



2023

IKOON
SUNNG
CITY

VOLUNTARY LOCAL REVIEW

2023

KAOHSIUNG CITY
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2023

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Chapter 1

Words from the Mayor

As one of the few cities in Taiwan that started as an industrial hub, Kaohsiung experienced several phases of development including development of sugarmaking factories during the Japanese ruling era leading to the rise of the Port of Kaohsiung and the “Ten Major Construction Projects” in the 1970s focusing on developing Kaohsiung into a heavy industry-led prefecture. A series of historical contexts laid the foundation for Kaohsiung’s growth into a city with a robust industrial character.

With the rapid global development of technology and the economy comes indirect environmental burdens. In recent years in particular, the international awareness of extreme weather conditions and climate change is on the rise owing to the natural disasters in multiple locations due to climate change resulting from global warming. Kaohsiung City is actively addressing climate change by not only actively mitigating it and establishing a carbon reduction path but also strengthening water supply resilience, enhancing urban adaptation governance, and ensuring a balance between natural environment and ecology. This

enables the residents of Kaohsiung City to face minimal negative impacts during extreme weather events and warming effects.

To maintain sustainable development on a global scale, the United Nations has put forth the “2030 Agenda”, which sets 17 Sustainable Development Goals (SDGs) and encourages countries and governments at all levels to actively review and voluntarily share their progress in sustainable development. The Kaohsiung City Voluntary Local Review (VLR) project has entered its third year, with reviews over the compliance with the 17 SDGs proceeded. As this year coincides with the amendment of Taiwan’s “Climate Change Response Act”, a chapter on adaptation focusing on “sustainable resilient cities” integrating climate adaptation with a sustainable vision has been added to the VLR this year.

Sustainable development is a global issue and a shared responsibility of global citizens. In the future, the City Government will continue to prioritize sustainability in policy planning for various governance and construction projects, hoping to work together with citizens, industries, and business groups to strengthen the City’s resilience to reduce the impact of climate change and jointly create a sustainable and resilient Kaohsiung, ensuring that Kaohsiung remains a city of sustainability for the happiness of its residents in the next century.

Mayor

陳其邁



Sustainable and Resilient City



Chapter 2

Preface

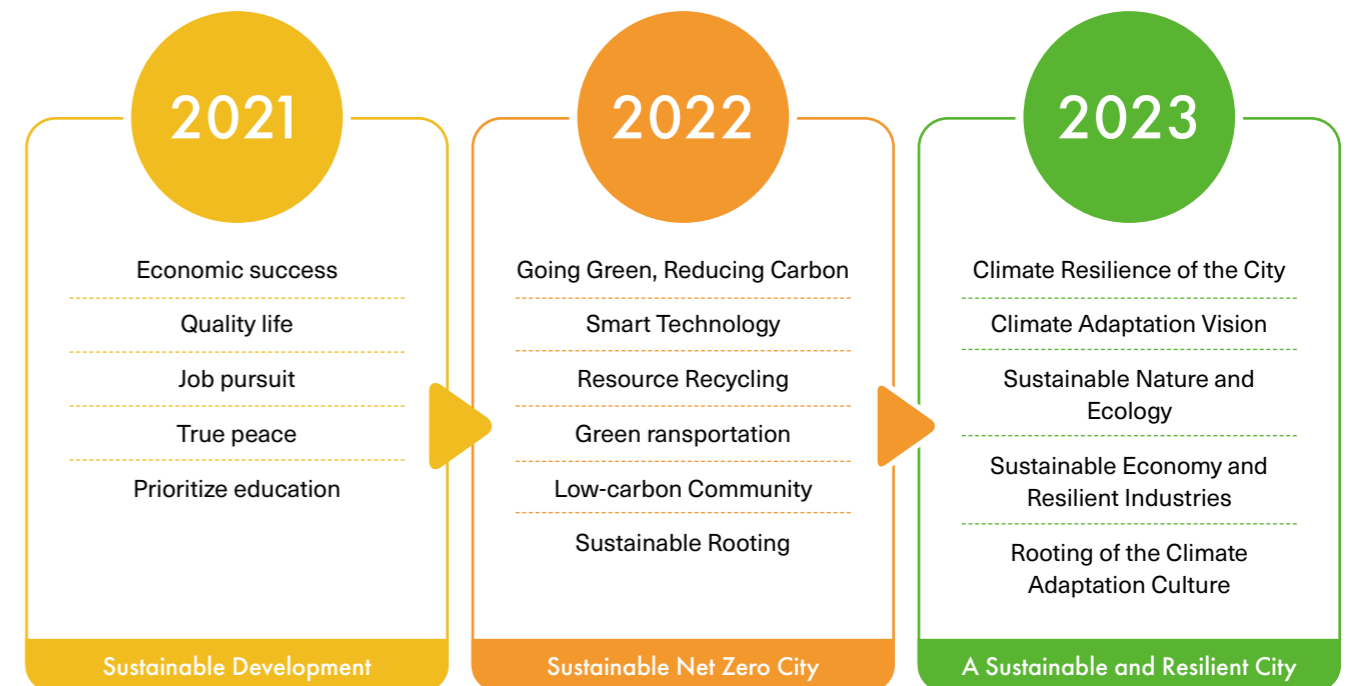
Global climate change is an urgent issue that requires immediate actions. The Sixth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC AR6) provides that when global warming exceeds 1.5°C, the vision for climate-resilient development will be limited. The threats posed by climate change impacts on human survival and the environment have become a global concern.

“Mitigation” and “adaptation” are currently the two key strategies for governments worldwide to address the threats of climate change. In February of this year, our nation renamed the “Greenhouse Gas Reduction and Management Act” to the “Climate Change Response Act” as a means to put mitigation and adaptation in parallel, aiming to implement intergenerational justice, environmental justice, and a just transition. Kaohsiung City set its goal and strategy for achieving net-zero emissions by 2050 in the preceding year (2022) and has been promoting various actions for net-zero transformation. In June of this year (2023), the Kaohsiung City Council passed the “Self-Government Ordinance for the Development of Net-Zero City” to establish policies tailored to Kaohsiung’s local context.

Kaohsiung City’s efforts to combat climate change began with the passage of the Kaohsiung City Self-Government Ordinance for Environmental Management in 2015. The City established a climate adaptation committee and assigned responsibilities to various working groups to promote adaptation efforts, laying the foundation for the

development of a sustainable and resilient Kaohsiung City. Following the issuance of net zero-themed VLR in 2021, Kaohsiung City have progressively adopted the “Kaohsiung City Self-Government Ordinance for the Administration of Net Zero City”, established the Net Zero Institute, and inaugurated the headquarters of the Taiwan Carbon Solution Exchange (TCX), laying foundations for the path toward Net Zero in Kaohsiung City. Due to diverse mountainous terrain and long, narrow geography within its territory, Kaohsiung City proposes transformation and relevant policies to address various climate hazards accompanying such geography, such as monitoring hillside landslides in mountainous areas, afforestation, land-use policies, etc. Meanwhile, at urban area, the City Government implements flood and inundation prevention, promoting the Kaohsiung House, and developing diverse water resources to create a safe living environment for residents.

Reflecting on Kaohsiung’s development journey, from low-carbon and net-zero transformation to climate adaptation and coping with the impacts of climate change in the current year, the City is equipped with the ability to recover rapidly from various impacts. Kaohsiung City has always pursued the primary goal of promoting the well-being of society, while also aligning with the United Nations’ Sustainable Development Goals to create a harbor city of “technology, livability, happiness, and charm”.



Chapter 3

In 2015, the United Nations introduced the 2030 Sustainable Development Goals (SDGs). The SDGs, as outlined in the United Nations publication “Transforming Our World: the 2030 Agenda for Sustainable Development”, consist of 17 goals categorized into five major pillars: People, Prosperity, Planet, Peace, and Partnership. Emphasizing the SDG spirit of “leaving no one behind”, achieving sustainable co-prosperity is expected. Kaohsiung City has reviewed its policy objectives and aligned them with the 17 SDGs of the United Nations, aiming to implement all SDGs by 2030 and disclosing the results of its actions through the publication of the VLR.

To respond to UN’s encouragement to nations in implementing a regular review and for a sound promotion mechanism for sustainable development, Taiwan presented its first “Voluntary National Reviews (VNR)”, followed by the completion of “Taiwan Sustainable Development Goals” in 2019, which included 18 goals, 143 targets and 337 indicators. In 2022, Taiwan issued the 2nd iteration of its VNR, which highlighted 71 out of 337 indicators.

Kaohsiung City followed up and initiated in 2021 the preparation of the “Voluntary Local Reviews (VLR)”, during which a review was made to 164 indicators tracked by the “Committee for Sustainable Development and Climate Change Response Promotion, Kaohsiung City Government”. In such review, 135 out of the tracked indicators were discovered linked to UN SDGs, whilst 46 indicators matched corresponding indicators under Taiwan Sustainable Development, indicating that Kaohsiung City’s governance has developed local features unique to the City under the premise of grasping international development context.

Sustainable Development Goals

People

To ensure satisfaction of basic needs, eradicating poverty and hunger are top priorities, whilst aiming to improve the quality of life for all people.

Corresponding SDGs



Prosperity

Availing people to a fulfilling life through advancements of society, economy and technology.

Corresponding SDGs



Planet

Taking appropriate adaptation actions in the face of climate changes e.g. constructing detention basins, developing renewable energy sources, etc.

Corresponding SDGs



Peace

All people shall live in a society of peace, inclusiveness, and justice for all, free from violence and fear.

Corresponding SDGs



Partnership

Promoting friendly relations, engaging in international exchanges, caring for the needs of vulnerable groups, and strengthening global partnerships.

Corresponding SDGs



Policy Objectives of Kaohsiung City in Comparison to United Nations SDGs



United Nations SDGs

SDG 1
End poverty in all its forms everywhere

Policy Objectives of Kaohsiung City

Assisting the underprivileged groups and low to middle-income households in employment and poverty reduction through education, counseling, and grants, thereby eliminating poverty in all its forms.



United Nations SDGs

SDG 2
End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Policy Objectives of Kaohsiung City

Industry, government and academia are engaged for a public-private collaboration to facilitate the practical implementation of smart technologies and therefore assist Kaohsiung in establishing smart agriculture practices. Additionally, by utilizing an agricultural information-sharing platform for information integration and value addition, the production of high-quality and safe fruits and vegetables is made available, ultimately contributing to the development of a safe agricultural city.



United Nations SDGs

SDG 3
Ensure healthy lives and promote well-being for all at all ages

Policy Objectives of Kaohsiung City

Supporting family caregiving by expanding public childcare service centers, promoting diversified caregiving services, and enhancing the development of social welfare facilities to ensure the health and well-being of individuals of all ages.



United Nations SDGs

SDG 4
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Policy Objectives of Kaohsiung City

Providing various learning resources and diverse learning channels, reinforcing the native language education, promoting urban reading programs, and implementing lifelong learning.



United Nations SDGs

SDG 5
Achieve gender equality and empower all women and girls

Policy Objectives of Kaohsiung City

Eliminating gender stereotypes and violence, offering diverse learning opportunities for women, and respecting women’s decision-making power for the equality and harmony of the society.



United Nations SDGs

SDG 6
Ensure availability and sustainable management of water and sanitation for all

Policy Objectives of Kaohsiung City

Exploiting diversified water sources, promoting water cycle and reclamation and hyporheic flow utilization, while also implementing leak detection and increasing sewage system coverage in the tap water network, improving soil water quality, and providing clean drinking water.

7 AFFORDABLE AND CLEAN ENERGY



United Nations SDGs
SDG 7
Ensure access to affordable, reliable, sustainable and modern energy for all

Policy Objectives of Kaohsiung City
Promoting green energy projects, developing solar energy as the foundation for building a safe, stable, efficient, and clean energy supply and demand system and thereby diminishing dependence on fossil fuels and reducing air pollution.

8 DECENT WORK AND ECONOMIC GROWTH



United Nations SDGs
SDG 8
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Policy Objectives of Kaohsiung City
Nurturing diverse talents, addressing the needs of entrepreneurship and business transformation, creating a favorable employment environment, and implementing various labor inspections and occupational safety measures.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



United Nations SDGs
SDG 9
Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Policy Objectives of Kaohsiung City
Accelerating land planning, promoting the development of industrial parks and business districts, providing guidance to incubate innovative industries, and marketing the unique features of Kaohsiung.

10 REDUCED INEQUALITIES



United Nations SDGs
SDG 10
Reduce inequality within and among countries

Policy Objectives of Kaohsiung City
Balancing the interests of diverse communities and industrial development to create various employment opportunities.


11 SUSTAINABLE CITIES AND COMMUNITIES



United Nations SDGs
SDG 11
Make cities and human settlements inclusive, safe, resilient and sustainable

Policy Objectives of Kaohsiung City
In order to ensure that citizens live in comfort, the City actively maintains and improves environmental quality, completes various infrastructure projects, and establishes parks to create a pleasant living environment for residents.


12 RESPONSIBLE CONSUMPTION AND PRODUCTION



United Nations SDGs
SDG 12
Ensure sustainable consumption and production patterns

Policy Objectives of Kaohsiung City
Implementing a circular economy by promoting resource recycling and reuse, as well as sustainable consumption and production patterns.

13 CLIMATE ACTION



United Nations SDGs
SDG 13
Take urgent action to combat climate change and its impacts

Policy Objectives of Kaohsiung City
Actively reducing greenhouse gas emissions, setting long-term carbon reduction pathways, and simultaneously promoting adaptation to reduce the impacts of climate change and enhance urban resilience.

14 LIFE BELOW WATER



United Nations SDGs
SDG 14
Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Policy Objectives of Kaohsiung City
Conserving and sustainably utilizing marine and ocean resources through education and regular monitoring.

15 LIFE ON LAND



United Nations SDGs
SDG 15
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Policy Objectives of Kaohsiung City
Cultivating forest resources, providing guidance for private afforestation, encouraging public participation through afforestation incentives, creating an ecological afforestation environment, and preserving the biodiversity of the City.

16 PEACE, JUSTICE AND STRONG INSTITUTIONS



United Nations SDGs
SDG 16
Significantly reduce violence in all its forms everywhere and the mortality rate thereof (Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels)

Policy Objectives of Kaohsiung City
Maintaining social order, safeguarding the lives and property of citizens, eliminating all forms of violence, and implementing open government and civic engagement in public affairs to establish a mechanism for overall civic engagement in the City.

17 PARTNERSHIPS FOR THE GOALS



United Nations SDGs
SDG 17
Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Policy Objectives of Kaohsiung City
Actively nurturing international exchange talents at all levels and striving to establish international training centers to facilitate international exchanges, enhance the City's international visibility, establish international communication channels, and cooperate towards achieving sustainable development goals.



Chapter 4

Getting to Know Kaohsiung

4.1

Status Quo of Geographical Environment

Located in the southwestern Taiwan, Kaohsiung become the largest city in western Taiwan and the third-largest city in Taiwan following its city-county merger into Kaohsiung Special Municipality in 2010. It consists of 38 administrative districts covering a total of 2,952 square kilometers of land presenting diverse landscapes including alluvial plains, mountain ranges, badlands, rivers, etc. Its narrow territory is crucial for climate adaptation. During the winter, cold air masses from the north are offset by warm airflows from the western Pacific, making Kaohsiung's winter temperatures much milder compared to other cities at the same latitude. The ocean has always been a vital drive of industry and core of Kaohsiung City, home to Taiwan's largest port and the 16th-largest port in the world, the Port of Kaohsiung, earning Kaohsiung the nickname "Harbor Capital". Within its jurisdiction is also the Kaohsiung International Airport and a light rail transportation system that began operation in 2015, making it the first city in Taiwan serviced by harbor, airport, railway, metro, and light rail system simultaneously. Thanks to its oceanic climate influence, Kaohsiung enjoys abundant sunshine and pleasant weather throughout the year. It has been recognized as one of the top 10 cities in the world worth visiting and was awarded the "Outstanding City" title in the 2022 APSAA Asia-Pacific Sustainability Action Awards.

Most of Kaohsiung City falls under a subtropical monsoon climate, making it one of the few areas in East Asia with a tropical climate. The rainy season occurs from May to September, accounting for about 90% of Kaohsiung's annual rainfall, while winter is the dry season, with only about 3 days of rainfall per month on average. Per statistics by the Taiwan Climate Change Information Platform (TCCIP) as of June 2023, due to the effects of global warming, Kaohsiung City has recorded extreme high temperatures of up to 38.3°C and lows of 4.3°C, with the annual average temperature showing an upward trend. The projection of future climate scenarios in the City shows a potential extension of summer days to 155-210 days from the current value of approx. 130 days, whilst the winter days may reduce from the current 70 days to 50 days. To conclude, the City shall focus on urban flood prevention driven by extreme rainfall, water scarcity resulting from prolonged droughts, and urban cooling as key aspects of the City's resilience development.

administrative districts

38 districts

Total land area

2,952 km²

K A O H S I U N G



4.2

Sponge City

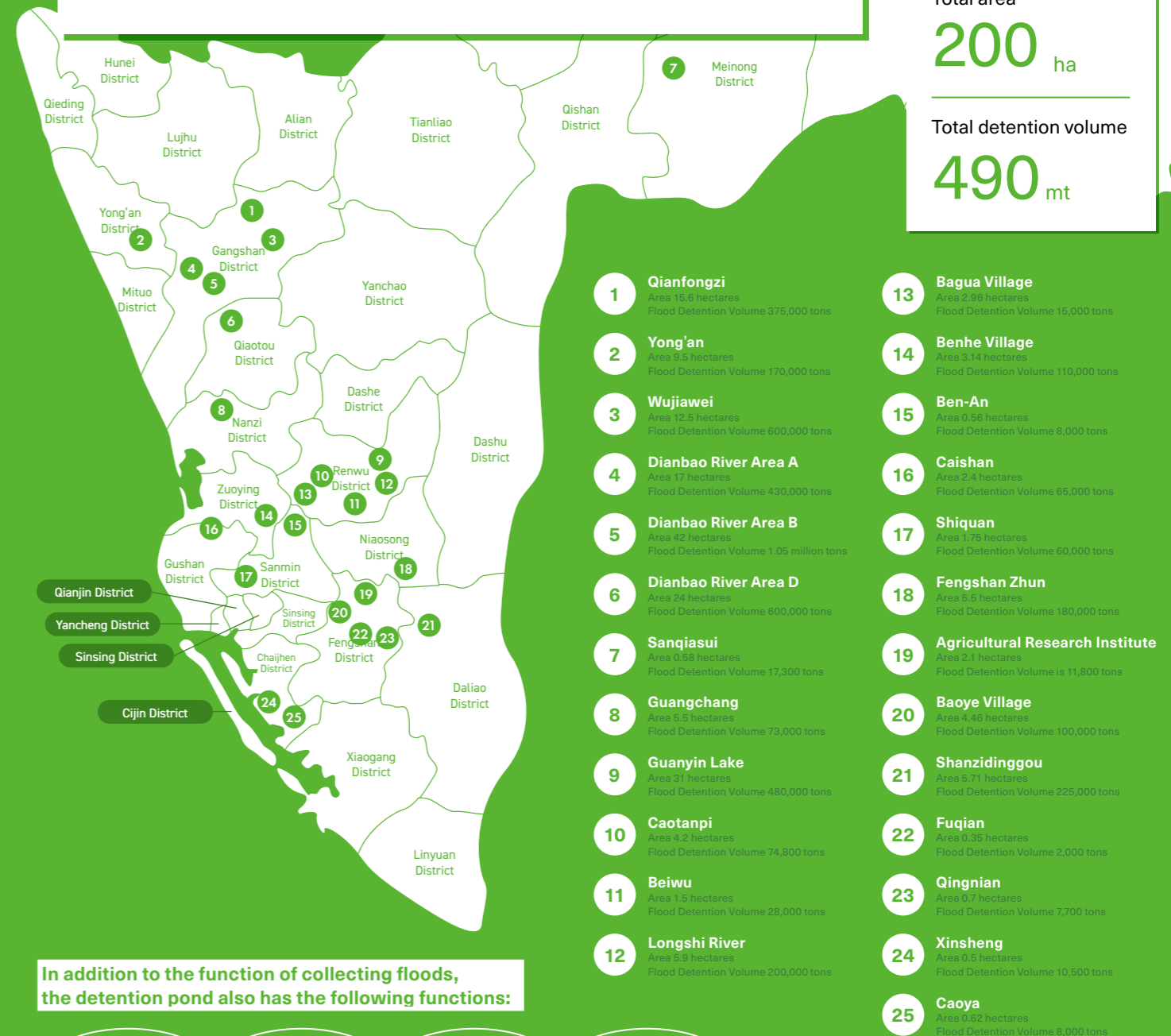
1. Construction of Detention Basin

As of June 2023, Kaohsiung City has completed the construction of a total of 21 detention basins, including the Area D Detention Basin at Dianbao River and the Wujiawei Water (Storage Tank) Detention Basin, among others. The cumulative storage capacity of these detention basins has reached approx. 4.735 million metric tons. In 2023, it is projected that an additional four detention basins, including Caotanpi and Guangchang detention basins, will be completed, bringing the total storage capacity to 4.9 million metric tons.

Liouguei District

Total area
200 ha

Total detention volume
490 mt

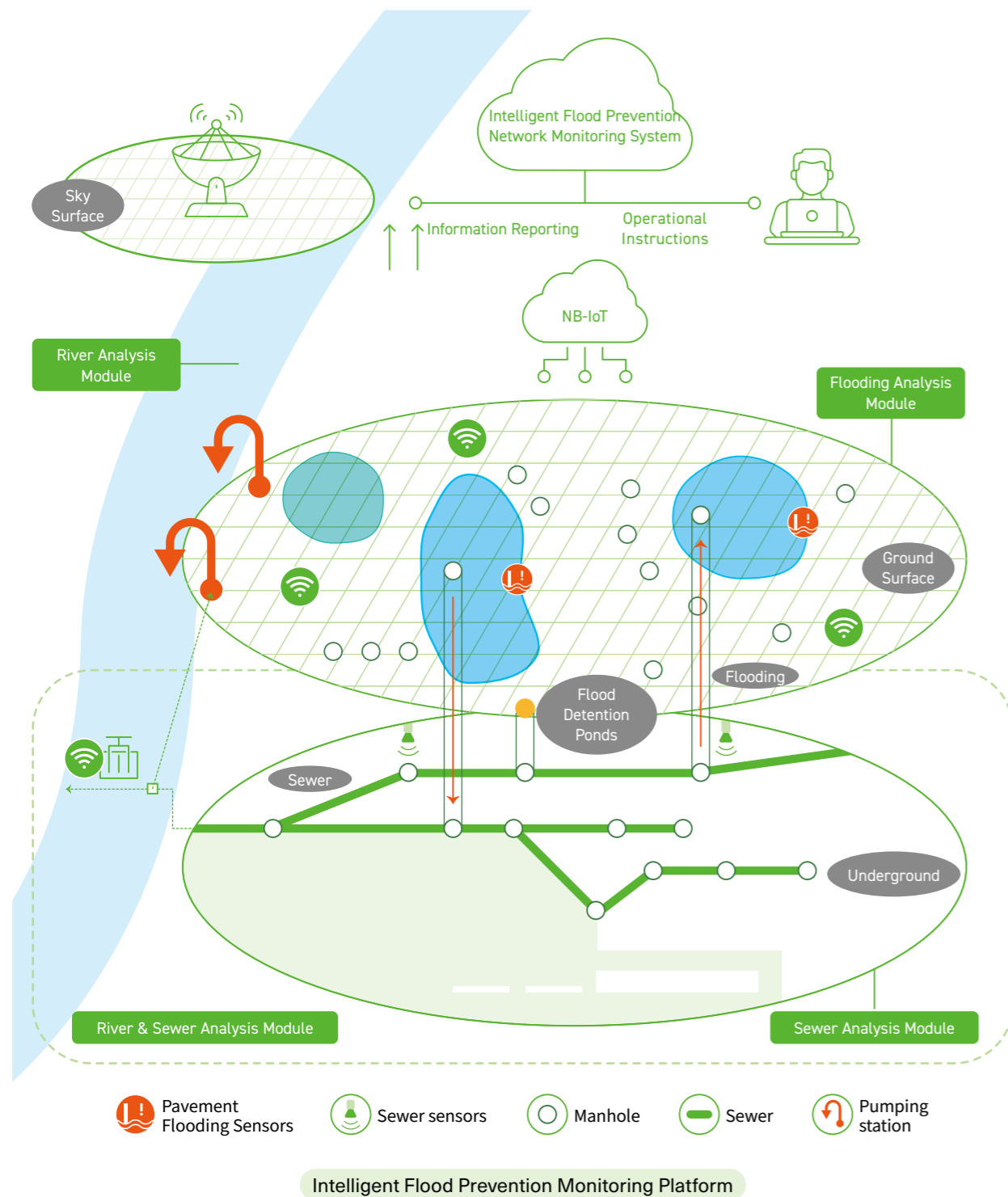


In addition to the function of collecting floods, the detention pond also has the following functions:

- Garden
- wetlands
- Physical fitness and recreational facilities
- Solar panels

2. Smart Flood Control

In response to the inundation threats posed by future short-duration intense rainfalls and to provide citizens with more real-time water information and disaster warning information, Kaohsiung City has undertaken the installation of sensing components at “Baozhugou Drainage and Collection Area” (including 2 water level stations each for both open and underdrain channels), “Shihcyuan Detention Basin Water Level Station” (1 station), and “Rain water sewer Water Level Stations” (11 stations). With integrated use by combining the capabilities of front-end monitoring sensors to monitor water conditions and the operation status of water facilities with the backend information management platform and flood prediction models, the risk of widespread flooding can be reduced, realizing the concept of a resilient city.



4.3 Resilient City

1. Hyporheic Flow Exploitation

Kaohsiung City’s major reservoirs supply 1.5 million metric tons of water for public use, with approx. 60% of such supply sourced from the Gaoping River. However, due to the impact of climate change causing severe droughts outside of the rainy season, the risk of water scarcity in the future has increased significantly. The traditional approach of relying solely on reservoirs and wiers for rainfall water storage and supply mediation is no longer sufficient to meet the demand. To mitigate water-related issues, Kaohsiung City has actively exploited the underground water and hyporheic flows. As many of Taiwan’s rivers are characterized by steep terrain and short flow distances with gravel layers beneath their riverbeds, Kaohsiung City leverages these environmental characteristics and access such water source. The City is therefore able to obtain the clear and clean river water filtered through these gravel and stone layers at a substantial amount. With such method, the City is able to obtain backup water supply at 800,000 metric tons, thereby enhancing water supply stability.

2. Diverse Water Resources Development

The Kaohsiung City Government has been actively diversifying its water resources by developing various sources, including reclaimed water, desalinated seawater, and drought-resistant wells. By treating and recycling wastewater through sewage treatment plants, the effluent resources are made available for industrial use. Currently, the City has completed the construction of seven wastewater treatment plants, including the Central Area Wastewater Treatment Plant, Nanzih Wastewater Treatment Plant, and Dashu Wastewater Treatment Plant. Meanwhile, the cumulative coverage of public sewage system users has reached 49.55%, and the total length of sewage pipelines is approx. 1,747 kilometers; in addition, Kaohsiung City has dug a total of 110 drought-resistant wells providing an additional daily supply of 310,000 metric tons of backup water, and has installed an emergency seawater desalination unit at the Hsinta Power Plant in Yong’an District integrated into the tap water supply network and providing 15,000 metric tons of water for daily domestic use. These efforts ensure that residents in the City can have access to water and therefore maintain sanitation and well-being.

4.4 Liveable City

1. The “Kaohsiung House”

Buildings tend to absorb a significant amount of solar radiation during the day and release heat into the surrounding air at night, leading to elevated urban temperatures. By combining the three major elements: vertical greening, universal design spaces, and green energy facilities, Kaohsiung City has constructed the “Kaohsiung House” featuring energy saving, liveability and local characteristics. Through improvements in building materials and design, the Kaohsiung House absorbs less heat and therefore contributes to lowered urban temperatures in an effective manner, while equipped with enhanced safety and disaster resilience. As of 2022, a total of 17,388.61 square meters of green spaces have been added. In 2023, the “Kaohsiung House 4.0 Project” was initiated, emphasizing epidemic prevention and healthy buildings, with reinforcements on natural ventilation in universal design bathrooms and modifications to the form of vertical greening, moving toward the goal of a more human-friendly and healthy living space.

2. Parks and Greenbelts

With rising average temperatures leading to urban heat islands, efforts to reduce heat generation need to extend beyond buildings to include natural solutions like parks and green galleries. Planting large arbors in parks not only increases ratio of green cover and reduces the threat of air pollution but also provides benefits like habitat preservation and linear green belt development. Kaohsiung City currently boasts the highest green space per capita among the Six Special Municipalities in Taiwan, with an average of 11.04 square meters of green space per person. The City has already developed 2,534 hectares of planned urban parks, green spaces, and children’s playgrounds. Efforts will continue to enhance the multifaceted value of existing parks and green spaces, not only improving urban temperature regulation but also providing shade for pedestrians, achieving the benefits of diverse urban adaptation.

Chapter 5

History of Sustainable Development Promotions

5.1

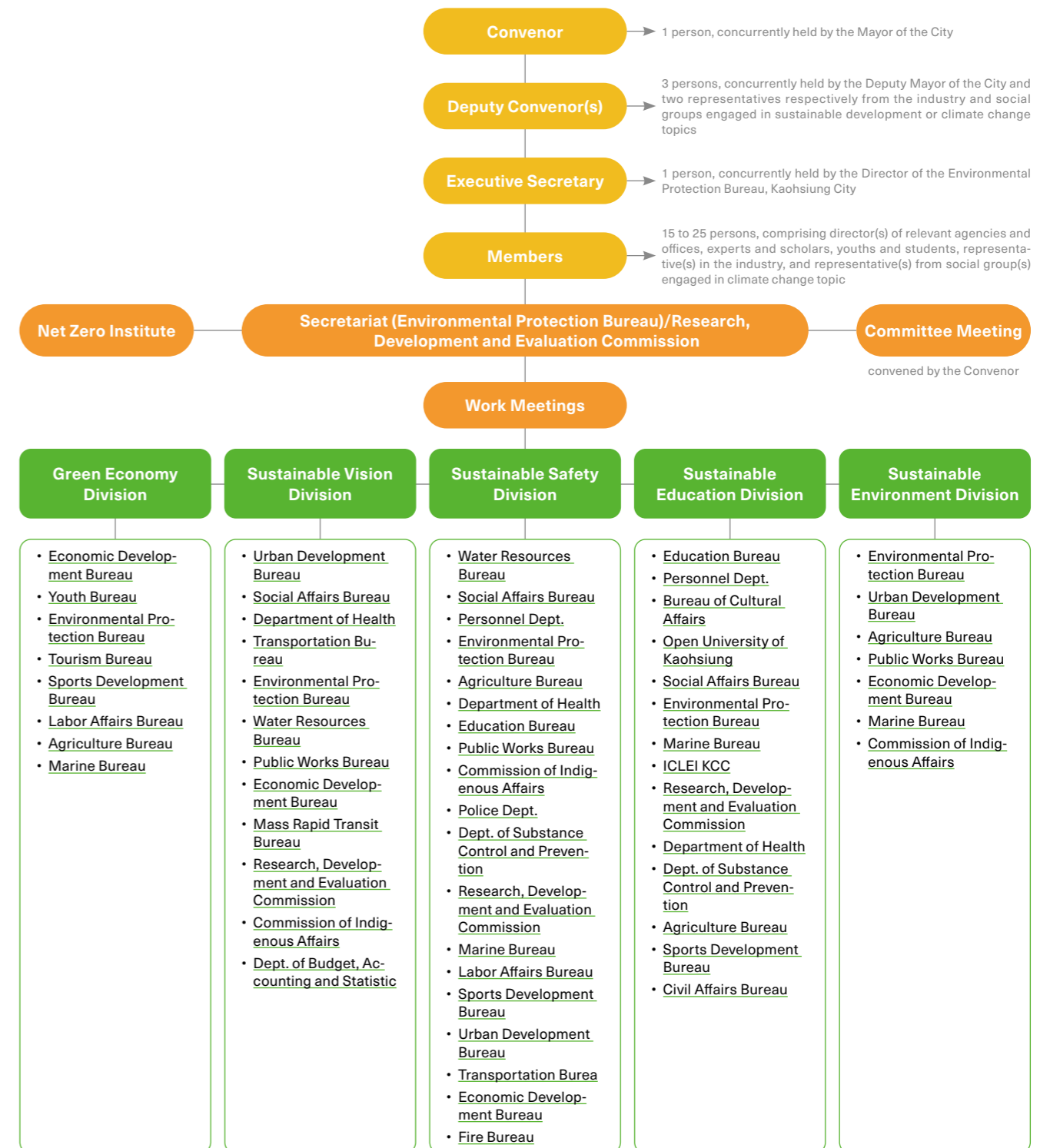
History of Sustainable Development Promotions in Kaohsiung City



5.2

Office(s) in Charge of Sustainable Development Promotion in Kaohsiung City

The City has established the "Committee for Sustainable Development and Climate Change Response Promotion of the Kaohsiung City Government" as the office in charge of promoting sustainable development, who convenes annual Sustainability Committee meetings to review and assess various sustainability indicators in Kaohsiung City. Meanwhile, in accordance with Article 14 of the Climate Change Response Act, the City also initiates promotions responsive to climate changes, strengthens environmental protection, promotes social justice, and fosters economic development in pursuit of sustainable utilization of natural resources across generations, aiming to achieve the vision of a resilient and green ecological city.

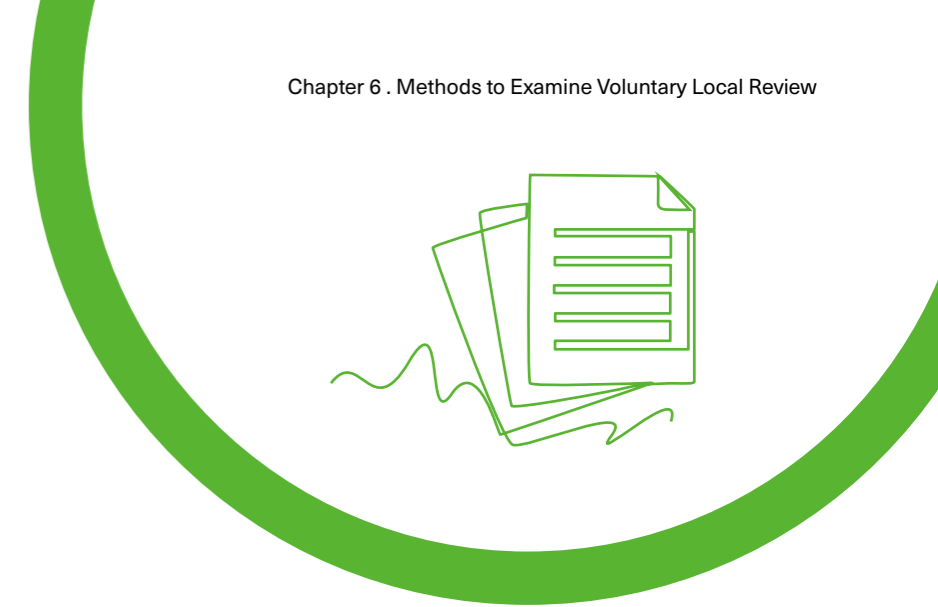


Committee for Sustainable Development and Climate Change Response Promotion of the Kaohsiung City Government

Chapter 6

Methods to Examine Voluntary Local Review

As a majority of the global population lives in cities, cities and human settlements will be crucial for achieving the SDGs. In 2016, the UN Sustainable Development Solutions Network published a report on ways to promote the SDGs in cities, highlighting that “urban SDGs” would facilitate strong partnerships and greater resources access for cities. Kaohsiung City also referred to the United Nations’ “Global Guiding Elements for Voluntary Local Reviews (VLRs) of SDG implementation”, as well as examination methods used in domestic and foreign countries and cities, along with relevant city policies, to establish the City VLR framework and introduce the review methods.



Chapter 7

Methods to Examine Voluntary Local Review

For the VLR this year, the main focus lies in Resilient City, “urban systems and their residents of the City operating normally under various impacts and pressures, whilst the City actively adapts and transitions towards sustainable development”, whilst aligning with the seven key areas vulnerable to the impacts of climate change outlined in the 3rd Phase of the National Adaptation Plan i.e. vital infrastructure, water resources, land use, coastal and marine environments, energy supply and industry, agricultural production, biodiversity and health, and capabilities building. These areas are further detailed in five separate strategies.

Descriptions for the **5 Main Topics** of Sustainable and Resilient City

Climate Resilience of the City

Reducing disaster losses caused by extreme weather events, ensuring a stable supply of resources for industries and citizens under extreme climate conditions, and furthermore preventing damage to the basic functions of the City. This aligns with SDGs 3, 6, 11, and 17, with a primary focus on the water resources.

Climate Adaptation Vision

Improving resilience in urban and rural areas will be improved through land use and flood control planning, plus enhancing the adaptation capacity of facilities construction, risk assessment, and maintenance and response capabilities. This aligns with SDGs 3, 6, 9, and 11, with a primary focus on land use and vital infrastructure.

Sustainable Nature and Ecology

Building a more sustainable ecosystems by maintaining natural ecological environments, including environmental protection to and management over “forests, rivers, villages, and ocean” found in mountainous areas, urban areas, and coastlines, to increase the resilience of the urban natural environment. This aligns with SDGs 9, 11, 14, and 15, with a primary focus on agriculture and biodiversity, and marine and coastal areas.

Sustainable Economy and Resilient Industries

Strengthening Kaohsiung City’s energy supply and industrial resilience, plus employing economic and insurance measures to enhance industrial resilience. This aligns with SDGs 7, 9, 11, and 12, with a primary focus on energy supply and industry. Additionally, topics such as natural disaster insurance and industrial resource security supply are addressed.

Rooting of the Climate Adaptation Culture

Enhancing urban health and emergency response capabilities, along with capacity building through education, collaboration, and climate adaptation to enhance the overall population’s ability to respond to climate change. This aligns with SDGs 3, 4, 6, and 11.

The primary focus will be on the health sector, with additional emphasis on capacity building and education-related issues.

7.1

Climate Resilience of the City

Corresponding to SDGs



1. Sustainable Water Resources Supplies and Water Quality Improvement

1. Reclamation of Wastewater from Animal Husbandry

Livestock manure, after anaerobic digestion, becomes liquid and solid digestates with rich nutrients and fertilizers, which contribute to crop absorption and increased yields. Additionally, fertilizing with liquid and solid digestates can improve river pollution and clean rural air quality, whilst facilitating the circular economy through recycling of nitrogen fertilizers from livestock manure. Since 2016, Environmental Protection Bureau, Kaohsiung City Government has assisted animal husbandry operators in reusing livestock wastewater resources, returning the liquid digestate produced after wastewater treatment facilities to be used as fertilizer in farmland or assisting operators in applying for effluents recycling for plant irrigation.

Currently, the City has 350 livestock farms (pigs and cows) holding basic discharge permits generating a discharge at 8,021.8 CMD altogether. Amongst all permit-holding farms, 132 farms have been approved for the use of liquid and solid digestates as farmland fertilizer, 72 farms have been approved for the reuse of effluent for plant irrigation, covering a total approved irrigation area of 162.39 hectares and a total approved irrigation volume of 211,000 tons. It is estimated that it can reduce biochemical oxygen demand by 526.19 tons, suspended solids by 675.51 tons, and ammonia nitrogen by 46.67 tons annually. Additionally, a resource treatment center has been established in Neimen District to centrally process wastewater generated throughout the breeding of 11,684 pigs across 15 surrounding livestock farms. Kaohsiung City expects to achieve in the future the goal of 5% resource utilization in the City’s livestock farms by 2025 and 10% by 2030.



2. Sustainable Water Resources Supply and Water Quality Improvement

In 2022, Kaohsiung City faced severe drought. To cope with extreme weather events and maintain stable supplies of domestic and industrial waters, the City actively diversified its water resources (hyporheic flow, reclaimed water, desalinated seawater, and drought-resistant wells). To improve river water quality and environmental hygiene, the City actively promoted the construction of sewage underground systems, with 10 sewage zones covering 8 major basins, including the Love River, Houjin River, Fengshan River, and Agongdian River planned. The proposed systems are expected to cover approx. 39,283 hectares. Currently, 7 sewage zones including Kaohsiung, Nanzih, Gangshan, and Chimei have been established, serving a population of approx. 2.42 million people. In the areas at which branch piping networks of sewage were completed, the City actively promoted user connection works, with the connection prevalence at 49.40 as of May 2023. This has significantly improved river water quality and living environments.

Prior to the widespread application of user connections, gravel contact oxidation treatment facilities were established to achieve onsite water purification. Gravel contact oxi-

Sewage System Coverage up to

39,283_{ha}

Sewage System Coverage up to

49.40%

dation treatment facilities embody standardized tanks followed with aerobic cultivation of microorganisms and natural riverbed gravel or artificial filter materials as contact carriers to allow a more ecologically friendly treatment. The City currently has 8 gravel contact oxidation treatment facilities, including Jiu-Fan-Pi Wetland Park, Beiwu Drainage and Water Quality Purification Plant, and Agongdian Contact Oxidation Treatment Facility, with a projected processing capacity totaling at 59,700 CMD. In addition, the City has utilized the abundant hyporheic flow of the Gaoping River providing 800,000 tons of water daily and dug 110 drought-resistant wells increasing standby water supply by 310,000 tons per day. An emergency desalination unit has also been installed at the installed an emergency seawater desalination unit at the Hsinta Power Plant in Yong'an District integrated into the tap water supply network and providing 15,000 metric tons of water for daily domestic use, ensuring access to water and sanitation for all.



3. Water Quality Improvement at Kaohsiung City's Houjin River — Onsite Purification at Qingpu Ditch

Various public works in Kaohsiung City have driven rapid population growth in the Nanzih District in recent years. To improve the water quality of drainage from the Qingpu Ditch in a short period of time and therefore reduce the pollution to Houjin River's mainstream, the City has promoted the "Onsite Purification at Qingpu Ditch".

Concerning the construction of Qingpu Ditch Park, the Water Resources Bureau, Kaohsiung City Government adopts gravel contact oxidation as the water purification method, with all purification structures built as underground facilities under the Park, whose surface was then restored to a green space. Serving the purposes of water purification as well as the site for recreation and environmental education, the purpose of such works is to intercept polluted water drained from the Qingpu Ditch, which after processing becomes effluents replenishing the Houjin River as freshwater. The average inflow rate from 2021 to 2022 is 16,125 CMD, with pollution reductions including approx. 461 kg/d of BOD, approx. 565.7 kg/d of SS, and approx. 290.5 kg/d of NH3-N. In addition to water quality improvement, a total of 148 trees (including existing tree species) were planted, contributing to a reduction of approx. 1,620 kg of carbon emissions per year. Furthermore, the City has de-

Educational guided tours

9

signed an underground visitor corridor and ecological environmental facilities. From 2021 to 2022, a total of 9 educational guided tours were organized for participation by civilians, schools and groups as a part of universal education for citizens of Kaohsiung.



4. Sewage Pipe Lines Examination and the Overall Construction Pla

As the sewage underground system in Kaohsiung has been in operation for over 30 years, the Water Resources Bureau, Kaohsiung City Government has adopted the "segmental repair" (non-excavation repair) method for maintenance, which reduces environmental pollution and traffic disruptions compared to traditional excavation and pipe replacement methods, extending the lifespan of pipelines by more than 20 years. Since 2013, inspections have been conducted on sewage pipelines older than 20 years, with a total length of approx. 207 kilometers. Then, repairs to the pipelines were made in priority evaluated based on degradation status of each pipeline. Amongst the inspected pipelines, about 93 kilometers of pipelines require repairs, and approx. 72 kilometers of such have been repaired between 2013 and 2022. This has effectively reduced the probability of pipeline damage leading to disasters. The City will continue to seek funding for pipeline inspections and repairs in the future, ensuring the concept of safe water resource use.

5. Water Environment Patrol Guidance Program

This year marks the 20th anniversary since the recruitment of volunteers for the Water Environment Patrol Program by the the Environmental Protection Bureau. Currently, 32 Water Environment Patrol Squads comprising 1,162 volunteers are in service, patrolling the 8 rivers in Kaohsiung City. To highlight local characteristics, the Program collects data on local cultural history and natural landscapes, and build squads aligned with the idea of "one patrol squad, one specialty" including school squads, corporate squads, specialty squads, and general squads. In addition, to disseminate knowledge about the water environment and deepen river protection efforts, as of June 2023, 16 river protection or river cleaning activities have been conducted, covering approx. 13 kilometers of river. These activities involved 439 participants, with 48 reports of pollution inspections. About 75% of the patrol squad members have obtained volunteer certificates. To instill a sense of importance for the land in school kids, environmental education and outreach activities have been conducted in the junior high and elementary schools near various river basins. A total of 7 such activities participated by 324 participants were organized. Among them, the Water Environment Patrol Squad of Kaohsiung Municipal Longhua Elementary School was honored the Outstanding Water Environment Patrol Squad of 2022, which embodied the concept of rooting sustainable water resource education.



6. Monitoring and Investigations to the Water Bodies in the Environment

Kaohsiung City as an early industrial hub used to discharge untreated industrial wastewater, livestock wastewater, agricultural water, and domestic sewage into channels and rivers which ultimately flowing into the ocean. To improve the current state of river pollution, continuous monitoring of environmental water bodies and water quality data is required. Therefore, the City has deployed regular water quality monitoring stations in high-pollution potential areas, most complained areas, or at river confluences. The monitoring results are published on the Environmental Water Quality Information website of the Ministry of Environment to provide data for pollution control achievements, pollution investigations, and environmental quality assessments.

Since the City-County merger of Kaohsiung in 2011, a total of 28 regular monitoring stations have been established to monitor 6 rivers and 3 lakes in the City, with additional monitoring stations deployed to meet the short- to medium-term strategies. Furthermore, to meet the monitoring needs of environmental water quality changes, the City has set up real-time water quality monitoring stations along the Love River since 2016. As of now, there are a total of 8 stations, which transmit real-time Love River water quality data every

5 minutes. This enhances the City's ability to respond to water pollution and provides the public with better environmental quality. Per statistics, the City's average River Pollution Index (RPI) has improved from 6.79 (severe pollution) in 2011 to 5.54 (moderate pollution) in 2022, indicating overall improvement of environmental water bodies in terms of urban water environment, environmental quality, and river water pollution levels. In the future, the City expects to engage Big Data analysis and AI as assistances to achieve environmental protection through various data analyses and function development and therefore increase urban resilience strategies progressively.



2. Disaster Prevention and Rescue and Emergency Evacuation

1. Establishing a Smart Emergency Medical Management System

In recent years, due to rapid climate change, the types of disasters have become more varied and complex. In 2021, owing to heavy rainfall, the "Minbakiu Bridge" connecting Taoyuan District to the Lavulan tribe in Kaohsiung City was washed away, ceasing the access to 3 indigenous tribes. In the past, emergency medical services during disasters were made possible through cooperation by local fire departments, health authorities, and hospitals; however, there were cases which the emergency room of a hospital was forced to take incoming patients in immediate danger even when overwhelmed by incoming patients and at capacity, or that the health authorities were unable to confirm patient lists. Therefore, providing appropriate emergency medical services to disaster-stricken patients as quickly as possible during disasters can effectively improve medical efficiency.

To effectively manage the daily congestion of emergency patients at nearby first aid responsibility hospitals and their special bed capacities, the Kaohsiung City Government built the "Emergency Medical Resource Information Platform" and has completed its information integration with the Ministry of Health and Welfare, the National Fire Agency, Ministry of the Interior (MOI), and 25 first aid responsibility hospitals in the City. This platform allows real-time access to information such as the number of emergency room patients, the availability of special antidotes or antivenoms, and the number of available ICU beds at each hospital. This information is synchronized for access via tablets in ambulances, allowing ambulance personnel to make informed decisions about patient transfers based on their conditions. During the COVID-19 pandemic, the platform was used in conjunction with the emergency medical resource information platform developed by the Department of Health, Kaohsiung City Government to monitor and distribute patients and medical resources effectively, demonstrating the functionality and effectiveness of the intelligent medical management system.

2. Preparation of Evacuation Shelter Resources and Diverse Advocacy

In response to the increasingly significant effects of climate change, the Social Affairs Bureau of Kaohsiung City Government has strengthened its disaster relief mechanisms to assist the public in avoiding harm to their lives and livelihoods during disasters. This includes setting up short-term shelters and refuge locations to reduce the impact of disasters and maintain social functioning and order.

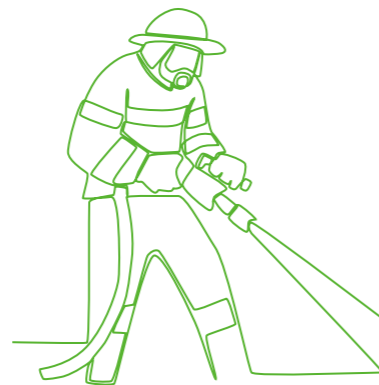
The Social Affairs Bureau periodically reviews the placement capacity, contact information, building inspections, and structural safety of evacuation shelters, making annual updates and improvements. In the meantime, the Bureau collaborates with district offices to engage in various community activities, using various types of media and announcements to inform the public about the locations of evacuation and shelter facilities, as well as the directions to these locations. As of June 2023, in cooperation with district offices, 81 disaster preparedness material storage locations and 437 evacuation shelters have been designated within the City. These facilities can accommodate approx. 280,203 people, accounting for about 10.2% of the City's registered population, which has reached the target capacity (10% of the population in the county/city). In the future, the Social Affairs Bureau will continue to make rolling adjustments to shelter and refuge locations in line with central government policies, conduct regular evaluations of disaster prevention and relief operations at district offices, and perform periodic safety checks on shelters (e.g., whether they are located in areas prone to landslides or inundation) and regular inspections of fire and structural safety, and the usability of utilities while tracking improvements thereof to ensure the safety of the public.



3. Disaster Prevention, Rescue and Evacuation Advocacy

Due to the rapid changes in climate and the evolving nature of disasters, which often transition from single disasters to complex ones, various disaster prevention and relief activities have been carried out in Kaohsiung City. In 2022, fire management drills under self-guard fire protection grouping were conducted in buildings and factories of a certain scale to enhance fire safety awareness among internal personnel, with a total of 3,868 drills organized; furthermore, community volunteer firefighters conducted household visits in communities and residential areas, carrying out a total of 4,153 advocacy activities; finally, a total of 972 fire safety advocacy activities were held for schools, government agencies, institutions, villages, and autonomous associations, ensuring the safety of citizens' lives and property.

Also, to prevent casualties, the public's disaster awareness and preparedness knowledge must be up-to-date. The Kaohsiung City Fire Bureau has developed a disaster prevention education implementation plan for 2023. Fire corps and volunteer firefighters use various forms of promotion, such as erecting signs, posting posters, displaying slogans, conducting disaster prevention drills, utilizing electronic and print media, to educate the public about fire safety and disaster prevention related to wind, earthquakes, radiation, floods, landslides, and other hazards, with collaborative advocacies made in joint with various agencies, schools, and mass media to ensure that the public has basic fire safety knowledge.



4. Deep Cultivation of Disaster Prevention Awareness and Building a Resilient and Disaster-Preventive Campus

Since 2012, Kaohsiung City has organized the “Disaster Prevention Education and Guidance Group by Education Bureau, Kaohsiung City Government” consisting of experts, scholars, school principals, and teachers as counseling team members. They assist in promoting disaster prevention education, facilitation and development of disaster prevention education plans, and constructing disaster-prepared campuses, thereby cultivating disaster resilience on campuses. Every year, activities such as kindergarten, special disaster prevention workshops, as well as National Disaster Prevention Day, are organized to provide training for seed instructors in campus disaster prevention education. These activities not only enhance the disaster prevention knowledge of teachers but also incorporate technological and innovative thinking with practical operations. Through disaster prevention workshop and smart innovative disaster prevention courses, locally adapted disaster prevention education materials are developed.

Kaohsiung City received received the “Guidance Excellence Award” in the 9th Assembly of Disaster Prevention Selection by the Ministry of Education, “Technological Innovation Award” in the 10th edition of the selection, and “Innovation Advancement Award” in the 11th edition. In 2022, all primary and secondary schools in Kaohsiung City have completed the foundational work for disaster prevention on their campuses. Furthermore, Xialin Elementary School and Zhongshan Junior High School received the “Technological Innovation Award” under the advanced promotion category, while Nanzi Special School received the “Excellence” award, and Daren Junior High School received the “Selected” award. Xialin Elementary School, amongst others, has developed disaster prevention Augmented and Virtual Reality (AVR) games related to nature, society, and disaster, such as “the Vulcan’s Maevel” in 2021 and “Strangers in the Mountains” in 2022. Zhongshan Junior High School has focused on developing a disaster warning module. In addition to above, several schools were recognized for their exemplary efforts in foundational disaster prevention work, including Wun Sian Elementary School, Guangxing Elementary School, and Fengxi Elementary School receiving the “Outstanding” award, Lide Junior High School, Wufu Junior High School, and Jiaxian Elementary School receiving the “Merit” award, and Dadong Elementary School, Ximen Elementary School, Yangming Junior High School, Meinong Elementary School, and Miaosong Junior High School receiving the “Honorable Mention” award. These awards and recognitions demonstrate the outstanding effectiveness of disaster prevention education in Kaohsiung City. They reflect the City’s commitment to the principles and practices of “prevention is better than rescue, and early evacuation is better than disaster reduction” in disaster management.

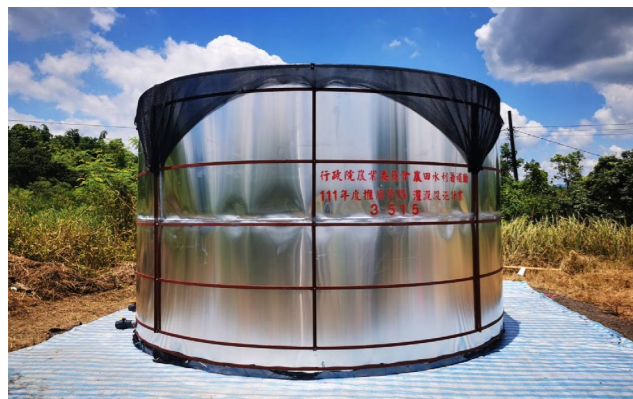
3. Drought Prevention and Water Conservation Measures

1. Resilient Utilization of Water Resources in Agriculture

The Agriculture Bureau of Kaohsiung City Government, in coordination with the central government, promotes the "Pipeline Irrigation Facilities Promotion Project" and provides guidance to farmers in setting up pipeline irrigation facilities to improve their technical expertise in irrigation, which may activate agricultural land and enhance irrigation efficiency. Kaohsiung City is the only city in Taiwan joining the pipeline irrigation proposed by the Irrigation Agency, Ministry of Agriculture (MOA), aiding remote areas such as Neimen, Jiashian, Taoyuan, and Namaxia in building reservoirs and irrigation pipelines to enhance drought resistance.

In the event of agricultural drought, the rotating irrigation measures under monitoring of the authorities will be implemented by the Kaohsiung Management Office of the Irrigation Agency, MOA to reduce peak water usage. Drought-resistant wells in the meantime will be made available for use. Meanwhile, the authorities continuously assess the impact of drought on flowering and fruiting crops. If agricultural losses reach the threshold for initiating a disaster assessment team, the Agricultural Bureau immediately engages agricultural research and extension stations, district offices, and the Agriculture and Food Agency, MOA for situation confirmation. During the 2023 drought period from February to March, the City successfully obtained cash assistance for tea trees (NT\$55,000 per hectare), green plums (NT\$62,000 per hectare), jelly figs (NT\$41,000 per hectare), and others to alleviate farmers' losses.

Furthermore, the City has assisted farmers in setting up dryland farming irrigation pipelines covering 279 hectares since 2017, securing approx. NT\$24 million in subsidies. In 2023, the City continued to seek subsidies for 40 hectares, amounting to NT\$4 million. The Kaohsiung Management Office of the Irrigation Agency, MOA is also striving for 40 hectares of subsidies totaling NT\$4.5 million. Compared to traditional flood irrigation, this method saves more than 30% of water usage. The City also cooperates with the COA (COA, now the Ministry of Agriculture or "MOA") in promoting the "Green Environment Subsidy Program" and plans the plantation of 45 regional specialty crops suitable for the City, encouraging farmers to grow water-saving crops. For each hectare of plantation, farmers receive a reward of NT\$25,000 to 60,000. In the first season cultivation of 2023, we promoted 1,431 hectares for contracted cultivation, contributing to the development of agriculture in Kaohsiung City and strengthening its resilience.



2. Strengthening Efficacy for Water Resources Utilization

In response to the impact of extreme weather conditions, the Economic Development Bureau, Kaohsiung City Government advocates for the efficient use of water resources in the manufacturing industry and collaborates with the Disaster Response Center to formulate short-term and long-term action plans to mitigate disasters. The Bureau additionally conducts drought and flood preparedness meetings for industrial parks and provide guidance, as well as develop phased water rationing plans (e.g. Benjhou Industrial Park, Gangshan Dist., and HOFA Industrial Park in Daliao Dist.). For companies failing to meet water conservation targets, the Bureau dispatches personnel for counseling to understand the reasons for falling short. In addition, the Bureau provides information to industrial users about the locations where Taiwan Water Corporation offers industrial water trucking services during drought and flooding periods as well as nationwide contacts water trucking services. Meanwhile, the Bureau conducts advocacies on diverse water resource utilization, further enhancement of percentages in the water usage plan for water resources constructions, etc. for backup sources.

During the drought, the Economic Development Bureau, in conjunction with the Taiwan Water Corporation, conducted outreach activities in the Qianzhen Dist., Linkuang Technology Industrial Park, Linhai Industrial Park, Nanzih Technology Industrial Park, and Benjhou Industrial Park. The Bureau used various communication channels including official documents and group messages for disseminating information about water conditions, water supply monitoring index, drought-resistant groundwater, and 15 water-saving measures across 4 industrial categories for the four industries. The Bureau also instructed service centers to closely monitor water-saving efforts among industrial park users, implement staged pressure reduction, rotational supply, and timed quantitative water supply. Additionally, we coordinated with the Taiwan Water Corporation to conduct water trucking drills to ensure the proper use of water resources during droughts. In the future, the Bureau will continue to work with various levels of water authorities on drought preparedness and water resource development plans. The Bureau will use the technology, steel, and petrochemical industries as water-saving benchmarks to lead industrial innovation and ensure the water security of Kaohsiung City's industries and residents.



3. Water Conservation Measures in Response to Drought

In early 2023, Kaohsiung City faced the most severe drought in 30 years, with the water supply monitoring index escalating from yellow to orange. To avoid inconvenience to residents due to water restrictions, the Water Resources Bureau implemented advanced measures including pressure reduction and water reduction measures, reducing daily water consumption to approx. 1.38 million tons. As of May 2023, the cumulative water conservation rate reached 6.2%, with a total water conservation of 5.52 million tons and the sealing of 642 water sources. The Bureau also utilized approx. 20,000 tons of recycled water from six sewage treatment plants in Fengshan Dist. and Linhai Industrial Park for street cleaning, dust control, and irrigation, effectively reducing the use of tap water.

Additionally, the Bureau conducted various outreach activities including shooting water saving advocacy videos, strengthened mass media exposure, Facebook advocacy (via graphics), advocacies made through radio and garbage truck, etc. to increase public awareness of water conservation and encouraged residents to reduce water usage, thereby getting through the drought season in joint. In the future, the Bureau will cooperate with the central government in promoting the Regulations on the Water Conservation Charge, advise the major water consumers in installing smart water gauges for monitoring improper leaks and in-time repairs thereof, whilst suggesting the water company to expedite the replacement of old pipeline for reduced water leakage rate, thereby fulfilling the saving of water resources and build up residents' habit of water saving.

The cumulative water conservation rate reached

6.2%



4. Soil and Water Resources Conservation and Coastal Protection

1. Soil and Water Conservation

In 2009, Typhoon Morakot struck Taiwan, resulting in torrential rainfalls that caused urban flooding, landslides in mountainous areas, bridge collapses, and houses buried under mud and rocks leading to significant losses of lives, properties, and major public infrastructure. Currently, Kaohsiung City has declared 3 large-scale potential landslide areas, including Liugui Dist., Jiashian Dist., and Maolin Dist., to prevent large-scale landslide disasters. In 2022, the Water Resources Bureau actively promoted the designation of large-scale landslide specific soil and water conservation areas and long-term soil and water conservation plans, such as Liugui Dist. D009 (Zhulin) and Taoyuan Dist. D382 (Baoshan).

In recent years, the frequency and intensity of natural disasters have increased. To address disaster issues, educational training is conducted for communities in 13 areas with the potential for mudslides, and exercises are conducted in local dialects (Taiwanese, Hakka, indigenous languages, etc.), such as self-precaution community drills and community improvement activities. Additional applications facilitating rescue include the use of drones in capture on-site disaster conditions in the event of a landslide disaster. Furthermore, environmental education on soil and water conservation is also promoted, in response to the "Cool School for Soil and Water Conservation" initiative, to popularize disaster prevention and education concepts. In addition, ecological assessments are incorporated into regulation projects to balance disaster prevention and ecological conservation. Strategies and measures that are eco-friendly are formulated based on principles of avoidance, reduction, mitigation, and compensation.

Kaohsiung City's Self-Precaution Community received 2 Silver Awards and 22 Bronze Awards from the Agency of Rural Development and Soil and Water Conservation, MOA, Executive Yuan between 2018 and 2022. Kaohsiung City also collaborated with district offices to implement landslide and large-scale landslide disaster prevention projects, and 10 district offices from including Gangshan, Tianliao, Maolin, Namaxia, and Gushan Districts received the "Special Excellence Award", while 2 district offices from Shanlin and Taoyuan Districts received the "Excellence Award". Interdepartmental cooperation was also conducted to investigate the situation of camping sites, with 86 cases of excessive use discovered, thereby strengthening the supervision of slope violation cases.

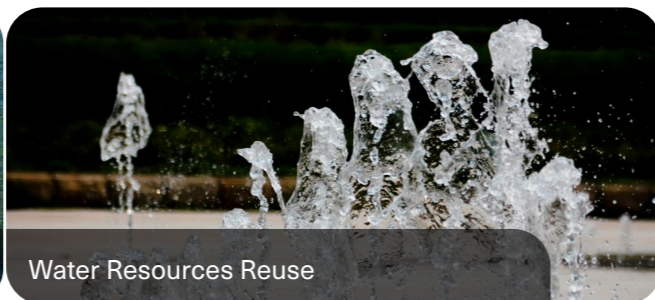
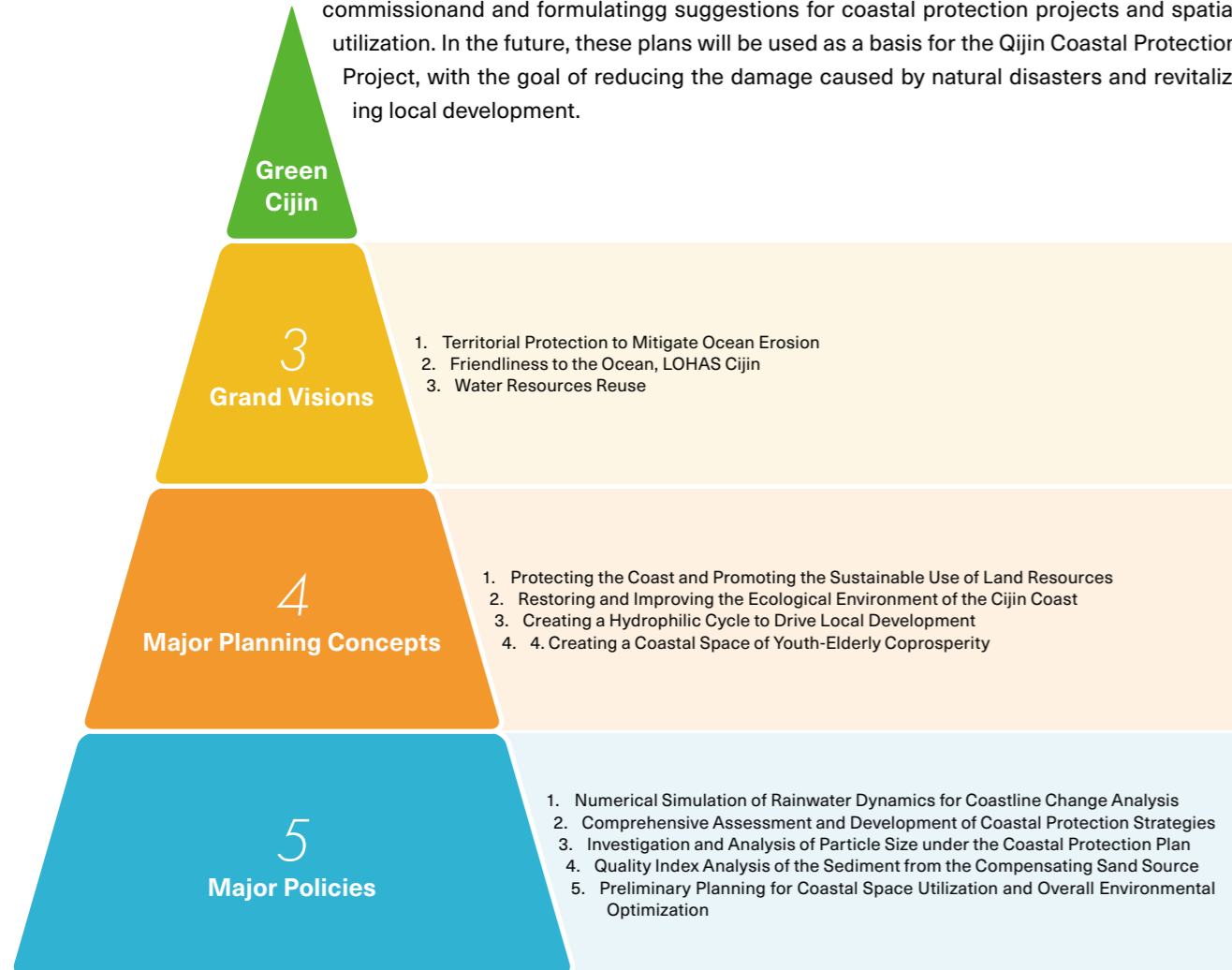


2. Coastal Protection

Kaohsiung City relies heavily on coastal aquaculture, yet there are problems such as scattered long-term irrigation pipelines and drifting garbage along the coastline, whilst various areas are left unmanaged. To address the issues at the Kaohsiung coast, the Water Resources Bureau proposes relevant remediation plans for the coast on an annual basis. Recent remediation projects cover the locations including Cieding Coast Park, the coasts of Linyuan and Qijin, etc.. Meanwhile, local residents' needs are considered through site inspections and explanatory meetings. The remediation projects further become a part

of principles including improvement and greening of coastal spaces, linking to local communities, etc., which may enhance coastal protection and provide recreational spaces for residents.

Additional acts by the Water Resources Bureau includes monitoring of coastal terrains, engagement National Sun Yat-sen University in numerical simulations of ocean currents under commission and formulating suggestions for coastal protection projects and spatial utilization. In the future, these plans will be used as a basis for the Qijin Coastal Protection Project, with the goal of reducing the damage caused by natural disasters and revitalizing local development.

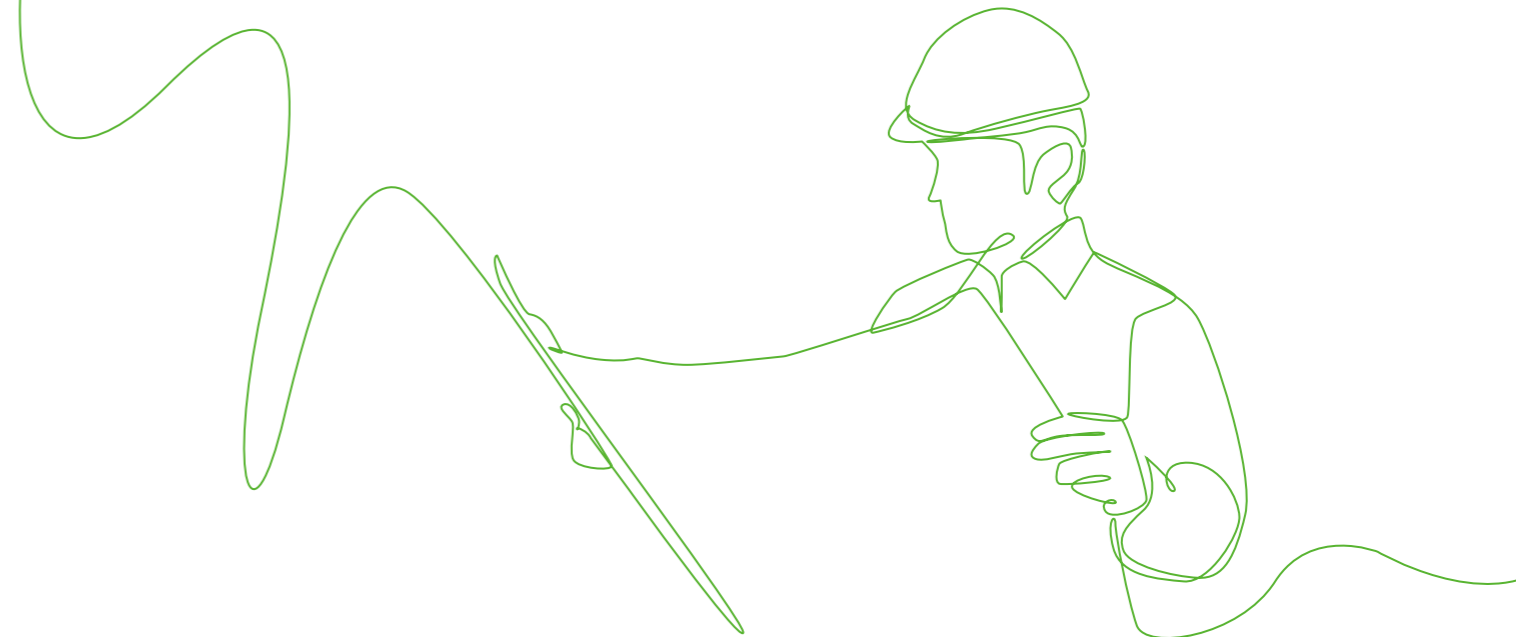


The Overall Coastal Protection Strategy and the Vision of Coastal Space Utilization and Environmental Optimization

3. Landslip Monitoring at Tzaishan

Due to its unique topography and geological structure, certain areas of Tzaishan have shown significant displacement over the past decade. The deformation of the strata is mainly concentrated during the rainy season from May to October each year, influenced by concentrated rainfall, infiltration, and rising groundwater levels. This causes displacement due to the weakening of the mudstone layer itself or at the interface with limestone. In the more severely affected areas, there is an average annual horizontal movement of about 14 cm towards the Taiwan Strait, starting from the west of Tzaishan Avenue.

Kaohsiung City government has been monitoring this situation since 2005, using inclinometer casings in soil, GPS, self-reading rain gauges, groundwater level gauges, and building inclination gauges. From 2013 to 2023, to provide evacuation and warning in advance, various monitoring instruments were installed, including 11 in-hole extensometers (as replacement to inclinometer casings in soil), real-time image monitoring, 9 groundwater level observation points, 2 rain gauges, and 16 GPS and RTK measurement points on the surface. In addition, 6 bidirectional inclinometers were added to retaining walls, such as those at the Tzaishan Shanhai Temple parking lot and on the west side of the Shanmeng Haishi Coffee shop. By including the building inclination gauges in the automated monitoring system, the monitoring alarms are activated in case of abnormal strata movement, extremely heavy rainfall, or typhoon warnings, triggering the corresponding evacuation to reduce loss in disasters.



5. Smart Flood Control Early Warning System

In 2021, the United Nations released the Sixth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC AR6), indicating that rainfall patterns are becoming more extreme and that both short-duration intense rainfall and long-lasting heavy rains are increasing in frequency, which makes strengthening flood control capabilities of water facilities as well as disaster warnings and response capabilities necessary to enhance the City's resilience and reduce the impact of disasters. Various types of water monitoring, disaster data collection, compilations and analyses on simulation as well as diverse applications are essential.

The construction of a smart flood control structure utilizes both software and hardware technologies to provide real-time and forecasted information needed for flood control. In recent years, with the development of Big Data, IoT is no longer limited to information provision but has transformed into decision analysis; meanwhile, the the original IoT architecture is introduced with AI and evolve into AIoT (Artificial Intelligence of Things), encompassing AI (artificial intelligence, machine learning), IT (information integration technology), and OT (contingency operational technology). For the "Baozhugou Drainage and Collection Area" (2 water level stations for open and closed channels), "Shihcyuan Detention Basin Water Level Station" (1 station), and "Rain water sewer Water Level Stations" (11 stations), sensing components have been installed. An integrated use is made possible by combining the capabilities of front-end monitoring sensors to monitor water conditions and the operation status of water facilities with the backend information management platform and flood prediction models. For physiographic inundation pattern, a model is established and coupled with models such as SWMM, HEC-RAS, and AI neural network for automatic calculating to obtain the conditions, boundaries, and corrections required for flood simulation, followed by in-time correction of flood simulation results applying the water physics at rivers and rain water sewers. In the meantime, the model is followed with Water Resources Bureau's established SOPs for various scenarios to reduce the risk of widespread flooding. In the future, 240 more rain water sewer water level information points will be gradually added, realizing the concept of a resilient city.



Kaohsiung Smart Water Resources Monitoring Platform II

7.2

Climate Adaptation Vision

Corresponding to SDGs



1. Operation of Critical Infrastructure

1. Ongoing Maintenance and Security Management over the Critical Infrastructures to Reduce Risks of Hazards and to Ensure Sustainable Development

The Economic Development Bureau, Kaohsiung City Government has cooperated with the Ministry of Economic Affairs (MOEA) to promote the “Small Water Supply Facilities Operation Project for Supply Improvement in the Areas without Tap Water Supply” to understand the current operation status of small water supply facilities in indigenous areas, strengthen the operation of indigenous area small water supply facilities management committees, and ensure the quality and stability of small water supply facilities. Since 2016, the Bureau has been seeking subsidies from the Water Resources Agency, MOEA for the “Operation Project for Small Water Supply Facilities in Indigenous Areas” to assist in improving the water supply systems. As of June 2023, repairs have been completed in 2 villages in Taoyuan Dist. and 1 village in Namaxia Dist., and maintenance and other guidance work have been carried out for 14 small water supply facilities in Namaxia, Taoyuan, and Maolin Districts.

In addition, the Economic Development Bureau manages gas (petroleum and natural gas) stations, fishing boat refueling stations, and applications for petroleum enterprise oil storage equipment establishments in accordance with the “Petroleum Administration Act” and “Natural Gas Enterprise Act”, with advocacy of relevant affairs conducted. The municipal competent authority conducts at least one annual inspection of “transmission and storage facilities” for public natural gas enterprises. Currently, 3 safety inspections of public natural gas enterprises have been completed, along with 1 simulation drill at the Natural Gas Disaster Response Center and 1 education and training session to enhance the effectiveness of safety management, achieving the goal of optimizing risk management.

2. Changing Sidewalk Design

The Public Works Bureau of Kaohsiung City Government follows the “Urban Humanity-Oriented Traffic Environment Planning and Design Handbook” developed by the National Land Management Agency, MOI as a principle and incorporates relevant accessibility facility requirements into its planning and design. In addition to emphasizing the “humanity-oriented” concept, it also incorporates the concept of “natural methods” to provide safe and friendly pedestrian spaces for the elderly, students, and people with mobility difficulties, as well as all citizens. By using permeable pavements and planting strips in the design, rainwater is directed and infiltrated into the water-retaining layer or soil to conserve urban water resources. The water resources conserved may double as a heat absorber, reducing the urban heat island effect.

In 2022, improvement projects were carried out for sidewalks in several areas, including Zuoying Avenue in Zuoying Dist., Zhingzheng Rd. in Sanmin Dist., Nanjing Rd. in Fengshan Dist., and Huaxia Rd. in Zuoying Dist., as well as school commuting route improvement projects for Nanzih Elementary School in Nanzih Dist., Fudong Elementary School in Lingya Dist., Aiqun Elementary School in Qianzhen Dist., and Fengjia Junior High School in Fengshan Dist. Repairs and improvements for sidewalks in various districts continue to be implemented, with a total improved area of 15,400 square meters. In the future, the Public Works Bureau will continue to vie for project subsidies from the central government, with a projected improved area of 18,200 square meters in 2025 and 242,000 square meters in 2030, working towards the vision of a pleasant and livable city.

Improved area in 2022

15,400 m²



3. Operation and Maintenance of Lightrail System

After the merger of the former Kaohsiung County and City, Kaohsiung City has experienced rapid changes in its socioeconomic environment. Under the central government’s “Kaohsiung Maritime and Air Economic and Trade City” project promoted in full swings, major construction projects in the Port of Kaohsiung area have been launched one after another. These include the overall development plan for the Marine Culture and Pop Music Center (now “Kaohsiung Music Center”), the Port of Kaohsiung Bus Station and Harbor Administration Building, the Kaohsiung Exhibition Center, the Kaohsiung Software Technology Park, and the Multifunctional Economic and Trade Park, which have been inaugurated successively.

To accommodate the economic development in the Port of Kaohsiung area, Kaohsiung City has developed the Light Rail system. Phase 1 of the Light Rail inaugurated in 2017, and the routes in Phase 2 is expected to be completed and operational at the end of 2023. The completion of Phase 2 will expand the coverage of the Light Rail service, connecting various major construction projects, stimulating development in the surrounding areas, and enhancing the overall economic benefits of the City. Between the beginning of 2022 and June 2023, the volume has reached approx. 8,761,999 passengers. Furthermore, in response to the impact of climate change, the Light Rail route has a greenery coverage rate of over 80% to reduce the urban heat island effect and regulate urban high temperatures. The Light Rail service in the meantime adheres to the concept of energy conservation and environmental protection with passenger trains powered by electricity and station designs incorporating double-layer ceilings with elevated open spaces. It is hoped that citizens may enjoy a convenient, friendly, comfortable, and reliable public transportation system after the full opening of the Circular Light Rail System in the City.

the Light Rail route has a greenery coverage rate of over

80 %



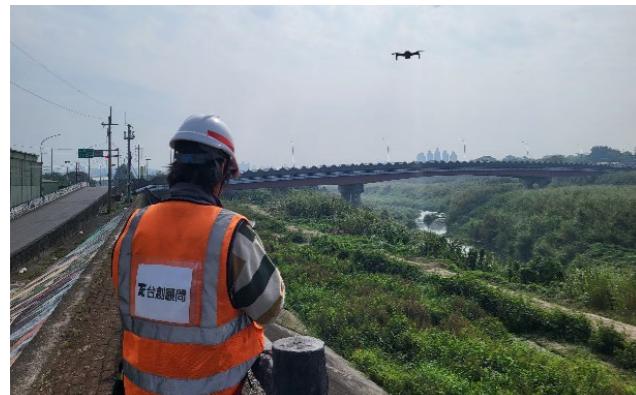
4. Bridge Overhaul and Resilience Enhancement Project

Kaohsiung City currently has approx. 1,370 bridges in use. Following the "Operation Directions for the Maintenance and Administration of Bridges" by the Executive Yuan and in coordination with higher-level authorities' emphasis on the repair of deteriorating bridges, the City has proactively designed and formulated effective repair policies based on bridge characteristics, regional factors, and the severity of damage to extend the service life of the bridges and ensure road safety. Bridge maintenance is divided into "above-bridge" and "under-bridge" based on the location of bridge components and the method of repair. The "above-bridge" maintenance covers bridge expansion joints, drainage facilities, bridge guardrails, sidewalks, and ancillary facilities, while "under-bridge" maintenance is further divided by components that can be repaired directly and those that can be repaired using a bridge inspection vehicle or aerial work vehicle, depending on the construction environment assessment.

The Public Works Bureau conducts regular inspections and special inspections to detect component damage early and compile data to identify components that require immediate repair and those that require repair within 3 years, so as to differentiate damage levels and enhance control over bridge damage. Priority is given to repairing components with higher damage levels, while mild damage components are also repaired to ensure safe passage. In 2023, Kaohsiung City received accolade of Excellence Award in the inspection and repair category under the "Bridge Evaluation by the Highway Bureau, Ministry of Transportation and Communications (MOTC), ranked 2nd in the number of bridge repairs among the Six Special Municipalities, achieving the policy vision of sustainable economy and bridge resilience enhancement.

In the number of bridge repairs among the Six Special Municipalities

RANK 2



2. The Vision of Urban Water Conservation and Temperature Reduction

1. Urban Water Conservation and Creation of Water Environment

To achieve the policy vision of "symbiosis, coexistence, and mutual prosperity with water", urban development has transitioned from a single focus to a complex, multifunctional, and diverse approach that addresses flood control and ecological nature. The Urban Development Bureau and Water Resources Bureau of Kaohsiung City have collaborated in active promotion of management, purification, and loving of water in integration, while increasing green space coverage, combining ecological conservation, water quality improvement, and the enhancement of the surrounding water environment as well as the original intention of urban greening. It not only improves the quality of life in the surroundings but also effectively reduces urban environmental pollution and microclimate regulation. Additional perks include urban water retention capacity and heat island effect reduction.

The Water Resources Bureau combines ecological methods with water control engineering to create an urban oasis with beautiful aquatic environment and for recreation, as well as the water conservator and the climate regulator. Current control projects include projects such as the "Houjin River Waterfront and Recreation Environment Construction Project" and the "Beiwu Drainage and Caotanpi Detention Basin Remediation Project" aimed to create ecological environments and build a recreation space with flood control pedestrian safety features. The Urban Development Bureau, through the "ratio of green cover" requirement, mandates that a certain percentage of green cover be preserved when applying for construction permits. For example, in the detailed plans under the Kaohsiung City Urban Project (at the National University of Kaohsiung area), a green cover at approx. 86.7 hectares, equivalent to 6.8 Central Parks, have been built from 2021 to 2022. This not only realizes the advantages of urban water conservation and cooling but also avails more green urban landscapes, making Kaohsiung City more livable and pleasant.

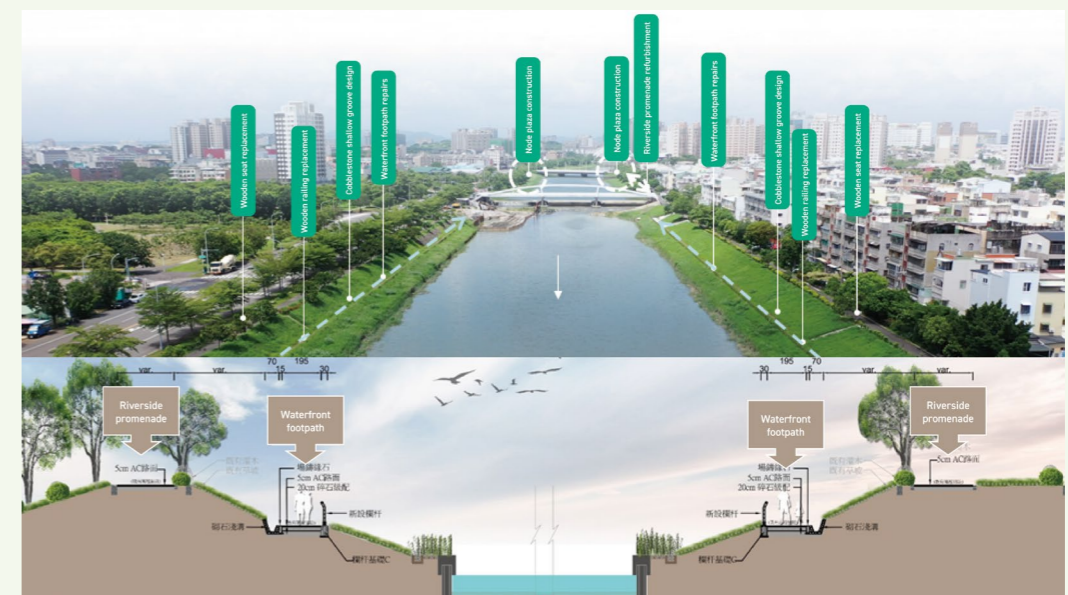
Approximate green cover area has been obtained

86.7_{ha}

Houjin River Waterfront and Recreational Environment Creation Project

Houjin River has completed the environmental improvement of the riverside trail and flat at Houjin River was implemented between 2003 and 2010. The functional benefits of the water-friendly environment of the existing embankment have declined due to prolonged use.

The Project features designs on the principle of diminishing the flood function of Houjin River and maintaining the plant-growing slope. Riverbank-top Trail with hydrophilic wooden railings overgrown with weed that originally affected the safety of pedestrian traffic were renovated with the hydrophilic AC trail. The damaged shore top trail were rebuilt, with node design integrated at the end of the trail, combined with entrance imagery, guide facilities, etc. to build a safe and convenient environmental field



Introduction, Elucidation, Transition and Conclusion, as well as Inclusion

Introduction-going back to the beginning

- ✓ The last mile of Love Reiver
- ✓ The bottleneck section of the Beiwu has been improved
- ✓ The style of Caotanpi was reshaped



Elucidation-inheritance and reengineering

- ✓ Make the downstream waterfront last
- ✓ And let the ecology at impounding reservoirs exist
- ✓ Show the spirit of the place



Transition-shift of mindset

- ✓ Low-impact development
- ✓ Energy Conservation, Carbon Reduction and Reuse
- ✓ Diverse and Friendly Environment



Conclusion-cross-domain merge

- ✓ Cross-agency cooperation
- ✓ Local in-depth communications
- ✓ Interaction with Ecology NGOs



Beiwu drainage and Caotanpi Detention Basin Remediation Project



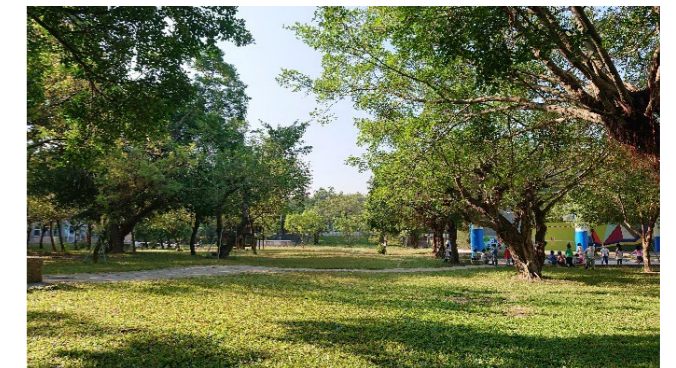
2. Air Quality Purification Zones for a Green Life

Since 1996, Kaohsiung City has been implementing air quality purification zone greening and beautification projects, establishing review and guidance mechanisms to activate unused open land for 100% reuse. The City integrates green projects of various City Government agencies and schools, promotes the use of public seedlings cultivated by the Agriculture Bureau and Public Works Bureau, and uses them for new planting or replanting in air quality purification zones. In addition, Kaohsiung City has formulated the "Kaohsiung City Government Directions for Establishment and Administration of Air Quality Purification Zones" to encourage government agencies and schools in the City to apply for the establishment of air quality purification zones, which may reduce dusts from bare land, increase green cover and improve air quality.

To date, the project has served its purposes of reducing bare lands, minimized dusts, and increasing green spaces, applied to a total of 430 locations covering 173.2 hectares. This results in an annual reduction of 3,983.6 metric tons of carbon emissions and positive effects on urban greening, climate adaptation, and mitigation. From 2021 to 2022, 21 new air quality purification zones were established, adding approx. 1.537 hectares of green cover. It is estimated that the project will contribute to reduction of emissions, including carbon dioxide by 35.35 metric tons, particulate matters by 0.79 metric tons, and sulfur dioxide by 11.49 metric tons annually. The City plans to continue the air quality purification zone greening and beautification project, aiming for a ratio of green cover of 90% by 2025 and 92% by 2030 in its realization of creating a more sustainable and ecological urban environment for citizens and students.

The green area reaches

173.2_{ha}



3. Promoting the Green Building Approval and the Vertical Greenery Action Plans

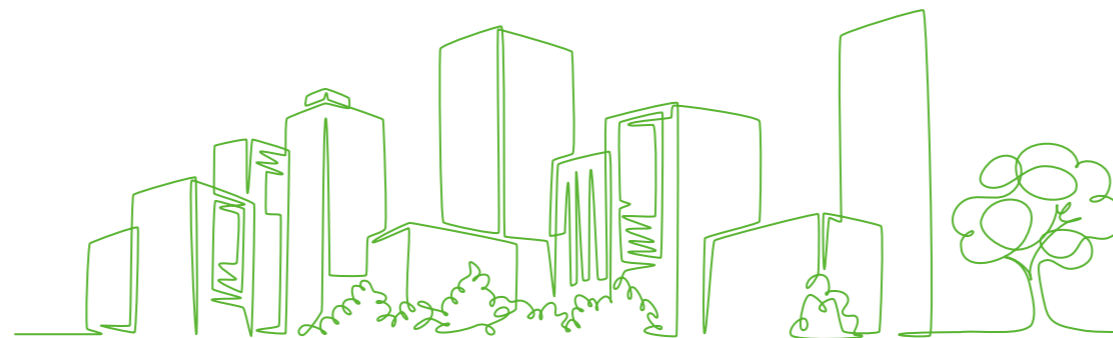
Kaohsiung City is located in a subtropical monsoon climate zone, with two-thirds of the year characterized by high temperatures. In recent years, the rainy season has become shorter and characterized by heavy rainfall, increasing the risk of disasters. Urbanization has led to significant land cover changes, resulting in issues such as loss of water retention capacity, poor climate regulation, and biodiversity crisis.

To address these challenges, the Public Works Bureau initiated the Self-Government Ordinance for Green Building in 2011 and promoted the "Kaohsiung House Project" in 2012 as a means to promote the vertical greening and Kaohsiung House policies, whilst incentivizing businesses to increase green covers. This collaborative effort among the industry, government, and academia has resulted in a total green cover at 620,046 square meters, equivalent to the area of 103 international standard football (soccer) pitches and capable of reducing carbon emissions by 12,400 metric tons annually. With the combination of "Roof Greening and Vertical Greenery" Project, energy saving, greening, ecology, and residential aesthetics were implemented along with enhanced building safety and disaster prevention capabilities. As of 2022, an additional 17,388.61 square meters of green coverage area has

Annual carbon emissions reduction

12,000_t

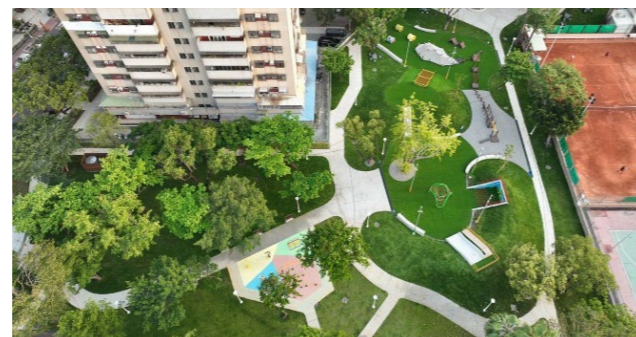
been added, creating a total of 600,000 square meters of green coverage for Kaohsiung City, equivalent to 5.3 Weiwuying areas. This reduces annual carbon emissions by 12,000 metric tons. The City plans to continue greening efforts, incorporating agricultural education, private building community activities, and creating a sustainable environment that combines green ecology and residential aesthetics.



4. Development, Improvement and Maintenance of Parks and Green Spaces

The importance of parks and green spaces has evolved from serving purely recreational needs in urban areas to encompassing roles in ecological conservation, environmental education, environmental aesthetics, disaster prevention, and buffering. The degree of urban greening has long been considered an indicator of societal progress. Therefore, quantifying green space and systematic categorization of park types have become important goals and indicators of national development.

In terms of park development and renovation, Kaohsiung City considers the “inclusive” needs of different ages, genders, ethnic groups, and integrates natural ecology, landscape environment, local culture, and smart creativity in the creation of public spaces that are safe, inclusive, and green, whilst meeting local needs. Currently, the City boasts the highest green space per capita among the Six Special Municipalities in Taiwan. There are already 2,534 hectares of urban planning parks, green spaces, and children’s playgrounds. The City plans to continue to create diverse values for existing parks and green spaces, tailor them to local needs, increase green coverage in existing parks, and enhance the net carbon benefit of parks.

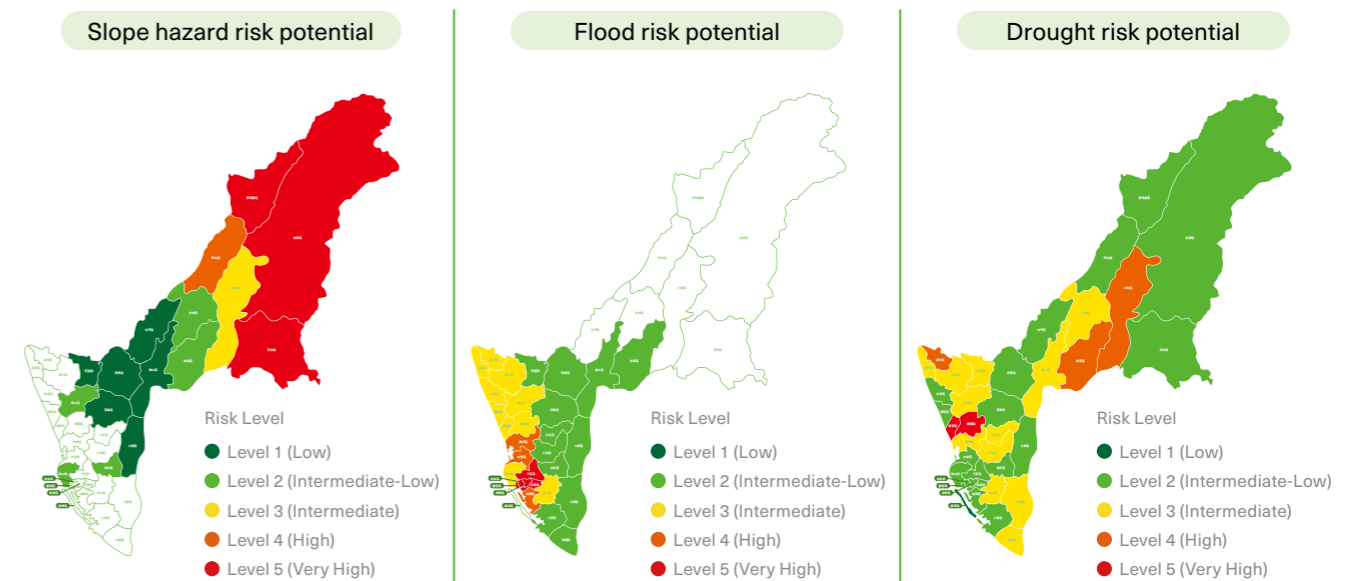


3. Land Use and Risk Assessment

1. Adapting the Land Use and Planning Principles in Response to Climate Change

In recent years, the climate change has led to increased typhoons and extreme heavy rainfall, resulting in an increased frequency of complex disasters in mountainous areas and flooding in low-lying areas. Coastal areas also face rising sea levels, coastal erosion, and increased flooding risks, affecting land use in both residential and industrial areas. Based on a comprehensive assessment of weather event hazards, environmental vulnerability, and population exposure factors by the National Science and Technology Center for Disaster Reduction (NCDR), it was found that various types of disasters have varying degrees of potential in different districts of the City. Flood risk is highest in districts including Yancheng, Lingya, and Sanmin, followed by Zuoying, Nanzih, and Qianzhen; districts with highest probability of landslide risk include Namaxia, Taoyuan, and Maolin, followed by Liugui and Jiaxian; tsunami inundation potential is highest in districts like Qieding, Yong’an, and Mituo; districts including Qiaotou, Zigan, and Meinong have the highest drought risks.

To address these risks, Kaohsiung City has appropriately designated national land use zones, setting aside 271,100 hectares as land conservation areas (accounting for 42% of the City’s land area) and 50,500 hectares as agricultural development areas (8% of the City’s land area) for differentiated land use controls to ensure sustainable land use and land security. In addition, 31 urban planning areas have been established in the City, covering approx. 41,400 hectares of urban land (5% of the City’s land area). Flood detention spaces in urban and rural areas to enhance urban flood control capacity and strengthen water conservation, flood control, and flood management adjustment mechanisms. In coastal areas, the City implements measures emphasizing on disaster prevention, conservation, and reasonable spatial planning to reduce environmental impact risks.



MRI-AGCM simulation data were used to evaluate the drought intensity of SPI indicators in townships and urban areas during the base period (1979 to 2003) and the estimation period (2075 to 2099). Based on drought intensity and drought potential across Taiwan as agricultural data, estimations on 1st-crop rice paddy in townships are made.

2. Promoting Outflow Control in Response to Threats of Climate Change

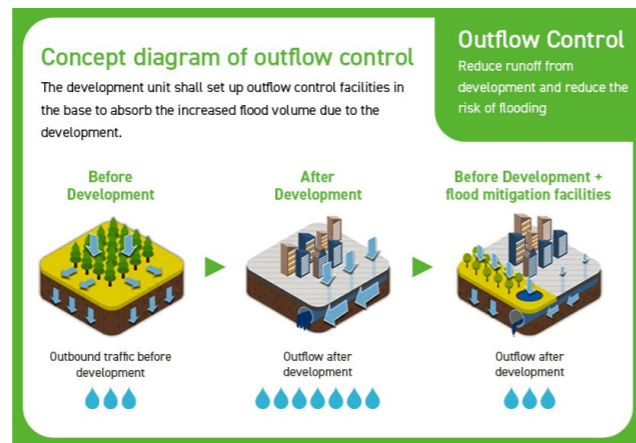
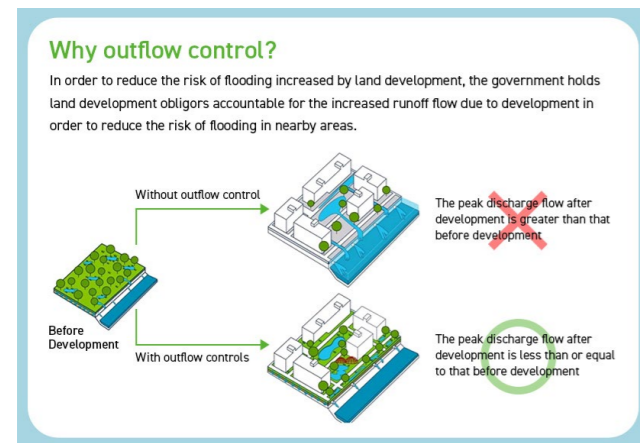
As land development becomes more diversified, Kaohsiung City's Water Resources Bureau has promoted outflow control to reduce runoff resulting from land development. The Bureau, according to the "Water Act" and the "Regulations governing Review, Supervision, and Exemption of Outflow Control Plan and Planning Document", mandates persons in charge of the developers to submit outflow control plans for land development projects above a certain scale that increase runoff volume. Meanwhile, runoff sharing and outflow control policies are enforced, which expand the shared responsibility for runoff from waterways to both waterways and land, thereby reducing the risk of flooding for both as a response to threats from climate changes.

Since the implementation of outflow control regulations in 2019, the Water Resources Bureau has reviewed and approved 32 development cases, contributing a total detention capacity of approx. 524,300 cubic meters. In the future, the City will continue to actively promote and implement outflow control review operations to ensure that development units properly carry out and manage projects according to approved plans, allowing flood detention facilities to effectively mitigate flooding and contribute to the vision of Kaohsiung as a resilient water city.

32 Development Cases were reviewed and approved

The total detention capacity amounted to

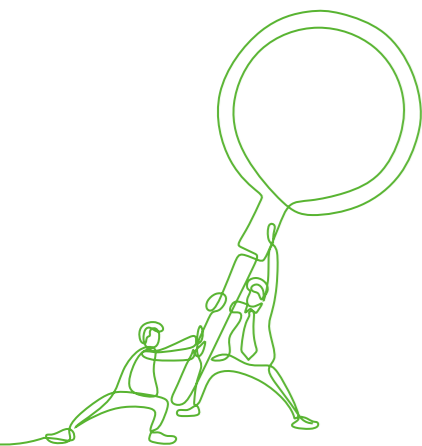
524,300 tons



3. Soil Liquefaction Investigations and Risk Assessment Plans

In 2016, Kaohsiung City experienced the Meinong earthquake (aka. 2016 southern Taiwan earthquake) with a magnitude of 6.6 on the Richter scale and a maximum intensity of 7. This earthquake caused soil liquefaction in many building foundations, leading to tilting, collapse, and structural damage. In response to concerns about soil liquefaction hazards, Kaohsiung City launched a two-phase Plan for Prevention and Improvement Demonstration of Areas with Soil Liquefaction Potential in 2017 and 2018, followed by the City's completion and launch of the Intermediate Soil Liquefaction Potential Map in 2019. Additionally, risk assessments for liquefaction were conducted for several old buildings and underground pipelines.

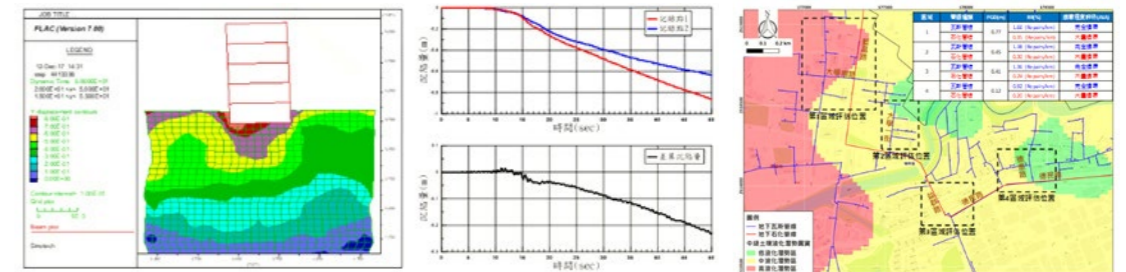
Starting in 2021, Kaohsiung City initiated a five-year plan to improve soil liquefaction prevention and control. The plan involves drilling investigations in areas with insufficient accuracy, improving the Intermediate Soil Liquefaction Potential Map, establishing an underground water level observation network, enhancing the application of liquefaction maps in urban disaster prevention (including risk assessments for old buildings and underground pipelines in areas with intermediate to high liquefaction potential), and educating the public on liquefaction issues. The goal is to provide reference information for urban disaster prevention, urban renewal planning, local engineering construction, and development site selection, thereby addressing concerns about public safety and property in areas prone to liquefaction.



Investigation location and implementation method - liquefaction risk assessment of buildings and pipelines

Risk assessment of old buildings and underground pipelines due to liquefaction of soil:

In the implementation of the first and second phases of the Kaohsiung City Soil Liquefaction Plan, the city has conducted liquefaction risk assessments for several buildings and underground pipelines



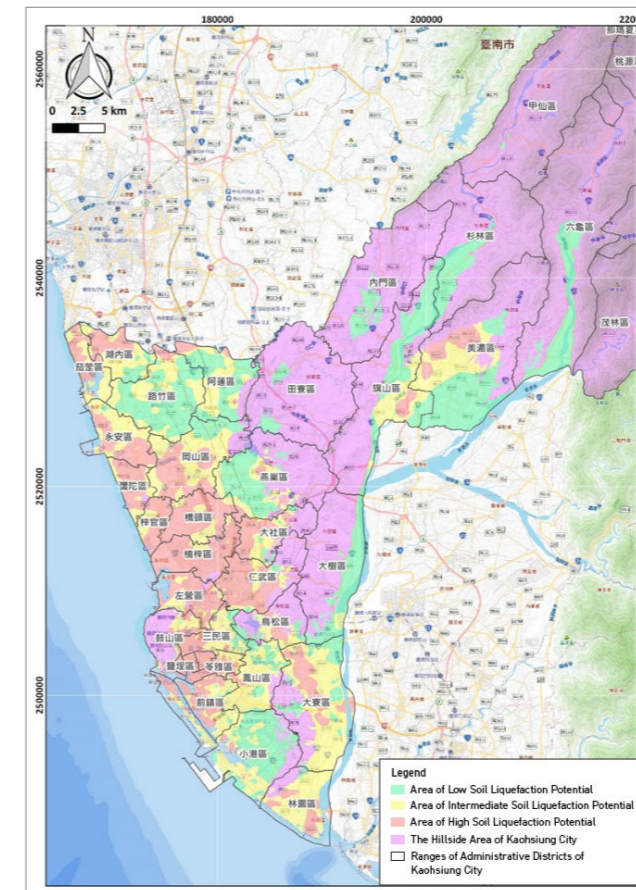
Building Liquefaction Disaster Risk Assessment (Numerical Analysis)

Pipeline liquefaction disaster risk assessment (preliminary evaluation of simple formula)

Considering that the risk assessment of soil liquefaction of buildings and pipelines is the focus of disaster prevention in the City, it is planned to continue to promote it within the 5-year plan.

The City is expected to conduct liquefaction risk assessment for old buildings and pipeline dense areas with medium and high liquefaction potential.

Quantitative liquefaction risk assessment for important old buildings (e.g., disaster shelters) or pipeline sections (e.g., dense petrochemical pipelines) conducted to estimate the possible sedimentation amount, disaster damage and expected losses, with expected proposal of contingency countermeasures.



4. Flood Detention and Control Capabilities

1. River Systems and Basins Remediation and Flood Control Planning

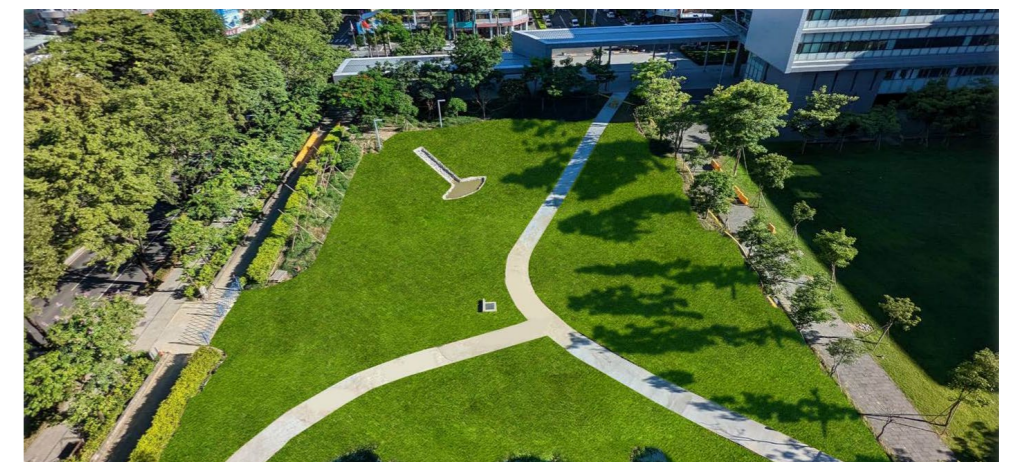
Kaohsiung City has a total of 119 regional drainage channels across 13 river systems. In recent years, excessive land development has resulted in increased runoff exceeding the originally planned capacity of natural river systems and regional drainage systems. To enhance urban flood resilience, the Water Resources Bureau of Kaohsiung City has adopted a flexible approach tailored to the characteristics of each river system. This approach allows rivers to have breathing space during typhoons and heavy rainfall, reducing the potential harm from extreme rainfall events. For example, detention basins are designed to provide temporary storage space for floodwaters, preventing rivers from overflowing their banks without unrestricted dyke heightening. Currently, the City has completed projects such as the deepening and embankment improvement (from the lower reaches of Tandi Bridge to National Freeway) of the Tandi drainage canal in Gangshan Dist. and the remediation of the bottleneck section of the Houjin River drainage canal in the FPG Renwu Industrial Zone. Additionally, the City has 21 detention basins, including the Area D Detention Basin at Dianbao River and the Wujiawei Water (Storage Tank) Detention Basin. As of June 2023, the total detention capacity is approx. 4.73 million cubic meters. In 2023, the City plans to complete four additional detention basins, including ones at Caotanpi and Guangchang, which will increase the total detention capacity to 4.9 million cubic meters.

For drainages and watersheds at Bixiu, Qiaotou Dist., the Urban Development Bureau prioritizes gravity-based flood control principles and eliminates highland runoff in its water management approach. In the past, various areas within the Dianbao River system experienced severe flooding issues. Therefore, in 2006, the central government initiated the "Flood Control in Flood-Prone Areas Project", and in 2014, the "Comprehensive Basin Management Project". These projects included about 16 tributaries, including the mainline of the Dianbao River and the Bixiu Drainage, in their scope. In 2008, the Water Resources Agency's Water Resources Planning Research Institute completed the "Remediation and Environmental Improvement Plan for the Dianbao Drainage System in Kaohsiung". Based on the approved governance plan land area designated by the Water Resources Agency, urban planning reviews and changes were conducted to avoid significant disasters caused by flooding in the region. The subsequent remediation projects for the Dianbao River drainage system and the Bixiu branch will align with the Water Resources Agency's "Forward-looking Infrastructure Program - Water Environment Construction" to improve the local flood situation. Relevant land use changes will be made for governance purposes to facilitate future land management.

There are a total of

21

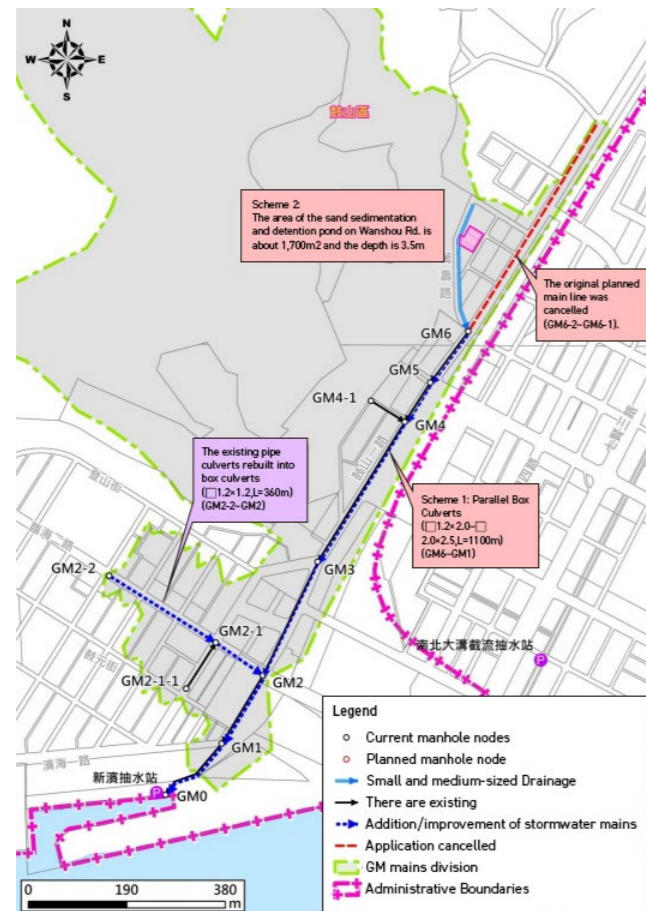
Detention Basins in the City



2. Review and Planning of the Rain Water Sewage, and Construction and Improvement Plans

As a system for collecting and diverting rainwater runoff, rain water sewers are crucial in densely populated urban areas, making its planning and construction closely related to urban development. Kaohsiung City, being an older city in terms of urban development, has experienced changes in land use and topography due to urban development, along with the effects of global warming leading to an increase in short-duration intense rainfall events. As a result, the planning and drainage protection standards for rain water sewers in different administrative districts need to be reviewed and revised to formulate drainage improvement strategies.

The Water Resources Bureau is conducting basic data surveys and updates for the rain water sewer system in the City, including hydrologic data, topographical surveys, and investigations of locations that have experienced flooding events. The accumulation and main causes of flooding in each district have been analyzed and, based on the current drainage system's simulation analysis results, in-depth analysis of drainage issues has been conducted. This analysis aids in the formulation of drainage system improvement plans, and subsequently, rain water sewer construction and improvements. Additionally, an annual budget of NT\$65.2 million has been allocated for rain water sewer review and planning, with plans to review 1,500 hectares of planning area and construct or renovate 350 meters of rain water sewers developed 2023. The City will continue to update and improve sewer and hydrologic information to enhance drainage and flood control capabilities.



3. Dredging Operations to the Gaoping River Basin

In recent years, the Gaoping River Basin has been susceptible to heavy rainfall, leading to the loosening of soil and rocks in the upstream slopes. These loose materials are easily carried downstream by floodwaters and, without proper dredging, may increase the flood flow cross-section, divert water into the deep channel in the river center, and potentially cause erosion on both sides of the riverbanks, leading to damage to embankments. The dredging plan in this section primarily focuses on dredging riverbeds and channel arrangements. It also incorporates the "Riverbed Groundwater Recharge Plan" of the Water Resources Agency, which utilizes the "Riverbed Groundwater Recharge Method" to recharge groundwater. Additionally, it utilizes sand and gravel obtained from riverbeds in dredging

to construct micro-dikes on-site to increase the water storage area and depth, which not only improves recharge efficiency but also reduces the costs associated with the policy's implementation. Furthermore, it significantly increases the amount of groundwater recharge through riverbeds and floodplains, addressing the needs of agricultural irrigation and domestic water supply.

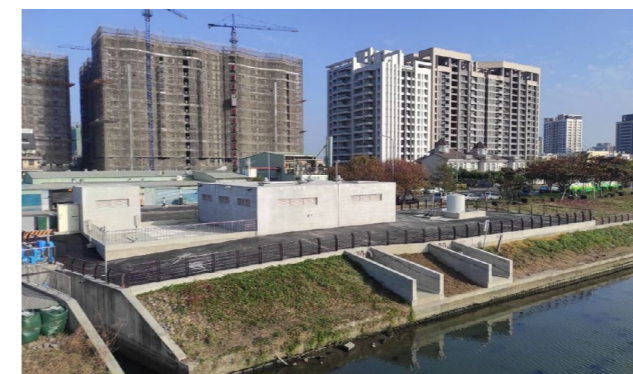
As safety remains a top priority during the execution of this dredging, it is conducted in stages with a gradual approach, with regular river channel monitoring in place. The project also serves as a stable source of sand and gravel for various local construction needs, ensuring the safety of hydraulic structures and bridges, reducing the demand for sand and gravel from external sources and is expected to effectively lower flood levels, ensure river flood discharge capacity, maintain the safety of hydraulic structures and bridges, and safeguard the lives and property of people along the riverbanks. The project also aligns with national sand and gravel supply policies by reconciling market supply and demand.



4. Pumping Station Establishment

The Water Resources Bureau of Kaohsiung City Government, based on regional drainage and rain water sewer planning reports of each river system, collects recent flooding events and identifies areas prone to flooding. With evaluations on environmental conditions and requirements in various areas, the Bureau takes multi-pronged strategy for the water control and builds pumping stations, which may strengthen flood control capabilities of pumping stations and ensure the maximal effects of flood control facilities during typhoons and torrential rains.

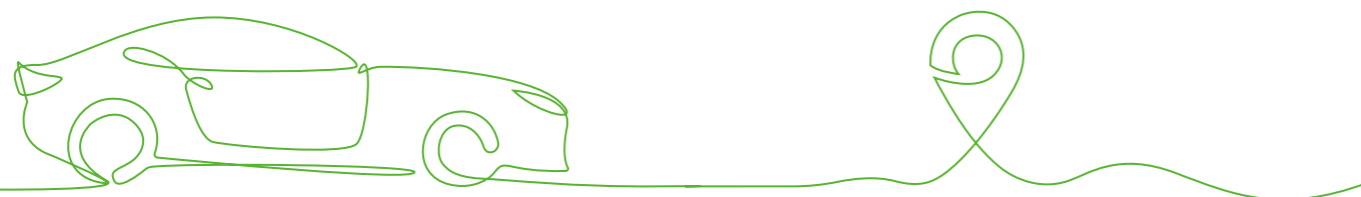
In 2022, the "Yuanzhong Rd. Pumping Station Project" was completed, improving drainage efficiency in low-lying areas south of Lantian Rd. and west of Dezhong Rd. Additionally, the "Project of Pumping Station Establishment at Gushan 3rd Rd., Gushan District" involving the construction of an underground pumping station forebay, pumping units, gates, and debris screens was completed. The 2 projects collectively increased the pumping capacity by 8 cubic meters per second (CMS) to enhance disaster resistance and flood control capabilities. In 2023, the "Project of Pumping Station Establishment at Yanpu Bridge, Qiaotou Dist." is scheduled to be carried out to realize the concept of urban water resilience.



5. Inclusion of Regulations by Requiring a Permeable Pavement at over 10% of Overall Area of New Ground Off-Street Parking Lots

To realize the vision of a sponge city, Kaohsiung City aims to mitigate urban heat island effects, improve urban flood control and drainage issues, and reduce the environmental impact of land development. In 2022, the City enacted the Article 4-1 of the “Kaohsiung City Self-Government Ordinance for Public Parking Lots”, which mandates that a new ground off-street public parking lot with spaces more than 50 small cars or an area over 1,500 squared meters must include a permeable pavement on over 10% of its area.

As of the end of September 2023, 68 ground off-street public parking lots have been completed with over 10% of their area covered by permeable pavement. The materials used for permeable pavement are mostly permeable asphalt, grass, and crushed stone. The Transportation Bureau, Kaohsiung City Government estimates that by 2025, there will be 213 such parking lots, and by 2030, the number is expected to reach 538. Such policy vision significantly enhances the City’s water retention capacity.



6. Farmway and Drains Improvement Works for Farmland Readjustment Area

Farmland readjustment areas are vital regions for Taiwan’s agricultural and grain production. However, local farmway and drain facilities often suffer from aging and damage to road surfaces and drains due to prolonged use, which not only affects the transportation of agricultural products but also leads to frequent water accumulation on farmways within agricultural production areas during heavy rainfall, posing a risk to public safety and properties.

Kaohsiung City Government continues to implement the “Farmway and Drain Improvement Operations in the Farmland Reafjustment Areas”. In 2022, a budget of NT\$70 million was allocated for the maintenance and management of farmways and drains. Among them, NT\$9.18 million was allocated for daily maintenance and further executed by relevant district offices. In total, 107 farmways and drains were improved in 2022. Additionally, in 2022, the COA provided approx. NT\$28.67 million in funding for the City’s emergency farmway and drain improvement project, with the City contributing about 7.17 million New Taiwan Dollars. This initiative led to improvement of a total of 58 farmways. The aim is to provide more convenient, safe, and comfortable living environments for rural areas, enhance the efficiency of agricultural product transportation, and increase agricultural crop values.

7.3 Sustainable Nature and Ecology

(Corresponding to SDGs



1. Sustainable Smart Agriculture

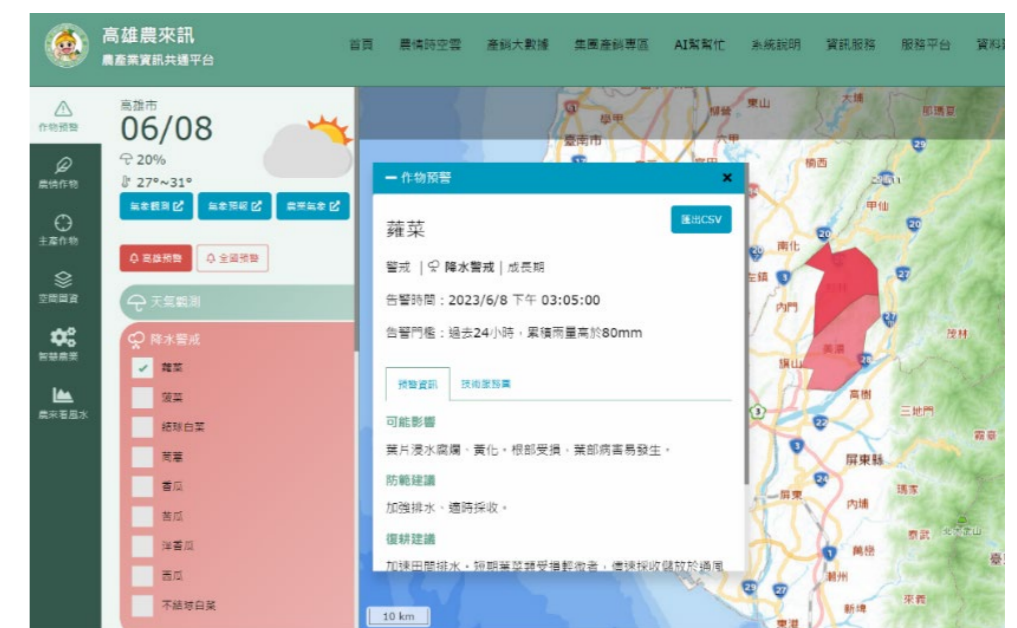
1. Sustainable Smart Agriculture — Agri-Data Kaohsiung

The Agriculture Bureau of Kaohsiung City Government, through the establishment of “Agri-Data Kaohsiung”, integrates internal and external information related to the agriculture, including agricultural information, basic production information, market transaction data, etc. A “Big Data Reservoir” and analytical modules have been built. Furthermore through the functions of the Big Data exchange module (Open API), a dynamic agricultural information dashboard is built to display references for industry policy analysis and farmer production management. Among the features is the “Crop Alert” function, which integrates agricultural and meteorological information, analyzing 62 types of crop disaster warnings per hour, providing information on potential impacts, preventive recommendations, post-disaster recovery, technical service teams, and more for farmers. Additionally, with the built-in “Nong Lai Kan Fengshui Agricultural Circumstances” feature, farmers may tap on the crop, plantation time and duration to make production and sales decisions, make growth and development forecasts and learn the occurrence of risks in accordance with AI computing results. It is hoped that, through smart agriculture, objectives such as crop production guidance, agricultural administrative management, natural disaster relief for agriculture, and land use management may be implemented.



Analyses on Disaster Prevention Warning for

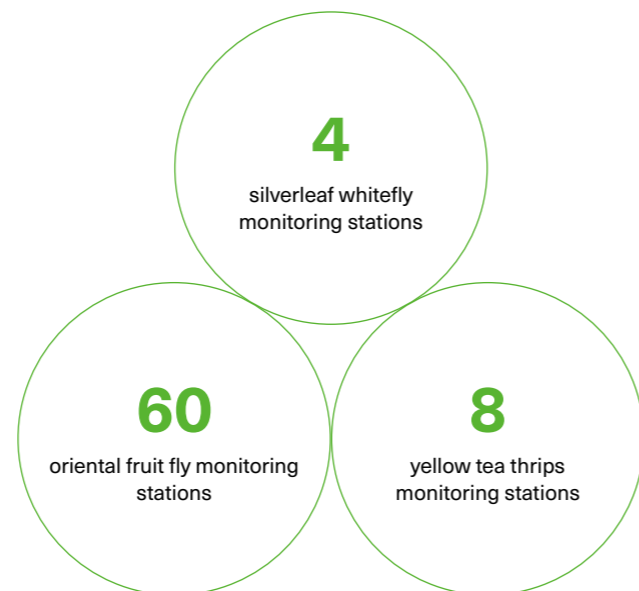
62
Types of Crops made Every Hour



2. Grasps on Climate-Related Plant Diseases and Building of Reporting System

Climate anomalies resulting from global warming have created favorable conditions for various invasive pests and diseases affecting crops, including the oriental fruit fly, yellow tea thrips, and silverleaf whitefly. These pests cause direct harm to crop and transmit pathogens leading to widespread crop diseases. To provide farmers with timely epidemic information and receive early warning content, the Agriculture Bureau has established the “Kaohsiung Plant Doctor Assistance” (Online Plant Pest Control Platform by the Agriculture Bureau, Kaohsiung City Government) official website and official LINE account to offer real-time monitoring data for specific crop pests and diseases and issue pest and disease alerts when necessary. Furthermore, the “Standard Operating Procedure for Monitoring, Early Warning, Control Notice, and Reporting of Plant Diseases” has been revised. Farmers can actively report disease information through local agricultural associations, district offices, local reserve plant doctors, the Kaohsiung Plant Doctor Assistance official website, or LINE.

The Agriculture Bureau has established 60 oriental fruit fly monitoring stations and 8 yellow tea thrips monitoring stations. In 2023, 4 more silverleaf whitefly monitoring stations are added, bringing the total to 72 stations. In 2022, there were 2,360 monitoring sessions for the oriental fruit fly and yellow tea thrips, with 2 pest and disease warnings issued. The introduction of information systems is expected to help farmers reduce the impact of specific pest and disease infestations and increase agricultural production.

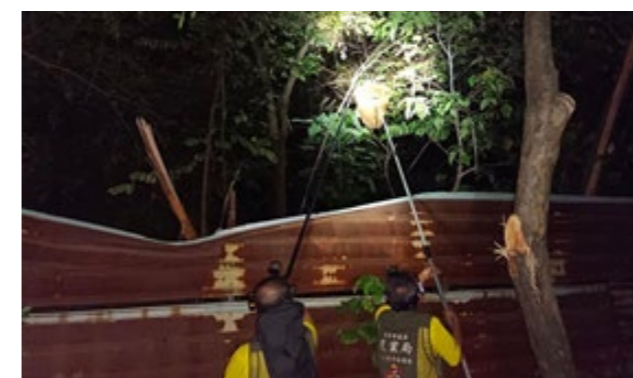


2. Biodiversity

1. Ridding the Invasive Alien Species

Based on subsidy programs from the Forestry and Nature Conservation Agency, COA, Executive Yuan, the Agriculture Bureau has been working on the removal of invasive fauna and flora. Professional removal teams have been commissioned to remove and monitor invasive species, including green iguanas, banded bullfrogs, zebra doves, and other central government-listed invasive species. In 2022, 153 banded bullfrogs, 50 Hong Kong whipping frog, 87 zebra doves, and 5,052 green iguanas were successfully removed. Additionally, 35.72 hectares of bitter vine and lesser snakeroot, 4.64 hectares of river tamarind, 6 hectares of Santa Maria feverfew, and 1.02 hectares of Mimosa pigra L. were removed.

In the future, the Agriculture Bureau will continue to reduce the number of green iguana hotspots in the City and completely remove green iguanas from closed urban areas. Besides green iguanas, the removal of invasive fauna and flora will also continue to prevent their spread. Public education on fauna and flora will be promoted to raise awareness among the public about the harm and impact of invasive species on native biodiversity. The responsibilities of land management agencies will be strengthened to effectively implement the removal of invasive species.



2. Marine Litter Removal, Waste Fishing Net Recovery and Conservation Works

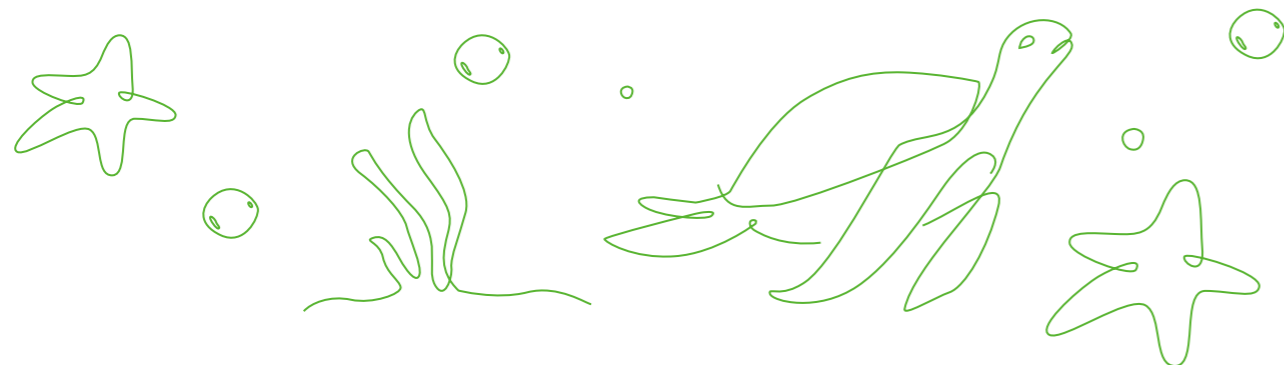
The Marine Bureau, Kaohsiung City Government is committed to strengthening the protection of the marine environment, promoting the “environmental protection fleet” initiative, and inviting fishing vessels from the City and related business units to participate in litter surveys and cleaning operations in the City’s artificial fishing reef areas to jointly maintain the marine environment and conduct inspections and investigations related to marine pollution prevention and marine litter. In 2022, a total of 8 marine litter investigations and cleaning operations were conducted in the Yong’an Dist., Mituo Dist., and Zikuan Dist. artificial fishing reef areas, removing approx. 260 kilograms of underwater litter. Additionally, 11 marine environmental awareness activities joined by 1,046 participants were organized.

Approx.
260 kg
of Underwater Litter Removed.

11

Marine Environmental Awareness Activities

Furthermore, to maintain the cleanliness of fishing harbors and reduce the disposal of abandoned fishing nets in harbor areas, thus preventing marine pollution and trapping of sea turtles or dolphins, the Marine Bureau has obtained NT\$850,000 in funding from the Environmental Protection Administration (now the Ministry of Environment) for a program to purchase and recover abandoned fishing nets (with a reward of NT\$15 in vouchers for every kilogram collected). The Marine Bureau has collaborated with 7 fishing associations in the City to carry out the purchase of abandoned fishing nets at 16 fishing harbors. In the future, the Bureau will continue to seek funding from relevant central authorities to maintain the City's spectacular scenery as a harbor capital.



3. Sustainable Utilization and Promotion of Biodiversity

The Agriculture Bureau of Kaohsiung City Government is dedicated to ecological conservation and promotion efforts, including projects such as "Eastern Grass Owl Awareness", "Black-faced Spoonbill Surveys", and "Fengshan Hill Migratory Raptors Surveys". In 2022, the Eastern Grass Owl Awareness Activities incorporating 6 campus events, 2 private enterprise events, 1 farmers' group event, and 1 outdoor large-scale promotional booth event were organized, with a total participation of 961 individuals. The Black-faced Spoonbill Surveys were conducted in the Qieding Wetlands and Yong'an Wetlands, with the highest number recorded in January at around 531 birds, totaling 990. The Fengshan Hill Migratory Raptors Survey recorded 10 species of raptors with a total count of 6,978 birds, with the Chinese Sparrowhawk being the most abundant, followed by the Grey-faced Buzzard.

For the conservation of endangered species, the Bureau has established the "Endangered Species Ecological Service Payment" program to encourage the friendly environment for endangered species. In 2022, the survey identified Qishan, Yanchao, Tianliao, and Dashu Districts as the habitat of the endangered Eastern Grass Owl, and Meinong Dist. as that of the endangered Pheasant-tailed Jacana. Farmers meeting the farmland friendliness clause are rewarded a maximum of NT\$20,000 per hectare of Eastern Grass Owl-friendly

6

target animal conservation courses

8

friendly agricultural habitat environment guidance courses and workshops

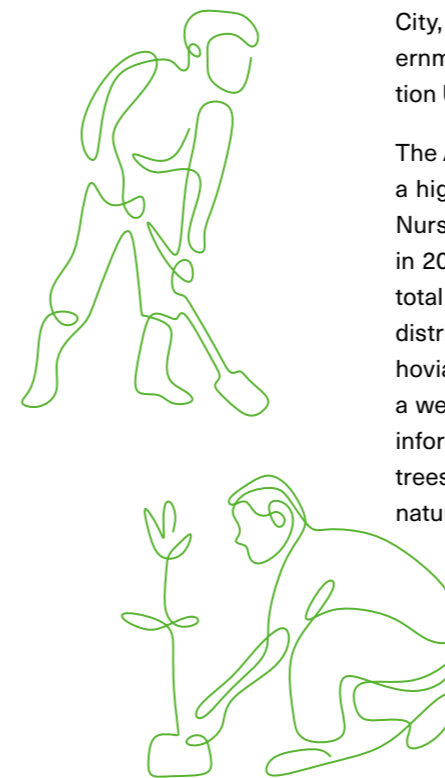
farmland owned, and NT\$30,000 for the Pheasant-tailed Jacan. The Bureau also provides incentives for setting up raptor perches, with a maximum of NT\$13,000 per year, and a reward of NT\$3,000 for each nest of Pheasant-tailed Jacan chicks in paddy fields. In the preceding year, 1,187 friendly farmland reward applications were received, and 281.19 hectares were approved for rewards, including 20 cases of perch monitoring incentives. Additionally, the Bureau conducted 6 targeted animal conservation courses in communities and 8 friendly agriculture and habitat environment guidance courses and seminars in rural areas.

3. Maintenance Management and Conservation for the Nature and Ecology

1. Maintenance for Specific Commemorative Tree Species

In line with the central afforestation policy, the Agriculture Bureau of Kaohsiung City Government has been cultivating, nurturing, and domesticating suitable arbor seedlings for planting in the southern Kaohsiung for many years. These trees are used to meet the afforestation needs of public and private forests in the City, serving various public benefits such as afforestation and greening, ecological conservation, water source conservation, air purification, and national land security. To protect the precious old trees in Kaohsiung City, the City Government enacted regulations in 2019 known as the "Kaohsiung City Government Directions for Establishing Specific Memorial Trees and Protected Trees Protection Unit".

The Agriculture Bureau encourages citizens and businesses to jointly plant trees to create a high-quality living environment. Citizens can also get their seedlings at the Shen Shui Nursery. In 2021, 40,914 seedlings were distributed, and this number increased to 45,756 in 2022, contributing to the increased coverage of urban greenery. Currently, there are a total of 717 specific memorial trees as cultural assets distributed across 38 administrative districts in Kaohsiung City, including Camphor trees, Banyan trees, Bishop Woods, Kleinhovia and more, with an average age of over 70 years. The Agriculture Bureau has built a website for "Specific Memorial Trees and Protected Trees" to allow citizens to access information about old trees. Through the planting of seedlings and the maintenance of old trees, biodiversity is ensured, while also enhancing urban landscape aesthetics and urban natural ecology preservation.



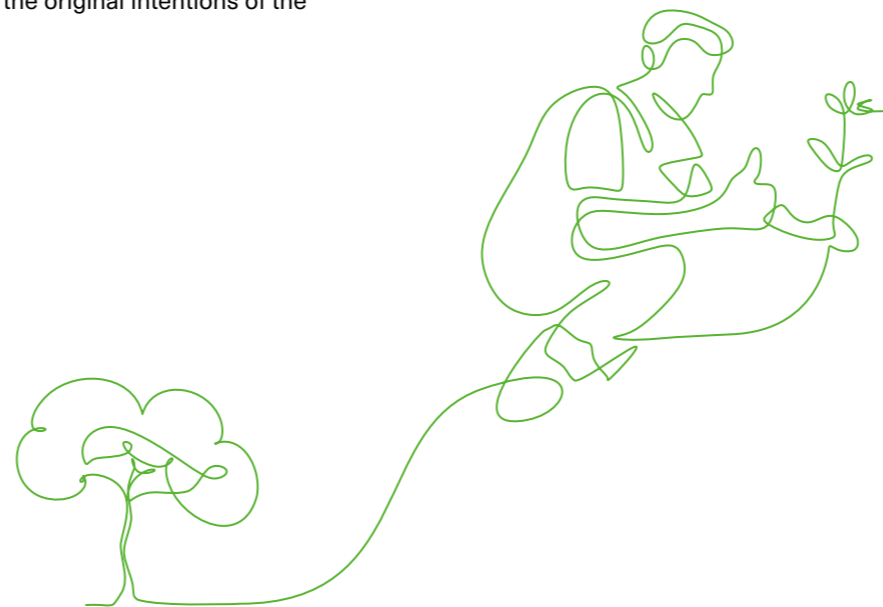
2. Area for Conservation and Incentive Afforestation Guidance Plans at Lands Reserved for Indigenous People

Kaohsiung City has three major indigenous administrative districts, namely, Namaxia Dist., Taoyuan Dist., and Maolin Dist.. The Agriculture Bureau collaborates with the CIP (CIP) to plan and consider the interests and safety and welfare of indigenous peoples. Areas in need of enhanced environmental greening, land overuse in hilly terrain, erosion gullies, steep exposed areas, and landslides sensitive ecological areas still require reforestation to strengthen the protection of national land security and the enhancement of ecological resources.

In 2008, the COA, Executive Yuan and the CIP promulgated the “Regulations governing Incentive Afforestation Guidance” to encourage reforestation on slopes. According to Article 48 of the Forestry Act, the CIP rewards private individuals, indigenous peoples, or groups for reforestation, providing free seedlings, issuing rewards, offering long-term low-interest loans, or other forms of guidance and incentives. Such measures ensures effective management of forest land resources, maintenance of forest landscape, increased forest water conservation functions, and the eventual achievement of national land security benefits. In addition, the measures also contributes to the absorption of greenhouse gases, the production of a large amount of oxygen, and the regulation of climate temperature, benefiting the entire nation.

As of the end of 2022, Kaohsiung City has achieved a remarkable results with afforestation at 131.725 hectares. In the future, in addition to setting new targets for afforestation and nurturing reforestation land, the CIP actively promotes and advocates through print media, radio, village meetings, seminars, and more. CIP expects to strengthen advocacy and gather grassroots feedback to ensure that the public understands the original intentions of the policy and has greater willingness for cooperations.

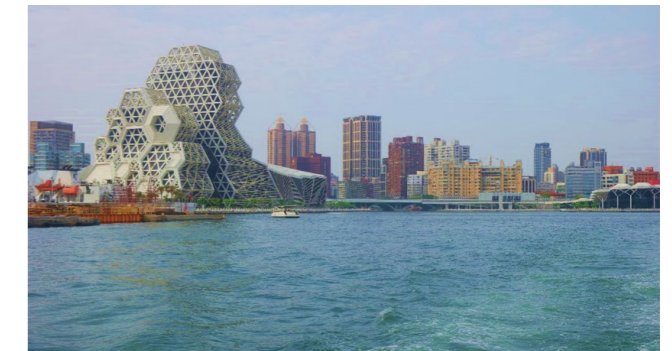
Afforestation at
131.725_{ha}



3. Monitoring of Sea Area Environment and Maintaining Oceanic Ecology

Kaohsiung City’s sea areas are adjacent to various rivers’ estuaries, military ports, commercial ports, fishing ports, coastal park areas, and other coastal areas. The water quality in these sea areas is often affected by natural environmental changes or human factors, leading to significant fluctuations and adverse impacts on the marine environment. To maintain the water quality in Kaohsiung City’s sea areas, the Marine Bureau implements the “Kaohsiung City Sea Area Environment Monitoring Program” to effectively monitor the current status of water quality in various areas, obtain an comprehensive information on the distribution of water quality in each vertical layer of the City’s sea areas, enabling a complete understanding of the spatial layout of the City’s sea areas.

In 2022, the Marine Bureau carried out tasks related to “Conservation and Sustainable Use of the Ocean and Marine Resources”, conducting inspections and surveys for marine pollution prevention and control in the City’s sea areas to ensure the cleanliness of the marine environment. A total of 14 offshore inspections and 83 inspections of land areas adjacent to the coastal areas were conducted in the City’s sea areas. In addition, the Marine Bureau conducts monitoring operations at the City’s sea areas in accordance with the “Marine Pollution Control Act”. Currently, 36 monitoring points have been established, covering 4major categories-hydrology, water quality, sediment, and ecology. The monitoring frequency is once per quarter for hydrology and water quality and once biannually for sediment and ecology. Furthermore, a marine environmental information system website has been established to allow the public to query marine environmental monitoring data, enabling real-time access to information about the marine environment in Kaohsiung City and the formulation of response measures.



4. The Left Bank of Qishan River-Qiwei Landscape and Maker Environment Modification Project

The Urban Development Bureau in collaboration with Taiwan Sugar Corporation promote the transformation of the left bank of Qishan River into an value-added agriculture park. The transformation includes the removal of walls and the construction of integrated walkways, allowing community residents to access the park space. Simultaneously, environmental improvements are being carried out around the sugarmaking factories and the surrounding settlements to enhance environmental tolerance.

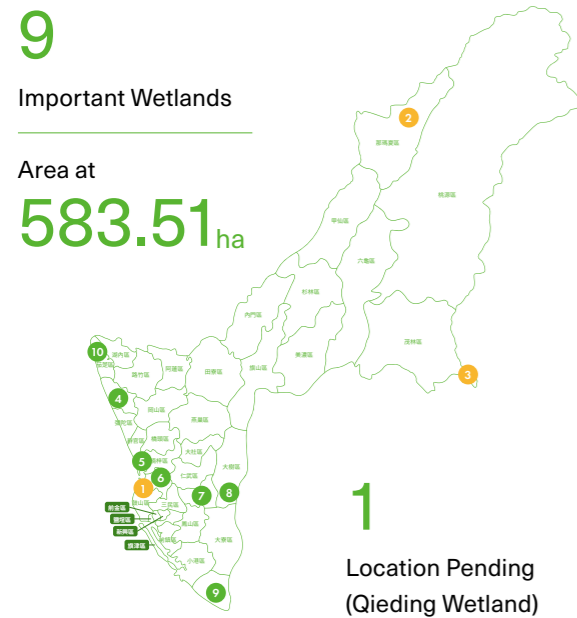
Taking the left bank of Qishan River as an example, the Qiwei Landscape and Maker Environment Modification aims to create an inclusive, safe, resilient, and sustainable urban and rural environment. This includes the construction of a wild grass rain garden, planting drought-resistant and water-resistant plants to enhance micro-stormwater retention capacity, reduce environmental flooding caused by extreme weather, create a space for both landscape trails and stormwater retention, and establish an ecological landscape on the left bank of Qishan River, where humans and the natural environment coexist.



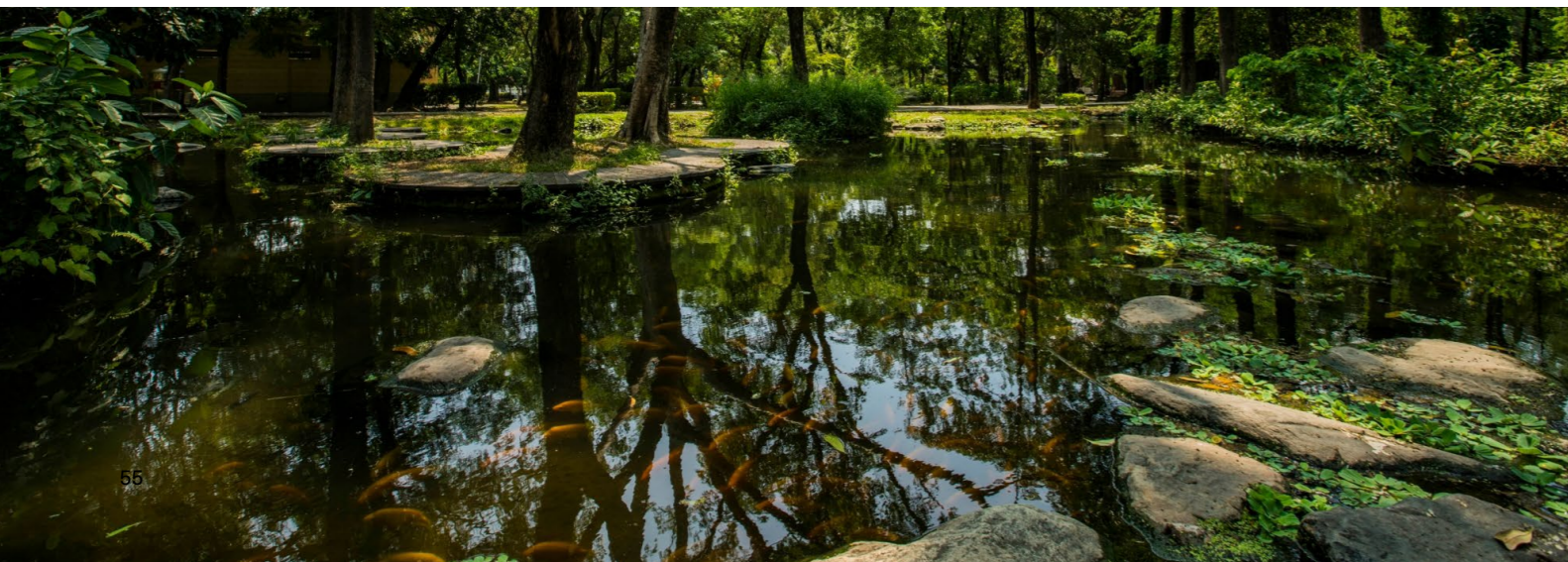
4. Wetlands Survey and Conservation Planning

Since 2017, our nation has been promoting the “National Wetland Conservation Guidelines” to consider aspects such as maintaining biodiversity, strengthening the wetland conservation network system, promoting wetland ecological conservation, ensuring zero net loss of important wetlands, enhancing research related to wetlands and Climate Change, and interacting with communities. Based on the concepts of ecosystem services and natural solutions, wetlands are included into relevant national spatial plans and socioeconomic development strategies.

Currently, there are a total of 21 wetlands within the territory of Kaohsiung City, including 9 wetlands officially designated by the MOI and 1 under evaluation. Additionally, there are 11 wetland parks, with responsibilities shared among various cross-agency departments such as the Public Works Bureau, Tourism Bureau, Water Resources Bureau, Agriculture Bureau, and Forestry and Nature Conservation Agency, COA. These agencies collaborate in the management and jointly conduct long-term research and monitoring programs related to the City’s wetland parks. In 2022, “Yuanzhong Harbor Wetland”, “Yong’an Wetland”, and “Niaosong Wetland” were awarded local-level honors by the MOI’s National Land Management Agency. In 2023, “Nanzixian Important Wetland” and “Zhouzi Important Wetland” were awarded national-level honors. In the future, local-level wetland conservation and utilization plans will be developed in accordance with the Wetland Conservation Act to enhance the biodiversity of the City and make it an ecological capital coexisting harmoniously with nature.



Name	Area (hectares)	Governing Authority
1 Zhouzi Important Wetland	9.1	Ministry of the Interior/Parks Office, Public Works Bureau
2 Nanzixian River Important Wetland	237.34	Ministry of the Interior/ Agriculture Bureau
3 Dagui Lake Important Wetland	39	Ministry of the Interior/ Forestry and Nature Conservation Agency, COA
4 Yong’an Important Wetland	41.25	Parks Office, Public Works Bureau
5 Yuanzhong Harbor Important Wetland	27.6	Parks Office, Public Works Bureau
6 Banping Lake Important Wetland	13.37	Public Works Bureau
7 Niaosong Important Wetlands	3.8	Tourism Bureau
8 Dayuan Artificial Important Wetland	160.05	Water Resources Bureau
9 Liyuan Artificial Important Wetland	52	Public Works Bureau
10 Qieding Tentative Important Wetland	171	Parks Office, Public Works Bureau



7.4 Sustainable Economy and Resilient Industries

Corresponding to SDGs



1. Circular Economy and Waste Reuse

Kaohsiung City produces approx. 250,000 metric tons of incineration bottom ash annually. In the early stages, burial was the main method of disposal, which not only wasted land space but also consumed government budgets. Meanwhile, establishing a new sanitary landfill was extremely difficult and costly. To extend the lifespan of existing facilities, the “Bottom Ash Reutilization Project” was initiated, processing bottom ash into incineration recycled aggregates. Kaohsiung City pioneered the establishment of Certified Lightweight Aggregate (controlled low-strength material, CLSM) precast concrete plants using incineration recycled aggregates in 2018. It can process 185,000 metric tons of incineration bottom ash per year, leading the nation. The City prioritizes and enforces the use of recycled materials in public projects to achieve the goal of zero waste in resource circulation.

The Environmental Protection Administration (now the Ministry of Environment) recognized the efforts of various cities and counties in promoting incineration recycled materials. Since 2018, they have been promoting assessments and evaluations of incineration recycled materials reuse. From 2018 to 2022, Kaohsiung City received the “High Distinction Award” each year, except for 2021 when it received the ‘Excellent Award.’ It stands as the record holder for receiving the High Distinction Award among the Six Special Municipalities. Looking ahead, to realize the central government’s goal of “reuse as the main approach, with final disposal as a supplementary measure”, it is estimated that the disposal rate will reach 82% by 2025 and 85% by 2030.

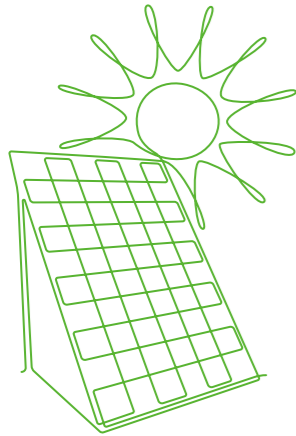
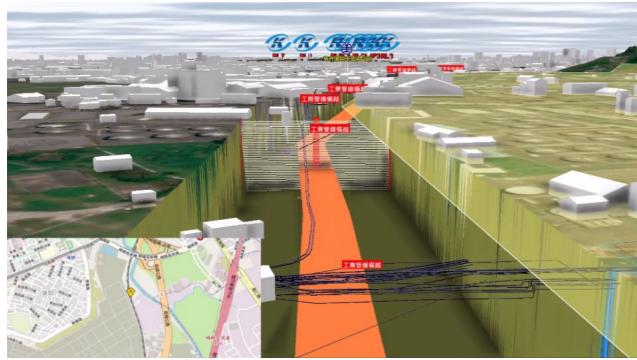


2. Industrial Energy and Resources Supply and Pipeline Safety

In 2014, Kaohsiung City’s Qianzhen Dist. experienced a shocking gas explosion incident at night, which led to nationwide concern. In response to this incident, the Economic Development Bureau announced and implemented the “Kaohsiung City Self-Government Ordinance for the Management of Existing Industrial Pipelines” and “Kaohsiung City Regulations governing Management and Maintenance of Existing Industrial Pipelines” in 2015 to establish a comprehensive industrial pipeline management system, among which necessary supervision and examination are performed on self-management of the industrial pipeline operators. A “Office of Pipeline Safety (OPS)” was established to create an emergency response system and provide consultation for emergency handling needs.

Since the establishment of the OPS, 176 actual leakage cases have been handled, with 61.7% of them caused by external damage to public gas pipelines, followed by natural damage to gas pipelines accounting for 26.6% of overall cases; only one case of leakage resulted from an abandoned nitrogen gas pipeline. The number of reported cases in 2022 decreased by 60.5% compared to 2016, indicating a trend of decreasing pipeline accidents. This has reduced the public’s concerns about safety risks in the petrochemical

industry, and therefore enhance local supply of industrial energy and resources supplies, promote the City's sustainable development and maintain the City's industrial resilience.



3. Sustainable Energy Transformation

1. Promoting the Establishment of Photovoltaics Facilities at Buildings

Kaohsiung City, known for its heavy steel industry, faced environmental impacts due to high pollution and energy consumption. To reduce reliance on fossil fuels and address urban heat island effects, urban greening, and promote low-carbon urban development, the City initially focused on the installation of solar photovoltaic facilities on buildings.

Kaohsiung City interacted with citizens in innovative ways. In addition to holding info-meetings to advocate relevant regulations and subsidies for installing solar photovoltaic systems, the City utilized various forms of promotion, including distributing pamphlets, posting posters, and providing online consultation through platforms including LINE. The City also designed a solar mascot to promote knowledge about renewable energy in an engaging and entertaining way.

Furthermore, efforts were made to encourage residents to integrate green energy into their homes and actively guide public buildings, apartment complexes, universities, and private colleges to install solar photovoltaic facilities, revitalizing idle rooftop spaces. From 2021 to the end of 2022, the installed solar photovoltaic capacity in the City reached 659.17 MW, estimated to provide electricity for 108,924 households in the City annually and reduce carbon emissions by 389,800 metric tons, equivalent to the carbon sequestration of 195 Kaohsiung Metropolitan Parks. These efforts move Kaohsiung City towards its vision of a livable city.

Installed Solar Photovoltaic Capacity Reaches

659.17_{mw}



2. Fishery and Electricity Symbiosis (Fishery as Foundation with Value Addition through Green Energy)

To align with the national energy transition policy, the MOEA and the COA, Executive Yuan jointly promoted diversified land use for aquaculture industries combined with renewable energy. In 2020, they announced the "Locational Areas for Priority Promotion of Fisheries Business Combined with Green Energy" i.e. the Fishery-and-Electricity Symbiosis Zone. Kaohsiung City prioritized areas including Qieding Dist., Hunei Dist., Luzhu Dist., Gangshan Dist., Alian Dist., Yong'an Dist., Mituo Dist., and Ziguan Dist., covering approx. 79% of the City's fishponds.

In 2021, Kaohsiung City established the nation's first "Fishery and Electricity Symbiosis Project Office" to serve as a one-stop shop for promoting the affairs providing convenient and professional consulting services to the public and project operators. In addition to organizing outreach meetings, it coordinated with industry, government, academia, and financial sectors to sign MOUs on the Fishery and Electricity Symbiosis. These MOUs led to the creation of preferential loan interest rates with banks and collaborations with the Fisheries Research Institute, COA to enhance the technical foundation of combining aquaculture with green energy; collaborations also extended to National Kaohsiung University of Science and Technology, the Kaohsiung Solar Equipment Installation Union, and the PVGSA to jointly nurture local talent in the domain of fishery and electricity symbiosis.



As of May 2023, a total of 136 fishery and electricity symbiosis projects have been processed, with an installed capacity of approx. 248,444 MW. It is estimated to generate 280 million kWh of electricity annually and reduce 146,944 metric tons of carbon dioxide emissions. The promotion has been highly effective, with the City reaching its goal of 210 MW in installed capacity in 2022, and it is now working towards the 250 MW target by 2026.

3. Building a Task Force for Green Electricity Promotions

Kaohsiung City has access to ample sunshine and, combined with its goal of localizing green energy industries, solar photovoltaic systems have proven to be the most economically viable option for the City. In 2020, Kaohsiung City established the "Kaohsiung City Task Force for Green Electricity Promotions" with a focus on "generation", "conservation" and "storage" of energy. The Task Force has determined to press ahead the five major tasks: "Promotion of Solar Photovoltaic Rooftop Installations in Public and Private Buildings", "Accelerating Energy Conservation and Low-Carbon Actions through Energy Service Models", "Planning for Green Energy and Smart Electricity Use in School Buildings", "Priority Demonstration of Fishery and Electricity Symbiosis Zones", and "Friendly Reduction and Transformation of Power Plants within Kaohsiung City", and proposed a goal of adding 450 MW of solar photovoltaic capacity within 2 years (2021-2022) and a total of 1,250 MW over 6 years. In reality, from 2021 to 2022, the registered solar photovoltaic capacity reached 659.17 MW, 1.46 times more than the original goal of 450 MW. There were 1,600 filed cases, making it the top city in the nation in terms of registered capacity.

In the field of energy conservation, Kaohsiung City promotes the implementation of Energy Service Companies (ESCO) for the promotion of "energy-saving service model for accelerated electricity saving and low carbon actions". With activities such as info-meetings, site visits, and project guidance for applying the central energy-saving performance guar-

antee projects, the businesses are encouraged to adopt energy-saving measures. Since 2021, over 200 government agencies and businesses have participated, and 16 organizations, including government agencies and businesses, have applied for subsidies under the Energy Administration, MOEA's "Energy Performance Demonstration and Promotion Subsidy Program", leading to an annual reduction of over 18 million kWh of electricity consumption and a decrease of 9,000 metric tons of carbon emissions. In addition to energy conservation efforts, Kaohsiung City Government has also initiated the Wanxing Energy Storage Project Site in the Sanmin Dist.-the first "AFC Smart Energy Storage System" in Kaohsiung City. It has officially joined Taiwan Power Company's (Taipower) Automatic Frequency Control (AFC) transaction platform, assisting Taipower in stabilizing the power grid. Furthermore, the City is actively collaborating with the central government's energy storage policies and is actively introducing various players in the energy storage industry, including MOLICEL.



4. Agriculture and Fishery Disasters Insurance and Administration

The conventional primary sectors of the economy (agriculture and fisheries) are highly susceptible to climate impacts, as their harvest yields are deeply affected by weather conditions. Recognizing the severe changes in climate and the increasing intensity and frequency of natural disasters caused by global warming, and to reduce losses suffered by farmers and fishermen due to natural disasters, protect their livelihoods, and maintain stable incomes, the Agriculture Bureau, in cooperation with the COA, offers 16 types of agricultural insurance, allowing farmers to choose different premium rates and coverage based on their insurance policies, among which COA subsidizes 50% of the insurance premiums. The Agriculture Bureau started the subsidy of 20% of the agricultural insurance premium since October 1, 2020, and increased it to 30% in 2022. As a result, the number of insured cases grew tenfold compared to the entire year of 2021, with the total insured area increasing sevenfold. In the future, facility insurance will also be included in local subsidies to further incentivize farmers to participate.

In addition, the Marine Bureau began promoting natural disaster insurance for aquaculture industries in 2017. Starting from 2021, it announced an increase in subsidies, reducing the insurance premiums borne by aquaculture fishermen from 1/3 to only 1/4, making it the only city and county in the nation to increase aquaculture insurance subsidies. Through

increased advocacy meetings for aquaculture industry insurance, the City aims to gradually establish the concept of risk diversification among aquaculture operators, thereby increasing insurance coverage and ensuring the stability of their livelihoods.



7.5

Rooting of the Climate Adaptation Culture

Corresponding to SDGs



1. Post-disaster Environment Hygiene Management Mechanism and Cleanup and Disinfection Operations

1. Post-disaster Environment Maintenance Administrations and Cleanup and Disinfection Operations

Disaster prevention and rescue operations include pre-disaster reduction, preparation, response, and post-disaster recovery. When the Environmental Protection Bureau receives disaster reports, it prepares waste cleanup equipment and environmental disinfection tools and equipment within its jurisdiction, ready to carry out post-disaster environmental cleanup and disinfection operations. The response to disasters includes reporting damage to environmental facilities (e.g. landfill sites). Citizens may utilize the Environmental Disaster Information Management System to report disaster information and environmental cleanup details, such as the presence of disasters, residential flooding areas, estimated disinfection areas, waste removal and sludge quantities, etc., thereby reducing losses of life and property.

In addition, before disasters arrive, the Bureau may clean road ditches, strengthen inspections, and clear debris and fallen leaves from drainage holes on the roadsides, compiling manpower and machinery for mobilization to reduce disaster damage. Currently, Kaohsiung City has completed 837 kilometers of road ditch cleaning, clearing 7,305 tons of debris. In the event of insufficient disaster relief capacity during a disaster, open contracts can be applied to shorten the disaster response time and request support from the local military. Furthermore, to prevent deterioration of living environments in disaster-affected areas, the Bureau conducts disinfection operations and cleans sludge and garbage processes after disasters, and district offices cooperate by distributing bleach and conducting a second comprehensive disinfection operation.

Road Ditch Cleaning at

837 km

7,305 t

of Debris Cleared



2. Waste Screening at Rivers

To promote the "Respect for the Sea" policy, the Environmental Protection Administration (now the Ministry of Environment) collaborates with the Water Resources Agency, the Irrigation Agency, MOA, and local county and city governments to jointly promote river waste screening. Through cooperation between central government agencies and local county and city governments, waste fences are set up in rivers and regional drainage areas, followed with regular cleaning of waterborne garbage to reduce the inflow of terrestrial wastes into the ocean and coastal areas, implementing the policy goal of reducing marine garbage at its source.

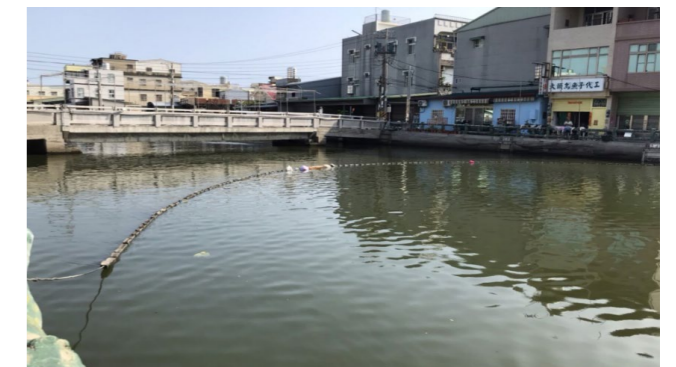
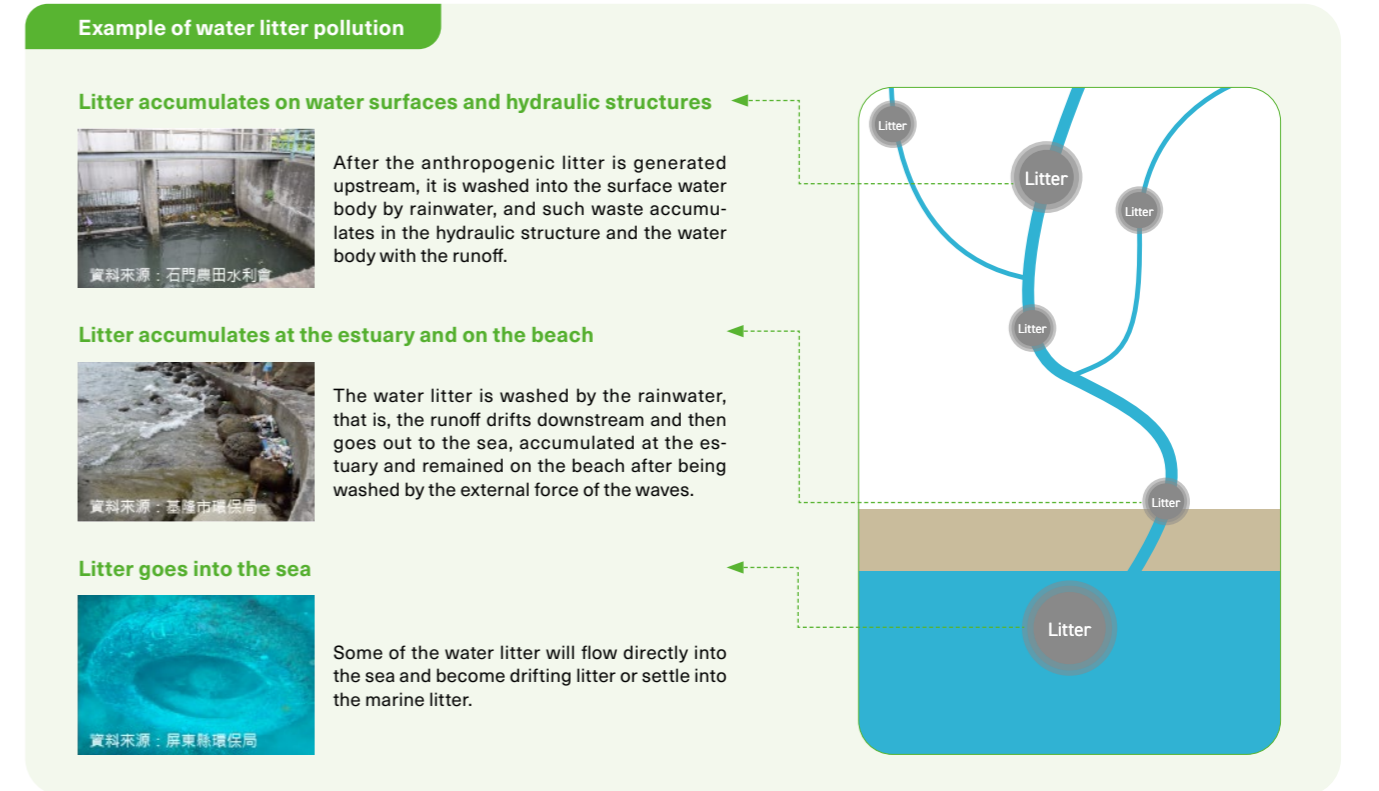
1,539.7 t

of Waterborne Wastes and Debris Removed

9

Waste Fences Installed

In response to this policy, Kaohsiung City allocates funds annually to carry out environmental maintenance and cleaning of waterfront green spaces, detention basins, and urban drainage areas under its jurisdiction. Waste fences are also set up in densely populated areas or hotspots where garbage is likely to be disposed, such as the Love River and the Qieding Drain, with regular cleaning carried out. In addition, emergency repair projects for water facilities are carried out every year to quickly restore the functionality of various facilities and environmental cleanliness after natural disasters. By May 2023, 1,539.7 tons of waterborne wastes and debris have been removed, and 9 waste fences have been installed on the river surface.



2. Grasps on Climate-Related Disease Information and Establishment of Reporting System

1. Dengue Fever Prevention and All-Out Inter-agency Actions

Climate change affects temperatures and the ecology of animals and plants, changing the distribution of vector species and the transmission of vector-borne pathogens. Kaohsiung City, located south of the Tropic of Cancer, has the highest population density of Yellow Fever Mosquitoes in Taiwan, with an average annual temperature of 25 degrees Celsius and high rainfall, making it the most favorable environment for the growth of vector mosquitoes. At the same time, Kaohsiung City is a key hub for Taiwan's New Southbound Policy, which may lead to the spread of dengue fever due to factors such as international marriages, the introduction of international migrant workers, tourism, and frequent business exchanges. To prevent dengue virus from entering the nation, incentives are provided to increase the number of entry screenings for people from Southeast Asia and South Asia, and post-entry environmental control, vector mosquito monitoring, and dengue fever rapid screening are strengthened as part of the epidemic prevention strategy.

In addition, to prevent dengue fever from entering communities, multi-party and horizontal coordination and cooperation among the City's Department of Health, the Environmental Protection Bureau, and the Civil Affairs Bureau are required. Kaohsiung City has specially formulated the "2023 Comprehensive Vector-borne Infectious Disease Prevention and Control Plan", aiming to improve the dengue fever case care and community prevention capabilities of the entire population through inter-departmental epidemic prevention task division. This includes the 4 major epidemic prevention projects i.e. "Medical Integration", "Fighting Overseas", "Vector Control and Technological Epidemic Prevention", and "Comprehensive Public Engagement and Legal Advocacy", with the aim to achieve 4 major goals—"rapid diagnosis, diversion of care, reduction of virus transmission risk, and reduction of death risk".

Kaohsiung City currently has a total of 480 medical institutions with integrated dengue fever medical care plans. With rapid reporting from grassroots clinics, the process duration from 2.61 days in 2016 has been shortened to 1.56 days in 2022, ensuring that severe cases receive good medical care. In addition, for places with gatherings occur frequently, where abnormal increase in vector density is found, preventive mosquito elimination work is immediately initiated, including "community mobilization inspections, breeding source elimination, chemical control" to ensure that the surrounding environment maintains a low vector density. During the year 2022 in which COVID-19 reached its peak, a dengue fever rapid screening and sampling program was implemented for international migrant workers, fishermen, and crew members departing from high-risk areas, with a total of 18,717 people screened, 9 NS1-positive cases, and 1 confirmed case. This effectively halted the risk of imported dengue fever outbreaks.

Furthermore, the Department of Health and the Environmental Protection Bureau jointly carried out high-risk village vector density monitoring, list and monitor breeding site areas, and monitor mosquito density using Gravitrap to strengthen inspections and encourage citizens to note environmental self-management; the Civil Affairs Bureau provided guidance to community mobilization and conducts environmental inspections and cleaning during "Dengue Fever Prevention Awareness Day", holding at least 1 community health education session per village to implement comprehensive public education and advocacy, aiming to achieve the 4 goals of "self-mosquito prevention, self-inspection, reduced virus transmission risk, and reduced death risk" and therefore protect the health of citizens.

480

Medical Institutions with Integrated Dengue Fever Medical Care Plans



2. Ecological Mosquito Killing to Stop Dengue Fever

Dengue fever is an environmental and community disease, and as long as suitable breeding sources are present in the environment, there is a possibility of an outbreak. To prevent and control dengue fever, Kaohsiung City organizes dengue fever prevention and control teams through vertical and horizontal division of labor by various municipal agencies, authorizing district offices to mobilize community residents and command units responsible for the management of breeding sites within their jurisdiction to jointly formulate prevention and control plans for dengue fever in each area.

In 2022, the Environmental Protection Bureau conducted long-term monitoring of certain villages (222 totally) in 11 districts in the City, using Gravitrap to investigate mosquito density. Each village was furnished a total of 20 traps to monitor vector mosquito density and provide command centers in each district with community cleaning and container reduction data, and guide cleanup efforts. In addition, inspections under guidance were carried out, with 12,595 villages cleaned up, 32,049 dirty and messy spots cleaned, 152,472 kilograms of breeding sources removed, 27,766 breeding sources were treated with larvicide, and a total disinfection area of 9,924,750 square meters made. A total of 75,478 persons were engaged in dengue fever vector control. In the future, vector mosquito density investigations and monitoring will continue to expand, adding some villages (a total of 9 villages added) in districts such as Qijin, Renwu, and Daliao, 231 villages in total. It is expected that citizens will participate together, strengthen health education advocacy, and community mobilization to achieve the goal of complete prevention of outbreaks and spread of the epidemic.

Personnel Engaged in Dengue Fever Vector Control

75,478 people



3. Rooting of Adaptation Education

1. Sustainable Use of Water Resources

Taiwan's primary water resources rely on typhoons and the plum rain season. According to research and analysis by experts from the Research Center for Environmental Changes, Academia Sinica, by the end of the 21st Century, the number of typhoons in the northwest Pacific will decrease by 40%, and the northward movement of frontal atmospheres will also reduce the suddenness of spring rain in Taiwan. Therefore, the sustainable use of water resources has become an urgent task for Taiwan to face the challenges of extreme climate.

Water resources involve topics such as "Climate Change", "Sustainable Use of Energy Resources", "Marine Education", and "Development of New Generation Environmental Education". Therefore, the Education Bureau, Kaohsiung City Government has organized a series of "Environmental Education Growth Workshop – About Wetness II (Water Resources)" lecture. The lecture satisfaction rate is as high as 99%, fully implementing the concept of sustainable education rooted in natural hydrology care. In the future, the Bureau will continue to keep up with international trends and formulate regionally appropriate sustainable education policies. It is expected that the "Environmental Sustainability Equation (Climate Change Empowerment Investigations)" will be held in the Academic Year 2023. Through special lectures and field surveys, the current situation of Climate Change and examples of sustainable resource cases will be promoted, enhancing teachers' willingness to care for the environment and participate in society.

Curriculum Satisfaction up to

99%



Chance

Chance

Drinking Actions

Descriptions

The easiest way to save water is to start by adjusting your water use

1. Check the recent water bills for potential water leak in your home
2. Lower the faucet outflow from the control switch to save water
3. Take shower instead of bath and reduce the shower duration
4. Reuse of wastewater from dehumidifiers and air conditioners

Task

List one other effective way to save water in your daily life

+ 2 points

Destiny

Chance

Taiwan's per capita water consumption has been increasing year by year

Descriptions

According to the water saving target expected by the Water Resources Agency (WRA), the daily per capita household water consumption is about 175 liters. A household uses 142 liters of water per person per day, which does not exceed the consumption average yet goes close to the WRA expected goal. Water conservation requires immediate actions by the people

- 2 squares

Course Activity Design: Water Sustainability Online Board Game (Water Sustainability Monopoly – Collective Creation & Play Together)

2. Popularizing Environmental Sustainability Knowledge and Rooting Education

To implement an environmental education strategy oriented towards sustainable development and ensure that teachers and students acquire the core competencies necessary to promote sustainable development, the Education Bureau has developed the "Four-Year Medium- and Long-Term Plan for the Development of Environmental Education Policy for the New Generation (2022-2025)". Each year, Kaohsiung City develops medium- and long-term plans for environmental education promotion, designs interdisciplinary curriculum designs that comply with the Curriculum Guidelines of 12-Year Basic Education, and presents aspects such as "Sustainable Campus", "Climate Action", "Energy Education", and "Resource Circulation". Exhibitions, with the participation of the Environmental Protection Bureau, the Department of Substances Abuse Control and Prevention, the Linyuan Society of Mangrove Conservation, and the Chengcing Lake High-Quality Water Environment Education Park, have been organized, with a total of over 8,000 participants. In addition, workshops on curriculum design for reducing plastic waste and accelerating marine conservation were held, with several elementary schools in the City selected to demonstrate the concept of "The Journey of Green Gold" (from land to table) education.

In addition, the library is the cradle of urban culture and education. Therefore, the Bureau of Cultural Affairs held a series of lectures on Climate Change, urban health, and related concepts, and holds thematic exhibitions on topics such as "Healthy Diet", "Talks on Dementia", and "Managing Negative Emotions", in line with the policy vision of "Mountain, Sea, River and Port, and Ecological City". Unique collections on natural ecology have also been obtained.



4. Facilitating Public Awareness on Health and Rescue

Kaohsiung City is affected by Climate Change, leading to a year-by-year increase in summer temperatures. To strengthen the resilience and adaptability of citizens to Climate Change, the Sports Development Bureau promoted water sports (canoeing, SUP) and safety drills based on policy concepts such as “Water Activities in the Harbor City” and “Livability and Sustainability”, and has held “Touring Sports Coaching Teams”, “iSports Intelligence Courses”, and other sports events multiple times, resulting in the second-highest proportion of regular exercise among the Six Special Municipalities. In the future, plans to establish 14 sports centers are underway to enhance urban health.

Kaohsiung City has a growing elderly population, with 514,293 residents aged 65 or above, accounting for 18.79% of the total population. This demographic shift reflects the City’s transition into an aging society. The Open University of Kaohsiung actively offers health-related courses to cater to this demographic, promoting health literacy and improve the quality of life for all residents through the courses covering various aspects of health, including physiological, psychological, nutritional, social, and environmental aspects. Specialized lectures on legal practices were also organized to enhance participants’ understanding of basic legal knowledge, enriching their life experiences.



5. Education on the Prevention of Climate-Related Diseases

1. Smart Adaptation of Air Quality and Climate

Kaohsiung City is influenced by the northeast monsoon and the impact of southern cloud systems, which can carry fine particulate matter and pollutants from outside the region into the City. These pollutants are more likely to accumulate, posing challenges to air quality. The Education Bureau has implemented measures based on the “Measures and Emergency Response Procedures for Handling Deterioration of Air Quality in Senior High Schools, Junior High Schools, and Kindergartens”, integrating campus management with smart information systems to promote functions such as “Real-time Air Quality Monitoring Station Information Signage” and the “Kaohsiung Campus Air Pollution Prevention Alliance Group on LINE”. These tools provide teachers and students with real-time information on air quality on campus.

Currently, there are up to 340 schools in the City that have installed “Real-time Air Quality Monitoring Station Information Signage” to ensure air quality protection on their campuses. Additionally, the Education Bureau conducts annual random checks on 20% of schools using self-check forms, with the aim of achieving 100% coverage within 5 years. The Bureau has also subsidized air purification equipment installations in 185 schools, effectively monitoring and improving air quality on campuses with an expectation to create a healthier learning environment for teachers and students.





2. Advocacies on High-and-low Temperature Adaptations

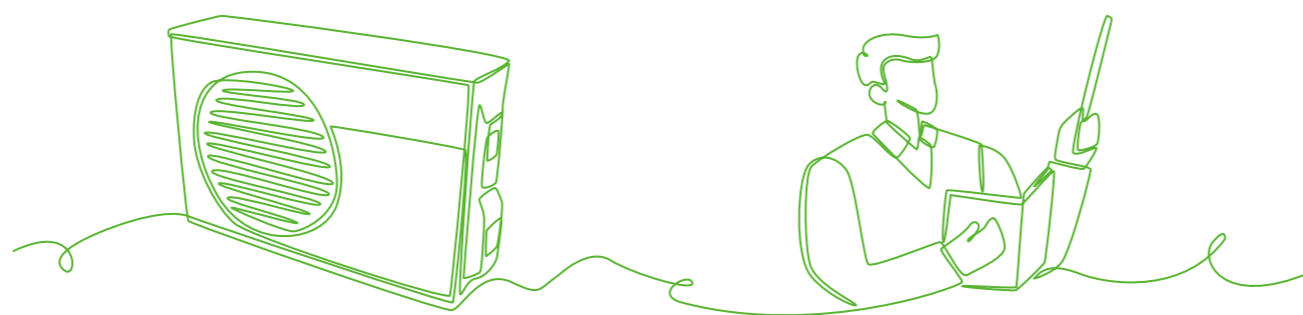
In the context of climate change, which has broad-ranging impacts on daily life, Kaohsiung City focuses on raising awareness and promoting adaptation to high and low temperatures. The Social Affairs Bureau and Education Bureau collaborate on initiatives such as women’s community colleges, lifelong learning academies, and volunteer education and training courses to deliver sustainable environmental education. The Bureaus also continue to promote education on heat injury prevention and temperature adaptation at all levels of schools in the City.

The Social Affairs Bureau The Social Affairs Bureau, in collaboration with the Education Bureau and the Civil Service Development Institute , organized hot and cold weather adaptation courses participated by up to 158,000 participants in 2022; meanwhile, the Department of Health, Agriculture Bureau and Youth Bureau had a cross-agency collaboration the preventive and response awareness campaigns for extreme heat adaptation, totaling 883 events in 2022, aiming to reduce the impact of extreme hot and cold temperatures on citizens. Furthermore, the Social Affairs Bureau has initiated a care mechanism in hot and cold days in response to extreme weather conditions by providing support and shelter measures for homeless individuals, such as food and supplies and shelters to resist heat (cold spells), to ensure the safety and well-being of people from various demographics and age groups in society.



185 schools
in total have been subsidized for installation of air purification equipment

340 schools
Real-time Air Quality Monitoring Station Information Signage



Chapter 8

Civic Engagement

In modern society, civic engagement plays a vital role. Through engagement, citizens may dive into urban affairs and share their insights, needs, and expectations, thereby promoting more inclusive and sustainable urban development. The Kaohsiung City Government recognizes the importance of civic engagement in the context of urban sustainable development and aims to incorporate citizen perspectives into decision-making processes to make policies more responsive to the needs of the citizens. By strengthening civic engagement, the vision of “a sustainable and resilient city” for the year may reach the citizens, allowing implementation of climate adaptation and resilience and liveability in daily lives.



In the promotion of resilient cities, the Kaohsiung City Government has introduced extensive civic engagement initiatives, including volunteer patrol teams, diverse educational outreach programs, open information disclosure, field inspections, and more. It also mandates that City agencies consider mechanisms for civic engagement in climate change adaptation and response planning, based on relevant legal provisions and civic engagement implementation plans. Since 2019, the Kaohsiung City Government has released the “Implementation Plan for the Promotion of Civic Engagement”, which is subject to periodic reviews and further updates on the czpn.kcg.gov.tw-Kaohsiung City’s Website of Citizen Participation. In 2022, the Research, Development and Evaluation Commission the Kaohsiung City Government approved 30 civic engagement proposals entailing The promotion of local

sustainable development initiatives through workshops, participatory budgeting, the World Café, consensus meetings, online engagement platforms, etc. These proposals cover a wide range of topics, including regional revitalization, water resource education, rural regeneration, environmental impact assessment advocacy, recreational environment development, etc., showcasing the close connection between citizens’ visions for urban development and sustainable development goals and aligning with the vision of a sustainable and resilient city.

To strengthen the role of civic engagement in the context of a sustainable and resilient city, the Kaohsiung City Government passed through third reading the “Kaohsiung City Self-Government Ordinance for the Development of Net Zero City” in June 2023. The “Committee for Sustainable Development and Climate Change Response Promotion, Kaohsiung City Government” drafts mechanisms for the involvement of Kaohsiung citizens in climate change adaptation to develop and promote policies and measures related to a just transition. Meanwhile, government agencies in charge are required to first review the hotzones and industries under potential impacts in the action plans of Net Zero transition and introduce citizen engagement mechanisms. Kaohsiung City Government becomes the first city to incorporate civic engagement and the just transition into local climate governance policies following the passage of the “Climate Change Response Act”, enduing the City Government agencies the authorities to review the incorporation of civic engagement in their governance. In the future, Kaohsiung City’s development as a resilient city will accommodate more recommendations of vulnerable communities, striving for sustainable equality in municipal development.



Chapter 9

Prospect

In 1987, the “Brundtland Report” defined sustainable development as the development that “meets the needs of the present without compromising the ability of future generations to meet their own needs, with fundamental principles of equity, sustainability, and commonality.” Today, climate change has become the most prominent global environmental issue, with long-term impacts on future generations. How to mitigate and adapt to the impacts of climate change is a global challenge in its transition toward sustainability, and Kaohsiung is no exception.

In the current year, Kaohsiung City has focused on “sustainable resilience” and aligned its policies with the seven key areas vulnerable to the impacts of climate change outlined in the 3rd Phase of the National Adaptation Plan: vital infrastructure, water resources, land use, coastal and marine environments, energy supply and industry, agricultural production, biodiversity and health, and capabilities building, to formulated governance strategies to gradually move towards a sustainable and resilient city.

Strengthening Kaohsiung’s Climate Adaptation Action

Utilizing the latest scientific research data, Kaohsiung will conduct climate risk assessments, identify Adaptation Gaps, and revise and propose Kaohsiung’s adaptation action plan in accordance with the central government’s strategies, national adaptation plan, and National Action Plan on Climate Change.

Advancing the Application of Artificial Intelligence (AI) Technology

AI will be used as a tool for sustainable development to help manage resources more efficiently, reduce energy consumption, and provide precise applications in agriculture and healthcare. In the context of climate change, AI can analyze vast amounts of meteorological and climate monitoring data, providing more accurate predictions and trend analyses to assist in decision-making.



Enhancing Cross-Disciplinary Thinking and Talent Development

Sustainable development involves multiple systemic issues that require the cultivation of interdisciplinary and integrated thinking talents. In the future, Kaohsiung plans to offer interdisciplinary courses through the Net Zero Institute to integrate mitigation, adaptation, and sustainability issues, seeking solutions for the sustainability of the planet.

Rolling Review of Kaohsiung’s Sustainable Development Indicators

Kaohsiung will continue to review its sustainable development indicators on a rolling basis, assess the applicability of these indicators, and enhance them through refinements and adjustments, strengthening the connection between Kaohsiung, the central government, and international trends to achieve sustainable development in Kaohsiung.

Appendix

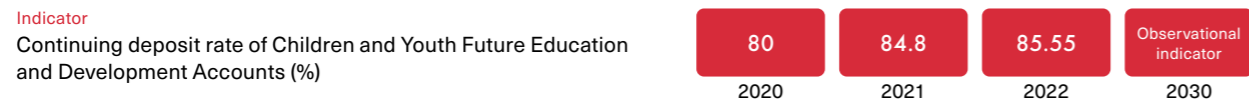
Indicators of Sustainable Development of Kaohsiung



SDG 1 End poverty in all its forms everywhere



• Applicants/eligible persons



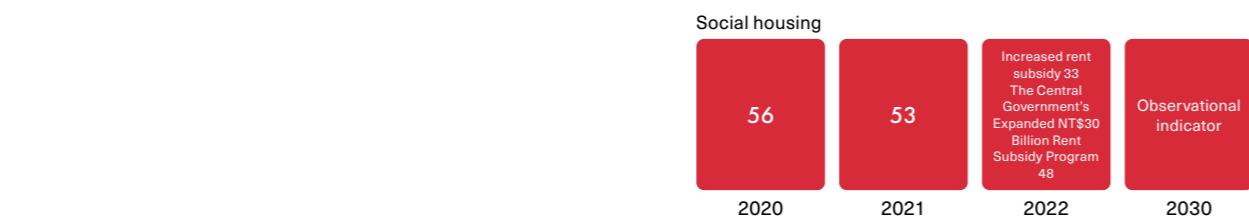
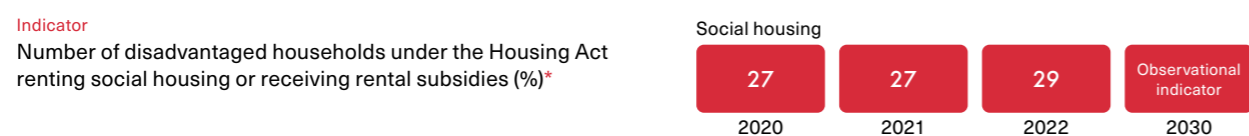
• (Number of Children and Youth Future Education and Development Accounts deposited this year) ÷ (Number of Children and Youth Future Education and Development Accounts opened this year)



• (Mobile healthcare area) ÷ (areas with insufficient healthcare resources announced by the Ministry of Health and Welfare)



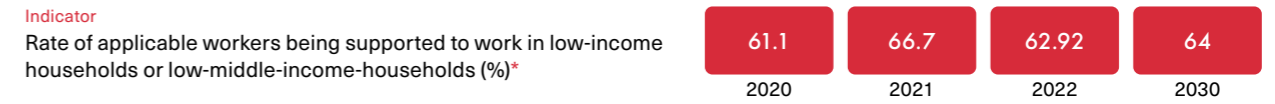
• 1.Indigenous areas:
(1)Tribal villages within the jurisdiction of indigenous areas (towns, cities, districts) that have not yet established culture and health stations.
(2)Tribal villages where the number of populations over 55 years old reaches 150 or more without a culture and health station.
• 2.City area: Area with a high proportion of indigenous population or gathering area without a culture and health station



• Number of disadvantaged households under the Housing Act renting social housing or receiving rental subsidies



• Fire Department Statistical Report



• (Number of successfully employed individuals in low-income, low-middle-income households) ÷ (number of registered employment-seeking individuals in low-income, low-middle-income households) this year

Items with asterisk ("**") corresponds to Taiwan Sustainable Development Indicators



SDG 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture



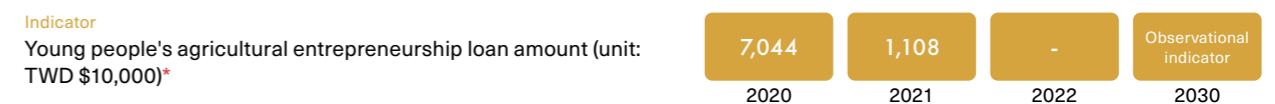
• Accumulated verified area over the years (hectares)



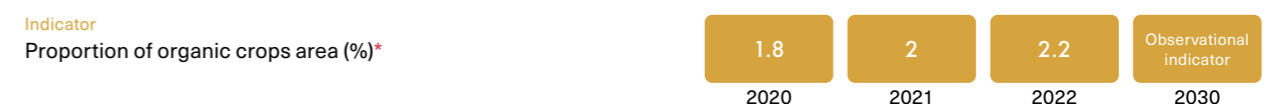
• In-kind contribution service stations



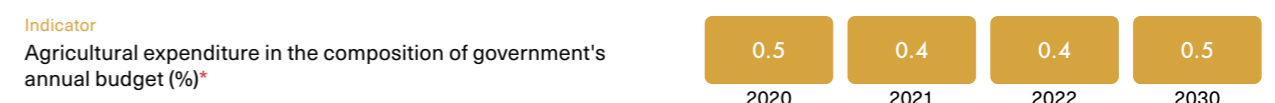
• (Number of inspected food manufacturing companies) ÷ (Total number of companies)



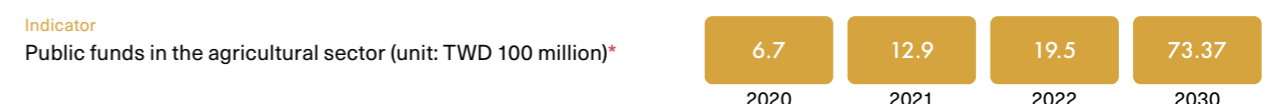
• Accumulations of the amount of young people's agricultural entrepreneurship loans



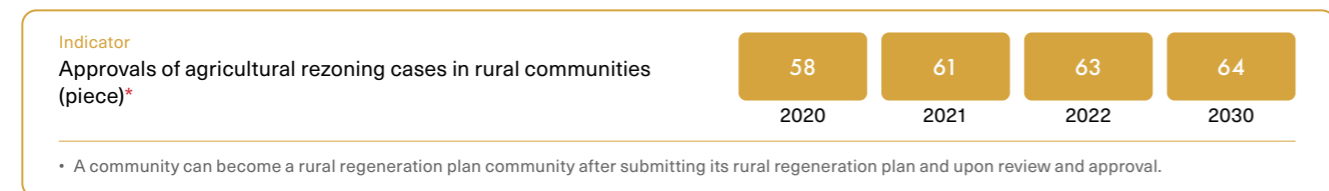
• (Organic crops area) ÷ (Total cultivation area)



• (Agricultural expenditure) ÷ (City government's annual budget)

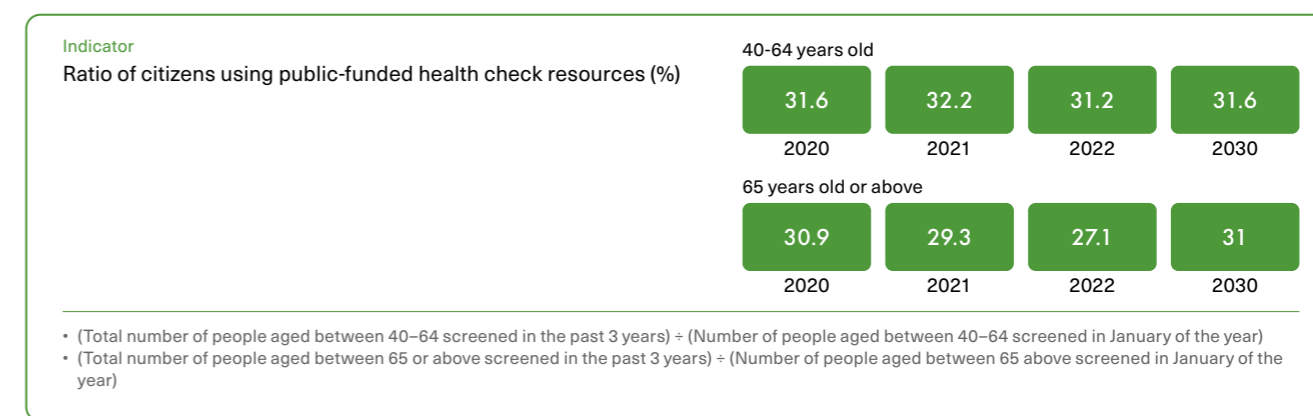
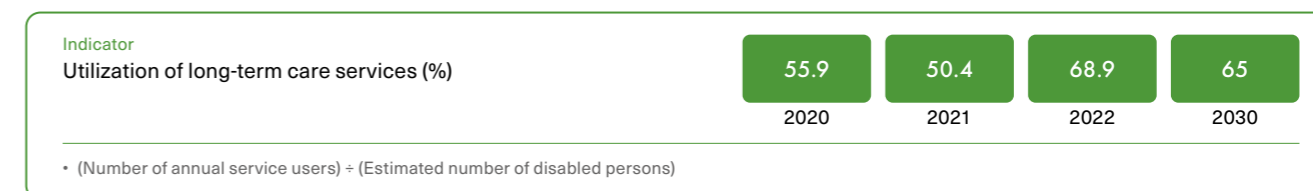
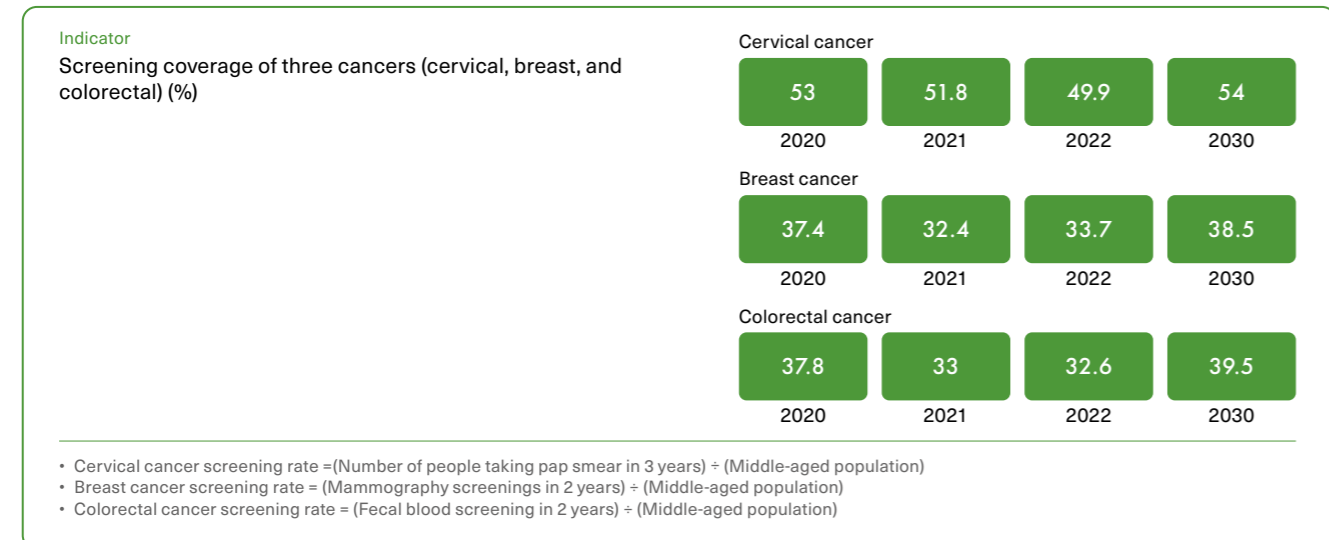
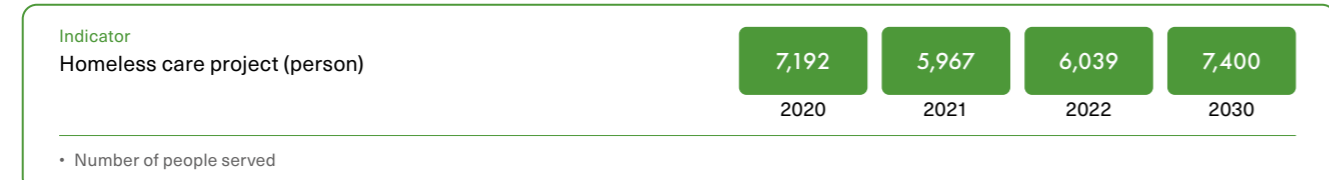
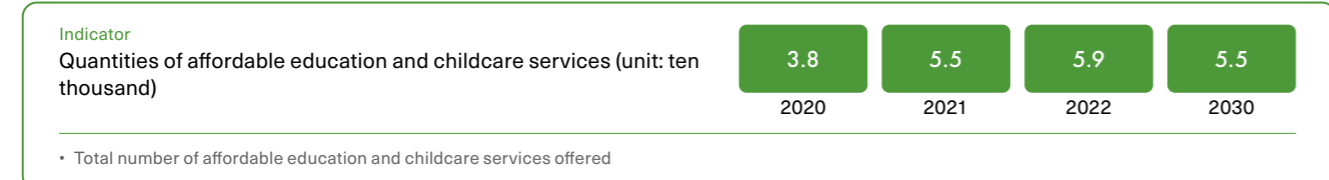
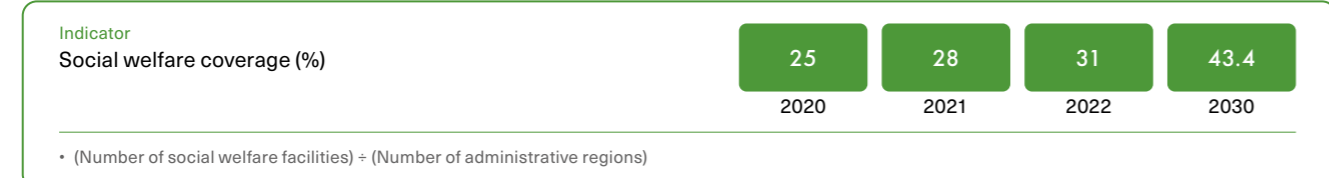
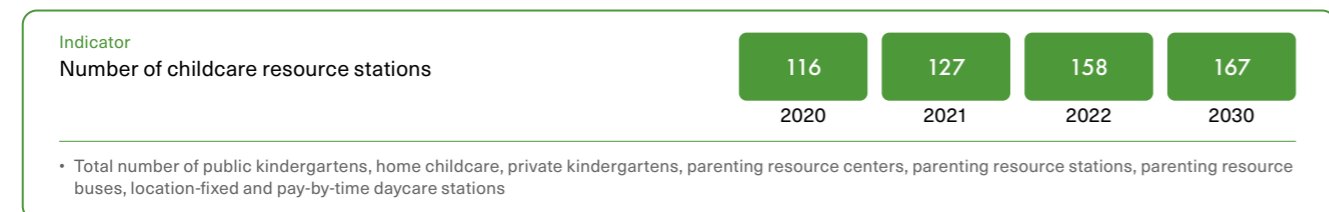


• Accumulation of the economic development expenditure

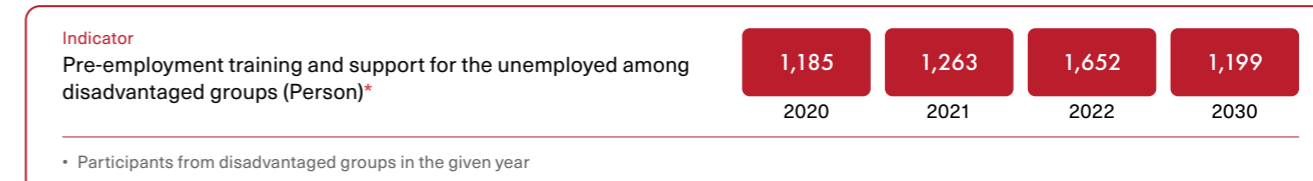
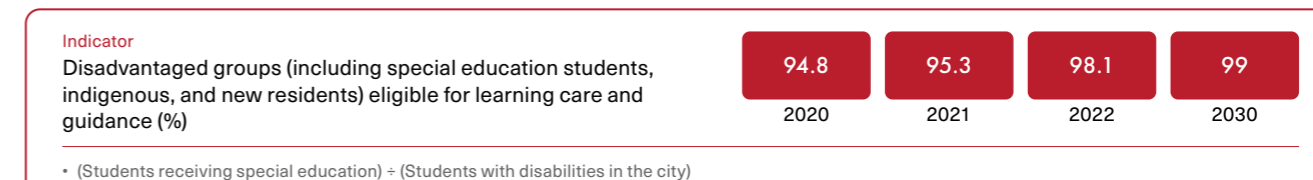
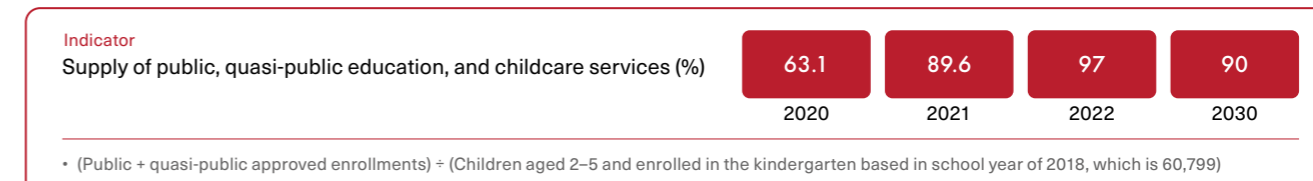


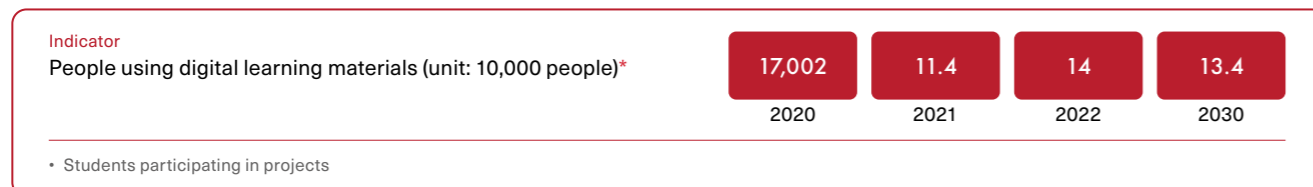
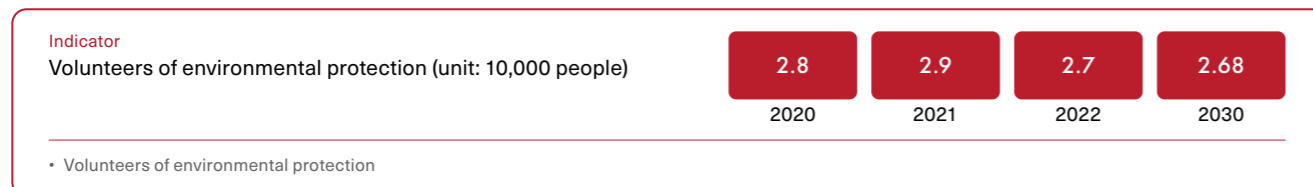
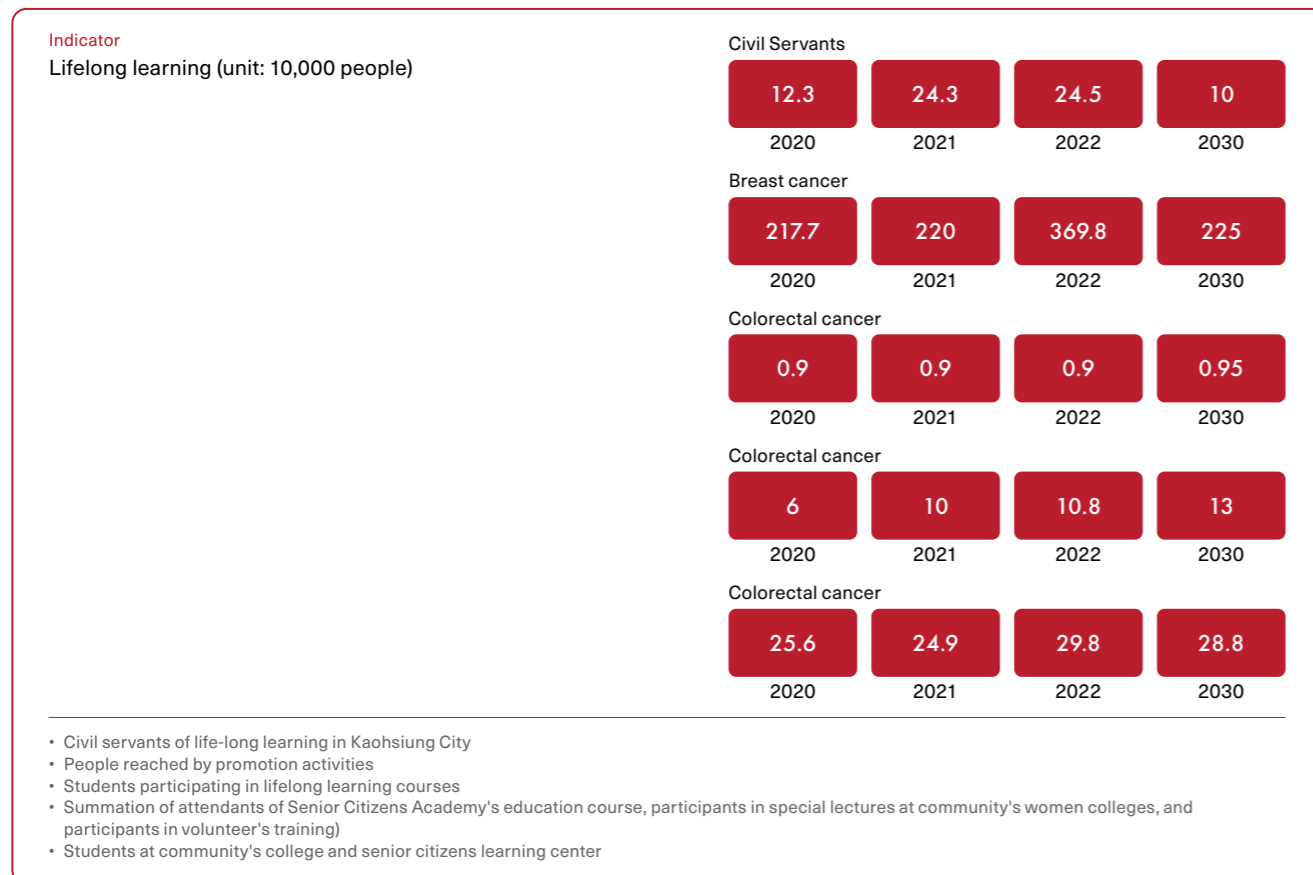
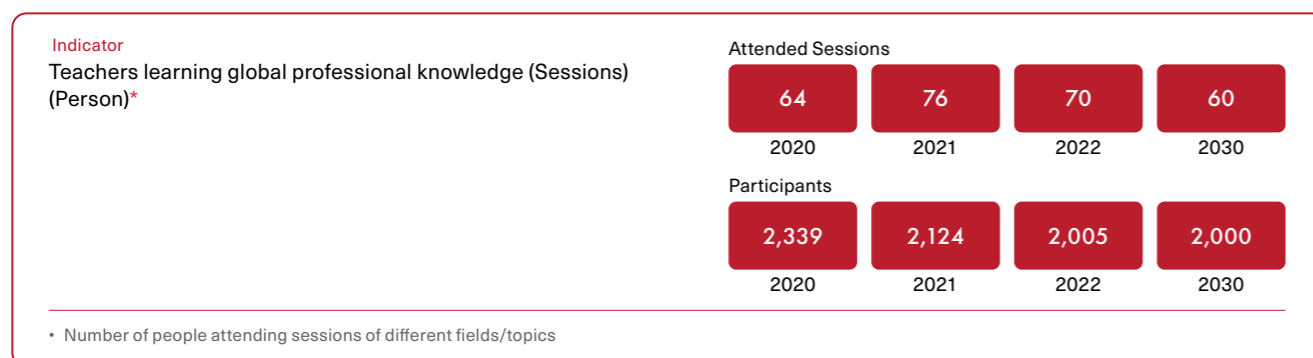
Items with asterisk (***) corresponds to Taiwan Sustainable Development Indicators

3 GOOD HEALTH AND WELL-BEING
SDG 3
Ensure healthy lives and promote well-being for all at all ages



4 QUALITY EDUCATION
SDG 4
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

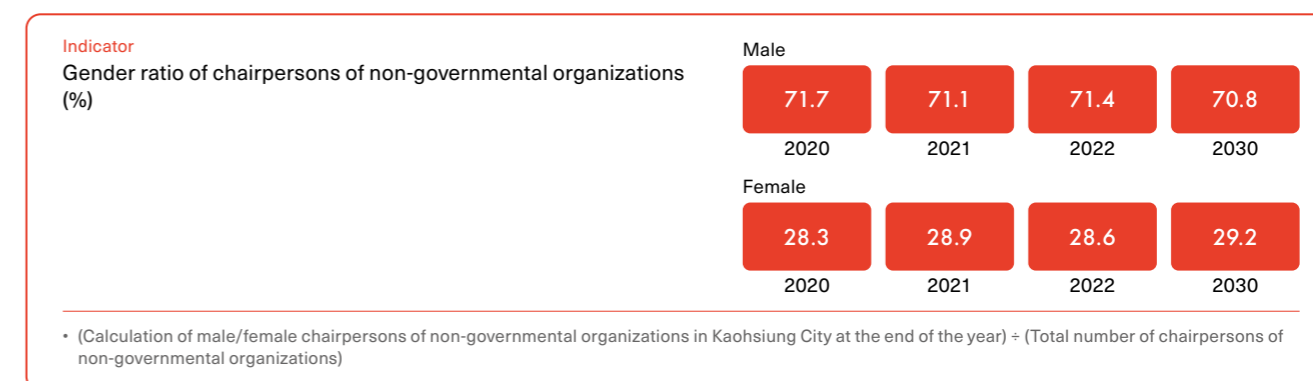
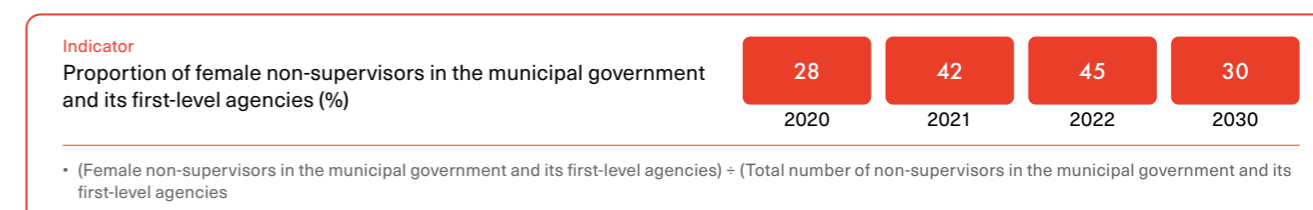
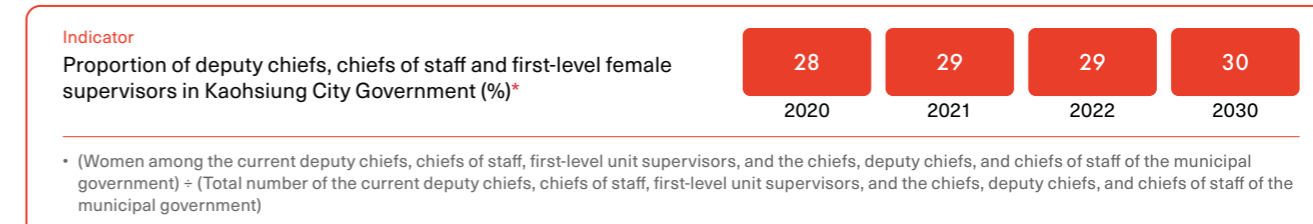
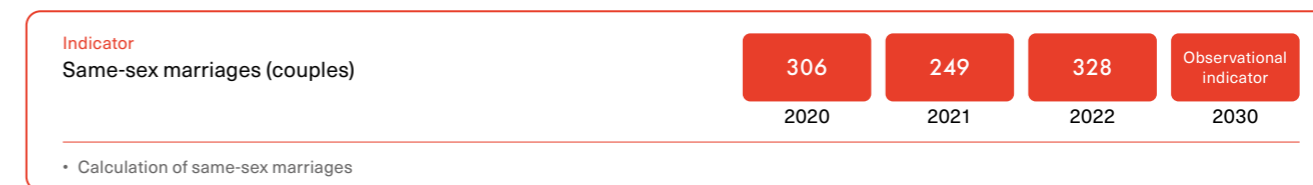
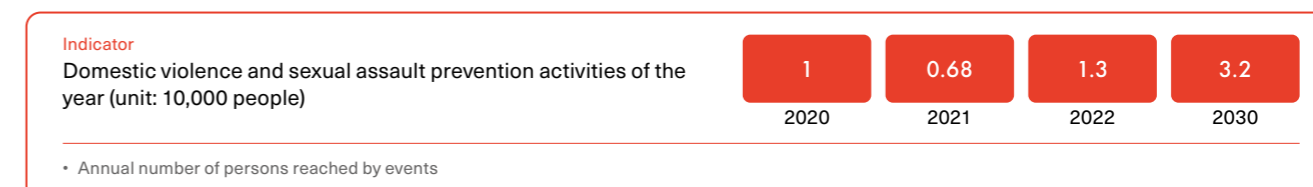
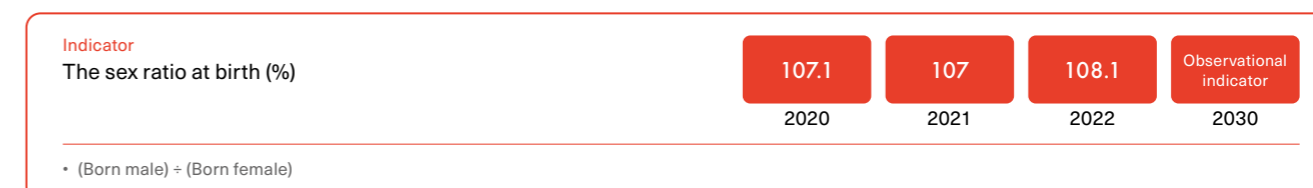




Items with asterisk (***) corresponds to Taiwan Sustainable Development Indicators



SDG 5
Achieve gender equality and empower all women and girls



Items with asterisk (***) corresponds to Taiwan Sustainable Development Indicators



SDG 6 Ensure availability and sustainable management of water and sanitation on for all

<p>Indicator Daily water consumption per person (Liter)</p>	281	272	280	Observational indicator
	2020	2021	2022	2030
<p>• (Tap water for domestic consumption + water supply population) ÷ 365 days</p>				
<p>Indicator Premium public toilets in Kaohsiung City (%)*</p>	79.2	79.8	92	85
	2020	2021	2022	2030
<p>• (Premium public toilets) ÷ (Registered public toilets)</p>				
<p>Indicator Households connecting to public sewer system and sewer (%)*</p>	46	47.4	49	55.5
	2020	2021	2022	2030
<p>• (Connected households × Number of households per county/city) ÷ total population per county and city</p>				
<p>Indicator Recycle of used water (Mts / Days)*</p>	5.4	5.9	9.9	21
	2020	2021	2022	2030
<p>• Summation of the amount of recycled water discharged from the public sewage treatment plant and the total amount of recycled water produced by the Water Resources Center</p>				
<p>Indicator Mildly and slightly/not polluted length of the main rivers (%)*</p>	34.9	30.3	25.2	≥50
	2020	2021	2022	2030
<p>• (Mildly polluted length + not/slightly polluted length) ÷ (Total polluted length)</p>				
<p>Indicator Stations' examining result with DO≥2.0mg/L in each water basin within the jurisdiction</p>	≥95	97.3	96.9	≥100
	2020	2021	2022	2030
<p>• (Stations with results of DO≥2 mg/L) ÷ (Effective stations)</p>				
<p>Indicator The length of tap water pipeline replacement (cases)*</p>	4,738	5,082	4,425	Observational indicator
	2020	2021	2022	2030
<p>• Repair leak density</p>				
<p>Indicator Tap water penetration rate (%)*</p>	96.6	96.6	96.8	Observational indicator
	2020	2021	2022	2030
<p>• (People with water supply) ÷ (Number of people in Kaohsiung City)</p>				

<p>Indicator Green building rainwater storage and rainwater recovery (unit: million liter)</p>	3.5	3.7	3.8	4.5
	2020	2021	2022	2030
<p>• Designed capacity of rainwater storage and rainwater recycling facilities for green buildings</p>				
<p>Indicator Kaohsiung city's soil and groundwater pollution public sites(numbers) released from listing*</p>	9	16	9	Observational indicator
	2020	2021	2022	2030
<p>• Numbers of Kaohsiung city's soil and groundwater pollution public sites released from listing</p>				
<p>Indicator Subsidence area or amount of stratum in Kaohsiung City (square meter)</p>	0	No monitoring results	No monitoring results	Observational indicator
	2020	2021	2022	2030
<p>• Area with the annual subsidence rate greater than 3 cm</p>				
<p>Indicator Water Environment Patrol Teams (teams)*</p>	30	31	32	30
	2020	2021	2022	2030
<p>• Number of Water Environment Patrol Teams in Kaohsiung City</p>				
<p>Indicator River volunteers with the volunteer service records (%)</p>	74.8	77.1	78	80
	2020	2021	2022	2030
<p>• (Number of river volunteers with volunteer records) ÷ (River volunteers)</p>				

Items with asterisk (**) corresponds to Taiwan Sustainable Development Indicators



SDG 7 Ensure access to affordable, reliable, sustainable and modern energy for all

<p>Indicator Energy consumption per capita (kWh/people)</p>	2,745	2,779	2,837	Observational indicator
	2020	2021	2022	2030
<p>• (Annual sales of electric lightings announced by Taipower) ÷ (Population in Kaohsiung)</p>				
<p>Indicator Solar photovoltaic facilities promoted (GW)*</p>	0.12	0.42	0.8	2.5
	2020	2021	2022	2030
<p>• Cumulative capacity of solar photovoltaic facilities installed on buildings</p>				

Items with asterisk (**) corresponds to Taiwan Sustainable Development Indicators



SDG 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Indicator	2020	2021	2022	2030
Entrepreneurship training courses held (sessions)	29	32	30	38

• Sessions of entrepreneurship training courses

Indicator	2020	2021	2022	2030
Service of support and advice (people)	249	275	250	315

• Number of applicants of support-and-advice service



SDG 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Indicator	2020	2021	2022	2030
Promoting of park development and transforming into high-end manufacturing center (unit:100 million TWD)	400	815.7	1,394.7	2,442

• Annual Accumulation of Amounts from Facilitation of Expanded Investments by Enterprises at the Park

Indicator	2020	2021	2022	2030
KO-IN Zhigao Point (Financial Data Innovation Lab) (cases)	2	2	2	10

• Number of applications for the financial data innovation laboratory



SDG 10 Reduce inequality within and among countries

Indicator	2020	2021	2022	2030
Multiples of household income quintiles gap	6.56	6.46	No Data Available	Observational indicator

• (Average highest quintiles) ÷ (Average lowest quintiles)

Indicator	2020	2021	2022	2030
Promoting employment for people with physical and mental disabilities (people)*	3,151	2,433	3,287	3,160

• Number of people with promoted employment

Indicator	2020	2021	2022	2030
Employment-by-referral rate of disadvantaged job seekers	54	58.2	57.6	58

• (Number of job seekers with special needs) ÷ (Number of newly registered job seekers with special needs)

Indicator	2020	2021	2022	2030
Gini coefficient of income per household	0.36	0.35	No Data Available	Observational indicator

• Area contained between the Lorenz curve and the perfect equal line to the area of the entire triangle below the perfect equal line

Items with asterisk (***) corresponds to Taiwan Sustainable Development Indicators



SDG 11 Make cities and human settlements inclusive, safe, resilient and sustainable

Indicator	2020	2021	2022	2030
Disadvantaged households (household)*	16,381	17,958	35,988	Observational indicator

• Summation of households signing the social housing contract and households receiving rent subsidies

Indicator	2020	2021	2022	2030
Urban renewal (cases)*	1	1	1	2

• Number of approved urban renewal cases

Indicator	2020	2021	2022	2030
Barrier-free buses increased (%)*	54	61	85	100

• (Number of barrier-free buses) ÷ (Total Buses in Kaohsiung city)

Indicator	2020	2021	2022	2030
Public bike promoted (unit: 10,000 people)	669.8	917.3	1,143.5	1,200

• Number of people riding public bicycles

Indicator	2020	2021	2022	2030
Bike lanes (kilometers)	1,035.3	1,047.9	1,047.9	1,100

• Bike lanes length

Indicator	2020	2021	2022	2030
Extended length of the MRT (kilometer)	42.7	42.7	42.7	90.3

• Extended rail length of the MRT

Indicator Extended length of the LRT (kilometer)	8.7 2020	12.8 2021	14.9 2022	22.1 2030
• Extended rail length of the LRT				
Indicator Senior Fun Caravan (unit: trips)	122 2020	50 2021	78 2022	123 2030
• Senior Fun Caravan trips				
Indicator Developed land size of urban planning public facilities areas (unit: 10,000 hectares)	1.2 2020	1.2 2021	1.2 2022	1.2 2030
• Statistics of developed of urban planning public facilities areas				
Indicator The suburban area planning in Kaohsiung city's spatial planning (cases)	1 2020	1 2021	2 2022	1 2030
• The suburban area planning in Kaohsiung city's spatial planning				
Indicator National land plan and non-urban land development permission (cases)	2 2020	3 2021	3 2022	2 2030
• Permitted cases of National Spatial Planning and non-urban land development				
Indicator Completion of barrier-free facilities in public buildings (%)	90.9 2020	91 2021	92 2022	91.3 2030
• (Barrier-free public facilities) ÷ (All public facilities)				
Indicator Pavement environment and access area around schools (unit: 10,000 square meters)	12.3 2020	14 2021	15.5 2022	24.2 2030
• Walkable area of pavement				
Indicator Continuous selection of public/private facilities in each jurisdiction suitable for emergency shelter for during disasters (%)	10 2020	10 2021	10 2022	>10 2030
• (Evacuation capacity) ÷ (Number of citizens)				
Indicator Length of pavements with motorcycles' parking space removed (kilometers)	4.5 2020	11.5 2021	13.5 2022	22.5 2030
• Total length of the motorbike parking spots removed on the pavement				

Indicator The number of people died, missing, injured during major disasters (earthquakes, typhoons, and floods) (person)	0 2020	0 2021	0 2022	Observational indicator 2030
• Fire Department Official Statistics Report				
Indicator Annual average concentration of fine suspended particles (µg/m3)*	18.4 2020	18.5 2021	16.9 2022	13 2030
• (Annual average sum of fine suspended particles found through manual monitoring stations) ÷ (Number of fine suspended particles manual monitoring stations)				
Indicator Ozone for eight hours(ppb)	75.3 2020	71.3 2021	69.2 2022	73 2030
• Average of annual ozone's concentration for 8 hours in 12 air quality automatic monitoring stations in Kaohsiung City				
Indicator AQI value*	82.8 2020	80.7 2021	87.5 2022	88 2030
• Improving the air quality by increasing AQI to ≤100				
Indicator Available air quality automatic monitoring data (%)	98.8 2020	96.8 2021	98.6 2022	>94 2030
• (Hourly data included in the scheduled number of effective data) ÷ (Month included in the total scheduled number of transactions) × 100%				
Indicator Environmental noise monitoring (%)	100 2020	100 2021	100 2022	96 2030
• 1-(Number of periods of anomalous environmental noise monitoring) ÷ (Total number of periods of monitoring)				
Indicator Increase of the average park/green area per capita (square meters)*	10.3 2020	10.4 2021	10.5 2022	12.3 2030
• Average park and green area per capita				

Items with asterisk ("**") corresponds to Taiwan Sustainable Development Indicators



SDG 12 Ensure sustainable consumption and production patterns

Indicator Increase of the issued green factory certificates (factories)*	18 2020	19 2021	19 2022	Observational indicator 2030
• Number of green factory acquired certificates				

Indicator Reuse of industrial food waste (%)	94.4 2020	91.7 2021	94 2022	95.5 2030
• (Amount of reused industrial food waste) ÷ (Amount of total industrial food waste)				
Indicator Reuse of industrial waste (%)*	90.6 2020	91.8 2021	91.1 2022	92 2030
• (Amount of reused industrial waste) ÷ (Amount of total industrial waste)				
Indicator Tracing cases of the flow of toxic chemicals (%)*	82.9 2020	100 2021	98.8 2022	88 2030
• (Inspections of the regulated factories with toxic chemicals) ÷ (Numbers of the regulated factories with toxic chemicals)				
Indicator Selling rate of particles recycled from incinerated bottom slags (%)	80.2 2020	90.4 2021	96.5 2022	85 2030
• (Selling number of particles recycled from incinerated bottom slags) ÷ (Total amount of particles recycled from incinerated bottom slags)				
Indicator Recycle rate of agricultural waste (%)	84.7 2020	84.7 2021	97.7 2022	85.7 2030
• (Amount of recycled agricultural waste in registered companies) ÷ (Total amount of agricultural waste in registered companies)				
Indicator Recycled food waste (%)	2.4 2020	2.2 2021	3 2022	5.5 2030
• (Amount of recycled food waste) ÷ (Waste volume, in despite of the business employees' household waste)				
Indicator Livestock wastewater turned into resource (%)	- 2020	2.5 2021	3.3 2022	10 2030
• The percentage of resource utilization of livestock ranches				
Indicator Recycled waste (%)	61.5 2020	64.8 2021	61.6 2022	62 2030
• (Amount of recycled food waste, recycled waste and recycled huge waste) ÷ (Waste volume, in despite of the business employees' household waste)				
Indicator Companies are encouraged to fulfill and integrate their social responsibilities into their operations and core strategies, becoming the cornerstone of their sustainable operations. (companies)	521 2020	586 2021	686 2022	Observational indicator 2030
• Number of registered companies that have submitted a corporate social responsibility report during the previous year to the Market Observation Post System of the Taiwan Stock Exchange				

Indicator Green procurement by public organizations (%)*	99.7 2020	99.2 2021	99.7 2022	99 2030
• The annual purchases of environment-friendly products that meet the first category (with environmental protection labels), the second and third categories of "low pollution, resource conservation, and recyclability" in total, which should reach a set target ratio of the agency's total purchase budget for the year				
Indicator Green procurement by private enterprises and organizations (unit: 100 million TWD)*	28.4 2020	45.1 2021	61.9 2022	40 2030
• The annual purchases with Taiwan's environmental protection labels, second-grade environmental protection labels, energy conservation labels, water conservation labels, green building material labels, carbon footprint labels, carbon reduction labels and foreign green products in total				
Indicator Occupancies of tourist hotels (%)	41.4 2020	45.7 2021	44.8 2022	50 2030
• (Number of guest rooms occupied) ÷ (Number of guest rooms)				
Indicator Low-carbon sightseeing (trips)	3 2020	3 2021	3 2022	4 2030
• Trips of low-carbon sightseeing				

Items with asterisk ("*") corresponds to Taiwan Sustainable Development Indicators

SDG 13
Take urgent action to combat climate change and its impacts

Indicator Areas of farmers encouraged to set up a disaster preventional net-plastilhouse (hectare)	67.2 2020	73.3 2021	No Data Available 2022	467 2030
• Cumulation of areas of farmers encouraged to set up a disaster preventional net-plastilhouse				
Indicator Volume of detention basins (Mts)	326.6 2020	326.6 2021	434.8 2022	490 2030
• Volume of detention basins in Kaohsiung city				
Indicator Volume of detention basins (%)	40 2020	40 2021	40 2022	Observational indicator 2030
• (Pedestrian areas with permeable pavement in square meters) ÷ (Pedestrian areas suitable for permeable pavements)				
Indicator GHG emissions reduction (%)	15.5 2020	19.4 2021	13.3 2022	30 2030
• (Annual GHG Emissions - 2005 GHG Emissions) ÷ 2005 GHG Emissions				




Items with asterisk (“*”) corresponds to Taiwan Sustainable Development Indicators

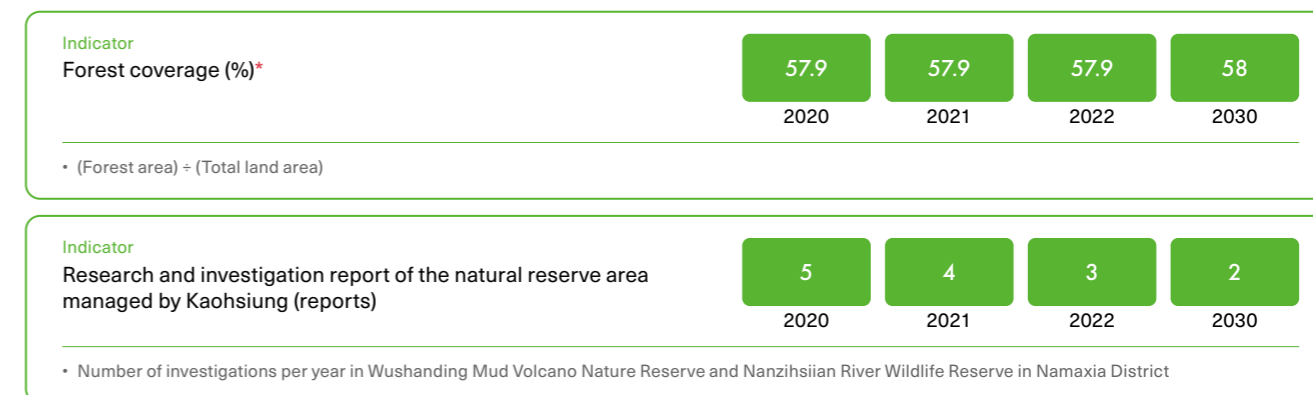
SDG 14

Conserve and sustainably use the oceans, seas and marine resources for sustainable development



Items with asterisk (“*”) corresponds to Taiwan Sustainable Development Indicators

SDG 15

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss



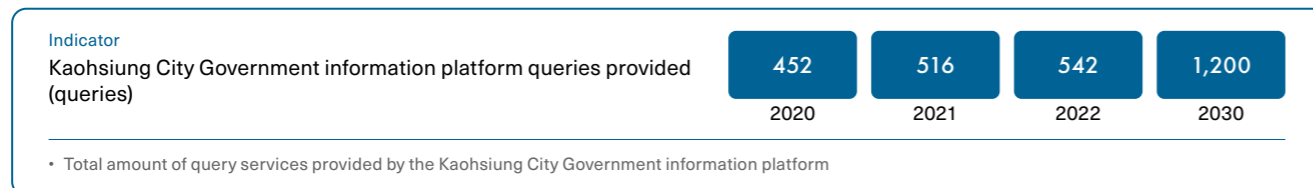
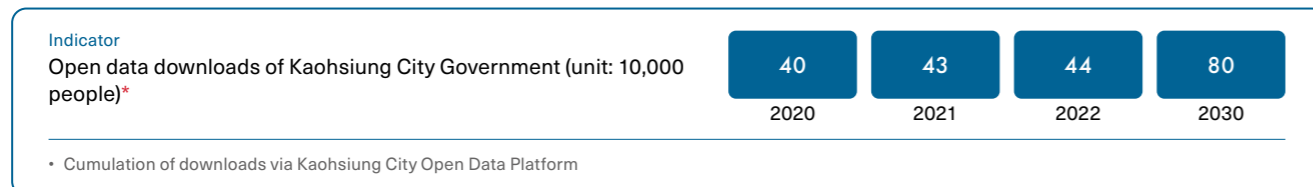
<p>Indicator</p> <p>Important wetland area (hectare)</p>	583.5	583.5	583.5	583.5																																																																																										
	2020	2021	2022	2030																																																																																										
<p>• According to the Wetland Conservation Act, the total area of international, national, and local grades of important wetlands approved by the central government</p>																																																																																														
<p>Indicator</p> <p>Reservation areas for indigenous people (hectare)</p>	12.7	8.8	14.9	25																																																																																										
	2020	2021	2022	2030																																																																																										
<p>• Applications by the public</p>																																																																																														
<p>Indicator</p> <p>Memorial trees registered and in conservation (trees)</p>	558	564	579	750																																																																																										
	2020	2021	2022	2030																																																																																										
<p>• Number of memorial trees in Kaohsiung</p>																																																																																														
<p>Indicator</p> <p>Proportion of reserved area in mountainous areas (%)*</p>	23.3	23.3	23.3	23.3																																																																																										
	2020	2021	2022	2030																																																																																										
<p>• (Total area of the city's natural reserves) ÷ (Total area of the city's mountainous areas)</p>																																																																																														
<p>Indicator</p> <p>Number of afforestation seedlings given out (unit: 10,000 seedlings)</p>	4.2	4	4.6	4.5																																																																																										
	2020	2021	2022	2030																																																																																										
<p>• The public was encouraged to apply for the afforestation seedlings</p>																																																																																														
<p>Indicator</p> <p>Removal of alien species*</p>	<table border="1"> <tr> <td colspan="5">Kaloula pulchra (unit)</td> </tr> <tr> <td>202</td> <td>987</td> <td>153</td> <td>Observational indicator</td> <td></td> </tr> <tr> <td>2020</td> <td>2021</td> <td>2022</td> <td>2030</td> <td></td> </tr> <tr> <td colspan="5">Polypedates megacephalus (unit)</td> </tr> <tr> <td>36</td> <td>30</td> <td>50</td> <td>Observational indicator</td> <td></td> </tr> <tr> <td>2020</td> <td>2021</td> <td>2022</td> <td>2030</td> <td></td> </tr> <tr> <td colspan="5">Egg foams of Polypedates megacephalus (unit)</td> </tr> <tr> <td>2</td> <td>-</td> <td>-</td> <td>Observational indicator</td> <td></td> </tr> <tr> <td>2020</td> <td>2021</td> <td>2022</td> <td>2030</td> <td></td> </tr> <tr> <td colspan="5">Geopelia striata (unit)</td> </tr> <tr> <td>28</td> <td>134</td> <td>87</td> <td>Observational indicator</td> <td></td> </tr> <tr> <td>2020</td> <td>2021</td> <td>2022</td> <td>2030</td> <td></td> </tr> <tr> <td colspan="5">Copsychus malabaricus (unit)</td> </tr> <tr> <td>42</td> <td>66</td> <td>124</td> <td>Observational indicator</td> <td></td> </tr> <tr> <td>2020</td> <td>2021</td> <td>2022</td> <td>2030</td> <td></td> </tr> <tr> <td colspan="5">Iguana iguana (unit)</td> </tr> <tr> <td>3,047</td> <td>5,217</td> <td>5,052</td> <td>Observational indicator</td> <td></td> </tr> <tr> <td>2020</td> <td>2021</td> <td>2022</td> <td>2030</td> <td></td> </tr> </table>				Kaloula pulchra (unit)					202	987	153	Observational indicator		2020	2021	2022	2030		Polypedates megacephalus (unit)					36	30	50	Observational indicator		2020	2021	2022	2030		Egg foams of Polypedates megacephalus (unit)					2	-	-	Observational indicator		2020	2021	2022	2030		Geopelia striata (unit)					28	134	87	Observational indicator		2020	2021	2022	2030		Copsychus malabaricus (unit)					42	66	124	Observational indicator		2020	2021	2022	2030		Iguana iguana (unit)					3,047	5,217	5,052	Observational indicator		2020	2021	2022	2030	
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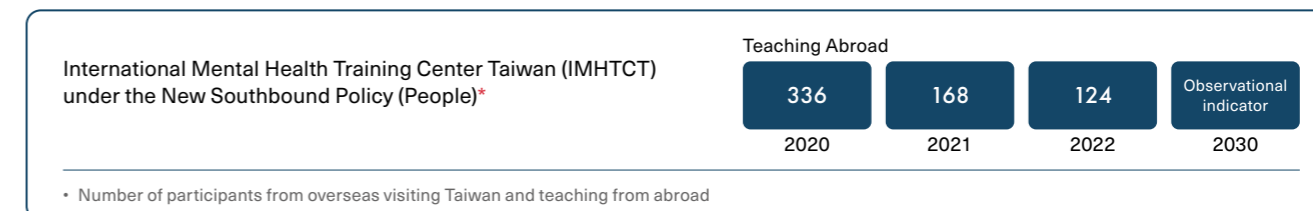
Items with asterisk (***) corresponds to Taiwan Sustainable Development Indicators

SDG 16
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

<p>Indicator</p> <p>Violence crimes committed (cases)*</p>	76	51	38	100
	2020	2021	2022	2030
<p>• Cumulation of violence crimes</p>				
<p>Indicator</p> <p>Investigation of children under 12 years old in the household of wanted criminals and current criminals in violation of the Narcotic Hazards Prevention Act (%)*</p>	100	100	100	100
	2020	2021	2022	2030
<p>• (Children interviewed by telephone + Children interviewed in-person) ÷ (Children that should be interviewed)</p>				
<p>Indicator</p> <p>Investigation rate of children in the household of suspected criminals in violation of the Narcotic Hazards Prevention Act(%)</p>	100	100	100	100
	2020	2021	2022	2030
<p>• (Number of visits to suspects that violated the Narcotic Hazards Prevention Act under a child protection or with vulnerable family for less than one year) ÷ (Number of suspects that violated the Narcotic Hazards Prevention Act under a child protection or with vulnerable family for less than one year)</p>				
<p>Indicator</p> <p>Crime reporting and requiring for assistance by the general public(%)</p>	29	30.8	28.7	32
	2020	2021	2022	2030
<p>• (General public reports through the 110, police phone number, and the 113, women's and children's protection phone number) ÷ (Annual crime reports)</p>				

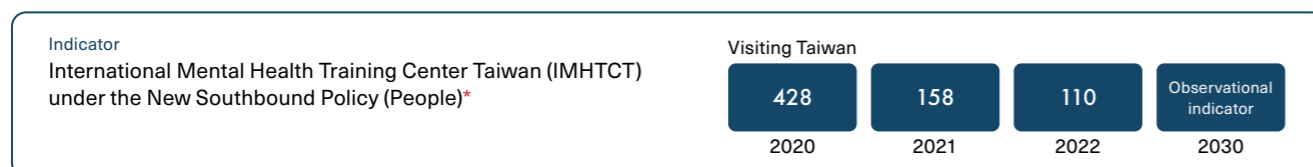
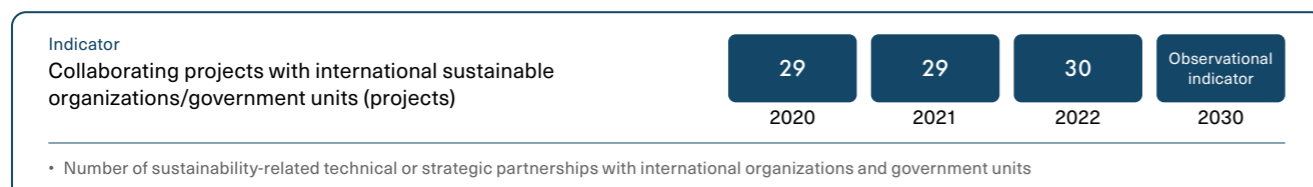
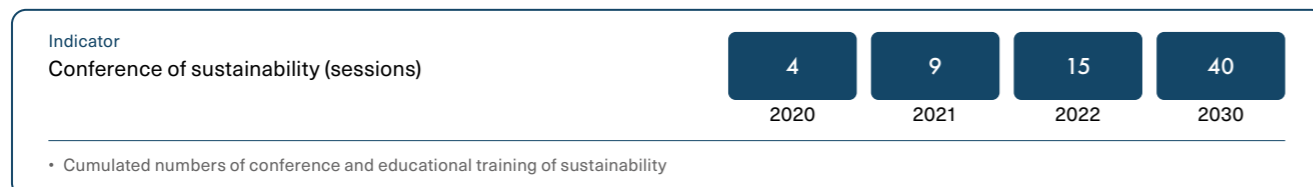
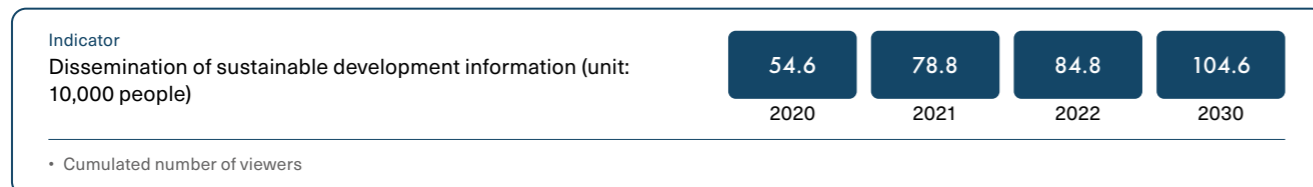


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SDG 17
Strengthen the means of implementation and revitalize the global partnership for sustainable development



2023



Issuing unit	Kaohsiung City Government
Report title	2023 Kaohsiung City Voluntary Local Review
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