WATER IMPACT AND SOLUTIONS FOR URBAN

Global thinking and Local action

CBCS

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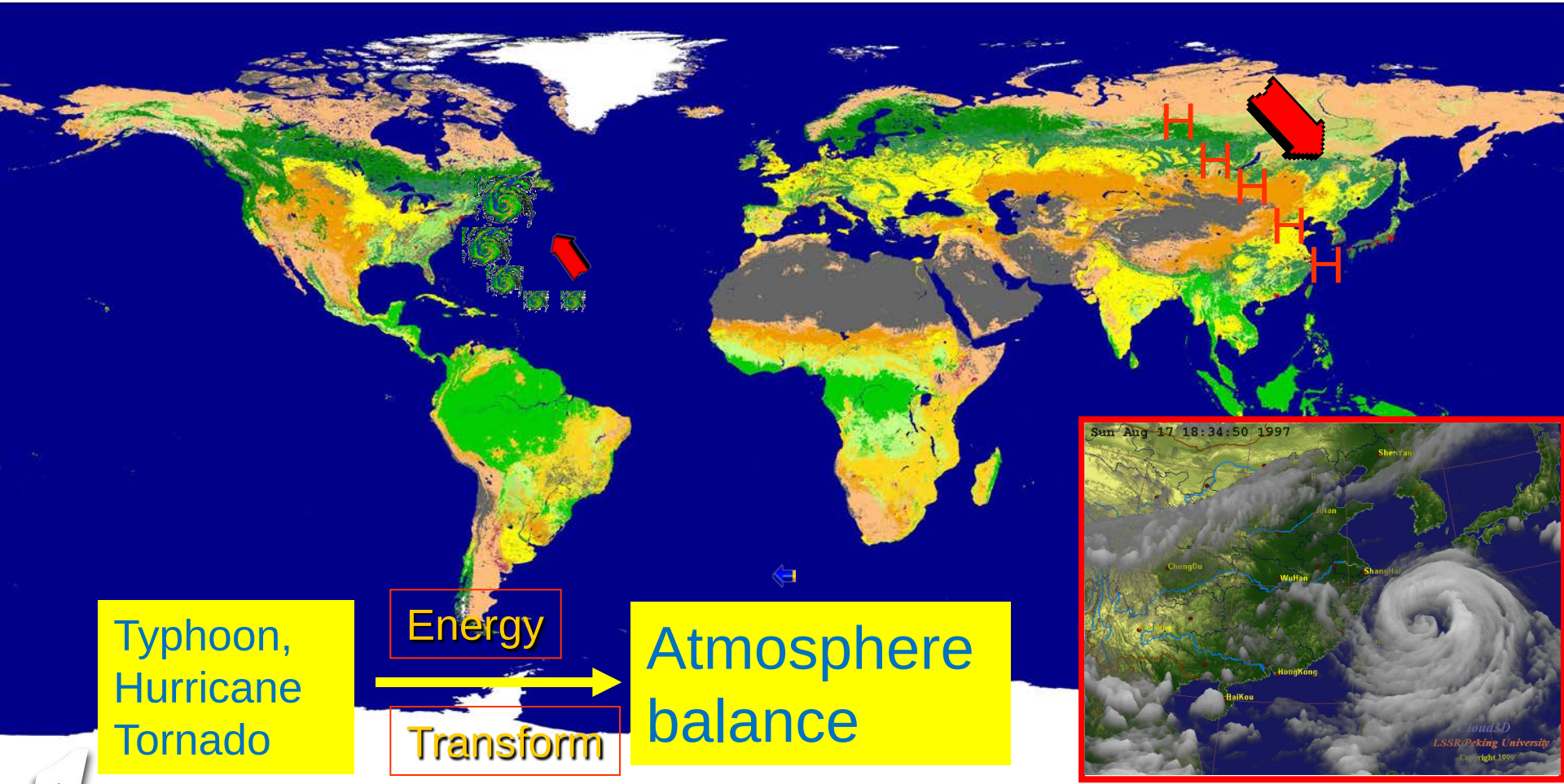
CONTENT

- *Global view to climate change*
- *Local experience from Taiwan*
- *Green building and water conservation*
- *Solutions for urban area*

global+local=Glocalization

Natural Mechanism-1

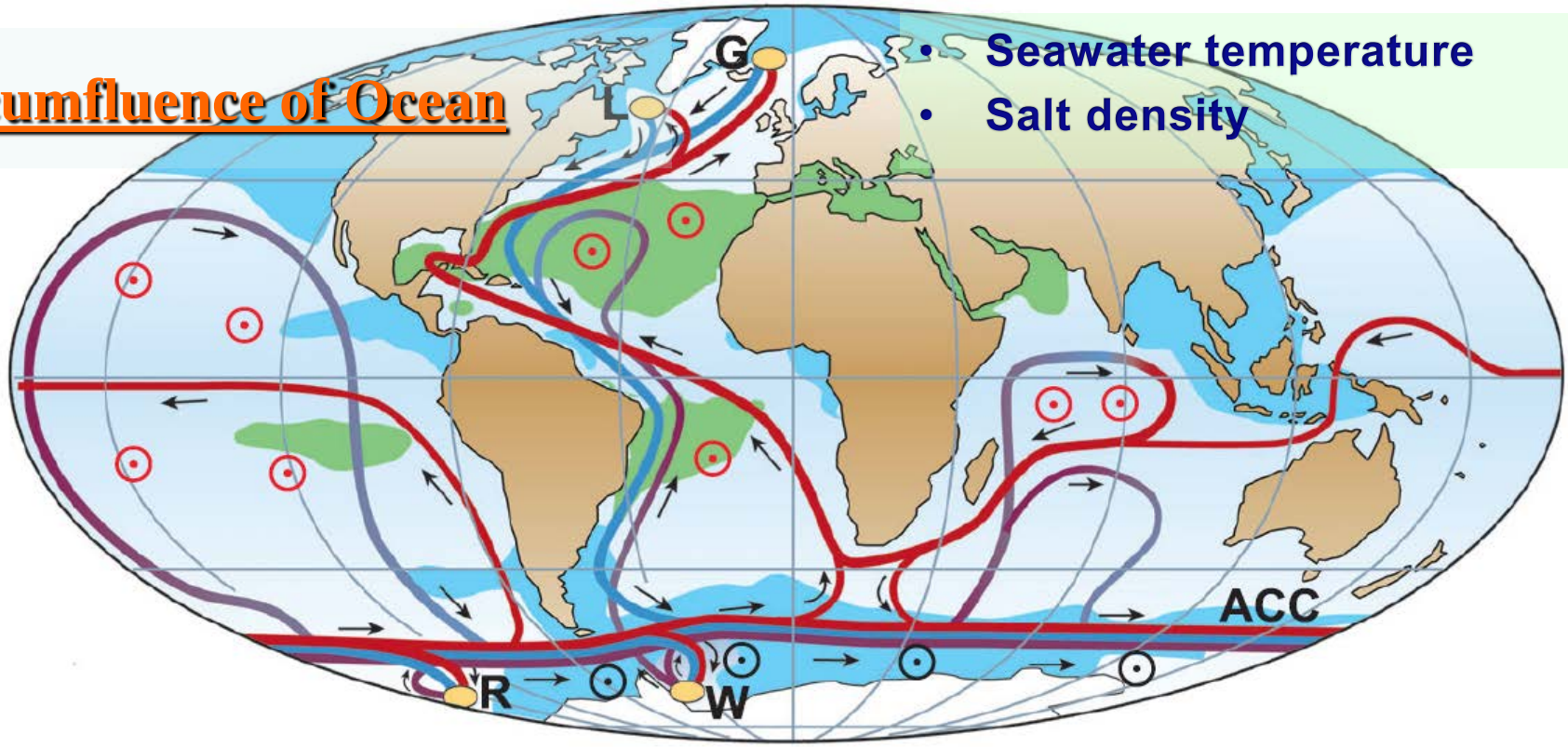


1. Global view to climate change

Natural Mechanism-2

Circumfluence of Ocean

- Seawater temperature
- Salt density



Surface flow		Wind-driven upwelling		L	Labrador Sea
Deep flow		Mixing-driven upwelling		G	Greenland Sea
Bottom flow		Salinity > 36 ‰		W	Weddell Sea
Deep Water Formation		Salinity < 34 ‰		R	Ross Sea

Current Impact 1

water disaster in Asia

Current Impact 2

Disaster in Australia

資料來源：左上圖：chinese.wsj.com；右上圖： chinese.wsj.com
左下圖：hkcna.hk；右下圖：epochtimes.com

Current Impact 3

Big Shake in Japan

資料來源：左上圖：picasaweb.google.com；右上圖：news.hainan.net
左下圖：hk.kpost.yahoo.com；右下圖：big5.ce.cn

Current Impact 4

Extreme weather in USA

資料來源：左上圖：geographyblog.eu；右上圖： chacha.com
左下圖：cbsnews.com；右下圖：hk.news.yahoo.com

Current Impact 5

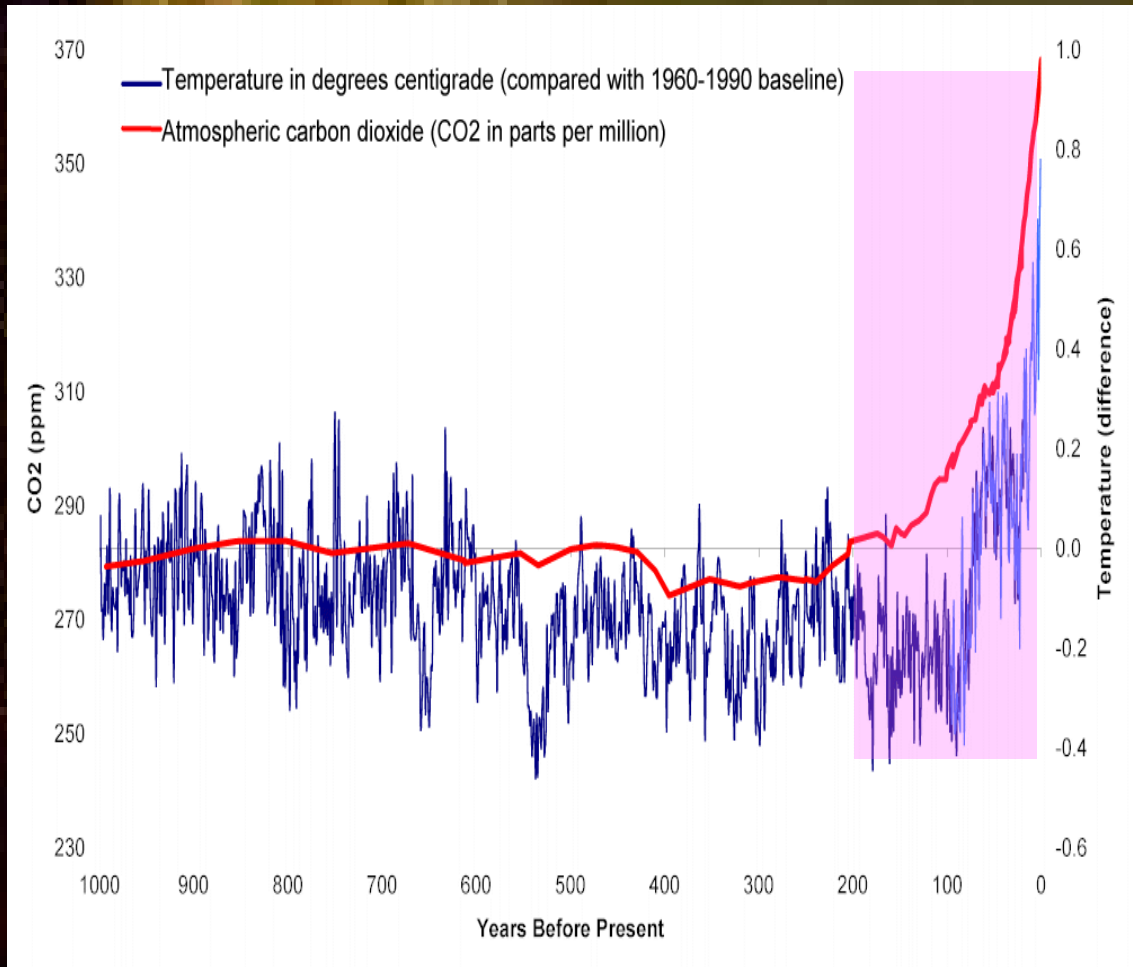
Disasters in Taiwan

資料來源：左上圖：blog.udn.com；右上圖： big5.china.com
左下圖：cna.com.tw；右下圖：cna.com.tw

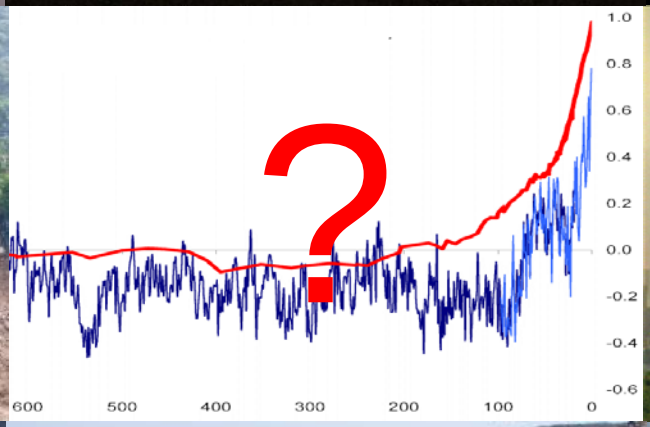
The root cause of climate change

- Industrial Civilization
  - Fecal energy consumption
  - CO_2 Emission
  - Over development
  - Urbanization

Global Worming



Extreme → Normal

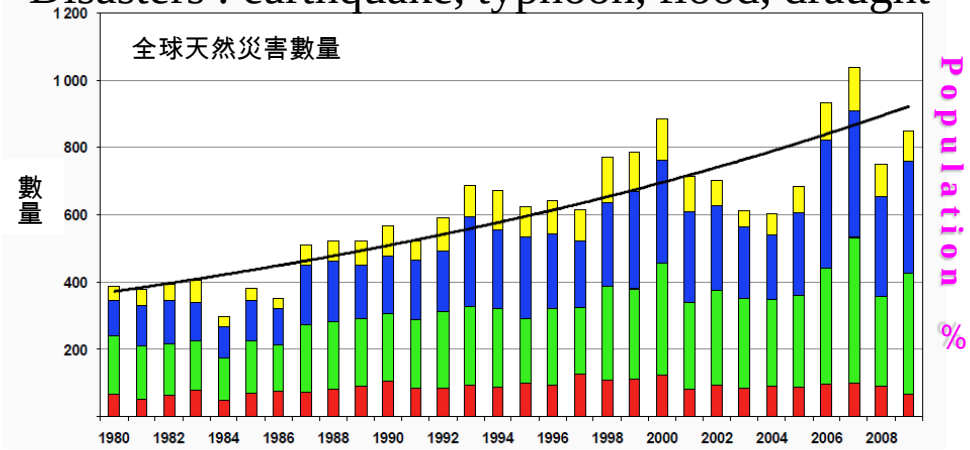


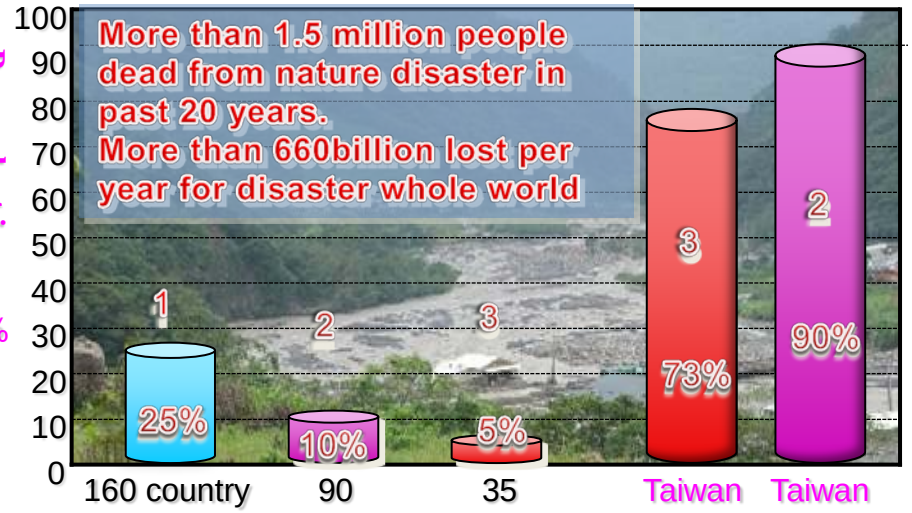
2.

Local Experience from Taiwan

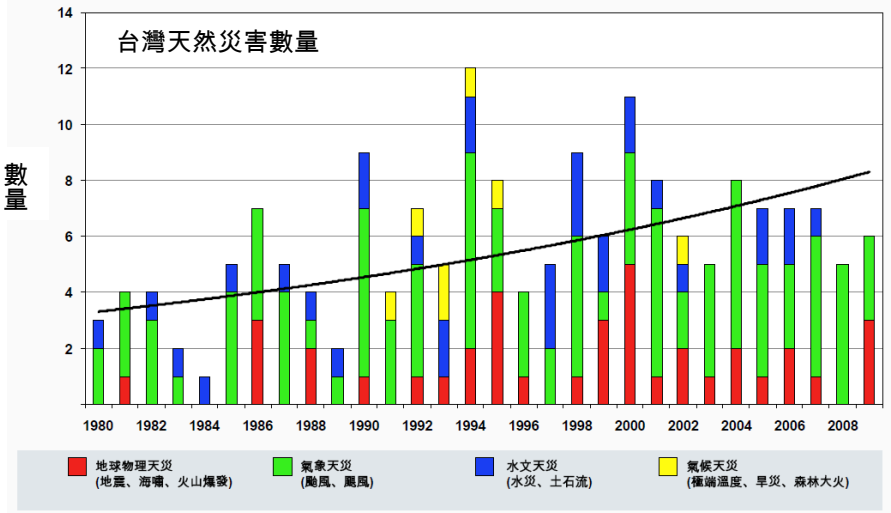
Increasing tendency of global disaster

Disasters : earthquake, typhoon, flood, draught



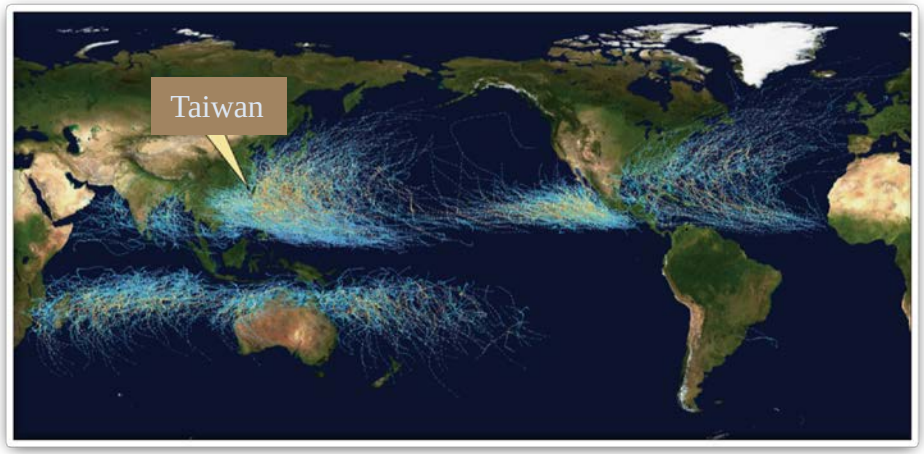


WBC report(2005):National Disaster Hotspots – A Global Risk Analysis



資料來源：Kua Ka Hin, 2010

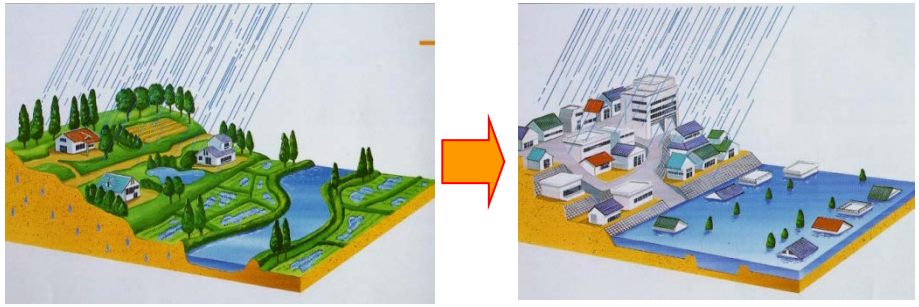
1985~2005 route of Taiphoon



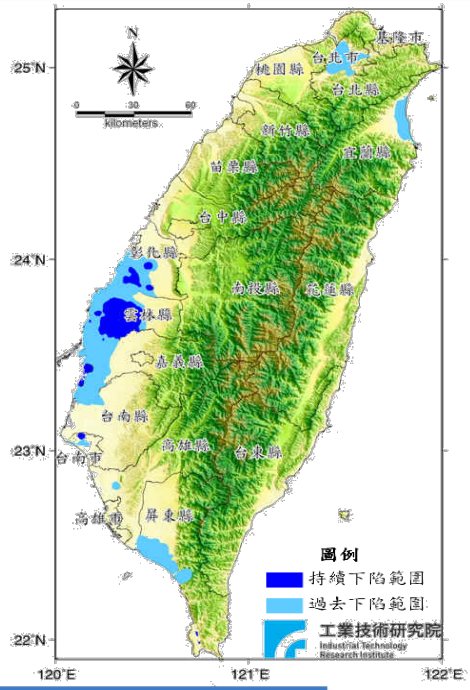
資料來源：NASA

Water Impact

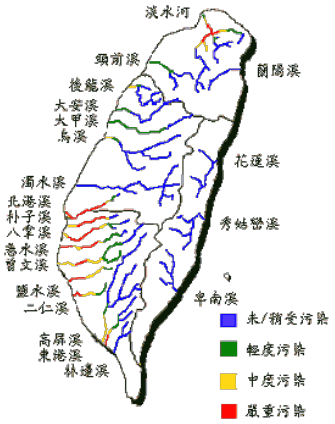
Over development, Urbanization

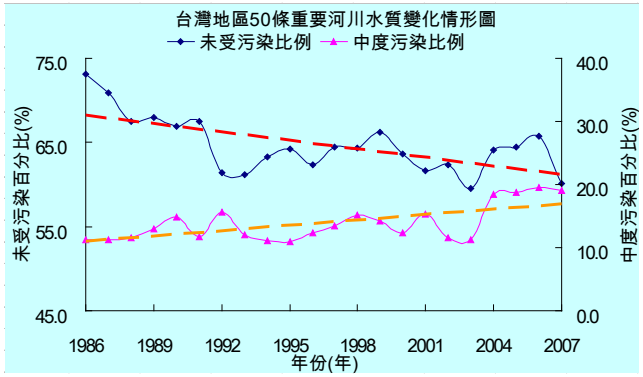


Underground water and sunken land



River pollution and reduction of storage





Land slide in hill area

Increasing demand and distribution issues

Climate disaster (Molark Typhoon)

Shau-Lin Village

Response Strategy

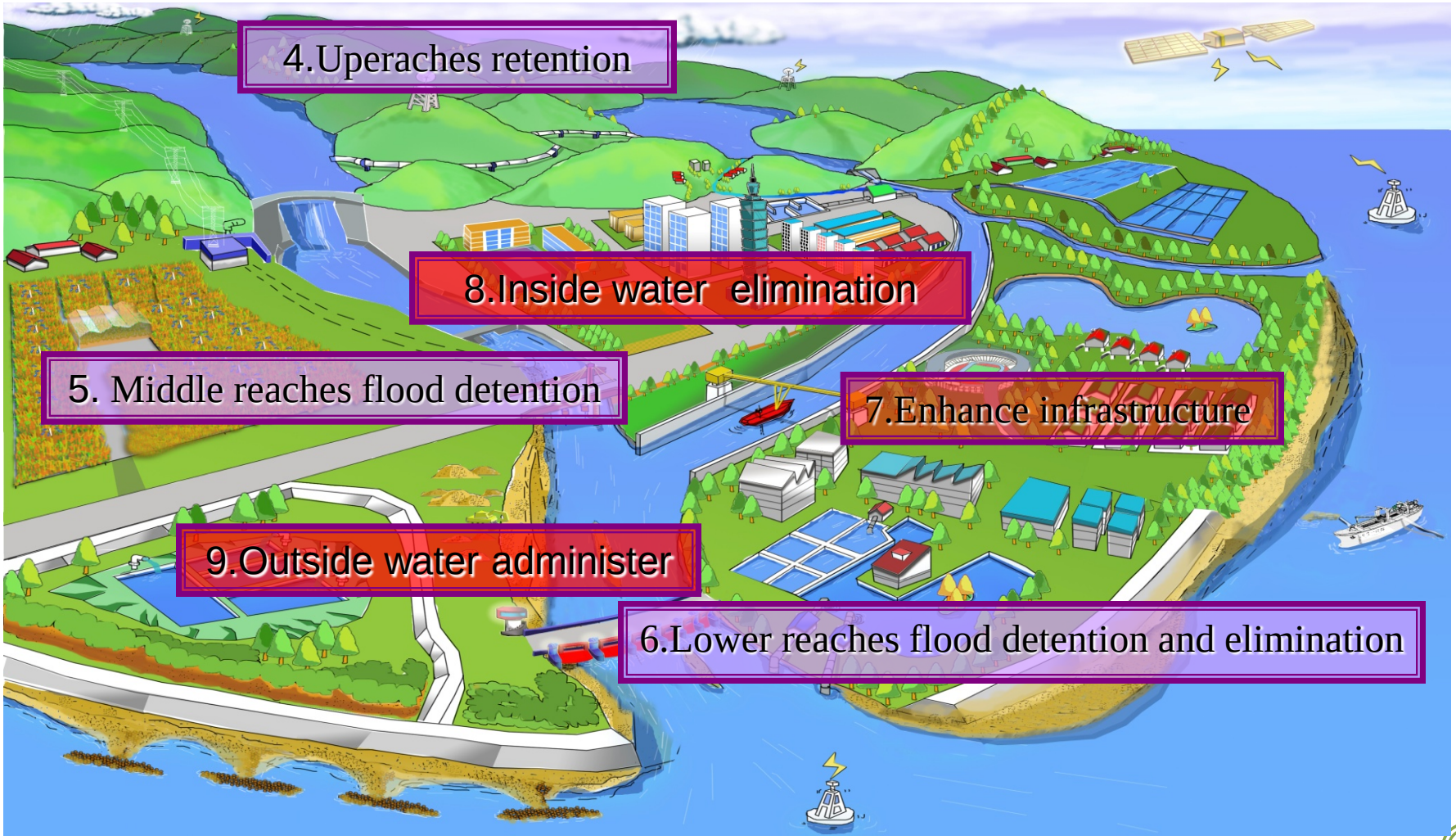
Water crisis

Solution 1: Integration plan

1.National land planning

2.Flood strategy

3.Imergency rescue system

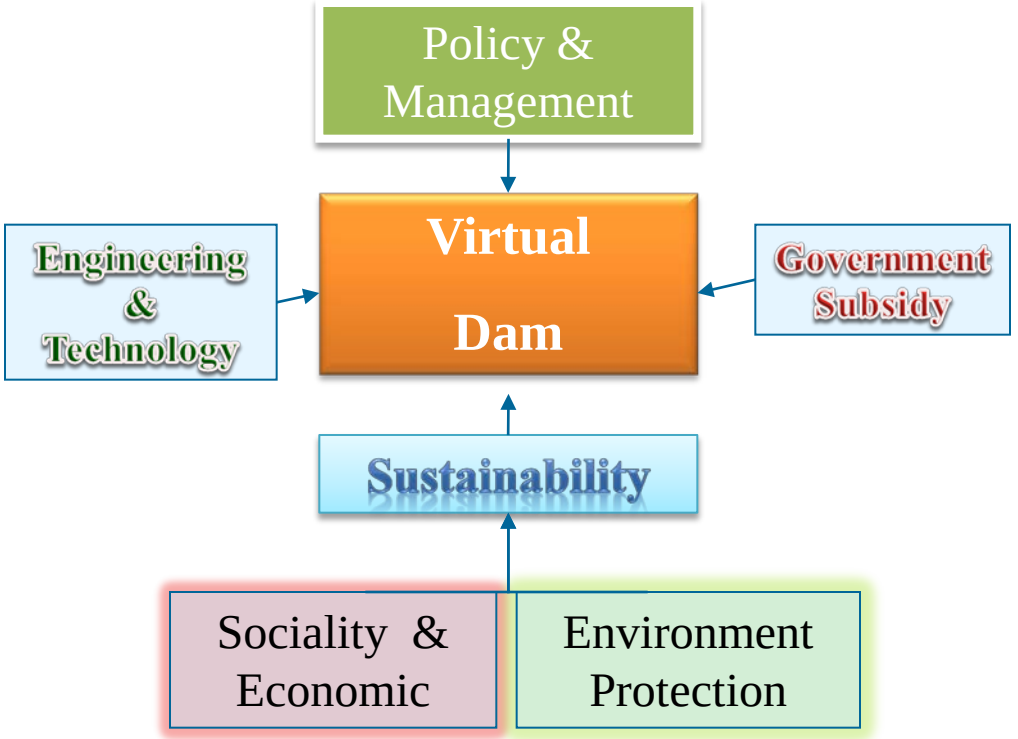


Water resource integration management

Concept of Virtual Dam

Alternatives of tradition→

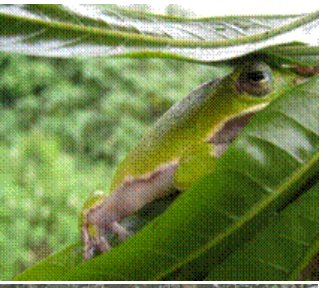
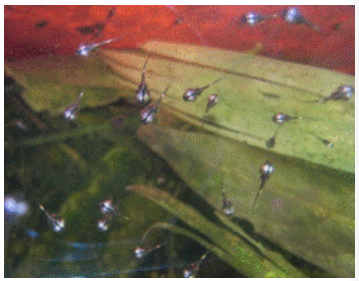
Integration of blend and saving strategy



Execution Results

Hu-San Dam



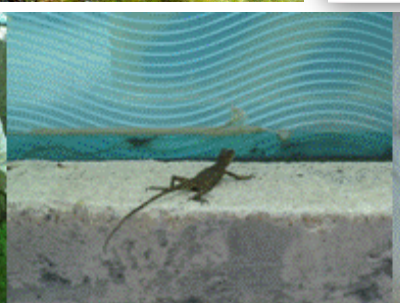














Risk Management

Flood level

2 hour

Level 1 (Danger)

Flood Alarm

5 hour

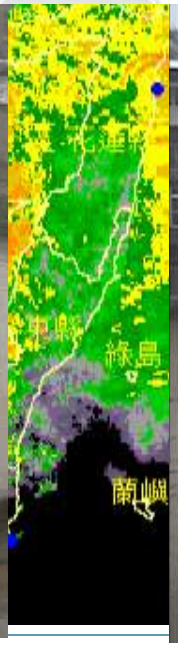
Level 2(Warning)

High beach

2 hour

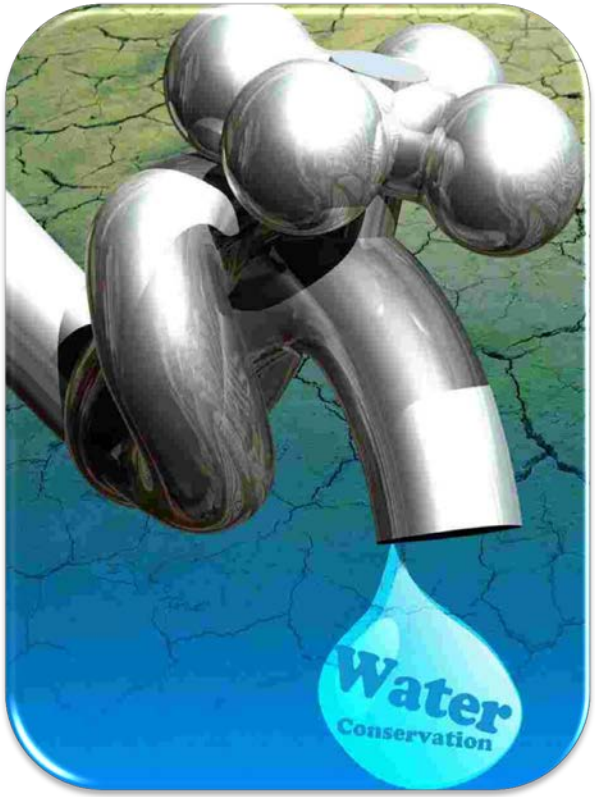
Level 3 (Watch out)

Immediately monitor and alarm system



Situation alarm sign system

Light sign



Situation normal	
Alarm level (watch out and preparation for getting worse)	
Level 1 shortage (Reduce supply pressure and agriculture water)	
Level 2 shortage (Limitation for major utility)	
Level 3 Shortage (Limitation for livelihood utility)	

3. Green Building & Water Conservation

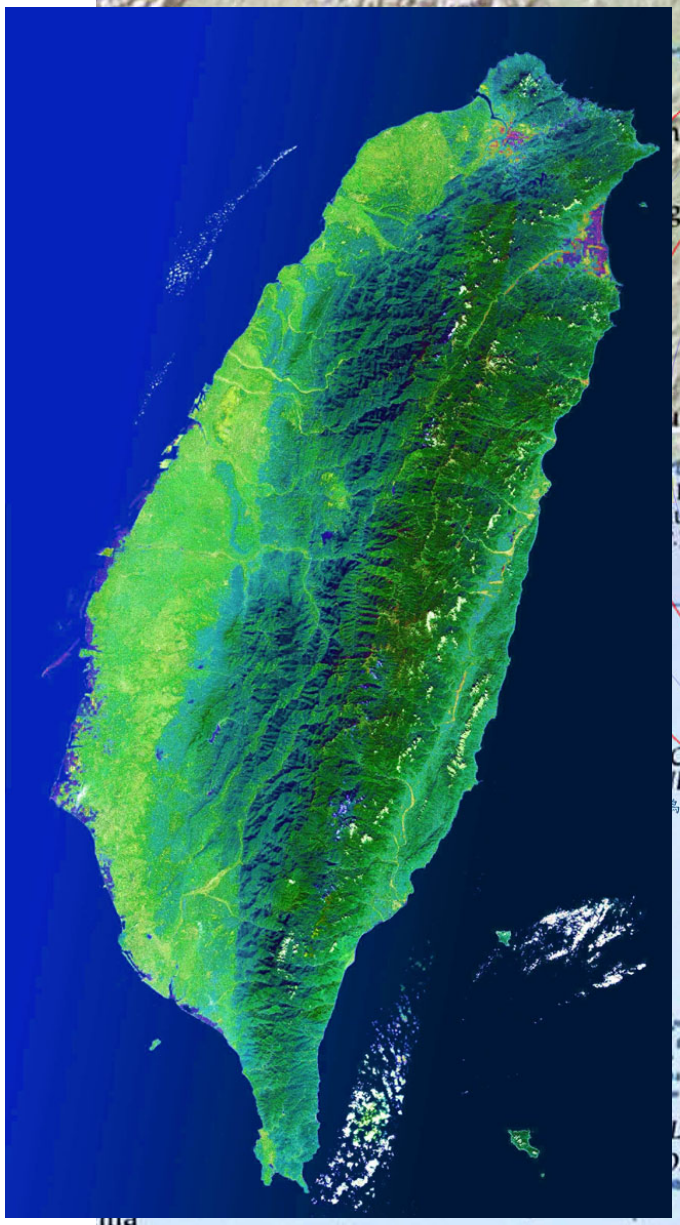
- **the policy of sustainable development**

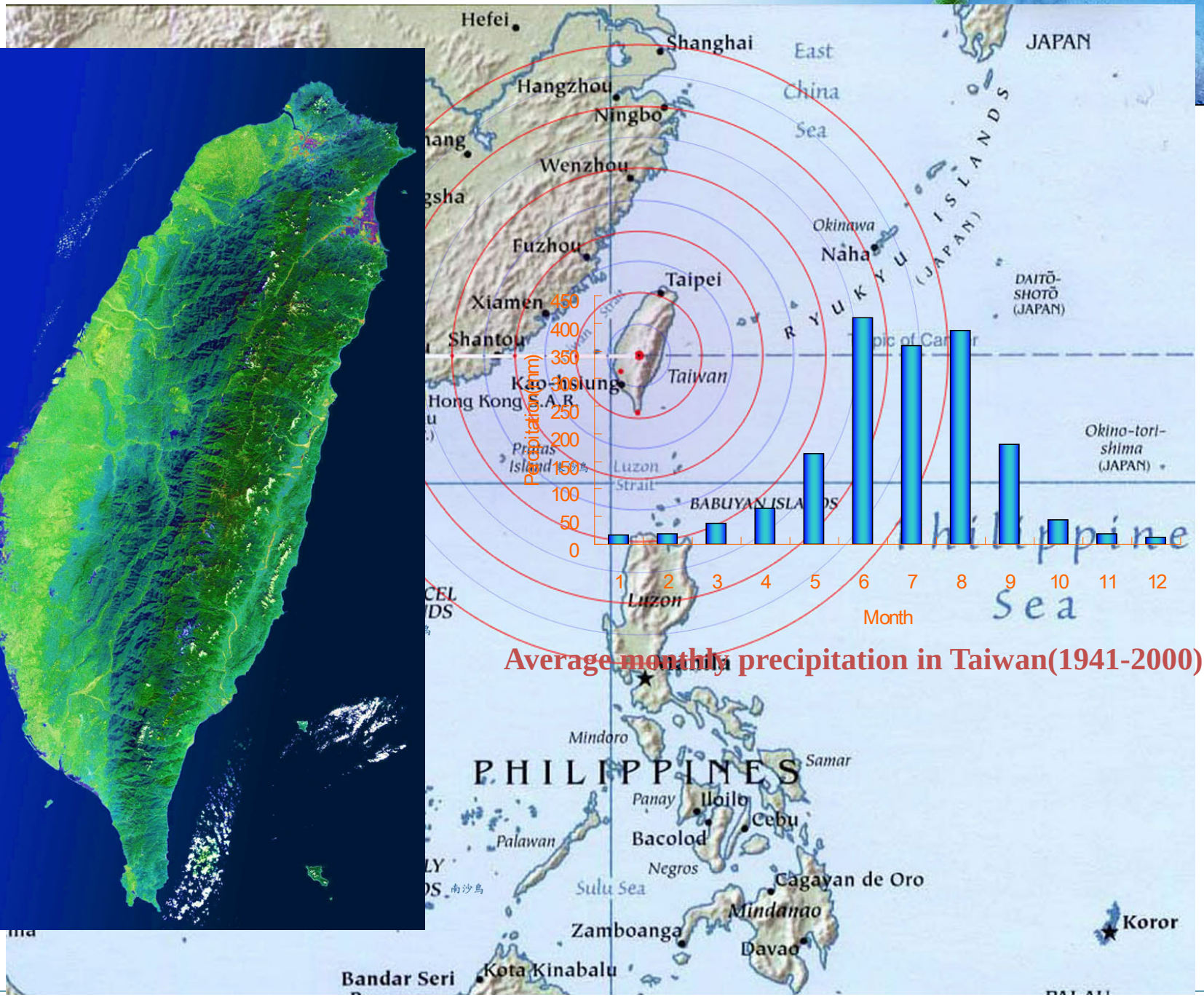
  performance of green building system emphasizes

  - ✓ *energy conservation,*
  - ✓ *resource protection,*
  - ✓ *low waste,*
  - ✓ *low impact,*

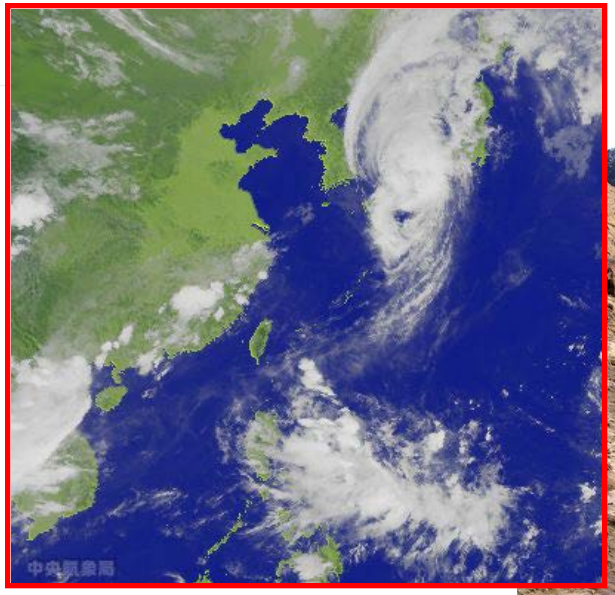
- ➢ improve the ecological living environment.

Actions for water conservation !

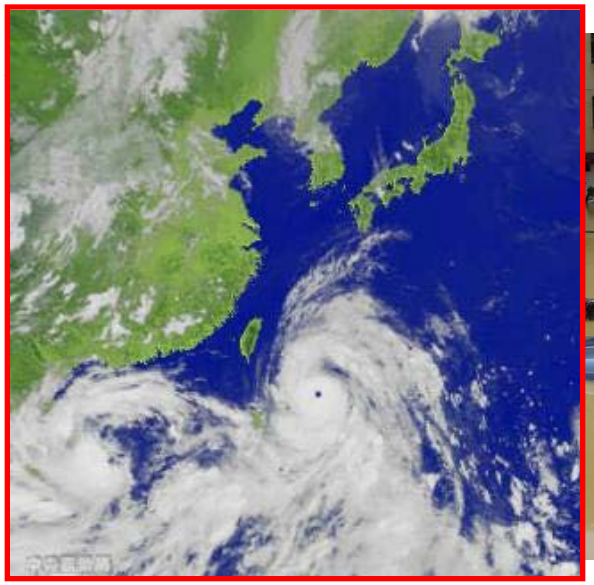




Average monthly precipitation in Taiwan(1941-2000)


中央氣象局


68




出入
駕駛
2:46 PM


新竹國際商業銀
1 3:18 PM

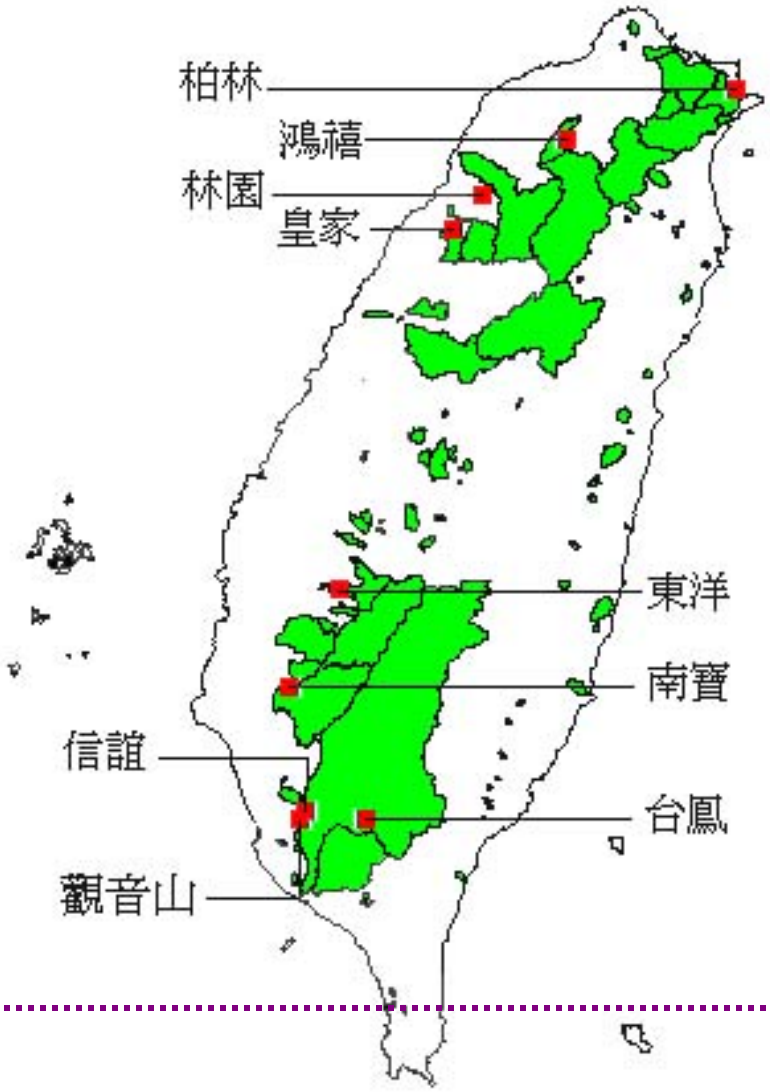

一念妙法 一世成佛
小門士炸雞
新竹國際商業銀行
1 3:23 PM


1 2:56 PM

26

Water resources and Construction

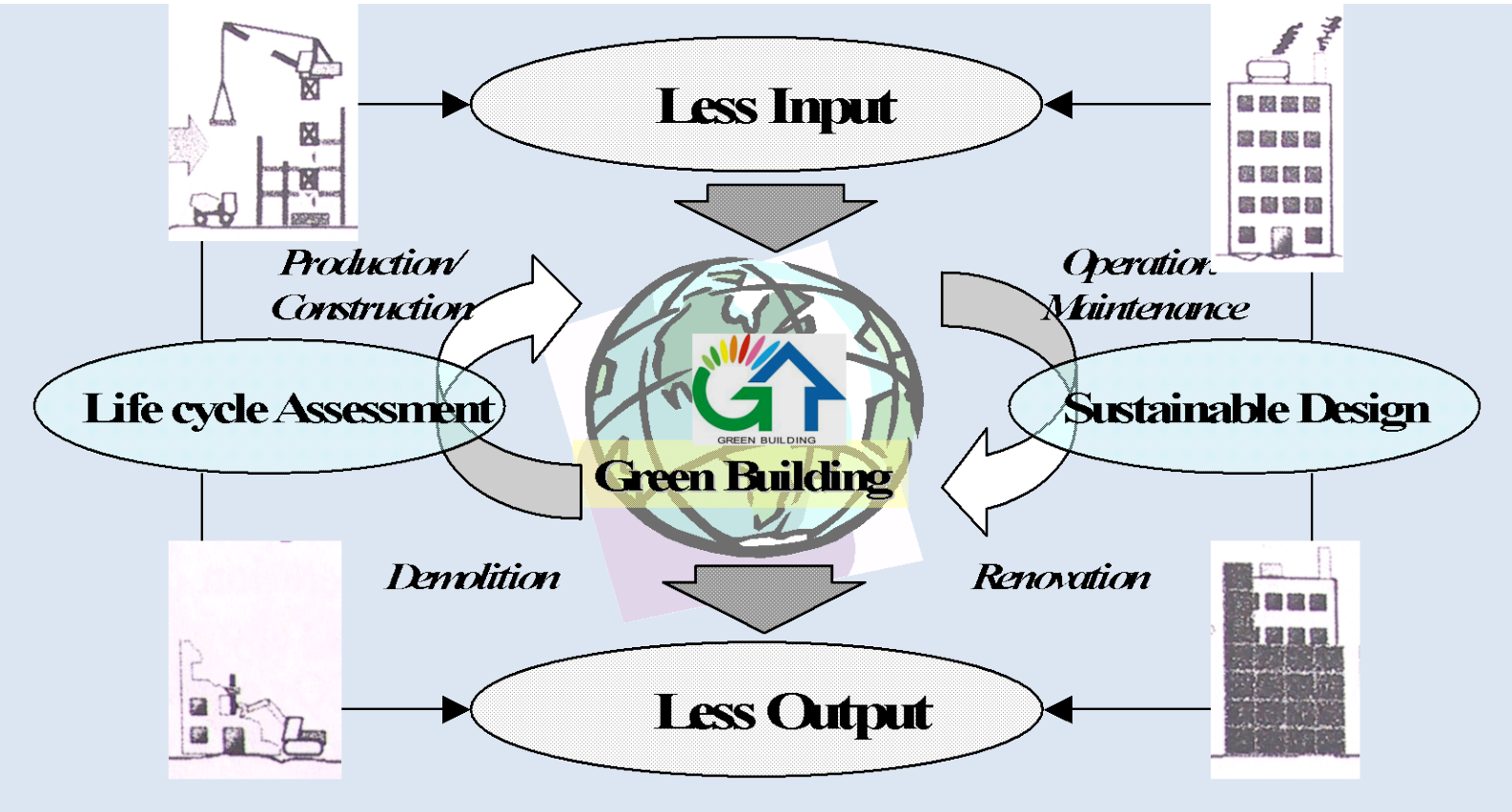
❖40 Dams and 800 Reservoirs



❖Protect area:

1/4 of Country Land

Green Building Design



Green Building Label in Taiwan

The Green Building Label is awarded by the Architecture & Building Research Institute of Ministry of Interior to promote the Green Building designs which emphasizes energy conservation, resource protection, low waste and low environmental impacts for the life cycle of the building.

- **Seven Categories for the Evaluation System---**

  1. *Green*
  2. *Soil Water Content*
  3. *Water Conservation*
  4. *Energy Conservation*
  5. *CO_2 Emission*
  6. *Waste Reduction*
  7. *Sewer and Garbage*

+ Ecology and Healthy Interior

綠建築標章
GREEN BUILDING

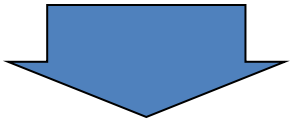
Water Consumption for Daily Life

- **TARGET---**

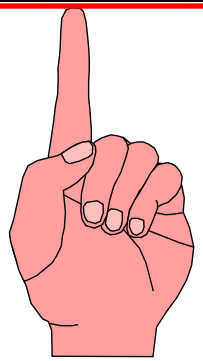
The distribution quantity and proportion of daily purpose shows the water consumption proportion for toilet, cleaning and others is totally above 30%. These purposes of water consumption can consider to be replaced by gray water or rainwater.

/// If half of the population in Taiwan live in green building, we can save almost a new dam (Nan-hua dam) for one year.

purpose / volume	bath	cloth washing	light washing	kitchen	toilet	cleaning	others	total
Proportion (%)	20%	24%	8%	16%	24%	4%	4%	100%
Daily average	50	60	20	40	60	10	10	250
Daily maximum	75	80	28	57	80	15	15	350



20% DOWN



Water saving facilities

產品項目	廠商名稱	產品件數	使用枚數
1. 洗衣機	台灣三洋、台灣松下、東元、歌林、大	35	120,404
2. 一段式省水馬桶	台灣東陶、電光企業、德久、和成欣業	67	362,190
3. 二段式省水馬桶	台灣東陶、和成欣業、德久、電光企業	8	4,268
4. 水龍頭	和成欣業、德久、振吉電化廠、莊頭北	15	16,252
5. 蓮蓬頭	瑩而富貿易、振吉電化廠、德久、伸亞	8	8,110
6. 二段式省水沖水器	鑫順、承益、合良五金、玲憶、和成欣設備、科保、祐旻、來順發企業、鼎興	34	230,067
7. 感應式水龍頭	亞力士衛浴設備、科保、祐旻、牧新科	9	2,744
8. 省水配件	細緻科技、府慶、伸亞實業、仁榮五金易、承益、力正自動衛材	15	67,985
合 計	60家次	191	812,020

Water recycle system

Gray water reuse from kitchen

Flash water from toilet

Sewerage equipment

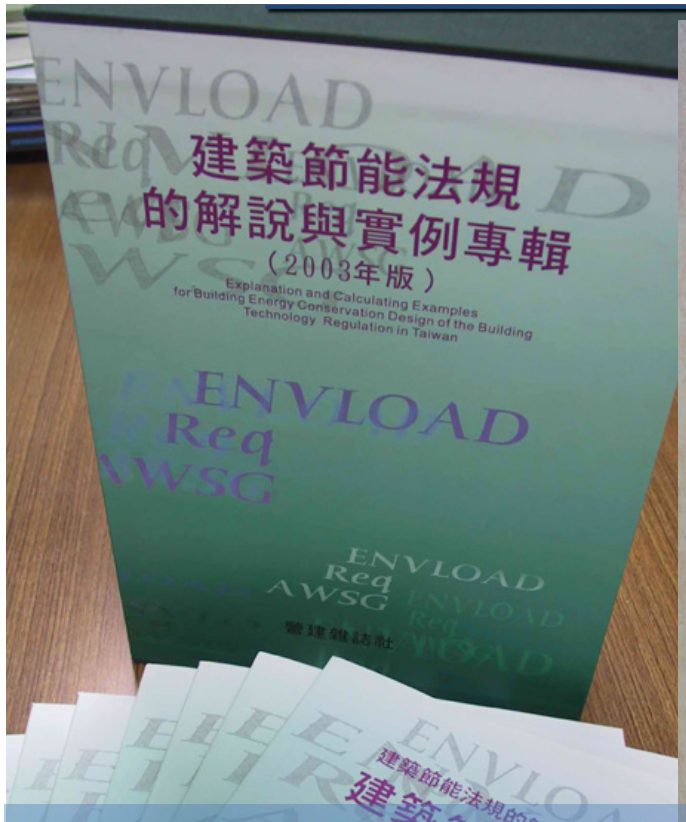
Plant watering

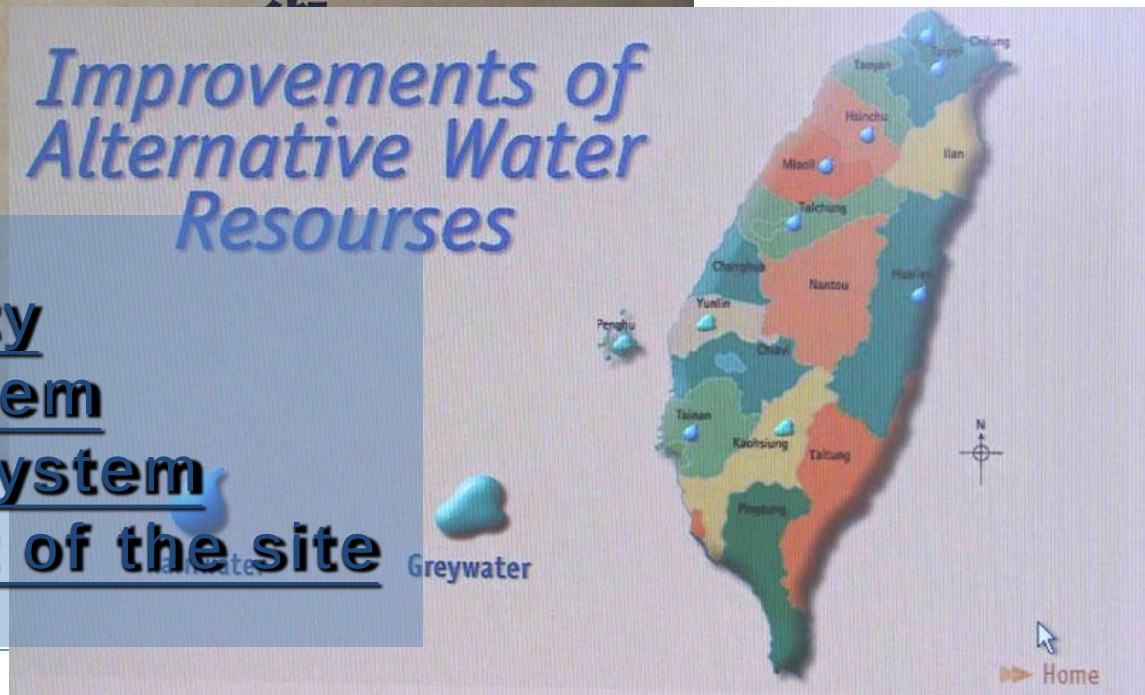
Refined version of EEWH System

綠建築標章
GREEN BUILDING

- Ecology
- Energy
- Waste
- Health

New Guideline link to Building Code





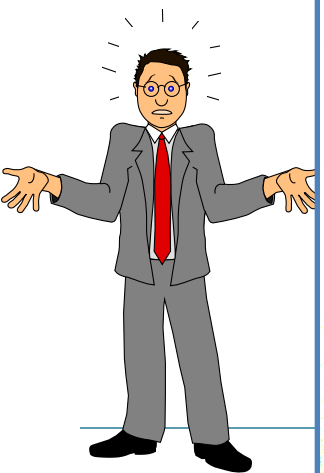
- Water saving facility
- Rainwater use system
- Gray water reuse system
- Water contentment of the site

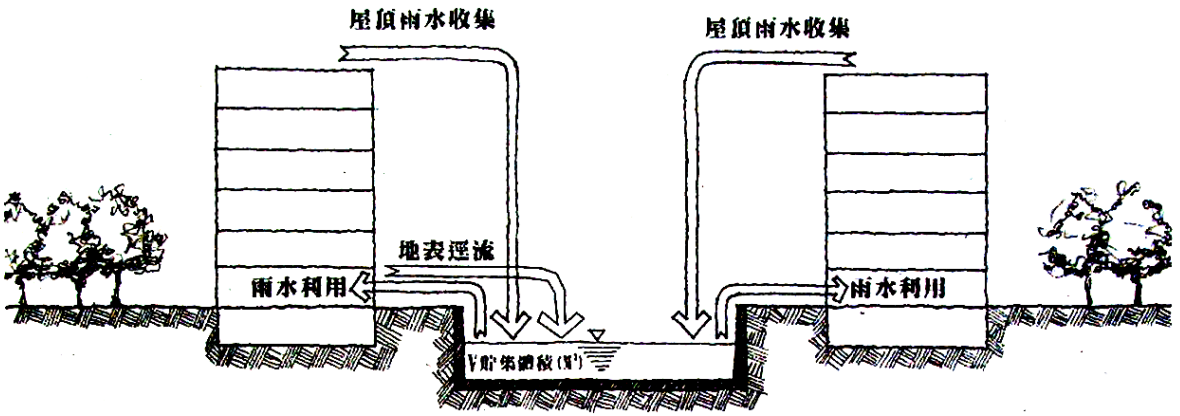
Water Conservation Information of Taiwan

http://wcis.erl.itri.org.tw

Rainwater Use System in Building

The average amount of yearly precipitation in Taiwan is about 2500mm, it is almost 2.5 times of world average (970 mm). If rainwater is effectively used in building, the potential for water conservation is remarkable in Taiwan.





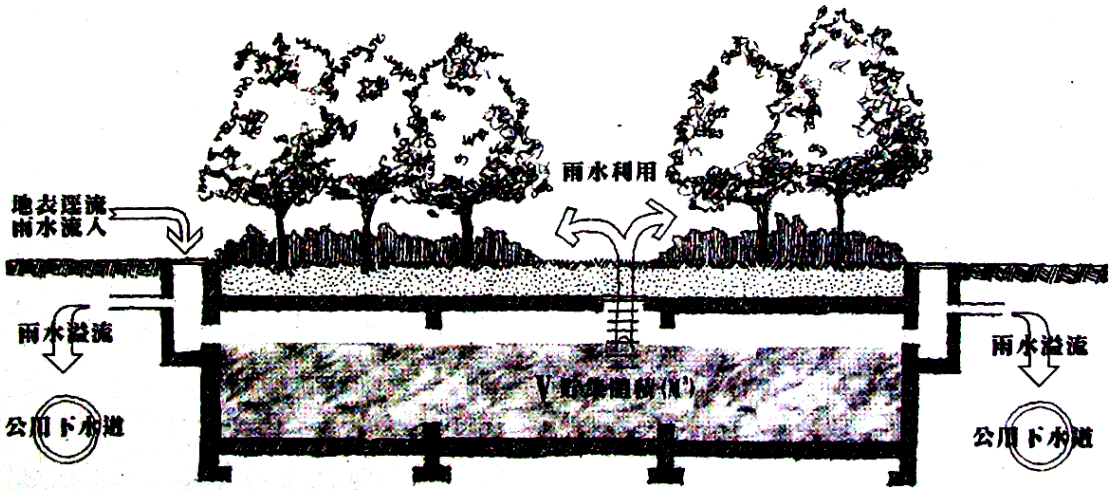
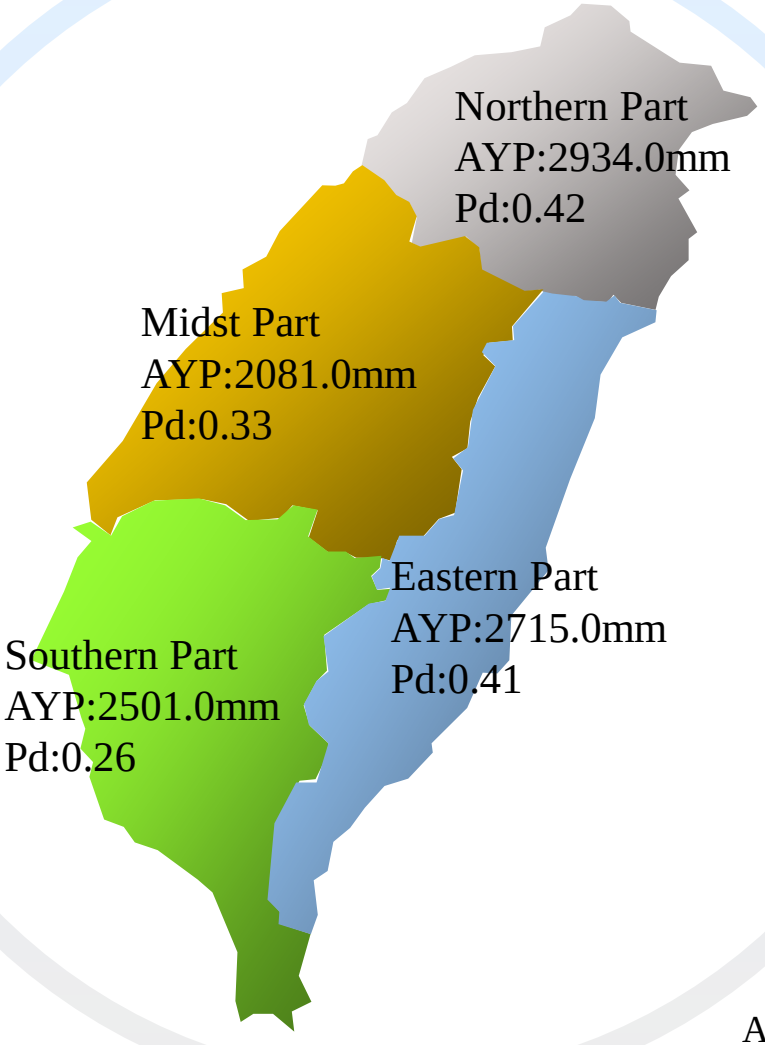


圖 8-3 地面型與地下型雨水貯集利用系統

Rainfall Distribution of Taiwan Areas

Terrain



Typhoon

AYP: Average Yearly Precipitation
Pd: Rainfall Probability

Problems and Potential

Problems

- Typhoons and terrain
- Rainfall distribution unequally in space and time
- High population and high water demand

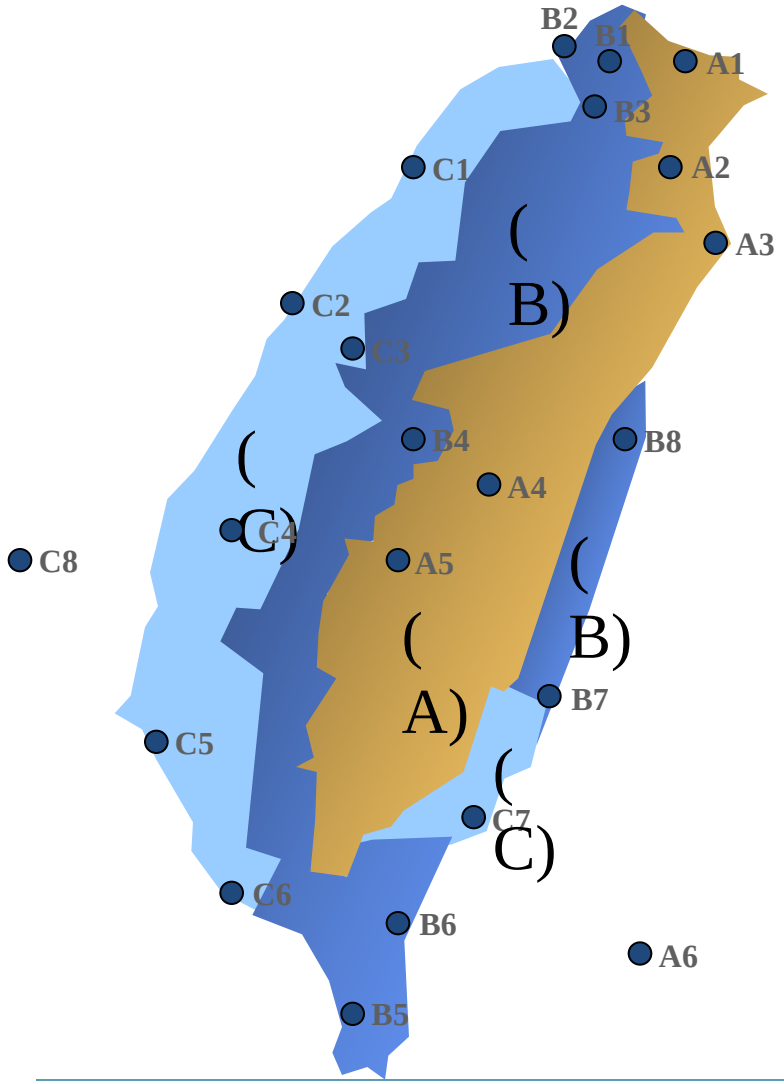
Potential

- High precipitation about 2500 mm
- Strategy for rainwater utilization
- Support of the authorities

Powerful Tools

- Accurate determination of rainwater utilization
- Interactive interface
- Simplified technological procedures

Zoning of Precipitation

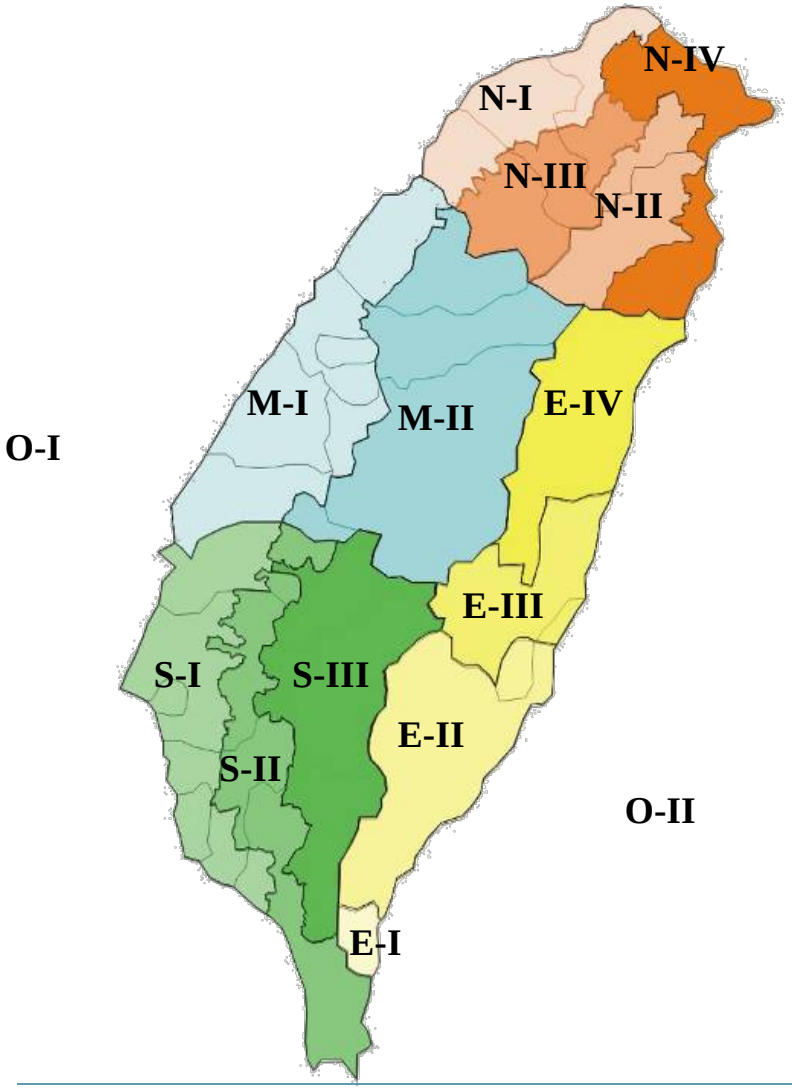


A. High precipitation area(>3000mm)	
A1.Keelung	A2. Ilan
A3. Suao	A4. Yushan
A5. Alishan	A6. Lanyu

B. Medium precipitation area(2000-3000mm)	
B1. Chutzehu	B2. Tanshui
B3. Taipei	B4. Jihyuehtan
B5. Hengchun	B6. Tawu
B7. Chengkung	B8. Hualian

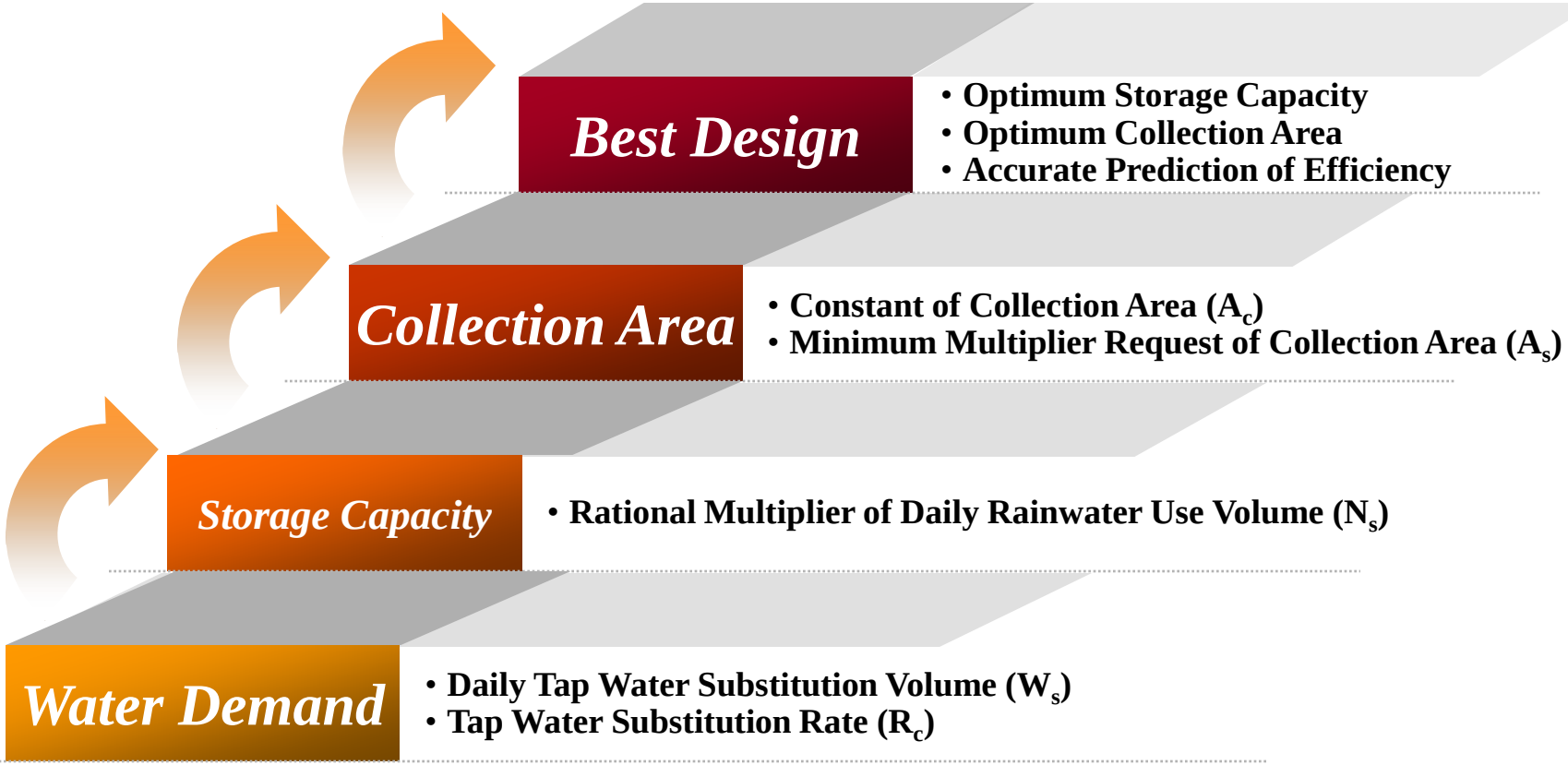
C. Low precipitation area(<2000mm)	
C1. Hsinchu	C2. Wuchi
C3. Taichung	C4. Chiayi
C5. Tainan	C6. Kaohsiung
C7. Taitung	C8. Penghu

Zoning for Specific Regional Rainfall Regime



Area	Region	Average Yearly Precipitation	Rainfall Probability
North	N-I	1815.0 mm	0.34
	N-II	3584.5 mm	0.50
	N-III	2302.9 mm	0.37
	N-IV	3564.6 mm	0.53
Midland	M-I	1406.2 mm	0.26
	M-II	2279.5 mm	0.37
South	S-I	1673.8 mm	0.25
	S-II	2328.7 mm	0.29
	S-III	2964.2 mm	0.37
East	E-I	2237.8 mm	0.43
	E-II	2070.9 mm	0.38
	E-III	2723.2 mm	0.45
	E-IV	2202.4 mm	0.42
Outside island	O-I	927.7 mm	0.23
	O-II	3104.5 mm	0.60

Framework of Evaluation System



Water Demand

Daily tap water demand volume (W_t)

Category	Type/scale	W_f[b] (l/m^2 per day)	W_t (l/day)
Office[a]	Reserved typical use	7	$W_t = W_f \times A_f$ (m^2) Where A_f would not include the non-dwelling area for example parking, machine, storage, lobby, stairs.
	Composite use	9	
Commercial Building	With restaurant	20	
	Without restaurant	10	
Hotel	Business hotel	15	
	Typical hotel	20	
	Resort hotel	25	
Hospital	Dispensary/sanatorium	15	
	General hospital	21	
	Teaching hospital	24	
School	Administration/teaching	10	
	Others	Same as others category	
Dormitory	–	10	
House	W_t = 250(l/person/day) × 4(person/family) × N_f, where N_f is number of assumed typical family units with four people.		
Others	Evaluation is dependent upon the practical water demand.		

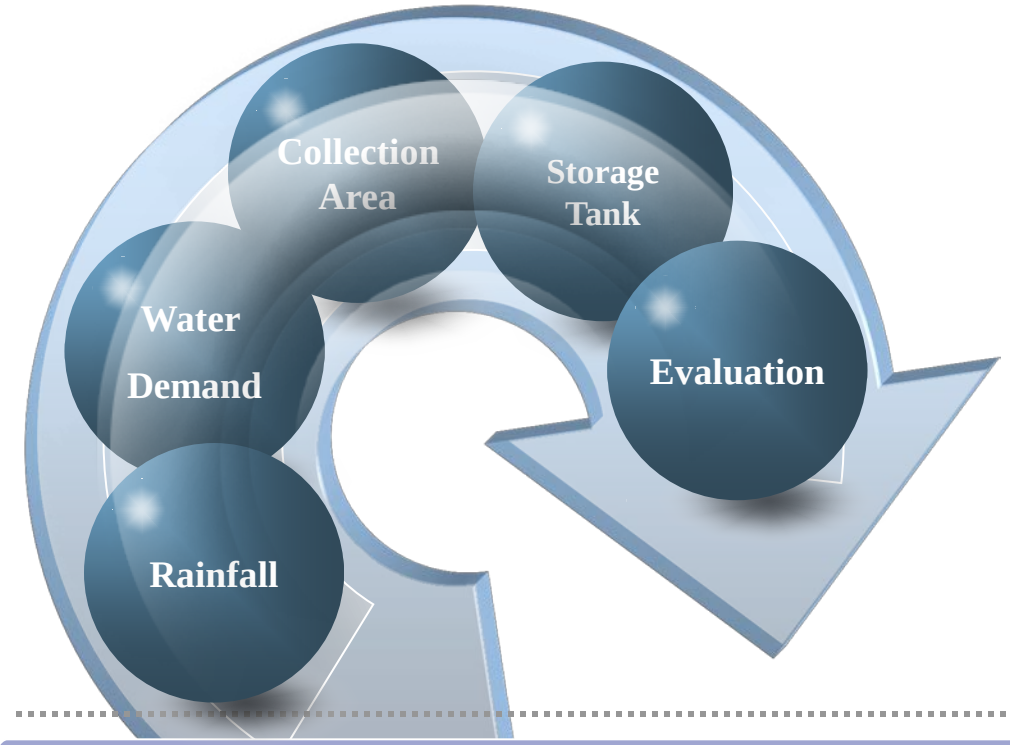
[a]Office is one kind of commercial building and which of composite use type is with coffee shop, restaurant or other commercial function.
[b]Parameter of water demand for per floor area per day W_f is empirical data from existing document and investigation.

Design Parameter

Area	Region	Constant of Collection Area (A_c)	Minimum Multiplier Request of Collection Area (A_s)	Rational Multiplier of Daily Rainwater Use Volume (N_s)
North	N-I	0.2376	2.49	8.59
	N-II	0.3263	0.81	5.84
	N-III	0.2597	1.65	7.89
	N-IV	0.2945	0.90	5.51
Midland	M-I	0.1514	4.14	11.23
	M-II	0.2105	1.80	7.89
South	S-I	0.1312	4.32	11.68
	S-II	0.1505	2.40	10.07
	S-III	0.1919	2.04	7.89
East	E-I	0.2295	1.95	6.79
	E-II	0.2134	2.48	7.68
	E-III	0.3069	1.20	6.48
	E-IV	0.2575	1.76	6.95
Outside island	O-I	0.1392	7.74	12.70
	O-II	0.4020	0.80	4.87

Evaluation Software of Rainwater Utilization

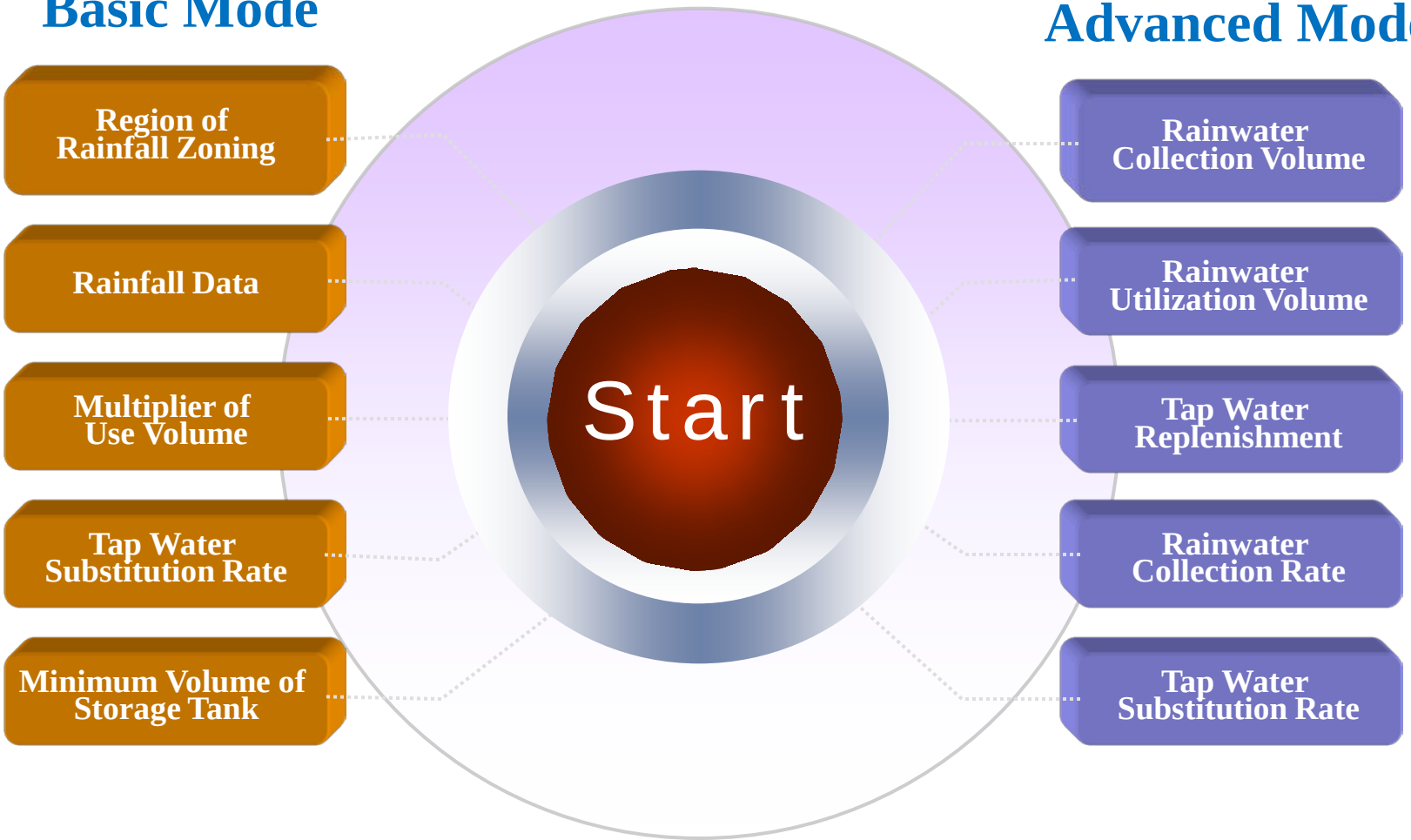
Framework of Basic Mode



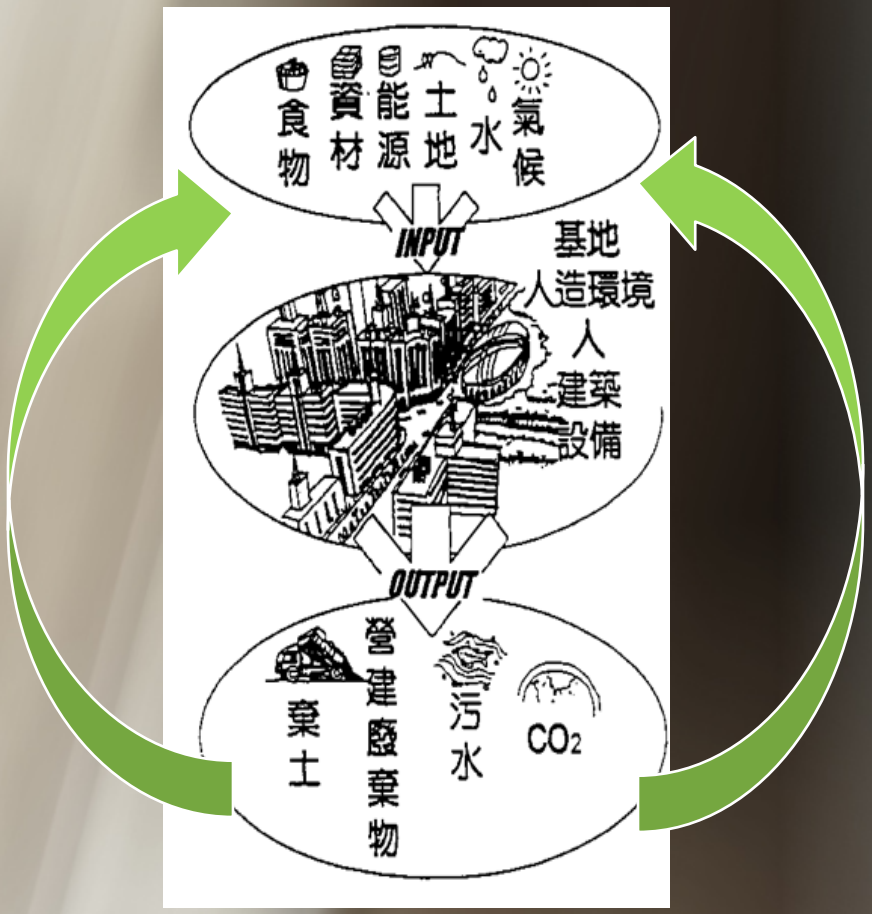
Basic Mode

Basic Information → *Calculation of Water Demand* → *Design Parameter* → *Calculation Results*

Evaluation Software of Rainwater Utilization



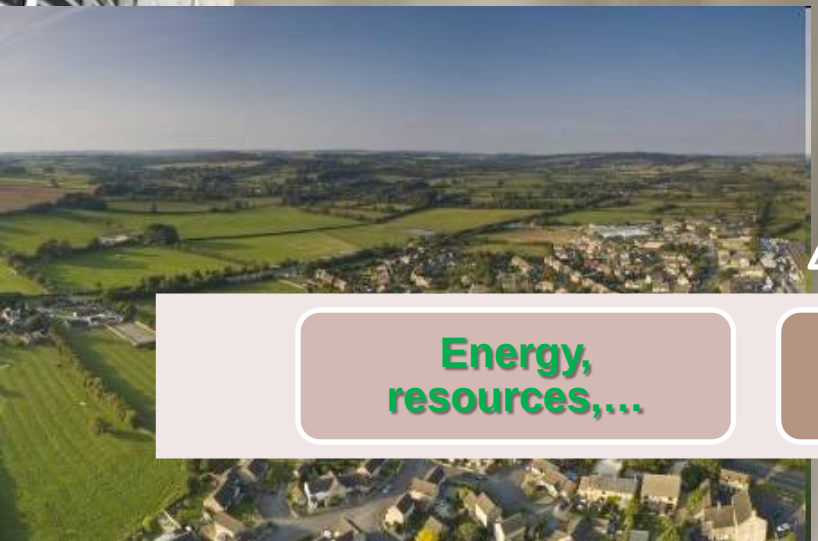
4. Solutions for urban



- **Less input & less output**

Composition of Urban

According to the natural conditions, urban composition follows up to the civilization, however people's thinking, behaviors and needs play a crucial role eventually.



Climate

Environment

Architecture

People

Energy, resources,...

Urban environment

Waste, pollution,...

Foundations of Eco-city


Air


Water


Energy


Resources

Challenge of Recycle and renew

Air
- Biodiversity
- Make green by planting tree
- Reduce carbon dioxide emission
- Strategy of heat island

Water
- Water retention for land
- Water saving
- Rainwater reuse
- Grey water recycle

Energy
- Energy saving
- Renewable energy
- Clean energy
- Green traffic

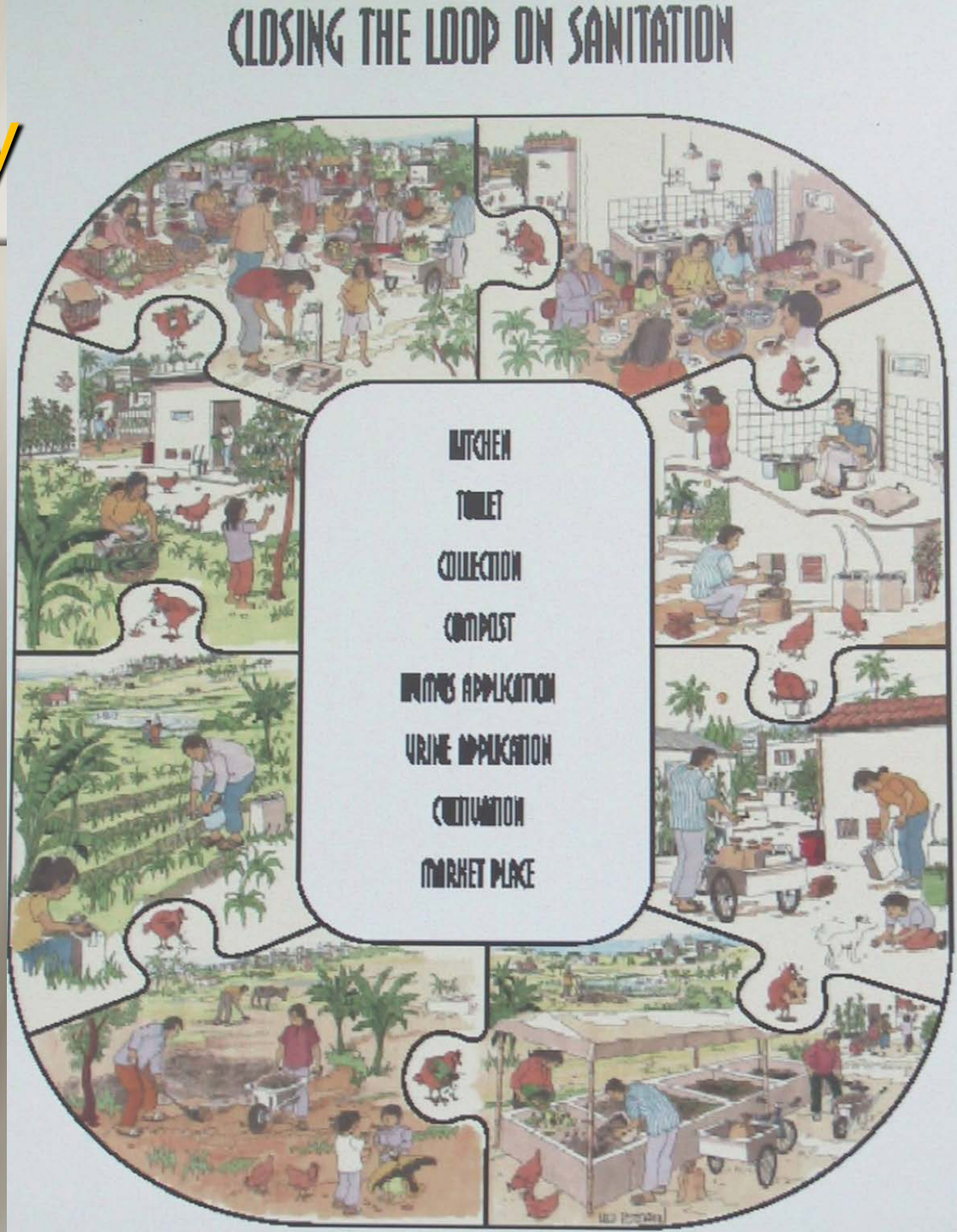
Resources
- Reduce waste
- Indoor quality
- Green, recycle materials
- Sewerage and garbage recycle and reuse

Recycle society

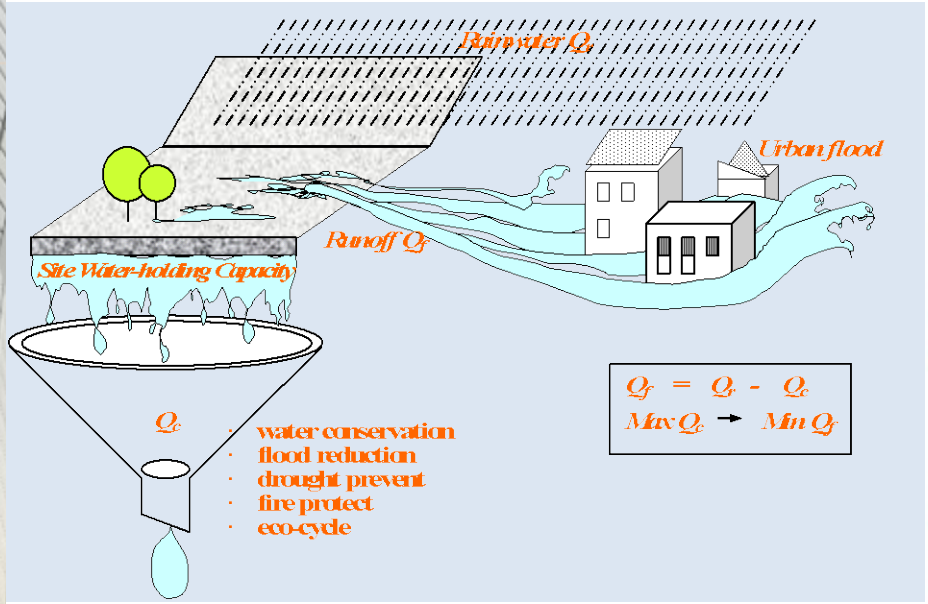
Food

People

Waste



Design for Water Retention

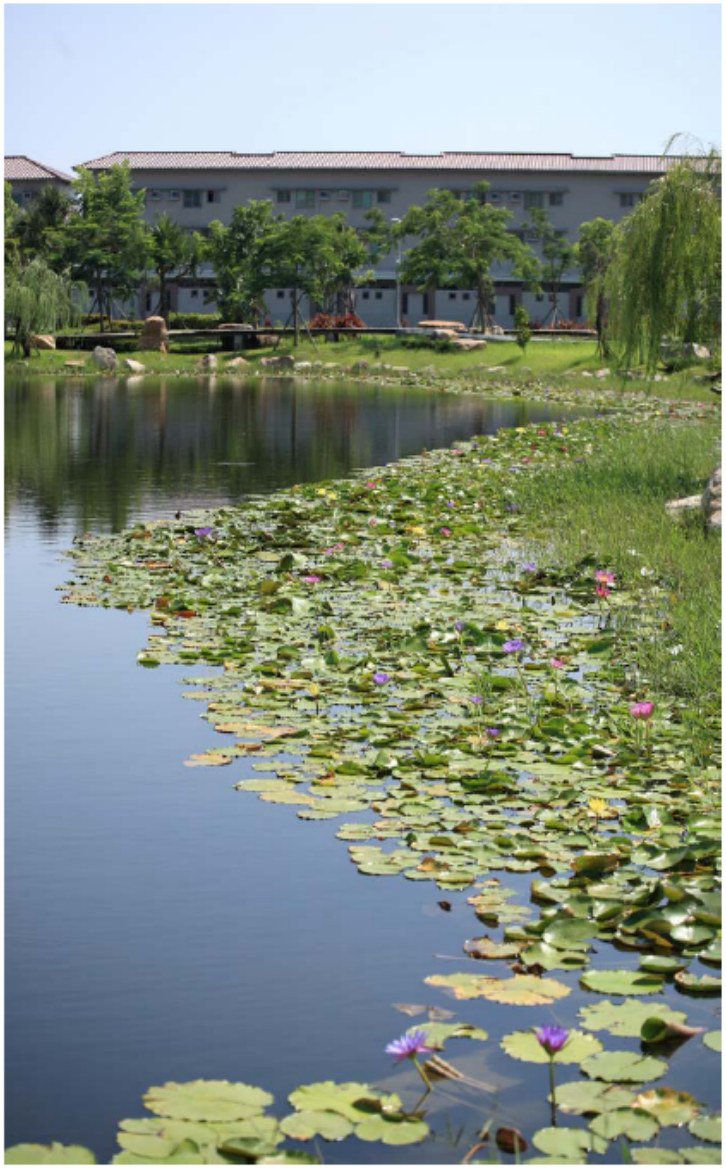


Eco Community, Taiwan

Eco Community, Taiwan

- Water saving facilities design
- Grey water reuse system
- Rainwater reuse system
- Wetland plan and maintenance

Water Retention and Wetland plan



Eco-environment & Diversity

高蹺鴴

彩鷸

水螳螂

貢德氏赤蛙

台灣萍蓬草

Creation of wetland + Sewerage

新海一期

茄苳溪下游

茄苳溪下游

樹林鹿角溪

新海二期

Creation of wetland + Nature protection

五股溼地

新店廣興溼地

挖子尾溼地

五股溼地


新海人工濕地

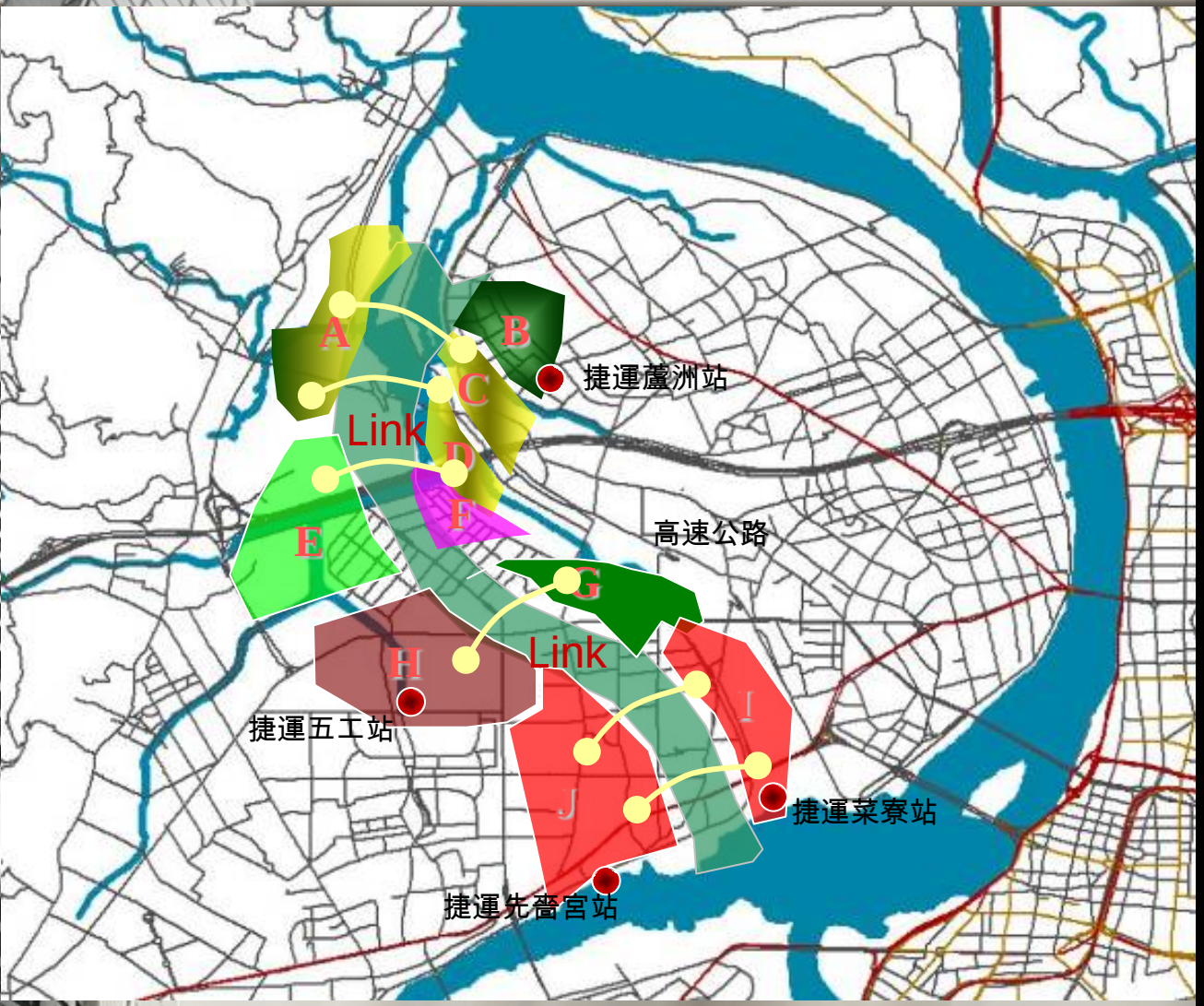
金山清水溼地與丹頂鶴

鹿角溪溼地

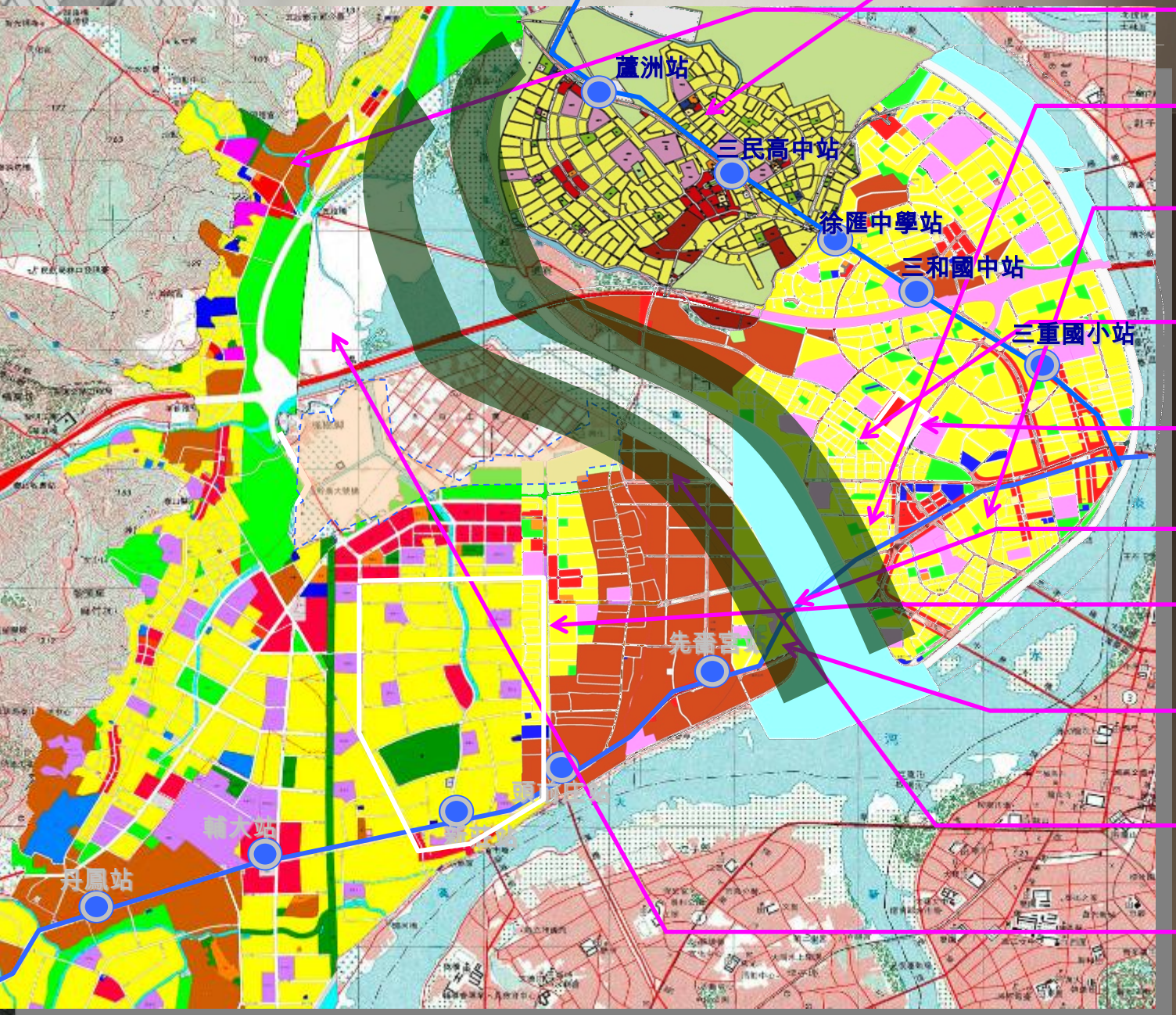
Opportunity for regeneration

- Central park of 424 hectare in Taipei metropolis
- Urban regeneration
- Landscape reform

Integration by urban plan



Start the urban reform



- 捷運三重蘆洲線
- 五股成功段都市更新案
- 三重過圳段更新案
- 三重中正南路更新案
- 三重寶士名宮更新案
- 三重果菜批發市場
- 捷運新莊線
- 新莊體育場及中港大排地區
- 中央公園週邊再發展策略規劃
- 二重疏洪道兩側都市計畫通檢
- 新訂五股新市鎮都市計畫

五股濕地生態園

疏洪蘆堤公園

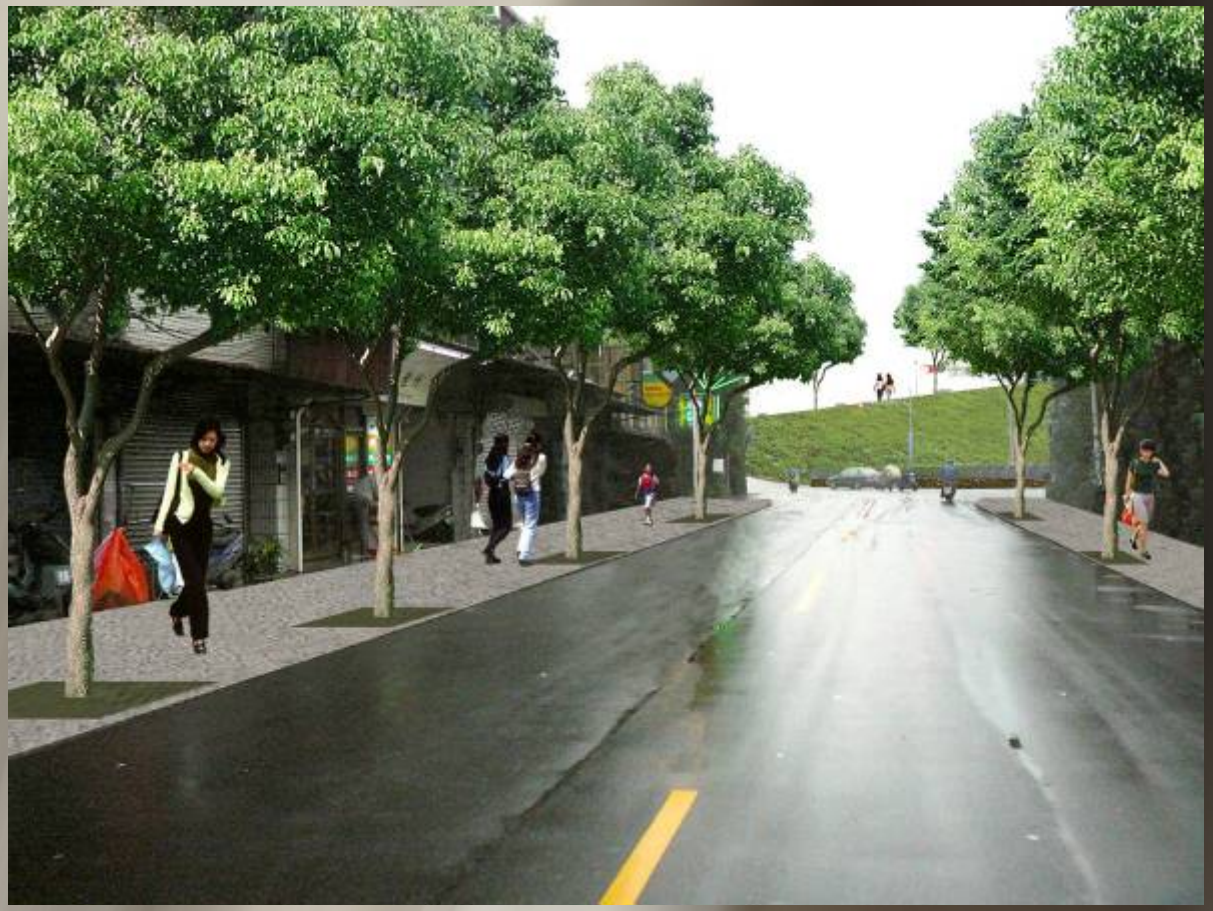
疏洪運動公園

壹 縣民農園

願景意象

堤防綠化--

堤防之道路應予以綠化，使公園能夠擴張並真正滲透到社區內，並設置人行道，以達便民之利。



大多數通往堤防之道路目前狀況不甚理想

願景意象

堤防綠化--

堤外覆土緩坡綠化使居民散步堤頂彷彿漫步於山陵線上，堤頂並種植優型樹種，提供樹蔭休憩，堤外運用地景藝術手法美化，更能提昇眺望的樂趣。

蘆堤現況模擬圖

Vision for the future

模擬圖

The problem is our environment,
And solutions is in the nature.

THANK YOU !