providers, and people, is essential. Urban goods transportation will be shaped in the future through public-private partnerships, technological and infrastructural innovation, and policy and regulatory frameworks. Urban planning, land use, last-mile delivery, and stakeholder involvement are just a few examples of the aspects that should be taken into consideration in a comprehensive strategy that takes into account the social, economic, and environmental components of urban goods transit. The efficacy and long-term viability of methods must be continuously monitored, evaluated, and changed.

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CHAPTER 9

AN OVERVIEW ON TERMINAL FACILITIES

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ABSTRACT:

Terminal facilities play a crucial role in modern transportation and logistics, serving as hubs for the efficient movement of goods, people, and information. This abstract provides an overview of terminal facilities, including their definition, functions, types, and key components. Terminal facilities encompass a wide range of transportation modes, such as airports, seaports, railway stations, bus terminals, and trucking terminals. They serve as critical nodes in the transportation network, facilitating the transfer, processing, and storage of cargo, passengers, and data. The functions of terminal facilities include handling, storing, and transferring goods and passengers, as well as providing various services, such as cargo consolidation, customs clearance, security screening, and passenger amenities. Terminal facilities also play a vital role in supply chain management, serving as key points of interface between different modes of transportation, facilitating intermodal transfers, and enabling seamless connectivity between various transportation networks. Terminal facilities are often operated by public or private entities, and their design, operation, and management are governed by various regulations, standards, and best practices.

KEYWORDS:

Baggage Handling, Cargo Handling, Container Terminals, Customs Facilities, Freight Terminals.

INTRODUCTION

Metropolitan areas with container ports and associated accompanying infrastructure, such as access ramps and chassis storage, are especially under pressure from intermodal transportation. According to estimates, the urban footprint covers 658,760 square kilometers, or roughly 0.51 percent, of the world's total geographical area.17 The top 453 container port terminals in the world together occupy 230.7 square kilometers of land, or 0.035% of the world's metropolitan area, according to a sampling of these facilities.18 Despite making up a relatively minor portion of urban land usage, container port terminal facilities take up valuable waterfront space, a resource that is limited in coastal regions. Since suitable locations are no longer readily accessible, major land reclamation operations are now necessary for the construction of new port facilities. Examples of the extensive land reclamation requirements that new port terminal facilities need include the development of the Maasvlatke II port terminal in Rotterdam (Netherlands) and the Yangshan container port close to Shanghai (China). Since many infrastructures, like highways and airports, are primarily utilized for passenger transport and might be seen as shared facilities, it is difficult to estimate the real transportation land take for freight distribution[1].

There tends to be a concentration of distribution facilities wherever there is an intermodal facility. This is especially true for big airports near groups of distribution centers and third-party logistics service providers, since air freight is a time-sensitive activity that necessitates closeness from supply chain management. As a consequence, a brand-new urban form known as the "aerotropolis" is emerging around significant airports. Distribution centers, logistics hubs, and just-in-time manufacturing are located within of it. It also has a ring of office parks, hotels, restaurants, and conference centers. The people who work in the aerotropolis live in the mostly residential perimeter. Access to the rest of the metropolitan region, in which an aerotropolis is located, is provided via high-capacity roadways and rail lines. These activities are engaged in global competition, which generally suggests that the aerotropolis' economy is more closely related to global than to regional dynamics. The finest planned aerotropolis may be in Dubai, United Arab Emirates, although numerous Asian airports, including Bangkok, Thailand; Singapore; and Kuala Lumpur, Malaysia, have started this sort of development. Several instances may also be found in the US and Europe, notably Schiphol (Netherlands) and Dallas-Fort Worth (US).

Distribution facilities

The need for distribution land includes different warehouses for break-bulk items like consumer products in containers as well as facilities to store freight in bulk storage facilities like grain silos or oil reservoirs. Distribution centers take up a lot of room because they conduct a variety of high-value tasks on a single floor, including cross-docking, consolidation, and deconsolidation. The last one could also need specific infrastructure, including cold storage to enable urban food delivery. According to estimates, warehousing takes up 0.8% of all non-agricultural and forestry land in England and Wales alone. The number of vehicle-kilometers and average journey duration required to reach retailers, industries, and homes are directly impacted by the geographical distribution of industrial, commercial, and logistical facilities. The majority of freight-related activities, including as factories, warehouses, and terminals, were situated near to the central business area of cities like Chicago, US, which flourished after the late nineteenth and early twentieth centuries. Most shipments to and from metropolitan regions are managed out of terminals and distribution centers (more than two-thirds in the case of European cities). As a consequence, a modern pattern has developed in which logistics are specialized and set apart from other urban activities[2].

Global supply chains depend on innovative uses of urban space, such the logistics zone, a designated region only for the delivery of freight. Unlike in the past, when land was available and (road) accessibility was sufficient, the agglomeration of freight distribution activities would naturally occur. Nowadays, logistics zones are frequently established by large, international real estate promoters, and some of them, dubbed "freight villages," can include ancillary businesses like hotels, convention centers, and restaurants.

The export-oriented free trade zone has developed into a city inside a city in several developing nations (Brazil, Malaysia), with a value proposition based on foreign investments and access to global markets via port and airport infrastructure. With its special economic zones, China is the model for this kind of growth, which throws light on the urbanization processes taking place in China's coastal regions. In the last 30 years, between 100 to 140 million individuals have migrated from interior regions due to work possibilities in special eco- nomic zones like Shenzhen (China).

Sprawling Logistics

logistical sprawl, or the geographical de-concentration of logistical infrastructure in urban areas, is another significant development. During the 1960s and 1970s, significant urban renewal initiatives as well as the intense land demand in big cities forced logistics and transportation corporations to adopt centrifugal locational patterns. Small-scale modifications in their spatial structure, including the closure of urban distribution centers and the development of new ones in the periphery, were used to effect the physical transfers. Having easier access to roads and needing more acreage were two of the key motivators.

Logistics sprawl occurs in new places that are better suited to the functional and operational characteristics of freight distribution, but it also poses problems. Large terminal and warehouse facilities brought forth by globalization have led to tensions and upheavals as well as requests for land to facilitate urban commodities distribution. Logistics sprawl also has an influence on commuter patterns and modes of transportation. Logistics zones tend to be poorly served by public transportation and encourage a dependence on automobiles because of their low density and suburban locations.

DISCUSSION

Urban Goods Transport Challenges: Modern freight distribution networks spread over the metropolitan environment, causing environmental and social externalities such as car emissions, accidents, traffic jams, and logistical sprawl. There are a number of environmental, economic, social, and institutional issues associated with addressing these externalities[3].

Environmental Difficulties: Urban freight distribution provides few alternatives to roads while being the most polluting land transportation mode per vehicle kilometer traveled. Leaded gasoline's steady phase-out and improved engine design have reduced air pollution. The majority of urban freight is carried by diesel trucks, which are still a significant source of particulate matter and nitrogen oxide emissions.24 It is difficult to assess the economic, environmental, and social indicators for these unreported activities.25 For the same number of tonne-kilometers, urban freight distribution is frequently twice as polluting as long-distance freight transport. The following are the key causes:

Vehicle year. Compared to the typical freight transport truck, urban delivery trucks are more aged. In drayage operations26 between port or rail ports and urban distribution centers, vehicles often reach the end of their useful lives. Because there are so many small, competitive businesses vying for business in urban freight, fleet renewal is often slower than it is for non-urban road freight traffic. In underdeveloped nations, where cars are even older and more prone to increased emissions and accidents, this issue is particularly acute.

vehicle dimensions. Urban delivery vehicles often have a lesser load capacity than conventional freight trucks, which suggests that some economies of scale benefits are lost. Even though smaller cars may emit less emissions per kilometer traveled, overall emissions may increase as a consequence of the need for more vehicles to transport the same amount of freight[4].

Running rates and idle time. Urban operating speeds are slower because of traffic jams and other roadblocks, which suggests that delivery trucks' engines are often operating below their optimum speed. Higher fuel use and emissions are the effects of this. Due to traffic lights and congestion, cars are subjected to constant acceleration and deceleration, which increases fuel consumption

and vehicle wear. Emissions are increased by the frequent idling of vehicles, whether for delivery or at stops. Other negative environmental implications of urban freight transportation include noise pollution and greenhouse gas emissions. Due to the traffic patterns in metropolitan areas, trucks contribute more than 22% of the transportation sector's overall greenhouse gas emissions. For instance, freight transportation accounts for a third of transportation-related nitrogen oxides and half of transportation-related particulate matter emissions in major European cities, mostly as a result of a greater dependence on diesel fuel for trucks. While little is known about the potential susceptibility of urban goods transport to climate change, it is assumed that events like floods, storms, and lightning will increase in frequency and intensity. In London, freight distribution accounts for less than 10% of urban traffic but contributes to 30% of nitrogen oxide emissions and 63 percent of particulate emissions.

The topic of reverse logistics merits examination because it includes the collection of garbage and material recycling in urban areas, which are major consumers of finished goods31. City logistics and environmentally friendly logistics (green logistics) are therefore inextricably interwoven. While cities in underdeveloped nations effectively leave a large portion of the recycling of items to the informal sector, the majority of wealthy countries have established recycling programs. There are several ways to recycle unwanted products, packaging, and cardboard; scavengers and recyclers are a significant aspect of city life with busy informal supply networks. Active Street vending, which offers a broad variety of retail and food commodities, is another feature of the urban environment in emerging nations. In many developing nations, informal settlements contribute significantly to the cityscape and have unique demands for supplies that are little understood[5].

Economic Difficulties

The volume of freight moving through metropolitan areas has increased, which has made the situation much worse for drivers. Given that urban retailers often have low inventory levels, urban goods transportation is typically characterized by lower quantities but more frequent deliveries. Urban commodities are routinely transported from distribution centers on the periphery since there is a lack of storage capacity in core locations. Nevertheless, despite heavy traffic during rush hour, deliveries must continue to flow regularly. This encourages freight distribution operations to happen at night if at all feasible. Additionally, many establishments in dense regions have little delivery space, necessitating the parking of delivery vehicles on the street close to the store, usually in front. This encourages the use of smaller vehicles that are better equipped to move through cities and locate parking spaces for deliveries. Trucks often park two spaces side by side to make quick deliveries, severely limiting local traffic.

Urban regions have more expensive real estate, thus shops there often have smaller footprints and less warehouse capacity. Smaller quantities are typical for urban freight distribution, and time-sensitive freight is required to meet ongoing demand. Given the huge sales volumes, this necessitates frequent delivery, which forces a contradiction in the cargo weight. The economies of scale of bigger delivery would benefit stores in central locations, but the environment precludes this advantage. This is one of the explanations for the rise of shopping in suburban regions. The advantages of economies of scale are enhanced by economies of distribution in big shops with plenty of parking, which may have their own cargo docking bays that can handle the largest delivery trucks available. The dependability of freight distribution is challenged by the propensity of major metropolitan regions to have significant levels of congestion. In comparison

to circulation that occurs in a suburban or non-urban context, this is especially true for the interruptions and slower driving speeds that urban congestion imposes, rendering urban freight distribution susceptible to inefficiencies. The performance of cities in terms of logistics for commerce is still troublesome and difficult to evaluate, despite several efforts to do so. Due to the presence of international trade infrastructure and a concentration of third-party logistics service providers, data suggests that port and airport cities often have greater capacities for city logistics. Urban freight distribution makes advantage of some of these skills[6]. With an increase in house delivery, the spread of e-commerce has also produced new kinds of needs and new kinds of urban distribution. The burgeoning parcels sector has been primarily attributed to e-commerce, and in certain instances, it has taken the initiative to build unique last-mile delivery methods.

Institutional and social problems

From a sociological perspective, the interactions between people and freight in cities lead to many disruptions that affect quality of life, health, and safety (accidents). Urban goods transportation may have a significant influence on the communities it passes through, returns to, or originates from. This is especially true when significant freight facilities, such ports, airports, train yards, or distribution centers, are in use. Especially during commutes around peak hours, when both systems substantially impede their respective capacity and performance, passenger and freight transportation do not mix effectively. With sluggish non-motorized vehicles sharing urban highways with motorized traffic, traffic congestion poses a huge operational challenge for city logistics in emerging nations.

Terminals, container storage facilities, warehouses, and truck depots are examples of freight-intensive industries that may detract from the aesthetics of the urban environment and diminish property values. Given that many freight facilities are open 24/7, lights may be both an inconvenience and a potential cause of sleep disturbance. Furthermore, inhabitants, especially women and children, are exposed to dangerous contaminants such particulates released by diesel engines when they live or work close to roadways or ports with significant freight activity. In addition, there are negative effects on the cost of healthcare, labor productivity, and overall quality of life. Given that trucks are louder than other vehicles, noise emissions from urban freight distribution, including terminal activities, are also a significant problem[7].

For both inhabitants and freight operators, safety is a key factor. Although they may not always be more dangerous than other types of vehicles, freight trucks should always be taken into account during planning because of their blind spots, longer response times, greater loads, or cargoes carrying hazardous items. Understanding the interactions between freight trucks and both motorized and non-motorized passenger transit may be especially crucial. Therefore, the possibility of accidents involving large trucks and the integration of truck traffic with non-motorized transportation are becoming more important policy issues. This is mostly because of the safety concerns that occur when large trucks carrying freight cross paths with people on small roadways. Freight has a detrimental effect on community social cohesiveness because it increases transportation congestion, which reduces social interaction.

Drivers and warehouse employees in the freight distribution industry are at a higher occupational risk than those in most other professions. The majority of freight-related jobs pay low wages and provide few benefits, and the workplaces are fast-paced and prone to accidents and injuries. Hazardous products are often shipped and transported via metropolitan areas, which might

provide safety hazards. Additionally, the prevalence of sexual risk behavior among truck drivers in certain cities and along metropolitan corridors has had a severe societal effect and accelerated the spread of HIV/AIDS and other STDs in many cities in developing nations. For instance, Santos and Itajai, two port towns in Brazil, observed significant rates of sexual risk behavior among truck drivers.

Urban regions are subject to a wide range of regulations, including those governing zoning, pollution, and even the terms of access to roadways and ports. Actors participating in urban goods movement are thus more vulnerable to regulatory constraints than freight forwarders operating outside of major metropolitan areas since high population concentrations suggest a low tolerance for infringements and disruptions brought on by freight distribution.

This adds to the possibility that urban freight activity may be regarded a nuisance, leading to expensive mitigation measures. For instance, owing to noise emissions over neighboring residential areas, night operations at a number of significant airports in urban regions have been restricted.

Additionally, the mechanisms for compensation and resettlement are frequently insufficient, especially in developing nations where state and local governments use the power of eminent domain to clear land for transportation infrastructure, making the poor more vulnerable in situations of forcible relocation. Since concentrations of the poor and minority populations suffer disproportionately from social effects of transportation-related developments, environmental justice is another issue that is becoming more and more important in urban goods transport. This is far from a recent phenomenon, as the siting of communities with lower economic status has historically been associated with proximity or adjacency to terminals and industrial areas. Communities often find themselves in a vicious cycle of receiving little benefits from activities incorporated into national and international supply chains that produce significant externalities. As they are often public enterprises, port authorities have a tendency to be more proactive in reducing the social repercussions on surrounding communities in this setting of escalating tensions between freight and the city. For instance, in response to demand from neighboring communities, the Port of Los Angeles (US) established the Port Community Mitigation Trust Fund in 2010, which put aside money from port operations to be used for social and environmental mitigation projects[8].

Existing Policy Responses

It is now advocated for a more coordinated strategy to freight distribution due to urbanization and the development in material consumption it has caused. In order to improve urban mobility and sustainability, it is necessary to comprehend the major difficulties in the distribution of freight in cities and to spread best practices and methodologies, particularly data collecting. Urban areas, as previously said, are confined and are subject to a complicated regulatory structure. As a result, disputes between various stakeholders are common in urban areas, but there are also opportunities for cooperation since space for urban logistics is an essential component of urban design. For a distributor, adjusting uniform freight distribution methods to a particular metropolitan setting with unique restrictions might be challenging.

The movement of large trucks through urban areas is still a problem in Europe and Japan because of the city's population density and the way its roadways are built. Due to lower densities in North America, the emphasis has been on load consolidation since urban deliveries there are

often less than a truck load. The absence of sufficient resources often prevents effective policy responses in many developing nations. Nevertheless, a number of solutions, the most of which are connected to traffic congestion, have been suggested to lessen urban freight distribution issues.

Delivery Rationalization

Given that they happen at a time when there is less traffic congestion and commuting-related conflict, night deliveries are increasingly being preferred for city logistics. Night deliveries, however, need significant adjustments to the way that labor is organized, for both the freight forwarder and the consignee. Even intermodal ports and distribution centers must be operational at night, and the consignee must have someone on hand to accept deliveries. Night delivery might result in unaffordable additional labor expenditures for smaller retailers. Carriers often favor night deliveries in this situation because they may use bigger trucks and operate in a less crowded environment, but shops would rather receive delivery during the day when their crew is available. Night deliveries in high-density regions may potentially cause neighborhood issues like noise while families are at home. Additional possibilities are made available by extended delivery windows, especially after peak hours. With longer and more erratic hours, they provide issues for the management of labor, much as night deliveries. Because labor circumstances are more flexible yet operating margins for businesses like retail are constrained, developing nations are better positioned to see the implementation of this sort of rationalization.

Logistics Facilities

The needs of municipal logistics may be accommodated in the construction and modification of freight facilities. Consolidating loads, many of which are smaller than a truckload, is crucial so that more merchandise may be packed onto each delivery vehicle. One such facility is known as the urban freight transhipment center, where supplies intended for certain business areas are bundled even if they are for various clients. It is comparable to cross-docking locations that merchants use to plan their local distribution. These facilities promote improved delivery asset use, which relieves core area traffic congestion. Due to an extra level of consolidation occurring at the urban freight distribution center, this is associated with greater prices. This results in more delays and reduces the likelihood that such a plan would be profitable. Additionally, it's possible that the common delivery service won't always satisfy the consignee's needs for delivery frequency and timing[9].

By providing a local point of consolidation or deconsolidation for pickups and deliveries, local freight terminals are an extra option in densely populated regions. Trucks bring cargo to nearby freight stations, and rolling carts are often used for the last delivery from the station to the destination. Due to their greater costs and lack of flexibility to meet the demands of certain supply chains, local freight stations have not gotten much attention. An emerging local freight station model that fulfills the requirements of e-commerce is automated locker banks. Thousands of "PackStations" have been set up by Deutsche Post (DHL) across Germany at key sites so that shipments may be delivered at any hour of the day. With the installation of delivery lockers in the heart of major US cities, primarily in coordination with pharmacies and convenience shops that operate during extended hours, the enormous online retailer Amazon launched a similar program.

The bus station, which serves as both a hub for regional passenger transit and a single point of entry for freight, is a crucial component of urban freight distribution in emerging nations. These stations are especially important since the populace relies heavily on interstate bus services and automobile ownership is often minimal. Small, often unofficial distribution centers and freight forwarding businesses play a crucial part in municipal logistics. In some developing nations, proper bus station design which includes setting aside a sector for freight such as delivery areas and warehouses could assist alleviate city logistical issues. This is especially true given that bus stations are often positioned in the middle of cities.

Implementing designated delivery zones, ensuring that delivery trucks have greater access to consignees, and ensuring that deliveries occur in a less disruptive manner such as by preventing double-parking) are further strategies. Even if freight parking spots are accessible at night, reserving space for deliveries indicates that there would be less space available for passenger cars, which may result in confrontations with locals. Despite the presence of delivery zones, the volume of freight distribution may result in a demand for parking that exceeds the capacity of such locations.

Change in Mode

It is possible to modify urban delivery vehicles to better fit the density of urban distribution, which often uses smaller vehicles like vans and bicycles. In high-density and crowded locations, the latter have the potential to become a favored "last-mile" transport. Delivery bicycles are also used to transport personal goods (like groceries) in areas with considerable bicycle use, like the Netherlands.45 Cargo bicycles have a lot of promise in both developed and developing nations due to their cheap acquisition and maintenance costs, like the becak (a three-wheeled bicycle) in Indonesia.46 Electrically assisted delivery tricycle services have been successfully deployed in France47 and are now being adopted progressively across the rest of Europe for services as diverse as catering and package deliveries. In example, rules that limit motor vehicle access to certain parts of a city, such the downtown or business districts, or the expansion of dedicated bike lanes, promote the use of bicycles as freight vehicles.

Additionally, efforts may be made to have cleaner, more energy-efficient automobiles, such as CNG and electric vehicles, which can lessen environmental effects and cut energy usage. However, these cars are often costlier, which in underdeveloped nations might be prohibitive. Furthermore, the world's growing traffic volumes cannot be offset by cleaner cars and alternative fuels. The active use of information technology by parcel carriers, such as vehicle tracking, load management, and navigation, has the potential to increase the efficiency of the utilization of distribution assets like cars and warehouse space. With better trip sequence matching (better order of pickups and deliveries to reduce travel distance), the Introduction of such technologies may result in new types of urban distribution, such as collaborative distribution (competing activities, such as stores, hotels, and restaurants, using the same distribution services). Such applications are appropriate in both developed and developing nations due to the fact that information technologies are becoming more affordable and commonplace (such as cellular data networks)[10].

The current public transportation system might be utilized to convey freight, but this presents a number of difficulties, including the need to change modes, utilise passenger terminals that are already in place, and deal with scheduling constraints. The fact that freight is not part of the public transport agencies' mission is one specific area of concern. As a consequence, many

authorities are either undermotivated to create freight programs or lack the legal power to do so. Since public transportation price systems are per passenger and do not have an equivalent for freight, fees may also be a problem. The use of public transportation has limited logistical justification since it entails load-break and probable integrity breaches. Several efforts to create "cargo-trams" (tramways modified to transport freight) have been unsuccessful, including the large-scale cargo-tram project in Amsterdam (the Netherlands) that collapsed in 2009.48 Due to freight's predominance in interurban lines, disputes often arise when passenger rail services are expanded in suburban regions. For instance, delays and problems with schedule integrity are likely to occur when freight trains and passenger rail services use the same track segments. There are just a few solutions available, including strict infrastructure sharing contracts between passenger and freight train services.

CONCLUSION

The modern metropolis is characterized by rapid flows of people, goods, and information. Consequently, goods transportation is a crucial element of the urban environment and has, up until recently, been disregarded in the planning process. The difficulty is to strike a balance between the requirement to ensuring that items are transported efficiently and avoiding externalities like traffic jams, pollution emissions, noise, and accidents. More effective urban freight distribution systems will arise as part of a shift towards greener forms of city logistics when new strategies and practices are implemented, as well as because of a tendency toward increasing energy costs.

The main focuses of these strategies are the optimization of deliveries, the creation of freight infrastructure that is better suited to urban environments, and modal adaptation (the development of vehicles, including non-motorized modes, that are better suited to urban circulation). However, it is still unclear if improvements in city logistics would be adequate to deal with rising levels of congestion and the associated social externalities, especially in developing nations. This is because these solutions are likely to reflect the distinctive modal and infrastructure arrangements of each city. As a result of the stark inequalities in wealth and population density, new types of city logistics are emerging in developing nations. These incidents, however, are far less well-documented. Transportation of goods continues to be a crucial component of urban sustainability. In order to effectively design accessible mobility for passengers, it is crucial to take into account the function and effects of goods movement in the urban setting. This is particularly true when taking into account the intimate relationships between urban land use, shape, and commodities mobility within a landscape that is becoming more and more contentious.

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CHAPTER 10

MOBILITY AND URBAN FORM

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ABSTRACT:

The concept of mobility and urban form is a critical topic in urban planning and design, as it affects the way people move and interact within urban environments. With increasing urbanization and the growing challenges of traffic congestion, air pollution, and unsustainable transportation patterns, understanding the relationship between mobility and urban form has become paramount in creating livable and sustainable cities. It begins by defining mobility as the ability to move and access different destinations within an urban area. It highlights the importance of mobility in supporting economic, social, and cultural activities in urban areas and how it influences urban form. Discusses urban form, which encompasses the physical layout, design, and organization of cities, including land use patterns, transportation infrastructure, and the built environment. It emphasizes the role of urban form in shaping mobility patterns, as well as its impact on social equity, public health, and environmental sustainability.

KEYWORDS:

Active Transportation, Compact City, Connectivity, Density, Mobility Patterns, Public Transit.

INTRODUCTION

A growing interest in examining the relationship between mobility and urban design has been inspired by increased worries about climate change, increasing gas costs, traffic congestion, and social marginalization.1 Concerns regarding travel time, air quality, traffic accidents, social integration, enhanced accessibility, and increased usage of various modes of transportation are issues that municipal administrators throughout the globe have in common. Despite this, most cities continue to give priority to motorized transportation and accompanying urban infrastructure, especially in developing and rising economies. Both in emerging and established nations, many cities are witnessing rapid and unchecked expansion in their peripheries. As a result, there are many different urban forms, each characterized by different land-use and transportation patterns, which make it difficult to provide "efficient" urban mobility. There's no denying that creating neighborhoods, cities, and regions that encourage healthier, more sustainable urban forms and a range of mobility options will help make cities more accessible to everyone. In metropolitan locations, there is a particularly pressing need to create sustainable mobility and transportation networks.

To create a more sustainable urban form, city planners, developers, and decision-makers have recently focused more on constructing compact communities with a variety of land uses. Although challenging to execute, the "compact city" strategy may assist minimize commute

distances, which will reduce emissions and fuel consumption, slash travel expenses, and enhance quality of life in many places. In order to transition from the present unsustainable tendencies in urban design and transportation to a more sustainable future, better solutions are nonetheless required[1].

There is mounting evidence that the development of sustainable mobility is dependent on the shape and functioning of the city. In fact, making cities more accessible means bringing a variety of activities closer together, into a smaller space, and integrating them with excellent infrastructure for pedestrians and bicyclists. As was emphasized in point 1, accessibility is crucial to creating an urban form that is socially inclusive, ecologically sustainable, and has a larger potential to produce economic exchanges that increase productivity and revenue. Sustainable mobility is a result of how neighborhoods and cities are planned and developed, but it also influences the urban form itself. This illustrates the strong, reciprocal link between urban shape and mobility, which emphasizes the need of properly coordinating and integrating the two. Therefore, a fresh perspective on urban planning as well as strong institutions and regulatory structures are needed to guide the process of this radical transition.

In order to find a more effective and sustainable solution, policymakers at all levels of government are now grappling with a variety of urgent transportation and environmental concerns. Campaigns to stabilize the global climate involve the development of less car-dependent urban forms, since the transportation sector is responsible for approximately a quarter of greenhouse gas emissions in metropolitan areas globally.The main goals of such initiatives are to stop sprawl, encourage expansion that is focused on public transportation, and build compact, walkable neighborhoods that cut down on the number of vehicle kilometers per person (VKT). Making an intriguing link between urban design and transportation, the EU's Climate Change Programme advocates for the development of "low-emission land-use activities" as a means of reducing VKT growth.4 VKT per capita should be monitored since it is the best indicator of resource consumption and environmental degradation in the urban transportation sector. It has been predicted that all gains in fuel efficiency and low-carbon fuels would only delay, not reverse, the growth in per capita CO2 emissions in the absence of significant decreases in VKT per capita globally[2].

Environmental concerns are just one justification for limiting urban mobility. Important economic and societal concerns must also be considered. Municipal finances are strained by sprawling, car-centered growth patterns, sometimes known as "sprawl," which drive up the price of expanding infrastructure and public services to suburbs and exurbs. In comparison to more compact, mixed-use development, the 'hard cost' of supplying local roads and utilities for low-density expansion is upwards of US$30,000 more per family.6 An estimated $10,000 per family (in US dollars of 2000) might be saved if center cities and inner suburbs accounted for one-third of projected urban expansion in the US.7 According to a recent research, transforming outlying housing projects into infill planned residential developments in Malaysian cities' consolidated areas might save the cost of municipal services by 19%.8

Interest in city planning has also grown as a result of rising social fairness concerns. The impoverished, many of whom live on the edge of cities, are financially burdened by their physical distance from places of employment, schools, and medical facilities. Overcoming this physical distance sometimes entails spending disproportionate amounts of money on lengthy commutes and public transportation expenses. In addition to reducing travel times and increasing

accessibility to social amenities, the relationship between effective transportation options and the provision of public goods can encourage more social interactions and, when done well, result in an urban form that is supportive of fostering a sense of place and 'place making[3]'.

This explains the present worldwide trends and circumstances that have an impact on urban structure and, therefore, mobility (or lack thereof). The factors driving cities' dispersed development and their effects on urban mobility are examined. Higher urban densities have the potential to promote the use of other modes of transportation, notably public transportation. It also looks at other aspects of built environments, such the variety of land uses and urban designs, like integrated bikeway networks, and their effects on transportation. Compact, mixed-use, highly walkable communities and neighborhoods may generate more accessible urban landscapes while reducing the amount of vehicle traffic and its negative impacts. Cities with better accessibility also have more equal social inclusion. Attention is also paid to the reverse side of the relationship—how urban transportation infrastructure, including highways and metro-rail systems, impacts urban design. The ends with considerations of the possibilities of several policy measures, such transit-oriented development (TOD) and regional jobs-housing balance, to increase mobility-urban form links and promote sustainable transport modes.

Eastern European transitional economies have seen a fast suburbanization. The majority of Eastern European cities during the period of centralized planning were the result of integrated land development and transportation, defined by vast urban rail networks with residential towers, commercial districts, and industrial zones physically oriented to stations. This was swiftly undone by the transition to free-market economies and the privatization of land development. The pace of suburbanization in several Eastern European nations has overtaken that of Western European cities. The most expansive cities in Europe, according to the most recent research on land-cover changes, are located in Estonia, Latvia, Croatia, Slovakia, Poland, Hungary, and Bulgaria.

According to one theory, "communist" urban structures were in many ways more sustainable than capitalist urban forms because they were more ecologically friendly. In contrast to sprawling and monofunctional suburban-type peripheries, they were more compact and had smaller ecological footprints. They also had high densities and clear urban edges, better integrated land uses, less social polarization, a lot of parks and greenbelts, and reliable public transportation systems. Ironically, every one of these characteristics of the communist metropolis is a sign of sustainable urban development. Most of them disappeared during the transition from the Soviet era[4].

The abandonment and frequently discontinuation of former state-owned urban rail services coincided with the privatization of land development, such as the construction of mega-malls and housing estates on the periphery. As a result of this, motorways were built in their place, along with the explosive growth of private car ownership. International aid organizations, including the European Bank for Reconstruction and Development and the European Investment Bank, have come under fire from some observers for encouraging sprawl in Eastern Europe by prioritizing investments in suburban motorways over modernizing and expanding deteriorating inner-city rail lines. Hyper-suburbanization has led to significant changes in travel patterns, as seen in Prague, Czech Republic, where long-distance car trips to malls and large retail outlets served by freeways are quickly replacing previous foot or public transportation trips to central city shops, sharply increasing VKT.

DISCUSSION

Decentralization, Car Dependence and Travel

The effects of decentralized urban expansion on global mobility and travel are discussed in this part, along with the role that transportation has played in the decentralization process and the effects of urban densities and urban land coverage on travel.

The scattered metropolis

It is a common occurrence for urban expansion to spread outward. Dispersal, a kind of decentralization, is at the core of emerging patterns of urban development that are ecologically, socially, and environmentally unsustainable, at least when it is badly managed. Lower densities, the separation of land uses and urban activities, urban fragmentation, economic and social class segregation, the use of valuable resources like farms and open space, and increasingly car-dependent systems are all effects of dispersion. In addition to global megatrends like increased prosperity and industrialization, social-cultural factors have contributed to the dispersion of cities. Social exclusion, class segregation, and poverty itself can also extend beyond the boundaries of cities; tugurios and favelas (i.e. slums) mark the periphery of most Latin American cities. Land held by government agencies, military authorities, and religious foundations frequently causes leapfrog (i.e. skipped-over) development. Purchasing land at cheap agricultural rates and leasing it to developers for higher prices are two examples of how municipalities in Chinese cities use peri-urban development to increase their income. Similar to China, Eastern Europe's suburbanization has been expedited by the shift to free-market economies. Zoning regulations that encourage allowable densities as a method of decongesting center cities have been held responsible for spurring sprawl in India in recent decades.

Easy access to credit for low-income housing has sparked an explosive growth in inexpensive but remote residential enclaves on the outskirts of many Mexican cities, which over time has resulted in abandonments; between 2006 and 2009, about 26% of such housing was built.10 Nearly a third of people who abandoned their homes did so due to poor access to jobs, schools, and family. Travel is unmistakably and significantly impacted by urban dispersion. Spread-out expansion increases the usage of private motorized vehicles while also lengthening routes by separating trip origins and destinations. Suburban living has led to lower population and employment densities in industrialized nations, which has led to increased motorization rates and the environmental issues associated with a dependence on cars. Urban problems like as vehicle dependence, energy consumption, environmental degradation, and social issues are made worse when urban distribution is mostly unplanned and driven nearly completely by market forces (5.3). By stifling market choices, excessive regulation of urban growth, such as zoning laws requiring large amounts of off-street parking, may also lead to car-dependent sprawl. Trends in affluent nations as well as some emerging nations indicate that more and more young individuals aspire to live in small, walkable neighborhoods[5].

Urban sprawl is becoming more and more common in developing nations. Between 1970 and 2000, the physical growth of all urban areas in Mexico was nearly four times greater than the growth of the urban population12. In Cairo (Egypt), Sana'a (Yemen), Panama City (Panama), and Caracas (Venezuela), sprawl is held responsible for consuming limited agricultural lands and sharply raising municipal costs for infrastructure and service delivery. Many low-skilled, low-income immigrants from rural regions and displaced low-income inner-city inhabitants are

compelled to live in outlying, marginal locations where property is less costly since higher-income families often occupy the most accessible and expensive districts close to the urban centre. The layout of many cities in developing countries and the difficulties with mobility are strongly ingrained with class and wealth differences.

Global trends and patterns of urban density

In comparison to cities in Latin America, Asian and African cities are typically 35% denser, 2.5 times denser than cities in Europe, and around 10 times denser than cities in North America and Oceania (mostly from the US, Australia, and New Zealand). In 2010, Asia was home to 39 of the world's 100 densest metropolitan areas.15 Cities in developing nations have been growing more quickly than those in wealthy nations. Average urban densities decreased from 3545 to 2835 inhabitants per square kilometer in affluent nations between 1990 and 2000, while they decreased from 9860 to 8050 in developing ones.

Urban densities have dramatically decreased during the last two centuries, particularly in emerging nations. In 5.2, the downward trend in built-up area densities for 25 cities is shown, starting with data from the late 1700s and ending in 2000. At an average annual rate of 1.5%, urban densities decreased fourfold from their peak, from an average of 43,000 people per square kilometer to an average of 10,000 people per square kilometer around the year 2000.17 At this rate, urban densities can be anticipated to decrease by another 26% by 2040. If past trends continue, each new resident's land area would triple by 2030, going from non-urban to urban land on average of 160 square meters, according to one projection.18 This would inevitably result in future cities that are more dependent on cars and less sustainable as a result[6].

Urban sprawl being exacerbated by urban transportation. Built-up densities decrease as sprawl continues in numerous places around the globe. In fact, the introduction of low-cost urban transportation options, such as omnibuses, horse cars, trolleys, commuter trains, and later buses and cars, has accelerated the outward physical expansion of cities and made density declines possible.19 Prior to the invention of the automobile, movement within cities was typically limited to walking, and urban forms were compact to lessen the need for physical travel. Urban distances remained small and walkable because to the placement of residences, businesses, restaurants, and even industries. However, those who had the resources to leave were compelled to do so due to the tremendous overcrowding, lack of privacy, and strong manure odor from horse-drawn carriages. Streetcar cities, which developed and grew as electrical power spread across most western cities, were hailed as a victory over the strolling and horse-car towns. This is so that the middle class could leave the oppressive urban densities of the early 1900s and migrate to less crowded suburbs. Suburbs serviced by rail grew quickly following. The internal combustion engine vehicle technology progressed quickly throughout the twentieth century, and with it the automotive city was born. Streetcars established the radial spines of most areas, expanding urban bound- aries five times or more beyond those of the pedestrian city. The automobile city, and particularly the provision of grade-separated, limited-access freeways, further accelerated the dispersal of economic activities, unleashing low-density, discontinuous patterns of urban growth associated with sprawl. Alongside the freeways (among other factors), a more polygonal pattern of development was also enabled, which allowed metropolitan boundaries to extend outward four to five times.

A renowned urban sociologist made the following observation seventy years ago: "Urban form is largely a product of the dominant transportation system that was in place during a city's

prevailing period of growth.25" European cities like London (UK), Madrid (Spain), and Prague (Czech Republic), which grew most quickly in the 1800s relative terms, still have many characteristics of walking and streetcar cities in their central areas. In contrast, sprawling, car-dependent US cities like Houston, Los Angeles, and Atlanta grew rapidly at the same time as highways were being built. This increasingly characterizes the periphery of cities in emerging nations that are now undergoing tremendous motorization and population expansion, such as Jakarta (Indonesia), Lagos (Nigeria), So Paulo (Brazil), and many more. Furthermore, it emphasizes the need of increasing sustainable transportation and urban-form practices in emerging nations with fast growing towns and cities, including China and India.

Urbanization and movement

Travel is significantly impacted by urban density. Following a worldwide energy crisis and an economic slump, the 1990s saw a surge in interest in the effects of density on travel and, therefore, energy consumption and the environment. In a 1989 cross-sectional comparison of 32 cities, it was found that the amount of energy used for transportation decreased precipitously as urban densities increased (5.3).26 US cities had on average the lowest densities and nearly twice the amount of gasoline consumed per person as Australian cities, about four times as much as more compact European cities, and ten times more than three compact Asian cities, Hong Kong, Singapore, and Tokyo. These findings were linked to the much greater use and mileage of private vehicles in large, expansive cities compared to small, focused on public transportation communities. Similar findings came from follow-up studies conducted in 1999 on 37 cities: low-density cities often had greater VKT per capita than high-density ones.27 This link held true even within nations. The doubling of urban densities has been linked in panel studies of density and travel in the US and the UK to 15% and 25% declines in VKT per capita28. However, what comes along with density, such as lower car ownership rates, less road space per capita, fewer and more expensive parking spaces, and better quality public transportation services, can also be important factors associated with density.

Studies at the city level, like the one in this example, have also come under fire for being too aggregate, which hides variances within cities and differences across subpopulations. However, significant variations in VKT per capita have been seen, even within the same metropolitan region. After adjusting for house size, income effects, and odometer readings, a study of three US metropolitan areas—Chicago, Los Angeles, and San Francisco—found that car ownership and use decreased in a predictable and systematic manner as a function of increasing residential density.30 Evidence also points to a negative correlation between urban densities and vehicular travel in other significant cities that are rapidly motorizing, such as Santiago (Chile), Beijing (People's Republic of China), and Shanghai (People's Republic of For instance, significant reductions in energy use and motorized transportation may be obtained without Hong Kong-style high-rise densities. The largest decreases in the energy consumption and VKT of the transportation sector are instead seen when moving from extremely low-density sprawl (such as the suburbs of Houston, Texas, which is car-oriented) to moderate densities of town houses and duplexes[7].

It's also important to consider the possibility of self-selection bias. Could the fact that people in compact, mixed-use neighborhoods opt to walk or bike more or that there is less demand for cars be contributing factors? Examining changes in travel patterns among people who relocated from one kind of neighborhood to another is one technique to account for such potential

consequences. According to a US research from Seattle, those who relocated to more accessible neighborhoods—such as those that are densely populated with mixed-use buildings and are near to other points of interest—logged much less miles on their cars. Furthermore, almost all research indicated that constructed surroundings, including density measurements, still had statistically significant affects on travel. This was demonstrated by a recent assessment of 38 studies that statistically adjusted for self-selection effects.

Other aspects of urban form that affect travel. One aspect of urban form that affects transport is density. Another crucial factor is the population and employment density' geographical dispersion. The location of journey origins and destinations, as well as the amount of time and energy spent traveling, are determined by where people live, work, shop, and socialize. The density gradients of US cities and a growing number of European cities have been flattened by factors including zoning constraints, greater income, and the development of high-capacity motorways. Additionally, it has lengthened commutes and encouraged use of private vehicles.

Additional characteristics of urban form include urban land cover (the total area of a city that is built up) and compactness (the degree to which a city's footprint resembles a circle rather than a tentacle-like shape). On average, North American cities occupy more than twice as much space as Latin American cities, which in turn occupy slightly more space than European, Asian, and African cities.Following the footprints of the cities of Bandung, Indonesia, and Accra, Ghana, we can see what kinds of land are being used for new construction in these two rapidly expanding developing-country towns. Bandung's urban footprint nearly doubled from 108 to 217 square kilometers between 1991 and 201137. Of the newly developed area, 60% was urban expansion into farmland and open space, 17% was leapfrog or non-contiguous development, and the remaining 35% was urban infill (i.e. redevelopment of existing built-up areas). Leapfrog development may be expensive to support since distant, remote settings must have access to basic infrastructure like sewage and piped water. Over the course of these 10 years, urban density in Bandung decreased overall by 1.4% yearly. Accra's land area increased by 153% between 1985 and 2000, which is twice as quickly as the city's population did. The majority of Accra's urban development was caused by the expansion of municipal limits into formerly agrarian regions[8].

Urban design and movement

The geographical patterns of journeys are influenced by other characteristics of urban form, such as the spatial distribution of people and employment and land covering, in a manner similar to how density affects travel lengths and modes. Radial journeys are primarily generated by a monocentric urban design, where the great majority of employment and commercial activity are centered in the city center and the majority of residences are located on the perimeter (5.6). While the concentration of traffic around the center often results in severe road congestion, it also promotes the success of extensively used radial public transportation networks. More dispersed, lateral, and cross-town travel patterns are produced by a multi-centered, or polycentric, form, which generally favors flexible modes of transportation like private cars38. Polycentric regions can mount effective public transportation systems by utilizing sub-centers to connect high-quality, synchronized rail services, like those in Singapore and Paris. Effectively, suburban centers and nodes serve as the linking sites for extensive public transportation networks. The greater proportions of trips made by non-motorized modes like walking and cycling determine how much station nodes average higher density.

Urban land covering has an impact on travel, much as densities. The average amount of land utilized per person in the US grew by about 20% between 1980 and 2005, which may help to explain the 50% rise in average annual driving distances in that country39. In India, journey durations are more impacted by land area (5.7) than by urban densities (5.8). The link between population density and average travel duration is marginally favorable among India's 21 major cities. However, the travel duration and the slope of the urbanized land area are both substantially steeper. This illustrates the sprawl-promoting impact of floor space index (FSI) regulations, which were utilized to decongest the center of most Indian cities' urban centres. Longer distance excursions, which are more reliant on motorized transportation (including two- and three-wheelers), may suffer as a result of shifting expansion to the periphery.

The complexity of a city increases with its size and has a higher capacity to affect future traffic conditions, especially if poorly managed. Larger cities have traffic densities (the number of cars traveling roadways per square kilometer, for example) that are noticeably greater on average than smaller ones. In 120 cities throughout the globe, doubling the population between 1990 and 2000 was correlated with a 16% increase in density. As cities grow in size and area, so do the typical journey durations, the intensity of traffic congestion, and environmental pollution. Regardless of the caliber of the metro services, traffic congestion is a fact of life in megacities. In medium-sized cities, which struggle with inadequate roadway designs, poor connectivity, and insufficient public transportation, the pace of congestion increase is also rising quickly. When traffic demand approaches or exceeds the transport system's capacity during peak hours, these problems are made worse. Inevitably, issues arise in the urban environment as a result of city growth and high densities, especially in emerging nations. For instance, in megacities like Manila (the Philippines), Lagos (Nigeria), Jakarta (Indonesia), and Mexico City, where employment and economic activity are concentrated in large areas, inadequate public transportation has led to extremely high traffic densities and comparatively lengthy trips by motorized transport.

While urban agglomeration enables employment specialization, effective market exchanges, and knowledge spillovers, the economic gains that emerge from concentrated development tend to diminish if it is not well managed, for example by integrating urban expansion with metro investments. Agglomeration dis- economies, or the inefficiency and loss brought on by poorly planned concentrations, manifest themselves via decreased labor productivity brought on by high traffic congestion, rising air pollution, and a general deterioration in the standard of urban life. Beijing's growing traffic congestion and environmental issues have been attributed to the excessive concentration of activity in the city's metropolitan center. According to recent research done in UK cities, decongesting the core by spreading expansion to sub-centres may boost economic productivity without raising levels of air pollution, greenhouse gas emissions, or energy demand for transportation.

CONCLUSION

In conclusion, a crucial component of urban planning and design is the interaction between mobility and urban form. Mobility patterns and city sustainability and livability are greatly influenced by urban form, which includes land use patterns, transportation infrastructure, and the built environment. Compact and mixed-use urban designs that put a premium on accessibility, connectedness, and walkability may encourage sustainable means of transportation including biking, walking, and public transportation, which has a number of positive social, economic, and environmental effects. But creating urban forms that support sustainable transportation is not

without its difficulties. For the creation of coherent and sustainable urban environments, integrated planning methods that take into account land use, transportation, and urban design are required. Innovative technology, data-driven decision-making, and community involvement are also essential in determining how cities look and how people move about. Understanding and putting into practice efficient solutions to improve mobility and urban design becomes increasingly more crucial as cities continue to struggle with issues including growing urbanization, traffic congestion, air pollution, and unsustainable transportation patterns. Cities can build more livable, egalitarian, and sustainable urban settings that are good for citizens, companies, and the environment by emphasizing sustainable mobility, integrating transportation planning and urban design, including communities, and using technology breakthroughs.

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CHAPTER 11

URBAN DENSITIES AND PUBLIC TRANSPORT THRESHOLDS

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ABSTRACT:

Urban densities refer to the spatial distribution of population and built environment in urban areas. They are a crucial element of urban planning and design, shaping the physical, social, and economic characteristics of cities. This abstract provides an overview of urban densities, exploring their definition, types, factors influencing them, and their implications on urban sustainability. Urban densities are often measured in terms of the number of people or buildings per unit of land area. They can vary greatly depending on the location and context, and can be categorized into low, medium, and high densities. Low densities are characterized by low population and building densities, typically found in suburban areas with detached houses and large open spaces. Medium densities are often seen in mixed-use neighborhoods with a mix of residential, commercial, and institutional uses. High densities are typically found in city centers with tall buildings and a high concentration of people and activities.

KEYWORDS:

Car Ownership, Commuting Patterns, Congestion, Density Thresholds, Modal Shift, Public Transport.

INTRODUCTION

The effects of urban density on public transportation ridership have received the most attention among all aspects of urban form and travel. High densities are commonly acknowledged as being necessary for maintaining affordable public transportation systems. It is argued that mass transportation requires "masses" or "density." Nothing is more beneficial to the relative economics of rail travel than large volumes and population density, as was stated approximately 50 years ago. All urban transportation systems have cost increases due to high population density, however rail has a far lower rise than other modes.44 Rail must reach a certain density of journeys in order to be less expensive than accommodating the same number of trips by vehicle or bus due to its high upfront construction costs and economies of scale. Since large passenger numbers are necessary for rail-based public transportation to be financially viable, stations must also have dense populations and employment.

a connection between the use of public transportation and urban design. Cities with very low population density and a primarily polycentric shape are blatantly autocentric. In large, dispersed cities like Atlanta (US), public transportation struggles to compete with private automobiles. Only cities with high urban densities, a high proportion of retail and employment in the downtown area, such as Shanghai, China, or those with polycentric cities with multidirectional

travel patterns, like Stockholm, Sweden, can provide affordable public transportation. Many big cities, such as Jakarta (Indonesia) and Paris (France), fall in the middle of the two aforementioned extremes. In these places, where densities are somewhat high and activities span the mono-centric-polycentric spectrum, both private mobility and public transportation may compete for trips. Urban population density and per-capita public transportation use are positively correlated. Hong Kong, a statistical anomaly due to its exceptionally high densities, averages relatively few transport trips per person in comparison to its high densities. This may be explained by the fact that numerous travel locations are near to one another, leading to an incredibly high proportion of foot travel. An even better statistical fit is obtained by excluding the Hong Kong instance from the database[1], [2].

In order to enable effective public transportation services, minimum density thresholds must be defined since public transportation is dependent on urban densities. On the one hand, cities need an average population density of 3000 people per square kilometer to sustain relatively affordable public transportation services.45 On the other hand, if public transportation is to generate enough ridership to pay expenditures in richer, more car-oriented nations like the US, UK, Canada, Australia, and New Zealand, a minimum threshold of 3500 people and employment per square kilometer is required.46 Evidence shows that new suburbs in these nations seldom surpass this minimal criterion by more than half.47 Public transportation trips per capita in Athens (Greece) grew dramatically to 20,000 people per square kilometer before tapering down, according to a comparable research. This finding suggests that this is the design standard for effective public transportation systems.48 Although density criteria have been established for some time to direct public transportation spending and TOD planning in the US, these standards are based on little information and experiences.

Based on the nation's experiences with recent light-rail and BRT expenditures, a recent US research investigated the employment and population densities that are related with cost-effective public transportation projects.49 A BRT system that costs US$30 million per kilometer would need around 4000 jobs and inhabitants per square kilometer within 800 meters of its station, according to 5.11, which is based on this research, in order to be within the top 75% of cost-effective investments. For a heavy-rail investment to rank in the top quartile, it needs approximately 14,000 jobs and inhabitants per square kilometer, whereas a light-rail investment needs 11,000 per square kilometer[3].

However, other observers have advised against becoming fixated on density since there are several city factors that affect the use of public transportation.50 In order for public transportation to be financially feasible, neighborhoods around stations must be walkable and have a diverse mix of property uses. People are less likely to utilize public transportation if they cannot securely and easily walk the half-kilometer to or from a station. On the other hand, people are more likely to use public transportation if they can conveniently perform errands and plan excursions while traveling to or from a station. Additionally, the likelihood that someone may use public transportation is increased by the existence of a convenience shop along the pedestrian corridor leading to the stop. It also matters how densities are constructed. In contrast to the uniformly dispersed, poorly planned densities in Los Angeles, US, lineal and well-articulated densities aligned along busways, as in the example of Curitiba (Brazil), are far more favourable to travel by public transportation (5.6). Public transportation will struggle to capture a decent market share of journeys if there is a mismatch between the geometry of transportation systems

(such as point-to-point rail lines) and the geography of travel (such as numerous origins to many destinations), no matter how effective the services.

DISCUSSION

Planning The Accessible City

For cities to have sustainable futures, land development and urban transportation must be coordinated and integrated. One distinguishing characteristic of "compact cities" or "smart growth" is the successful integration of the two, which helps to shape transportation investments and provide the greatest results. Making the linkages between urban development and transportation work in both directions is necessary for successful integration. As already said, a city's layout and design have a significant impact on travel demand. At the same time, the city's transportation infrastructure is a crucial component. Coordinating and integrating both spatial planning and development and transportation planning and development is essential.

Beginning with a unified vision of the future city among municipal administration and the key players in civil society, coordinated planning for urban mobility and land development may be initiated. After then, a strategic plan is created to coordinate urban development and actualize the common vision. This plan must involve, among other things, developing the institutional, statutory, and financial capacity to carry it out. A strategic plan tries to transform urban development objectives into long-term execution with regard to where and how development and redevelopment happens, as well as the tools such as laws and regulations, fiscal instruments, and organizational changes required to accomplish desired results. Considering the future of the city before making transportation choices illustrates the derived nature of travel. People travel to go to certain locations, and it is these locations that fulfill the needs and ambitions of the travelers. In order to guide transportation investments and achieve the best results, whether measured in economic prosperity, energy resourcefulness, cleanliness of the natural environment, or quality of life, well-planned cities like Singapore, Stockholm (Sweden), and Curitiba (Brazil) have created compelling future visions[4].

The famed "Finger Plan" and the city of Copenhagen in Denmark serve as textbook examples of long-term planning visions that have influenced rail investments and urban development. The metaphor for determining where development would and would not occur became a five-finger hand. Each pointer pointed toward a historic Danish market town that was in the general vicinity of the large city of Copenhagen. In ahead of travel demand, the development of rail-based public transportation was intended to direct expansion along anticipated growth axes. Major infrastructure was also moved away from the districts, and greenbelt wedges designated as agricultural preserves, open space, and natural habitats.

With a population under 900,000, Ottawa, Canada, provides a wonderful illustration of how urban planning and transportation investments may work together. A multi-centred urban form with five development lanes extending outward from the city center was proposed in the 1974 plan. In order to stimulate development along these corridors, Ottawa's leaders first invested in a high-quality, high-capacity busway, based on a concept design that identified the intended growth axes. Land-use restrictions and incentives, such as investments in specific infrastructure, directed commercial and employment expansion to the busway corridors. For instance, the plan required that any retail centers larger than 354,000 square meters gross leasable area be situated close to the busway or any future additions. The required parking fees was one of the

transportation demand management strategies. Public art to brighten up station areas, short street blocks to make it simpler and more fun for walkers to reach busway stations, and beautiful building designs and set-backs were all part of Ottawa's 2007 adoption of guidelines.56 In contrast to practically all other Canadian cities, Ottawa's daily trip mode share for public transportation has been stable at 15% since 1990[5].

Atlanta

The two instances given above show how investments in transportation have been utilized as instruments to produce desired results, with urban form acting as the "horse" and transportation acting as the "cart." Similar to how state and municipal governments may utilize a variety of instruments to control urban expansion, including land use rules, infrastructure improvements, taxation (such as enterprise districts), and land acquisitions (such as greenbelts). However, history suggests that one of the most crucial expenditures is in transportation. This is especially true in cities that are rapidly expanding, have thriving economies, increasing traffic congestion, and a significant pent-up demand for mobility. According to one argument, "transport-land use links are the most significant ones in infrastructure plans and should take precedence."

Some communities choose to advocate concepts and goals, stated in very broad terms, concerning intended development rather than being site or corridor particular about where growth should occur and how. Instead of precise spatial designs, this often takes the form of strategic spatial plans that include long-term goals and conceptual notions. An example is Barcelona's most recent strategic plan, which advocates for conserving the city's historic tradition of excellent urban planning and making the city walkable. Through a number of local multi-sectoral initiatives, including housing construction and brownfield redevelopment, as well as proactive investments in sustainable transportation infrastructure, the plan offers a framework for this vision to be clarified and put into action. Barcelona's long-standing dedication to planning and creating a compact, mixed-use walkable city has resulted in a geographical coverage and carbon footprint that are just a small portion of Atlanta's. Barcelona has a population comparable to Atlanta. Due to the low travel distances produced by a small city, 20% of Barcelonans' travels are performed on foot.

Long-term strategic plans guiding urban expansion are often less well defined in underdeveloped nations. Without providing specifics on where new development should be located, the city of Ahmedabad (India) adopted the idea of designing a city for accessibility rather than mobility in its "Accessible Ahmedabad" plan. The plan calls for directing growth and spending on transportation in order to: (1) lessen the demand for travel; (2) shorten travel distances; and (3) encourage the use of public transit and non-motorized vehicles to lessen reliance on private automobiles. The backbone of Ahmedabad's expanding transportation network is the BRT system. To elevate "accessibility" to a crucial component of mobility and city expansion, urban planning required to be better articulated.

In order to improve connection, more urban land must be dedicated to roadways as part of the accessible city plan. According to studies, the ratio of urban land allotted to roadways to the total land area of the city may be used as a proxy for measuring the overall connectedness of the city. According to current trends, emerging nations the majority of which have insufficient roadway and other facilities needed for enhanced accessibility are where the majority of urban population expansion is taking place. While it is crucial that these communities make investments in their streets, it should be understood that making a city more accessible requires more than just

allocating a large portion of urban territory to roads. Additionally, it is important to consider the street system's effectiveness and adaptation to key urban mobility modes including high-capacity public transportation systems (such metros or BRTs), walking, and cycling. Three key factors the percentage of land area devoted to roadways, the quantity of street junctions, and the separation between these crossings are integrated into an effectively designed street system. A further crucial component of the city's connectivity matrix and a key component of accessible urban transportation systems is the hierarchy of the street system, which includes the arterial, main, and secondary streets as well as biking and footpaths. According to its economic, institutional, social, and environmental capacity, each city must thus make investments in suitable and well planned street networks[6].

Planning for integrated transportation and urban expansion must take place at several spatial scales, including the area as a whole, districts and corridors, and communities. The core element of Portland, Oregon's well praised strategy for smart-growth development is this multi-level planning. There, a long-term regional strategy has been established that includes several, hierarchical development centers connected by secondary bikeway/pedway networks and high-quality public transportation. In order to stop urban expansion, lessen reliance on cars, and make Portland a healthier, more livable city, an urban growth limit had to be established. At the local level, this limit ensures that future expansion will be upward and inward rather than outward. The ecological environments in which cities operate are best captured at the regional scale, which also geographically correlates to vulnerable resources like airsheds and water tributary regions.

The physical setting in which many daily economic activities, such as going to work and shopping for necessities, take place is captured at the district or corridor size. A necklace of pearls urban form may develop for a public transportation corridor, where nodes of mixed-use, public transportation-served centers encourage inhabitants to utilize public transportation for their everyday activities. When it comes to the neighbourhood scale, activities like convenience shopping, neighborhood interaction, and walking children to school often occur in areas where TOD and gridded street patterns are prioritized in urban planning. As shown in Portland (US) and Curitiba (Brazil), spatial harmony between these three levels regions, districts/corridors, and neighbourhoods can be essential for the effective integration of transportation and urban development.

These three scales neighbourhoods, corridors, and regions are discussed in turn in the following three sections. At these sizes, the orientations of the interaction between transportation and urban form are also examined. These sections focus on how investments in and regulations around transportation have an impact on the growth and structure of cities, as well as how urban development and land use patterns affect travel. Examples are given to illustrate both the advantages and disadvantages of combining urban development and transportation at various scales.

Neighborhood Scale Built Environments and Travel

The easiest way to quantify the mobility impacts of a city's finer-grained characteristics, such as the size of city blocks, the design of roadway networks, parking arrangements, and the intermixing of land uses, is at the neighborhood scale. Many everyday activities should be within a five- to ten-minute walk of one another according to modern definitions of smart development,

such as TOD and new urbanism, both of which are covered in the next section. This is comparable to how a normal neighborhood is covered in space.

The possibility of reducing motorized traffic via modifications to the built environment has been the subject of several studies. Density, diversity, design, destination accessibility, and distance to transportation are the "5 Ds," or key dimensions, along which analysts often characterize characteristics of built environments (5.8). These 5 Ds are present in various situations and settings and have a significant impact on travel demand, including the frequency of journeys, the means of transportation selected, and the distances traveled.68 VKT per capita is impacted by the 5 Ds both separately and jointly.

The majority of the evidence for this comes from advanced nations. The average effect of each D component on VKT, represented as elasticities (denoting the percent change in VKT for a 1 percent change in each D factor), is the result of a recent meta-analysis of more than 100 research from North America. According to the study's findings, "destination accessibility" is by far the most significant land use factor that significantly affects travel; on average, a doubling of access to destinations for example, the number of jobs that can be reached in less than 30 minutes by public transportation is associated with a 20% decline in VKT. The best-designed, compact, mixed-use complex in a distant area will not create as little motorized traffic as a development in a central, easily accessible location.

Urban planning such as roadway connections and safe, comprehensive sidewalk facilities and strategically placed pedestrian paths are other factors that affect mobility. In contrast to the residential end of journeys, discusses the significance of land-use variety, such as the amount of mixing, which tends to exert major impacts on commute lengths and modes to the office. Because density is entangled with other D factors, such as mixed-use settings, compact city blocks, and central locations, which all reduce journeys and promote walking, there is a very weak statistical association between density and travel in the US. Individual elasticities may seem tiny in 5.1, but their combined effects are significant[7].

The findings of European research on the 5 Ds and travel substantially support those from the US. Location within a region is important, much as in the case of the US. A large percentage of cars are used in remote neighborhoods with insufficient access. According to a research conducted in Copenhagen, Denmark, VKT rose by 30% when the distance from the city center was doubled.69 A study of two European towns with comparable land sizes and family incomes, the master-planned British new town of Milton Keynes and the more traditional Dutch settlement of Almere, highlights the significance of road designs and land-use combinations.70 While Milton Keynes is a car-oriented city built on a super-grid of four-lane thoroughfares, dividing residences, workplaces, and businesses into distinct quadrants, Almere was planned for walking and bicycling.

According to the survey, automobile travel accounted for two-thirds of urban residents' out-of-home journeys in Milton Keynes, compared to 42% in Almere. Additionally, Almere had 25% lower journey lengths on average. Greater differences were seen when Milton Keynes was compared to Houten, a Dutch master-planned new town that was more carefully developed for bicycle riding. In 2010, bicycles were used for 55% of journeys made by Houten inhabitants, compared to 20% of trips made by Milton Keynes urban residents. Even though there is a dearth of information about the 5 Ds and travel in developing nations, data is starting to accumulate. Evidence from Santiago (Chile) showed that between 1991 and 2001, the impact of urban

densities on automobile ownership quadrupled, decreasing the chance of families having a car as population densities rose.72 A decrease in automobile ownership was also seen in areas near metro stations. Diversity in land use, however, had a little impact on travel.

According to a study of Bogotá residents conducted in Colombia, neighborhood design elements like roadway connectedness and sidewalk amenities had a far greater effect on how much time inhabitants spend walking and cycling than density and land-use variety. Moving from a neighborhood in Bogotá with low levels of road connectivity (determined by the ratio of linkages to junctions) to one with greater levels raised inhabitants' chance of walking 30 minutes or more per day by 220 percent.74 Many of Bogota's oldest neighborhoods, which grew naturally during the days before automobiles, had stringent zoning regulations, which led to urban neighborhoods that share comparable densities, combinations of land uses, and accessibility to public transportation. However, the quality of the walking environment varied and had little to no impact on non-motorized travel. Similar to this, street designs have a stronger effect on walking in Taipei and Hong Kong (China) compared to high densities and varied land uses which are typical in both cities.

Age and gender have significant roles in the environment for walking. According to a recent research conducted in Tehran, older people are more likely to walk more often in neighborhoods that are extremely walkable. More street illumination and a diversity of land uses that encourage foot circulation are likely to reduce the incidence of violence against women in environments. Furthermore, in compact, mixed-use neighborhoods, individuals of all ages and genders tend to mingle more and engage in greater physical activity. Urban planners refer to well-designed streetscapes with nearby attractions as having "natural surveillance" and more "eyes on the street" because they tend to entice city dwellers to sidewalks and public areas. By proactively investing in nearby walkways, plazas, and sidewalks and connecting the city to the Transmilenio BRT system, Bogotá has further improved public safety and compelled residents to improve their properties and neighborhoods[8], [9].

Pathways that have been expanded, upgraded, and better linked are significant components of slum rehabilitation programs. As part of a significant neighborhood development program, 30 walkways that crisscross steep slopes have been erected or renovated in La Vega Barrio, one of Caracas, Venezuela's biggest and oldest informal settlements, to improve access to employment, schools, and medical facilities.81 In emerging towns, architectural elements like smaller city blocks may also promote walking. Smaller blocks indicate that walking journeys will probably be less complicated. In Ahmedabad, India, just 13% of journeys were conducted on foot by residents in neighborhoods with an average block size of 4 hectares, as opposed to 36% in an area with an average block size of 1.2 hectares.

Experiences from China show how travel in quickly expanding places is significantly altered by changes in built surroundings. Urban settings have seen substantial changes in tandem with China's transition to a market economy, going from a conventional high-density, pedestrian- and cyclist-oriented urban shape to a more spread-out, auto-oriented one. Many Chinese working-class homes were relocated to the periphery during the 1990s land market liberalization, often to isolated superblock developments surrounded by broad roadways. When car-oriented large-block suburbs replaced naturally developed, mixed-use enclaves, where many people lived, worked, and shopped nearby, families' trip footprints were significantly increased. A research on the effects of 900 families moving from the urban heart of Shanghai to isolated, gated housing units

on the outskirts found that there were significant changes from non-motorized to motorized transport, as well as trips that were much longer in length. The homes questioned saw a 50% rise in VKT as a consequence.85 In comparison to urban dwellers living in more car-oriented, superblock districts, a different research indicated that people in higher-density parts of Shanghai with smaller blocks and denser street networks on average owned only half as many cars.86 Moreover, even when the method of transportation remained the same, people of neighbourhoods that encourage walking and bicycling traveled less distances than those in other neighborhoods.

Around the world, different neighborhood designs and renovations are being implemented to cut down on the demand for personal vehicle travel and encourage more environmentally friendly means of transportation. Traditional neighborhoods, commonly referred to as new urbanism, TOD, and car-restricted areas are a few of them.

Neighborhoods with a long history and the modern urbanism. Traditional neighborhoods were small and very walkable before the invention of the private automobile. The pre-automobile period was characterized by daily activities (including stores, restaurants, and schools) being no more than five minutes distant.87 The 'new urbanism' urban design trend first emerged in the US around the beginning of the 1980s. This movement aimed to bring back the architecture and atmospheres of pre-automobile neighborhoods, locations that encouraged walking, permitted everyday face-to-face contact with people from all walks of life, and provided a variety of dwelling types, jobs, commercial-retail offers, and public spaces.88 The movement made placemaking and diversity become buzzwords. In contrast to the uniformity and sterility of suburban sprawl, new urbanism focused on the small details that make communities enjoyable, distinctive, and useful, such as gridiron street patterns that are good for walking, prominent civic spaces that bring people together (and thereby contribute to the development of social capital), tree-lined skinny streets with curbside parking and back-lot alleys that slow car traffic, and a variety of housing types and prices.

In the US, more than 600 new urbanist neighborhoods have been developed, are planned, or are now being created. Florida's Seaside, which debuted in the early 1980s, is the most notable no. Since the 1980s, a number of former brownfield sites in Europe have been renovated using traditional as opposed to modernist architectural concepts. Poundbury, England, a town outside of Dorchester, serves as one example. Heulebrug (Belgium), Pitiuosa (Greece), Agelada de Cima (Portugal), Hardelot Plage (France), and Kemer in Istanbul (Turkey) are some non-European new urbanism communities that have either been created or are developing. Recent examples of neighborhood designs and redevelopment projects in developing nations include Orchid Bay in Belize, Rosetown outside of Kingston in Jamaica, Timphu in Bhutan, and Melrose Arch in Johannesburg in South Africa. These projects all adhere to modern urbanism ideas to varied degrees. However, these initiatives mostly serve middle- or upper-class families who can afford the neighborhood amenities such as civic squares, improved streetscapes, etc. that come with new urbanist neighborhoods. As a result, they haven't done much to alleviate systemic socioeconomic issues like slums and extreme poverty.

Making cities attractive places to walk and bike is one of the goals of constructing communities, such those suggested by new urbanism. This will help reduce the reliance on cars. The majority of experience supports this. A research in the Research Triangle region of North Carolina discovered that decreases in VKT were brought about by replacing outside-neighborhood

automobile trips with inside-neighborhood pedestrian trips. At identical income levels, residents in low-density, single-family suburban neighborhoods made as many daily excursions as those of compact, mixed-use, "traditional" neighborhoods. However, the reduction in journey lengths and the move from driving to walking led to around 20% fewer VKT per home per daily.

CONCLUSION

In summary, urban densities are important in determining how cities look and operate. They have substantial effects on urban sustainability and are impacted by a number of variables, including historical growth patterns, land availability, planning regulations, and transportation networks. Despite the fact that greater densities may encourage effective land use, prevent sprawl, and maintain lively urban settings, they must be carefully managed to meet possible issues including overcrowding, traffic congestion, and decreased access to green areas. The right density levels for various settings must be carefully considered by urban planners, politicians, and designers, who must also strike a balance between the advantages and disadvantages of urban densities. Adopting tactics like compact urban forms, mixed-use communities, effective transportation networks, and equal access to amenities and services may be necessary for this. Planning for sustainable urban density may also take socio-cultural preferences into account and include local stakeholders and communities.

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CHAPTER 12

A DISCUSSION ON TRANSIT-ORIENTED DEVELOPMENT (TOD)

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ABSTRACT:

Transit-oriented development (TOD) is a planning and design concept that aims to create compact, walkable, and vibrant communities centered on transit stations. This abstract provides an overview of TOD, including its definition, key principles, benefits, and challenges. TOD is a land use and transportation strategy that promotes the integration of transit systems with land development, with the goal of creating sustainable, livable, and inclusive communities. It typically involves mixed-use developments, including a mix of residential, commercial, and institutional uses, located within a short walking distance of transit stations. TOD is often characterized by higher densities, pedestrian-friendly environments, and an emphasis on public transportation, cycling, and walking as modes of transportation. The key principles of TOD include proximity to transit, mixed land uses, higher densities, pedestrian-oriented design, and community engagement. TOD seeks to create compact, walkable communities where residents can easily access transit options, amenities, and services without relying heavily on private vehicles. Mixed land uses are encouraged to promote diverse and vibrant urban environments, where residents can live, work, and play in close proximity. Higher densities are often incorporated to maximize land use efficiency and reduce sprawl, and pedestrian-oriented design is prioritized to create safe, pleasant, and accessible environments for pedestrians and cyclists. Community engagement is also an essential aspect of TOD, involving stakeholders in the planning and decision-making processes.

KEYWORDS:

Accessibility, Affordable Housing, Alternative Transportation, Amenities, Bicycle Lanes, Community Development.

INTRODUCTION

Development that is physically oriented around a public transportation hub is referred to as TOD, whether it is classic or new urbanism. Residents and employees are more likely to use the train or bus for longer excursions outside of their immediate neighborhood and to walk or ride a bike for shorter trips inside their immediate neighborhood if pedestrian-oriented development is concentrated near public transportation hubs. The purpose of TODs is to serve as community hubs and locations where people choose to "be," rather than just "pass through," for events like farmers' markets, outdoor concerts, and other activities that foster a sense of community. Planners, legislators, and ordinary residents all agree that public transportation terminals are a sensible location to focus urban expansion and redevelopment. To begin with, high-quality, well-connected public transportation must be available, therefore TOD depends on and implicitly presupposes that public transportation is just as safe, dependable, and time-efficient as a private vehicle[1].

TOD is becoming more widely acknowledged as a practical paradigm for directing urban expansion. The most advanced TOD markets are in Europe, notably in Scandinavia. The creation of a vision and conceptual picture of the future city, like the renowned "finger plan" of Copenhagen or the "necklaces of pearls" of Stockholm, is the first step in making TOD a reality. In both of these cities, rail infrastructure was built, frequently ahead of demand, to direct growth along desired growth axes. Corridors for channeling overspill growth from the urban centers within a walkshed (650 meters) of a public transport stop, with densities tapering with distance from the, were defined early in the planning process. Few cities in developing nations have historically been focused on public transportation, with fine-grained land use mixtures, an abundance of paths for walkers and bikes, and an abundance of transit services on main roadways. Around BRT stations in Curitiba (Brazil), Santiago (Chile), and Guatemala City, TOD is being planned or has already materialized to varied degrees. Asian cities including Kuala Lumpur (Malaysia) and Kaoshiung, Qingdao, and Jiaxing (China) have also had notable bus-based TOD experiences.

For the purpose of controlling expansion and maximizing the returns on significant rail and BRT expenditures, several Chinese cities are turning to TOD. In their long-range master plans, Beijing and Guangzhou have embraced TOD as a guiding design paradigm. ToD initiatives have been thwarted in many Chinese cities by the inability to communicate densities (e.g., by not tapering building heights with distances from stations), the placement of stations in solitary superblocks, and insufficient pedestrian access. Since Beijing invested in a large 372-kilometer subway network two decades ago, housing complexes and certain employment and consumer services have moved to train routes outside of the metropolitan center. Numerous neighborhoods with train service have developed into true dormitory communities, which has shifted commuter patterns. According to a study of three residential areas in Beijing's northern suburbs that are serviced by trains, there may be up to nine times as many rail passengers traveling in during the morning peak as there are traveling out. Long passenger lines and unpredictable pedestrian circulation patterns have also been caused by a lack of interaction between station designs and the surrounding development at suburban stations.

The US provides the majority of the evidence about how TOD has affected travel and environmental quality. There, studies have shown that TODs may cut the amount of cars per capita usage in half, saving families 20% of their income since they have, on average, one less automobile or often none at all. Residents in TODs travel four to five times as often by transport as the typical commuter in the US. Similar ridership advantages for TOD projects in Toronto, Vancouver, Singapore, and Tokyo have been documented. A recent research in China found smaller differences in train travel between residents who lived close to and far from suburban rail stations of around 25%. While TOD planning often focuses on residences, US experience demonstrates that placing employment near train stations in well-designed, pedestrian-friendly environments may have an even greater impact on the mode of transportation. The choice of travel mode may be significantly influenced by the placement of TOD in an area and the quality of linked public transportation services. When surrounded by auto-oriented development, a TOD will have little of an impact on travel[2], [3].

DISCUSSION

Traffic-calmed and car-restricted neighborhoods. Liveability and pedestrian safety are now at the center of transportation planning in many European towns. Initiatives have been made to control

and lessen reliance on the private automobile. One such example is traffic calming, which was invented by Dutch planners who slowed down traffic by installing speed bumps, realigning roads, necking down junctions, and planting trees and flowerpots in the center of the roadways. With traffic slowing, a neighborhood's liveable space is extended into the street, making it a place to stroll, engage in conversation, and have fun. Passing cars become less important. Heidelberg, Germany, had a 31% drop in accidents and a 44% drop in fatalities after slowing traffic on its streets in the early 1990s.

The full prohibition of vehicles from historic neighborhoods and districts, along with an improvement and attractiveness of pedestrian areas, has been an even more audacious strategy in the same direction. Many ancient European towns, whose twisting, narrow streets were not intended for motorized traffic, have adopted this approach. In Athens (Greece), Seville (Spain), Lübeck and Bremen (Germany), Bologna and Siena (Italy), and Bruges (Belgium), as well as significant portions of university towns like Groningen and Delft (the Netherlands), Oxford and Cambridge (UK), Freiburg and Münster (Germany), car-free historical districts are now thriving. Promenades and extended pedestrian-only retail avenues have also grown in popularity; examples include Gamla Stan in old-town Stockholm (Sweden), Lisbon's Baixa, and Copenhagen's Strget. Like Curitiba, Brazil (20 city blocks), Buenos Aires, Argentina (12 blocks of Florida Street and several car-free waterfront redevelopment projects), Guadalajara, Mexico (15 downtown streets), and Beirut, Lebanon (most of the historical core), multi-block car-free streets and enhanced pedestrian zones are also found in developing-country cities. Vauban (7.12) and Rieselfeld outside of Freiburg (Germany), the GWL Terrein brownfield redevelopment in Amsterdam (the Netherlands), the Mustersiedling Floridsdorf housing project in Vienna, the Kolumbusplatz neighborhood in Munich (Germany), the Stellwerk 60 project in Cologne (Germany), and Masdar City outside of Abu Dhabi (United Arab Emirates) are just a few examples of entire residential communities that have car restrictions.Retail sales transactions in West German cities' pedestrianized districts changed between 1965 and 1975.

Using cellular neighborhood designs that force drivers to take roundabout roads while offering direct links for bikes and pedestrians when moving from one cell to the next, several European municipalities have chosen to include traffic calming measures. One such is Houten, a 41,000-person master-planned city south of Utrecht the Netherlands that was created with a focus on bicycle and foot movement.

Global experiences with developing car-free zones, auto-restricted neighborhoods, and pedestrian-only streets have largely been favorable, despite some early unease by commercial merchants, residents, and politicians. However, care must be taken to make sure that there are regular, high-quality public transportation options available to replace the lost vehicle traffic. In a study on pedestrianization in German cities, it was found that there were decreases in traffic accidents and deaths along with improvements in pedestrian flows, public transportation usage, land prices, and retail sales transactions.

Even after accounting for potential increases in traffic on parallel routes, a study of more than 100 cases of road capacity reductions (such as car-free zones, pedestrian-only streets, and street and bridge closures) in developed countries found an average overall reduction in motorized traffic of 25%. This "evaporated" traffic was a result of individuals choosing other means of transportation, such as public transportation, walking, and cycling, in place of low-value, discretionary excursions[4].

Traffic Contexts

A transportation 'corridor' is made up of 'one or more principal transportation infrastructures that provide a single conduit for the movement of people and commodities within and between activity centers, as well as the adjacent land uses and supporting roadway network. Corridors describe the geographical environment where coordination of transportation and land development across several jurisdictions often faces major obstacles. 'Accessmanagement' - the trade-off of the mobility against site-access functions of roads - may also provide substantial policy issues, especially in rapidly expanding cities and regions. Corridors may provide a spatial framework for creating a network of TODs if they are properly thought out and developed.

Trade-Offs Between Mobility and Development

Transportation corridors are used to carry people and products, but they often encounter strict construction restrictions that over time may compromise this role. Experience has shown us that constructing highways without properly controlling urban expansion is a sure-fire method to create future traffic jams. Particularly in the case of cities in emerging nations. Access to new areas is made possible by new roads, which leads to an increase in land and building development as well as traffic. Road construction projects in Sub-Saharan Africa have boosted domestic cash crop production and urbanization in small towns where farmers can sell their produce and purchase services and imported commodities. Since the majority of commerce in Africa is trans-oceanic, access to port towns is extremely important. According to a survey of 287 African cities, those who were reasonably near (465 kilometers) to a major port through paved roads saw a 6% quicker growth rate between 2002 and 2008 than similarly situated locations. According to a different research on projected road improvements between northeastern Congo and the Central African Republic, in addition to promoting urban expansion, the value of products trafficked along this route would rise from its present level of US$16 million to US$142 million, or by roughly 800%. The assessment came to the conclusion that over a 15-year period, trade development encouraged by the upgrade would cost around US$220 billion less than it would have[5].

Roads get more congested as a result of growing urbanization and stimulated economic expansion. The advantages of urbanization and economic expansion would decrease if such growth is not adequately handled.123 In essence, the roadway's purpose shifts from facilitating transportation to facilitating site access. In more affluent nations where enough rights of way have been retained to enable both, the two are in basic lanes. Due of land shortages, they might be challenging to construct in Asia and Sub-Saharan Africa. Limited-access toll roads may also be constructed to let those who are prepared to pay to escape traffic in their area. The development of corridor-level growth control plans that connect land use to new or expanded amenities is an alternative to supply-side corridor management strategies such as building frontage roads and enforcing curb-cut regulations. Implementation of both land development and transportation infrastructure takes years. Therefore, strategic long-range planning that is integrated is crucial. Once a port investment is made and land-use regulations are put in place, the two may develop together over time.

Through multi-modal corridor planning and design, freeways and rail lines may complement one other rather than compete with one another. Suburban trains and motorways are physically connected in the suburbs of Munich, Germany, making it easy for drivers to transfer to trains. Large digital displays provide information to drivers about downstream traffic velocities and

anticipated train journey times to the city center. Through-traffic movements are hampered by high corridor access, which is characterized by many driveways, curb cuts, and slow-moving autos entering and leaving locations. Furthermore, when traffic speeds go down, accidents occur more often. When many entities have influence over the corridor's infrastructure and land use, the issue is often made worse. Local governments want to take advantage of the extra capacity by permitting new construction as a way to expand the local economy and raise property tax revenue if a national government or state constructs a new road to enhance cross-city traffic flows.124 In certain regions of Sub-Saharan Africa and South-Eastern Asia, these situations where local governments use newly constructed transportation infrastructure to drive new development and boost tax revenues at the cost of intercity mobility are especially troublesome.125 A strategy for reducing unexpected consequences is to regulate corridor access better.126 This can be accomplished using growth management, road layouts, price signals, or other instruments of policy such as travel license-plate restrictions. Building frontage roads to divide through-moving traffic from local, slower-moving traffic is an example of a road-design reaction. In both North America and Europe, this is a custom front streetscorridors focused on public transportation.

Some cities have directed land uses, such as housing, offices, stores, restaurants, and strip malls, that are dispersed across suburbia, to corridors that are serviced by public transportation.130 Scandinavian towns including Stockholm (Sweden), Helsinki (Finland), and Copenhagen (Denmark) have built networks of connected TODs, or corridors that are focused on public transportation. This "necklace of pearls" constructed form may promote balanced, bi-directional flows and hence more efficient use of infrastructure via land-use intermixing in addition to encouraging the use of public transportation. Other stations are more specialized, serving as either employment hubs or residential towns, while other stations offer a mix of land uses. However, one may find a balance of employment, housing, retail, and population services within the 10-15 kilometer linear train routes that are provided. As a result, during peak hours, traffic flows in many directions. Instead of the uneven flows prevalent in unbalanced environments, public transportation is effectively utilised in both directions[6].

Greater Stockholm has grown along routes that are focused on public transportation. Strategic regional planning over the last 50 years has led to regional commuting and settlement patterns that have significantly reduced the need for cars in Stockholm's middle-class suburbs. The city's investment in radial rail lines has resulted in an urban shape that resembles a necklace of pearls and a balanced use of land for both housing and employment. The region's wide radial rail network is dotted with mixed-use neighborhoods, lower-density construction, and open space. A significant percentage of journeys are self-contained inside sub-regional corridors thanks to Stockholm planners' deliberate creation of jobs-housing-retail balance along rail-served axial routes, which also results in a directional balance of travel flows during peak hours. In order to provide short- to moderate-distance journeys that are well supported by railway and fast-bus services, less cross-hauling from one quadrant of the territory to another has lowered traffic demands on the region's transportation networks and ration- alized travel flows. As a consequence, public transportation modal splits are high greater than in major rail-served cities like Berlin, Germany, and London, UK), and the transportation sector's CO2 emissions per person are relatively low (lower than in Tokyo, Japan, New York, US, and Rome, Italy. The majority of people in Stockholm commute to work using public transportation, and they only sometimes utilize private vehicles for errands or extended weekends away.

Another textbook example of a successful public transportation-oriented corridor is Curitiba, Brazil, one of the world's most sustainably designed cities, but with a less expensive public transportation system than in Stockholm, namely: BRT. Curitiba has developed along well defined radial axes and lineal corridors that are heavily supported by dedicated busways by prioritizing development for people rather than vehicles. Double-articulated bus streams can transport 16,000 people per hour along certain lines, which is similar to the capacity of considerably more expensive metro rail systems. The number of people using the city's present system of 390 routes, operated by 2000 vehicles, is 2.1 million per day, which is twice the number from 15 years ago. The government of Curitiba requires that all medium- and large-scale urban development be located along a BRT line in order to guarantee a constructed form that is focused on public transportation.

The 'trinary', or three parallel roads with compatible land uses and building heights that decline with distance from the BRT corridor, is a design feature employed in Curitiba to improve accessibility and maintain balanced corridor expansion. Urban design guidelines and zoning regulations support increased ridership productivity and environmental quality. Retail uses take up the first two floors of buildings along the busway, which do not count against allowed plot ratios (building height/land area). Buildings above the second story must be set back from the property line by a minimum of 5 meters to enable sunlight to shine on the busway. Property owners are entitled to density bonuses when upper-level housing is included, which encourages the vertical mixing of uses inside buildings. Additionally, the trinary design's greater density have led to a rise in ridership. Residential journeys from areas outside BRT terminuses have also been diverted to the trinary corridors by concentrated business development. For instance, 76.4 percent of passengers boarding at the end of the north-south trinary corridor in Curitiba in 2009 were headed to a bus station along the same line. Daily ridership at stations along the north-south BRT route in Curitiba placed on the skyline of the corridor. Experience has often shown that as population densities rise, so do transit usage levels. Additionally, the trinary corridors' mixed land uses have created bidirectional flows, enabling effective utilization of the bus capacity[7].

The mobility and environmental advantages of Curitiba's coordinated development along public transportation lines over the last three decades or more are well acknowledged. Despite being an industrial city, Curitiba has Brazil's highest public transportation mode splits (at 45%), the lowest congestion-related economic losses, and the lowest rate of urban air pollution.134 Curitiba is one of Brazil's wealthiest cities on a per capita basis, but it averages significantly more public transportation trips than much-larger cities. Rio de Janeiro and So Paulo.135 In 2005, Curitiba's VKT per capita (7900) was only half as high as Brasilia, the nation's capital of Brazil, a city with a comparable population and income level but an autocentric, sprawling built form.136 Based on data from 2002, Curitiba's estimated annual congestion cost per capita of US$0.67 is much lower than So Paulo's (US$7.34). Most of the credit goes to the solid, practical connection that exists between Curitiba's mixed-use linear settlement pattern and its bus-based public transportation system.

The prosperity of Curitiba has been greatly influenced by steadfast political commitment. Over 40 years of political continuity, with forward-thinking, like-minded mayors who built on the work of their forerunners, the harmonization of transportation and land use took place. In order for the city to create a sustainable urban future, it has been essential to have a strong long-term vision and a semi-autonomous municipal planning organization to carry it out. Curitiba has just started to encounter the limitations of rubber-tire technology. Buses travel at 30-second intervals

on major routes during rush hour, which has caused bunching issues that have delayed and interrupted services. Buses and veri elephant trains have raised operation expenses and prevented the same types of scale savings that single-driver operated trains could. Many middle-class travelers have started driving as a result of extreme overcrowding. A long-discussed light-rail route to replace packed buses hasn't gained traction owing to financial considerations.Additionally, Curitiba has been under fire for giving intermodal links to BRT lanes scant shrift. For instance, just six of the 22 BRT stations in the city have dedicated bike lanes connecting them, which is less than the Transmilenio BRT in Bogotá.

Regional Setting

For millennia, cities have expanded beyond their fortifications and territorial limits. Large urban agglomerations and city clusters, on the other hand, are relatively recent developments. This development was followed by the UK new towns movement in the late 1940s, which has since been imitated in many countries, particularly in the construction of new national capitals like Canberra (Australia), Dodoma (Tanzania), and New Delhi (India), which are designed as cluster or regional cities. The modern approach to new town development began with Ebenezer Howard's concept of the "Garden City" in 1898, leading to the development of Letchworth and Welwyn Garden City. The favored planning methods traditionally used in European and American cities have been adopted by many nations, notably China. For instance, Shanghai has created detailed plans for its metropolitan area. Other Asian cities are investigating new town methods to the planning and development of their area based on clusters, including Delhi (India), Kuala Lumpur (Malaysia), and Jakarta (Indonesia). The world's largest new town, Navi Mumbai, is being planned next to the Indian city of Mumbai. Other Latin American cities, including Buenos Aires in Argentina, Rio de Janeiro in Brazil, Santiago in Chile, and Mexico City, have also adopted new town approaches to regional development based on clusters. In order to encourage cross-river expansion into new urban growth zones, the idea of city cluster development was used to the planning of Abuja (Nigeria), Brasilia (Brazil), Shanghai (China), Mumbai (India), and Hanoi (Vietnam). Growth triangles, like those in Shenzhen, Hong Kong, and Macau (China), Singapore, Jahor Baru (Malaysia), and Bintan (Indonesia), are examples of network planning concepts based on a regional agglomeration idea.

Large-scale urban layouts and connectivity: Cities of varying sizes have begun to combine more often, creating novel spatial configurations that generally take one of three main shapes: mega-regions, urban corridors, or city regions. These forms serve as nodes for the fusion and commingling of regional and international flows of people, capital, goods, and information, leading to demographic and economic growth that is faster than that of the countries in which they are located.146 Connectivity and regional transport are essential for the growth of these large agglomerations.

In certain instances, huge cities like Bangalore (India), Mexico City, or Cairo (Egypt) are combining neighboring cities and towns within their economic orbit to form vast urban configurations in which they dominate the nearby regional environment. In some instances, two or more major cities, such as Mumbai and Delhi in India, So Paulo and Rio de Janeiro in Brazil, Ibadan, Lagos (Nigeria), and Accra (Ghana), create transit corridors for commercial growth, commerce, and other reasons. The government also sometimes develops deliberate "supra-agglomerations" as part of a regional and overall development strategy. This is the situation in China, where the Guangdong Provincial Government has proposed the creation of the Pearl

River Delta mega-region, which would comprise nine major cities and have an amazing transportation infrastructure and a combined surface area of 40,000 square kilometers. Similar large urban configurations, grouped in networks of cities, amplify the benefits of economies of agglomeration, increasing efficiencies and enhanc- ing connectivity. For example, the economically large and prosperous cities of Shanghai and Guangzhou have invested in infrastructure to connect outlying towns and improve the large urban configuration147. Additionally, they provide economies of scale that are advantageous for labor markets, transportation systems, and communication infrastructure, which in turn boosts local consumer demand.

Variations in city clusters and transportation responses. The patterns of city clusters vary significantly across regions and sub-regions. Geography, climate, population size, natural resources, culture, land management, political history, infrastructure, markets, and degrees of development all play a role in explaining this. They are also characterized by economic activity and the functions of connection and transportation.

More than in any other part of the globe, urban and regional planning has a significant impact on Europe. Along important transportation corridors, where multi-modal networks integrating land, sea, and air transportation systems are used, large urban designs have been established. The Trans-European Transport Network (TEN-T) is working to enhance citizens' quality of life and strengthen the economy by promoting sustainable urban mobility and increased use of clean, energy-efficient vehicles. The regional infrastructure has played a significant role in boosting competitiveness and employment through better connectivity that allows goods and people to circulate quickly and easily for higher economic, social, and territorial cohesion.

Along important transportation corridors, expansive urban layouts have developed throughout Europe as specialized industrial and corporate hubs. However, compared to their counterparts in emerging nations, the people in these urban structures are less dense. The national capital now serves as the heart of several so-called supra-clusters of European capital cities, which are groups of cities with extensive, interconnected national transportation networks. City clusters in Eastern and Southern Europe are spreading out considerably and resembling regional city dominated clusters. Cities like Warsaw, Poland, and Moscow, Russia, have grown outward from their ancient city centers in a circular pattern. With an increasing ring road system, dispersed employment, and residential growth, Moscow has many characteristics with Beijing (China) and Dallas (US)[8].

The large investment in motorway networks and planned urban/regional growth, with scattered urban population patterns and specialized roles, is what causes city clustering in North American cities, notably in the US. Most of the cities in these sprawling urban configurations have populations of over a million, and both the urban shape and the economic structure often exhibit polycentric morphologies. The majority of cities in North America have built core business districts. However, a growing number of economic and employment-related activities are taking place outside of these regions. For instance, the Washington, DC, area has grown into the neighboring states of Virginia and Maryland to become a sizable polycentric metropolis. It consists of clusters or sub-regional global employment hubs that are close to the junction of the freeway and beltway networks. Cities like Dallas, Boston, San Francisco, Los Angeles, and Chicago are just a handful that repeat this.

The National Highway System, a 260,000 km network of vital roadways, links the nation's main ports, airports, rail and truck terminals, railroad stations, pipeline terminals, and other important transportation hubs. The system covers 4% of the country's roadways, yet it transports 90% of all tourist traffic, 75% of all heavy truck traffic, and more than 40% of highway traffic. The longest network in the world is within 8 kilometers of every metropolitan center with a population of over 50,000 people and around 90% of people in America. In the US, there is just one operational high-speed rail line, making intercity or high-speed rail networks small. The 633-kilometer Acela Express travels from Washington, D.C., to Boston via New York City. High-speed rail is less valuable than air or vehicle transport in the US due to the scattered population and huge distances between major cities. Comparatively, China, which has one of the world's highest population densities, has a high-speed rail network that already covers more than 8300 kilometers and is being expanded by another 17,000 kilometers.

Asian large urban agglomerations are less organized and more scattered. Large urban agglomerations often have densities above 15,000 people per square kilometer in newly industrialized nations, but in metropolitan regions, especially in inner-city neighborhoods, they may be twice as high. Large urban patterns, including industrial cluster growth (high technology and conventional manufacturing), and services (health, technology, and transportation), are becoming more specialized. The development of city clusters varies significantly throughout Asian sub-regions. A scattered pattern of urban city cluster growth, with industrial and commercial development migrating out of the crowded inner-city districts, has emerged in South, Central, and South-Eastern Asia as a result of a lack of essential amenities, overcrowding, and high levels of congestion and pollution. These sub-regional cities are growing significantly in size, decentralization, and specialization. Some cities, such Kuala Lumpur (Malaysia), Delhi (India), and Manila (the Philippines), have well-developed sub-metropolitan employment hubs, which include commercial centers and sizable export enterprise zones. However, there are insufficient connections and integration between the city centers' transportation networks and services. In the majority of the cities in these sub-regions, unchecked leapfrogging of urban growth and satellite city development has continued apace. Due to this, urban densities in these city clusters are fast decreasing, with some cities seeing yearly densification rate declines of over 3%.

China has followed its policy of spatial concentration of urban population and industry on the basis of the regional planning concept to utilize major cities to promote the growth of minor cities. In China's coastline region, along the Beijing-Guangzhou and Beijing-Harbin Railways, as well as the Baotou-Kunming trans- portation corridors, cities are organized along the Longhai Railway's (Lianyungang-Lanzhou) horizontal axis. There aren't many sprawling metropolitan areas in Africa. For example, the Abidjan (Côte d'Ivoire), Accra (Ghana), and Lagos (Nigeria) corridor, as well as the main arterial roadways connecting neighboring provincial capitals Johannesburg-Pretoria (South Africa) and Lagos-Ibadan (Nigeria), tend to be linear along transit corridors or coastal commercial routes.

Abidjan, Accra, Lomé, Cotonou, and Lagos are just a few of the biggest and most vibrant capital cities in Africa that are connected by the 998 km Abidjan-Lagos coastal corridor. With up to 10,000 passengers and a few thousand cars crossing borders every day, the corridor serves a population of over 35 million people and accounts for the majority of traffic in West and Central Africa.154 These corridors are poorly managed. As a consequence, infrastructure and logistics for transport as well as trans- port services are subpar. Trading, access to natural resources, and

low-level services are the main sources of employment in these regions. The usual pattern consists of low concentrations in the countryside and high densities in inner cities. Large urban agglomerations in Eastern, Middle, and Southern Africa often grow into low-density urban cluster development that is distributed across extensive peri-urban regions. Poor connectivity and underdeveloped transportation infrastructure are the effects of this.

Latin America and the Caribbean have the lowest percentage of big urban configurations worldwide while having the greatest number of urban inhabitants. The historical trend of urbanization was first monocentric. But as secondary cities have grown and communication has improved, a city cluster pattern has evolved, leading to polycentric urban expansion. A tiny number of megaregions have recently arisen, including the 43 million-person region in Brazil that extends from So Paulo to Rio de Janeiro. Although a high-speed rail is being planned to be built in the near future, the megaregion is now mostly serviced by commercial planes and the road. The physical topography of city areas like Rio de Janeiro, Santiago, Chile, and Caracas, Venezuela, causes overflow corridor growth along valleys and interprovincial routes. Numerous other big cities are expanding in a dispersed, low-density manner, with nearby housing and industrial growth.

CONCLUSION

In conclusion, urban densities play a crucial role in urban planning and design and have an impact on how people are distributed across cities' built environments. They are influenced by several things such previous growth patterns, land availability, planning regulations, transit infrastructure, and socio-cultural choices. Urban densities have a big impact on urban sustainability, with greater densities potentially providing advantages including effective land use, less sprawl, and improved accessibility and walkability. But managing urban density necessitates carefully taking into account possible problems like crowding, traffic jams, and restricted access to open areas.

Understanding and regulating urban density becomes more important as cities expand and confront greater issues linked to social equality, climate change, and population expansion. To balance the advantages and difficulties of urban density, creative solutions, community involvement, and multidisciplinary cooperation are required. To construct sustainable, inclusive, and resilient cities, urban planners, legislators, and designers must take into account context-specific methods such compact urban forms, mixed-use projects, efficient transportation systems, and fair access to amenities and services.

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CHAPTER 13

IMPACTS OF TRANSPORTATION INVESTMENTS ON URBAN FORM

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ABSTRACT:

The impacts of transportation investments on urban form are a critical aspect of urban planning and design. This abstract provides an overview of the relationship between transportation investments and urban form, including the key concepts, challenges, and implications of such investments. Transportation investments, such as the construction of new roads, highways, public transit systems, or active transportation infrastructure, can significantly shape the spatial distribution of population and built environment in cities. These investments influence urban form, which encompasses the physical layout, design, and configuration of cities, including land use patterns, building densities, transportation networks, and public spaces. The impacts of transportation investments on urban form are complex and multifaceted. They can have both positive and negative effects on the physical, social, economic, and environmental aspects of cities. For instance, new transportation infrastructure can enable greater mobility, accessibility, and connectivity, facilitating economic development, improving access to jobs, services, and amenities, and promoting social inclusion. On the other hand, transportation investments can also contribute to sprawl, congestion, air pollution, and social inequity if not carefully planned and managed.

KEYWORDS:

Accessibility, Automobile dependency, Bicycling infrastructure, Commuting patterns, Equity.

INTRODUCTION

Transportation investments influence urban form, just as they do for land use and urban form. The locations, intensities, and kinds of development as well as the land value are impacted by the introduction of a new road or public transportation route. Following expenditures in transportation infrastructure, changes in urban form and land use are driven by accessibility changes rather than actual physical infrastructure. If desired land-use results are to occur, infrastructure hardware and associated policy software must be matched. Supportive policies might include permissive zoning that permits densification close to metro-rail stations or comprehensive development of sewerage/water-supply trunk line capabilities to support additional growth.The section examines how investments in public transportation have affected urban form. Motorways and their effects on urban development are then discussed. According to collective experiences, transportation is a required but far from sufficient prerequisite for changes in land use[1].

Effects of expenditures in public transportation. Urban rail systems like metros and light rail have the ability to reshape cities, according to history.155 They often define the axes and spines of urban expansion, resulting in increased concentrations of enterprises, offices, and industries

along rail-served corridors. The economic supremacy of core city sites is strengthened by investments in rail-based public transportation that are matched by regular, high-quality services. Decentralization and sub-centring are also encouraged.

CBD's separation from CBD

depend on the degree to which new development is leveraged and the effect of onerous rules on growth is minimized. Regional governing systems help coordinate TOD in cities like Toronto (Canada), Portland (US), and Munich (Germany) via a combination of legislation and incentive-based policies (e.g., helping with land assembly and financing construction expenses in redevelopment areas). Significant portions of new projects have been drawn to station locations in these cities by the new train lines. Large, congested cities see the greatest geographic effects of public transportation expenditures in rail-based services. Although the majority of empirical data comes from wealthy nations, theory predicts that new rail investments in emerging nations may have greater city-shaping effects. This is a result of the high levels of congestion (and the resulting pent-up demand for placing new construction in accessibility-enhanced areas), fast rates of population increase and motorization, and growing disposable incomes. However, poor institutions for regional-scale planning and a preference for short-term project spending over long-term strategic planning are obstacles to effective integration of land use and public transportation in developing nation cities. Because they provide accessibility to remote areas, rail-based public transportation expenditures often wind up being a bigger push for decentralization than concentration.

\A new public transportation route may channel expansion in a certain direction, although it is likely that this direction will be outward in most cases.160 Investments in metro-rail systems in Mexico City, Santiago, and other Latin American cities have also contributed to the separation of households by income and class, pushing the urban poor out into the suburbs while modernizing and opening up the inner city to more affluent groups of the population.161 Critics claim that these inequitable effects are a result of transportation spending that favor the mobility needs of wealthy people. Lack of compensating programs, such as mandates for affordable housing, to limit such displacements, further exacerbates the issue.162 Such unforeseen effects may be reduced with a more well-balanced portfolio of transportation upgrades that guarantees benefits flow to all socioeconomic groups. Bogota's proactive expenditures in top-notch BRT and bikeway networks over the last ten years are partially explained by the aim to better meet the transportation demands of the underprivileged[2].

According to experiences from throughout the world, a number of preconditions must be met before urban public transportation expenditures may result in a sustainable urban form. Several empirical studies on the effects of high-capacity public transportation systems on urban form in both developed and developing nations are summarized and some of them are based on them. If decentralized development is to take the shape of sub-centers, proactive planning is required. The level of public support for regionally-scaled strategic station-area planning determines whether decentralized development adopts a multi-centered shape. Experiences from places like Toronto (Canada), Stockholm (Sweden), Munich (Germany), Hong Kong (China), and Singapore demonstrate how taking a proactive stance to take use of rail services may result in more concentrated kinds of decentralized development. Given the obligations of public resources, trains and bus routes not only enhance the core but also result in many sub-centres.

Under the correct circumstances, railways and busways may encourage core city regeneration. As seen in major cities like Tokyo (Japan), Hong Kong (China), London (UK), the San Francisco Bay Area, and metropolitan Washington (US), public transportation can help attract private capital and give struggling areas new life when government agencies are willing to absorb some of the risks involved in redeveloping economically stagnant neighborhoods.

Public transport expenditures must be made in conjunction with other pro-development policies. Experience has shown us that encouraging policies and public initiatives are also necessary to boost land development, in addition to financial incentives. A hospice physical setting (in terms of aesthetics, ease of pedestrian circulation, and a positive neighborhood image); complementary public improvements (e.g. upgrading sidewalks, expanding water and sanitat; permissive and incentive zoning (e.g. density bonuses); the availability of nearby vacant or easily-assembled and developable parcels; support for land-use changes among local residents; and NIMBY forces. Incentives for using public transportation and "equalizers" (disincentives) for private vehicles encourage land-use changes in station areas. To draw private capital to station regions, regular, dependable rail and feeder bus links are required. Railways won't be time-competitive with the private automobile until that point. Such pro-public transportation policies often need to be coupled with 'equalizer' policiesa that eliminate many of the ingrained inducements to drive, such the provision of cheap, abundant parking. In Singapore, Stockholm (Sweden), and London (UK), congestion pricing partially explains why train services are highly used and not unconnected, as well as why new land development is taking place near rail stations in these cities. Experiences in Singapore, Copenhagen (Denmark), Stockholm, and Ottawa (Canada) imply that the combination of TOD with transportation demand management might be particularly effective, producing synergistic advantages[3].

Network effects are crucial. Fixed-guideway public transportation systems must imitate the geographic coverage and regional accessibility of their main rivals, limited-access freeways and highways, in order to cause significant land-use changes. Examples of such systems are railroads and BRT systems with exclusive rights of way. The geographical reach of backbone systems is increased through effective intermodal links between high-capacity public transportation networks and secondary systems, such as feeder bus and paratransit systems. These network effects, whereby trains service proportions of origin-destination combinations that are equivalent to highway and motorway networks, are largely responsible for the powerful city-shaping impacts of metros in Paris, London, and Tokyo. A new railway or BRT line's addition results in spillovers and synergies that benefit both the newly serviced corridors and the old ones. Newly opened lines enhance the number of regional origin-destination combinations that may be serviced on existing metro lines.

DISCUSSION

Public transport and land price appreciation: Rail networks' accessibility advantages are reflected in land values. Increased prices for plots with rail access put pressure on the market to accelerate land development. A survey of 150 rail projects in the US, UK, and Europe found that public transport services generated positive effects on residential as well as commercial properties, though the magnitude of impacts varied significantly.165 When rail investments are carefully coordinated with land development through planning, land-value premiums of commercial parcels within walking distance of metro-rail stations can sometimes be as high as 100% in the downtowns of some large cities. Within walking distance of its stations, Portland's east and west

light rail lines generated over US$2.4 billion in investment166. The city's new streetcar route through the Pearl District's mixed residential and commercial district sparked US$2.3 billion in private investments. According to estimates, Portland's public transportation spending leveraged US$31 in private investments for every dollar spent.

Bus-based public transportation and changes to urban design. According to conventional thinking, traditional bus services have little impact on how cities look and how land is used since, unlike many train systems, they do not significantly improve accessibility. This is particularly true in industrialized nations, where the prevalence of private automobile ownership means that for the great majority of journeys, traditional buses are much slower than vehicles. The capacity to vary bus service levels and routes, as well as the stigma associated with bus riders' low economic status, most likely mitigate the negative effects of traditional bus services on land development. BRT is an exception, however, since it gives buses access to a dedicated, exclusive lane, greatly enhancing the level of service. It is not public transportation "hardware," such as steel-wheel trains or rubber-tire buses, that unleashes land-use changes; rather, it is the quality of service and, more specifically, the comparative travel-time savings of taking public transportation compared to the private vehicle. BRT investments in Ottawa (Canada), Pittsburgh (US), Brisbane (Australia), and Curitiba (Brazil), for example, generated land-use benefits that were as large as those that would have been created by railway investments.

Similar to rail, BRT investments have led to land intensification, and real estate markets have reacted. In Bogotá (Colombia), Seoul (Republic of Korea), Brisbane (Australia), and Los Angeles (US), significant land price increases have also been observed close to BRT stops.171 One study found that multi-family housing units in close proximity to Bogotá's TransMilenio BRT were rented for noticeably more per square meter than those units located farther away.172 Pedestrian-friendly environments close to TransMilenio stops further increased land-value benefits. Bogota uses value capture to fund urban infrastructure through a program called Plusvalia, but implementation issues, such as high revenue collection costs and accusations of assessment biases and institutional corruption, have undermined the program.175 More successful has been Ahmedabad's program of enforcing surcharges from landholders in exchange for the right to increase their building densities by up to 30% along the 89-kilometer Janmarg BRT system in Ahmedabad. Some of the funds are used to develop affordable housing, especially for low-income families who have been displaced by the extension of the BRT. Additionally, by building parallel bike lanes alongside the Janmarg BRT, system designers and locals are fostering the idea of "complete streets" and multimodal corridors[4].

Effects of Highways

Since access is practically universal in a car-based economy, activities tend to be scattered and divided, and highways often have a bigger effect on urban design than public transportation lines177. US cities like Los Angeles and Phoenix are examples of how roads cause sprawl. Similar to a rail system, shopping malls and other big standalone retail establishments that tend to cluster and aggregate tend to be located at motorway intersections. Additionally, consequences are often context-specific and are influenced by local real estate market needs as well as how liberal local land-use regulations are. The institutional ability to supplement roads with other supporting infrastructure to handle increasing expansion and the capability to temper possible neighborhood resistance to neighboring infrastructure projects are further effects.

The effects of new roadways may differ greatly around the globe. Road investments encourage fresh economic development in less developed nations by providing access to new markets and enlarging trade hubs. In contrast, developed nations are more likely to have consequences that are mostly redistributive, which shifts development that would otherwise take place in certain areas to newly serviced highway areas. This is mostly because accessibility levels are often already so high in industrialized environments that any economic effects of a new roadway are typically minimal.

Access to Urban Mobility on a Fair Basis

A social and economic need is mobility. The accessibility of transportation alternatives and the manner in which they are provided may pose significant obstacles to the mobility of many city dwellers in the modern day. If the services offered are prohibitively expensive or physically impossible to reach, investments in urban transportation infrastructure do nothing to ease the mobility issues of the urban poor or other vulnerable and disadvantaged groups. Such obstacles exacerbate socio-spatial inequalities in metropolitan settings, including prejudice towards weaker and less advantaged groups. These obstacles are not only financial or technological in character; they also result from institutional, political, and social considerations that impede the development of socially viable urban transportation networks. As a result, this concentrates on features of urban mobility that are related to granting affordable access to opportunities, reducing social exclusion, and enhancing the quality of life for everyone[5].

In order to more clearly describe the effects of transportation expenditures, transportation policy has recently started to concentrate more on new assessment and evaluation regimes. While transportation projects are subject to environmental and economic impact assessments, the application of social impact assessments is still in its infancy. By incorporating social dimensions throughout the lifecycle of transportation projects, the potential for life-changing benefits to the end users is increased while the risk of unfavorable social outcomes is decreased. Travelers are subject to traffic-related disputes and accidents, congestion, and the expenses of motorized transport as metropolitan mobility systems grow more and more motorized, which penalizes individuals who cannot afford a vehicle. Without an effective public transportation system, travelers must make difficult decisions regarding shelter security, travel time, and mode of transportation. In addition, non-motorized road users, primarily cyclists and pedestrians, are frequently forgotten when designing and modernizing transportation infrastructure, especially in developing nations.

Urban mobility systems' major goals are to provide people access to necessities like job, education, health care, shopping, and socializing, as well as to make it possible for them to take part in civic life. Since women and children "often bear the greatest burden of poverty," the Habitat Agenda explicitly calls for full accessibility to work, goods, and services as well as to affordable public transportation, including for those who belong to vulnerable and disadvantaged groups. However, in practice, not everyone has equal access to urban opportunities. The distribution of effects (benefits, disadvantages, and costs) might be deemed "unfair," in which case this turns into a social equity issue. Unequal access in se is not necessarily a problem. Considerations of equality in urban mobility systems usually examine differences in income and cost of travel, as well as differences in access to metropolitan possibilities. In light of these difficulties, promoting equal opportunities in life requires meeting the mobility needs of all societal groups. In the end, limitations on access to urban opportunities may indicate a violation

of human rights, particularly economic, social, and cultural rights (such as the rights to free choice of employment, public health, medical care, social security and social services, right to education and training, and t[6]

What do we mean by socially sustainable urban mobility in light of this intimidating information? As there are several interpretations and implementations of "social sustainability," some cities choose to use a broad definition that downplays the intricacy of the idea. In order to produce meaningful results, metrics must be tailored to reflect specific socio-cultural characteristics of contexts and locations, which hinders the adoption of any one common measure-ment. It is also difficult at best to translate the complex subjective, qualitative, and political dimensions of social sustainability into easy-to-measure quantitative indicators. However, it is crucial to take into account the aspects of social sustainability when assessing different mobility options since these social implications have an impact on people's behavior, which is ultimately what determines whether an urban transportation system succeeds or fails.

It will be difficult to meet the mobility demands of expanding urban populations in a way that is socially inclusive and equitable. The diversity of urban people and the geographic dispersion of social and economic activity provide the greatest difficulty. The best method to address the mobility demands of the underprivileged and vulnerable groups is to have a sufficient public transportation system and the right infrastructure for non-motorized modes of transportation. New technology, better urban planning, and infrastructural improvements are also required. The free and secure movement of people and products, as well as ensuring equal access to services, should be prioritized[7].

This describes worldwide patterns, circumstances, and problems relating to equal access to urban transportation. It examines existing and proposed policy options as well as practices that might improve social sustainability and address social justice in urban transportation networks. A crucial component of equal access is cost, which is covered in the first section. It points out that low-income families are disproportionately impacted by transportation costs. The second portion talks about how disadvantaged populations may use urban transportation networks. This gives the required context for comprehending and adjusting to the varying mobility requirements of distinct demographic groupings.

The third portion investigates concerns about security and safety in urban transportation networks. It makes a distinction between issues with transport security privacy and a lack of anxiety and issues with transport safety accidents and damages. Concluding remarks and lessons for policy are provided in the last part.

Decent Urban Mobility

Urban public transportation must be affordable to the majority of the urban population, especially for those who have no alternative means of transportation to access essential commodities, services, and activities, in order for urban mobility systems to be socially viable. This important equality goal may ease burdens and provide possibilities for those who are weaker or less advantaged, in particular. This part examines the difficulties and effects connected to equal access and the cost of public transportation based on the discussion in prior sections. It also looks at legislative measures intended to advance reasonably priced transportation. In order to successfully reform urban mobility culture, it concludes by outlining effective techniques and policies from throughout the globe[8], [9].

CONCLUSION

The link between transportation networks, mobility, and cities is undergoing a paradigm change. The removal of elevated freeways, the construction of high-rise downtown towers connected by extensive pedestrian infrastructure, and transit-oriented corridors are just a few examples of public policy changes that recognize that connecting people and places is the primary goal and that travel is a "derived demand." Transportation policies may be implemented to increase mobility while preventing (or at least lowering) negative externalities and fostering community stability and cohesiveness as long as it is understood that transportation is a means to a goal rather than an objective in and of itself. The dominant transportation system in use throughout the time of a region's prevalent expansion is mostly responsible for the formation of urban form. Cities like Toronto (Canada) and Curitiba (Brazil) that saw fast urban growth with the construction of high-capacity public transportation networks feature high-density and linear architectural forms. Those that sprang up alongside the construction of freeways, such in Phoenix and Houston (US), feature low-density, autocentric layouts. Unprecedented prospects for integrating land development and transportation infrastructure will present themselves as cities grow and flourish in emerging nations. In industrialized nations, motorization levels are stable, but elsewhere, they are rising quickly.

A bus-based type of smaller scale TOD interwoven by high-quality infrastructure for walkers and bikes may be acceptable in many urban contexts, given that the great majority of expected future urban expansion will occur in places with a present population of fewer than 500,000 people. Cities that implement rail and BRT systems will inevitably result in significant land-use changes, including fast population growth and growing real wages. Naturally, this is predicated on supportive planning and zoning, public sector leveraging and risk sharing, a commitment to travel-demand management to eliminate many built-in incentives to drive, and the ability to manage the changes in land use that are triggered by investments in transportation infrastructure. There are indications that cities are evolving toward more compact shapes in several places of the globe. Worldwide, there is a growing understanding in various developing-country cities that integrated transport and land-use planning is essential for future economic success, more equitable development, and environmentally sustainable solutions. Numerous cities have unveiled development plans that place an emphasis on urban designs that shorten trips, create complete streets, encourage mixed-use developments, and make cities more liveable. Global experiences show that a strong regional vision is very helpful in ensuring that transportation expenditures result in the intended urban shape. Visions need visionaries, like Jaime Lerner from Curitiba, Enrique Pealosa from Bogotá, and Myong-Bak Lee from Seoul. Visions may alter as reality materialize because they are changeable. Breaking away from ingrained practices may be challenging and time-consuming in cities since they often rely on certain paths for their spatial growth. In the past, roads were constructed to accommodate urban sprawl, which calls for the building of more motorways. It might be challenging to disrupt the cycle of road building and urban expansion feeding off of one another. Therefore, it is much more important for continuous leadership to strive toward a shared urban-form vision.

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CHAPTER 14

CHALLENGES AND IMPACTS OF URBAN POVERTY

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ABSTRACT:

Urban poverty is a complex and multifaceted challenge that affects millions of people worldwide. This abstract provides an overview of the challenges and impacts of urban poverty, including the socio-economic, environmental, and health consequences of living in poverty in urban areas. Urban poverty refers to the condition of individuals or households living in cities who lack the necessary resources, including income, education, health care, and social support, to meet their basic needs and participate fully in urban life. The challenges of urban poverty are diverse and include inadequate access to affordable housing, clean water, sanitation, education, health care, employment opportunities, and social services. Urban poverty is often compounded by issues such as discrimination, inequality, social exclusion, and environmental degradation, which further exacerbate the challenges faced by urban poor communities.

KEYWORDS:

Affordable Housing, Crime, Discrimination, Education, Food insecurity, Income Inequality.

INTRODUCTION

To gauge the severity of urban public transportation users' mobility issues, it is necessary to comprehend their travel habits. The concept of mobility suggests a balance between individual skills and accessibility (i.e., the availability of public transportation and other modes of transportation), as well as the user's acceptance of the mobility system (i.e., their experiences, routines, perceptions, and values related to travel mode and space). Because it creates the conditions for potential motion, access is thus the most significant aspect of motility. Through the removal of obstacles caused by the accessibility, availability, acceptability, and cost of the urban mobility system, improved transport links may aid in the fight against social exclusion. In these situations, the creation of mobility systems requires input from and engagement from all stakeholders throughout the planning process[1].

According to international studies on the connections between transportation and poverty, the poor are becoming more and more concentrated on the outskirts of metropolitan centers. They travel further than many groups that are better affluent as a consequence, which increases the demand for inexpensive transportation. This suggests that social exclusion and poverty, both at the individual and societal levels, are made worse when (transportation) disparities prevail. In this instance, poverty is understood to be the absence of the financial means to satisfy one's fundamental material requirements or those of the family, while social exclusion is the presence of obstacles that prevent individuals from fully participating in society. Income levels influence

the mobility mode selection. There aren't many options that are reasonably priced for those on modest incomes. As a consequence, only a tiny share of journeys are made using motorized vehicles in many developing nations. Long walking distances are common, which suggests inadequate accessibility and a lack of accessible, inexpensive transportation choices. Therefore, it is crucial that any public transportation strategy take pedestrians into consideration. Eighty percent of all commuter journeys in Tianjin, China, use non-motorized transportation, mostly bicycles. Cycling provides a cheap way to increase accessibility for everyone. Bicycle usage as a form of transportation is rising gradually in certain European nations, both as a primary mode and as a secondary or feeder mode.However, owing to harmful societal representations equating bicycle usage with poverty, it is often overlooked in terms of design and safety throughout Africa and Latin America.

Car ownership is still a luxury reserved for a tiny (but quickly expanding) minority in emerging nations. Vehicle ownership rates may be as low as three automobiles per 1000 people in various African and Asian nations. Therefore, families with limited resources rely only on official or informal public transportation for motorized journeys, putting them at risk from rising transportation expenses. Dependence on private motorized transportation tends to raise per capita transportation expenses and lower the affordability of transportation in many industrialized nations. There is little incentive for automobile owners to switch to greener modes of transportation since driving is so much cheaper because the majority of road infrastructure is subsidized. However, car-dependent urban expansion and urban sprawl persist everywhere, which may compromise accessibility for disadvantaged and vulnerable populations including the elderly and children.

The poor and other minorities are less likely to own vehicles and more likely to use public transportation, according to socioeconomic inequalities in travel habits in many industrialized nations (such as the UK and the US). The provision of affordable and easy "last-mile connectivity" that is, from the point where the journey ends to the point where one may access public transportation systemsremains a key subject of concern from Delhi to Shanghai and from Brussels to New York. Poor walking and cycling conditions exacerbate the issue for those who utilize public transportation, especially the elderly and crippled. The tendency toward fixed-route bus services is prevalent in bigger cities, which sometimes means that routes grow more complicated, frequently including interchanges and protracted waiting and walking periods. Evidence shows that the poor are more affected by public transportation issues in metropolitan settings than are other groups. However, when one considers the absence of tariff integration across lines, private informal operators sometimes charge greater rates than do government owned ones. While a passenger using a public transportation system may sometimes pay a fixed cost for a journey made up of many separate legs, such fare integration is uncommon among providers of unofficial transportation. As a result, the impoverished are pressured to carefully consider their spending and mobility requirements.

The cost of transportation is quite high compared to family earnings for many metropolitan residents. Between 8 and 16 percent of family income is spent on transportation in cities in developing nations. This jumps to almost 25% among the poorest families in big cities. Because commuters in low-income communities mainly rely on public transportation for transportation requirements, the amount and quality of transportation services are often poorer for residents in these areas. People are left with no choice except to put up with a failing service. Poor people everywhere have an unfair financial barrier while trying to access career possibilities. According

to US data, low-income workers spend over twice as much of their money (6.1 percent against 3.8 percent) getting to work than non-poor people do [2].

A key component of the social isolation that characterizes urban poor is restricted mobility.24 As was said above, impoverished families cannot obtain essential commodities, services, and activities without efficient transportation infrastructure. It is crucial to take into account the flow of social capital, which is aided by trans- port networks and takes the shape of knowledge, news, or employment prospects. Manufacturing is time and energy consuming for the poor because they lack resources and technology. This is true for both home and market-oriented manufacturing. Women do the majority of the labor that is time-consuming and poor in productivity. Their "time poverty" may be greatly lessened by concentrating greater investment on the infrastructure and services utilized by and suited to women. The creation of jobs in the transport service sector and in transportation infrastructure projects are two further direct effects on poverty that the trans-port sector may contribute to. Infrastructure may be delivered in a manner that makes the most use of local labor and resources. Similar to this, local transportation services have the potential to provide jobs for drivers and other service providers. However, better service planning and infrastructure planning are resources that, when combined, may either benefit or hurt urban people' quality of life[3].

Eviction and relocation as a direct outcome of urban transportation infrastructure developments is a significant example. These projects often cause disruption to people's lives and way of life, and they may even create physical barriers that split communities apart. Streets that originally served as meeting spots for people and play areas for kids are now reserved only for automobiles. Additionally, air pollution and noise pollution significantly degrade the local environment's quality. Furthermore, without stable housing, the poorest people run the danger of being uprooted by gentrification. High-income private car users often stand to gain the most from the limited emphasis on relieving congestion. To benefit a larger population, more considerate and comprehensive solutions are thus required.

Urban mobility assessments that take into account social concerns in-depth and methodically increase the likelihood of successful results while minimizing or mitigating risks and unfavorable effects of transportation infrastructure investments. Regrettably, assessments of transportation projects and planning often leave out the urban poor. However, developing strong bonds with stakeholders and paying attention to their issues has the potential to lead to considerable advantages for the project and the organizations involved. In conclusion, city design, socioeconomic features, transportation facilities, and the availability of services all limit the access and mobility of the urban poor. The following section outlines some general ways that policy can be refocused to provide special assistance to the poorest groups, whether directly by focusing on the needs of particular social groups or indirectly by supporting the transportation systems that are known to be particularly important to the urban poor.

DISCUSSION

Policy responses and innovative practices: The ambitious policy responses that have been put out in recent years to deal with the issues mentioned above are highlighted in this section. Actions that promote non-motorized mobility, lower the price of transportation services, and boost transportation affordability via enhanced land accessibility are all necessary to meet the goals of transportation affordability[4].

Supporting non-motorized Transportation

By encouraging walking and cycling, transportation policy initiatives may lower vehicle use rates.29 These transportation options are beneficial for short excursions, which account for the majority of travel in metropolitan areas and are generally inexpensive.30 A policy package that includes investments in infrastructure, enhanced transit networks, public awareness initiatives, and penalties for the use of private motorized cars may encourage non-motorized transportation. The necessity to create street networks and pedestrian surroundings that encourage neighborly interactions and, therefore, the growth of social capital, is widely acknowledged in modern cities.

Several notable transportation innovations provide instructive lessons. Both Copenhagen and Amsterdam in the Netherlands have high rates of bicycle usage and relatively low rates of traffic-related fatalities.32 Decades of investment in non-motorized transport infrastructure allowed for the high modal shares. This entails adopting comprehensive pedestrian and bicycle design standards whenever practical, making extensive enhancements to pedestrian and bicycle facilities, and creating infrastructure for intermodal connection. As shown in Shanghai (China) and Curitiba (Brazil), many other cities have abandoned car-centric urban paradigms and fully embraced pedestrianization of their central business centers. This has resulted in financial savings and advantages, which are reflected in rising land prices. Using both public transportation and cycling together may provide very economical travel. The free public bicycle rental program called vélib in Paris, France, is a prime example. China's Hangzhou and Mexico. In order to promote cycling while keeping costs to taxpayers and program participants to a low, the city has also developed bicycle rental programs. These policies place non-motorized transportation infrastructure as crucial feeder networks for BRT ridership, as seen in Delhi (India), Guangzhou (China), Jakarta (Indonesia), and Dar es Salaam (Tanzania), among other citie[5].

It is crucial to think about bicycle designs that would satisfy both commuters' demands and environmental criteria.38 Recently, the Institute for Transportation and Development Policy (ITDP) was successful in getting an upgraded cycle rickshaw from India used commercially. Reduced weight and improved comfort have enabled rickshaw drivers to raise their pay by 20–50%. However, rickshaws have been prohibited from main highways in Dhaka in an effort to lessen traffic congestion, despite the fact that they are essential for the livelihood of many owner-drivers. Such policies may have detrimental effects on vulnerable and disadvantaged individuals, such as limited mobility and job loss. In contrast, there were over 200,000 boda bodas (bicycle-taxis) in Uganda as of 2000, which employ a significant portion of the country's formerly jobless young. As a result, both in Kenya and Uganda, the usage of motorcycle taxis has significantly increased.

In addition to spreading new information, training is a crucial strategic tool for developing capacity and raising awareness of the demands of non-motorized transport users. Through the promotion of microcredit programs and the provision of cycling instruction, the private sector might be a significant partner in supply-side interventions to promote bicycle ownership and usage. Women in Pudukkottai, India, received loans in the 1990s to buy bicycles and received riding instruction so they could enroll in a literacy program. The initiative also gave the women job chances when they completed their bicycle repair training. Five years later, women are now accepted in society when they ride bicycles, and they use them to go to school, gather water, and travel to the hospital in an emergency. Strong non-motorized transport policy, awareness

campaigns, and political commitment may change the public's perception of non-motorized transport and improve social inclusion, as shown by the case of Bogotá, Colombia. The Transmileno system has to be improved more before it can live up to its promises, albeit there is still much work to be done. Many groups of individuals are left out of the existing 84-kilometre system simply because it is not yet operational in their communities, which is one of the main criticisms. Because of this, a large portion of Bogota's population still uses the conventional bus system, which effectively competes with Transmileno

Due to their high population density, most cities in developing nations are ideal for policies that support non-motorized transportation. The management of travel demand is crucial in this situation. Through the regulating and pricing of various means of transportation, these urban policies have an impact on the demand for travel. Along with increasing the quality of affordable transportation options, one significant advantage of travel demand management measures has been raising the accessibility of public transit for low-income populations. In the UK, the focus has shifted from constructing roads to implementing demand-management programs. With the ability to transform traffic lanes into bicycle lanes thanks to its con- gestion pricing plan, London has gradually witnessed a modal shift. The efficiency and dependability of bus services have significantly increased since automated bus lane enforcement was implemented. In general, customers may save money by avoiding crowded roadways by using other means of transportation, routes, or times of day[6].

Enhancing the accessibility and effectiveness of public transportation. The cost of public transportation should be determined such that commuters may utilize it. Fares are often set above the levels of equilibrium competition in underdeveloped nations. This encourages frequent bus admission, which is made worse by the regulator's capture. Price competition is not a useful technique for controlling the ideal number of buses in the market since buses are not ideal substitutes. Even when a more affordable bus could arrive in a few minutes, most passengers choose to utilize the first bus that comes in order to reduce waiting time. The most crucial factor for the rider seems to be time, not costs. This makes the bus company's ability to increase prices more straightforward.

Notably, care should be taken to make sure the ticket (plus subsidies) covers the cost of operating while keeping it accessible to the general population. This is crucial because arbitrarily low prices established without compensating service providers might make a trans- port system unprofitable. For instance, in Lomé (Togo), the bus ticket required to cover operational expenses was 295 CFA Francs. However, the tickets were 250 CFA Francs, which were then cut by the government to 200 CFA Francs, leading to a 22 million operating loss. Thus, a careful balance must be established between the operator's need to balance its budgets or to earn a profit, in the case of private-sector operators, and the convenience and willingness to pay of the customer.

A strong framework that defines and measures transportation affordability effectively is necessary for the development of inexpensive transportation. Traditional planning often takes into account a very narrow range of goals and implications related to transportation affordability. The World Bank has created an affordability index to meet the demand for publicly accessible and comprehensive, comparative information on affordability of public transportation fares throughout the world in order to solve this restriction. The fares paid for a total of 60 10-kilometer journeys per month expressed as a proportion of income may be used to establish the

index values. It may be calculated for different income brackets, and the findings can be used to assess how reasonable, expensive, or burdensome the percentage of income spent on fares is[7].

Due to the vast differences in context amongst the cities, the statistics in demonstrate this. Since transportation costs would take up more than half of their wages, low-income inhabitants of So Paulo, Rio de Janeiro, and Brasilia (Brazil) are all confronted with intolerable conditions. As a result of affordable public transportation (Bangkok) and the lack of acute poverty in the lowest quintile (Cairo), cities like Bangkok and Cairo, in contrast, have cheap fares. Despite this development, the index is still constrained by the indicators' oversimplification and the dubious stature of accessible data. As a result, a more accurate analysis is required.

Transport subsidies are a crucial policy choice to provide equal access to transportation for the underprivileged and other road users. Such subsidies, however, are crude tools that need careful planning to be both socially and economically acceptable. Poorly targeted subsidies might lead to the affluent receiving an unfair advantage over the poor. A plan including suitably targeted subsidies by route or via employer-based programs is more effective. In Brazilian cities, since 1987, the Vale-Transporte or "transportation vouchers" system has required companies to reimburse their workers' transportation expenditures if these costs surpass 6% of their income. This concept suggests that the employer directly tops up the electronic transport permits of their workers or purchases public transportation vouchers on their behalf (i.e., without contacting the government). As an alternative, employers may provide for worker transportation. The majority of the poor and low-income people in cities, which makes up more than 50% of the workforce, are not covered by the system since it only applies to those working in the official sector[8].

An example of a project that helps the poor out of poverty is Kazakhstan's overhaul of the metropolitan public transportation system. Before the reform, the public transportation system was characterized by poor services, congested conditions, and protracted wait times. To deregulate and liberalize the supply of trans-port services and enhance the service's quality, a transport intervention was started.56 As a result of the fare cut, transportation became more affordable for users. For the convenience of users, several cities and regions are updating their fee payment technology and unifying fare systems amongst various public transportation routes, modes, and even operators.

Due to the streamlined pricing structure and simplicity of transfer, the 'Oyster' smartcard ticketing system in London, UK, has improved bus usage. Additionally, it has increased service coordination and provided commuters with information on the variety of completely integrated pricing options. Another encouraging trend is seen in Seoul, Republic of Korea, where the use of "smart cards" makes it possible for commuters to switch from one means of transportation to another at a reduced price. An accommodating institutional setting aids in the development of unified and integrated tariff systems, which improves ticketing efficiency. The German Verkehrsverbund transport federationsserves as an excellent example.

Affordable housing via urban design and land usage

By addressing the physical segregation of activities, enhancing land-use accessibility, and finding ways to shorten distances, one may boost the affordability of urban transportation. The goal is to include sustainable mobility into patterns of urban form and layouts while also making public transportation, walking, and bicycling feasible and inexpensive. Urban dwellers may now access the services and facilities they need by walking, cycling, and using public transportation

because to accessibility planning. The institutional arrangements presented were developed in Atlanta, Georgia, USA, and enable for the coordination of investments in transportation and land-use infrastructure, which may increase accessibility and affordability, especially for racial and ethnic minorities.

Integrating land use and travel-demand management strategies may significantly increase accessibility and result in more affordable public transportation. A prime example is Curitiba, Brazil, which has spent the last 40 years methodically combining urbanization and transportation upgrades.61 Curitiba has developed along five well defined linear corridors that safeguard the city center, replacing automobiles with people. Zoning regulations support high-density commercial growth along major transportation routes, which minimizes the distance traveled to obtain essential products, services, and activities. People are swiftly and effectively transported from residential areas to express bus routes using minibuses. Curitiba consumes 30% less gasoline per capita than other comparable-sized Brazilian cities, and reasonable prices enable the typical low-income household to spend just 10% of their income on transportation, which is a low proportion in Brazil.

A key component of land-use planning is gaining public support for public transportation and affordable housing close to major job centers. Singapore has effectively built new towns that are self-sufficient in terms of employment and is methodically addressing the housing requirements of the underprivileged. The regional centers are designed as commercial hubs encircled by high-density housing and connected to an effective public transportation system. A good strategy to cut down on low-income families' transportation costs is to increase the diversity of services in the area. The Singapore example, meanwhile, could not be easily transferable to cities with low-density suburbs and urban sprawl. It makes sound financial sense to connect housing policy with urban transportation networks. Housing and transportation costs together often account for half or more of family consumption costs. Less money spent on transportation means more money available for housing expenses. The successful car-sharing programs in Europe are in part based on this principle. US inhabitants are encouraged to dwell in high-density, highly accessible places that lessen their need for vehicles via location-efficient mortgage rules. They enable a family to utilize the money they save from not having a vehicle to purchase a more costly property in a neighborhood known for location efficiency[9].

Vulnerable and Disadvantaged Groups and Urban Mobility

Women, ethnic minorities, the elderly, people with disabilities, young people, children, and other vulnerable and disadvantaged groups stand to gain significant social benefits from improved urban mobility networks, technologies, and facilities as improved access and mobility reduce dependency, vulnerability, and isolation. If these groups are to get the advantages, mobility networks must address their unique demands. Even with efficient public transportation networks, some users may not be able to purchase the provided services. Additionally, insufficient security may make it difficult for certain people to travel alone, or many elderly and handicapped people may find it physically impossible to use the public transportation system. Since these groups are often overrepresented among pedestrians, it is important to take into account their unique requirements. For instance, elderly and handicapped people sometimes struggle to cross busy streets or maneuver around other people.The factors influencing the travel habits of disadvantaged and vulnerable populations are described in this section. It describes the general circumstances, patterns, difficulties, and effects that various urban population groupings deal

with. It also takes into account how much urban mobility strategies take into account or clash with the various activity requirements of such passenger groups.

Global Circumstances, Trends and Difficulties

Societies all across the world are gendered, with men and women often playing separate roles. Women often commute differently from males in industrialized nations, especially if they are married with kids. Additionally, they are more prone to "trip-chain," which means that they travel with various goals and locations in mind at the same time. Time constraints and the fact that they often have limited access to both private and public transportation play a role in this. Age just makes the issue worse. In general, women are more likely than males to be employed in lower-paying, part-time occupations, which adds to their higher time-related travel expenses. In the EU, for instance, 31.9% of working women had part-time jobs in 2010, compared to just 8.7% of males. Furthermore, the research that is currently available points to a low proportion of women working in the transportation industry, with those who do so earning 20% less than males. Women's travel habits in developing nations are impacted by their various responsibilities as wage earners, childcare providers, home managers, and up- keepers of community networks, despite sharing comparable gender inequalities. Women often travel more than males do, but over shorter distances, in metropolitan and peri-urban settings. When it comes to getting to locations of employment, education, or essential amenities, high transportation expenses might make using such services especially burdensome for women. According to a research conducted in Kampala, Uganda, women spend around 29% of their income on public transportation.Women seem to work closer to home than males as a consequence.Additionally, women often walk longer distances and depend on public transportation for shorter ones.

Numerous cities routinely report high levels of sexual harassment of women on metropolitan public transportation networks. For instance, a poll conducted by the Tokyo Metropolitan government of women who commute during rush hour in Tokyo found that 2/3 of the females in the 20–30 age range reported being grabbed on packed trains.73 The social institution of pardah, which forbids the mingling of men and women in public, makes the issue worse in many places with significant Islamic populations. In Dhaka, Bangladesh, overcrowding in buses, public sexual harassment (also known as "Eve teasing"), and poor sidewalk conditions prevent women from using public transportation. If they believe that urban transportation is risky, women will significantly alter their behavior when it comes to transportation and have fewer alternatives available to them.

Additionally, data shows that males are more likely than women to design, provide, and operate public transportation and other forms of urban mobility. Because "women's travel patterns differ from men's, and these differences are characterized by deep and persistent inequalities where they have less access to both private and public means of transportation, “There is a compelling argument for integrating gender issues into urban transportation enterprises' workplace culture.Children and young people's mobility requirements are mostly influenced by their desire to use daycare, educational institutions, and other associated services. In both industrialized and developing nations, the majority of young people under the age of 18 are unable to drive because of their age. When distance and other considerations become obstacles, someone must thus supply them with transportation. The majority of the time, women bear the brunt of this trip-making for passenger service. Due to the fact that children's travel requirements are mostly reliant on cars, data from throughout the world shows that children's travel demands have a

considerable influence on family travel patterns. The figures on accident rates involving children, especially when they are walking or cycling, confirm the parents' sense of road risk. Road traffic accidents cause more than 26 child fatalities per 100,000 people in South Africa, compared to 1.7 per 100,000 people in the EU. In Bangladesh, children account for one in every four traffic fatalities and one in every six major injuries suffered by the poor.

The distance that students must travel to go to their schools is a key factor in education drop-outs in elementary schools in underdeveloped nations. According to studies conducted in Nepal, the probability that a kid would attend school decreases by 2.5% for every kilometer they must travel to get there. For females and kids with impairments, this increases. Some of the contributing causes to absence or irregular attendance include weariness, tiredness, and the possibility of risks like sexual assault.

Youth may move more freely and independently thanks to public and informal motorized transportation. While most wealthy nations have specialized school bus services at well-known institutions, the poorest people often rely on public and unofficial transportation. The main issues with informal transportation in developing nations are similar to those with public transportation linked to uncontrolled charges. Trans-port operators refuse to transport retirees and students on discounted tickets in Dar es Salaam (Tanzania), Colombo (Sri Lanka), and Faisalabad (Pakistan), or they arbitrarily cut short their voyage to assure a double payment. According to estimates, more than 1 billion individuals worldwide (15.3% of the world's population) have some kind of impairment. Nearly 200 million of them (or 2.9% of the population) "experience considerable difficulties in functioning". The incidence of disability is often greater in poor nations than in developed ones, and it is greatest among older people. In many developing nations, more than half of those 60 years of age or older have moderate to severe disability, compared to around a third in industrialized nations.

People with disabilities often identify a lack of suitable transportation as a barrier to getting access to healthcare since it is either scarce, expensive, or inaccessible. The issue of disability will only become worse in the next years. The growth in chronic health illnesses including diabetes, cardiovascular disease, cancer, and mental health issues worldwide as well as the aging of the population and the increased risk of impairment in older individuals are to blame for this. The percentage of senior people (defined as those 60 or older) has been continuously increasing from 1950, ranging from 8.1% in 1950 to 11.7% in 2013, and is predicted to reach 21.8 percent in 2050 (6.2). There will be 3.2 million persons over the age of 100 in the world by 2050, 1.3 million of whom will reside in emerging nations. Although mobility is essential for everyday life, a lot of individuals who are used to driving their own automobiles will have to give up the habit owing to age-related impairments. Due to the many kinds of impairments and how they affect movement, the difficulties these individuals confront vary greatly.

For instance, people in wheelchairs who are blind or deaf confront various challenges and need different types of help. Steps, stairways, etc. make it difficult for them to move, necessitating a modification of the facilities' floor area needs. Furthermore, they may need to travel with a guard or utilize specific navigational equipment when there is no pedestrian infrastructure, including signs or zebra crossings. Therefore, design improvements like improved information systems and low-floor cars would assist older people and those with impairments. Older and handicapped people prefer privately operated services like shared taxis and minibuses because they need door-to-door transportation. However, the majority of these cars are too expensive and unable to

transport wheelchair users. The option of hiring private transportation is often out of the price range of handicapped persons, and there aren't many parking places in the center city that are designated only for their use.

Although many nations have legal frameworks that demand these issues be handled, there are few viable solutions. Particularly in Africa, such law is not well monitored, implemented, or implemented. Broad international agreement on how disability problems should be handled was signaled by the adoption of the United Nations' Standard Rules on the Equalization of Opportunities for Persons with Disabilities in 199492 and the Convention on the Rights of Persons with Disabilities in 200693. Country by country, national rules are also in effect. It should be emphasized that a lot of people have a variety of vulnerabilities and/or disadvantages. Women with disabilities, for instance, often experience further prejudice based on their gender and financial level in addition to their handicap.

CONCLUSION

In conclusion, urban poverty poses serious difficulties and has a wide range of effects on people, communities, and cities. Urban poverty is complicated and multidimensional, requiring comprehensive and holistic measures to successfully address its problems and lessen their effects. Urban poverty must be addressed from a socioeconomic, environmental, and health perspective. This entails tackling concerns including access to affordable housing, clean water and sanitary facilities, education, healthcare, and job opportunities. The societal injustices, prejudice, and exclusion that feed the cycle of poverty must also be addressed. Urban poverty has several negative effects that go beyond socioeconomic issues and include social conflicts, environmental deterioration, and health hazards. These effects have larger consequences for urban sustainability, public health, and social cohesion in addition to having an influence on people and communities who are directly suffering poverty. Integrative strategies including multispectral cooperation, community involvement, and democratic decision-making are essential to successfully combating urban poverty. Urban poverty presents a number of issues that may be addressed and its effects lessened by policies and programs that emphasize social safety nets, affordable housing, inclusive urban design, and increased access to services.

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CHAPTER 15

POLICY RESPONSES AND INNOVATIVE PRACTICES

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ABSTRACT:

Policy responses and innovative practices are essential in addressing the complex challenges faced by cities and urban areas. This abstract provides an overview of the importance of policy responses and innovative practices in urban planning and development, including the need for adaptable policies, stakeholder engagement, and creative solutions to urban issues. Policy responses play a critical role in shaping urban development and addressing various challenges, such as urbanization, climate change, inequality, and social exclusion. Effective policies provide a framework for decision-making, resource allocation, and governance mechanisms that guide urban development towards sustainable, inclusive, and resilient outcomes. Adaptable policies that can respond to changing urban contexts and emerging issues are crucial for ensuring that urban development remains relevant and effective over time.

KEYWORDS:

Environmental Sustainability, Financial Inclusion, Health, Job, Social Services.

INTRODUCTION

Numerous programs and policy choices are in place in various cities that have improved access for disadvantaged and vulnerable populations as well as mobility for urban poor. There are some of the policies and programs listed here that don't cost anything. Through more cost-effective management, others could produce savings or return via spin-off impacts. Cities at different stages of development may learn from the successes and failures of other cities to advance their own growth or enhance current circumstances. For the unique conditions of each city, the actual design of the practice or policy will need to be changed.

In terms of accessibility, mobility, and transportation organization, gender planning approaches have seen major recent changes. There is evidence that several nations have included gender into their transportation projects and programs. Women must be given the chance to work in the transportation industry in a way that benefits them. The Trans Jakarta BRT program in Indonesia, which gave Indonesian women their first chance at official, regularized employment in the industry, placed a strong emphasis on hiring female bus operators. According to experience, more female recruitment advances gender equality in society as a whole and improves women's sense of security and comfort while managing transportation scenarios.

The reason for this emphasis on gender problems is because it improves the efficiency of transportation-related measures, which has an influence on poverty reduction. Gender-

disaggregated data on user demands and access restrictions should be gathered via normal monitoring and evaluation procedures for transportation projects. One such program to map targeted stakeholder usage patterns for integration with planning is a recent World Bank pilot project in Lesotho that encourages the use of cognitive mapping exercises and geographic information systems (GIS) for gender-sensitive transport planning. For the creation of equal practice and the development of gender-sensitive understanding of transportation requirements and systems, the engagement of female transport users is essential. A comprehensive and integrated approach to policy-making is necessary to establish a sustainable urban transportation system with the goal of offering customer-focused, cost-effective, and environmentally friendly mobility solutions. The sections that follow provide concrete examples of how policies might be implemented to provide transportation that is gender-sensitive, effective, safe, and attentive to the mobility requirements of disadvantaged and vulnerable populations.

Gender-Responsive Infrastructure, Design and Services

Planning for public transportation must take into account the unique roles, demands, and experiences of women. Gender main- streaming is crucial as a result. An Asian Development Bank initiative in Bangladesh seeks to enhance transportation vehicle design and infrastructural facilities. The proposal considers the particular requirements of women (public restrooms, separate market booths, lower stairs on buses, etc.). Additionally, 15% of the small businesses situated along the roads being built are set aside for women. The little changes made to the current infrastructure strike a compromise between women's desires for social participation and privacy. Additionally, it starts the process of integrating women into previously sex-segregated and sometimes male-dominated social and economic spheres.

The protection of women's comfort and safety in urban transportation is the subject of several governmental measures. Japan, Brazil, Egypt, Mexico, India, Belarus, and the Philippines have all established 'women only' passenger train vehicles. Similar to this, nations with sizable Muslim populations, such Lebanon, Syria, and the United Arab Emirates, have cabs that are exclusively for women. The majority of these taxis have female drivers and are prominently identified in pink. Although these sex-segregated policies are sometimes contested, they unquestionably have improved circumstances for female travelers[1]. In France, producers of rolling stock agree to abide by a charter put forward by a group called Femmes enmouvement, les transports au féminin, which mandates that the group be involved in the creation of new vehicles. Consultations are held about environmental sensitivity, interior design, accessibility, and safety. This contributes to a more gender-sensitive design of public transportation vehicles that can accommodate women with children and/or shopping bags, such as women-only carriages, kid sitting, and storage areas for strollers and shopping.

In many underdeveloped nations, transportation methods including carts, bicycles, and animals are seen as an affordable way to help satisfy women's mobility demands. Bicycles have often been suggested as a way to improve women's socioeconomic and political engagement by enhancing their general mobility. Women like the door-to-door demand service offered by auto-rickshaws, according to a survey conducted in India. The creation of separate lanes for auto-rickshaws may speed up traffic and help marginalized communities. In North America and Europe, new mobility services, such women-only carpooling programs, are starting to flourish. These programs provide the benefit of inexpensive access. At certain periods of the day, families, commuters, and employers may share automobiles with discounted or preferred

parking. In order to protect their safety, well-lit parking spaces have been designated for women in multi-story parking lots close to stairs and elevators.108 Similar to this, rules promoting disabled parking privileges guarantee that people with impairments have access to parking that does not pose an excessive difficulty. By enabling them to park near to their destination, the UK's blue badge handicapped parking program, for instance, enables disabled persons with severe mobility impairments to access products and services. Many elderly and handicapped travelers now have more private transportation choices. There are many non-motorized vehicles in use, including hand-operated bicycles, three-wheeled bicycles, and various carts. Hand-powered tricycles provide convenient local transportation and are ecologically beneficial in Bangladesh. Electric wheelchairs, three-wheeled motorized vehicles, and hand-controlled automobiles and vans are some of the other motorized vehicles available on the market.

Governments may decide who pays and who benefits via fare arrangements. Special passenger groups, such as students, children, the elderly, and the jobless, travel for free or at least at a reduced rate in nations like the UK, Denmark, Spain (Madrid), and Mexico (Mexico City), to name a few. Cross-subsidies have been used successfully in Bogotá, Colombia, where the fare for lower-income groups is subsidized by that of higher-income groups. This shows that cross-subsidies may boost affordability. When making many trips, integrated ticket structures make it relatively simple and less costly for disadvantaged and vulnerable groups to travel. The integration of railway and regional bus services, for instance, has enabled passengers to traverse regional boundaries in Denmark with a single ticket, even when the trip necessitates a transfer involving many public transportation providers. Children under the age of 12 who are traveling with an adult on public transportation are now eligible for free rides thanks to similar funding.

Increasing accessibility and safety for pedestrians by enhancing pedestrian accessibility and safety, the construction of exclusive sidewalks as a part of road and transportation projects effectively addresses the travel requirements of women and other vulnerable users. The majority of cities in developed nations have started a curb-cut program, whereby all new sidewalks will be constructed with curb cuts that help visually impaired people identify the street margin when using walking aids like a cane while also allowing wheeled pedestrian traffic to negotiate the height change comfortably. Numerous curb cuts have been added to existing footways in cities including Pretoria, South Africa, Rio de Janeiro, Mexico City, and Rio de Janeiro, Brazil. The World Bank and other organizations are putting more emphasis on developing the infrastructure for non-motorized transportation[2].

A textured surface in Tokyo, Japan, indicates the direction and level change of the pedestrian crossing. Curb cuts have been put in the already-existing sidewalks, making the textured area bright yellow and easily visible. In order to accommodate the slower crossing speed of elderly or handicapped walkers, the timings of the pedestrian crossing lights have been extended by 20% at important crossroads.There are also designated locations for the installation of light and sound signals for pedestrian crossings. Different noises let pedestrians know if it is safe to cross and whether they are moving from north to south or east to west. For instance, "peep-peep" noises are employed for east-west crossings in Ottawa, Canada, while "cuckoo" sounds are used for north-south crossings. The pedestrian crossing light may be turned on by pressing a button at the ground. When there is enough demand for wheelchairs, wheelchair sensors may be put in specific situations.

Street design and the built environment may influence the promotion of physical exercise and active travel habits, particularly for kids traveling to and from school. For instance, in a hamlet in Morocco, the amount of school attendance was significantly impacted by the presence of paved roadways. Girls' and boys' attendance rates increased from 21% to 48% and from 58% to 76%, respectively. If accessibility, safety, and the social advantages of the experience are acknowledged and taken into consideration, school travel presents a chance to replace some automobile journeys with walking and bicycling.

'Access for everyone' or 'universal design': Many nations are passing laws requiring the expansion of accessibility for transportation services in order to comply with international law. For instance, South Africa has implemented a comprehensive national disability plan that is dedicated to creating accessible and inexpensive public transportation. In order to provide equitable access for everyone, the UK government approved an act in 2010 that addresses accessibility concerns pertaining to age, race, gender, and disability. The advent of low-floor vehicles has changed access to urban public transportation in Europe and, more recently, in North America. Wheelchair users may board the bus via a straightforward ramp or, if the curb is lifted at stops, directly from the sidewalk. Wheelchairs and strollers may be parked inside the vehicle and fastened using a clamp belt. This accommodates individuals with young children or luggage, those with impairments, and older people who are weak. A local NGO in Delhi, India, has collaborated with the city's transportation authorities to make metro stations barrier-free, add safety elements and tactile guideways to the platforms, and guarantee that wheelchair users have enough room in the trains. Similar to Mexico City, where a meeting of a disability advocacy organization resulted in the installation of thousands of kerb ramps on busy streets as well as the introduction of accessible buses and trolley buses[3].

Accessible taxis, including those that have been specially converted and those designed for the purpose, are also spreading. Canada's Ontario Province provides a subsidy to modify taxis so that they can accommodate all users. Private businesses may modify some of their fleet, provide regular service, and send accessible taxis to people who want them. The 'Dial-a-ride' service, which operates in many US and UK cities, is a variant of the taxi service. A 'telebus' in Berlin runs on the same idea. Disabled customers are often issued a "travel card" and are subsequently allocated a certain number of trips. Additionally, certain efforts have been taken to guarantee that passengers have access to information in a way that is simple to understand. For instance, many cabs in Hong Kong are equipped with audio systems that display the taxi price in Cantonese, Putonghua, and English. In order to increase the support they provide passengers with special needs, authorities must encourage disability awareness and teach conductors and drivers of public transportation. A goal of Mexico City's public education campaign is to increase public knowledge of the city's integrated system of accessible transportation and pedestrian services. It has also been thought of providing taxi drivers with sensitivity training.

DISCUSSION

Safety and Security in Urban Mobility Systems: Making roads safer and more secure for disadvantaged and vulnerable road users, such as the poor, is a crucial aspect of developing sustainable urban transportation networks. Likewise, enhancing the security and safety of transportation modes may be a crucial first step in persuading passengers to switch to alternative and environmentally friendly modes. Since there have been so many terrorist attacks on urban infrastructure over the past 20 years, stakeholders have been forced to see transport security as

more than just one component of the world's networks for moving people and things. Security, which was once a standard feature of contemporary transportation, is now a top national issue.

Global circumstances, trends, and difficulties

The effects and trends of traffic accidents in metropolitan settings are examined in this section. It takes into account minimizing the worldwide toll of these incidents by better legislation, safer road design, and traffic management. Additionally, it examines transportation security in terms of how individuals perceive their own personal security, whether that perception is accurate or not. This section makes use of national statistics on traffic accidents due to the dearth of information on metropolitan regions.

Highway traffic collisions

With 1.2 million fatalities annually or 2.2% of all deaths, road accidents are the tenth largest cause of mortality in the world. The WHO estimates that 20–50 million more people are injured in traffic accidents every year. The Middle East and Africa have the highest incidence of traffic fatalities (approximately 32 per 100,000 people each year). Nearly twice as many people die in traffic accidents in developing nations as in industrialized ones (20 fatalities per 100,000 people annually). In reality, developing nations account for more than 90% of deaths, even though they only have 33% of the world's registered automobiles. The most productive age group (15-44 years) accounts for around half of all deaths. Road traffic accidents are the greatest cause of mortality among those aged 15 to 29. All age groups have a disproportionate number of male deaths.138 Pedestrians, cyclists, and motorized two-wheelers are the most vulnerable road users, and they cause close to half of all deaths on the roads. And as can be observed, poor nations have a considerably greater rate of mortality among such vulnerable users than industrialized ones[4].

The distinctive traffic mix on the roads, defined by the availability of automobiles and non-motorized transport, as well as a lack of segregated facilities in the road network, may be blamed for the prevalence of vulnerable road-user fatalities in Asian and African nations.139 Due to insufficient funding, logistical issues, and corruption, road safety standards are not enforced effectively. It might be argued that accidents and deaths would rise before they can be decreased, putting a load on developing nations' inadequate public health systems. Patients with traffic-related injuries make about 10–30% of all surgical ward admissions in India. Emergency response times that are delayed might negatively affect the patient's recovery, leading to negative health outcomes and long-term incapacity. Additionally, in many underdeveloped nations in particular, a shortage of qualified professionals in trauma treatment often leads to traumatic injuries being permanent or life-threatening. According to estimates, road traffic accidents cost developing nations at least $100 billion annually. The overall cost of poor road safety and accessibility is staggering, especially when you include the already high cost of urban congestion.

A relatively high proportion of traffic-related injuries and fatalities is also linked to older pedestrians. About 194,000 older people (60 years and older) perished in road traffic accidents in 2002, accounting for 16% of all such deaths worldwide. Despite having the lowest collision rates of any age group, many people believe that elderly drivers pose a danger to traffic safety.145 For instance, incentives like restaurant discounts are provided in Japan to senior drivers 65 years of age and older to entice them to surrender their licenses. Transport security does not only apply to personal motorized vehicles. In Mumbai, India, train and bus transport account for around

88% of all motorized transit. The majority of railroad accidents in Asia include injuries and deaths to train passengers, road vehicle occupants, and other railroad level crossing users. These accidents are more common and may have more severe consequences in Asia. Bus passengers and users of unofficial transportation networks also make up a sizeable population that is particularly at risk for fatalities due to traffic accidents in many developing nations. Additional problems including irresponsible driving, inadequate driver training, and driver exhaustion have contributed to the rise in deaths in addition to the financial motivation of overloading. The majority of nations have a system in place for collecting statistics on traffic accidents utilizing hospital or police records, or a combination of the two. However, developing nations have especially poor statistics on road accidents in terms of both quality and dependability. Therefore, a system that is efficient at documenting and analyzing accidents is urgently needed. This system should be helpful for a variety of authorities, including the police, the court, emergency services, etc.

Transportation security: Perils and apprehensions associated with using public transportation. Security threats and the fear of criminality when participating in transportation activities have skyrocketed over the world. The terrorist assaults in Madrid, Spain (March 2004)150 and London, United Kingdom (July 2005) demonstrate how susceptible and attractive public transportation networks are to terrorists. Because they house huge populations of people, transportation hubs and infrastructures have been the target of terrorist attacks. Attacks cause public transportation service to be disrupted, which leaves many commuters stranded. Evidence reveals that as trust in the London buses and subway fell, two-wheelers and bicycles gained popularity. Although the most significant assaults have mostly targeted large networks in big cities, this does not imply that smaller cities or local bus services are immune to attack. Many individuals are deterred from utilizing public transportation by crimes that seem to have nothing to do with it, such being robbed or slain while waiting at a bus stop.

The four basic categories of dangers to the safety of people and property are outlined. While port circumstances may not be the primary cause of the issue in each instance, considerations concerning the development and administration of transportation infrastructure and services come into play[5], [6].

Inadequate street illumination and poorly designed public transportation stations sometimes 'enable' sexual harassment and gender violence, which is pervasive in many countries on and around public transportation facilities. The rise of criminal gangs that demand money from transport providers and passengers is a developing issue in many cities. In Nairobi, Kenya, for instance, violent adolescent gangs like Mungiki have grown in popularity. Five persons were killed when more than 50 armed Mungiki members ambushed a matatu (minibus) crew in April 2003.

These are symptoms of a pervasive social ill. Although it influences everyone's transportation habits, low-income populations often cannot afford alternatives. As a consequence, there are fewer necessary journeys for employment, health, or education.Furthermore, it is commonly known that elderly people worry more about safety and security than younger people do.156 Many people are conscious of their weakness and fragility, which makes them prone to certain types of crime (such bag stealing). This alone raises a number of safety issues (such as traffic safety, skateboarders in malls, living alone, etc.) that have an impact on operations and policy. Threats to people's and property's safety.

Innovative techniques and policy responses

This section looks at policy responses and examples of projects that promote best practices for lowering traffic accidents, enhancing road safety, and securing transit. It should be emphasized that developing countries experience quite different types of traffic, a mix of diverse road users, and road traffic accidents than industrialized nations do. Additionally, industrialized nations in the past have never encountered the traffic patterns of developing countries today. So, without adaptation, technologies and policies cannot be automatically transferred from industrialized to underdeveloped nations.

Reducing traffic accidents on the road

The majority of industrialized nations have been experimenting with drastic methods to lessen the frequency and severity of traffic accidents. Improvements have been made in infrastructure design, vehicle characteristics (such as seatbelt use, which has been mandated by 57% of the countries surveyed by the WHO158), and driving behavior such as speed limits and campaigns to discourage drunk driving based on a combination of engineering, enforcement, and education measures. Approximately 96% of nations have a national or regional regulation against drinking and driving. Furthermore, around 49% of nations have laws limiting the blood alcohol content of drivers. Sweden's 'vision zero' project is an excellent example, with a specific goal of achieving zero traffic accidents soon. The impact of the imposed traffic-calming measures have been credited with causing almost three-quarters of the dramatic decrease in fatalities and injuries on Swedish roads. However, a significant takeaway from these events is the value of maintaining the goodwill of all road users.

The policy emphasis in developing nations has been on protecting the underprivileged who suffer disproportionately from traffic accidents as a result of the presence of both automobiles and unprotected road users on the same roads (6.10). Their safety has been proven to be significantly impacted by simple, inexpensive treatments. For instance, Ghana's Accra and Kumasi had a 35% decrease in traffic accidents between 2000 and 2001 after installing speed bumps in the form of rumble strips and speed humps.162 In order to segregate road users, Malaysian road planners are working toward new regulatory standards demanding pedestrian danger evaluations[7].

Enhancing vulnerable populations' security and safety

There are "Safe route to school" programs everywhere. The initiative, which was pioneered by Denmark in the 1970s, focuses on encouraging kids to walk and cycle safely via engineering enforcement, teaching, and encouragement. The safety of children traveling to and from school is the responsibility of the police and municipal authorities under the Road Traffic Act. This entails a variety of road enhancements, such as traffic islands, slow-speed zones, "road narrowing's," and distinct routes for pedestrians and cyclists. The initiative has been quite effective, and in certain areas the incidence of accidents has decreased by 85%. The success of these programs in Denmark has served as a model for many other nations throughout the globe.

To prevent accidents from happening to children, the deaf, and persons in wheelchairs, several European towns are striving to restrict through traffic on their streets. The Netherlands has created a cooperative street design approach for sharing space with motorized traffic in residential areas. A traffic sign modeled like a home is used to clearly identify some locations as

woonerfs or "living streets". The layout of the roadway has been changed such that pedestrians are given precedence, and parking places are clearly marked by the pavement. Through-traffic slows down as a result of the strategic placement of speed bumps and the curving roads. With amenities like trees and flower boxes, little play places for kids, and seats where adults may congregate, asphalt and concrete's harshness is eased. In the Netherlands, woonerfs were thought to be home to 20% of the population as of 2011. Other nations have also implemented similar programs, notably Norway where they are known as gatetun and the UK also known as "home streets".

The personal security of users of public transportation networks, particularly women, has been taken into account by several nations' transportation designers since the 1980s. In Toronto, Canada, a "request stop" service was introduced in 1980 during the hours after dusk, enabling a female passenger to ask the bus driver to halt along the route, not necessarily at the bus stop, where it is more convenient for the lady to get out. The woman's trek from the bus to her destination was made shorter by doing this. In 1996, Montreal accepted the service, and a few UK towns followed suit.Increased security guards at stations, more nighttime services, and increased knowledge among station officials, drivers, and passengers are just a few of the additional steps done to increase the personal safety of commuters in Toronto.

Environmental design is crucial for lowering crime in public transportation. Both the New York Port Authority Bus Terminal and the Washington Metropolitan Area Transit Authority are well-known success stories of applied security design against criminality in rail transportation systems in the US. In each instance, systematic policing, stringent upkeep processes, and 'zero tolerance' strategies for enforcing laws and regulations are jointly credited with better security together with environmental design. Another instance of crime prevention via environmental design may be seen in the UK, where closed-circuit video cameras are commonly utilized to keep an eye on public places including parking lots, shopping malls, and certain residential neighborhoods.

Unprecedented opportunities to support transport planning and management have arisen in developing nations due to the emergence of low-cost open-source mapping tools, widespread cellular network coverage in those countries, falling prices for mobile phone hardware, and rising internet usage by government organizations. Approximately 75 percent of people on the planet now have access to a mobile phone. More than 6 billion mobile subscriptions were in use in 2012, up from less than 1 billion in 2000; approximately 5 billion of them were in developing nations. More than 30 billion mobile programs, or "apps," were downloaded in 2011 alone. Apps are pieces of software that provide phones new functions, such as the ability to function as mobile wallets, navigational tools, or pricing comparison tools[8].

It is now feasible thanks to technological advancements to cater to individual requirements, especially those of particularly vulnerable populations like women, people with restricted mobility, and those with disabilities. This can include gaining access to new possibilities through safer and simpler transportation options. In order to assist in reporting and mapping occurrences of harassment, the unique website "HarassMap" was introduced in Egypt in December 2010. Because of the accessible and adap technology, harassed individuals may report instances anonymously by sending an SMS to this website. Another innovation is the "Access Advisr" online application, a trial project in the UK that utilizes crowdsourcing to discover local people's needs in order to enhance accessibility to the current public transport network for those with disabilities and the elderly. Through a live feedback community of users who may share their

opinions, images, and videos based on their own experiences, the program allows for the examination of information about the physical infrastructure and the rating of it. It also highlights issue areas for accessible transport.

CONCLUSION

Mobility is necessary for social fairness since it ensures access to necessities like products, services, and activities. Access restrictions might indicate a violation of human rights. Cities must be able to discern between the priorities of men and women, the young and elderly, the able and the handicapped in order to comprehend the transportation demands of all urban residents and offer equal access. Therefore, it's important to comprehend the goals and applications that would result from better access as well as the barriers standing in the way of meeting those objectives. Despite the fact that social goals are often acknowledged in transportation initiatives, experiences indicate that relatively little actual practice extends beyond pilot projects and case studies. However, it is crucial to recognize the value of urban transportation's social sustainability since it is a necessary condition for social advancement. Theoretically, there is already some understanding and awareness of the role that mobility plays in enhancing or degrading a person's quality of life. However, the intricate dynamics are often not well understood. As a result, those in charge of taking action are forced to rely on tried-and-true measures like infrastructure development, bettering the circumstances for private transportation, and lump-sum payments or untargeted subsidies. Transport subsidies are a crucial policy choice to support equal access to transportation. To target the poor and other marginalized and vulnerable populations, these subsidies must be properly planned, however. Good mobility policy should recognize the need for both increased macroeconomic efficiency and for targeted targeting of transportation initiatives in order to reduce poverty. These two aspects of transport policy have a history of being treated independently, which has prevented an effective and cohesive strategy for urban mobility. One way to address this is to make sure that eradicating poverty is a stated goal of transportation policies, with specific plans to help the poor benefit from economic efficiency through redistribution and direct targeting programs, including preferential treatment for certain vulnerable and disadvantaged groups.

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CHAPTER 16

URBAN MOBILITY AND THE ENVIRONMENT

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ABSTRACT:

Urban mobility, the movement of people and goods within urban areas, has significant impacts on the environment. This abstract provides an overview of the complex relationship between urban mobility and the environment, including the challenges, opportunities, and potential solutions for creating sustainable urban mobility systems. Urban mobility is a critical aspect of urban life, enabling economic activities, social interactions, and access to goods, services, and opportunities. However, the dominant modes of urban mobility, including private vehicles and motorized transport, contribute to various environmental challenges, such as air pollution, greenhouse gas emissions, noise pollution, congestion, and land use impacts. These environmental impacts not only degrade the quality of urban environments but also have adverse effects on public health, social equity, and ecological sustainability. To mitigate the negative impacts of urban mobility on the environment, innovative and sustainable solutions are needed. This includes promoting and incentivizing the use of sustainable modes of transportation, such as public transit, walking, cycling, and electric vehicles. Implementing effective and integrated public transportation systems, including mass transit, shared mobility, and multi-modal connectivity, can reduce congestion, emissions, and pollution, while also enhancing accessibility, equity, and livability in urban areas.

KEYWORDS:

Active transportation, Air quality, Bicycle infrastructure, Carpooling Clean transportation, Climate change.

INTRODUCTION

The increased mobility being seen in cities throughout the globe helps society greatly and also gives the necessary tools for a city to run efficiently. A rise in the number of journeys taken, an increase in the duration of each trip, and - last but not least - an increase in the motorization of urban people and commodities movement are the three main manifestations of the expanding urban mobility. Since the transportation industry is one of the largest contributors to greenhouse gas emissions, the main cause of climate change, the environmental effects of increased motorization, and in particular the use of private motorized vehicles (cars and motorcycles), are of great concern not only locally in the city but also globally. It has previously been said often that transportation is a necessary pre-requisite for economic expansion, at least for cities that are still in the early stages of their development. Additionally, it has been stated that in cities in industrialized nations with an established broad network of routes and high accessibility levels, this association is less significant.1 Prosperity without development has been advocated for in recent discussions, which means that economic expansion and transportation must be more

closely linked with environmental and social concerns. Urban development must be founded not just on economic growth but also on social equality and equal access and environmental sustainability, it is becoming more accepted. Therefore, interventions in urban transportation systems should include both the social and environmental repercussions of adopting certain policy trajectories, in addition to the economic advantages of greater accessibility (and mobility)[1].

This is done to draw attention to issues with environmental sustainability related to urban transportation networks. This involves identifying the environmental costs and talking about how their effects might be lessened. Urban mobility will always consume resources and produce externalities, but its negative effects on the urban environment can be greatly reduced, keeping it within acceptable bounds and greatly enhancing other aspects of sustainability, such as considerations for future generations. The first part of the paper outlines the major environmental issues that urban mobility must deal with, with a particular emphasis on oil reliance, greenhouse gas emissions, sprawl, and health issues. Five parts that examine the policy solutions to these problems follow.

The second through fourth parts concentrate on cutting down on travels, shortening city commutes, and shifting travel patterns toward non-motorized and public transportation. The fifth section addresses the efficiency and age of the vehicle stock, standards for fuel use and emissions from vehicles, alternatives to oil-based fuels, and the need for increased vehicle efficiency in order to discuss the potential of technology in reducing the negative externalities of motorization.

The sixth part makes the case that, practically speaking, a blend of many strategies is probably going to work best. In the part that follows, international financing strategies are briefly discussed in order to create urban transportation systems that are ecologically sustainable. There is a concise overview and some key policy takeaways in the closing section.

Over the past several decades, environmental issues have taken center stage in discussions on sustainable urban transport. However, in actuality, it seems that developmental goals take precedence over environmental considerations. Finding strategies to simultaneously and mutually supportively address environmental and developmental problems is a major point underlying the topic in this article. A significant increase in the global consumption of these oil-based products has resulted from the shift in urban transport technology toward motorization, which depends almost entirely (95%) on oil-based products for its energy supply, primarily in the form of gasoline and diesel. In 1973, the transportation industry utilized 45.4% of the world's oil resources; by 2010, this figure had risen to 61.5%.

Thus, over the 1973–2010 period, worldwide oil consumption climbed by 63%, while the transport industry’s consumption increased by 120%.6 It has been estimated that the transport sector uses around 22% of the world’s energy[2], [3]. About two thirds of this is used for passenger travel, with the remaining third going to freight travel. The majority of private motorized transportation cars and motorcycles consumes over half of the energy used in the transportation industry.

The transportation sector's energy usage and CO2 emissions, the primary transport-related greenhouse gas, have been directly correlated because of the reliance on an oil-based energy source. Given the significant growth in the demand for urban travel globally (as the world's urban population is projected to increase by 40% between 2010 and 2030), mitigation

technologies and practices are urgently needed to achieve a significant global reduction in carbon-based energy use for urban transport. CO2 emissions from the transportation sector have remained constant at about 23% of total energy-related CO2 emissions over the 1973–2009 period[4].

However, oil-based transport energy has a number of additional significant effects on both the built environment and the natural environment. The emphasis of this section is on these effects and associated environmental difficulties. Cities' environmental conditions differ greatly from one another and from city to city. Although the poor in many cities suffer disproportionately from many of the negative externalities of urban transportation, many of the issues coming from the transportation sector nevertheless have an influence on health and the overall quality of life in cities. The four main threat groups mobility and climate change, reliance on motorized modes of transportation and urban development, as well as issues with human health are covered.

Motorization and reliance on oil

Despite the many drawbacks associated with the transportation industry's reliance on oil-based energy products, this industry is expected to continue to be a major consumer of these goods. There are several causes for this, the most important of which are as follows:Oil-based goods have the greatest energy density of all fuels, therefore any switch to other fuels (such electricity, solar power, hydrogen, or biofuels) has to be carefully considered in light of how much of those fuels are needed to cover a certain distance.Oil-based goods cannot yet be replaced with alternatives that are accessible in the necessary quantities.

DISCUSSION

Fuel stations and oil refineries are examples of the infrastructure supporting oil-based transportation that has already undergone significant investment. However, there are limits to the world's oil resources, and politics often meddles with them. As a part of national energy security, political manipulation of oil supply in the 1970s and the recent decade's sharp price increases have served as examples of the potential repercussions. The urban poor in developing nations are particularly hard hit by rising gasoline prices. Kenya had a fuel supply deficit in 2011, which was followed by a surge in diesel. Different taxes are levied on these items in other nations. As a result, the price of gasoline at the pump varies greatly across and even within nations, ranging from US$0.02 per liter in Venezuela to US$2.54 in Eritrea. Different countries have quite different political justifications for subsidizing gasoline costs, but the paradoxical result of fuel subsidies has been to promote increased vehicle use. Additionally, it may be claimed that fuel subsidies favor automobile owners in particular.

If the goal is to make transportation more accessible to the urban poor, targeted subsidies to public transportation are a preferable solution. In general, it is not advisable to subsidize fuel costs in the sake of short-term political gain, as it is crucial that consumers bear the entire financial burden of fuel's environmental consequences. It has been estimated that "a universal phase-out of all fossil-fuel consumption subsidies by 2020 would cut global primary energy demand by 5%," with savings primarily in the transportation sector. If fuel subsidies are to be retained, it is frequently argued that it would be better to subsidize renewable energy sources, to encourage a shift away from fossil fuels. This is known in international law as the "polluter pays principle."For all kinds of public transportation excluding ferries, the transportation industry has to diversify its energy sources and decarbonize the sources of fuel utilized, but the criteria for the

US are substantially lower. However, the overall finding of the is that encouraging more people to utilize public transportation has a large potential to cut energy usage and hence greenhouse gas emissions.

Transportation and Climate Change

The United Nations Framework Convention on Climate Change, often known as the cent of the CO2 emissions, was created as a response of concerns about global policy in the 1970s and 1980s. Another 12.4% comes from aviation, while the emissions from rail transportation are negligible. In all regions of the world, private transportation uses more energy and generates more CO2 emissions per capita than public transportation; in Africa, this ratio is 3:1 while it is 50:1 in the US.24 At the city level, there is significant variation in energy use between cities. The differences between cities in terms of their structure, urban form, densities, levels of sprawl, the importance of public transportation, and the balance between energy use in transportation and other sectors are reflected in the fact that more than half of the total energy consumption in Mexico City and Cape Town is related to transportation,25 while levels in many European cities (such as London and Paris) are about a quarter lower. CO2 emissions from passenger transport vary between cities in different areas of the globe. With emissions between 2 and 7.5 tonnes per person, US cities have the greatest emissions, followed by Canadian and Australian cities. Emissions in the majority of European cities vary from 1-2 tonnes per person. However, emissions are substantially lower in the majority of cities in developing nations. As an example, consider the fact that each Atlanta resident generates 150 times more CO2 emissions due to their mobility than a resident in Ho Chi Minh City, Vietnam. In most cities, the emissions from public transportation are negligible in comparison to those from private motorized transportation.

Cities are found around major rivers or on the ocean in over half of the world's cities. These areas have historically experienced sporadic floods, but hazards have grown as a consequence of increasingly frequent storm surges and strong winds, which are exacerbated by climate change and sea level rise. As a result, these cities are far more susceptible to floods, while some have already made steps to mitigate the effects. A recent survey of 90 cities found that severe flooding and storm-water management are among the top three challenges facing cities.28 Transportation is essential to the operation of cities, and it is frequently the transport system that is initially affected by flooding and high temperatures. However, some 40 million people are still exposed to a 1 in 100-year coastal flood event, and this will rise to 150 million in 2070. However, access to the places that have been cut off by floods has to be provided by the same transportation infrastructure. The failure of urban transportation infrastructure may also have far-reaching economic repercussions since it prevents people from getting to work and prevents the distribution of commodities[2].

Cities must thus act right now to save the current transportation infrastructure from the effects of climate change. Continuous maintenance is a part of this, but it can also need making extra expenditures in engineering structures for erosion control, drainage, and protection. To lessen susceptibility to new developments, communities everywhere should combine general land-use planning with planning for climate change. This should impose restrictions on construction in areas prone to flooding. The infrastructure should be elevated above the surrounding countryside to facilitate passage during floods and can be made more resistant to high temperatures (e.g., buckling of rail, impacts on steel bridges, etc.). Furthermore, new or improved transportation infrastructure should take into account the needs of the entire urban population, including

disadvantaged and vulnerable groups, and drainage systems should be able to divert flood waters away from the infrastructure.

Urban sprawl and reliance on motorized transportation. In most cities, higher rates of motorization have led to lower densities and decentralization, with the subsequent impact that suburban life has typically favored automobile ownership. Motorization also makes congestion worse, which may lengthen wait times for public transportation and encourage more use of private vehicles. Buses in many cities tend to be unpredictable partly because of congestion, but a vehicle appears to provide the driver more control since other, less crowded routes may be taken. Mobility levels rise for people who have access to a vehicle, and many also want to reside in lower density projects. The result is urban sprawl. This makes it challenging to provide alternatives to the automobile. Such development has been prevalent in areas with affordable and readily accessible land. But not everyone can afford a private vehicle, which results in a socioeconomic stratification of urban transportation networks (in many cities). Women, children, teens, elderly people, and people with disabilities are among the poorest and most vulnerable populations who cannot afford or utilize private cars. For these groups, urban expansion often results in social isolation[3].

Low-density constructions take up more land, but the transportation systems in such communities also need a significant amount of room for the roads, railroads, parking lots, and other related infrastructure. Greater land allocation for urban development and motorized transportation results in the loss of agricultural land and a changing local climate, which may lead to increased habitat fragmentation, biodiversity loss, and impacts on regional ecosystems as a result of roads acting as barriers.37 An Australian study found that energy use in suburban households was 50% higher than that in urban centers, with this difference being primarily explained by g The urban land take in Hyderabad (India), whose population more than quadrupled between 1980 and 199939, grew from 9% to 24% of the total land available during that time. As a consequence, the amount of agricultural land was reduced by 24%.

Worries about Human Health: The rising motorization of urban transportation is also posing significant health risks to people. The key physical health concerns connected to air and noise pollution, decreased physical activity, challenges with community cohesiveness, open spaces, and mental health are outlined in this section. As part of the conversation on urban safety and security, road traffic accidents, which are perhaps the most significant human health risk from urban mobility, are included.

Air Toxicity: Residents and local governments are paying more and more attention to the effects of air pollution on air quality and human health.41 It has been estimated that "a record 3.2 million people died from air pollution in 2010, compared with 800,000 in 2000."42 While all urban residents are affected by the effects of transport-related air pollution, there is strong evidence that it disproportionately affects the poor and vulnerable groups. In actuality, the social groups who suffer the most severe effects are often not the ones that contribute to pollution. The primary categories of local air contaminants, including particulate matter, carbon monoxide, nitrogen oxides, and volatile organic compounds, are outlined[5].

Particularly in metropolitan locations (where density result in greater concentrations), nitrogen oxides (NOx) may cause respiratory issues and impaired lung functioning when coupled with other air contaminants. Catalytic converters have reduced transport emissions of NOx by 32% (1990–2008) in the 32 member nations of the European Environment Agency, but this reduction

has been partially offset by an increase in traffic. In many developing nations, the add-on technology is not required, and traffic has been increasing quickly.

The incomplete combustion of fossil fuels produces a broad range of hydrocarbons and other chemicals, such as methane and ethylene, that make up volatile organic compounds. Hydrocarbons and volatile organic compounds are major contributors to photochemical smog because they mix with NOx in the presence of heat and sunshine to produce low-level ozone. Although their influence on respiratory processes and as an irritant may be measured, these levels are decreasing as technology advances. An virtually colorless, odorless gas known as carbon monoxide (CO) is very harmful because it prevents the body from absorbing oxygen. In turn, this may result in a rise in morbidity and have an impact on fertility and overall health. Due to the fact that carbon monoxide is mostly produced when fuel is burned insufficiently, the transportation industry is a significant source. Particulate matter is made up of extremely tiny particles (PM10, less than 10 microns in diameter), which are mostly produced by diesel fuel, tyre debris, and road dust. They may result in early death for all city dwellers, exacerbate heart and lung conditions in vulnerable populations, and cause cancer[6].

Only two of the 59 cities in Asia, Africa, and Latin America satisfy the WHO limit for PM10 (90 milligrams per cubic meter), and 46 of the cities surpassed it by more than twice.c Cities in underdeveloped nations are especially at danger, in part because there is little enforcement. To tackle dangerously high air pollution in Beijing, China, the government closed 103 extremely polluting enterprises and removed 30% of government cars off the road. ..But in January 2013, despite the efforts, the air quality remained dangerous. The WHO recommends a daily level of no more than 20, but the amount of PM2.5 (particles with a diameter of less than 2.5 microns) reached more than 500 milligram per cubic meter, on a scale where 300 is hazardous. Similar high levels have also been reported in other Asian cities, including New Delhi, India.

Other pollutants, such as lead (Pb), ammonia (NH3), and sulphur dioxide (SO2), have transport linkages but are less significant than the four mentioned above since their levels are being decreased by the use of improved catalytic converter designs and alternative, "cleaner" fuels. However, despite the acknowledged risks for children's health and the development of their minds, many communities continue permit the use of leaded gasoline.

Noise Pollution

People who live in cities often complain about noise and vibration, but the most bothersome sounds are frequently the peaks or sudden noises. Around 130 million individuals in industrialized nations are subjected to unbearable noise levels above 65 dB (A), and 400 million to uncomfortable levels over 55 dB (A). Only 5% of citizens in certain 'silent' nations (such of Scandinavia) are exposed, compared to up to 30% of residents in 'noisy' cities. Long-term noise exposure may cause anxiety, depression, and sleeplessness. All cars produce vibration, but huge trucks are the most disruptive, which again interferes with sleep and raises tension and anxiety levels. Many cities have frequent horn noises, and automobile alarms frequently annoy locals. Nearly 75 percent of people in Moscow live in neighborhoods where noise levels from moving vehicles exceed WHO guidelines. Health and physical exercise in people

The lack of exercise that comes along with greater motorization has negative health impacts as well. The perceived risk of cycling and walking is a significant deterrent to using non-motorized transportation. Less people walk and bike because there are higher dangers to vulnerable road

users when there are more motorized vehicles on the road. Physical inactivity and weight have been linked to increased risk of diabetes, heart disease, colon cancer, strokes, and breast cancer, according to increasing body of research. Food-energy consumption has not reduced in tandem with a decline in physical activity, and obesity is on the rise in many nations[7].

The Global Burden of Disease Study estimates that physical inactivity and overweight and obesity together contribute for an additional 32 million disability adjusted life years (DALYs) lost per year.53 In the UK, the majority of people are now overweight or obese, and over 66% of individuals do not exercise enough. Through educational initiatives and the engagement of physicians, it is important to highlight the connections between health and non-motorized transportation. Since there are so many commercial and state programs to encourage cycling, Copenhagen, Denmark, is often highlighted as an excellent example of a bicycle metropolis. Over half of cyclists (54%) cite speed and convenience as their primary reasons for cycling, meaning that their journey times were shortened. This finding comes from a study of 30,000 people over a 14-year period that found that cycling to work reduced the risk of mortality at a given age by 39% relative to those who did not cycle.

Public places, community preservation, and mental health. Communities may become divided and fragmented as a consequence of community severance, which often happens when highly used transportation infrastructure creates a barrier that prevents people from crossing a road or rail track. It has a negative impact on people's quality of life, the quantity of street activity, and the degree of social engagement within communities. Young individuals who are attempting to interact and often come to the realization that the metropolitan area around them belongs to motorized vehicles rather than humans should pay special attention to this. Roads are broadened and less space is made available for non-motorized forms of transportation as a result of the reallocation of space from people to autos. Additionally, the construction of new roads often competes with areas that are open and green as well as parks and other places where people may gather. These areas play a crucial role in the city's 'lungs' and quality of life.

A large portion of these areas are accessible to the general people and may be utilized for leisurely and athletic pursuits, as well as for providing habitat for animals and absorbing carbon. Additionally, there is proof that traffic congestion may harm one's "health, psychological adjustment, productivity, and general sense of well-being."59 According to research, using public transportation does not improve work satisfaction and engagement, and perceived traffic stress is linked to both sadness and a worse overall state of health.60 In the 2011 IBM commuter pain study, 42% of participants reported higher stress levels caused by traffic, while 35% indicated higher levels of rage. In addition to safety concerns and traffic delays, pedestrian/vehicle conflicts on congested streets also have an adverse effect on the environment. These conflicts result in visual intrusion from elevated roads, bus stations, etc., and a distorted perception of the city, which makes it less livable and reduces tourism potential[8].

Draining Down the Amount of Motorized Trips. There are several ways to lessen the demand for motorized transportation. Instead, one may choose non-motorized transportation (such as walking or cycling). As long as the infrastructure is there, including a place to lock up the bike, cycling may be promoted for many shorter excursions (i.e., often less than 10 kilometers). More creative innovations are the cycle hire programs that are now common in many cities, where the bicycle has been combined with new technology (smartcards) to allow for on-demand bike use for a nominal fee or for free for an initial period. Another excellent example is Paris, France,

which has established a well-liked bike sharing program (vélib) and plans to expand the city's network of bike lanes to over 700 kilometers by 2014.64 Both the user who is quick and healthy and the transportation system which uses less space may clearly see the co-benefits. It should be highlighted, nevertheless, that the likelihood of increasing bicycle usage is influenced by factors like age and disability as well as prevailing cultural norms that, for instance, can restrict the use of bicycles by women.

Unfortunately, the promotion of cycling as an alternative to motorized transportation is dangerous in many developing country cities owing to a lack of designated bicycle lanes, which forces cyclists into an unfair competition for road space with motorized cars. However, there have been some good developments. For instance, the City of Buenos Aires in Argentina has established a 94-kilometer network of protected bike lanes and launched a bike-share program with more than 22 stations and more than 850 bikes since 2010. By 2013, the City wants to add 130 kilometers to its network of bike lanes. In a similar vein, the cities of Fayoum and Shebin El Kom in Egypt are proposing to build 14 kilometers of bike lanes and upgrade the sidewalks on important routes.66 Trip-chaining, when numerous activities are carried out on one tour (from home back to home) rather than as a sequence of several separate journeys, is another way to decrease the number of visits. Again, this cuts down on total distance traveled, but mixed-use lands and near proximity to destinations must also be considered[9].

The most practical method of lowering the number of travels is to stop making a particular journey because it has been replaced by a non-travel activity or by technology, such as online purchasing. There have been discussions about the feasibility of teleworking, teleactivities, and teleconferencing for many years, and the more recent emergence of mobile technology has created a wealth of new opportunities. Although there is a lot of room for replacement, the interactions seem to be mutually beneficial, offering more flexibility in travel schedules as certain events are replaced, while others are created, and others are replaced by fewer shorter distance trips. New technology has tended to focus on mobile phones, which are now widely accessible and often transform lives by enabling social and professional connections. Although the ramifications for travel are not yet obvious, the environment is expected to benefit since less fossil fuels will be required. Traditionally, the effects of mobile phones have been divided into three categories: production-related (selling mobiles and associated services), transformative (providing something new), and incremental improving the speed and efficiency of what people currently do. Mobile phones have had the biggest effects on underdeveloped countries, where telephone services were formerly only available to the wealthy.

CONCLUSION

Considering the environmental effects of urban mobility is essential for developing sustainable, livable, and resilient cities since urban mobility and the environment are inextricably linked. Innovative solutions and legislative changes are required to address the problems caused by the present forms of urban transportation, such as air pollution, greenhouse gas emissions, congestion, and consequences on land usage. Promoting environmentally friendly means of transportation, such as public transportation, walking, cycling, and electric cars, may lessen the negative effects of urban mobility and increase the sustainability of cities as a whole. Urban mobility may be made more effective, accessible, and egalitarian while lowering emissions and pollution thanks to integrated public transit networks, smart mobility solutions, and creative business models. Environmentally friendly alternatives, such as green infrastructure, pedestrian-

friendly streets, and designated bike lanes, should be given priority in the planning and construction of urban areas and transportation infrastructure. Designing and implementing sustainable urban transportation solutions that are inclusive and sensitive to the demands of urban people also requires stakeholder involvement, democratic decision-making, and multispectral cooperation.

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CHAPTER 17

A BRIEF DISCUSSION ON CHANGING THE MODAL SPLIT

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ABSTRACT:

Modal split, or the distribution of travelers across different modes of transportation, has a significant impact on urban mobility, sustainability, and quality of life. With the increasing challenges of traffic congestion, air pollution, and climate change, there is a growing need to shift the modal split towards more sustainable and efficient transportation modes. This paper examines the concept of modal split and explores various strategies and interventions that can be employed to change the modal split in urban areas. The existing literature on modal split, including its determinants and impacts, and highlights the importance of understanding the underlying factors that influence travelers' mode choice decisions. These factors include travel time, cost, convenience, accessibility, comfort, and environmental considerations. The paper also discusses the role of emerging technologies and changing travel behavior patterns in shaping the modal split, such as the rise of shared mobility, electric vehicles, and telecommuting. Furthermore, the paper presents a range of strategies and interventions that can be implemented to shift the modal split towards more sustainable modes of transportation. These strategies include investment in public transportation infrastructure, promotion of active transportation modes such as walking and cycling, implementation of congestion pricing and road pricing schemes, development of integrated and multimodal transportation systems, and adoption of smart mobility solutions. The paper also discusses the importance of policy interventions, stakeholder collaboration, and community engagement in achieving modal shift objectives.

KEYWORDS:

Active Transportation, Behavioral Change, Commuting Patterns, Cycling Infrastructure, Demand Management, Electric Mobility.

INTRODUCTION

Given that it connects the geographical distribution of people and occupations inside the city to the pattern of travels, urban spatial structure, also known as urban form, is crucial in determining the mode of transportation and distance travelled. Therefore, urban planning is crucial in arranging spatial activities in cities so that their consumers may easily access them. There are two significant things at play here. First, accessibility is increased if travel lengths are cut down since fewer trips are required to complete tasks. Second, if travel distances are low, it is more appealing to walk, bike, and use public transportation, especially if space is designated for exclusive rights of way. This minimizes the energy usage and environmental effects of transportation. Such a strategy suggests that the amount of roadway space that may be used in cities can be maximized for the greatest number of people. The city runs more smoothly when

there is a greater emphasis on urban planning, but equality also rises as more people have access to services and amenities. However, optimizing street space is not only an issue of urban planning. Urban transportation services and infrastructure must be introduced and maintained in developing nations with the help of effective supply and demand management, traffic law enforcement, and effective city government. Due to inward migration and population expansion, many cities in emerging nations are expanding quickly. This suggests that there is a lot of room for urban design to minimize commute times. As it consumes important agricultural land, increases travel distances, and makes it more difficult to provide public transportation, peripheral sprawl has to be resisted. Both transportation and land use considerations support high urban densities, and cities should be encouraged to expand up (higher structures) rather than out (suburban sprawl).

Whatever the shape of the city, it is critical to center development on nodes for readily accessible public transportation in order to effectively exploit the areas' appeal. These regions promote high-density construction at accessible sites and include adjustments to the public transportation network, facilitating walking and bicycling as well as an increase in the usage of public transportation systems. So that these activities may be carried out in one area, development must contain mixed uses, including housing, employment, schools, stores, health facilities, educational services (like crèches), and recreational possibilities. These advancements are especially significant for women; whose travel patterns are often highly intricate.

Transport development zones often transform into the new major hubs in cities where people congregate to conduct their social and professional activities, and as a result, they foster social cohesiveness. Thus, locations like Canary Wharf, London, and Shin Yokohama (Japan) might use these public transportation hubs to serve as their new commercial centers. In Singapore, public housing has also been built next to metro stations, providing lower-income individuals with access to both housing and transportation. Developers often provide funding for these public transportation hubs, as has been the case in Hong Kong, Singapore, Frankfurt, and London. In addition to their significant role in promoting sustainable mobility in cities, transport development areas are seen as essential to the process of urban regeneration, which involves the creation of new city places and spaces. Typically, there is strong community involvement, allowing the advantages to be shared widely among all social groups[1].

DISCUSSION

The usage of public transportation in the city has often been extensively emphasized in transportation policy. Success has been constrained, however, due to the interference of other variables including rising wages and expanding urban populations. These elements have led to the dominance of the automobile and the motorbike. Since non-motorized and public transportation are the most ecologically friendly forms of transportation, it is crucial for both the quality of life and the environment that as much urban travel as possible be done this way. Up to 60% of travels in several European cities are done by foot, bicycle, or public transportation. According to a study of 26 cities across four EU nations, the percentage of journeys made by automobile ranged from 17 to 73%. The survey's findings are interesting in that there is a wide range in modal shares and no clear correlation between population density or size and the prevalence of particular transport modes. However, high-capacity public transportation systems, like BRT, can provide an effective substitute for a city's reliance on cars in developing nations.

Real cost increases reduce the amount of energy used and thereby the greenhouse gases emitted, reduce travel distances as they encourage more local travel, and increase the use of non-motorized and public transport. It is crucial that the full cost of the energy used in transportation, including all externalities, is reflected in the price. There are three main groups of strategies that can be used to encourage modal shift to more energy-efficient forms of transport, namely: regulatory measures, pricing measures, and investments in public transport. This full economic price could be based on the carbon content of the fuel, but it also needs to include a number of other external factors[2].

The number of vehicles that may be on the road at any particular moment or day may be restricted by regulatory measures. The amount of new automobiles that may be registered in the city may also be subject to restrictions. Beijing and Singapore, for instance, both have a quota system. According to the volume of cars taken off the road permanently and the present traffic circumstances, Singapore's Land Transport Authority allots quotas for each kind of vehicle. In Bogotá, Colombia, the pico y placa regulates the number of vehicles on the road by allowing odd and even number plates to be used on alternate days, but this latter type of measure may encourage higher income-residents to buy a second car, often with an older, less efficient engine. The vehicle quota for a given year is administered through the monthly release of "certificates of entitlement," and the certificates are allocated through an auction.

Parking rules are crucial because they affect how space is distributed in cities according to cost and hour of day, and they apply to both on- and off-street places. In order to encourage commuters to leave their cars at home, parking availability was reevaluated as part of the congestion charging scheme in London, UK, which was implemented in 2003. Many cities have also implemented park-and-ride programs, whereby drivers leave their cars at the outskirts and continue their trips into the center by public transportation. A recent study of 45 systems in Europe revealed that implementation was relatively unequal, but where it had occurred, there was high public support since traffic and pollution levels were decreased[3].

Electronic road pricing (Singapore), congestion pricing or cordon pricing (London, UK, and Stockholm, Sweden)85, as well as parking cost that reflects the value of the occupied space, are examples of pricing methods. But only a tiny number of cities have used pricing as a means of reducing the number of automobiles entering the downtown area, and even those that have, the schemes have only been implemented in a portion of the city. Additionally, fuel prices are frequently taxed, though the amounts vary greatly from nation to nation due to the levels of duty and additional national and local taxes levied.86 Some nations have tried to use fuel duty escalators to make the real price of gasoline and diesel rise over time to reflect the full economic costs, but this has not been well received by the oil industry, automakers, or drivers.87 All of these measures have been criticized by these parties.

The TransMilenio BRT system in Bogotá, Colombia, consists of 84 kilometers of median busways, roughly 25% of which is totally isolated from other traffic. The first two stages of the system were finished by 2003. Unresolved political concerns, such as those involving plans to build a metro, have caused a delay in the completion of the last phase, which is another 100 kilometers long and was scheduled to be finished in 2012[4].

Around 1190 articulated buses, 10 bi-articulated buses, 114 access stations (with prepayment), 6 terminals, and 4 intermediate integrated stations made up the BRT system as of 2011. There were also 448 feeder buses operating on 61 feeder routes totaling 420 line-kilometers.

TransMilenio is widely highlighted as an example of a BRT project that follows best practices. On weekdays, it transports around 1.7 million people, with 43,000 of them traveling in one direction per hour. Bogotá's system is unique in that it "transformed a busway corridor with severe pollution, safety issues, and aesthetically deplorable into a new BRT system with significantly lower travel times, lower noise, and fewer greenhouse gas emissions."a households, but it is crucial that such subsidy goes to the identified user. A high environmental standard must be maintained for the fleet of public transportation vehicles, and operators must be encouraged to make investments. However, as shown by a study of public transportation in Sub-Saharan Africa, subsidies have considerably larger effects on livelihoods:

Subsidies and other kinds of remuneration may aid formal public transportation, but for all modes of transportation to be successful, there must also be an integrated system and a fair playing field. Instead of letting the informal sector profit at the expense of local governments and society as a whole, financial mechanisms should be put in place to support the system and integrate the various forms of community transport. Trust funds, improved lending options, land-value capture, and other sources of income may all be utilized to support the construction of long-lasting, low-carbon transportation networks that will help Africa prosper and advance economically.

Subsidization, a kind of inducement to persuade individuals to modify their behavior, may also apply to vehicles, as was previously mentioned. For instance, subsidies for purchase costs, preferred parking, or exemption from the congestion charge may all be used as incentives to promote the purchase of electric and fuel-efficient vehicles. The UK has implemented all three of these incentives. To ensure that this form of transportation is given priority since it enables the most people to be transported most effectively, investment in public transportation and public transportation infrastructure are both essential. Public transportation loses efficiency because it must share space with other vehicles on crowded roadways. The clean transportation with a clear priority via control (traffic lights) and dedicated tracks has been made possible by trams[5]. BRT is now seen as a flexible and affordable approach to invest in high-quality public transportation with a distinct right of way, as stated in 393. BRT may provide a high-capacity, reasonably priced, and flexible type of public transportation in many places. BRT systems may be implemented in a number of ways and have strong environmental credentials.

Efficiency and Technological Innovation in Vehicles

The utilization of the most cutting-edge technology and other policy solutions to improve the efficiency of motorized vehicles are presented in this part. This suggests that all modes of motorized transportation (freight and passenger) should switch to cleaner, lower-carbon fuels and significantly limit their consumption. As was already said, there is significant room for decreases in the quantity of CO2 created by motorized vehicles, which is directly correlated to the amount of gasoline used. It should be kept in mind, however, that efficiency improvements must be weighed against traffic increase, which often dominates them. The emphasis of the debate is on four primary issues: the efficiency and age of the vehicle fleet, the fuel regulations for cars, the viability of alternative fuels, and vehicle occupancy[6].

It is crucial to emphasize that there is a significant chance for technology 'leapfrogging' at this point. Therefore, there is no justification for cities in developing nations to adopt the same high-motorization and high-pollution strategy as those in rich nations. Thus, there is a chance to invest in the future low-carbon city transportation system as a result of the rapid urbanization occurring

in many emerging nations. Having stated that, it is crucial to remember that this cannot be done without significant financial assistance from the wealthy countries. This indicates the necessity for the establishment of efficient procedures, such as the fuel security credits being evaluated by the Asian Development Bank or efforts under the Kyoto Protocol's clean development framework.

Efficiency and the stock's age of Vehicles

A number of variables, including the effectiveness and turnover rate of the vehicle stock, the average distance traveled by each vehicle, and the propensity to purchase bigger and heavier cars, affect the scope of any emission reduction. Over a 15-year period (1990–2005), new car technology decreased fuel consumption per unit of power by 50%; however, much of this potential savings was offset by general increases in power and weight, notably in the US. As a result, there has been no change overall. However, the adoption of new technology does not immediately result in reduced emissions. Any single car on the road will always be less efficient than the newest innovations. This suggests that total emissions are generally influenced by the fleet's average age in any given nation or location. Additionally, maintenance becomes a crucial concern in the nations with the oldest fleets of vehicles. The average age of automobiles is much lower in industrialized nations than it is in underdeveloped nations, where it may reach over 15 years. However, there are rare outliers, such as Brazil, one of the few developing nations with its own automobile manufacturing sector.

Rare automobiles in developing nations have a lifespan of more than 40 years. Despite their relatively low numbers, these older vehicles contribute a disproportionately high percentage of air pollution. The main causes of this are the high price of new cars, the relatively low cost of maintaining and supporting older technology, and the absence of government fleet renewal incentives (such as inspection and maintenance regimes)[7]. However, there are instances of effective fleet-upgrading plans from developing nations as well. For instance, the government of Cairo, Egypt, has launched a plan to update the taxi fleet. The initiative got underway in 2007 with the of 100 brand-new CNG-fueled, air-conditioned and metered, taxis. The program was fully implemented in 2009 thanks to a combined initiative with five auto manufacturers, three banks, advertising agencies (who were granted permission to post adverts on the cabs), and owners of scrapyards. A total of 43,000 outdated cabs have been replaced by 2013.

With China, Brazil, and India as the main exceptions, the majority of emerging and transitional nations lack their own auto manufacturing sector. Thus, imported automobiles are a common source of transportation in developing nations. Additionally, many of the imported automobiles are used since new ones are expensive. In essence, rich nations are selling to underdeveloped nations their dirtier, less effective cars.

For instance, 2.45 million automobiles with an average age of 11.4 years were imported into Mexico from the US and Canada between 2005 and 2008. Vehicles exported from the US to Mexico showed greater emissions of nitrogen dioxide (22% higher), carbon monoxide (4% higher), and hydrocarbons (4% higher) than the typical US vehicle. Nevertheless, these cars nevertheless had fewer emissions than Mexico's current fleet.103 Several nations have imposed age or technology limitations on imported automobiles to combat the problem of this "dumping" of polluting vehicles. In Belarus, the government discourages the import of older automobiles by levying substantial import fees. For instance, in Kenya, only models that are eight years old or newer are permitted for import.

Standards for Fuels Used and Vehicle Emissions

The quality of the gasoline, the fuel economy of the vehicle stock, and the collection of pollutants before they escape from the vehicle are the three key elements that affect the emission of pollutants from motorized vehicles. These are covered in further depth.A typical automobile is now around 35% more efficient than it was 10 years ago because to significant advancements in the quality of fuel used and the efficiency of the standard petrol and diesel internal combustion engines. The EU introduced legislation (2009) for a decrease of the greenhouse gas intensity of fuels by up to 10% by 2020 a "low carbon fuel standard" which may immediately translate into lower CO2 emissions. This will be accomplished by using more renewable energy sources in electric cars and biomass sources, such as pre-mixed bioethanol (5%) in fuel. Despite the fact that diesel cars emit less CO2 per unit of distance traveled, the longer distances traveled have neutralized their growing dominance in the vehicle fleet (both passenger and freight). Additionally, the emissions of other pollutants like nitrogen oxides and particulate matter often tend to be higher from diesel automobiles. Due to this, the WHO has declared diesel exhaust to be carcinogenic and recommended for stricter emission regulations, equating the danger of exhaust to that of passive smoking. The Environmental Protection Act, which adheres to EU norms, contains legislation in India that governs the fuel quality criteria for transportation fuels. Two stages have been used to establish new requirements; the first phase was used in 13 major cities109, and the second phase included national deployment. Since 2000, unleaded gasoline has been utilized nationally in India [8].

Due to the very high sulphur levels111 in diesel fuels produced in many developing nations, sulphur reductions in diesel have a significant impact on emissions. Low sulphur levels114 in fuel for petrol vehicles enhance the performance of catalytic converter systems, which are required in developed nations. Reducing sulphur to very low levels112 also reduces the emissions of particulate matter and makes it possible for emission control technologies to provide even greater emission reductions (such as diesel oxidation catalysts and diesel particulate filters). By importing both new and used automobiles, low sulphur levels are currently being adopted in the majority of emerging nations.

Governments are turning to automakers more and more to increase the stock of vehicles' fuel efficiency. The EU attempted, unsuccessfully, to introduce voluntary agreements with the vehicle manufacturers over the past ten years. Currently, many governments are setting more stringent mandatory targets for fuel efficiency in new vehicles, and this single action will significantly reduce CO2 and other emissions from the transportation sector. Mandatory goals have just lately (2009) been established. However, the fact that these objectives have already made considerable progress could imply that they are not challenging enough. The CO2 emissions from new cars are clearly on the decline, and the fleet-wide mandated objectives established by the EU will serve as a standard for other manufacturers.

Through the use of catalytic converters, particle traps, and other technologies, many pollutants may be filtered out; however, this comes at an additional expense to car owners. However, it's also critical to check that the filters are functioning properly, which again pertains to routine vehicle maintenance and testing. Because catalytic converters are ineffective when engines are cold, many short trips do not result in the removal of pollutants. These standards are also being adopted elsewhere, such as in Russia118 and China119. The US and Japan have their own emissions standards that were tougher than those in the EU until 2000, but all three have since

followed essentially the same path and are convergent towards zero emissions for all pollutants. Regulations in Europe have been gradually tightened so that emissions levels for all vehicles including freight vehicles conform to EU standards.

Since older vehicles must be scrapped and replaced with new ones, the emission standards only apply to new cars, so it will take some time before their full benefits are realized.120 Despite the clear intentions to reduce key vehicle emissions, in practice it will take 10-15 years to work its way through the entire vehicle stock in developed countries. It will take much longer in underdeveloped nations because of their stock of much older vehicles.

The amount of pollutants produced by cars with gasoline engines has been reduced by 80% because to additional technology, namely the catalytic converter, cleaner fuels, and more efficient and lightweight automobiles. However, there are concerns about how well the technology operates and how quickly the fleet of current vehicles is changing, especially in the cities where the rate of auto ownership is rising the fastest. Additionally, there are still questions about whether diesel vehicles can achieve the same levels of air quality improvement. Additionally, the problem of particulates is still an issue because these are produced by fuels (diesel), tyres, and other sources, and they are much more difficult to control and are a particular issue for freight trucks in urban areas.

The idea that more technology can'solve' the problem of poor air quality is oversimplified. As mentioned above, there are significant restrictions on how well catalytic converters function, how well diesel emissions can be managed, how long it will take to retrofit all cars, and how slowly we will transition to alternate fuels. The catalytic converter actually only provides a maximum of 10 years of "breathing space" before pollution levels start to climb once again when compared to the growth in automobile ownership and usage. For instance, the catalytic converter has been required in the US since 1979, and the whole automobile fleet now fully benefits from its use. The CO2 issue has not been addressed since cutting down on fuel consumption is the only way to lower these emissions.

Alternative Fuels

There has been significant about the adoption of alternative fuels in the transportation sector in order to minimize dependency on oil and to reduce emissions of greenhouse gases and other pollutants. However, it's crucial to bear in mind that both gasoline and diesel have very high energy densities and that, in the majority of nations, significant expenditures have already been made in infrastructure supporting them (such as gas stations). Alternatives must thus be generated inexpensively, cleanly, and in significant numbers. They must also have a high energy output. Alternative fuels cannot yet be generated or supplied in the amounts needed to replace the existing oil-based fuel sources in the foreseeable future. This implies that niche markets are most likely to exist for all alternative fuels. In the long run, they may transform into choices for the mainstream market. The I of new fuels may occur sooner in circumstances where the supporting infrastructure is less developed such as in developing nations. This offers a chance to launch fresh approaches to urban motorization in developing nations. The usage of BRT and electric vehicles including e-bikes has made this already clear in various nations[9]. In terms of policy, the EU aims to achieve carbon-free goods transportation in cities by 2030, halve the usage of conventionally fueled automobiles by 2030, and phase them out of cities by 2050. The EU anticipates that technology innovation will significantly contribute to this process, together

with rules and guidelines established by individual governments, demand management, road pricing, and restrictions at the local municipal level.

The first emphasis of the public debate on alternative fuels was on improving the efficiency of current internal combustion engines. Efficiency levels have increased significantly, as was mentioned above, and during the following 10 years, CO2 emissions are predicted to be cut in half again. Now, the public is debating hydrogen and biofuels. Conflicts caused by rising food prices have limited the potential of biofuels, however, as more energy crops are being produced at the expense of food crops on agricultural land.125 Additionally, the production of liquid fuels from sugar, biomass, and cellulose requires a significant amount of water. The viability of hydrogen as a clean fuel has also been questioned due to its energy-intensive manufacturing (typically from carbon-based materials like coal or oil) and logistical challenges associated with its storage and transportation.

The electric car has lately become a more viable option for urban transportation. Hybrid electric cars, plug-in hybrid electric vehicles, and other electric vehicles including battery-driven vehicles fall under this category. Many of the local pollution issues may be resolved by increasing the usage of such cars. However, energy must still be produced typically using coal, and there are problems with the infrastructure for recharging, the usage of materials, and the need for a lifetime approach to energy consumption and emissions. The most significant advancements have been made by hybrid cars, which combine an internal combustion engine with an electric propulsion system to provide both electric propulsion at low speeds and an internal combustion engine and electric propulsion at greater speeds. In such hybrid cars, a battery that can be recharged while the vehicle is in operation supports the conventional engine. Although these cars serve as a direct alternative for the standard automobile yet only require roughly 60% of the gasoline, greenhouse gases and other pollutants are still released. It is expected that the owner will save money over the course of the car's lifespan since reduced fuel expenses will offset the higher purchase pricing.

China has implemented a number of initiatives, such as pilot projects, regular announcements, and purchasing incentives, to help with the industrialisation and commercialization of electric vehicles. A number of automakers have declared ambitions to produce electric cars in large quantities. Electric cars are starting to have a major influence on public transportation and public service vehicle fleets in several areas.

Delivery vans, buses, and other services (like taxis) are included in this. One of these "electric" transport cities is Hangzhou, where a number of measures have been combined to achieve an innovative and environmentally friendly transport pathway. In June 2010, six cities were chosen to implement electric vehicle purchase subsidies with a maximum of US$9000 per vehicle in the private car market.

There is a lot of promise for using electric power and hybrid technology for public and freight transportation inside cities, even though the private automobile has received the majority of attention globally. By December 2012, more than 300 hybrid buses were running in London, UK, for instance, and similar programs are presently being implemented throughout Latin America. Local deliveries have been made using electric trucks, and hybrid vehicles are becoming more often utilized by multinational corporations. These vehicles are heavily utilized, and the company's facilities may be used to repair and recharge them.

Aspects of Occupancy (Load)

In collaboration with the Clinton Climate Initiative, the C40 Cities Climate Leadership Group introduced the Hybrid and Electric Bus Test Programme in June 2011. The initiative aims to lessen the carbon footprint of public transportation in the five participating cities of Bogotá, Curitiba, Rio de Janeiro, Santiago de Chile, and So Paulo while also creating a market for low-carbon, fuel-efficient buses in Latin America. The initiative, which is funded by the Inter-American Development Bank, brings cities, bus technology firms, and local transportation operators together to assess the effectiveness of bus technology under city-specific driving circumstances and duty cycles. The program's ultimate goal is to stimulate the deployment of up to 9000 buses throughout Latin American cities over the course of the next five years, resulting in a reduction of 475,000 tonnes of CO2 annually. The program contrasts traditional diesel technology with hybrid diesel-electric technology. Promising research reveals that hybrid technology is at least 32% more fuel efficient and emits less greenhouse gases and local air pollutants than traditional diesel buses, while electric buses emit no on-road emissions and are 250% more fuel efficient.

All techniques, however, are based on the need of vehicle occupancy for both freight and passengers), and the efficiency measures highlight the significance of occupancy or load. Public and private, freight and passenger, fully filled vehicles are much more efficient than empty ones. Additionally, this lessens its negative effects on the environment, raises the standard of living in the metropolitan region, and helps to ease congestion. To enhance vehicle occupancy, "high-occupancy vehicle" or "car-pool" lanes have been implemented in various cities mainly in industrialized nations). High-occupancy vehicle lanes require cars to carry at least one (and sometimes two) passengers in addition to the driver. There are several high-occupancy vehicle lanes that are only open at specific times. All cars are permitted to use them outside of specified hours.132 In several emerging nations, high-occupancy vehicle lanes have also been implemented.

The Composite Answer

Several examples of initiatives to improve environmentally friendly urban transportation systems were shown in the parts that came before. Each case has clarified the effects of certain sorts of policy. However, a set of measures rather than a single policy has often been used in successful implementation examples. Such "packages" are more likely to be accepted by the general public and permit a combination of regulations that may be seen as unfair to certain users but advance societal welfare benefits as a whole. Although policy packaging can undoubtedly support effective and efficient policy-making not least by enhancing interventions' implementation and the ex-ante mitigation of unintended effects, if its benefits are to be truly realized, the packaging process needs a deep and holistic appreciation of policy subsystems along with a structured approach.

It is crucial to take into account a broad variety of impacts that generate co-benefits in order to support the environmental case. For instance, health may be regarded in three primary ways: as improved local air quality due to less motorized traffic or "cleaner" cars; as increased road safety due to slower travel; and as direct health advantages due to non-motorized mobility. Additionally, the decrease in CO2 emissions that will result from these changes is anticipated to be beneficial for combating climate change. All of these elements result in significant co-benefits that must be taken into account in every environmental assessment. Some towns have begun the

transition to the "car-free city" in order to meet the EU 2050 aim of zero carbon emissions from transportation in cities. Vauban in the German city of Freiburg is one such neighborhood. It was built at a size that makes it easy to get about on foot, by bicycle, and by local public transportation. Vauban is one illustration of how many of the many components discussed here may be combined to provide a logical set of recommendations. Based on this experience, it seems that city dwellers may survive without a vehicle if the proper transportation infrastructure is put in place (i.e., connections to the main station and the city's multi-story parking lots on the perimeter, which cost $18,000 per year in 2008).

Vauban's traffic idea meant that new legislation were required to take into account the federal state of Baden-Württemberg's construction standards. As a formal organization to carry out the idea, the Association for Car-Free Living in Vauban (Verein für autofreies Wohnen) was established. Residents of Vauban may sometimes utilize automobiles that are provided by the car sharing firm Freiburger Auto Gemeinschaft and are stored in the neighborhood parking lot. Those who participate in the car-sharing program get access to the shared automobiles, as well as a one-year pass that is free for use on all public transit in Freiburg and a 50% discount on all rail tickets for that time period.

Urban Mobility Systems with Environmentally Sustainable Finance Mechanisms

While finance for improvements in urban transportation is discussed in greater detail in Chapter 8, a quick mention of global financial possibilities that are directly tied to environmental sustainability is pertinent here. The systems developed to deal with such financing haven't been successfully used in cities or the transportation industry up to this point. One of the three flexible mechanisms included in the Kyoto Protocol, the clean development mechanism only had 28 projects specifically related to transportation out of the 6660 clean development mechanism projects that had been registered as of 1 April 2013140. The clean development mechanism makes it possible for nations that are developing to implement emissions reduction initiatives and earn "carbon credits," which can later be sold globally and so be compensated for having decreased emissions. Developed nations may partially achieve their emission reduction goals by acquiring these carbon credits by paying for the license to pollute. Sadly, this kind of carbon emissions trading favors projects that are less expensive but may not have the best ability to decrease greenhouse gas emissions over the long term. The majority of transportation projects are costly because they need upfront investment or the creation of new technology and fuels. A valid baseline, the necessity to identify project boundaries, the diffuse nature of the emissions, and the scope of change required in the trans- port sector are all factors that make them difficult to assess. As a result, the current carbon market is insufficient for the transportation industry, and a different sector-based mechanism may be needed.

As an alternative, cities may be given a bigger responsibility in reducing greenhouse gas emissions from transportation and adopting national relevant mitigation measures143 for deployment at the local level. Undoubtedly, there is a compelling argument for incorporating current financing sources for climate change mitigation into the clean development mechanism, including the Global Environment Facility (GEF), the Environmental Fiscal Reform, and Official Development Assistance (ODA). Additionally, there may be significant potential for developing nations and cities to adopt a less carbon-intensive trans- portation strategy. By treating energy security as a public good that can be valued and converted into a cash flow, the Sustainable Fuel Partnership, for instance, is investigating the justification behind a new market mechanism to

provide energy incentives for improving energy security in the Asia-Pacific region. This will help to address market inefficiencies. This will be accomplished by using "fuel security credits" that are intended to decrease actual oil consumption, invest in less energy-intensive transportation projects, look into ways to avoid trips, promote the use of public and non-motorized transportation, and advance technology. There are also significant overlaps between many general development programs, which are funded by official development assistance, and global public goods programs, which include strategies for mitigating climate change, like public investments in clean transportation.149 Additionally, although it is not currently mentioned specifically, there should be significant room to include funding for sustainable urban mobility, particularly in developing countries.

CONCLUSION

Compact cities are the most effective settlement pattern on earth when they are thoughtfully designed and suitably supported by sustainable infrastructure. Urban density provides for better protection of natural areas and minimizes the total geographical impact of development. Additionally, it enables more effective use of transportation infrastructure, which lowers emissions and resource consumption. To overcome these obstacles, policy interventions are required that promote change in five key areas, namely: a decrease in the number of motorized trips taken (e.g., telecommuting, online shopping, or a switch to non-motorized transportation); decreased travel distances in cities (e.g., changes to the urban form); changes in the modal split (e.g., encouraging public transportation); and technological advancements that lessen the negative externalities of motorized transport (e.g., The majority of policy interventions may be divided into three categories: regulatory actions, pricing actions, and investments in infrastructure for public transportation and other non-motorized modes of transportation. To promote a modal shift toward public transportation, regulatory measures may be employed to limit the number of automobiles on the road at any one time or to limit the number of parking spaces in inner-city regions. Such actions might be taken to lower emissions from motor vehicles, promote the use of energy-efficient automobiles, and promote the more effective use of infrastructure and vehicles, for instance by establishing specialized lanes for high-occupancy vehicles.

The use of private motorized transportation may be discouraged by the use of pricing mechanisms such as electronic road pricing, congestion charging, parking pricing, fuel taxes, etc., or it may be encouraged through the use of more energy-efficient cars through the application of sales duties based on engine size. Similar to the previous example, these policies may also take the form of subsidies to promote the use of public transportation (fare subsidies) and the purchase of more fuel-efficient automobiles (subsidies on low-emission fuels, vehicle purchase prices, exemptions from congestion or parking fees, etc.). Investments in public transportation and infrastructure for non-motorized and public transportation may also be very important in promoting changes to more environmentally friendly modes of transportation. City dwellers are being encouraged to rely less on private cars due to improvements in connection, capacity, quality, and trip times for these modes.

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CHAPTER 18

ECONOMICS AND FINANCING OF URBAN MOBILITY

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ABSTRACT:

Urban mobility, the movement of people and goods within cities, is a critical aspect of modern urban life. It plays a significant role in shaping urban economies, social dynamics, and environmental sustainability. This paper focuses on the economics and financing of urban mobility, examining the key economic principles and financial mechanisms that influence the planning, operation, and sustainability of urban transportation systems. By discussing the economic characteristics of urban mobility, including the demand for transportation services, the supply of transportation infrastructure, and the market failures associated with transportation externalities, such as congestion, air pollution, and greenhouse gas emissions. It also highlights the economic benefits of efficient and sustainable urban mobility, including increased productivity, enhanced accessibility, and improved quality of life. The financing of urban mobility, examining the various funding sources, mechanisms, and challenges associated with financing transportation infrastructure and services. It discusses traditional funding sources, such as government revenues, user fees, and public-private partnerships, as well as innovative financing approaches, such as value capture, congestion pricing, and mobility-as-a-service (MaaS) business models. It also explores the equity implications of different financing mechanisms, including issues of affordability, accessibility, and social equity.

KEYWORDS:

Active Transportation, Air Quality, Bicycle Infrastructure, Carpooling, Clean Transportation, Climate Change.

INTRODUCTION

This aims to explain the economics and financial possibilities that affect whether urban transportation systems are successful or unsuccessful. Every one of these systems offers a variety of transportation choices, from walking to rail-based metro systems. The different urban transportation options are competitive and complimentary from an economic standpoint. They are comprehensive because individuals often utilize many modes of transportation as they go about their everyday lives in cities. These modal options often compete for passengers at the same time. Understanding the incentives and disincentives encountered by purchasers and sellers of transportation services is necessary if more efficient and sustainable transport systems are to emerge from such complex networks.

The costs of these options and the ways in which these costs are financed directly through fares, indirectly through taxes and fees, or absorbed as pollution, climate change, congestion, road

traffic deaths and injuries, or other social costs have a significant impact on how urban transportation options emerge and develop. In light of the effects on the decisions taken to expressly cover or implicitly absorb the expenses, this article analyzes the economics and finance of urban transportation[1].

The importance of financial arrangements is usually utmost in discussions about urban transportation economics. Financial systems have the power to promote or inhibit the coordination of social, environmental, and economic objectives. There are social, geographical, environmental, and equitable effects of differences in investments and operating budgets across modal choices. As the different modes compete for limited urban space and market shares, they might be advantageous or detrimental. These decisions are always being made, whether intentionally or unintentionally, and the outcomes in this respect are a direct effect of and influence on public policy.

Understanding the economic links between and within urban transport modes is crucial in order to comprehend the financial dynamics. All other modes of urban transportation, from walking to driving a car, depend on access to a common network of sidewalks, streets, roads, and highways, with the exception of rail-based modes which operate on segregated rights of way. Because they share and often compete for the same public infrastructure, distinct urban mobility modes while seeming to be physically and financially independent of one another are really physically and financially interconnected. Making strategic decisions on the channels through which the infrastructure and tools that support urban public transportation are funded is necessary for the advancement of urban mobility networks. Public transportation has to be promoted as both a practical substitute for private vehicles including motorbikes and a solid ally and addition to non-motorized mobility. Therefore, it is necessary to address the incentives and disincentives included in the present financial structures[2].

The first part provides a quick summary of the circumstances and patterns that govern the economics of urban mobility in order to address the challenges mentioned above. The consideration of the economic contribution of transportation to the operation of an urban economy and the need of shifting away from the economics of mobility and toward the economics of access follows. The comprehension of the systems of incentives and disincentives included into the present financing techniques for urban transportation networks is developed in the fourth part. Based on this debate, the fifth part makes policy and plan recommendations that will enable urban transportation to significantly contribute to the creation of socially and environmentally sustainable cities. The last section also offers some closing thoughts and policy-relevant lessons. The main economic characteristics of urban transportation are covered in this section. Since private motorized transportation is the least ecologically sustainable and most land-intensive mode of transportation, the study starts by looking at changes in private automobile ownership and usage. It then analyzes user costs, construction expenses, and operating costs for different urban transportation options.

DISCUSSION

The global dominance of private motorized transport. Global urbanization is on a collision course with the world's urgent equity and environmental concerns due to the dominance of the private car as the preferred mode of urban transportation, as shown in 1 and 2. If current car-ownership trends continue, the outlook for non-motorized and public transportation is not encouraging.The data show a substantial positive correlation between growing income levels and

rising rates of automobile ownership; as income grows, car ownership climbs. Wealthier citizens are far more likely to possess automobiles inside nations. For instance, in Santiago, Chile, and Bogotá, Colombia, modal split is highly connected with socioeconomic categories. In Santiago and Bogotá, private automobiles are used by 80% of the high-income group compared to public transit being used by 70% and 60% of the low-income groups, respectively. Estimates suggest that for every 1% increase in average disposable income, car ownership in Chinese cities is expected to increase by 1.8%.5 So Paulo is another example of the trend; bus ridership fell by nearly half (from 6.7 million to 3.8 million passengers per day) during the 1990s. China, with only 44 passenger cars per 1000 people in 2010,4 is another country where this trend is evident. Bus speeds decreased from 19 to 12 kilometers per hour at the same time as automobile usage and traffic congestion increased. Although there is a considerable correlation between income levels and automobile ownership in low-income nations, this association is rather minor in high-income ones. A general rise in wealth in these nations might have a substantial effect on automobile ownership since the bulk of the world's population resides in low-income nations.

The irony of this facts is that as living standards grow in emerging nations, communities will face increasing pressure to accept private motorized transportation, with all of its attendant detrimental impacts. When economic development strategies are effective8, economic expansion will increase the need to buy expensive property for parking lots and highways. The simple explanation for this is that, given the current state of urban public transportation, private motorized transportation is almost always regarded as the superior option whenever people have the means to do so.9 One effect of this perception is the support for transportation financing policies that prioritize expanded street and road networks to accommodate expanded reliance on car-based transportation, while other options languish[3].As a result, from an economic perspective, the main problem is to make sure that funding for public transportation, non-motorized transportation infrastructure, and service delivery is at least on par with efforts to accommodate the vehicle. Less would almost guarantee that public transportation would continue to be the lesser option.

Features of the economy by manner and context

Walking and biking are examples of non-motorized transportation, along with public transit, unofficial motorized transportation, and private motorized transportation. Each of these forms has unique economic properties that are heavily influenced by contextual elements such city size and density, geography, demography, institutional framework, and history.The relationship between modal usage, infrastructure finance, and modal use is often somewhat disjointed. In other words, a significant section of the population relies on non-motorized or public transportation, whereas financing and infrastructure support for private motorized transportation are disproportionally low. For instance, in Dhaka, Bangladesh, almost 80% of trips are made by walking, bus, or informal motorized transport, but 70% of the road space is devoted primarily to private vehicles. In some Eastern African cities, however, accommodating private vehicles results in 50% of the total system costs. This section provides an overview comparing the economics of the various modes of transportation[4].

Transport without a motor

Because they simply need sidewalks and designated street lanes, non-motorized modes are very cost-effective because they have the lowest up-front and ongoing expenses. They are also the least costly for people who merely burn calories and have access to reasonably priced bicycles.

Non-motorized transportation is thus the primary mode of transportation in many developing nation cities.Despite being relatively inexpensive, non-motorized transportation infrastructure (pedestrian bridges, paths, sidewalks, and crossings) is woefully lacking in many urban areas, making it a relatively unsafe and frequently inconvenient mode of transportation.13 However, the historical nature of urban transportation policy has a clear bias towards motor vehicles. As a consequence, non-motorized transportation has either received no funding at all or a budget that is inadequate. The main reason why non-motorized transportation facilities are underfunded in cities of developing countries is that they do not produce "revenue," so private investors and foreign lending organizations are not eager to provide funding, even though the cost is frequently out of the reach of the cities. This is a paradox because most trips include at least one segment of walking.

Public transportation

In general, public transportation can offer excellent access within urban areas if it is affordable to the user, frequent, predictable, safe, and integrated into a comprehensive network.16 However, public transportation frequently entails high capital and operating costs compared to private cars, despite being unquestionably more environmentally sustainable.Despite large variations in capital costs, rail typically has greater expenses than other public transportation options. This is true regardless of per capita national income. The projected total capital cost per kilometer for metros (in 2002 dollars) is between $50 million and $150 million.18 BRT construction costs (i.e., stations and designated lanes) are much cheaper and the systems are constructed more quickly than rail. In India, the first phase of the BRT system in Ahmedabad cost only 5% of the capital cost of the Delhi Metro (US$1.4 million and US$30 million per kilometer, respectively), and a US study from 2001 found that the average capital cost per kilometer of BRT lines was about US$8.4 million, compared to US$21.6 million for light rail.20 Tunnel excavation is a major factor in the high cost of metro construction. According to estimates, building metro lines underground costs between four and six times as much as building them above ground. BRT does often cost more to operate and maintain than rail, however[5].

The main sources of funding for public transportation are fares, subsidies, and value-capture agreements. The most contentious aspect of funding for public transportation is probably the fares. Cost recovery from fares might vary significantly. Many times, fares are out of reach for sizable portions of the population. Therefore, it is necessary to look for wider-based subsidies as well as international aid to support public transportation systems. These include taxes on people and businesses as well as on commerce, industry, and sales. Tolls collected on the nearby metropolitan area's bridges and tunnels may also be used to fund public transportation. In London (UK), congestion fees paid by drivers of private automobiles entering the central business area help to support public transportation in part. The combination of public transportation subsidies should generally result in a source of income that is consistent and stable throughout time, and not susceptible to political and economic upheavals (as in New York, US). To collect and disperse money for public transportation on a broad scale, it is vital to have effective regulatory and controlling structures.

Although it is typically presented as a third method of financing, the congestion charges and real estate transaction fees mentioned above could be fairly interpreted as forms of value capture. Value capture is the practice of linking fees and taxes on the indirect but real beneficiaries of transport access. It has recently emerged as an attractive political approach to the challenge of

creating sustainable revenue sources for public transportation. The Hong Kong public transportation system's sustainable financing approach is the most commonly referenced modern example of value capture. The goal of Hong Kong's value capture policy is to guarantee that investments in transportation infrastructure or operations get all or a part of the value generated by and incorporated in the location value of property parcels that can be attributed to transportation. In public transportation projects, public-private partnership concessions have had varying degrees of success (for examples, see the London Underground, New Delhi's disastrous attempt to privatize its bus system in the early 1990s, and failures like to these in Pakistan).

Motorized Informal Transportation

From the standpoint of the user, informal motorized transportation (such as minibuses, shared taxis, motorcycle taxis, etc.) might function similarly to public transportation, but is often run by for-profit businesses or people. It is possible for each informal transportation system to have a separate pricing structure from the rest of the public transportation network. Additionally, as mentioned in 6, informal transport buses in Tanzania and a number of other nations will not carry students who are not paying for transportation. The informal transportation system's fare structures often alter based on consumer perceptions of price sensitivity and market sectors. Different fee structures were charged to regular customers (lowest), casual customers, goods and prostitute runs, and tourists (highest), according to a study of the Malaysian trishaw industry.33 Differentiated pricing is also seen when weather or road conditions vary. As in most of South-Eastern Asia during the monsoon season, prices are often increased during periods of severe rain in Nairobi, Kenya.

Informal motorized transportation makes advantage of the roads and other infrastructure that society has built. They often don't have constructed stations instead using roadside stops that frequently cause other vehicles to be held up and delayed. As a result, their capital expenditures are relatively cheap, and their running expenses are also kept to a minimum via low pay and little overhead. Since fuel and maintenance are less costly, motorcycle taxis are even more affordable to run than minibuses. Although profit margins may be slim, informal motorized transport may make money from rider fees because of these implied subsidies, a lack of administrative costs, and freedom from laws (which may prevent safety and environmental issues)[6].

These kinds of circumstances show how unreimbursed societal expenses support the capacity of informal sector transport providers to make a profit. Despite the fact that police and other government authorities are known to routinely demand payments from informal transport providers, legally collecting fees and taxes from these forms of transportation has proved to be bureaucratically challenging, like in Cotonou, Benin36. To enhance service and safety, many communities in developing nations struggle to formally enact public transit.

Motorized Personal Transportation

The costliest form of transportation for the traveler is often private motorized transportation, including automobiles and motorbikes. The usage of private automobiles rises with wealth, as was seen in the preceding section. 7 percent of Addis Ababa, Ethiopia, inhabitants use private vehicles, compared to 87.9 percent of business travels in the US38. Travelers must buy or lease a car, acquire insurance and registration, pay tolls and fees, buy gasoline, and maintain the vehicle.Each private car lowers space and diminishes the quality and speed of the journey for all other vehicles, creating a choke point of congestion. Private automobiles may potentially

obstruct the functioning of public transit, depending on the system's architecture. Nevertheless, it might be difficult to estimate the cost of congestion.

Value of the Transportation Sector Economically

Urban transportation is an essential urban public utility and a crucial component of the city-region's economy. The transport sector's total size varies from country to economy, although it often makes up a modest but important component of GDP. For instance, in the US, transportation contributed roughly 8.5% of GDP in 2009, as opposed to between 3% and 8% in Asia and the Pacific nations. The need for transportation is what economists refer to as a derived demand, meaning it was created in order to achieve another objective. Rarely is transportation of persons and things done for its own sake. Spending on transportation has a significant direct and indirect impact to overall productivity and job generation. As a result, it's critical to design transportation systems that are as cost- and social-beneficial-effective as they can be. In Houston (US), where more than 70% of commutes are made in personal vehicles, the expense of urban transportation accounts for 14% of GDP. In New York City (US), where more than 50% of commuters use public transportation, the similar percentage is 9.4%, or almost one-third less of the local GDP.

Urban transportation is a significant contributor to both production and consumption in cities, as well as a significant employer. According to conservative estimates, there were over 13 million full-time equivalent jobs as transport operators in the official public transport industry worldwide in 2009. Of these occupations, roughly 7.3 million are direct jobs held by public transport operators (8.1). The remaining individuals are either directly employed by public authorities (300,000 persons) or engaged in the supply of products and services to public transportation authorities and operators44 (5 million individuals). In Amsterdam (the Netherlands), Barcelona (Spain), Brussels (Belgium), Genoa (Italy), and Dublin (Ireland), public transportation providers are the greatest employment. Public transportation providers are among the top employers in Paris (France), Budapest (Hungary), Porto (Portugal), Madrid (Spain), Turin (Italy), and Tallinn (Estonia)[7].

However, in many developing nations, work in the informal sector dominates the transportation sector46. In most Sub-Saharan African cities, employment in the informal urban transport sector is a key component of the local urban economy. The majority of the 80,000 direct and 80,000 indirect employment in Kenya are provided by the country's 40,000 matatus (urban minivans). In South Africa, the 'Kombi taxi' (urban minivans) generated over 185,000 direct jobs and 150,000 indirect jobs in 2003. Between 40,000 and 60,000 individuals are reportedly employed by the informal minivan business in Kampala48. These figures illustrate to the significant employment value of the informal transport sector in many developing nations. Additionally, the transportation industry often generates greater income totals. Worldwide, it has been projected that every US$1 of value produced by public transportation is related to an additional US$4 of value creation. In Geneva, it has been calculated that for every US$1 invested, US$3.8 of value is added. Additionally, "every direct job in public transportation is linked to four jobs in other economic sectors"50. Comparable multipliers are shown in the US, where more than 36,000 jobs are produced for every US$1 billion spent in public transportation.

The construction of networked infrastructure, including sidewalks, streets, roads, highways, and trains, results in the production of the transportation service. Thus, the creation of this infrastructure contributes to both current employment and future production. Between 2005 and

2030, it is predicted that around US$7.8 trillion will be invested worldwide on transportation infrastructure projects (8.2). The development of public transportation infrastructure in the US appears to have almost twice as much of a job-stimulating effect as a comparable amount spent on highway infrastructure, which is worth noting52. However, what is perhaps most striking about the data is that the regions with the lowest projected infrastructure investments are likely to experience the most severe urban mobility challenges. The entire yearly cost of road traffic accidents has been estimated at US$518 billion, or around 1-3% of worldwide GDP. While these costs are sometimes disregarded in the context of transport economics, they should always be taken into consideration in policy-making.

Away from Mobility Economics and Into Access Economics

The fact that private motorized transportation requires disproportionate support is one of the strongest arguments in favor of doing so. The development of urban transportation policy as a result encourages an increased dependence on mobility to address urban congestion and access issues. Mobility is just one of two ways to get access in the context of urban life, however. Access may also be attained via the co-location of urban activities, as was mentioned before in this paper. The appeal of greater mobility as a practical problem for policy-making is that it is simple to assess and, therefore, to value, but co-location, or mixed-use urban land arrangements, is challenging to monetize. Due to this methodological restriction, cost-benefit assessments have been slanted to favor infrastructure improvements that support mobility over those that would promote co-location.

This section revisits the structuring of cost-benefit methods to transportation project assessment and demonstrates how and why the priority of mobility over access results in the promotion of private motorized transport over more environmentally friendly modes. The treatment of urban transportation as an economic good often concentrates on its mobility value, which is typically measured as travel time saved. This is because it is assumed that if mobility promotes access, measuring the value of travel time saved is a good proximate measure for the ultimate end product, i.e. more time for other activities. Time spent moving, or mobility, offers a strong foundation for assessing transportation improvements since it is such an easy concept to grasp and quantify. The project is considered beneficial if the benefits outweigh the costs. This realization led to the development of current cost-benefit analysis for transportation decision-making[8].

Governments, international financial institutions, and bilateral donors increasingly use cost-benefit analysis as their main decision-making tool for big public works projects. Few people now challenge the limitations of adopting improved mobility as a stand-in for urban access since its components have become so conventional.

But it's critical to reconsider this strategy now that the financial and environmental costs of mobility are becoming harder to bear. An analysis of a variety of cost-benefit studies on transport conducted recently in the UK found that time savings are responsible for around 80% of the advantages associated with transportation. However, over the last three decades, the amount of time spent in urban transport in the UK has been steady at around one hour each day. trip log studies show that the advantages of transportation advancements over time allow a wider variety of spatial access within the same trip time budget.59 If this is the case, it is important to differentiate between "the value of access" and the hypothetical advantage of "time saved" while evaluating trans-port investments[9], [10].

CONCLUSION

In conclusion, developing and operating sustainable transportation systems in cities requires careful consideration of the economics and finance of urban mobility. Demand, supply, market imperfections, and benefits are a few of the economic concepts that underpin urban mobility that have been covered in this essay. It has also looked at the equity implications of a number of funding methods, including government revenues, user fees, public-private partnerships, value capture, congestion pricing, and mobility-as-a-service (MaaS) models. How crucial it is to match financial incentives with sustainability goals in order to advance effective, fair, and environmentally responsible urban transportation. Pricing, subsidies, and other economic tools, as well as legislation, may have a big impact on how people travel and promote the use of environmentally friendly forms of transportation. Emerging technologies, such as electric cars, self-driving cars, and digital platforms, bring potential and difficulties for urban mobility funding and economics, and they must be properly taken into account in transportation planning and policy. Given that every city has a different environment, set of issues, and set of possibilities, it is evident that there is no one size fits all solution to the economics and finance of urban mobility. In order to build sustainable transportation networks in metropolitan areas, it is crucial to use an integrated and comprehensive strategy that takes into account economic, social, environmental, and equitable considerations. Urban mobility solutions must be successful and sustainable, which requires evidence-based decision making, stakeholder involvement, constant monitoring and assessment of financial systems, and policy interventions.

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CHAPTER 19

A STUDY ON HIGH PRIVATE COST OF TRANSPORT

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ABSTRACT:

The high private cost of transport is a significant issue faced by individuals, households, and businesses in many urban areas. This paper examines the economic implications and challenges associated with the high private cost of transport, including the impacts on household budgets, business operations, and overall economic competitiveness. By discussing the factors that contribute to the high private cost of transport, including vehicle ownership and operating costs, fuel prices, tolls and fees, parking expenses, and insurance premiums. It explores how these costs can impose a significant financial burden on households, particularly those with limited income and mobility options, and affect their ability to access employment, education, healthcare, and other essential services. The economic impacts of high private transport costs on businesses. It discusses how transportation costs can affect the competitiveness of businesses, particularly those that rely on transportation for the movement of goods and services. It also examines the indirect costs of transport, such as congestion and delays, which can increase operational costs and reduce productivity for businesses.

KEYWORDS:

Automobile Expenses, Car ownership, Commuting Costs, Fuel Costs, Insurance Costs.

INTRODUCTION

Transport contributes considerable value to the local economy to the degree that it enhances an urban area's capacity to optimize the agglomerative advantages of access, or the economies of market density and supplier density. The rise in productivity per worker as a consequence of better access would serve as a workable definition of the advantages of agglomeration. These computation techniques are used in a recent analysis of London's Crossrail project to calculate access advantages in addition to travel-time savings benefits. The benefit-cost ratio for conventional time savings based benefits increased from 36 to 93% when these agglomerative benefits were added to the more traditional time-cost savings advantages. The essential thing to remember is that these estimates provide an empirical sense of the substantial advantages that access imparts, even if the methodology employed to evaluate these impacts may be disputed and have generated a lot of controversy. The notion that access and subsequently economic welfare might be increased via the co-locational features of locations is most significant for issues of economic sustainability. This calls for a greater emphasis on foot and bicycle traffic, as well as more and better public transportation alternatives, all of which are essential to the viability of sustainable urban transportation from an economic standpoint.

Road traffic accident costs are frequently disregarded in the context of transport economics, but they must always be taken into consideration when making policy.Both a private and a public good, urban mobility. The complexity of mobility as an economic benefit must be taken into account in an economic study of sustainable urban transportation. Because it is feasible in the setting of private marketplaces where buyers and sellers agree upon quantities and prices, mobility lends itself to the basic economics of supply and demand. Even the existence of 'externalities' is correctable through disincentives, such as taxes on negative externalities (like air pollution), congestion charging, and parking fees (8.5), to deter excessive car use, and incentives for positive externalities, like access to 'free' bicycles and well-designed, pedestrian-friendly streets.

In terms of economics, competition in consumption and excludability in ownership are the two traits that set mobility apart as a private commodity. Rivalry is the idea that anything one person eats cannot be devoured by another. A second person cannot occupy the same seat for the same journey as someone who has purchased a ticket for a specific seat on a railway. Excludability refers to the ability of the vehicle's owners to prevent anyone who have not purchased a ticket from boarding.

While there is a strong argument for mobility as a private benefit, there is an even stronger case for the access that mobility fosters as a public good, and for the same reasons. Inverting the two qualities of a private good non-rivalry in consumption and non-excludability in ownership implies the existence of a public good. Access is defined by its non-excludability and lack of competition. When one person enters the city by working or residing there, she does not hinder the entry of another person. In reality, she makes it more valuable for someone else to enter the city. Although there may be certain exceptions, because there is no entrance price to a city, access to its possibilities is also non-excludable. However, depending on traffic and pricing, the mobility choice one must employ to get there could be characterized by both competition and excludability. Due to its reliance on the assumption that private commodities exist, the normal economic analysis of supply and demand is therefore only partially effective in creating viable financial models to support urban mobility.

The ideal planning and policy aim for an economics of sustainable urban mobility is one that prioritizes maximum access and least transportation. A sustainable city is one in which moving people and products requires the least amount of resources feasible. The intended social benefit is the co-locational characteristics of the city, which are the opportunities for specialization and innovation made possible by the density and variety of people and businesses. Access to these products is made possible via mobility. The value provided by transportation in expanding accessibility while minimizing the environmental and social costs of mobility is related to the economic sustainability of urban mobility. Cities are hence the co-location of activities to reduce the necessity for travel as physical realities[1], [2].

Although required, road tolls often aren't enough to increase accessibility in cities.There is strong evidence that most nations' vehicle users do not pay enough to fully offset the costs of this method of transportation to society.61 Practically speaking, this means that society as a whole is inadvertently funding private motorized transportation (by spending money on mitigating economic, social, and environmental externalities). The common diagnosis from the perspective of traditional microeconomics is that the market for urban automobile transport is inefficient. 'Getting pricing right' is one of the policy recommendations to address such inefficiency.

The policy suggestions that follow from 'proper' pricing include finding ways to effectively increase the cost of driving in order to better reflect the environmental and social costs that this form of transportation imposes on society. This strategy, known as "full cost pricing," aims to impose on motorist's permits and fees that roughly reflect the economic worth of the associated social and environmental costs. An example of this may be seen in Singapore, where the government has put in place a variety of financial incentives to reduce the use of private automobiles and promote the use of non-motorized and public transportation. Even if this strategy did as expected, it would still be an unending urban nightmare if put into effect.

There are public transportation options, along with pedestrian and other non-motorized modes of travel that may significantly impact both individual mobility and urban sustainability, as the research given in this paper demonstrates. The promise of improved public transportation is shown by the experiences in several Asian and European cities, where travel times on public transportation are faster than those of private vehicles. In light of this, a more pragmatic reading of is that it accurately captures the way things are: a less than ideal option between an often hazardous and unreliable public system and being snarled in traffic in a car-based system. However, public finances, not private market judgments, serve as the ultimate arbitrator of the scope and caliber of urban transportation alternatives. Once one advances beyond walking and other non-motorized means of transportation, motorized modes of transportation are never completely funded by fees to users, which makes public financing the critical determinant of the choices that define private markets. Beyond what customers directly pay, motorized transportation needs additional support, as mentioned in the section. Policymakers must acknowledge that user fees will never be enough in order to create urban public transportation systems that are both adequate in terms of quality and quantity and that also decrease environmental and social justice issues[3].

DISCUSSION

Achieving either a zero balance between revenue and expenditure or a positive cash flow to support future developments is the ongoing financial issue for every metropolitan public transportation provider. This calls for closing the gap between fare revenues and the total cost of service while promoting effective operations in a way that is long-term sustainable. Both the problem and the remedies are neither simple or without debate. The extent of this persistent financial shortfall is examined in this section. Possible remedies are discussed in the next section.

User fees are never enough to fund public transportation.There is no logical theoretical justification why urban public transportation cannot recover all of its expenses via user fees. However, as mentioned in Section 8.1, there are very few situations in practice where fares represent both full cost recovery and enough profit to allow a private market to sustainably meet passenger travel needs.65 The situation in some developing nations, like Poland in the early 1990s, best illustrates the issue:

This example brings to light the two approaches that policymakers have used to'solve' the cash-flow issue: fee hikes and competitive bidding. These measures often fail because policymakers frequently lack clarity on their desired outcomes. Is urban transportation a public good that also provides some private advantages, or vice versa? The results for policies vary greatly depending on how that question is answered. This research is based on the unmistakable assumption that urban transportation is fundamentally a public benefit since it makes access easier. The objective of the policy is to increase the usage of public (and non-motorized) transportation. Its private

good characteristics can be used to generate part of the required cash, but that won't be enough on its own. Public transportation has a better likelihood of success if it is only seen as a private mode of transportation to meet personal needs, but this success comes at a cost. In order to have a sustainable or equal influence on urban spatial patterns, the transportation system must either function at a sufficiently high volume, or if it does, its quality is so poor that everyone avoids it. The upshot is rising rates of automobile ownership and travel for work and school. Recognizing that other income sources outside the fee box are required in order for urban public transportation to provide its important public goods advantages (i.e., to increase access) is the first step in overcoming the financial barrier.

The fare box and organizational changes, such competitive bidding to increase efficiency, that policymakers and bureaucrats attempt to make public transportation self-supporting via invariably fall short. Fare policy and organizational structure are not trivial; on the contrary, they are of the utmost importance. If accessibility is the policy aim, these second-order requirements by themselves are insufficient. The issue for policymakers is to expand both the service's mass, sustainable use and to support alternative income streams to the fare box. The objective is to develop workable financial models that match organizational structures for providing services with the particular transportation requirements of each metropolitan region. The issue on the consumer side, as was said above,67 is that although travelers in underdeveloped countries do pay high transportation costs relative to their income, the quantity is inadequate compared to the revenue amounts necessary for complete cost recovery. Urban and low-income populations usually have substantial transportation costs, whether they are expressed in terms of money or time. Costs are often expressed in monetary terms in industrialized nations. People in poorer nations often spend a greater portion of their waking hours traveling[4].

High expenditures associated with poor transportation are sometimes not allocated fairly within the city or among families. Women could be stuck trying to combine childcare and work excursions, the elderly might make fewer journeys, and kids might have arduous or hazardous school trips, for instance. For high-income people and households, these expenditures may represent anywhere between one-tenth and one-fifth of income when calculating travel expenses alone in terms of personal or family earnings. It may make up close to half of the income for the impoverished. Users' ability to generate funds to cover the expenses of running the urban transportation system is constrained by these financial restrictions. The severity of this issue is particularly apparent in poorer nations. It is obvious that using an excessively unequal approach—increasing expenses for people currently paying fares that heavily burden their capacity to pay—to address revenue deficiencies would not likely be successful.An effective urban transportation system is the answer.Urban transportation's worth is directly correlated with how well it functions as an integrated system, as opposed to a collection of separate modal alternatives and route-specific options. Urban areas provide greater value because inhabitants have more alternatives for getting to job, school, shopping, social connections, etc.

Studies from Nairobi (Kenya), Lagos (Nigeria), and South Africa reveal that transportation expenditures account for 15 to 54% of family income for lower-income families. The price of public transportation is exorbitant and inadequately controlled. For instance, bus drivers often compel passengers to get off and pay another fee to go back on in Lagos. Riders often have to haggle with drivers about the rate. Poor people's access to necessities is hampered by high transportation expenses. It decreases national and local economic efficiency as well as the effectiveness of individual economic activity.Additionally, a 1990 survey of four towns in

Eastern Africa revealed that accommodations for non-motorized transportation, such as walking and cycling, were insufficient. Walking satisfies up to 50% of the demand for transportation while costing only 1% of the total. Contrarily, less than 10% of the demand is satisfied by private motorized transportation, but more than half of the expenses are incurred.

The risk to finances comes from the tendency to emphasize individual pathways rather than systems while trying to save money. When travel demand is sufficiently high, individual routes may sometimes recoup their construction expenses as well as part or all of their operational costs. This often happens in busy public transportation corridors that go through areas of metropolitan central business districts with the greatest densities. The finest instances of this are Singapore and Hong Kong. However, the value of access as a public benefit comes from the presence of complete urban transportation networks, not simply from travel on their busiest routes.69 Less-busiest routes are often more expensive to run than can be covered by fee revenue. However, without these feeders, we wouldn't have the variety of options that help to build urban value. The level of valued access the system generates increases with the degree of system integration inside and between modes. Publicly funded expenditures in service delivery, infrastructure, and equipment are necessary to reach that worthwhile objective.

Increasing the financial options for non-motorized and public transportation. The following four strategies (as well as combinations of these) are examined in this section:direct distributions derived from general national and local income (i.e., general taxes);further grants from governmental sources;financial arrangements that let the transportation system to "capture" some of the value they generate from urban access;There are further structures that let public-private partnerships to profit from the value that transportation networks generate.

General models for revenue

By allocating funds from general tax revenues, governments most often fill the budget gap for urban transportation. It displays a widespread conviction in the worth of the public benefits that the service produces. This structure may be effective to the degree that governments see public transportation as as one of many other public services like law enforcement and education. For instance, China uses this strategy often. The local municipal government normally provides general revenue allocations to promote urban transportation, with rail-based transportation receiving preference over bus-based transportation. The government of Shanghai budgeted an extra US$541 million71 to guarantee smooth operations in 200972 as part of its preparations for the World Expo[5].

Almost every city has certain general funds that are in some manner utilized to assist the municipal transportation system. The running expenses for the commercial businesses that provide the services, including discounted and free tickets for specific categories of customers, are covered by the rates on the BRT system in Curitiba, Brazil. However, the user-generated income falls short of fully funding the infrastructure. The municipality uses its general income streams to fund the creation and maintenance of the system's street-based exclusive rights of way. The political susceptibility of general income as a source of funding is one of its flaws. Any kind of public assistance is often seen as ephemeral and readily administered in places where public transportation is generally seen as a private product because of the perception that the country's financial woes are the self-inflicted injuries of an inefficient business. This is particularly true during lean financial periods (like the present global financial crisis), when politicians may use this justification to find politically convenient areas to decrease public

expenditure. Every time there is a loss of funding, there are service cutbacks and fee increases at a time when more people need mobility to find job and have less money to spend on it.

Changes in political leadership at the local and federal levels are another kind of political vulnerability that should be discussed in this context. This is true for both shifting political trajectories brought on by the growth and fall of support for certain political parties as well as the departure of individuals who may have led particular transportation-related efforts. In five cities in industrialized countries, gives an overview of the sources of operational money for public transportation. According to the, TriMet in Portland, Oregon, Translink in Vancouver, Canada, and Sytral in Lyon, France all derive more than three-quarters of their operating income from either fares or dedicated tax revenues (over which they have some degree of control). Operators that depend on direct government financing for their income sources, such as municipal, provincial, or federal governments, may be more vulnerable to the adverse impacts of shifting political environments[6].

However, funding for such infrastructure investments could also be derived from revenues from advertising, road pricing/taxes, and private-sector participation. Ideally, funding for non-motorized transport should come from normal operative budgets from departments dealing with transportation and public works. However, it should be mentioned that many low-income individuals in developing nations are so destitute that they find even the most affordable bicycles to be too costly. The poorest urban dwellers should thus be able to afford bicycles thanks to financial choices included in non-motorized transport regulations in these nations.

Other governmental funding distributions

Many governments have also appropriated funds from other revenues and tax incomes, primarily from indirect beneficiaries, i.e., people and organizations who are not necessarily public transportation users but are thought to benefit from the reduction in traffic. This is because public funds to finance public transportation are limited. About 10% of the toll system's yearly income go toward running expenses, with the remaining funds going toward expenditures in roads and public transportation. Since then, several towns throughout the globe have adopted other methods. It is doubtful that the tolls will cover more than operation and maintenance, and maybe a portion of the building cost, in developing nations with low traffic volumes or expensive construction expenses. For instance, in Mexico, the currency crisis of 1994, lower than anticipated revenues as a result of traffic shortages, overly high toll charges, and failed road concession projects have all been blamed.

Urban road pricing programs are intended to provide the social advantages that are wanted, but experience has shown that there are significant challenges that must be overcome throughout the planning stages in terms of equality, public acceptability, politics, economics, technology, and pricing scheme design. The city of Hong Kong contemplated implementing an electronic congestion solution in the 1980s. The effort, however, was a failure since the public's reaction was negative and there were serious privacy concerns regarding the government's capacity to monitor users' identities and movements.

Models of Value Capture

It is better to relate publicly sponsored forms of financial assistance as directly as possible to the advantages urban mobility bestows upon indirect recipients since direct public financing is

virtually always politically susceptible (especially during times of financial hardship). Location-based taxes and assessments that support transportation services have come to be known as "value-capture systems" in this context. The word captures the fact that urban transportation does, in fact, generate value for parties who are not directly using the service via external advantages. This strategy is politically attractive since it can explain how the cost links to the value and can provide high-quality assistance in line with the requirements of a developing community.

The most well-known example of a public transportation provider covering all costs and turning a profit using a value-capture model is undoubtedly Hong Kong78. The Mass Transit Railway Corporation (MTRC), the service provider, has a special public-private corporate structure that contributes to this unusual situation. It serves a big city's need for transportation while also being heavily influenced by the demands of the private market for profits due to the public selling of its minority shares. The whole Hong Kong area gains significant advantages from this arrangement in terms of urban access. Additionally, the MTRC is able to maintain urban public transportation via the process of value capture because of a direct connection to the continuous real estate returns.The way the practice has developed in Hong Kong is distinct from other places because of the institutional setup[7].

The core idea, nevertheless, is applicable in many situations. Although the phrase "value capture" is relatively new, the idea has long been recognized as a crucial component in the development of urban public transit. The lesson from the Hong Kong experience is that value capture may be done while serving the general welfare. However, other cities also have a history of taxing real estate that benefits from infrastructure improvements in order to pay for transportation expenditures. For instance, in Bogotá, Colombia, this kind of funding has been used to build new roads, enhance public spaces, build bicycle routes, and build TransMilenio lines.

The key takeaway from the experience is the idea of establishing a body capable of bridging the gap between land use and transportation in support of improved urban access. Variations on the value capture concept include trials with parking fees, motorway tolls, congestion fees, and land taxes. The same idea underlies tax- increment financing: when a site's value rises as a result of the construction of new transportation infrastructure, the government can anticipate an increase in real estate taxes and borrow money against this anticipated tax revenue to pay for the construction of the transportation infrastructure.80 Likewise, private investors may contribute money to transportation projects in exchange for a portion of future profits.

Value-capture strategies perform best in places with a rising population and low beginning per capita automobile use. The first circumstance indicates that there is less opposition to eliminating dependency on automobiles, while the second circumstance indicates that the system has a large potential user base. These situations are essentially common in Sub-Saharan African and Asian cities that are experiencing rapid urbanization. Value capture by claims on increasing real estate income will often be underwhelming in places where population growth is slow or even dropping and automobile usage is widespread, as is the situation in many cities in North America and Europe.

The distance between places of residence and public transportation stations, whether they be BRT or rail, is the second most important element, supposing the appropriate demographic and mode usage criteria are present. According to estimates, property prices decrease by 1% for

every 10% increase in distance from a public transportation hub.83 Therefore, the relative real estate value increases and the possible base of support for the system grows the closer the target population is to the public transportation stations.

In particular, three institutional variables are crucial for the effective implementation of value-capture mechanisms:Municipal governments need significant capacity to assess property values, collect land taxes, and charge motorists congestion and parking fees.These governments need rigorous supervision over the assembling of land parcels that correspond with plans for the construction of trans- port infrastructure.The idea of public-private partnerships is adaptable and applies to a multitude of legal frameworks.For the public-private partnership to manage the accompanying real estate projects in a sustainable manner, the ability of the government to operate as an informed business partner is crucial.

Additional public-private partnerships

Value capture is a highly specialized application of a more general strategy for delivering public services known as public-private partnerships. It is used in Hong Kong. In order to supply a particular facility or service that is the obligation of the public, a public sector body (such as a ministry, department, or agency) and a private sector partner enter into a contractual arrangement. A paradigm for public-private partnerships does not exist in isolation. Instead, it is a versatile idea that may be used to a spectrum of contractual arrangements, from conventional methods of government procurement to complete private ownership of publicly utilized infrastructure.

In terms of infrastructure, these agreements might include planning, building, renovating, operating, maintaining, or financing just about any kind of public facility or service. From the standpoint of the public partner, the goal of these agreements with regard to urban mobility is to gain the advantages of pricey components of networked transportation infrastructure while avoiding the costs and hazards related with both building and maintenance. The main objective for the private partner is a respectable return on the cash invested. Such agreements include commitments that might last for many years.

Nevertheless, economists refer to these contractual arrangements as "incomplete contracts"85 because it is impossible to draft a legally enforceable contract that can anticipate every scenario in which the parties to the arrangement could find themselves. Due to the inevitable occurrence of disagreements during the course of the agreement, the parties often include clauses mandating arbitration or some other kind of third-party control to (hopefully) settle the disagreements. However, these arrangements are far less effective in reality than they seem to be in principle because of how difficult it is to deal with constantly shifting conditions. As a consequence, before entering into such partnerships, public partners must carefully consider their options.

To transfer the risks of development and maintenance to the private sector in such circumstances is a significant unsaid but significant driving force for the public partners. To get a good return on their investment, the private party is motivated to take on the risk. The private party goes to considerable pains to minimize the scope of their risk and obligation since there is a significant amount of cash at stake. In a typical public-private partnership for infrastructure, the private partner is really a group of businesses that come together to establish what are referred to as "special purpose vehicles," which are autonomous, stand-alone organizations designed to meet a particular public-sector need. These tools aid in protecting the parent company from the full

extent of project-related risk. From a public policy standpoint, the fundamental issue is that the risk can never be completely offloaded onto the private sector. Bankruptcy is always an option for the private party to relieve themselves of an unworkable circumstance. The public partner, however, is unable to withdraw since the investment includes crucial pieces of public infrastructure. As a consequence, the difficulty for such a comparative cost analyst is determining which partner carries that risk over time; the greater the expenses of the public sector comparator, the more risk that may be allocated to it. Advocates of public-private partnerships argue that risk should be taken on by the party most equipped to do so. Value-for-money research nearly always shows that the public-private partnership is less expensive since the public sector is almost always involved[8].

In reality, there is no way to predict in advance whether a particular public-private cooperation would be financially advantageous. In reality, public-private partnerships are formed more often on trust than on knowledge. Having stated that, it is crucial to remember that a value for money analysis "should also take into account the potential non-financial benefits of PPPs public-private partnerships, such as the accelerated and enhanced delivery of projects."The public sector often finds itself forced to purchase the private partner at tremendous expense to the public coffers. When the UK government made the decision to improve the London Underground in 1997, a public-private partnership was chosen to carry out this infrastructure investment. After years of underfunding and financial turmoil, the administration thought this was a wise course of action. Additionally, it was thought that while the London Underground's poor administration resulted in time and cost inefficiencies, train operations had been excellent.Three public-private partnership consortia were established to handle various aspects of the maintenance and restoration of the subsurface infrastructure under a complicated public-private partnership framework that was constructed. The provision of transportation services was still under the control and ownership of the public sector.

The "companies" for infrastructure (infracos) would be completely funded via performance-based incentives and penalties, related to the parameters of the contracts, thanks to particular and properly worded contracts. A public arbitrator was appointed to decide on claims for such unexpected expenditures during the repair and renewal of train systems in order to account for any unplanned costs that may arise due to the age of the metro system. Additionally, provisions were created for a 7.5-year-long periodic review of the contract terms. Infracos employed private cash to fund the public-private partnership, which had to be returned by the yearly loan payments made by the government, which put the project at a disadvantage from the start. This was a more expensive choice since private borrowing was more expensive than obtaining money via the sale of governmental bonds. Additionally, private lenders need a 95% state guarantee for their loans. There was also little to no motivation to assess the effectiveness of infracos or hold them accountable for the use of the money provided to them since the risk assumed by lenders was negligible. Risk was placed on the public sector in the event that the initiative failed, as it ultimately did.

This PPP arrangement was undercut by two significant issues. The first was the division of labor between public and private partners throughout operations and construction. The infracos wanted to complete tasks that would increase their revenues while potentially ignoring London Underground's purpose of providing services. For instance, construction work was consistently done at inconvenient hours. The second issue was the two major consortiums engaged not working together well and being divided. As a consequence, the execution was ineffective and

lacked a defined corporate governance framework. Thus, it can be concluded that this enterprise was doomed from the start and would not survive long. The fundamental issue is that public-private partnerships deal with situations where knowledge is always inadequate and future circumstances are unclear and changeable. The cost of developing the framework for this PPP was close to £500 million.89 This public-private partnership is thought to have cost UK taxpayers over £2 billion in unnecessary losses, leaving London with a large number of subway stations in varying states of disrepair. These start-up transaction costs, losses resulting from guarantees to private banks, plus cost overruns on the contracts. The central government "forced a deal on their city, and this is just the beginning: costs for the City of London are expected to grow by an additional £1 billion." This project serves as an example of the careful planning necessary to undertake such significant urban transportation public works using public-private partnerships because of the attention paid to developing the public-private partnership model. However, the fact that this 30-year project was abandoned altogether in 2010, a fifth of the way through, also serves as a significant learning lesson concerning the inherent limitations of such a method for doing significant public works. The London Underground's parent organization, Transport for London, is now working on an internal initiative to renovate the system. It seems to be usually moving forward on schedule and within budget [9].

This trip to London was educational on a number of levels:It exemplifies the issues that develop when the purpose is seen differently by the public and private partners.It highlights the reality that forming a public-private partnership might have start-up expenses that are far greater than anticipated when these procedures commence, in terms of consultant and operational costs. When the public-private partnership is being created and politically supported, these transaction costs are generally either neglected or grossly overestimated. Bringing in private partners to manage public infrastructure comes with the guarantee that they will implement cutting-edge technologies. Although it sometimes happens, once contracts are signed, organizations whether public or private tend to become risk-averse and strive to safeguard earnings from reliable income sources.Last but not least, it shows that even when there is an effort to address the issues with incomplete contracting with extremely specific contract provisions, in relation to deliverables, deadlines, and penalty clauses, the issue of contract compliance still poses a significant obstacle. The key takeaway from this experience is that the likelihood of the public sector achieving its objectives increases with the simplicity and clarity of the rules of participation in a public-private collaboration. Public-private partnerships typically fail for certain reasons that are specific to each circumstance. It becomes tempting to assert that the following attempt will avoid such issues and everything will go according to plan as a result. International consulting companies do in fact release 'how to' manuals in which they claim that knowledge and openness are required everywhere.

However, the underlying general issue is that public-private partnerships must cope with situations where knowledge is always inadequate and future circumstances are unpredictable and changeable if they are to effectively address substantial urban transportation concerns.

CONCLUSION

The high cost of private transportation is a critical problem that affects metropolitan regions, companies, and people economically significantly. The different variables that go towards the high private cost of transportation have been addressed in the study, including car ownership and operation costs, fuel costs, tolls and taxes, parking charges, and insurance rates. It has been noted

how these expenses might put a strain on family budgets, reduce corporate competitiveness, and harm metropolitan regions' overall economic performance. The need for governmental changes to alleviate the high expense of private transportation. The financial effects of high transportation expenses may be reduced by using strategies including encouraging environmentally friendly modes of transportation, enhancing public transit alternatives, enforcing congestion pricing, and offering targeted subsidies to low-income families. Additionally, it has emphasized the need of taking equality, environmental sustainability, and economic efficiency into account when developing and putting into practice policy initiatives.

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CHAPTER 20

INSTITUTIONS AND GOVERNANCE FOR URBAN MOBILITY

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ABSTRACT:

Institutions and governance play a crucial role in shaping the planning, development, and management of urban mobility systems. This paper provides an overview of the key concepts and challenges related to institutions and governance for urban mobility, drawing on existing literature and case studies. By discussing the importance of institutions and governance in urban mobility, highlighting the role of policies, regulations, and decision-making processes in shaping transportation systems. It examines the interplay between various stakeholders, including government agencies, private sector actors, civil society organizations, and citizens, in shaping the governance arrangements for urban mobility. The challenges and complexities associated with institutions and governance for urban mobility. It discusses issues such as fragmentation and coordination challenges among different levels of government, the need for integrated planning and decision-making, the role of private sector actors and public-private partnerships, and the importance of stakeholder engagement and participation in decision-making processes.

KEYWORDS:

Governance Structures, Institutional Arrangements, Interagency Coordination, Multilevel Governance, Regulatory Frameworks, Stakeholder Engagement.

INTRODUCTION

The majority of urban transportation networks are generally financed by a mix of sources that in some ways resemble value capture and general revenue financing methods in others. The most practical payment structures are probably some mix of these together with direct user fees for the majority of systems. Any system's unique financial structure will be highly influenced by the historical environment in which it functions as well as by local norms and values with respect to the organization of the public sector. Understanding how models that include components of user and public income may effectively work in reality is the difficult part. This section examines experiences from India and New York.

The New York Metropolitan Transportation Authority (MTA) serves as an illustration of how many income streams may be gathered by a single organization while maintaining an emphasis on providing a multi-modal regional transportation system. The organization depends on a variety of federal, state, and municipal government resources as well as a collection of taxes designated for transportation. Last but not least, the MTA's finances depend heavily on the

income surplus from tolls on bridges and tunnels, which also functions as an implicit cross-subsidy from drivers of cars and trucks to users of public transportation[1].

The regionally and modally integrated urban transportation system in New York is appealing because it makes it simple to distribute expenses and income across modes. As a result, a potentially simple policy instrument is now available to support efforts to develop a sustainable urban transportation system. But it's crucial to realize that time and institutional context are very significant. Each agency battled to maintain its current autonomy inside the new organizational structure throughout the first ten years of the New York experience. As a result, although the concept shows some promise for the possibility of integration and progress towards a real "urban transport system," it also needs considerable governmental administrative competence and commitment to succeed.

The National Urban Transport Policy (NUTP) of India specifically switched the emphasis of transportation policy from the proactive development of non-motorized transport to the reactive easing of traffic congestion through road and highway growth. The seven-year (2005–2011) JnNURM, which gave centrally supported grants to urban transportation projects in certain cities that agreed with NUTP requirements, is where NUTP receives its funding. Among the initial initiatives supported by this program are the Delhi Metro (Phase II) and the Janmarg BRT in Ahmedabad[2], [3].

Several important practical guidelines for funding the development of economically sustainable urban transportation may be drawn from this experience. These consist of:Local buy-in: Janmarg and Delhi Metro both highlight the value of local ownership of initiatives. The effectiveness of implementation depends on political commitment at all levels, but local buy-in is also crucial, especially at the agency and bureaucracy levels. Local ownership enhances the responsiveness of the design and construction process to local circumstances and may result in cost savings via greater usage of local resources. Building public acceptability requires local implementation teams to have a strong conviction in the advantages of their programs[4].

Financing for urban transportation systems should be multi-tiered, combining different funding options in accordance with the relative comparative advantages of various funding actors and the short- and long-term financing requirements of the schemes (such as capital investment versus recurrent expenses). Particularly in Delhi, alternative financial possibilities were successfully attracted from a number of international, national, state, and local partners.

Devoted Organization: The necessity for cooperation among several agencies was reduced by the establishment of a single-purpose organization to execute and run public transportation programs. To guarantee good integration with other means of movement under this system, considerable caution must be used.

Implementation in Stages: Carefully planned, gradual adoption has benefits in terms of both the physical world and the financial world. Payoffs include better designs, time and cost savings via feedback and change, as well as a rise in ridership and public approval. Ahmedabad served as a particularly good illustration of this.

Cutting-edge Technologies: Technology may have a big impact on whether a plan is accepted by the general population. The integration of many means of transportation might be substantially facilitated by modern communication and ticketing technologies. But

'modernization' also has significance because of the way it is seen as being safe, secure, and clean. This is crucial in developing nations as the usage of private vehicles (or motorcycles) is often associated with modernization goals.

Equity and Affordability: In the pursuit of financial cost recovery, affordable fares should never be compromised.Promoting sustainable urban transport development, which was formalized in the National Urban Transport Policy (of 2006), through the use of robust financial incentives aimed at local governments, can provide a strong basis for sustainable urban mobility. Schemes that successfully allow urban transport to be supported by the value of the access that they create. The Delhi Metro and Janmarg BRT projects provide two different alternatives to this new approach. The diverse solutions provided by the two projects exhibit comparable underlying effective concepts for funding sustainable urban transportation networks, notwithstanding their differences in size, mode, and particular methods.

The two Indian initiatives show how national governments might set up financial systems to encourage regional investments in urban public transportation. Both instances demonstrate how encouraging national policies and financial incentives may be essential in promoting the adoption and use of more environmentally friendly urban transportation options. Additionally, both experiences were supported by substantial grant contributions for capital expenses. The encounters highlight the value of intergovernmental collaboration and the need of a distinct local public authority over the management of public transportation networks.

The mechanisms that transform political, technical, and financial choices into resource allocation and priority setting for executing urban mobility plans, programs, and projects are the institutional and governance frameworks. Regardless of how sound the policy suggestions, their implementation depends on how well the institutional and governance structures that will guide, manage, resource, and provide them are suited for the job. Without addressing the very sustainability of the main organizations involved and their institutional and governance frameworks, visions for sustainable urban transportation cannot be transformed into plans and neither can plans be effectively implemented.

The effectiveness (and speed) with which urban transportation infrastructure and services are designed, evaluated, provided, and operated depends on institutional and governance frameworks and the networks that support them. They are also crucial to how effectively land-use developments and urban mobility planning are coordinated and how both are compatible with the stated objectives of sustainable development. Formal entities that have an impact on the transportation industry usually run in a less than ideal way in many cities. This is especially true in emerging nations. Despite this, movement of people and products continues, and in many situations, traffic is increasing. The question at hand, therefore, is at what potential cost, with what suboptimal level of efficiency, and at whose expense does this increase occur.

The begins with a definition of the key terminology used to analyze the institutions and governance of urban mobility. A review of regional institutional and governance changes that have an impact on urban mobility policy-making, planning, and management, as well as many elements of urban land-use developments, is then presented. The results of this study are then used to identify some of the major institutional, governance, and underlying forces that cities must contend with. The also includes a discussion of policy solutions to these issues, along with some in-depth examples taken from best practices. It concludes with last thoughts and recommendations for policymakers[5].

DISCUSSION

Understanding Institutional and Governance Frameworks for Urban Mobility. Relationships between the various branches of government are impacted by the interaction of the institutional structure and agency actors, which is characterized by both formal (i.e., rules and laws) and informal (i.e., customs and traditions) dimensions. In some cases, there are institutions (such as trade unions, city chambers of commerce, and industrial lobbying groups) that, although not formally involved in the urban transport decision-making processes, possess a variety of influence. Their actions are indicative of their political clout and often financial strength. These impacts should be made clear through enlightened institutional and governance structures.Building and sustaining high-quality infrastructure and services for urban mobility depends on well-functioning institutions and broad political backing. Parties linked with land use, social effects, and environmental effects have an influence on urban mobility as well. Strong non-specialist stakeholders may substantially impair attempts to achieve integrated development between urban mobility and land use, especially in poor nations.

In general, institutions at the level of an urban area are responsible for the design and implementation of policies related to urban mobility. Organizations at the national and sometimes regional or provincial government level also design frameworks that may strongly affect the adoption of policies, despite the fact that this may not match with the administrative boundaries of the major city. These have an impact on both the institutional integration of transportation modes and the arrangements for their integration with other industries in metropolitan areas. Particularly in the areas of land use, pollution, climate change, safety, and finances, this is true. Numerous issues may occur in certain big cities of emerging nations when national (or regional/state) administrations actively participate in choices about urban transportation policy. This is true because such tiers of government often possess more authority and have greater influence on expenditures allocated to the urban level. Furthermore, local administrations often lack the capable management and skilled employees needed to meet the issues they face. As a consequence, coordination between the two levels of government is usually difficult and frequently unfair, even if they may be well aware of what has to be done.

It is important to underline the importance of informal structures and organizations in the urban transportation sector. These are particularly important for non-motorized, public, and freight transportation. The informal sector and NGOs play an increasingly significant role in supporting and encouraging sustainable urban mobility, even in the well-organized cities of many affluent nations. For effective governance and a 'bottom-up' decision-making process that allows for participation from all stakeholders, the presence of such informal institutions and groups is crucial. Urban mobility decision-making should ideally incorporate all significant players who provide urban transportation infrastructure and services, as well as those who are affected by the sector's choices. Similar to how institutional and governance frameworks should handle issues with barriers to the private sector's successful engagement. Government must thus establish enabling and regulatory processes to guarantee that the information used to support plans for urban transportation is thorough, accurate, unbiased, and transparent[6].

Circumstances and Trends

With distinct institutional players impacting urban growth and mobility trends, different government structures govern the delivery of urban mobility in different regions of the globe. It is crucial to keep in mind that urban mobility difficulties in developing nations and those with

transitioning economies are quite different from those experienced in metropolitan areas of industrialized nations. In general, the institutional frameworks and resources (human, technological, and financial) available to policymakers and planners in such places are often less well developed. As a result, the sections concentrate on a few specific circumstances and patterns of institutional changes and governance, as well as the underlying factors that have an impact on rich countries, nations in economic transition, and developing nations.

Developed Nations

Most of Europe's institutional and governmental frameworks for urban mobility are modeled after the institutional and governmental structures of mature industrialized countries. Most European cities have a highly educated multidisciplinary professional class to meet the demands of urban development in general and urban mobility in particular. All of the bigger, more populous nations, as well as the smaller nations of northern Europe, have robust, multi-tiered administrations. However, there are still some significant gaps, especially between several of the Southern European nations in terms of budget levels, technological prowess, and organizational efficien- cies. Institutional, governmental, and technological capabilities are less well-developed and resourced in these nations. Nevertheless, via several EU programs, there is idea-cross-fertilization across all of these nations, with some notable advances noted.

The French city of Nantes has been successful in unifying all of the local decision-making bodies into one entity. With the agency in charge of housing, town planning, land use development, and highways and public spaces, these agreements provide a variety of capacities. Additionally, while it has made some progress, this organization is capable of handling all facets of planning public transportation in the metropolitan region. Since 2008, Nantes has had a single agency in charge of all mobility-related issues. This organization is in charge of both strategic and operational management of a wide range of sustainable mobility-related issues, including road and highway planning, traffic management, traffic and public road management, cycling and parking policies, and management including all off-street parking such as multi-story car parks, park and rides, and other sustainable mobility-related issues[7].

Similar changes are presently taking place in London, where the Mayor's Transport Strategy for the Greater London Authority, which is directly under the authority of the mayor, calls for a greater integration of the surface and subterranean train systems across the metropolitan area. Sixty years of private car-oriented transportation infrastructure investment and suburbanization in the US have contributed to widespread urban traffic congestion10 and created a significant urban mobility divide, which has negatively impacted the mobility of those who cannot afford to own a private car. This car dependency has been accentuated by an institutional emphasis on the importance of personal mobility - whether related to distances that need to be traveled or other factors.

Given the history of motorization in the US, it may come as a surprise that the nation has introduced legislation aiming to revolutionize the planning and implementation of urban transportation investments. This legislation looked to a hierarchy of supporting transportation plans and programs introduced and carried out by metropolitan planning organizations in collaboration with states for major urban areas. The statute, however, does not provide these planning entities any further legal power in this regard. Instead, it places a focus on "partnerships" across all relevant authorities in order to advance regional interests and objectives.

The Greater Toronto Transportation Agency was established as a result of the Canadian federal government's recognition that insufficient funding, coupled with disjointed planning and implementation of urban mobility systems and related land use, are the main obstacles to establishing effective urban transportation networks. This gave the entire urban region "the governance mechanism to plan, fund, and deliver integrated transportation and related land use for the entire urban region comprehensively and consistently over time"16. In Vancouver, the governance structure for urban transportation also aims to coordinate and achieve integration and a balance between various modes. TransLink was established by the Government of British Columbia in 1998 to take over many of the provincial government's former transportation duties. The regional transportation system in Metro Vancouver, British Columbia, including the main thoroughfares and bridges, is managed by TransLink.

Australia has a federal government system, while state and municipal governments are primarily responsible for integrating land use and transportation. The Western Australian Department of Planning and Infrastructure, which has its own minister in the state government, is responsible for the city of Perth's transportation and land-use planning. Despite the fact that all recent significant transport infrastructure investments in the country's major cities were made within the same federal institutional context, responses to urban mobility challenges have been quite varied. The Public Transport Authority, a government organization, is in charge of overseeing public transportation including bus, rail, and ferry services in Perth and outlying centers. additional transportation issues, such as main and minor roads, trans- port safety, etc., are handled by two additional organizations, Main Roads and the Department of Transport.

New Zealand's largest cities' institutional and governmental structures have undergone a number of recent developments. The reorganization of metropolitan Auckland is one of the largest and most comprehensive local government restructurings in recent years from the standpoint of the integration of urban transport. The capital city of Wellington has likewise used a regional approach to the development and delivery of its transportation infrastructure and services. It provides a unique governance framework for local authorities to administer council-controlled companies[8].

Nations with developing economies

The three primary institutional transformation processes taking place in the former communist nations of Central and Eastern Europe are democratization, privatization, and decentralization. These nations had robust, centralized decision-making structures and a history of state planning of urban land use and transportation at the end of communist control in the early 1990s. They also had a professional elite that was reasonably well educated and employed in safe formal institutions, as well as a civil society that was mostly subservient to government. The power of various stakeholders' influence shifted with democracy. As increasingly affluent individuals stopped relying on public transportation, the voice of the populace grew more fractured. Several public transportation providers also discovered that they were unable to expand their service to nearby low-density neighborhoods. Operators were adversely affected by the steep cutbacks in government subsidies that made public transportation costlier to offer and unaffordable for many prospective users. Public transportation operators in Poland, for example, were compelled to dramatically increase fees as a result of these reductions. In the meanwhile, underspending resulted in worsened public transportation services, decreased operational effectiveness, and decreased investment in public transportation equipment and associated infrastructure.

Privatization and neoliberal tendencies have led to the formation of far more complicated institutional decision-making, which has made it very difficult to close the gap between income and spending. Governments have gradually under-mined the economic, social, and environmental dimensions of sustainability due to their prolonged delay between plan creation and execution, in addition to their lack of knowledge of how market forces function.

The developing world

Urban transportation institutions and governance structures in the majority of developing nations have been unable to keep up with the expansion of the urban population and the demands for mobility. The urban transportation sector is characterized by its high traffic fatality rates, rapid motorization, inadequate public transportation options, informality in its mobility systems, congestion, and pollution, all of which have different effects on travelers depending on their income levels, gender, age, ability to work, and level of education.

Africa

Despite encouraging developments like the creation of the Executive Council of Urban Transport in Dakar, Senegal, the Lagos Metropolitan Area Transport Authority in Nigeria, and the introduction of coordinated urban mobility plans in South Africa28, there is still a lack of coordination between the various institutions involved in urban transport throughout the majority of Africa. This has made it difficult to create coherent, comprehensive urban transportation policy. Actions that may be in conflict arise from the fact that too many ministries are active in the local urban transportation industry. Additionally, urban public transportation is routinely underfunded, and formal participation by transport users or civil society in city administration is seldom ever substantial. This reflects the pervasive lack of decentralization in the trans-port sector, which is still under the jurisdiction of national governments. For instance, urban transportation is not one of the sectors affected by the decentralization process in nations like Senegal or Burkina Faso. In Egypt, attempts have recently been made to consolidate responsibility for urban transportation in Greater Cairo, where a Public Transportation Regulatory Authority was formed by presidential order in 2012 and is now in charge of all forms of urban transportation in the city[9].

Caribbean and Latin America

With the exception of a few investments in urban highways, developed countries particularly North America have a significant influence on the institutional and governance frameworks in the field of urban land use and transportation in Latin America and the Caribbean. The region's major new institutional initiatives concern efforts to formalize public trans- port modes and to improve formal public transport services through the introduction of new BRT systems and metro extensions. Cities like Curitiba, Brazil, have a long history of developing novel and integrated ways of transportation, as was previously mentioned. In Colombia, Bogotá and Medellin are constantly implementing fresh and more inclusive methods of transportation decision-making.

European Asia

As varied as the regional government systems are, so too are the institutional and governing frameworks for urban transportation. Despite the contrasts, recent decentralization changes linked to growing urbanization seem to be leading to the emergence of a decentralized model of

urban transport governance across the area.Oil-rich nations, such as the Gulf States and Saudi Arabia, must deal with urban land-use and transportation expansions brought on by sharp rises in wealth. Because of their riches, their governments have been able to create urban transportation networks that are comparable to those in industrialized nations. Along with it, certain well-funded, cutting-edge new institutional and governmental frameworks for urban mobility have been established, such as the Urban Planning Council in the United Arab Emirates. Iran and Turkey, two populous nations, have far fewer resources. Their institutional capabilities are more underdeveloped and under pressure. Poorer nations, like Yemen, have underdeveloped urban mobility systems more analogous to those in less developed regions of South Asia or Sub-Saharan Africa.

In Western Asia, it is typical for conflict or competition to exist between the government organizations in charge of various facets of urban transportation and land-use planning. The government often establishes autonomous public bodies that are focused on project planning and execution as a solution to such difficulties. For instance, there are several such devoted urban transport bodies in Istanbul whose duties are not effectively linked and sometimes compete.

Asia in South

In general, South Asian cities' institutional frameworks for urban transportation and land-use development show a strong multi-tiered set of national, regional, and local government plus quasi-government institutions, along with a significant rise in private-sector transport operators and investors. The region's rapidly expanding demand for urban mobility presents a number of difficulties for urban transportation agencies.

These organizations are primarily designed to manage formal transportation and traffic issues, allowing unorganized means of transportation and non-motorized modes to fend for themselves. When compared to their vertical institutional ties, the lateral links between the institutions are often weak both functionally and geographically. It is becoming clearer that institutional restructuring, capacity expansion, and process simplification are necessary to close the gap between planning and execution. However, unified metropolitan traffic and trans-port administrations have been established in a number of Indian cities, including Delhi, Mumbai, Jaipur, Hyderabad, Chennai, and Bangalore.

Institutions with insufficient funding and a lack of general ability to design, carry out, manage, and provide cheap sustainable urban transportation.Fragmented policy creation and execution, with a lack of coordination across several ministries and transportation organizations.Due to a lack of funding, public transportation systems and infrastructure need significant institutional and governmental assistance, concessions, and subsidies. inadequate accounting/audit systems and financial processes.Urban transportation infrastructure and services are delivered with difficulty due to bureaucratic procedures. Lack of the necessary legal, regulatory, and capacity frameworks and resources for urban transportation and land-use improvements.

Lack of thorough information systems, disclosures, and public involvement encourages corrupt behavior. Strong regional political divides in Thailand and the Philippines make it difficult for transport ministries to cooperate with local administrations. These have been put in place to encourage a more efficient response to problems with municipal transportation and associated land-use issues. In other South Asian nations, efforts to organize urban transport organizations and governance have had far less success.

Asia, South-East

In terms of institutional growth and urban transportation governance, South-Eastern Asia paints a highly ambiguous image. This is a result of the extremely varied levels and types of governments that are in place, as well as the very distinct colonial histories and subsequent political process progression. However, like in the instance of Jakarta, Indonesia, many of the duties relating to urban transportation in the area are often delegated to a variety of different state ministries.

Strong regional political divides in Thailand and the Philippines make it difficult for transport ministries to collaborate with local administrations. Institutional structures in Manila have hardly altered throughout the years. The Metro Manila Development Authority is in charge of land-use planning, urban redevelopment, transportation, and traffic control, although it does not have complete authority over the transport industry. Singapore is likely the anomaly in South-Eastern Asia when it comes to having institutional frameworks that improve the integration of land use and transportation as well as the integration of modes within the transport sector.

Asia's East

In Eastern Asia, mainland China has borne the brunt of Hong Kong and Singapore's robust institutional and governmental frameworks for urban migration. Strong political backing for important urban transportation projects has aided China's long-term policy-making and planning efforts in various ways. However, there are sometimes conflicts between national and local interests, as well as between those of the public and private sectors. These have sometimes impeded the development of an integrated institutional strategy for land use and transportation development.

There are a number of interesting advances in urban-mobility planning in China thanks to the rising technological sophistication of local professional cadres. With its rationalization of urban land-use and mobility management frameworks, Shanghai serves as an example of this. The Urban Planning Bureau, the Urban-Rural Construction and Transport Committee, and the Traffic Police Headquarters are the three agencies responsible for the city's transportation and associated land-use development. However, rail and water transportation, which are very important in the majority of Chinese cities, are often managed at the regional or state level and not under local administration.

CONCLUSION

Urban mobility systems must be structured according to a financial model that is intended to safeguard the crucial public goods component of public transportation in order to be sustainable. These models may be structured in a diverse and flexible variety of ways, as the experiences described in this demonstrate. However, there isn't a straightforward "best-practice" method for creating such financial models. Instead, one should go beyond personal experiences to find generalizations that apply to other contexts. The seven principles outlined in this section should guide the development of sustainable urban transportation financing. As a public benefit, an urban transportation system should encourage access rather than movement. Mobility is only one tool for achieving that greater goal. As a result, policy should emphasize the value of access rather than the time saved by improved mobility solutions.

Locations with a high density and mixed use minimize the demand for transportation while facilitating access by combining key urban functions. It is crucial that modal alternatives be

integrated so that users may switch between them without difficulty. For instance, park-and-ride areas on the outskirts of congested metropolitan areas may make it simple for people to get out of their automobiles and transfer to public transportation for the remaining portions of their excursions. Plans that effectively enable urban transportation to be funded by the worth of the access they generate may offer a solid foundation for long-term urban mobility. Real estate taxes that take location into account as well as intricate land investments are two ways to collect value. The capture-able values will be greater for means of transportation that are more exclusive and high density, such rail and BRT. In terms of land use, it is also possible to anticipate greater prices and volumes of usage the closer residences and other centers of activity are near terminals. Value capture is less effective on regular bus routes, in areas with significant levels of vehicle usage, and/or in regions with stagnant or declining populations. A competent public sector is necessary for good public transportation. The argument about the relative effectiveness of public and private producers of public transportation has been a pointless diversion. The secret to success in developing successful urban transportation networks, regardless of organizational structure, is always a competent public governing body acting in a transparent manner.

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CHAPTER 21

ADMINISTRATIVE AND GOVERNANCE CHALLENGES

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ABSTRACT:

Administrative and governance challenges are critical issues that arise in the planning, development, and management of urban systems. This paper provides an overview of the key administrative and governance challenges faced in the context of urban settings, drawing on existing literature and case studies. By discussing the complex administrative and governance landscape in urban areas, involving multiple levels of government, public and private sector actors, and diverse stakeholder interests. It highlights challenges related to fragmented governance structures, coordination issues, and conflicting priorities among different administrative entities, which can hinder effective decision-making and implementation of urban policies. Specific administrative and governance challenges faced in urban settings, such as inadequate infrastructure planning and management, inefficient resource allocation, lack of transparency and accountability, and challenges related to capacity and expertise in urban administration. It examines how these challenges can affect the efficiency, effectiveness, and equity of urban systems, leading to issues such as congestion, inadequate service delivery, and social disparities.

KEYWORDS:

Bureaucratic Red Tape, Capacity Building, Coordination Issues, Decentralization, Institutional Capacity, Interagency Coordination.

INTRODUCTION

The primary difficulties and underlying factors affecting urban transportation institutions and governance globally are discussed in this section. They have been categorized into four broad groups: problems of adaptation; administration and governance; mobility policy, plan-making, manage- ment, and regulation; and resources and capacity-building. Although the difficulties are presented as distinct topics, it is crucial to recognize how they are interconnected. For instance, the difficulty presented by fragmented decision-making is practically applicable to all subjects.

Adaptation difficulties

Governments (and many other stakeholders) are slowly coming to the realization that in order to achieve the aims of sustainable mobility, institutions and governance must reform. The acceptance of this transformational requirement differs significantly between nations, cities, levels of government, and cultural and development settings. The creation of this capacity for change and comprehending how to change, however, both have significant deficiencies. The

transformation entails adopting a wide understanding of "governance" and controlling demand for movements that benefit marginalized and vulnerable individuals as well as the environment[1].

The environmental argument has become more politicized and more globally interconnected, which poses problems that might have significant local effects. When negative manifestations occur, this creates conflicts that have shaped the perspectives of many players in urban mobility as well as those working on urban land-use policy and planning. There are several examples of urban transportation policy papers that explain the necessary modifications and how'smart development' might encourage more sustainable urban mobility planning.50 However, owing to the reluctance to change inside many institutions, this has only partially translated into action. Programs built on a more holistic way of thinking often need strong political leadership to be implemented successfully. Aspirations for more holistic thinking often fail in the absence of such leadership.

The need of integrating land-use and transportation planning to guarantee the effectiveness of urban mobility networks is becoming more widely acknowledged. The issue is not so much the difference in perspective, but rather the influence and power that these perspectives carry along with them and their capacity to affect outcomes. It is important to recognize the similarities and differences between the nature and roles of participants in both fields. While changes to urban mobility often occur continuously, consultations for land-use developments tend to focus more on planned one-time changes of usage. Therefore, unlike urban transportation, land-use planning may need more permanent structural adjustments to institutional and governance frameworks. Urban land ownership and management policies are participatory in emerging nations. Governments are slowly coming around to the idea that, in order to achieve sustainable mobility objectives, institutions and governance must reform. A smart approach to do this is to force these professionals to think more holistically, as is necessary in transit-oriented development initiatives. Cities often pitch against one another due to competitive dynamics, which encourages offering "sweetener deals" to possible significant investors in the form of exclusions and lax development regulations.

As was already said, the three fundamental obstacles to the institutional changes that have taken place in Eastern Europe over the last 20 years have been democracy, privatization, and decentralization.57 The roles of many important transportation infrastructures and services have changed as a result of the abandoning or gradual breakdown of earlier centralized decision-making and planning. In the meanwhile, private automobile usage has surpassed public transportation in importance. Due to this, there are now unprecedented levels of urbanization and motorization issues. Some emerging nations have seen similar changes as well. Due to changes in the kinds and impacts of parties participating in the development of urban infrastructure and the provision of transportation services, new issues have emerged. Such developments, along with the expansion of privatization and neoliberal influences, have led to more complex institutional decision-making arrangements, especially with regard to the delivery of investment in transportation infrastructure and services linked to private-finance initiatives and public-private partnerships.

Cities often expand beyond their initial administrative borders as a consequence of urban expansion, incorporating neighboring communities in a larger metropolitan region. When rail- and road-based transportation services stretch well beyond city limits into their hinterland as

inter-city transporters for people and commodities, the difficulties connected with municipal administrative boundaries are shown in the discussion in the preceding section. Therefore, decision-making is not only fragmented due to institutional tasks that are overlapped, but it also confronts considerable difficulties with horizontal coordination between lower tier administrations and, more importantly, with vertical integration.59 Thus, a need for coordinated action is the designation of a lead authority to give strategic direction in decision-making[2].

To solve issues with urban mobility, organizations routinely change their organizational structures. Particularly when a new government takes office, whether at the federal or local levels, such modifications are made. On organizational charts, these changes, however, have a reputation for doing little more than "moving the boxes around" and renaming them. A failure to change organizational culture, a failure in business procedures, and a failure in staff skill development are all to blame for this unfavorable image of organizational reform. All three must be addressed together if organizational reform is to be successful. A prejudice against integrated planning and management is possibly the most damaging of all the obstacles that initiatives to promote integrated urban land-use and transportation planning must overcome. Many institutions, whether public and private, have this prejudice. While it is clear that collaborative thought and action are necessary for the successful pursuit of sustainable development goals, mounting evidence points to the emergence of serious conflicts in environments that also support neo-liberal free market ‘solutions' to public sector issues. This is owing to the fact that proponents of the free market typically equate integrated planning and management with top-down comprehensive planning and management, which inhibits innovation and may be inefficient because of its non-competitive high transaction costs.

DISCUSSION

Mobility policy, plan-making, management and regulatory challenges: As mentioned in 6, the challenges relate to their reliance on non-motorized movement, their limited access to motorized public and private transport especially due to affordability and their capacity restraints, and their vulnerability to traffic accidents. The mainstreaming of the mobility needs of the socially and economically disadvantaged also includes gender concerns, as well as the needs of the disabled, the elderly, children, and youth. In order to decide how to best enhance the future design, administration, and delivery of public transport services, particularly for security enforcement, it is necessary to conduct thorough research to better understand the type, distribution, and magnitude of these problems[3].

The best way to organize, run, and control urban public transportation, as well as the extent to which this entails enterprise operator duties for constructing the necessary roads, railways, or operating buses is a significant global challenge, particularly where non-nationalized models of public transport governance exist. Some stakeholders argue that these organizations should eventually evolve into self-sufficient firms that operate along commercial lines. Others, however, favor a more welfare-focused strategy and do not think it is desirable (or inevi) for public transportation to constantly be run for profit.The highways of many if not most cities in developing nations are serviced by informal public transport services in addition to the types of official urban public transport systems mentioned above. The attitude of city authorities in underdeveloped nations is often disdainful of informal forms of transportation, despite the fact that certain municipal institutional systems show considerable flexibility toward operators in the

informal sector. This is true despite the fact that a significant portion of the population relies on these forms of transportation and that poverty is pervasive in urban areas.

All cities' economy depend on the flow of freight. Thus, there is a constant demand for more private investment in infrastructure and operations to meet the requirements of freight transit. Despite being substantial on a worldwide scale, such investment is especially crucial for cities with big ports and/or airline hubs in emerging nations and countries with transitioning economies, where globalization has created a wealth of new options. Significant advancements in information and communication technology have been made by private investment in freight transportation, and these advancements have in turn led to significant changes in logistic services in the ongoing effort to cut costs[4].

The placement of logistics facilities and the unpredictability of changes to land uses as a consequence of the lack of land-use zoning protection of existing logistic hubs provide significant challenges to freight mobility in urban regions in developing nations. Many freight businesses have as a result relocated their logistical operations to the perimeter, where property is less expensive and more easily accessible. Such changes have aided in the expansion of distribution and freight logistics facilities, or "logistics sprawl."In metropolitan places across the world, there are various and diverse obstacles to multi-modal integration. They are crucial for the delivery of effective public transportation and the transfer of freight. Integration of railroad planning, administration, and operation with other traffic, public transportation, and other activities is a typical difficulty for metropolitan organizations. The more pressing problem of permitting efficient rail-road inter-changes for peak commuter routes and maintaining fare integration represents a bigger challenge for fast-growing cities in emerging nations.It is also crucial for city planning agencies, who are in charge of land developments, to work together with the organizations responsible for the planning, administration, and operation of different urban modes of transportation. For municipal and governmental authorities, establishing such teamwork is one of the most fundamental issues, particularly in areas where silo-thinking is all too common[5].

Urban mobility institutional and governance systems clearly need to include environmental concerns65. Transportation and non-transport engineering and environmental departments often vie with one another for funds, resources, and leadership positions within governance frameworks. Although the idea of mainstreaming transportation disciplines is a good one for organizational reorganization, the transport division often belongs to a larger engineering or environmental division that must balance other goals. In actuality, when there are unique demands on the availability or value of land that restrict the dispersal of people and jobs/goods/services, transportation is often given more significance.

Challenges with resources and capacity development

Lack of consistent financing for transportation services and infrastructure, including institutional infrastructure, may be the biggest problem facing urban transportation organizations worldwide. These difficulties may lead to "wicked problems" when coupled with a lack of knowledge of urban economics and the intricate interactions between land-use planning, infrastructure investment, and the benefits that efficient mobility can provide to the public good. If economic rent from land value-added via investment in infrastructure is absorbed by the city and "recycled," then cities may finance transportation and other necessary infrastructure on their own.68 However, few few cities even come close to putting the theory into practice. Cities are

thus compelled to create public transportation improvement plans that heavily rely on fee box financing for fixed assets[6].

The performance of the urban transportation industry may be improved through the advancement of information and communications technologies69. Numerous options are available, especially via the internet and mobile communication, in the rapidly evolving world of such technologies to assist overcome the present dearth of sustainable financing for urban transportation infrastructure and services. However, these technologies are often not well understood and/or provide severe technical and financial difficulties (especially at first) to many traditional civic organizations, particularly in developing nations. Because of the rising opportunity costs of not using such technologies, this continues to be a significant problem. The United Nations has worked to promote tools that can track urban land and infrastructure developments (including land values) in order to improve the ability of government decision-makers to better plan, manage, and finance future urban development as part of online capacity-building efforts. This is done in recognition of the potential for urban transport institutions of information and communications technologies.

With regard to the creation of urban mobility systems, the developing frontier of web 2.0, social media, open source content, and volunteer geographic information has to be taken into account, handled, and maybe even welcomed. Up until recently, the planning, design, implementation, and operation of urban mobility systems were the responsibility of the public sector, the private sector, or a partnership between the two. Civil society actors were occasionally consulted as a routine part of the planning or implementation process. The 'professionals' whose knowledge influenced transportation endeavors were engineers, planners, financiers, architects, and urban designers.

However, today's civil society organizations and people are outspoken supporters of, and increasingly see themselves as "experts" in, initiatives to promote sustainable mobility. Even though the majority of geospatial mobility and logistics data are private by nature, civil society organizations and individuals often seek and even demand access to government-owned data sets. Additionally, crowdsourced and/or voluntary geographic information data sets are currently becoming more prevalent as open source substitutes for proprietary and private data, and they are increasingly seen to have the potential to improve the sustainability of urban transportation systems.

In many cities throughout the globe, open source information is presently being utilized to design non-motorized vehicle transportation in order to extend the infrastructure for walking and bicycling and to enhance the conditions and connection of existing networks. Additionally, organizations like "seeclickfix.com" solicit community members for suggestions on issues that need to be resolved (including mobility-related ones), and then they forward the suggestions and comments to the local authorities or organizations that have the authority to address the issues. Similar to this, smartphone apps like "Moovit" assist users in making choices about using the public transportation system based on crowdsourced information about the efficacy, efficiency, and any transient issues that can result in delays or interruptions. Additionally, the World Bank is launching an open data system of public transportation routes, timetables, and rates in the Philippines in collaboration with federal and municipal transportation organizations.

Participants who receive training and capacity-building as part of foreign aid technical assistance frequently aren't at the required level for the course and weren't initially trained or educated to

work in the field of their employment, such as when efforts are made to operationalize the sustainability vision in the urban transport sector.At the international level, improved global information and communications technologies today make it easier for developing nations to learn from one another as well as from wealthy countries when it comes to exchanging knowledge and lessons. Making decisions regarding whether information obtained or shared from an international source is suitable given one's own developmental circumstances and ambitions is a problem in this situation.

However, it should be highlighted that participants who get training and capacity-building as part of foreign aid technical support usually aren't at the appropriate level for the course and weren't initially trained or schooled to operate in their line of work. Additionally, the incorrect people are often being taught, especially in emerging nations. In certain circumstances (especially when supported by foreign organizations), participation in training courses is considered as a fringe benefit and a way to get access to travel, additional allowances, etc. The people invited to training courses are not the ones who are really performing the job. Additionally, the training course is often not appropriately planned to address the actual requirements of the participants since the course organizers frequently are unaware of the reality of the trainees' working situations.

Policy Responses and 'Successful', Innovative Practices

This section highlights a number of creative and effective institutional and governance solutions to many of the problems covered in the part before. It must be emphasized, nevertheless, that not all aspects of effective practice are included in each of the listed examples; rather, just a few are. For example, in integrated urban land-use and mobility planning, the mayor is in charge of institutional arrangements for land use and transportation, with one vice mayor in charge of the City Transportation Headquarters and another vice mayor in charge of the Urban Planning Bureau. The Management and Planning Office, a third branch of government under the mayor's control, is responsible for managing and planning the complementary aspects of both.78 In Japan, the institutional framework at the national and regional levels is particularly suited to the growth of rail-oriented urban development. The Ministry of Infrastructure, Transport and Tourism, which has five agencies in charge of urban transportation, including the Railway Bureau, is ultimately in charge of this[7]. In Canada, the regional government frameworks that made it possible for TransLink to be established in Vancouver, the Capital Region Board's transportation division to be established in Edmonton, and Metrolinx to be established in the Greater Toronto and Hamilton Area83 have all been praised. All of these bodies "encourage regional planning and decision-making for land use and transportation." This involves initiatives to plan and combine various means of transportation.

Planning for sustainable transportation is being led by the French city of Nantes. This is mostly attributable to its long-term outlook and dedication to an integrated approach to urban planning and transportation over the course of almost 30 years. In part, Nantes' strategy of offering an integrated network of multi-modal trans-port services has assisted the city in controlling the rise in private automobile usage while maintaining a high level of mobility for its residents and sustaining their standard of living. The city has also been a leader in creating urban mobility plans. The most recent of these (2010-2020) "sets out transport policy for the next ten years and thematic action plans are elaborated on topics such as public transport, ments can guarantee a fail-safe service or reverse its privatization decision if contract is breached." Although the

transportation authorities in Barcelona's center have elected to continue providing its services, under these agreements, Barcelona has made it feasible to outsource bus services in other localities. However, the fundamental drawback of this approach is that the Metropolitan Entity of Transport, which regulates public transportation, maintains considerable autonomy from the public transportation provider, Transports Metropolitans de Barcelona, making it difficult to oversee the former.

With its' mobility agreement' between the major players in the transportation industry, Barcelona is also offering a strong example of how to improve public engagement. Since then, many more cities have adopted this concept. All participants are encouraged to participate in Barcelona's mobility pact, and associated events are organized in both official and informal methods. For instance, a number of newspapers do publish daily pieces on issues with mobility in the section titled "Letters from Our Readers," often with a picture and a chance for the institutions in question to reply.Amman, Jordan, is a prime example of a successful decentralized form of institutional development and governance for the urban transportation sector because to its multi-stakeholder structure92. Setting rules and overseeing the transportation system are within the purview of the Greater Amman Municipality. The Ministry of Transport is in responsible of all short-term plans and research, while the Public Transport Regulatory Commission is in charge of public transportation on a national basis. Although this Commission is affiliated with the Ministry of Transport, it is financially and administratively autonomous.

The promise of a centralized form of institutional growth and governance for urban transportation is being shown in Viet Nam, in contrast. Strong city-wide transportation authorities of the kind that have lately been suggested for Hanoi have been made possible by a very straightforward line of jurisdiction between the national and local governments. Even though it moves slowly, the city offers outstanding examples of progress toward best practices in institutional development and governance for public transit planning and administration.

Addressing border issues in Cities

The governance structure of Auckland, New Zealand, just underwent a considerable reform, as was previously noted. As a result, in November 2010, the newly amalgamated Auckland Council created Auckland Transport, a new council-controlled organization. The new organization combines the knowledge and duties of eight former local and regional councils and an ARTA. In Auckland, all transportation-related activities and services are presently managed under a single entity. The concept behind the establishment of Auckland Transport is that "local boards will have an advisory role in identifying local service needs and a budget for planning and "place-shaping"," and that "the Long-Term Council Community Plan and District Plan will continue to guide Auckland Council decision-making, pending decisions on a spatial plan and infrastructure investment plan"[8].

The assumption behind the decision that Auckland Transport should administer the whole local government transportation system in Auckland as a single network is that it will do so with a degree of concentration that the complete Auckland Council, with its variety of duties, simply cannot match. The governance structure gives Auckland Transport the primary transportation responsibilities, while Auckland Council is in charge of the council community's long-term strategy. The Auckland Regional Land Transport Strategy outlines the transportation goals that the area wants to attain over a 30-year period, and thus creates council transportation spending for the Auckland Transport. According to these agreements, Auckland Transport is in charge of

organizing and implementing neighborhood "roads and footpaths...parking and train, bus, and ferry services," including the creation of the Auckland regional land transport programme, which outlines the projects that are expected to be completed over the following three years.

In 1967, Storstockholms Lokaltrafik was established as a single regional transportation organization as a result of continued urban expansion in Stockholm, Sweden. The duties related to public transportation that had previously been divided up among several municipalities were taken on by this body. One of the main objectives of this institution was to integrate services and fees. Storstockholms Lokaltrafik purchased bus, metro, regional rail, and ferry services for the city. Storstock-holms Lokaltrafik, which is owned by the Stockholm City Council, serves as the parent company for six related businesses, two inactive subsidiaries, and four functioning firms. The organization's activities include offering an operational "overview" of the region's public transportation system and services, an overall assessment of the system's service quality while also being in charge of overseeing maintenance, initiatives for the system's development, and services for purchases and procurements.

Making and managing plans for Mobility

Through its recent legislative changes brought about by the State of Victoria Transport Integration Act of 2010, the Australian State of Victoria provides a strong example of encouraging institutional system integration and sustainability for urban mobility. The Act offered a single state policy framework, while Victoria's urban transport governance was previously fragmented among several parties with disparate goals and interests, making it impossible to recognize the interrelated nature of transportation and land use. To guarantee that transportation authority’s collaborate to create an integrated and sustainable transportation system, this framework aims to: Unify all aspects of the transportation portfolio;Recognize that the transportation system must be sustainable in terms of its impact on the economy, society, and environment;Allowing for the conception and planning of the transportation system as a single system as opposed to several competing or distinct transport modalities;Provide a global framework for sustainable and integrated transport operations;expanding the Act's scope to land use agencies whose actions are expected to have a substantial influence on the transportation system would help to integrate land use and transportation planning and decision-making;To improve the modal share of public transportation, align the missions of transportation organizations with the broad policy framework.

CONCLUSION

The design, development, and administration of urban systems may be greatly impacted by administrative and governance concerns, which are critical issues that occur in the context of urban environments. In this study, the complicated administrative and governance environment in metropolitan regions has been explored. The concerns raised include coordination problems, fragmented governance structures, and competing administrative organizations' agendas. It has also looked at particular concerns such poor infrastructure planning and management, ineffective resource allocation, a lack of accountability and transparency, and problems with capacity in urban government. The effects of these problems on urban systems' equality, efficacy, and efficiency, which may result in problems including socioeconomic inequities, traffic congestion, and poor service delivery. In addition, it has brought attention to the need of governance frameworks that enable the inclusion of social, economic, and environmental sustainability concerns in urban policies and practices as well as transparency, involvement, and inclusiveness

in decision-making processes. It is obvious that tackling administrative and governance issues in metropolitan environments calls for coordinated efforts from a variety of stakeholders, including government organizations, business people, members of civil society, and ordinary people. To enhance decision-making procedures, resource allocation, and service delivery in metropolitan settings, it calls for coordinated and creative governance initiatives, capacity development, and institutional changes.

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CHAPTER 22

MAINSTREAMING ENVIRONMENTAL CONCERNS

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ABSTRACT:

Mainstreaming environmental concerns is a critical approach that seeks to integrate environmental considerations into various spheres of human activity, including policy-making, economic development, and social planning. This abstract highlights the importance of mainstreaming environmental concerns as a means to address the growing environmental challenges facing the world today. By providing a brief overview of the current state of the environment, emphasizing the urgent need to address issues such as climate change, biodiversity loss, and pollution. It then discusses how mainstreaming environmental concerns involves incorporating environmental considerations into the mainstream decision-making processes, rather than treating them as standalone issues.

KEYWORDS:

Biodiversity, Climate Change, Conservation, Eco-Friendly, Environmental Education, Environmental Policy.

INTRODUCTION

There is a lot of climate change action at the state level even if the US federal government has not passed any climate change legislation. These demonstrate important developments that may contradict foreign perceptions of the US federal government's opposition to the climate change agenda. London considers itself an example in the UK when it comes to transitioning to a low carbon economy. Sustainability is seen as "primarily an environmental quality with carbon dioxide and local pollutants being the main objectives," according to this perspective. London has concentrated on "investing in higher density developments and the use of transport development areas at key interchanges that are public transport accessible" in order to lower its greenhouse gas emissions. It is currently thinking about alternative fuels and has taken the lead in investing in infrastructure for electric vehicles, bicycle rental programs, and cycle lanes.100 In order to improve the capacity and connectivity of the capital's public transportation system after a history of underinvestment, major infrastructure investment is considered as a vital aspect of the mayor's 2010 Transport Strategy[1].

Including the mobility requirements of those who are economically and socially disadvantaged. One of the most inventive strategies to support institutional growth and governance within the urban transportation sector is the EU's ambition to provide a framework for the creation of urban mobility plans. This is a significant pan-European initiative to encourage urban walking, bicycling, and public transportation. The European Commission suggests that you:the creation of

processes and financial support systems at the European level for creating urban mobility audits and plans; the investigation of the viability of making such plans required for cities of a certain size;The allocation of EU cohesion and regional development subsidies to regions and cities who have filed a "urban mobility performance and sustainability audit" certificate that is up to date and has been independently confirmed;The investigation of the potential for a European framework to enable the gradual implementation of urban mobility plans.

Since 1999, South Africa has made attempts to promote urban mobility plans that, in some ways, mirror European advances.103 The "Moving South Africa" Project made an effort to provide a strategic framework for the nation's transportation system. It demanded open decision-making, finance, and pricing for the transportation industry and urged for a shift in the direction of client requirements. The government's responsibilities included establishing strong institutions, establishing clear norms to uphold the vision, fostering the development of human potential, and assessing and monitoring performance. Customers of the South African (urban) transportation system were seen in the project as "disempowered and weakly organized." Furthermore, it views "the upgrading of customer power as a precondition for improvement to the transport system."

Initiatives to encourage youth involvement are another cutting-edge international measure that might have an influence on the institutional development and governance of urban transportation. In light of this, the UITP's Youth Project established the Youth for Public Transport Group.105 "The group was formed to recognize creative youth-inclusive public transportation projects and to launch a dialogue between youth organizations and government through more formal mechanisms so that young voices can be heard," according to the mission statement.106 The Tanzanian proposal to establish a regulatory framework and a Consumer Consultative Council to represent the interests of all users of public transportation (including the handicapped) is yet another move in this area.107 With regard to the disabled's right to mobility, Hong Kong, China, has already started systematizing monitoring and enforcement against extremely specific standards and objectives.

DISCUSSION

Since the early 2000s, the city of Paris has utilized a clear freight transportation strategy and advocated a Charter for freight mobility. Despite a few setbacks, "Paris can be considered one of the most active European cities in the field of urban freight management" (Paris, 2010). Approximately "two-thirds of shipments coming into and going out of the metropolitan area of Ile-de-France go through a regional terminal in order to be transhipped and reorganized" (Ile-de-France, 2010), demonstrating the strategic role of logistics terminals in large metropolitan areas.

The French Ministry of Transport developed the "National Programme for Freight in Cities" in 1993, which conducted studies of freight movement across France and created a database for urban freight demand throughout the whole nation. It created a simulation model of potential future actions based on this information. The surveys' second phase began in 2010. The studies showed that "logistics sprawl" has certain features and that a significant amount of the pollution caused by local transportation in Ile-de-France comes from freight transportation. As a consequence, Paris was named as one of six "zones for priority" in 2011 to combat the air pollution caused by commercial vehicles, focusing particularly on the access restrictions placed on outdated commercial vehicles. Urban goods transportation, long ignored by Paris' mobility policies, has been placed on the municipal agenda since 2001 as a part of a new approach to

transportation planning, with the primary goal of reducing the detrimental environmental effects of freight movement[2].

In order to learn more about one another's issues and goals, the deputy mayor and the many players in freight transportation, as well as train operators, energy suppliers, and other governmental agencies, met for a consultation in 2002. Following these discussions, a Freight Charter was signed by all parties in 2006. Despite not being a binding legal agreement, it included promises made. The charter's most important conclusions were that: it introduced enforcement of truck access and delivery regulations; highlighted the lack of land for logistical activities, especially in the inner suburbs; suggested that experimenting with new forms of city logistics organizations is an effective way of spreading new ideas; and declared that consultation helped parties who (previously) rarely met defuse conflicts before they break out:

Service provision and planning for public transportation. For the city of Bogotá, Colombia, the TransMilenio system offers extensive public transportation services in the form of a BRT system. In addition to offering strategies for bettering public transportation, it also aims to reclaim open space, discourage driving, and promote cycling. An essential need for TransMilenio was the transfer of authority from newly established local administrations with directly elected mayors to the national government. In accordance with a 1998 law, the government is responsible for building and maintaining the infrastructure while private companies purchase and manage the fleets of buses and other public transportation vehicles in the Bogotá metropolitan area.112 This law established a public entity with the responsibility of managing, planning, and controlling passenger urban transport services. There are no agreements between TransMilenio and these running businesses.

Instead, TransMilenio offers the management service for the infrastructure including cycling lanes and transportation operations, and the local authority puts the contracts. The impact of residents as transportation users is significant due to the official institutional connection between TransMilenio and the municipal authorities of Bogotá. Accordingly, there is "political leadership and authority to make the appropriate decisions required to implement the transport system." BRT systems have recently been delivered and operated by a number of institutional structures in India, notably Ahmedabad, where Ahmedabad Janmarg Ltd. was established to manage the system. The use of local expertise rather than hiring foreign consultants "not only ensured respon- siveness to local conditions and technology transfer, but was also effective in keeping cost low." State and federal support was provided through a steering committee under the State Urban Develop- ment and Urban Housing Ministry, along with money and other incentives at the local, state, and federal levels[3].

The Delhi metro, like the Janmarg BRT, was intended as an essential element of a wider multi-modal transportation system and funded from several sources. Similarly, it had strong political backing from the federal government, despite the Delhi project's enormous size posing more difficulties. The fact that this project's institutional structures are being marketed as a workable public transportation model for other South Asian cities is what is most remarkable about it. It's also fascinating to see how Japan has adopted a rail-oriented urban development approach. The national and local governments, important private train corporations, and the government of the nation all support this. The rail businesses are a component of significant Japanese commercial and industrial consortia that also have holdings in retail, real estate, banking, and construction. These aim to maximize utilization of their rail networks by taking use of land developments

around stations. They do this by purchasing vast tracts of property along imagined rail expansions before any construction is done. The nation's land readjustment program has been notably beneficial to Japan's rail-oriented development plan. Here, irregular agricultural land holding patterns were previously restructured into standard construction plots and provided with basic urban infrastructure, with a tiny portion of each landowner's holding supplying land for roads and parks to defray the project's expenditures. The impression of metropolitan public transportation is generally negative throughout the US. Thus, there are significant governance implications for improving the performance and image of this method of transportation. New investments in light rail and BRT have been undertaken as a result, particularly in some of the smaller but fast expanding cities like Portland, Oregon, and Salt Lake City, Utah. In the instance of Portland, the government's land use and transportation policies have been used as complementary pillars to increase capacity and spur economic development.

Integration of many modes

The public transportation system in Stockholm and the surrounding area is recognized as one of the greatest in all of Europe. Together, they are renowned for their innovative approaches to multi-modal integration and integrated urban land use and transportation planning, with their public transportation services of particular interest to those concerned about sustainable urban mobility. The current development plan for the Stockholm region envisions a polycentric structure of seven new "cores" for urban growth, with public transportation recognized as essential to meeting the increased mobility demands spawned by this growth.

Storstockholms Lokaltrafik hired Deutsche Bahn Arriva in August 2012 to provide a new regional transportation service that entails developing and managing an integrated and complicated system of bus and rail. This was done to improve the multi-modal integration of passenger services. This is the biggest multi-modal transport contract of its type in Sweden, and it is anticipated that these services would carry 94 million people annually after the second phase of the contract has been implemented. In several African towns where metropolitan transport agencies have lately been set up to unify the administration of various modes, there are also some hopeful developments. For instance, the Metropolitan Area Transport Authority in Lagos was established in 2002.

Public transportation strategy: As part of a larger plan for Portland, a light rail system with 38 stations that are near to one another has improved pedestrian trips and decreased the need for parking.The city raised parking fees to help fund the renovation, and the city issued bonds secured by future parking income that are expected to bring in $28.5 million USD. Along the route, property owners also consented to establish a "local improvement district" that was expected to bring in an additional US$10 million. A tax increment and a variety of other sources brought in an additional US$11 million.

Urban redevelopment plan that goes along with it: The Portland Development Council was established to boost the private sector by making investments in new homes, businesses, and open space in areas close to the light rail stations before the project. This made it possible for the city to use public investments to promote a more balanced, higher density development, which in turn produced a significant amount of tax income[4].Some national governments are struggling with the problems of infrastructure investment. Have created national organizations with duties for planning, evaluating, and financing essential infrastructure

Dependable Financing

Similar to Singapore, Hong Kong (China) is well known for having a well-managed and consistent financing of its urban transportation system. As stated in 8, Hong Kong's metro projects have always been self-financing due to its successful regulatory and coordination mechanisms that subordinated all agencies and transport operators to basic policy objectives.125 As noted in 8, Hong Kong's metro projects have always been self-financing due to its successful regulatory and coordination mechanisms. The MTRC is one of the few profitable railway companies in the world because to the cash it receives from its very profitable property development and the extremely high levels of patronage that its services get.

Since property in mainland China is still owned by the government, urban public authorities there, like in Hong Kong and Singapore, have been able to profit far more from gains in land value brought on by investments in transportation and other urban infrastructure than in most other cities. The use of land leases in China for mixed-use developments connected to urban transportation provides enormous scope and possibility for comparable financial gains for the public sector. Land leases in China are typically of 70 years. However, in certain instances, these benefits do not show up to the extent anticipated. certain have hypothesized that this is as a result of the abnormally tight ties that have grown between certain local mayors and notable businesspeople, including opaque business dealings and conflicts of interest[5].

The mayor of Greater London (UK) is given the authority and mandate to swiftly design and implement congestion charging, which has improved access to and through central London while also proving to be popular.128 In addition, the mayor was given the authority129 to raise money for infrastructure projects through the introduction of the community infrastructure levy in March 2012. Despite these initiatives, the investment requirements seem destined to remain difficult due to a backlog of infrastructure investment over the last 50 years. These revenues will be charged on the majority of developments in London at different rates depending on zones, ranging from £20 to £50 per square metre.

Some national governments (primarily in developed nations) have set up national agencies specifically tasked with planning, evaluating, and funding crucial infrastructure, including significant urban transportation projects, in response to these infrastructure investment challenges. For instance, "Infrastructure Australia" in Australia advises the Treasury on budget allocations and priorities for significant infrastructure projects as well as the best ways to work with the private sector to finance such projects.

Aiming for Sustainable Urban Mobility

Urban accessibility and mobility are severely threatened by global trends like the growing urbanization and motorization. However, the evolving environment in which these are taking place and the knowledge it is producing provide fresh chances for advancing creative policies and programs for sustainable development as a whole. The preceding sentences have covered the breadth and depth of various current issues and top techniques in urban mobility and accessibility around the globe. This conclusion brings the study together and focuses on strategies, policies, and practices that may be implemented by both local and federal governments. The core of this is an explanation of the practical implications of the report's primary statements on the change from emphasizing increasing urban transportation efficiency to promoting accessibility in the city as a whole[6].

It is important to go through some of the dysfunctional patterns that were mentioned in the preliminary findings before moving on to the policy suggestions since they call for the paradigm shift that has been emphasized throughout this study. The fact that it is usually getting more difficult to reach locations, opportunities, and services in many cities throughout the globe is, in fact, the most obvious trend emerging from s 2 to 4. Urban sprawl has resulted in longer journey times, larger distances between useful destinations, and higher construction and operational expenditures, all of which have raised accessibility prices. As a consequence, many areas of the cities where these socioeconomic classes reside are structurally inaccessible to them, depriving certain city dwellers of the full advantages that urbanization has to offer. Furthermore, many cities throughout the globe now operate with less effectiveness due to limited accessibility.

The constant rise in the percentage of private motorized transportation, especially the astronomically high rates of motorization in emerging nations, is another trend that this research highlights. This also happens in places like Africa and Asia where non-motorized transit is still the predominant means of transportation. Private motorized transportation has many negative externalities on top of the fundamental unfairness that it entails. Public transportation has been shown to be rather stagnant and even declining in cities of developing nations, despite the fact that it is one of the most efficient ways to improve urban accessibility and encourage sustainable urban growth.

The paper also shows that the predominance of private transportation infrastructure, facilities, and services has had a significant impact on how cities are organized in terms of form, structure, and function. The layout and design of streets and neighborhoods, the distribution of densities, and the placement of services have all been governed by the inherent imperative of private motorization as the predominant mobility modality. The continuation of this model over the course of the last century has led to a self-perpetuating crisis in urban accessibility: more vehicles require more infrastructure, which drives the need for more vehicles, which encourages more spatial expansion, which calls for more vehicles, and so on in an endless cycle. At the same time, in most cities, the neglect of urban freight management and distribution, both in land-use and transportation planning, tends to make goods transportation a significant barrier to entering the city and to sustainable urban mobility[7].

A pronounced distortion in the institutional structures, management systems, and legal and regulatory frameworks has been at the root of all the aforementioned difficulties. There is a lot of fragmentation among the entities that deal with various facets of accessibility and mobility. The management standards and norms governing planning, design, and even delivery have a tendency to exacerbate issues rather than solve them. Additionally, the regulatory tools do not entirely meet the requirements of sustainability.

Policies and Practices for Urban Mobility Reframe

The main lessons to be learned for adaptation and replication are based on the general problems as well as the good experiences and techniques addressed in this research. In terms of both policy and practical ramifications, they highlight the multifaceted character of sustainable urban transportation. Some of the fundamental ideas that follow from the previous sentences are the coherence of strategic interventions and links across processes. It is believed that the ultimate improvement in accessibility is neither a result of ad hoc spatial delocalization and decongestion nor a consequence of hardware, such as roads, trains, or cars.This research urges a paradigm change in how urban transportation is addressed. The report is filled with instructions on how to

make the change. The debate covers some of the main elements for recalibrating city planning, design, and delivery of urban transportation services in the pursuit of more sustainable mobility.

Systemic and holistic thinking and behavior

The physical, social, economic, political, and environmental fabric of cities is intricately intertwined with urban mobility. Applying an ecological and systems perspective that takes this into account is crucial when laying up a plan for sustainable urban transportation. Numerous modern urban difficulties, such as auto-dependent sprawl, chronic poverty, a lack of accountability, and lack of participatory decision-making, are structural in origin and have their roots in existing institutional, institutional, and economic methods and systems. Making significant progress toward a sustainable mobility future requires recognizing the systemic nature of issues (mispricing results in excessive use of roads during peak hours; sprawling settlement patterns render public transportation systems ineffective; urban design for machines rather than people creates cities for cars rather than people).

Transportation as a tool, not as a goal

It is critical to acknowledge that travel is a "derived demand," that is, one that results from the need for individuals to engage in social and economic interaction. The purpose of most trips rather than just moving is to meet up with friends, make money, go to school, or buy things. Bicycles, trains, buses, and cars are only tools for achieving these goals. By making this difference, the emphasis is shifted from "movement" to "people" and "places". With transportation acting as a supporter, this view sees cities, neighborhoods, regions, and mobility networks as instruments for promoting desirable social outcomes including liveability and inexpensive access. Operationally, this might manifest as compact, mixed-use communities that drastically reduce travel times and enhance infrastructure for pedestrians and bicyclists. Compact communities reduce the need for personal vehicles and travel distances, saving energy, land, and natural resources. They can also better adjust to the whims and uncertainties of climate change and other global unknowns since they are more robust[8].

Prioritizing accessibility above transportation

The fundamental idea of accessibility is connected to this idea of travel as a derived desire and transportation as a means to an end. Accessible cities provide cheap, high-quality public transportation alternatives, as well as secure, efficient pedestrian and cycling corridors that bring locations such as houses and offices or "trip origins and destinations" closer together. In other words, everyone may access them. It is inevitable that a distinct set of policies and initiatives, such as transit-oriented development and the provision of highly linked bikeway networks, result from redefining the sector's principal goal as one of improving accessibility. These methods aid the poor and others without private motor cars in gaining access to products and services in the city while also conserving land, energy, and financial resources. Simply said, inclusive, resourceful, and pro-poor cities are accessible cities.

CONCLUSION

Urban mobility system problems can only be solved if they are seen as political problems that call for political consideration, decision-making, and implementation rather than as merely technical problems that call for the "right" technological solutions. Because of this, creating sustainable urban transportation networks and, ultimately, sustainable cities, as well as the

corresponding institutional and regulatory frameworks, is at the core of urban governance. Such frameworks should have as their main goals the removal of barriers to effective participation of all stakeholders in the decision-making process, assurance of comprehensive, accurate, impartial, and transparent information used to support urban transport proposals, and facilitation of effective implementation of political decisions. A complicated problem is the creation of efficient institutional and urban governance systems.

There are no perfect answers. This does not, however, mean that finding "good practice" is pointless. Urban transport agencies and allied organizations need to be aware of the lessons learned from other places' and other periods'"successes" and "failures" in urban mobility planning. Furthermore, international development organizations are increasingly recognizing the idea of sustainable development as a crucial factor in determining financing when working with local decision-makers. Therefore, it is anticipated that over time, good practices would proliferate as a result of the "success" in drawing outside investment to produce more sustainable results in urban transportation. Urban transportation planning interventions and investments should be supported by institutional design that encourages holistic thinking and integrated activities in line with sustainability plans. Ad hoc, short-term, politically motivated decision-making should thus be avoided owing to their significant costs. In actuality, political leaders have been instrumental in fostering integration in urban administration. Particularly in the design and execution of large-scale transportation infrastructure projects, strong political leadership is crucial. To prevent it from becoming personal and transitory, it is crucial that such leadership remain open and accountable. This might increase people's faith in institutions and governance systems while also helping to prevent them from collapsing after its advocate is no longer in power.

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CHAPTER 23

LINKAGE BETWEEN LAND USE AND TRANSPORT

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ABSTRACT:

The linkage between land use and transport is a fundamental aspect of urban planning and transportation planning that has significant implications for sustainability, livability, and equity in urban areas. This abstract provides an overview of the interconnection between land use and transport, highlighting their mutual influence and the importance of integrated planning to achieve sustainable urban mobility. By outlining the relationship between land use and transport, emphasizing that the way cities are designed and developed has a direct impact on how people move and access transportation options. It highlights how land use patterns, such as density, mix of uses, and connectivity, influence travel behavior, mode choice, and transportation demand. The impacts of land use on transport and vice versa. It discusses how compact and mixed-use developments can promote walking, cycling, and public transportation use by reducing travel distances and promoting accessibility. It also addresses how sprawling, car-dependent development patterns can lead to increased private vehicle use, congestion, and environmental degradation. The abstract highlights the feedback loop between land use and transport, where transportation infrastructure and services can shape land use patterns and vice versa, creating a complex interplay between the two.

KEYWORDS:

Accessibility, Active Transportation, City Planning, Commuting, Mass Transit.

INTRODUCTION

The following section outlines six policy and operational areas that may be customized to fit various contexts and which can be used to achieve accessibility-based sustainable mobility. These include improving the connection between land use and transportation, reviving urban planning and engineering designs for transportation, realigning investment and development in transportation infrastructure, integrating facilities and operations for urban transportation, streamlining urban institutions and governance frameworks, and modifying legal and regulatory instruments. In the sections, each of them is covered in further depth.

The aforementioned groups' general names mirror standard policy procedures. Two factors led to the adoption of these policy areas for this conclusion. To start, it is important to emphasize that the shift advised in this paper is primarily feasible when implemented within the framework of already-existing institutional structures and procedures. Second, to emphasize that as these are general suggestions, they would need to be significantly modified to account for the particularities of each city's situation before being put into practice. The categories are also seen to be relevant since they may include a range of environments and developmental stages. The

strategic connections between the six categories and their combined capacity to affect policy and operational change, however, constitute the overarching logic of the six categories[1]. Improving how land use and transportation are interconnected. While there are risks associated with relying too much on supply-side and technical solutions for urban mobility, the significance of transportation cannot be understated. The gap between the fundamentals of land use and the logic of transportation has been the crucial component producing the observed problem. For sustainable urban mobility to be realized, this relationship has to be restored. National urban policy efforts are the only way to do this successfully at the highest level.

The national urban policy is given priority in this regard due to its function as a legislative document that not only articulates a vision for urban development but also establishes the relationships between various sectors, organizations, and stakeholders. National urban policy, when correctly formulated, is the most authoritative tool for lifting the relationship between land-use and transportation planning above the often made political and administrative compromises. As further explained, integration is more than just a local technical effort. It outlines the bounds of cities' potential future expansion while also representing the whole of how cities are at a certain moment. So as to effectively exploit the dynamic synergy of a certain national urban system, substantial rules are needed. Then, these directives should be translated at the sub-national level, starting with the region, moving through the metropolitan area to the municipality, and finally ending at the neighborhood and street level. A coordinated and integrated exercise at the policy and operational levels is achieved by harmonizing land use and transportation planning, which frees the two processes from the restrictions of particular ministry and departmental responsibilities. It moves planning's emphasis from the location of buildings and the allocation of land uses to facilitating the most effective and sustainably realized human needs and daily activities.

The main obstacle in this strategy is thus not only to guarantee that transportation and land-use planning are handled separately, or even that they are juxtaposed. Instead, it aims to promote the natural integration of the whole spectrum of multimodal mobility within a comprehensive and sustainable land-use system, where dynamic synergies are tapped, interconnections are encouraged, and usefulness is maximized. Throughout the process, the element of design acts as the essential connection connecting the crucial dimensions and characteristics for guaranteeing sustainability and accessibility.

The question of whose job it is to move the integration of land use and transportation as well as concepts like those stated above from theory to practice persists in many cities across the globe, especially those in developing nations. This is especially true given the geographical limits imposed by the land, the distribution and growth of activities, the financial and economic restraints, and the institutional and regulatory restrictions[2].

The complete integration of land use and transportation must be multi-sectoral and cross-cutting in nature. This highlights the interdependence of urban systems; for instance, urban expansion brought about by an investment in world-class, high-capacity public transportation raises the need for additional housing construction, commercial centers, and electric and water capacity. The use of rights of way designated for a new fixed-guideway public transportation line to also lay broadband cable, storm-runoff channels, and utility lines is one example of how multi-sectoral planning takes use of possibilities to reduce the costs of urban services and infrastructure investments.

DISCUSSION

Revitalizing urban planning and transport engineering designs. This report's major focus is the close relationship between urban design and transportation "supply and demand." Both positive and negative interactions between these impact and reinforce one another. The many scenarios mentioned in the paper show how processes arising from the interaction between the patterns of transportation and urban form in a specific environment impact the ease of movement and degree of accessibility in cities. An essential organizational concept may be inferred from the research of urban structure and the subsequent development of sustainability pillars. In particular, the optimization of density, increased closeness and co-location, as well as advances in the functioning and inclusive-ness of places and amenities, are key to realizing the relationship between urban form and transit.

Sustainable densities are crucial for sustainable mobility because they increase closeness and co-location while using less energy and leaving a smaller environmental imprint. The employment of regulatory tools, like zoning rules, and the implementation of locational incentives, such infrastructure improvements, as well as design interventions may be used to maximize density. Compact designs combined with development focused on mobility reduce private motorization while enabling towns to invest in a variety of public transit options. The study discusses several density configurations and gradients to show the variety of possibilities for encouraging compactness for sustainable transportation. However, it should be noted that although density is important, it is not a sufficient requirement, particularly for reducing the use of private vehicles and stopping urban sprawl.

The term "sustainable density" is used in the study strictly to distinguish between the conditions of "overcrowding" and "slum-like" population concentration. A variety of amenities may be provided at the lowest possible cost thanks to the planned optimization of density that is supported in this study. More public space is made possible while still having a minimal environmental effect because to the compactness that is created. It promotes non-motorized and public transit, enhances conviviality, and improves a feeling of place when combined with appropriate architecture.

The need to maintain variety and mixed-use neighborhoods is a related characteristic. Planning allows for the provision of a diversity of housing options, a balance between the locations of employment and housing, and the placement of several daily conveniences in close proximity. By enhancing closeness and minimizing the need to travel, mixed-land use encourages non-motorized mobility and makes it possible to do numerous tasks with fewer and shorter journeys. All of this is made possible through the imaginative application of planning and design, as well as cutting-edge transit engineering and planning ideas[3].

The usability and accessibility of various locations and amenities improve the connection's overall quality between sites of origin and destination. By improving each location's functioning, the value of access is increased, resulting in shorter travel lengths and fewer trips overall. Additionally, encouraging inclusivity and a feeling of place helps toss off inhibitions and fosters identification and camaraderie. At this level, street configurations, transport nodes, and neighborhood layouts are the primary intervention areas, and urban design and transport engineering design are key techniques.

The integration of freight distribution within the framework of sustainable urban mobility via planning and design requires a great deal of study, however there are several techniques that have been created and that may help to lessen the current drawbacks of freight distribution in cities. These include encouraging modal adaptability, enhancing freight infrastructure, and rationalizing delivery. However, it has been emphasized in the research that most of the concepts of sustainable urban development tend to be at odds with the business logic of freight distribution.

Refocusing growth and investment in Transportation Infrastructure

The choice of infrastructure improvements, especially in terms of budgeting and finance, is acknowledged in this research as being crucial in deciding the choices and alternatives for sustainable mobility. The existing financing and investment disparity between private and public modes of transportation must be corrected gradually. Facilities that serve the needs of the majority of people in both developed and developing nations ought to get more public funding. In order to provide more financing to creating and expanding non-motorized and high-capacity public transport infrastructure, the present bias in favor of roads and highways has to be rectified. Cities that invest in high-end BRT, light rail, and metro systems should focus more of their future expansion on these routes for public transportation.

The type of car-based sprawl that undermines urban sustainability can be stopped through transport-oriented development. However, it is crucial to maintain a suitable alignment between land use and the layout of the trans-port; otherwise, the opposite, i.e. Public transportation systems with great capacity may exacerbate urban sprawl.

Additionally, it is crucial to approach the urban transportation industry as a cohesive unit via system financing and pricing. This is best accomplished by combining financial resources into a single fund and allocating them to various programs and modes in line with clearly stated goals, such as improved air quality and decreased traffic congestion. Such centralized and coordinated finance is being used in the US, Canada, Singapore, and Japan. In order to support strategic, forward-looking planning, such as protecting rights of way for potential infrastructure developments, dedicated, long-term financing is also necessary. It is crucial to remember that in some cities of developing nations, it is simpler to negotiate and secure funding for metro, light rail, or BRT systems than for covering the (very marginal) cost of implementing integration facilities with other urban transport modes at metro, light rail, or BRT stations, such as buses, informal share taxis, and cars.

The worldwide urban transportation industry has seen a rise in public-private partnerships as a result of the budgetary limitations faced by local governments and rising demand from private investors. Contracts, franchises, concessions, and, in certain cases, complete privatization of the transportation services are used to govern these relationships.

Public-private partnerships have the ability to increase efficiency in the urban transportation industry and also spur new developments like automated toll collecting and pricing depending on the market. When governmental money is limited, they may also use private cash. Public-private partnerships have often been most successful in nations and areas that are fast urbanizing and rising in population, such as Taiwan (China) and the Republic of Korea, as well as in those that have the institutional ability to monitor and control private players. This emphasizes the need of achieving institutional and economic sustainability. This report also emphasizes the risks

associated with using public-private partnerships in urban mobility projects, as evidence from a number of cities suggests that these projects' financial risks are typically borne by the general public rather than by the private sector partners[4].

Urban public transportation must adhere to economic efficiency standards since it has a significant financial impact on local governments. Urban train systems, for instance, can transport heavy loads, but they do so at very high prices that might cause them to collapse financially. To make sure that local and federal governments have the financial resources to sustain its services, a metro investment's high initial construction expenditures and ongoing running expenses must be carefully considered. Low-cost BRT investments, which have recently been implemented by cities including Jakarta (Indonesia), Ahmedabad (India), Lagos (Nigeria), and Chiang Mai (Thailand), present a more practical option for investment in high-capacity public transport, unless a city has relatively high urban densities and abundant financial resources.

This research makes the important point that the financial models created to safeguard the public goods component of both land use and the transportation system are crucial to the sustainability of urban mobility systems. The option of value capture, among other funding sources, is strongly advised as an addition to public funding. The relationship between land use and transportation is strengthened by recovering the rise in value of surrounding land and turning it into public funds for investments in urban mobility networks. This strategy is also politically attractive since it shows how closely charges are related to benefits received.

Integrating infrastructure and operations for Urban Transportation

The relationship between land use and transportation goes beyond only the hardware and physical characteristics of the two activities. The structural and managerial issues of assuring mobility convenience, efficiency, aesthetics, and safety are also included in the discussion of transport-oriented development and traffic-calming measures in this paper. on order to provide a good mobility experience, it is necessary to coordinate the operation of multi-modal neighborhood stations, the atmosphere surrounding the movement of cars, bicycles, and pedestrians on the streets, and the processes at toll-collection sites.

For the simple reason that waste and poor spending might indicate that limited financial resources be diverted to other productive and advantageous social purposes, such as education, healthcare, or private consumption, the urban transportation sector must adhere to the concept of economic efficiency. Generally speaking, efficient land-use patterns (such as compact, mixed, and walkable) enable reduced dependence on pricey transportation infrastructure. An rise in economic production, the creation of jobs, and corporate development are all benefits of well-designed transportation infrastructure. Unquestionably, mobility is a necessary (but not sufficient) requirement for economic development and growth[5].

In the urban transportation industry as a whole, managerial, operational, and system design approaches must be based on efficiency. Redeploying buses and equipment to high-ridership areas that provide the best fare-box returns is one option for high-capacity public transportation networks. In order to cross-subsidize services and reduce or eliminate government subsidies, it is important to create legislation that permit operators to generate "outside the fare box" financial resources, such as value capture, advertising at stations, stops, and cars, etc. Building bikeway overpasses at congested intersections where comprehensive cost-benefit analyses show a net

societal benefit may be necessary for non-motorized transportation. The research emphasizes the challenges encountered by cities in developing nations in obtaining funds from public and other sources to meet the expenses of building and maintaining non-motorized transportation infrastructure. Non-motorized transport infrastructure seldom appeal to private industry or foreign financing organizations since they do not generate cash. Innovative solutions that highlight the benefits non-motorized transport has for the environment and society are required. For the movement of urban goods, night or off-peak deliveries, freight stations and consolidation centers that permit shared use of delivery vehicles, and bicycle carriers appropriate for urban circulation restrictions may be required. Installing occupancy sensors in parking spaces might increase parking efficiency by allowing rates to be adjusted in response to demand and guiding drivers to the nearest available spaces in real-time.

A mix of user fees and public funding is often required to economically and fairly finance transportation infrastructure and services since transportation is both a private and a public good, providing benefits to both individual users and society as a whole. User costs, including road tolls and public transportation fares, promote efficient behavior. When fuel taxes increase, higher costs encourage drivers to buy more fuel-efficient cars or use public transportation. Using general revenue from sales, income taxes, or borrowing to pay for port infrastructure does not encourage efficiency or social responsibility since the fees charged are unrelated to the burden placed on the transportation system or the advantages gained.

At all geographic scales, urban development and transportation must be integrated. At the micro level, there is much to be gained by expanding the concept of "complete streets," which recognizes that roads serve more than simply transporting automobiles and trucks. The "complete streets" concept, which is gaining traction in most of North America, Eastern Asia, and across Europe, regards the right-of-way for roads as "public spaces," controlling and even delaying traffic in favor of walking, bicycling, and public transportation. One example is multi-way boulevards, which offer spaces for vehicles, buses, pedestrians, and occasionally even tramways - packaged with good designs that prioritize high-quality spaces and safety. Non-motorized modes of transportation, like walking and cycling, liven up a city, promote social interaction, and allow a more physically active lifestyle. Some communities have taken things a step further by recovering territory for pedestrians, bicycles, and public transportation that had previously been used for roads and motorways. In addition to reducing inner-city traffic congestion, Seoul's Cheng Gye Cheon highway to greenway conversion, which was made feasible in part by enhanced BRT services to absorb lost roadway capacity, is also credited with promoting central-city redevelopment and urban infill. The inner-city greenway, a 6-kilometer stretch that is dotted with bike lanes and urban art, is now the second-most popular tourist attraction in Seoul[6], [7].

Progressive initiatives such as entire streets and green transport-oriented development do not just materialize overnight; rather, they start with well-considered strategies and ideas. At all levels of government, land-use planning and transportation planning must be effectively linked. National governments are uniquely positioned to encourage state/provincial, regional, and local institutions to link transport investment and urban development strategies in master plans, zoning practices, and infrastructure design standards through both carrots (e.g., financial aid) and sticks (e.g., regulatory requirements). National urban development strategies and plans must also place a strong emphasis on integrated transport and land-use planning development. For instance, integrated transportation and land-use planning are prioritized in India's 2006 national urban

transport strategy. In reality, the federal government pays for half the cost of creating integrated transport and land-use plans in Indian towns.

Streamlining the foundation for urban institutions and governance

To ensure the effective implementation of novel concepts and strategies aimed at sustainable mobility, robust institutional and governance frameworks are necessary. In order to earn the public's confidence, political will, competent leadership, openness, and accountability are necessary. The planning institutions, which are capable of developing appealing ideas of urban futures, are also essential to the whole process. Additionally, it is important to have participatory processes in place to guarantee that all social groups are represented in planning and investment choices. This entails include non-state entities and locals in negotiations when making crucial choices for urban mobility, such as neighborhood groups. Financial resources must be allocated to training and capacity-building of the relevant employees as part of institutional development in order to provide them with the necessary skills to meet the complex issues of the urban transportation sector.

A strong regional government structure, which fosters inter-municipal collaboration, is necessary for the development of a fully integrated and sustainable multimodal urban transportation system. This promotes accountability and gives a region's travel-shed a geographical framework for coordinating development and services. To finance transportation projects and service management, regional entities must be given the authority of regulatory control and financial resources.

As mentioned above, higher levels of government also play a key role even though the majority of the innovations in urban transportation will come from local and regional players. Smaller cities may benefit from national urban transport policies that support integrated planning, offer capital loans, and offer technical assistance.8 Brazil has had a national urban transport policy for more than 25 years, which has aided in fostering sustainable transportation practices in BRT-served cities like Curitiba and Belo Horizonte. Through financial assistance for the creation of unified metropolitan transport authority, India's Ministry of Urban Development is now aggressively pushing development that is focused on transportation along existing and future BRT lanes.

Technology by itself has the potential to support more inclusive and localized policy-making in the transportation sector. For instance, social media enables like-minded people to unite and influence the public conversation. When the TransMilenio BRT system in Bogotá, Colombia, was experiencing issues with excessive congestion and protracted lines at ticket offices in 2008, locals used social media to plan a sizable public protest. Active media coverage resulted in even greater public outcries, which finally compelled local politicians to implement a number of capacity-expansion projects, such as lengthening some of the crucial modular stations, extending services, and introducing additional articulated buses [8].

Injecting efficiency, accountability, and openness into the urban trans- port decision-making process is also necessary. This necessitates the development and institutionalization of planning procedures and assessment methods that are based on impartial performance indicators and connected to clearly stated objectives and desired results. This encourages accountability and openness. A transparent and democratic planning and decision-making process is also necessary, especially in light of the benefits and wide applicability of the urban transportation sector. This

will guarantee that the needs of the least advantaged are acknowledged and completely addressed, as well as that the views of all citizens are heard, including those of women and men, children, the elderly, people with disabilities, companies, governments, and the general civil society.

Everywhere in the globe, from Eastern Europe to Sub-Saharan Africa and South-East Asia, the distribution of responsibilities for the urban transportation sector is increasing. The effective transfer of duties and investment obligations from central to local governments requires both human and financial resources. Metropolitan planning and operating authority must represent regions as "ecological units," which means they must permit planning and control across a geographic area that resembles commute-sheds, trade-sheds, and air basins. Plans for human resource development and reliable, coordinated, and profitable urban transportation finance programs are also required[9], [10].

Readjusting legal and regulatory instruments

The interventions mentioned above demand for adjustments to institutional and financial structures associated to urban development as well as to social behavior, constructed form, engineering of transportation, and space management. These components are based on a tradition of legal principles that have upheld mobility systems that this investigation determined to be woefully deficient. Therefore, any change would need a significant overhaul of the laws and regulations governing urban administration. For instance, it is necessary to change the regulations governing the planning process to encourage greater mixed-use and compactness rather than the often used usage of strict zoning and use segregation. The same holds true for construction regulations and standards, directives and power granted to various entities, as well as penalties intended to lessen unwanted externalities. There is still more to be done, even if some communities have made substantial progress in implementing the appropriate laws and regulations to meet some of the aforementioned goals. The urgent need to promote inclusivity and environmental preservation necessitates not only the passage of a complete set of legislation but also the augmentation of enforcement resources to guarantee that the rules and laws are followed.

CONCLUSION

Urban sustainable mobility is a development topic that touches on many of the most pressing problems facing the world today. Sustainable mobility is one of the most pressing issues facing the international community today, and it cuts across the intersection of efforts being made to reduce greenhouse gas emissions as well as actions being taken to stop the rising economic disparities between and within nations. Similar to this, the fight against poverty and the promotion of shared prosperity cannot be won without also addressing current inequalities in urban transportation systems and barriers to entering the contemporary city. This study has shown how transportation systems affect the morphology of the city, influencing both its built form's configuration and its spatial organization. Urban mobility consequently has a local as well as a macro influence inasmuch as these two factors are connected to the productivity and vitality of the city in a larger context. The paper makes the case that it is feasible to launch and support initiatives that may successfully improve the accessibility of cities today by working along the three main pillars of sustainable development and within the framework of strong, integrated, and participatory institutions.

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CHAPTER 24

TOWARDS SUSTAINABLE URBAN MOBILITY

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ABSTRACT:

Achieving sustainable urban mobility is a pressing challenge in the face of rapid urbanization and increasing transportation demands. This abstract provides an overview of the concept of sustainable urban mobility and the key principles, strategies, and approaches towards achieving it. By defining sustainable urban mobility as a transportation system that meets the mobility needs of people while minimizing negative social, economic, and environmental impacts. It highlights the importance of integrating economic, social, and environmental considerations in transportation planning and policy-making. It further explores the key principles of sustainable urban mobility, including accessibility, affordability, safety, efficiency, and environmental sustainability. It emphasizes the need for transportation systems that provide equitable access to opportunities, are affordable for all users, prioritize safety for pedestrians, cyclists, and public transport users, are efficient in terms of time and resource use, and minimize negative impacts on the environment.

KEYWORDS:

Accessibility, Active Transportation, Cycling, Electric Mobility, Green Transportation, Mass Transit.

INTRODUCTION

Around the beginning of the 2000, the transition to a more urbanized world was officially recognized, but it took more than ten years to begin developing global regulatory frameworks on climate, sustainability, and biodiversity. A broad spectrum of stakeholders and interest groups from civil society and the corporate sector have actively embraced change, being on the front lines of everyday issues, together with national governments and, in some cases, even more actively, local and regional governments. Cities are turning to fast environmental transformation and adaptation to address some of the most critical challenges facing communities throughout the world, including transportation, health, greener infrastructure, air quality, and CO2 and greenhouse gas emissions. This occurs in the context of broader global industry changes, such as digitalization and the growth of on-demand mobility systems, which have a great deal of potential to help with the creation of new sustainable mobility strategies. The world still has to transition from fragmented experimental techniques to fundamental structural reforms, as this study makes clear[1].

Mayors gathered at the U20 Summit in Tokyo in May 2019 and jointly affirmed that "building sustainable and resilient cities is crucial to safeguard the quality of life, livelihood, and health of our city dwellers" in a world where more than half of the urban population lives in growing

metropolitan areas and 600 million new metropolitan residents are expected by 2030.3 The current Handbook of the Transport Health Environment Pan-European Programme is intended to foster practical solutions and to support local governments and leading stakeholders in moving towards healthier and yet affordable urban systems, even though mobility and transportation are obviously necessary changes. Urbanization is a source of global expansion, but it also comes with numerous issues, since there are over 70 million additional people moving into urban regions every year and a predicted 6.5 billion urban residents by 2050.4. Investment disparities are growing, inequality is increasing, and social and territorial cohesiveness is under jeopardy. Land-use regulations are seriously flawed. The affordability gap, which is predicted to be expanding by more than US$ 650 billion year, continues to widen. By 2025, the worldwide markets for smart cities could generate between US$ 2 trillion and US$ 3.5 trillion annually. However, there is scant proof that industry 4.0, internet 3.0, and IoT are self-help forces behind inclusive territorial development. Social networks, design, film and television, literature, and other mediums are rife with speculation and science fiction about cities and their potential physical and virtual infrastructures as residents of cities and regions throughout the world deal with clogged transportation systems. With a market worth more than US$ 2 trillion annually the creative industries as a whole influence the world's imaginaries and human activity's ecological imprint is expanding more quickly than ever. This is the new standard for infrastructure expenditures, but more research is still needed to establish what the future cities will look like in terms of their infrastructure and transportation systems.

Communication regarding off-grid local trials or investments in designated smart urban mega projects tends to be overemphasized in the lack of a clear route towards an ideal city form that ensures equality, sustainability, and development. In affluent nations, despite a rising need for mobility, administration costs of current infrastructure are skyrocketing and voters' aversion to new projects is increasing. Lack of funding for infrastructure in low- and middle-income nations harms the environment and long-term economy. The Nationally Determined Contributions to Achieve the Paris Agreement and the Voluntary National Reviews of the Sustainable Development Goals serve as examples of the growing demand on local, regional, and international levels for a cross-sectoral approach to urbanization, mobility, and infrastructure development. However, it still needs to be turned into relevant policies. A new approach to infrastructure projects is emerging as we move toward the decoupling of economic growth from carbon emissions. This approach connects hard and soft infrastructure, infrastructure finance and user behavior, civil and financial engineering, evolving business processes, and the creation of inclusive infrastructure. With digitalization presenting a multitude of new chances to switch from siloed to platform or even distributed methods, mobility is fast evolving[2], [3].

DISCUSSION

The demands for a swift shift to more sustainable urbanization models are being made both locally and internationally at a time when urban stress and health issues are becoming more widely recognized as global issues. Over the previous ten years, the trend of automobile ownership has increased in the Commonwealth of Independent States. However, since beginning reference values were low, these nations' present levels of motorization are far lower than those of wealthy nations. However, the ratio of automobiles per 1,000 people in several of these nations' major cities is approaching 300–400, and it is expected to continue to climb. Most nations have witnessed an increase in automobile use, as measured by the number of kilometers driven per person, along with the rise in privately owned cars.

The opposing trend is being pushed by local governments and civic society in other areas of Europe, who see private vehicle ownership and private automobile mobility as significant barriers to sustainable living. The recent significant social unrest in France, which was brought on by the idea of raising the price on fossil fuels, particularly diesel, in order to finance a more carbon-neutral economy, demonstrates that the equation is not that straightforward. Along with the ideas, steps were taken to decrease the posted speed limits on the nation's roads. Around France's main metropolitan centers, in periurban and rural regions, automobile ownership isn't only seen as a lifestyle choice that can be altered to fit current fashions. Global trends, whether they be related to electromobility, shared mobility, or active mobility, are altering mobility patterns across the UNECE member nations and having an impact on transportation systems and cars. Industry, society, and urban government are all impacted by this. Urban patterns and mobility difficulties may be rethought in many ways thanks to the economy's fast growing digitalization, but doing so will need future cross-sectoral and multi-stakeholder collaboration[4].

Congestion vs growth and accessibility

"A city that relies only on automobiles develops permanent dysfunction, inefficiency, and inconvenience. The transportation system's main objective is to move people, not cars.Researchers who study urban transportation systems concur that conventional, developed cities are becoming uncomfortable to live in due to the unchecked increase in the usage of privately owned vehicles. Urbanization and population expansion increase the need for transportation, population mobility, and the concomitant difficulties with access to certain metropolitan areas, travel destinations, and transportation services. Large metropolitan road networks get congested because transportation demand exceeds the capacity of the existing road infrastructure.Around €100 billion, or more than 1% of the European Union's gross domestic product, is projected to be lost annually in economic losses due to traffic-related delays in passenger and freight transportation.

Major city administrations have long seen expanding the capacity of urban highways via their rehabilitation and development as the primary method of reducing traffic congestion. The paradigm of "planning for cars in cities" served as the foundation for the respective transport planning theories that were adopted throughout the century noted for "rapidly developing motorization." The experience has demonstrated that these efforts to address the problems of enhancing accessibility to urban areas and reducing congestion never produced long-term favorable results as a result of the creation of so-called "induced" mobility. The realities of rising car ownership that far outpaced the growth of the urban road system, as well as rising pollution and environmental damage brought on by increased road infrastructure, highlighted the need for a new paradigm for urban transportation development.The idea of "sustainable urban transport" or "sustainable mobility" aimed to maintain the population's mobility by redirecting transportation demand into riskier and greener types of transportation[5].

Nevertheless, despite all the advantages of this strategy, which has already been largely adopted in many large cities, it is still a result of the specific transportation needs for which the public transportation system was created. Planning cities and transportation infrastructure around motor vehicle traffic continues to have significant negative externalities related to transportation activities in particular, resulting in 1,250,000 fatalities annually from traffic accidents and 3,200,000 deaths annually from air pollution. It is obvious that we need to change the current transport paradigm and concentrate efforts on building vivacious, vibrant cities that can

accommodate people's daily activities. A rising number of experts in the field of urban planning are recognizing the significance of this method.

This reorientation of transportation planning goals is meant to support the fundamental planning tenets of sustainable urban transportation systems, such as: Developing effective alternatives to driving one's own car. putting in place systems for managing transportation demand.Developing tools for active mobility.Successfully combining urban planning with transportation.Choosing a transparent and participative strategy to engage stakeholders.

Transportation-related activities continue to be a significant source of noise and air pollution emissions, especially in metropolitan areas. According to recent World Health Organization statistics, nine out of ten people worldwide breathe air that exceeds WHO air quality standards for contaminants. According to estimates from the WHO, exposure to ambient air pollution results in almost 500,000 preventable deaths per year in the European area. The emissions of greenhouse gases that contribute to climate change are mostly caused by the road transportation sector. According to a "business as usual" scenario, by 2030, 40% of the world's carbon dioxide emissions might be attributed to transportation. The health implications of climate change include changes in the patterns of vector-borne illnesses like malaria and tick-borne encephalitis as well as a rise in the frequency and intensity of severe weather events like heatwaves, droughts, flash floods, and cold spells.

One of the biggest environmental threats to our physical and mental health and wellbeing is noise. It is believed that at least 100 million individuals in the European Union are impacted by road traffic noise levels that are over WHO guideline values, despite the region's limited data availability. Road traffic noise alone costs as least 1.6 million healthy years of life in western Europe. Road traffic accidents are the biggest cause of mortality for young people between the ages of 5 and 29 and cost governments around 3% of GDP. A pedestrian or cyclist is involved in about one out of every four traffic fatalities.12 Transport operations have a number of negative side effects, including injury from traffic hazards, physical inactivity, air pollution, psychosocial effects, such as noise, and climate change.The main cause of environmental pollution is transportation, particularly motor vehicles. The burning of gasoline in automobile engines results in the emission of more than 200 distinct chemicals into the environment. Nitrogen oxides, hydrocarbons, particulate matter, carbon monoxide, and sulphur oxides are the most dangerous byproducts of vehicle emissions.

Motor Vehicle Environmental Safety Specifications

In the EU, air pollution results in over 350,000 preventable deaths each year, and heavy vehicle emissions alone are responsible for between €43 billion and €46 billion in annual health costs. Additionally, automobile emissions have a harmful impact on the health of the flora and fauna as well as the status of buildings and structures.Motor cars emit hazardous exhaust gases into the atmosphere, but they also release other pollutants into the environment, such as gasoline vapors, byproducts of tyre and road wear, and byproducts of brake lining wear.

The effect of transportation on climate change is a further troubling problem. In the next years, the growth rate of CO2 emissions from urban passenger transport will accelerate due to the continued urban population expansion and economic development. Limiting the increase in world average temperature to 2°C would be difficult since, compared to 2015 levels, urban passenger transit is expected to increase by 60 to 70 percent by 2050. Between 2015 and 2050,

the amount of motorized transportation in cities might rise by 94%, which would result in a 26% increase in global CO2 emissions from urban mobility expansion alone.

Mobility versus wellbeing and health

The detrimental consequences of transportation activities are mostly related to how it affects people's quality of life and their ability to live healthy lives. Road safety, the effect of transportation on the environment, and decreased physical activity as a result of the overuse of private automobiles have an influence on people's quality of life and health. On the list of risk factors for global health, air pollution comes in at number four.The chances of developing cancer from diesel engine particle emissions are much greater than the equivalent risks from other contaminants. Due to the difficulty in dispersing the exhaust fumes produced by motor vehicles, which are emitted into the atmosphere at ground level, they stand out among other sources of pollution emissions into the environment. The percentage of people who live beside urban highways in ten European cities with chronic non-communicable illnesses[6].

Climate change also has an impact on public health. According to the WHO, between 2030 and 2050, climate change would result in an extra 250,000 fatalities annually. Also to be considered is the fact that the percentage of emissions from motor vehicles exceeds 35% of those covered by the Climate Action Regulation, which mandates that Member States cut GHG emissions in sectors outside of the Emission Trading Scheme by 2030.The effects of transportation, particularly those of motor vehicles, on the environment and public health play a significant role in determining how well off a community is. Well-being is sometimes seen as a crucial component of both the wide and mostly illusive idea of "happiness" and the quality of life.

Living close to the busiest streets and roads in European cities may increase your risk.The rise in illness and death brought on by the use of motor vehicles increases the expense of public health care significantly, as well as strains budgets at all levels. Due to the importance of effective planning for metropolitan regions where transportation is a key component of urban sustainability, many governments give prevention a high priority.The most crucial task in planning for sustainable urban transportation is creating multiple forms of active mobility. Individuals profit from active urban mobility via lower health care expenditures, and municipal governments benefit from lower health care costs.According to research findings, each mile driven by a car in EU countries costs society on average 0.15 euros, whereas each mile driven by a bicycle benefits society in the form of 0.16 euros thanks to the improvement of public health and the absence of the negative effects related to driving.

There are several ways that active mobility benefits the economy. They consist of:reduced atmospheric emissions of noise and pollutants. less crowded roadways.lower costs for building roads. improved accessibility and urban lifestyle.increased population health and physical exercise. increased employment creation and tourism.The Economic Impact of Walking and Cycling in London. According to studies, the growth of active transportation benefits the urban economy since walkers and cyclists spend 40% more time in shops than drivers do.Researchers from the Bartlett School of Planning, University College London, and the London Department of Transport came to this conclusion. Additionally, workers who commute by bicycle use sick days 1.3 times less often than their counterparts, saving the nation's economy £128 million annually.

The rise of active transportation modes among the people, which increases their motor activity, is encouraged by the provision of compact and dense urban development and various land-use

patterns in metropolitan regions.Important issues should be resolved: increasing demand for transportation and an overreliance on using private automobiles. Effects of air pollution from transportation on ecosystems and human health.Due to insufficient coordination of transportation and spatial planning, there will be more traffic congestion and less green areas.Non-communicable illnesses are becoming more prevalent as a result of sedentary lifestyles and general inactivity.

The Sustainable Development Goals and THE PEP

The United Nations' Member States approved the 2030 Agenda for Sustainable Development, which includes 17 Sustainable Development Goals, on September 25, 2015. All nations must intensify their efforts to address concerns like social protection, economic development, environmental protection, safeguarding everyone's well-being, and combating inequality if they are to succeed in achieving these objectives. Almost every SDG has some connection to urban and transportation planning, urban activities, and improving the sustainability of transportation networks. Planning all the activities in connection with the economics, land use, urban planning, geography, ecology, sociology, and psychology is necessary to create a sustainable urban transportation system. The following SDGs 17 in total are connected to sustainable development and urban transportation systems:

The Healthy Cities Initiative of the World Health Organization

Beginning in 1986 with 11 European towns, the WHO European Office Healthy towns programme swiftly spread to additional cities in Europe. The idea quickly expanded internationally as a means of putting local public health policies into practice. By making political pledges in line with the "Health for All" and "Sustainable Development" guiding principles, the project's goals are being achieved.

Sustainable urban transportation principles

We can identify a first set of fundamental guidelines and goals for environmentally friendly urban transportation systems in light of the different worldwide initiatives:Put the needs of the people as your first concern.By guaranteeing equitable, secure, and open access to locations, amenities, commodities, services, and other people, it is possible to enhance quality of life and satisfy the requirements of all individuals.Prioritize the employment of the most ecologically friendly, safest, and cleanest means of transportation and travel, and make sure that all urban transportation options are carefully chosen and coordinated.Make sure that packages of effective policies and solutions are created to provide outcomes at a reasonable cost and encourage long-term socioeconomic development.

Utilize Interdental Planning Software

Ensuring the timely and secure conveyance of commodities would help the economy. Make sure that transportation operations have less of a negative effect on the environment and human health. Participate in transportation planning with important stakeholders, the general public, and locals. Make sure that the rights of current and future generations are protected. A sustainable urban transportation system should be able to provide mobility, particularly to underprivileged and vulnerable populations, while addressing negative internal and external influences.The relationship between urbanization, increasing motorization, and the status of the environment is a result of a number of socioeconomic development factors and human-nature interactions. The

humanization of cities, wherein they not only gain in convenience to fit people's lives but also contribute to their professional fulfillment and broaden their social and cultural scope, is the new essential message of contemporary urban environment development[7].

The idea of quality of life in cities has gained prominence during the last 15 years. A house, a neighborhood, and a city as a whole are all brought into focus by the idea of a liveable city. These conditions include safety, economic possibilities, well-being, health, comfort, mobility, access to health services, education, and leisure.Today, the fundamental principle of urban development is evolving to include providing all required advantages to people. Accessibility is becoming the primary objective of transportation systems, creating the conditions for comfortable, quick travel, and efficient mobility via "open" architecture and urban planning.

Rebuilding Models and Making Money by Raising Environmental Awareness. In this paper, we provide case studies from the UNECE area and beyond to demonstrate how the creation of effective public transportation networks is ultimately necessary for sustainable urban planning and transportation. Plans for sustainable transportation should be supported by both public and private finance. To balance the influence of venture capital hunger for particular transportation systems, new international laws may be put into place.As shown in the present paper, we firmly believe that measures to promote active mobility should be developed. Even more so, they play a crucial role in more comprehensive public health programs. However, we also think that local policies concerning active transportation and better urban lives ought to take the effects of global trends into account. Cities need to be more actively involved in discussions about the future of infrastructure, and we hope that this research will demonstrate that infrastructure projects throughout the world must support and service mobility policies, plans, and investments that are centered on the needs of citizens and their health. Spatial planning has grown vehemently opposed to private motor vehicles, particularly those fueled by fossil fuels, in a number of cities around Europe. As demonstrated in June 2019 by sizable protests in Madrid against the newly elected municipal government's proposal to scrap the creation of a low emission zone in the center of the city - a proposal which was part of its electoral programer - this trend is accompanied by intense debate and much controversy. Real estate development and governmental policies that support sustainable development are becoming convergent throughout Europe. Programs like those promoting "comfort of living" in the Russian Federation promote strategies for development that put the needs of people first, such as improved public spaces.We support the conversion of urban master plans across UNECE nations into integrated urban and transportation development strategies with rolling investment plans in sustainable mobility systems by means of this Handbook, as demonstrated in 7 and succinctly stated in 8. In order to ensure long-term funding for public transportation networks, we request that the UNECE Working Party on Transport Trends and Economics vigorously advocate for such a shift in policy[8].

There is much to be done, with little prospect of a one-size-fits-all solution, despite evident trends toward reduced reliance on automobiles and more integrated sustainable spatial planning and mobility policy. In contrast to Switzerland, where government agencies are working with civil society groups like the Association Transports et Environment to assist "housing without cars" initiatives, rising nations continue to place a high focus on growth and development.Mega-projects or designated "smart cities" are competing with one another in Central Asia for size and height. The no-car method hasn't yet been promoted, despite the fact that such projects, driven by cash flows from the United Arab Emirates or Asian nations, incorporate green elements and

certification. The UNECE area exhibits a broad variety of subtleties, from integrated and R&D-fueled development initiatives like those in Amsterdam to more traditional but quickly evolving planning rules like those in Tashkent.

CONCLUSION

In conclusion, achieving sustainable urban transportation is a complex and urgent issue that calls for an all-encompassing strategy. To create cities that are more livable, inclusive, and ecologically sustainable, it entails tackling the social, economic, and environmental aspects of transportation. We may strive toward attaining sustainable urban mobility by encouraging sustainable modes of transportation, integrating land use and transportation planning, using technology and innovation, involving stakeholders, and guaranteeing policy coherence. Sustainable urban transportation has various, extensive advantages. It may result in a higher standard of living, less traffic and pollution, better public health, and more social fairness. Sustainable urban mobility may help build cities that are approachable, inexpensive, safe, effective, and ecologically sustainable, which will benefit both the present generation and future generations.

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CHAPTER 25

SPATIAL PLANNING FOR SUSTAINABLE URBAN MOBILITY AND ACCESSIBILITY

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ABSTRACT:

Spatial planning plays a crucial role in shaping urban mobility and accessibility, and it has the potential to contribute to sustainable and inclusive cities. This abstract provides an overview of the concept of spatial planning for sustainable urban mobility and accessibility, highlighting the key principles, strategies, and approaches towards achieving it. By defining spatial planning as a process that involves the organization and management of physical space to meet social, economic, and environmental goals. It emphasizes the importance of integrating mobility and accessibility considerations in spatial planning to ensure that transportation systems are efficient, equitable, and sustainable. The key principles of spatial planning for sustainable urban mobility and accessibility, including land use integration, compact development, mixed-use development, and transit-oriented development. It underscores the need for spatial planning that promotes the efficient use of land, reduces sprawl, and encourages development patterns that support sustainable modes of transportation such as walking, cycling, and public transport.

KEYWORDS:

Active Transportation, Cycling Infrastructure, Integrated Transport Planning, Land Planning, Mobility Hubs.

INTRODUCTION

Sustainable social, territorial, and economic growth depends on effective spatial planning at the national, regional, municipal, and neighborhood levels. It is situated where the growth of infrastructure, real estate, and land use intersect. Spatial planning, which formerly relied on long-term projections, is now impacted by systemic disruptions or changes, such as climate change, natural disasters, globalized money flows, and the rise of international migration. In order to strengthen national and local systems of urban and rural development and to better integrate sectors like housing, transportation, energy, and industry, spatial planning should always take environmental factors into account.

The drive for mobility seems to be the biggest trend influencing cities across Europe and the larger UNECE area. Over 3 million people are flying in the air at any one time. Our roadways are becoming more and more congested with automobiles. Our highways and streets are being overrun by an unprecedented number of delivery trucks as a result of global commerce and the personalization of products delivery. At the Habitat III Summit in Quito, the United Nations endorsed the New Urban Agenda in 2016. This paper advocates for the establishment of integrated and mixed-use urban development-based national urban policy. A universal "right to

the city," encompassing access to basic services, housing, and work, as well as "the benefits and opportunities that cities can offer," is also promoted in this passage[1].The New Urban Agenda often mentions the need for mobility as a means of preventing urban sprawl, promoting balanced urban and metropolitan growth, and lowering the economic and environmental costs of traffic and pollution.

Uncertainties about Models

Since the year 2000, several cities have participated in long-term visioning exercises, with infrastructure planning playing a crucial role. Such broad ideas have prompted the adoption of significant investment packages from New York to Tokyo, Sydney to London, Moscow to Shanghai. Numerous cities in South-East Asia, Central Asia, and India are also following this trend. However, the encouragement of innovation and the creation of new, extensive transportation networks have not stopped a systematic worldwide reduction in home affordability. Complex metropolises often have poor governance, and the negative consequences of infrastructure expansion on spatial inequality are understated. Neo-classical and post-Keynesian economics have disregarded the link between investments in large-scale infrastructure projects and the development of social capital.

The promotion of compact urban development paradigms has failed. With the exception of dubious success stories like the densification of downtown Vancouver, urban expansion now uses three times more land per capita than it did in the 1990s throughout the globe. Although the ideas of transit-oriented development have been explored since the early 1990s, no international TOD standards have yet been established. Although the idea of "smart cities" has been extensively established since 2005 or 2006, there are currently no international standards for this. Sustainable community norms have been a focus of the International Organization for Standardization since 2012. There are currently no international standards, although the Institute of Electrical and Electronics Engineers is working on creating synthetic standards[2].

Confusion and possibilities in the areas of transportation and mobility

Urban financial success stories are born from unchecked urban expansion, which offers promise but also causes complexity. Between 2010 and 2016, $110 billion USD was invested in mobility startups, the majority of it going to companies in the sharing and autonomous vehicle industries, with the majority of the money coming from Silicon Valley. Mobility was seen to be the next great opportunity by the global venture capital community, which led to fundamental shifts in urban government, infrastructure financing, and planning paradigms. The stock market valuation of ride-hailing businesses now often surpasses that of some of the biggest infrastructure investment programs worldwide.

Public transportation that receives subsidies has long been considered the best option for moving big populations with little encumbrance and pollution. The individualization of travel using apps and fleets of affordable light electric cars and technologies to transport people efficiently and at far lower prices than traditional taxis is reflected in several potential mobility solutions today. The number of people using public transportation in the United States is already falling. Should cities forgo significant infrastructure investments and convert parking spaces and roadways into new free-floating fleets instead? Since no city has been able to considerably reduce automobile ownership, it is uncertain to what degree new technology can replace intricate transportation networks[3].

Infrastructure management and development are undergoing several changes, from multirole infrastructures integrating transportation and energy systems to integrated multimodal infrastructures. Innovative approaches to examine infrastructure costs and promote clean transportation include intelligent transport systems. However, multi-level urban governance structures are necessary for scaling up these sets of solutions, but they are lacking. Nowadays, segregated urban systems are the norm rather than aesthetically pleasing networks of urban mangroves.

The United Nations Settlements Programme states that future cities should create a new kind of urban area and structure where urban life flourishes and the most prevalent issues associated with existing urbanization are addressed. In order to create a new and sustainable interaction between urban people and urban space and to raise the value of urban land, UN-Habitat suggests a strategy that enhances current sustainable urban design ideas. The three main characteristics of sustainable neighborhoods and cities compact, integrated, and connected are supported by five guiding principles. In order to solve modern urbanization concerns such population increase, urban sprawl, poverty, inequality, pollution, congestion, as well as urban biodiversity, urban mobility, and energy, UN-Habitat aids nations in creating urban planning methodologies and systems.These are the five guidelines:an effective street network and enough room for streets. At least 30% of the land shall be taken up by the street network, with a minimum of 18 km of roadway length per kilometer.Quite dense. 15,000 or more persons per kilometer.mixed-use land. In every community, at least 40% of the floor area should be set up for commercial usage[4].

DISCUSSION

Combination of social groups. With 20 to 50% of the residential floor space devoted to affordable housing, there are homes in the particular neighborhood that are available in various price ranges and tenures to meet different income levels. Not more than 50% of the total should be allocated to each tenure type.Limited specialty in land use. This is to prevent single-use blocks or communities from taking up more than 10% of any one community.Cities' environments have undergone tremendous alteration in recent decades as a result of the increasing urban population expansion. Urban sprawl, which encourages the settlement of enormous tracts of land and is often accompanied by critical issues including inefficient land use, excessive reliance on automobiles, poor density, and high usage segregation, is a key characteristic of rapidly expanding cities. Current city expansion approaches produce fragmented, inefficient urban spaces where urban advantage and the city idea are lost when combined with land-use speculation.

The idea of the "compact city" was created as a result of the application of these ideas. defining traits of a compact urban setting. A compact urban environment is defined by the coexistence of mid-rise structures with mixed-use buildings and areas, as well as high-density development and a high-density street and road network.Effective spatial planners should be able to interact with actors at all developmental stages. Participation involves establishing mutually beneficial communication ties[5].

Consultation: providing knowledgeable counsel in order to reach conclusions. Acting on behalf of one or more groups of actors in an attempt to represent people and ideas is known as representation.

Appeal: serving as a voice for group decision-making and for the development of the impacted neighborhood. Planning for the built environment successfully requires effective management. Organization and coordination, planning and policy, and project monitoring are all parts of management. Its objectives include hearing different points of view, doing analysis, making decisions, and defining any concepts that could have been misunderstood.

Broader objectives of spatial planning:to advocate for the development of a genuine, democratic form of local government.To enhance the performance of the urban environment. to promote security and social cohesiveness.To encourage the urban and housing sectors to alter the market.To strengthen the real estate and land markets and protect private property rights.High transportation demand and a heavy burden on the infrastructure are indicators of high population density. The provision of excellent public passenger transportation is the best approach. The transportation supply and mobility options should be as varied as the number of customers and the range of their needs in terms of the quality of the transportation service. Every form of transportation, including walking and cycling, is given full attention in a tight urban area with a very congested street and road network. Urban residents prefer to live, work, rest, and shop in one location rather than spending time, money, and effort traveling between various parts of the city. As a result, a new trend in urban development known as "mixed-use development" has emerged within the compact city concept, which is meant to meet the diverse needs of residents[6].

A notion of territorial development known as mixed or multifunctional usage indicates a range of functions, socioeconomic strata, and ages. With a balance struck between strategically positioned amenities and the pace at which inhabitants move around, the potential reach of tourist destinations is significantly expanded. The phrase "mixed-use" refers to a building that combines at least three different uses, such as dwelling, commercial space, and a business sector. Only a few grocery shops should be located in the building's commercial portion, which should otherwise be used as a sizable retail area for clothing stores, sporting goods stores, pharmacies, cafés, and restaurants. The main goal of the developers is to minimize the amount of time that building inhabitants spend moving around town since everything they need is nearby.

The mixed-use idea is now a favored urban design style.The reduction of the negative impacts of the urban environment on human health is the goal of the land-use and development rules. Accordingly, locations that might cause noise, vibrations, odors, excessive traffic, or high pedestrian traffic should not be placed next to residential areas. A list of allowed uses is provided for each zone.In areas with mixed uses, many lifestyles may coexist. As a result, residents do not have to sever long-standing social connections or leave the region to which they have become more connected as they age. The enhancement of the quality of the urban environment is encouraged by multifunctionality, which raises the value of real estate as well as the earnings of the city and property owners[7].

The amount of people walking and bicycling increases by 10% to 20% when homes, workplaces, and retail establishments are positioned near to one another in mixed-use zones. The elimination of the need for individuals to own vehicles and public transportation improves living circumstances for low-income residents while also eradicating the lines of spatial segregation. Compact neighborhoods significantly reduce travel time, allowing the city to save money on environmental protection measures while simultaneously improving the health of its citizens. In recent decades, urban agglomerations in Europe have increased in size and number. There are

now roughly 100 agglomerations in Europe, which are home to 60% of the continent's population. Agglomeration growth is linked to a high demand for transportation capacity, deteriorating infrastructure, environmental concerns, and the need for legal control of interactions with local governments. Functional zoning is another characteristic of agglomeration regions.Planning, decision-making, and strategy formulation for urban and transportation that is inclusive.

Principles

The quality of spatial planning, which should ensure inclusivity by striking a balance between urban accessibility and population mobility, taking into account the interests and capabilities of all categories of users as well as the impact of the transportation system on the environment and public health, is a major determinant of the quality of urban management.An effective urban strategy that is in line with multimodal transportation options aids in preventing uneven spatial growth, promotes the social and economic blending of various urban districts and demographic groups, and prevents environmental deterioration[8].

In order to provide an inclusive urban environment, access to transportation services must include:Infrastructure for transportation that is physically accessible and free of barriers, particularly that for public passenger transportation and non-motorized transportation.Motor vehicles are physically accessible to all user groups. Public passenger transportation costs and new urban mobility options. Urban regions' temporary accessibility while employing public passenger services.A crucial performance measure of the excellence of the urban transportation network and public passenger transportation services is accessibility. In the latter scenario, the indicator of availability should be utilized to define criteria for the services of transport operators as well as to shape requirements for the route network. An established set of standards and guidelines establish the accessibility criteria. Building barrier-free multimodal transport networks for all user groups is a key component of planning for inclusive urban transportation systems.

System for getting to Stockholm's center. A map of the new cycling plan in Paris. Wide participation of many user categories in all talks is required to guarantee inclusivity of decision-making in urban transportation.Additionally, it's critical to learn from the many mistakes committed over the years in other nations and to steer clear of repeating them. The inability to implement sustainable transport and urban planning concepts and the absence of a structured multimodal transport planning process may have been the biggest mistake of all.Generally speaking, cities that adopted sustainable urban and transportation design concepts were successful in improving their likeability via a variety of actions, such as:Creating and putting into use new communications and information technologies. Creating "smart mobility," "electro mobility," and shared mobility.Putting autonomous driving technology into practice. Increasing environmental consciousness among people. Increasing the emphasis on healthy habits.Encouraging changes in people's transportation habits.

Framework for Sustainable Urban Mobility System at the System Level. An urban mobility strategy must concurrently strengthen all four components since the performance of the weakest link will have an impact on the final outcomes.The art and science of effectively fusing urban and transportation planning are discussed, along with a set of actions needed to create and advance sustainable urban transportation systems. Each city should choose the precise order in which to carry out the suggested initiatives, taking into account its unique limits and resources. A spatial strategy adds value by coordinating the territorial effects of industrial strategies and gives

an overview of the desired pattern of territorial spatial development. The crucial question is how to maximize sustainable development by promoting and directing the spatial distribution of development, redevelopment, and investment, the coordination of infrastructure, such as the transportation, water, housing, health, and social services that support such development, as well as the maintenance of environmental assets. The various spatial development choices that are subject to consultation and strategic environmental assessment should be considered when developing a plan[9].

Algorithm of Action to Develop a Sustainable Urban Mobility Plan

The Leipzig Charter on Sustainable European Cities and a Green Paper Towards a New Culture for Urban Mobility were both accepted by the EU in 2007. It developed an urban agenda in 2015 with mobility as one of 12 pillars. And in 2011, the European Commission approved a series of 40 specific steps to boost mobility and create competitive transport networks on the basis of a White Paper Roadmap to a Single European Transport Area. SUMPs were introduced as part of the package's implementation, which emphasizes the connected responsibilities of the EU, national, and local governments in fostering innovation and change. In 2013, the Urban Mobility Package was adopted, recognizing the responsibility of local level stakeholders to promote sustainable urban mobility. The package serves as an example of how urban mobility ties to other important policies, including those pertaining to accessibility, social fairness, economic growth, and air quality.

A SUMP's main objective is to make urban areas more accessible while also delivering high-quality, sustainable mobility and transportation to, though, and within the metropolitan region. Instead of focusing on a municipal administrative zone, it examines the demands of the "functioning city" and its surrounding area.The SUMP idea is supported by the European Commission, which also provides the essential resources and direction to assist towns around Europe in putting their mobility strategy into action. The fundamental SUMP tenets are given. SUMPs are not merely technical devices. They may act as gathering places for decision-makers, local governments, and planners of urban transportation, academia, NGOs, and other experts in the field of mobility.

The SUMP recommendations have gained significant traction since their introduction in 2013 and have been extensively implemented across Europe, according to the European urban mobility observatory Eltis. The SUMP Guidelines are being modified as of 2019 to take into account current societal, technological, and mobility developments. The moment is opportune to aggressively promote a triple helix-style strategy for sustainable urban mobility and transportation, linking multilevel governance, urban and transportation policy, and industry.

An urban mobility plan that is sustainable takes into account the following:Public transportation. The strategy should address infrastructure, rolling stock, and services in order to improve public transportation's quality, security, integration, and accessibility.Conveyance without a motor. The strategy should improve cycling and walking's allure, security, and safety. It is important to evaluate the current infrastructure and make any required upgrades. It is important to consider the creation of new infrastructure outside the routes of motorized transportation. Where applicable, separate infrastructure for bikes and pedestrians should be taken into consideration to keep them away from congested motorized traffic and to shorten travel times. Additional technical, policy-based, soft, and complementary approaches should be used in conjunction with infrastructure initiatives[10].

The strategy should aid in improving the interoperability of the various modes and should include actions geared primarily at promoting seamless and multimodal mobility and transportation.Road safety in cities. A review of the primary issues and risk factors should inform the plan's inclusion of improvements to road safety. The strategy should cover both moving and stationary traffic for the road system and motorized transportation. The goals of the measures should be to improve the general situation, maximize the utilization of the current road infrastructure, and address the "hot-spots" that have been identified. The possibility of reallocating road space to other modes of transportation or to other public uses and services unrelated to transportation should be investigated. The strategy should include actions to boost urban logistics effectiveness, particularly urban freight delivery, while lowering GHG, pollutant, and noise emissions. The strategy should include measures to encourage a shift toward more environmentally friendly transportation patterns. It should include the participation of citizens, businesses, schools, etc. Given that ITS is applicable to all modes of transportation and mobility services for both people and freight, it may aid in the development of strategies, the execution of policies, and the oversight of all the plan's measures.

The Basel Sustainable Urban Mobility Plan Is Centered on Regional and Inner-City Connectivity. Therefore, there are many stages of the Basel SUMP going on at once: the objectives are sometimes being adjusted, while new measures are being designed, implemented, and monitored.Within the first three years, a lot of promising outcomes were already evident. Examples include a very good showing in surveys regarding the perceived quality of life of residents of the canton and the extremely high accessibility that characterizes the region, especially with regard to public transportation, despite the current population and economic growth in the canton Basel- Stadt.

Additional evidence that the strategy has been successful includes a considerable rise in the number of bicycles as well as improvements in road safety and air quality. Additionally, the ability to modify and set particular targets every three years enables the plan to take into account and integrate new technical advances and trends. It is anticipated that by continuing to follow the SUMP and putting its recommendations into practice, the goals will be achieved as intended, and the outcomes will benefit not only the people who live in the canton of Basel-Stadt but also the area surrounding the German city of Lörrachand and the French city of Saint-Louis. Therefore, the Basel SUMP serves as an example of regional and international collaboration for increased sustainability. The population will benefit from the anticipated local, national, and international benefits and repercussions of sustainable urban and transportation development methods. Additionally, it is crucial that local administrations create plans for the coordinated development of the transportation infrastructure, which must include all types of transportation.

The following are the key tenets of such programs:

For the people living in a settlement or urban area, as well as for businesses and sole proprietors operating there, transportation services must be safe, effective, and reliable.the accessibility of transportation infrastructure for the general public and the targets of economic activity in line with a settlement's or a municipal district's urban planning requirements.The development of transportation infrastructure should take into account the population's demands for mobility as well as those of businesses, both legal and unofficial, that move people and goods.

Infrastructure development for transportation is balanced with urban growth.Control over transportation demand.Priorities for protecting the lives and health of road users in regard to

economic. Business activity imperatives.Public transportation must move with priority. Development and encouragement of cycling and walking.Efficient operation of the current transportation system.For the following duties, several transport planning papers are required:A regional and municipal network should be developed with the goal of lowering the off-target load on federal highways, which is necessary to preserve local communications. This includes ideas for the development of transportation and pedestrian connections in the various areas[11].

Assemble a sensible allocation of traffic, including transit, throughout the network of roadways, using reversing and one-way traffic when needed and enhancing driver information assistance. Control traffic signals and put in place a computerized traffic management system.Plan the flow of public transportation, particularly in designated lanes. Create a single parking place, and if required, a pay space.Create safe infrastructure for bicycle and pedestrian traffic to alleviate a huge burden on the road network.Ensure the safety of the roads.Comprehensive Plan for Almaty's **Sustainable Transportation and Mobility: Creation of a Brat Network**

With a length of 8.7 km, the first segment of the BRT line, a high-speed bus corridor, was completed in 2018. It presently serves 26 routes and carries more than 140,000 people each day. Within this route, buses and trolleybuses are both in service. Due to the axial placement of dedicated lanes for public transportation, its major portion stands out and has a distinct advantage over private cars. Almaty's experience is exceptional since the city was able to forgo building station overpasses thanks to the open-type BRT. The benefits include reduced surrounding space requirements, accessibility for those with limited mobility, and quick passenger gathering on and off stop platforms. The height of the platform also enables unimpeded boarding or disembarking from low-floor public transportation vehicles for those with limited mobility.

For those who utilize public transportation, the decrease in journey time is more than 20%. New articulated 18-meter buses entered service in December 2018, and electronic times were implemented. Another notable development in 2018 was the widespread replacement of Euro-2, Euro-3, and Euro-5 vehicles in bus fleets.In order to encourage sustainable modes of transportation across the city, approximately 100 km of dedicated lanes for public transportation and more than 80 km of cycling pathways were officially opened in 2018, along with an urban bike rental program and major cycling events. In an effort to reduce motor vehicle emissions, the city is moving closer to banning private automobile traffic.

In the Russian Federation, specifications for project documentation on transportation planning have been established by a legislative and regulatory framework. The Russian Federation's Town Planning Code requires local administrations to create integrated transportation infrastructure development plans. Resolution No. 1440 of the Government of the Russian Federation outlines the specifications for these programmers.These programmers' framework provides a current and long-term distribution of passenger flows by mode of transportation while taking into account difficulties with accessibility, service quality, and the effects of transportation on the environment and human health. The legal processes and sequence for the creation of documentation on traffic management at the local and network levels are established by Federal Law No. 443 "On Traffic Management in the Russian Federation" to guarantee the efficiency and safety of traffic. Public transportation must be given priority in traffic control plans.

Planning for public transportation networks is based on Federal Law No. 220, "On the Organization of Regular Passenger and Luggage Transportation by Road and Electric Public

Transport in the Russian Federation and on Amendments to the Certain Legislative Acts of the Russian Federation." Generally speaking, these agreements make it possible to provide the legal foundation for guaranteeing a sustainable transportation system.

Implementing limits on the use of cars with poor environmental performance in specific metropolitan areas is one aspect of Russian Federation transportation planning. According to Article 30 of Federal Law No. 257 from November 8, 2007, "On Roads and Road Activities in the Russian Federation and on Amendments to Certain Legislative Acts of the Russian Federation," and Article 6 of Federal Law No. 96 from May 4, 1999, "On Protection of Ambient Air," such solutions were given a legal foundation. These papers allow State authorities to guarantee the preservation of residential areas' air quality. And impose restrictions on the use of cars.

2017 saw the definition of the phrases "electric car" and "hybrid car" as well as the addition of pertinent traffic markings and signage. The new road sign "Zone with restriction of truck traffic by ecological class" and extra information signs "Ecological class of vehicle" were both established by the same decision. In order to lessen the negative effects on the environment and public health and to promote the use of "clean" transport modes and vehicles, these solutions give public authorities, local governments, and road owners the chance to outlaw the transit of low-emission vehicles through settlement territory.

To predict the results of urban and urban transportation developments, sophisticated and effective modeling tools are needed. Models of several kinds may be utilized, including:Traditional network and transportation planning methodologies ignore how land use affects transportation. Models used in policy studies that provide a distilled perspective of a city and aid users in understanding the kinds of consequences that a policy may produce.Without describing transportation systems or the specifics of land use, sketch planning models illustrate the strategic relationships between demand, supply, and land use in a city.

Models for transportation and urban planning combine land use and transportation to provide a comprehensive knowledge of land use and transportation networks as well as how they interact with an emphasis on strategic considerations. The construction of this model is the most intricate.The land-use and transportation model can aid in understanding how people's transportation habits will change in response to changes in the transportation system, how the effectiveness of the system will change as a result of changes in the way it is used, how traffic congestion, pollution, accidents, and public mobility will change, how changes in land use will impact the use of the transportation system, and how changes in the cost of using the transportation system will affect land.

In actuality, it is beneficial to combine qualitative estimation techniques for indications that cannot be quantified with mathematical modeling for forecasting quantitative indicators. However, using these sophisticated models requires a significant investment in time and knowledge. The following three crucial factors must also be taken into consideration when creating and executing an efficient urban planning system: Communities and local organizations involved in particular urban development initiatives. Stakeholders whose actions, needs, wants, and values are directly impacted by concerns with urban development.

Platforms that enable interaction between partners and stakeholders.The participation of all parties involved necessitates cooperative efforts that are positive and beneficial. National and

municipal governments, the transportation and health industries, authorities in charge of environmental protection and urban planning, as well as corporate entities and civil society, should all be involved in these initiatives. There should be both vertical and horizontal integration: vertical, involving a coordinated strategic approach across all four sectors—transport, health, environment, and urban development—and extending from the highest levels of ministries to local communities and grassroots civil society organizations that are crucial to sustainable development policies.

The tasks of the separate authorities may be combined to accomplish horizontal integration institutionally, or specific interdepartmental administrative entities, such as commissions or committees, chaired by the heads of municipal administrations, can be established.The transport and land-use sectors should include environmental protection and public health objectives and aims into their decision-making processes since they are critical to these processes. Along with the appropriate monitoring and assessment methods, as well as ways to submit claims in the areas of environmental protection and public health, quantitative indicators to track the advancement of these objectives and their related activities must also be identified.

In order for the population's transportation habits to change, individuals must comprehend and integrate the goals of municipal plans. Therefore, educating the public and promoting knowledge of issues like mobility implementation methods and features of transport demand control are crucial for gaining support from the general public. Significant progress may be made by: Constantly informing local and municipal officials about surveys and policy assessments that are released to ensure decision-making is transparent. Maximizing the use of regional and national health systems to highlight the positive effects of transportation policy on health.

Launching extensive public awareness initiatives to promote active mobility as a useful, healthful, and secure substitute for the use of private autos. Educating parents and kids about the advantages of cycling and walking, and encouraging them to practice active mobility by providing them with demonstration activities. Collaborating with the media and NGOs to promote walking, bicycling, and the use of public transportation, as well as to create a positive perception of public transportation; promoting car-sharing, car-pooling, park-and-ride locations, and bike-sharing through public events; and ensuring that all positive environmental, economic, and social effects are widely covered. The injury rate decreases as more people utilize physically active means of transportation and as drivers eventually become used to seeing bicycles and pedestrians as fellow road users with the same rights.

CONCLUSION

In conclusion, spatial planning for accessible and sustainable urban transportation is a key tactic for developing more resilient, inclusive, and sustainable cities. With a focus on promoting sustainable modes of transportation, prioritizing accessibility, equity, and social inclusion, utilizing technology and innovation, and involving local communities and stakeholders, it entails integrating mobility and accessibility considerations into land use planning, infrastructure design, and participatory processes. Numerous advantages come from spatial design for sustainable urban mobility and accessibility, including less traffic, better air quality, improved public health, more social fairness, and better quality of life for city dwellers. It acknowledges the relationship between land use and transportation and seeks to develop urban areas that are friendly to sustainable modes of transportation like walking, cycling, and public transportation while

guaranteeing that everyone has equitable access to opportunities and services regardless of their abilities, income, or location.

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