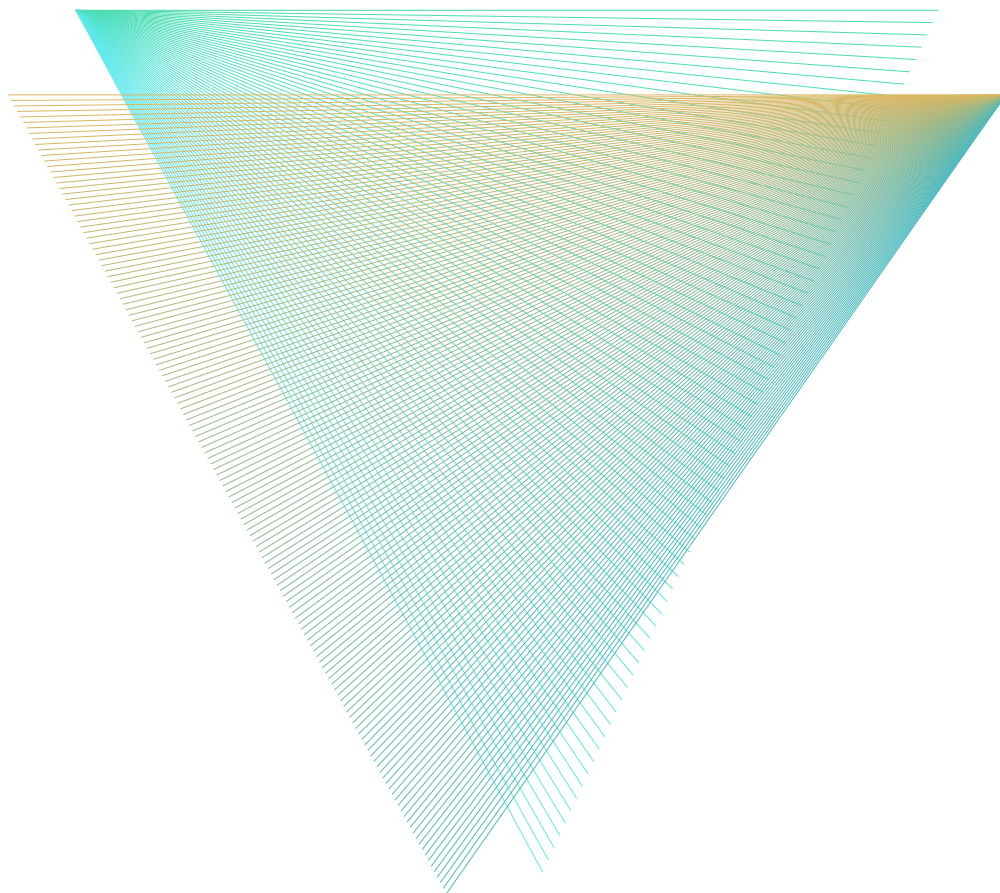


Environmental Protection Department
New Taipei City Government

New Taipei City Climate Adaptation Action Plan (Abridged Edition)

HAZARD

RISK



ADAPTATION

August 2015

I hereby declare the intent of the city of New Taipei to comply with the Compact of Mayors, the world's largest cooperative effort among mayors and city leaders to reduce greenhouse gas emissions, track progress, and prepare for the impacts of climate change.

The Compact of Mayors has defined a series of requirements that cities are expected to meet over time, recognizing that each city may be at a different stage of development on the pathway to compliance with the Compact.

I commit to advancing the city of New Taipei along the stages of the Compact, with the goal of becoming fully compliant with all the requirements within three years. Specifically, I pledge to publicly report on the following within the next three years:

- The greenhouse gas emissions inventory for our city consistent with the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC), within one year or less
- The climate hazards faced by our city, within one year or less
- Our target to reduce greenhouse gas emissions, within two years or less
- The climate vulnerabilities faced by our city, within two years or less
- Our plans to address climate change mitigation and adaptation within three years or less

Yours Faithfully,





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CHAPTER 1

Origin and Purpose

To combat the increasingly significant climate change, UN adopted the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and started organizing the Conference of the Parties (COP) once a year to collectively discuss the response actions for climate change. Taiwan has analyzed the adaptation actions taken by nations worldwide, and with the consideration of the peculiarity and past experiences of Taiwan environment, Taiwan has adopted the "Adaptation Strategy to Climate Change in Taiwan" in 2012 and established the legislative foundation for Taiwan's response action in climate change. In 2015, Taiwan adopted "Greenhouse Gas Reduction and Management Act" with appeals in the mitigation, adaptation and green growth to promote the specific actions taken by Taiwan in response to climate change.

New Taipei City is one county with the highest number of population in Taiwan and has long been committed to the adaption and mitigation work related to climate change. New Taipei City envisions the overall administration with the "New Capital of Quality Cities" by including "local employment, school, home care and local LOHAS" in the general administration. In 2009, New Taipei City joined the Local Governments for Sustainability (ICLEI) and proactively participates in international affairs. In 2015, New Taipei City signed Seoul Declaration to express its determination in defying climate change related issues and the continual building of low-carbon and resilient city to cope with climate change.



2015



2015

Adaptation Strategy to
Climate Change in Taiwan



2012



2009



1994

CHAPTER 2

Hazard Identification

Most cities have been threatened by different climate-related disasters for a long period of time. In spite these city governments and communities have familiarized with these climate-related disasters and taken relevant actions, extreme events could become more frequent and intense under climate change while all cities must reexamine their protection actions and strategies.

The current and future possible types of hazards for New Taipei City have been identified on the basis of the City Climate Hazard Taxonomy provided by Compact of Mayors, which collects and consolidates all hazard related records, graphs and data, literature, and reports to analyze the potential of current and future hazards.



2.1 New Taipei City Environmental Status



1 Geography

New Taipei City is located in northern Taiwan and encircles Taipei City and Keelung City, forming a common living circle of Great Taipei Metropolitan. It is bordered to Taoyuan City and Yilan County, with a width of 68.4km and length of 69.09km. New Taipei City faces the ocean to the east and west coast, bordering with Yilan County to the south and Taoyuan City to the west. The coastlines are adjacent to Pacific Ocean and Taiwan Bay, including Ruifeng District, Gongliao District, Wanli District, Jinshan District, Shimen District, Sanzhi District, Danshui District, Bali District, and Linkou District. The total city area is 2,052 square kilometers, accounting for 6% of total Taiwan area, with a coastline length totaled 120 kilometers.

2 Administrative Organization

New Taipei City is the former Taipei County which was restructured and promoted to municipality on December 25th, 2010. The city is divided into 29 districts with the City Government located in Banqiao City. Pursuant to Paragraph 1, Article 62 of Local Government Act and Paragraph 1, Article 3 of Criteria of Local Administrative Organization, it is stipulated in New Taipei City Government Organization Self-Government Ordinances that New Taipei City establishes 27 departments, offices and committees, namely: Secretariat, Civil Affairs Department, Finance Department, Education Department, Economic Development Department, Public Works Department, Water Resources Department, Agriculture Department, Urban and Rural Development Department, Social Affairs Department, Land Administration Department, Labor Affairs Department, Transportation Department, Tourism and Travel Department, Legal Affairs Department, Police Department, Public Health Department, Environmental Protection Department, Fire Department, Cultural Affairs Department, Indigenous Peoples Department, Information Department, Personnel Department, Department of Budget, Accounting and Statistics, Civil Ethics Service Office, Research, Development and Evaluation Commission, and Hakka Affairs Department.



3 River and Reservoirs

The administration of New Taipei City is connected by Tamsui rivers, with the upstream Dahan River flowing through Yingge District and Shulin District to converge in Sanxia River and then flowing through Tucheng District, Banqiao District, Xinzhuang District, and Sanchong District, converging again between Banqiao Jiangzicuei and Taipei City Wanhua with the Xindian River flowing through Xindian District, Zhonghe District and Yonghe District to form Tamsui River. Tamsui River then flows through Sanchong District, Luzhou District and Wugu District and from south of Guangdu, flowing through Pixin District, Ruifang District, and Xizhi District to converge with Keelung River in Taipei City, before rolling to the sea in Tamsui District in 8 kilometers of northwest. There is only Feitsui Reservoir in New Taipei City however the administration of Feitsui Reservoir belongs to Taipei City Government and hence there is no reservoir within the administration of New Taipei City.



4 Climate

The climate of New Taipei City is the humid subtropical monsoon climate with southwest monsoon in the summer, few days with precipitation and much rainfall; and northwest monsoon in the winter, more days with precipitation and fewer rainfalls. The average annual rainfall for northern Taiwan reaches 2,850mm and is an area with considerably abundant rainfall. Particularly the upstream mountain of Keelung River has hit a record of annual rainfall between 7,500 ~ 8,000mm. The period between each May and October is the high water season and the rainfall during this period accounts for approximately 62% of the total annual rainfall. The main precipitation model consists of the heavy rain triggered by typhoon or southwest airstream. Moreover, the monsoon season and the convectional thunder shower in summer afternoons also contribute certain amount of rainfall. Additionally the City's geographic environment is located in Taipei Basin where impact of tidal level from Tamsui River is considerably significant that the City is highly susceptible to flood after the heavy rain brought by every typhoon.



5 Population

The gross population registered with New Taipei City Household Registration Office by end of June, 2015 is 3,966,100 people, where male accounts for 1,950,300 people and female accounts for 2,015,800 people. Among the male population, 14.56% is children, 76.39% is young and mid-aged population and 9.05% is senior population. Among the female population, 13.00% is children, 77.11% is young and mid-aged population, and 9.89% is senior population.



6 Industries

New Taipei City outperformed other four cities with its exceptional industry characteristics. Not only does the gross output exceeds NTD4,000 billion, the service industry output also exceeds the manufacturing industry. There are more than 248,000 companies and registered businesses in New Taipei City, which tops in the nation and accounts for nearly 20% of the total number of firms nationwide. The number of registered businesses shows an average 10% growth rate for the last 5 years with the average growth rate in investment reaching 24%. After some decades of development, the industries in New Taipei City feature the follows: (1) Co-establishment of manufacturing and commercial service industries. (2) Co-existence of traditional industries and high-tech industries. The distribution of different industries also forms industry clusters due to the interaction of various factors.

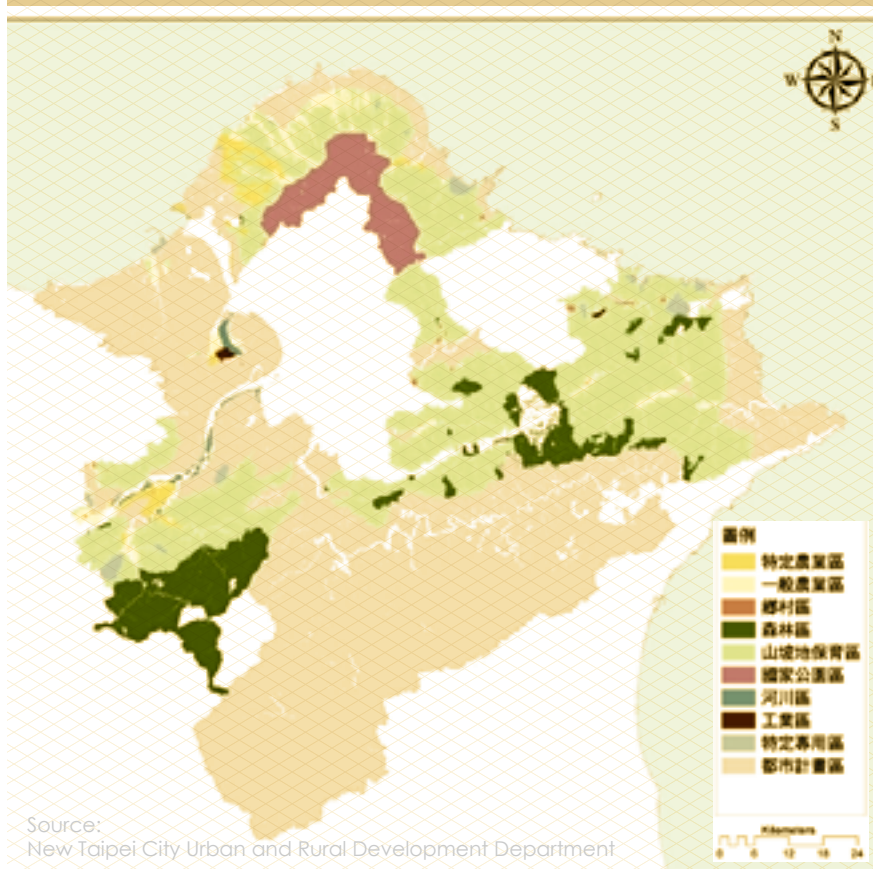


Figure 2.1-1 New Taipei City Land Use Distribution Map

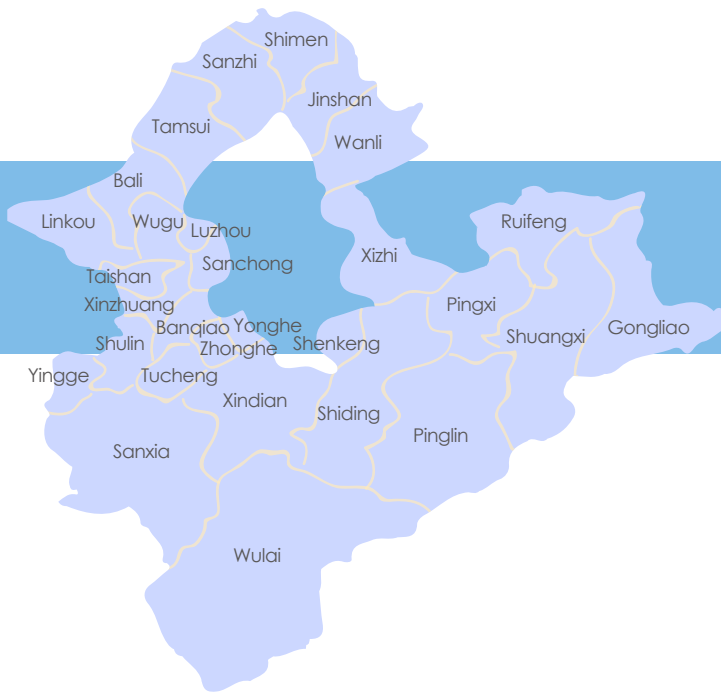
7 Land Use

The current land use plan of Taiwan divides land resources into “urban land” and “non-urban land,” which are controlled by regulations from Urban Planning Act and Regional Planning Act. The non-urban land area of New Taipei City is approximately 85,000 hectares, accounting for nearly 42% of the total land area of the city. The urban land area is approximately 111,000 hectares. The land use distribution overview and ratio of division use is shown in Figure 2.1-1.

8 Natural Disasters

Taiwan is situated in West Pacific Ocean and therefore the hub to typhoons. Moreover with its location on the Ring of Fire, the incidence of natural disasters becomes quite common. Due to the vast territory with highest population compared with other cities in Taiwan plus the varying topography, New Taipei City is subject to the subsequent disasters caused by typhoon and earthquakes such as flood, landslide and mudslides, where injuries and mortalities frequently take place. The list of major natural disasters taken place since 1995 has been summarized in Table 2.1-1.

List of Major Natural Disasters Occurred Since 1995



Banqiao District		08/01/1996	Flood from Typhoon Herb		Flood over 5 meters high
Xizhi District		10/15/1998	Flood from Typhoon Zeb		Flood over 6 meters high
Xizhi District		10/25/1998	Flood from Typhoon Babs		Flood over 4 meters high
Sanzhi District		10/25/1998	Sanzhi Dabris flow		3 deaths
Xinzhuang District		09/21/1999	921 Earthquake Doctor's House Collapse		30 deaths
					7 missing
					730 injured
Xizhi District		10/31/2000	Flood from Typhoon Xangsane		Flood over 7 meters high
Ruifang District		11/01/2000	Ruifang Dabris flow		30 deaths
					7 missing
					730 injured
Xizhi District		05/12/2001	Oriental Science Park fire		Property loss summed to some tens of billion in NT Dollars
Xindian District		06/07/2001	Beiyi Highway avalanche of mud		5 deaths
Danshui District		09/05/2001	Danshui Dabris flow		5 deaths
					24 injured
Xizhi District Ruifang District Shuangxi District		09/15/2001	Flood from Typhoon Nari		24 deaths
					5 missing
					80 injured

Xinzhuang District Tucheng District Zhonghe District		03/31/2002 331 Earthquake	 223 buildings requiring attention  28 hazardous building
Sanchong District Xinzhuang District		08/23/2004 Typhoon Aere	 2 deaths  2 injured in Sanchong District  flood over 180 hm ² , affecting 18,000 households in Xinzhuang District.
Xinzhuang District Xizhi District		09/11/2004 911 flood and Typhoon Haima	 2 deaths  2 injured from Xinxhuang District  flood of approximately 400 hm ² in Xizhi, affecting approximately 7,740 households.
Shuanxi District Gongliao District Ruifang District Xizhi District		10 / 25 / 2004 Typhoon Nock-Ten	 3 deaths  1 injured in Shuanxi District  flood over 2,200 hectares in Gongliao District, Ruifang District and Xizhi District, affecting approximately 5,860 households
Xinzhuang District Sanchong District		05 / 15 / 2005 0515 heavy rain	 Xinzhuang District (flood over 200 hectares, affecting approximately 4,000 households), Sanchong District (water logging)
Whole City		09 / 12 / 2008 Typhoon Sinlaku	 7 injured
Whole City		09 / 27 / 2008 Typhoon Jangmi	 16 injured
Whole City		08 / 08 / 2009 Typhoon Morakot	 12 injured
Whole City		09 / 17 / 2010 Typhoon Fanapi	 29 injured
Whole City		10 / 21 / 2010 Typhoon Megi	 1 person with minor injury
Whole City		08 / 02 / 2012 Typhoon Saola	 2 deaths  9 people with minor injury
Whole City		07 / 12 / 2013 Typhoon Soulik	 1 death  38 people with minor injury
Whole City		07 / 22 / 2014 Typhoon Matmo	 4 people with minor injury
Shimen Reservoir water supplied area		March 2015~May 2015 Draught	 Phase III Water Rationing
Whole City		07 / 10 / 2015 Typhoon Chan-hom	 1 death  16,358 household blackout

9 Infrastructure

1. Traffic

New Taipei City is built with complete traffic system for transportation construction, where the Three Rings & Three Lines MRT construction is currently the key policy administration. Figure 2.1-4 shows the New Taipei City Railway and Highway Map. The MRT facilities are shown in Figure 2.1-5.

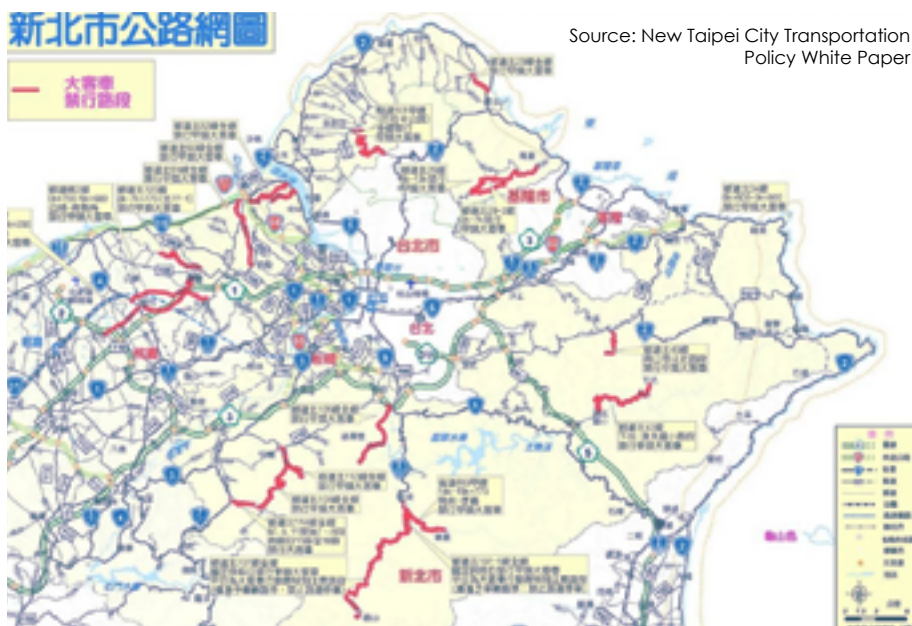


Figure 2.1-4 New Taipei City Highway Network Distribution Map



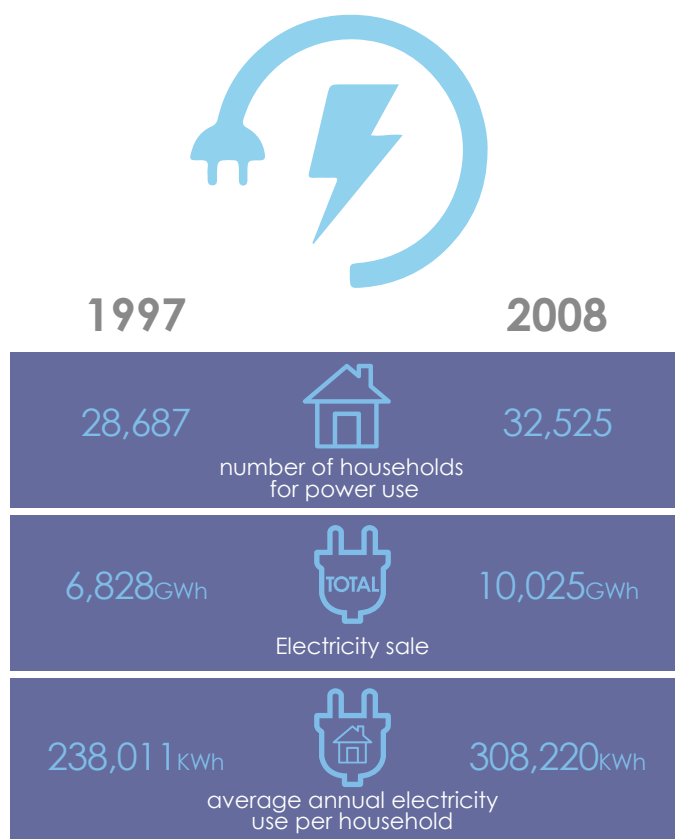
Figure 2.1-5 New Taipei City Mass Transportation Route Map

2. Running Water and Source of Water

The running water of New Taipei City is administered under First Branch and 12th Branch of Taiwan Water Corporation. The overall water supply rate of population served is 97.48%.

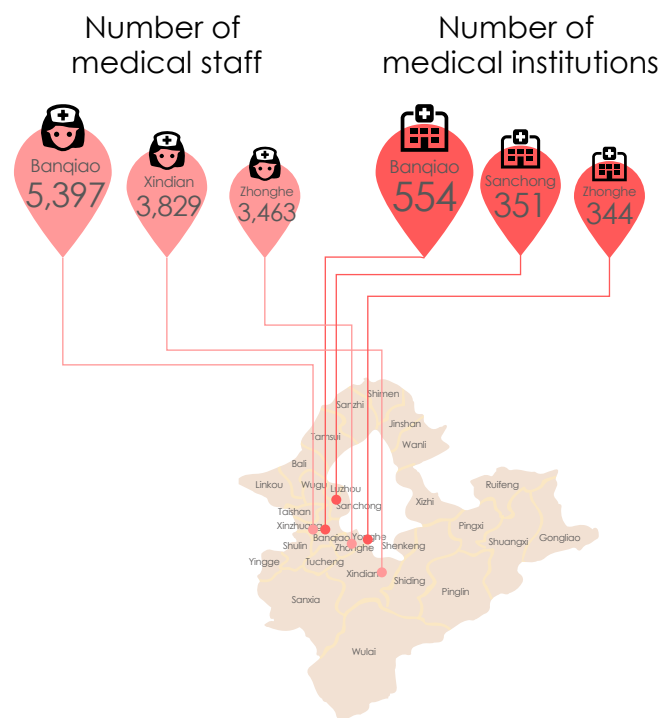
Table 2.1-2 New Taipei City District Water Supply Rate of Population Served

District	Water Supply Rate of Population Served
New Taipei City	97.48
1. Sanchong District	99.97
2. Zhonghe District	99.83
3. Wugu District	99.85
4. Taishan District	99.78
5. Yonghe District	100.00
6. Sanxia District	99.62
7. Tucheng District	99.56
8. Shuanxi District	37.92
9. Shidian District	28.54
10. Yingge District	97.54
11. Xindian District	97.01
12. Danshui District	96.94
13. Ruifeng District	91.84
14. Sanzhi District	91.27
15. Linkou District	90.00
16. Wanli District	81.62
17. Jinshan District	77.97
18. Shimen District	29.56
19. Wulai District	20.65
20. Banqiao District	99.07
21. Xinzhuang District	98.72
22. Shulin District	99.03
23. Luzhou District	98.64
24. Bali District	98.37
25. Shizhi District	98.63
26. Shenkeng District	98.25
27. Gongliao District	59.04
28. Pingxi District	45.14
29. Pinglin District	15.63



3. Electricity

The increase of population and technological advancement has driven people to use more power compared with the past electricity supply for New Taipei City. For this reason the number of households for power use increased from the 28,687 households in 1997 annually to the 32,525 households in 2008, up 13.38%. Electricity sale increased from the 6,828GWh in 1997 to the 10,025GWh in 2008, up 46.82%. The average annual electricity use per household increased from the 238,011KWh in 1997 to the 308,220KWh in 2008.



4. Medical Institutions

The New Taipei City medical institutions and medical agency practice (licensed) personnel mostly emphasize on administrative districts with more population. In terms of the number of medical institutions, there are the most number in Banqiao District (554), followed by Sanchong District (351) and Zhonghe District (344). In terms of the number of medical staff, Banqiao ranks first (5,397 people), followed by Xindian District (3,829 people), and Zhonghe District (3,463 people).

2.2 Hazard Identification Techniques

C40 Cities Climate Leadership Group is committed to helping member cities collaborate with each other to enhance the adaptability of each city. Hence, the group develops the City Climate Hazard Taxonomy for cities to conduct hazard identification and will provide online report system and planning tools for cities to adapt capacity and promote global cooperation.

The plan applies the City Climate Hazard Taxonomy to supplement the existing observatory and research data for conducting the hazard identification for New Taipei City today and in the future (climate change). The plan also analyzes the degree of impact preliminarily and conducts further disaster potential analysis, vulnerability analysis and risk assessment for hazards with medium level.



Table 2.2-1 City Climate Hazard Taxonomy

Hazardous Group	Hazard	City Climate Hazard	City Climate Secondary Hazard
 Meteoric	Precipitation	Heavy rains Heavy snow	Rain season, typhoon Snow storms
	Wind	Strong wind Hurricane Typhoon Tropical storms	Sandstorms Extratropical cyclone
	Lightening	Electrical storms	Lightening / Thunder shower
	Fog	Fog	
	Extreme low temperature	Extremely cold winter Cold Current Extremely lower temperature	Ice, hail, sleet, snow avalanche Cold current, frost Cold days
	Extreme high temperature	Heatwave Extremely high temperature	Hot days
 Climate	Water shortage	Draught	Few precipitation and snow-melting season (snow, glacier)
	Wild fire	Forest fire Land fire	Bush, grassland, and ranch fire
 Hydrologic	Flood	Earth surface flood River flood Coastal flood Underground water flood	Glacier disintegration Waterlogging
	Wave motion	Storm surge	Waves
	Chemical changes	Saltwater intrusion Ocean acidification	
 Geophysics	Mass Motion	Landslide	Lahars, mudslide, debris slide
		Snow avalanche	Snow avalanche
		Debris slide	
		Land subsidence	Sudden subsidence / long-term land subsidence
 Biological	Insects and microorganism	Waterborne diseases	Cholera, typhoid, legionnaire's disease
		Insect borne disease	Malaria, dengue fever, yellow fever,
		Airborne infectious disease	West Nile virus, bubonic plague
		Insect pest	Plague pneumonia, influenza Pine beetle, killer bees, termites

2.3 Hazard Identification Achievement

Due to the fast territory of New Taipei City, the hazard identification of this section refers to the use of meteoric observation data, relevant research literature and geographic data for analysis and support. Additionally to focus on the key research, the plan also determines the degree of impact for each hazard preliminarily and chooses the hazard with medium level of impact as subsequent target of disaster potential analysis, vulnerability assessment and risk assessment.

1. Meteoric Hazard Group

The latitude of New Taipei City falls between 24 degrees, 40 minutes and 51 seconds and 25 degree, 18 minutes and 11 seconds for north latitude, which is categorized as subtropical area. The highest mountain in New Taipei City is Taman Mountain with a height of 2,310 meters. The historic temperature currently does not show any record below 0°C. In terms of high temperature, currently the neighboring monitoring stations of New Taipei city have not shown any records of heatwave. Additionally there is no availability of research related to sandstorm, typhoon (wind velocity), lightening, thunder shower, fog and weather climate, and hence the degree of hazard could not be determined.



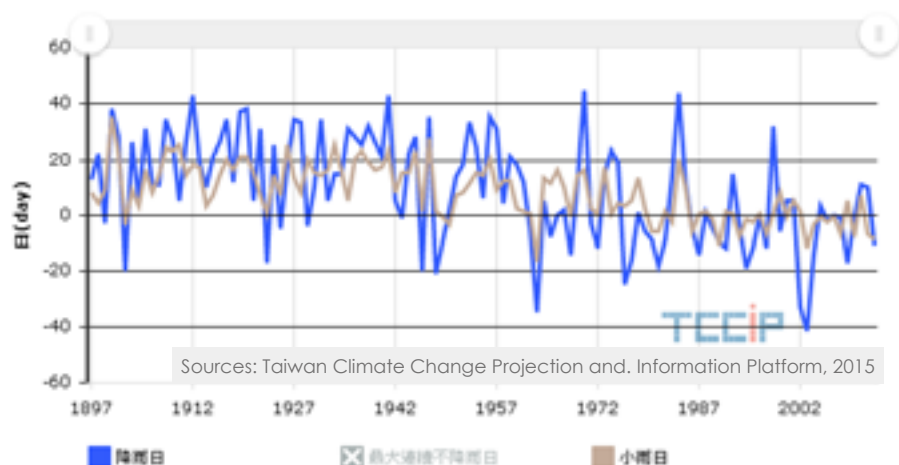
(1) Meteoric /Precipitation/Heavy Rain/Rain season, typhoon

Current

The change if overall precipitation in New Taipei City is small with reduced number of rainy days, small rain days and torrential rain days, hence determined as low-level for current status.

Future

Rainfall increase still falls within reasonable range and hence is determined as low level in the future





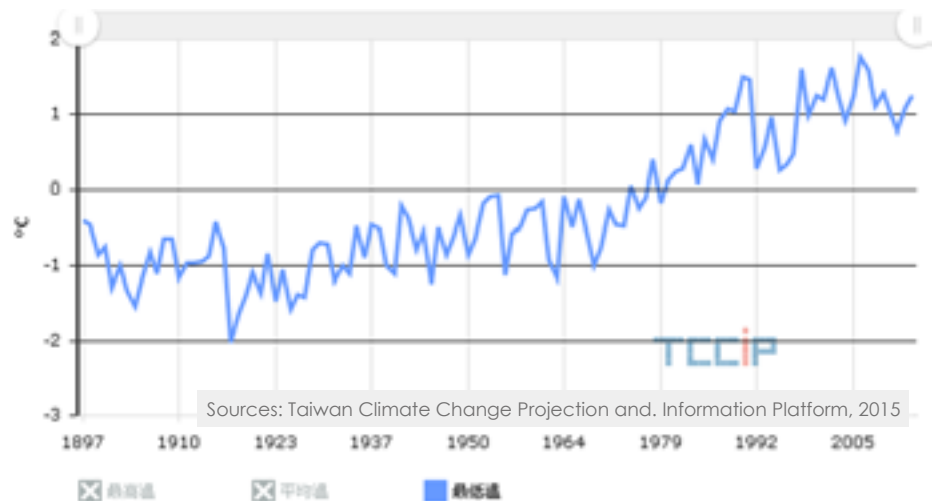
- (2) Meteoric / Extremely low temperature / Extremely cold winter / ice, hail, sleet, snow avalanche
 Meteoric / Extremely low temperature / cold current / cold current, frost
 Meteoric / Extremely low temperature / extremely low temperature / cold days

Current

The minimum temperature at Taipei Monitoring Station appears uprising trend and is assessed as low level hazard.

Future

The future temperature change will be increased by 0.58 to 0.73°C and hence assessed as low level hazard.



- (3) Meteoric / extremely high temperature / extremely high temperature / hot days

Current

The number of extreme high temperature days shows uprising trending and is assessed as medium level hazard.

Future

The future temperature still shows upright trend and hence assessed as medium level hazard.



- (4) Meteoric / water shortage / draught / few precipitation and few snow-melting season (snow, glacier)

Current

The change of overall precipitation is small while the number of days with precipitation and small rain days show reducing trend, and hence assessed as low level hazard.

Future

The change for future precipitation still appears in increasing trend and hence is assessed as low level hazard.

2. Hydrologic Hazard Group

New Taipei City is a subtropical area; there is no glacier topography or historic temperature record lower than 0°C. There are currently no waterlogging, waves, ocean acidification, and climate change related research conducted and hence could not be determined of the level of hazard.



(1) Hydrologic / flood / river flood

Current

The disaster potential for the overall river banks of New Taipei City is mostly medium level with sporadic areas with high level hazard. The river flood hazard in New Taipei City is assessed medium level.

Future

The future precipitation still appears in uprising trend and hence the hazard level is maintained at medium level.



(2) Ocean acidification / flood/ coastal flood

Current

The vulnerability of New Taipei City coast is mostly low vulnerability and only the vulnerability of Linkou District and Bali District are medium level. Hence it is assessed as low level hazard.

Future

Compared with other counties and cities, the region still contains low risk and is assessed as low level hazard.



Source: Disaster Adaptation Strategy in Response to Climate and Environmental Change, National Science and Technology Center for Disaster Reduction, 2013

Figure 2.3-1 Taiwan Northern Coast Vulnerability Distribution Map



(3) Hydrologic / Chemical changes/ Saltwater intrusion

Current

The agricultural land along the coast centralizes on northern New Taipei City and is inferred not to use the underground water of Northwest Cape. Hence the impact of agricultural water subject to underground water salinization is lower and is assessed with low level hazard.

Future

Due to the lack of relevant research, hence the current hazard is undeterminable. Currently there is no study conducted on future situations.

3. Geophysics Hazard Group

New Taipei City is subtropical area without the historic temperature record of 0°C and hence no records of snow avalanche have been found. There is currently no rock slide, sudden subsidence and long-term land subsidence as well as research related to climate change. Hence the hazard level could not be determined.



(1) Geophysics /Mass motion / Landslide / Lahars/mudslide/ debris slide

Current

The environmental sensitive area of New Taipei City is analyzed as medium sensitive and hence assessed as medium hazard.

Future

Due to the lack of current northern region research on landslide, the future hazard could not be assessed.

4. Biological hazard group

Taiwan suffers sever impact from Dengue Fever and currently the research conducted on infectious disease and climate change also focus on Dengue fever study. The other related infectious disease lack research results and hence could not determine the hazard level of cholera, typhoid, legionnaire's disease, Malaria, yellow fever, West Nile virus, bubonic plague, Plague pneumonia, influenza, pine beetle, killer bees, termites.



(1) Biological /Insect and microorganism / Insect borne infectious disease / malaria, dengue fever, yellow fever, West Niles Virus, bubonic plague

Current

The number of dengue fever cases in New Taipei City continues to rise in the last 9 years and is assessed as medium level hazard.

Future

Research shows that for every rise of 1 degree in temperature, the hazard of New Taipei City dengue fever is assessed medium level.

In sum of the aforementioned assessment results for current situations, the city climate hazard with more significant degree of impact on New Taipei City is extremely high temperature (hot days), river flood, landslide (debris slide), and insect borne infectious disease (dengue fever). For future climate change, the city climate hazard with greater impact on New Taipei city (medium level or higher) consists of extreme high temperature (hot day), river flood, and insect borne diseases (dengue fever) (Table 2.3-1). In spite of the lack of evidence that suggests the degree of impact of landslide (debris flow) on New Taipei City under future climate change, the strong precipitation caused by climate change will increase and hence it is still suggested that landslide (debris flow) should still be included in the possible hazards to be faced by New Taipei City in the future. In spite the draught for current or future hazard is low level, relevant studies show that the livelihood, agricultural and industrial water use in some areas of New Taipei City is highly vulnerable and hence the plan conducts further analysis on draught. For more information, please refer to the climate hazards for disaster potential analysis shown in Table 2.3-2.

Table 2.3-1 Types of Hazard and with Significant Impact on New Taipei City and the Degree of Impact

City climate hazards with significant impact on New Taipei City status (city climate sub-hazard)	
Current	Future
Medium Extremely high temperature (hot days)	Medium Extremely high temperature (hot days)
Medium River flood	Medium River flood
Medium Landslide (debris flow)	
Medium Insect borne diseases (Dengue fever)	Medium Insect borne diseases (Dengue fever)

Medium Degree of Impact

Table 2.3-2 Type of Hazards Taken into Considered by New Taipei City in Response to Climate Change

Type of Hazards Taken into Consideration by New Taipei City in Response to Climate Change				
Extremely high heat (hot days)	Draught (few precipitation)	River flood	Insect borne disease (dengue fever)	Landslide (Debris Flow)

CHAPTER 3 Risk and Vulnerability Assessment

The purpose of conducting risk and vulnerability assessment is to understand the risk level and thereby develop related response actions or solutions. The plan adopts the research method of IPCC AR5 and conducts disaster potential analysis, vulnerability assessment and risk assessment to consolidate the comprehensive risks of climate hazard.

3.1 IPCC AR5

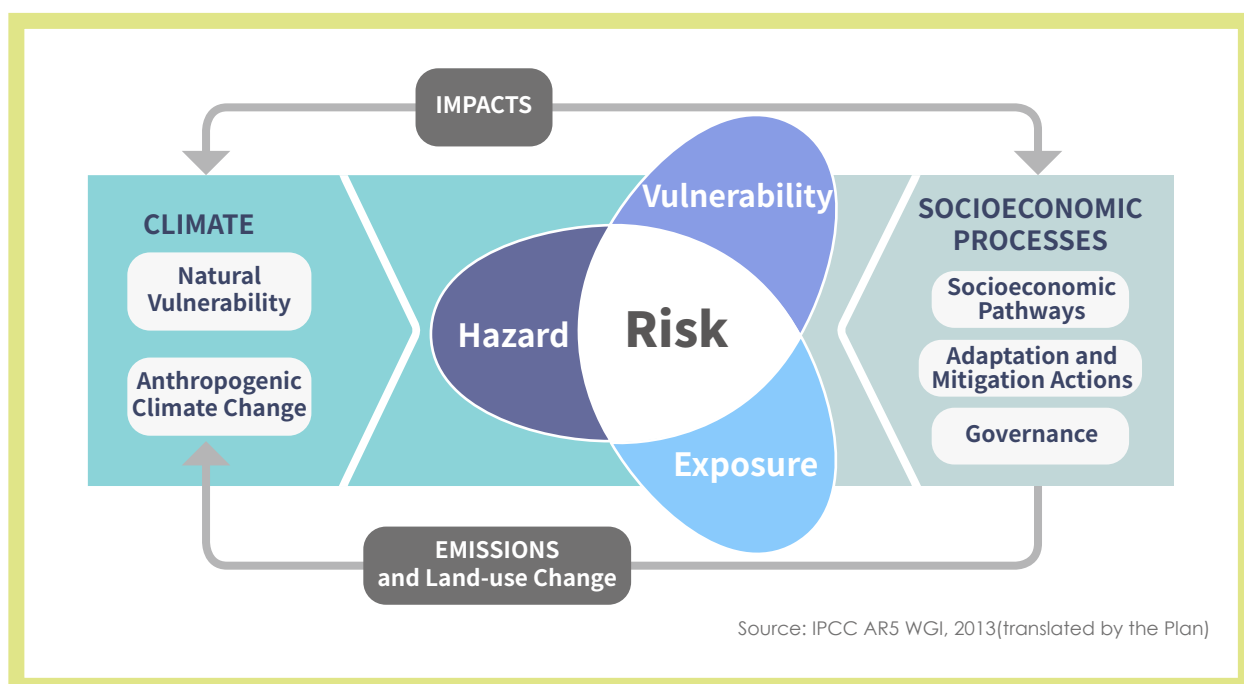


Figure 3.1-1 Climate Change Relation Diagram

IPSS AR5 explains the effect and response under the impact of climate change through Figure 3.1-1. The impact of climate change is essentially determined together by the probability of events and the scale of consequences of damage impact. The scale of consequences of impact is determined by the vulnerability and exposure of system (i.e. various systems of humanity society or natural environment) when facing climate impact.

IPCC has already changed the key from “vulnerability” to “risk” on its fifth report and re-interpreted the definition of vulnerability and risk. Simply put, the fourth report of IPCC mainly analyzes vulnerability which refers to the adverse effect on a system subject to climate change and the impact that could not be completely eliminated through various means, defined as “vulnerability = F (exposure, sensitivity and adaptability). The fifth report primarily assesses risks and suggests that risk comes from the interaction between vulnerability, exposure and the hazards, defined as “risk = F (sensitivity, exposure, hazard). In particular, vulnerability is defined as “vulnerability = F (sensitivity, adaptability).”

3.2 Risk and Vulnerability Assessment Techniques

The Plan defines vulnerability as the function of the degree of social-economic impact and the response ability to climate change (adaptability), in addition to applying hazard and exposure as the assessment index for disaster potential analysis, followed by assessing climate risk through the function of vulnerability and disaster potential.

1. Index System:

- (1) Disaster Potential Index = f (Hazard, Exposure) Classification Low Medium High
- (2) Vulnerability Index = f (Sensitivity, Adaptability) Classification Low Medium High

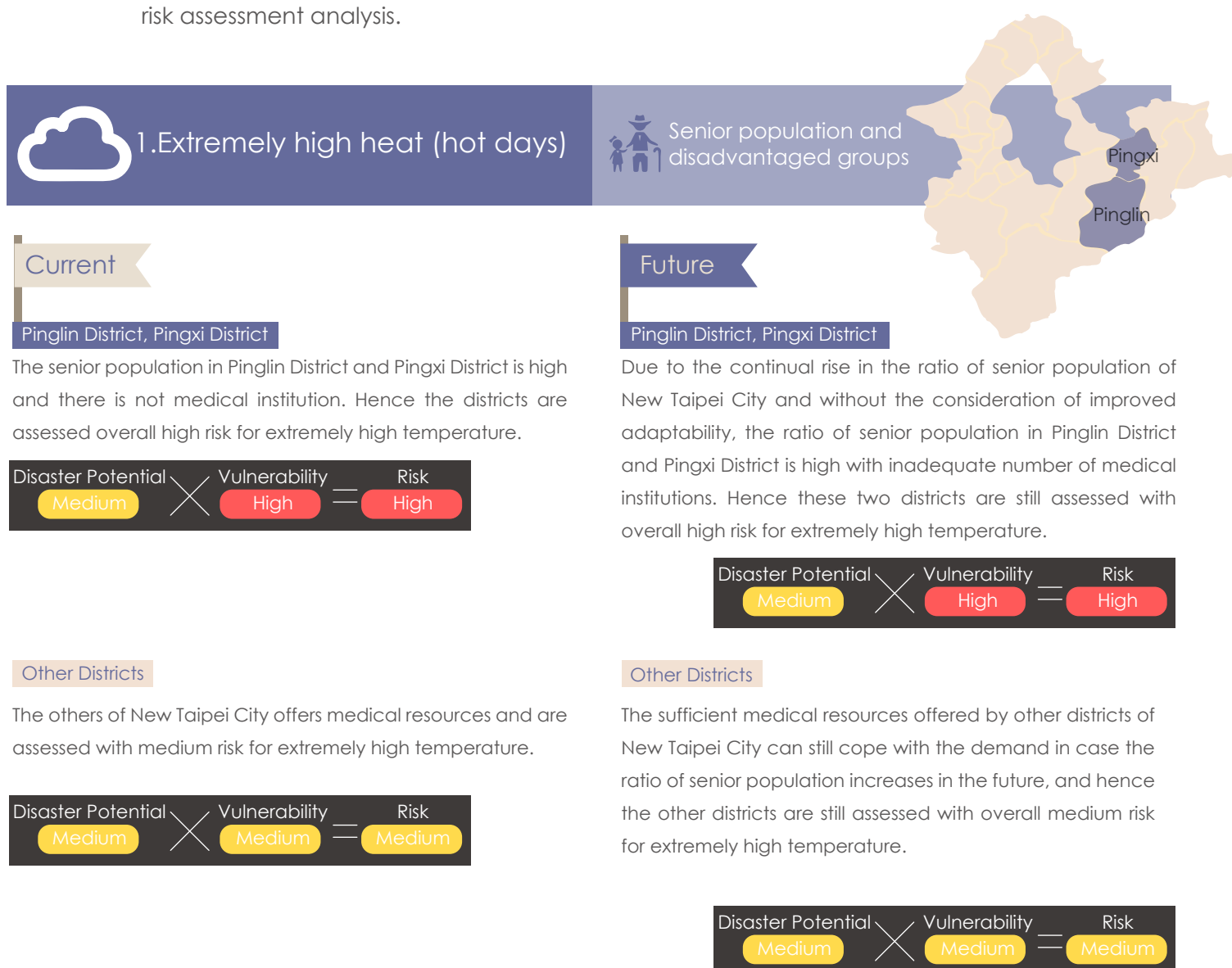
Vulnerability Assessment Matrix		Sensitivity		
		Low	Medium	High
Adaptability	High	Medium	High	High
	Medium	Low	Medium	High
	Low	Low	Low	Medium

(3) Risk Index = f (Hazard, Exposure, Vulnerability) Classification **Low** **Medium** **High**

Risk Assessment Matrix		Vulnerability		
		Low	Medium	High
Disaster Potential	High	Medium	High	High
	Medium	Low	Medium	High
	Low	Low	Low	Medium

3.3 Risk and Vulnerability Assessment Outcome and Comprehensive Analysis

Climate risk is a composite matrix of disaster potential and vulnerability. This chapter follows the outcome of disaster potential and vulnerability assessment to conduct risk assessment analysis.

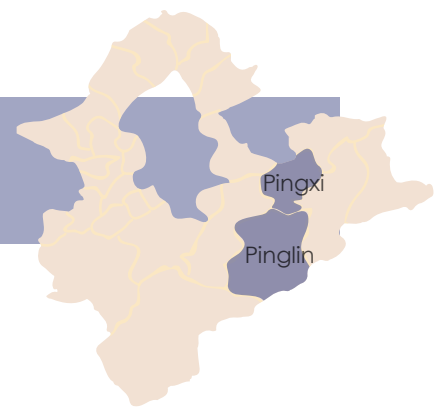




1. Extremely high heat (hot days)



Workforce



Current

Districts with dense population

The building density in districts with dense population (Banqiao District, Zhonghe District, Yonghe District, Xinzhuang District, Shizhi District, Xindian District, Tucheng District, Taishan District) is high and offers sufficient sunshade space. Therefore these areas are assessed with overall low risk for extremely high temperature.

Disaster Potential	Vulnerability	Risk
Medium	Low	Low

Suburbs

The building density in suburbs (Shimen District, Sanzhi District, Linkou District, Jingshan District, Wanli District, Pingxi District, Shidiang District, Wulai District, Pinglin District, Shuanxi District, Gongliao District, Sanxia District) is relatively lower however in consideration of natural sunshade items such as forests, the districts are assessed with over medium risk for extremely high temperature.

Disaster Potential	Vulnerability	Risk
Medium	Medium	Medium

Future

Districts with dense population

Urbanization for New Taipei City continues and the building density of districts with dense population (Banqiao District, Zhonghe District, Yonghe District, Xinzhuang District, Xizhi District, Xindian District, Tucheng District, Taishan District) is still maintained at high density, which shall provide sufficient sunshade space. Hence these districts are assessed with overall low risk for extremely high temperature.

Disaster Potential	Vulnerability	Risk
Medium	Low	Low

Suburbs

Although the building density in suburbs (Shimen District, Sanzhi District, Linkou District, Jingshan District, Wanli District, Pingxi District, Shiding District, Wulai District, Pinglin District, Shuanxi District, Gongliao District, Sanxia District) will likely increase due to urban design, the overall risk of the districts remains medium for extremely high temperature in consideration of the spacious areas available.

Disaster Potential	Vulnerability	Risk
Medium	Medium	Medium





2. Drought (reduced precipitation)



Water Resources

Current

Districts with dense population

The water supply to all districts of New Taipei City is adequate with relevant water resource plan available. Hence the risk assessed for drought (reduced precipitation) is low.

$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Low} & & \text{Low} \\ \hline & & \text{Risk} \\ & & \text{Low} \end{array}$$

Future

1.Domestic water use

Shulin District, Tucheng District, Banqiao District, Xinzhuang District, Sanchong District

With reference to the research data from "Strengthening Water Supply System Adaptive Capacity to Climate Change in Northern Region" conducted by the Water Resources Agency, the abovementioned districts are subject to high vulnerability and hence are assessed with high risk for drought (reduced precipitation).

$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Medium} & & \text{High} \\ \hline & & \text{Risk} \\ & & \text{High} \end{array}$$

Linkou District, Wugu District, Bali District, Xindian District, Xizhi District, Ruifeng District, Yingge District, Sanxia District

With reference to the research data from "Strengthening Water Supply System Adaptive Capacity to Climate Change in Northern Region" conducted by the Water Resources Agency, the abovementioned districts are subject to medium vulnerability and hence are assessed with medium risk for drought (reduced precipitation).

$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Medium} & & \text{Medium} \\ \hline & & \text{Risk} \\ & & \text{Medium} \end{array}$$

Shimen District, Sanzhi District, Tamsui District, Jingshan District, Wanli District, Pingxi District, Shuangxi District, Gongliao District, Shenken District, Shiding District, Wulai District

With reference to the research data from "Strengthening Water Supply System Adaptive Capacity to Climate Change in Northern Region" conducted by the Water Resources Agency, the abovementioned districts are subject to low vulnerability and hence are assessed with low risk for drought (reduced precipitation).

$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Medium} & & \text{Low} \\ \hline & & \text{Risk} \\ & & \text{Low} \end{array}$$

2.Agricultural water use

Shimen District, Sanzhi District, Tamsui District, Jingshan District, Wanli District, Shuangxi District

With reference to the research data from "Strengthening Water Supply System Adaptive Capacity to Climate Change in Northern Region" conducted by the Water Resources Agency, the abovementioned districts are subject to medium vulnerability and hence are assessed with medium risk for drought (reduced precipitation).

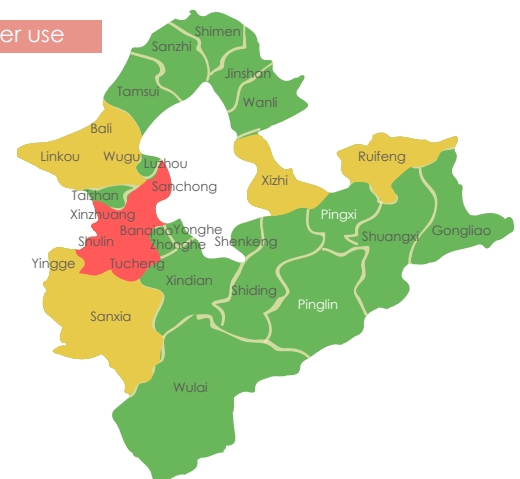
$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Medium} & & \text{Medium} \\ \hline & & \text{Risk} \\ & & \text{Medium} \end{array}$$

Other Districts

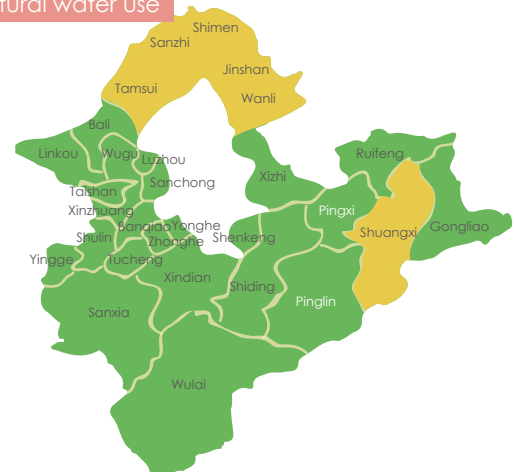
With reference to the research data from "Strengthening Water Supply System Adaptive Capacity to Climate Change in Northern Region" conducted by the Water Resources Agency, the abovementioned districts are subject to low vulnerability and hence are assessed with low risk for drought (reduced precipitation).

$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Medium} & & \text{Low} \\ \hline & & \text{Risk} \\ & & \text{Low} \end{array}$$

1.Domestic water use



2.Agricultural water use



3. Industrial water use

Wugu District, Xinzhuang District, Banqiao District, Sanchong District, Shulin District, Tucheng District, Xindian District, Xizhi District

With reference to the research data from "Strengthening Water Supply System Adaptive Capacity to Climate Change in Northern Region" conducted by the Water Resources Agency, the abovementioned districts are subject to high vulnerability and hence are assessed with high risk for draught (reduced precipitation).



Tamsui District, Linkou District, Yingge District, Sanxia District

With reference to the research data from "Strengthening Water Supply System Adaptive Capacity to Climate Change in Northern Region" conducted by the Water Resources Agency, the abovementioned districts are subject to medium vulnerability and hence are assessed with medium risk for draught (reduced precipitation).

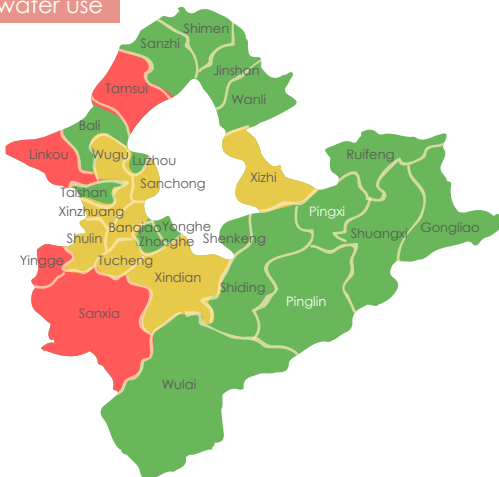


Other Districts

With reference to the research data from "Strengthening Water Supply System Adaptive Capacity to Climate Change in Northern Region" conducted by the Water Resources Agency, the abovementioned districts are subject to low vulnerability and hence are assessed with low risk for draught (reduced precipitation).



Industrial water use



3. River Flood

Current

There are currently sufficient levees and pumping stations to cope with extreme precipitation and hence the vulnerability is assessed low while the overall risk is also low.

Future

Levee

Tamsui River, from Fuzhou Bridge to Dahan Bridge

With reference to the "Vulnerability assessment and adaptive management of new hazard on flood prevention systems (1/2)" (2007) conducted by Water Resources Agency, the research data regarding Tamsui River show that the vulnerability is 1 for levees between Fuzhou Bridge to Dahan Bridge in Scenario A2 and B2 with overbank, suggesting the river section belongs to area with higher vulnerability.



Tamsui River and Other Districts

With reference to the "Vulnerability assessment and adaptive management of new hazard on flood prevention systems (1/2)" (2007) conducted by Water Resources Agency, the research data regarding Tamsui River show that there is no overbank event, regardless in Scenario A2 or B2, and hence the vulnerability is assessed low with overall low risk.



Regional Drainage and Pumping Station

The situation where the water level outside of levee exceeding that of the front pool of pumping station inside of levee merely appears in Yonghe, Wayao and Zhonghe. Moreover when compared with the pump of each pumping station, the vulnerability produced by water to pumping stations are all considerably low and hence the vulnerability is assessed low and the overall risk is also low.





4. Insect-Borne Diseases

Current

Banqiao District, Sanchong District, Zhonghe District

Dengue fever is considered non-critical illness. Although the population density in Banqiao District, Sanchong District and Zhonghe District of New Taipei City is high, the districts offer adequate medical resources and hence the risk assessment for insect-borne disease (dengue fever) is low.

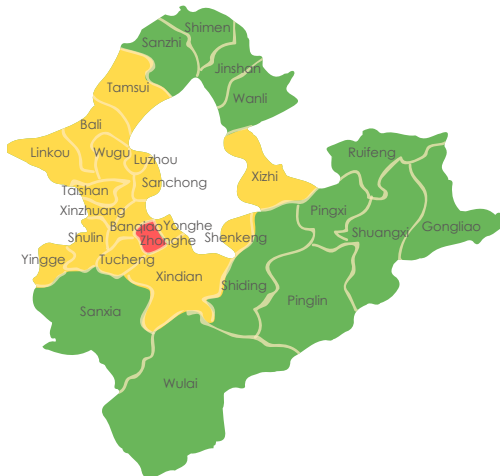
$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Medium} & & \text{Low} \\ \hline & & \text{Risk} \\ & & \text{Low} \end{array}$$

Other Districts

The previous disaster potential was low and in spite some districts (Pingxi District and Pinglin District) do not supply adequate medical resources, the overall risk assessment for insect-borne disease (dengue fever) is still low.

$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Low} & & \text{Low} \\ \hline & & \text{Risk} \\ & & \text{Low} \end{array}$$

Insect-Borne Diseases Future Risk Map



Future

Zhonghe District

Under climate change, each one degree increase in average temperature will increase the disaster potential for Zhonghe District to high. However in consideration that Dengue fever is a non-critical illness while Zhonghe District is equipped with adequate medical resources with low vulnerability, hence the result of overall risk assessment is medium.

$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{High} & & \text{Low} \\ \hline & & \text{Risk} \\ & & \text{Medium} \end{array}$$

Xindian District, Shenken District, Xizhi District, Tamsui District, Bali District, Linkou District, Wugu District, Luzhou District, Taishan District, Sanchong District, Xinzhuang District, Yingge District, Shulin District, Tucheng District, Yonghe District, Banqiao District

Under climate change, each one degree increase in average temperature, the disaster potential for Xindian District, Shenken District, Xizhi District, Tamsui District, Bali District, Linkou District, Wugu District, Luzhou District, Taishan District, Sanchong District, Xinzhuang District, Yingge District, Shulin District, Tucheng District, Yonghe District, Banqiao District, will increase to medium. In consideration of the medical resources available in all districts, the vulnerability of all districts remains low and hence the overall risk assessed is low.

$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Medium} & & \text{Low} \\ \hline & & \text{Risk} \\ & & \text{Low} \end{array}$$

Other Districts

The previous disaster potential was low and in spite some districts (Pingxi District and Pinglin District) do not supply adequate medical resources, the overall risk assessment for insect-borne disease (dengue fever) is still low.

$$\begin{array}{ccc} \text{Disaster Potential} & \times & \text{Vulnerability} \\ \text{Low} & & \text{Low} \\ \hline & & \text{Risk} \\ & & \text{Low} \end{array}$$



5. Landslides (debris flow)

Current

Subwatersheds including Dacukeng, Chingtan River, Tonghou River, Cikeng, Xiaofengliao, Naj, Dajiao River, Tuanlu, Neishuang River, Donglu, Wutu River, Zhkeng River, Yongding River, Hongludi Mountain, Tonghouluan Mountain, Quchi, and Wawagu.

With reference to the “2013 Taipei Branch Debris Flow Hazards Related Emergency Contingency and Equipment Upgrade Plan” conducted by the Soil and Water Conservation Bureau, Council of Agriculture, the research results show that the analysis of disaster-prone area is high and hence the risk assessment is high.



Subwatersheds including Langsheng Bridge, Pingxi, Nanshi River, Chingtan Reservoir, Qianqinlin, Jinming, Kuangku River, Fangjiao River, Daluolan River, Baochang-keng River, Feicui River, Pingguang River, Xiayun, Xiong-kong River, Dingbayen, Jinguashi, Wanfang Community, Koukeng River, Ankeng, Qingshui River, Houdongkeng River, and Xiangneikeng.

With reference to the “2013 Taipei Branch Debris Flow Hazards Related Emergency Contingency and Equipment Upgrade Plan” conducted by the Soil and Water Conservation Bureau, Council of Agriculture, the research results show that the analysis of disaster-prone area is medium and hence the risk assessment is medium.



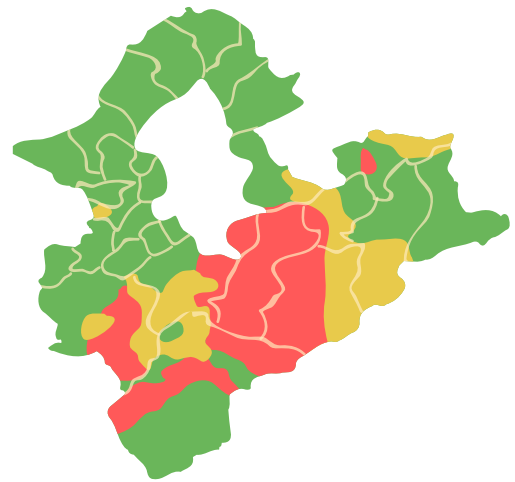
Guangdu Bridge, Xisheng, Houkeng River, Qingnian Park, Ganpi Village, Yingge River, Aliban River, Beishikeng River, Houzhou River, Xinhuadian River, Beiheng River, Guizikeng River, Malingkeng River, Luliao River, Tamsui River downtown, Neigo River, Zhonghai Lake, Luzhou, Chongyang Bridge(continue)

Keng River, Zhouziwei Gou, Sanchong City, Nanggang, Huajiang Bridge, Sifeng River, Shanzhuku River, Banqiao, Huanhe Bridge, Guangfu Bridge, Guting, Jingmei, Taoyuan, Muzha, Laoquan, Shitou River, Erqiao, and Zhongliao.

With reference to the “2013 Taipei Branch Debris Flow Hazards Related Emergency Contingency and Equipment Upgrade Plan” conducted by the Soil and Water Conservation Bureau, Council of Agriculture, the research results show that the analysis of disaster-prone area is low and hence the risk assessment is low.



Landslides (debris flow) Current Risk Map



Future

The change in potential debris flow torrent is huge and requires annual inventory count and analysis. For study on future scenarios, the Soil and Water Conservation Bureau, Council of Agriculture, currently conducts research analysis on Dajia River but lacks the research data on Tamsui River. Hence for future risk assessment, the current assessment results shall remain.

The risk assessment results for the abovementioned climate hazards are summarized below. To lower the risk impact from climate change, it is recommended to draft strategy and solutions for items and regions with relevant high risks in order to reduce the risk impact brought by climate change.

Table 3.3-1 Risk Assessment and Comprehensive Comparison Chart

Climate Hazard	Current/ Future	Issue	Districts	Risk Level
 Extremely high temperature (hot days)	Current		Pinglin District, Pingxi District	High
		Senior population and disadvantaged groups	Banqiao District, Zhonghe District, Yonghe District, Xinzhuang District, Xizhi District, Xindian District, Tucheng District, Taishan District, Sanzhi District, Linkou District, Jingshan District, Wanli District, Shiding District, Wulai District, Shuangxi District, Gongliao District, Sanxia District	Medium
		Outdoor labor force	Banqiao District, Zhonghe District, Yonghe District, Xinzhuang District, Xizhi District, Xidian District, Tucheng District, Taishan District	Low
			Shimen District, Sanzhi District, Linkou District, Jingshan District, Wanli District, Pingxi District, Shiding District, Wulai District, Pinglin District, Shuanxi District, Gongliao District, Sanxia District	Medium
	Future		Pinglin District, Pingxi District	High
		Senior population and disadvantaged groups	Banqiao District, Zhonghe District, Yonghe District, Xinzhuang District, Xizhi District, Xindian District, Tucheng District, Taishan District, Shimen District, Snazhi District, Linkou District, Jingshan District, Wanli District, Shiding District, Wulai District, Shuangxi District, Gongliao District, Sanxia District	Medium
		Outdoor labor force	Banqiao District, Zhonghe District, Yonghe District, Xinzhuang District, Xizhi District, Xindian District, Tucheng District, Taishan District	Low
			Shimen District, Sanzhi District, Linkou District, Jingshan District, Wanli District, Pingxi District, Shiding District, Wulai District, Pinglin District, Shuanxi District, Gongliao District, Sanxia District	Medium
 Draught (reduced precipitation)	Current	Water resource	Entire New Taipei City	Low
			Shulin District, Tucheng District, Banqiao District, Xinzhuang District, Sanchong District	High
		Domestic water use	Linkou District, Wugu District, Bali District, Xindian District, Xizhi District, Ruifang District, Yingge District, Sanxia District	Medium
			Shimen District, Sanzhi District, Tamsui District, Jingshan District, Wanli District, Pingxi District, Shuangxi District, Gongliao District, Shenken, Shiding District, Pinglin District, Wulai District	Low
	Future	Agricultural water use	Shimen District, Sanzhi District, Tamsui District, Jingshan District, Wanli District, Shuangxi District	Medium
			Banqiao District, Zhonghe District, Yonghe District, Xinzhuang District, Xizhi District, Xindian District, Tucheng District, Taishan District, Linkou District, Shiding District, Wulai District, Gongliao District, Sanxia District, Pinglin District	Low
		Industrial water use	Wugu District, Xinzhuang District, Banqiao District, Sanchong District, Shulin District, Tucheng District, Xindian District, Xizhi District	High
			Tamsui District, Linkou District, Yingge District, Sanxia District	Medium

Climate Hazard	Current/ Future	Issue	Districts	Risk Level
 River flood	Current	River flood risk	Tamsui River	Low
	Future	Levee	Tamsui River, from Fuzhou Bridge to Dahan Bridge	Medium
			Tamsui River and other districts	Low
		Regional drainage and pumping station	Entire Tamsui River	Low
 Insect-borne Disease (Dengue fever)	Current	Dengue fever risk	Entire New Taipei City	Low
	Future	Dengue fever risk	Zhonghe District	Medium
			Xindian District, Shenken District, Xizhi District, Tamsui District, Bali District, Linkou District, Wugu District, Luzhou District, Taishan District, Sanchong District, Xinzhuang District, Yingge District, Shulin District, Tucheng District, Yonghe District, Banqiao District, Shimen District, Sanzhi District, Jingshan District, Wanli District, Shiding District, Wulai District, Shuangxi District, Gongliao District, Sanxia District, Pingxi District, Pinglin District	Low
 Landslide (debris flow)	Current/ Future	Debris flow risk	Subwatersheds including Dacukeng, Chingtan River, Tonghou River, Cikeng, Xiaofengliao, Naj, Dajiao River, Tuanlu, Neishuang River, Donglu, Wutu River, Zhkeng River, Yongding River, Hongludi Mountain, Tonghouluan Mountain, Quchi, and Wawagu.	High
			Subwatersheds including Langsheng Bridge, Pingxi, Nanshi River, Chingtan Reservoir, Qianqinlin, Jinming, Kuangku River, Fangjiao River, Daluolan River, Baochang River, Feicui River, Pingguang River, Xiayun, Xiongkong River, Dingbayen, Jinguashi, Wanfang Community, Koukeng River, Ankeng, Qingshui River, Houdong River, and Xiangneikeng.	Medium
			Guangdu Bridge, Xisheng, Houkeng River, Qingnian Park, Ganpi Village, Yingge River, Aliban River, Beishikeng River, Houzhou River, Xinhudian River, Beiheng River, Guizikeng River, Maling River, Luliao River, Tamsui River downtown, Neigo River, Zhonghai Lake, Luzhou, Chongyang Bridge, Keng River, Zhouziwei Gou, Sanchong City, Nangang, Huajiang Bridge, Sifeng River, Shanzhuku River, Banqiao, Huanhe Bridge, Guangfu Bridge, Guting, Jingmei, Taoyuan, Muzha, Laoquan, Shitou River, Erqiao, and Zhongliao.	Low



CHAPTER 4

New Taipei City Adaptability Plan

Climate change means change in the global climate system and takes place in a global scale, which impact affects worldwide with penetration expanding to all fields and issues, surpassing national and geographic boundaries, and has become a comprehensive “human safety” related issue. For this reason, the traditional idea of administrative and disciplinary division of labor model no longer applies to the response for climate change but the framework of interdepartmental division of labor that surpasses the hierarchical segmentation between central and local governments can help the world face with this unprecedented impacts with interactive new concept. Taiwan has developed the “Adaptation Strategy to Climate Change in Taiwan” in 2012 to improve and upgrade our national adaptability, reduce social vulnerability, and establish our integrated operation system as the implementation foundation for policy framework and plan promotion. The adaptation strategy also takes consideration of the different types of impacts and challenges that could occur due to a variety of geographic locations or spaces, emphasizing on the regional environmental resources and social-economic characteristics to promote local adaptability plan and continue expanding the influence of climate change adaptability.

In view of the vast territory of New Taipei City, the changes in future temperature, number of days with precipitation and extreme weather events are likely to aggravate the frequency and scale of disasters occurrence. It is necessary to examine the overall degree of impact when faced with climate change for uncertainty against extreme weather events, thereby to develop corresponding adaptive measures to improve the adaptability and reduce vulnerability of New Taipei City for climate change.

New Taipei City Adaptive Vision

Construct a quality new capital city of resilient and livability



Promote urban development and create win-win situations for Taipei City and New Taipei City

- New Taipei City Plan Comprehensive Review of Case Changing Entrusted Plan (North of Dahan River)
- New Taipei City Plan Comprehensive Review of Case Changing Entrusted Plan (South of Dahan River)
- New Taipei City Public Facility Comprehensive Review
- Great Taipei Water Source Area Overall Development and Urban Planning Control Design
- New Taipei City Regional Plan
- Comprehensive Plan for New Taipei City Urban Plan, Newly Developed and Expanded Urban Plan



Promote education for all and implement local schooling

- Promote education for all and implement local schooling Upgrade New Taipei City Citizen Health Knowledge Plan
- Village Environment Education Promotion Plan
- New Taipei City Environment Education Mid-Range Plan



Maintain community safety and build safe homes

- Establish Mobile ER
- Northern Region Disaster Prevention Park
- Promote Community Disaster Prevention
- Organize "New Taipei City Disaster Prevention and Rescue Foundation Phase II Plan"



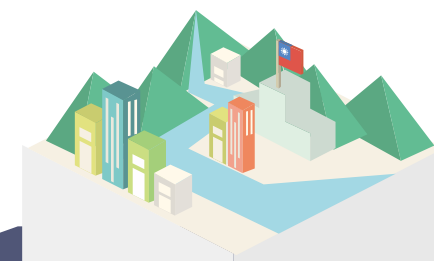
Build a garden city and progress toward low-carbon and environmental protection

- Geothermal Development Plan
- Eco New Taipei City – Ecology and Conservation Maintenance and Promotion
- Agricultural Environmental Improvement Engineering
- Promote New Taiwan City Water Resource Conservation and Restoration
- New Taipei City Green Doctor
- New Taipei City Entrusted Waste Incineration Ash Recycling Handling Plan
- Xindian and Shulin Incineration Plant Upgrade Improvement and Outsourced Management Feasibility and Pilot Plan
- Compost and Kitchen Waste Recycling Plan



Improve social welfare system and strengthen health care

- Remote Area Medical Service Upgrade Plan
- Health and Elderly Friendly City Plan
- City United Hospital Public Health Operation Promotion and Location Medical Subsidy Plan
- Remote Area Rehabilitation Medical Service Plan
- Long-Term Care Integration Plan
- Rational Distraction of Medical Resources (including re-designing of medical regions)
- New Taipei City Medical Subsidy Plan
- Long-Term Care Volunteer Bank Project
- Infectious Disease Prevention Plan



Build a capital city of water governance with strengthened protection for flood

- River Highland Beach Riverside Park Facility Upgrade and Improvement Project
- Promote Dashuanhe Waterfront Renovation Land Use Bid Purchase and Simple Greening for Wayao Restoration Plan
- Additional Pumping Station to Xinzhuang Huacheng Road Drainage System Project
- New Taipei City Luzhou District Yamugang Pumping Station Construction Project
- New Taipei City Luzhou District Luzhou Pumping Station Construction Project
- Routine inspection and slat removal for citywide rain water sewer system
- Dakekeng River Flood Detention Basin Construction Project (including pumping station).
- City Drainage Construction Improvement and Various River Comprehensive Governance Plan
- Xinhai and Huajiang Pumping Station Expansion Construction Project
- New Taipei City Government Organizing River Water Resource and Regional Drainage Improvement Governance Project, and Land Use Construction and Maintenance
- New Taipei City River Environmental Building and Improvement Project
- Rive Comprehensive Governance Project - Governance Project
- Banxin Area Water Supply Improvement Plan, Phase II Project
- City River Regional Drainage Restoration Improvement, and Dredge Project and Design Monitoring
- City Inland Waterway Facility Maintenance Project
- Inspection, Assessment and Measurement for City River, Regional Drainage and Flood Diversion Facility Construction
- Constructing City Sewage System Project
- New Taipei City Sanxia-Yingge Water Recycling Center Construction Project
- New Taipei City Ruifang Water Recycling Center Construction Project
- Sewage System and Handling Facility Post-Maintenance and Improvement Project
- Pumping Station New Construction Plan
- Implementation of Drainage City Research Plan