WHERE THE ROAD IS WITHOUT CONGESTION & ENVIRONMENT IS POLLUTION FREE: TRIP TO SUSTAINABLE URBAN MOBILITY

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Abstract: Current era is the era of motorization. Head to toe every aspect is engrossed with motorization. Motorization is perceived as synonymous to civilization and elite status. Motorized mobility is in its full boom numbers of private motorized registered vehicles is on splurge and is expected to increase further in the wake of development. In the backdrop of above said status, congested roads, polluted air, jostling sounds of vehicles and road injuries has become the most common scene in cities. This situation calls for 'sustainable urban mobility' characterized by shift to non-motorized and public transport resulting in better urban quality of life.

Most of the tools and techniques of sustainable transportation were developed before coinage of the term "sustainable transportation" such as walking, public bus, passenger tram, Passenger rail service, pedal bicycles.

Earlier innovations and interventions aimed at bettering the status of road infrastructure and fuel efficiency of vehicles. But cities with overbuilt highways have experienced unintended consequences, linked to radical drops in public transport, walking and cycling. In many cases streets become void of 'life'. Yet another impact was an increase in sedentary lifestyles causing and complicating a national epidemic of obesity and accompanying dramatically increased health care costs. Certain other provisions adopted with the objective of sustainable mobility are carpooling, high occupancy vehicle lane, congestion pricing, and transportation demand management.

In the area of sustainable urban mobility there is no one size fits all approach. Thus, the idea of the present study is to provide with an exhaustive review of various success models with the objective of analyzing myriad of ideas and concepts involved by various cities to attain the status of sustainable urban mobility.

Present study aims at in-depth analysis of the urban mobility practices of cities bestowed with sustainable transport award (STA) by Institute for Transportation and Development Policy (ITDP) in the years 2005 to 2013. And as a result, provided with certain approaches and actions adopted by various cities to attain sustainable urban mobility.

STA is presented annually to a city that has shown leadership and vision in the field of sustainable transportation and urban livability in the preceding year. Nominations are accepted from anyone and winners and honorable mentions are chosen by the STA steering committee. Since 2005, the award has been given out annually to a city or major jurisdiction that has implemented innovative transportation strategies, especially in several different areas of urban transportation. The award rewards cities for such accomplishments as improving mobility for all residents, reducing transportation green house gas and air pollution emissions, and improving safety and access for bicyclists and pedestrians. The sustainable transport award looks for cities, working in at least three of the following policy areas i.e., improvements to public transportation, improvements to non-motorized travel, Expansion or improvements to public space, implementation of travel demand management, reduction of urban sprawl by linking transportation to development (TOD), reduction of transport related air pollution and green house gas emissions

Present study is descriptive research work involving collection and analysis of selected cities' sustainable transport practices. It involves analysis of transport structure over the six noted criteria in table 2 in terms of relative significance by the awarded cities.

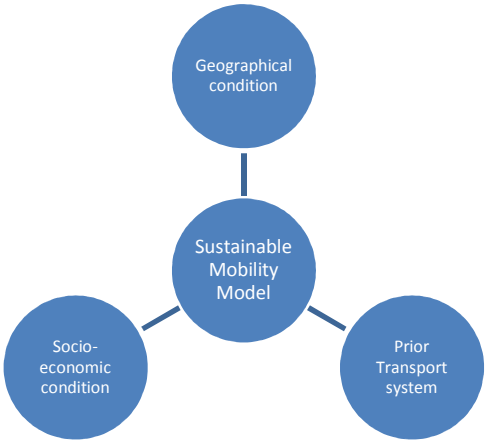

Figure 1: Sustainable Mobility and its determinants

The 11 cities which were awarded sustainable transport award from year 2005 to 2013 by ITDP had been selected as sample of study. The cities of Bogota, Seoul, Guayaquil, London, Paris, New York City, Ahmedabad, Guangzhou, San Francisco, Medellin and Mexico city grabbed STA from year 2005 to 2013 respectively.

Prevalent transport systems in all the selected cities along with recent developments have been studied and analyzed base on information availed from various online sources. Background variables such as geographical condition, socio-economic status and prior transportation condition were also paid heed in the course of analysis. These sources provided with detailed as well as specific information required for analyzing the successful sustainable transportation models and their background variables and determinants.

Thus, to recapitulate the study provided with a comprehensive compilation of various sustainable transport practices in association with various means of sustainability.

As Implications of Research, the present study would facilitate the researchers working in the area of sustainable mobility by providing various success models as well as their critical analysis. It would also pave the way for success for cities proceeding towards adoption of sustainable transportation model by providing a guideline in terms of which sustainable mobility could be adopted by particular cities with reference to their geographical, socio-economic and cultural conditions.

Keywords: Non-motorized transportation, Public Transport, Sustainable transportation, Sustainable Mobility, Transport Infrastructure.

INTRODUCTION

Current era is the era of motorization. Head to toe every aspect is engrossed with motorization. Motorization is perceived as synonymous to civilization and elite status. This approach is hazardous and should be avoided to sustain environment and human resource as well.

In the present scenario motorized mobility is in its full boom, numbers of private motorized registered vehicles is on splurge and is expected to increase further in the wake of development. In the backdrop of above said status, congested roads, polluted air, jostling sounds of vehicles and road injuries has become the most common scene in cities. This situation calls for ‘sustainable urban mobility’ characterized by shift to non-motorized and public transport resulting in better urban quality of life.

With the development, demand for mobility increased and attention shifted towards motorized private transportation and facilitative road infrastructure for motor vehicles. Public interest and investment in transit, walking and cycling turned out to be a matter of poverty ridden compulsion instead of willingness. It further resulted in increased burden over natural resources (from fuels, urban land etc.) and poor quality of life (air pollution, noise pollution, traffic injury and accidents, congestion etc.)

Sustainable Urban mobility

It refers to modes of transport and systems of transport planning which are consistent with wider

concerns of sustainability. Sustainable transportation gradually evolved from sustainable development and is used to describe modes of transport, and systems of transport planning which are consistent with wider concerns of sustainability.

European Union Council of Ministers and Transport

It defines a sustainable transportation system as one that allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations; is affordable, operates fairly and efficiently, offers a choice of transport mode, and supports a competitive economy, as well as balanced regional development; limits emission and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rate of development of renewable substitutes, while minimizing the impact on the use of land and generation of noise.

Current status of urban mobility

With the gradual development in economic status and technology demand for mobility increased and attention shifted towards motorized private transportation and facilitative road infrastructure for motor vehicles. Public interest and investment in transit, walking and cycling turned out to be an outcome of poverty-ridden compulsion instead of willingness. It further resulted in increased burden over natural resources (fossil fuels, urban land etc.), and decrement in quality of life (air pollution, noise pollution, traffic injury and accidents, congestion etc.)

Most of the tools and techniques of sustainable transportation were developed before coinage of the term "sustainable transportation" such as walking, public bus (Blaise Pascal, 1662), passenger tram (Swansea & Mumbles railway, South Wales, 1807), Passenger rail service (Stockton & Darlington railway, 1825), pedal bicycles (Frenchmen Pierre Michaux, Pierre Lallement, 1860).

Earlier innovations and interventions aimed at bettering the status of road infrastructure and fuel efficiency of vehicles. But cities with overbuilt highways have experienced unintended consequences, linked to radical drops in public transport, walking and cycling. In many cases streets become void of 'life'. Stores, schools, government centres and libraries moved away from central cities and residents who did not flee to suburbs experienced a much reduced quality of public space and public services. Yet another impact was an increase in sedentary lifestyles causing and complicating a national epidemic of obesity and accompanying dramatically increased health care costs.

Certain other provisions such as carpooling$_1$, high occupancy vehicle lane$_2$, congestion pricing$_3$, transportation demand management$_4$ have also been introduced to sustainable urban mobility.

Need of the hour

The environmental impacts of transport can be reduced by improving the walking and cycling environment in cities, and by enhancing the role of public transport, especially electrical. Due to urban sprawl (outward spreading of cities and sub-urbans) distances have increased manifolds. Thus the Present condition calls for speedy seamless transport system combining public and non-motorized transports. This is the means of attaining better speedy mobility and decreased congestion, pollution and safety concerns of users.

In the area of sustainable urban mobility there is no one size fits all approach. Thus, the idea of the present study is to provide with an exhaustive review of various success models with the objective of analyzing myriad of ideas and concepts involved by various cities to attain the status of sustainable urban mobility.

MATERIALS AND METHODS

Present study aims at in-depth analysis of the urban mobility practices of cities bestowed with sustainable transport award (STA) by Institute for Transportation and Development Policy (ITDP) in the years 2005 to 2013. And as a result, provided with certain approaches and actions adopted by various cities to attain sustainable urban mobility. The 11 cities which were awarded sustainable transport award from year 2005 to 2013 by ITDP had been selected as sample of study. Present study is descriptive research work involving collection and analysis of selected cities' sustainable transport practices. It involves analysis of transport structure over the six noted criteria in table 2 in terms of relative significance by the awarded cities.

The selected cities are presented in table 1 along with year of being awarded STA.

Table 1: Sustainable Transport Award Winners by ITDP

Year	City	Country
2013	Mexico City	Mexico
2012	Medellin	Colombia
	San Francisco	US
2011	Guangzhou	China
2010	Ahmedabad	India
2009	New York City	US
2008	Paris	France
	London	United Kingdom
2007	Guayaquil	Equador
2006	Seoul	South Korea
2005	Bogotȧ	Columbia

Table 2: Criteria of Sustainable Transport Award by ITDP

S.No.	Criteria of Sustainable Transport Award
1	Improvements to public transportation
2	Improvements to non-motorized travel
3	Expansion or improvements to public space
4	Implementation of travel demand management
5	Reduction of urban sprawl by linking transportation to development (TOD)
6	Reduction of transport related air pollution and green house gas emissions

Sustainable transport Award (STA)

STA is presented annually to a city that has shown leadership and vision in the field of sustainable transportation and urban livability in the preceding year. Nominations are kept open and winners and honorable mentions are chosen by the sustainable transport award steering committee.

Since 2005, the award has been given out annually to a city or major jurisdiction that has implemented innovative transportation strategies, especially in several different areas of urban transportation. The award rewards cities for such accomplishments as improving mobility for all residents, reducing transportation green house gas and air pollution emissions, and improving safety and access for bicyclists and pedestrians.

Criteria of STA

STA are awarded to cities that have demonstrated significant progress in using transportation to create a more sustainable, livable city. The sustainable transport award looks for cities working in at least three of the following policy areas:

RESULTS & DISCUSSION

Prevalent transport systems in all the selected cities along with recent developments have been studied and analyzed base on information availed from various online sources. These sources provided with detailed as well as specific information required for analyzing the successful sustainable transportation models and their background variables and determinants.

Urban mobility practices of all the selected 11 cities were studied and various procedures to introduce sustainability were analyzed in the course of study. The analysis suggested four major criteria under which the complete practices could be categorized. These are: (a) Betterment or control over private motorized transport (b) Pro-public transport (c) Pro-non Motorized transport (d) Environmental betterment and or improvement

First practice is preventive while the other three are facilitative measure to promote sustainable urban mobility. All the cities were found to be focusing on one practice or other. Some have also adopted combination of both carrots and sticks as part of their process. The strategies adopted by the cities are presented in table 3.

Table 3: Introduced Sustainable Urban Mobility practices in STA winner cities

STA Award winner City	**Intervention in transport system towards sustainable urban mobility**			
	Betterment or control over Private motorized transport	**Pro-public transport**	**Pro-non motorized transport**	**Environmental betterment and or improvement**
Mexico city	Comprehensive on-street parking reform program (ecoParq)	**Bus Rapid Transit**: Expansion of BRT system. As of June 2013, 367 Metrobús transported 850,000 passengers daily.	Expansion of successful public bike system (Ecobici)	Revitalized public spaces
Medellin	Stop lights and safe crossings Ridesharing program "Comparte tu carro" Vehicle exhaust emission control and sulphur content improvement Web 2.0 developments through social networks and websites, the mobility related institutions provide information and feedback to users. Intelligent mobility system	BRT "Metroplus": It integrates into the metro system.	Pedestria connection improvements Bike lanes Public bicycle program (EnCicla)	Improvement of public spaces (Qualitatively and quantitatively) Environmental Parks Urban Promenades
San Francisco	Slow speed zones around all city schools		City's innovative pavement to park programs has created new street plazas and many new parklets (sidewalk platforms that replace car parking spaces). Sunday Streets Program (Ciclovia Recreativa) Upgrading and expanding the bike network to attract riders of all ages.	SFPark, a smart approach to parking management in commercial districts around the city.
Guangzhou	--	Integration of BRT system with bike lanes, bike share and metro stations, raising the bar for all cities. BRT station areas including double tier bike parking racks at several key stations	Donghaochong Greenway project has created a 4 Km. off-street bikeway and walkways combined with parks and plazas and areas for children to play alongside the water. Bike sharing positions at	Donghaochong Greenway – a spectacular greenway projects along a former polluted canal, which is part of a wider project to build dozens of Kms. of high quality greenways throughout the city.
Ahmedabad	--	Janmarg, BRT Stations in the median Buy tickets before	Quality pedestrian facility throughout the city as well as bicycle lanes.	--

		entering system stations, to allow for quicker boarding of the buses and fewer delays At-level boarding of buses Well-designed-attractive and providing shelter from sun and rain		
New York City	--	--	Conversion of road space, traffic lanes and parking spots into bike lanes, pedestrian areas and public plazas	--
London	Largest city to adopt congestion pricing Increased fees for motor vehicles and new city wide tolls that are spurring more rapid adoption of cleaner, fuel efficient vehicles.	--	--	--
Paris	--	--	Prioritizing pedestrians by renovating public squares and plazas, widening sidewalks, adding landscaping, raising crosswalks. Vélib (freedom bikes)-individualized mass transit system- people pay a low fee to use the bikes from one of the many bike parking stations located in the city and they can return the bikes to the station they wish.	--
Guayaquil	--	Metrovia bus rapid transit system	--	--
Seoul	--	--	High quality walkways and public squares	Replacement of 4-mile elevated highway covering Cheonggyecheon river with a river front park
Bogotå	--	--	TransMilenio BRT, integrating bicycle infrastructure with mass transit and redefining and reclaiming public space for its citizens.	--

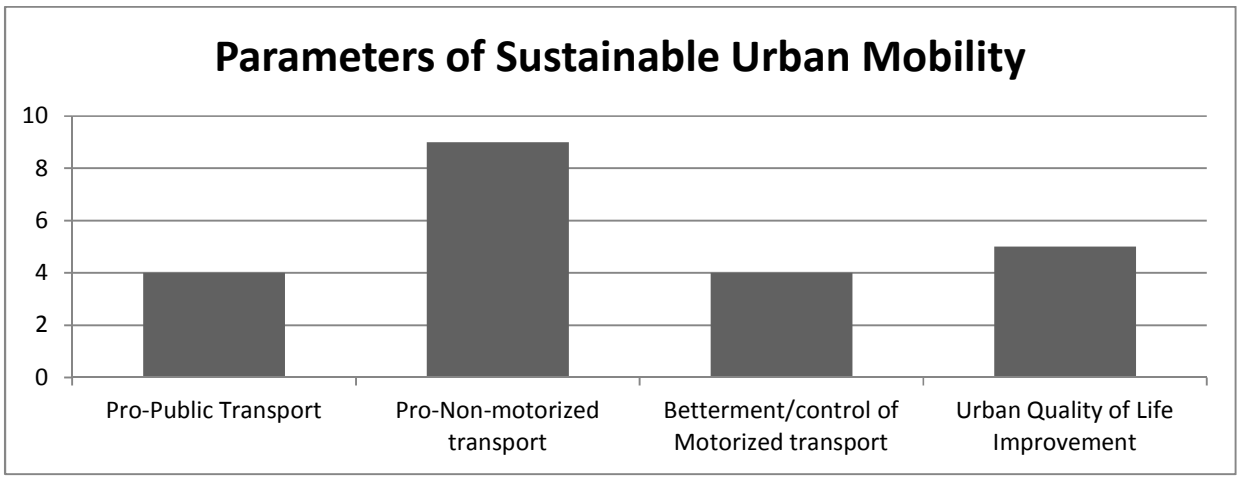

Figure 1: Categorization based on measures of Sustainable Urban Mobility

Thus, on the basis of table 3, it could be stated that facilitation of non-motorized transport is provided highest weightage amongst the selected sample size. Urban environment betterment includes increasing green spaces, public parks and plazas. It is, again, focused to promote non-motorized modes of travel such as walking and biking. However, providing better, accessible, economic and frequent public transport is also given due importance along with control and betterment of private motor transport usage.

Moreover, it could be seen that with the passage of time the strategies of SUM have became all inclusive rather than focusing on some aspect of sustainability. Here, lies the solution to Urban mobility crisis i.e., looking the complete picture and focusing over every minute detail to make it a flawless system.

In the current scenario of urban sprawl complete switch to non-motorized modes is neither feasible nor practical. Thus the solution lies in better quality public transport and usage of non-motorized modes to bridge the gaps between public transports, making it seamless. It could be done as seen in the selected cases by government intervention in terms of better services and policies and people sensitization to switch to healthier modes of travel.

CONCLUSION

Present study provides with a guidance as well as model to be learnt from to promote sustainable urban mobility. It covers SUM models of plain fields as well as hilly terrain. Economically well off and also poverty-ridden backward status. All the cities tried to alter the course of mobility patterns and ended with better, cleaner and healthier mobility status. Various lessons to be learnt and implemented are intricacies to be focused while designing transport system. Human issues should be focused to introduce behavioral interventions. However, government provisions and policy interventions prove to be the backbone of the stature of sustainable urban mobility. Present study would facilitate the researchers working in the area of sustainable mobility by providing various success models as well as their critical analysis. Prior **transport systems were not considered to analyze the shift of focus over public and non-motorized modes of transport as well as over the infrastructure facilitating the shift to pro-environment transportation among all. The study presents with an idea to promote shift to pro-environment and pro-human transport practices not due to poverty ridden compulsion but as a matter of pride and choice.**

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ANNEXURE

[1] Carpooling first became prominent in the United States as a rationing tactic during world war II. The first employee vanpools were organized at Chrysler and 3M.)
[2] **High Occupancy Vehicle Lane:** It is also known as HOV lane, carpool lane, diamond lane, and transit lane or T2 and T3 lanes in Australia and New Zealand is a restricted traffic lane reserved at peak travel times or longer for exclusive use of vehicles with a driver and one or more passengers, including carpools, vanpools and transit buses.
[3] Congestion pricing or congestion charges is a system of surcharging users of public goods that are subject to congestion through excess demand such as higher peak charges for use of bus services, electricity, metros, railways, telephones, and road pricing to reduce traffic congestion. The application on urban roads is currently limited to a small number of cities, including London, Stockholm, Singapore and Milan, as well as a few smaller towns. Implementation of congestion pricing has reduced congestion in urban areas, but has also sparked criticism and public discontent.
[4] Transportation demand management, traffic demand management or travel demand management (TDM) is the application of strategies and policies to reduce travel demand - specifically that of single occupancy private vehicles- or to redistribute this demand in space or in time. The term TDM has its origins in the US in the 1970s and 1980s, and is linked to economic impacts of the sharp increase in oil prices during the 1973 oil prices and the 1979 energy crisis.