PRO-POOR MOBILITY
Policy guidelines and case studies
## Title

Pro-poor mobility: Policy guidelines and case studies

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Preface

The report ‘Pro-poor mobility - Policy guidelines and case studies’ has been prepared by The Energy and Resources Institute (TERI) under the pro-poor mobility component of the Global Energy Network for Urban Settlements (GENUS). GENUS was established by the UN-HABITAT to promote the design and implementation of energy and mobility-access programmes and projects for the urban poor worldwide. Anchored by TERI, the pro-poor mobility component of GENUS focuses on Asian region and aims to generate knowledge and promote exchange of experiences on solutions related to pro-poor mobility. To advance the objectives of GENUS’ focus theme in Asia, the report brings together a compilation of nearly fifty best practices on pro-poor mobility solutions from across the developing regions of the world. Case studies ranging from provision of public transport, improvement of non-motorized transport infrastructure and informal transport among others, indicate the approach needed to conceive, design and implement pro-poor mobility policies, programs and projects. The case studies bring together successful initiatives of infrastructure enhancement, service improvement, technological improvements, regulatory and institutional reforms, innovative approaches and government and community actions, in the field of:

• Non-motorized transport,
• Public transport, and
• Informal transport.

Learning from the experiences of case studies, the report also provides guidelines and principles to be followed for formulation of pro-poor mobility policies and plans at national and city level. The guidelines are expected to aid the policy makers and city planners in design of pro-poor mobility policies and plans.
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I. Introduction

Mobility has a critical role to play in the socio-economic development of the population. Provision of adequate and quality mobility choices for all sections of the society is being widely recognized as a mainstream challenge for the cities in the developing countries where demand-supply mismatch is commonplace and cities encounter high levels of spatial and temporal imbalances in transport supply. The low income population and the urban poor are the most affected because of the inadequate mobility options in the cities and are also most vulnerable to the negative externalities on account of transportation such as, high levels of emissions, traffic congestion, unsafe pedestrian and cyclist environment, poor road safety, etc. Therefore, the cities in developing countries face a twin challenge of augmenting the transport supply, especially to meet the mobility demand of low income groups and at the same time to limit the negative impacts of transportation to the minimum.

Enhancing mobility options for poor is of prime importance to the cities as mobility is the first step to improve the socio-economic conditions of the poor population, as higher mobility implies higher access to socio-economic opportunities. A pro-poor mobility approach while planning for transportation is important as it is this section of the society, which faces severe mode-choice constraints, due to the inability to own personal modes, low levels of affordability for public transport services, locational disadvantage and unusual demand character (e.g. long-distance travel in odd hours – early mornings and late evenings).

It has been observed that non-motorized transport (NMT) i.e. walking and cycling is the primary modal choice for poor. For distances which cannot be traversed by either pedalling or walking, the poor depend on the cheapest available mass motorized options, like public buses, but only if they are affordable. If public transportation is not accessible to low-income population, either due to financial, spatial or temporal constraints, then they depend on different ad-hoc transport solutions to meet their mobility requirements.
Efforts are being made to improve the existing transportation systems, with special consideration being given to evolve more efficient and pro-poor transport systems. There is a need to learn from such successful initiatives in order to replicate and scale up the tested pro-poor mobility solutions. The report on ‘Pro-poor mobility - Policy guidelines and case studies’ consists of 50 best practices on pro-poor mobility solutions from across the developing countries. The compilation of case studies is intended at providing information on the kinds of efforts, actions and initiatives that are being undertaken in different parts of the world, and thus help other cities in the developing world to appreciate the importance of pro-poor mobility as a critical component of growth and development of cities and, thereby motivate them to prioritize the issue of pro-poor mobility and design appropriate initiatives. The case studies included in the report cover a wide array of actions and approaches, which have been successful in enhancing mobility of poor.

The case studies have been categorized into five sections:

• Section A: Organizing informal transport sector
• Section B: Reducing environmental impacts of informal transport sector
• Section C: Providing public transit connectivity to urban poor areas
• Section D: Pro-poor mobility policies and planning
• Section E: Pro-poor transport infrastructure planning and development
• Section F: Promoting NMT: Innovative pilot projects
II. Case Studies

Section A

Organizing informal transport sector
Despite catering to large amounts of urban travel, the role of the informal sector in providing pro-poor mobility remains largely unacknowledged. Poor organization of informal transport sector is one of the major challenges, which leads to operational inefficiencies, low earnings, and other negative impacts, like lack of driver safety, high cost due to lack of resource sharing, etc. This section focuses on innovative approaches that have been adopted in different parts of the developing world to organise informal transport systems. 13 case studies have been discussed in this section.

- Three Wheels United: A social enterprise for addressing the challenges faced by auto rickshaw drivers in Bangalore, India
- Bicycle taxis: Offering cheaper and faster mobility option in East Africa
- Alwar Vahini: Mini passenger public transport service in the city of Alwar in India
- Van Transit system as a public transport service in Bangkok Metropolitan Region (BMR)
- Enabling ownership of cycle rickshaws by cycle rickshaw drivers: Dipbahan Rickshaw Bank Project in India
- ECOCABS: World’s first dial-a-cycle-rickshaw scheme
- Organizing the cycle rickshaw industry: Case study of Sammaan Foundation’s work in India
- Pangkalangs: a cooperative organization of drivers of informal transport system in Indonesian cities
- Shift system: Solving the problem of oversupply of Angkots in Bogor, Indonesia
- Improving informal transport system through legal and regulatory mechanisms: Regulations for improving the minibus-taxi industry in Western Cape, South Africa
- Improving informal auto rickshaw services through fleet organization: G-Auto services in Rajkot city, Gujarat, India
- Legislative reforms to organise informal transport modes: Case of non-Transmilenio buses in Bogota, Colombia
- Integration of informal transport systems with the formal systems: Attempts to integrate daladalas and BRT system in Dar-es-Salaam, Tanzania
Three Wheels United

A social enterprise for addressing the challenges faced by auto rickshaw drivers in Bangalore, India

Place: Bangalore, India

The problems faced by the auto rickshaw sector in India are numerous. The economic and social conditions of the auto rickshaw drivers are poor. These drivers have no means to access formal financial options from banks and hence are led into the exploitive hands of the private money lenders. They live with low self-esteem and have no social security. Another major concern is the noise and air pollution that is caused by these vehicles. In order to tackle some of these issues, a private company called the Three Wheels United India Services Private Limited (TWUISPL) was established in Bangalore (as a subsidiary of a Dutch entity called the TWU B.V). The main focus of the TWUISPL is to improve the lives of auto rickshaw drivers "through financial inclusion generating alternate channels of revenue and making them environmentally and socially responsible". Their work focuses on the cities of Bangalore and Bagyapalli in the state of Karnataka.

Key Features

- Financial schemes for auto rickshaw drivers to help them generate additional revenue
- Technology improvements for better environmental performance of auto rickshaws
- Community development initiatives for drivers and their families

Launch of Green Autos in Bangalore

Karnataka in India as of now and they have started expanding their work to the city of Madurai in Tamil Nadu state also.

There are about 120,000 auto rickshaws in Bangalore. The earnings of the auto rickshaw drivers, who mainly rent these vehicles, are typically between Rs.100-150 (i.e. USD $1.83 – 2.76) per day and certain groups (mafias) control the ownership of the vehicles. The low incomes, exploitation by the mafia, unrevised fares, increased living costs, lack of recognition, absence of economic and social security, etc. lead to poor living conditions and bad behavioural patterns among the auto rickshaw drivers.

To improve the working conditions and the quality of life of the auto rickshaw drivers, the TWUISPL actively involves the participation of the drivers in deciding how to solve the challenges faced by them. Three main strategic interventions of the TWUISPL include:

- Providing financial services to the auto rickshaw drivers in order to help them own auto rickshaws
- Providing additional means of revenue for the auto rickshaw drivers
- Reducing environmental pollution through promoting or adoption of cleaner technologies by auto rickshaw drivers

The financial services provided by the enterprise for the poor drivers include financing ownership of four-stroke vehicles, helping them open savings bank accounts and providing them with life and health insurances. The financial model followed is beneficial

ING Branding inside the auto rickshaws
to the economically poor drivers. The bank contributes 90% of the vehicle cost and the drivers are expected to contribute 10%. The TWUISPL gives 15% of the vehicle cost as guarantee. The drivers are then expected to repay the amount in daily instalments for 26 days a month for 60 months. In cases of non-compliance, the auto rickshaw is seized back. The TWUISPL has recognised some additional revenue generation means for the drivers. These include revenue generation through advertisements in auto rickshaws, micro franchise schemes such as mobile recharging and increased ridership through mobile based applications. The advertisement revenue has provided for life insurance for the drivers and the franchise scheme has helped drivers take up entrepreneurial roles. Other potential revenue generation means are being studied currently, like local courier services by the auto rickshaw fleet. The clean technology approach includes replacing the two-stroke auto rickshaw engines with four-stroke engines. This has resulted in positive impact on the environment and has also helped in creating higher incomes for the drivers.

Alongside the financial and environmental objectives, the TWUISPL also focuses on community development among the drivers and their families. With the help of NGOs and co-operatives, the drivers form Self Help Groups (SHGs). The presence of such community and peer groups ensures payment of loans on time. There is also a compliance team to ensure timely repayments. The compliance team includes the drivers themselves so that a peer pressure is built and accountability is raised. In future, the drivers associated with the TWUISPL, will be also given 10% of the equity shares of the company to build a sense of ownership, once the company group has over 200 drivers.

The organisation with its mission to improve the lives of 1 million auto rickshaw drivers in India has been successful in reaching out to 2,500 plus auto rickshaw drivers in Bangalore and over 100 plus drivers in the surrounding rural areas. The financial assistance is provided by local banking partners such as Corporation Bank and Pragati Gramin Bank and business partners include ING insurance and AirTel India. The organisation is now looking into a regulatory framework, which will deal with advertisement and fleet system operations. The initiatives have helped the poor auto rickshaw drivers in Bangalore to have a better lifestyle and also serve the city in a better way.

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Ramesh Prabhu, Three Wheels United, Presented at the Mobility for Poor workshop at TERI, New Delhi on 5th October 2012
Bicycle Taxis

Offering cheaper and faster mobility option in East Africa

Place: Africa

The countries in East Africa are characterised by poor public transport facilities. Besides, the levels of private vehicle ownership are also considerably low. For instance, Dar-es-Salaam, which is the third fastest growing city in Africa, has only 6%\(^1\) of its households owning a car, which is low by any of the international standards. This leads to limited mode choice options for people and they have to largely depend on walking and cycling to meet their travel needs.

East African cities typically have inadequate public transport and the situation of traffic congestion is extremely problematic. Since the limited road space is shared by a multitude of modes, ranging from cars, two-wheelers, buses to hand-carts, peddle carts, cycles

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Key Features

- The bicycle taxis (boda-bodas) are enhancing mobility in the East African countries by providing a low-cost transportation option to people
- Boda-bodas are faster and environment friendly
- Bicycle taxis have helped in enhancing the socio-economic condition of the boda-boda drivers

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\(^1\) Mobility: An important driver of economic and social development,(2010), Geneva, Available at http://www.wbcsd.org/Pages/EDocument/EDocumentDetails.aspx?ID=12403&NoSearchContextKey=true

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Bicycle taxi in Uganda
Source: http://upload.wikimedia.org/wikipedia/commons/a/a4/Bicycle-taxi.jpg
and pedestrians, the speed of traffic is reduced considerably, negatively affecting the travel times. Further, traffic congestion and increasing number of road fatalities result in negative externalities in the form of higher operating cost, environmental pollution, loss of life and property, economic losses, etc. The lack of capacity within the cities to provide adequate options to move people and goods is adversely affecting socio-economic development.

The local people have found out an innovative solution to their mobility issues in the form of bicycle taxis, better known as boda-bodas in this part of the world. Origin of the bicycle taxis can be traced back to 1960s-1970s, when bicycles were used on the Kenya-Uganda border for transporting people across the border, in order to skip the paper work involved in the case of crossing the border on a motorized mode. Since then, boda-bodas have spread to other parts of Africa, largely because of their inherent advantages over the other modes.

Minibuses have been the most common form of motorized public transportation in East African countries. Overtime, it has been observed that the preference of people is shifting towards bicycle taxis, as they are cheaper. In Kenya, boda-bodas charge half the price and reach the destination faster than the matatus, by evading traffic. The bicycle taxis also have an added advantage, as they can offer excellent last mile connectivity solution by providing transport connectivity to any destination, as they do not operate on any fixed route. Thus, the boda-bodas are offering a cheap, environment friendly and fast transportation to the people.

Apart from offering a mobility solution to people with limited modal choice, boda-bodas are also an important source of employment for the people. As per the Fourth National Human Development Report for Kenya, “Linking Industrialisation with Human Development” (issued in 2005 by the United Nations Development Programme), the lower cost of bicycles due to industrial advances in the country (Kenya) has led to a revival of bicycle usage. In Kenya, lower bicycle cost accompanied by high unemployment levels has led to a large number of people opting for the bicycle taxi sector as an opportunity for employment. This sector offers a decent earning of about three dollars per day in a country where one fifth of the population lives on less than a dollar per day.

The advantages of bicycle taxis are being acknowledged and this is evident from the manner in which this mode is replacing its motorized counterparts (motor bikes and other motorized public transport) in the cities. It is worth noting that in some parts of Africa, even motorcycles are also known with the same name.

Minibuses are known as matatus in Kenya. They usually have a seating capacity of 10-20 passengers.

transportation, like *matatus*). In East African cities, *boda-bodas* are offering a direct competition to these more carbon dependent modes.

Although this system is fast spreading to other parts of Africa, dedicated efforts are required to further evolve the operations of this specialized informal public transportation service, so that this system can contribute significantly towards fulfilling the urban travel demand in developing countries.

This case study depicts that it is possible to find successful mobility solutions through utilization of already existing resources. The East African region has limited private vehicles and public transportation availability, yet the mobility options are being enhanced by the use of bicycles as public taxis, which are present in abundance in this region.

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Alwar Vahini
Mini passenger public transport service in the city of Alwar in India

Place: Alwar, India

With a population of about 315,310 persons in 2011 (Census, Government of India), the city of Alwar is one of the fastest growing urban areas in Rajasthan state as well as the National Capital Region (NCR) in India. The rapid pace of industrialisation in the city is accompanied by increasing residential, commercial and industrial areas in the city, which have increased pressures on the existing infrastructure. This has been felt most acutely in the public transport sector. Intra-urban mobility connectivity with the adjacent cities is a serious challenge in view of the growing travel demands, which have arisen as a result of the increasing development. The poor/low income communities, which don’t have personal mobility modes are the most affected because of lack of adequate and quality public transport services.

The mobility needs in the city of Alwar were until recently, dependant on the local informal modes such as the auto rickshaws, Mini passenger public transport service in the form of minivans with a seating capacity of 8 persons
Zero direct investment by the government in establishing the public transport system
Replacement of older polluting fleet by new Euro IV compliant vehicles

Alwar Vahinis being launched in Alwar
Source: www.alwarvahini.com
vikrams\textsuperscript{1} and tempos. These modes being generally old and poorly maintained offered cheap and flexible services to the poor and the rest of the city population, but at the same time brought along with them the problems of air pollution, noise, overcrowding, and were considered highly unsafe. As a result, significant risks were attached to their use and were therefore not preferred by women, elderly and children for their travel needs. Due to the medium size of the city, other options of introducing city bus service, metro, BRT system, etc. faced many viability constraints.

To cater to the growing mobility demands in the city, a mini-bus passenger service was launched in Alwar on 3rd December 2011. A fleet of 58 vehicles was launched in the city. It included Euro IV compliant Tata Magic and Mahindra Maximo models of mini-passerger vans having a seating capacity of eight persons including the driver. These new vehicles have replaced the old autos, vikrams and tempos. The conception of the idea and the project launch took only about two months’ time. Launched with the idea of reducing the congestion on roads caused by private vehicles, the project is a joint effort of various organizations like the Regional Transport Office (RTO), Punjab National Bank, Urban Improvement Trust (UIT) Alwar, UIT Bhiwadi, and Deputy Registrar Co-operatives, with each agency having a clearly defined role. The entire project is privately funded, with the District Administration playing a coordinating and facilitating role. The whole model was worked out with the idea of “minimum investment with maximum returns”. The motto of “Samman aur Seva”\textsuperscript{2} i.e. respect and service is the guiding principle behind the initiative.

As a part of the project, the district government brought in an attractive exchange programme for the three wheeler owners.

\textbf{Special red color Alwar Vahini launched with women drivers}

Source: www.alwarvahini.com

\textsuperscript{1}‘Vikram’ is the local name given to a three wheeled auto rickshaw offering shared passenger services in the city of Alwar.
\textsuperscript{2}“Samman aur Seva” meaning Respect and Service in English is the motto of the Alwar Vahini service. It encourages everyone to give due respect to all involved in the project – stakeholders as well as the passengers.
The idea was to first give opportunity to the people already engaged in public transport service to upgrade to a newer and better means of transport. As a result, around 720 vehicles have been exchanged and scrapped under this scheme over a period of one year. Additionally, other incentives like loan facilities at reduced interest rates from nationalised banks and financial institutions also helped in the easy purchase of the new mode. Also, arrangements were made to ensure documentation of all formalities (including vehicle insurance, RTO formalities, route permits and others) under one roof, once at the time of purchase of the vehicle.

The RTO office was made responsible for allotting the route permits to the applicants and also to ensure that all the passenger vehicles ply as per the government norms. Painted in attractive colours, every Alwar Vahini vehicle has a unique number prominently displayed on the exterior. This helps in easily identifying the vehicle if any sort of traffic violation is made. Significant attention has been given to driver behaviour and etiquettes. An NGO specialising in soft skills training has been engaged in the personality development programme for the drivers. The drivers are advised to keep their vehicles clean and well maintained, follow proper uniform code, and also address their passengers respectfully.

Apart from introducing the new vehicles in place of the older three wheelers, certain infrastructural measures have also been identified for effective implementation and management of the project. These include creation of support infrastructure in the form of construction of 20 modern bus stops, signages, erection of 45 high mast lights, traffic signals, installation of 25 Close Circuit Tele Vision (CCTV) cameras for traffic monitoring throughout the city and construction of an advanced police control room. UIT Alwar and Bhiwadi have built the support infrastructure and also borne the cost of uniforms, identity cards, group insurance and soft skills training of the drivers. Specially designed driver uniforms are provided to maintain similarity and easy recognition in the city.

A cooperative society has also been formed of all the Alwar Vahini owners so that they can avail their rights and organise themselves. All the drivers are entitled to get regular medical check-ups and insurances. Regular meetings and get togethers are held within the society to build up a feeling of belonging and a unique group culture.

To enhance the livelihoods for the women and provide secure travel options to women commuters, Mahila Alwar Vahini was formed. Here, the word Mahila literally means woman. This service has lady drivers and is particularly aimed at offering safe and comfortable commuting services to the women in the city.
launched in January 2012. The vehicles under this scheme have lady drivers and follow a special light red colour scheme, which allows easy identification. Alwar did not have a city taxi service. A 24 hour taxi service was also launched at the same time. Any person requiring a taxi can call for the vehicle through the Alwar Vahini helpline.

The Alwar Vahini project has gained significant attention in its one year of operations. The attractive vehicles carry more than 100 thousand passengers every day, especially from the weaker sections of the society. At present, around 1,310 Alwar Vahini vehicles have been launched and it is projected that the total requirement would be around 2,200 vehicles in the entire district. As these vehicles are becoming more and more popular within the city, private vehicle usage has reduced considerably and provided benefits like reduced pollution and congestion, thus making the city more liveable. With zero investment on the part of the government, the project brings in additional revenue to the government from permit fees and taxes. It has employed more than 3,000 persons directly and many more indirectly. The project has the potential of quickly transforming the public transport scenario with minimum investment and at the same time creating jobs and providing mobility solutions to the public at large.

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www.alwarvahini.com
Van Transit System

A public transport service in Bangkok Metropolitan Region (BMR)

Place: Bangkok, Thailand

Rapid urbanisation in the Bangkok Metropolitan area has led to the continuous growth of new developments and job opportunities in the suburban areas. The sprawling city has induced high demand for travel between the city centre and the suburban areas.

The Thai government since long has been focussing on developing a road network system until 2004. This government strategy highly encouraged automobile use in the city. Limited attention was given to improving public transportation services in the city. As a result, the existing public transportation systems were unable to cope with the increasing travel needs of the locals. Many commuters shifted to private vehicles further adding to the existing traffic problems of congestion, air pollution, noise, etc. The poor/low income groups who could not afford other modes of transport suffered the most.

The mobility needs of the people were met by the informal public modes in the city. To meet the growing mobility demands, the Bangkok Metropolitan Region (BMR) Authority established a van transit system in very congested areas (especially where the buses could not enter) as well as for travel between city centre and suburban areas in 2004. The van transit is a public transportation service provided by private operators and supported by the fares collected from the customers. No government funding was involved in the project.

The air conditioned vans used to offer transportation service have a seating capacity of 12 persons, including the driver. These vans operate on public streets as well as on mixed traffic expressways. The operators are required to register their vehicles with the Bangkok Mass Transit authority (BMTA) and receive authorization to operate on a commercial basis. The routes are generally fixed by the private operators themselves, organising services along the routes where there is high travel demand and operations would

Key Features

- Organising vans as a public transport service
- Self-regulated public transport system with limited government role
therefore be financially viable. The Land Transport Department and BMTA also provide help to certain operators in identifying the high demand routes. They also publicize the route of vans as in the case of buses.

The service is essentially self-regulated by a group of service providers and operates on the principle of offering the shortest travel time between origin and destination by having only two stops. A few more stops are added in cases when there are not many passengers opting for the same origins/destinations.

Lack of adequate public transport services in the city has resulted in a huge demand for the van transit services for intra-city travel and has become the most preferred mode. The mode became so popular that the number of vans increased from a few hundred in 1995 to about 8,300 in early 2004. It became the preferred mode for travelling between residential areas, business areas, shopping centres, and transportation hubs. With increasing popularity of these modes, the service has attracted a large number of private car operators, as well as bus users who could have switched to private vehicles if this van service had not been available. The service has helped considerably in reducing the congestion levels in the city. It is estimated that these vans carried as many as 800,000 passengers per day in 2004.

The system demonstrates a good example of a self-supported public transport service with minimum investment. It also plays a significant role in promoting ride sharing for mobility of the low income groups.

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Enabling Ownership of Cycle Rickshaws by Cycle Rickshaw Drivers

*Dipbahan* Rickshaw Bank Project in India

**Place: Assam, India**

In most small-sized and medium-sized cities of India, cycle rickshaws play an important role in meeting the mobility needs of the population. Cycle rickshaws serve as an appropriate mode in these cities as most of the trips here are short enough to be covered by pedalling. Typically, in Indian cities, cycle rickshaw drivers do not own the rickshaw; some studies suggest that almost 95% of them in India hire the rickshaw on a daily basis and pay a rent. In this type of financial arrangement between the cycle rickshaw owner and the driver, the driver usually pays a fixed rent to the owner and the rest of his earnings are his income. The fixed rents generally form almost one-third of the income of cycle rickshaw drivers, or sometimes even more, thus reducing their net earnings significantly. The financial arrangement is highly exploitative for

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**Key Features**

- Financial scheme introduced to enable cycle rickshaw ownership by the drivers
- Scheme coupled with measures like improvement in rickshaw design, provision of insurance, uniforms, identification badges, etc.

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*Dipbahan rickshaws lined up on the launch*

*Source: Dr. Pradip Sarmah, Presentation on Improving informal transport: Challenges and solutions, Presentation made at the Mobility for Poor workshop at TERI, New Delhi (October 2012)*
the rickshaw drivers as they tend to work for 12–14 hours to make a decent living.

The Initiative

An initiative in the form of “Dipbahan Cycle Rickshaw Bank Project” was taken up by Dr Pradip Kumar Sarmah (Founder, Centre for Rural Development, Guwahati) in Guwahati in November 2010 to enable the cycle rickshaw drivers to own a cycle rickshaw through a simple financial scheme. The aim of the project was to rescue the cycle rickshaw drivers from the exploitative daily rent system and enable asset ownership. Under this scheme, the rickshaw driver is required to pay a sum of 0.88 USD per day towards the cost of the cycle rickshaw, and at the end of the year or a half, he is able to own one. This innovative funding approach has been coupled with other measures to meet the capital needs. The corporate firms are given space for advertising on the cycle rickshaws in exchange for a fee, which makes up for the seed capital of the bank.

The design of the cycle rickshaws has also been improved through this scheme and new light weight, comfortable, and cost-effective cycle rickshaws have been developed in association with Indian Institute of Technology (IIT), Guwahati. The scheme also includes provision of insurance; each cycle rickshaw driver is provided with third-party insurance. All Dipbahan drivers are given a uniform,

Dipbahan rickshaw design
Source: Dr. Pradip Sarmah, Presentation on Improving informal transport: Challenges and solutions, Presentation made at the Mobility for Poor workshop at TERI, New Delhi (October 2012)
a pair of slippers, a license, an insurance policy, and an identity card. Under the scheme, the rickshaw drivers are provided with additional benefits like health check-up, fuel package (Liquefied Petroleum Gas [LPG] with stove), and educational exchange programme for the children of rickshaw drivers. The distinct identity is helping the rickshaw driver community gain a sense of dignity, while they continue to provide their services to meet a significant part of urban mobility needs.

The initiative has been a huge success, not just in Assam but throughout India. By 2012, there were about 5,000 Dipbahan rickshaws operating in various cities of Assam. The initiative has been expanded to other cities like Lucknow, Varanasi, and Allahabad in the state of Uttar Pradesh, with a total of about 12,000–14,000 more Dipbahan cycle rickshaw drivers in all these cities.

New models of cycle rickshaws are also being developed by the Centre for Rural Development (CRD), Guwahati, with solar panels, lights, FM radio, and a mobile charger. This initiative is truly making a difference at the ground level. The rickshaw bank has emerged as one of the largest cycle rickshaw service providers in India, while offering low-cost innovative financial solutions to the cycle rickshaw sector. The membership of the bank has now reached more than 30,000 families.

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Centre for Rural Development. See website http://www.crdev.org/cs2.html
Ecocabs

World’s first dial-a-cycle-rickshaw scheme

Place: Fazilka, India

‘Ecocabs’ is the name given to the traditional Indian cycle rickshaw operations after adding to it facilities like dial-a-rickshaw.”¹ These are cycle rickshaw services made available at one’s door step through a network of call centres, similar to dial-a-cab/taxi service. Introduced in the town of Fazilka, located in the state of Punjab, India, the scheme is a first of its kind in the country as well as in the world. Aimed at improving the unorganised cycle rickshaw transport system in the town and providing an affordable means of mobility to the city residents, the scheme has been a success in the city and earned accolades, both nationally and internationally.

It has been initiated by the Graduates Welfare Association (GWA), Fazilka, an NGO focusing on issues related to education, employment, environment, and energy. As a pro-poor mobility scheme, it has not only provided affordable mobility choices for the city residents, but has also generated employment for the

New fleet of Ecocabs being launched

Source: http://ecocabs.org/gallery/

Key Features

- Dial-A-Rickshaw scheme
- Livelihood generation for urban poor
- Node to node connectivity and affordable and comfortable services for city residents, especially for the ones belonging to lower and middle income classes
- Zero-emission technology

urban poor of the city. As reported by the GWA, the scheme is a source of livelihood for about 0.3 million families.

The project was first launched in June 2008 by organizing a group of 500 rickshaw-pullers in Fazilka along with the dial-a-rickshaw service operating through five call centres. In the first phase of the project, the main focus was on improving accessibility of the rickshaws followed by service quality improvements. The service was later extended in 2011 to nine call centres, one call centre in each of the nine city zones (around 1 sq. km each in area). Apart from the call centres, dedicated mobile phones and numbers are being distributed from time to time among the rickshaw operators at subsidized rates.

Main features of the scheme are:

- Rickshaw pullers, also known as traction men, are provided with mobile phones
- About nine call centres attend to the customer requests
- Operations are based on the hub-and-spoke model
- Services are made available at affordable prices
- Rickshaws are designed on ergonomic principles; new rickshaws, which are light-weight, low-floor and can carry extra luggage are being introduced;
- Advertisement space is being introduced on rickshaws from which the rickshaw-pullers can earn extra income

The members of the project receive several benefits, like free health check-ups, discounted medicines and tests, free education and annual scholarships to school-going children of the operators, digital identity card, accidental insurance for INR 50,000 (USD 915)\(^2\), better rickshaw parking facilities, free legal help cell, and

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1 USD=54.64 INR (December 2012 exchange rate)

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Ecocabs Stand constructed by Municipal Council, Fazilka
Source: http://ecocabs.org/gallery/
access to credit financing schemes of leading banks. Provided with rickshaw licenses and work uniforms, the traction men are required to follow a code of conduct.

The project is supported by an innovative financial model, which allows each traction man to become a stakeholder in the project at an initial capital cost of Rs. 10,000 (USD 183) for which a loan can be availed at a low annual rate of interest of 4% under the Reserve Bank of India’s differential rate of interest scheme. With daily instalments of Rs. 20 (or USD 0.4) per day (which is less than what rickshaw-pullers generally pay to rent a rickshaw) and along with additional advertisement revenues, the scheme allows the rickshaw-pullers to reach the breakeven point within 10–12 months.

Significant research, especially in terms of design and technological improvements is also being conducted to make cycle rickshaws a more comfortable mode of transport for both the passengers as well as the drivers. While GWA is responsible for all the research, operations, etc., the local government provides infrastructural help, especially in setting up ‘Ecocab’ stands at different locations within the city.

The “Ecocabs” scheme in Fazilka has been a success and has attracted significant attention and appreciation from all ends. If viewed from the perspective of mobility for poor and mobility as a livelihood for poor, it has contributed towards both. Additionally, the scheme has promoted the use of the most environment-friendly means of transport. It has made a huge contribution towards well-being of the rickshaw pullers and the improvement of the environment in addition to providing a low-cost mobility choice for the city residents.

The project was awarded with the “National Award of Excellence” in the area of non-motorized transport (NMT) in 2011 by the Ministry of Urban Development, Government of India. The success of the scheme in Fazilka has encouraged the state government to introduce the concept in 22 other cities of the state. Beyond cities in Punjab, the state of Haryana and other cities in the country like Delhi, Chandigarh, and Jaipur are also considering implementation of similar schemes to promote sustainable and inclusive mobility choices.

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Organizing the Cycle Rickshaw Industry
Case study of Sammaan Foundation's work in India

Place: India

Cycle rickshaws are a predominant mode of transportation in many Indian cities. Even though cycle rickshaws are one of the most popular modes of transportation, the cycle rickshaw industry remains a highly unorganised sector; almost 95% of the cycle rickshaws in any given city are run on a daily rent basis and are not owned by the cycle rickshaw drivers. The cycle rickshaw-pullers are usually exploited by the owners, who otherwise claim to be charging a nominal rent for their cycle rickshaw.

In 2007 the Sammaan Foundation was established with the aim to organise the cycle rickshaw industry. The foundation follows an innovative business model. The underlying idea is that the cycle rickshaws being mobile have the potential to offer a higher

Key Features
• Innovative business model to organise the cycle rickshaw industry
• Cycle rickshaws provided rent-free to the rickshaw pullers
• Revenue earned from advertising, commissions on loans, and R&D activities

Rickshaw of Samman Foundation
Source: Irfan Alam, Presentation on Sammaan: An Initiative to Organize Micro Transport System (Cycle Rickshaws) in India, Presentation made at the Mobility for Poor workshop at TERI, New Delhi (October 2012)
market penetration to the corporate sector in the cities and towns of India. Sammaan Foundation capitalized on this characteristic of the cycle rickshaw industry and successfully transformed it into a marketing instrument for corporates. The profits generated through the sale of advertising space on the cycle rickshaws are partly used to cover the cost of the cycle rickshaws that are provided rent-free to the rickshaw pullers.

The cycle rickshaws while serving the mobility needs of the local population also provide services like magazines, newspapers, first-aid, and music, and also sell items like fruit juices, water bottles, etc. Passengers are even provided with facilities like payment of their utility bills and mobile phone recharge. All these facilities have led to value-addition to the cycle rickshaw industry. The foundation has also focused on improving the design of the cycle rickshaws. Improved, spacious, and lighter cycle rickshaws have been introduced.

Sammaan Foundation’s revenue comes from the following sources:

- Commission on vehicle financing loans for the cycle rickshaw-pullers, commission on the recovery of those loans, and on opening of new bank accounts for the rickshaw-pullers (30% of the total revenue)
- Revenues earned through R&D activities, which the foundation carries out for the cycle rickshaw manufacturers in India (40% of the total revenue)
- Revenue from selling the advertising space (30% of the total revenue)

*Improved rickshaw design of Sammaan foundation*

*Source: Irfan Alam, Presentation on Sammaan: An Initiative to Organize Micro Transport System (Cycle Rickshaws) in India, Presentation made at the Mobility for Poor workshop at TERI, New Delhi (October 2012)*
In 2010, Sammaan Foundation has adopted 300,000 cycle rickshaws in the states of Bihar, Jharkhand, Uttar Pradesh, Madhya Pradesh, and National Capital Region (excluding Delhi). Initiative by the Sammaan Foundation has transformed the lives of hundreds of rickshaw-pullers by ensuring them some form of financial security and rescuing them from the exploitative daily cycle rickshaw hiring system. Through appropriate training, capacity building, and financial support, the Sammaan Foundation has transformed the cycle rickshaw industry into an organised sector and also into a business opportunity.

References


**Pangkalangs**

A cooperative organization of drivers of informal transport system in Indonesian cities

**Place:** Indonesia

Informal transport plays an important role in meeting the urban mobility demand. This is especially true in the case of small and medium-sized cities where formal public transport systems are limited in reach and capacity. The informal systems in these cities play a critical role in meeting the medium- to long-distance urban mobility needs, especially of those who cannot afford private motorized vehicles.

A variety of informal modes operate in the Indonesian cities: Angkot, Ojek, Bajaj, and Becak are examples of common informal modes. Angkot is a 10–12 seat minivan, Ojek is a motorcycle taxi to ferry a single passenger, Bajaj is a motorized three-wheeled taxi service, and Becak is a non-motorized three-wheeled vehicle used as taxi service.

The informal systems in Indonesian cities not only complement the formal public transport systems, but also meet the needs of specialized traveller groups. The flexible services provided by these modes accommodate a variety of demand and uses. The

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**Key Features**

- Cooperative organization of informal transport drivers, Pangkalang or rank, regulates the operations of informal transport modes
- Pangkalangs can be instrumental in influencing city-level policies/planning

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*Pangkalang of Becak drivers*
informal transport modes are also a cheap mobility option, thus meeting the needs of the low-income and urban-poor population in Indonesian cities.

The complementary nature of these modes helps in filling the gap left by the formal public transport systems. The informal modes typically do not compete with the formal system but rather serve the areas un-served by the formal public transportation. The figure shows coverage of the formal public transportation system as well as the informal systems in the city of Solo, a medium-sized city located in central Java. Comparison of both the networks clearly shows the extensive coverage of the informal system. The informal transport network does not overlap with the formal transport network. Informal systems provide a far better coverage in the city along with providing last mile connectivity to the passengers, which the formal public transportation system is unable to provide.

In the context of Asian cities where the formal and informal transport systems coexist, it is important that both systems complement each other. But, if instead of working as complementary transport modes, they act as competing modes, problems like oversupply on certain routes and under supply on others start occurring. Such a situation causes problems like reduced revenue for both modes, poor safety conditions due to competition, reduced last mile connectivity, etc.

Pangkalang or rank, is a cooperative organization of informal transport drivers in Indonesian cities. Ranks could be formed
through a variety of means, ranging from government recognition to sharing of uniforms among the rank members. The membership in a rank permits a driver to operate in a particular territory like near a market or in a neighbourhood or to serve a station or a specific customer group. Rank members have access to uniforms, parking attendants, shared repair equipment, and sometimes even an emergency fund. Each rank could be identified through its distinct uniforms, design of vehicles, sign boards, etc. This makes the informal transport stands easy to locate. In Pangkalangs, members are accountable to the group; the drivers tend to follow safety guidelines like providing passengers with helmets. Sometimes, these organizations are also supported by public and private actors like police, hotels, or other businesses. Such associations not only enhance the mobility options for the residents but also benefit the informal transport drivers by ensuring they have a regular income. Formation of Pangkalang helps the member drivers gain political leverage. This helps them to negotiate with the police or the local government. Thus in this way, if powerful enough, the Pangkalang can also influence policies. This was demonstrated in the case of Solo where a rank – PPBS consisting of 400 members influenced the annual participatory budgeting process in 2008–09. Through this process, the residents can direct government investment into their neighbourhoods. The PPBS in 2008–09 participated in this public planning forum and received a grant of USD 36,600 for the purchase of becaks.

This small innovation in the form of ‘Pangkalang’ on the part of informal transport drivers is not just ensuring resource sharing, political influence, and more importantly a stable income, but steps like an emergency fund are providing some form of insurance in this sector. Such organizations on one hand are benefitting the drivers and on the other hand are also proving their worth for the society at large through incorporating better safety conditions. Such a step is certainly a way forward towards better urban mobility, however more needs to be done to organise the sector and gain from its ‘unique’ operational characteristics. The government should participate proactively in providing integration between the formal and the informal public transport systems. To enhance urban mobility, a proper support mechanism should be evolved for the operators of informal transport. The government can provide support to informal public transportation (IPT) providers through provision of infrastructure, like, parking space, designated stands/stops, etc. Small investments towards integration of formal and informal public transport systems can go a long way in enhancing the quality of public transportation — formal and informal — in the cities of Indonesia.
References

Shift System

Solving the problem of oversupply of Angkots in Bogor, Indonesia

Place: Bogor, Indonesia

Bogor is a city of approximately 1 million people and is located about 50 km south of Jakarta, Indonesia. Angkots, 10–12 seat minivans, are a dominant public transport mode in Bogor. They ply on fixed routes with a high frequency and boarding and alighting passengers wherever required. High frequency ensures lower waiting time for the passengers and high route densities lead to better last mile connectivity. This informal transport system while meeting the mobility needs of the city has also led to serious traffic problems in the city of Bogor.

There are more than 8,000 Angkot vehicles that are licensed to operate in Bogor. A large number of Angkot vehicles lead to competition amongst the drivers to increase their patronage and thus their revenue. The patronage of Angkots has been reducing.

Key Features

- Shift system introduced for informal transport modes, i.e., Angkots
- Angkots can ply only in specific shifts
- The oversupply of Angkots in the city has been checked
- The problems of congestion, unsafe road conditions, etc., on account of Angkot operations have reduced

Mini bus on a congested road in Bandung city, Indonesia
over time as people prefer to travel by private vehicles, especially motorcycles, as they are faster and more convenient. Also, the Angkot vehicles with low roof and door height make it difficult for the passengers to alight and board the vehicle, thus leading to discomfort. The inappropriate design of Angkot vehicles has also contributed in reducing its popularity. As a result of the declining patronage of Angkots, the drivers have resorted to unsafe driving practices, which lead to congestion and safety problems. To increase the patronage, the Angkot drivers are either too slow to pick up passengers or they drive too fast to overtake the leading Angkot vehicle, so that it can pick up more passengers. In both the cases, they either cause congestion in the limited road space or create unsafe road conditions due to fast-driving practices.

To solve this problem, the Bogor City Angkot association and Bogor City government took a decisive step in the year 2009 to introduce a shift system for its operations. Under this system, shifts were introduced; the Angkot vehicle could operate only in one of the shifts, either A or B or sometimes a third shift C, depending upon the number of Angkot vehicles operational on a given route. The ‘A’ shift vehicles operated on certain days and ‘B’ shift vehicles operated on the other days. Such a system has reduced the number of Angkot vehicles operating on the roads to half and has offered multiple advantages to the operators, passengers, and the city administration. The first advantage is the reduction in congestion as the number of vehicles has reduced by half. The Angkot operators have benefitted as they are able to earn the same revenue doing half the shift. The competitive driving practices are no longer adopted by the Angkot drivers, thus addressing the safety issues. The passengers are also satisfied with safer operations and are unaffected by the reduction in service frequency of the Angkots as there is unnoticeable increase in their waiting time. In case of A, B, and C shift system; two of the three shifts are allowed to operate at any point of time. A three-shift system is adopted for only those routes where the demand is too high to be catered by a two-shift system.

By 2011, the shift system had been implemented in 11 of the 23 Angkot routes in the city. This system has been immensely successful, as it has reduced almost 8% of the vehicles from the city streets. The most appreciable aspect of the whole system is that there are almost zero adverse impacts. Urban traffic condition in Bogor city has improved; congestion has reduced, safety has increased, while at the same time there has been no loss of income to the Angkot drivers. The shift system has truly offered a win–win situation for all the stakeholders.
References

Improving Informal Transport System Through Legal and Regulatory Mechanisms

Regulations for improving minibus-taxi industry in Western Cape, South Africa

Place: Western Cape Province, South Africa

The Western Cape Province in South Africa has a population of about 4.5 million people, with 70% of the population living and working in and around the city of Cape Town. Western Cape has a good transport infrastructure. An extensive road and rail network provides connectivity between all the major centres of the province. The road-based transportation is provided by a large fleet of buses and minibuses. In spite of the presence of a well-established rail and road system, it has been observed that there has been a steady decline in the number of rail and bus commuters and rise in the mini-bus ridership in the province.

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Source: Y. Ahmed, paper on “Transformation of public operations from informal to formal services: An examination of initiatives by the Western Cape Provincial Department of Transport to transform the minibus taxi industry”

Key Features

- Legalization of informal minibus-taxis
- Requirement of registration of associations and operators of minibus-taxis with the Provincial Registrar
- Route-based permit system introduced
- Mandatory replacement of old fleet
- Scrapping allowance for minibus-taxi owners in exchange for their vehicles; used as a deposit for the new Recap vehicles
- Formation of a ‘Unified Taxi Council’ at the provincial level
- Policy to encourage integration of informal systems with formal systems

Minibus taxis parked along main road, Cape town
Despite the large government subsidies to the rail and bus services, their ridership has continued to decrease. The informal minibus-taxi services have filled the gap created by the inefficient public transport services. The popularity of minibus-taxis has grown primarily due to the fact that it provides door-to-door service to the commuters. Being aware of the significant role played by the minibus-taxis in enhancing the economic opportunity of its people and meeting their mobility needs, the new democratic government of South Africa (in 1994) gave the minibus-taxi services and operations very high priority. Initiatives were taken by the government to improve the informal minibus-taxi operations.

**National Taxi Task Team**

With the spirit to understand the problems of the minibus-taxi industry, a National Taxi Task Team (NTTT) was setup in South Africa in 1995. This team consisted of representatives from the taxi industry, from all the tiers of government, and also specialist advisors. The focus area for NTTT was regulation and control, formalization and training, and economic assistance for the minibus taxi industry. In Western Cape, a Provincial Taxi Working Group was established by the provincial department of transport and public works to implement the recommendations of NTTT published in 1996. The key recommendations of the NTTT were regarding registration of the minibus taxi operators, training and empowerment of the operators, formation of taxi councils and establishment of their election procedures, and improvements in the legislation regarding minibus taxi operations and recapitalization of the old fleet.

**Legislation**

In 1994, after the new government came into power, the Road Transportation Act of 1977 was amended and metred taxis and buses were accepted as legal public transport vehicles, unlike previously when no provision existed for the minibus-taxis.

**Registration**

In 1996, Western Cape Road Transportation Act Amendment was introduced wherein a legal definition of the minibus service taxi was presented. This new act also required the associations and operators to register themselves with the Provincial Taxi Registrar. The Provincial Registrar is an autonomous institution appointed by the Provincial Minister of Transport, not subject to reporting under any government department. The Provincial Registrar is
responsible for registration of minibus-taxi associations, their members, and the vehicles. He also keeps a record of the routes on which the associations are given a permit to operate. Before registration, the registrar makes sure that the taxi association meets the minimum criteria as per the national and provincial legislation. In case of Western Cape provincial regulations, the association should comprise of a minimum of 10 members, each having at least one legal operating permit linked to a roadworthy bus. The association also needs to sign a constitution and a code of conduct. This ensures that the associations adopt a standard minimum constitution. Under the standard minimum constitution, the associations are required to hold annual general meetings, prepare audited financial statements and establish a mechanism for managing grievances, and internal disciplinary procedure. The registrar is also responsible for monitoring the compliance of the constitution and the code of conduct by the associations. In case of contravention of the constitution or the code of conduct, the registrar has the powers to summon an association or its members, or fine the association or even cancel the permit of the association, in case of serious violations.

Changes in the permit system

The Provincial Minister for transport and public works formulated regulations, which required all the new permits to be issued on route basis and the minibus-taxis were marked to identify them as the legal operator and also to identify the route on which they were permitted to operate. Previously, the minibus-taxis were issued radius permits that authorized the minibus operators to work along any route falling within the permitted radius (generally a 30 km radius). The increase in number of minibuses led to fierce competition amongst the minibus operators for passengers and the most profitable route. Due to the lack of enforcement by police, operators trespassed the “boundary agreements” leading to turf wars. As per the new regulations, the permit holders were required to convert their radius based permits to route based permits. By the end of 2002, 95% of the radius-based permit holders were converted to route-based permits.

Recapitalization of the minibus-taxi fleet

Due to the lack of investment on replacement of the old fleet, the average age of the fleet climbed up posing a serious safety hazard; in 1997 the industry spent only 35% of the required investment on recapitalization of the minibus fleet. To encourage
recapitalization of the minibus fleet, the government proposed a strategy to replace all the 16-seater minibuses. As per the National Land Transport Transition Act, 2000, all the old minibuses were to be replaced by 18- and 35-seater buses. It was also announced that the operating licenses will no longer be issued to 16-seater minibuses. The government also proposed a “scraping allowance”, under the “Recapitalization Programme”. Scrapping allowance was to be paid to the minibus taxi owners in exchange for their current vehicles and used as a deposit for the new Recap vehicles.

**Training**

A government-funded training programme to enhance the standards of operations and management of minibus-taxis was also taken up. Training programmes like advanced driving techniques, fleet management, first aid, customer care, etc., are now conducted regularly to improve the functioning of the minibus-taxi operations.

**Enhancing the institutional capacity: Unified Taxi Council and EISA**

One of the problems that government faced in formalizing the minibus taxi operations was the fragmented nature of ownership of the minibus-taxi industry. Government found it difficult to engage with more than 150 individual associations in the Province and thus facilitated the formation of a “Unified Taxi Council”, which represented interests of all the minibus taxi operators in the province.

At national level, the requirement of a representative body was felt, which could express the views and fears of the taxi industry on key issues. The provincial department of transport and public works set up an independent body — Electoral Institute of Southern Africa (EISA) — to supervise the elections of a new provincial representative structure. In 2002, EISA ensured transparent elections at special general meetings, regional, and national level.

**‘Public transport first’ policy**

The Western Cape Province adopted a policy of ‘Public Transport First’, giving preference to public transport over other traffic. A public transport branch was established under the department of transport and public works. The public transport department developed a provincial vision and also a strategic delivery programme to realize the vision over a period of five years. Under
this programme, a lot of emphasis has been put on the inclusion of the minibus-taxi operations into the formal public transport system through funding, training, and institutional reforms.

In a short time, the Government of South Africa has achieved success in formalizing the highly unregulated minibus taxi industry in the province of Western Cape through its industry friendly policies and stakeholder participation. The government has taken the issue of transformation of the informal minibus taxi industry a step further by a ‘Public Transport First’ policy where it gives emphasis on integrating the informal public transportation with the formal transport system. The case highlights the initiatives on the part of the government to improve informal transport systems through legal and regulatory mechanisms.

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Improving Informal Auto Rickshaw Services Through Fleet Organization

G-Auto services in Rajkot city, India

Place: Rajkot, India

G-Auto is the brand name given to an organised fleet of auto rickshaw service. The service is provided by a public charitable trust called Nirmal Foundation based in Rajkot city in Gujarat, India. The scheme aims at organizing the auto rickshaw drivers under a social umbrella and improving the quality of service. Currently offering services in different cities of Gujarat namely Ahmedabad, Gandhinagar, and Vadodara, G-Auto has become a brand in itself.

With a population of around 1.3 million people, Rajkot is one of the fastest-growing cities in India. Auto rickshaws play an important role in meeting the mobility needs of the people in the city. Until very recently, the auto rickshaw service in Rajkot was highly unorganised comprising a collection of informal auto-rickshaw fleets and companies, with more than 12,000 auto rickshaws providing shared services and charging the fares as per

Key Features

- Entrepreneur-driven fleet organization
- Dial-A-Rickshaw service
- Affordable and comfortable services for all
- High quality service

Auto rickshaws in Gujarat
their own discretion. Recognizing the large benefits offered by the auto rickshaws in terms of door to door service, flexibility in operations, etc., local authorities decided to organise the auto rickshaw service in the city as a step to offer a safe and reliable service to the locals. The Rajkot Municipal Corporation (RMC) in partnership with EMBARQ India selected G-Auto as a strategic partner for implementing and running its unified auto rickshaw fleet with the ‘dial-a-rixa’ service. The project was launched in July 2012 with a pilot fleet of around 50 autos and is expected to scale up over time.

G-Autos provide metre-based services with a government regulated fare structure, on the lines of other cities where G-Auto is currently offering services. ‘Dial an auto rickshaw service’ makes the auto rickshaws only a phone call away. Autos are available to the passengers at their doorstep at any time of the day with no extra charges for the same. It also helps auto rickshaws serve as a major alternative to the door to door use of private automobiles. Furthermore, auto rickshaws also serve as a major feeder mode ensuring last mile connectivity to the other modes of transport. To achieve this, auto rickshaws are being made available at all the major public transit stations, high-demand transport hubs, such as bus stops, intercity bus terminals, railway stations, and the airport.

In Rajkot, fleet organization in the auto rickshaw sector is expected to address the key challenges related to the mode including poor

![CNG Auto rickshaws in Rajkot, Gujarat](http://www.mobiprize.com/2012/04/16/g-auto/)
public perception, informal fare structure, lack of employment benefits to drivers, operational inefficiencies, and lack of regular maintenance of the vehicles. At the same time, giving due recognition to the mode under a distinct brand image is expected to improve the quality of service offered. Apart from the above, the project also promises employment benefits to drivers, which includes accident insurance, health cover, training, and additional revenue from advertising.

While G-Auto is responsible for implementing the project and setting up operational systems for the same, the RMC is committed to providing seed funding, infrastructural support, and stakeholder management for the duration of the project. EMBARQ India offers technical advice and expertise in the scheme.

The project has brought significant attention and appreciation from the central as well as state government, as an initiative to improve the quality of services for passengers as well as quality of life for the drivers. Reforms related to auto rickshaws do not directly fall under the regulatory purview of the city municipal corporation, but the city government in coordination with other stakeholders including traffic police, regional transport office (RTO), service providers, and driver unions has made significant efforts in the implementation of the fleet auto rickshaw service. With slight changes based on its context and applicability, this model is definitely worth adopting in other cities as a way to improve and promote the informal manner of service provision by modes like auto rickshaws, mini-buses, etc.

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Legislative Reforms to Organise Informal Transport Modes

Case of non-Transmilenio buses in Bogota, Colombia

Place: Bogota, Colombia

Bogota has two types of public transportation systems — Transmilenio and non-Transmilenio. While the Transmilenio can be categorized as a formal public transportation system provided by the city government through a bus company known as Transmilenio Co., the non-Transmilenio public transportation system can be described as an informal system because of its operational characteristics.

Transmilenio is a world-class Bus Rapid Transport (BRT) System, which is operated under a trunk and a feeder system. The non-Transmilenio bus services on the other hand are the traditional bus services operating under three broad categories of buses (fitted on truck-chassis): buses, buseta, and microbuses. The Colombian law authorizes only bus companies to run a public transportation service, hence traditionally, the bus companies in Bogota used to acquire the route permits and then rented the routes to the bus owners. Even though the law made it mandatory for the bus companies to own at least 10% of their fleet, the law was grossly disregarded.

There is a high dependence of population on public transportation system in Bogota, with almost 70% of the motorized trips being made by public transport — formal and informal. Despite owning a world-class BRT system, Transmilenio, a large proportion of public transportation demand is met through poor quality non-Transmilenio buses.

The non-Transmilenio services are typically characterized by their poor quality of service, leading to longer travel times, and sometimes even unsafe travelling conditions. An oversupply of the non-Transmilenio buses over the years has led to congestion, air pollution, and at times even penny wars. These vehicles are typically inadequately maintained by the operators in order to reduce the cost of operations and increase the revenues. The oversupply

Key Features

• Legislative reforms introduced to address the problem of oversupply of non-Transmilenio buses and enhance their quality of service and productivity
• Mandatory electronic tags for non-Transmilenio buses
• Fare box collection and its distribution-responsibility of the bus company
• Encouragement to buy new fleet and scrap old fleet
of buses has also reduced the ridership per bus; to keep up the profitability, the operators resort to cost cutting through practices, like lowering investments on the maintenance of their vehicles, etc. The quality of bus services also deteriorates as the bus companies delink themselves from service provision. Once the bus companies acquire route license (permit to operate bus service on a particular route), they rent out routes to as many bus owners as possible to increase their profit, instead of running the bus service through their own bus fleet.

In order to solve the problem of oversupply of non-Transmilenio buses and also enhance their quality of service and productivity, the Secretariat of Traffic and Transport (STT), Bogota, in the year 2003, restructured the non-Transmilenio system through a series of legislative reforms. Decree 112 to 116 were introduced to reform the non-Transmilenio bus operations.

- Decree 112 provided better controls and sanctions to the operators.
- Decree 113 made it mandatory for all vehicles to carry an electronic tag. This law helped in reducing the number of ghost vehicles, better known as pirates in Bogota.
- Decree 114 ordered the bus companies to rent the buses from the bus owners. This was done to ensure that the bus companies participate in the operation and maintenance of the buses, as against the existing practices, wherein the bus owners were no longer responsible for service provision and were expected to become investors to earn profit from their asset. The bus company was entrusted with the responsibility of farebox collection and its distribution to the bus owners as rent for the buses. This was opposite to the prevailing practice, wherein the bus driver was required to collect the farebox revenue and return it to the bus owner, who further shared a part of revenue with the bus company.
- Decree 115 called for a reduction of 29% (5,700 bus equivalents) in the number of buses affiliated to the bus companies. It also asked the bus companies to collect a part of farebox revenue for the purchase of new fleet and scrapping the old fleet.
- Decree 116 ordered the bus companies to deposit the funds collected in a fiduciary fund. But later, the law was amended and the bus companies were allowed to manage their funds themselves.

The legislative reforms undertaken in Bogota in 2003 highlight some interesting and innovative measures to manage a highly unorganised sector like the non-Transmilenio bus operations.
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Integration of Informal Transport Systems with the Formal Systems

Attempts to integrate daladalas and BRT system in Dar-es-Salaam, Tanzania

Place: Dar-es-Salaam, Tanzania

Dar-es-Salaam, the capital city of Tanzania, has a population close to about 4 million people. The city is dependent on public transport services for meeting a significant portion of the mobility needs of its population. The public transport services in the city are largely provided by the informal transport modes, daladalas.

Daladalas are privately owned minibuses. The daladala service is highly demand-responsive, affordable, and plays an important role in meeting the mobility needs of the people in Dar-es-Salaam. Even though daladalas are meeting most of the public transport needs of the city, the service provided by these modes is generally of poor quality, and the daladala drivers often resort to unsafe and highly aggressive driving practices, sometimes even leading to violence among the operators. Daladalas are considered to be a key cause of traffic congestion in Dar-es-Salaam.

Given the nature and problems associated with daladala services, the government has proposed a formal Bus Rapid Transit System

Key Features

- Owners of informal public transport modes, daladalas, being given an opportunity to become part of the formal BRT system proposed for the city
- Consortia with existing daladala operators being given preference for operating contracts
- Existing daladalas to serve areas not served by the BRT system and gradually to be phased out as the BRT system expands
for the city called ‘DART’ (Dar Rapid Transit). The DART will operate services on trunk and feeder routes. The high density areas would be served by the trunk service and the low-density areas would be served by feeder service.

The city is attempting to integrate the existing informal public transport system with the proposed DART system. However, the city government is facing several challenges in involving the daladala operators in the integration process as the daladala industry is highly fragmented, with majority of owners owning one or two daladala/s. Even the management structure is highly inconsistent across the daladala industry. Some operators are also the drivers of the daladalas, while others keep drivers to run their buses.

To successfully integrate the daladalas with the DART, the government is involving the Dar-es-Salaam Commuter Bus Owners Association in the planning and implementation of the DART project. The first phase of the project, which is 20.9 km long is being planned to be operated through two companies, wherein each would be responsible for the operation of trunk and feeder lines. It has been proposed that in the bidding process, the companies should give preference to those consortia, which include former daladala owners and operators. The daladala owners are also required to organise/include themselves into consortia and bid for the operating contracts or alternatively, form a company in association with an international bidder. The international bidders are required to partner with the existing operators while bidding.

In order to prevent competition between the DART and the daladalas, the government has stopped issuing licenses to the daladalas for the Central Business District (CBD) area since 2007. The daladalas, which were operational in the CBD area have been relocated to peri-urban routes, which would be uncovered by the

A dala dala in the city of Dar es Salaam, 2008
first phase of DART. This has reduced the number of daladalas from 6,000 to only 2,000 in the CBD. It has been planned that daladalas would serve all those parts of the city, which would not be served by the DART and gradually as the DART service would expand, the daladala service would be phased out. The government is also encouraging the registration of new buses, which conform to the technical specifications of feeder buses.

It can be observed from the case study that the city government is making efforts to involve the already existing daladala industry in the planning process of the formal DART system. The consortia including the daladala operators are being preferred for operational contracts for formal service provision. The government has prepared a well thought-out plan, which focuses on a gradual phasing-out of the daladalas as DART becomes operational; the daladala operators would be given an opportunity to become part of the formal services proposed for the city.

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Section B
Reducing environmental impacts of informal transport sector
Cities across the developing world are becoming increasingly conscious of the importance of providing mobility options to people in an environment friendly manner. Some cities have gone a step further and demonstrated how it is possible to gradually shift from a polluting mode to a clean technology without affecting the levels of mobility. Since, informal transport modes are primarily used by the low income population, such efforts directly benefit the users as well the operators of such vehicles and also lead to enhanced quality of life in the context areas. Six such case studies highlighting the initiatives to reduce the environmental impacts of informal transport systems have been discussed in this section.

- Electric three-wheelers in Kathmandu: A clean informal transport system
- Soleckshaws: Dual-powered cycle rickshaws in Delhi
- Reducing environmental impacts of informal modes: Conversion of shared auto rickshaws in Ahmedabad to CNG
- Reducing the environmental impacts of informal modes: Conversion of diesel-run Jeepneys in Manila to clean fuels like LPG and electricity
- Reducing the environmental impacts of informal modes: Tricycle conversion programme in San Fernando City
- Reducing the environmental impacts of informal modes: Case of Puerto Princesa city in the Philippines
Electric Three-Wheelers in Kathmandu

A clean informal transport system

Place: Kathmandu, Nepal

The problem of air pollution in the valley of Kathmandu was escalating at an alarming rate and the concentration of pollutants was above the levels set by the World Health Organisation. The source of this pollution was largely attributed to motor vehicles and specifically the privately run three-wheelers that run on diesel fuel. These vehicles with a seating capacity of 10 persons had become popular in Kathmandu during 1989-92.

To address the problem of air pollution generated by these vehicles, in 1992 the government banned the registration of new three wheelers and established emission standards in 1994. The government could not entirely ban these vehicles from the roads due to various political and local economic reasons. To solve such issues, the government with the help of the private sector and the civil society promoted the use of electric three wheelers in 1993 to fill the supply gap, until the diesel operated three wheelers were completely banned by 1999. Government agencies, particularly the Ministry of Environment, Department of Transportation

Key Features

• Banning of diesel three wheelers
• Promotion of electric three wheelers
• Pilot program undertaken
• Public involvement

SAFA Tempo, Kathmandu, Nepal

7 Asia-Pacific Environmental Innovation Strategies (APEIS), Research on Innovative and Strategic Policy Options (RISPO), Good Practices Inventory, Introduction of electric three-wheelers in Kathmandu, Nepal
Management, Ministry of Finance and Valley Traffic Police were actively involved in introducing electric vehicles in the city. The objective of the stakeholders involved in this project was to stop the use of polluting three wheelers run on diesel and to promote a cleaner transportation system. The initial efforts of the government were not successful, but in 1999 owing to the public involvement against these polluting vehicles, the government in its budget allotted incentives for owners of the three wheelers to replace their vehicles. This incentive was in the form of a 75% discount on customs duty on imports of 12-14 seater public transportation vehicles. Subsequently, the government passed a ban on operation of diesel three wheelers in the valley.

The interest in electric vehicles in Kathmandu valley had started since 1993, when Kathmandu Metropolitan Corporation with the support of USAID and the US-Asia Environmental Partnership Program started a pilot project under Global Resources Institute (a US based NGO). The pilot program included designing and converting diesel three wheelers to electric three wheelers and demonstrating that these vehicles were economically feasible. As part of the program, eight electric three wheelers were introduced and test run for six months. This step by the city corporation succeeded in creating awareness, encouraged acceptance of the stakeholders and brought them together to take forward the initiative. Following this, private sector expanded the fleet size of the electric vehicles and by 2002, sold over 600 electric vehicles. The manufacturing, sales, charging station operations and operation of these new vehicles were in the hands of the private sector and were represented by the Electric Vehicle Association of Nepal. The electric vehicle manufacturing industry in Nepal now enjoys a 50% discount from taxable income to promote electric vehicles.

SAFA Tempo, Kathmandu, Nepal
There were more than 600 electric three wheelers in Kathmandu in 2003 and they operate on 17 routes in the city, serving 120,000 passengers daily. The electricity used for charging the batteries is sourced from hydro-power and hence has zero emissions. In addition, the battery is charged during the off peak hours using the unutilised energy. The battery leasing scheme has been introduced for the operators, where 50% is paid initially and the rest 50% is paid in instalments at 7% interest.

The three wheelers in Kathmandu are one of the cheaper transport options for the population. The project, which focuses on improvement of environmental performance of this mode has provided cleaner mobility options to the population. The success of this program is attributed to the citizens and the media which helped create awareness about the pollution problems, which further led to action by the government. By starting with a pilot test run of the electric vehicles, the city government was able to catch the attention of the government of Nepal and the private sector to work towards making electric vehicles a success. There is zero local emissions and since the electricity is generated from the locally available hydro power, there are low generation emissions. Also, since the electric vehicles are manufactured locally, there has been considerable employment generation. The introduction of electric three wheelers also saw women entering the sector to work as drivers. Therefore, overall this program has provided environmental benefits, social benefits and economic benefits to the people of Kathmandu.

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2 Dr. Shobhakar Dhakal (2002)
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4 http://www.energyhimalaya.com/energy-efficiency/transportation.html
Soleckshaws
Dual-powered cycle rickshaws in Delhi

Place: New Delhi, India

Soleckshaw is a battery-powered and pedal-assisted dual-powered tricycle. The batteries in soleckshaws are charged using solar energy. Though pedalling is not required, if pedalled, the soleckshaw gains more power. Aimed at reducing the physical effort involved in pulling passengers on cycle rickshaws, soleckshaws have been designed by the Council of Scientific and Industrial Research (CSIR) and Central Mechanical Engineering Research Institute (CMERI). The technology has now been transferred to the manufacturers selected by the government.

Soleckshaws were first launched as a pilot project in 2008 in the old city area of Chandni Chowk in Delhi. Chandni Chowk is one of the oldest and busiest markets of Delhi characterized by a network of narrow and winding streets.

Key Features

- Introduction of dual-drive (manual and solar power assisted) cycle rickshaws
- Removal of drudgery and hardship of the rickshaw pullers
- Zero-emission technology
- Employment options to the poor, especially old and the weak

Design of the Soleckshaw vehicle

The Soleckshaws can carry two passengers, a payload of 200 kg excluding the driver and run at an average speed of 15 km/h, which can go up to a maximum speed of 40 km/h. Typically, a fully-charged battery can run for about 70 km. When batteries run out, the solar-powered rickshaw drivers swap the exhausted cells for fully-charged ones at solar-powered charging stations. The cost of recharging the battery is about Rs. 45 (less than 1 USD). Battery recharging stations have been set up by the Central Electronics Limited (CEL) at few locations in the old-city area. An alternative battery is also provided to the rickshaw-puller for the time his battery is being re-charged at the station. For increased safety of both the driver and the passengers, all the three wheels have the braking system.

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<tr>
<th>DESIGN CHARACTERISTICS</th>
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<tr>
<td>Power source</td>
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Initially the soleckshaws were available at a cost of Rs. 30,000 (USD 550) which was about three times higher than the cost of traditional rickshaws and were far from the reach of the rickshaw-pullers. Due to the high cost, the soleckshaws did not gain much popularity initially despite their huge environmental and health benefits. Significant research — especially in terms of design and technology improvements — has been done to make soleckshaws more economical and available to the rickshaw-pullers. To promote the vehicle and make it more affordable, the government is providing incentives like 4% concessional excise duty and also exemption from customs duty on its key parts and components. Greater volumes of production are expected to further bring down the cost of the vehicle. Apart from the above, loans at lower rates and microfinancing schemes are also being made available by the government and NGOs working to promote this eco-friendly vehicle.
Designed to ease the physical labour involved in pulling the rickshaws, these dual-powered soleckshaws with widespread use are expected to promote cleaner modes of urban mobility. It is also seen as a major source of employment generation for the poor. The project is also expected to reduce the incidence of several diseases suffered by the rickshaw-pullers on account of hard work and malnutrition. With zero emissions at the end-use level, soleckshaws are seen as a new potential face of urban transport for short-distance travel.

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Reducing Environmental Impacts of Informal Modes
Conversion of shared auto rickshaws in Ahmedabad to CNG

Place: Ahmedabad, India

Ahmedabad, also known as Amdavad, is the fifth-largest city and seventh-largest metropolitan area of India with a city population of more than 5.5 million and an extended population of 6.3 million (Census of India, 2011).

Ahmedabad has been consecutively ranked over the last few years as one of the best cities to live in. But that has not been the case always. In 2001, Ahmedabad was listed as the fourth most polluted city among 85 cities in India monitored by the Central Pollution Control Board (CPCB) under the National Ambient Monitoring Programme. As per CPCB’s monitoring results, the city showed alarming levels of air pollution in 2001 and required immediate attention. High pollution levels in the city were primarily attributed to the unprecedented growth in vehicles in the city. Vehicular pollution was estimated to contribute to about 50–70% of the air pollution.

Key Features

- Shift from petrol to compressed natural gas (CNG) run shared auto rickshaws
- Reduction in pollution levels at the city level

Auto rickshaws being used to transport children to school
Vehicle population in Ahmedabad comprises buses, auto rickshaws, private vehicles, etc. Among the various modes, auto rickshaws have been a vital mode of transport providing low-cost mobility options to the locals. The popularity of the mode among other modes of transport can be attributed to a number of reasons. Auto rickshaws provide affordable and comfortable door to door services to all sections of society. Auto services also operate on a shared basis within the city (informal operations). Old city area of Ahmedabad is a major hub of employment for the low-income population in the city, many of whom have to come to the old city from the peripheral areas. The shared auto rickshaw services help in meeting the mobility needs of these low-income population groups living on the fringes at relatively lower fares as compared to formal transport systems. Apart from this, shared services are also a preferred mode for travel to other nearby towns like Gandhinagar or the industrial areas due to their availability at all times and faster service in comparison to the public transportation buses operating on these routes.

Also, these modes are considered to be safe; evidential data shows that auto rickshaws are safer than other modes of transport. Specifically, due to the auto rickshaw’s lower speed of travel, smaller size, and easy manoeuvrability, it is the motorized way of transport with the lowest commuter fatality rates.\(^1\) Auto rickshaws are also a major source of livelihood among the lower income groups.

Despite their popularity and critical role in meeting the mobility needs of the residents, auto rickshaws have significantly

\(^1\) The Auto Rickshaw Restructuring Project (2011), OneWorld Foundation India.
contributed to air pollution. The Supreme Court of India in 2001 had directed various states\textsuperscript{2} including Gujarat to prepare ‘urgent’ action plans to lower the pollutants in their cities showing high pollution levels as per the CPCB report in 2001. In response to the ruling, the Government of Gujarat prepared Air Action Plans for its various cities namely, Ahmedabad, Vadodara, Bharuch, Surat, Rajkot, Jamnagar, Vapi and Gandhinagar in 2002. In these plans, the Gujarat Pollution Control Board had identified auto rickshaws as one of the major contributors to air pollution on account of the transportation activities and recommended conversion of all the auto rickshaws to CNG.

Gujarat is favourably placed with regard to both the availability of natural gas and the natural gas pipeline infrastructure. Also, the compression requirement is considerably reduced in Gujarat, as the gas is already received in a compressed state to a level of nearly 50kg/cm\textsuperscript{2}. CNG in its ready state is compressed to a level of 250 kg/cm\textsuperscript{2}. The government saw it as a great opportunity and therefore proposed switch over of motor vehicles — public buses, autos, and taxis — to CNG owing to its high environmental benefits.

The implementation of the proposal to shift to CNG faced significant resistance from transport operators as well as suppliers. Shift to CNG included technological changes at both ends, i.e., supply side as well as consumer side. The main concern areas for the switch over included lack of infrastructure for refilling (stations or outlets, pipeline network, etc.), existing incompatible vehicles, lack of availability of conversion kits, etc. The state of Gujarat focused on ensuring an adequate CNG supply, adequate supply stations and outlets to avoid long queues and also adequate availability of conversion kits in order to plan for smooth and easy delivery of CNG to the customers. 45 CNG stations were set up in the city on a public private partnership (PPP) model.

Apart from the reduced emission levels, it was estimated that the conversion to CNG would lead to an average saving of Rs. 100 (USD 1.83)\textsuperscript{3} per day per vehicle. But, this saving came along with an initial investment of Rs. 20,000 (USD 366) per auto as auto rickshaws required installation of CNG conversion kits. After installation, the vehicles were able to operate on both CNG as well as petrol as per the requirement and convenience of the owners. CNG use involves low operating and maintenance costs and therefore, also helps in recovering the initial conversion costs within a year. The rickshaw owners welcomed the idea of shifting to CNG, but their major concern was the one-time conversion cost, which seemed too high and most of them found it difficult.

\textsuperscript{2} Notice for preparation of action plans to the States of Maharashtra, Andhra Pradesh, Gujarat, Uttar Pradesh, Karnataka, and Tamil Nadu. Cities indicating high pollution levels: Ahmedabad, Kanpur, Sholapur, Lucknow, Bangalore, Chennai, Hyderabad, Mumbai, and Kolkata. For details see http://www.cpcb.nic.in/divisionsofheadoffice/pci3/08_Interim_report_on_cities.pdf

\textsuperscript{3} 1 USD = 53.64 INR (December, Exchange rate 2012)
to meet it. The Gujarat Pollution Control Board, therefore, gave the auto rickshaw drivers an incentive of Rs. 10,000 (USD 186) per auto for conversion. State, district, and local administration helped in the procurement of loans. Banks offered soft loans to the first 1,000 auto rickshaw owners who approached them for installation of kits. Also, all auto rickshaws registered before 1991 were phased out and a new fleet was introduced on roads to reduce the emission levels. At the same time, significant attention was given to provide proper training and awareness to all the stakeholders.

Ahmedabad had 72,937 CNG-operated auto rickshaws in 2011. The implementation of the plan has significantly helped in bringing down the air pollution levels and improving its ranking among the most polluted cities from fourth in 2001 to 13th in 2005, 43rd in 2006, and 66th in 2009.

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Reducing the Environmental Impacts of Informal Modes

Conversion of diesel-run Jeepneys in Manila to clean fuels like LPG and electricity

Place: Manila, The Philippines

Jeepneys are the most popular travel mode throughout the Philippines. Crafted out of the remnants of the American jeeps used in the Second World War, these informally designed vehicles can be seen in many colours throughout the city offering a cheap alternative transportation mode to the people. Often associated with flamboyant decorations and overcrowded seating, Jeepneys are looked upon as the symbol of the Philippines culture and creativity.

Apart from the informality in the design of the Jeepneys, informal ways of operations also characterize this mode of public transportation. It is the main choice of mode for medium travel distances ranging from 5–20 km and can accommodate up to 20–25 passengers on average. Jeepneys generally operate along fixed routes, which are clearly indicated on the exterior. They are mainly owned by the private owners who customize and

Key Features

- Shift from diesel-run Jeepneys to clean fuels like liquefied petroleum gas (LPG) and electricity
- Incentives to informal transport operators to shift to clean/alternative fuel vehicles

Jeepney in Manila
decorate them as per their own choice. They are also available on fixed rent on a day to day basis.

Since its origin, the government has made numerous regulations to organise and improve this basic mode of transportation in the Philippines. Today, the drivers require special licenses, charge fixed fares, and operate on fixed routes unlike earlier when the drivers could pick up passengers from anywhere along the way and follow any route. The route followed along with the origin and destination is boldly demarcated along the sides of the Jeepneys on the exterior. Also, proper areas have been identified for loading/unloading of passengers in order to ensure an uninterrupted and smooth flow of traffic. However, despite the efforts, Jeepneys have long been negatively associated with congestion and high pollution levels. Considering the significant contribution of the diesel-run Jeepneys towards environmental pollution and its adverse health impacts on the population, the government has now started to encourage the operators to shift from diesel to cleaner fuel options like electricity and LPG, especially for the new fleet. In March 2012, a study\(^1\) has been taken up to ascertain the “economic viability, environmental soundness, health impacts, and social acceptability” of LPG-run Jeepneys.

LPG as a fuel leads to a significant reduction in the emission levels of particulate matter and other gases like carbon dioxide, carbon monoxide, hydrocarbons, etc. Also, the noise levels of engines running on LPG are less. Though, the diesel-run Jeepneys involve a high cost of conversion to LPG (in comparison to taxi conversion), the overall benefits are much more. The conversion of diesel-run Jeepneys is estimated at around Philippine Pesos

![Jeepney in Iloilo City](image)

\(^1\) The said study is being conducted by Global Ambient Hi-Technology Systems, Inc. (GATES); Philippine Automotive Depot Inc (PAD, Inc.); the Environmental Studies Institute of Miriam College in Quezon City; Citizens Organization Concerned with Advocating Philippine Environmental Sustainability (COCAP); Partnership for Clean Air (PCA); and Clean Air Initiatives Asia (CAI-Asia)
300,000 (USD 7,386)\textsuperscript{2} per vehicle, as it requires changing the whole engine. Almost all Jeepneys have second-hand or even third-hand engines, which add to the cost of conversion.

The government is also promoting the use of electricity-run Jeepneys. Electric Jeepneys or e-Jeepneys were first launched in 2008 by Green Renewable Independent Power Producers, Inc. or GRIPP in partnership with Mr Robert Puckett, President of Solar Electric Company in the Philippines. Since then, they are gaining popularity; the new set of e-Jeepneys is believed to be less costly than diesel-run vehicles and they are also more environment friendly with zero tail-pipe emissions. Reduction in the age limit of the Jeepneys is also being looked at as a solution to reduce their environmental impact.

In 2012, the Filipino government had passed a Bill\textsuperscript{3} to promote the use of alternative fuel vehicles (AFVs) as a measure to reduce the country’s dependence on oil and reduce emission levels. As per the Bill, the government will provide tax incentives to the manufacturers, assemblers, etc., including exemption from excise taxes and duties for nine years and exemption from value added tax (VAT) for purchase and import of raw materials, spare parts, components, and capital equipment for nine years. Alternative-fuelled Jeepneys — e-Jeepneys and LPG-run Jeepneys — are expected to benefit from the provisions of this new Bill.

As the Filipino government promotes and introduces a fleet using more environment friendly fuels, Jeepneys are expected to further grow as a low cost and environment-friendly mode meeting the demands of the locals especially the lower-income groups.

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\textsuperscript{2} 1 USD = 41.08 Philippine Pesos or PHP (December Exchange rate, 2012)

\textsuperscript{3} Bill titled “An act granting incentives for the manufacture, assembly or importation if electric, hybrid or alternative vehicles”. For details see http://www.philstar.com/Article.aspx?articleId=788988&publicationSubCategoryId=63
Reducing the Environmental Impacts of Informal Modes

Tricycle conversion programme in San Fernando City

Place: San Fernando City, The Philippines

Around the world, outdoor air pollution kills 800,000 people a year and affects the health of many more. Throughout Asia, vehicles with two-stroke engines produce vast amount of pollution including dangerous hydrocarbons, carbon monoxide, and smoke.¹ Two-stroke petrol-powered three-wheelers (tuk-tuks and tricycles) cough up roughly 13 times more lung-damaging particulates than other engine types.² In most cities in the Philippines, tricycles are the vehicle of choice because of their schedule flexibility, simple construction, high power-to-weight ratio, and their relatively low cost. Unfortunately, tricycles currently in use are predominantly carburetted two-stroke engines, which emit high levels of unburned hydrocarbons, carbon monoxide, particulate emissions, and carbon dioxide.

Key Features

- Awareness generation and communication with stakeholders
- Voluntary implementation
- Loan-assistance programmes

¹ http://discovermagazine.com/2008/may/21-two-strokes-and-youre-out
San Fernando City is the capital for Region I in the Philippines, also known as the Ilocos Region. San Fernando City has been a major centre of trade and commerce in the area. It hosts a small airport and a commercial sea port, along with numerous business establishments to rival those found in any regional centre. San Fernando belongs to the first generation of City Development Strategy (CDS) implementers. The strategy focuses on the city’s liveability, competitiveness, bankability, and good governance, and serves as a knowledge resource for other cities for best practices in local governance and in enhancing business opportunities in urban areas.3

The Mayor Mary Jane Ortega (1998–2001), after learning that the two-stroke tricycles were a major source of air pollution in the city because of the type of oil they burnt, initiated the phasing out of over 1,200 two-stroke tricycles in the city. Her early initiatives for tricycle management included traffic rerouting, tricycle colour coding, and capping the franchise at 1,600 tricycle units.4 For implementing the phasing out of two-stroke vehicles and replacing them with the cleaner four-stroke vehicles, an inventory of tricycles in the city was conducted in 2000 by the City Permits and Licensing section on the model and age of tricycles. Consultations and discussions were held in 2001 with the tricycle sector educating them about the ill effects of pollution on health and environment and by 2002, the operators were offered individual interest free loans of USD200.00 to make down payments for buying new four-stroke vehicles. This programme was implemented under the aegis of The Philippine Clean Air Act which was notified in November 2000. With increased awareness and the need to formulate strategies to reduce vehicle emissions, this initiative evolved into a transportation and environment management programme and the tri-cycle conversion programme became the key focus area of the city’s Clean Air Program.

Draft resolutions were brought out in 2001 banning models from the 1970s and 1980s by 2003 and 2004,5 respectively. However, this was not finalized and implemented. The city claims that even without these resolutions, they were able to convince operators to convert their tricycles to four-stroke engines through education, as a result of which the tricycle operators volunteered to convert to four-stroke vehicles. The city government offered loans for the upgrade in 2003. By Nov 2005, 102 operators had availed this facility and around 662 vehicles converted to four-stroke.6 The loan had to be repaid in one year through monthly instalments; the operators could choose to defer monthly instalments for the first two months and then pay back in 10 months.
The project was implemented in phases:

- 30-year-old tricycles replaced by 2002
- 25-year-old tricycles replaced by 2003
- 20-year-old tricycles replaced by 2004
- 15-year-old tricycles replaced by 2007

The scheme received a positive response and even the drivers, who were not required to change their tricycles, opted to have new ones.

Along with the financial assistance provided to operators to convert to four-stroke tricycles, programmes like conducting workshops on maintenance and emission reduction were conducted for selected drivers and operators with the help of the United States Agency for International Development–US–Asia Environment Partnership (USAID–US–AEP) and the Motorcycle Development Programme Participants Association (MDPPA). Additionally, there were provisions for granting interest-free loans to tricycle co-operatives and allowing co-operatives to sub lend the amount to members at 3% per annum interest. Other initiatives included physical inspection of tricycles every year, issuance of stickers, painting the side car white, requirement of body number, and regulating passenger loads.

By 2008, two-stroke tricycles were completely phased out without even enacting an ordinance. The city was also successful in phasing out tricycles, which were more than 15-year-old. Feedback from drivers indicates that four-stroke engines were more capable in uphill drives, took longer to heat up, had fewer emissions and although these engines consumed slightly more fuel than two-stroke engines, they were still able to save more due to lower maintenance costs.\(^7\) This programme was successful mainly due to stakeholder involvement, capacity building, education, and advocacy. The drivers appreciated the care and initiatives taken up by the city government in providing awareness, medical check-ups, and preventive maintenance and interest-free loans.

**References**


Clean Development Mechanism Project design document form (CDM–SSC–PDD) Version 03 http://cdm.unfccc.int/filestorage/
Reducing the Environmental Impacts of Informal Modes
Case of Puerto Princesa city in the Philippines

Place: San Fernando City, The Philippines

The city of Puerto Princesa is the capital city of Palawan, the Philippines. It is the largest city in the Philippines with a land area of about 2,539 square km. According to the 2000 census, the city had a population of about 0.2 million in 2000.

The city has been facing the problem of deteriorating air quality due to the increasing number of tricycles, which account for about 60% of the city's vehicles and constitute the principal means of transport.

To address the problem of increasing air pollution, the Clean Air Program was initiated by Mayor Hagedorn in November 2003. In February 2004, the city developed a strategy to reduce the harmful emissions from tricycles with the technical assistance from the United States–Asia Environmental Partnership (US–AEP). The strategy was officially launched in April 2004; reduction in hydrocarbon and carbon monoxide emissions from tricycles were given priority in the programme for cleaning the air. The five key areas identified for improvements included:

- Improved traffic management and infrastructure development
- Inspection and maintenance
- A financing scheme for cleaner tricycle engines (e.g., buy-back scheme for old tricycles, shift to four-stroke engines)
- Public awareness programme
- Promotion of alternative livelihood for tricycle drivers

The main initiative under the programme and the first to be implemented was the “50/50” scheme aimed at reducing the volume of tricycles operating in the city by 50%. Under the 50/50 scheme, tricycles with a number ‘1’ sticker were allowed to operate only on Monday, Wednesday, Friday, and Sunday. Those with number ‘2’ were allowed to operate on Tuesday, Thursday, Saturday, and Sunday. The proposal was initially opposed by the
tricycle operators, as a result of which a two-week trial period was first observed. Within 1 day, drivers/operators observed that the scheme had doubled their day’s income from an average of Philippine Pesos 400 (USD 9.75)\(^1\) to Philippine Pesos 800 (USD 19.50) and the drivers actually maintained their weekly income despite operating only for four days. The commuters’ complaints were primarily regarding the longer commuting time. The city government raised the franchise cap to 4,000 to address this issue. A consensus was thus achieved and the city council on November 2004 passed City Ordinance No. 271 formally adopting the 50/50 scheme.

Initiatives like public-awareness campaigns, roadside inspections, and the promotion of proper vehicular maintenance among drivers were introduced to complement the 50/50 scheme. Capacity-building initiatives were also undertaken to ensure enforcement and monitoring; trainings on the installation, operation and maintenance of ambient air samplers and gas analysers were conducted and actual roadside monitoring was initiated. Tricycle organizations’ member drivers underwent four month training on proper maintenance. About 12% of the total tricycle drivers were trained in these preventive maintenance workshops through lectures and hands-on lessons. Tools and manuals were also distributed as part of this initiative. It was observed during stakeholder consultations that the proposal to ban two-stroke engines in order to make way for cleaner four-stroke engines was controversial. It was, therefore, decided to “encourage” the shift to four-stroke engines “or other more efficient technology” over a period of four years.

Public-awareness programmes were launched to make people/tricycle operators and drivers aware of the economic benefits of traffic volume reduction, generation of alternative livelihood opportunities, health impacts of pollution, etc. Livelihood development training workshops were held for the tricycle drivers and their spouses after assessing their skills and need for alternative livelihoods. Financial assistance was also extended for the required capital to start alternative livelihoods.

The local government has created a “Trike Fund” to support local drivers to switch to cleaner technologies like liquefied petroleum gas (LPG), or direct injection technologies through discounted rates and flexible repayment schemes.

Congestion is no longer a problem in the city and the environment officials claim that the scheme may have had an impact in terms of reducing emissions of hydrocarbon and carbon monoxide by

\(^1\) 1 USD = 41.08 Philippine Pesos or PHP (December Exchange Rate, 2012).
at least 50%. The maintenance workshops have also helped in improving driving and maintenance practices.

Tricycle drivers have maintained their average weekly income even though they now operate for only three to four days. The three-day break enables them to have more time for maintenance activities as well as quality time for their families. Surveys show that drivers claimed improvement in health conditions because of the three-day rest and less exposure to air pollution and enough time to spend with their families. The programme is a success primarily as a result of the extensive stakeholder consultations carried out to reach consensus for programme implementation. Political will and skill of the city’s political leadership was also very important in the success of this programme; the Mayor went ahead with the implementation of the 50/50 scheme despite upcoming elections. Also, close coordination with civil society groups and local government institutions enhanced the credibility of the Clean Air Program among the general public.

References

Clean Development Mechanism Project design document form (CDM-SSC-PDD) Version 03 – 2006, http://cdm.unfccc.int/filestorage/H/K/9/HK9V413TN8I76UQYDJ02BML0PCG5WZ/SSC%20New%20Methodology%20PDD.pdf?t=SlF8bWF3amM4fDBBVhGJYYWQBQ7VMe5Oldld

ht t p : / / c d m . u n f c c c . i n t / f i l e s t o r a g e / H / K / 9 / HK9V413TN8I76UQYDJ02BML0PCG5WZ/SSC%20New%20Methodology%20PDD.pdf?t=SlF8bWF3amM4fDBBVhGJYYWQBQ7VMe5Oldld

Section C

Providing public transit connectivity to urban poor areas
It has been observed that the low income population is largely dependent on public transportation for travelling distances, which are beyond pedalling and walking ability of people. Thus, it becomes important to plan and develop public transport systems judiciously so as to ensure connectivity of low income population with public transport services. Case studies included under section C depict efforts taken by different cities to promote pro-poor public transport systems. The efforts range from providing physical connectivity to poor neighbourhoods to context-specific design solutions. This section includes eight case studies.

- Metrocable Project in Caracas: Providing physical connectivity to ranchos/slums and improving local socio-economic prospects
- Metrocable: World’s first modern urban aerial cable-car public transport system connecting the low income settlements in Medellin
- BRT- Lite: A formal transport system catering to the urban poor and low income groups in Lagos
- Bus Rapid Transit in Jakarta: Connecting the urban poor areas and providing urban poor an affordable mobility option
- Ahmedabad BRT system: Reviving mobility in low income neighbourhoods
- BRT system, Quito: Socially-inclusive transport system
- City Bus Service, Indore: An Affordable and financially sustainable model
- Alternatives to informal transport for providing connectivity to the urban poor areas: Cable-car connectivity to favelas in Rio de Janeiro
Metrocable Project in Caracas

Providing physical connectivity to ranchos/slums and improving local socio-economic prospects

Place: Caracas, Venezuela

The San Augustin area is located in the south west hilly area of Caracas and is home to 40,000 inhabitants, who belong to the city’s poorest and socially backward communities. The area was characterised by shanty dwellings, small scale infrastructure, unemployment, crime and low education levels. The area had no means of formal transportation and most of the trips were executed on foot. The pedestrian paths included steep flights of stairs owing to the difficult terrain. People often had to climb 39 floors each day to reach destinations, thus ruling out the mobility for the elderly and the disabled. The ranchos/slums were not recognised by the authorities and had never been provided connectivity with a public transportation system. In 2001, the area’s connectivity was improved by connecting it with a 2.10 km long cableway system after a three year long planning and implementation process. The system now has five stations and

Key Features

- Provision of public transport connectivity to ranchos
- Community involvement
- Minimum demolition and rehabilitation during construction of public transport infrastructure
- Development of social infrastructure around the stations

Metrocable San Agustin
The end stations connect the ranchos to the subway (metro) system for access to opportunities and improved mobility.

The government had initially planned to build a highway through this area, which would have removed most of the dwellings. This move was strongly opposed and discussions were started to provide alternative ways to deal with mobility issues in the city and to provide a public transportation system. The government had also adopted Misiones-program in the meantime, aiming at bringing equality and improving conditions of the poor in the city. It was found that it was difficult to plan and implement most of the improvement programs in the ranchos due to the internal hierarchies and informal structure of the neighbourhoods and the lack of physical space to build infrastructure. Finally, the state owned Metro of Caracas and the Urban Think Tank together developed a plan to build a cableway in San Augustin and connect it to the existing subway (metro) system as the winding, narrow and steep roads were unsuitable for any other system. The elevated system on towers would have required less space on land and much less demolition and rehabilitation, as compared to any other transportation option for the area.

Due attention was given to address the issues, expectations and suggestions of the disadvantaged population groups living in the neighbourhoods by extensively involving them in the entire process of planning and implementing the Metrocable project. Community representatives were included in the task force to provide inputs like identifying locations for the stations, developing the area around the stations and how to address the service and maintenance programs. The interactions between the
inhabitants were done through meetings, interviews and surveys of all classes and sections in the area. Through this exercise, the inhabitants developed attachment and sense of belongingness towards the project. This also helped the planners and experts involved in the project to better understand the inner structure and needs of the neighbourhood.

The central nodes for the stations were identified and community and cultural centres were built around them. Playgrounds, public spaces, parks and basic infrastructure were also included in the plans. The stations were built of cheap and simple materials like concrete, glass, and chequered sheets and given the appearance of airports and railway stations. To minimise impact of construction in the densely populated area, pre-fabricated modules were used in the construction. Another interesting section of the Metrocable project was the two year training given to some of the inhabitants on operating the cable way in a move to run the system on a local basis and to provide employment opportunities in the area.

The Metro Cable project had a cost of around 262 million USD with major chunk of the finances going into the participatory and development process. The system runs between 6 am and 10 pm and has a capacity of moving 1200 persons per hour on the Parque Central and San Augustin. Each cabin can carry 10 persons. The fare of the cable car is set at 1 Bolivar Fuerte (USD 0.23)\(^1\), of which 50% is set aside for the maintenance and operational costs and the other 50% is used to support schools and health care centres near the five stations, thus moving towards the social and economic improvement of San Augustin. The system is integrated with the subway system both physically and in terms of fare.

The project was able to connect the informal ranchos to the rest of the city. The system provided the much needed mobility option in the ranchos and also provided the inhabitants with ways to support themselves. The idea of welfare society and pro-poor planning was thus converted into physical form for the physical and socio-economic improvement of the ranchos of San Augustin. The project can also be noted for bringing minimum disruption and change to the informal structure of the area and also maintaining the formality of the cableway public transport system. With improved access to socio-economic opportunities, healthcare, education, etc., the community of San Augustin has now got the motivation to improve themselves and come out of poverty.

\(^1\) USD=4.35 Bolivar Fuerte (December Exchange rate, 2012)
References


Pro-poor mobility

Place: Medellin, Colombia

Medellin is the second most important city after Bogota in Colombia, South America and is one of the best examples to illustrate how a public transportation system can change the life of the poor by providing them with mobility options. The city of Medellin has introduced three Metrocable (aerial Gondola system) lines to connect the surrounding hill areas to the main city and to solve the problem of low ridership on the city's Metro. These hill areas, north east of the city (Communes 1 and 2) are one of the most marginalised areas in the city with many

Key Features

- Pro-poor planning of public transport system
- Up gradation of social infrastructure along the public transport corridors
- Community participation
- Increase in the ridership of subway

Overhanging cable cars carrying passengers in Medellin
informal settlements and characterised by high levels of poverty and unemployment. By introducing this innovative aerial public transportation system, the city has not only improved mobility of the inhabitants primarily belonging to poorer neighbourhoods, but has also led to a social and physical transformation of the area. The Metrocable connects these settlements with the main Metro line/subway and the main city in the valley.

The project was initiated under the Integral Urban Project (IUP) and was included in the Medellin Development Plan. The project was possible because of the strong leadership of the then newly elected Mayor, Luis Perez (2001-2003) who took deep interest in the project. The technical support is handled by the Metro Medellin and the operation is handled by Empresa de Transporte Masivo del Valle de Aburrá Ltda (ETMVA).

The Metrocable started its operations in 2004. It transports about 30,000 people a day (Line K) and has converted an aerial transport system, which was traditionally intended for catering to tourists to a successful urban transport option. The system is in operation 18 hours/day on all days round the year and there exists a single tariff for any length of the journey and the fare is integrated with the main Metro line. The capacity of each line is 90-120 cable cars, each with a capacity of 8 passengers sitting or 10 standing passengers. Since it is an aerial system and is being used as a public transportation system, safety lines have been installed and care has been taken to ensure that total shut downs are minimized.

Prior to introduction of the Metrocable, the hilly areas had poor road infrastructure and poor connectivity with the city. By strategically introducing the Metrocable lines: Line K, Line J and Line L, the city authorities were able to connect the poor and

1 www.myclimate.org/carbon-offset-projects
2 Blanco & Kobayashi (2009)
3 Julio D. Dávila & Diana Daste (2012)
4 www.myclimate.org/carbon-offset-projects
extend the benefits of the Metro/Subway to the poor living in the inaccessible areas of the city. By doing this, the city was also able to improve the low ridership of the Metro line and utilise its full capacity.

The second component of intervention was focused on creating and upgrading social infrastructure like social centres, schools, public libraries etc. along the new mobility system. This is expected to further increase the utilization of the system. Along with social benefits, Medellin Metrocable has been successful in achieving environmental benefits and has signed up for the Clean Development Mechanism (CDM). The project was successful in replacing vehicles run on fossil fuels with cable cars run on hydroelectric power and hence helped achieve lower emissions per passenger km. The project is predicted to reduce about 121,029 tonnes of CO2 between 2010 and 2016.⁵

The project is in the public sector and is financed by the city municipality and the publically owned Metro Company. The low construction costs made budgeting through capital investments possible⁶ and since it was an aerial cable car system, the land acquisition was minimal.

The reason for success of the Medellin Metrocable was the approach adopted by the city authorities based on the community participation and involvement of the local authorities aimed at improving the social component of the marginalised communes. The positive impacts it has brought to the city are clearly visible.

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⁵ Julio D. Dávila & Diana Daste (2012)
⁶ Julio D. Dávila & Diana Daste (2012)
The mobility option provided by the Metrocable has been able to include the poor and marginalised areas in the city and provide them with improved quality of life, a better society, lesser crimes and better access to jobs and opportunities in the city. The introduction of the Metrocable has also made the main Metro one of the few profitable metros in the world by helping increase its ridership.

References

Julio D. Dávila and Diana Daste, “Medellin’s aerial cable-cars: social inclusion and reduced emissions”, Development Planning Unit, University College London,. Available at http://www.bartlett.ucl.ac.uk/dpu/metrocables/dissemination/Davila-Daste-2012-UNEP.pdf


www.myclimate.org/carbon-offset-projects, Cable Cars reduce CO2 in Medellin, Colombia, Beyond Carbon Colombia, 2012, my climate, protect our planet
BRT- Lite

A formal transport system catering to the urban poor and low income groups in Lagos

Place: **Lagos, Nigeria**

The Bus Rapid Transit System (BRT) system was started in 2008 in Lagos, Nigeria and was the first BRT system to be implemented in Africa. Planned and implemented with the focus on providing local users with a cheap mobility option and to improve quality of life, economic efficiency and passenger safety. The project had to be completed within a budget and time period of 15 months. The unique characteristic of this project is that it is a BRT system but without the usual high-level specifications and quality and is therefore suitable for a city plagued by an unorganised informal sector. The project was completed at a cost of USD 1.7 million per km compared to 6 million per km, as was the project cost of TransMilenio, Bogota and the Brisbane South east Busway, giving rise to a new low cost BRT system. The BRT-Lite carries about 195,000 passengers per day on average.

The city of Lagos prior to BRT-Lite did not have any formal public transport system despite having a population of more than 10 million people. The city inhabitants who did not have access to

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**Key Features**

- Africa’s first BRT system
- Cheaper to construct than conventional BRT system
- Cheaper fares than alternatives modes of travel

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*Bus shelter*

*Source: [http://www.lamata-ng.com/brt.htm](http://www.lamata-ng.com/brt.htm)*
private vehicles were solely dependent on the informal transport such as minibuses (*danfo*), midi buses (*molues*), shared taxis (*Kabu-kabu*) and motor cycle taxis (*okadas*). The *danfos* and *molues* were known for aggressive drivers and variable fares. The routes served by these modes were short, of low quality, and the journey was slow and uncomfortable. The fares were subject to demand, weather conditions, and the attitude of the conductors. Commuters were vulnerable to crime, both during the journey and waiting time. In addition, the congestion and the traffic issues in the city combined with constant breakdowns and accidents, made the journey times close to two hours.

In 1999, the Lagos Urban Transport Project (LUTP) was launched to address transport issues; it involved exercising regulatory control and order over private bus operators and the issuance of route licenses to them. Another authority Lagos Metropolitan Area Transport Authority (LAMATA) was formed in 2002 for integrated transport planning of the city and to plan and implement public transport system for the city. The planning for the BRT-Lite started in 2006 and it emphasized efficient levels of service, adequate institutional framework and regulation, high socio economic benefits especially for the poor, minimum public expenditures, and maximum private partnership and adequate mitigation of environmental and social impacts. The needs of the potential users were thoroughly studied and their concerns understood. The major concerns were safety, affordability, and reliability. The catchment area population (about 6 million) of the BRT system, which included 65% of the captive public transport users, 25% reluctant users and the wealthy, were engaged to promote BRT system as means to solve their own problems. This helped in achieving public support for the project and in educating them about BRT system and how to use it.

The system has about 22 km route length. Evaluation studies have shown that the passengers are saving time, money, have less interchanges, and are travelling more safely as compared to other alternative modes of transport. 65% of the route length is physically segregated, 20% separated by paint marking and the rest merges with the mixed traffic. The BRT routes connect the extended suburbs and satellite centres to the main city of Lagos and run seven days a week between 6 am and 11pm. The operational hours are reduced during the weekends and headways on all days are dependent on vehicle availability. The *molues* and *danfos* were restricted from operating on the main carriageway along the corridors, but can run on service lanes and provide the passengers with mobility options, especially for shorter distances.
The passengers usually use them as feeder services to complete their journeys.

The BRT-Lite in Lagos serves the inhabitants of the city with premium services at fares that are lower and preferential over other alternatives. The BRT further reduces the need to interchange, saving time, money and effort, since they run for longer distances compared to the informal modes and thus gets high patronage. The system is serving the mobility needs of the population, the majority of which do not have any other motorized transport options, especially for longer trips.

**References**

Bus Rapid Transit in Jakarta

Connecting the urban poor areas and providing urban poor an affordable mobility option

Place: Jakarta, Indonesia

The Bus Rapid Transit (BRT) in Jakarta, TransJakarta, was implemented in 2004 for the purpose of dealing with transport-related congestion and pollution in the city. In 2012, TransJakarta had a total of 11 corridors covering about 172 km and a fleet of 545 buses, run primarily on Compressed Natural Gas (CNG). In 2010, the BRT system catered to about 10 million passengers a month. The system has headway of 2-4 minutes.

The system was built as a cheaper and faster mode of transportation for different population groups in the city and for the commuting workers from the surrounding areas of Jakarta. Keeping the poor and low income households in mind, TransJakarta is a government operated system that is subsidised to keep the fares low. The BRT system can be used for short, medium or long trips on a flat fare of IDR 3,500 (USD 0.36)\(^1\) during the day. In the morning, before 7am, the BRT system fare has been kept at IDR 2,000 (USD 0.20)

\(^1\) 1 USD = 9722.22 IDR (December Exchange rate, 2012)

Source: http://www.transjakarta.co.id/

Key Features

- Subsidized flat fare on BRT system
- BRT connectivity provided to slum areas
- Early morning low fare slot for low income riders
by the government with the notion that lower income groups generally travel early in the morning and hence they can travel faster at fares comparable to that of bus services like *Metromini* and *Kojpaja* (which also have a flat fare of IDR 2,000, i.e. USD 0.20).

The low income population/ slums in Jakarta are almost uniformly distributed, with distinct concentration in the northern side of the city. The BRT routes/corridors spatially cater to the low income areas in the north and the east. Studies have shown that even if the BRT system corridor is running through high-income areas, such as corridor 8, a high number of low income passengers are using the service. The families from the low income areas also use the BRT system for accessing recreational and shopping areas. The poor and the low income groups in Jakarta can travel all over the city at a flat fare of IDR 3,500 (USD 0.36), which was earlier impossible by other public transport modes existing in the city.

Pedestrian facilities have also been improved in many parts of Jakarta as part of the BRT system project. The sidewalks in the central business area and the high income areas have been made obstruction free and pedestrian friendly. The project has converted a major public space and historical area, Plaza Fatahillah into a no-vehicle zone and provided the city with open urban spaces. In many low income areas, improvements in pedestrian and cycling infrastructure are still to be carried out; these areas currently have walking and bicycling in mixed traffic conditions.

TransJakarta has been received well by the low income groups in Jakarta who have appreciated the quality of the system as...
compared to the other public transport modes. The planning of the BRT system has taken care that the low income areas in the city have been connected by the system. The early morning fare setting and the subsidized fares have been implemented by the government keeping the poor in mind. The increase in the use of the BRT system by the poor would further increase if the BRT system provides direct access to their choice of destinations and also if the fare is further reduced.

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Lisa Wentzel, Urban Mobility among Lower Income Communities in Jakarta, A minor Field Study, Degree project, KTH, Division of Urban and Regional Studies, Stockholm, 2010


http://cleanairinitiative.org/portal/node/434
Ahmedabad BRT System
Reviving mobility in low income neighbourhoods

**Place: Ahmedabad, India**

Ahmedabad is one of the fastest growing cities of India. It has a population of approximately 4 million people. It is a compact city with mixed land use, high density and a ring radial road network structure.

Prior to the implementation of a Bus Rapid Transit (BRT) system in Ahmedabad, the city suffered from severe traffic and transport problems. The city was witnessing a rapid rise in the vehicle population and in 2005 almost 430 vehicles were being added to the city roads on a daily basis. With the rapid rate of vehicle growth in the city, it was foreseeable to envisage the city in a grid lock in the near future. The declining fleet of public transport

**Key Features**

- Ahmedabad BRT system is offering a world class transport service to its commuters
- The system has provided connectivity to various low income settlements
- Enhanced mobility in low-income areas has revived the socio-economic and environmental conditions in these settlements
- BRT system has contributed in enhancing the quality of life of people by reducing congestion, pollution, etc.

**Corridors of janmarg**

Source: Presentation on 'Janmarg Bus Rapid Transit in Ahmedabad' An Initiative of Ahmedabad Municipal Corporation under JNNURM, Prof. H.M. Shivanand Swamy, CEPT University, Ahmedabad
added to the traffic woes of the city. Due to resource shortage and inefficient operations, the fleet size of public buses was reduced to mere 540 buses in 2005 from 942 buses in 2000. To cater to the demand gap created by insufficient bus transportation, the number of auto-rickshaws in the city increased rapidly. The auto-rickshaws catered to substantial amount of travel demand, constituting almost 8% of the total modal share in 2000. This led to even more serious problem, as the auto-rickshaws used

**BEFORE.. AT AKHBARNAGAR**

**AFTER.. BRT AT AKHBARNAGAR**

*ROW condition before and after implementation of BRTS*

*Source: Presentation on 'Janmarg Bus Rapid Transit in Ahmedabad 'An Initiative of Ahmedabad Municipal Corporation under JNNURM, Prof. H.M. Shivanand Swamy, CEPT University, Ahmedabad*
adulterated fuel and generated toxic emissions deteriorating the air quality.

An urgent need was felt to improve the quality of life in the city in the wake of rapidly deteriorating environmental quality. In 2005, the city decided to implement a world class BRT system. The BRT system was developed with the vision laid in the National Urban Transport Policy (NUTP) of India that the transport systems in the cities should focus on mobility of people rather than that of the vehicles.

**Planning of the BRT system**

The Ahmedabad BRT system, ‘Janmarg’, started its operations in 2009. The initial corridor length of BRT system in Ahmedabad was 12.5 km, consisting of 20 stations. Some of the salient features of Ahmedabad BRT system are:

- Exclusive busways
- Dual side access buses
- Bus stations in the median
- Global Positioning System (GPS) enabled buses
- Passenger Information system
- Automatic pre-ticketing system
- Priority at intersections

Location of low-income settlements and BRTS route alignment

*Source: Presentation on ‘Preliminary assessment of bus rapid transit systems in urban India’, Prof. Darshini Mahadevia, Rutul Joshi, Abhijit Datey, CEPT University, Clean and Sustainable Mobility for All: An Agenda for Reforms, September 28-29, 2011. New Delhi*
• Closed system
• Well integrated with cycling infrastructure
• Average operating speed of BRT system in Ahmedabad is 24kmph, making it the fastest public transport system of India

Another important feature of the Janmarg, which establishes itself as a pro-poor transport system is the route alignment. Almost 80% of the corridor passes through areas inhabited by low and middle income population, which reflects that the corridor alignment has been chosen with a focus to serve the mobility needs of people living in these settlements. It has been observed that providing connectivity to low-income areas by BRT system has revived these areas by significantly enhancing the mobility services available to the residents. The socio-economic impacts of enhanced mobility are clearly visible in the areas adjoining the BRT system network, as it has increased the economic opportunity of people living in the vicinity of BRT system, leading to their better economic condition. Enhanced accessibility of the low income neighbourhoods has also led to physical upgradation of infrastructure, improving the environmental conditions in these settlements. Thus, Janmarg can be promoted as an example of a transport system, which is extensively promoting social inclusion.

Some of the key parameters on performance of the BRT system in Ahmedabad have been described in the table below:

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<th>Parameter</th>
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<th>October 2011</th>
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<td>Fleet size (no. of buses)</td>
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<td>45</td>
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</tr>
<tr>
<td>Demand (PPHPDT)</td>
<td>1430</td>
<td>2650</td>
<td>2950</td>
</tr>
</tbody>
</table>

Source: Presentation on ‘PPP in Bus operations’, Swamy H.M. Shivanand, UMI-2011, New Delhi

BRT system in Ahmedabad is offering commuters an excellent travel experience by providing them a world class transport system, apart from enhancing the overall environmental quality of the city. Post BRT system implementation, the city has witnessed an increase in the travel speeds, and consequently reduced travel times, for the BRT system as well as mixed traffic running along the BRT system corridors. The average peak hour speeds on BRT system corridors are as high as 24kmph, as against 16-18 kmph average speed of Ahmedabad Municipal Transport service. The ridership on the system has been rising since the commencement

of the system, leading to a constant increase in revenue generation. The BRT system has also helped in improving the safety of road users and a reduction in fatal and serious accidents has been observed after the implementation of BRT system in Ahmedabad.

Conclusion

*Janmarg* has established itself as a successful model of BRT system implementation in India, whether it is its technical, institutional, or financial model. The implementation of the system clearly depicts that enhancing public transport connectivity to low-income areas has significant positive impacts in the form of enhanced socio-economic and environmental conditions in these settlements. For promotion of sustainable mobility, there is a need for wide replication of this model across different cities in India.

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Presentation on ‘Preliminary assessment of bus rapid transit systems in urban India’, Prof. Darshini Mahadevia, Rutul Joshi, Abhijit Datey, CEPT University, Clean and Sustainable Mobility for All: An Agenda for Reforms, September 28-29, 2011. New Delhi

Presentation on ‘PPP in Bus operations’, Swamy H.M. Shivanand, UMI-2011, New Delhi
BRT System, Quito

Socially-inclusive transport system

Place: Quito, Ecuador

Quito, the capital city of Ecuador, had an estimated population of 2.1 million people in 2012. The city has grown linearly due to geographical constraints, as the city has mountainous topography, almost 50km in length and only 5km in width. The city is culturally rich and is marked by a number of historic sites and it also features in UNESCO’s world heritage list.

In 1990’s, the city was suffering from severe traffic and transport related problems. Most of the public transport fleet (which was informally supplied by the private parties) was old and the average age of the fleet was more than fifteen years. The inefficiently operating old diesel buses generated high levels of air and noise pollution, adversely affecting the historic landmarks of the city and hence threatening the thriving tourism industry of the city. Further, the quality of service provided by the public transport system was extremely low, with high travel times, overcrowding

Key Features

- BRT system connects low income areas in the city to commercial and industrial areas
- Telescopic fare structure of BRT system helps subsidize long-distance travel, typically undertaken by low income group people
- The Quito BRT system runs on a gross cost model

Quito’s trolleybus running on exclusive BRT lanes with underpass crossings
in the buses, and lack of fleet-renewal. Thus, seeking an effective solution to the traffic and transport problems of the city had become an important issue for the local administration.

With the aim to improve the public transport of the city, various studies were carried out and it was concluded that an integrated transport system was required for the city. In line with the conclusion, an extensive network of Bus Rapid Transit (BRT) system was proposed for the city of Quito.

The BRT system of Quito is known as ‘MetrobusQ’, and it runs across the city from north to south (as the city is linear). The BRT system is divided into three sections; the relevant information about the three sections has been summarized in the table below:

A trolleybus stopped at the “Estadio” station, in the trolleybus-only lanes in of Avenida 10 de Agosto
<table>
<thead>
<tr>
<th>Section</th>
<th>Trolebus</th>
<th>Ecovia</th>
<th>Central Norte</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line</td>
<td>Green</td>
<td>red</td>
<td>Blue</td>
</tr>
<tr>
<td>Year of</td>
<td>1995</td>
<td>2001</td>
<td>Late 2004</td>
</tr>
<tr>
<td>implementation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of</td>
<td>17km</td>
<td>9.7km</td>
<td>11.5km</td>
</tr>
<tr>
<td>corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corridor overlap</td>
<td>90% longitudinally segregated</td>
<td>95% longitudinally segregated</td>
<td>Segregated corridor</td>
</tr>
<tr>
<td>Stations and terminals on the corridor</td>
<td>3 integration terminals and 28 stations</td>
<td>2 terminals and 16 intermediate stations</td>
<td>4 integration points and 24 stations</td>
</tr>
<tr>
<td>Fleet</td>
<td>113 articulated electric trolley buses and integrated 78 feeder buses</td>
<td>42 articulated diesel buses and integrates 30 buses</td>
<td>84 articulated diesel buses and 67 feeder buses (conventional)</td>
</tr>
<tr>
<td>Demand</td>
<td>246,000 pax/day</td>
<td>81,000 pax/day</td>
<td>Estimated 120,000 pax/day</td>
</tr>
</tbody>
</table>

An important feature of the Quito BRT system is that it has been planned with a consideration that a public transport solution should serve people of all the sections of society; the same is reflected in the various aspects of BRT system planning, like route alignment, fare structure, etc.

**Route alignment catering to low-income areas**

Planning of the BRT system corridors was undertaken by the local administration of the city. The alignment of corridors has been planned comprehensively and includes transport links connecting various low-income areas to the commercial and industrial centres of the city.

**Fare structure supports mobility needs of poor**

The BRT system of Quito has a telescopic fare structure, thus contributing to social equity by allowing people travelling for longer distances to be subsidized by those who travel for shorter
distances. Such a fare structure supports the travel needs of low income groups who generally travel for longer distances.

**Extensive network**

The MetrobusQ has been designed extensively and covers even the most spatially constrained areas of the city. The BRT system passes through the historical centre of Quito where the width of the streets is limited to a mere 3m\(^1\), disproving the notion that ‘BRT systems require a large right of way’.

**Operating model**

The Quito BRT system works on a gross cost model, wherein the bus drivers are paid on the basis of km of service operated, rather than being based on the number of passengers. Such an operating model reduces competition among the bus-drivers to pick up passengers, and thus enhances the quality of service and safety of the whole system.

**Environmental impacts**

The positive impacts of the efficient public transportation system are visible in Quito. There has been a reduction of 400 tons of contaminants per year along the 11.2 km electric trolley bus line.

**Issues**

Quito can be quoted as an example of a socially inclusive public transport system, but the BRT system is facing certain issues related to integration, which need to be addressed to make the system more user-friendly and seamless. Though Quito has three lines, but all the three are independent and there is no integration between them, even on the overlapping sections. The authorities in Quito are intending to integrate the three lines, which at present is difficult due to institutional hurdles, as the ‘Trole bus’ line is operated by the government and the other two lines, ‘Ecovia’, and ‘Central Norte’, are operated by private parties.

**Conclusion**

The Quito BRT system successfully demonstrates the example of inclusive planning of public transport system. It shows that a well-planned transport system can enhance mobility choices for everyone, irrespective of their socio-economic characteristics.
References

Asia-Pacific Environmental Innovation Strategies (APEIS), Research on Innovative and Strategic Policy Options (RISPO), Strategic Policy Options; Available at http://enviroscope.iges.or.jp/contents/APEIS/RISPO/spo/pdf/sp4202.pdf


Introduction of Affordable and Financially Sustainable City Bus Service in Indore, India

Place: Indore, India

Indore is one of the largest cities and an important business and trading centre of central India. The city’s road network is characterized by narrow road widths, with a highly mixed traffic composition, resulting in severe traffic related problems, like traffic congestion, high accident rate, poor air quality, etc. Some of the other transportation issues, like inadequate non-motorized transportation (NMT) infrastructure, and an inefficient public transport system, added to the poor state of urban transportation in the city.

Key Features

- Indore City Transport Services Limited (ICSTL) is a Special Purpose Vehicle (SPV), which regulates the operations of Indore city buses in Indore
- ICSTL runs on a financially sustainable public private partnership (PPP) model
- The fare structure for the new bus service fixed keeping in consideration affordability of the poor
- No existing transport service provider forced out of market during introduction of the new city bus service
- Existing polluting tempos¹ phased out and replaced with cleaner vehicles, preventing unemployment of tempo drivers

¹ Tempo is a five to eight seater autorickshaw, which generally operates on a sharing basis.

Route plan of City bus service, Indore
Source: http://img193.imageshack.us/img193/9889/citybusroutes.jpg
Various studies conducted in the city identified development of an efficient mass public transportation system as a cost-effective solution to the mobility issues of the city. With the aim to establish a well-organized mass transport service for the city of Indore, Indore City Transport Services Limited (ICTSL) was incorporated in 2005. Its main objective was to operate and manage the city bus service in Indore. Prior to ICTSL’s bus service, Indore did not have any specialized regulatory agency to manage different modes of public transport systems available in the city. The intra-city public transportation in Indore was served by a number of transport modes, like, minibuses, auto-rickshaws, *tempo*, metro-taxis, etc.

**Planning the system**

The ICTSL adopted a public-private partnership (PPP) model to run the city bus service. ICTSL was established as a regulating body and provided a regulatory framework for other private companies, which operated on different routes. ICTSL was also responsible for establishment and maintenance of a fleet of passenger coaches, development of transport infrastructure, and for development of mechanisms, which would ensure access of the system by the poor (largely fare regulation). The ideology behind ICTSL’s model was to promote competition in provisioning of a public transport system and thus enhance the quality of transport services for the people in a financially viable manner. The model developed by ICTSL was based on the approach - ‘Minimum Investment with

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2 ICTSL is now known as AICSTL – Atal Indore City Transport Services Co. Ltd.
Maximum Returns' for all the parties involved in the business. The model focused on providing maximum profitability for the company as well as the operators.

While introducing the city bus service, one of the key concerns was unemployment of people involved in minibus operations. This issue was resolved by not forcing any of the existing transport service providers out of market, but rather to introduce the new city bus service as a competitor. It was proposed to phase out the existing tempo services, as these were identified as one of the major causes of depreciating air quality in the city. The tempo owners were given permits to operate new ‘Maruti Omni’ vans. Introduction of new vans addressed the issue of poor environmental quality as well as the negative social impact of phasing out the existing transport mode, which would have been caused due to large scale unemployment of the tempo drivers (estimated to be 550 in numbers).

**Network and infrastructure**

The network for the city bus was planned scientifically based on the hub and spoke model. Routes were planned in a manner that they provided connectivity between important residential, commercial and institutional areas, thereby catering the travel demand of daily commuters.

Initially, 18 high demand routes were identified and operations on the same were started with 37 ultra-low-floor modern buses. The buses were designed with two wide doors, which allowed passengers to board and alight from the bus at the same time, reducing the service time of buses on the stops. This helped the buses to achieve savings in fuel and time, therefore leading to improved economy of operations. The buses were also equipped with Global Positioning System (GPS) for real time tracking. A central control room has also been established to manage the schedule of the buses, thereby enhancing the overall efficiency of the bus operations. The ticketing system was fully automated and the bus stations were equipped with computerized ticket vending systems. Provision of a real time public information system has also been made on each of the bus stations, with the VMS sign boards displaying exact arrival time of the next bus.

Further, ICTSL along with Indore Development authority and Indore Municipal Corporation has developed massive transport infrastructure in the city, including Inter-state Terminals at three locations and a number of bus shelters (300 in number) along different routes.

2 VMS: Variable message sign
Fare

The fares for the city bus service were set up low enough to be affordable for the poor and high enough to give reasonable competition to the private minibuses and vans. Thus, the optimally set fares ensured higher utilization rates as well as the financial viability of the system. A facility of passes has also been provided, wherein, monthly, weekly, employee and student passes are made available for the commuters, adding to their convenience and therefore encouraging ridership on the city buses.

Sources of revenue

The main sources of revenue for the company are:

• Monthly premium amount received from the bus operators
• Revenue from advertisements on the buses
• Revenue generated from sale of passes

Sources of revenue for the operators are:

• Fare box collection
• Share of revenue generated from advertisements on buses and sale of passes

Conclusion

The Indore’s city bus service is a successful model for provision of public transport service in a city with respect to financial sustainability. The whole model has not just reduced the negative externalities by preventing unemployment of the already existing transport service providers, but more so, contributed positively to city’s growth by enhancing the overall environmental quality in the city.

Indore city is going a step further in enhancing the public transportation in the city and is introducing a Bus Rapid Transit System for the city. The pilot BRT SYSTEM corridor of 11.5 km is expected to be operational by January, 2013.

There is a need for cities across the world to undertake similar initiatives and therefore evolve a sustainable model for running urban bus services in a pro-poor yet financially sustainable manner.

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Municipal Corporation Indore

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Alternatives to Informal Transport for Providing Connectivity to the Urban Poor Areas

Cable-car connectivity to favelas in Rio de Janeiro

Place: **Rio de Janeiro, Brazil**

With a population of around 6.3 million people, Rio de Janeiro (commonly referred to as Rio), is the second-largest city and the third-largest metropolitan area of Brazil. The city of Rio is served by a comprehensive public transit system, which includes metro, suburban trains as well as buses. Despite that, the transportation services are often unable to serve the informal settlements known as the favelas.

The slums of Rio de Janeiro or favelas pile onto, up and over the city’s iconic steep hillsides. Improper and unorganised development and a hilly terrain have not supported any kind of public transport system in these favelas, thereby making it quite difficult for these favelas to be connected to the rest of the city. As 20% of Rio’s population lives in favelas, a large part of the population has to do without any public transportation. Gondola or cable car is one feasible option that

<table>
<thead>
<tr>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cable car connectivity in hilly regions - Connecting favelas (slums) with the main city</td>
</tr>
<tr>
<td>• Affordable and comfortable</td>
</tr>
<tr>
<td>• Reducing the travel time by nearly half an hour</td>
</tr>
</tbody>
</table>

*Cable suspended gondola transporting people in Rio*
Rio de Janeiro has adopted to connect these favelas with the rest of the city.

Gondolas, as they are known in Rio, are systems equipped with cabins moving along on a unidirectional loop. The gondola cabins are small, with each accommodating an average of between four and forty people. Systems of this kind generally have a declutching mechanism, which allows one car to be slowed or stopped in a station without any impact on the overall flow of cabins on the loop. One of the advantages of these systems is that they operate within their own dedicated space and are therefore independent of constraints to which other modes of transport operating on the road network may be subjected.¹

The 74 million USD project is part of a larger investment in public works initiatives by the Brazil government, ahead of Rio’s hosting of the 2016 Olympics.² According to the government, 152 gondolas carry about 30,000 people a day along a 2.1 mile route over the neighbourhood, transforming the hour-and-a-half trudge to a nearby commuter rail station into a 16-minute sky ride.

The gondola system in Rio not only falls under recent smart transport innovation concepts but also promotes and fosters

² [http://www2.macleans.ca/tag/rio-de-janeiro/](http://www2.macleans.ca/tag/rio-de-janeiro/)
equity in mobility choices provided to the population, especially the urban poor. The system ensures an easier and faster way to employment and educational opportunities, saving the slum residents from the tiring hours of journey per day through the steep and narrow roads. As the gondola system connects to the conventional mass transit systems (suburban train), it has significantly helped in improving the overall accessibility in the city.

References


Sustainable Cities

Website: http://sustainablecities.dk/
Section D
Pro-poor mobility policies and planning
To promote pro-poor transportation planning in urban areas, it is important for the governments at all levels to develop pro-poor policies and plans. Developing such policies and plans shows the commitment of the government/s towards pro-poor mobility issues. This section includes a variety of examples from different parts of the developing world, which successfully demonstrate the role of policies and extensive planning and government action in achieving pro-poor transport systems in the cities. This section includes seven case studies, ranging from national-level policies, city level initiatives and neighbourhood level actions.

- Metrovivienda Project, Bogota: Planning housing for urban poor along BRT system corridors
- Hanna Nassif project, Dar-es-Salaam: A poverty-focused transport intervention project
- Metro Manila Urban Transport Integration Project: An integrated project for urban transport improvement
- Cheonggyecheon: Improving NMT infrastructure by restoring a highway in Korea
- National Urban Transport Policy, India: A policy promoting equitable and pro-‘people’ transport solutions
- City of Palembang: Moving towards a pro-poor and pro-green transport system
- Bridging spatial and social divide in urban areas: Improved mobility solutions and provision of public spaces in Bogota
Metrovivienda Project, Bogota
Planning housing for urban poor along BRT system corridors

Place: Bogota, Colombia

The city of Bogota has given priority to providing sustainable urban transportation systems to its inhabitants. Mr Enrique Penalosa, the Mayor of Bogota responsible for the Bus Rapid Transit (BRT) system had observed that the poor walked, biked and used public transport. The city gave priority to transport projects in the order of pedestrians, cyclists, public transport and lastly private vehicles. One major project/program taken up by the city of Bogota is the Metrovivienda program, based on accessibility based planning. The city officials planned a housing facility for the poor by integrating it with the Transmilenio BRT system.

The informal housing settlements in Bogotá were mainly built illegally in inaccessible areas of the city with very limited public services like water, sewerage, public roads, and transit services. With limited access to public transport systems, the workers/daily commuters staying in these settlements had to spend almost 2.5 hours every day commuting and paying multiple fares on informal transit modes, which accounted to almost 15% of their wages.

Key Features

- Provision of low cost housing to urban poor
- Housings well connected with public transportation system
- Savings in daily commuting costs for the poor

The Metrovivienda housing project
In 1999, a poverty alleviation program called the Metrovivienda was launched, which aimed at providing low cost housing to the low income groups; these housing projects were planned to be well connected by the public transportation system.

Under this project, land was acquired along the Transmilenio corridor, before the land prices went up. This was possible because the Metrovivienda officials were also part of the Transmilenio project and they were aware of the corridor extensions and other plans of the BRT system. Open agricultural plots were acquired by the city for the affordable housing program at cheap prices and sold to the developers at high costs. The profit was used by the city to build infrastructure in these housing projects. The developers were asked specifically to keep the average prices of the housing units under USD 8,500. This allowed the population belonging to upper lower income and lower middle income groups to own housing units.

The inhabitants in these new formal settlements previously used feeders and trunk lines resulting in expenditure of about 3,200 pesos (USD 1.39) per day on transportation. With the access to Transmilenio services from their new homes, these workers now spend on an average 1,800 pesos (USD 0.78) on daily transportation costs as Transmilenio services are more affordable and the feeder buses are free.

Trans Milano buses in Bogota

1 1 USD=2302.16 pesos (December Exchange rate, 2012)
The city of Bogota has built four such sites near Transmilenio termini, providing housing to about 8,000 families. These families have access to improved infrastructure and transit services. The program aims to provide 440,000 such housing units for the low income groups. This program is a good example of public transport accessibility based planning and planning for the poor in developing countries. This program provided the illegal inhabitants of slums with legal housing, infrastructural facilities, and improved and affordable access to the city centres.

References


Hanna Nassif Project, Dar-Es-Salaam

Planning housing for urban poor along BRT system corridors

Place: Dar-es-Salaam, Tanzania

In developing countries, the fast pace of population growth in the urban areas is not matched by equally expanding infrastructure network and services. This is especially evident in most of the low-income settlements of the cities, which are marked by a substantial lack or sometimes complete absence of infrastructure. Hanna Nassif, a low income settlement in Dar-es-Salaam also suffered from lack of basic infrastructure like, water supply, sewerage, transport access, etc., and was also prone to frequent...
flooding, due to lack of proper drainage facilities. The improper drainage system not only degraded the urban environment, but also forced people to opt for alternative longer routes to their destinations.

**Project detail**

Hanna Nassif Community Based Upgrading Project was initiated in 1993 and phase II, of the project (funding) lasted from 1997 to 2000. The project was executed with the cooperation of the International Labour Organisation (ILO) and was implemented with extensive community participation. This project is considered to be one of the best practices of a poverty-focused transport intervention project.

**Evolving paradigms of infrastructure upgradation in low income settlements**

In the 1970s, the approach to upgrading low income settlements was to demolish the settlements and erect new low income housing with minimum standards of infrastructure. But, it was observed that such an approach led to more destruction than construction of low income housing. It was felt that slum upgrading i.e. provision of infrastructure on the slum site, could offer a more sustainable and cheaper solution. But later, even this approach was found to be unsustainable, as people never agreed to pay for the added infrastructure and services.

In the latest approach, the community itself is involved in developing the infrastructure in the low-income settlements. The level of participation of the community can vary significantly; it can be limited to stakeholder consultation or it may be extensive, like, management, construction or maintenance of the infrastructure. Such an approach not only enhances the acceptance of such projects among the local residents, but also utilizes local knowledge to prioritize problems and solutions.

**Project approach**

The project focused on enhancing the accessibility of the residents living in the low-income settlement of Hanna Nassif. Various
mechanisms, which were considered to meet this objective are described in the table below

<table>
<thead>
<tr>
<th>MEASURES ADOPTED FOR IMPROVING ACCESSIBILITY</th>
<th>Remarks</th>
<th>Adopted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of storm water drainage to prevent flooding, which in turn would result in lesser damage to roads and would therefore help in enhancing the accessibility throughout the year</td>
<td>This measure was a cost–effective solution to enhance the urban environment of the low-income settlement</td>
<td>This measure was adopted on a priority basis</td>
</tr>
<tr>
<td>Improvements in non-motorized transport infrastructure, like footpaths and bicycle lanes.</td>
<td>This measure offered a cheap and effective mobility solution as the majority of the people were already dependent on walk and cycle to meet their daily travel needs</td>
<td>Emphasis was laid on improving the walking and cycling facilities in the area. This measure focused on: restoration of efficient network of footpaths, by rebuilding the old footpaths and constructing the missing links, construction of footbridges, wherever required developing physical access at places facing severe access restriction</td>
</tr>
<tr>
<td>Relocation of services to reduce travel demand</td>
<td>This was an expensive option and involved demolition of existing houses and compensation to land owners</td>
<td>Not adopted</td>
</tr>
<tr>
<td>Provision of public transport</td>
<td>Expensive option</td>
<td>Not adopted</td>
</tr>
</tbody>
</table>
The proposed road hierarchy for the Hanna Nassif settlement was 8 m ROW for main access road, 6m ROW\(^1\) for access road, 6m ROW for access path and 2m for footpaths. The minimum standard for ROW in the planned residential areas was 10m in Dar-es-Salaam.

**Community participation and use of labour-intensive techniques**

The underlying principle of the project was that the local infrastructure should be developed by building local capacity. The basic elements of community participation in this project were:

- Extensive involvement of local residents at all the levels of project, from planning to implementation to monitoring and evaluation.
- The planning and design of the infrastructure was done in a manner so as to cause minimum demolition to the existing built environment.
- Construction techniques were adopted, which yielded maximum benefit for the local community, such as, labour based methods and community contracts. The use of labour-intensive techniques was essentially beneficial to the local community, as the unemployment rates were very high and moreover the scope of machinery work in the area was limited due to physical access restrictions.

**Conclusion**

The Hanna Nassif project successfully demonstrates the benefits of community participation at all levels of planning and portrays that the most effective pro-poor policies can have a focus on improvement of the NMT infrastructure in the context areas. Such measures are not only cost-effective but also cater to the mobility needs of the poor population who cannot even afford the subsidized government fares of the public transport facilities. It is equally important to replicate similar efforts in other parts of the world, as they have the potential to substantially enhance the socio-economic conditions of people living in the low income settlements.

**References**


\(^1\) ROW: Right of way
Documentation of regularization experience in informal settlement in Kinondoni municipality Dar-es-Salaam, Experience of Hananassif, (2010), WAT human settlement trust

Hanna Hassif Community Based Settlement Upgrading Phase II, Kinondoni District, Dar-es-Salaam, (2005), Prepared by I.T. Transport Ltd.
Metro Manila Urban Transport Integration Project
An integrated project for urban transport improvement

Place: Manila, The Philippines

Metro Manila is the national capital region (NCR) of the Philippines. It is one of the most populous metropolitan areas of the world. As per the census of 2010, it had a total population of more than 11.85 million. Metro Manila comprises four cities and 17 municipalities. The region has been witnessing a rapid population growth, accompanied with growing economic prosperity; the NCR region of Manila contributes approximately one-third to the GDP of the Philippines. This has resulted in rising travel demand, which was earlier catered primarily by motorized vehicles, resulting in severe traffic congestion and degrading air quality, leading to poor quality of life in the city.

Fortunately, public transport has always been an important mode of transportation in this region, despite rising levels of car ownership. But, it was anticipated that in the absence of any intervention, the situation could become grave, and continuous penetration of motor vehicles could significantly reduce the use of the sustainable modes of transport, like, cycle and public transport in Metro Manila. Thus, with the aim to improve urban transportation in Metro Manila, the government of the Philippines undertook the Metro Manila Urban Transport Integration Project (MMURTRIP), with the help of Global Environment Facility (GEF) and the World Bank. The objectives of the project are:

- To enhance the economic productivity and quality of life of citizens of Metro Manila
- To improve operational efficiency and safety of the transport system
- To enhance access to public transport and NMT

The project has five components.

1. Improvements in Public Transport: Manila has a multi-modal public transport system. Most of the transport plans and policies

Key Features

- Project initiated to address the poor state of transportation in Metro Manila
- Project aimed at enhancing the quality of life in Metro Manila
- Focus on improving public transportation, non-motorized transportation (NMT), enhancing the integration between different public transport modes, increasing access to the peripheral areas of Metro Manila, improving network of secondary roads, and traffic management measures
- Improvements in public transportation and NMT infrastructure directly benefited the low-income population.

are mode specific and there have been limited efforts with regard to integrating different modes. The project seeks to develop measures for integration of different modes, like Light Rail Transit (LRT), Mass Rapid Transit (MRT), buses, Jeepneys, etc. This includes development of interchange facilities, measures for giving priority to public transport systems, traffic management, enhancing safety of pedestrians and cyclists, etc.

2. Access to Marikina Valley Area: It was observed that the existing transport system provided lower levels of access and connectivity to the areas located on the periphery of Metro Manila. Marikina being one such area, experienced long travel times and poor accessibility, and an inadequate public transport system was perceived as a critical issue by the people who worked in Manila. The project proposed to enhance access and transport connectivity to this part of the metropolitan area through measures like development of a new public transport corridor and traffic management measures.

3. Improvements to Secondary Roads: It was proposed to restore the sidewalks and develop proper drainage systems along the secondary roads. Improvement in the secondary network of roads was recommended as this would have helped in reducing the traffic load on arterial roads and thereby leading to an

<table>
<thead>
<tr>
<th>Mode</th>
<th>Mode share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorized Private vehicles</td>
<td>18.2</td>
</tr>
<tr>
<td>Motocycle</td>
<td>0.7</td>
</tr>
<tr>
<td>Car/Jeep</td>
<td>17.5</td>
</tr>
<tr>
<td>NMT</td>
<td>1.9</td>
</tr>
<tr>
<td>Bicycle</td>
<td>1.6</td>
</tr>
<tr>
<td>NM tricycle</td>
<td>0.3</td>
</tr>
<tr>
<td>Public transport</td>
<td>68.6</td>
</tr>
<tr>
<td>M tricycle</td>
<td>11.8</td>
</tr>
<tr>
<td>Jeepney</td>
<td>41.9</td>
</tr>
<tr>
<td>Bus</td>
<td>14.9</td>
</tr>
<tr>
<td>Other</td>
<td>11.4</td>
</tr>
<tr>
<td>Private Bus</td>
<td>2.5</td>
</tr>
<tr>
<td>Truck</td>
<td>2.4</td>
</tr>
<tr>
<td>Taxi</td>
<td>4.9</td>
</tr>
<tr>
<td>HOV taxi</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Source: Project details of ‘Philippines: Metro Manila Urban Transport - Marikina Bikeways Component’, World bank website
enhanced network capacity of the whole road network.

4. **Facilitating NMT Movement:** This component of the project laid emphasis on developing extensive NMT network, all across Metro Manila. The Marikina Bikeways Project was part of a demonstration project under the MMURTRIP. The Marikina Bikeway network was developed in a manner that connected most of the low income residential areas in Marikina with important activity nodes in the city, like commercial, industrial, and educational centres.

5. **Traffic Management:** The project also proposed capacity building in traffic management in the existing transport agencies: the Metro Manila Development Authority (MMDA) and the Department of Public Works and Highways (DPWH). This component was considered important due to higher dependence of the metropolitan region on road-based transport. And, improvements in traffic flow were critical for improving the environmental quality and safety.

**Conclusion**

MMURTRIP has successfully achieved its objectives of enhancing the quality of life in Metro Manila. Due to higher use of public transportation and NMT modes, Metro Manila has significantly improved average speeds of traffic and reduced the incidences of traffic congestion. The improvements in public transportation and NMT have especially helped low-income populations as they are captive users of these modes.

MMURTRIP shows that it is important for the local authorities to plan transport improvements in a comprehensive manner. The MMURTRIP has addressed all the possible elements of transport improvements, whether it is improvement in NMT and public transportation, or, issues related to integration and coordination. MMURTRIP has also been successful in catering to the mobility needs of low-income populations.

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Improving NMT infrastructure by restoring a highway in Korea

Place: Seoul, South Korea

The city of Seoul is planning a drastic shift from car oriented development to a human centric development, which values quality of life of its residents. Restoration of Cheonggyecheon was one such project undertaken by the city in 2003 to test if Seoul can progress on the lines of sustainability and turn into a globally competitive world city.

Cheonggyecheon is a name given to a stream running from west to east in the heart of downtown Seoul. Having been long neglected, it was covered by concrete roads in 1958. It roughly took around 20 years to completely cover the stream. Later in 1967-76, a 5.84 km long and 16 m wide elevated highway was constructed over the covered stream, which became the symbol of Korean development era. More than 168 thousand cars a day were running on the road and the elevated highway, and 62.5%

Key Features

- Restoration of an expressway into a public space
- Promotes pedestrianization
- Reduced traffic problems and improved quality of life.

A long park runs on both sides of the stream
of them were through-traffic\(^1\). The heavy car movement on the highway brought along serious problems of congestion, illegal on-street parking, and serious pollution levels in the downtown area around the stream. As a reflection of these facts, the health awareness survey conducted for those who live or work near Cheonggyecheon revealed that the residents were more than twice as likely to suffer from respiratory diseases\(^2\). To make matters worse, the area lacked pedestrian facilities, which limited the movement of the common citizens substantially. As a result, the population in the downtown area saw a decline of 66% over a period of 10 years and the business activities declined by 24.1%.

The overall highway structure was aging and had serious safety risks. Immediate repairs were required, which were estimated to be around 100 billion won (around 90 million US dollars) and additionally would have also required the highway to be closed for a minimum period of three years. To address the above mentioned issues, the Seoul Metropolitan Government in 2003 decided to restore Cheonggyecheon into a large human and environment friendly space. The government wanted to improve the quality of life in downtown and improve connectivity between the north and south sides of the city, which were divided by the expressway.

The main idea of this project was to restore the urban natural stream and to create ecological, recreational as well as economic opportunities in the downtown area of Seoul. Restoration was first done on a stretch of 6 km and it took almost two years. It included three main tasks: dismantling the elevated expressway,
uncovering the road over the river and the actual restoration work. A total of 680,000 tons of waste was generated during the demolition work. Of these, 100% of the scrap iron and steel was recycled and 95% of the waste concrete and asphalt also recycled\(^3\). Measures like using diamond wire saws and wheel saws were employed to reduce noise and dust during demolition.

Today, Cheonggyecheon is an 8.4 km (5.2 miles) long, modern public recreation place. It is seen as a green corridor for pedestrians, bicyclists and wildlife running west to east, right in the centre of Seoul. Initially, the authorities faced significant criticism as the removal of the highway carrying approx. 170,000 vehicles daily was expected to create congestion and further exacerbate the traffic conditions in the area. Though no issues of congestion have arisen to date since the opening of Cheonggyecheon in 2005.

Restoration has helped in discouraging car use, strengthening public transport use and promoting non-motorized transport (NMT) in the area. 22 bridges were added (12 pedestrian and 10 for both automobiles and pedestrians), connections with five nearby subway lines were provided for, and 18 bus lines serving the neighbourhood were added, thereby improving the connectivity and accessibility of the area. The stream now can be accessed at 17 locations. Levelled terraces, vertical walls and sidewalks were built alongside to create interest as well as improve access and interaction of the citizens with water. Natural stone banks on both sides help regulate water speeds and also serve as walkways for adventurous pedestrians. On both sides of the stream, as much as 13.5 m of space has been left for one-way-two-lane roads, sidewalks and loading/unloading activities. In an effort to minimise inconvenience and stimulate business activity, the local authorities provided economic support and made special arrangements for the vendors likely to be displaced under the project.

The project also led to the preparation of a downtown revitalisation plan, which aimed at developing the area into an eco-friendly urban environment enhancing business, cultural and commercial activities, and tourism. Had the Cheonggyecheon expressway remained, it would have required 100 billion won (90 million USD) and three years of repairs to secure the safety of the aging structure. While these costs would be approximately 289 billion won (260 million USD) less than the cost of the Cheonggyecheon Stream Restoration, the restoration has served as a catalyst for an estimated 22 trillion won (1.98 billion USD) worth of capital investment in the Cheonggyecheon-area redevelopment that would not have otherwise been invested\(^4\).

\(^3\) Prof. Hwang Kee Yeon, Cheonggyecheon Restoration and Downtown Revitalization
\(^4\) http://lafoundation.org/research/landscape-performance-series/case-studies/case-study/382/c
Since its opening in 2005, Cheonggyecheon has become an enduring tourist attraction with billions of visitors visiting every year. The removal of the paved expressway, increased vegetation, and the stream itself helped in reducing the urban heat island effect in the downtown area with temperatures reduced by approximately 2-5 degrees Celsius. The overall biodiversity increased by almost 639% between the pre restoration work in 2003 and end 2008\(^5\). Remarkable improvement was also recorded in the air and water quality in the area and reduction in noise levels and smells. Businesses are now booming in the area with rising real estate prices adding to the Seoul economy. Most importantly, it has helped accomplish balanced regional development in the northern and southern parts of the city of Seoul.

Additionally, the project has assisted in improving NMT infrastructure. It has proved to be very successful in reviving the declining economy of Seoul and is now being studied by government officials across the world as a good example of urban renewal and design. Such projects can prove helpful in giving back nature to the people in our so called developed cities and help reduce problems like high pollution levels, congestion, noise etc.

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http://www.terrapass.com/society/seouls-river/

\(^5\) http://lafoundation.org/research/landscape-performance-series/case-studies/case-study/382/c
National Urban Transport Policy, India
A policy promoting equitable and pro-‘people’ transport solutions

Place: India

The Government of India announced a National Urban Transport Policy (NUTP) in 2006 to meet the challenge of India’s rapid urbanization phenomena and the resulting increase in the urban travel demand. The policy aims at meeting the mobility needs of the current and projected population and ensuring sustained flow of goods and people in urban areas. The policy addresses some of the key transport problems faced by most urban areas, namely:

- Congestion and difficulty in accessing jobs, healthcare, educational and leisure facilities, all of which contribute to an improved standard of living
- High rate of personal travel thereby increasing cost (both monetary and non-monetary) to the urban poor, causing inequity and negative externalities
- Threat to safety, especially to the non-motorized vehicle users, pedestrians, and public transport users who are also pedestrians
- Increased air and noise pollution.

The policy has defined the following vision for the transport sector in cities:

- To recognize that people occupy center-stage in our cities and all plans would be for their common benefit and well-being.
- To make our cities the most livable in the world and enable them to become the “engines of economic growth” that power India’s development in the 21st century.
- To allow our cities to evolve into an urban form that is best suited for the unique geography of their locations and is best placed to support the main social and economic activities that take place in the city.

Key Features

- **Aim of the policy** - To promote equitable and sustainable urban transport systems
- **Policy** gives priority to mobility of ‘people’ not ‘vehicles’
- **Policy recommendations** address the urban mobility concerns of the urban poor and the low income population

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2. Ibid
Approach suggested by the Government of India to implement the NUTP

The Government of India launched the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in 2005, which aimed to rejuvenate the urban milieu through implementation of a number of projects with active private sector participation. Cities with million-plus population, state capitals, and cities of cultural and tourist importance were to be included under the Mission. This major initiative sought to bring about comprehensive improvements in urban infrastructure by commitment of substantial funds for this purpose and required a series of reforms that would make the investments sustainable. Some of the policy objectives in the NUTP are being realized as proposals and projects under the JNNURM, which has selected 63 cities (two more cities have been added recently) in India and is implementing an urban reforms agenda of which urban transport is a component. Each of these 63 cities has come up with a City Development Plan, which is a policy and investment plan for the city for the next five years (2007-2012). Both the NUTP and the Mission makes it conditional upon the cities to take up projects in line with the recommendations made in the NUTP, in order to receive funding and grants. For this, each of the cities has to come up with a Comprehensive Mobility Plan for the city.

Key features of the policy

**Equity**

- Road space allocation principle - focus on people and not vehicles, more space for public transport and NMT modes

**Safety**

- Addressing the safety concerns of cyclists and pedestrians by encouraging the construction of segregated rights of way for bicycles and pedestrians
- Strict enforcement to reduce encroachment of footpaths

**Integrated planning**

- Integrated land use and transport planning in a manner that serves the entire population and yet minimizes travel needs
- Transit oriented development - channel the future growth of a city around a pre-planned transport network and plan for an urban form that best suits the geographical constraints of its
location and also one that best supports the key social and economic activities of its residents

**Promote use of public transport**

- Investing more in public transport as well as measures that make its use more attractive than that of personal motor vehicles
- Operating different types of public transport services for different segments of commuters - a basic service, with subsidized fares and a premium service, with better quality but higher fares and no subsidy³ (Access and equity issues also addressed)
- Restoring para-transit to its normal role of catering to occasional and emergency trips by persuading the improvement of public transport

**Promote use of NMT**

- Improving NMT access to public transport stations
- Creating safe bicycle parking spaces, facilities like shade giving landscaping, provision of drinking water and resting stations along bicycle corridors and pedestrian pathways
- Public bicycle program – rent and use a bicycle

**Adopting transport demand management measures**

- Discouraging use of personal motor vehicles
  - higher fuel taxes
  - higher parking fees, graded scale of parking fee
  - reduced availability of parking space; preference in the allocation of parking space for public transport vehicles and non-motorized modes
  - no free parking on carriage ways in residential areas
  - congestion pricing schemes
  - freight traffic movement – use off-peak passenger travel times to move freight

**Promote clean technologies and fuels**

- Promoting cleaner technologies (CNG, electricity, renewable energy) by offering concessions and benefits that would enable them to make an entry and compete with established technologies on more equitable terms (state governments can offer such incentives)

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³ To ensure that the fares charged are fair and reasonable, NUTP recommends that a regulatory authority be set up by the State Government to, inter-alia, regulate the prices to be charged by different types of public transport services.
Institutional and capacity building measures

- Coordinated planning, implementation and management of urban transport systems
  - Setting up of Unified Metropolitan Transport Authorities (UMTA) in all million plus cities
  - Setting up of professional bodies that have the capacity to make scientific assessment of the demand on various routes and contract services that can be properly monitored
  - Setting up of umbrella bodies that regulate the overall performance of the public transport system and ensure that the city has a comprehensive public transport system
- Capacity building of urban development and planning bodies (institutional and individual capacity building)

Financing urban transport projects

- Innovative mechanisms to fund transport plans/projects
- Involvement of private sector in implementation and management
- Financing high cost mass transit systems - setting up of Special Purpose Vehicles (SPV); basic financing principle - government should provide the infrastructure but the users (direct and indirect beneficiaries within the city) must pay for the operating costs and the rolling stock

Participatory planning process

- Involvement of community, experts, users in transport planning process

The National Urban Transport Policy is a comprehensive policy document that aims to steer the transport sector growth in cities towards sustainable pathways by emphasizing on many of the sustainability elements of transport systems, especially equitable growth. Effective implementation of the policy is expected to address several urban mobility concerns of the urban poor and low income population in Indian cities and provide for equitable and sustainable transport systems.
City of Palembang

Moving towards a pro-poor and pro-green transport system

Place: Palembang, Indonesia

Palembang is the capital city of South Sumatra Province in Indonesia and is located on the bank of river Musi. The city has a population of approximately 1.5 million people. The city is an industrial and commercial centre, growing with an economic growth rate of 6.5%.

The public bus transport of the city was characterized by an old fleet, with an average age of 10-15 years. These buses not only generated high levels of emissions but were also unsafe due to the improper design and old condition. There was also a lack of proper infrastructure, like bus-queue shelters, bus-bays, etc., which lead to traffic congestion. Due to the poor public transport system, the city witnessed a constant rise in the number of private vehicles and intermediate public transport modes (including becaks and ojeks), along with a continuous decline in the number of buses.

Key Features

- City government’s commitment towards development of ‘pro-poor’ and ‘pro-green’ transport system for the city
- Land-based and water-based transport systems being revitalized
- Improvements in land-based transport system include development of TransMusi, the Bus Rapid Transit (BRT) system for the city, and improvements in the non-motorized transport (NMT) infrastructure
- Traditional water based transport system being revived by development of infrastructure like, jetties, docks, etc.

Condition before BRTS

Source: Presentation on ‘Transportation in Palembang City’, Eddy Santana Putra, Mayor of Palembang City

1 ‘2011 KLRTC (Kuala Lumpur Regional Training Center) 21 workshop on sustainable transport’,(2011), KLRTC Update
2 ‘2011 KLRTC (Kuala Lumpur Regional Training Center) 21 workshop on sustainable transport’,(2011), KLRTC Update
3 Bacak: Pedicab or cycle rickshaw
4 Ojek: Motorcycle taxi
To improve the condition of public transportation in the city, the local government committed itself towards developing a ‘pro-poor’ and a ‘pro-green’ transport system for Palembang. The program to revitalize the public transport system in the city focused on improving the bus transport, water-based transport system and NMT facilities in the city.

**Improvements in public bus transport system: BRT system - TransMusi**

As part of improvements in the bus transport system, the city has developed a Bus Rapid Transit (BRT) system. The BRT system

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Motorcycles</th>
<th>Number of Cars</th>
<th>Number of Mini-buses</th>
<th>Number of Buses</th>
<th>Number of Becak &amp; Ojek</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>192,175</td>
<td>54,698</td>
<td>30,653</td>
<td>3,299</td>
<td>275</td>
</tr>
<tr>
<td>2007</td>
<td>215,206</td>
<td>59,539</td>
<td>21,238</td>
<td>3,189</td>
<td>296</td>
</tr>
<tr>
<td>2008</td>
<td>248,904</td>
<td>66,647</td>
<td>34,568</td>
<td>3,140</td>
<td>326</td>
</tr>
</tbody>
</table>

**Variation in the number of different modes in the city of Palembang**

*Source: Presentation on ‘Transportation in Palembang City’, Eddy Santana Putra, Mayor of Palembang City*
of Palembang is known as the ‘TransMusi’. It started functioning in 2010 with 25 buses, along two corridors. The new TransMusi buses run on gas rather than on fuel oil, thus emitting lesser pollutants than the conventional buses. The new buses are clean, safe and comfortable.

**Improvements in the water-based transport system**

The water-based transport system in Palembang has been the traditional form of transportation in the city, as the river Musi passes through the centre of the city, dividing it into two parts. The water-based transportation is dependent on traditional water boats. The water based transportation in Palembang severely lacks basic infrastructure, like jetties, etc., to allow safe landing of passengers. The water transport is the life line of poor people in Palembang, as most of the low-income population resides along the banks of river Musi.

The city is encouraging the traditional water based transportation by developing passenger infrastructure like developing safe docking places, along the river. The city authorities have also introduced a number of water buses. Further, efforts are underway to integrate land-based and water-based transport systems.

*TransMusi Buses*

Source: Presentation on ‘Transportation in Palembang City’, Eddy Santana Putra, Mayor of Palembang City
Improvements in NMT facilities

As part of a revitalization program, the city is also promoting use of NMT modes among the citizens. The use of bicycles and becaks is being encouraged. Projects are undertaken in the city for the creation of safer sidewalks to promote pedestrian movement. Campaigns like ‘walk to work’, ‘bike to work’ and ‘car-free days’ are being organised to discourage use of private motorized vehicles.

Conclusion

The strong commitment of the government of Palembang towards developing a pro-poor and pro-green public transport system has led to visible changes in the urban transport scenario of the city. The city now has a lesser number of private vehicles, improved air quality, and less traffic congestion due to higher usage of the public transport system, therefore leading to better environmental quality in the city. The city is further expanding its efforts of improving public transportation by growing the BRT system from two corridors to a city wide network, consisting of 6 corridors. Further, it is also being considered to replace all the conventional buses with the cleaner BRT buses. The city is also exploring the options of a public-private partnership to improve the NMT facilities in the city.

A strong commitment from government is a quintessential element for achieving sustainable urban growth. The city of Palembang demonstrates the robust role that a local government can play in placing the city on the path of sustainable development. There is need for cities around the world to undertake similar initiatives.

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Bridging Spatial and Social Divide in Urban Areas

Improved mobility solutions and provision of public spaces in Bogota

Place: Bogota, Columbia

Bogotá, the capital and the largest city of Colombia is well recognized globally for its sustainable transport policies. With a population of nearly 7 million inhabitants, it is the fourth largest city in South America.

The city, has long since witnessed a strange divide between the rich and the poor with large parts of the city lying in isolation, spatially as well as economically. Over the past two decades, the city leaders have concentrated on bridging this social divide by initiatives focusing on the spatial, economic, social, and political front. It was realized that improved mobility options and citywide public spaces will help in connecting and bringing people together.

Key Features

- Using mobility interventions to bridge rich-poor divide
- Priority to walking and cycling
- Recovering and enhancing public spaces
- Discouraging private automobile use

Large number of people come out on streets to walk and cycle during ‘Ciclovia’
from all classes and areas. Over the last 20 years, the city’s leaders have embarked on a citywide campaign to improve the public spaces and the transportation systems so as to bridge the social divide and create opportunity for all of Bogotá’s citizens.

The transformation of the city was initiated way back in 1998 under the leadership of the former mayor Mr Enrique Peñalosa. The transport policy for the city started giving priority to pedestrians and also promoted the use of public transport. The main focus areas included improvement of public transport, discouraging private car use, expanding and improving bicycle paths and enhancing public spaces. It was during Mayor Peñalosa’s tenure that Transmilenio, the high quality bus raid transit (BRT) system, was planned, designed, and opened for the city in 2000. The new bus system aimed at providing a well-organized, faster, and more efficient mode of travel to the city residents. The municipality created a dedicated company ‘Transmilenio S.A.’ to plan, organize, and construct the transportation infrastructure, as well as to supervise the bus services. The bus operations were contracted to private firms while the revenues and finances were managed by the company. Transmilenio became central to all planning and development in the city.

Significant efforts were made to improve public spaces and promote walking and cycling in the city during 1998-2000. A dedicated office, The Defence of Public Space office was created to recover

Special signage is put up on car restricted streets during Ciclovia in Bogota

1 Placemaking and the Future of Cities (Draft, 2012); By Project for Public Spaces, Inc. under the auspices of the UN-HABITAT Sustainable Urban Development Network (SUD-Net.
2 http://www.globalurban.org/Issue1PtMag05/Montezuma article.htm
illegally occupied or encroached public spaces and substantially renovate them through basic infrastructural improvements in traffic signals, road infrastructure, lighting etc. During this time, the city witnessed a substantial physical transformation with the following initiatives:

• Almost all parking bays were closed in the downtown area and many were converted to protected sidewalks,
• Barriers (bollards/high curbs) designed to stop automobiles from parking on the sidewalks were installed,
• Widening of sidewalks was undertaken, and
• Pedestrianized zones like Jimenez Avenue, the main street downtown, etc. were introduced.

The efforts resulted in the recovery of 338,297 sq. m and construction of 147,000 sq. m of space under bridges (these spaces previously had been badly planned and inhospitable) and 432,000 sq. m of sidewalks — a total of approximately 917,000 sq. m of available public space. The city administration restored, improved, and maintained 1,034 parks, or 54% of the green space in the city. For a cost of 212 billion pesos (about USD 100 million), the city government planted almost 70,000 trees, installed 183,651 planters, and added greenery to 202 km of roadsides and 280 hectares of parks.

To promote cycling in the city, the city administration adopted a program – ‘Cicloruta’, which involved development of an

Cycle routes in Bogota
Source: http://rorybergin.wordpress.com/2012/01/05/cycling-are-our-policies-working/

\[1\text{ http://www.globalurban.org/}
\text{Issue1PIMag05/Montezuma\ article.htm} \]
extensive network of nearly 300 km of dedicated cycling paths in the city in accordance with the Mayor’s ‘Master Plan of Bicycle Paths’. It was an important step in managing the city’s traffic. The cycling network was linked to public transportation stations/nodes and provided improved access to several destinations in the city including schools, recreational facilities, and other socio-economic needs. Separate bicycling stands at Transmilenio stations were provided. As a result of this initiative, bike use increased from 0.58% to nearly 4%⁴.

Another recreational program, better known as ‘Ciclovia’ was promoted in the city. Under this program, around 97 km of streets were temporarily closed down to motorized vehicles on Sundays and other holidays for several hours. The streets allowed people to enjoy biking, walking, and various other recreational activities. Both the programs helped in raising awareness regarding the negative impacts of using a car and also promoting healthy lifestyles through physical activity in the city. Given the socio-economic context of the city, both the programs were widely accepted by the citizens. These initiatives were matched by car restrictive initiatives like ‘pico y placa’ (‘peak times and license plates’). Through a license tag system, nearly forty percent of cars were banned from central city streets during peak hours every day⁵.

The strategies adopted have resulted in a considerable increase in green spaces and playing fields in neighbourhoods and also a reduction in crime activity around Bogota. Citizens from all groups including women and children now enjoy a safe and healthy lifestyle.

The city today is a leading example of an efficient and sustainable transport system offering improved connectivity to all city areas and promoting a good quality of life. The existing systems ensure that people meet in places like public transport, public spaces, while walking and cycling, thereby reducing the rich-poor divide that existed in the city’s fabric. The city has attracted policy makers and planners from all over the world in the past decade to experience and learn from the Bogota experience.

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⁴ Ando Despacio, Bogota: edging back from the brink; Published by Institute for Transportation and Development Policy (ITDP) in Sustainable Transport magazine (issue number 20), Winter 2008
⁵ Robert Cervero; Progressive Transport and the Poor: Bogotá’s Bold Steps Forward; Published in Access (Number 27, Fall 2005)
Robert Cervero; Progressive Transport and the Poor: Bogotá’s Bold Steps Forward; Published in Access (Number 27, Fall 2005)

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http://www.globalurban.org/Issue1PIMag05/Montezuma%20article.htm
Section E
Pro-poor transport infrastructure planning and development
Non-motorized transportation (NMT) is the primary mode of travel for the poor. Developing safe pedestrian and cycling infrastructure can hence significantly enhance mobility and safety of the poor. Some parts of the developing world face an acute shortage of transport supply, as there is a complete absence of any form of public transportation. In such situations, the low income populations depend entirely on walking and cycling. The case studies listed under this section showcase how cities around the world are seeking solutions to the problem of mobility constraint for the urban poor through innovative approaches and government’s commitment towards developing NMT friendly infrastructure.

- NMT infrastructure in Cape Town
- ASCOBIKE Parking Facility, Sao Paulo
- Enhancing NMT infrastructure through community action: Example from Mexican cities
- Improving access and safety on roads for cycling in Jayanagar, Bengaluru
- Multi modal transportation: Integrating BRT with public bicycle sharing in China
- ECOBICI: Promoting bicycling as an environment friendly and low cost mobility solution for the population in Mexico
- World’s largest bike sharing program providing clean mobility options to city residents in Hangzhou
- Promoting bicycling as an environment friendly mode of transport in Marikina
- NMT project in Temeke, Dar-es-Salaam
- Improvement of walking and cycling infrastructure: Interventions undertaken in Nairobi
- Creating a safe walking and cycling infrastructure: Pilot project in Eldoret
NMT Infrastructure in Cape Town

Place: Cape Town, South Africa

In 2001, the city of Cape Town had about 19.5% of the population walking and bicycling to work or school. It was also estimated that about 11 million NMT trips related to public transport were generated daily during the peak hours. But, the infrastructure in the city to meet the needs of NMT users was not adequate or effective considering that out of 100 road fatalities reported in 2001 in Cape Metropolitan Area, 59 were pedestrian fatalities.

Key Features

- Non-motorized transport (NMT) supportive polices
- Legal and regulatory backup
- Cycling inclusive planning
- Stakeholder involvement
- Pro-poor planning

1 Pretorius and Bester (2004)
2 Pretorius and Bester (2004)

Roadside pedestrian sign in Cape Town
Studies showed that the affected were among the economically productive population and the worst accident prone sites were low income areas of the city.

Non-motorized transport (NMT) has been recognised as a mode by South African government in several national legislations, policies and frameworks. The importance of NMT has been emphasized in national documents like National Department of Transport’s (NDoT) Green Paper on Transport (1996), Rural Transport and Development Strategy for South Africa (2002), Moving South Africa (1998), Development Strategy for South Africa (2002), and the National Land Transport Transition Act (RSA, 2000). In addition to national recognition, NMT has also been given due significance in the city of Cape Town through provincial legislations such as a White Paper on Western Cape Provincial Transport Policy (1997).

Given that a good policy, legal and regulatory back up is available for NMT mode in Cape Town, the city is trying to improve its NMT infrastructure and improve safety. Due to the strong leadership provided by Mayors such as Helen Zille and Dan Plato, the NMT movement is gaining momentum in the city. With the help of several organisations like the Bicycling Empowerment Network (BEN), non-motorized transport Forum, etc. the city is striving to transform Cape Town into a cycle friendly city and hence achieve sustainability. The city is trying to achieve an NMT environment by planning and preparing Metropolitan Bicycle Route Master plans,

Road cycling, Argus Cycle race, Cape Town
local area network plans, traffic calming and traffic management approaches and developing an NMT policy.

As a result of the efforts of the city authorities, by 2003, 90 km of bicycle routes and the following projects had been designed and constructed.

1. Dignified Spaces Program: This focused on integration of public spaces, public transport and NMT and pedestrianization of Ngulube Drive at Philippi Station and St. Georges Mall, Cape Town CBD.
2. Klipfontein Corridor Program: This identified NMT desire lines between public amenity projects to create an NMT environment
3. Shared bicycle and pedestrian facility along Kommetjie Main Road and in Khayelitsha community for increased safety of NMT users
4. Cycle ways in Blaauwberg around schools to promote cycling to schools
5. Bicycle Empowerment Network to promote cycling as a form of low-cost mobility and employment generation.

The city of Cape Town has adopted cycling inclusive planning and stakeholder involvement since 2007 to enhance the NMT environment with a special focus on pro-poor orientation through a city wide NMT programme. The aim is to achieve a 10% cycling share by 2020 and 500 km of standard cycling routes integrated with traffic calming. For the purpose of planning and implementation of NMT projects, the city had been divided into four regions with eight districts with two projects being implemented on a priority basis out of the total number of projects identified for each district. In 2010, 16 prioritised projects were queued to be implemented with a budget of R200 million (USD 23.08 million) in 2011. By 2010 the city had implemented the following NMT projects/programs:

1. 11 out of 14 Klipfontein Corridor NMT projects
2. On West Coast IRT network, 165 km of NMT facility had been completed
3. Completed NMT facilities surrounding the FIFA 2010 stadium, Inner City NMT and the Cape Town Stadium NMT (65 km)
4. Included bicycle infrastructure as part of Traffic Impact Assessments and restricting projects.

The stakeholders include several urban and transport related departments at city-level, the National Department of Transport, Province of the Western Cape (Transport and Public Works), Metrorail South Africa, Cape Town Partnership (public/private

1 USD=8.66 R (December Exchange rate, 2012)
sector), BEN, Pedal Power Association (PPA), private agencies, the University of Cape Town, consultants, and the special needs programs.

With organisations like BEN being actively involved, the focus has been brought to the low income areas and the disadvantaged people of Cape Town. The organisation together with the National Department of Transport (NDoT) and municipalities, also works towards the planning and implementation of bicycle infrastructure such as cycle lanes and facilities. The travel information is collected through surveys from the bicycle recipients at the end of their training and provided to the city authorities to help them plan roads, safe bicycle routes, and manage traffic. The bicycle maintenance facilities and safety training on bicycle use and maintenance are provided to some extent by the Bicycle Empowerment Centres (BEC) under BEN.

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http://www.benbikes.org.za/about.php

ASCObike Parking Facility, Sao Paulo

Place: Sao Paulo, Brazil

Efforts are being made in Sao Paulo to make it a City of Bicycles, which will help reduce the existing traffic congestion problems. To make cycling more popular, a bicycle parking facility has been created and administrated by the Association of Bicycle Users (ASCObike) of Maua, Brazil in the suburban area of Maua. A parking facility for about 1,700 cycles has been created near a train station for the use of cyclists. ASCObike was found by Adilson Alcantara who was the station manager at the Maua station when he noticed the unorganised bike parking in the station surroundings. Without any facilities for parking their bicycles, the cyclists were using the neighbourhood passages to the station and blocking the pathways.

Adilson organised the cyclists and formed a civil association that opened the facility for parking bicycles in a safe and organised

Key Features

- Cheap bicycle parking facility near train station
- Facility run by civil association consisting of the cyclists
- Trained staff members
- Additional services to members

Ascobike parking facility
Source: http://ascobike.org.br/home.asp
manner. The Metropolitan Trains Company of São Paulo (CPTM) provided the association with a location near the train station to start its initiative. ASCOBIKE started with 700 bicycle lots and only 200 users per day and has now expanded to 1,700 bicycles lots with almost 100% usage every day. At the facility, bicycles are hung vertically using metal hooks, efficiently using available space of 11,272 sq. m. The racks have been installed at intervals of 30 cm and are mounted alternatively at a height of 1.80 m and 1.95 m to prevent interference of bicycles with each other. The members are assigned a registration number, which is used during parking to identify parking lots and issue parking receipts. The bicycles can be retrieved by showing the parking receipts.

At the ASCOBIKE facility, cyclists can park their bicycles, are ensured of security, have access to regular maintenance facilities, and also have refreshment facilities to change and wash before boarding the train. The facility is also proving to be a centre for social networking with the members organising rides and picnics. The facility also has services like lending of bicycles to members whose bicycles are under repair. Legal and customer services for its members are also provided by ASCOBIKE. Educational programs are held by the association to educate cyclists, drivers, and pedestrians about their rights and obligations related to the traffic laws. ASCOBIKE also has contracts with health insurance companies to provide health plans for its members at reduced

Vertically hung bicycles to save space
Source: http://ascobike.org.br/home.asp
rates. All these facilities are available to the members at R$ 10 (USD 5.00) per month. Non-members can avail of the parking facility for 24 hours at R$ 1 (USD 0.50). The members save money by commuting by bicycle as the bicycle is a cheaper option than the bus to reach the station.

The facility has trained staff to serve the members. A special interest of ASCOBIKE is to make its members feel valued and respected. Considerations like providing horizontal parking lots for the elderly and less able bodied have been incorporated into the facility’s design. The responsibility given to the member is to store the bicycle properly and to use a lock to secure their bicycles.

The maintenance of the facility is looked after by the association from the monthly membership fees. CPTM has sponsored major renovations in the facility when the capacity was increased.

In a city, which lacks both infrastructure and facilities for cyclists, this cyclist lead venture meets the basic needs of its members and promotes a bicycle friendly environment. Being set up at a prime location and providing high quality parking in a convenient manner has improved the status given to the bicycle by the people. Providing an affordable and cheaper option than other alternative public transport systems to reach the train station, ASCOBIKE has been able to help people save money. The association promotes the role of bicycles as a sustainable means of transport.

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Enabling NMT Infrastructure Through Community Action

Example from Mexican cities

Place: Mexico

Guadalajara is the second largest city in Mexico; the Guadalajara Metropolitan area has a population of more than 4 million. The city suffers from a number of traffic and transportation related problems, like, heavy traffic congestion, lack of non-motorized transport infrastructure, depreciating air quality, etc. The city has witnessed a rapid rise in its vehicle population and in a single decade, the vehicle fleet in the city has doubled. The lack of quality public transport services in the city has led to a gradual shift in the modal share in favour of private vehicles. The modal share of public transportation has decreased from 68% in 2003 to 47% in 2008, while the modal share of private vehicles has increased from 32% to 45%, during this period, reflecting the poor state of public transportation in the city. Further, the traffic

Key Features

- Community-based action to create/improve non-motorized transportation (NMT) infrastructure
- Investments for the citizen actions came from contributions by citizens themselves
- Citizen actions received mixed reactions from the government and city authorities

*NMT infrastructure in Guadalajara*
congestion has led to a significant drop in the traffic speeds; the average speed has decreased to a mere 18kmph.

**Proposed government action**

To solve these problems, improvement in NMT infrastructure was considered one of the most important actions by the city government. Consequently, an Urban Mobility Plan for NMT for the Guadalajara Metropolitan Area was developed. This plan proposed an extensive network of footpaths and cycle tracks, extending to almost 1,500 km. This plan was envisaged to cater for approximately 4.5 million people, spread across the metro area of 2,700 square km. But, the plan met with major challenges in its implementation, blamed on the inaction of the city authorities.

**Reason for community action**

A lack of action by the city authorities to promote NMT facilities in the city led to angst and frustration among the general public. As a result, a few independent citizen organisations decided to take action and a community based event called the ‘Ciclovía Ciudadana’, or citizen cycleway, was organised. The main objective of the event was to demonstrate that informal organisations could produce effective results and could significantly contribute in enhancing cycling as a worthy means of transportation in the city. Therefore, the actions undertaken during the community event focussed on carrying out visible actions to improving road safety for cyclists and thereby exposing the inability of authorities to manage the city.

**The community event: Ciclovía Ciudadana**

As part of community action, a group of local teachers and students decided to take direct action and make physical changes on the street. So, informal bike lanes, also called the DIY cycle lanes were painted by the people themselves. All the investments for these events were contributed by the citizens themselves and the total cost of enhancing the NMT infrastructure worked out to be cheaper.

Some of the other similar events in Mexico City focused on enhancing pedestrian infrastructure, in which the citizens painted pedestrian sidewalks and also zebra-crossings at some of the unsafe intersections.
Government reaction

Such actions have received mixed reaction from different government agencies and city authorities. In the case of Guadalajara, the city authorities showed disinterest and refused to take any action to further improve the NMT infrastructure developed by the citizens. Whereas in case of Mexico City, the citizen actions were well acknowledged and were even enhanced further by the local authorities.

Conclusion

Efforts like the Ciclovía Ciudadana in Guadalajara, can be described as a link between public participation and political action. In Mexico City and Guadalajara, the active citizen participation led to the creation of vital NMT infrastructure, enhancing the safety and liveability of the communities. Such actions show that small efforts by the citizens can play a positive role in accelerating creation of healthy communities.

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www.embarq.org
Improving Access and Safety on Roads for Cycling in Jayanagar, Bengaluru

Place: Bengaluru (Bangalore), Karnataka, India

The city of Bangalore is in a state of urban transportation crisis with increasing use of personal cars and two wheelers. In 2011, the city had around 8.5 million people with nearly 4 million motorized vehicle population i.e., one vehicle for every two people. These numbers are further increasing at an alarming rate and accompanied by related problems of congestion, high pollution levels, increase in road accidents, increase in travel times, etc. The poor/low income groups who cannot even afford the subsidized public transport systems and are dependent on walking and cycling for their travel needs, suffer the most. Their problems receive limited attention when planning and designing urban transportation systems.

With growing consensus towards achieving sustainable development and reducing greenhouse gas emissions, cycling

Key Features

- Network of bicycle friendly streets
- Safe routes to schools
- Improved access to institutions and recreational areas
- Better infrastructure for cycling

Lane marking for cycling in Jayanagar

Source: http://www.rideacycle.org/gallery/bicycle-friendly-streets/
has been recognised as an integral element of sustainable urban transportation. Realising the significant benefits associated with the use of cycling, the Directorate of Urban Land Transport (DULT), the government of Karnataka has evinced a lot of interest in encouraging non-motorized transport (NMT), especially bicycles in its cities\(^1\). Owing to the worsening traffic conditions in Bengaluru, DULT felt the need to develop a network of bicycle friendly streets in the city. Based on the proposal of building ‘Safe Route to Schools’ on the streets of Bangalore, earlier recommended by Ride a Cycle Foundation (RACF), DULT identified Gubbi Labs, a research collective for the task of developing a network of bicycle friendly streets to encourage cycling as a safe, convenient and sustainable mode of transport.

The primary aim of the initiative was to create bicycle friendly streets in certain localities in a phased manner. Contrary to the initial proposal of creating the network in Jayanagar only, it was decided to link various destinations spread over different localities in the city and ultimately integrate with the Madiwala Tank Cycle Project (another project taken up by DULT). The network was proposed to start from Makkala Koota (Chamarajapete) and pass through the areas of Basavanagudi, Jayanagar, JP Nagar and BTM Layout. Due to the intensity of the project, it was delivered in three phases. It included the task of building bicycle friendly streets in the areas of Jayanagar in the first phase, Basavanagudi in the second phase and JP Nagar- BTM layout in the third and final phase of the project.

![Safe routes to School Campaign organised by RACF](http://www.rideacycle.org/2012/09/jayanagar-bicycle-friendly-streets/)

\(^1\) Bicycle friendly streets in Jayanagar, Bengaluru by Gubbi Labs (2011)
Jayanagar was selected for the first phase as it is one of the greenest localities of the city and is predominantly a residential locality with a number of educational institutions – colleges and schools. The major target groups were children, beginners or basic cyclists and also advanced cyclists (experienced holders who can ride under any traffic condition). The idea was to create an environment conducive to cycling for all. In the first phase, a route network was developed after properly assessing and analysing the access and destination points along the desired travel corridors. As students were the first intended users, special attention was given to connecting all the schools, colleges, coaching centres, playgrounds, parks, etc. Points of conflicts along the streets especially at the junctions/intersections were identified. Rapid assessment of the critical junctions/intersections falling on the identified routes was done in order to assess the impact of commuting along them. It was observed that there was a serious lack of infrastructure for NMT in the city. Wherever existent in bits and parts, other issues were observed like encroachment, poor maintenance, parking on footpaths, dumping of garbage, enforcement issues etc. which made cycling difficult and unsafe.

The routes identified for bicycling were categorised as ‘Most suitable’ and ‘Moderately suitable’ for cycling and the intersections were categorised as signalised, non-signalised median open intersections and non-signalised median closed intersections. Significant measures were identified to resolve the conflicts on the intersections. Simple measures primarily related to provision/improvement/upgradation of infrastructure were identified which included:

- Marking of bicycle lanes (including bicycle stencil marking), 100 m from all categories of intersections identified.
- Construction of raised pedestrian crossings
- Installation of signages: informative, cautionary and mandatory, at all identified locations
- Installation of informative signages with the network map at prominent locations identified including all schools and colleges in the neighbourhood
- Installation of bicycle parking facility (stands) at all the identified locations.

Bruhat Bengaluru Mahanagara Palike (BBMP) was identified as the main agency for implementation of the above infrastructural measures. Also, clearance of the carriageway of garbage and unauthorized parking at certain locations was done by BBMP. To ensure smooth flow of traffic, strict enforcement of no-parking
zones at least up to about 100 m along the streets leading to the main intersections was recommended. Additionally it was suggested that in cases of high demand for on-street parking in the locality wherever the Bicycle Friendly Streets are identified, alternate day parking shall be permitted at certain stretches. Traffic Police were made responsible for the enforcement of no parking zones, installation of traffic signals at the identified traffic signals, and synchronisation of signal phases for NMT crossings. At the same time, regular initiatives were taken up for sensitization of the user groups and spreading awareness in the area for full realisation of new infrastructure for cycling. RACF played a significant role in achieving the same. It also planned week long campaigns in schools and colleges of Jayanagar.

Currently, the first phase of the project i.e. building bicycle friendly streets in Jayanagar has been completed and inaugurated in mid-2012. The project has helped in making the city streets more bicycle friendly and also revived cycling as a mode of travel in the city. Cycling is now much safer and faster in the city. Through this pilot initiative, it was intended that significant learnings can be drawn out, which aid in scaling up and replication in other localities. The project has gained significant attention from various state governments and city officials.

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Multi Modal Transportation

Integrating BRT system with public bicycle sharing in China

Place: **Guangzhou, China**

Guangzhou is the third largest Chinese city with a population of around 12.78 million in 2010. Initially known for its walkable environments and bicycling, the city had fallen victim to rapid urbanisation and increasing vehicle ownership. As the city continues to grow, the mobility needs are expected to grow very fast. To address these trends, the city has adopted several strategies to plan and implement “green development of urban transport” in the city.

The city started its BRT system in February 2010. Guangzhou's BRT is the one of the highest capacity BRT system with more than triple the peak passenger flows than any other BRT system in Asia. The system, unlike the other traditional low to medium capacity systems, is the first capable of replacing metros in terms of peak hour capacity outside South America (Transmilienio). It carries around 800,000 passengers a day, which is more than any

**Key Features**

- Multimodal approach – Integration of Bus Rapid Transit (BRT) system with cycling infrastructure.
- High capacities equivalent to metro systems

of the city’s five metro lines. With rapid growth along the BRT corridor, it is expected that the Guangzhou system will exceed the one directional passenger flows of all the metro systems in mainland China in a few years’ time. The system also records the highest BRT volumes of 350 per hour in a single direction i.e. roughly one bus every 10 seconds.

The size of all the stations in the system was determined based on the passenger demand, which has resulted in varying lengths from 55 m to 260 m (world’s longest station). At certain stations, direct connections have been made between the metro and BRT stations through tunnels, which has made the intermodal transfers easy and less time consuming. Also, bridges have been designed to connect BRT stations with the adjacent buildings. These various inter-modal connections (BRT system, metro, bike sharing, bike parking, pedestrians, and adjacent buildings) make the corridor a leading example of multi-modal transport integration. The BRT system is operated by more than one operator and currently includes three corporate groups consisting of seven different bus operating companies all operating the BRT routes.

The BRT system incorporates bicycle parking and a new bike sharing scheme in its design so as to improve accessibility at the city level. The public bike sharing system was launched in June 2010 with an initial fleet size of 5,000 bikes and 109 stations. It is a government initiated project with implementation done at the district level. In the first and initial phase of the project, the focus was mainly on developing bicycling infrastructure along the BRT corridors in an integrated manner. The completion of the entire first phase of the project would bring around 15,000

A bike sharing stand near a BRT station in Guangzhou
Source: http://www.transportphoto.net/photo.aspx?id=173251810&c=Guangzhou
bicycles on roads, also placing Guangzhou among the ten largest bike sharing systems in the world.

The stations are built and owned by the government, whereas each district can choose its company for operating the bike system. Several infrastructural measures are being implemented to promote cycling as a safe travel mode. Bicycle lanes have been reintroduced on major roadways including dedicated lanes along the BRT corridors. Parking facilities are also being incorporated at almost every BRT station. Initially 5,500 bike parking positions were opened at the BRT station areas, which included double tier parking racks at several stations. Apart from the public bicycles issued under the project, many of these public bicycle stations also cater to private bicycle parking needs as well. Also automated self-service is being made available at most stations.

Apart from the physical integration of the bicycles along with the BRT system, fare integration is also an important aspect of the project. The payment is done via a smart card called the Yongcheongtong public transport smart card which allows payment for most of the multiple modes available in the city for example, bicycle, metro, BRT/bus and can also be used in various convenience stores. The common card is very convenient to use and makes the payment simple and easy across the multiple public transport modes available in the city.

Further, in order to incentivise bicycle use, the users were initially offered a free first one hour, after which the service is charged

Segregated way for pedestrians connecting a BRT station to a head over bridge
Source:http://www.transportphoto.net/photo.aspx?id=165163159&c=Guangzhou
(1-2h is 1 RMB or 0.16 USD¹, 2-3h is 2RMB or 0.32 USD ,over 3h is 3 RMB or 0.48 USD per hour and so on). Daily users can either opt for a temporary subscription or an annual one. Both the options require an initial security deposit (300 RMB or 48 USD). Most bicycle stations are operational from 7am to 10pm and three stations are open for 24 hours. Route maps are also published indicating the station locations and routes for cycling. The city is also looking at integrating maps so that users can find all forms of public transport modes and choose the best mode to take from any point in the city.

The city is facing several challenges to further expand and implement the project. Urban space is scarce and is of high value, making it hard to find locations for bicycling stations in the city. Secondly, the capital cost of the station is a significant barrier to expansion whereby the operational cost of an additional station is very small. In response to the above, one solution that has been realised is that private entities (hotels, shopping centres, real estate developments etc.) can give space on their property and provide capital to have a station set up on their premise.

Along with enhancing the public transport modes, the city government is involved in building 1,500 km of greenways in all its eight districts. In September 2010, the city opened a greenway namely ‘Donghaochang greenway’ along a polluted former canal, which included a four km off-street bikeway and walkway combined with parks, plazas and playing areas for children along the waterside. The greenways are also planned in an integrated manner especially with the public bicycle infrastructure (lanes, stations etc.) and the BRT stations improving overall accessibility as well as connectivity. Guangzhou’s planning strategies make travel much easier in and across the city.

The Guangzhou’s BRT system incorporates buses, bicycles, pedestrian paths, and smart transfer points to reduce what used to be an hour or more commute down to about 10-20 minutes². It is this integrated approach that earned Guangzhou the International Sustainable Transport Award in 2011. With capacity equivalent to metro systems, this BRT system showcases sustainable mobility solutions for the rapidly growing Asian cities.

¹ 1 USD = 6.24 RMB (December , 2012 exchange rate)
² http://www.doobybrain.com/2011/04/05/bus-rapid-transit-in-guangzhou-china/
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ECOBICI

Promoting bicycling as an environment friendly and low cost mobility solution for the population in Mexico

Place: Mexico, Latin America

ECOBICI is the name given to a bike sharing program launched in the city of Mexico. Mexico, a sprawling metropolis in Latin America with a population of around 9 million (2011) is facing the problem of rapidly increasing vehicles on roads and increasingly unsafe road conditions. To arrest the growing motorization and promote the use of environment friendly modes, the city government introduced its own bike sharing program in 2010 despite an already existing private bike sharing program in the city.

The project was one of the major components of the city master plan as a commitment to ensure a safe environment for cyclists and was intended to be the largest public bicycle program in Latin America. The main idea behind this initiative was to create a new environment friendly alternative to automobile usage.

An EcoBici cycle stand in Mexico

Key Features

- Zero emission technology
- Reduction in automobile usage by promoting bicycling
use. Only 28% of the city residents own automobiles (2009); the program aims to improve the conditions on road for the remaining population by reducing the number of vehicles on the roads. Additionally, the city government has also set a target of increasing the number of bicycle trips from 1.2% to 5% by the end of 2012.

The project has helped in bringing back the city roads to the citizens. The bike sharing scheme serves the rich and the poor alike and has made travel easy, comfortable and safe. Launched in 2010, the project is implemented on a public-private partnership model between the Ministry of Environment (Secretaría del Medio Ambiente) and Clear Channel, one of the world’s largest outdoor advertisement companies. The city government is responsible for providing the stations, whereas the operations and management completely fall under the domain of the private company. Initially funded by the city government (an initial investment of 75 million pesos or about 6 million USD), the system maintenance and operations are now funded by the earnings from advertisements on bicycle stations and other street furniture.

Initially the project was launched with a fleet size of around 1,114 bikes and 84 stations; the system since then has been expanding with around 1,200 bicycles available at 90 bike stations, and 35,000 registered users in 2011. The city government also looked at building 186 miles (300 km) of bicycle lanes in the city as part of the city master plan. Bicycles complement the existing public transport system and fill up the gap.

An EcoBici cycle stand with a card reader installed (right side)

The first phase of the project included implementation of the project in the central area of the city, which had a significant number of cyclists and also some bike lanes and traffic calming projects already existing in the area. Based on the success of the first phase, the network was expanded to the other parts of the city. The users are required to purchase a RFID card better known as the ECOBICI card, which entitles them to bicycle use for a period of one year. With stations spread across the city, the facility allows the users to borrow and leave bicycles at any station provided by the network. The first 45 minutes are free for the users and are then charged based on their usage.

Apart from providing the stations, the city government planned several initiatives to spread awareness and promote cycling as a mode of transport. Proper traffic signages for cyclists were installed at several places. A program ‘Bike-school’ was launched to teach safe use of bicycles as vehicles to the city residents. A special cyclist–police command was brought in to monitor the system and the users. Zones with a speed limit of 30 kmph were also introduced in certain areas. In order to help cyclists navigate the city, the Mexico City Government has also released the Urban Cyclist Manual in 2011, which provides comprehensive guidance for cyclists in the city – a move to help promote cycling as a viable method of transport\(^2\). Significant attention is given to improving accessibility, traffic design, proper enforcement and at the same time to transforming people’s road behaviour to respect the vulnerability of cyclists on the road. Currently, the city has around 42,000 registered users, and it is calculated that some 9,000 ECOBICI rides are taken every day. Accident rates are very low and no cyclist’s deaths have been recorded since the beginning of the program.

The program has proved very effective, especially in catering to the short trips. The use of bicycles in Mexico is continuously growing and expanding. The system has proved very beneficial to the lower class who cannot afford their own vehicles or even the public transport systems. It is expected that the system will have around 275 stations, 4,000 bicycles and 73,000 users making 30,000 trips a day by the end of 2012. This would make ECOBICI, the seventh largest bike sharing system in the world.

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World's Largest Bike Sharing Program

Providing clean mobility options to city residents in Hangzhou

Place: Hangzhou, China

The cities in China have experienced a steady decline in the use of bicycles over the last 20 years. Once known for high modal shares in the favour of bicycles, the mode has fallen prey to rapid motorization, high economic growth, increasing distances and subsequently a deteriorating environment for cycling. To deal with the same, the central and city governments in China adopted the Public Transit Priority policy in 2004. The Hangzhou public bike sharing program is part of the same effort.

The city of Hangzhou, with a population of 6.78 million is one of the richest cities in China. The bicycle modal share in the city had decreased from 60.78% in 1997 to 33.5% in 2007. In light of the growing traffic problems and decreasing modal share of bicycles in the city, the city government launched a public bike sharing scheme in 2008 to support a more ‘Eco mobile transport system’. The main idea was to provide a convenient public bike sharing system for residents and tourists that further encourages

Key Features

• Zero emission technology
• Reduction in automobile usage by promoting bicycling

Hangzhou bike sharing station
seamless public transportation among the various modes (bus, metro, bicycles, etc.).

Initiated and backed by the local government, the system is operated by a state-owned enterprise called the Hangzhou Public Transport Corporation. The system was launched with around 2,800 bicycles, and 61 docking stations (a combination of fixed and mobile stations). Initially the system relied on 31 mobile docking stations i.e. the stations could be moved as needed to meet demand and also for program optimization. The mobile stations were converted into fixed stations, once the travel patterns were determined. An initial investment of around 180 million RMB (USD 26.35 million) was made by the government for the program launch. Also, discounted governmental loans worth 270 million RMB (USD 39.53 million)\(^1\) were provided to the enterprise.

The bike sharing system uses smart cards, automated check-in and check-out, and distinguishable bicycles and docking stations. The smart card is integrated with the city public transit system (bus, BRT and parking systems) and allows a 10% discount to the users for taking bus rapid transit or the bus. The users are required to deposit around 200 RMB (USD 30) for bike sharing use. However, the first hour of bicycling is free, followed by incremental pricing in which the users pay an additional 1 RMB (USD 0.15) for the second hour, 2 RMB (USD 0.30) for the third hour and so on. Additionally, the program also includes 24 hour service centres. Low cost one speed bicycles were used in the

\(^1\) 1 USD = 6.24 RMB (December Exchange rate, 2012)
program in order to limit financial losses in the project from bike thefts and vandalism. Each bicycle is equipped with handlebar baskets and bicycle locks.

In 2011, the system consisted of 60,600 bicycles and 2,416 fixed stations in its eight districts. The stations are located at an average distance of around 300 m from each other. Also, the stations have security cameras installed at each docking station. As a result, the system has experienced little theft and vandalism cases in contrast to some other bike sharing programs in the world. The system operates around 40 stations 24 hours a day due to high usage and the remaining stations operate from 6.00 am to 9.30 pm to allow for maintenance and bicycle redistribution. Bike sharing has become more preferable than private bicycle use due to fear of theft and maintenance concerns. Like many other bike sharing programs, the bike sharing contract is linked to a contract to manage public advertising, which is the main source of funding in the project. The city also has a network of bike only lanes which further enhances bicycle use in the city.

Since its opening in 2008, the daily use per bicycle has increased from less than one to around five rides. It has grown into the world’s largest bike share program. The project has helped in bringing back bicycling as a mode of travel in the city. Bicycle trips in Hangzhou account for 43% of all trips (2011) and daily cover about 1,123,200 km. An automobile covering the same distance would produce more than 200,000 kg of CO2 emissions. Given these figures, and the goal of reaching 175,000 public bikes by 2020, there is potential for further greenhouse gas emission reductions in the city.

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Promoting bicycling as an environment friendly mode of transport in Marikina

Place: Marikina, The Philippines

Often referred to as a bicycle friendly city in the Philippines, the city of Marikina is located at a distance of about 21 km from Manila and is among the most rapidly growing cities in the Philippines.

Marikina Bikeways Network project has evolved from a river rehabilitation program in which an initial 10 km of jogging paths and bikeways were built along the Marikina River. An approximate area of around 220 hectares, formerly occupied by illegal settlers was recovered and then developed into a public space including theme parks and playgrounds. The new public place attracted citizens in large numbers, the majority of whom commuted by bicycles.

Key Features

- Network of bicycle lanes to promote cycling as an alternate means of transport
- Zero emission technology
- Example of good local governance

Participants in a bike race
This led to the idea of promoting non-motorized transportation (NMT) in the city by adopting a pilot project aimed to promote the NMT component of the Metro Manila Urban Transport Integration Project (MMURTRIP) in 1997. The proposal connecting the recreational paths to an on-street bikeways network was developed by the Department of Public Works and Highways (DPWH). The main intent was to provide an alternate mode of transport to the city and at the same time reduce air pollution and traffic congestion problems in the area. As the city traffic problems had not grown beyond tolerable levels and also a large share of trips were still made by bicycling, the city was considered as the most ideal site for the implementation of the proposed project.

The Marikina Bikeways project, a city government initiative aimed to provide facilities for low cost and environment friendly alternate means of transport to the city residents. The World Bank supported the initiative and also offered USD 1.3 million funding through Global Environment Fund (GEF) for conducting a pilot study on introducing a bikeways project in the city. The proposed NMT system consisted of the following components:

- Creation of 66 km of bikeway network with 49.7 km of segregated bikeways on existing roads and 16.6 km of bikeways along the Marikina river, connecting to the new LRT station
- Traffic calming and pedestrian facilities around schools and market areas

Bike lanes in the city
Source: http://brommieskywalker.blogspot.in/2011/02/my-brompton-goes-to-marikina.html
• Provision of bicycle parking at key interchanges
• Public outreach and awareness programs
• Organising bicycle safety programs
• Monitoring and evaluation programs

The implementation work started in 2002. An ‘experimental’ approach was adopted to allow opportunities of timely evaluation and adjustments/changes if required in the course of bikeways construction. The existing bikeways network connects the city’s residential areas, particularly the low income communities to employment centres, markets, schools, government offices, and the LRT station. Around 19.3 km of bike paths or 42 per cent of the total 66 km of the planned network was built out of the World Bank funding and the remaining was built out of local funds. Around Philippine Pesos (PHP) 14.9 million (0.36 million USD) was invested in parts by the city government. Majority of the bikeways run parallel to the river and its creeks, while others run next to the major thoroughfares and in quiet subdivisions.

To deal with the barriers to city cycling, several supporting programs were implemented within the city, which included initiatives like:

• Attractive loan schemes (interest free, 6 months to pay) for the city employees.
• Bicycle safety education in schools and organisation of Saturday Cycling Clinics dealing with basic bike maintenance, bike commuting, minor repairs and more, which had participation of children and women learners
• Safety information dissemination activities
• Organizing and/or sponsoring annual cycling competitions and regular cycling advocacy events to promote cycling as a sport and also promote air quality protection
• Building more complementary bicycle facilities, such as better bicycle traffic flows and informative signages, innovative design on bicycle lane pavement markings and installing bicycle parking and bicycle stations to enhance overall bicycle trip experience

The project gained significant recognition as one of the best practice in promoting cycling as an environmentally sustainable mode of transport. It was also cited by the Galing Pook Foundation as one of the top ten outstanding local government programs in 2005.
References

Marikina Bikeways: Bicycle Planning and Evaluation Toolkit (2008); DENR-UNDP Environment and Natural Resources Capacity and Operations Enhancement (ENR-CORE)

http://pcij.org/stories/two-wheel-revolution/
http://www.innovations.harvard.edu/awards.html?id=41311
NMT project in Temeke, Dar-es-Salaam

Place: Temeke, Dar-es-Salaam

In Sub Saharan Africa, the majority of the urban residents are poor and are highly dependent on non-motorized transport (NMT) for their daily trips. Walking is very dominant with modal shares as high as 40-50% of the total daily trips in the cities. Bicycling is not very common and is almost negligible. The low bicycle use in the cities can be mainly attributed to lack of dedicated NMT infrastructure facilities, high accident rates and financial inability of a large section of the population to purchase a bicycle. The city lacks the very basic infrastructure facilities for NMT users. Consequently, pedestrians and cyclists have to struggle for space with the other faster motorized modes of transport. As a result, traffic accident rates were high and involved NMT users form the most vulnerable road user group. Despite having the highest

Key Features

- Defined set of interventions
- User group participation
- Emphasis on traffic calming measures

Effective carriageway and shoulder separation
share in daily trips and being subjected to maximum road related
disks, NMT has continuously been neglected by city planners and
policy makers in Africa.

To deal with the above problems, the World Bank and the United
Nations Economic Commission for Africa (UNECA) carried out
a program known as the Sub-Saharan African Transport Policy
Program (SSATP). The main idea was to facilitate policy making
and capacity building in the transport sector. The program gave
significant attention to improvement of NMT infrastructure
and services in the cities owing to the high NMT shares and
low safety conditions on road. Four cities were selected for pilot
project implementation, namely Nairobi and Eldoret in Kenya,
and Dar-es-Salaam (Temeke district) and Morogoro in Tanzania.
The studies and pilot projects were carried out by an international
team of consultants; national teams in Kenya and Tanzania and
the municipal teams from the four selected cities. The projects
were carried out during 1995-99 with financial help from the
Dutch Government.

The main aim of the project was to improve mobility and
accessibility of all the user groups in the selected cities at an
overall lower cost. To achieve this, three main interventions were
planned, which included the following:

- Building special infrastructure for pedestrians and cyclists,
- Introduction of traffic calming measures and
- Supply side interventions to increase bicycle ownership and
  usage.

The NMT improvement measures identified and implemented
in the selected cities revolved around these three interventions.
In this case study, the interventions implemented in the city of
Dar-es-Salaam (Temeke district) in Tanzania are discussed. The
cases of Nairobi and Morogoro are discussed in the next two case
studies.

Dedicated walkways and bicycle lanes, car free road shoulders,
construction of missing NMT links and the provision of short cuts
for NMT users were the priority in the first set of interventions
undertaken in Dar-es-Salaam. Measures related to intersection/
junction re-design, speed lowering, speed humps, road narrowing,
raised zebra crossings, etc. and pedestrian crossing islands and
medians, were taken as part of traffic calming to increase the safety
for NMT users. To increase the use of bicycles and lower the travel
time of the poor, supply side interventions like credit/ discounted
sales of bicycles, introducing bicycles for women, cycling lessons
to school students, encouraging bicycle hire businesses and providing organised bicycle parking were undertaken.

Temeke is an old low-income area in the centre of Dar-es-Salaam with a population of above 150,000 people. Pilot Project Unit (PPU) was established within the local government structure (Municipal Engineering Department) for implementation and ensuring user participation. For user participation, General User Platform (GUP) and Local User Platform (LUP) were created for users to voice their opinion and be heard by the concerned authorities. The GUPs had representatives of various user groups and became the advisory group to the local government. The LUPs had representatives living in the immediate vicinity of the proposed interventions and played a major role in the planning, design and implementation stages. The PPU overcame the disruptions caused by the automobile lobby. Awareness programs were also undertaken to campaign about road safety for the NMT users.

The two main NMT improvements taken up at a priority level were: safe crossings and traffic calming on Temeke Street and constructing NMT only bridges on the Yombo River to improve safety for pedestrians and to improve NMT connections. Dar-es-Salaam City Commission (DCC) approved the plans, which consisted of five raised zebra crossings, two speed bumps on Mahunda Street and street corner realignments. Test realignments were conducted with removable oil drums filled with concrete to demonstrate the effectiveness of the intervention to reduce vehicle speeds and improve pedestrian safety, which were then constructed. Raised zebra crossings and bus bays and restrictive parking on the NMT lanes were introduced. Physical segregation between the motorized and NMT modes was provided by bollards, non-mountable pre-cast concrete curbs and blocks. The construction and repair of the Yombo River bridges in Temeke were completed with the free labour of the local community. The next main intervention included creation of safe, direct and comfortable access to the Central Business District (CBD) of Temeke with a pedestrianized core access network to the market from three sides, with a minimum number of crossing points with roads at a cost of around USD 70,000. USD 15,000 was for walkways, USD 19,000 for carriageway reconstruction, and USD 38,000 for the drainage system.

The traffic calming measures brought down the vehicular speeds from 30kmph to 10-25kmph and reduced the number of pedestrian accidents substantially over the years that followed. Most people felt more safe and at ease after the traffic calming
interventions. The CBD interventions received a positive response from all the road users including motorists. The (pedestrian) Average Daily Passenger Traffic at different spots varied from 1,000 to 4,000, right after opening up of new walkways and was expected to rise. The average travel time gain by pedestrians using the new walkway was estimated at four minutes per km. The traffic calming measures throughout the road network along with cycle lanes also encouraged bicycles to a larger extent. The project illustrated that traffic calming measures throughout the road network must be a primary objective, along with the provision of safe NMT road space to provide a safe and efficient NMT environment.

References:


Improvement of Walking and Cycling Infrastructure

Interventions undertaken in Nairobi

Place: Nairobi, Kenya

Nairobi city is spread over an area of 696 sq. km and houses a population of nearly 2 million inhabitants. With growing urbanization and motorization levels, the city has witnessed the problems of heavy congestion, rapid population growth and motorization, lack of long-term urban planning, poor air quality, and growing inequity. Nearly 47% of the total daily trips in the city were made by pedestrians followed by another 42% by public transport. Bicycling comprises only 1% of the daily trips in the city and is not very common. At the same time, pedestrians and cyclists are the most vulnerable group with a high share in road accidents.

As stated in the previous case study, to improve mobility and accessibility of all the user groups in the city at an overall lower cost, Nairobi was selected for NMT pilot project implementation along with three other cities namely Eldoret (Kenya) and Dar-es-Salaam (Temeke district) and Morogoro in Tanzania under Sub-Saharan African Transport Policy Program (SSATP). In Nairobi, significant attention was given to reducing traffic speeds on certain roads like Jogoo road and Nile road. These roads accounted for

Design of speed bumps on Nile road (not to scale)


Key Features

- Focus on improvement of pedestrian safety
- Provision of non-motorized transport (NMT) infrastructure
- Introduction of traffic calming measures in areas with heavy traffic
the maximum number of accidents in the city and were facing other problems of heavy congestion, air pollution, and high noise levels. To deal with these issues, certain traffic calming measures were adopted to reduce traffic speeds and improve road safety along with NMT infrastructure development.

Infrastructural changes introduced included development of dedicated walkways/sidewalks, cycle tracks and bicycle lanes, construction of missing NMT infrastructure links, and installation of bollards on roadsides to prevent motor vehicles from driving and parking on shoulders or walkways. Traffic calming measures introduced in the main congested areas of the city included installation of speed bumps, raised zebra crossings, pedestrian crossing islands, medians, road narrowing with bicycle slips and bus bays. Several intersections were re-designed keeping in mind the safety concerns of the pedestrians as well as other road users.

Jogoo road is a five km long urban corridor in the city. Minimum interventions were implemented on the Jogoo road, as it was believed that it would disrupt the already congested traffic flow on the road. It included measures like demarcation of pedestrian waiting areas with steel bollards, painting zebra crossings, installation of road signs and guardrails at crossing points, etc.

**Nile Road Interventions**

The Nile road is a collector road in the city passing along two schools, which generated a lot of pedestrian traffic around them. The road was 7-8 m wide and had no intersections in its immediate vicinity, which attracted high speeds. The average number of pedestrians crossing in front of one of the schools was 830/day (620 children and 210 adults) with similar numbers near the other schools.

Given the unsafe conditions, speed bumps and signages were introduced in the area on the recommendations of a school teacher. The main idea was to create safe traffic conditions for the pedestrians, especially for primary school children by considerably reducing the average speeds of the motorized traffic in between the bumps. An average speed of 15-20 kmph was targeted at the school crossings. To achieve this, three round shaped asphalt concrete bumps were installed. The bumps were designed to be nearly 10 cm in height with a slope of 1:10. As the roads were already surfaced (bitumen surfaced), no additional work was required. The construction cost for implementing the interventions was around USD 2,400 and an annual capital and maintenance cost of USD 510 was also required.

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1 Non-motorized Transport in African cities: Lessons from experience in Kenya and Tanzania; By V. Setty Pendakur (September 2005)
The interventions got a very positive response from the pedestrians including teachers, parents as well as school children. The speed bumps proved very useful in achieving the desired reduction in average speeds, from around 62kmph to an average of 20kmph in between the bumps. However, the road capacity was not impacted with the introduction of speed bumps. Also, no serious road accidents or vital traffic conflicts were observed over an observation period of one year after the implementation. The number of prevented injuries was reported to be significantly high.

The pilot project brought about significant improvement in the NMT environment, which benefitted the poor who rely heavily on NMT for their daily travel. The interventions were highly cost effective and improved the overall mobility and accessibility in the city. The case study demonstrates that significant improvement in NMT infrastructure can be brought about by minimal infrastructural interventions.

References

Non-motorized Transport in African cities: Lessons from experience in Kenya and Tanzania; By V. Setty Pendakur (September 2005); Sub-Saharan Africa Transport Policy Program (SSATP), Working Paper No.80

Creating a safe walking and cycling infrastructure

Pilot project in Eldoret

Place: Eldoret, Kenya

Eldoret is a medium sized city in Kenya with a population less than 150,000 inhabitants. Historically, the city has had a high share of walking and cycling. However, these sections of daily commuters have been victims of most road-related accidents. As stated in the previous two case studies, Eldoret was chosen as one of the pilot cities under the Sub-Saharan African Transport Policy Program (SSATP) to improve the NMT infrastructure and promote safety of NMT users. The project was implemented from 1995 to 1999 with financial contributions from the Ministry of Foreign Affairs, Netherlands.

The pilot projects for improvement of NMT facilities were taken up in the city. The key approach to improve NMT infrastructure included:

- Approach was to plan for specific local needs with the help of user groups
- Separation of non-motorized transport (NMT) facilities from the main carriageway
- Emphasis on traffic calming measures
- Test interventions before large scale implementation
- Increasing levels of cycle ownership

**Key Features**

**Physical separation using bollards**

• Pilot testing of NMT measures and policies,
• Institutional development and capacity building of local authorities, and
• Training of professional staff

The primary objective of the pilot project was to explore instruments, which could enhance efficient walking and cycling. Several interventions were implemented according to the local needs and their performance was monitored to take up further interventions of the same nature. The local authorities of Eldoret were taught on matters relating to NMT mobility planning, improving mobility and accessibility at low costs, and meeting the needs of road users including pedestrians, cyclists and motorists.

The mobility planning adopted for the city of Eldoret comprised of two components: preparation of an urban mobility plan for pedestrians and cyclists and the provision of spot improvements for non-motorized transport infrastructure in tune with the mobility plan. The Pilot Project Unit (PPU) in Eldoret was led by engineers and the interventions underwent considerable review before implementation. Some of the test interventions were taken up at Uganda road, Kisumu road and NMT bridge at Sosiani River and involved interventions like parking rearrangement, pedestrian crossings and NMT tracks, road layout realignment for traffic calming, and constructing a new concrete bridge and a new steel footbridge.

Physical barriers were constructed using solid concrete blocks on the road surface to create division between motor vehicles and NMT users and to prevent vehicles from parking on the cycle path. This was clubbed with municipality’s development controls to forbid hawkers on pavements through enforcement. Pedestrians and cyclists could thus use new NMT lanes without any obstruction. The concrete blocks were chosen for this purpose because they were largely maintenance free and vandal proof. Along with benefitting the NMT users, these interventions also benefitted the motorists as the carriageway became much safer because of reduced conflicts between the two modes and reduced dangerous overtaking manoeuvres. On certain roads like the Kisumu Road, redesign of on-street parking was carried out to accommodate a cycle lane and traffic calming measures like speed bumps were deployed to reduce speeds. All these interventions made the NMT infrastructure very attractive and all pedestrians refrained from using the carriageway. Also, improved murrram footpaths were constructed in certain areas to facilitate and increase pedestrian usage. The new footpaths separated from
the carriageway were ranked highly as one of the more successful NMT interventions leading to higher NMT movement along the improved roads. To increase the levels of bicycle ownership, the Savings and Credit Cooperative Organization (SACCO) of Raymond Textile Factory (a large private firm) started a bicycle credit scheme for its members and offered 300 bicycles to its members on credit.

The impacts were measured to assess the effectiveness of the interventions. Among the implemented actions, notable was the new NMT Bridge and track over the Sosiani River, which was a cost effective investment that increased the number of cyclists using the facility by 100%. In the first three months after the construction of the concrete medians on the roads, a 13% increase in cycling was noted. Bicycle network improvements made simultaneously on Uganda Road and on Kisumu Road led to the shift of riders from the mini-bus to bicycles as people already owning bicycles shifted immediately. The project was successful in improving and providing safe NMT facilities in Eldoret and the residents of the city sanctioned their approval by using the facilities and shifting to NMT use.

References

Section F
Promoting NMT: Innovative pilot projects
Being a primary mode of travel for the poor, various efforts are being undertaken across developing nations to address the issue of pro-poor mobility through prioritizing development of non-motorized transport infrastructure. Five case studies have been included under this section, which demonstrate some of the pilot projects which address the issue of lack of NMT facilities by adopting innovative approaches.

- **Bicycling Empowerment Network, Namibia**: Providing a means of private transport to rural population
- **Project Rwanda**: Providing better transport options to the coffee farmers
- **Bicycling Empowerment Network, South Africa**: Enhancing mobility among youth living in poor settlements
- **Cycling out of Poverty (CooP)**: An Africa-wide initiative to promote bicycling as a pro-poor mobility option
- **Development of bicycling infrastructure in Guadalajara, Mexico**: An initiative by a citizen group
Bicycling Empowerment Network, Namibia
Providing a means of private transport to rural population

Place: Namibia, Africa

The Bicycling Empowerment Network (BEN), Namibia was started in 2005 by Mr Michael Linke in partnership with BEN, South Africa to empower the disadvantaged Namibians through bicycles. BEN, Namibia was mainly formed to distribute donated bikes to health care workers (mainly rural women) and establish community based bicycle workshops. The main objectives of the organisation include providing affordable and sustainable transport to the poor, providing means of sustainable income generation through bicycles, promoting cycling as a means of transport and improving sustainable transport infrastructure in Windhoek. BEN also works for the global 'bicycles for development' for sub-Saharan Africa. By introducing bicycles as an affordable and reliable transportation mode, BEN has been able to improve livelihood options for the rural poor.

The donated bicycles by organisations in the West are repaired and refurbished and sold at affordable prices by community members. BEN provides them with mechanical skills through trainings and also gives access to tools and spare parts required for the work. It is preferred to distribute bicycles through established

Key Features

- Reuse of bicycles discarded in the west for distribution among the rural poor in Namibia
- Bicycles for women and rural health workers
- Medical transport systems for the poor
- Bicycle Empowerment Centres
- Employment generation

*Medical worker with a bicycle ambulance*
local cycle repair shops to enhance community involvement and the sense of ownership. New entrepreneurs are also encouraged to start bike shops. Women are especially encouraged to take up repair and maintenance activities. Bicycle Empowerment Centres (BEC) have been set up with the help of 'Bicycle for Humanity' for a distribution model. BEC is a shipping container loaded with 300 bicycles, tools and spare parts and then handed over to the community after extensive training to run as bicycle workshops and distribution centres. BECs remain under BEN for support and monitoring. The incomes generated from the BECs are used to fund future supply of bicycles and spare parts and a share of the profits goes towards community development. School children and outreach volunteers also receive a portion of the bicycles through BECs.

Rural women work as the majority of the home-based health care workers in Namibia helping HIV/AIDS and vulnerable children. Prior to the BEN program they had to walk long distances for work without access to any other means of mobility and enduring their disadvantaged status in the communities. BEN has also started a pilot micro finance scheme for bicycle ownership for the women to make cycling more accessible to them.

BEN is researching and advocating the impact of transport in health care access. The Namibians spent on an average N$20 - 40 (USD 2.31 – 4.62 ) every month on transport for health purposes and N$400 (USD 46.23) on emergency transport services. With the access to bicycles, the disadvantaged groups can now access health facilities at much lower costs. The main initiative of BEN for this cause is the bicycle ambulance program for the use of health workers through community based organisations to fill the gap where no such services exist and the poor do not have access to a private vehicle. These ambulances are equipped with pulling handle for crossing thick sand and stand-alone use, a removable stretcher with adjustable backrest, carry bag for basic medical

A Bicycle Empowerment Centre

supplies, sun shade and standard mountain bike wheels. The workers receive training on use, maintenance and management of these ambulances. These ambulances are expected to meet the needs of communities until public emergency ambulance systems are set up.

BEN is actively involved in advocating improved conditions for cyclists in the city of Windhoek and working with government authorities and other stakeholders for building cycling infrastructure. They were successful in raising N$4,000,000 (USD 462,346.03) from the City of Windhoek Council and Euro 40,000 (USD 52,339.90) from Interface for Cycling Expertise (ICE). But the process of planning has yet to be started. BEN is also involved in HIV/AIDS awareness through cycling and bicycling racing awareness programs.

Several organisations like Institute for Transportation and Development Policy (ITDP), Tour d’Afrique, US Embassy, Australian High commission, Yelula/U-Khai, Bicycles for Humanity, Rotary International, etc. are involved with BEN. The organisation is now focussing on making the project sustainable. The project has been able to bring social awareness and has promoted social unity in the communities in Namibia. Through improved access to employment opportunities, education and health, BEN has reduced the vulnerability of the disadvantaged communities.

References


1 USD=8.66 N$ (December Exchange rate, 2012)
Project Rwanda

Providing better transport options to the coffee farmers

Place: Rwanda, Africa

The economy of Rwanda is largely dependent on its coffee industry. A critical part in the production of coffee is the quick transportation of ripe coffee cherries from the fields/plantations to the central washing stations (CWS) because the quality of the cherries decreases with time after picking. To aid the poor, small scale farmers in Rwanda who had no means of transporting these coffee cherries other than hand drawn wooden carts or walking carrying heavy loads, a non-profit volunteer organisation was formed. Project Rwanda was founded in 2005 by Mr Tom Ritchey; the project focussed on providing specially designed coffee bikes to the farmers through co-operatives.

Key Features

- Aid to coffee farmers
- Provision of long hauling bicycles for coffee transport
- Micro financing scheme
- Increase in incomes of coffee farmers

The coffee bike provided to coffee workers through Project Rwanda

Source: http://projectrwanda.org/cargo-bike
It was found that if the transport time of cherries was reduced from 12 hours to 6 hours, quality of the coffee increased (4-5 points higher) and received higher premiums for the coffee sold per pound. Therefore, to facilitate easy and cheap transport of coffee cherries, bicycles were introduced. Prototypes were designed and tested through pilot projects by Ritchey Design Inc. and the best selected were taken up for production during the first year of the project. These bikes are then produced cost effectively (approximately USD 100.00 – 200.00 per bike) by foreign vendors and exported to Rwanda for distribution, with Project Rwanda as the facilitator. Ritchey Design Inc., Rwanda Smallholders Specialty Coffee Company (RWASHOSCCO), Texas A&M University (management), U.S. Agency for International Development (funding) are the collaborators associated with Project Rwanda in this project. In 2012, Project Rwanda has started a partnership with West Hills Coffee, a for-profit enterprise to look after the sales distribution and to make the program sustainable.

The coffee bikes were distributed through co-operatives who did not have funds of their own, to member farmers on micro financing mechanism. The co-operative was required to be associated with the Sustaining Partnerships to enhance Rural Enterprise and Agribusiness Development (SPREAD) project of U.S. AID and the Texas A&M System. The micro financing system subsidises the cost of the bike and requires the recipients to repay a percentage of the bike cost at low interest rates. The bike cost for the farmers is 20,000 Rwandan Francs (USD 50.00¹), which has to be repaid in three year time. The cycle credit was given to interested farmers on the basis of their ability to repay the loan and the number (< 300 trees) and maintenance of their coffee trees. The beneficiaries are asked to bring their coffee cherries to the CWS before three pm, so that the bike coffee is processed separately and then sold at premium prices. It has been estimated that these premium prices will enable the coffee farmer to repay the loan and also use the revenues for health, education, food and home improvements. Project Rwanda provided the farmers with tools to maintain their bikes and set up bike maintenance facilities. Project Rwanda is also involved in activities to improve the image of Rwanda as a tourist destination through cycling and improve the nation’s Gross Domestic Product. The organisation is now involved in developing infrastructure for Rwandan Bike industry to manufacture the bikes locally and at cheaper prices than the imported bikes.

¹ 1 USD=400 Rwandan Francs (December Exchange rate, 2012)
The coffee bikes have helped the coffee farmers in Rwanda to increase their quality of coffee and increased their income levels. In 2012, the organisation had distributed over 2,500 bikes since 2005. The bicycle is being considered as a major capital asset in Africa, these coffee bikes also are used by the farming families as collateral for loans and to generate supplementary incomes. These bikes are additionally used for daily activities and attending community activities/events. These coffee bikes are turning out to be a cost-effective, practical and environment friendly solution for the transportation and hauling needs of the coffee farmers in Rwanda and helping the entire nation through the increased coffee export returns.

References


http://projectrwanda.org
Bicycling Empowerment Network, South Africa

Enhancing mobility among youth living in poor settlements

Place: South Africa

The Bicycling Empowerment Network (BEN) South Africa was established in Cape Town in 2002 with the objective of poverty alleviation through enhancing mobility of the poor and thus providing them access to larger economic opportunities. With the conviction that bicycles could play a pivotal role in changing the socio-economic condition of people in South Africa, BEN began its operations.

Operational mechanism of BEN

BEN imports second-hand cycles from countries in Europe, Australia, Asia, etc., and distributes them to low income people in different parts of South Africa. BEN has 17 bicycling Empowerment Centres in South Africa and has imported around 7,000 bikes,

Key Features

- Second hand cycles from different countries are imported and distributed among low income people
- Aim of this program is to enhance economic opportunities for low-income people
- Repair and training facilities are also provided together with distribution
- BEN also advocates development of safe NMT facilities

BEN’s training initiative at schools

Source: http://www.benbikes.org.za/updates-gallery.php#bec
to date. The bicycles are distributed in the schools, employment centres, and environmental organizations for distribution under the sustainable livelihoods program.

Once the bicycles have been imported, workshops are set up in areas wherever it is considered that requirement for low-cost transport exists. In the workshop, bicycles are stocked along with tools to support cycle repair works.

**Training and distribution**

Training is an integral part of the bicycle distribution process. The bicycles are distributed to disadvantaged people and focus is also laid on understanding their specific travel needs. Since, cyclists are one of the most vulnerable road users, it becomes all the more important to train and educate them about the safety aspect. Such efforts not only enhance the safety of cyclists but also of the other road users. The training programs conducted by BEN vary from a one day brief training session to a two week long extensive program.

**Advocacy for safe NMT network**

BEN also advocates a safer bicycling environment through development of bike lanes and paths and secure bike parking facilities in the cities. While undertaking bicycle and training programs in different parts, BEN conducts surveys to understand
the travel pattern of people. Through these surveys and its own expertise, BEN helps the city authorities in traffic management, and in developing a safer and better network of bicycle paths in the cities. Apart from providing a low cost transport mode, BEN also implements programs, which help people with varied travel needs, to travel safely, like, ‘safe route’s to school’, work program, etc.

**Poverty alleviation**

The purpose of providing low-cost mobility options to the youth is to assist them to access economic opportunities and consequently reduce poverty. The project itself has a number of training and job creation initiatives for the local people, like cycle repairing, imparting safety training, etc.

**Conclusion**

BEN has been contributing significantly towards promoting pro-poor mobility in South Africa. It has directly empowered the poor by enhancing their access to economic opportunities. It is also playing an important role in ensuring a safe bicycle environment through imparting training and assisting the cities in building a safe bicycle network. Such an initiative has multi-dimensional advantages in terms of enhanced employment opportunities for the economically weaker, reduction in poverty, higher mobility, health and environmental benefits.

**References**


Cycling Out of Poverty (CooP)

An Africa-wide initiative to promote bicycling as a pro-poor mobility option

Place: Africa

African countries have a large section of poor populations who are compelled to walk long distances daily to meet their travel needs for work, school, etc. often carrying a heavy load as well. This is mainly due to their inability to afford other modes of transport, lack of any form of public transport services and lack of resources to buy a bicycle. To address the mobility needs of poor in Africa, Cycling out of Poverty (CooP) was launched in 2006 with the idea of making bicycles more affordable and promoting the use of bicycles as a mode of travel.

CooP-Africa is a charity, which supports small entrepreneurs, students and health workers in Africa by making bicycles more affordable to them. Since its launch, six different local partner organizations in six different countries across Africa namely Uganda, Kenya, Rwanda, Ghana, Togo and Burkina Faso have

An African man with his bicycle

Key Features

- Promoting bicycle as a tool to move out of poverty
- Improving access to basic socio-economic services & facilities- work, school, healthcare centres, etc.
- Bicycle design modifications customized to meet business needs and local conditions
been identified and incorporated with CooP. They collectively work towards promoting the bicycle as a means of coming out of poverty. CooP and the partner organizations work towards making innovative modified bicycle designs available to the locals, which help them improve access to work, school, etc.

Several projects have been launched under the main themes of Bike4school, Bike4work, Bike4care and African Bicycle Design. Some of the projects launched include Cycle to School (Katakwi, Uganda, 2008-2009; Kisumu, Kenya, 2009), Bicycle Ambulances (Katakwi, Uganda, 2008-2009), Bicycle Workshops (Kisumu, Kenya, 2009-2010), and Curriculum Development for Bicycle Mechanics (Kenya, 2009). These projects demonstrate developing poverty reduction programs in a way that help improve environment as well. Apart from the above, an African Bicycle Network, a network of various organizations in Africa working on promoting bicycles and cycling was also launched in 2009 so as to allow knowledge and experience sharing between the partner organizations.

Under the initiative, people who cannot afford to buy a bicycle but have a vision on how a bicycle can help them improve their livelihood, can apply for a bicycle on credit via any of the partner organisations. Small entrepreneurs including farmers, traders, waste collectors, water vendors, etc. see the bicycle as a tool to cycle out of poverty and also improve their well-being. CooP and its partner organizations support these small entrepreneurs and other potential users in purchasing bicycles using micro-credits, providing modified bicycle designs suitable for small businesses, and training users on bicycle mechanics and technical aspects. Training centres and bicycle workshops are also set up
by the involved agencies to provide assistance to the locals for buying/selling, repairing and modifying their bicycles for better opportunities. Women workers are encouraged to participate in the various projects/schemes. CooP also helps the various community groups in implementing bicycle micro-finance projects within their groups (train them on developing leadership skills, credit and savings, etc.).

Generally, the poor in African countries live far away from healthcare centres and are forced to walk long distances even when sick. The projects under Bike4care have helped in improving their accessibility to medical facilities with the introduction of mobile pharmacies. Also, the medical staff can now visit more patients each day. The Bike4school initiative has also reduced distances for the students as well as teachers and helps them in performing better in school.

Based in the Netherlands, the organisation, CooP, comprises a six member board and has established an office in East Africa. The main functions of the organisation include:

- Raising funds and identifying companies, institutions and donor agencies;
- Spreading awareness;
- Lending support and coaching partner organizations in Africa to develop projects to promote the use of bicycles;
- Facilitating knowledge exchange by linking global partners, e.g., on bicycle designs;
- Focusing on small entrepreneurs – mainly women; and
- Improving access to bicycles via micro-credits using local partner organizations in Africa.

CooP has made bicycles more affordable to the commons. The bicycle design modifications customized as per the business needs and the local conditions have helped in encouraging the use of bicycles significantly. It has also helped in making schools, employment areas, etc. more accessible to the local residents. It has improved the employment opportunities for many households in Africa and also helps them in generating more income. The initiative demonstrates the positive aspects of some practically feasible ideas in promoting bicycling as a tool to move out of poverty in developing countries in a way that can also help in improving the environment as well.

References

Based on information provided in www.cyclingoutofpoverty.com
Development of Bicycling Infrastructure in Guadalajara, Mexico

An initiative by a citizen group

Place: Guadalajara, Mexico

Guadalajara, the second largest city in Mexico suffered from poor infrastructure for bicyclists. There was an acute shortage of bike parking facilities in the city, discouraging the use of bicycles as a mode of transportation. Government’s apathy towards this cause led to ‘Bicipublica’, a group of bike activists to develop bicycling infrastructure in the city. The group of industrial designers experiencing difficulty in commuting was drawn towards issues related to mobility and urban design. Absence of bike parking facility at their work place instigated them to design a bike rack. The bike rack developed by Bicipublica is called the ‘Ciclo Puerto’ and has a capacity to hold six bikes in a space equivalent to one car.

One of the challenges for Bicipublica was to install the parking facilities on the streets. Bicipublica adopted an innovative approach

NMT infrastructure in Guadalajara
towards developing a network of bike parking facilities in the city. Cycle racks were designed with the logo of the business/shop where the bike rack would be installed and a bike map, for the convenience of the bicycle users. These cycle racks were readily purchased by the local businesses all around the city. Thus, cooperation of private business was an important element of success of the Bicipublica cycle plan. After successfully installing cycle racks in the city, using bikes became extremely convenient in Guadalajara as bike parking was now installed at public places like, cafes, mini markets, restaurants, bars and stores. Further, Bicipublica mapped all the cycle racks on a Google map and made this application available on their website: www.bikla.net.

After witnessing the success of Bicipublica in developing the bicycling infrastructure in the city, the municipal government extended assistance by offering them a grant to expand the Bicipublica cycle parking plan.

The model so conceived for developing cycling infrastructure in the city was a win-win situation for both Bicipublica and for the local businesses, as Bicipublica earned by selling cycle racks to the businesses and the businesses enhanced their clientele by installing bike parking in front of their shops.

Bicipublica further expanded the cycling infrastructure in the city by investing the money earned through selling cycle racks in
developing a “Bikla bike sharing network” for Guadalajara. The Bikla bike sharing system is a financially self-sustainable system with minimum levels of user fees and minimum start-up cost. This system is very simple, affordable and easy to implement, independent of any government subsidies and advertising contracts, unlike the other modern bike sharing systems. The Bikla bike sharing system does not even depend on GPS or any other tracking device. It simply relies on members and local businesses, which are interested in promoting cycling at their location.

To use Bikla bike sharing system, users have to pay a membership fee of 15 USD/year. Members receive a Bikla identity card and a list of Bikla cycle stations with their hours of operations. Every participating business is expected to have internet access and cycle racks or staple style bike racks. At the time of check in and check out, the staff at Bikla station needs to record the details of Bikla members on the Bikla website. According to the usage, the “Bike time” keeps on deducting from the user card.

This system is cost-effective, as it has minimal infrastructural requirements; requirements include bikes, normal keyed locks, bike racks, and internet access by businesses. Moreover, the system does not require the participating businesses to pay anything, except from buying the bike racks and also Bikla does not pay anything to the businesses.

Ever since its launch in 2010, Bikla has become a huge success in Guadalajara. By January 2012, it already had 2,600 members and 21 bike stations. The success of Bikla has led to Guadalajara municipal government and local newspapers to launch their separate bike sharing system in the city.

The cycling activists of Guadalajara have demonstrated that it is possible to bring about positive change in the infrastructure and culture of cities through citizen action. Guadalajara has now become a cycling friendly city and the cycling culture has become an integral part of the city.

References

http://www.activierightofway.org/

http://bikla.net

http://globalgreenways.org/
III. Guidelines for Pro-Poor/Inclusive Mobility Policies and Plans

The ability of the low income population to travel in a quick and affordable manner in order to access socio-economic opportunities has been recognized as a key requirement for improving their overall wellbeing. The case studies presented in this report indicate that the ability of this population group to access their socio-economic needs can be enhanced by formulating appropriate policies and plans. The lessons and experiences from the case studies compiled in this report have been used to develop a set of guidelines for the policy makers; these guidelines lay down the principles that need to be followed while developing policies and plans related to urban development and urban transport.

Guidelines for pro-poor/inclusive mobility policies and plans

The urban development and urban transport related macro policies at national/sub-national level and city level plans need to ensure that urban development and transport interventions are inclusive i.e. they address the mobility needs of the socially and economically marginalized groups like the urban poor. The formulation of these policies and plans has to be guided by the following principles.

1. Urban planning and development interventions like land use plans, slum relocation schemes, redevelopment schemes for inner/old city areas, development of new townships, etc. should not lead to the spatial marginalization of settlements inhabited by low income groups and the urban poor.

2. Policies and plans should promote adequate connectivity of areas inhabited by low income groups and urban poor with public transport services that are affordable, reliable and frequently available, especially during morning and late evening hours. Adequate non-motorized transport infrastructure connecting these settlements to important locations like public transport stops.terminals should also be ensured.
3. In many cities where adequate formal transport systems are not available, low income groups and urban poor rely on informal transport services. Policies and plans should aim at improvement of these services until such a time as robust formal systems are established in the city. The formal systems should by all means be affordable to the poor. Also, integration of informal systems with formal systems should be ensured. This essentially implies that the population depending on informal transport sector for livelihood, should not be affected due to the introduction of new systems. Efforts should be made to include the existing systems/service providers in the new formal systems.

4. A significant portion of low income populations depend on cycling as a means of transport, especially for distances that are not walkable. Policies and plans should promote provision of adequate infrastructure for cyclists such as dedicated cycle lanes on main roads; bicycle parking at public transport stops, market areas, employment places, etc.; and facilities like shade giving landscaping, provision of drinking water and resting stations along bicycle corridors.

5. Adequate provision of infrastructure for pedestrians, many of whom belong to low income groups, should be ensured. Good quality and wide sidewalks/footpaths should be provided along all main roads, so as to segregate and protect pedestrians from fast-moving motorized traffic. Facilities like public conveniences, sitting areas, etc. should also be provided along pedestrian pathways.

6. Since low income and urban poor populations rely heavily on walking and cycling, they have maximum risk of road related accidents. Policies and plans should ensure safety of these groups. Dedicated infrastructure for pedestrians and cyclists on main roads is essential to ensure safety. Additionally, a safe road environment should be provided through proper road designs; provision of street lighting, signages, road markings, signals, etc.; and continual maintenance of roads, sidewalks and cycle lanes.

7. Interaction of slow-moving traffic i.e. cyclists, pedestrians, cycle rickshaws, etc. increases vulnerability to road-related accidents. Traffic crossings are critical in terms of ensuring the safety of slow-moving traffic. Experiences in several developing countries indicate that slow-moving traffic, especially pedestrians do not prefer to use grade-separated crossings like pedestrian under/over bridges, skywalks, etc. Policies and plans should not promote infrastructure solutions for traffic crossings that are not accepted and convenient for pedestrians and cyclists. At-grade crossings that ensure safety of pedestrians and cyclists should be promoted through policies and plans.
8. Users of non-motorized transport have maximum exposure to vehicular air pollution. Policies and plans should promote interventions like technology improvements, setting up of stringent emission and fuel efficiency standards, improvement in quality of fuel, strict inspection and monitoring of in-use vehicles, promotion of alternative clean fuels, etc. in order to reduce vehicular air pollution. The urban poor, who are primary users of non-motorized transport will benefit from such interventions that help reduce air pollution.

9. Policies and plans should protect the right of pedestrians and cyclists over road space and in no way should motorized means of transport gain priority in transport/traffic related planning over pedestrians and cyclists. This implies that equity-principles should be adopted while proposing transport/traffic related interventions and solutions at city level. An equity principle would imply focusing on mobility solutions for people not vehicles i.e. provision of adequate public transport and non-motorized transport infrastructure and low priority to expansion/widening/improvement of road network, construction of flyovers, expressways, etc.

10. It is also very important for the policies and plans to promote the principle of universal access. The needs of several groups within low income population like differently abled, the elderly, women, children, etc., who rely on public transport and walking should be taken care of in the design of transport infrastructure like sidewalks, pedestrian crossings, bus stops, bus designs, public transport terminals, etc.

11. Policies and plans need to promote innovative approaches and schemes that enable access to non-motorized transport modes (bicycles) for the population in general; the low income groups tend to benefit from such schemes, only if they are affordable. Bicycle sharing schemes should hence be promoted through policies and plans and efforts should be made that some services/schemes are also affordable to the low income groups. Low income groups can benefit from these schemes and use bicycles for trips that cannot be managed by walking.

12. Government policies focusing on poverty alleviation should consider facilitating ownership of bicycles by urban poor. Ownership of cycles will improve the ability of the urban poor population to access employment and increase livelihood options. Such schemes can therefore go a long way in reducing the poverty levels and improving the overall wellbeing of the population. In fact, poverty alleviation policies could also consider generating livelihood options for urban poor in the cycle rickshaw and auto rickshaw sector.
13. It is important that transport related projects, especially mega projects like public transport infrastructure creation, construction of roads, etc. are evaluated for their inclusiveness. The positive and negative impacts of these projects on urban poor should be evaluated before and after implementation and alternative strategies/design/interventions proposed to mitigate these impacts. Policies should mandate such impact assessment exercises for transport projects.

14. Successful implementation of pro-poor policies, plans and interventions would require that-
   a. A clear implementation strategy for policies and plans is indicated
   b. Targets and indicators are set to monitor and measure the performance of the policies
   c. Adequate financing sources are identified to implement the identified actions/action plans
   d. Efficient institutional mechanisms are established along with capacity building measures
   e. The policies and plans are reviewed periodically and updated/revised to include changing conditions, unforeseen developments, etc.

Policies and plans should ensure inclusion of all the above components for successful implementation.
IV. Conclusion

Cities in developing countries are witnessing rapid growth in their population, which is also reflected in a sharp increase in travel demand. Usually, the rise in urban travel demand outpaces the expansion in transport infrastructure and services, creating an acute shortage of transport supply, thereby affecting the socio-economic development of low income populations. It is now being widely recognized that there is a need to address the mobility concerns of the poor in the most efficient and sustainable manner to ensure equitable socio-economic growth and reducing poverty. The report ‘Pro-poor mobility - Policy guidelines and case studies’ brings together best practices on pro-poor mobility initiatives from across the developing world. The report is expected to offer useful insights to the cities in the developing countries that are aiming to address the mobility concerns of the poor.

The case studies and best practices presented in the report highlight different types of pro-poor mobility initiatives ranging from provision of public transport and NMT infrastructure to improvement of the informal transport sector. The best practices relating to informal transport sector improvement from cities in India, Indonesia, South Africa, etc., highlight that most of these initiatives have been taken up by individuals, without any government support. The majority of the initiatives involve small actions, but such actions have changed the entire socio-economic and mobility scenario in the context area, by significantly improving the condition of operators, as well as increasing the level of mobility. Some of the case studies on informal transport sector improvement from Bogota and Dar-es-Salaam indicate the kind of actions that can be adopted by governments to improve the informal sector. These case studies show that government can intervene through legislative reforms and incentive-based policies to encourage the informal transport sector to become
more efficient, complimentary to existing public transportation and eco-friendly.

The case studies also provide some insights into solutions for improvement of environmental performance of the informal transport sector and indicate that the city governments would have to play a pro-active role to limit environmental pollution caused by informal transport modes, while also ensuring that the levels of mobility offered by these modes are not reduced. Case studies from Manila, Ahmedabad and Kathmandu are some of the few examples where the governments have undertaken steps to ensure that the urban poor population is served with eco-friendly fleet. Governments are promoting use of cleaner technology like 4-stroke engines and cleaner fuels like CNG, electricity and solar-powered transport modes to cut-down on emissions.

The best practices in this report also highlight that usually the national and city governments lack targeted policies and plans to deal with mobility concerns of the urban poor. Thus, indicating a need for formulating policies, visions and plans at national and city-level to guide the future actions of cities with regard to pro-poor mobility. Case studies from the Philippines, South Korea and India clearly show the importance of strong policy and vision in achieving pro-poor and people-friendly transport systems. The example of the National Urban Transport Policy of the Government of India indicates the shifting focus of policies in developing world; policies and plans are beginning to realize the importance of people-oriented rather than vehicle-oriented mobility planning. Policies and plans need to promote mobility solutions for the ‘people’, especially the ‘low-income groups’, which implies that NMT and public transportation need to be promoted to achieve inclusive development in cities. Case studies from Manila, Seoul, Sao Paolo, etc. show that initiatives like, developing non-motorized transport infrastructure like, NMT network, bicycle parking, etc. are key to improving mobility options for the poor. In cities where there aren’t enough motorized modal choices for the poor, improvement of NMT infrastructure becomes important from the perspective of mobility for poor as the poor are highly dependent on NMT to meet their mobility needs. Some cases indicate that significant improvements in levels of mobility of the poor have been experienced through improvements in NMT network and initiatives like distribution of bicycles among the low-income population. In some cases, linking of low-income residential areas to important activity areas of the city with NMT networks has yielded successful results by directly increasing the socio-economic opportunities for the poor.
Further, the world experience reveals that even capital intensive improvements in public transportation are considered incomplete without improvements in last mile connectivity, for which walking and cycling are the primary modes. The importance of NMT improvements is well demonstrated in examples from Cape Town, Seoul, Marikina, etc. It is important to understand at this point of time that besides government actions, community interventions and pro-activeness can also play pivotal role in development of pro-poor transportation systems, as is demonstrated in case of Bengaluru, Mexican cities, and Hanna-Nassif neighbourhood in Dar-es-Salaam.

The low income population largely depends on public transportation for long-distance commute in the cities, as it is one of the cheapest modes of travel. But, in most of the cities, public transportation is unable to cater to the rising travel demand, which results in overcrowding in buses, inadequate frequency of buses, inadequate spatial coverage of public transport network in the cities, and poor state of public transportation services. In such situations, it is the low-income neighbourhoods, which have to suffer the most due to their locational disadvantage and low levels of affordability. Some of the case studies included in the report highlight measures taken up by the governments in various cities to address issues of inclusion of urban poor in provisioning of public transportation. Examples of BRT system planning from Quito, Ahmedabad, Lagos, etc. clearly depict the efforts undertaken by these cities to cater to the mobility needs of the economically poor section of the society.

The best practices presented in this report provide example of various approaches that can be adopted to address mobility concerns of the poor. It is expected that the wide range of case studies and best practices presented in this report along with a set of policy guidelines would assist the cities in the developing world in planning socially inclusive and at the same time environmentally sensitive transport systems that address the mobility concerns of the poor.
List of Abbreviations

<table>
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<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AFV</td>
<td>Alternative Fuel Vehicles</td>
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<td>ASCOBIKE</td>
<td>Association of Bicycle Users</td>
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<td>BBMP</td>
<td>Bruhat Bengaluru Mahanagara Palike</td>
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<td>BEC</td>
<td>Bicycle Empowerment Centres</td>
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<td>BEN</td>
<td>Bicycling Empowerment Network</td>
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<td>BMR</td>
<td>Bangkok Metropolitan Region</td>
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<td>BMTA</td>
<td>Bangkok Mass Transit Authority</td>
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<td>BRT</td>
<td>Bus Rapid Transport</td>
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<td>CAI</td>
<td>Clean Air Initiatives</td>
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<td>CBD</td>
<td>Central Business District</td>
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<td>CBD</td>
<td>Central Business District</td>
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<td>CCTV</td>
<td>Close Circuit Tele Vision</td>
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<td>CDM</td>
<td>Clean Development mechanism</td>
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<td>CDS</td>
<td>City Development Strategy</td>
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<td>CEL</td>
<td>Central Electronics Limited</td>
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<td>cm</td>
<td>centimeter</td>
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<td>CMERI</td>
<td>Central Mechanical Engineering Research Institute</td>
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<td>CNG</td>
<td>Compressed Natural Gas</td>
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<td>CO2</td>
<td>Carbon dioxide</td>
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<tr>
<td>COCAP</td>
<td>Citizens Organization Concerned with Advocating Philippine</td>
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<td>CooP</td>
<td>Cycling out of Poverty</td>
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<tr>
<td>CPCB</td>
<td>Central Pollution Control Board</td>
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<td>CPTM</td>
<td>Metropolitan Trains Company of São Paulo</td>
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<tr>
<td>CSIR</td>
<td>Council of Scientific and Industrial Research</td>
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<td>CWS</td>
<td>Central Washing Stations</td>
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<td>DART</td>
<td>Dar Rapid Transit</td>
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<td>DCC</td>
<td>Dar-es-Salaam City Commission</td>
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<td>DPWH</td>
<td>Department of Public Works and Highways</td>
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<td>DULT</td>
<td>Directorate of Urban Land Transport</td>
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<td>EISA</td>
<td>Electoral Institute of Southern Africa</td>
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ETMVA  Empresa de Transporte Masivo del Valle de Aburrá Ltda
GATES  Global Ambient Hi-Technology Systems
GDP  Gross Domestic Product
GEF  Global Environment Fund
GPS  Global Positioning System
GRIPP  Green Renewable Independent Power Producers
GUP  General Users Platform
ICE  Interface for Cycling Expertise
ICSTL  Indore City Transport Services Limited
IDR  Indonesian currency
ILO  International Labour Organisation
INR  Indian Rupee
IPT  Informal Public Transportation
ITDP  Institute for Transportation and Development Policy
IUT  Institute of Urban Transport
JNNURM  Jawaharlal Nehru National Urban Renewal Mission
kg  kilograms
km  kilometer
kmph  kilometer per hour
LAMATA  Lagos Metropolitan Area Transport Authority
LPG  Liquefied Petroleum Gas
LRT  Light Rail Transport
LUP  Local Users Platform
LUTP  Lagos Urban Transport Project
m  meter
MDPP  Motorcycle Development Programme Participants
MMDA  Metro Manila Development Authority
MMURTRIP  Metro Manila Urban Transport Integration Project
NCR  National Capital Region
NDoT  National Department of Transport
NGO  Non-Governmental Organisation
NMT  Non-motorized Transport
NTTT  National Taxi Task Team
NUTP  National Urban Transport Policy
PAD  Philippine Automotive Depot
PAX  Passengers
PCA  Partnership for Clean Air
PHP  Philippines Pesos
PPA  Pedal Power Association
PPP  Public Private Partnership
Glossary

- **BRT system**: Bus Rapid transit (BRT) system is a bus-based mass transit system with exclusive Right of Way for buses, pedestrians and cyclists. The system is designed to provide a high quality of service equivalent to a light rail transit (LRT) service at one third cost of a LRT project. BRT is fast, efficient, safe, and user-friendly in comparison to the traditional bus systems. Some of the key features\(^1\) of a BRT system are:
  - Exclusive right-of-way lanes
  - Rapid boarding and alighting
  - Free transfers between lines
  - Pre-board fare collection and fare verification
  - Enclosed stations that are safe and comfortable
  - Clear route maps, signage, and real-time information displays
  - Automatic vehicle location technology to manage vehicle movements
  - Modal integration at stations and terminals
  - Clean vehicle technologies
  - Excellence in marketing and customer service

- **Four-stroke engine**: An internal-combustion engine in which an explosive mixture is drawn into the cylinder on the first stroke and is compressed and ignited on the second stroke; work is done on the third stroke and the products of combustion are exhausted on the fourth stroke\(^2\).

- **Two-stroke engine**: A reciprocating internal combustion engine that requires two piston strokes or one revolution to complete a cycle\(^3\).

- **Dual-powered cycle rickshaws**: Cycle rickshaws that can be driven by two sources of energy, like solar energy, electrical energy, or manual power (pedalling).

- **Euro IV compliant vehicles**: Euro IV compliant vehicles are the vehicles that comply with the European Union (EU) emission standards that were introduced in January 2005. These

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\(^1\) [http://www.itdp.org/documents/brtplanningguidedec04.pdf](http://www.itdp.org/documents/brtplanningguidedec04.pdf)


standards regulate the vehicle emissions of nitrogen oxides (NOx), total hydrocarbon (THC), non-methane hydrocarbons (NMHC), carbon monoxide (CO) and particulate matter (PM) for most vehicle types, including cars, lorries, trains, tractors and similar machinery, barges, but excluding seagoing ships and aeroplanes.

Note: Images whose sources have not been mentioned have been sourced from shutterstock.com and wikipedia commons.
The Energy and Resources Institute (TERI)
A dynamic and flexible organization with a global vision and local focus, TERI (The Energy and Resources Institute) was established in India in 1974. Deeply committed to every aspect of sustainable development, TERI has a commitment towards creating innovative solutions for a better tomorrow. All activities in TERI move from formulating local and national-level strategies to suggesting global solutions to critical environmental issues. TERI is headquartered in New Delhi, India, and has several offices in various parts of the country. It has international presence through its offices in Washington, North America; TERI Europe in London; TERI South East Asia in Kuala Lumpur, Malaysia; TERI Japan in Tokyo; TERI Gulf Centre in Dubai; and TERI Africa in Addis Ababa, Ethiopia.

Centre for Research in Sustainable Development & Transport Systems (CRSUD&TS)
CRSUD&TS works extensively on various urban issues with an aim to promote sustainable urban development. It was established in 1999 in response to the growing urban demands, particularly in the urban infrastructure sectors. Its activities range from carrying out energy-environment related analysis, giving inputs to policy and planning, improving urban service provision and governance, carrying out sustainability assessments, exploring climate change implications and mainstreaming climate resilience planning, and carrying out capacity building for various stakeholders, all in the context of the transport and urban development sectors.

UN-Habitat
UN-Habitat is the coordinating agency within the United Nations System for human settlements activities and focal point for monitoring, evaluation, co-ordination and implementation of the Habitat Agenda as well as the Millennium Development Goals of significantly improving the lives of at least 100 million slum dwellers by the year 2020. UN-HABITAT runs a number of global programmes that involve a wide range of partners ranging from central government, local government to civil society and beneficiary communities from countries all over the world. It aims to help the policy-makers and local communities to deal with urban issues related to human settlements and find workable, lasting solutions.

Global Energy Network for Urban Settlements (GENUS)
The Global Energy Network for Urban Settlements (GENUS) is established by UNHABITAT to encourage and support the design and implementation of energy-access programmes and projects for the urban poor worldwide. GENUS is a dynamic partnership of institutions to promote collaboration among the public and private sectors, governmental and nongovernmental organizations, grassroots groups, national and international development agencies, working in the urban energy sector.