

如何引导

海绵城市发展？

How to steer the success  
of the sponge city?

# 如何引导海绵城市发展？

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## 目标

近年来，中国政府为中国城市发展提出了新的要求：海绵城市。自1979年以来，中国经历了快速的城镇化以及工业化进程。然而，随之而来的却是如今我们所面临的水资源质量差、数量少的困境。在未来十年里，中国中央政府将在防洪、中小型河流整治、加固具有风险的水库、保护饮用水供给、建设灌溉及水利设施方面加大投资。在2015年9月，中国财政部、住房和城乡建设部和水利部选定了16座城市作为海绵城市示范城，其中包括武汉、重庆和厦门。每一座城市将会获得政府部门的专项资助，在未来三年里建设海绵城市，使城市能够有更强的吸收、储存、排放和净化水的能力。深圳将在市内24个地点规划建设海绵城市，总面积达256平方公里。光明新区以及位于其中心的凤凰城就是政府规划指定地点之一。

## 概要

光明新区凤凰城的海绵城市项目由52个子项目组成，涵盖主干道建设、水利基础设施、公园绿地、湿地、河道、工业园、建筑、办公区及居民区。光明新区正在制定战略来落实这些项目，以满足海绵城市的验收标准：在未来三年内实现“渗、滞、蓄”至少达到70%。而当前，光明新区的年均径流总量控制率只有20%。我们发现，凤凰城的海绵城市实施规划中侧重于具体项目，而整体目标与具体项目之间缺乏衔接。总体而言，现有规划基于以问题和风险为导向的思维方式，而对于水能够为城市发展提供的价值则体现不足。而根据目前的投资水平来看，光明新区完全有能力实现更高水准的城市发展目标。因此，我们建议光明新区凤凰城可以以“平衡的城市体系”为理念来打造海绵城市。而每一个子项目都将成为这个平衡体系上的一部分。这个平衡体系不仅关乎洪涝和污染的防控，同时也涉及整体城市质量的提高。我们将52个子项目根据系统框架重新划分为9大类（即，基建、再生、建筑、办公和住宅区、工业园、道路、公园绿地、湿地和河道），并针对每一类项目制定了有甄别性的“滞、蓄、排”措施及管理要求，并提供设计指南和工具箱。

# HOW TO STEER THE SUCCESS OF THE SPONGE CITY?

WORKSHOP MAY 30–JUNE 3, 2016

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## OBJECTIVE

Recently, the national government added a new requirement for cities to develop: the Sponge City. China is facing severe problems with the quality and quantity of its water resources due to the rapid urbanization and the industrialization process going on since 1979. In the next ten years, China's central government will invest heavily in flood prevention, regulation of small and midsize rivers, strengthening risky reservoirs, safeguarding the supply of drinking water and building irrigation and hydraulic structures. In September 2015, China's Ministry of Finance, MoHURD and the Ministry of Water Resources selected 16 pilot cities including Wuhan, Chongqing and Xiamen to implement the Sponge City concept. Each city will receive a budget for three years to execute projects that can better absorb, store, drain and purify water. Shenzhen is implementing the Sponge City program in 24 areas, covering 256 km<sup>2</sup> in total. Guangming and its centrally located Phoenix Town in particular (an area of 14.89 km<sup>2</sup>), is one of the selected zones.

## SUMMARY

The Sponge City program in Phoenix Town currently consists of 52 projects of mainly roads, water infrastructure, green parks, wetlands, rivers, industrial parks, buildings, business parks and residential housing. Guangming is currently looking for a strategy to start implementing these projects and meet the requirements of having at least 70% of infiltration, retention and storage of water in the overall area in the next three years instead of the current 20%. It is clear that there is a lot of focus on the project level, but hardly any on the level of the system. In general, the attention is on seeing water as a source of problem or risk to the city, while water can also create value. Current investments can be leveraged to achieve higher urban quality. We reclassified the list of projects and proposed additional targets, goals and guidelines to reach a higher quality. We proposed to implement the Sponge City as a balanced urban system.

何为光明海绵城市？

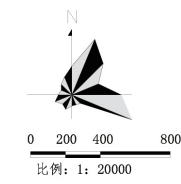
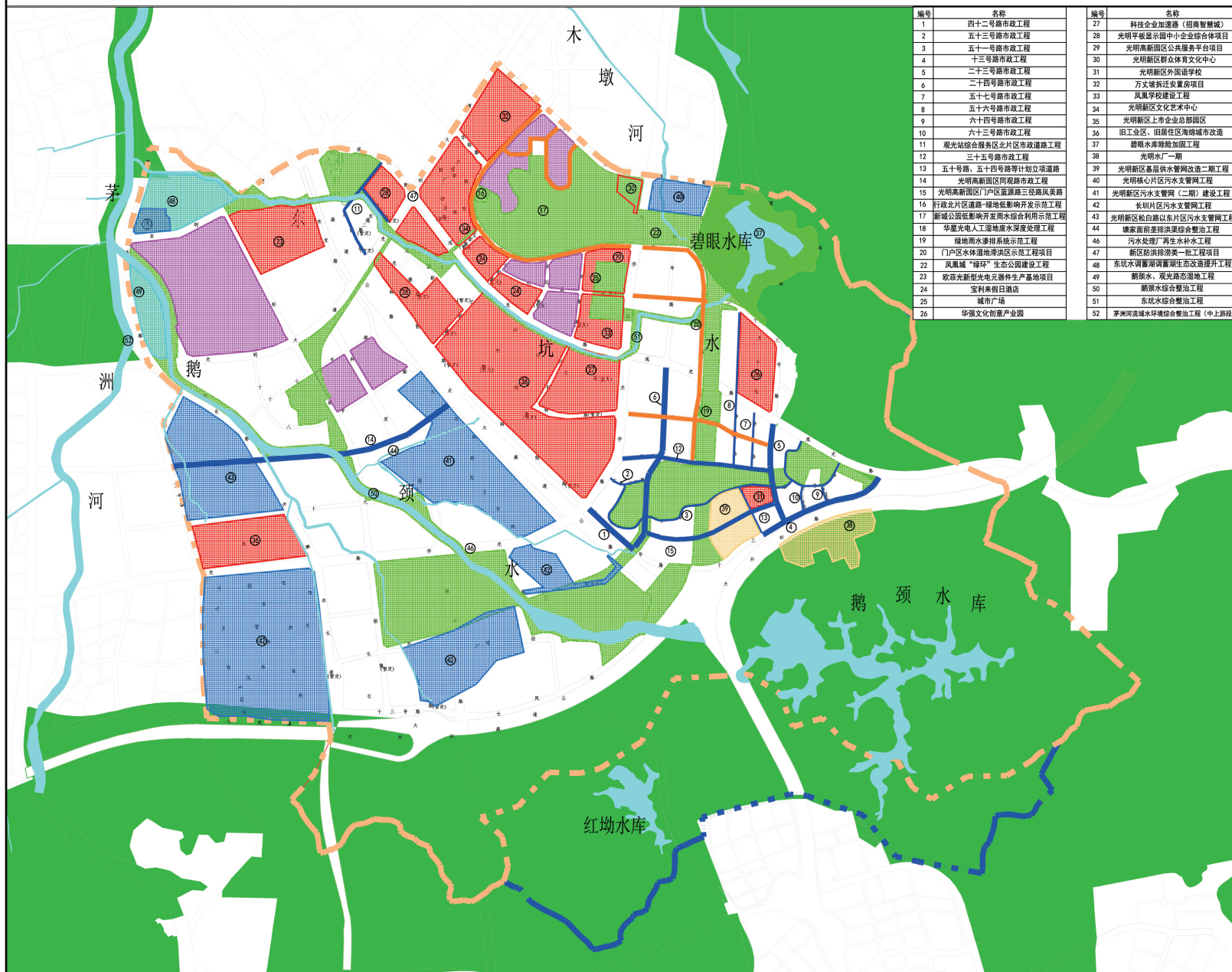
What is the Sponge City in Guangming?



深圳正在市内24个地点规划建设海绵城市，总面积达256平方公里。光明新区以及位于其中心的凤凰城就是政府规划指定地点之一（14.89平方公里）。光明新区凤凰城的海绵城市项目由52个子项目组成，涵盖主干道建设、水利基础设施、公园绿地、湿地、河道、工业园、建筑、办公区及居民区。光明新区正在制定战略来落实这些项目，以满足海绵城市的验收标准：在未来三年内实现“渗、滞、蓄”至少达到70%。而当前，光明新区的年均径流总量控制率只有20%。

Shenzhen is implementing the Sponge City program in 24 areas, covering 256 km<sup>2</sup> in total. Guangming and its centrally located Phoenix Town (an area of 14.89 km<sup>2</sup>), is one of the selected zones. The Sponge City program in Phoenix Town consists of 52 projects of mainly roads, water infrastructure, green parks, wetlands, rivers, industrial parks, buildings, business parks and residential housing. Guangming is looking for a strategy to implement these projects and meet the requirements of having at least 70% of infiltration, retention and storage of water in the overall area instead of the current 20% by 2017.

## 深圳市海绵城市建设试点三年实施计划-试点区域建设项目分布图



### 图例

- 试点范围线
- 研究范围线
- 海绵型公园绿地建设项目
- 海绵型建筑小区建设项目
- 海绵型市政道路建设项目
- 水系治理及防洪排涝建设项目
- 水污染治理建设项目
- 供水保障建设项目
- 已建海绵型建筑小区
- 已建海绵型市政道路
- 建设项目编号
- 生态区

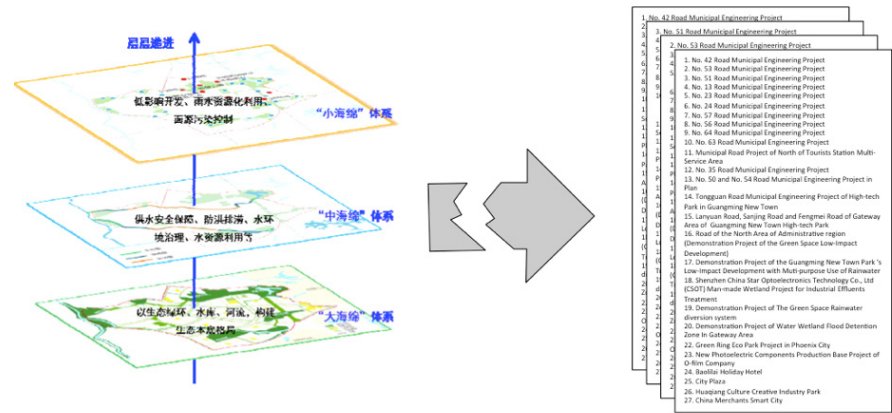
编号	名称
21	明珠城市公园一期工程
45	光明再生水厂一期
53	海绵城市监测、评估研究平台
54	智慧水务监控和管理平台

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## 当前规划分析

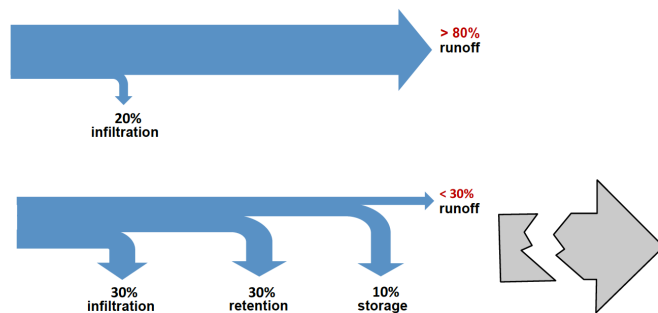
What is our analysis of the current approach?





目标原则与实施的衔接  
 现有规划重点在具体项目，总体目标原则与具体项目之间缺失连接  
 CURRENT AMBITIONS  
 It appears there is a strong focus on the project level, but not on the system level

凤凰城的海绵城市实施规划中侧重于具体项目，而整体目标与具体项目之间缺乏衔接。总体而言，现有规划基于以问题和风险为导向的思维方式，而对于水能够为城市发展提供的价值则体现不足。而根据目前的投资水平来看，光明新区完全有能力实现更高水准的城市发展目标。



缺乏海绵城市作为一个总体城市系统的建设目标

The performance of the total system is not included in the targets

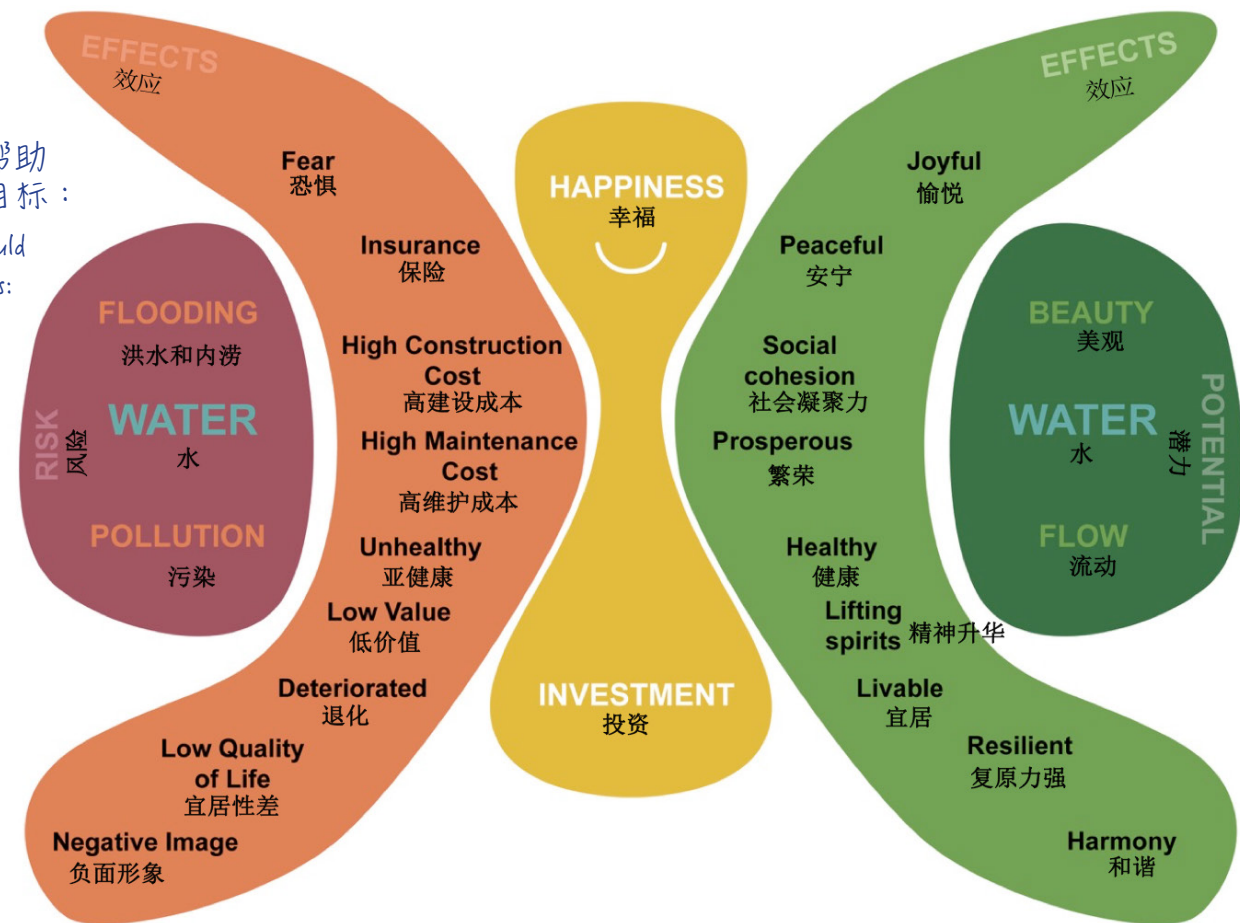
It is clear that there is a lot of focus on the project level, but hardly any on the level of the system. In general, the attention is on seeing water as a source of problem or risk to the city, while water can also create value. We reclassified the list of projects and proposed additional targets, goals and guidelines to reach a higher urban quality.

总体规划类别 Master Plan Category	系统性能目标 System Performance Targets
海绵型公园与绿地 Sponge City Parks and Green Area	年径流总量控制率 > 85%; SS 削减 92% Runoff rate > 85%; suspended solids reduce by at least 92%
海绵型建筑小区 Sponge City Buildings and Blocks residential / industrial / redevelopment	年径流总量控制率 > 70%; SS 削减 45% Runoff rate > 70%; suspended solids reduce by at least 45%
海绵型道路与广场 Sponge Roads and Public Plaza	年径流总量控制率 > 60%; SS 削减 40% Runoff rate > 60%; suspended solids reduce by at least 40%
水系整治与生态修复 Waterways and Ecology	调蓄洪峰，增强河流综合防洪能力； 净化水体水质，增强河道生态降解功能 Increase buffer capacity; clean(er) water
防洪 Flooding and Drainage	雨水管渠暴雨重现期标准3年一遇；内涝防治整治标准50年一遇；河流防洪能力标准50年一遇 Rainwater pipeline 1 in 3 years; lodging 1 in 50 years; flood safety 1 in 50 years
内涝治理 Water Pollution / Pipeline	2020年实现100%雨污分流 Separation of rain water with black water, 80% by 2017, 100% by 2020
雨水收集利用 Grey Water	污水再生利用率达到30%，其中替代城市自来水供水15% Grey water reuse 30%, replace drinking water 15%
管网建设 Drinking Water Safety	供水管网及供水安全 Improve pipeline leakage; 100% quality and quantity safety
管理 Monitoring	管理平台及体系 Operation and monitoring

如何让水系为海绵城市创造价值，而非只是问题和风险？

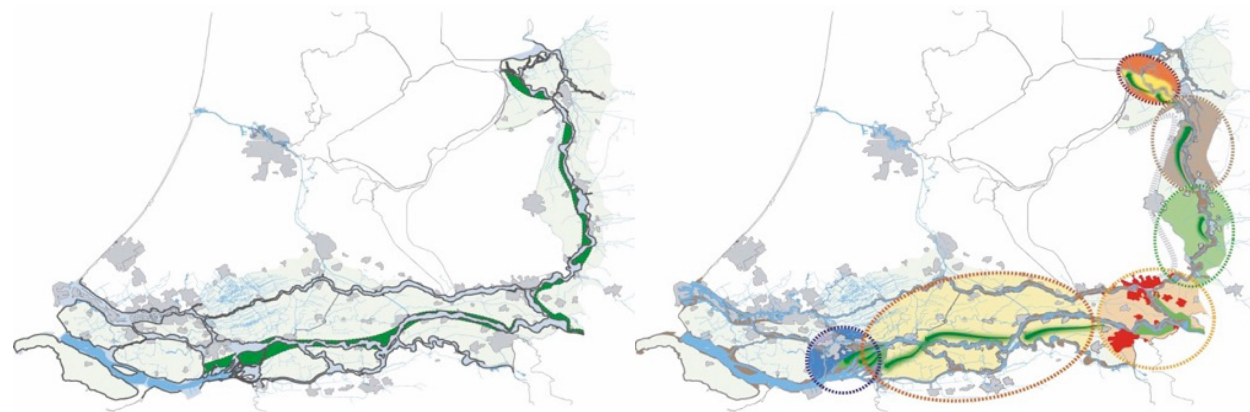
How could water create value instead of being just a risk?

平衡的城市体系能够帮助我们实现下述关键词目标：  
A balanced urban system would entail the following keywords:



我们建议引入“平衡的城市体系”概念，界定了每一类项目在凤凰城水系“滞、蓄、排”方面的贡献。在荷兰，我们拥有丰富的平衡体系管理经验。要从宏观上去了解整个体系，并且清楚地认识到：水是一种风险，但水也可以带来很大的城市价值。因此，每一个子项目都要从整体体系以及局部环境两个方面进行考量。

We proposed to implement the Sponge City as a balanced urban system. Every project should contribute to that system, not only in managing risks like flooding and pollution, but also by adding something “inexplicit” like urban quality. In the Netherlands we have experience in managing such balanced systems. It is all about understanding the system as a whole and by acknowledging two perspectives: water as a risk and water as a potential for quality. Every project is managed in regard to the overall system and the local conditions.



荷兰“还空间予河流”项目是为了能够给予河道更多空间，以控制未来气候变化所导致的高水位的威胁。该项目涵盖30多个地点，采用不同的手段来拓宽河道空间用以安全泄洪。与此同时，项目的设计也兼顾到河道相邻周边地区的质量改善。

The goal of the Dutch Room for the River Program (2007 - 2019) is to give the river more room to be able to manage higher water levels due to climate change in the future. At more than 30 locations, measures are taken to give the river space to flood safely. Moreover, the measures are designed in such a way that they improve the quality of the immediate surroundings.

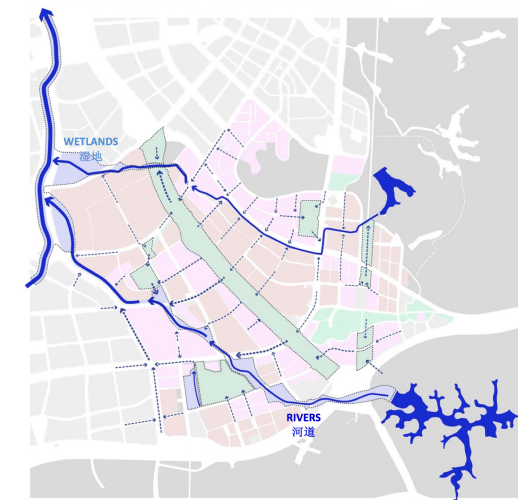
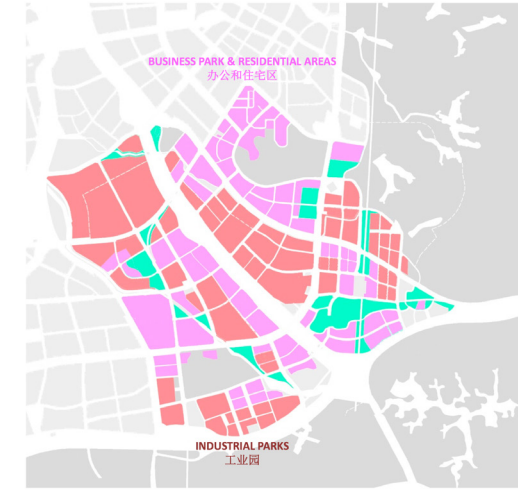
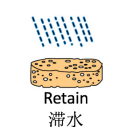
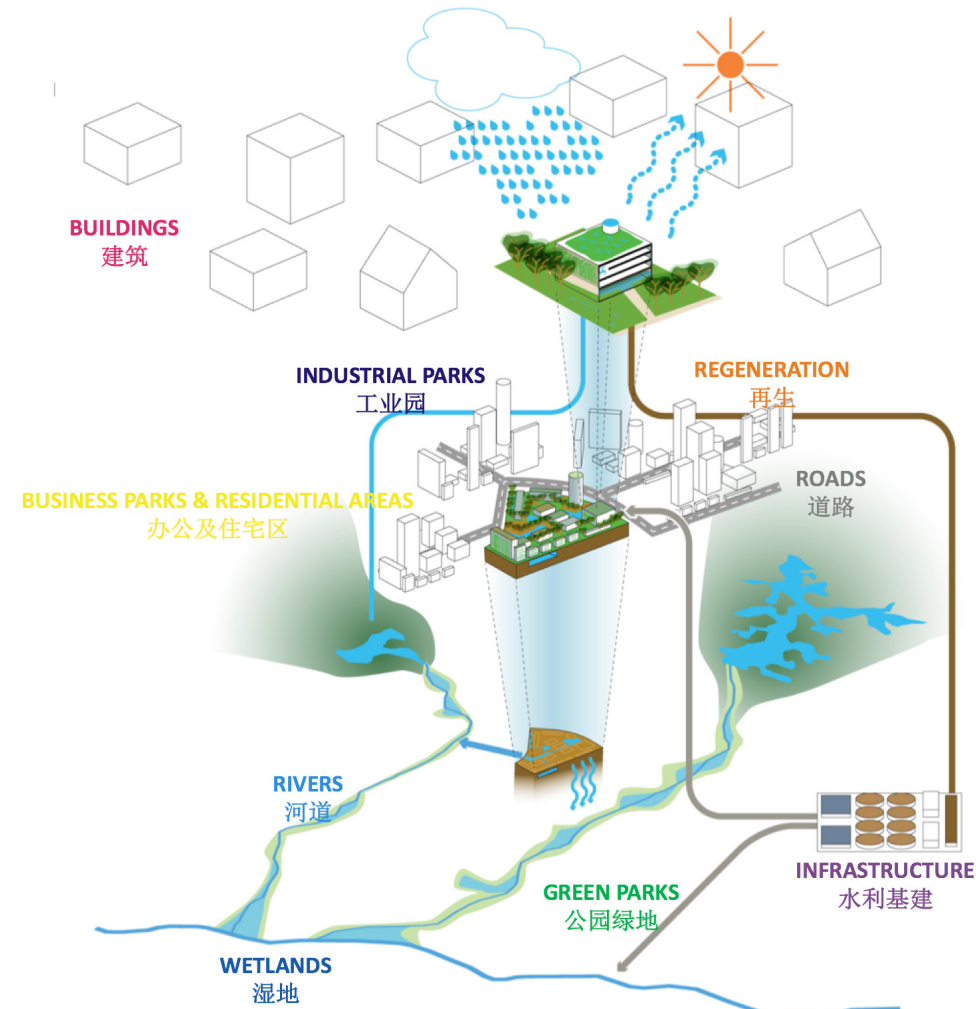
## 对凤凰城海绵城市而言，平衡的城市体系意味着什么？

What would a balanced urban system mean for the Sponge City in Phoenix Town?



我们根据每一个子项目在“滞、蓄、排”方面的系统功能，将整个体系划分成为了三个级别。

We organized the system on three levels according to how the different categories can contribute to the level of retaining, storing and draining the water within the water system.

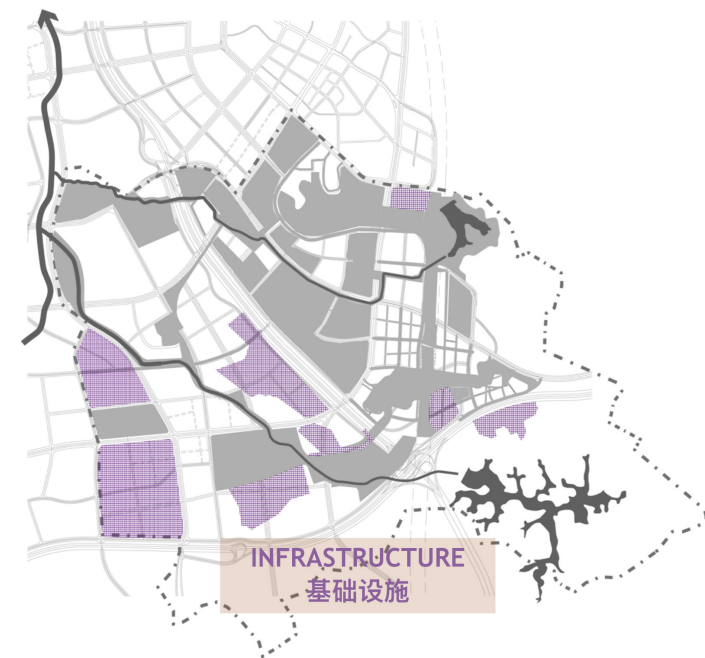
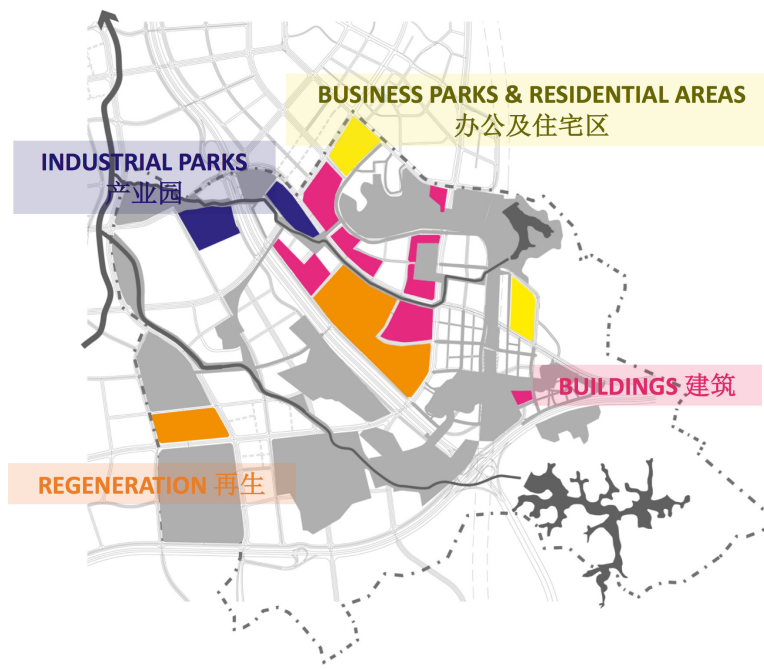
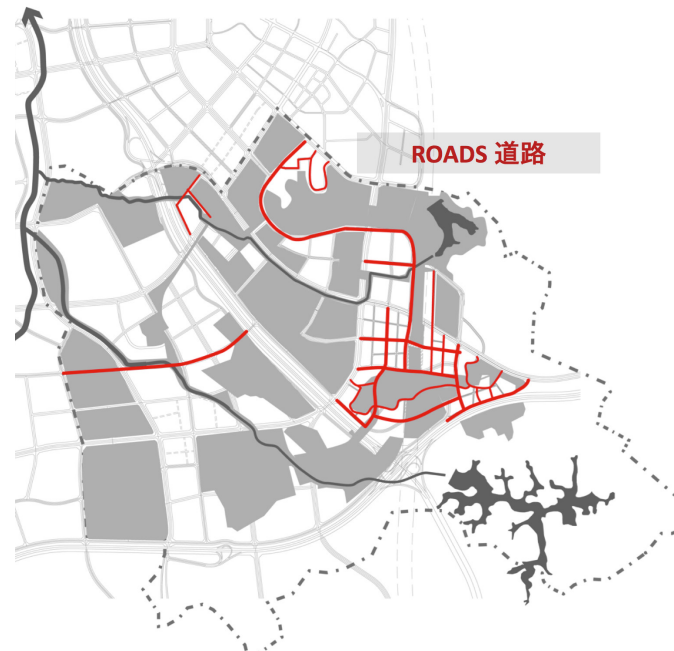
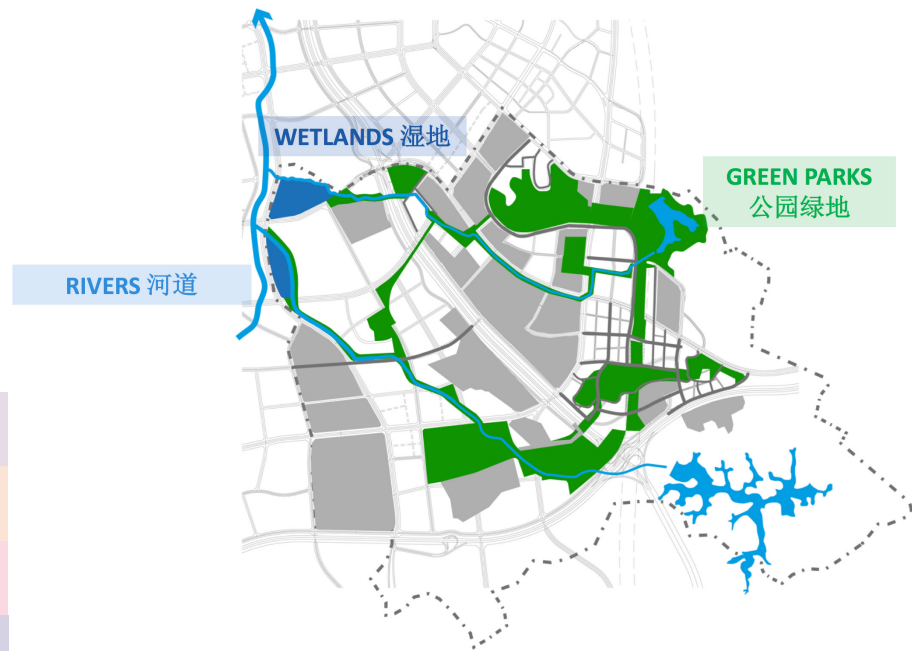
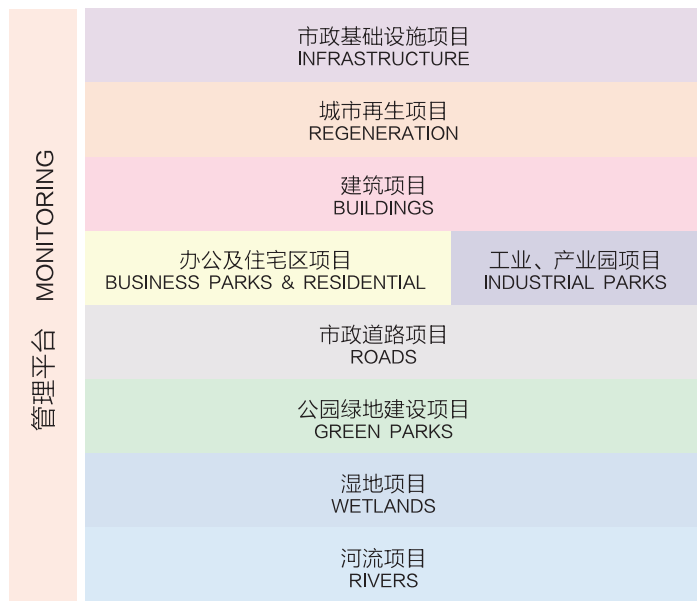


如何划分海绵城市的级别？

How do we classify the Sponge City projects?

我们将整个体系分为了四个层次九大类型。整个体系的主干包括河道、湿地和绿色公园来维护体系的健康平衡，同时湿地被列为单独的一个类别。产业园也被独立列为一个风险管控类别。

The next step in organizing the system was a reclassification of the projects into nine categories and four layers. Backbone of the system consists of rivers, wetlands and green parks to maintain a healthy balanced system, while wetlands is a separate category. Industrial parks are also singled out since they are a separate category in managing risk.



在项目层面，平衡的城市体系如何运作？

How would a balanced urban system work on the project level?



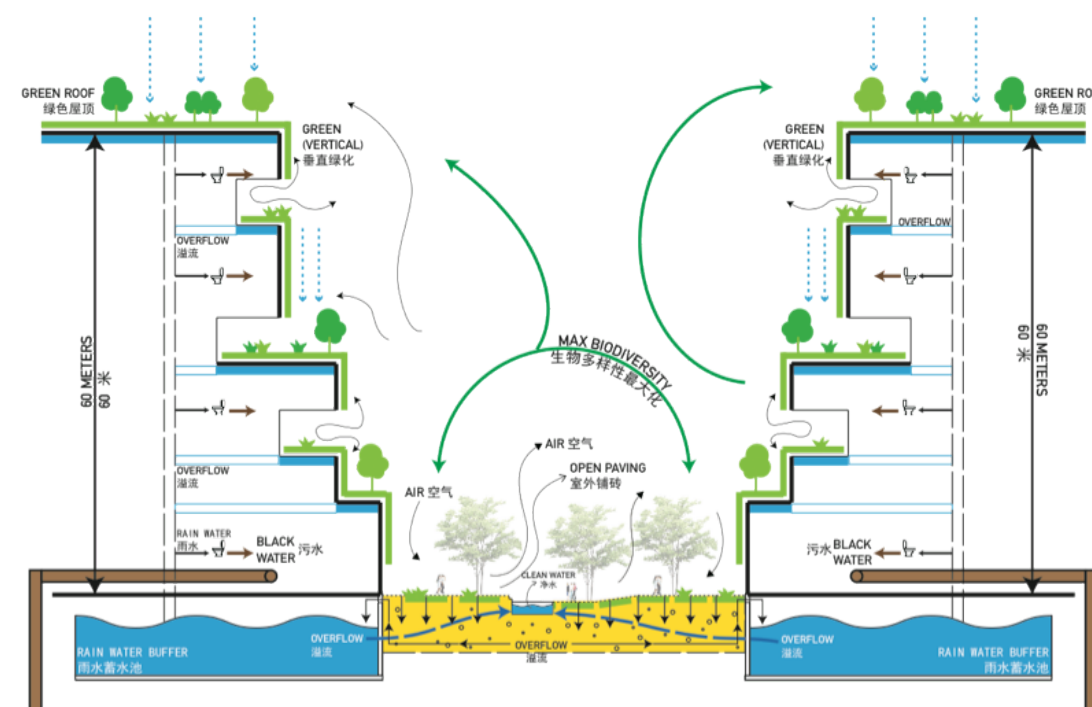
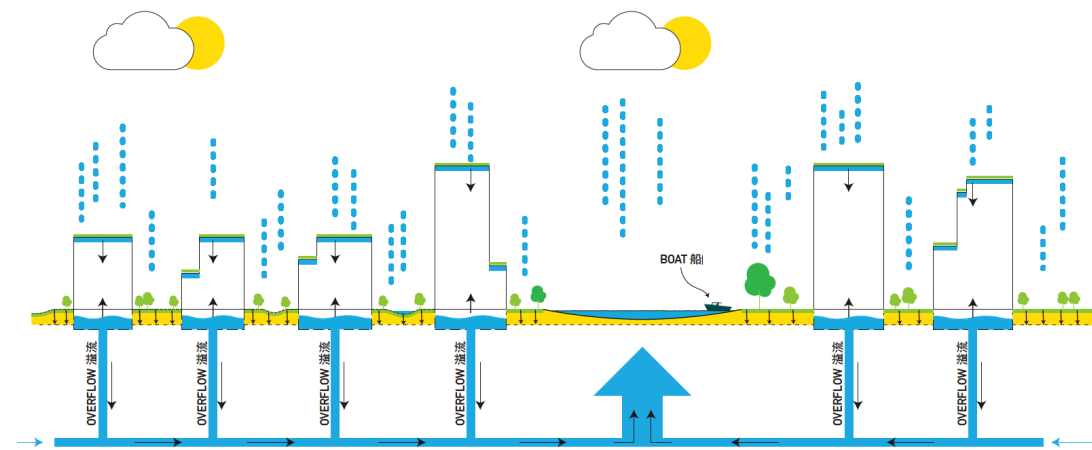
我们分析了现有所有九大类型的子项目，并提出了额外的发展目标和目的，以及引导每一类型达到城市质量的发展指南。

We analyzed representative projects in all nine categories and proposed additional targets, goals and guidelines for each category to reach more urban quality.



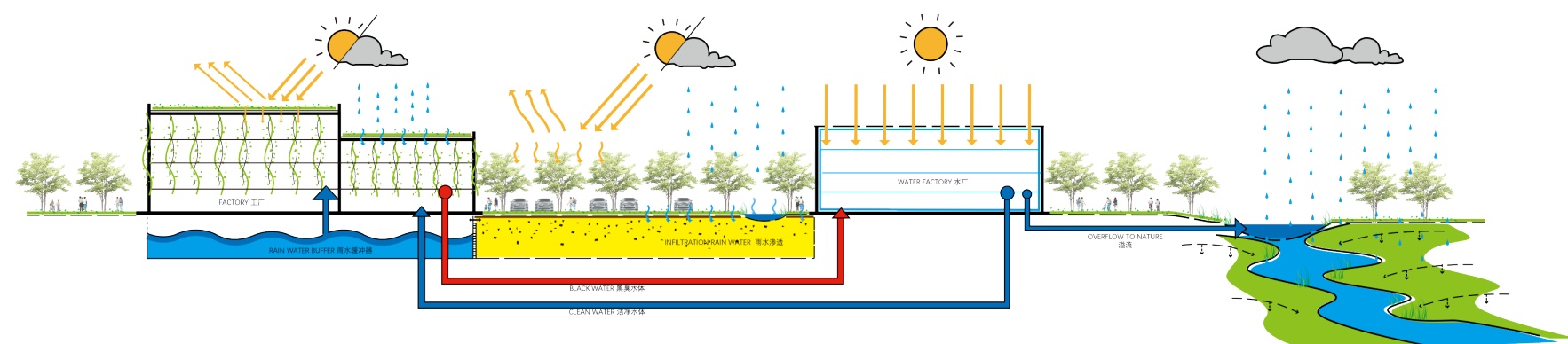
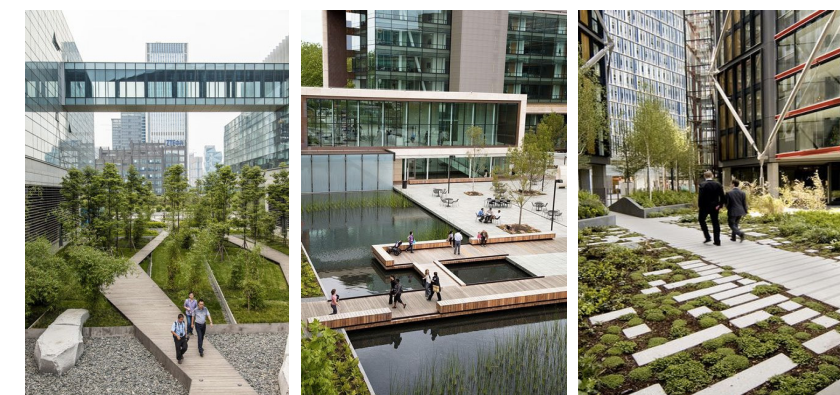
硬性指标 Targets	系统功能 Goals	系统构成 Systems
年径流总控制>70% Runoff rate > 70%  SS消减45% Suspended Solids reduced by at least 45%	零废水排放 Zero waste water emission  预清理 Pre-cleaning  控制高峰流量 Handling peak loads	封闭的 / 独立的污水体系 Closed / separate waste water systems  灰水和污水回收再利用 (用于冷却、加工等环节) Re-use of grey water and black water (cooling, processing etc.)  过滤系统 Filtration systems 地下沙滤 Sand filters in basement 沼生植物过滤系统 Helophytic filter systems  景观设计 Landscaping 渗透性表面 Permeable surfaces 最大化软质表面 Maximize soft surfaces 最大化阴影景观设计 Maximize shadow features 水景 / 水道 Water features / Waterways  监控系统 (与公共系统相连) Monitoring system (linked with public system)
***	现有 海绵城市总体规划 In Sponge City Master Plan	
	提案 海绵城市体系打造 Proposal for Sponge City System	

### 工业园体系 Industrial parks system

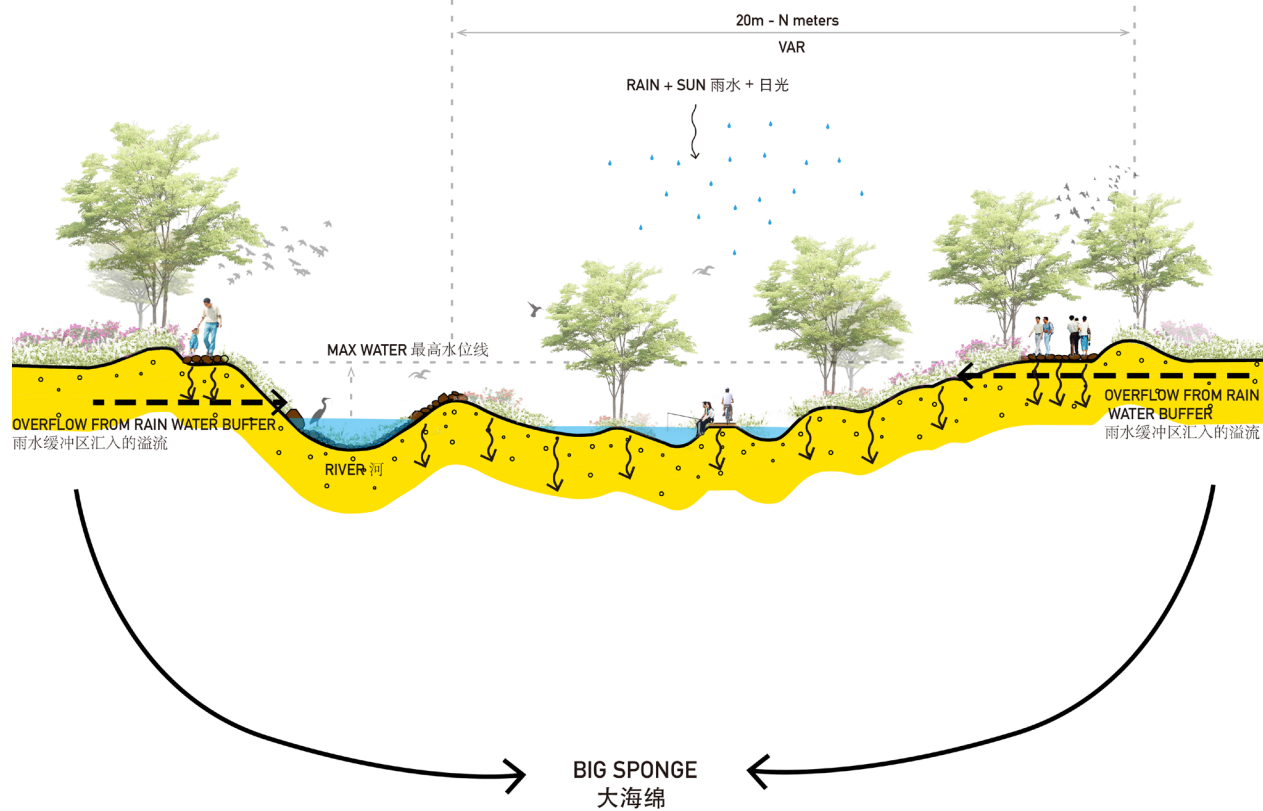


硬性指标 Targets	系统功能 Goals	系统构成 Systems
年径流总控制>70% Runoff rate > 70%  SS消减45% Suspended Solids reduced by at least 45%	将城市区域发展成自给自足的生态系统 Urban area development as self sustaining eco-system  降低热岛效应 Lowering heat island effect  预清理 Pre-cleaning  控制高峰流量 Handling peak loads  提高公共空间质量 (互动环境) Quality public space (interaction environment)  提高景观以及自然材料的使用效率 More efficient use of landscape and natural materials	自给自足的水系 Self sustaining water system 水面蓄水 Water surface storage area  过滤系统 Filtration systems 地下沙滤 Sand filters in basement 沼生植物过滤系统 Helophytic filter systems  景观 Landscaping 可渗透表面 Permeable surfaces 最大化软质表面 Maximize soft surfaces 最大化阴影景观设计 Maximize shadow features 水景 / 水道 Water features / Waterways  互动环境 Interaction environment 水作为聚焦点 (水塘、喷泉、水池、水道) Water as a focus point (pond, fountain, waterbed, waterways)  监测系统 (与公共系统相连) Monitoring system (linked with public system)
***	现有 海绵城市总体规划 In Sponge City Master Plan	
	提案 海绵城市体系打造 Proposal for Sponge City System	

### 办公和住宅区体系 Business Parks and Residential Areas System



湿地体系  
Wetlands system



硬性指标 Targets	系统功能 Goals	系统构成 Systems
提高缓冲能力 Increase buffer capacity	相互连接的系统 (更大水系的一部分) Interconnected systems (part of larger water system)	开阔的水面 Wide waterbeds
改善水质 Clean(er) water	渗透和清洁 Filtration and cleaning	种植芦苇等能起到过滤作用的植物 Reeds and special plants capable of filtering the water
	滞水和蓄水体系 Retaining and storage water systems	多样化植被作为动物保护区 Diversity in greenery as protective places for fauna
*** 现有 海绵城市总体规划 In Sponge City Master Plan	生物多样性 Biodiversity	休闲小径 (步道和自行车道) Pathways for recreation (walking and cycling)
	降低热岛效应 Lowering heat island effect	观景点 Viewpoints
提案 海绵城市体系打造 Proposal for Sponge City System	有限的可达性 Limited accessibility	有限的景观设计 (划船、游泳、垂钓等) Limited programming (canoeing, swimming, fishing etc.)
		使用未开发的土地作为暂时的表面蓄水区 Use of undeveloped land as temporal water surface storage





如何实现体系监测?

How to monitor the system?



监管平台  
Monitoring :

硬性指标 Targets	系统功能 Goals	系统构成 Systems
2017年完成系统模型 Complete system model ready in 2017  2017年实现对单项进行监测 Monitoring individual component output by 2017  年度绩效提升 Increase yearly performance  2017年以后能够在系统模型中对新项目进行建模监管 New projects can be modelled in the system model from 2017>	追踪KPI KPI tracking  确认问题 / 潜在收益 Identifying problems/ possible gain  预测 / 预防功能建模 Predictive / preventive modelling  公共责任 Public accountability	综合措施及监管体系 Integrated measure and monitoring system  通过透明的监管提升公共意识 (在公共场所显示, 或通过手机应用来发布等) Public awareness with visible monitoring (in the public space and digital with apps etc.)  通过监管来进行奖惩 Naming and shaming through monitoring  定期对系统进行全面审查, 找出存在的问题或潜在的收益 Reviewing the complete system on regular basis for detecting problems / possible gain  使用预测软件, 采取预防性措施, 落实新的开发项目 (情景建模、冲击效应建模等) Predictive software for preventive measures and new developments (scenario-, impact modelling etc.)
 <b>现有</b> 海绵城市总体规划 In Sponge City Master Plan	 <b>提案</b> 海绵城市体系打造 Proposal for Sponge City System	

下一步规划?

What should be the next steps?

## 总体建议：

### 总体规划层面：

1 根据海绵城市系统功能及体系重新定义项目分类并制定设计管理导则

- 根据新的项目分类制定更详尽的功能目标
- 根据系统风险级别区分封闭系统性质(内部废水废物处理)的工业/产业区类项目及开发连接性质的生态功能湿地类项目
- 对于城市更新类项目分开定义及制定设计管理办法
- 对于生态功能湿地项目分类定义及制定设计管理办法

2 根据新的项目分类定义更详尽的系统目标及功能、规划设计、运营管理导则及管理办法

3 根据海绵城市系统功能及项目分类制定实施规划方案

4 在项目层面进行综合系统影响评估

- 已定义的55个项目
- 未来新建项目

### 具体针对方面：

1 光明新城办公室应针对重要项目进行统筹协调

- 工业园区/湿地
- 城市再生项目
- 与深圳水务局协调鹅颈水的生态建设

### 创新管理模式

- 径流控制率交换机制
- 鼓励机制(税、总建筑面积)

## Action list:

### In general:

1 Re-classify projects according to sponge city system (see detailed project table)

- Include wider system goals with current projects based on new classifications
- Clarify differentiation between Wetland parks and Industrial parks
- Adopt Regeneration as a separate category within the system and expand scope
- Adopt Wetland projects as a separate category within the system

2 For the new classifications develop goals and Design, Build / Operate, Management guidelines based on sponge city system

3 Develop an implementation masterplan that meets the goals of the new classification

4 For each individual project evaluate impact on system through impact studies

- Current 55 projects
- New projects

### Further studies:

1 New Town Office should coordinate critical projects

- Industrial park / wetland
- Regeneration
- Dialogue to discuss development of Ejing River with Shenzhen Water Bureau

2 Innovative operation model

- Runoff rights (trading scheme and rules)
- Incentives for sponge development (GFA, Tax rates etc.)