

International Workshop - Session 1

Urban Ecological Red Line & Case
Study in Dapeng, Shenzhen



Urban Ecological Red Line & Case Study in Dapeng, Shenzhen

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Keywords: Urban; Ecological Red Line; Allowable Pollutant; Control Area

Since the end of last century, China has experienced an intensive and rapid urbanization process since Reform and Opening. Rapid urbanization transformed massive ecological land into urban areal, resulted in huge environmental press. To avoid this trends, Chinese government set "Keep Ecological Red Line " as important National Policy.

Ecological Red Line is defined as limits on the amount and space boundaries of ecosystem that safeguard national ecological security and environmental quality. Which including 3 key topics(1) the Maximum Allowable Pollutant Emission; (2) Ceiling Limit of Nature Resource and Energy Consumption; (3)Minimum Control Area of Critical Ecosystem.(Figure1).

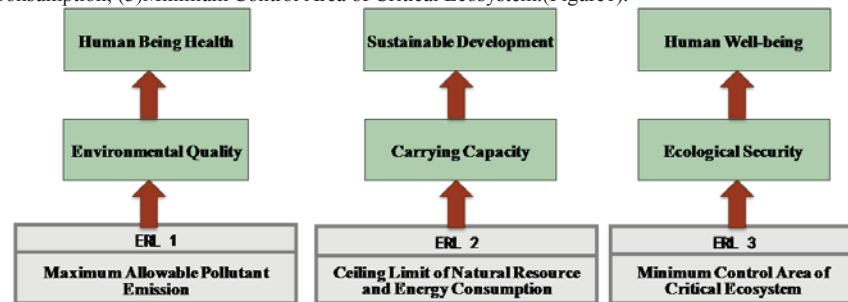


Fig. 1 Framework of Ecological Red Line

Dapeng is a district in ShenZhen, located in South East of China, which is famous for its large area of forest and beautiful beach sight. We try to recognize its "Ecological Red Line "as its baseline for economic development.

(1) The Maximum Allowable Pollutant:

We divided total region into 25 small basin according to its water system, and calculate its maximum allowable water pollutant by Water Quality Module.

Table 1 the maximum allowable water pollutant(t/a)

Street	COD _{Cr}	NH ₃ -N	TN	TP
1 KuiChong	429.84	20.82	39.20	3.97
2 Dapeng	161.90	8.52	15.72	1.56
3 NanAo	128.78	7.08	12.59	1.15
Total	720.51	36.42	67.51	6.67



Fig. 2 The maximum allowable TP discharge

As the key gas pollutant is from the discharge of motor vehicles, so we design several scenrio to define the Maxium Number of motor vehicles.

Table 2 The scenes designed

Scenes	Increase of Power plants	Increase of Industries discharge	Motor vehicles (10 ⁴ /d)
情景1	+13%	0%	0.8
情景2	0%	+13%	0.8
情景3	-	0%	2
情景4	-	0%	4
情景5	-	0%	18

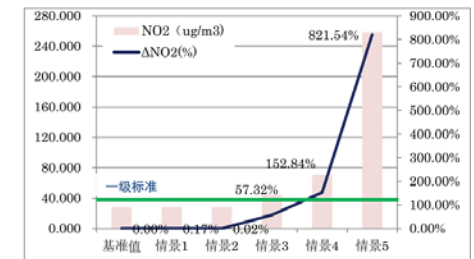


Fig3 The NO₂ discharge in designed scenes

(2) The limitation of resource

The key resource in Dapeng is tourism resource , the maximum number of tourists is the key limited factors in tourist. We caculate the tourist capacity according to resource , space & social psychology individually , we found that 677,3million /a is the maximum of tourists.

(3) The Minimum Control area of critical Ecosystem

The Minimum control area is defined by its function of SpeciesDiversity, EcosystemService and Landscape Security

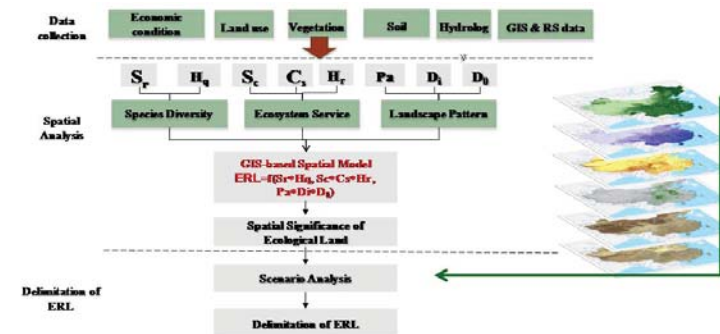


Fig. 4 Frame work of the defination on the minimum control areas of critical ecosystem



Fig. 5 The minimum Control area of ecosystem in Dapeng



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Urban Ecological Red Line & Case Study in Dapeng



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Zhang Linbo, Li Fen

Nov. 13, 2014, Kawasaki, Japan



Outline

Part I Background of ERL Research

Part II Case Study in Dapeng



Background of ERL Research

- China has experienced an intensive urbanization progress since 1970s;
- China will remain rapid and dramatic urbanization process in the future;
- The rapid urbanization process will exert much pressure on environmental protection;
- **Eco-City building is the inevitable choice in urbanization process.**





Background of ERL Research

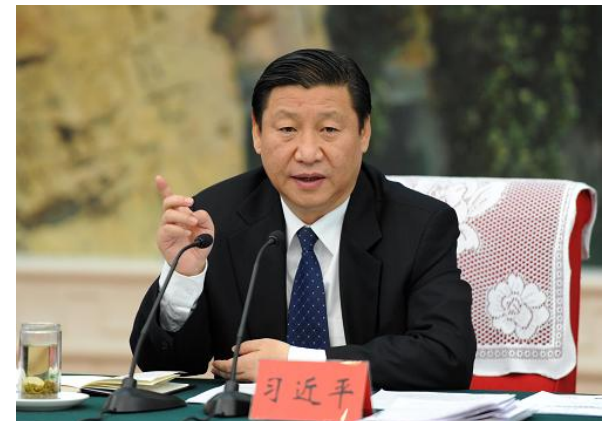
- In 2012, Ecological Civilization was set as national development goal by the 18th CPC National Congress.



- **Ecological Red Line shall play an important role in Chinese ecological civilization process especially in eco-city building.**

elaborated detailed plan to construct Ecological Civilization

- *Improve natural resource capital administration system*
- *Implement ecological compensation and payment*
- *Reform ecological protection management system*
- ***Delimit Ecological Red Line***

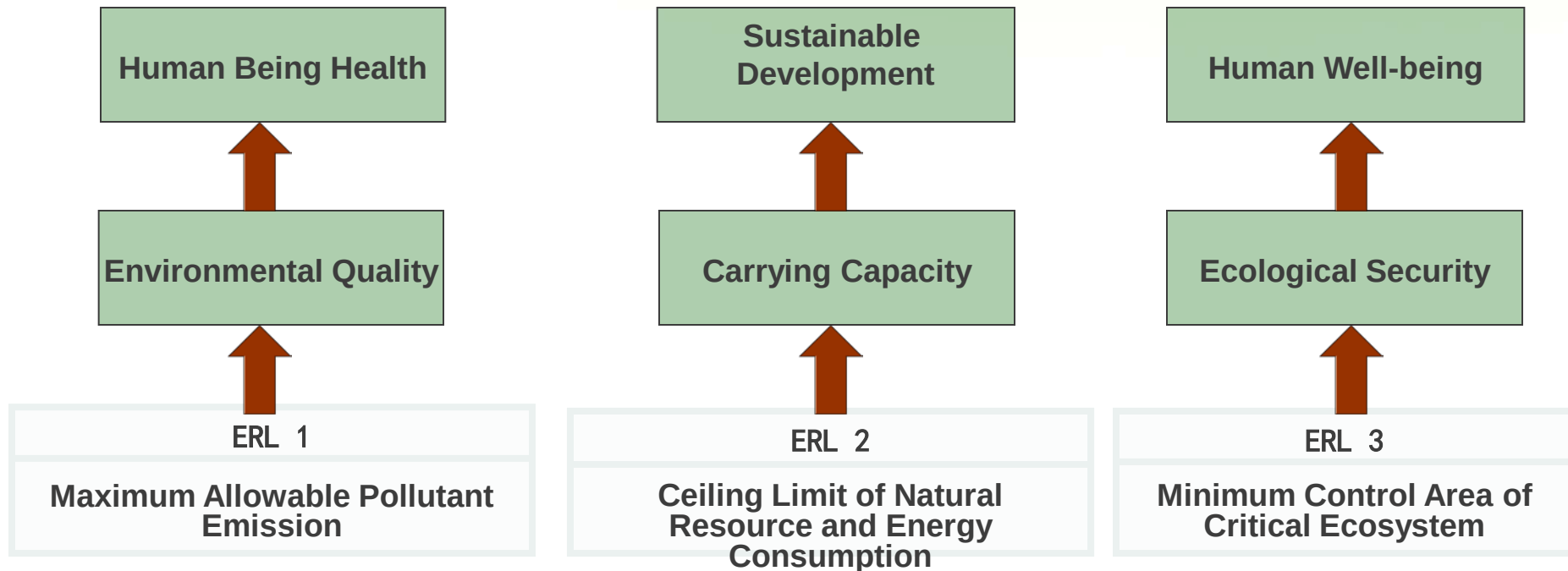




Understanding of ERL

■ The Concept of Ecological Red Line (ERL)

ERL are the limits on the amount and space boundaries of ecosystem that safeguard national ecological security and environmental quality.

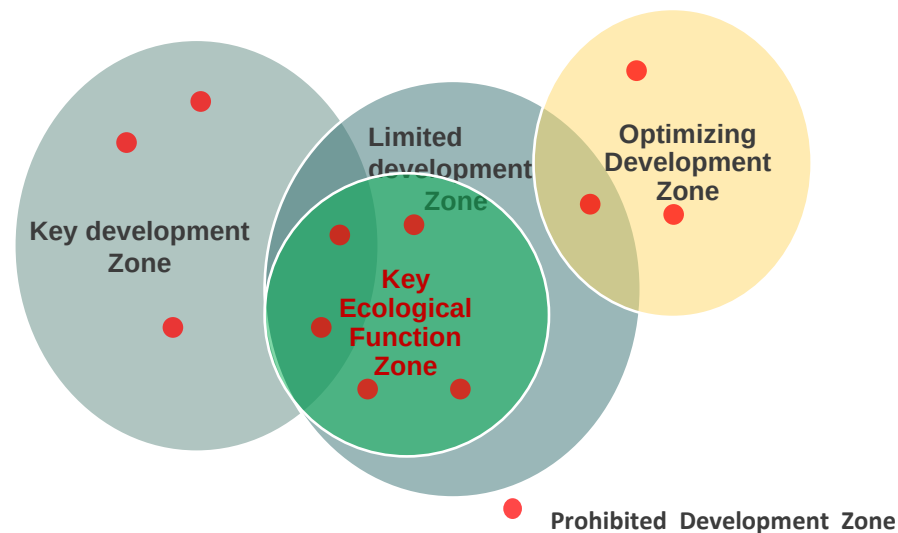


Background of ERL Research

The Reason for Delimiting Ecological Red Line (ERL)

The large quantity of protected areas are overlarge and belong to many different types. There are overlapping between these areas, at the same time some important place do not be protected.

Protected Area	Number	Area (X10 ⁴ km ²)	Proportion (%)
Natural Reserve	2541	141	14.7
Key Ecological function area	25	386	40.2
Priority areas for Biodiversity Conservation	32	232	24.2
National Forest Park	738	10.07	1.05
National Scenic Area	208	10.17	1.06
National Geological Park	138	8.56	0.89
World Natural Heritage	40	3.72	0.39
Total	3722	791.52	82.49





Concept and Methodology

■ Protective Requirements on ERL

- Unalterable in protective type
- No decline in ecosystem service
- No shrink in area

The ERL is not unalterable forever, the boundary or threshold will alter according to the variety of influencing factors .





Part III

Case Study in Dapeng

Case Study in Dapeng

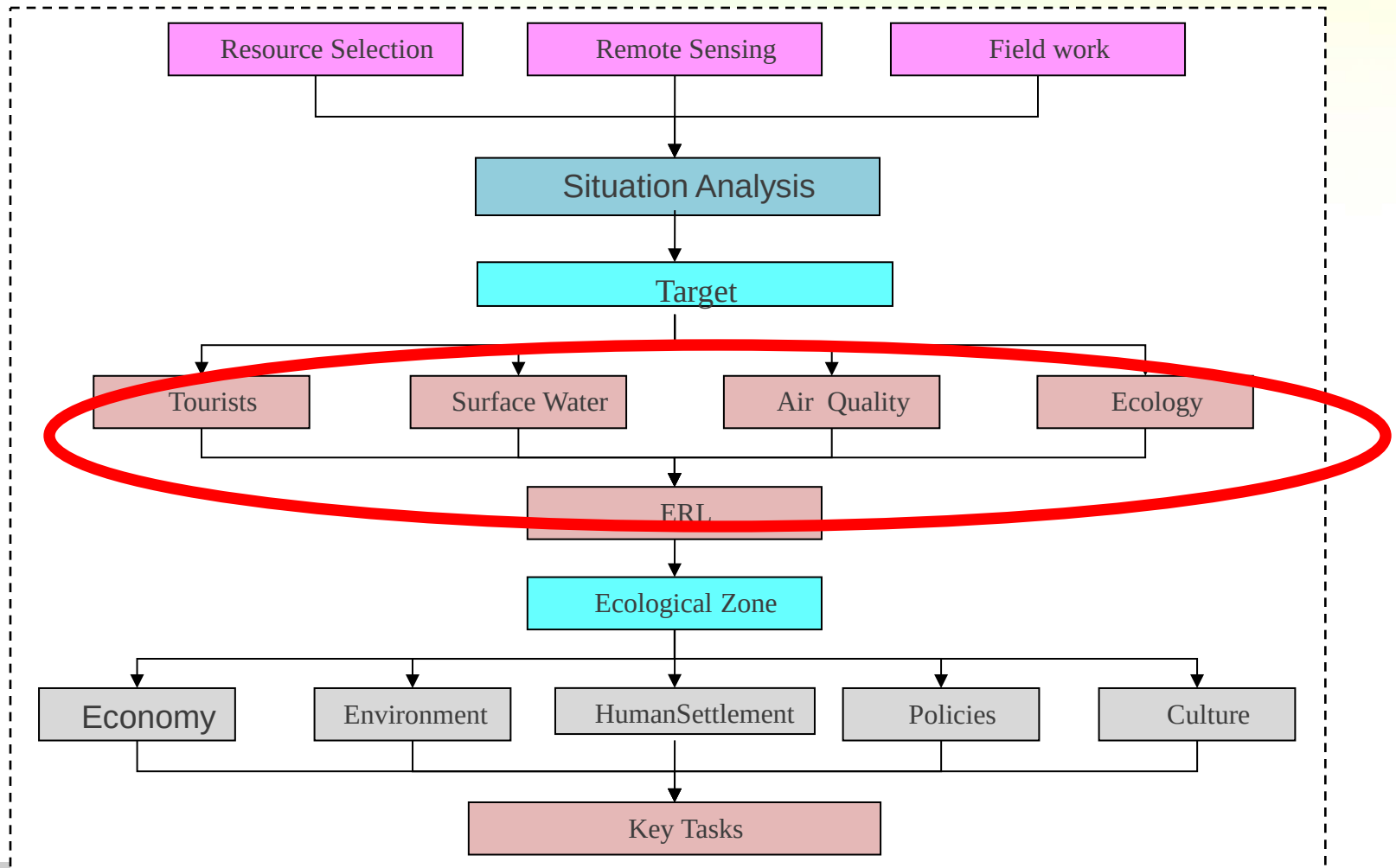
广东省行政区划



Total area: 307 square kilometers
Population: 180,000

Case Study in Dapeng

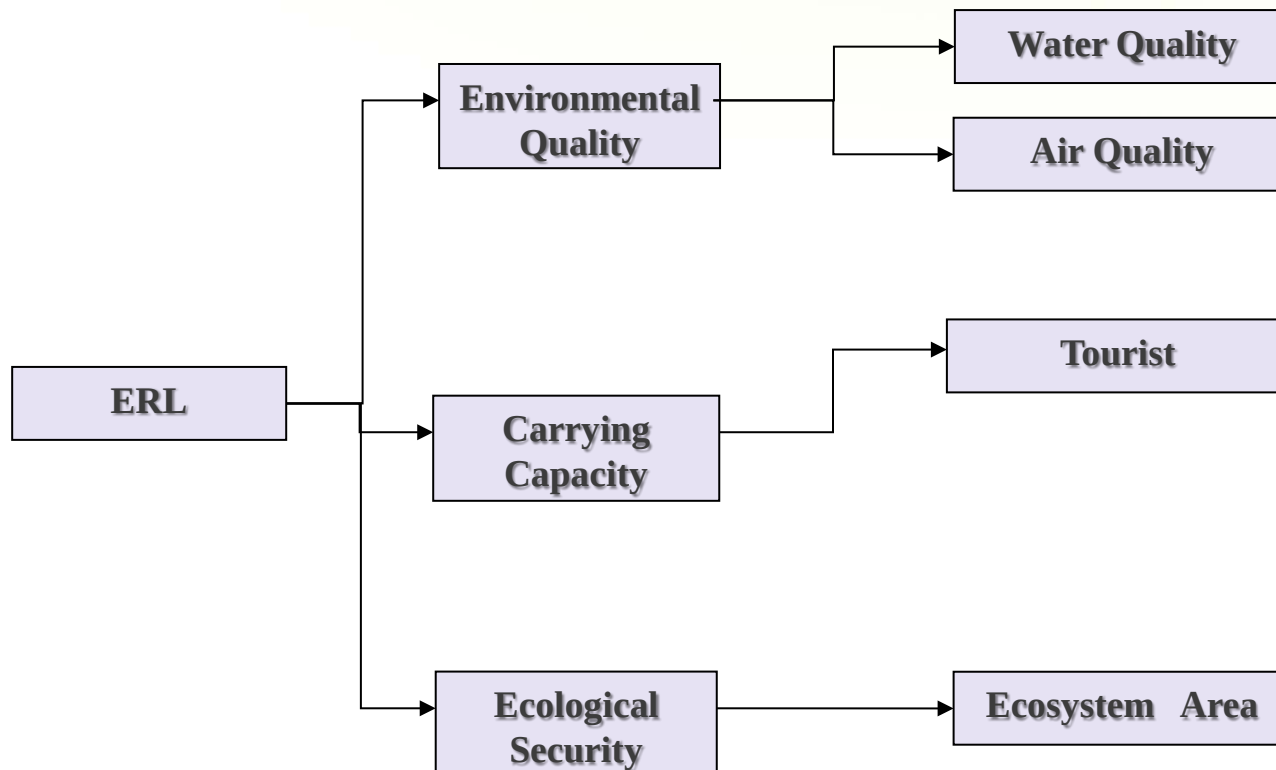
Framework of Eco-City Planning





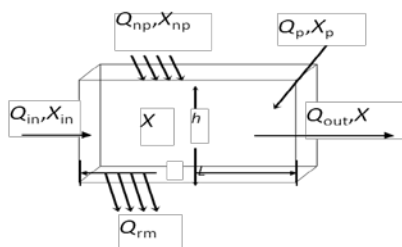
Case Study in Dapeng

■ Key contents of ERL in Dapeng



Case Study of Dapeng

- **ERL for Water Quality:** The maximum water pollutants are analyzed according to the river capacity of each basin.



ir : 河段编号 ;
 nir : 河段 i 内箱体划分的总数。
 $Q_{in} \cdot X_{in}$: 上游来水流量 (m^3/s) 和水质 (mg/l)
 $Q_p \cdot X_p$: 点源流量 (m^3/s) 和水质 (mg/l)
 $Q_{nrp} \cdot X_{nrp}$: 非点源流量 (m^3/s) 和水质 (mg/l)
 Q_{rm} : 取水流量 (m^3/s)
 Q_{out} : 下游流量 (m^3/s)
 X : 箱体水质 (mg/l)
 L : 箱体长度 (m)
 h : 箱体高度 (m)

Maximum water pollutants discharged

序号	Town	COD _{Cr} (t/a)	NH ₃ -N(t/a)	TN(t/a)	TP(t/a)
1	葵涌	429.84	20.82	39.20	3.97
2	大鹏	161.90	8.52	15.72	1.56
3	南澳	128.78	7.08	12.59	1.15
合计		720.51	36.42	67.51	6.67



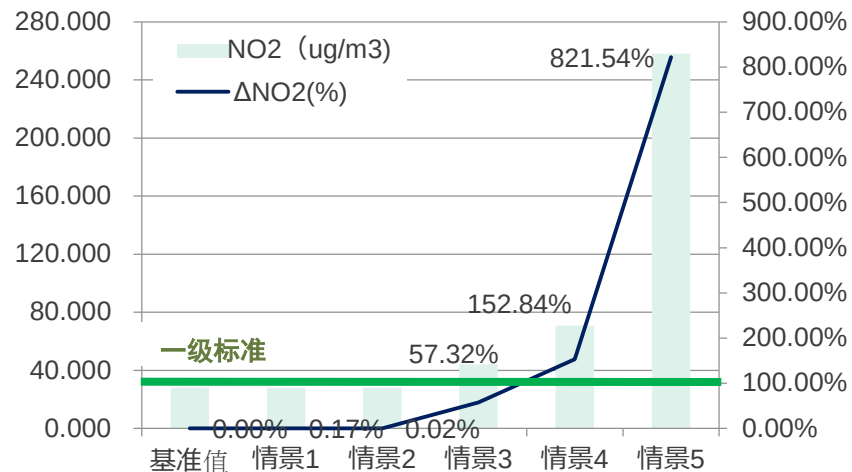
总氮单位面积可利用环境容量

Case Study of Dapeng

ERL for Air Quality:

- Automobile discharge is found to be the key source on atmosphere pollutant by model & scenario analysis.
- The Maximum number of automobiles shall not exceed 15,000 every day.

情景	电厂排放	工业源排放	机动车数量 (万辆/天)	
情景1	增加13%	不变	不变	
情景2	不变	增加13%	不变	
情景3		不变	2	中间值
情景4		不变	4	旅游旺季
情景5		不变	18	黄金周



大鹏新区不同情景NO2排放量影响



Case Study of Dapeng

■ ERL for Tourist

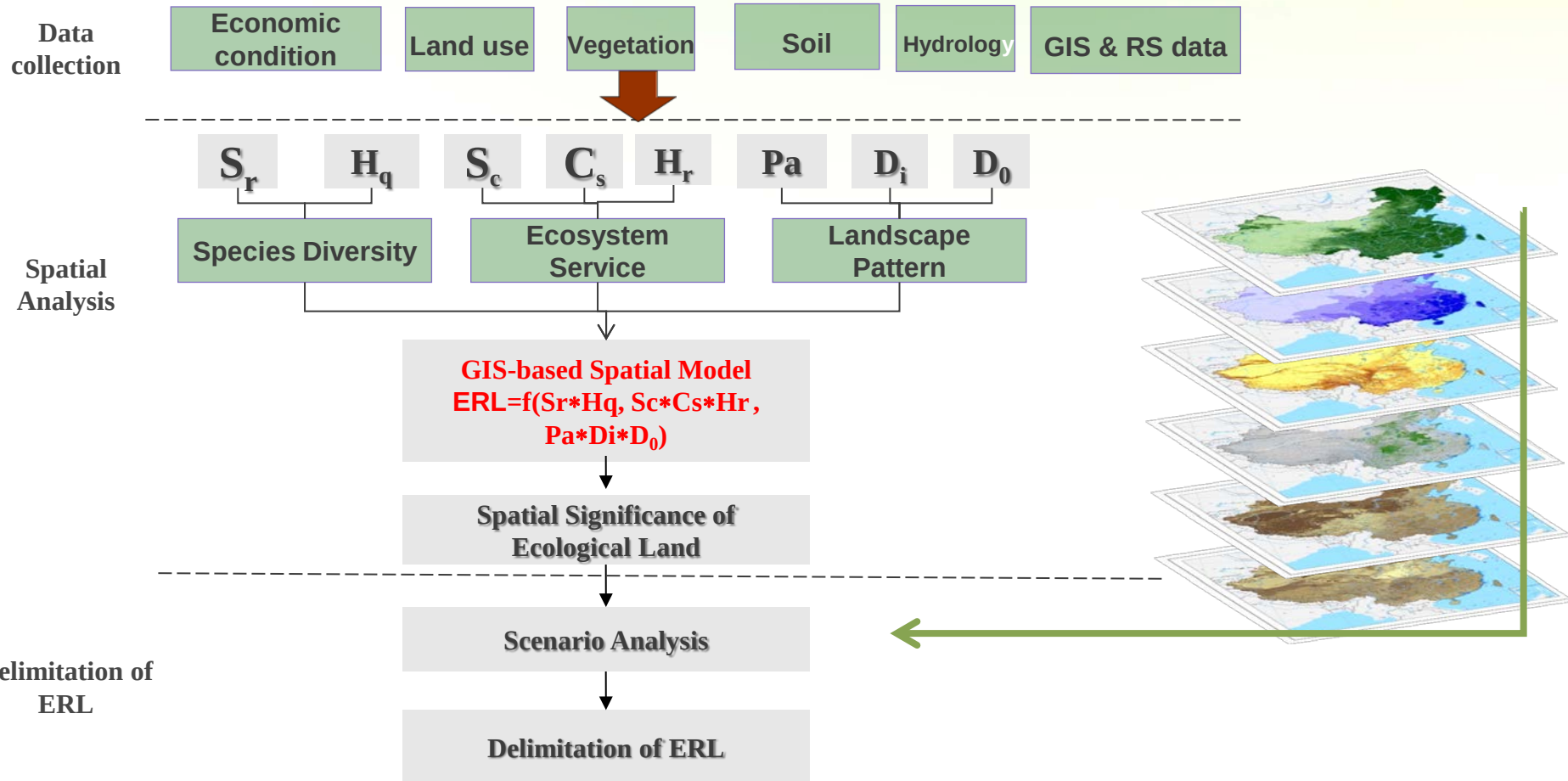
$$TE = \omega_1 \times RE + \omega_2 \times EE + \omega_3 \times PE$$

- RE: Capacity of space
- EE: Capacity of Environment
- PE: Capacity of social psychological
- ω : Weight

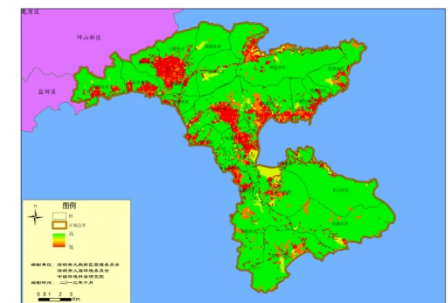
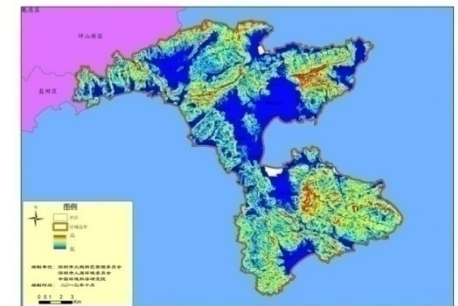
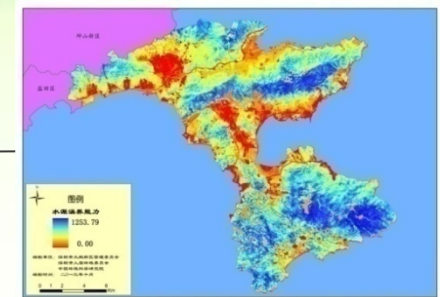
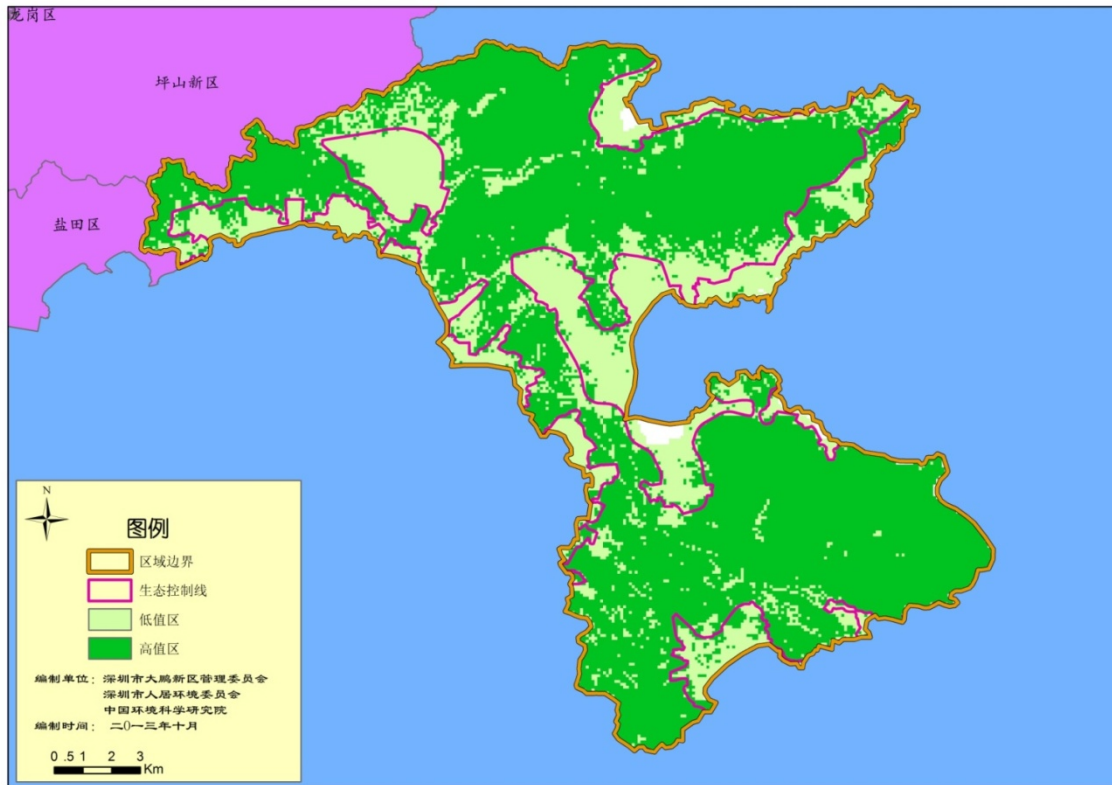
		Max	Mid	Suitable
Capacity for tourists	Day	41,370	20,245	18,555
	Year($\times 10^6$)	15.1	7.49	6.77

Case Study in Dapeng

■ ERL for Minimum Area of Protective Ecosystem



Case Study in Dapeng

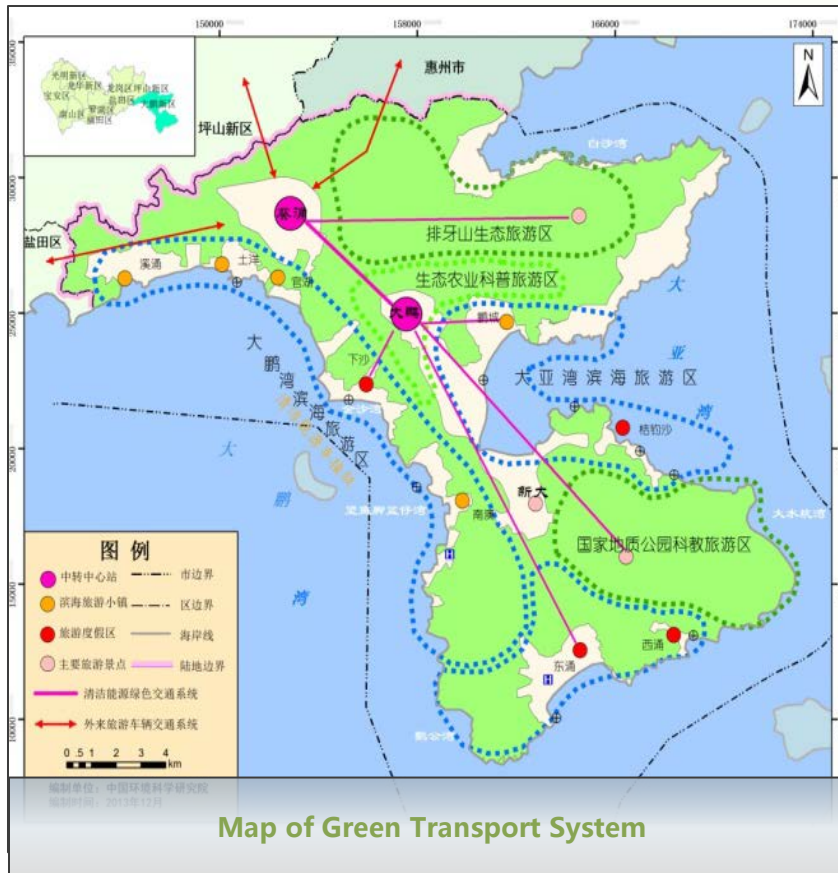


- 91.2% of value of ecosystem services;
- All important species habitat and key region of biodiversity;
- over 80% soil erosion sensitive area

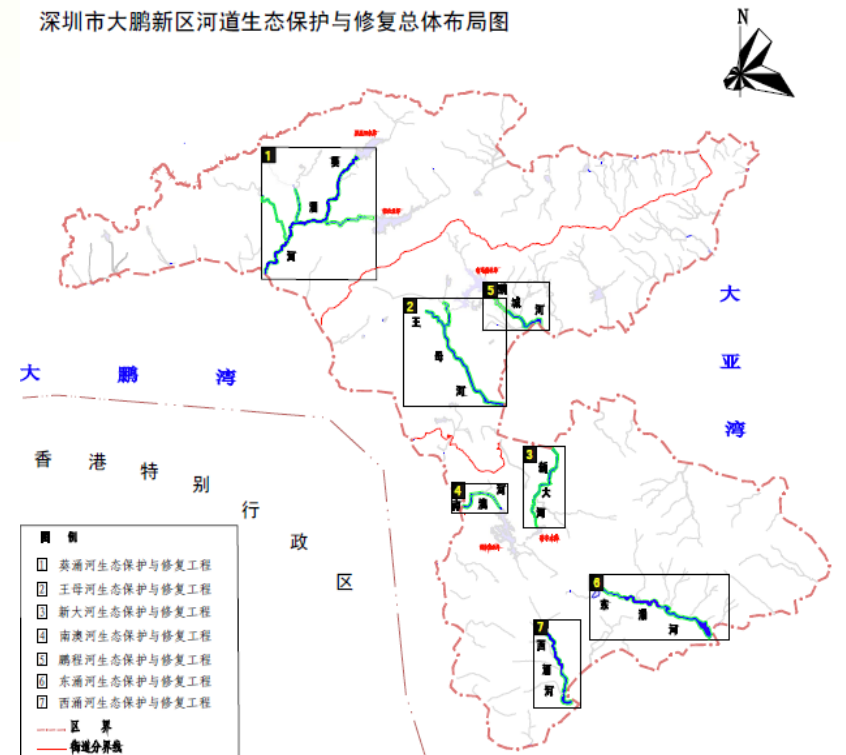


Case Study in Dapeng

■ The Role of ERL in Dapeng Eco-City Planning



深圳市大鹏新区河道生态保护与修复总体布局图

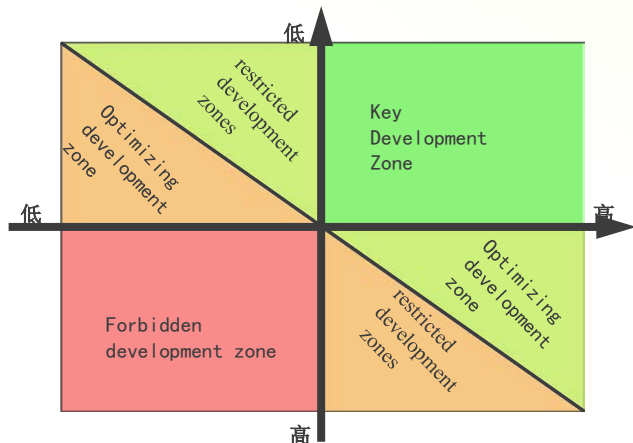


Map of Green Transport System

Map of Key River pollutant Treatment

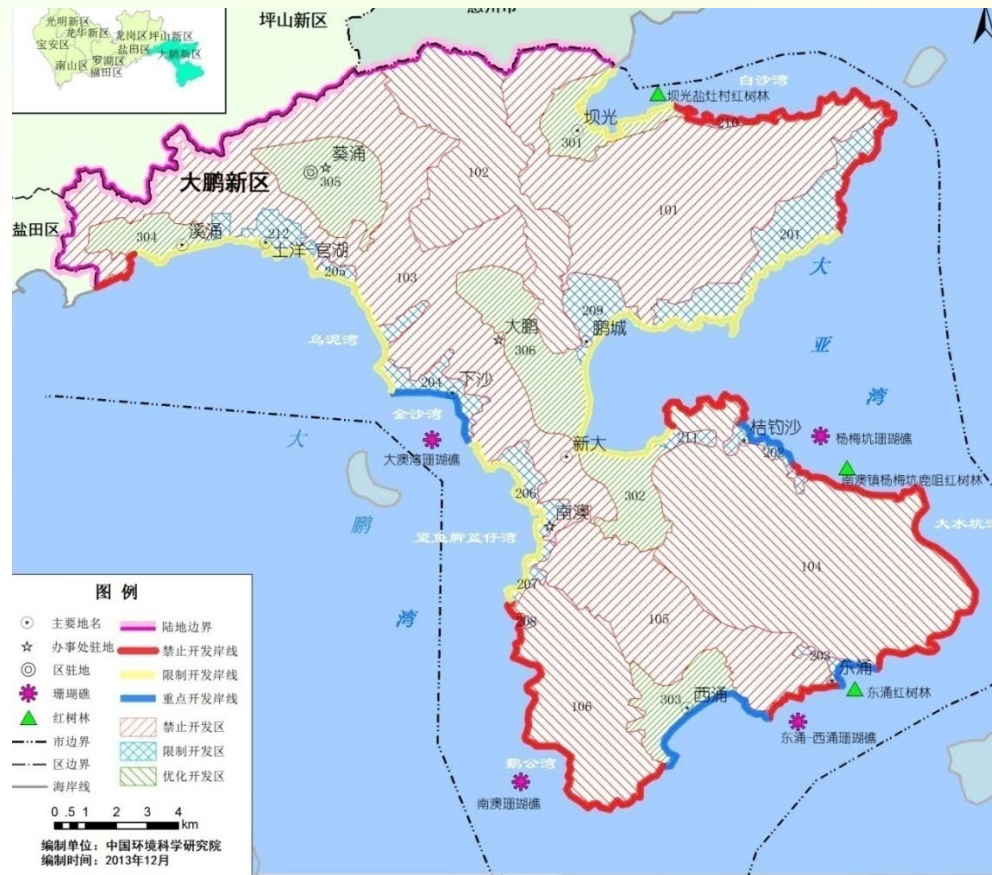
Case Study in Dapeng

■ The Role of ERL in Eco-City planning



Y: Limitation of resource and environment
X: capacity of economical of development

	Restricted Development Area	Optimizing development Ares
投资密度	144	120
单位面积产值(亿元/km ²)	150	125
单位产值能耗	0.28	0.35
单位产值水耗(t/万元)	4.64	5.8
万元产值COD排放量(千克/万元)	0.4	0.5
万元产值SO ₂ 排放量(千克/万元)	0.04	0.05



The ecological function regionalization in Dapeng, Shenzhen



Thanks For Attention !