TAINAN CITY

臺南 Tainan City Government

CLIMATE ACTION 2016

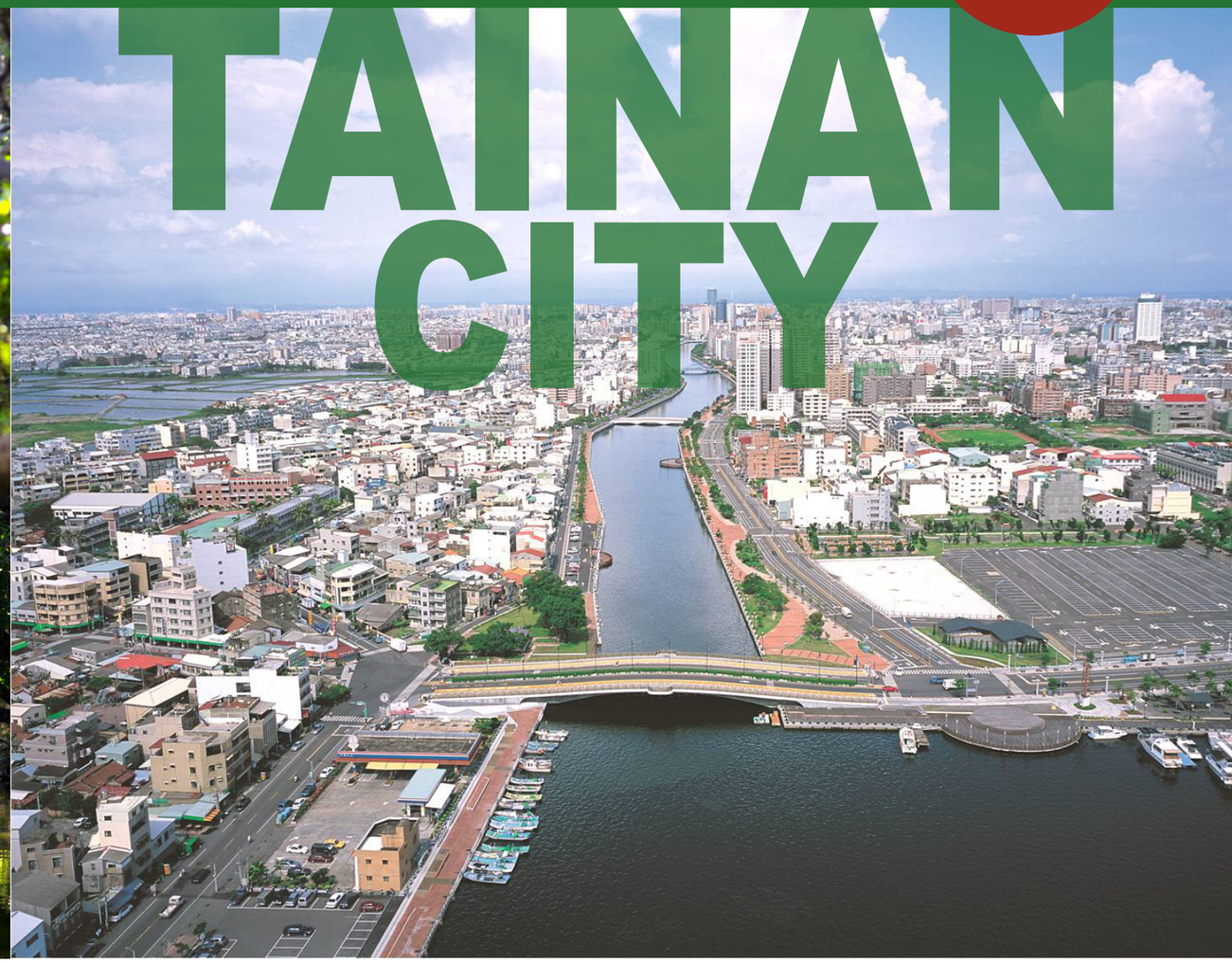

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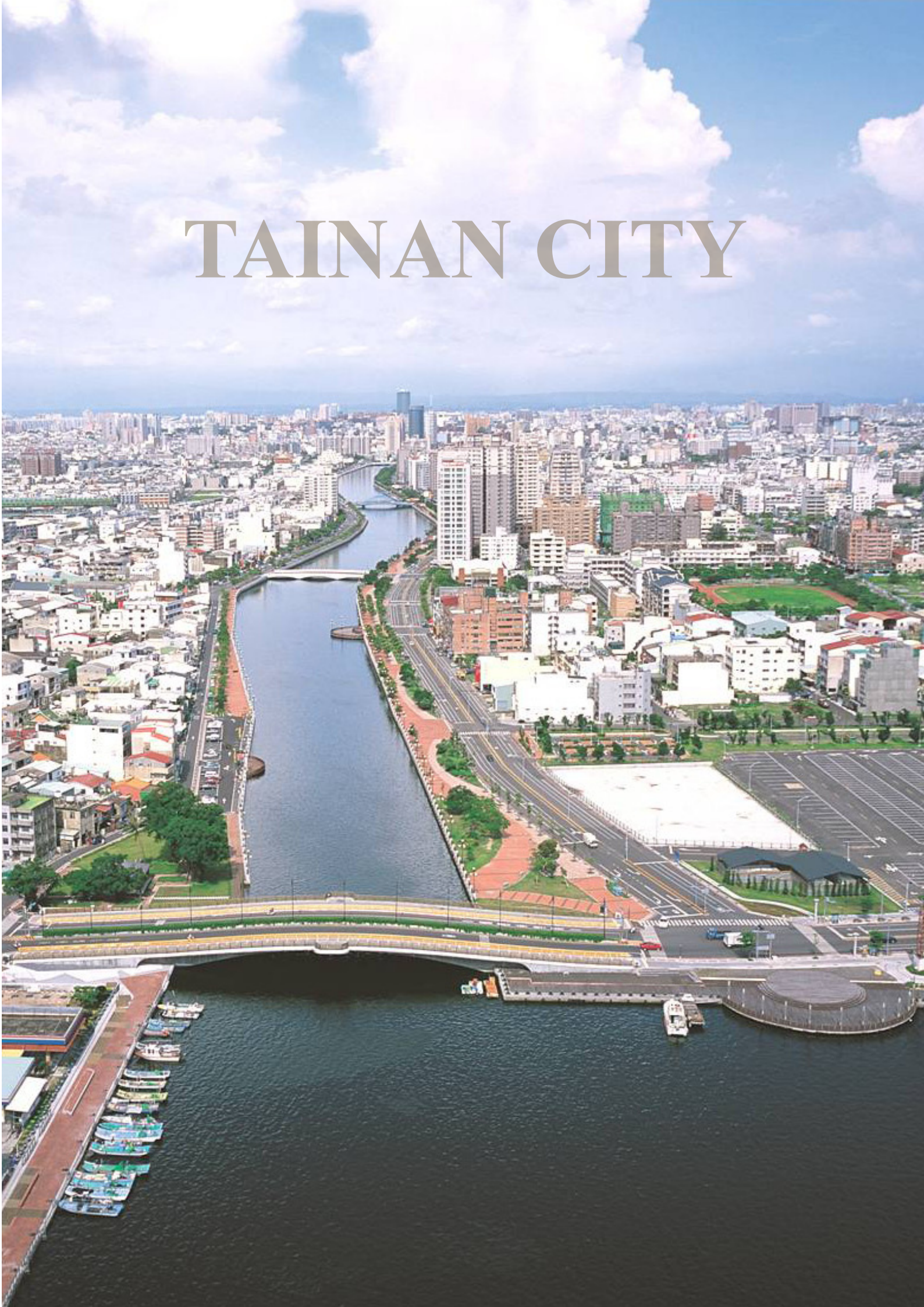
Table of Contents

List of Tables

List of Diagrams

TAINAN CITY



From Low-Carbon City to Climate-Resilient Municipality

"Resilience" is the key in successful, future-proof urban planning and urban development: in addition to racing against time to minimize climate-induced costs, governments must also consider environmental sensitivity and responsibility in their urban planning and development programs. "Mitigation" and "adaptation" are two overarching climate change response strategies adopted to combat global warming. The former aims at reducing the greatest culprit of climate change - greenhouse gas emissions; the latter addresses effective response strategies to battle the impacts of global warming. Both "mitigation" and "adapation" measures have to be executed in tandom to take effect; they also require wide public support to minimize climate change-associated risks and threats. With that, both mitigation and adaptation solutions can ensure humanity a chance at sustainable survival in the face of global warming-triggered environmental and social changes.

I have listed the development of "a Cultural Capital, a High-Tech Metropolis, a Tourism Destination and a Low-Carbon City" as my four administrative priorities since I took office. In 2011, Tainan City was recognized by the Environmental Protection Administration of the Executive Yuan as the only paragon low-carbon city in southern Taiwan. Eight carbon reduction categories, and "Perfect Ten" (ten

action plans) for "Low Carbon City of Tainan" were unveiled as follows: building sustainable communities; promoting sustainable cultural tourism; supporting green energy solutions; bolstering Tainan's eco-city programs; installing high-efficiency, sustainable transport services; encouraging sustainable living; community commitment to recycling, reuse and upcycling; encouraging sustainable building practices, creating sustainable campuses, and international education engagement programs, totaling 59 measures, and 113 courses of action. The goal is to make low-carbon lifestyle a movement for all.

Upon reviewing the city's adaptation capabilities and establishing a robust, integrative operation model, the City of Tainan is honoring "The National Climate Change Adaptation Policy Guidelines" and adopting a bottom-up planning method to consolidate consensus, and formulate "Tainan City Climate Change Adaptation Framework," in hopes of transforming Tainan into a climate-resilient city for better climate adaptation.

Transforming Tainan into a low-carbon city is a vision shared by every citizen; the City Government is committed to making that vision a reality. The development of a robust adaptation framework would for sure strengthen Tainan City's climate mitigation and adaptation policymaking.

Tainan Mayor, William Lai 賴清德

Chapter 1, Foreword

Human-driven overdevelopment triggered by the ballooning human population has severely depleted natural resources and fossil fuels, severely disrupting the carbon cycle and greenhouse effects of the natural environment, and leading to a warming climate system; this warming climate system has been scientifically proven to impact global economy, food supplies, the balance in the ecosystems, and regional security. To address the many crises led by climate change, nations worldwide have long begun formulating and promoting a myriad of mitigation measures by emissions reduction, which includes: improving energy efficiency, developing new energy solutions and renewable energies, and exploring new technologies to reduce greenhouse emissions.

International climate actions for mitigation and adaptation are now in full force. Back in Taiwan, the lack of natural energy resources has forced the country to heavily

depend on energy imports. With that in mind, Taiwan has included "energy conservation and carbon emissions reductions" and "climate-adaptation" into its administrative policymaking. Since 2010, the City Government has begun a full-bore campaign on transforming Tainan into a carbon-neutral city; in December, 2012, "Self-Governance Statute for a Low-Carbon City" was unveiled for implementation. A year later, a local climate adaptation project was officially launched in keeping with The National Climate Change Adaptation Policy Guideline. A local adaptation action promotion platform was inaugurated accordingly to effectively integrate local support resources, conduct a climate change impacts assessment, and formulate adaptation policy responses.

Tainan Mayor William Lai is committed to his administrative vision of "building a carbon-neutral, livable city perfect for dreaming, professional fulfillment, falling in love, marriage, and leisure living." Through intersectoral coordination and partnerhip, "Climate Action: Tainan City" will integrate and supervise the execution of every climate-smart project to effectively reduce greenhouse-gas-induced impacts on Tainan, and transform it into a low-carbon city that is also "a Cultural Capital, a High-Tech Metropolis, a Tourism Destination and a Community of Sustainable Living."

Chapter 2,
Cityscape and Socioeconomic Status

Tainan is your starting point if you wish to get to know Taiwan.

The very origin of Taiwan's contemporary history began in Tainan. In 1624, the Dutch built a small port here, thus beginning the period of Dutch rule. Tainan was established as the capital of Taiwan Prefecture, and remained so during the rule of Ming and Qing dynasties, totaling 264 years, until 1887. The rich history has defined Tainan's cityscape with the most number of historical monuments and cultural landmarks in Taiwan. It is also home to Taiwan's most historic and vibrant temple festivals and carnivals rooted in folk religions, scrumptious snack food, and an amazing array of local specialties. Tainan also boasts the biggest lagoon, two world-class wetlands, two national scenic areas, and one national park. Tainan's diverse natural landscape and cultural strengths make the city Taiwan's homestead, and a cultural capital. You will discover Taiwan's histories, cultures, traditional art, snack food and natural ecosystem encapsulated in this amazing city. Tainan's many allures are being spotlighted, and the city is poised to become a tourist destination of low-carbon footprint, unforgettable eco-tours, and lifestyle wellness.

2.1 Geographic Overview

Tainan is home to a population of 1.88 million. With an area of 2,192 square kilometers, Tainan accounts for 6% of Taiwan's total size. It is situated in the center of Jianan Plain, Taiwan's largest alluvial plain, and bounded by mountains and oceans all around. The eastern region is upraised, while the western region is flat and even. Tainan borders the frontal region of the Central Mountain Range in the east, and faces the Taiwan Strait in the west, overlooking Penghu islands. Tainan has a total of 37 administrative districts, and 752 wards. The total area is expansive, with a hexagonal shape. See Diagram 2-1.

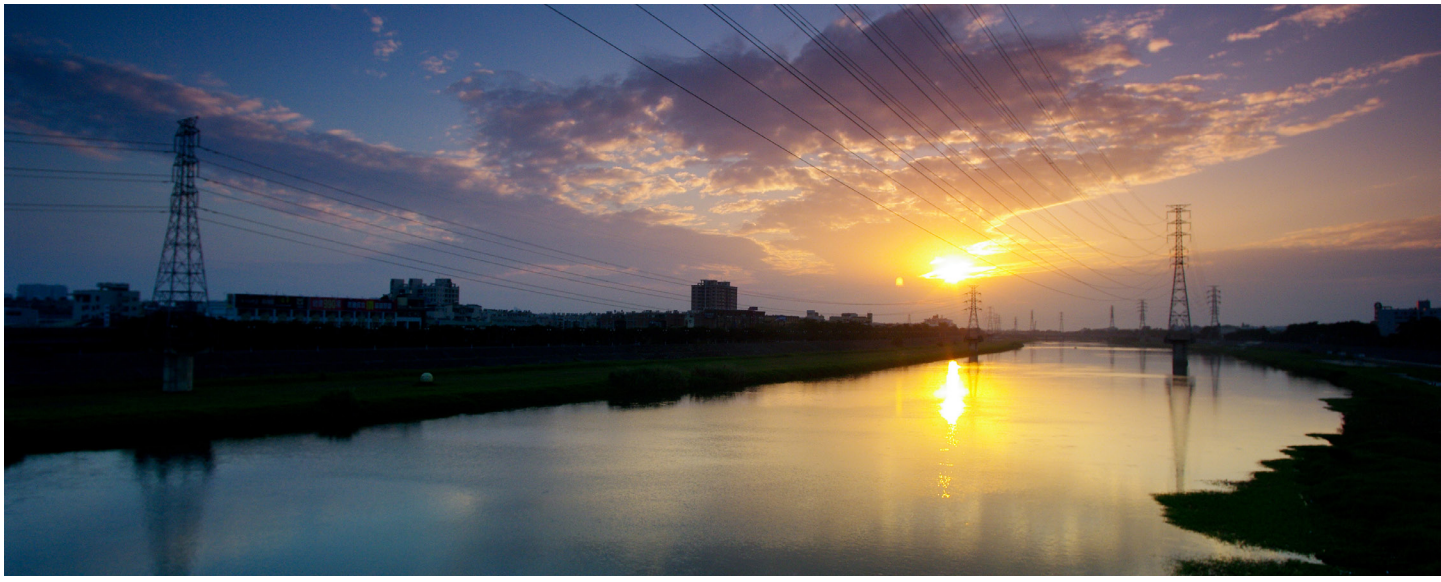
Diagram 2-1 Administrative Districts in Tainan City

The city was also the earliest development in Taiwan, rightfully the cradle of Taiwan history. The coastal areas composed of Daofeng Neihai ("inland shore"), Taijiang and Neihai lagoons; but most of these regions have given way to artificial terrains. Two world-class wetlands are situated in Tainan (Zengwen Estuary Wetlands, at 3,218 hectares in size; and Sicao Wetlands, at 547 hectares in size), six national-class wetlands (Bajhang Estuary Wetlands, at 635 hectares in size; Beiman Wetlands, at 2,447 hectares in size; Cigu Salt Mountain Wetlands, at 2,997 hectares in size, Yanshuei Estuary Wetlands, at 635 hectares in size, Jianan Irrigation Canal Wetlands, at 1,383 hectares in size, and Bajhang Midstream Wetlands, at 363 hectares in size),

Plus three community-class wetlands (Guantian Wetlands, at 15 hectares in size, Baihe Elementary School Artificial Wetlands, at 0.4 hectare in size, and Chia Nan University of Pharmacy & Science Artificial Wetlands, at 1 hectare in size). These eleven wetlands are sized at 12,241.4 hectares in total. In 2010, with the endorsement of the central government, Tainan established the country's only national park purposed for wetlands conservation.

Tainan also boasts abunddant water resources, with Baihe Reservoir, Zengwen Reservoir, Wusanto Reservoir, Nanhua Reservoir, and Hutoupi Reservoir across the district, accounting for 40% of the water supplies available in Taiwan. Zengwen Reservoir, a dam with the largest water storage capacity in Taiwan, sits astride Chiayi and Tainan. It is credited for the development of successful agricultural and high-tech services in the city.

Almost all the rivers within Tainan City travel in an east-west direction before they flow into the Taiwan Strait. Rivers in Tainan that fall under the jurisdiction of the central government include: Bajhang River (a river bordering Chiayi County), Jishuei River, Zengwen River, Yanshuei River, Erren River (a river bordering Kaohsiung City). Among which, Zengwen River is the fourth longest river in Taiwan.



The primary pollutans impacting Tainan's rivers are: household wastewater, industrial wastewater, and wastewater from animal husbandry (livestock). For many years, RPI estimates of the city's rivers indicate an above-medium pollution level. As the City Government actively promotes a lineup of pollution treatment programs, and works with the Environmental Protection Administration of the Executive Yuan to unveil a variety of measures, river pollutions in Tainan City have been effectively controlled. A comparison survey between 2009 and 2010 on RPI's recorded by the pollution monitor station erected on Jhaigang Bridge over the heavily polluted Jishuei River show that pollution has been successfully controlled: its pollution level had dropped to medium level. Rivers with more than 10% of pollution treatment success rate have been documented by these monitor stations at these sites: Jishuei Bridge over Jishuei River (the former Tiesian Ward) and Jhaigang Bridge, Sinwan Bridge and Fenghua Bridge over Yanshuei River, and Shihan Bridge over Erren River. The RPI in these streams has shown a consistent improvement over the years. In particular, pollutions in Erren River, Yanshuei River and Jishuei River have dropped significantly, and water quality here has largely improved.

2.2 Population

The total population of Tainan City was figured at 1,884,284 at year-end 2014, with a population density of 859.75/ km^2, higher than the national average of 647.47/ km^2. The shifts in the city's population over the years (see Diagram 2-2) indicate a steady growth, with the exception of 2010, when the population dropped slightly. Statistics show that Yongkang District has the highest population, followed by East District, whereas Longci District is the least populated. Jiali is the most densely populated District, followed by East District; Nanhua is the most sparsely populated District. At present, Tainan's population is mostly concentrated in the River South Region, distributed across YongKang District, East District, Annan District, North

District, South District, and West Central District, and accounting for two-thirds of the city's population. This distribution is caused by the modernization in the River South Region, which is now a modern metropolis. The River North Region remains agriculturally-centric.

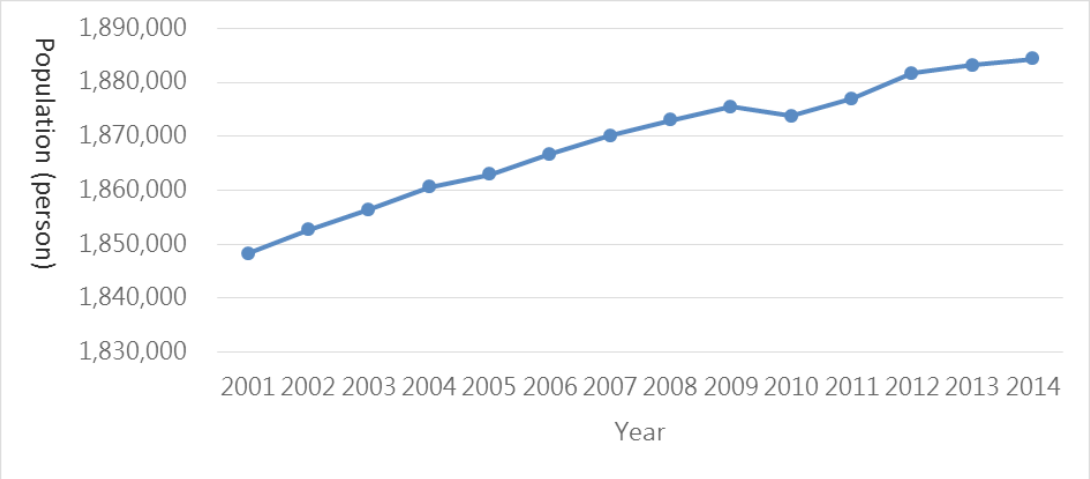


Diagram 2-2 Population Shifts in Tainan City Over the Years

2.3 Land Use

318,931 tracts of public property are currently registered with Tainan's Land Administration Bureau, totaling 77,220.46 hectares; 1,424,385 tracts of private property are government-registered, totaling 132,755.793 hectares. In whole, there are 1,743,316 pieces of land registered with Land Administration Bureau, totaling 209,976.253 hectares. The City of Tainan is home to the following industrial compounds: Sinying Industrial Park, Guantian Industrial Park, Yongkang Industrial Park, Liouying Technology Industrial Park, Yongkang Technology Industrial Park, Tree Valley Park, Longci Industrial Park, Sinshih Industrial Park, Baoan Industrial Park, Jiayi Industrial Park, Syuejia District Industrial Park, Nanbu Section Industrial Park, Anping Industrial Park, Tainan Technology Industrial Park, Tainan Environment

Technology Park, and Southern Taiwan Science Park (Tainan Park). More than 8,000 plants and factories are stationed across the aforesaid industrial estates.

Tainan is a city rich with historic and cultural treasures; it is also home to 22 National Historic Monuments, and 156 Municipal Historic Places, including: Fort Provintia, Taiwan Confucian Temple, The Koxinga Temple, Fort Zeelandia, Eternal Golden Castle and many more. Fort Provintia, among which, is recognized as a world-class historic destination. The cityscape has also become more vibrant with a myriad of cultural and tourism events, such as Dongshan Coffee Festival, Beehive Rockets Festival in Yanshuei, and Koxinga Cultural Festival. The City, noted for its incredibly delicious snack food, has been lauded by the Wall Street Journal as a veritable food museum. Blessed by its flourishing cultural tourism, Tainan has reinvented itself into a modern metropolis. Other than the aforementioned historic monuments and cultural tourism programs, the Golden Beach and bird-watching in Cigu for the migratory black-faced spoonbills also offer tourists another type of leisure option. In other words, the City of Tainan is a tourist mecca with something for everyone.

2.4 Economy and Industrial Makeup

I. Agriculture

Tainan has a subtropical climate, with pleasant weather and abundant rainfall. The expansive, fertile Jianan Plain sits nearby Tainan, with rich natural resources available for successful agricultural development and economic growth. Boasting a superb geographic makeup, Tainan has taken advantge of its level, produce-ready and arable land, sized at more than 90,000 hectares. It is the largest tillable tract in Taiwan. Tainan's production of mango, pineapple, lotus seed, water caltrop, flax, Taiwan tilapia, milkfish, pork, and orchids is ranked top three in the country. Tainan produces three out of four of Taiwan's flagship export products: mango, Taiwan tilapia and moth orchid.

At present, Tainan is hard at work developing high-value-adding, quality agriculture exports of flowers and fruit. The growth in orchid exports is the most noticeable in recent years. In 2012, Taiwan's flowers and saplings export output hit a historic record of US$177.18 million; US$165.66 million of which belonged to orchid exports, accounting for 93% of the total flower export value. "Taiwan Orchid Plantation," located in Tainan's Houbi, is the primary floristry production outpost. One out of every six orchids in the world comes from Tainan. It is estimated that export orders in the next three to five years will reach NT$9.26 billion to hit a record high. The status of Tainan's arable areas and farm produce by year-end 2014 is as follows:

1. Arable Land Size

As of the end of 2014, there were 93,023.74 hectares of arable land in Tainan

City; 55,418.11 hectares - or 59.57% - were designated for short-term farming; 31,975.5 hectares - or 34.37% - were assigned to extended farming. In addition, 5,630.13 hectares - or 6.05% - were designated as a space for agriultural tourism.

2. Staple Crop

(1) Rice: By year-end 2014, 135,489 metric tons of rice were harvested from a total of 24,470.17 hectares of land.

(2) Mango: By year-end 2014, 75,784 metric tons of mango were harvested from a total of 7,025.83 hectares of land.

(3) Pineapple: By year-end 2014, 44,897 metric tons of pineapple were harvested from a total of 1,131.91 hectares of land.

II. Fisheries

Tainan's coastal soil consists primarily of alkaline alluvial. The high concentration of saline in the soil makes the land unsuitable for farming; fish farms were built instead for aquaculture. Milkfish is the signature aquacultural fish in Tainan. Many kinds of snack food featuring milkfish are also available here as a primary tourist draw. There are eight fish ports in Tainan City; among which, Anping Port is the biggest port in Taiwan. It has the city's largest catch, and the greatest ship tonnage. Other fish ports focus on offshore aquaculture.

The City of Tainan boasts a rich, expansive fishing ground; the coastline, at 54.25 kilometers in length, starts from Bajhang River in the north, and ends at Erren River. In recent years, the City Government has invested heavily to improve fishing techniques, and bolster fishing facilities. Fish farming has flourished as a result.

1. Aquaculture Production

By the end of 2014, aquacultural production reached 75,435 metric tons; among which, offshore aquaculture accounts for 677 metric tons - or 0.89% - of total

production; coastline fisheries , 138 tons - or 0.18% - of total production; oceanic fish farming, 5,978 tons - or 7.92% - of total production; inland aquaculture, 68,612 tons - or 90.96% - of total production.

2. Size of Fish Farm Enclosures

By the end of 2014, the size of fish farm enclosers were measured at 13,364.22 hectares. Among which, single-species fish culture accounted for 9,085.42 hectares - or 67.98% - of total fish farming size; composite fish culture, 3,152.57 hectares - or 23.59% - of total fish farming size. 1,126.23 hectares of fish farm enclosures- or 8.43% - are left in disuse for restoration.

III. Livestock

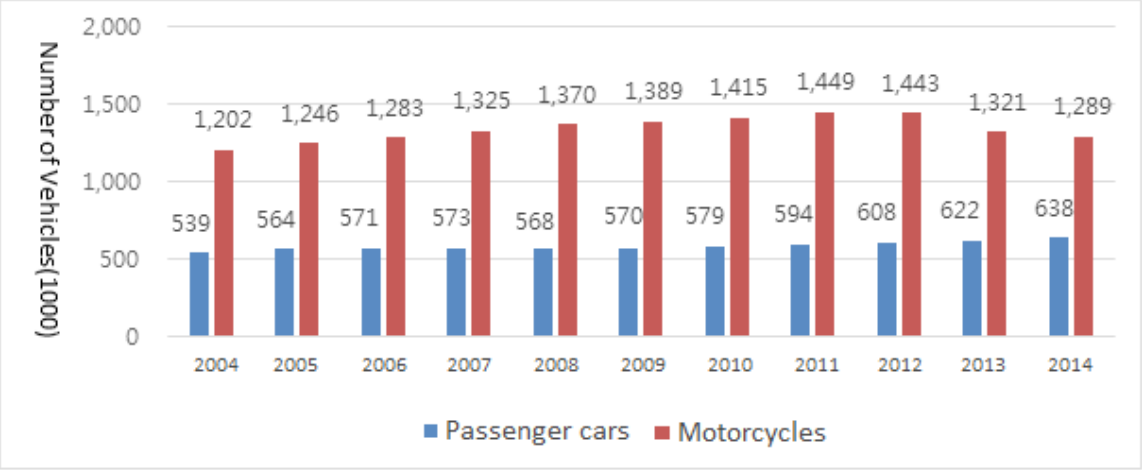
The City of Tainan has continued to promote and support animal husbandry. It encourages production growth and breed improvement programs for professional, commercialized management. Milk production in Bawong Dairy Farm of Liouying District forms one-sixth of the country's total dairy output. By the end of 2014, there were 24,096 dairy cows, and 572,347 pigs in the city. Chicken, duck, geese, and turkey are the primary poultry species, with chicken and duck being the staple. There were 12,321,000 chickens , 785,000 ducks, 275,000 geese, and 42,000 turkeys.

2.5 Transport

Motor vehicle emissions such as carbon monoxide, hydrocarbon and nitrogen oxide are the primary contributors to mobile source air pollution. According to statistics from the Ministry of Transportation and Communications, by the end of 2014, there were 1,927,000 motor vehicles, with motorcycles as majority (at

1,289,122, or 66.9%), followed by small passenger cars, (at 537,564, or 27.9%), large and small trucks, at 12,420 (0.6%) and 81,820 (4.2%), respectively.

See Diagram 2-3 for the shifts in the status of registered motor vehicles over the years. The number of vehicles appeared to grow before 2007, but has since stalled, even dropped slightly. Growth picked up again between 2010 and 2014. The number of registered motorcycles is increasing over the years (with a growth rate of 24.5% between 2001 and 2012). But that number slid between 2013 and 2014. By 2014, the number of registered motorcycles dropped to 1,289,000. The decrease is contributed to City Government's campaign to replace motorcycles with two-stroke engines, and its subsidization program for electric mopeds.

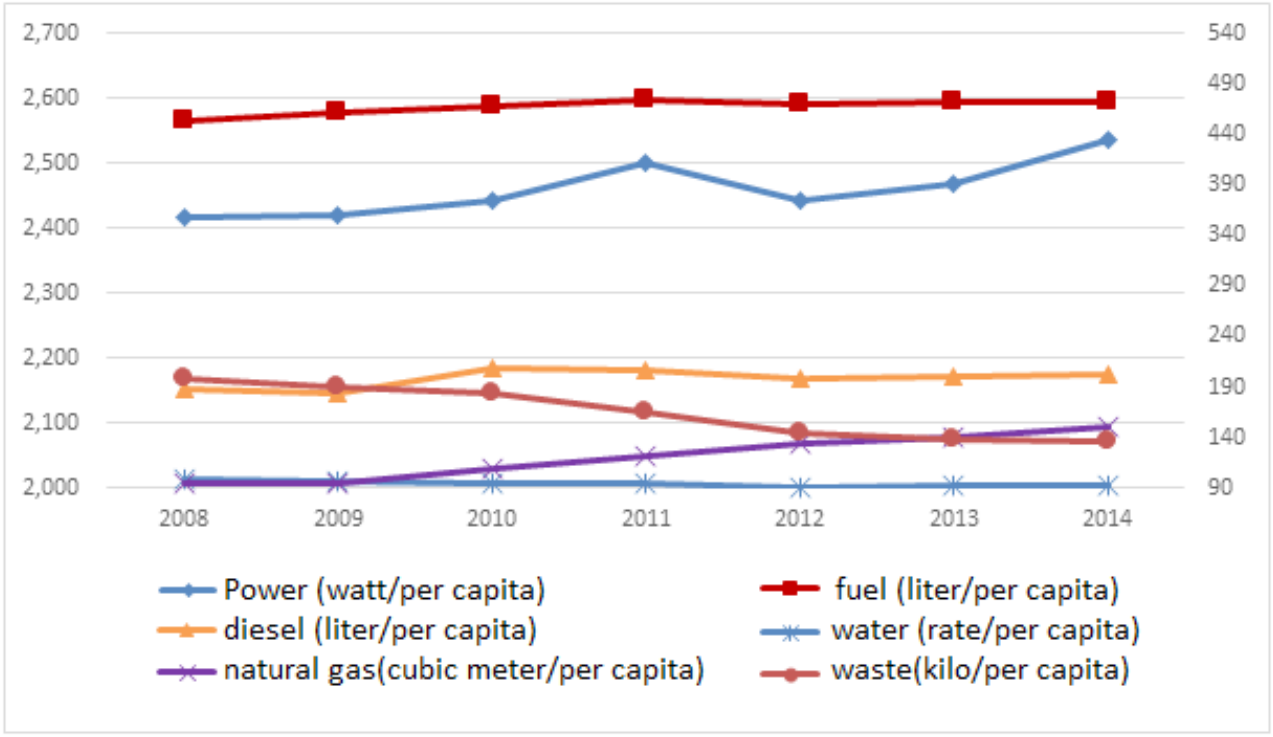


2-3 Shifts in Registered Motor Vehicles Status Over the Years

2.6 Energy Use

Consumption status of the city's five major energy sources (electricity/fuel/gas/water/waste) has been summarized and explored in the aforementioned sections. There is a strong correlation between population and energy use; and, in a bid to

place a sharper focus on the shifts of energy use in Tainan City, a year-to-year trending diagram is shown in 2-4 that explores energy use per capita per year, after excluding non-residential power and water use, to serve as frame of reference for the City Government's energy use evaluation. Overall, the use of power, fuel/diesel, natural gas and water per capita in Tainan City is growing year after year; the trend is particularly obvious before 2005. But since 2006, with the exception of diesel use, which reflects an increase, the consumption of electricity, fuel, and gas has either slowed or dropped; water use has noticeably dropped. The volume of waste collection services has consistently and successfully dropped thanks to a more rigorous recycling and waste classification program.



2-4 Shifts in Energy Use (electricity/fuel/natural gas/water/waste) over the Years

2.7 Greenhouse Gas Emissions

To better monitor the output and status of greenhouse gas emissions in Tainan City in a bid to formulate a doable goal and strategy for carbon reduction, and transform Tainan into a Carbon-Neutral City, the City Government completed an inventory on greenhouse gas emissions between 2001 and 2013 by communities bordering direct municipalities, consistent with the Environmental Protection Administration's "Guidelines on Greenhouse Gas Emissions Inventory and Measurement by Local Governments." 2010 was designated as base year. The data inventoried was verified by a third-party certification authority.

The City of Tainan referenced data provided in the Guidelines, and categorized the sources of greenhouse gas emissions into seven sectors: residential and commercial services; industrial energy services; transport services, industrial manufacturing, agriculture, forestry, and waste management. Statistics obtained from actual inventory was used as priority reference for quantifying data, followed by estimation obtained from emission factor calculation, a method more widely adopted (the primary calculation method is based on the actual activity data; e.g: emissions output = activity data x emission factor).


Statement TW15/00002GG

Greenhouse Gas Verification Statement

The inventory of Greenhouse Gas emissions in year 2012 of

Tainan City Government
(Government agencies)

No. 6, Sec. 2, Yonghua Rd., Anping Dist., Tainan City 708, Taiwan (R.O.C)

has been verified in accordance with ISO 14064-3:2006 as meeting the requirements of

ISO 14064-1:2006

Direct emissions
15,305,910.0289 tonnes of CO_2e
Energy indirect emissions
12,338,017.2841 tonnes of CO_2e
Direct emissions and energy indirect emissions
27,643,927.313 tonnes of CO_2e

Authorized by

Chief Operation Officer of Eastern Asia
Date: 12 January 2015
Version 1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Greenhouse gas emissions inventory conducted in 2013 on Tainan's various administration districts indicated that the total CO_2-e was 25,680,000 metric tons, with the industrial energy services sector as the biggest contributor of CO_2-e, at 17,760,000 metric tons, or 67.17%. It is followed by transport services, at 12.26%; and residential and commercial services, at 11.80%. The remaining groups are

ranked as follows: industrial manufacturing, 1,146,700 metric tons of CO_2-e; waste management, 454,800 metric tons of CO_2-e; and agriculture, 138,300 metric tons of CO_2-e, accounting for 4.47%, 1.77%, and 0.54% of the emissions total, respectively. In 2013, per capita emissions was 136,300 metric tons. However, if we exclude industrial carbon emissions from both industrial energy and industrial manufacturing services, Tainan's CO_2-e total in 2013 was 6,770,200 metric tons; per capita CO_2-e was 3.60 metric tons.

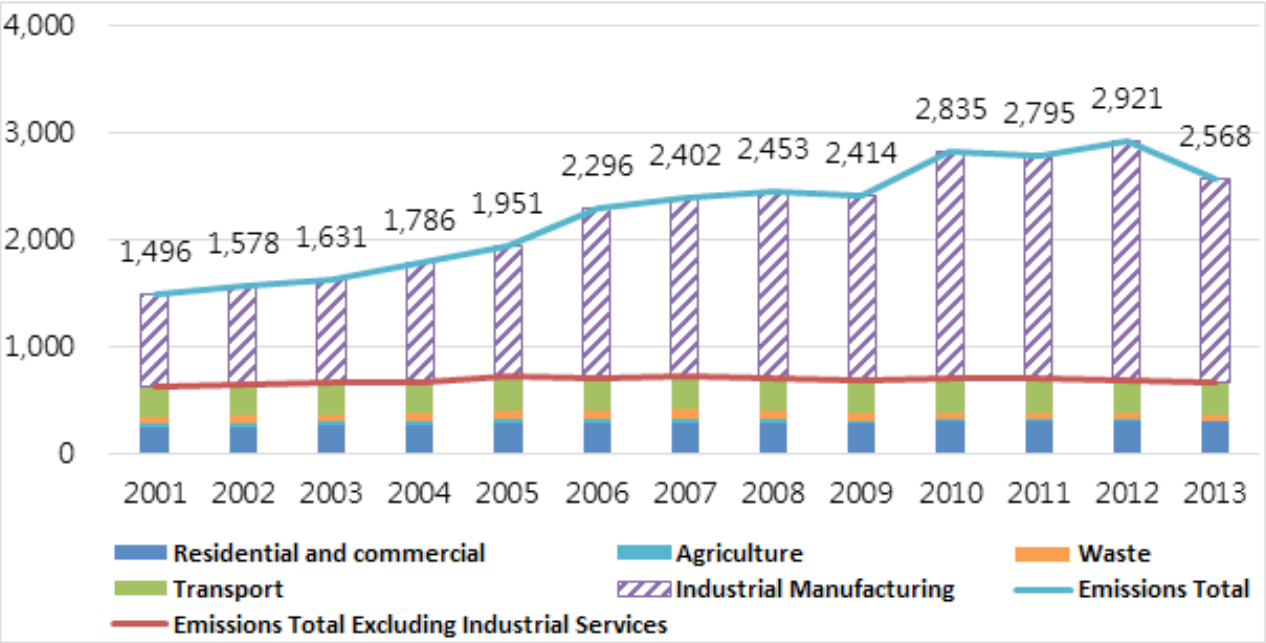
The diagram shows that between 2001 and 2013, greenhouse gas emissions in Tainan City have increased steadily, except for the slight stagnance between 2008 and 2009. If we exclude factors of fuel use by the industrial services and manufacturing sector, greenhouse gas emissions output in Tainan appear growing slowly year by year.

The status of greenhouse gas emissions by the five sectors between 2001 and 2013 are summarized as follows: the energy sector has signified a steady year-by-year increase due to heavier reliance on fuels; emissions output by the residential and commercial sector, and transport services sector have dropped, thanks to the City Government's promotion of public conveyance and energy stewardship campaigns. Emissions by industrial manufacturing sector have grown over the years due to the development of semiconductor production. Emissions by agriculture sector has dropped, due to shifts toward industrial development and the decrease in farming and animal husbandry. The forestry sector is credited for its carbon sink capabilities, so there are minimal changes. Emissions by waste management sector appear to grow in the first few years, but drop in the last years, due to waste reduction enabled by waste sorting and better recycling programs.

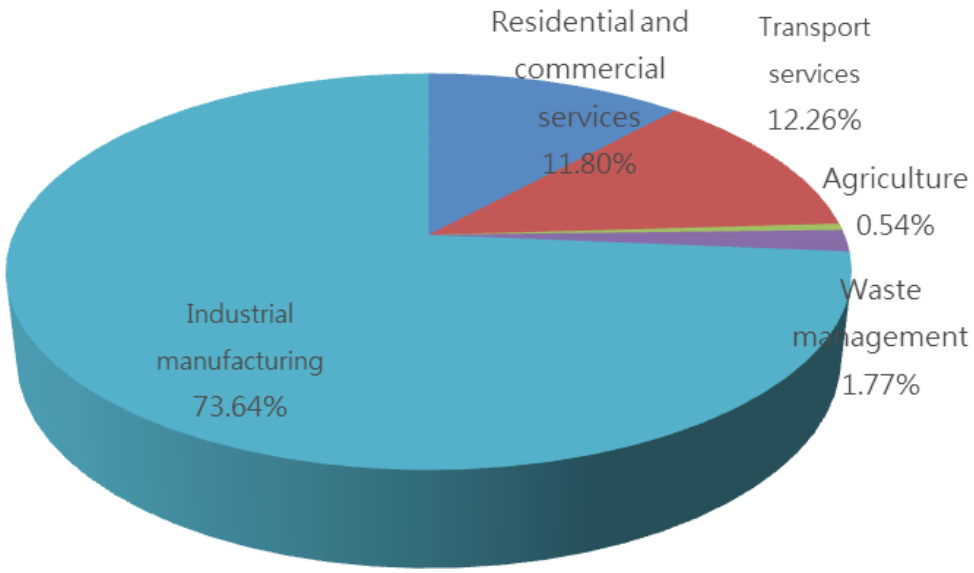
2-1: GHG Emissions by Sectors between 2001 and 2013

Year	Residential and Commercial Services	Industrial Energy	Transport Services	Industrial Manufacturing	Agriculture	Forestry	Waste Management	Emissions Total
2001	252.86	783.18	278.17	85.96	34.75	-38.17	60.73	1,495.65
2002	260.80	834.16	286.72	85.96	33.03	-38.16	76.92	1,577.59
2003	270.31	875.52	292.67	85.96	32.49	-38.17	73.89	1,630.85
2004	278.29	963.81	285.37	149.68	32.19	-38.17	76.62	1,785.96
2005	289.98	1,087.84	321.41	135.99	31.94	-38.11	83.89	1,951.04
2006	296.90	1,386.27	297.56	197.15	31.39	-38.17	86.36	2,295.62
2007	297.21	1,430.06	316.11	235.54	29.58	-38.14	93.39	2,401.89
2008	292.87	1,446.97	302.55	287.95	28.18	-38.14	94.14	2,452.66
2009	285.61	1,451.47	299.59	266.73	27.50	-38.11	83.17	2,414.08
2010	306.88	1,831.13	320.53	296.34	16.00	-38.12	63.95	2,834.83
2011	311.34	1,817.47	323.22	266.31	17.48	-38.12	59.15	2,794.96
2012	304.48	1,944.38	312.48	281.33	17.74	-38.12	61.08	2,921.49
2013	302.89	1,776.29	314.82	114.67	13.83	-38.20	45.48	2,567.98

Unit: 10,000 metric tons of CO_2-e
Forestry sector is excluded from the emissions total list due to its carbon sink capabilities



2-5: GHG Emissions Status between 2001 and 2013 in Tainan City



2-6: Composition of GHG Emissions in Tainan City, 2013

Chapter 3, Low-Carbon Actions in Tainan

Impacted by the escalating climate crisis, members of the international community have defined ecological sustainability as the core and objectives of their eco-city and low-carbon city programs; eco-city development is poised to be the top priority as nations invest tremendous resources and formulate smarter climate policies. Carbon waste elimination is the common goal shared by campaigners of eco-city, green capital, and eco-town, to live within environmental means, and become carbon-neutral. Included in these campaigns are several specific action plans, including: the protection and restoration of the natural environment and wildlife habitats, reexamination and adjustment of existing city layout and planning, the change in travel behavior and transport options, the recycling and upcycling of our resources, and smarter energy use, plus sustainable economic development.

The spirit of Tainan's low-carbon city initiative lies in the following: by promoting "quality living," "employment in place," and industrial development" for the next generation through the establishment of green infrastructure and carbon-neutral living, the City Government aims at rewarding the citizens of Tainan for lifestyle improvement and greater livelihood prospects with benefits and resources amassed from these green programs. It is an initiative that "serves the people for the people." Economic development successes and attainments by a carbon-neutral Tainan would act as a green paragon for all local administrations in Taiwan.

3.1 Blueprint and Roadmap

3.1.1 Blueprint

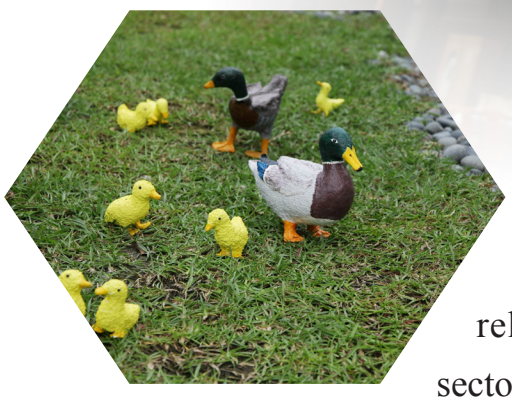
Tainan City has long been lauded as "the cultural capital of Taiwan," given its rich history. The city's historic and cultural essence is made more prominent by the

many ancient historic monuments that line the streets and alleys, which have solidified local awareness of the people who live, and grow up here. In addition to keeping pace with their leisurely lifestyle, the people of Tainan also strongly identify with their community, and they display an intense interest in community building.

The City Government has actively promoted a series of award-winning community-centric programs, such as healthy city, a clean homestead, and demonstrative eco-friendly communities. Since its upgrade to a direct municipality, the City of Tainan was given greater resources and many more talents, and it redefined the City Government's urban planning with a more future-proof outlook. To effectively address global warming and climate crises, the City Government redirects its municipal governance toward an adaptation-centric, carbon-neutral focus. With excellence, benchmark-setting, and infrastructure layout at the core, the City Government adopts a systematic, progressive approach to promoting low-carbon living, and low-carbon communities across the city, to make Tainan a carbon-neutral and resource-upcycling community.

The City would take advantage of its unique local features to smartly and effectively integrate a lifestyle of energy stewardship into Tainan's prevalent community awareness, and a cultural climate of leisure living. Its next step would be leveraging its existing industrial strengths, plus research and development potentials to fully promote green infrastructure and sustainable industries with rigorous finance planning and conscientious policymaking. The goal is to encourage and support the growth of a green economy while achieving carbon neutrality.

Beside low-carbon administrative policies and environmental-friendly public



services, the City Government vows to formulate actionable plans and business models, while relying on the voluntary partnership of the private sector, the support and mutually-constructive feedbacks from corporate entities, to ensure that the vision of building a carbon-neutral city is no longer limited to government-driven infrastructure services; rather, it would be a concerted program spearheaded by citizens and business establishments, to redefine Tainan's city branding campaigns and competitiveness.

That said, Tainan's carbon-neutral campaign would build on the city's experience with effective low-carbon measures and infrastructure, and continue on the path of a partnership between public and private sectors, collaboration among industries, the government, and academia, and intersectoral alliances. Eight carbon reduction strategies, including: renewable energies, environmental greening, sustainable transport services, sustainable building practices, sustainable campuses, sustainable living, resource recycling/reuse/upcycling, and energy conservation would be integrated into Tainan's low-carbon city development and sustainable home programs, implemented through a bottom-up, progressive approach. It would begin with communities, wards, and administrative districts to cover the whole cityscape,

attaining Tainan's vision of carbon neutrality and sustainability.

The creation of Tainan's carbon-neutrality blueprint begins with "Carbon-Neutral Tainan for Livability, Leisure, and Wellness," followed by a two-stage carbon waste elimination goal (reducing GHG emissions by 11% from business-as-usual levels in 2014, and 22% of GHG reduction from BAU levels by 2020). Next, the City Government works in accord with its eight carbon reduction strategies (energy conservation, sustainable living, sustainable transport services, resource recycling, sustainble buildings, renewable energies, sustainable campuses, environmental greening) to launch "Perfect Ten: Low-Carbon Actions in Tainan." The ten solutions are: building sustainable, low-carbon communities; promoting low-carbon cultural tourism; alternative applications of green energies; expanding functionalities of eco-cities; installing high-performance, sustainable public transport; supporting a sustainable lifestyle for all; promoting community commitment to recycling, reuse and upcycling; promoting sustainable building practices; pioneering in sustainable campuses; and international education engagement. "Perfect Ten" helps to enforce and fulfill the City Government's low-carbon blueprint, to attain total carbon neutrality and carbon waste elimination.

3.1.2 Carbon Reductions

At the president's request, the Cabinet established "Green Energy and Low Carbon Committee" to consolidate and organize energy conservation and carbon neutrality projects launched by government agencies of various levels. With that, the Cabinet enlisted the support of ministries with vested interests in the project to formulate a "National Energy Conservation Master Plan" to map out a general goal to achieve carbon neutrality, support the growth of a green economy through effective

policymaking, thus building an energy-aware and low-carbon society.

According to the master plan, Taiwan's carbon waste emissions by 2020 should be reduced to its 2005 levels; by 2050, the 2000 levels (per "National Energy Conservation Master Plan," May, 2010). Vowing to make Tainan a carbon-neutral city, in 2015, the City Government completed the GHG inventory for years between 2001 and 2013: in this inventory, 2010 was designated as the base year, and all the data and figures would not be released until they are verified by a credible third party. With that in mind, the City Government estimated the BAU levels (a "business-as-usual" baseline is often associated with high GHG emissions in absence of effective control measures) of the next ten years, based on the 2001-2010 GHG inventory, and took into account the effectiveness of low-carbon measures promoted in the past, future campaign strategies and financing, and carbon waste reduction goals determined by several advanced nations. Upon careful evaluation, the Tainan City Government determines that its carbon waste emissions by 2020 should be reduced to its 2010 base year level, with an additional 10% GHG reduction.

I. GHG Reduction Goal

In considering that the goal of the carbon-neutral city campaign is building a sustainable home and living space, each one of the City Government's low-carbon measure focuses on behaviors associated with citizens' daily living. On the other hand, GHG emissions of the industrial service sector are determined by specific competent agencies, and they could impact the nation's economic planning; therefore, determining reduction measures and goal-setting in the foreseeable future would pose certain challenges. That is why the City Government has excluded GHG waste elimination goals by the industrial sector from its energy conservation master plan, but it would continue to execute industrial-generated GHG emission reduction campaigns.

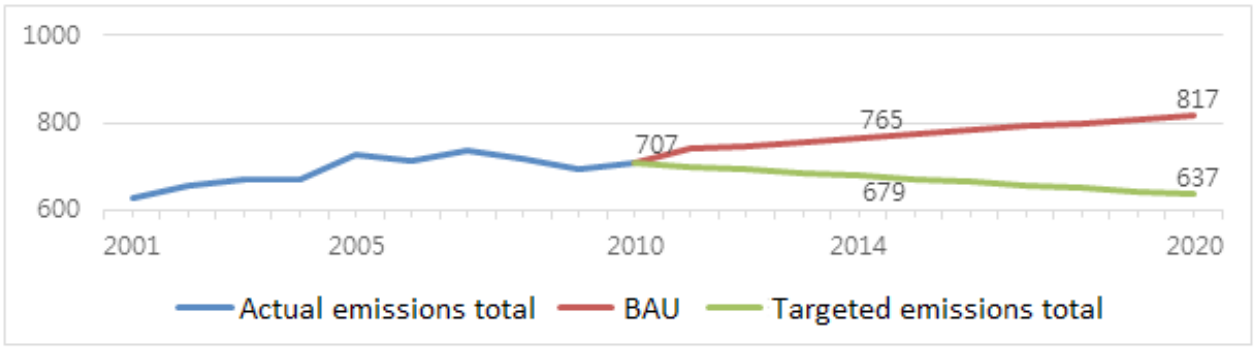
Not counting industrial CO_2-e emissions, the City of Tainan's GHG wastes were 7,070,000 metric tons in 2010. According to GHG emission trending between 2001 and 2010 in Tainan City, emission levels were indeed trending upward over the years; but they slowed beginning in 2007, and even dropped slightly. One can deduce that the decrease was likely associated with the financial crisis that causesd Taiwan's down market between 2007 and 2009. The economy recovered in 2010, but it also led to an increase in GHG emissions. Based on Tainan's GHG emissions growths between 2001 and 2010, the BAU levels and reduction status of the next ten years are as follows in Diagram 3-1; reduction target for the City Government's short and medium-term goals are as follows in Table 3-1. See below for summary.

1. Short-term Goal (2013 - 2014):

   The City Government hopes to cut Tainan's GHG emissions by 11% from BAU levels in 2014, totaling 860,000 metric tons of CO_2-e.

2. Medium-term Goal (2015 - 2020)

   The City Government hopes to cut Tainan's GHG emissions by 22% from BAU levels in 2020, totaling 1,800,000 metric tons of CO_2-e.



3-1 GHG Emissions and Reductions by BAU Levels

3-1 Tainan City's Short-term, Medium-Term GHG Reduction Goals Year-to-Year

Item	Base Year	Short-term		Medium-term					
	2010	2013	2014	2015	2016	2017	2018	2019	2020
BAU BAU levels	707.35	756.55	765.13	773.70	782.28	790.85	799.43	808.00	816.57
Emission Goal		686.13	679.06	671.99	664.91	657.84	650.77	643.69	636.62
BAU Reduction Goal by BAU levels		70.42	86.07	101.71	117.37	133.01	148.66	164.31	179.95
BAU Reduction ratio by BAU levels		9%	11%	13%	15%	17%	19%	20%	22%

Unit: 10,000 metric tons/ CO_2-e
The table excludes industrial GHG emissions.

According to Article 3, Paragraph 2 of Tainan City's "Self-Governance Statute for a Low-Carbon City," the City Government would inaugurate a Carbon-Neutral City Campaign Committee; and to meet the city's carbon-neutrality goals, it is the Committee's responsibility to determine specific reduction benchmarks, subject to review biennially. The benchmarks should also be made public knowledge on the Internet.

Carbon emission reduction benchmarks established in Tainan City are inspired by the ten benchmarks and examples launched here in Taiwan and overseas. Locality, feasibility, sustainbility and future-proofness were taken into account when the indexes were created; the City Government also reviewed the content of "Perfect Ten: Low-Carbon Actions in Tainan" and drew up the indexes, which contains eight major carbon reduction categories, and 29 benchmarks.

The eight major categories are: greenhouse gases, renewable energies, energy conservation, sustainable transport services, sustainable building practices, environmental greening, recycling, and sustainable living. See Table 3-2 for specifics.

3-2 Carbon Reduction Benchmarks

Category	Benchmark	Definition	Calculation
GHG	CO_2-e per capita	Total CO_2-e emissions per capita (ton/person)	Annual GHG emissions total ÷ population total
	Rate of progress achieved	Assessing rate of progress achieved to cut urban CO_2-e emissions	Annual CO_2-e emission reduction cut ÷ annual reduction target
Renewable energies	Wattage of renewable energy produced per unit size	With specific unit size as baseline to assess the extent of renewable energy services to be installed	Wattage of renewable energy produced ÷ total land size
	% of renewable energy produced	Using solar power and hydraulic power generation for calculation to determine % of renewable energy consumption	Renewable energy generation total ÷power production total

Category	Benchmark	Definition	Calculation
Renewable energies	% of population using renewable energy	Using solar power and hydraulic power generation for calculation to determine % of renewable energy consumption	Renewable energy generation total ÷ population total
	% of population using solar-powered water heater	Based on the number of households with solarized water heater to assess public interest in renewable energy solutions	Households with solarized water heaters÷ total number of households
No.of entrances Energy conservation	KW/per capita	KW/capita reflects citizens' effort in cutting power consumption	Total energy consumption÷ total population
	LED streetlamp coverage %	LED streetlamp coverage % is used to evaluate the success of LED campaign	Number of LED streetlamps ÷ total number of streetlamps
	LED traffic signals coverage %	LED traffic signals coverage in Tainan City	Number of roads installed with LED traffic signals ÷ total number of roads with traffic signals
Sustainable transport	Percentage of bike trails	With GIS data covering the country's traffic lanes as basis to assess % of bike trail use by public	Bike trail KM ÷ total roadway KM
	Public transport unit size mileage (km/m2)	Assessing the coverage of public transport services to be installed	Public transport mileage ÷ total land size

Category	Benchmark	Definition	Calculation
Sustainable transport	Percentage of public transport use (%)	Assessing the status and use of low-carbon means of transport	Mileage registered by low-carbon means of transport
	Percentage of sustainable modes of transport	Assessing public willingness to use sustainable modes of transport	No. of sustainable modes of transport ÷ total no. of vehicles
Low-carbon buildings	Percentage of green building floor size (%)	Compairing green building floor size and total floor size, to assess the progress of green building promotional campaigns	Green building floor size ÷ total floor size
	Percentage of low-carbon repairs	Using the percentage of low-carbon repairs to assess public interest in green buildings	No. of low-carbon repairs ÷ total repairs
Greening	Green coverage (%)	The percentage of urban green coverage in relation to the city's total size	(Parks + private gardens + wildlife and flora habitats and distribution) ÷ Total size projected for urban development
Recycling	Waste production per capita (KG/capita per day)	With the amount of waste generated per capita per day to assess emissions status after waste reduction	Waste production per day ÷ total population
	Waste collection per capita (KG/ capita per day)	Waste collection in the city per day (KG/capita)	Daily waste collection ÷ total population

Category	Benchmark	Definition	Calculation
Recycling	Percentage of kitchen compost collection (%)	With the percentage of kitchen compost collection to assess public interest in recycling	Kitchen compost collected ÷ waste production
	Percentage of resource recycling (%)	With the percentage of resource recycling to assess public interest in recycling	Amount of resource recycled ÷ waste production
	Water consumption per capita (Liter/ capita per day)	With non-industrial water consumption per capita per day as reference to assess public's water conservation status	Water for household use per day ÷ water supplied to total population
	Percentage of sewage treatment (%)	Sewage has been included in total treatment percentage	Number of households with sewage treatment services ÷ total number of households
Low-carbon living	Sustainable procurement	Assessing Tainan's green public procurement performance	Percentage of green procurement achieved
	Carbon management and carbon neutrality promotion (including carbon labeling)	Assessing the all-inclusiveness and prospects of Tainan's low-carbon campaign	Carbon management and carbon labeling execution reaches predetermined percentages
	Green tourism Reducing the burning of paper money	Assessing Tainan's green tourism and public participation status Assessing the extent of temple support for energy conservation programs	No. of green tourism participants Good deeds in replacement of paper money Rice in replacement of paper money

Category	Benchmark	Definition	Calculation
Low-carbon living	Percentage of green campuses (%)	Using the percentage of middle- and elementary schools participating in Education Ministry's "Green Campus Partners Network" to assess the level of participation	No. of green campuses ÷ total number of campuses
	Sustainable diet	Assessing the status of sustainable diets in Tainan City	No. of sustainable dieters
	Prevalence of Ecolife network	Communities sign up for a group account on Ecolife, pledge to honor the ten declarations, and register with their water and electricity meter numbers	Household users ÷ total number of households

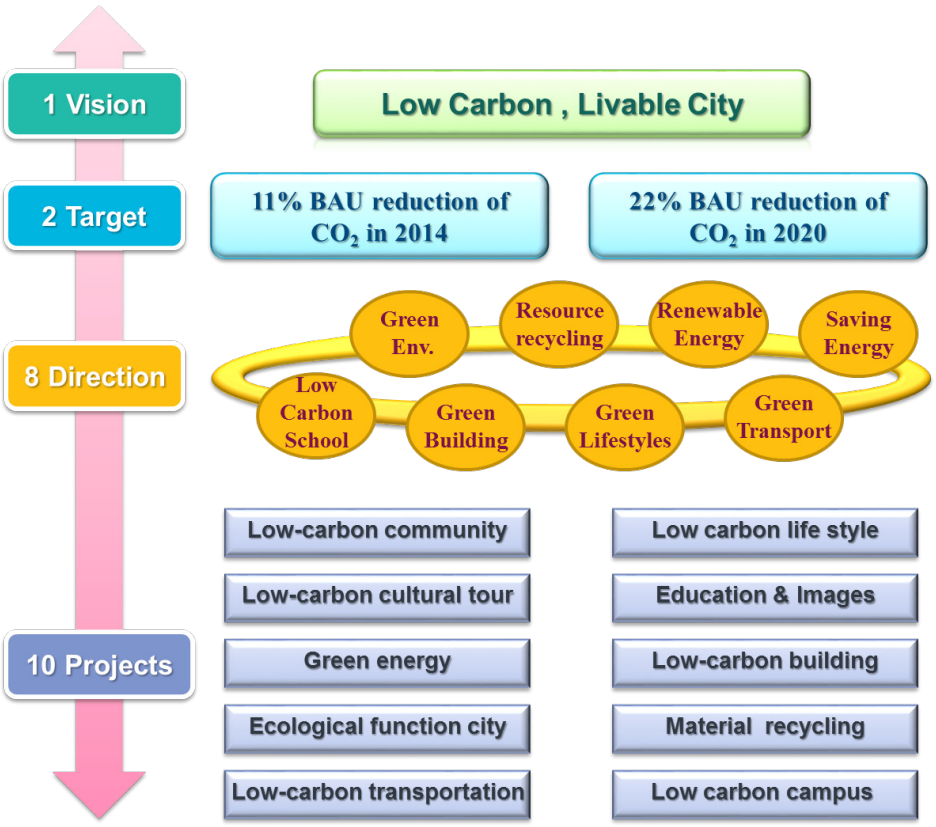
3.2 Carbon-Neutral City: Tainan

3.2.1 Framework

In meeting the aforesaid blueprint, emissions reduction goals and vision, the City Government would continue to work with its carbon-neutral city framework, unveiled in "Carbon-Neutral Year One: 2012," with Mayor Lai as cconvenor. The Mayor presided over several caucuses and symposiums, with attendees from the industry, the government sector, the academia, research agencies, and private groups for debriefing, so that a consensus could be reached to preserve locality and character, while achieving innovation and consistency. Tainan's Low-Carbon City Project Office spent

twelve months on "Rolling Wave " management, assessment, routine monitoring and reviews. In 2014, "Perfect Ten: Low-Carbon Actions in Tainan" (see Diagram 3-2) were enforced to continuously promote every carbon-neutrality solution, so that the notion of sustainability and bioconservation can deep-root in Tainan.

Other than the campaign, the City Government also pioneered the country in instituting "Self-Governance Statute for a Low-Carbon City" to testify the city's resolve in transforming Tainan into a carbon-neutral metropolis. The Statute went into effect following the third reading by Tainan City Council for final approval, and a nod from the Cabinet. It was promulgated for enactment on December 22, 2012. Tainan thus became the country's first direct municipality with "carbon-neutral city" as an administrative benchmark.



3-2 "Perfect Ten: Low-Carbon Actions in Tainan" (ten action plans) Framework

2012 was "Carbon-Neutral Year One" for Tainan City. With the establishment of Low Carbon City Project Office, resources have been successfully integrated to promote carbon neutrality, environmental protection and energy conservation measures. These policies were translated into specific courses of action; ideas into enforcement, so that environmental protection could be fully realized iin the City of Tainan. In the program emblem (see Diagram 3-3), the ten action plans are denoted in leaves to symbolize the deep-rooting of carbon neutrality and environmental sustainability in Tainan; they also signify a bottom-up creation of a low-carbon city. The ten action plans are: building sustainable communities, promoting sustainable cultural tourism, supporting green energy solutions, bolstering Tainan's eco-city programs, installing high-efficiency, sustainable transport services, encouraging sustainable living, community commitment to recycling, reuse and upcycling, creating sustainable campuses, and international engagement, etc.

Duties and the division of labor designated for the City Government's various departments for campaign promotion are detailed in Table 3-3. Bureau of Land Administration, Bureau of Urban Development, Tourism Bureau, Bureau of Economic Development, Agriculture Bureau, Bureau of Transportation, Environmental Protection Bureau, Department of Health, Public Works Bureau, Education

Bureau, and Water Resources Bureau are in charge of specific tasks of this program. Support agencies asked to assist with the program are: Department of Budget, Accounting and Statistics, Department of Finance, and Department of Legal Affairs. Every agency is assigned particular missions to facilitate program promotion, and the City Government hopes to provide actionable low-carbon solutions and create a sustainable environment with thorough planning and innovative policymaking to guide citizens and business establishments in Tainan City toward a future of green living.

3-3 "Low-Carbon Actions in Tainan" Visualized

3-3 Enforcement Measures

Action plan	Measures	Task
Sustainable communities	Low carbon communities	Sustainable community: Jioufenzih District
	Improvement assistance for sustainable communities	Improvement assistance for building sustainable communities
Sustainable cultural tourism	Eco-tours	Promoting eco-tour packages
		Launching No. 88 and No. 99 eco-tour buses
		"Eco-Anping" - eco-tour shuttle services in Anping for Lunar New Year holidays
		Sapling nursery for eco-education installed in demonstrative area
		Enhancing hiking trail signage visibility, and adopting APP and QR code technologies
		Assisting business communities in commercializing Tainan's icon, the sword lion, with themed eco-tours
		Promoting eco-lodges and green hotels
		Promoting green lodging services assisting legal lodging establishments with eco-lodge application
	Green consumption	Installing water coolers in tourist destinations to minimize the use of bottle waters
		Source reduction for green consumption

Action plan	Measures	Task
Green energy solutions	low-carbon, solarized metropolis	Solar rooftop
		Solar communities
		Green factories
		Solar cities
		"A town of light" - Emergency solar power production in remote areas for disaster relief efforts
		Solar campuses
		Solarized public buildings
		Solar greenhouses
		Solarized LED devices
		Solar landmarks
Bolstering eco-city programs	Wetlands for carbon sink capabilities	Key wetlands conservation programs
	Afforestation for clean air	Subsidizing community afforestation programs
		Promoting "one park for one district," and inaugurating a tree-lined Tainan Boulevard
		Building a tree-lined, waterfront Shanhaijhen Bike Trail
		"Project: Cornerscape" for community building
		Sinying Stage Five Waste Landfill air purification zone
		Launching "Project: Cityscape Beautiful" to increase green covers and permeability to enhance Tainan's cityscape

Action plan	Measures	Task
High-efficiency, sustainable transport services	Subsidizing the replacement of motorcycles with two-stroke engines for electric mopeds	Subsidizing the replacement of motorcycles with two-stroke engines for electric mopeds
	Seamless public transit services	Developing public transit systems, and evaluating the need for shuttle transit services in remote areas
		Installing priority signal lights for buses
		Replacing outdated buses with low-carbon models
		Subsidizing the launch of low-floor buses, and expanding fare discounts on connecting bus travels
		Establishing an advanced public transit system spanning Tainan City
	Developing a bike trail network	Connecting the city's waterfront hiking and biking trails
	Promoting and subsidizing electric vehicles	Launching a pilot program for e-buses
	Increasing the use of e-vehicles for civil services	Launching a smart e-vehicle program
	Installing and improving pedestrian trails	Using permeable pavement designs, increasing the number of green belts, reducing surface runoff and carbon emissions,

Action plan	Measures	Task
Sustainable living	Upgrading energy-consuming faciilities	Replacing energy-consuming facilities in the city hall, affiliated agencies and schools
	"Project: Conserve to Preserve"	"Project: Conserve to Preserve"
	Improving water efficiency	Promoting water-saving devices (water-conserving toilets and faucets)
	Sustainable diet	Promoting local food labeling
		Encouraging sustainable diets
		Project: "Design, Create, Inspire"
		FoodCloud: Local Food Tainan
		Assisting the food industries with acquiring low-carbon labeling
		Sustainable night markets
	Sustainable religious worship	Carbon waste reductions at temples
		Reducing the burning of paper money
Community commitment to recycling and reuse	Supporting sustainable procurement	Encouraging "total green procurement" among city-affiliated agencies and schools, supporting private business practices to choose sustainable products, and sponsoring the setup of green businesses/shops
	Energy conservation programs targeting animal husbandry and fisheries	Replacing traditional lighting facilities in livestock ranches and fish enclosures with energy-saving models
		Reusing wastewater and methane produced in ranches and fisheries

Action plan	Measures	Task
Community commitment to recycling and reuse	Recycling, reuse and upcycling	Supporting the composting of kitchen scrap and fallen leaves, and licensing the reuse of these compost products
		Soap making using used cooking oil
		Sustainable living and resource recycling campaigns
		Logo-remake for demonstrative areas featuring "Utopia of Recycling"
		Installing facilities for production of methane (biogas) from sludge
	Reusing earthworks	Reusing earthworks
	Upcycling bottom ash	Reusing incinerator bottom ash
	Reusing large-size discards	Auctioning used furniture, boosting resource upcycling
	Reusing recycled water	Recycling wastewater: Anping Water Recycling Center reuses wastewater after recycling
		Cleaning and treating water manure: improving the performance of existing water manure treatment facilities, recycling and reusing treated water
		Developing rainwater harvesters
	Reusing agricultural resource	"Project: Organic Farming Multiplied" - promoting organic farming licensing, and increasing the size of orgamic farmland
		Reusing and retreating rice straws and supporting green fertilization - promoting rice straw reuse, and growing green fertilizers

Action plan	Measures	Task
Community commitment to recycling and reuse	Energy-saving renovation programs	Reducing pre-treatment fuel use during renovation
		Minimizing thermal treatment fuel use during renovation
		Extensive greening during renovation
Sustainable building practices	Green building	Green building
	Reviving old building structures	"Project: Reviving Old Building Structures" - renovating and reusing the city's historic heritage sites, preserving and reviving historic houses.
Sustainable spaces and campuses	The New Locavores Movement	Using local food for school lunches
		Launching food education campaigns ("getting to know locally-sourced ingredients")
	Promoting sustainable living	Installing energy-saving devices and power-consumption monitors in classrooms
	Campaigning for carbon-neutral campuses	Solarizing campus rooftops, replacing energy-consuming lighting devices with energy-efficient models, and installing power-consumption monitors
	Setting up an on-campus resource-sharing platform	Usable devices and resources available from schools across Tainan are featured on "59410: Resource-Sharing Platform," allowing interested users to "treasure-hunt" for items they need; the platform expedites resource exchange and minimizes unnecessary costs in purchasing new facilities/devices
	Subsidizing the installation of on-campus "fallen leaves compost sites"	Installing or improving on-campus fallen leaves compost site

Action plan	Measures	Task
Sustainable spaces and campuses	On-campus power conservation	Project: On-Campus Power Conservation - schools are encouraged to manage and monitor power conservation status, cutting back electricity use down to 2005 levels
	On-campus water conservation	"Put a Stop to the Drop" - the on-campus water-conservation campaign that supports the installation of flow-reducer on faucet, recycling systems for reclaimed water, the setup of rainwater harvesters and low-flush toilets
	Sustainable campus	Processing the application of sustainable campuses, conducting onsite inspections, and campus tours; 30 schools in Tainan have passed sustainable campus reviews and been recognized accordingly. Ten model sustainable schools are chosen for the highest-level "green excellence" campuses, and awarded with plaques and certificates
		Erecting energy-saving, sustainable school buildings
	Building on-campus power generation facilities/devices	Food Forest For Us - idle campus spaces are repurposed for self-sustaining food gardens and orchards
	Promoting no-idling-on-campus campaign	No idling allowed around campuses - promoting "no-idling" in the parent pickup area

Action plan	Measures	Task
International education exchange	Launching "Climate Action" labeling	Advocating "Climate Action" labeling to raise awareness
	Promoting "Earth-Easy Communities"	"Earth-Easy for Our Homes" - advocating low-carbon community living
		Project: Sustainable Community Building - supporting a self-imposed eco-awareness campaign for sustainability
	Environmental education campaigns	Subsidizing private schools and NGO's for their environmental education advocacy campaigns
		Subsidizing government agencies and schools for their environmental education advocacy campaigns
		Subsidizing community groups for hosting "eco-academy programs"
	Community-based environmental education advocacy programs	Training programs for volunteers to join eco-community environmental education campaigns
		Supporting community-based environmental education advocacy programs for carbon waste elimination
	Expanding international exchange and engagement	1. Becoming part of international carbon-neutral advocacy groups 2. Hosting international exchange programs and conferences/seminars

3.2.2 Program Specifics

I. Sustainable Communities

Communities are the core of the city. A successful sustainable community program is the foundation of an eco-city. There are two types of sustainable communities: newly developed models, and existing communities. Newly developed communities are planned and created with sustainability features in mind. In addition to upgrading residential quality, their eco-elements are beneficial for consolidating community awareness. For existing communities to be transformed into sustainable models, the City Government has plans to adopt the ESCO (Energy Service Company) financing methods to help communities cut back on energy consumption. Building sustainable communities is the focus of Tainan's advocacy campaign, and see below for specifics.

Carbon-neutral, green energies and eco-community building are incorporated into infrastructure planning during urban development. Furthermore, energy-saving, carbon waste elimination, detention basin facilities, waste recycling and reuse, green energy solutions and innovative devices (such as low-carbon and rainwater harvester installations) are incorporated into development project planning. Detention basin features are added in community park landscaping designs. Old trees in the community are also ecologically transplanted. In addition, improvement assistance for sustainable community programs are advocated, carbon-neutrality clinics established.

Support service is also in place to help government agencies, schools, residential compounds and business buildings establish energy-conservation facilities and community building.

II. Sustainable Cultural Tourism

Tainan is arguably Taiwan's most historic city, with rich culture, art, fine food, an amazing eco-landscape, and technological innovations. The cityscape is defined by traditions and modernity, and contrasted by nature and culture. As Taiwan's "historic city," Tainan prides itself in its incredible cultural heitage sites. Citizens and out-of-town tourists to Tainan naturally result in substantial water and power use and significant waste production. Therefore, sustainable cultural tourism is a crucial part in Tainan's eco-city advocacy. The City Government is conscientiously monitoring and promoting its carbon-neutral programs while expanding its tourism reach. The programs compose of two measures. See below for specifics.

1. Eco-tours
   (1) Promoting eco-tour packages
      A. Designing eco-tour packages, itineraries, and promotional campaigns
      B. Instituting an eco-tour service webpage, combining tourism events, or using Internet, Facebook, media scout groups, or citizen participation to market Tainan's eco-tour packages
      C. Promoting on-foot tours
      D. Launching tourism bus services
   (2) "Eco-Anping"
      A. Popularizing holiday on-foot tours for pedestrians
      B. Free eco-tour shuttle services for Lunar New Year holidays
      C. Creating a demonstration area for eco-gours
      D. Eco-friendly, themed sword lion tours

E. Public bicycle-sharing system for shuttling

(3) Eco-lodges and Green Hotels

A. Promoting green lodging and hospitality services as part of "Eco-Action"

B. Formulating "Eco-Action Subsidization Guidelines for Lodging and Hospitality Service Providers in Tainan City"

(4) Historic Monuments for Earth-Action

Traditional lighting devices installed in exhibition sites and bathrooms of Tainan's iconic historic sites are replaced with power-saving lighting models.

(5) Culinary Tours for Earth-Action

Promoting eco-industry learning programs to encourage service providers to become environmentally-conscious and adopt power-saving measures

2. Green Consumption

(1) Installing water coolers in tourist destinations to minimize the use of bottle waters

(2) Source reduction for green consumption: legal sanctions on excessive packaging, one-use plastic bags, disposable dining utensils, plastic trays and plastic packaging

III. Green Energy Solutions

Wind power accounts for 1% of clean energy applications in Taiwan; hydropower, 1.5%; and solar power, less than 0.1%. In other words, clean energy application percentages are disatisfactorily low in Taiwan, which highlights the urgency of expansive green energy and renewable energy use. Understanding the significance of green and renewable energy solutions, the Tainan City Government has taken action to extensively promote the city's greatest natural asset - solar power - for clean energy practices, transforming Tainan City into a low-carbon, solarized metropolis. See below for specifics.

1. Solar rooftop: promoting building-integrated photovoltaics in residential areas
2. Solar communities: promoting building-integrated photovoltaics in residential communities
3. Green factories: promoting roof-integrated photovoltaics for factories and plants
4. Solar cities: photovoltaics systems are planned and installed for new development projects.

   These development programs would serve as demonstration sites for eco-communities, and low-carbon criteria for Taiwan's future urban planning programs
5. "A town of light": emergency solar power production in remote areas for disaster relief efforts
6. Solar campuses: photovoltaics installations are included in new campus building additions, renovations, ane expansions

7. Solarized public buildings: promoting photovoltaics in public buildings
8. Solar greenhouses: pushing for photovoltaics installations in farms and fishery enclosures
9. Solarized LED devices: installing solarized LED devices and replacing traditional lighting models
10. Solar landmarks: establishing solar landmarks in public buildings or spaces that advocate clean energy development programs

IV. Bolstering Tainan's Eco-City Programs

In a move to transform Tainan into a livable eco-city, the City Government is actively creating and expanding Tainan's lifestyle features with specific low-carbon and ecologically-centric functions. They include: wildlife habitat bioconservation measures, eco-tours, research and education programs, reducing urban heat island effect, and preserving the character of Tainan's urban and rural landscape. That being said, eco-city functions are bolstered in Tainan's eco-city program to contain: wetlands for carbon cycling and carbon sink capabilities, afforestation for clean air, and "Project: Cityscape Beautiful." Among which, afforestation for clean air is a direct-action plan for mitigating GHG impacts and purifying air. Community residents would be the principal promoter of the campaign to encourage widespread afforestation efforts. Every single community engaged in the campaign can be connected into one great network spanning Tainan City. See below for specifics.

1. Wetlands for Carbon Cycling

   The City Government is advocating several conservation action plans for Tainan's iconic wetlands, such as Jianan Irrigation Canal Wetlands, Beiman Wetlands, Sicao Wetlands, Yanshuei Estuary Wetlands (east side), and Bajhang Estuary Wetlands. These are national-class wetlands with rich environmental and biological research values. They require extensive research, monitoring, and community engagement for better bio-management

   (1) Afforesttion for clean air

   (2) Subsidizing community afforestation programs

   (3) Promoting "one park for one district," and inaugurating a tree-lined Tainan Boulevard

   (4) Building a tree-lined, waterfront Shanhaijhen Bike Trail

   (5) "Project: Cornerscape" for community building

   (6) Corner beautification program, and "Projet: Cornerstone Tainan" launched

   (7) Sinying Stage Five Waste Landfill air purification zone

2. "Project: Cityscape Beautiful"

   Launching "Project: Cityscape Beautiful" to increase green covers and permeability to enhance Tainan's cityscape

V. High-Efficiency, Sustainable Transport Services

To set up high-performance, eco-friendly transport infrastrctures, the Tainan City Government launches a subsidization program for the replacement of motorcycles with two-stroke engines, and buying electric mopeds/vehicles; it also inaugurates seamless public transit services, BRT, a bike trail network, promotes and subsidizes electric vehicles. See below for specifics

1. Subsidizing the replacement of motorcycles with two-stroke engines for electric mopedsGuidelines for subsidization are specified; promotional campaigns or

the subsidization program are also launched. The City Government is now subsidizing the replacement of heavily-polluting motorcycles with two-stroke engines, and the buying of electric models; it also provides subsidies to buyers of electric mopeds, newly-purchased/remodeled LPG vehicles, and buyers of hybrid taxicabs.

2. Seamless Public Transit Services

   (1) Subsidizing the launch of low-floor buses, and expanding fare discounts on connecting bus travels

   (2) Devising plans for the inauguration of a transit terminal ("Bus Station")

3. The Building of BRT

   The City Government works to develop rail transport and Bus Rapid Transit systems

4. Developing a Bike Trail Network

   Connecting Tainan's waterfront hiking trails and bike trials to form a expansive networ; the linkage of bottlenecked tree-lined Shanhaijhen bike trails, and juncture engineering between Jioufenzih Low-Carbon Community, Yanshuei River, and Jianan Irrigation Canal

5. Promoting and Subsidizing Electric Vehicles

   (1) Launching a smart e-vehicle program

   (2) Expanding the availability of charging stations for electric vehicles throughout the city

VI. Sustainable Living

To create a space conducive for sustainable living for all, the City Government launched a number of innovative measures, including: upgrading energy-consuming facilities, "Project: Conserve to Preserve," improving water efficiency, sustainable diet, and sustainable religious worship. See below for specifics.

1. Upgrading Energy-Consuming Faciilities
   (1) Replacing and upgrading lighting devices in parking areas
   (2) Launching LED-integrated streetlamps
   (3) Replacing and upgrading power-consuming devices at the city hall and affiliated agencies and schools
2. "Project: Conserve to Preserve" - enforcing power-saving programs across the city government, and affiliated agencies and schools
3. Improving Water Efficiency

   Campaigning for water-saving devices (low-flush toilets, and water-saving faucets); through wastewater reduction advocacy, the City Government hopes to improve public awareness of cutting back residential wastewater, to effectively mitigate wastewater impacts on the environment
4. Sustainable Diet
   (1) Promoting local food labeling
   (2) Sustainable restaurants/catering
   (3) Meat-free day
   (4) Eco-friendly night markets
5. Sustainable Religious Worship
   (1) Carbon waste reductions at temples
   (2) Reducing the burning of paper money: centralized burning of paper money, encouraging temples to promote the reduction of paper money burning, and

enlisting the help of social welfare groups to strengthen advocacy, and to support good deeds in replacement of paper money

VII. Community Commitment to Recycling, Reuse and Upcycling

Resource recycling, reuse and upcycling is now an integral part of present-day environmental protection measures. In a move to achieve total resource categorization for recycling efficiency and attain zero waste, the City Government drafted "Project: The Establishment of a Recycling/Upcycling-focused Community." The aim of which is to encourage the following ten causes: sustainable procurement, energy conservation programs targeting animal husbandry and fisheries, recycling, reusing earthworks, upcycling bottom ash, reusing large-size discards, reusing recycled water, reusing agricultural resource, "It's Easy Being Green," and energy-saving renovation programs

1. Support Sustainable Procurement

   Encouraging the city's affiliated agencies and schools to opt for total green procurement services, supporting private business establishments to choose green merchandise, and assisting with the setup of sustainable businesses

2. Energy Conservation Programs Targeting Animal Husbandry and Fisheries

   (1) Replacing traditional lighting facilities in livestock ranches and fish enclosures with energy-saving models

   (2) Reusing wastewater and methane produced in ranches and fisheries

3. Recycling, Reuse, and Upcycling

   (1) Supporting the composting of kitchen scrap and fallen leaves, and licensing the reuse of these compost products

   (2) Soap making using used cooking oil

   (3) Reusing and repurposing renovation project discards

   (4) Installing a kitchen scrap composting site in Dongshan

(5) Advocating for community commitment to recycling, reuse and upcycling

4. Reusing Earthworks

Contractors of public works and development programs are asked to report to the Information Management Center on extra earthworks left from construction projects, and work with the government on earthworks exchange for reuse, or for repurposing

5. Upcycling Bottom Ash

Reusing incinerator bottom ash

6. Reusing Large-Size Discards

Organizing auctions for second-hand yet upcycled furniture, to promote resource reuse.

7. Reusing Recycled Water

(1) Recycled water is treated for reuse in Anping, Liouying, Yanshuei, and Yongkang Water Recycling Centers

(2) Cleaning and treating water manure: improving the performance of existing water manure treatment facilities, recycling and reusing treated water

8. Reusing Agricultural Resource

(1) "Project: Organic Farming Multiplied" - promoting organic farming licensing, and increasing the size of organic farmland

(2) Reusing and retreating rice straws and supporting green fertilization - promoting rice straw reuse, and growing green fertilizers

9. "It's Easy Being Green"

This program seeks to upcycle and reuse residential discards, and transform them into artworks. The goal is to designate one upcycled artifact for each administrative district.

10. Energy-Saving Renovation Programs

(1) Reducing pre-treatment fuel use during renovation

(2) Minimizing thermal treatment fuel use during renovation

(3) Extensive greening during renovation

VIII. Sustainable Building Practices

The advocacy for sustainable building practices serves to increase green covers, minimize the urban heat island effect, reduce light pollution, building-integrated energy-saving exteriors, energy-saving air-conditioning and green maintenance services to meet the goal of sustainability. The campaign is appropriately called, Sustainable Building Practices; its popularity and construction guidelines are trending into the future. For now, the City Government is developing a new set of urban design guidelines to advocate the sustainable building practice, and retrofit old building structures. See below for specifics.

1. Sustainable Building

The City Government honors "Sustainable Building for an Eco-City Program Campaign" and works on transforming Tainan into a sustainable metropolis. It now imposes more rigorous criteria when reviewing features pertaining to green building practices included in development project applications. They are: total carbon dioxide emissions (TCO2), minimal green

cover, water-saving indicators, energy-saving capacities of building exteriors, and utilization percentage of rainwater harvesters. The City Government also pays closer attention to features pertaining to sustainable building, consistent with Article 21 of "Self-Governance Statute for a Low-Carbon City," which requires developers to acquire a certificate for being shortlisted as a green building before development begins when applying for a permit. Also, upon acquiring a building use permit, the developers must obtain a green building label within a year. These measures work to transform Tainan into a veritable "eco-city."

2. Reviving Old Building Structures

(1) "Project: Reviving Old Building Structures" - renovating and reusing the city's historic heritage sites, preserving and reviving historic houses

(2) Retrofitting and reusing old houses in the City: renovation and greening are conducted on old building structures in Tainan's historic districts

IX. Sustainable Campus

The promotion of sustainable campuses can help indoctrinate the ideas of energy stewardship and sustainability into young minds so that they practice what they preach, in addition to achieving effective carbon waste elimination. To that end, the students can help influence 400,000 families with their understanding of eco-city development, and inspiring everyone to join the movement and build a sustainable home. Some of the measures for achieving sustainable campuses are: the New Locavores Movement, setting up an on-campus resource-sharing platform, subsidizing the setup of an on-campus resource recycling station, subsidizing the installation of on-campus "fallen leaves compost sites," on-campus power conservation, on-campus water conservation, sustainable campuses, building on-campus power generation facilities/devices, and promoting no-idling-on-campus campaign. See below for specifics.

1. The New Locavores Movement

   Encouraging locally-sourced food ingredients for school lunches, and conducting food education campaigns ("getting to know locally-sourced ingredients"). The fundamental principles of the New Locavores Movement lies in reducing food miles to decrease the amount of gasses emitted. It also boosts local farmers' participation willingness and profit

2. On-Campus Resource-Sharing Platform

   Usable devices and resources available from schools across Tainan are featured on a Resource-Sharing Platform, allowing interested users to "treasure hunt" for items they need; the platform expedites resource exchange and minimizes unnecessary costs in purchasing new facilities/devices

3. On-Campus Resource Recycling Station

   Installing or renovating on-campus recycling stations

4. The Installation of On-Campus "Fallen Leaves Compost Sites"

   Installing or improving on-campus fallen leaves compost site

5. On-campus Power Conservation

   "Project: On-Campus Power Conservation" - schools are encouraged to manage and monitor power conservation status

6. On-Campus Water Conservation

   "Put a Stop to the Drop" - this is an on-campus water-conservation campaign that supports the installation of flow-reducer on faucets, recycling systems for reclaimed water, the setup of rainwater harvesters and low-flush toilets

7. Sustainable Campus

   Processing the application of sustainable campuses, conducting onsite inspections, and campus tours; 30 schools in Tainan have passed sustainable campus reviews and been recognized accordingly. Ten model sustainable

schools are chosen for the highest-level "green excellence" campuses, and awarded with plaques and certificates

8. On-Campus Power Generation Facilities/Devices

   "Food Forest For Us" - idle campus spaces are repurposed for self-sustaining food gardens and orchards.

9. No-Idling-On-Campus Campaign

   No idling allowed around campuses - promoting "no-idling" in the parent pickup area.

X. International Education Engagement

The development of an eco-city must be grounded in robust planning, which determines the direction of follow-up policymaking and execution. A sound vision-planning is defined firstly by a set of all-reaching regulations; the success of policymaking lies in extensive public participation. That said, an effective environmental education campaign could inspire greater public participation, and better implementation of carbon waste elimination measures. To heighten Tainan's international competitiveness, the City Government is working on greater visibility by actively participating in international groups and conferences. Tainan's international presence would be effectively spotlighted in international exchange activities on the eco-city movement and advocacy campaigns.

As for legislative enactment, the City of Tainan pioneered the nation in promulgating "Self-Governance Statute for a Low-Carbon City" (see Appendix 1). The Statute went into effect following the third reading by Tainan City Council for final

approval, and verified by the Cabinet. It was promulgated for enactment on December 22, 2012. Tainan thus became the country's first direct municipality with "low-carbon city" as an administrative benchmark. The Statute also bore witness to the city's resolve in executing its low-carbon measures.

To that end, Tainan's international engagement programs include: "Climate Action" labeling, "Earth-Easy" communities, environmental education campaigns, community-based environmental education advocacy programs, expanding international education engagement.

1. "Climate Action" labeling

   Promoting "Climate Action" labeling.

2. "Earth-Easy Communities"
   (1) "Earth-Easy for Our Homes" - advocating low-carbon community living
   (2) Project: Sustainable Community Building - supporting a self-imposed eco-awareness campaign for sustainability

3. Environmental Education Campaigns
   (1) Subsidizing private schools and NGO's for their environmental education advocacy campaigns
   (2) Subsidizing community groups for hosting "eco-academy programs"

4. Community-based environmental education advocacy programs
   (1) Training programs for volunteers to join eco-community environmental education campaigns

5. International Exchange and Engagement
   (1) Becoming part of international carbon-neutral advocacy groups
   (2) Hosting international exchange programs and conferences/seminars

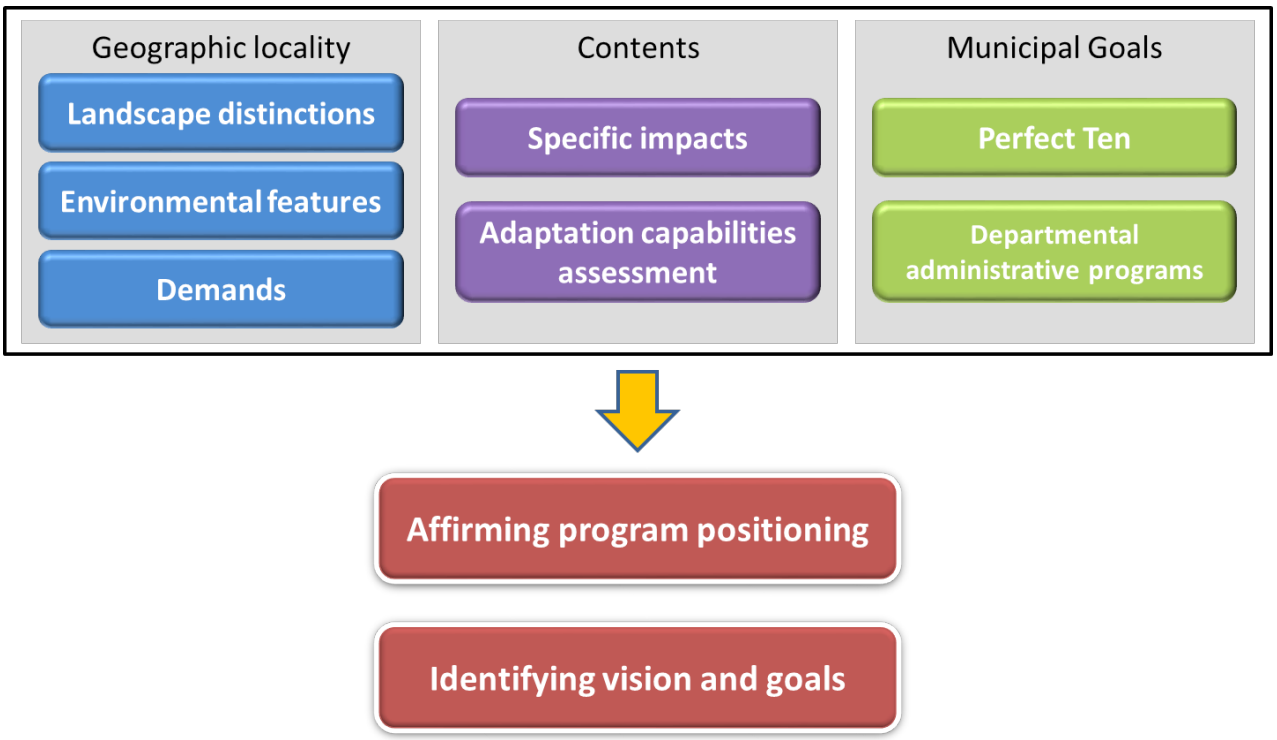
Chapter 4,
Coping Mechanisms and Collective Action

The word "vision" indicates a collective hope for the future. According to "Guidelines on Local Climate Adaptation Planning," local administrations should delineate a "vision" as the general direction (goal) of their adaptation measures. They guide local administrations, task forces of professional planners, and committee members on making effective policies and planning.

4.1 Vision and Goals

The development of Tainan City Government's Climate Change Adaptation Vision is drawn from interviews with representatives of every department, plus experts and scholars, on Tainan's geographical locality and climate change impact assessment. General goals and eight major categories are put forth accordingly as the experts evaluate the priorities of Tainan's geographic localities and specific

community demands in reference to Taiwan's national development objectives. These programs include: sustainable agriculture development model, climate disasters and risk management, alternative water resource development, climate change-adaptive land acquisition policies, epidemic prevention capacity-building, climate change adaptation for industries and businesses, and more. These programs are developed to accommodate Tainan's specific demands. See diagram 4-1 for vision development process.

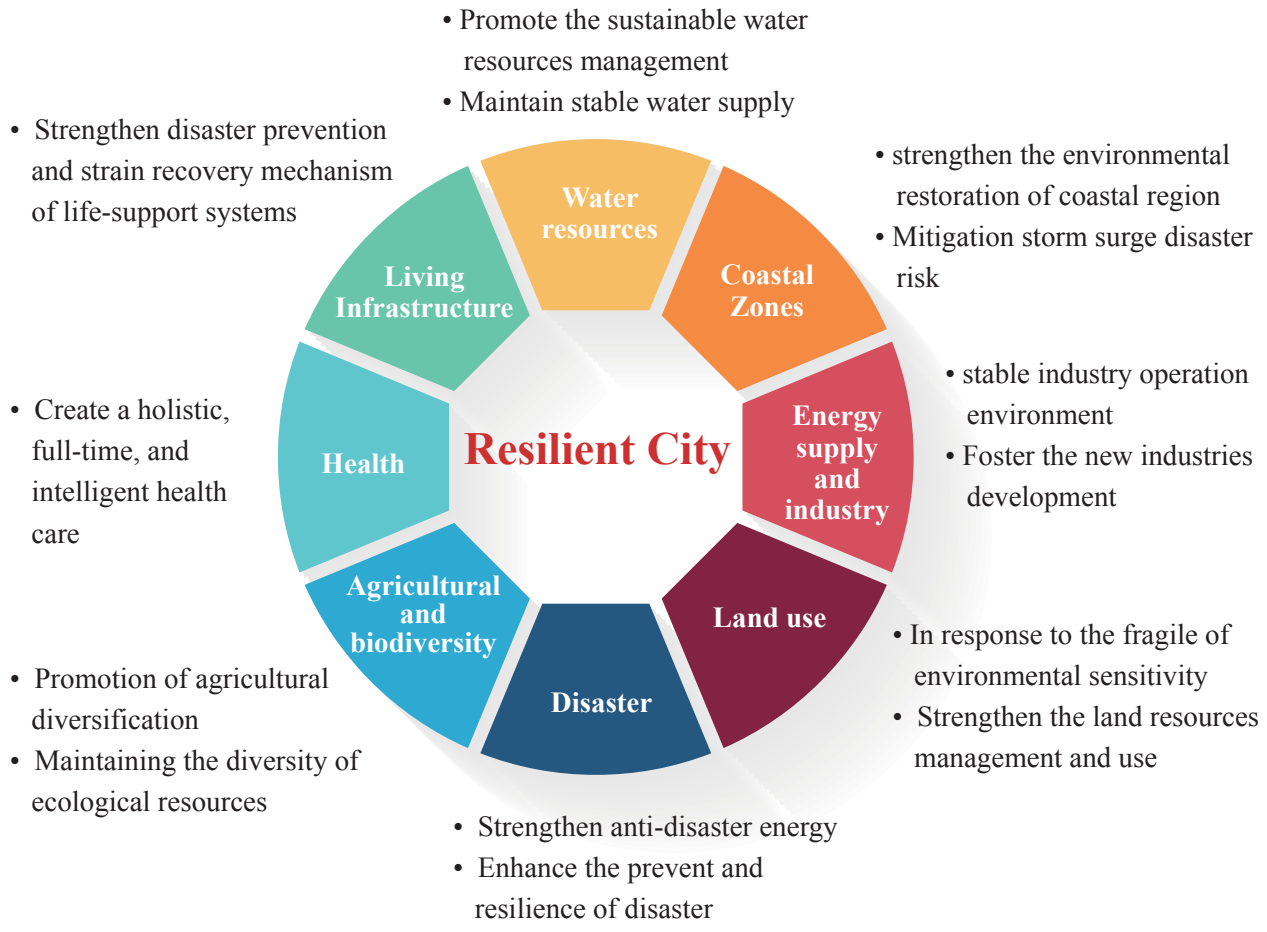


4-1 Defining Climate Change Adaptation Vision: The Process

4.1.1 Outline

The term, "resilient cities," was coined by ICLEI - Local Governments for Sustainability, an international association of local governments committed to

sustainable development. The City of Tainan is also a member of the organization. The word, "resilient," signifies "being able to rebound," and "being adaptable." More specifically, it suggests the capabilities of a country's socioeconomic structure, technological integrity and infrastructure to resist impacts and pressures from various sources, allowing the same viable structures and functions to stay the course. The fundamental definition of the word is consistent with the spirit of the movement trending toward sustainable development and eco-city ideals, and it would be the core vision of Tainan's municipal administration for the journey toward sustainability. The core vision and the eight adaptation categories are summarized in Diagram 4-2.



4 - 2 Adaptation Vision in Detail

4.1.2 Key Adaptation Areas

Adaptation mechanisms are quantified accordingly to attain the prospect of "resilient cities." In a bid to make the goals more focused, results are defined by specific adaptation areas, with "disaster management" and "water efficiency" as priorities.

I. Defining Goals

Our previous brush with disasters indicates that flash floods caused by extreme weather patterns are the principal cause of disasters. The unpredictability of the intensity and rainfall total of these flash floods had prompted the City Government to invest significantly in manpower and flood management to better monitor the storms. According to scientific assessment, these disaster management measures could help allay flood intensity and occurences in vulnerable, low-lying areas this year (2014). However, due to limited quantifiability of marginal values on the current flood management budget, it is unlikely that the size of the flooded areas - and the effort that every agency has devoted into the cause - would expand effectively proportionally with prevention investment dollar.

To that end, disaster prevention and recovery capabilities are included in our vision for effective disaster management. For densely-populated areas, the goal is to increase "flash flood resistence" in a bid to enhance Tainan's flood control capacity, and minimize disaster occurences triggered by extreme weather. Meanwhile, water recovered and stored from the floods could be repurposed for usable resources to upgrade Tainan's water supply competence; it also is conducive for better water resource adaptation measures. Meanwhile, the City Government would take a national land planning approach to manage agricultural areas and sanctuaries, establishing "environmentally vulnerable" and "overdevelopment prohibited" designations. See table 4-1 and diagram 4-3 for assignments, agencies in charge, and quantifiable goals.

Table 4-1 Agencies in Charge and Assignments

Agency	Assignment
Water Resources Bureau	Large-size cistern for floodwater storage
Bureau of Land Administration	Cisterns set up in rezoned areas
Bureau of Economic Development	Cisterns set up in new industrial areas
Public Works Bureau	Retrofitting historic parks with increased floodwater retention spaces
Public Works Bureau	Rainwater harvesters in new residential communities

II. Setting Goals

Water demand in Tainan City is met by supplies from Zengwen Reservoir via Nanyu Water Treatment Plant, Wusanto Reservoir via Wusanto Water Treatment Plant, Tangding Water Treatment Plant, and Nanhua Reservoir via Nanhua Water Treatment Plant. At present, these services combined have a water supply capacity of 940,000 metric tons of water per day. On average, the services yield 900,000 metric tons of water per day.

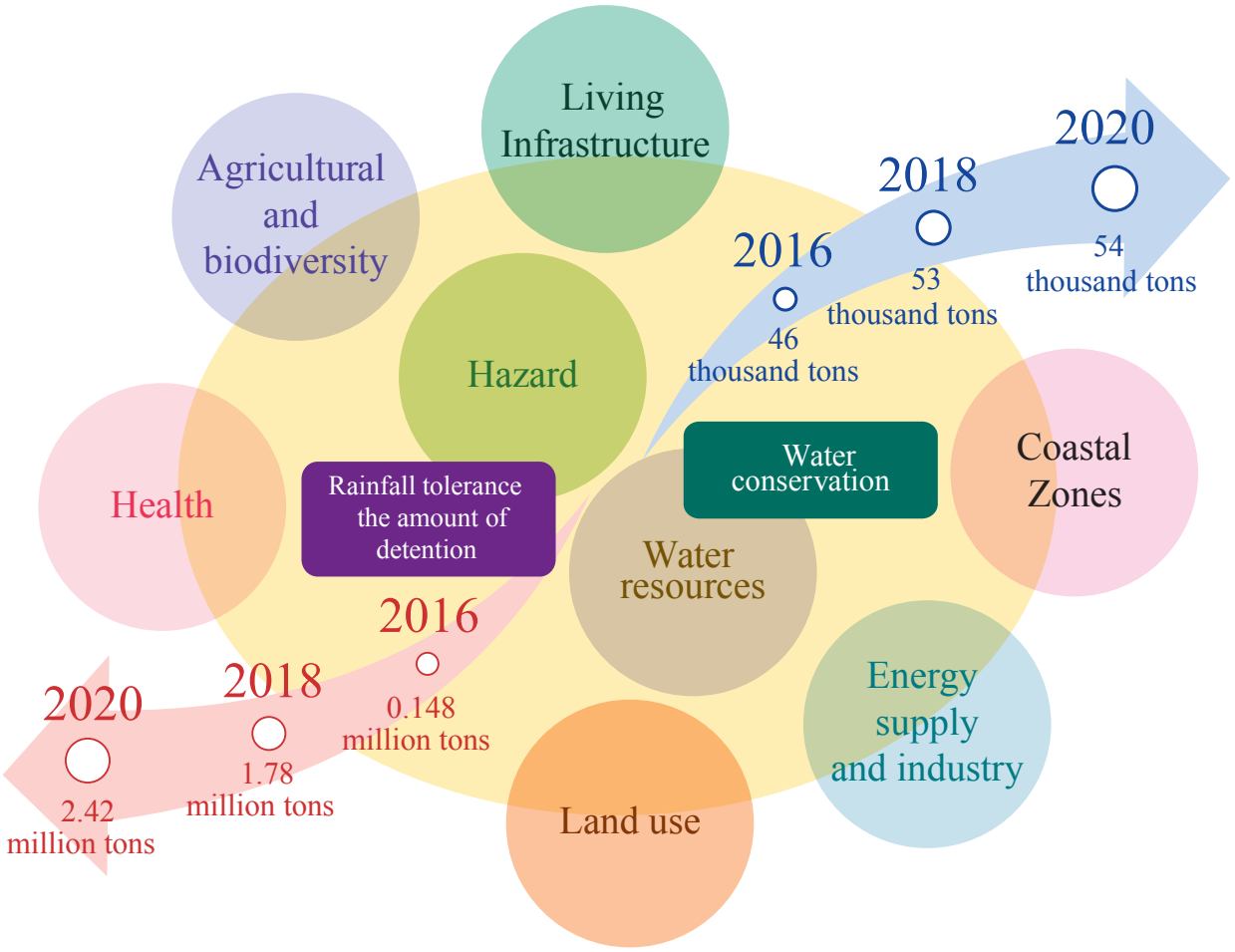
According to water resource management framework for southern Taiwan, household and industrial-purpose water demand will reach 1,201,000 metric tons a day by 2021; and there would be a shortage of 261,000 metric tons per day. To prevent supply shortage, the City Government is proposing new development measures. By 2019, seawater desalination plant would

yield 100,000 tons of water per day; by 2026, the amount of reuse-ready wastewater processed by Yongkang Wastewater Treatment Plant will reach 40,000 metric tons per day. According to government estimate, water supply capacity will reach 1,080,000 metric tons per day by 2031. A shortage of 121,000 metric tons still remains. This calls for the government to seek out more development alternatives.

What's more, water conservation requires a concerted effort by every department and agency of the city government. Other than reducing our reliance on water, we also need to consciously and habitually save water in our routine, honoring the spirit of "adaptatioin." "Water conservation," therefore, is the goal we strive after for greater water efficiency. See table 4-2 and diagram 4-3 for assignments, agencies in charge, and goals.

Table 4-2

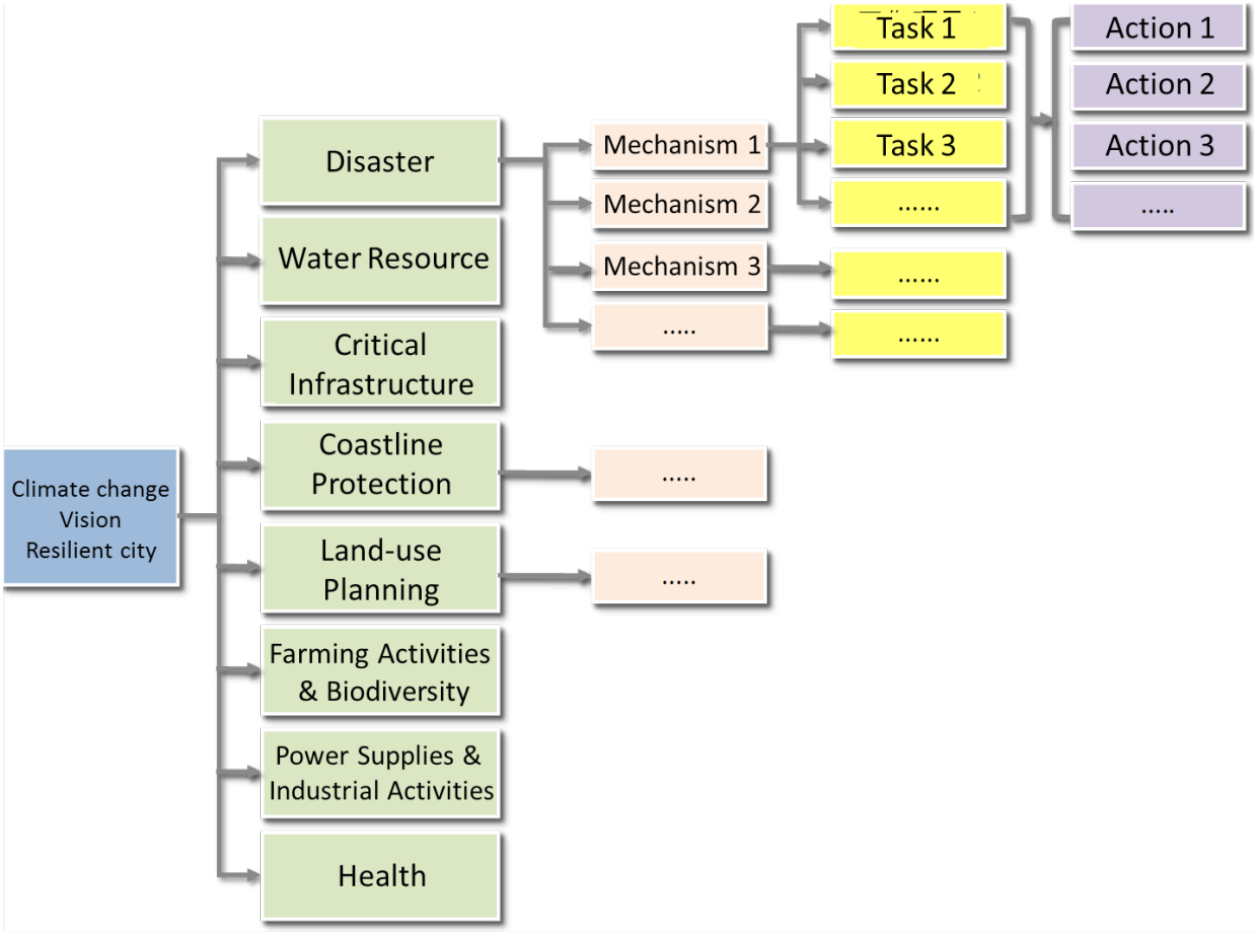
Agency	Assignment
Education Bureau	Water-saving devices are installed throughout government agencies and schools
Public Works Bureau	Recycled water is used for watering roadside trees; asphalt and concrete plant also supports the use of recycled water
Protection Bureau	Recycled water processed by wastewater treatment plant used for car services
Agriculture Bureau	Water recycling systems for farming, ranching and fisheries
Agriculture Bureau	Encouraging farmers to opt for rainfed agriculture instead of rice-growing
Bureau of Economic Development	Assisting heavy water users with setting up water recycling and reuse systems
Department of Secretariat	Implementing "Project: Conserve to Preserve"



4-3 Key Areas for Climate Change Adaptation Programs

4.2 Coping mechanisms and Tasks

Climate change adaptation program is now trending around the world, and consistent with the global adaptation movement, this Project would honor "The National Climate Change Adaptation Policy Guidelines," enacted and promulgated in June, 2012, to develop a Tainan City Climate Change Adaptation Framework, see. diagram 4-4. The framework contains a vision for policymaking, goals, strategies, and tasks to upgrade Tainan's adaptation capabilities.



4-4 Tainan City Climate Change Adaptation Framework

Coping mechanisms and tasks are created in line with the city's eight major carbon reduction categories and 33 issues (see Table 4-3), which contain 65 strategies and 234 tasks. 23 of the tasks are newly added (see Table 4-4). In principle, the strategies are developed in line with preparatory work, such as capacity-building (including information management, the gathering and focus-building of the government's response systems, campaigns, an assessments on climate-vulnerable communities and regions, and the strengthening of technological innovations and research), boosting disaster-response mechanisms and planning, and post-disaster recovery and feedback. The tasks would be aligned with initiatives chosen so that plans currently in place

would be closely examined; or created in accord with campaigns launched by the central government.

4-3 Coping mechanisms and Task Summary

Impact Area	Initiatives	Strategies	Tasks		
			Currently in Place	New additions	Total
Disaster	2	10	45	7	52
Water Resource	3	4	14	4	18
Critical Infrastructure	3	7	23	2	25
Coastline Protection	4	7	15	2	17
Land-use Planning	3	6	18	4	22
Farming Activities and Biodiversity	6	14	41	1	43
Power Supplies and Industrial Activities	6	10	27	1	28
Health	6	7	28	2	30
Total	33	65	211	23	234

4-4 Additional Tasks

Area	Task Additions	
Disaster	D1-1-4	With Tainan Water Information App as the principal platform to integrate disaster prevention updates (such as road and bridge shut-downs/barricades, or disaster bulletin board, etc) released by every department for a Tainan City Disaster Prevention Network
	D1-5-5	Set up a preventive response system to activate underpass shutdown
	D1-5-6	Assessing the pros-and-cons of setting up automated barricade and alarm systems
	D2-3-6	Combining meteorological technologies to install a smart, digital outfit to boost disaster prevention performance
	D2-3-7	Combine private support and resources to expand public participation in disaster prevention and relief services
Water Resource	D2-4-5	Boost disaster relief capabilities of regional disaster-response battalions
	D2-7-3	Develop and install shelter services in schools of all levels
	W1-1-4	Enforce more rigorous reviews on hillside development plans to ensure better soil and water conservation effectiveness
	W2-1-5	Increase designated pipeline network connecting Zengwen Reservoir to Dongkou Weir to minimize water leaks by 5.3% (approximately 110,000 CMD

Area	Task Additions	
Critical Infrastructure	W2-2-6	Ensuring Nanhua Reservoir's water level is satisfactorily high before the rain season ends
	W3-1-3	Develop plans to refill groundwater along seashores and subsidence areas, and prevent seawater encroachment
	I1-1-2	Install flow speed reducers along areas vulnerable to water erosion
	I1-2-2	Inaugurate real-time monitoring and report systems
Coastline Protection	C3-1-3	Encourage adaptation-minded thinking to minimize development projects along coastlines
	C3-1-4	Consistent with the promotion of Coastline Conservation Act to strengthen seashore protection area and coastline sanctuary management, and reduce property losses caused by the rising sea levels
Land-use Planninng	L1-1-5	Foundation water conservation indicators for monitoring development projects that are consistent with
	L1-2-3	Setting up buffer zones and and flood retention zones along waterfront areas
	L1-2-4	Including a robust, total storm run-off management structure in urban and regional planning reviews; the amount of post-development run-off should not exceed pre-development total
	L2-1-4	Imposing stricter management on illegal land use

Area	Task Additions	
Farming Activities and Biodiversity	AB2-3-4	Promoting agricultural insurance systems
Power Supplies and Industrial Activities	IE1-1-1	Installing new facilities on higher-elevated sites
	IE4-3-1	Including climate change impact response systems in tangible cultural assets conservation project
Health Services	H3-1-10	Investigating and monitoring the distribution and shifts in the populations of vectors
	H4-2-2	Seeking the support of health centers to strengthen medication safety campaigns and offer blood pressure measurement services to people with allergies, senior citizens and their caretakers

4.2.1 Disaster Areas

Disaster areas are defined by two issues. Ten coping mechanisms are created for these two issues. Strategies and tasks for each adaptation issues are diagrammed in table 5-4.

Issue One: In D1, flash floods of short intervals shorten disaster response time needed; they also impact the government's disaster prevention mechanism. That being said, the coping mechanisms are characterized by five aspects. They include an upgrade of calamity rescue performance in four areas: response mechanisms, disaster relief support, disaster prevention knowhow, and better drainage systems. Also, high-risk flood areas - underpasses, culverts and bridges - would be defined independently

for specific strategization.

Issue Two: In D2, prolonged heavy showers exact greater impacts on wider disaster areas and higher pressure on disaster response systems. The river course capacity management and enbankment protection, early-alarm systems for disaster updates transmission, disaster relief responses, drills and exercises, and better evacuation shelter services. The City Government's coping mechanism are also characterized by five aspects, including river course capacity and embankment reinforcement plans, better monitoring and data transmission via forewarning systems, response mechanisms and disaster reliefs, exercise drills, evacuation and shelter services.

4.2.2 Water Resources

Water resources management are confronted by three issues. Four coping mechanisms are developed accordingly. Strategies and tasks for each issue are diagrammed in table 5-5.

Issue One: In W1, flash floods cause sediment spill, which leads to siltation in the reservoirs, impacting water storage capacity. That said, the minimization of siltation in reservoirs should be the focus of these coping mechanisms. The most effective remedy is strengthening soil and water conservation in the water catchment areas to reduce soil erosion or sediment spill. Meanwhile, a quality earthworks repurposing and construction technique should be adopted to enhance siltation dredging effectiveness.

Issue Two: In W2, prolonged droughts have depleted the reservoirs, causing water shortage; the coping mechanisms thus are defined by two features. One is to enhance usage efficiency among water users; the other is to increase water supply adjustability.

Issue Three: In W3, water shortage could heighten groundwater use, and thus lead to subsidence and seawater encroachment. In this regard, coping mechanisms should begin with a groundwater usage survey, followed by conscientious management and monitoring.

4.2.3 Critical Infrastructure Management

Critical infrastructure contains three issues to be addressed. Seven coping mechanisms are developed accordingly. Strategies and tasks for each issue are diagrammed in table 5-6.

Issue One: In I1, Rapids lead to soil erosion that disintegrates the foundation of bridges. Coping mechanisms for this particular issue contain two angles: one, strengthen the bridges' defense capabilities; two, set up regular checks and exercise drills to improve response effectiveness.

Issue Two: In I2, for hillside collapses caused by flash floods, the coping mechanisms encompass two elements for remediation, which are regular roadway patroling and maintenance services, and timely restoration of damaged backup systems.

Issue Three: In I3, flash floods and typhoons are great threats to the health of critical infrastructure. Coping mechanisms for this regard contain three components. In addition to routine checks and better response mechanisms, the infrastructure would be reinforced for flood prevention to minimize damage.

4.2.4 Coastline Protection

Four issues now challenge the City Government's coastline protection program;

seven coping mechanisms are created to address these issues. Strategies and tasks for these mechanisms are diagrammed in table 5-7.

Issue One: In C1, typhoons intensify the threat posed by swelling tides, which lead to flooding along seaboards and impacting local fisheries. The City Government's coping mechanisms contain three elements, including coastline preservation, industrial adaptation programs in seaboard areas, and the installation of buffer zones.

Issue Two: In C2, flash floods erode hillside areas and push a large number of driftwood to the oceanfront, damaging the environment and crippling the levees. To that end, the strategies contain three approaches, including the improvement of shoreline development projects, hillside thickets protection, soil and water preservation in upstream areas, and driftwood clear-up to minimize tidal enroachment on the shorelines through amassed jetsam.

Issue Three: The rising sea levels shrink beach sizes; they even lead to land losses. The City Government's coping mechanisms focus on coastline restorations.

Issue Four: The rising sea levels are found to push tidal storm surges inland; the drainage systems are not functional enough to expel inland waters, leading to severe floods. The City Government's coping mechanisms include the setup of high-performance surge drainage systems in buffer zones to remedy the floods.

4.2.5 Land-Use Planning

The City Government's land-use planning is confronted with three issues. Six

coping mechanisms are developed accordingly. Strategies and tasks are diagrammed in table 5-8.

Issue One: In L1, the City's coping mechanisms contain two elements to address heavy rainfall caused by flash floods and flood retention space insufficiency. They are: improving and bolstering soil absorbency, land permeability, and flood retention capacities.

Issue Two: In L2, the management and monitoring of flood-prone areas are enhanced for better protection. Coping mechanisms for this issue contain two aspects, including land-use reviews, coupled with better management programs.

Issue Three: In L3, the heat island effect would escalate temperature rise; to that end, the City Government's coping strategies contain two areas, including better architectural planning, and greater buffer zone planning.

4.2.6 Farming Activities and Biodiversity

Farming activities and biodiversity conservation are confronted by six issues. 14 coping strategies are developed to address them accordingly. See table 5-9 for strategies and tasks.

Issue One: In AB1, flash floods trigger siltation in reservoirs, impacting their water storage capacities and leading to droughts. Farmlands are lay fallow. The City Government's coping strategies contain two aspects, which are: crop improvement under adverse drought conditions, and enhancing water efficiency in farming activities.

Issue Two: In AB2, drainage failures in certain areas lead to flooding, and damaging agricultural, forestry, fishing and livestock facilities. The City Government's coping mechanisms are characterized by three areas: disaster prevention programs for agricultural services; improving agricultural production and technologies for flood conditions; and establishing post-disaster recovery services to prevent further

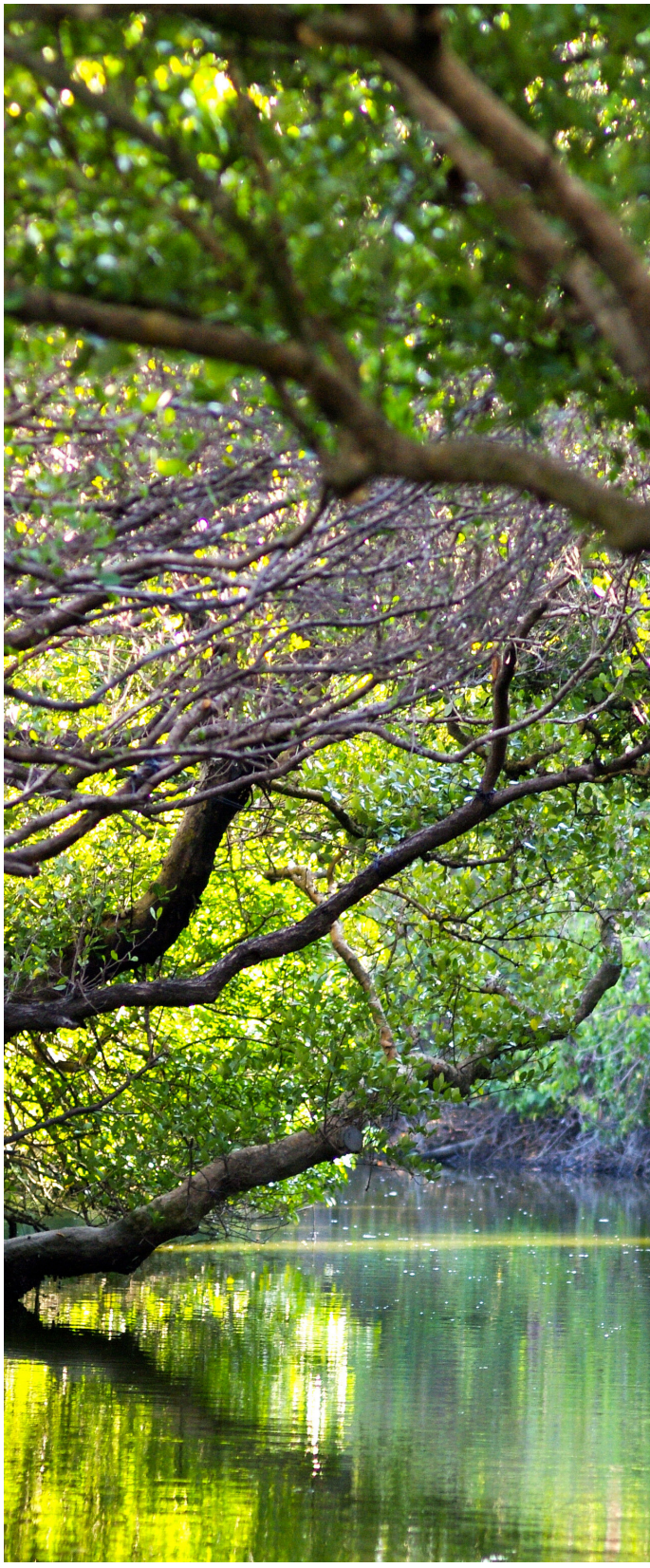
damages.

Issue Three: In AB3, flash floods result in damaged roadway accesses for agricultural (fisheries) activities. The City Government strengthens roadway remedies and maintenance to ensure better protection.

Issue Four: In AB4, drastic temperature fluctuations impact agricultural productions, which inspire three coping mechanisms. Firstly, modify agricultural patterns and conduct crop improvement to ensure sustainable supplies; secondly, stabilize the balance between agricultural production, demand, and quality, to prevent either crop excess or shortage. Meanwhile, inaugurate land-friendly policies to boost agricultural value, consistent with future agricultural trending.

Issue Five: In AB5, rising temperatures make pest controls more challenging, impacting the output and quality of agricultural and livestock productions. Coping mechanisms for this issue contain two elements. One is to fortify pest and disease controls; the other targets environmenta sanitation for livestock and fishery services for effective pest control.

Issue Six: In AB6, all the causes of adverse weather patterns would impact the planet's



biodiversity. To that end, the City Government's coping mechanisms contain two elements, one concerns the management of wildlife habitats, nature reserves and sanctuaries; furthermore, bioconservation monitoring should be established to document the shifts in the ecosystems to safeguard biodiversity richness.

4.2.7 Power Supplies and Industrial Services

Power supplies and industrial services are confronted by six principal issues. Ten coping mechanisms are formulated to address them accordingly. See table 5-10 for strategies and tasks.

Issue One: In IE1, floods set off by typhoons or flash floods are destructive and rapid, and they exacerbate industrial losses. For prevention and recovery, the City Government's coping mechanisms contain three aspects, which are: enhanced self-initiated disaster prevention capabilities; effective forewarning programs and campaigns, plus efficient response, recovery and compensations to quickly regroup for normal operation.

Issue Two: In IE2, typhoons and tropical storms are prone to destroy fuel, water, power and gas supply facilities, leading to machinery breakdowns and suspension. The City Government's coping mechanisms focus on stabilizing power supply services.

Issue Three: In IE3, droughts triggered by the shifts in rainfall patterns would force higher costs, which impact industrial output capacity and operation. Coping mechanisms for this issue

centers on improved water efficiency.

Issue Four In IE4, temperature fluctuations would put pressure on the preservation of facilities and heritage monuments, leading to more pressure on power supplies and maintenance costs. The City Government's coping mechanisms are characterized by three approaches, including power efficiency and greater alternative energy options. Meanwhile, preservation strategies for Tainan's unique cultural assets are develoed accordingly.

Issue Five: In IE5, industrial services along the coastlines are vulnerable to saltwater intrusion, and surging tides set off by typhoons. Coping strategies for this issue include: facility barricades and reinforcement along the seaboards.

4.2.8 Health Services

Six issues need to be addressed for better health services. Seven coping mechanisms are created accordingly. See table 5-11 for strategies and tasks.

Issue One: In H1, Intensified rainfalls, increased rainfalls and saltwater intrusion cause flooding in residential areas, which would lead to heightened risks of feces contamination and contagious diseases. The City Government's coping mechanisms contain two focuses. They are: post-disaster endemic control, plus health and sanitation management education to curb the diseases from spreading.

Issue Two: In H2, droughts expose the riverbeds to heavy dusts, and they lead to an increase in particulate matter suspended in the atmosphere. The City Government's coping mechanisms focus on fugitive dust controls to curb pollution.

Issue Three: In H3, incessant rain and rising temperatures prolong the activity of vectors and escalate their impacts; this signify greater endemic threats. The City Government's coping mechanisms focus on better vector control programs to reduce risks.

Issue Four: In H4, drastic temperature changes magnify the threat of cardiovascular diseases among disadvantaged populations, such as the elderly and the homeless; plus patients with heart and blood conditions. The City Government's coping mechanisms include two areas: better health education programs for patients with heart and blood conditions, and the general public; and outreach programs for disadvantaged populations.

Issue Five: In H5, the drastic changes in temperatures magnify flu symptoms and complications. The coping mechanisms focus on better command of the endemic.

Issue Six: In H6, risk priority with regard to the increase of elderly population over the years, and medical resource distributions targeting citizens in remote areas is ranked "medium to low" in climate change issues. The City Government has not yet developed strategies nor tasks.

Chapter 5, Conclusion

Nations worldwide are proposing adaptation and mitigation initiatives to address challenges induced by global warming and climate change. To tackle climate change-related issues, the Tainan City Government has actively and consistently integrated support projects proposed by every department to encourage carbon neutrality since Tainan's promotion to direct municipality status. In 2011, the City Government launched a "Green Governance" framework to institute actionable plans, and was chosen as one of Taiwan's four low-carbon model cities. Tainan is eyeing more robust and specific courses of action and programs to reduce carbon waste emissions. Also, the concerted effort by "Tainan City Climate Change Adaptation Promotion Task Force" has pinpoint "disasters" and "water resources" as two priority areas for the city's adaptation measures, which are encompassed in eight carbon reduction categories. 33 issues have also been identified accordingly for the development of 65 policies and 234 tasks.

Statutes and policies are instituted accordingly to fulfill the City Goverment's vision of "Carbon-Neutral Tainan for Livability, Leisure, and Wellness." A Carbon-Neutral City Campaign Committee is set up to determine water conservation and rainfall tolerance levels, so as to effect climate change adaptation actions. It is estimated that by 2020, water conserved would reach 340,000 metric tons daily; rainfall tolerance levels, 2,420,000 metric tons in retention.

The Tainan City Government formulates every mitigation and adaptation strategy and goals through the establishment of the two aforesaid projects, to instill the spirit of carbon neutrality and lifestyle in citizens and industries. Energy-saving infrastructure is promoted; low-carbon buildings, communities, businesses and public conveyance systems are inaugurated to steer Tainan to the course of becoming a "Resilient City." Tainan will also actively participate in international strategic alliances and align its vision with the global community to sharpen its competitiveness. It vows to building Tainan into a low-carbon, sustainable metropolis, making it a global carbon-neutral destination.