

Sustainable Urban Transport Management and Its Strategies

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Abstract—Rapid process of urbanism development has increased the demand for some infrastructures such as supplying potable water, electricity network and transportation facilities and etc. Non-efficiency of the existing system with parallel managements of urban traffic management has increased the gap between supply and demand of traffic facilities. A sustainable transport system requires some activities more important than air pollution control, traffic or fuel consumption reduction and the studies show that there is no unique solution for solving complicated transportation problems and solving such a problem needs a comprehensive, dynamic and reliable mechanism. Sustainable transport management considers the effects of transportation development on economic efficiency, environmental issues, resources consumption, land use and social justice and helps reduction of environmental effects, increase of transportation system efficiency as well as improvement of social life and aims to enhance efficiency, goods transportation, provide services with minimum access problems that cannot be realized without reorganization of strategies, policies and plans.

Keywords—Sustainable Urban Transport, Environment, Social Justice, Air Pollution

I. INTRODUCTION

IMMIGRATION from rural areas to cities has begun since the twentieth century in line with rapid industrialization process especially in developing countries (45 percent of the world population lived in urban areas in 1995 and it is predicted that this figure gains to 60 to 65 until 2025). Environmental issues and human health losses due to quick development of motorized transport and weak process of its legitimacy has seriously made many problems. Every year more than 750,000 persons, who are mostly pedestrians, are killed by car accidents. Moreover, about 500 thousand persons in developing countries suffer from early death due to air pollution resulting from ground transportation.

Stability may not be realized only by changing designing, usable patterns and vehicle management, and it demands some changes in our attitude towards identification and evaluation of possible strategies for solving transportation problems.[1]

II. HISTORY

Most of the tools and concepts of sustainable transport were developed before the phrase was coined. Walking, the first mode of transport, is also the most sustainable. Public transport dates back at least as far as the invention of the public bus by Blaise Pascal in 1662. The first passenger tram began operation in 1807 and the first passenger rail service in 1825. Pedal bicycles date from the 1860s. These were the only personal transport choices available to most people in Western countries prior to World War II, and remain the only options for most people in the developing world. Freight was moved by human power, animal power or rail[2].

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The post-war years brought increased wealth and a demand for much greater mobility for people and goods. The number of road vehicles in Britain increased fivefold between 1950 and 1979, with similar trends in other Western nations. Most affluent countries and cities invested heavily in bigger and better-designed roads and motorways, which were considered essential to underpin growth and prosperity. Transport planning became a branch of civil engineering and sought to design sufficient road capacity to provide for the projected level of traffic growth at acceptable levels of traffic congestion - a technique called "predict and provide". Public investment in transit, walking and cycling declined dramatically in the United States, Great Britain and Australasia, although this did not occur to the same extent in Canada or mainland Europe[2].

Concerns about the sustainability of this approach became widespread during the 1973 oil crisis and the 1979 energy crisis. The high cost and limited availability of fuel led to a resurgence of interest in alternatives to single occupancy vehicle travel. Transport innovations dating from this period include high-occupancy vehicle lanes, citywide carpool systems and transportation demand management. Singapore implemented congestion pricing in the late 1970s, and Curitiba began implementing its Bus Rapid Transit system in the early 1980s. Relatively low and stable oil prices during the 1980s and 1990s led to significant increases in vehicle travel from 1980–2000, both directly because people chose to travel by car more often and for greater distances, and indirectly because cities developed tracts of suburban housing, distant from shops and from workplaces, now referred to as urban sprawl. Trends in freight logistics, including a movement from rail and coastal shipping to road freight and a requirement for just in time deliveries, meant that freight traffic grew faster than general vehicle traffic. At the same time, the academic foundations of the "predict and provide" approach to transport were being questioned, notably by Peter Newman in a set of comparative studies of cities and their transport systems dating from the mid-1980s.

We recognize that we cannot simply build our way out of the problems we face. It would be environmentally irresponsible - and would not work. A companion document to the White Paper called "Smarter Choices" researched the potential to scale up the small and scattered sustainable transport initiatives then occurring across Britain, and concluded that the comprehensive application of these techniques could reduce peak period car travel in urban areas by over 20%[3]. A similar study by the United States Federal Highway Administration was also released in 2004 and also concluded that a more proactive approach to transportation demand was an important component of overall national transport strategy[1].

III. SUSTAINABLE URBAN TRANSPORT

One of the most important elements of urban development is transportation which is essential for person and goods transportation; also realization of effective productivity in urban areas will be exclusively provided by meeting

transportation requirements. In fact, sustainable urban transport is smooth movement of vehicles, people and commodities which requires for people's convenience and environment stability with the most desirable cost and effort. According to Canadian Institute of Transportation, sustainable transport system aims to make sure that if environmental, social and economic factors are taken into account in decision making of transportation activities. Furthermore, based on the report prepared by World Bank (1996), sustainable transport and its elements are as follows.

Economic and financial elements which include appropriateness of organizational structure measure and investment for transportation infrastructures.

Environmental and ecologic element which involves how to invest on transportation and select different transportation methods which effects on reduction of energy consumption and pollutant emission and social element which focuses on sufficiency of accessibility of transportation services for all people. Stability may realize by change of people's behavior; when all people are fully informed of negative effects of selection of their transportation method, they will voluntarily help to reduce natural resources consumption and transportation destructive effects. [2]

IV. CITIES AND SUSTAINABLE TRANSPORT

Cities are shaped by their transport systems. In *The City in History*, Lewis Mumford documented how the location and layout of cities was shaped around a walk able centre, often located near a port or waterway, and with suburbs accessible by animal transport or, later, by rail or tram lines [5].

In 1939, the New York World's Fair included a model of an imagined city, built around a car-based transport system. In this "greater and better world of tomorrow", residential, commercial and industrial areas were separated, and skyscrapers loomed over a network of urban motorways. These ideas captured the popular imagination, and are credited with influencing city planning from the 1940s to the 1970s[6].

The popularity of the car in the post-war era led to major changes in the structure and function of cities. There was some opposition to these changes at the time. The writings of Jane Jacobs, in particular *The Death and Life of Great American Cities* provide a poignant reminder of what was lost in this transformation, and a record of community efforts to resist these changes. Lewis Mumford asked "is the city for cars or for people?" Donald Appleyard documented the consequences for communities of increasing car traffic in "The View from the Road" (1964) and in the UK, Mayer Hillman first published research into the impacts of traffic on child independent mobility in 1971. Despite these notes of caution, trends in car ownership, car use and fuel consumption continued steeply upward throughout the post-war period.

Interstate 10 and Interstate 45 near downtown Houston, Texas Mainstream transport planning in Europe has, by contrast, never been based on assumptions that the private car was the best or only solution for urban mobility. For example the Dutch Transport Structure Scheme has since the 1970s required that demand for additional vehicle capacity only be met "if the contribution to societal welfare is positive", and since 1990 has included an explicit target to halve the rate of

growth in vehicle traffic. Some cities outside Europe have also consistently linked transport to sustainability and to land use planning, notably Curitiba, Brazil, Portland, Oregon and Vancouver, Canada. Greenhouse gas emissions from transport vary widely, even for cities of comparable wealth. Source: UITP, Mobility in Cities Database There are major differences in transport energy consumption between cities; an average U.S. urban dweller uses 24 times more energy annually for private transport than a Chinese urban resident, and almost four times as much as a European urban dweller. These differences cannot be explained by wealth alone but are closely linked to the rates of walking, cycling, and public transport use and to enduring features of the city including urban density and urban design[1].

The cities and nations that have invested most heavily in car-based transport systems are now the least environmentally sustainable, as measured by per capita fossil fuel use. The social and economic sustainability of car-based urban planning has also been questioned. Within the United States, residents of sprawling cities make more frequent and longer car trips, while residents of traditional urban neighborhoods make a similar number of trips, but travel shorter distances and walk, cycle and use transit more often. It has been calculated that New York residents save \$19 billion each year simply by owning fewer cars and driving less than the average American[7]. The European Commission adopted the Action Plan on urban mobility on 2009-09-30 for sustainable urban mobility. The European Commission will conduct a review of the implementation of the Action Plan in the year 2012, and will assess the need for further action. In 2007, 72% of the European population lived in urban areas, which are key to growth and employment. Cities need efficient transport systems to support their economy and the welfare of their inhabitants. Around 85% of the EU's GDP is generated in cities. Urban areas face today the challenge of making transport sustainable in environmental (CO₂, air pollution, noise) and competitiveness (congestion) terms while at the same time addressing social concerns. These range from the need to respond to health problems and demographic trends, fostering economic and social cohesion to taking into account the needs of persons with reduced mobility, families and children[6].

V. DIFFERENT DIMENSIONS OF SUSTAINABLE TRANSPORT

Urban transportation issues are investigated from three main social, economic and environmental aspects. (Zietsman, J, Laurence, R, Rilett, 2003) the following is a brief explanation of each transportation aspect:

- A. *Transportation Social Aspects*
- ✓ Social justice,
 - ✓ low income people and urban transportation,
 - ✓ women, and urban transportation
 - ✓ Children and urban transportation
 - ✓ Disabled people and urban transportation,
 - ✓ Health, safety
 - ✓ Noise pollution and urban transportation,

- ✓ Air pollution and urban transportation
 - ✓ Citizens health, drivers' anger and nervousness
 - ✓ Destruction of cultural heritages,
 - ✓ Quality of life, society
- And social security [3]

B. *Transportation Environmental Aspects*

- ✓ Ecologic stability,
- ✓ Car manufacturing environmental effects,
- ✓ Demand for fossil fuels,
- ✓ Air pollution
- ✓ Global warming or climatic changes,
- ✓ Destruction of natural habitats and green areas[5]

C. *Transportation Economic Aspects*

Transportation investment should be cost effective and ensure long term stability of allocation of financial resources to transportation services. Urban transportation by private car is the most expensive strategies among different options of transportation. The investigations show that cities where transportation is mostly through private cars spend more share of their wealth for transportation in ratio to the cities with balanced transportation system. It seems that low price transportation mechanisms must be planned based on social justice, economic efficiency, ecologic stability, urban environment dynamicity and prosperity and enhancement of social life quality. [2]

VI. URBAN TRANSPORT SUSTAINABLE DEVELOPMENT STRATEGIES

A. *Transport Demand Management*

There are too many potential strategies for solving transportation problems in transportation comprehensive management and planning; however, if all aspects are taken into consideration, transport demand management (TDM) will be considered as the best and most cost effective strategy. TDM involves various profits such as reduction of traffic, pollution, accident costs, non-motorized transport etc. and effective planning of land use is accessible. (ITDP, 1999)

B. *Land Preparation*

Improper urban development is one of the basic reasons of most transportation problems of the world. Land preparation techniques are necessary for coordination of travel and means of transportation. Intelligent development is a concept which is used as development management and encounters with suburbanization and aims to implement land use strategies which increases population density in residential areas and consequently facilitates transportation. [1]

C. *Non-Motorized Transport*

Bicycling and walking are the sustainable methods of transportation because they do not produce any air or sound pollution and the required energy is directly supplied by the person. (Pucher J. and Dijkstra L., 2006) Making Moreover, it is completely economic and its cost is less than public transportation. [5]

D. *Using Bus Rapid Transit & Mass Rapid Transit*

Notwithstanding the type of technology, optimal use of public transport systems may stop irregular development of using private vehicle and reduce energy consumption and emission of greenhouse gases. The best option must be selected based on local conditions and existing priorities using a combination of various technologies. Light rail system is also another economic option. For the UNEP [4]

E. *Public Partnership, Training & Awareness*

Public partnership is one of the regular strategies for stability realization which improves long term status of a certain city or region. In some countries, public partnership should be considered in transportation designing and planning [5]. Today, in some countries, public partnership in transportation designing and planning is attracted in form of nongovernmental organization (NGO) which has positive reflect in further cooperation of local people in implementation of plans.

Moreover, we should pass from our traditional fields and responsibilities and they should be replaced by a new training approach as a continuous process and key mean for realization of a sustainable future. [7]

VII. CONCLUSION

Global development of sustainable transport process is a subject which has been seen in national, regional and even local policymaking of the developed countries within the recent 10 years and is considered as the issues accepted for transportation. Complicated problems need using long term comprehensive strategies. Strategies may be instant, short term and long term. The present paper is the result of research and investigation of the policies and strategies of sustainable urban transport used in developed and under developing countries and it has been tried to consider acceptable generalities of official active organizations and institutions. Meanwhile, it is emphasized that there is no strategy or sets of strategies that can uniquely meet the requirements of urban traffic; solving such a problem requires a comprehensive, dynamic and reliable mechanism which should be designed and used based on the facilities and resources of each country or even each city, cultural, social, economic and ... issues using practical experiences of other countries or cities.

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