

Cities SHIFT

CAPACITY BUILDING AND NETWORKING FOR CLIMATE-AND PEOPLE-FRIENDLY MOBILITY

Measuring ecomobility in six cities in China, India, and Uganda

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Capacity building and networking for climate - and people-friendly mobility

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Executive Summary

Mobility is a prerequisite to social and economic opportunities, making transport development an urgent issue that confronts cities across the world. Cities are increasingly recognizing the need to create a sustainable mobility system, albeit at varying stages of implementation. With the pressing issues of congestion, air pollution, inequality, and climate change, the question is no longer if a sustainable and ecomobile transportation system will exist but when. Effective implementation can be realized by making an informed decision. This is imperative because you cannot manage what you do not know.

This report demonstrates how the EcoMobility SHIFT+ tool can be adopted to assess and measure the transportation system of six cities in China, India, and Uganda. The EcoMobility SHIFT+ is a useful tool for local authorities to measure, assess, and act to improve ecomobility. Furthermore, evaluation and monitoring is an essential step in the process of developing sustainable urban mobility plans.

The analysis presented in this report is a result of the multiple stakeholder discussions; literature review of the documents or policies provided by the project cities; capacity building workshops; peer-to-peer city exchange; study visits; and thematic working group discussions implemented under the "Cities SHIFT: Capacity building and networking for climate- and people-friendly mobility" project. Tailored interventions are recommended by engaging the different stakeholders, ranging from public officials to the national transportation research center to informal transport operator representatives.

In summary, a functioning and well-informed governing institution to invest in excellent mobility services and infrastructure complemented with an integrated urban and land-use design are enabling factors for equitable access and mobility. Drawing on the analysis and narratives raised by the multi-stakeholder groups in these six cities, the resulting recommended actions for policymakers are also presented in this report. A sustainable and ecomobile transport system is not an overnight miracle but a continuous and committed process of nurturing and making the right decisions.

What kind of cities do we want to live in?

Sustainable, accessible mobility is at the core of a healthy, modern city, allowing communities to function and thrive. Today, our cities are experiencing unprecedented levels of automobile traffic that is polluting the air, raising urban emissions and making travel increasingly inefficient, frustrating, and time-consuming. Even when cars are not in use, they occupy precious urban space, which could have allowed other social interactions. To create sustainable urban environments, a paradigm shift on urban planning is needed: urban mobility systems must move from a car-centered to a people-centered design. By enabling communities and organizations to access goods, services, and information in a sustainable manner, ecomobility supports residents' quality of life, increases travel choices, allows for the use of public spaces, and promotes social cohesion. A mobility system designed through an ecomobile approach produces numerous benefits compared to car-centric mobility models.

EcoMobility gives priority to walking, cycling, shared, and public transport. It promotes integrated, socially inclusive, and environmentally-friendly transport options without depending on privately owned vehicles.

Measuring ecomobility

Indicator systems are increasingly recognized as a policymaking tool because it is challenging to make informed decisions to manage something that you do not know. To this end, ICLEI developed the EcoMobility SHIFT+¹ scheme to provide local authorities with a useful tool to measure, assess, and act to improve sustainable mobility. By working with the key stakeholders in the city, the tool supports cities to analyze the ecomobility performance and status quo to identify main areas for interventions. This helps cities to make efficient and effective policy interventions with improved priorities.

The SHIFT+ scheme is made up of three stages:

- **Self- assessment** process allows cities to measure ecomobility performance by assessing a set of indicators.
- **Analyze** process allows cities to identify specific strengths and weaknesses in the fields of passenger (and freight) transport so that the city can prioritize short-term and long-term improvement actions and goals; and
- **Act** to improve the urban mobility system based on priorities for implementation. A repository of strategies is provided for cities to consider best practices from other cities.

Every city taking part in the process will **assess** data to determine how ecomobile and sustainable the urban mobility system is. The gist of the **analysis** process is to collectively review policies, plans, and actions as well as outlining short-term and long-term priorities and action areas.

Once they are completed and documented, the city can practically plan on how to act on implementing plans and actions. A repository of management strategies which showcases the different policy instruments and best practices are provided to cities for consideration. However, it is essential to note that implementation in itself is not part of the SHIFT+ scheme. Municipalities are encouraged to repeat the process every three years. **Figure 1** illustrates the seven steps of the SHIFT+ scheme.

¹ The EcoMobility SHIFT scheme was developed in 2013 for European cities and is updated to cater also for cities in the developing world while including prevailing mobility trends and services, known as the EcoMobility SHIFT+ (SHIFT+).



ASSESSMENT

1. Organiza a SHIFT Working Group workshop
2. Data collection
3. Data compilation/ Measure Indicators
4. (Self-)assess performance



ANALYZE

5. Review policies, plans, and actions
6. Outlining priorities and action areas



ACT

7. Implement plans and actions



Figure 1: EcoMobility SHIFT+ process

EcoMobility SHIFT+ Indicators

An indicator system can capture complex information into meaningful and bite-sized information to interpret trends, ranking, or even monitor evolutions over time, making it a powerful tool in policymaking and assessment of a complex system. The EcoMobility SHIFT+ indicator system measures ecomobility by evaluating the 23 indicators categorized into three main groups, namely Enablers (E); Transportation system and services (TSS); and Performance (P). The process involves public and private stakeholders related to urban transport planning and implementation to assess the transportation system to identify short- and long-term interventions. The final ecomobility performance is displayed in a spider chart.



Enablers refer to what a city does and how it does it. These are the foundations for a sound transportation system and services to achieve excellent performance. It is a consensus that a Sustainable Urban Mobility Plan (SUMP) or EcoMobility Plan is needed to set a vision, strategy, and implementation pathways to achieve a sustainable urban mobility and ecomobility vision. In doing so, understanding the current mobility system and needs of the various stakeholders and residents is needed. Sufficient human and financial resources are critical factors for actual implementation. In this era of digitalization, new mobility services are emerging in developing and developed countries. Thus, city governments need to be prepared for the future of urban mobility to guide the development trajectory.

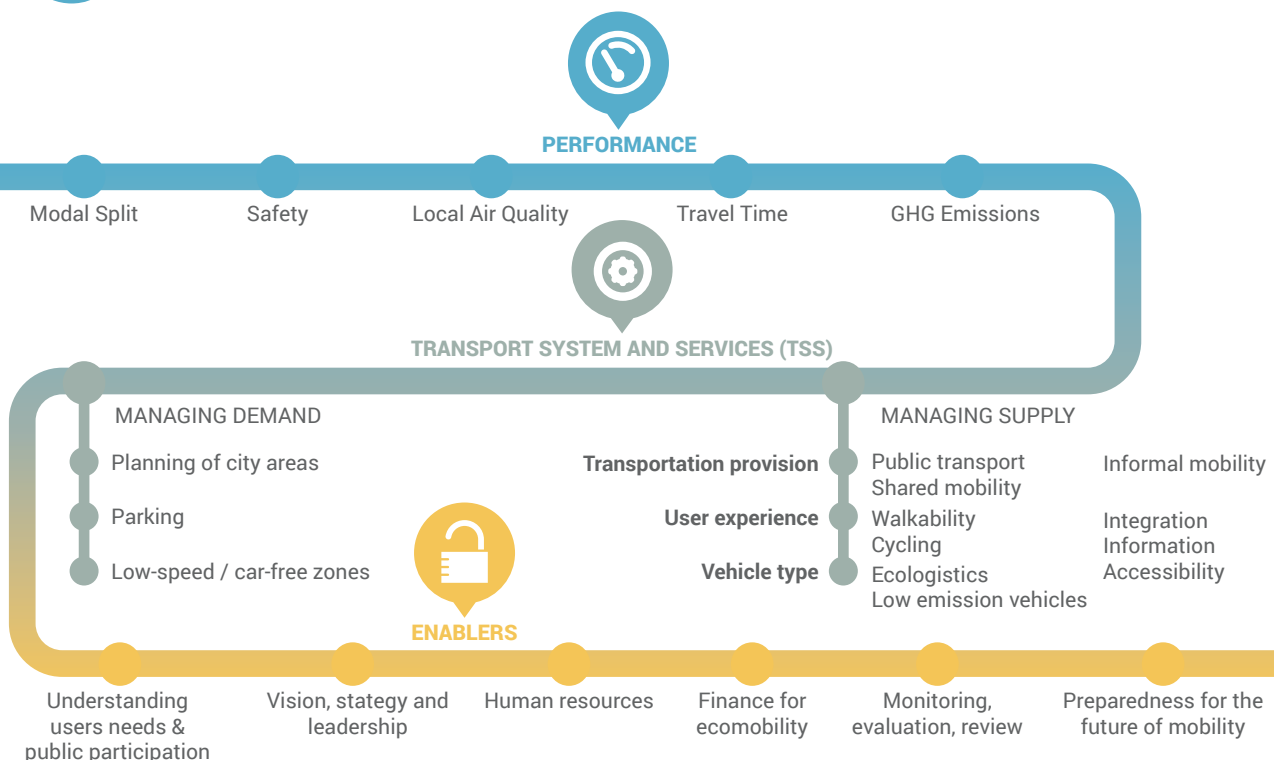


Transport systems and services look at managing supply and demand refer to what is delivered 'on the ground', i.e., the achievement of the transport department in partnership with others. Managing demand refers to reducing the need to travel by proper land use and urban planning as well as measures to reduce the need for travel with cars. If traveling is inevitable, it is then vital to manage the supply as the services it provides influence a commuter's travel experience and behavior (e.g., should I travel with a car or with the bus today?). Managing supply encompasses three dimensions:

- *Transportation provision* refers to the various modes of transport available in the city, whether or not the local government provides it (e.g., informal transport);
- The transport system directly impacts *user experience* if it is integrated, connected, easy to use;
- *Vehicle type* looks at the types of vehicles in the city and the way to manage them so that the transportation system could be sustainable and low emission.



Performance refers to quantifying measurements of these achievements that have been put in place.



Cities SHIFT: Capacity building and networking for climate- and people-friendly mobility

The overarching goal of the *“CitiesSHIFT: Capacity building and networking for climate- and people-friendly mobility”* project is to support cities to identify challenges and opportunities of urban mobility system in the hope that the city could shift towards more ecomobile modes of travel, i.e., walking, cycling, public and shared transport. The three main pillars of the projects are as follows:

Performance measurement

The EcoMobility SHIFT+ is a tool designed for cities to measure the performance in ecomobility and make informed decisions based on the areas that need improvement. Upon completing the SHIFT+ assessment, cities will be better positioned to create and strengthen mobility plans by making informed decisions.

Capacity building

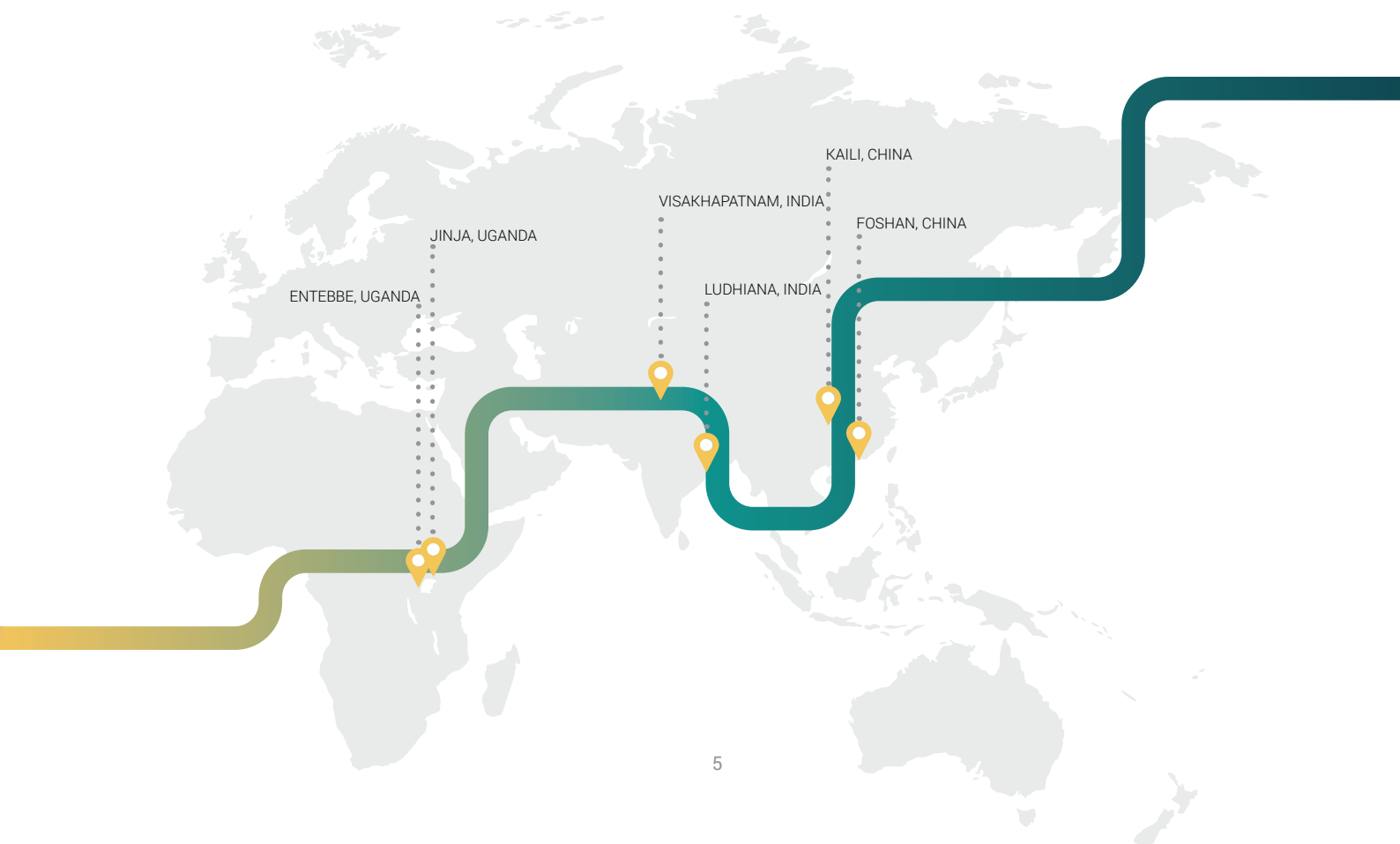
This project strengthens institutional capacity through thematic working groups, workshops, and mentor program by peer cities to facilitate knowledge exchange and direct feedback. The peer cities are the head of transport or urban planning departments from Barcelona Metropolitan Government, Spain; Leipzig, Germany; and Nairobi, Kenya, who visited the different cities for an intimate exchange with the stakeholders.

Global dissemination

Learning outcomes and experiences are collated and disseminated through knowledge products and at international workshops or conferences. The goal is to encourage other cities to replicate the process.

Project cities

Six cities from China, India, and Uganda are selected for this project, as reflected in the map below. The chosen cities play an important role in the social and economic growth of the region. Besides, the projected highest growth rates in cities are the medium-sized cities.



What we learned: Main findings

This section presents the key findings based on the assessment of the six project cities. They are organized according to significance. In general, these findings can be categorized into: (1) Governance and planning; (2) New mobility trends and technologies; (3) Sustainable mobility for all.

National government's vision on sustainable mobility stimulates local change

There is an increasing awareness and focus on sustainable mobility at the national level in all three countries, especially on active mobility or public transport. Since 2017, China stipulated policies to promote green transportation, public transport, and shared mobility, such as the Green Transport Action Plan 2019 – 2022, which provides guidelines for local authorities to implement. Foshan and Kaili, China displayed strong implementation capacity due to practical technical and financial support from the national and state, despite being cities of different sizes and characteristics.

India's Smart Cities Missions catapulted Ludhiana, and Visakhapatnam's sustainable mobility progress

catapulted, which identified transport as one of the fundamental tenets. The Indian government funds this too. Uganda developed the National Non-Motorized Transport Policy 2012. However, this policy is not well-communicated to the local authorities, resulting in sluggish implementation and lack of awareness. Many global and national policies, targets, and efforts are not reaching to the second- and third-tier cities because they are concentrated in capital cities. There is also a lack of capacity and resources to plan sustainable transport. While it is assumed that the situation is not as dire in such cities, this could be a false perception of the very livelihood of such people is severely impacted. The lack of a transportation department in the Indian and Ugandan cities is a huge contributing factor for the lackadaisical implementation of policies and plans.

Walking and cycling are gaining prominence, but infrastructure needs to be enhanced

The majority of the residents walk and cycle in the cities, although the quality of the infrastructure provided is still subpar, especially in Ugandan and Indian cities. Foshan's walking and cycling infrastructure extend to different parts of the city, although connectivity still needs to be improved. Pedestrian zones are even demarcated in the historical parts of the city with

How a fourth-tier Chinese city established an effective public bus network: Kaili City



Presentation at the capacity building workshop on aligning urban and transport planning for inclusive, clean and sustainable mobility in Lianyungang, China

Yong Wang, Director of the Municipal Road Transport Administration, Kaili, China

Nested within a mountainous Guizhou province, public transport is considered as a lever to social inclusivity and regional economic development. The primary public transport mode for Kaili, a city of 522,601, is the public bus. Since 2011, Kaili developed eight public transport policy and planning documents to promote public transportation and active mobility. One of the ongoing plans is Bus Rapid Transit (BRT) development. Since being named as a Bus Demonstration City, Kaili is very dedicated to creating a network of public buses within the city. Besides that, under the "one city and 14 districts system", Kaili's public buses expanded to serve all districts

within the Qiandongnan Province with 715 buses and 71 lines. The system is run by a state-owned operator working closely with the city's Transport Bureau. Walking and cycling network serves as last-mile connectivity.

After developing the network, the city leverages big data and technology to improve operational efficiency, integration, and convenience of commuters by investing in a Kaili Intelligent Bus Management System to support: (1) smart card system for seamless transfer and integrated payment within the province; (2) real-time video monitoring system for safety; and (3) intelligent dispatching system for timely and

efficient service. This system allows convenient and efficient deployment of buses, especially during peak hours, and the average waiting time is 5 to 15 minutes. A Qiandongnan application serves as live information and online ticketing for commuters. The city is currently upgrading 20 of the bus stops in the city center with electronic information and signage.

Since 2012, Kaili started investing in new energy buses, and in 2018, the city achieved 100% of green buses, including hybrid and electric buses. Under the 2020 New Energy Public Bus Plan, the city aims to realize 100% of new energy public buses. As a result of its efforts, public buses represent 58% of the modal split and achieved 82.2% of satisfaction based on the general survey in 2018. Kaili's success can be attributed to the ambitious vision, strategic policy, and robust implementation with close collaboration between the national government, researchers, city, and operator.

quality public space to attract locals and tourists. Kaili is expanding the cycling network mainly for recreational purposes while the city's inner core is still more dependent on walking. Cycling level remains very low in Kaili due to legal barriers that do not allow pedestrians and cyclists to co-exist in the inner city core.

Walking and cycling infrastructure in the Indian and Ugandan cities is almost non-existent, although this will be improved in selected areas under the Smart Cities Missions in India. The lack of quality environment reinforces the perception that these are transport modes for the poor unless if one owns an expensive mountain bike. The situation is ameliorated in China with better infrastructure and the prevalence of shared bicycles. In Foshan, the shared bicycles replaced 18% of private and ride-hailing car trips. However, pedestrian and cyclist safety is a crucial concern. In Uganda, 48% of road fatalities are pedestrians and cyclists, raising key equity concerns and the need to provide safe and accessible infrastructure.

Integrated public transport fueled by digitalization but still a challenge in developing cities

Efficient and functioning public transportation is a fundamental issue in the Indian and Ugandan cities where investments are still very much road-based. Informal transport, such as boda, matatu, and auto-rickshaw fills in the public transport gap.

Financial investment and institutional capacity are key factors to establish a public transport system. Both Entebbe and Jinja do not have a public bus network within the city yet, but Entebbe recently found the Kampala – Entebbe bus line. India's public bus services are provided by the municipal enterprises and contracted to a private bus company to finance and operate. Controlled low fares strained these companies to maintain the services, without financial support or subsidy from the municipal corporation. This is a severe issue in Ludhiana, whereby the bus operator refuses to operate due to low profitability resulting in the 200 buses provided by the municipal corporation stored in the bus depot, running only 50 buses. Meanwhile, the Bus Rapid Transit (BRT) in Visakhapatnam remains only partly operational with intrusions from other vehicles. A big reason for this is the lack of technical understanding to design and establish the structure institutionally, although this is being revamped now.

Public transportation is strongly supported by the federal government in China, as indicated in the State Council on Priority Urban Development of Public

Transport 2012. Under the Bus City Demonstration initiative, more than 80 cities are selected in three phases to pilot and establish a public bus network. Kaili, one of the chosen pilot cities, demonstrated success with an extensive bus network. Foshan, with much higher density and population, offers multi-modal transportation, including subways, light-rail, and buses. The municipality aims for 30% of people in the inner city access to a public transport stop within 15 mins of walking distance by 2020.

Digitalization of the public transport supported integration between the transportation modes. Kaili and Foshan also launched a public transport application showing travel times and online ticketing, which enhances convenience for the commuters. The Chinese social networking app, WeChat, can also be used for payment, common in Chinese cities. The success of these two Chinese cities is due to suitable financing mechanisms and support from technical institutions. Foshan's Urban Planning and Design Research Center specialize in conducting transport research. An annual transport report is also published. Kaili is supported by the Chinese Academy of Transportation System (CATS), a research arm under the Ministry of Transport.

Private companies are providing alternatives to public buses. In Shanghai Changning District, a private transport company is pioneering a dynamic vanpooling service known as "Ctrip Super Shuttle" by clustering companies and residential areas to provide door-to-door shuttle service to users. A platform is used to provide such personalized service. Within two years of launching, there are 4,000 users commuting from 3 km to 30 km per trip.

Shared mobility is disrupting the mobility systems, for better or for worse?

A digital wave is disrupting the transport system by leveraging on new information technology, mobile phone penetration, cellular networks, Global Positioning System (GPS) and internet infrastructure, enabling new mobility services to develop in numerous forms. Such a scenario is not just familiar to developed cities but even in growing cities in Uganda, reconfiguring the relationship between transport modes and users. Ride-hailing services are available in all countries such as DidiChuxing in China, Ola Taxi in India, or SafeBoda in Uganda. The rise of the ride-hailing industry impacted the cities differently. In Uganda, 7,000 people are killed in three years due to the reckless boda drivers. As such, SafeBoda, a ride-hailing app for motorcycle taxis, addresses safety

training drivers and introducing a customer rating system. The service is much acclaimed by the users. This growth reflects how technologies can exert soft pressure on the traditional mobility system to progress and enable the urban poor to access safer transportation in the absence of a functioning public transportation system.

Foshan presents a compelling case on how shared mobility disrupted the mobility patterns of the residents. Based on the annual city survey, the emergence of shared bicycle and ride-hailing services reduced the public transport ridership. The bike-sharing trips substituted shorter public transport trips. They are used as last-mile connectivity (25%) or trips for daily necessities such as shopping (75%). However, ride-hailing services induced more car trips, by 3.2%, representing 80,000 cars. The survey also revealed that 78.9% of passengers would have used public transport, walk, or cycle if ride-hailing services did not exist. Only 12.3% and 7.4% of passengers gave up the car or taxi trips. Indian cities appear to reflect a similar trend, although this phenomenon is yet to be validated by studies.

Innovations by private companies are rapidly driving changes in mobility, filling in the needs that are the public sector overlooked. Shared mobility plays a crucial role in urban mobility, and the question is how cities can manage them in terms of allocation of precious open space, city's priority, and general needs so that innovations support cities to fulfill their visions.

Air pollution and climate change, the bottom-line incentive to electrify transport

Rising incomes and social status of owning a car feed to the desire of many in India and Uganda to own an automobile, either a two-wheeler or preferably a car while walking and cycling are seen as a poor man's mode. Such perception is hindering the city from investing in better infrastructure for ecomobile modes. The International Transport Forum (ITF) projects that transport urban emissions will increase by 26% (2015 – 2040), with personal automobiles in India and China contributing the largest share.

A fundamental dimension of ecomobility is addressing air pollution, climate change, and environmental degradation by reducing transportation emissions. Electrification is one of the critical pathways to achieve this, and all project cities are accelerating the deployment of new energy transportation systems, except for Ugandan cities, although Entebbe is in talks to purchase electric buses. With the Chinese central government's push, both Foshan and Kaili intensified efforts on electrification. By 2019, all of Kaili's public buses are green vehicles, comprising of hybrid or pure electric buses. Foshan commenced the first hydrogen-powered light rail system powered in China. China's acceleration in electrification is heavily driven by the central government's push as well as available technology companies such as BYD. Financial subsidies are also provided to purchase new energy buses.



The shared bicycle scene in China

Presentation at the capacity building workshop on aligning urban and transport planning for inclusive, clean and sustainable mobility in Lianyungang, China

Professor Yin Zhifang, Chinese Sustainable Urban Mobility System, China Urban Sustainable Transportation Research Center

The bike-sharing craze in China is well known – four billion people registered as bike-sharing users with 470 million bike trips each day and average use of 200 million bicycles in China. Bike-sharing is a massive market with 70 companies investing more than 30 billion € (230 billion CNY) in 360 cities since the onset of the technology. Today, the leading bike-sharing companies are Meitu, MoBike, and Alibaba. Chinese bike-sharing companies not only dominate in China but also around the world. Based on the study, shared bicycles significantly affected 85.5%

of residents' travel patterns, and only 3.2% indicated no impact on their mobility pattern. Shared bikes have replaced other travel modes, with the most significant effect on walking (84.5%), followed by mass rapid transit (51%), public buses (30.1%), taxis (6.8%), private cars (4%), electric bikes (2%) and other personal mobility modes (1.2%). The study also indicated that the shared bicycle improved urban travel efficiency by 15 to 19%. Many cities, such as Foshan and Beijing, also saw an increase in cycling. The environmental benefits of shared

bicycles are notable. To date, the distance traveled by shared bikes equals to circling the equator 6 million times, saving 10 million tons of diesel and reducing 50 million tons of CO².

Despite the success, there are problems associated with the boom – inadequate parking of dockless bikes and safety. To manage operations, technological means are adapted, such as electric fencing, to guide better parking. The metropolitan cities are now working with different companies to collect, analyze, and share data. Such information is used by the local governments to design urban and land-use plans to influence road and urban designs. Bike-sharing companies also utilize such data for better deployment of dockless bikes and parking management.

Under the Smart Cities Mission, both Indian cities have plans also to purchase electric buses and install charging infrastructure in selected parts of the city. Currently, electric rickshaws operated by a private company runs through the streets of Ludhiana.

Equitable access, an overlooked integral element for a people-oriented system

Equitable access to markets, health services, education, and opportunities is a fundamental consideration in sustainable mobility. This requires a paradigm shift in viewing transport – not as an infrastructure but as a service that serves different social groups (e.g., children, ethnic minorities, the urban poor) with a range of use patterns and needs. While access to affordable multimodal transport is available for Foshan and Kaili, the other Indian and Ugandan cities perform. More strategic efforts need to be done to achieve accessibility goals as stipulated in the Sustainable Development Goals 11, “by 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons”.

While funding for public transport projects is one of the main barriers to providing excellent public transportation, institutional arrangement, and technical knowledge is essential to consider, even if

funding is in place. Visakhapatnam built a BRT system but is not functioning due to the institutional structure and the design.

Access for the disabled is primarily overlooked, such as the lack of universally accessible walkways and more inclusive public transport. The poorest of the urban poor spend most of their income on transportation, and this percentage increases significantly in India and Uganda, where up to 70% of the income is said to be spent on poor quality transport. The lack of high quality and affordable transportation services becomes a barrier for the urban poor to enhance their quality of life and escape from the poverty lock-in.

Public transportation in Chinese cities is heavily subsidized by the federal or state government, making it affordable with most fare costing only 2 CNY (less than 0.50€). A question is raised on the impact on public transportation ridership and operations if fares are reformed, or subsidies are phased out. A study in Foshan showed that the reliance on active mobility and public transport increases with lower-income households, making it a priority to develop such systems.

Safe access for women and children is not explicitly discussed in all cities, but the issue is more apparent in Indian and Ugandan cities as the cities are more reliant on informal transport, which is the leading factor for accidents and incidents. The negative image of the paratransit is exacerbated by the lack of



Shenzhen, the first city in the world to achieve 100% electric bus

Webinar on “Accelerating electrification in public transport: Policy and financing framework.”

Yubing Shen, Deputy Director, Shenzhen Urban Transport Planning & Design Institute, China

Shenzhen leads globally in the electrification of public buses and taxis. Since 2009, Shenzhen started to introduce electric buses starting with 2011 buses, which grew to 17,000 electric buses and 21,000 electric taxis, achieving 100% electrification. Shenzhen Eastern Bus Group capitalized this opportunity to enhance the efficiency and quality of its services by creating a better public bus network. The network is based on a system of charging, driving, control, and function. Each bus is controlled by an intelligent management system to ensure the timely charging and deployment

of buses. How Shenzhen Eastern Bus Group succeeded is through commercialization. In the first phase of promotion (2009 – 2014), the company purchased new energy vehicles (NEVs) without batteries from the vehicle manufacturer while renting battery and charging services from energy enterprises. Since 2015, the company adopts two new models. The first is purchasing NEVs from vehicle manufacturers while buying charging services from energy enterprises. This reduces the need to maintain and handle batteries while reducing capital costs. The next model is in the form

of mixed-lease, referring to renting both NEVs and charging piles, and after the 8-year lease, both NEVs and the charging piles belong to the Company. Shenzhen’s electric bus to charging point ration achieved 2:1 as of the end of 2018.

Due to the electrification efforts, the energy-saving rate achieved 72.9% between 2014 and 2016, whereby energy used per 100 km is 106.38 kWh for electric buses in comparison with fossil-based buses. The average GHG emissions per kilometer for an electric bus is 40% less than a diesel vehicle, reducing carbon emissions by 0.63 million tons each year. Based on Shenzhen’s success, strong government support through policy and financial means are necessary while working very closely with bus manufacturer and energy companies to steer innovation, in technology and business models.

safer public transportation options deters women and children from traveling at night or alone.

Urban planning and design, the basis for sustainable mobility that prioritizes accessibility over mobility

The reason for mobility is to link people to places and services. By 2030, urban land will triple, with the majority of this growth in China, India, and Africa. On a macro-scale, unplanned growth will lead to urban sprawl, inducing more demand to commute because of the distance between an urban center and the residential area. On a micro-scale, urban design such as car-free center, reduced speed limit, allocation of carpark impact the choice of travel mode, and behavior of commute. For example, in Foshan, the historical urban core was redeveloped to a car-free center and also a car-reduced area around the periphery. Human-centric urban design and land-use influence the demand or need to travel and inherently impacts urban mobility, especially in emerging economies where expansion is rapid, leaving more room for better planning.

The six cities encountered issues with parking and intrusion of road space, intensely discussed in Ugandan and Indian cities. Inadequate parking and informal makeshift encroached to road space in an already congested area, especially seen in urban centers. In Foshan, functioning or broken dockless bicycles are seen along the roadsides. The city responded by demarcating areas for dockless bike parking by drawing boxes in high-density areas. Bad

car parks and shared use with small logistics van are also observed intruding the walking or cycling lanes, posing a danger to pedestrians and cyclists.

Chinese and Indian cities have the potential to leverage the high population density in cities to plan for compact and transit-oriented cities. Visakhapatnam recently updated the Masterplan based on this concept. While there are many good initiatives and plans invested in sustainable mobility, there is a tendency in Chinese cities to developed new areas at the periphery of the city. As the city grows, the city center is designed less intensely. In newly developed zones, the transport model is to prioritize mobility over accessibility.

EcoLogistics and urban freight: A primarily overlooked area

The urban freight and logistics system is a largely overlooked area as most plans focus on passenger transport. The global demand for urban goods delivery will increase by a whopping 83% in 2030 and another 64% in 2050, a much faster growth rate than passenger transport.

Freight movement contributes to congestion, especially in developing cities with less necessary infrastructure, such as freight terminals, warehousing, or staging areas. Heavy trucks also add to the already low-quality roads. Informal goods transport provides vital city logistics services with last-mile delivery, using two-wheelers, wheelbarrows, or cycling rickshaws, weaving through Indian and Ugandan cities.



Equitable access in Leipzig, Germany is planning for efficient and high capacity transport

Peer-to-peer sharing in Ludhiana and Visakhapatnam

Torben Heinemann, Head of the Department for General Planning, Office of Traffic Planning and Road Construction, Leipzig, Germany

For Leipzig, equitable access means creating a multi-modal transportation network with trams as the backbone and strengthening the walking and cycling network. An extensive tram system is established to connect the entire city, making Leipzig's tram network the ten most protracted in the world with 148 km. The tram system is more favored as the central public transportation system compared to mass rapid transit (MRT) because of the size and the urban form of the city. All public transport vehicles and stations are accessible to people with reduced mobility.

The inner city (about 900 meters x 700 meters) is designed as a car-reduced zone with the inner core as a pedestrian zone where no other motorized vehicles are allowed, while limited access for cars is permitted in the surrounding area. Meanwhile, more than 30 covered walkways were constructed throughout the inner core to connect between buildings and provide a comfortable walking environment. This attracts more pedestrians to enjoy the streets and walk into the shops, creating better social and economic opportunities for the locals and shop owners.

Carpark is significantly controlled by reducing the parking slots in the inner city and increasing parking fees by 200%, but bike parking slots almost tripled with the opening of bicycle garages. Good cycling infrastructure is continuously developed, and it presently maintains 499 km of the bicycle network. Pedestrian and Bicycle Specialists are employed by the administration to oversee the task of improving the walking and cycling network of the city. The efforts led to almost five times more cycling trips.

Leipzig's experience shares how the provision of space and transportation investment always prioritizes a higher efficiency system that caters to different residents instead of expensive investments for car users only.

In China, the urban freight system is booming with the growth of e-commerce, accounting for 72% of urban delivery in 2016. This market will continue to grow at a rapid pace. In response, the Chinese national government issues the New Express Delivery Guidelines 2018 to regulate the logistics sector. The race for urban logistics also compels Chinese companies to innovate delivery system to reduce cost and faster delivery time. The general trends observed are electrification, intelligent and autonomous warehousing, use of new technologies (drones, underground delivery channel), customizing logistics, and the use of the smart platforms. The

growth of such platforms evolved quickly to enhance customer demand. The first phase of platforms is to improve city connectivity, and the next stage is to reinforce the efficiency of vehicle deployment through data analysis. The latest trend leapfrogs to combining data and strategy to provide individual service to customers. For example, the platform matches customers' preferred service characteristics with the most appropriate delivery man.

In summary, the key findings from the project can be categorized as: (1) Governance and planning; (2) Technologies and new mobility trends; and (3) Sustainability for all.



Building human-scale cities with Superblock and Low Emission Zones in Barcelona, Spain

Peer-to-peer sharing in Kaili and Foshan, China

Marc Iglesias Perez, Project Director of Sustainable Mobility and Transportation of Barcelona Metropolitan Government, Spain

Barcelona's superblock model is a concept that restructures the urban road network to enhance the quality of public space and active mobility. To achieve this, the existing road network is modified, and the road hierarchy is established for different transport modes. The chosen area is structured into grids of 400 by 400 meters. The interior streets within this grid are closed to motorized vehicles and parking, allowing pedestrians and cyclists to move safely. The motorized vehicle circulates at the exterior perimeter of this grid. Pockets within the inner

grid are beautiful public spaces for residents to enjoy and socialize. This integrated solution combines urban planning and sustainable mobility without massive modifications to existing areas, especially in older districts.

In many parts of Barcelona, most of the commercial and residential areas are also mixed land-use with easy access to supermarkets, bakeries, and shops within walking distance, reducing the need for travel. Within the older parts of the city, there is more potential to strengthen walking

and cycling by providing quality infrastructure and creating beautiful public spaces to enjoy and rest. The speed of motorized vehicles can be reduced to less than 20 km/hr in older parts. In Barcelona's superblock area, it is reduced to less than 10 km/hr.

To effectively reduce cars in the city core, Low Emission Zones are demarcated to prevent high polluting vehicles from entering. This is implemented in phases. To improve the connectivity of cycling lanes between different districts, a Metropolitan Cycling Plan to improve connectivity is proposed. Each district needs to improve cycling infrastructure within their jurisdiction and work with other communities to ensure connectivity at a local and metropolitan level.



Integrating active mobility into spatial planning: The case of Nairobi city, Kenya

Peer-to-peer sharing in Entebbe and Jinja, Uganda

Patrick Analo Akivaga, Urban Planner, Department of Urban Policy & Research, Nairobi, Kenya

Sub-Saharan Africa has more than 200 million slum-dwellers, with more than half of the urban population (61.7%) living in slums. The urban population growth poses a challenge in the sprawling Nairobi. 85% of Nairobi residents do not own a car and relate to walking (36%), matatu, and buses (45%) with a marginal cyclist (4%). However, the national vehicle growth rate is 19.9% annually. Mobility is a critical issue in Nairobi due to high population growth, the encroachment

of roads by street vendors, dark and dirty lanes, inadequate lighting in informal settlements leading to safety concerns. There are 3,000 fatalities from road crashes in Kenya annually, whereby 40% of the victims are pedestrians, costing 5.6% of the GDP (2,737,434,060 Euros).

Under the Safer Nairobi Initiative spearheaded by Nairobi administration with the support of various international organizations (e.g., UN-Habitat), the city aims to

reinvent downtown Nairobi to be more people-centric, safer and more comfortable for pedestrians and cyclists. The methodology includes conducting public dialogue and stakeholder meetings, collective design, and tactical urbanism. The issues and use for different roads are collected, and the street designs are imagined through civic engagement.

A place-making week was organized to create awareness and engage different stakeholders in dialogue. Residents and visitors used precious public space in a comfortable, safe and fun way. Starting from only one street, Nairobi aims to serve and rejuvenate more places in the central business district soon.

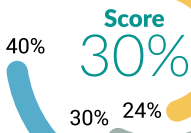
Entebbe Municipal Council, Uganda

EcoMobility Analysis

Performance

Transport system and services

Enablers



Quick Facts



Land area 56.2 km



Population 72,931
(2014 census)

Modal Split



1% Cycling

25% Walking



45% Boda Motorcycle



5% Personal car

7.7% Matatu



4.6% Water Transport



100%



Public transport options

- Boda motorcycles, matatu minivans



Enablers As Entebbe houses Uganda's largest international airport, there is a collective interest to develop transportation and reduce congestion with the Civil Aviation Authority as the most pivotal stakeholder.

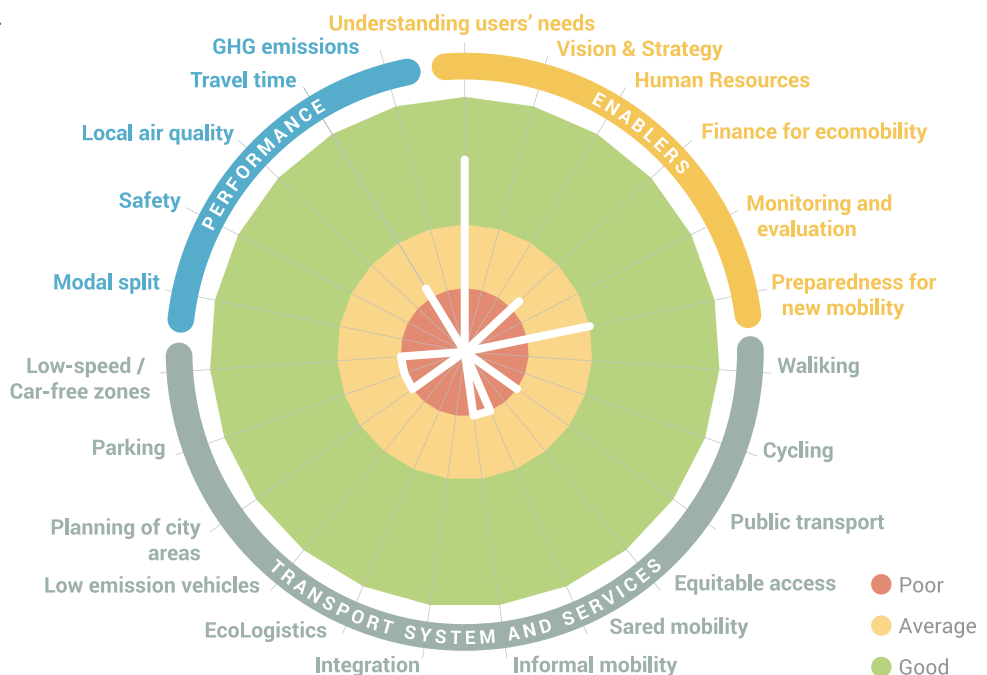
- There is no transport department, but all transport-related issues are taken care of by the urban planning department. The Mayor takes a strong lead in holding public campaigns to sensitize the public on walking and cycling to negate the notion of walking and cycling as a poor man's mobility.
- Entebbe relies on external funding for transport, with most investments from development banks or agencies. Such projects require Entebbe to build facilities that are inclusive and accessible for all. More funded projects to create walkable streets, cycling lanes and introduce public buses are being planned.
- Stakeholder consultation is conducted in the form of public forums led by the Municipal Development Forum (MDF) committee consisting of the local council, public institutions, and civil representatives, although transport issues are largely overlooked except when it is related to a project's need.



Transport system and services

Recognized as part of the metropolitan area of Greater Kampala, Entebbe receives more attention from the Ugandan government to improve the road transport and connectivity between the two cities. The latest Physical Development Plan 2019, recognizes the importance of active mobility.

- Walkways and cycling paths are limited to the central business district and are often encroached by makeshift



huts or roadside hawkers. Most public school students walk (68%, up to 1 hour) or cycle (7%) to school, but more than 80% of private school students are driven by parents with private car or use the school bus to school, reflecting inequity in transport.

- Matatu minivans serve intercity travels between Entebbe and Kampala (85%), the capital, and only 15% operate within Entebbe. Boda motorcycles functions as the vital passenger and goods transport within the city due to the physical agility that is suitable to maneuver around poor community roads that are in poor condition as 54% of roads are unpaved. Even if they are paved, it is often damaged.
- In the past two years, most notable advances are installation of solar street lights and 200 traffic lights; completion of the new Kampala-Entebbe expressway, but the latter significantly fragmented the indigenous walking route for the local communities. Therefore, residents are forced to run across the highway dangerously.
- Bottom-up initiatives such as the SafeBoda is a private boda ride-hailing service that screens and trains their boda drivers for improved safety and customer service.

Performance



Entebbe is dependent on walking to move around, but the lax enforcement of road safety exerts pressure on the pedestrians, leading to the increasing use of boda motorcycles.

- The rate of motorization is steadily increasing over the past seven years.
- The transport sector is the most significant contributor to air pollution and GHG emissions due to imported sub-standard second-hand vehicles and aircraft, although the Ugandan government recently restricted the import of vehicles for more than eight years and levies an environmental tax for vehicles older than five years.
- Road safety is an issue contributed by the lack of discipline by boda drivers and dilapidated road conditions with potholes.

Key focus areas to improve ecomobility

- Work with the central government, Entebbe's Civil Aviation Authority, or tourism board to receive financial support and plan for a sustainable approach to invest in ecomobility. Bottom-up initiatives can also be considered through tactical urbanism and placemaking, mainly when Entebbe is a tourist town.
- Enhancing road safety and security by maintaining a modest and quality road network that also provides for universally accessible walking and cycling lanes; install street lights, and organize boda services by engaging the self-organized Boda Organization. Educating residents to adhere to traffic lights and signs.
- Establish a transport authority as the policymaker for sustainable mobility for Entebbe, including planning and operating public transport, and working together with the Urban Planning Department.

About Entebbe

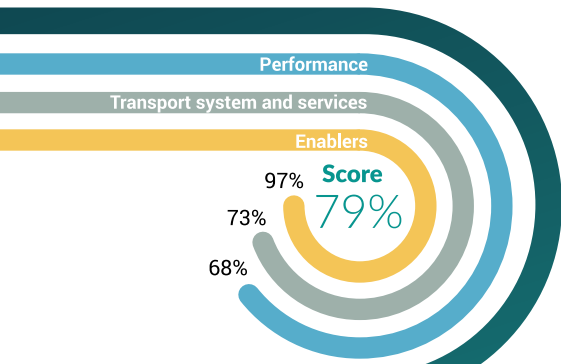
Entebbe Municipality is situated in Wakiso District in the southwest of Kampala, the capital city of Uganda. Located on a peninsula into Lake Victoria, the second-largest freshwater lake in the world, the municipality spreads across an area of approximately 56.2 square kilometres (km²), of which almost 36% is water.

Entebbe hosts the Entebbe International Airport (EIA), which is the only international airport in the land-locked country, and it handles international passenger and cargo traffic as well as domestic flights. The central area, which stretches roughly from Entebbe to Jinja in the east of Kampala, forms the economic center of the country and is the densest area in terms of population.



Foshan Municipal People's Government, China

EcoMobility Analysis



Quick Facts



Land area 88.60 km²



Population 7.19 million (Foshan City); 1.1 million (Foshan New City)

Modal Split



Walking 24%



Cycling 21.3%

Public transport 9.1%



Personal car 33.3%



Taxi 7.7%

Others 4.6%

100%

Public and shared transport options

- Bus, light rail, mass rapid transit, intercity rail, high-speed rail
- Public bike-sharing system: 1,113 stations and 35,000 bicycles
- Dockless bike-sharing with 400,000 bikes

Transport authorities

- Foshan Landuse and Urban-Rural Planning Bureau
- Foshan Transport Bureau
- Foshan Urban Planning and Design Research Centre
- District offices, various state-owned transport companies, and traffic police



Enablers

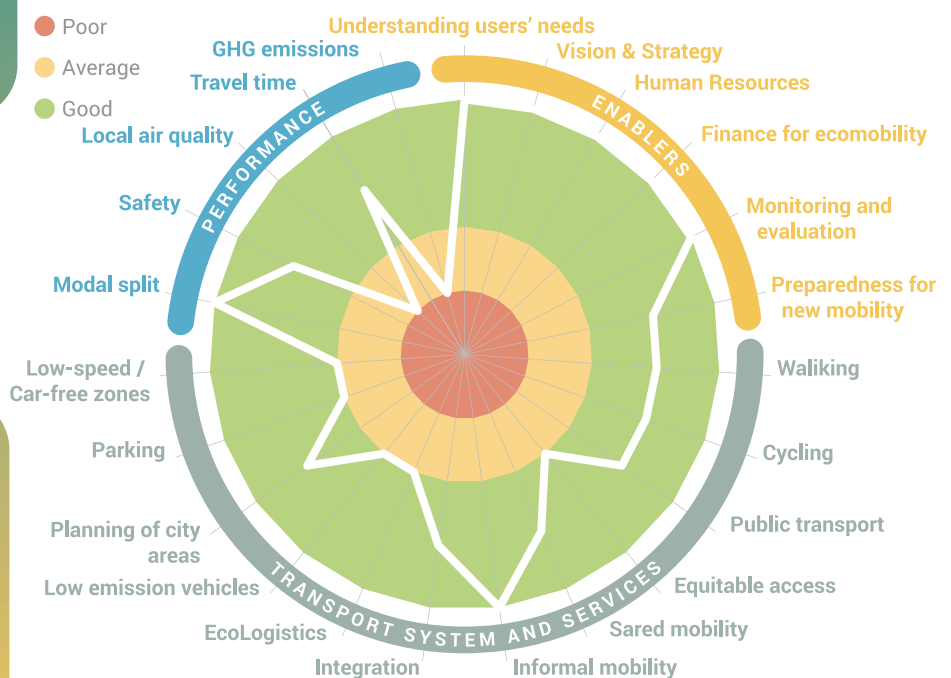
Foshan's Transport Development White Paper 2013 is the first White Paper in China advocating for seamless, green, and equitable mobility as the core of a healthy mobility vision. All policy documents in Foshan address the city-wide mobility system, as well as tailor-made solutions for each district, such as Active Mobility Plan, Public Transport Plan, Cycling Development Plan, Light Rail Transit Design Plan, among many others.

- The different departments and districts within Foshan City maintain close cooperation and are supported by a research institute that conducts an annual assessment of transport performance and trends annually to set ambitious targets and goals in their sustainable transport plans.
- Various new technologies, new mobility services, and business models exist, with some pioneered by the city administration itself, such as the first hydrogen-powered tram in China. The new transportation system is carefully evaluated and promoted by the administration by forming a task force.
- Foshan maintains stable financial resources to invest in sustainable mobility options as well as subsidies to offer affordable public transport.



Transport system and services

Public transportation is the backbone of Foshan's sustainable transportation system, complemented by active and shared mobility. Foshan's "13th Five-Year Transport Plan" indicates five dimensions as key indicators to transport planning, i.e., improved accessibility, efficiency, greening, equity, and safety.





About Foshan and Foshan New City

Foshan City is a prefecture-level city in southern China's Guangdong Province. It is located at the hinterland of the Pearl River Delta (PRD), adjoining Guangzhou on the east and Hong Kong and Macao in the south. As a junction of PRD's transportation system, Foshan is well connected with other cities via air, rail, highways, and water transport.

Due to its strategic location, Foshan New City was established in 2003 in the south-central part of Foshan City, with a demarcated zone known as the Foshan Sino-German Industrial Services Zone or previously known as Dongping New City. As a national cooperation platform, it has been acknowledged in the "Joint Declaration to Further Advance Two-way Investment" under the strategic partnership between China and Germany. Additionally, it is among the first batch of China-European Union Urbanization Cooperation Demonstration Areas, supported by the Chinese national government. Foshan New City is poised as a leading economic development catalyst and has invested in physical developments to attract high value-added international investments. Its industry is based on three pillars: advanced manufacturing, convention, and exhibition as well as the pharmaceutical industry.

- Foshan's pedestrian coverage network in the five central districts of Foshan is high, averaging at 89% while lanes for non-motorized vehicles (cycles, electric scooters) are 67%. 60% of the sidewalks are designed for the blind except for Guangming District, while 50% of the walkway is about 2 to 5 km wide, which is sufficient for fast-moving motorcycles or mini freight vans to contravene the space, posing a danger to pedestrians.
- At least 10 shared mobility services are available in different forms, disrupting the mobility system of Foshan. Bike-sharing replaces almost 18% of private and ride-hailing car trips, but ride-hailing induced more automobile trips with up to 78.9% of ride-hailing passengers replacing public transport, walking and cycling, while only 12.3% and 7.4% passengers were former car and taxi users.
- Equitable and integrated transport access is part of Foshan's transport goals. The city is working on public transport coverage—transit time average at 15 minutes, with 50% of the transit occurring in less than 10 minutes. Differentiated fares are also available for different user groups.
- Under the Foshan Hydrogen Energy Industry Development Plan 2018–2030, 900 million CNY (11.8 million €) will be invested to develop charging stations, hydrogen energy stations, and electric- or hydrogen-powered buses.



Performance

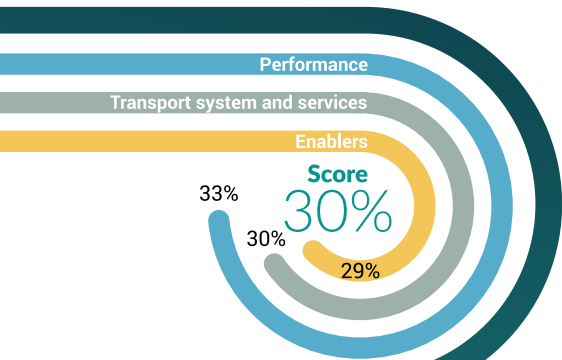
More than half of the trips made in Foshan are in an ecomobile manner, although there is increasing private car ownership.

- In 2017, the city suffered 604,239 € economic losses due to road accidents and fatalities, although it has reduced from 2016. Most accidents are caused by poor driving, but there is a notable percentage that is due to the competition of space between motorized vehicles and pedestrians or cyclists.
- 79% of the days in 2017 complied with the air quality index. Transport emissions represent one of the key contributors to air pollution in the city. There are many efforts to electrify transport, but there is no calculation of GHG emissions yet.
- Public transport trips take 30 to 35 minutes, with an average waiting time of 10 to 15 minutes.

Key focus areas to improve ecomobility

- Most policy interventions are centered on encouraging ecomobility, but adopting restrictive policies to discourage car ownership or private car usage is equally pertinent to discourage unnecessary private automobile ownership or use, especially ride-hailing trips show signs of inducing more automobile trips.
- New developments should be based on people-oriented instead of growth-oriented urbanization as well as strengthening land-use and transport planning for better inclusivity, accessibility, and connectivity. The goal of transport planning is not movement but access to services, opportunities, and goods.
- Enhance the pedestrian and bicycle network and infrastructure to improve safety and comfort. Separation of lanes and better parking enforcement reduce competition between motorized vehicles and people.

EcoMobility Analysis



Quick Facts

- Land area 673 km²
- Population 70,219 (2014 census)

Modal Split

- 25% Walking
 - 2% Cycling
 - 43% Boda Motorcycle
 - 15% Personal car
 - 10% Matatu
 - 3% Special Hire
- 100%

Public transport options

- Boda motorcycles, matatu minivans



Enablers

• There is no transport department in the city, but all transport-related issues are taken care of by the urban planning or environmental department. There is strong political leadership in promoting walking and cycling, although the implementation is a challenge.

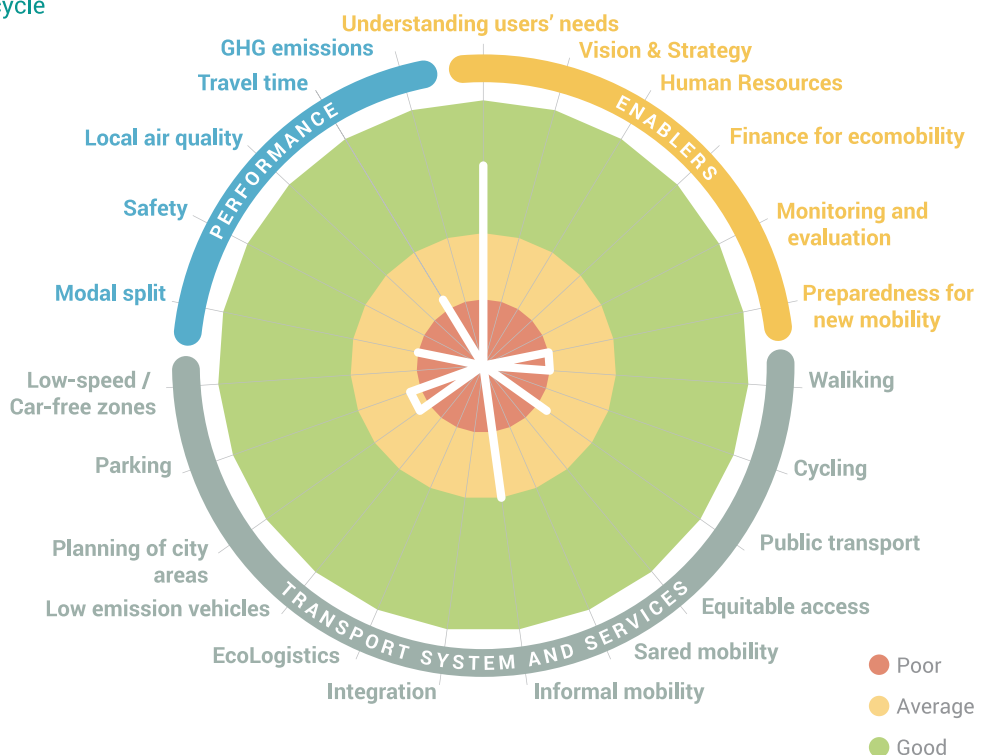
- A stable financial resource is a challenge as the city relies on external funding, such as international or national development agencies. Stakeholder consultation is conducted in the form of public forums led by the Municipal Development Forum (MDF) committee consisting of representatives from the municipal authorities, informal transport service providers, and residents who bring stakeholders' needs and concerns at budget conferences and local council meetings.

Transport system and services



• Walkways and cycling paths are limited to the central business district and are often encroached by makeshift huts or roadside hawkers or illegal parking. The city plans to upgrade the market area by redirecting traffic flow, reorganizing streets, and opening pedestrian-only streets.

- Matatu minivans serve intercity travels between Jinja and the capital, while boda motorcycles function as the essential goods and passenger transport within the town.
- Jinja town was planned during the colonial rule in the 1940s, providing a practical basis for a walkable and compact town. Jinja is currently improving walkability in the city center by widening walkways from



1.5 to at least 3 m, installing traffic lights and solar street lights, which showed an immediate growth of walking residents at night.



Performance

- The use of boda motorcycle taxis (45%) is one of the most significant contributors to road fatalities, leading to decreasing levels of walking (25%) and cycling (2%) in Jinja. Each year, at least 40 road fatalities are caused by boda but most incidents are not reported or recorded.
- Traffic is not yet an issue in Jinja, although private cars are increasing.
- Jinja does not monitor ambient air quality, but thick polluting fumes from the four-stroke engine of boda motorcycles or imported vehicles are the primary contributor to poor air quality.

Key focus areas to improve ecomobility

- Work with the Boda Association, national government, and traffic police to regulate the boda industry as this is a detrimental issue to social cohesion and economic losses. Organize public campaigns to raise awareness of ecomobility and road safety.
- Planning for safe access and upgrading the quality of the matatus services and the Taxi Park as they provide essential services to the local communities. Planning for walking and cycling network that is universally accessible; install more traffic lights and street lights.
- Establish a transport authority as the policymaker for sustainable mobility for Entebbe, including planning and operating public transport, and working together with the Urban Planning Department.

About Jinja

Jinja Municipal Council lies 81 kilometers east from the capital of Kampala, Uganda, also in the Busoga sub-region. Jinja has the second-largest economy in the country, after Kampala. It is located at the source of the River Nile and is on the northern shores of Lake Victoria with rich freshwater ecosystems and wetlands. Jinja forms part of the emerging Entebbe-Kampala-Namataba-Jinja corridor and is connected by railway. It also has a small airport with national and regional flights.

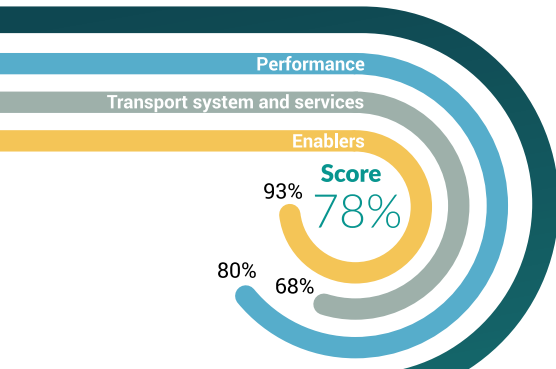
Given its strategic location, Jinja enjoys good links to other major urban centers. Its beautiful sceneries and cultural sites make it a high tourism attraction.

Jinja is a proud winner of the 2019 TUMI Global Urban Mobility Challenge Award. It aims to reorganize and transform the market area to be more pedestrian-friendly.



Kaili Municipal People's Government, China

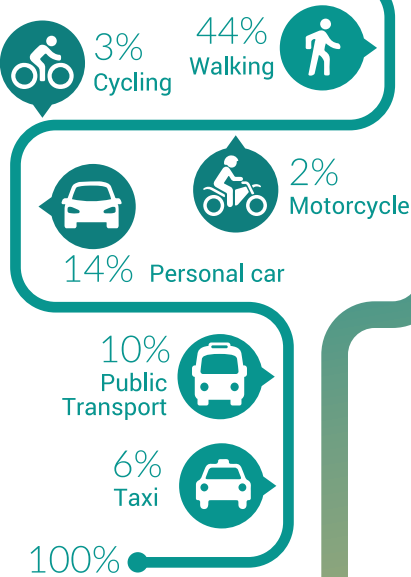
EcoMobility Analysis



Quick Facts



Modal Split



Public transport options

- Bus, taxi, high-speed rail

Transport authorities

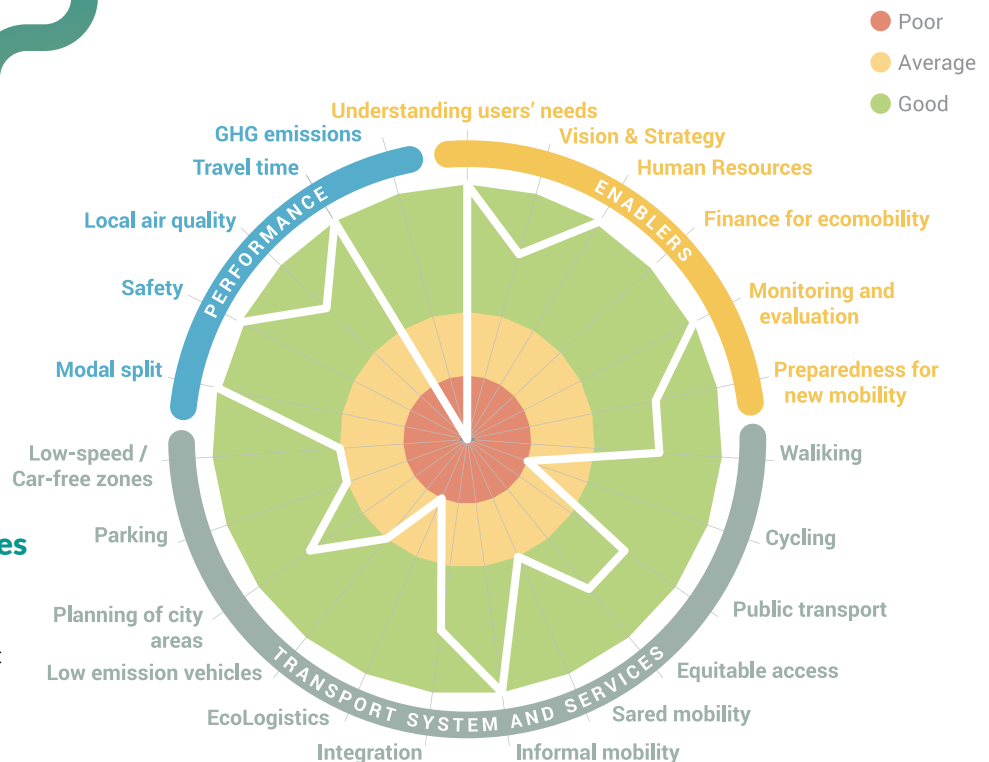
- Kaili Transport Bureau
- Kaili Public Bus Group
- Municipal Public Transport Corporation
- Traffic Bureau



Enablers

Kaili City's visionary policies, coupled with stable financial subsidies from the central government, create an enabling environment to plan transportation systems and services. The Urban Mobility Plan 2010 – 2030 serves as the main sustainable mobility planning document involving different agencies and city departments to implement. The “Public Transport Priority Plan 2018 – 2020” identified various indicators, such as achieving 85% of public transport satisfaction.

- The Transport Department works very closely with the Kaili Public Bus Group, which is the state-owned bus operator, as well as the Urban Planning Department and the Traffic Bureau.
- Researchers from the China Academy of Transportation Research under the Chinese Ministry of Transport provides technical guidance to transport policy and planning as well as capacity building, supporting the Transport Department to make excellent informed policy decisions.
- Kaili receives financial support from the central government to create and enhance the quality of the public transportation system (such as electrifying bus fleets) and the green mobility network.
- The city is dynamic in evaluating and welcoming new mobility services, such as appraising the need to create a public bike-sharing system before deciding that it is currently not the priority. Ride-hailing services such as Didi Chuxing are considered operating illegally, but the city is evaluating the safety and reliability before deciding to regulate or legalize it.





Transport system and services

Named as the National Bus City, the city invested significantly in public bus services (including the planned BRT system) and started to build a green belt to improve walking and cycling.

- As walking is a primary mobility mode, 84.6 km of the walking path and 9 km underground walkway is developed in Kaili, especially in the city center. Since 2017, the city started expanding the 60 km green network for walking and cycling near the Bala River.
- Cycling uptake is low in Kaili because the legal framework that prohibits cyclists from sharing pedestrian lanes and crossings while cycling lanes are limited. The planned 33.1km cycling network is mainly for recreational purposes.
- There are 28 bus lines in Kaili City with 522 stops and 72 bus platforms (77.9 km) within Kaili, with an annual passenger volume of 99 million. 90% of the population within the city lives 500 m from a public transport stop, and the Public Transport Priority Plan aims to reach 100% by 2020;
- 100% of the buses are green buses (natural gas, electric, and hybrid buses), while new energy buses (pure electric and hydrogen buses) account for more than 60%. There are currently 103 charging poles in Kaili and is expanding. As of 2019, 151 electric buses operate in Kaili City, transporting 33.7 million passengers/ year, reducing 11,290 tonnes of carbon emissions each year.



Performance

Kaili shows an excellent example for many smaller cities of how proactive planning makes ecomobility a reality despite the increasing affluence of the society. The transport strategy centers on preventing traffic congestion before it even starts.

- Most Kaili residents travel in an ecomobile manner (more than 70%). Private cars constitute only 13.9%
- Low traffic fatalities
- Travel time within the city takes no longer than 60 minutes, even with public buses.

Key focus areas to improve ecomobility

- Investment on a continuous pedestrian and bicycle network and infrastructure to encourage more residents to walk and cycle as part of their mobility mode, instead of just recreational activity.
- Strengthen city design and transport planning for better inclusivity, accessibility, and connectivity so that people with reduced mobility can also access to services and opportunities.
- Adopt policies and incentives to discourage the use of private cars, e.g., parking policy and pricing, and using big data to assess demand for routes to evaluate underserved peripheral areas.



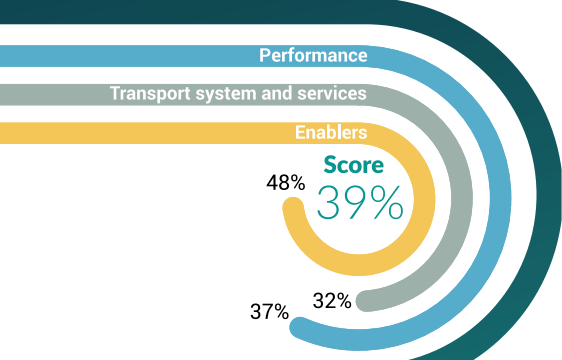
About Kaili

Kaili City is a central regional city of eastern China's Guizhou province. Known as the Pearl of the Miaoling Mountains, it is the epicenter of the Guizhou economic zone and the capital of Miao and Dong autonomous prefecture. The city attracts crowds of local and international tourists each year charmed by the scenic landscape, ancient architecture and colorful mix of Chinese ethnic minorities, predominantly the Miao group.

Kaili is traditionally one of the leading rice producers in China. To the south of the city is the Guizhou-Kaili Economic Development Zone, which was established in 2000 to catalyze industrial development for the region. The construction of railways, high-speed rail, airport, and water transport significantly improved regional connectivity, positioning Kaili to be the main gateway connecting Guizhou province to eastern and southern China, catapulting economic development of the city in recent years.



EcoMobility Analysis



Quick Facts



Land area 159.37 km²



Population 1,618,879 (2011 census)

Modal Split



31% Walking
16% Cycling



53% Motorized transport



78% Two-wheelers



16% Private cars



0.82% Auto-rickshaws

100%

Public transport options



- Bus, auto-rickshaws
- Ride-hailing for cars

Transport authorities

- Ludhiana Traffic Authority



Enablers

Ludhiana is one of the Smart City Missions pioneers in India, where improving transportation is one of the cornerstones. Furthermore, the city developed the Comprehensive Mobility Plan 2015 – 2031, but implementation is significantly lacking due to the lack of qualified staffs and financial resources.

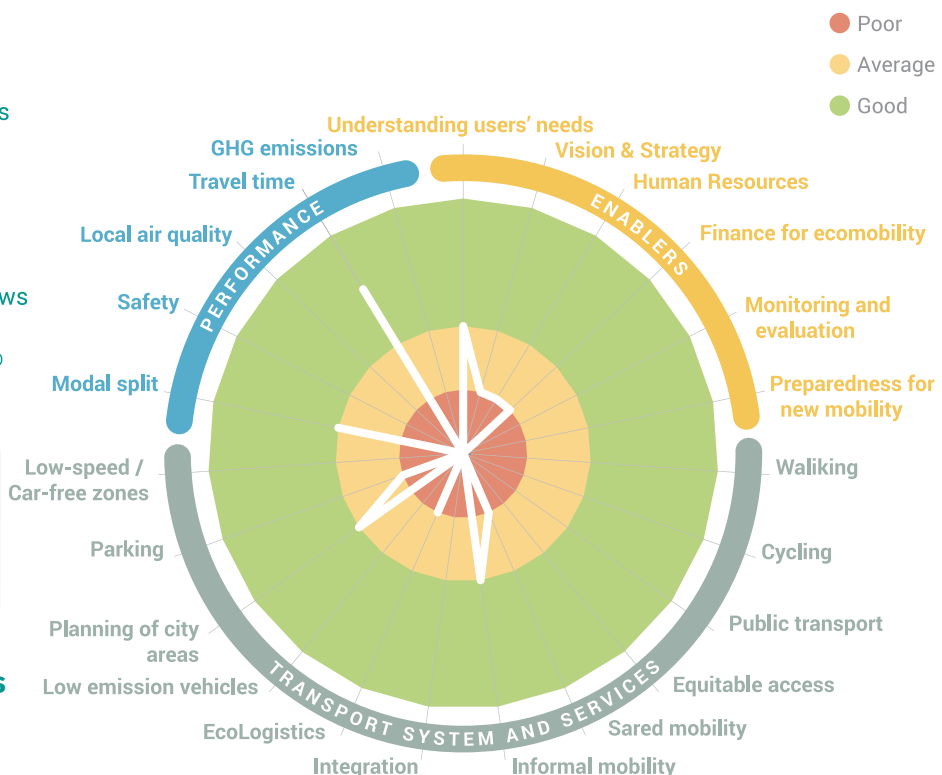
- Ludhiana Municipal does not have proper transportation or urban planning department. Transport issues are taken care of by the Engineering Department for road designs; and traffic safety by the Traffic Authority, which are car-centric. Urban plans are only at the regional level with a lack of involvement from the municipal.
- A city-wide public consultation process in 2015 identified poor public transportation (89%); severely polluted air quality (85%); unsafe at night (76%); and inadequate parking facilities (65%) as their top concerns.
- Implementation of some extent of ecomobility is limited to the Smart City Mission coverage area only, and this is spearheaded by a consulting company since the city does not have sufficient human resources.



Transport system and services

Due to the lack of a functioning public transportation system, auto-rickshaws fulfill mobility demands.

- Ludhiana is a compact city with a high potential for transit-oriented development.





About Ludhiana

Ludhiana is the fastest growing city in the State of Punjab in northern India. It is the most populous city in the State that qualifies for a metropolitan character with a population of 1.6 million, and it is also the largest city in the State in terms of area.

Ludhiana is the largest business and trade hub in Punjab and Asia's biggest bicycle manufacturing hub. It is well known for its small scale industrial units, which produces machine parts, auto parts, hosiery, and industrial goods. With a strong industrial and manufacturing base, the city is set to be the economic powerhouse for the region.

- Although walking and cycling are essential mobility modes, there is almost no walking and cycling paths. Cars, auto-rickshaws, cycle-rickshaws, rickshaw pullers, and bicycles compete for the same road space, especially in the inner city. Current active mobility improvement is under the Smart City Missions area, which is a more affluent area.
- There are about 30,000 auto-rickshaws, while it is advantageous, the lack of formal regulation results in reckless driving and parking. In 2017, a private investor introduced GPS-enabled smart electric rickshaws to replace polluting auto-rickshaws, offering to the population living below the poverty line. Such data collected is analysed in an integrated platform to improve user experience.
- There are 200 public buses over 5 public transport routes (62 km) commissioned to a private operator, but only 50 buses are operational because of the low profitability of the individual operator and lack of subsidies by the city. Instead, investments are on road infrastructure such as flyovers in the inner city that exacerbated the traffic situation and safety of pedestrians and cyclists.



Performance

Due to the lack of technical and financial capacity, significant works are needed.

- Poor safety with a high fatality rate due to reckless driving and the barrier to receiving a driving license is low.
- Ludhiana's "Safe City Project" develops video surveillance (1,700 cameras in 25 locations), street lighting at public places to enhance safety.
- Old fossil-based vehicles result in poor air quality and high GHG emissions.

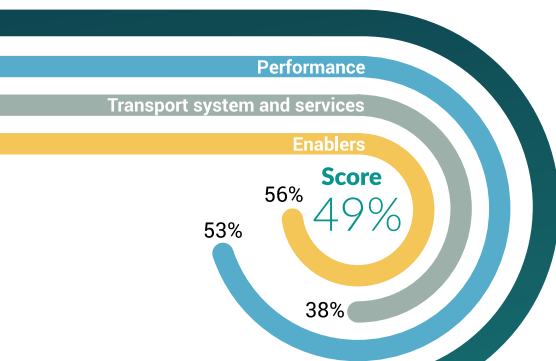
Key focus areas to improve ecomobility

- Strengthen technical and financial capacities to invest in sustainable mobility by setting up an EcoMobility Department. Develop a plan for sustainable fiscal revenue and expenditure stream to subsidize public transport and charge car users as this is a crucial factor that hindered the public buses from operating while car ownership is increasing.
- Land-use and transport planning with equitable access as a core goal. Future projects need to also consider the social component to ensure that the most vulnerable population can also benefit investments.
- Walking and cycling infrastructure and network or car-reduced zones need to be implemented, especially near the central train station and market area, to relieve traffic congestion and improves the safety of pedestrians and cyclists. Adopt Vision Zero to improve road fatalities.



Visakhapatnam Municipal Corporation, India

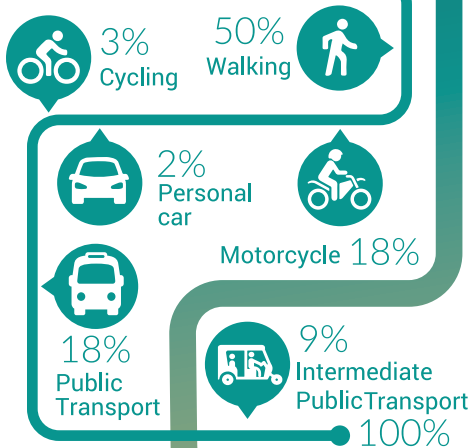
EcoMobility Analysis



Quick Facts

- Land area 88.60 km²
- Population 1,728,128 (2011)

Modal Split



Public transport options

- Bus, auto-rickshaws
- Ride-hailing for cars

Transport authorities

- Visakhapatnam Urban Development Authority (VUDA)
- Visakhapatnam Regional Development Authority (VMRDA)
- Andhra Pradesh State Road Transportation Corporation (APSRTC)
- Traffic Authority



Enablers

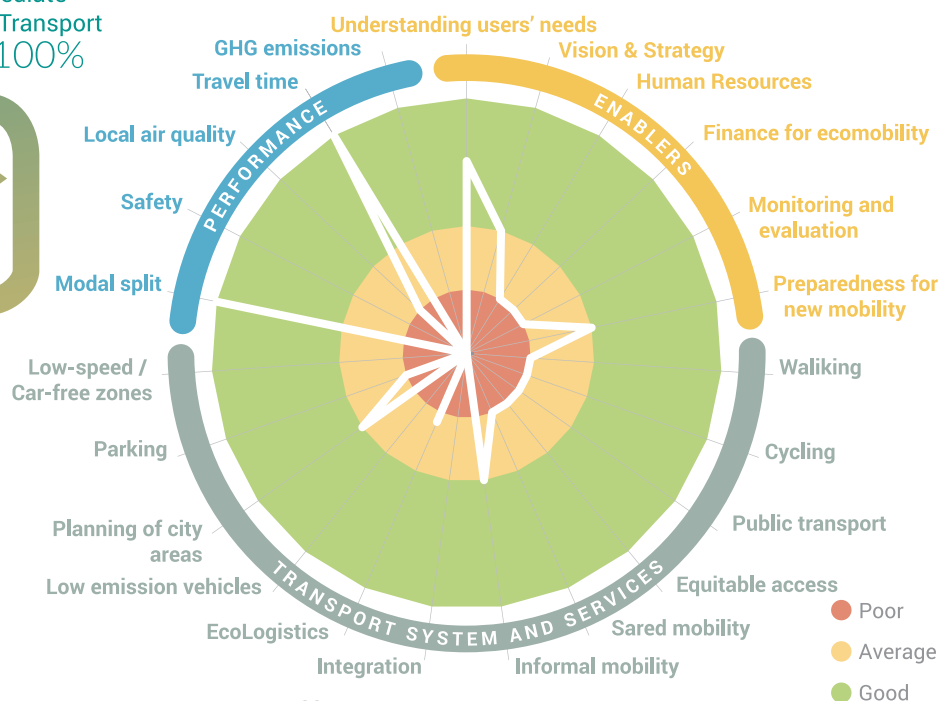
Visakhapatnam is one of the Smart City Mission cities in India, which highlighted a poor public transportation system and high annual vehicular growth rate (9%) as vital issues. Visakhapatnam transport development is included under the Greater Visakhapatnam Masterplan headed by VUDA.

- The city does not have a transport department, so all transport-related issues are taken care of by the urban planning department, VUDA. There is an appreciation for active mobility and public transport, although car-centric growth is still given substantial attention, with 70% of transport investment is on road networks, and less than 25% is on ecomobile-friendly infrastructure.
- Stakeholder consultation meetings are mandated for all projects involving the Port Authority, technical experts, NGOs, institutions, private companies, and the general public. Data and feedbacks from the residents are actively collected through mobile applications under the Smart Cities Mission, including ideas on reviving the BRT project.
- The city is open to new mobility services, although there is not much engagement with privately-owned new mobility companies such as Ola, Uber. The first public bike-sharing system in the city is a result of a public-private partnership.



Transport system and services

Public bus and auto-rickshaws are the primary forms of public transport in Visakhapatnam, while many residents still walk, albeit at a decreasing rate due to the rising middle-class population that favors cars. The Smart City Mission sets out ambitious targets and plans for multimodal transportation with various feasibility



studies and proposals developed. The key right now is implementation and enforcement.

- The city maintains 78 km of footpath out of the 480 km road network, with most being discontinuous and not universally accessible. In the new Masterplan, walking and placemaking are given attention to beautifying the town. Cycling has taken a setback due to the hilly nature of the city.
- Current public buses are uncomfortable and insufficient to accommodate demand. Paratransit vehicles (three- and seven-seaters auto-rickshaws) serve the peak hour demand, competing with the public buses although the price is slightly higher.
- In 2014, the 45 km BRT completed construction but could not be operated effectively due to issues related to financial and legal matters. The BRT corridors are intruded on by unauthorized vehicles. The city continues to place efforts to revive the BRT.
- Equitable access is overlooked as the poorer residents spend more on public transportation or rely solely on walking or cycling, while most transport infrastructure designed is not universally accessible. Unorganized on-street parking and encroachment by informal kiosks reduce road capacity, inhibit vehicular flow, and pose a threat to pedestrian safety.



Performance

The high population growth is not met with the supply of efficient public transport system, while the better economic situation of the population resulted in higher automobile ownership. Thus, the city faces a familiar problem: the increasing motorization rate resulted in traffic congestion and degraded quality of life.

- Road safety is a significant concern with one of the highest fatalities in India, especially for pedestrians (43%), motorcyclists (33%), and cyclists (5%) as they represent 80% of the road fatalities.
- Air quality is not a major concern because it is a coastal city, so pollutants can be easily-dispersed. No measurements on GHG emissions yet, although the city hopes to introduce electric buses.
- Travel time is short due to the polycentric metropolitan nature as the city urbanizes.

Key focus areas to improve ecomobility

- Enhance quality, comfort, and safety of public transportation through increased coverage and use of intelligent management systems. The latter is to analyze data, identify hotspots for better transport planning, timely deployment of buses, provide live information, smart payment system. Integrate modes or even monthly passes to attract more public transport users. Engage intermediate passenger transport (IPT) operators to improve last-mile connectivity.
- Improve physical connectivity between essential transport hubs, pedestrian and cycling lanes that are universally accessible.
- Establish a transport authority as the policymaker for transport in the city, including planning and operating different transport modes. This can be reinforced by creating a centralized fund to ensure stable revenue and investment streams for sustainable mobility.

About Visakhapatnam

The City of Vishakhapatnam, commonly known as Vizag, is Andhra Pradesh's largest city, both in terms of population and economy. Located in the southeastern part of India, it is one of the largest municipal corporations with a population of around 1.7 million, spread across 515 square kilometers (km²) of land area.

This coastal city is well connected by all modes of transport: east coast railway, national highway, airport, and seaport. Visakhapatnam Port is one of the largest ports in the country and has the only natural harbor on the east coast. The geographical advantage, coupled with a myriad of infrastructural facilities, positioned the city on the international market as the financial and industrial capital. The rapid pace of growth made the city the fifth-fastest growing industrial town in the Asian subcontinent. It has also attracted in-migration from the surrounding suburban areas and villages.

Recommendations for policymakers

Vertical and horizontal integration in transport planning and operation



Governance and planning

All tiers of governments must be informed of international and national policies and targets, paying more particular attention to second and third-tier cities as information is least communicated to them. Any policies related to sustainable mobility that is formed by the national government must take into consideration the local practices and conditions to address fragmented decision-making. Federal policies should also be communicated, providing support on capacity buildings, particularly for smaller cities. Often times, the fragmentation in the information flow or decision-making process is the result of overlapping institutional responsibilities or the lack of coordination. Therefore, identifying or establishing a leading authority to provide strategic guidance to make well-informed decisions is instrumental in integration.

Establishing a single (metropolitan) transport authority bridges the links between planning and operation of different transport modes. The role of such a body can be categorized into (1) strategic planning and financing; (2) operations and enforcement; and (2) administration (legal, public relations). This not only increases accountability, it also streamlines procedures and management. For example, several Indian cities, such as Kochi, Mumbai, have established a unified transport authority to oversee intermodal planning and operations. Another form of integration refers to urban transport facilities and service operations, which can be done through more inclusive design and the use of information technology. For example, transport hubs can be tailored for seamless transfer between modes with a unified ticketing system and station design.

Vision Zero: Improving road safety



Sustainable mobility for all

Road safety is a distinct and pressing problem in all cities. In most cases, the worst victims are the most vulnerable users, such as the elderly, pedestrians, or cyclists. The Vision Zero aims to attain zero traffic fatalities and serious injuries. This approach assumes that accidents are avoidable through safer road designs, vehicles, and road use. More than 30% of road fatalities are attributed to poor road designs such as at pedestrian crossings and intersections. The use of safer vehicles can either prevent accidents or mitigate the impact of the crash. Managing the speed of vehicles is pivotal, through reducing speed limits or encouraging the use of vehicles that are of slower speed (e.g., bicycles). Finally, education and awareness lead to safer road use. This could also mean increasing the bar of getting a driving license or strict enforcement of lousy driving and even revoke a license.

Sustainable financing that prioritizes public transport and active mobility



Governance and planning

Cities must make smart investments in sustainable transportation infrastructure, not just to mitigate current traffic problems but also provides for the future based on sound projection and assessment. Investment criteria must mainstream the mobility needs of the socially and economically vulnerable population, also considering gender needs to build sustainable and inclusive communities. This refers to creating high-quality public transport and active mobility network. There is a strong economic case to invest in ecomobility. Sydney shows that cycling tracks have a benefit to cost ratio that is higher than other transport projects with a return of about 7 € (7 Australian Dollars, AUD) for every 0.60 € (1 AUD) invested.

Ensuring the sustainability of the financing model is essential and can be best done through the pooling of fiscal resources into a central transport fund and distributing them according to the city's sustainable goals. Different fiscal resources include subsidies, land-value capture, public-private partnership, and, most importantly, charging car-use. Many developing cities aspire to construct expensive metro systems, although growth projections prove that such luxurious infrastructure can be financially crippling. Transparency and accountability are pivotal to prevent corruption and ensure that public service is effectively delivered.

Equitable access through inclusive planning



Sustainable mobility for all

The goal for transport planning is not movement, but the realization of accessibility to goods, services, and opportunities and equitable access

is firmly influenced by social and economic conditions. More accessible cities are more inclusive cities by shortening journey and make social amenities and opportunities more accessible. Such cities can be created through compact, mixed land-use cities with highly walkable neighborhoods and an excellent and affordable public transportation system.

Taking into considerations of social equity in transport planning and infrastructure design is crucial to improve access and reliability of mobility options. For example, the United Kingdom government promulgated legislation that addresses accessibility issues related to different social profiles (gender, age, disability, affordability). Many European cities also designed universally accessible transport infrastructure, such as low-floor buses or seamless walking networks even for wheelchair users.

Many developing cities ostracize informal transport, although they offer valuable services and job opportunities to the locals. While not romanticizing the industry, it is also essential to acknowledge the vital services they provide. Instead of sidelining them, concerted efforts must be made to enhance the safety and service quality to serve the needs of all population groups.

Adoption of carrot-and-stick policy instruments to nudge sustainable mobility



Many cities invested heavily in offering attractive multimodal mobility system, but private car ownership and usage continue to increase because of the lack of restrictive policies that prevent car ownership. Therefore “stick” strategies are also needed to disincentivize the use of private automobiles while investments on high-quality mass transport systems remain (“carrot”). Innovations for new mobility services are happening faster than the transport authorities’ responses. Hence, cities must maintain clear policy goals to harness the potential of new innovations through a myriad of policy instruments to influence the supply and demand. They can be categorized as economic (e.g., taxes, subsidies), regulatory (e.g., vehicle access restrictions, speed limit), information (e.g., standards, marketing).

In this whole process, the aspect of design serves as the primary linkage to integrate the critical features of diverse policy interventions that prioritize accessibility; and nudge sustainable user choices and behavior.





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This publication shall be cited in full as "ICLEI-Local Governments for Sustainability (2020). Cities SHIFT: Capacity building and networking for climate- and people-friendly mobility report."



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