

ST-1: Energy Efficient Urban Transport Network

Basic Information

Project name:

Revolutionizing Urban Mobility: The Impact of Youbike on Kaohsiung Residents' Sustainable Travel Behavior

Managing Organization:

Transportation Bureau of Kaohsiung City Government

Government Initiatives and Policies:

Global warming and energy shortage issues have raised public awareness of environmental protection and sustainable operation. Since motor vehicles are one of the main sources of air pollution and energy consumption, bicycles, in contrast, have the advantage of being energy-free and serve multiple functions such as commuting, transferring to other transportation modes, sports, and leisure activities. As a result, bicycles have become a green vehicle that governments around the world are actively promoting.

In line with the development of public transportation in Kaohsiung City, the Kaohsiung City Government Transportation Bureau is promoting the "Operation and Management Commissioned Service for the Kaohsiung City Public Bicycle Rental System." This project introduces a new generation of public bicycles in Kaohsiung City, equipped with high-quality bicycles, smart bicycle devices, and backend systems. By integrating with regional public transportation, this system aims to reduce private vehicle ownership and usage, alleviate urban road congestion, environmental pollution, and energy consumption challenges. It can also increase citizens' mobility, improve their quality of life, promote public health, and build a net zero smart city.

Project Description:

Overview

In response to the goal of achieving net-zero carbon emissions by 2050, the Kaohsiung City Government Transportation Bureau is actively introducing shared green transportation vehicles. Kaohsiung City is also the city with the most diverse modes of transportation in the country, including the MRT, buses, ferries, light rail, shared scooters, shared cars, and public bicycles. We plan that by integrating public bicycles with various other modes of transportation and the existing Red and Orange Line MRT, light rail, and bus public transportation networks, they can serve as the first and last mile connections, effectively expanding the service range of Kaohsiung City's rail transit system.

In July 2020, Kaohsiung City introduced the brand new "Kaohsiung YouBike 2.0 Public Bicycle System," creating innovative thinking to integrate operations and installation services, with stations set up quickly and easy-to-use operations. The public bicycle system is an effective way to reduce carbon emissions, encouraging citizens to choose bicycles over cars and motorcycles for short-distance travel, thereby reducing emissions from private vehicles. Additionally, the popularization of the public bicycle system helps reduce traffic congestion and improve urban air quality. By promoting eco-friendly transportation, the city can significantly lower its carbon footprint and contribute to addressing climate change. After more than 3 years of operation, it has accumulated over 50 million uses. The Kaohsiung YouBike 2.0 has become the best transfer option for residents to relax, commute, and for tourists to go sightseeing and shopping.

Challenges

Kaohsiung City faces several challenges in promoting public bicycles, including high private vehicle usage, low public transportation use, budget constraints, difficulties in acquiring land for bicycle stations, and challenges integrating public transportation systems.

1. High private vehicle usage rates

According to statistics, the private vehicle usage rate in Kaohsiung City is 79.2%, while the public transportation usage rate is 8.4% (Summary Analysis of Daily Transportation Mode Usage Survey for 2022, Statistics Office of the Ministry of Transportation). The high usage rate of private vehicles leads to road congestion and air pollution, affecting the overall efficiency of urban transportation and environmental quality.

2. Difficulty in securing budgets

Constructing a public bicycle system requires significant initial investment for bicycles, station construction, and management systems, all demanding substantial financial support. Operational and maintenance costs, including daily repairs, dispatching, staff salaries, and system upgrades, also need continuous funding. Limited government financial resources make securing funds for public bicycles challenging.

3. Difficulty in obtaining land for public bicycle station installations

Land resources in urban centers and densely populated areas are limited and expensive, making it difficult to find suitable locations for station installations. Additionally, land-use planning and related regulations increase the complexity of station installations, requiring lengthy application and approval processes. Furthermore, some residents and businesses in certain areas may oppose the station installation plans, fearing impact on their daily lives and business environments, further increasing the difficulty of land acquisition.

4. Difficulty in integrating public transportation systems

Kaohsiung City offers various public transportation systems, including railways, metros, light rails, buses, ferries, and public bicycles. Previously, different companies operated these modes with separate systems and fare structures, complicating their use. The lack of integrated tickets and fares further discouraged public transportation use.

Objectives

The goal of promoting a public bicycle system is to foster an environmentally friendly, healthy, and sustainable urban transportation model. Firstly, we are committed to reducing urban carbon emissions by encouraging citizens to use public bicycles to replace private vehicles for the last mile, thereby improving air quality and mitigating climate change. Secondly, improving residents' health is another important objective; public bicycles provide a convenient and economical way to exercise, allowing citizens to stay fit during their daily commutes. Furthermore, we hope to enhance the convenience and connectivity of the urban transportation system by optimizing transportation facilities and services, allowing more people to enjoy a seamless public transportation experience. Ultimately, promoting the development of a public bicycle system aims to create a green, healthy, and harmonious urban environment and improve citizens' quality of life and happiness.

1. Carbon reduction and reduction in the use of fuel-powered vehicles

The public bicycle system is an effective way to reduce carbon emissions. These systems encourage citizens to choose bicycles over cars for short-distance travel, thereby reducing carbon emissions from private vehicles. By promoting this environmentally friendly mode of transportation, cities can significantly reduce their carbon footprint and contribute to addressing climate change. From 2020 to the present, the accumulated carbon reduction from Kaohsiung City's public bicycle system has reached 6,385 tons.

2. Changing residents' lifestyles

The public bicycle system not only helps reduce carbon emissions but also significantly changes residents' lifestyles. This convenient mode of transportation has led more people to choose bicycles over private vehicles, promoting a healthy and environmentally friendly way of commuting.

3. Improving the public transportation network and connecting the last mile

By setting up public bicycle stations at transportation hubs, important commercial districts, office spaces, and schools, and integrating them with Kaohsiung City's rail, metro, and light rail networks, a comprehensive public transportation network is constructed, facilitating daily commute and promoting community interaction and exchange.

4. Increasing public transportation usage rates

By integrating public bicycles with other public transportation systems and providing seamless transportation services, the attractiveness and usage rates of public transportation can be increased,

promoting the popularization of green transportation modes. These measures not only increase public transportation usage rates but also promote the sustainable development of the city.

Strategies

To promote the use of public bicycles, we have adopted a series of strategies. Firstly, by reducing the cost of usage, we aim to attract more citizens to choose public bicycles. Secondly, we have streamlined the land use acquisition process to rapidly expand public bicycle stations and infrastructure. In terms of dispatching, we utilize big data technology to improve the timeliness of bicycle dispatching, ensuring effective satisfaction of user demand during peak periods. Finally, we have integrated the public bicycle system with other public transportation networks, providing seamless travel solutions, further optimizing convenience and efficiency for citizens. These measures will jointly promote the popularization of public bicycles and contribute to the development of a green city.

1. Reducing the cost of using public bicycles

By reducing the cost of usage, we encourage citizens to shift from using private vehicles to public bicycles for the last mile of travel. Combined with a public bicycle rental and return model, citizens no longer need to worry about parking costs associated with private vehicles. Additionally, Kaohsiung City offers discounts such as half-price rates for the first 30 minutes of use, transfer discounts, student discounts, and TPASS commuter monthly passes, effectively reducing the cost of usage.

2. Streamlining land use acquisition procedures

The installation of public bicycle stations requires the use of land, involving the acquisition of land use rights. By simplifying the procedures for obtaining public land, governmental departments assist in surveying potential station locations, allowing for faster and denser establishment of public bicycle stations, with an average of 40 stations installed per month.

3. Big data management and operations

Effective utilization of big data for real-time control and prediction to meet the needs of a large number of users. Optimize vehicle allocation and dispatching of human resources to achieve the most efficient operational model.

4. Integration with public transportation networks

By integrating public bicycles with urban rail, metro, light rail, buses, ferries, and shared electric scooters, we provide integrated MaaS (TPASS) ticketing and fare systems. Through hardware and software information integration, citizens can conveniently switch between various public transportation modes.

Measures

1. Establishing guidelines for public bicycle rental stations to raise funds

The Kaohsiung City Transportation Bureau has established guidelines for the public bicycle stations. Through urban design reviews, traffic impact assessments, or environmental impact assessments for development projects involving floor area transfers or bonuses, enterprises are required to donate public bicycle rental stations to develop the public bicycle system. This has already accumulated over NT\$59 million in funding.

2. Designing diverse subsidy methods to change the public's usage habits

To attract citizens to shift from using private vehicles to public bicycles for the last mile of travel, Kaohsiung City provides users with diversified fare subsidies, such as half-price rates for the first 30 minutes of use, transfer discounts, student discounts, and TPASS commuter monthly passes. This encourages the public to complete their trips by transferring to public transportation and cultivates the habit of using public transportation among students, thereby changing citizens' lifestyles and creating a low-carbon transportation city.

3. Coordinating municipal land resources and conducting public-private site surveys to obtain land

Prior to the introduction of the Kaohsiung YouBike 2.0 public bicycle system, the Kaohsiung City Transportation Bureau convened meetings with various municipal departments to prioritize obtaining consensus on using municipal land for public bicycle station installations. The Transportation Bureau assisted in renting land from non-municipal central government agencies. Additionally, the Transportation Bureau, together with the public bicycle contracted operator and local community representatives, conducted on-site surveys before station installations to facilitate immediate communication and improve installation efficiency.

4. Optimizing and expanding public bicycle numbers and stations

Kaohsiung continuously optimizes public bicycle equipment and expands the number of stations and bikes to improve user experience and safety. Users can operate the solar-powered smart bicycle computer to borrow and return bikes directly. Each station supports multiple users simultaneously with diverse borrowing methods, including iPASS, EasyCard contactless payments, and mobile QR code scans. The seat height is adjustable with one hand. In 2022, YouBike 2.0E electric-assisted bicycles were introduced, allowing citizens to travel up to 80 kilometers on a single charge. The smart bicycle computer has a battery level reminder, and users can check the battery level via the app. Kaohsiung's public bicycle system features rapid station construction and high-quality bikes, increasing public willingness to use the system.

5. Utilizing big data management and operations

Effective utilization of big data not only provides users with real-time information such as available parking spaces and borrowable bicycles at each station for convenient rental, but also enables demand forecasting and equipment life cycle prediction through historical data. This allows for

advance arrangements of dispatching, station additions or relocations, and equipment maintenance to meet user needs.

6. Establishing KPI performance management indicators

To effectively manage the contracted operator's operations, the Transportation Bureau has established KPI performance management indicators for the Kaohsiung YouBike 2.0 public bicycle system, such as bicycle availability rates, proportions of bicycles awaiting maintenance, lock equipment functionality rates, and dispatching service standards. Big data can be utilized to ensure the contracted operator's service quality.

7. Integrating with Kaohsiung's MeNGo/TPASS mobility service (Mobility as a Service, MaaS)

The introduction of the MeNGo/TPASS monthly pass allows unlimited rides on Taiwan Railways, metro, light rail, buses, and ferries, as well as free use of YouBike 2.0 (E) for the first 30 minutes. It also integrates time-based tickets for major events in Kaohsiung, providing flexible options for travelers. All public transportation can be paid for using QR code mobile payments, traveling in Kaohsiung more convenient.

Performance

The implementation of Kaohsiung YouBike 2.0 has provided the best convenient and comfortable option for commuting, traveling to school, or tourism. To date, 1,330 rental stations have been launched, providing services with 10,700 bicycles. In 2023, the usage reached 15.49 million times, a significant increase of 35% compared to 2022. Since its launch in 2020, the cumulative usage has exceeded 50 million times. After introducing the TPASS commuter monthly pass in 2023, the usage of YouBike with the monthly pass grew 5.8 times, effectively reducing the use of scooters and cars, and enhancing the public transportation network.

According to statistics from 2020 when Kaohsiung launched the "Kaohsiung YouBike 2.0 Public Bicycle System" at the end of 2023, the estimated accumulated carbon reduction reached 6,385 tons.

According to the satisfaction survey of the city's public bicycle system, 51.3% of respondents stated that they would use public bicycles to replace scooters and cars.

According to the 2023 satisfaction survey, 72.8% of respondents said they would use public bicycles for first/last mile transfers to other public transportation.

Out of the 38 administrative districts in Kaohsiung City, excluding the mountainous areas, public bicycle rental stations have been installed in the remaining 31 districts, achieving a penetration rate of 81.6%.

The Kaohsiung YouBike 2.0E electric-assisted bicycles have achieved the highest national average daily turnover rate of 9 times.

The public satisfaction rate is as high as 97.6%, making it the most well-received policy among Kaohsiung citizens.

Vision

By 2026, Kaohsiung City is projected to have 1,500 public bicycle rental stations, with one station every 350 meters, and provide 13,000 public bicycles for service. Future new MRT routes and extension plans will feature the installation of YouBike 2.0 stations to enhance the accessibility and convenience of public transportation and construct a comprehensive public transportation network.

Kaohsiung City has a total of approximately 1,047 kilometers of bicycle paths. In response to the national 2050 net-zero emissions target, one of the twelve key strategies—"Net-Zero Green Living"—clearly states that "completing the cycling environment" is one of the concrete actions for 2030. Kaohsiung City is conducting a comprehensive inspection of its bicycle path network, inviting local cycling associations and road maintenance units to actually ride and comprehensively review the city's bicycle paths. This will further upgrade Kaohsiung's bicycle path network and actively encourage citizens to use environmentally friendly, low-carbon, and green transportation modes, shaping Kaohsiung into a livable, shared, and smart green city.

APEC Economy:

- Australia
- Brunei
- Canada
- Chile
- China
- Hong Kong, China
- Indonesia
- Japan
- Korea
- Malaysia
- Mexico
- New Zealand

- Papua New Guinea
- Peru
- Philippines
- Russia
- Singapore
- Chinese Taipei
- Thailand
- United States
- Viet Nam
- Non-APEC Economy _____

Energy Efficient Urban Transport Strategy:

See Appendix at end of document for complete descriptions of each strategy.

- Facility Efficiency
- Vehicle Efficiency
- Renewable Efficiency
- Fixed guideway/rail
- Fuel Cell

- Transit-oriented development
- Intelligent Transportation Systems (ITS)
- Bus Rapid Transit (BRT)
- Transportation Demand Management (TDM)
- Pedestrian/bicycle and other non-motorized facilities
- Other Transit Service enhancements

Project Costs

Capital Cost total: \$(USD)

\$21,550,000(USD)

Effectiveness - Emissions

CO2 reduction: (metric tons per year)

2,430(metric tons per year)

Effectiveness – Fuel Displacement

Liters of Gasoline Equivalents Displaced: (per year)

1,075,642(per year)

Liters of Diesel Equivalents Displaced: (per year)

732,214(per year)

Additional Project Details

Image:

Please attach an image that represents this project.



Project Website:

Please provide the project website.

<https://www.youbike.com.tw/region/kcg/>

Contact Information

Contact Name: Please provide your name.

LIN,MENG-SIAN

Contact Email: Please provide your e-mail address.

menglin825@kcg.gov.tw

Contact Phone Number: Please provide your phone number.

07-2299825#715

Appendix

Facility Efficiency - This includes projects that reduce energy use, greenhouse gas emissions, and/or decrease overall environmental impact of transit facilities, including maintenance facilities, transit stations, offices, buildings, etc.

Vehicle Efficiency - This includes projects that reduce energy consumption and greenhouse gas emissions of transit vehicles. This may include the use of alternative fuels, as well as improvements in fleet logistics leading to more efficient scheduling and route optimization, and other enhancements.

Renewable Energy - This includes a wide range of renewable technologies, such as solar, wind, geothermal, etc., that provide off-the-grid power generation from renewable sources. While these technologies typically apply to improvements to transit facilities, this could also include vehicle improvements (e.g. solar panels on roof or rail cars, etc.).

Fixed Guideway/Rail - This includes any project that provides a dedicated guideway for (exclusive or shared) operation of transit vehicles. Both rail and bus projects may fall in this category.

Fuel Cell - This includes transit projects involving the conversion of chemical energy from a fuel (typically, hydrogen) into electricity through a chemical reaction with an oxidizing agent (typically, oxygen) and using that energy for vehicle propulsion or stationary uses. This covers both fuel cell vehicles and stationary fuel cell installations.

Transit Oriented Development (TOD) - Projects involving land development strategies that maximize access to public transportation, encourage transit ridership, and enable higher density mixed-use development, leading to reductions in energy consumption and greenhouse gas emissions.

Intelligent Transportation Systems (ITS) - Projects that make use of information and communication technologies to improve transit safety, travel reliability, environmental performance,

and network operation resilience, or/and to enable informed travel choices, promote social equity, or provide other transportation benefits.

Bus Rapid Transit (BRT) - This includes a variety of public transportation projects involving the provision of highly reliable, fast, and more efficient bus service, compared to ordinary bus line. BRT projects can range from traffic signal prioritization, provided to public transportation vehicles, to dedicated lanes used exclusively by transit buses.

Transportation Demand Management (TDM) - This includes a variety of projects that use innovative transportation strategies and policies to reduce travel demand or to redistribute it in space or time. This may include projects involving various ride-sharing programs, such as carpooling or vanpooling, and policies that redistribute trips away from peak times, as well as congestion pricing, and other capacity management strategies.

Pedestrian/Bicycle and Other Non-motorized Facilities - Projects involving improvements in facilities used for non-motorized transport, leading to higher accessibility and usage of non-motorized modes of transportation. This may include pedestrian sidewalks, bike lanes, and other improvements.

Other Transit Service Enhancements - Projects that do not fit into any of the above categories.