

Kaohsiung, Chinese Taipei

Steering towards an eco-mobile city with integrated public transport

Kaohsiung is on the fast-track toward becoming an eco-mobile city through the integration of a variety of public transport systems, including Bus Rapid Transit (BRT), Metro rail (MRT) Light rail (LRT) and a bike sharing system, along with enhancing user behaviors through incentives and smart urban planning.

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Abstract

Public transportation is the backbone of urban mobility. In addition to the deployment of public transport infrastructure, convincing residents to opt for public transit over private transit is a pivotal challenge to eco-mobility. In recent years, the City of Kaohsiung has integrated a mix of viable transportation alternatives with the aim of building a sustainable and eco-mobile city. The City is realizing its ambitious goals through the provision of Bus Rapid Transit (BRT), Metro Rail Transit (MRT), Light Rail Transit (LRT) and a public bike system, and has thus far achieved encouraging results. Kaohsiung's experience serves as a valuable example to other cities interested in implementing similar transportation systems and policies. With infrastructure now in place, the City continues to devote considerable attention to the importance of challenging user behavior.

The importance of sustainable eco-mobility in Kaohsiung

As a typical urbanized metropolis, Kaohsiung has encountered challenges transitioning out of unsustainable automobile dependency into sustainable eco-mobility. To counteract this, the City of Kaohsiung's transportation planners are addressing the challenge of reducing private vehicle dependency through people-oriented, low carbon transport alternatives to improve the environment and quality of life.

The threat of climate change related disaster to human settlement is well known to Kaohsiung City, which has been severely affected by torrential rains and floods. Hence, the city urgently needs to strengthen its policies and infrastructure to reduce greenhouse gas (GHG) emissions and increase its resiliency



Population / Land area
~ 2.78 Mill. (2014)/ 2948 km²

Municipal budget
Approx. USD 4420 million (2014)
(EUR 3280.76 million)

Photo: Wikimedia Commons



The Kaohsiung City Harbor



Kaohsiung City has been a member of ICLEI since 1996, and a member of the EcoMobility Alliance since 2011.

Case Study

Kaohsiung in context

Located in Southern Taiwan, Kaohsiung City has a long history as a hub for heavy industry. The total amount of the city's carbon emissions is an enormous 23 tons per capita per year; two times higher than the average of the entire island of Taiwan.

In 2010, Kaohsiung City and the surrounding county merged into one municipality, which substantially enlarged both the city's land area and population. Today, the administrative area of Kaohsiung City amounts to roughly 2,946 km², with a population of 2.77 million, which makes it the largest municipality in Taiwan. The downtown urban area is roughly 153 km² and is home to 1.5 million inhabitants.

According to Kaohsiung City's current CO₂ emissions portfolio, the transport sector ranks third in total emissions (6.2 percent). The city, however, has the highest per capita emissions (22.3 tons/per capital/year) in the state. In order to achieve its goal of reducing emissions by 30 percent by 2020 (compared to 2005 levels), Kaohsiung intends to introduce the following initiatives:

- provision of an integrated and energy efficient public transportation mix
- improvement of public transportation usage rates
- creation of enhanced walking and cycling paths
- reduction of the CO₂ emissions of current transportation and station facilities

In addition to these initiatives, Kaohsiung has implemented state-of-the-art Integrated Transport Systems (ITS) to reach its low-carbon emission goals. Since construction began in 2000, the ITS infrastructure has expanded considerably. Consequently, popularity for public transportation alternatives has grown as well: the number of public transportation network users tripled between 2007 and 2012.

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Scooter transport in Kaohsiung City

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Kaohsiung City's bicycle infrastructure is a significant contribution to improved urban mobility

Challenges: reforming transportation habits of residents via sustainable alternatives

As is typical in many cities, residents in Kaohsiung primarily rely on motorized vehicles for daily transportation. Of the 8.8 million daily commuting trips in Kaohsiung, 86.5 percent occur via private cars and scooters. Private vehicle ownership in Kaohsiung is approximately 242 vehicles per thousand people for automobiles, and 814 for scooters. On the other hand, the public transportation utilization rate in Kaohsiung city stands at 17 percent; a relatively low share of total transportation. Consequently, providing eco-mobile transportation alternatives and reforming transportation habits is crucial to reducing emissions, as well as for enhancing the aesthetic value of Kaohsiung's streetscapes.

Transit plans in action: five transport systems for an integrated eco-mobile framework

To provide residents and visitors with seamless public transport services, Kaohsiung orients its public transportation system according to its population density through the use of the five major public transport systems – Bus Rapid Transit (BRT), Light Rail Transit (LRT), Metro Rail Transit (MRT), shuttle buses and DRT (Demand Responsive Transit). The first three systems, BRT, MRT, LRT, together with a public bicycle sharing system, form Kaohsiung city's eco-mobile framework.

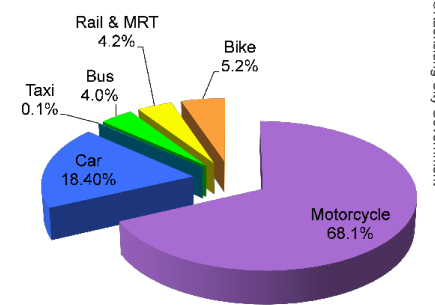
Kaohsiung Bus Rapid Transit (BRT)

In order to provide more energy-efficient service, the Kaohsiung City government undertook the development of two bus rapid transit (BRT) systems in 2012 by making improvements to the existing bus infrastructure, vehicles, and scheduling. The city has optimized its bus route network, set up new routes for sight-seeing ferries, and made use of the tourism infrastructure within the river and harbor districts in order to offer better-quality bus and ferry services. The accessibility of transport opportunities has been enhanced through an increase in the quantity of shuttle-bus routes, which have doubled in number from 25 to 50. The bus-stop distribution of the downtown area has been structured so that no bus-stop is further than 5 minutes away, regardless of location. Moreover, buses depart every 10 minutes during peak traffic hours, and the new BRT's guarantee a maximum travel time of 30-minutes to any destination.

The successful enhancement of infrastructure and technology constituted half of the Kaohsiung City eco-mobility strategy; however, finding creative ways to increase transportation usage amongst residents was equally as important. A key component of this included making transport as accessible as possible. Incentives including: special fares and free transfers, innovative "iPass" tickets, the "iBus" smartphone application, and the dissemination of time tables all combined to make public transport both attractive and accessible. The result of these efforts included a 7 percent increase in ridership in 2013.

Kaohsiung's Light Rail Transit (LRT) Project

Among the five major public transportation systems, the LRT and Express Buses are under development as pilot systems to serve the growing population. Phase I of the Circular Light Rail Line (also known as the Kaohsiung LRT or, Kaohsiung Tram) has been under construction since 2013, and is scheduled to open in mid-2015. An estimated budget of NTD 16.5 billion (approximately USD 550 million) was allotted to complete the project.



Transportation preferences in Kaohsiung City

Public Bike Rental System

Kaohsiung recognizes the importance of cycling in cities, and thus promotes bicycles as a low carbon transportation method for commuting to work, as well as championing their considerable applications in regard to health and fitness, leisure and travel. Yet although Kaohsiung has been internationally recognized as one of the “5 best biking cities in Asia” (CNN, 2010), in 2012, only 5.4 percent of residents (mostly students) were using bicycles on a daily basis.

In order to increase the appeal of bicycling as a viable alternative to short motorized trips, Kaohsiung City launched its public-use rental system in 2009, making it the first city in Taiwan to set up a self-service bike rental system. The rental service is managed through a public-private partnership between the City and the MRT company. The City plans to increase the amount of bike lanes to 1,000 km in the near future, making it easier and safer for all bike users. In addition, the Kaohsiung City Public Bike launched the “Kaohsiung Public Bike Easy Go” smartphone application in February 2012, offering users a real-time overview of the conditions at every rental station location, along with social media and text services. By the end of 2013, 160 rental stations had been installed, extending the city’s network from 6km to 13km and providing for 6,742 trips per day. By 2015, the total distance of bicycle routes is planned to exceed 740 km and serve over 10 percent of the population.

Kaohsiung Mass Rapid Transit (KMRT) System

Kaohsiung City recognizes the importance of linking transport systems in an integrated method. Therefore, in 2008, the City developed the Kaohsiung Mass Rapid Transit (KMRT) system to ensure that both residents and tourists could travel from point-A to point-B without having to rely on private transportation.

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Kaohsiung MRT System connects with the main transportation networks

The KMRT system is currently made up of 39 stations dispersed over two metro lines, covering a total distance of 42.7 km. In addition, the KMRT connects to numerous major transportation networks including: the BRT, railways, high speed rails, harbors for both cruise and cargo ships, and the international airport.

Several of the 39 KMRT stations have received international recognition: the Formosa Boulevard Station and Central Park Station have been honored in both the “50 most beautiful subway stations in the world” (Metrobits, 2011) and the “Top 15 most beautiful subway stations in the world” (BootsnAll, 2012). In

February of 2013, the number of average daily passengers on the KMRT system was approximately 190,690. Moreover, on New Year’s Eve in 2012, the system transported 472,378 passengers. The goal is to increase resident use from a current 18.1 to 36 percent by 2018.

Lessons learned

Pursuing ambitious public transportation programs improves resident's lives and the environment. In 2007, 34.5 million passengers utilized the City's public transportation network. As a result of Kaohsiung's initiatives, total ridership tripled within five years. At the end of 2012, 101.7 million residents were integrating the public transportation network into their daily routine.

The City of Kaohsiung has reformed the public transportation system to make it more user-friendly and efficient; however, shifting user preferences remains a challenge. In the future, public transport services such as the BRT, MRT, and LRT are likely to further reduce private vehicle dependency and associated congestion. However, there have been limits and difficulties with this approach: because of the convenience that private vehicles and ample, inexpensive parking offer, residents do not have a strong incentive to alter their transportation habits. In order to combat this trend, the City needs to integrate transportation, housing, and land usage together, while also making its streets more attractive and safer for bicycling and walking. Through measures such as these, Kaohsiung City can continue to increase the appeal of public transportation for its residents.

Eco-Mobility Alliance

Kaohsiung City is a member of the EcoMobility Alliance, a network that brings together cities which are committed to providing urban mobility infrastructure.

The vibrant, ambitious cities in the Alliance display leadership, foresight, and accountability, and pave an EcoMobility path for others to follow.



Kaohsiung Cityscape

Providing alternative choices to residents is crucial; however, they must be coupled with affordable pricing schemes. Although the number of residents using the Kaohsiung public transportation systems has risen dramatically, the public transportation operators are still not confident that they will be able to balance revenues and expenditures. The KMRT system has incurred deficits of at least NTD2 billion (USD 67.7 million) every year since it began operations in 2008, and this is largely the result of low usage. As a result, the City must provide a lump-sum subsidy to the KMRT service provider to keep the service in operation. This creates a costly dilemma: potential funding for other eco-mobility projects is being regularly directed back into the KMRT.

In Kaohsiung's case, transit initiatives follow a top-down project-oriented model. Given the importance of community involvement, as well as the apparent resistance to initiatives such as the KMRT, communication between the local government, service providers and residents could be enhanced.

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Replication

Kaohsiung's experiences provide a tangible example of promoting a transition in residential transportation habits, from private-vehicle to public-system use, in a developing Asian city. However, when it comes to promoting a transition towards becoming an eco-mobile city, the Kaohsiung example suggests that more comprehensive plans are needed, both financially and behaviorally, to guarantee the commitment that is necessary with ambitious projects. All sectors of the community play a critical role in shaping the development of livable cities, and Kaohsiung City's experiences reflect the inertia that can be met when attempting to adopt an alternative transportation model in an automobile-oriented city. That being said, by exploring a diverse range of public transport alternatives, Kaohsiung City is on the path towards becoming an eco-mobile city, and has many perspectives and projects which other cities can learn from

Budget and finances

In operation since 2008, the KMRT is managed by Kaohsiung Rapid Transit Corporation (KRTC) under a Build-Operate-Transfer (BOT) agreement. The total operational and capital budget amounted to USD 6 billion, and was primarily funded by the Kaohsiung City Government. BRT (USD 13.33 million), LRT (USD 0.41 billion) and Public Bike Rental System projects are now directly funded by the Transportation Bureau via Demonstration Projects. The City believes these investments will facilitate the transition to a new phase of urban mobility, which is fundamentally linked to quality of life, the low-carbon environment, and city livability.

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