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

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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

2009, Typhoon Morakot

2010, Typhoon Fanapi
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.

- 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.

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 severe storms in Taiwan after the typhoon Morakot.
- 100-year storm.
## Dengue Fever: Current Status and Challenges

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
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<tbody>
<tr>
<td>Confirmed cases</td>
<td>15,043</td>
<td>19,784</td>
<td>379</td>
<td>37</td>
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<td>Indigenous cases</td>
<td>14,999</td>
<td>19,723</td>
<td>342</td>
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<td>Overseas cases</td>
<td>44</td>
<td>61</td>
<td>37</td>
<td>34</td>
<td>44</td>
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<tr>
<td>Death toll</td>
<td>20</td>
<td>112</td>
<td>4</td>
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<td>Mortality rate</td>
<td>0.13</td>
<td>0.57</td>
<td>1.06</td>
<td>0</td>
<td>0</td>
<td>0</td>
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### Dengue cases in Kaohsiung City (2014/01-2018/05)

- **Period of onset**
  - Determined cases
  - Notified cases

### Spatial distribution of dengue fever cases in Kaohsiung City

- 0 - 0
- 1 - 5
- 6 - 50
- 51 - 500
- > 501

Taiwan CDC 2019
Highlights on Carbon Reduction and Adaption Actions
Resilient City under the Definition of ICLEI

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
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.

**Transitioning towards a Sponge City**

**Widely Constructed Flood Detention Ponds**

- **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

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

Before the construction of Chai Shan Detention Pond

After the construction of Chai Shan Detention Pond

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

**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.

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.

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.

2015 The First Phase 2018 2019 The Second Phase 2022

- 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.
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.

<table>
<thead>
<tr>
<th>Person time (Ten thousand people)</th>
<th>Carbon reduction (tons)</th>
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<tbody>
<tr>
<td>2011 Q1</td>
<td>900</td>
</tr>
<tr>
<td>2011 Q2</td>
<td>720</td>
</tr>
<tr>
<td>2011 Q3</td>
<td>540</td>
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<td>2011 Q4</td>
<td>360</td>
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<td>2012 Q1</td>
<td>180</td>
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<td>2012 Q2</td>
<td>150</td>
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<td>2012 Q3</td>
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<td>2013 Q1</td>
<td>60</td>
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<td>2013 Q2</td>
<td>45</td>
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<td>2013 Q3</td>
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<td>2014 Q1</td>
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<td>2014 Q2</td>
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<tr>
<td>2018 Q1</td>
<td>0.15</td>
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</table>

Public Bike Rental Station
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.

**Electric scooter**
- Reduced 15,506 tons of CO₂

**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.
  - 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

The overall improvement of the pedestrian crossings.

More than 150 events
More than 300,000 participants

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 Buses

Going Green in Hamasen

Hamasen Ecomobile Neighborhood

EcoMobility World Congress

EcoMobility Expo

Local Cultural Activities

Practice indicators: carbon reduction, lightweight vehicles and Ecomobility community

Eighty indoor and outdoor booths
Based on the “Greenhouse Gas Reduction and Management Act”

Long-term Goals

**Base Year (2005)**

- **2017**: 13.2% lower than the Base Year
- **2020**: 2% reduction
- **2025**: 10% reduction
- **2030**: 20% reduction
- **2050**: 50% reduction

**Rolling Review**
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

Personal protection & prevention
Self-inspection
Reduce risk of viral transmission
Reduce risk of death from infection

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”.

Community involvement in dengue outbreak control
【Civil Affairs Bureau】

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

Start-Up Period 2012-14

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

Development Period 2015-16

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

Accelerating Period 2017-18

Deep-diving Period 2019-21

Capacity Building on Sustainability

Events

50 +

1500 +

- 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

Member recruitment and business start

- Establishment of ICLEI KCC
- Mentor city partnership project
- Participate in Metropolitan Solutions @Hannover Messe
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- Host LAB Conference

ICLEI Resilient Cities Series @ Bonn
COP Cities and Regions Pavilion
A Future Vision of Kaohsiung

Safety, Health, and Livable City

安全 健康 宜居城市
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

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

<table>
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<tr>
<th>Challenge</th>
<th>Countermeasure</th>
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<tbody>
<tr>
<td>Fuzzy zone of authority and responsibility</td>
<td>Disaster prevention mechanism</td>
</tr>
<tr>
<td>Unable to source</td>
<td>Pipeline management specification</td>
</tr>
<tr>
<td>Composite material pipeline material</td>
<td>Update pipeline management specification</td>
</tr>
<tr>
<td>Lack of emergency shut-off valve</td>
<td>Site inspection system</td>
</tr>
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Kaohsiung City Road Excavation Management Center Road Excavation Information and Inspection Report

<table>
<thead>
<tr>
<th>Approval Date</th>
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