



Green City in Transformation: Adaptation and Mitigation Actions in Kaohsiung City

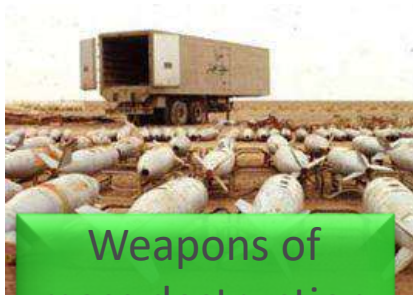
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CEO, Kaohsiung Capacity Center, ICLEI

■ World Economic Forum (WEF): 2018 Global Risk Report

Top 10 Risks to the Global Economy



Weapons of mass destruction



Extreme weather events



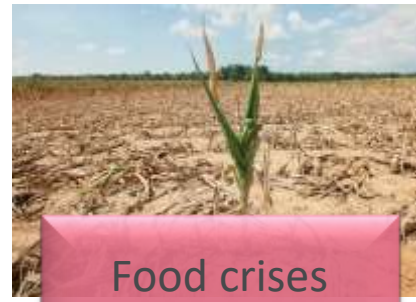
Natural disasters



Failure of climate-change mitigation and adaptation



Water crises



Food crises



Biodiversity loss and ecosystem collapse



Large-scale involuntary migration



Cyber-attacks



Spread of infectious diseases

Geopolitical

Technological

Environmental

Social

■ Climate Change and Disaster Threats in Kaohsiung City



■ Frequency of One-Hundred-Year **Extreme Weather Events** in Kaohsiung City

Typhoon Morakot in Aug. 2009

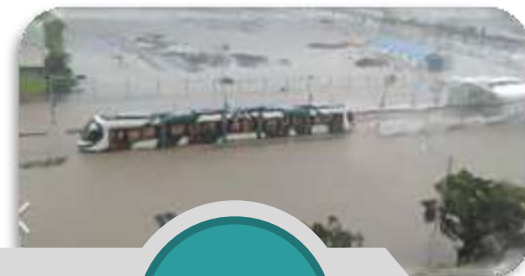
- Severe floods in the central and southern Taiwan from Aug. 6-10
- A catastrophic damage happened in Xiaolin Village of Jiaxian District
- **702 people died**, 22 people missed, 4 people seriously injured, and agricultural losses exceeded \$520 million.

Typhoon Fannaby in Sept. 2010

- On Sept. 19, Nanzih area with a total rainfall of 618 mm, **approaching the two-hundred-year rainfall frequency**.
- 2 people died, 111 injured, the loss of agriculture and fisheries in Taiwan has exceeded \$109 million.

Typhoon Megi in Sept. 2016

- On Sept. 19, **the daily rainfall in mountain area exceeded 500 mm**.
- 4 people died, 662 injured, the loss of agriculture has exceeded \$9.52 million.



Extremely torrential rain
higher than 500 mm/day

2009

2010

2016

2018

The daily rainfall was
over **1000 mm**
ranked the highest in the
world

The biggest disaster in
Kaohsiung in the past 50 years



823-828 Floods in 2018

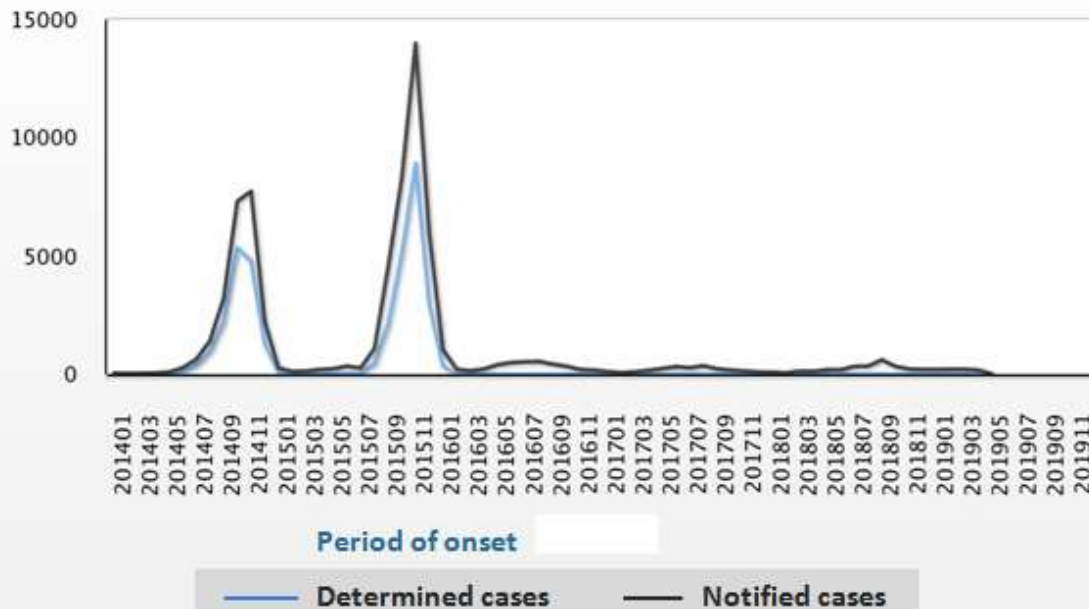
- The daily rainfall in the city center was 210 mm, **and the instantaneous rainfall was higher than 100 mm/hr**.
- **The most sever storms in Taiwan after the typhoon Morakot.**
- 100-year storm.

■ Dengue Fever: Current Status and Challenges

Year	2014	2015	2016	2017	2018	2019
Confirmed cases	15,043	19,784	379	37	56	47
Indigenous cases	14,999	19,723	342	3	12	20
Overseas cases	44	61	37	34	44	27
Death toll	20	112	4	0	0	0
Mortality rate	0.13	0.57	1.06	0	0	0

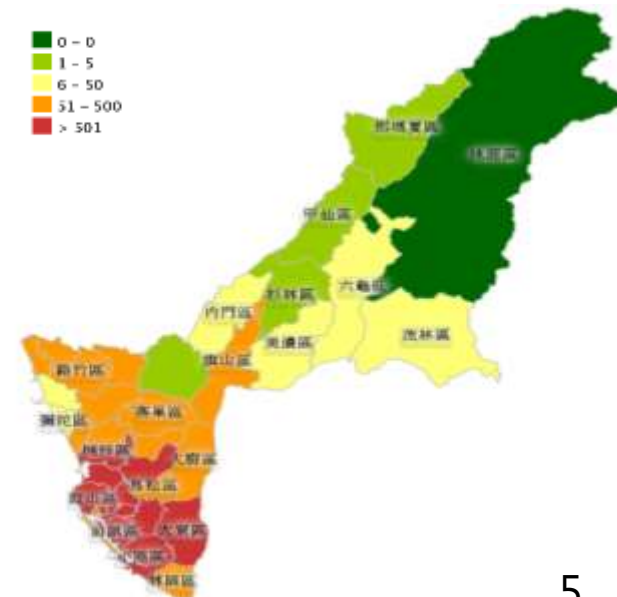


Dengue cases in Kaohsiung City (2014/01-2018/05)



Taiwan CDC 2019

Spatial distribution of dengue fever cases in Kaohsiung City



Highlights on Carbon Reduction and Adaption Actions



Transforming Cities for Resilience & Safety

□ Resilient City under the Definition of ICLEI

• I C L E I Local Governments for Sustainability

Resilient City : A resilient city is defined as a city of low risk to natural and man-made disasters. It reduces its vulnerability by building on its capacity to respond to climate change challenges, disasters, and economic shocks.



■ Transitioning towards a Sponge City

□ Green Building and Sponge City

- Enacting “**Green Building Autonomy Act**”
- Regulations for designing and rewarding Kaohsiung LOHAS Building



Water Butt



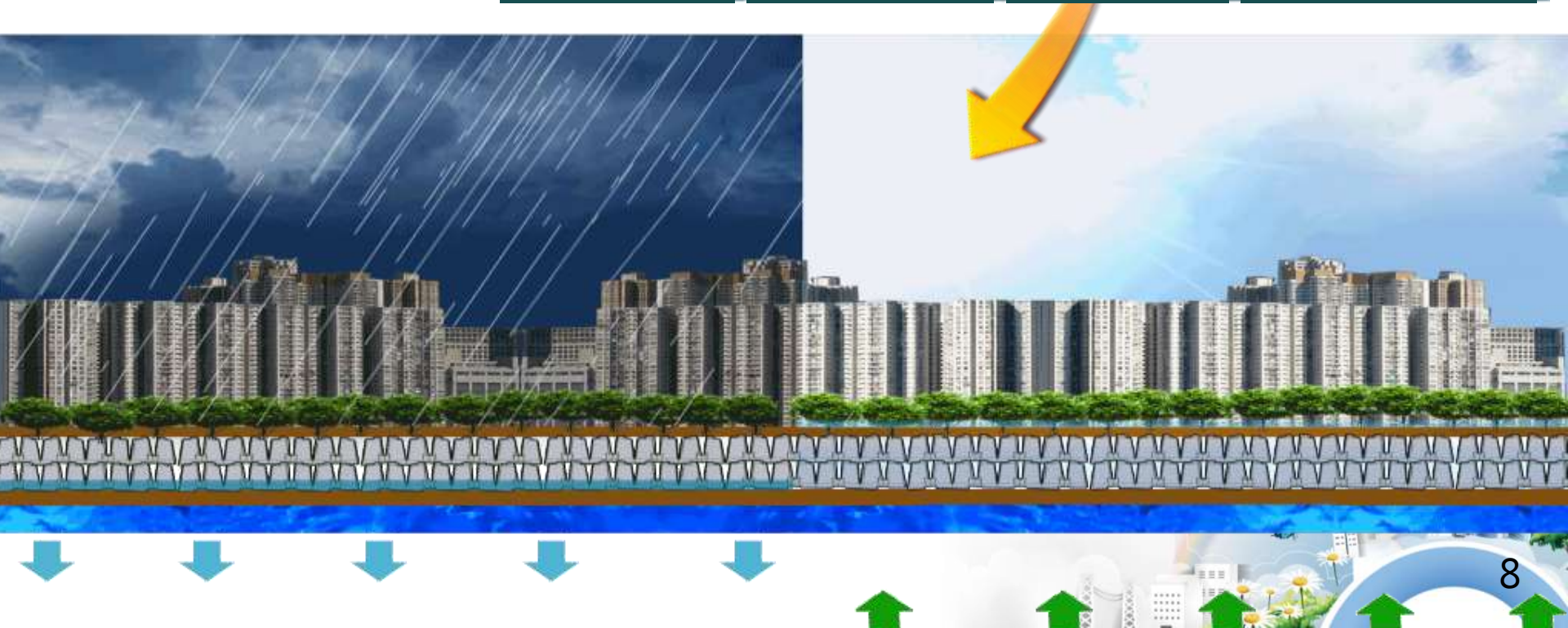
Rain Garden



Green Roof



Permeable Pavement



■ Transitioning towards a Sponge City

▣ Widely Constructed Flood Detention Ponds

- Kaohsiung City has constructed **13 flood detention ponds** by 2018, with a total of flood storage capacity of **2.956 million tons**. The area has increased from 639 to 957.96 hectares.
- Currently, **the overall flooded area has been decreased by about 6,352 hectares** compared to the flooded area prior to its merger with Kaohsiung County. The amount of flood detention is the highest in the country, creating a sustainable city.

Chai Shan Detention Pond was constructed in 2017 and won **the Executive Yuan 17th Gold Medal for public works**.

Benheli Detention Pond was built in 2005 to become **the first urban flood control detention pond in Taiwan**.



■ Transitioning towards a Sponge City

Engineering Improvement Project

The flooding area **reduced from 15 to 5 hectares** after constructing Chia-Shan detention pond.

Before the construction of
Chai Shan Detention Pond



Sept. 15th 2016
Typhoon Merandi
Severe Flooding in
Jiuru Land Bridge &
Gushan 3rd Rd.



After the construction of
Chai Shan Detention Pond



Aug. 23rd 2018
Extremely heavy rain
fell on Jiuru Land
Bridge & Gushan 3rd Rd.
The Chai Shan Detention
Pond is effective for
stormwater.



■ Transitioning towards a Sponge City

□ Widely Constructed Wetlands

An **blue belt** eco-system water management

- **21 wetlands** in the city
- Over 1,000 hectares

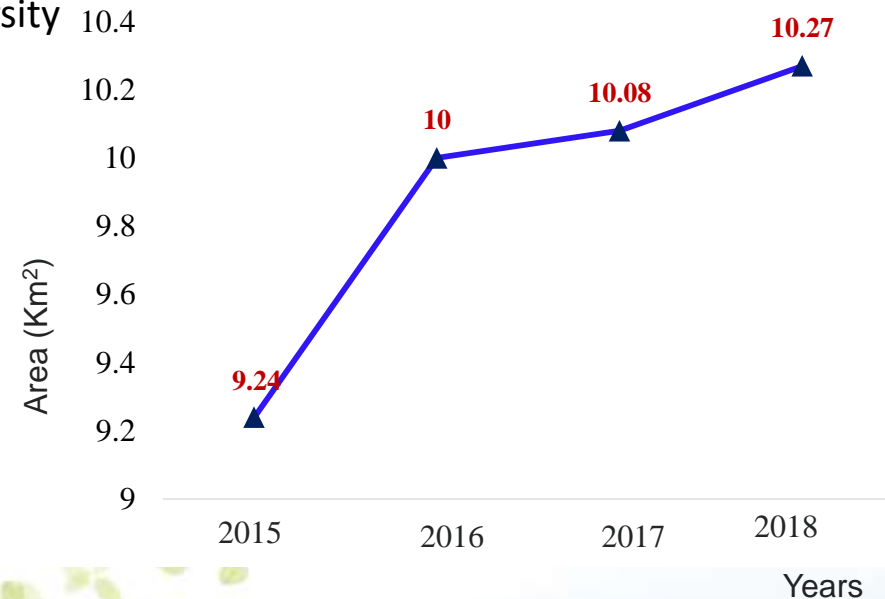


■ Transitioning towards a Sponge City

□ Green Spaces and Parks

- Providing citizens the best leisure places
- Improving living quality and space
- Improving climate change, air pollution, biodiversity
- Creating a modern cosmopolitan landscape
- Transforming the harbor city into a humanized and ecological garden city

With the highest percentage of public green space within 6 municipalities in 2018



Linyuan Daan Jade Park No.2



Fengshan Sports Park

Green space for people in urban areas



■ Promoting the Green Roof Project

□ Green Building Autonomy Act

- Green building is designed for energy conservation and disaster prevention.
- Priority specification for public, large-scale development, and high-pollution construction
- Achieve the goal of **energy conservation, carbon reduction, and urban transformation**
- **Carbon reduction is about 5,800 tons/yr, and water saving is 380,000 tons/yr.**



Solar photovoltaic facility



Roof insulation



High efficiency & energy saving T5 lamps



Kaohsiung LOHAS Building



Green Building Autonomy Act

- 1) Solar photovoltaic, greening, and heat insulation
- 2) Water-saving toilets, rainwater recovery and storage facilities
- 3) Green building materials
- 4) Construction waste management & disposal
- 5) Affinity fence installing
- 6) Bicycle facilities design for buildings

Promoting the Green Roof Project

Kaohsiung's geographical environment is suitable for setting up solar photovoltaic

Kaohsiung City is located in southern Taiwan, with sufficient sunshine and an average of 2,100 to 2,300 hours of sunshine per year.



Clean Energy

Constructing of 350MW solar photovoltaic facilities



Economy

Creating \$1.1 billion economic benefits for green energy industry



Intelligence

Establishing 200 smart green energy systems for public school buildings

2015

The First Phase

2018

2019

The Second Phase

2022

- The installed capacity is 293.94 MWP
- With 450 kWh a month household average, the power generation can be used by 64,000 households per month.

Target

- Set up 350MW in 4 year
- Power generation is 447 million kWh/yr
- Carbon reduction is 236,500 tons/yr



As Taiwan move toward a nuclear-free homeland in 2030, every household in Kaohsiung City will be equipped with solar photovoltaic facilities. Thus, the whole city could supply energy by itself.



Nanzhi District Office
photoelectric facilities set up
in public buildings

■ Developing Sustainable Transport

■ Approaches/Goals

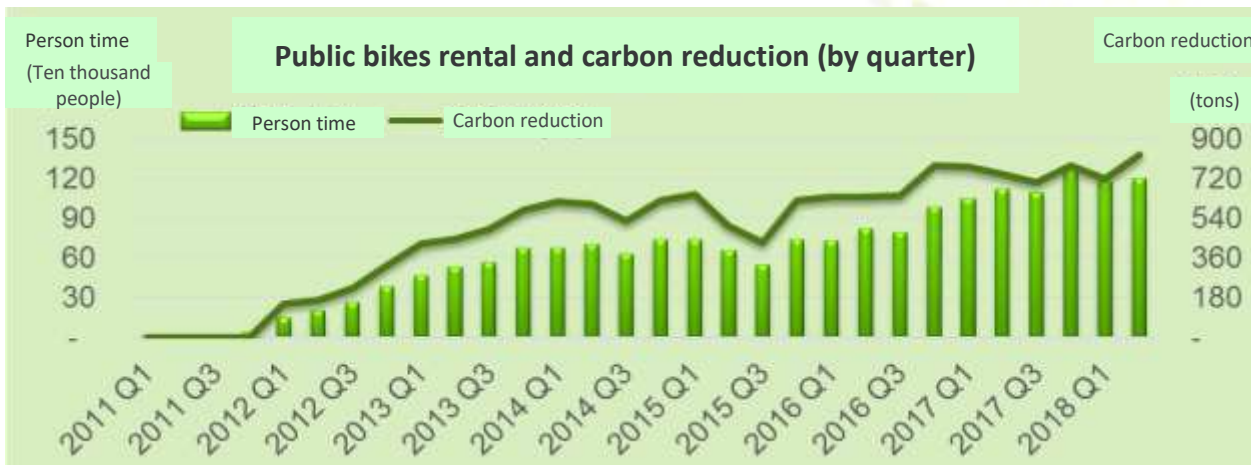
- Set up Public Bike Rental Station (C-Bile).
- Reduce the use of private transport and reduce carbon dioxide emissions.

■ Outcomes

- The C-Bike rental station has been expanded to 300. It is expected to set up 100 stations from 2019 to 2021.
- In 2017, the reduction of CO₂ emissions was about 80 tons, equivalent to reducing the emissions of 1,000 heavy-duty diesel trucks or 129,500 four-stroke scooters.
- From 2011 to 2018, the cumulative carbon reduction was about 14,700 tons, equivalent to the annual carbon absorption of 6.7 Kaohsiung Metropolitan Park.
- Kaohsiung has more than 1,030-kilometer cycle network.



Public Bike Rental Station



Connect Metro Station & Public Bike

■ Developing Sustainable Transport

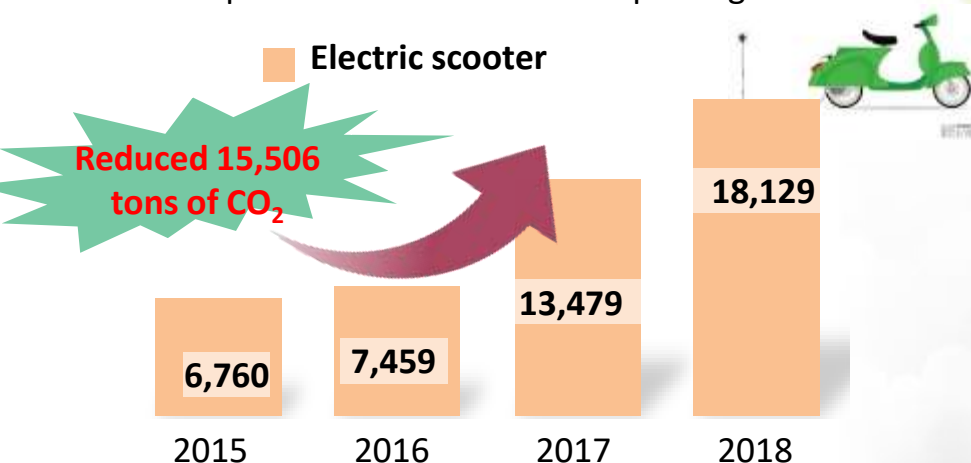
Promote the use of *electric scooters*

■ Vision

- In order to promote green transportation and reduce GHG emissions from scooters, Kaohsiung City Government **provides subsidies for the purchase of electric vehicles and free charging station services.**
- By updating the system, **the subsidy remittance period is effectively shortened**, thus people's willingness to purchase electric vehicles is enhanced.

■ Current Outcomes

- Completed the setup of **138 public electric scooter charging stations.**
- The pilot operation will be held for 2 years from July 1, 2018. The electric scooters can **park with free charge** on public roads and on-street parking lots.



Promote the use of *electric buses*

■ Goals



By 2030, the share of electric buses is expected to reach 100% in Kaohsiung.

■ Approaches/Achievements

- Kaohsiung now has the largest electric bus fleet in Taiwan.

Reduced 2,921 tons of CO₂

- ✓ Subsidize old for new
Replace **75** diesel buses every year

- ✓ New route planning
Buy in **5** electric buses per year

- ✓ Highest achievement in Taiwan
The total number of electric buses reached **109** as of January 2019.

109 electric buses have been launched until January 2019, accounting for **10.8%** of the city's 1,010 buses.

EcoMobility World Festival

- Practice indicators: carbon reduction, lightweight vehicles and Ecomobility community
- Five major transportation facilities

用綠發動哈瑪星
Going Green in Hamasen

Over 43 countries, 50 cities, 23 mayors and 1,200 delegates participated in the event.

Kaohsiung Strategies



*50 enterprises participated
80 indoor & outdoor booths*

Electrical vehicles



Electrical Buses



The overall improvement of
the pedestrian crossings.

*More than 150 events
More than 300,000
participants*



GHG Emissions in Kaohsiung City

13.2% Lower than the Base Year



Based on the "Greenhouse Gas
Reduction and Management Act"

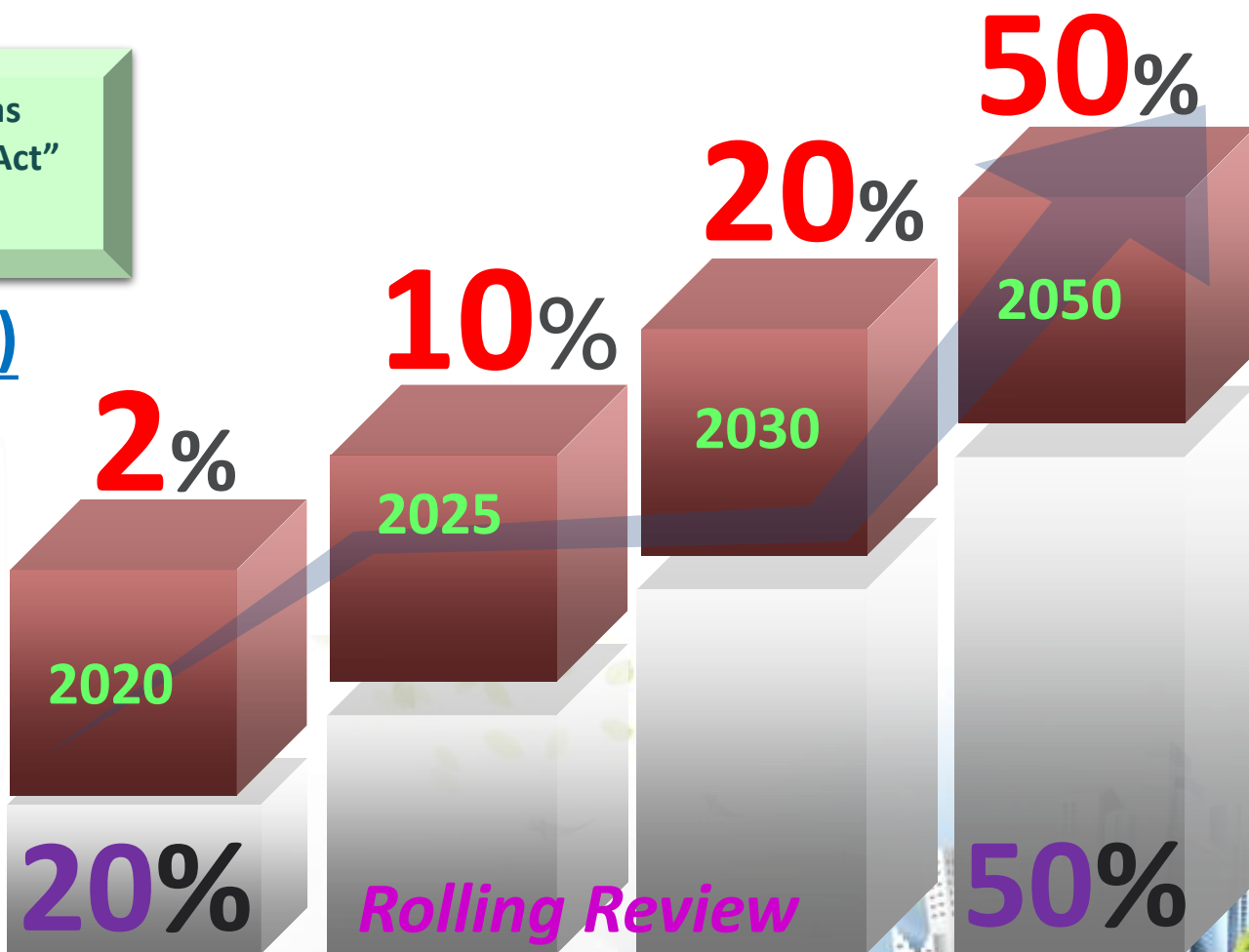
Long-term Goals

Base Year (2005)



2017

13.2%



■ Tackling the Threat of Dengue Fever

Inter-Departmental Action Plan / Environmental Self-Management

Tackling the epidemic across country borders

【Department of Health】

- In order to prevent infection with dengue virus from travelling, people need to take the initiative to go to the health clinic for blood test within 5 days after returning home.



Measures for epidemic control



Community involvement in dengue outbreak control

【Civil Affairs Bureau】

- The reward program of neighborhood self-supporting dengue prevention work in high-risk areas.



Spraying medicine been replaced by mandatory inspection of breeding sources

【Environmental Protection Bureau】

- Dengue fever ecological anti-mosquito program.
- Handling the events of "Eliminating dengue fever mosquito breeding source".



ICLEI KCC Achievements 2012-

Actively host international events to improve our international visibility



- Participate in ICLEI World Congress
- Host Intl. Forum on Industrial Pipeline Management
- Host workshops on Carbon Disclosure Inventory workshops in Taiwan
- Host ICEO&SI*ICLEI Resilience Forum
- Host forums and workshops on EcoMobility
- Participate in UNFCCC COP21、COP22
- Support Kaohsiung to fulfill the EcoMobility Alliance Chair Tasks 2016-2018

Intl.
Participation
& Exchanges

50 +

Capacity
Building on
Sustainability
events

**60+ Ppl.
1500+**

Equipped with in-depth
professional capacity and
knowledge outputs

**Start-Up Period
2012-14**

**Development Period
2015-16**

**Accelerating Period
2017-18**

**Deep-diving Period
2019-21**

Member recruitment and business start

- Establishment of ICLEI KCC
- Mentor city partnership project
- Participate in Metropolitan Solutions @Hannover Messe
- Host DRR Forum and ICLEI GexCom Meeting
- Host LAB Conference



Renewal of ICLEI KCC Host Agreement & Cohost EcoMobility Global Congress

- Renewal of ICLEI KCC Host Agreement
- Cohost EcoMobility World Festival & World Congress
- Participate in EcoMobility Days at UN HABITAT III
- Host more than 20 training programs and peer learning courses for cities on resilient cities, smart water, SDGs, EcoMobility, Renewable and so on
- Assist Taiwan City Delegation at ICLEI World Congress



**ICLEI Resilient Cities Series @ Bonn
COP Cities and Regions Pavilion**





A Future Vision of Kaohsiung

安全 健康 宜居城市

Safety, Health, and Livable City

Thank You for Your Attention

carbon reduction

temperature control

adaptation

adapt to the environment



Outlines

01

Climate Change Impacts on Global and Local Kaohsiung Environment

02

Highlights on Carbon Reduction and Adaptation Actions

Climate Change Impacts on Global and Local Kaohsiung Environment



4. Man-made Disaster Threat in Kaohsiung City (Gas Pipeline Explosions)

- ▶ Venue: Cianjhen and Lingya District, Kaohsiung City
- ▶ Time : 31 Jul. 2014 at 21:00 - 1 Aug. 2014 before dawn



Impacts of Gas Pipeline Explosions



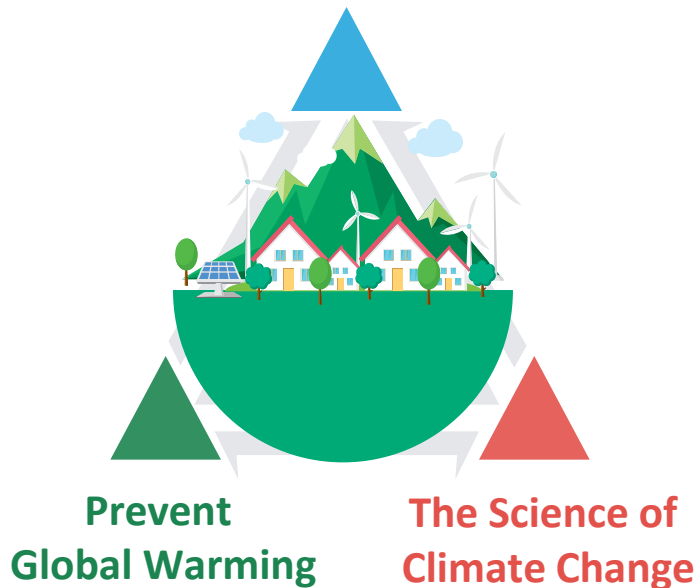
❑ Caused by the managing flaw of the propylene transportation

❑ Restricted zone covers **4 km** long and **7.2 km²**

❑ 32 were killed and over 300 others were wounded

Highlights on Carbon Reduction and Adaptation Actions

Impacts & Adaptation



1. Transitioning towards a Sponge City

2. Promoting the Green Roof Project

3. Tackling the Threat of Dengue Fever

4. Disaster Management and Notification for Industrial Pipeline

5. Developing Sustainable Transport



4. Disaster Management and Notification for Industrial Pipeline

Comprehensive review and analysis of pipes for petrochemical industry in Kaohsiung

- High density steel industry distribution
- 57 most dangerous petrochemical industrial plants
- 800 steel fastener manufacturers
- 7 large industrial parks
- Widely distributed shipyards and container handling areas
- Concentrated power supply is greater than five major public investments, such as the construction of light rail

Safe City Transformation Response Strategy after Gas Explosion

Challenge

Countermeasure

Fuzzy zone of authority
and responsibility

Disaster prevention
mechanism

Unable to source

Pipeline management
specification

Composite material
pipeline material

Update pipeline
management specification

Lack of emergency
shut-off valve

Site inspection system

Kaohsiung City Road Excavation Management Center Road Excavation Information and Inspection Report

全部案件

臺灣電力股份有限公司鳳山區營業處										臺南市108年03月道路修繕工程進度表										12345TSP		
編號	計畫資訊與申請資訊										輸入資訊		申請日期									
	類別	工程名稱	自行	補助	0.5小時	3.5小時	4.5小時	4.5小時	以上	備註	申請人	申請人電話		申請日期								
主路水溝工程	31	7	10	40	40	自來水管總管漏水搶修					W10800962	從 1080326 至 1080326										
員工進出設備工程	41	17	100	700	900	填補(主路水溝)					T1080423	從 1080426 至 1080509										
員工進出設備工程	47	21	700	300	424	自來水管總管漏水搶修					W10800962	從 1080426 至 1080509										
員工進出設備工程	10	6	150	100	100	自來水管總管漏水搶修					T1080423	從 1080426 至 1080509										
員工進出設備工程	10	10	300	300	300	自來水管總管漏水搶修					W10800962	從 1080426 至 1080509										
主路水溝工程						自來水管總管漏水搶修					T10800451	從 1080426 至 1080509										
新山區公所						自來水管總管漏水搶修					W10800969	從 1080425 至 1080502										
新山區公所						自來水管總管漏水搶修					E10800978	從 1080425 至 1080508										
新山區公所						自來水管總管漏水搶修					W10800969	從 1080425 至 1080502										
新山區公所						自來水管總管漏水搶修					E10800978	從 1080425 至 1080508										