# Synergies between the Green and Blue Agendas: Some Emerging Ideas from WRI Research

# 绿色和蓝色议程之间的协同作用：WRI研究的一些初步想法


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# Climate Mitigation and Climate Adaptation
# 气候缓解与气候适应

## Green Agenda 绿色议程

- Growing cities are major emitters of GHGs through energy generated by fossil fuels
- 发展中城市由于使用化石燃料发电，是主要的温室气体排放者。
- Green spaces being replaced by built-up areas
- 建成区正在取代绿地
- Low Carbon Development creates significant co-benefits in terms of quality of life and air quality improvements
- 低碳发展在提高生活品质和改善空气质量方面有重要的协同效应

## Blue Agenda蓝色议程

- Hydrological cycle disrupted by built-up areas, affecting surface water and groundwater flows
- 建成区破坏水文循环，影响地表水和地下水流
- Water pollution further affects regeneration capabilities of water bodies
- 水污染进一步影响水体的再生能力
- Water risks through floods, droughts and intense rainfall affects quality of life
- 洪水、干旱和强降雨带来的水风险会影响生活质量。

# Example from Hyderabad city, India
# Synergy between the Green/Blue Environment
## 绿色/蓝色环境之间的协同作用——印度海德拉巴市为例

**Highlights of Hyderabad Metropolitan Area**

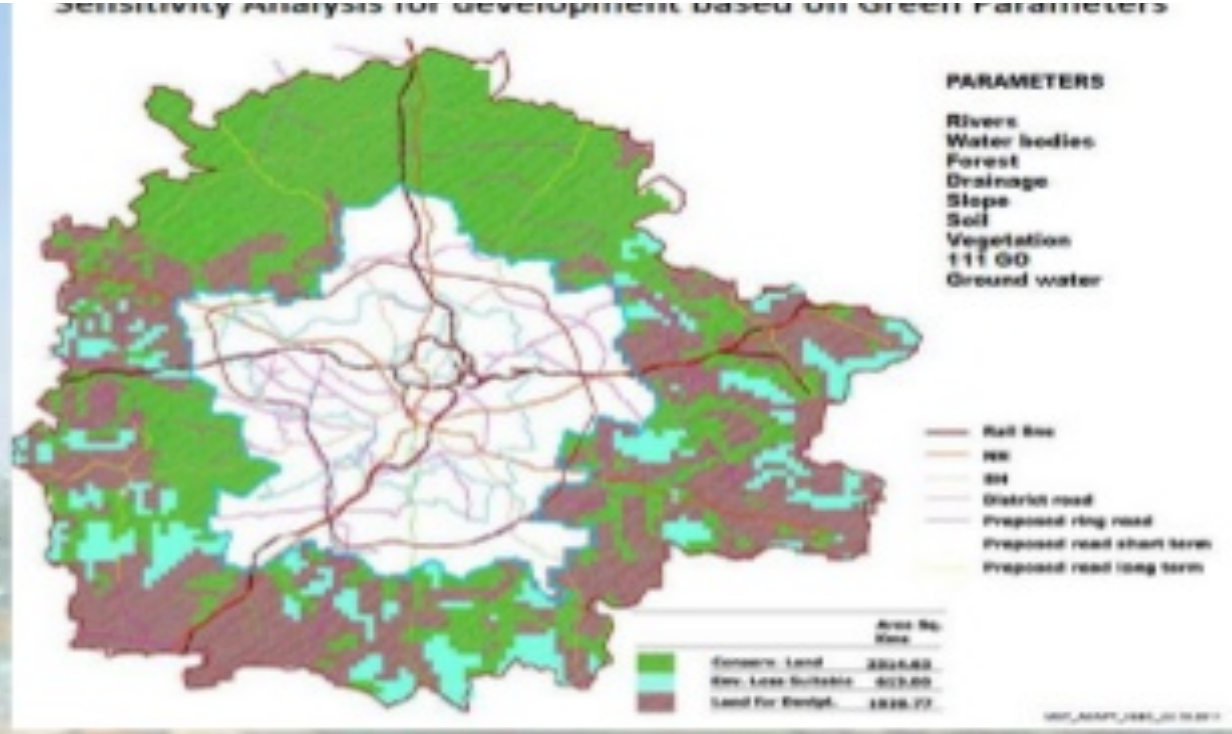
The 'City of Lakes' is also acquiring the image of 'Garden City' & 'Green City'.

- The Green fly-over concept introduced for the first time in India.
- Making use of the existing landscape and natural rocky out crops, 15 rockeries are being developed in the 2.1 kms stretch.
- Landscaped gardens parks and recreation areas have also been developed around the lakes, along the roads etc. which falls within BPPA area.

**:LEGISLATION :**

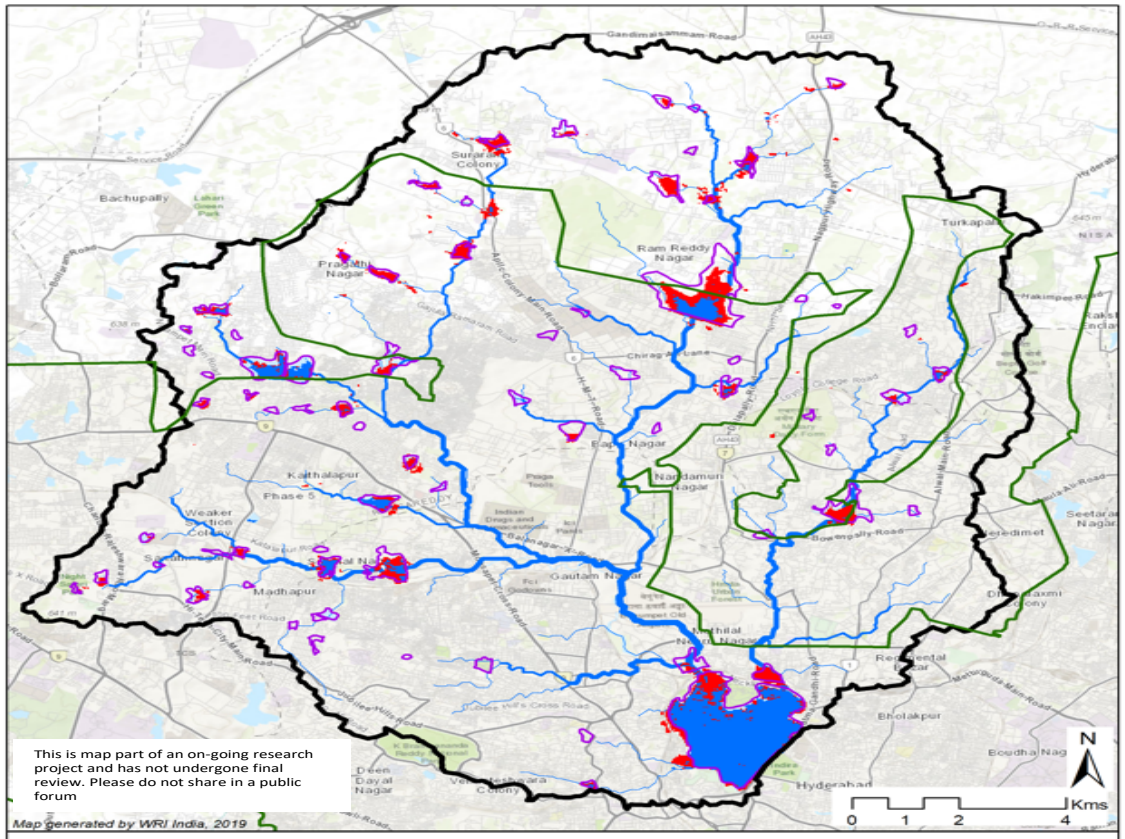
AP Water & Trees Act2002 and Rules
1. Ground Water Protection Measures
2. Surface Water Protection Measures
3. Tree Protection Measures

2002年水源与林木法案
1.地下水保护措施
2.地表水保护措施
3.林木保护措施




# Built-up areas affect Groundwater Recharge

# 建成区影响地下水补给




**Surface water loss in the Hussain Sagar watershed**

Data Source: European Commission JRC; LandSat (USGS / NASA); Bhuvan, NRSC

Disclaimer: This map is created for study purposes, jurisdictional boundaries indicated are representational only

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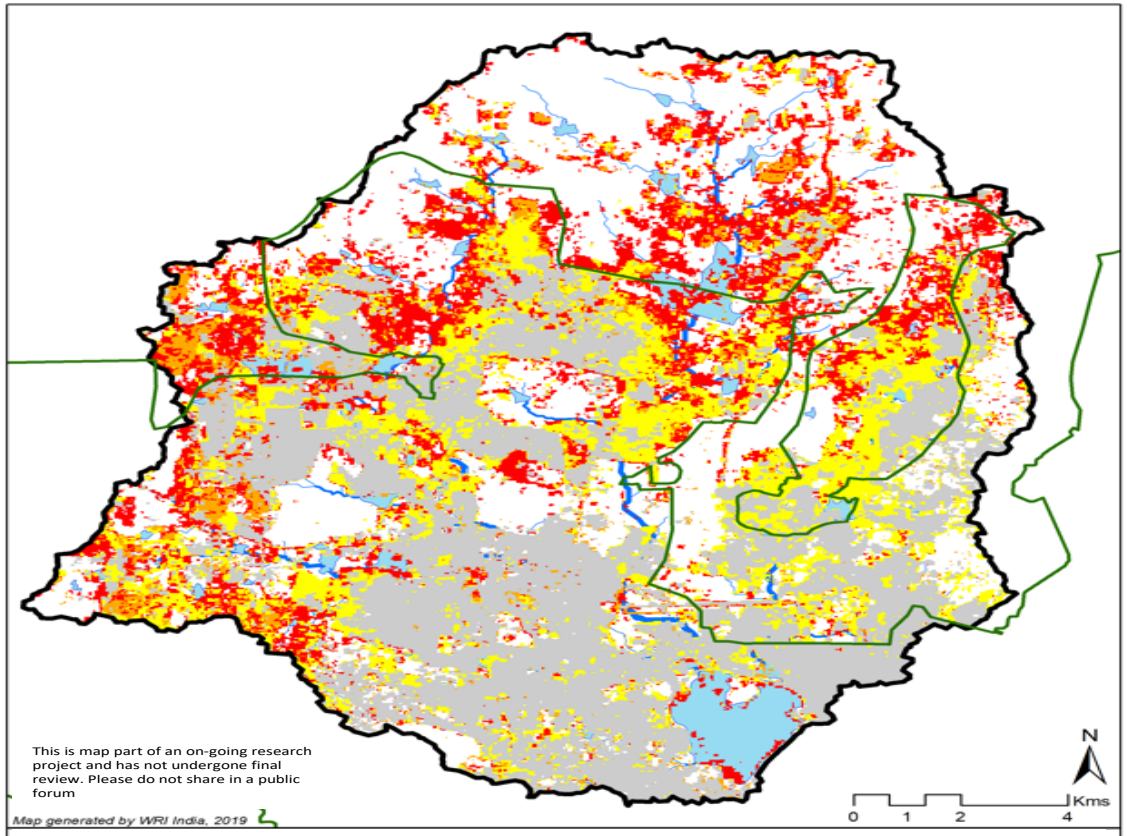
Legend

- Watershed Boundary
- Lakes
- Surface water extent in year 2015
- Surface water extent in year 1988
- ULB Boundary

Natural Drainage Order




**Urban development (since 1990) in the Hussain Sagar watershed**

Data Source: European Commission JRC; LandSat (USGS / NASA); Bhuvan, NRSC

Disclaimer: This map is created for study purposes, jurisdictional boundaries indicated are representational only

WRI INDIA — ROSS CENTER

Legend

- Impermeable Areas in 1990
- Impermeable Areas added by 2000
- Impermeable Areas added by 2010
- Impermeable Areas added by 2015
- ULB Boundary
- Watershed Boundary
- Lakes

Natural Drainage Order

# Every decision to augment water supply results in higher energy costs + GHG Spike

## 增加供水会导致更高的能源成本+温室气体的激增

For Hyderabad: 对海得拉巴市来说：

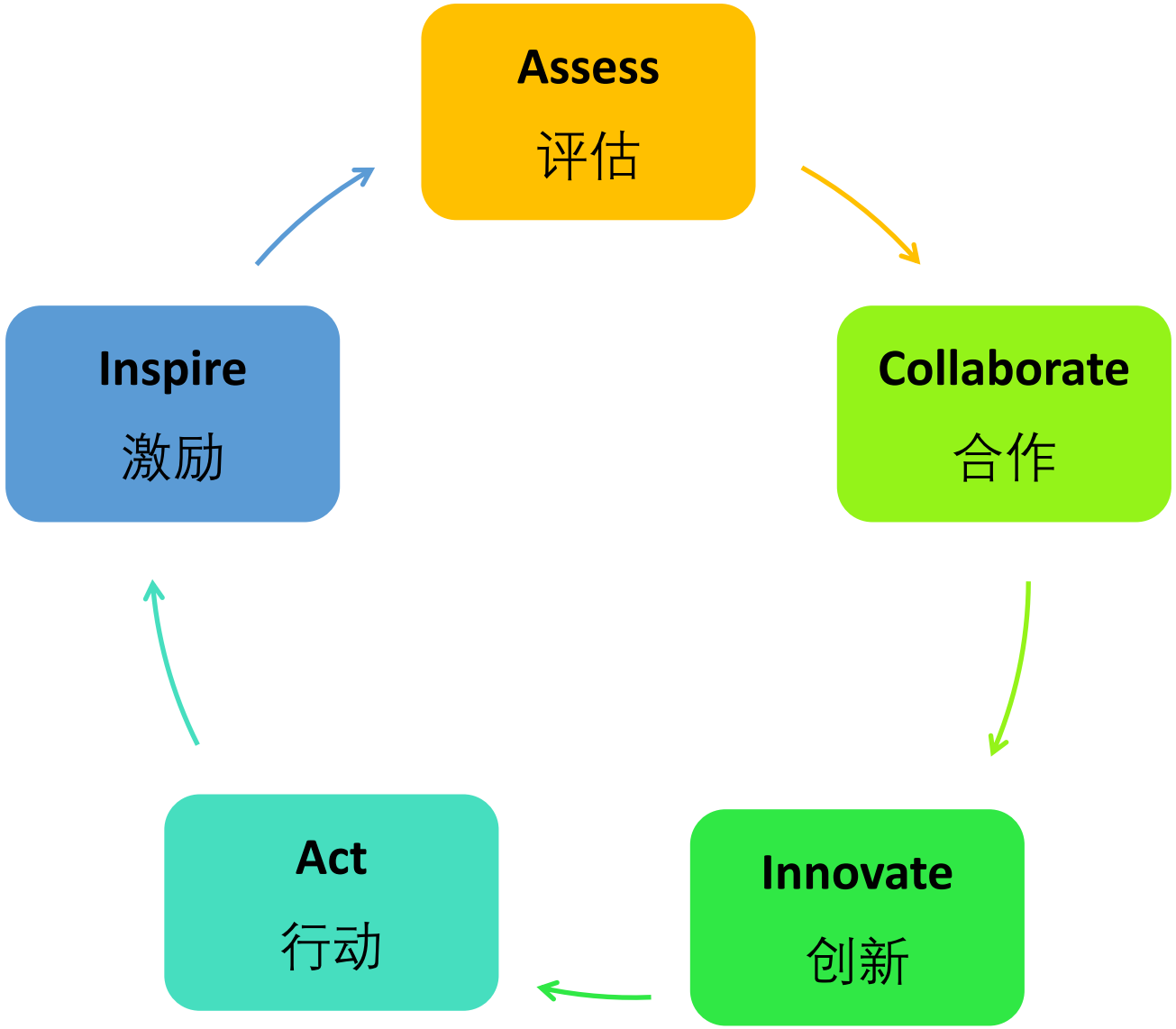
- One kiloliter of bulk water from River Krishna (at a distance of 120 km) is five times greater than the cost of sourcing from local lakes at less than 15 km.
- 从克里希纳河（距离120公里）获得1千升水的成本是从当地湖泊（距离不到15公里）获得水的成本的5倍。
- Drop in groundwater in the city worsens as a result of increased runoff and reduced infiltration as the built-up areas rapidly expand
- 随着建筑区迅速扩大，地表径流增加，渗透减少，导致城市地下水位下降情况恶化。

Source: Presentation by M.G. Krishna 2008 for Hyderabad

# Opportunity costs of tapping new water sources: Example from Chennai, India
# 开发新水源的机会成本——以印度金奈为例

| Source<br>来源 | Cost (Rupees/m3)<br>成本（卢比/立方米） | Quantity available (MLD)<br>可用容量（MLD） | Comments<br>评论 |
|---|---|---|---|
| Existing sources<br>现有资源 | 2.5 | 100 | Rainwater recharge improves yield<br>雨水补给提高产量 |
| Recycled treated wastewater<br>再生处理废水 | 60 | 10 | Green co-benefits (methane capture, urban forestry, industrial demand<br>绿色协同效益（甲烷捕获、城市林业、工业需求） |
| **River Krishna<br>克里希纳河** | **3** | **300** | **High Energy costs, GHG implications<br>高能源成本，温室气体影响** |
| Tanks/aquifers<br>水库/含水层 | 3 | 300 | Rainwater recharge improves yield<br>雨水补给提高产量 |
| Palar river<br>帕拉尔河 | 8 | 10 | Reduced availability to farmers<br>农业供水减少 |
| Veeranam tank<br>维埃兰姆水库 | 15 | 80 | Rainwater recharge improves yield<br>雨水补给提高产量 |
| **Desalination<br>海水淡化** | **55** | **1200** | **High energy costs, GHG implications<br>高能源成本，温室气体影响** |

# Theory of Change: Adopt a Systems Approach
## 变革理论：采用系统方法



# 城市蓝色-绿色解决方案
# Urban Blue-Green Solutions

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- Restoration and conservation of urban water bodies and associated ecosystem
- Rain Water Harvesting 雨水收集
- Artificial Aquifer Recharge 人工蓄水层
- Blue-Green Infrastructure 蓝色-绿色基础设施
- Flood Plain and Catchment Protection 漫滩与流域保护
- Ecological Solutions for Polluted Water Bodies 污染水体的生态解决方案
- Water Sensitive Urban Planning and Development 水敏感城市规划与发展


# 为什么选择蓝色-绿色解决方案？
# Why Blue-Green Solutions?

## 系统高效 System Efficiency

Can provide multiple services like flood control, groundwater recharge, water security, water quality improvement etc. simultaneously

可同时提供洪水控制，地下水补给，水安全，水质提升等多种服务

## 低成本 Lower costs

Requires lower investment than traditional grey infrastructure solutions; operation and maintenance costs are also lower

与传统灰色基础设施解决方案相比，投资更低，运行与维护成本也更低

## 提高宜居性 Increased liveability

Increases liveability condition by offering co-benefits such as health improvement, micro-climate control, recreational benefits and overall economic productivity

健康改善、微气候控制、休闲消遣、经济发展协同效应

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# Value Proposition 价值主张

## Three Pillars 三大支柱

- Leverage Technology 杠杆技术
- Incentivize Innovations through creative PPPs + Finance Leverage 通过创造性的公私合营加上财务杠杆激励创新
- Build on stakeholder engagement for Quality of Life Focus 利益相关方参与

## Disruptive Solutions 颠覆性解决方案

- No longer uni-functional ('build') and uni-disciplinary ('engineering') bureaucracy that Commands and Controls 不再是单一功能（“建设”）和单一学科（“工程”）进行指挥和控制
- Water Supply agencies partner with water users, tech innovators to massively increase sector investments 供水机构与用水者、技术创新者合作，大幅增加行业投资。
- Provide leaders with measurable outcomes that reduce water risks and minimize pollution costs, reported transparently 向领导提供水风险降低和污染成本最小化的可测量的结果

## Green + Blue = Smart City Goals 绿色+蓝色=智慧城市目标

Balance built and natural environment, regulate air, water and land pollution, improve quality of life

平衡建设与自然环境，控制空气、水和土地污染，提高生活质量

# Operationalizing Circular Economy and Sponge City Concepts
# 循环经济运行与海绵城市理念

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**Climate-friendly cities气候适宜都市**

**Minimize water risks**
**减少水风险**


**Minimize carbon footprint**
**减少碳足迹**

**Build sponge city to capture excess runoff**
**建造海绵城市截留多余径流**

**Reuse Wastewater**
**废水再利用**

**Capture GHGs from solid & liquid wastes**
**从固体和液体废弃物中捕捉温室气体**

# Leverage Synergy between the Green and Blue Water Agenda
# 利用绿色和蓝色水议程之间的协同作用

Water with Large GHG Footprint → Very Costly to Economy + Society

水里含有大量温室气体足迹→高昂的经济和社会成本

**Trans-basin water diversion**

**跨流域调水**

**Desalination**

**海水淡化**

Recyclable resources → Green Funds

可回收资源→绿色基金

Treated wastewater

污水处理

Methane capture from sludge and organic wastes

从污泥和有机废物中收集甲烷

Local water sources → Regulations

当地水资源→规章制度

Surface water

地表水

Groundwater

地下水

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# A Blue Water Economy Example: Zhuzhou City Sponge City Construction Plan

# 蓝色水经济实例：株洲市海绵城建设规划

- By 2020 more than 20% of the urban built-up area will meet the sponge city construction target requirements
- 到2020年，超过20%的城市建成区将达到海绵城市建设目标要求
  - More than 70% rainwater targeted for effective control;
  - 目标是有效控制70%以上的雨水
- By 2030, more than 80% of the urban built-up area will meet the construction target requirements
- 到2030年，80%以上的城市建成区将达到建设目标要求
  - The annual total runoff control rate will reach 80%.
  - 年总径流控制率达到80%

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# Questions?
# 欢迎提问