Global Water Quality Challenges and Grey-Green Solutions

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...and many colleagues

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***WWW* Pollution-driven *Water* Scarcity Session**

Stockholm SWEDEN *26 August 2018*

CUNY ADVANCED SCIENCE RESEARCH CENTER

the City College of New York

CUNY The City University of New York

NASA

NSF

EPA United States Environmental Protection Agency

US Army Corps of Engineers

GWSP

SWFP

WATER PARTNERSHIP PROGRAM

DIVERSITAS

IIASA

The World Bank

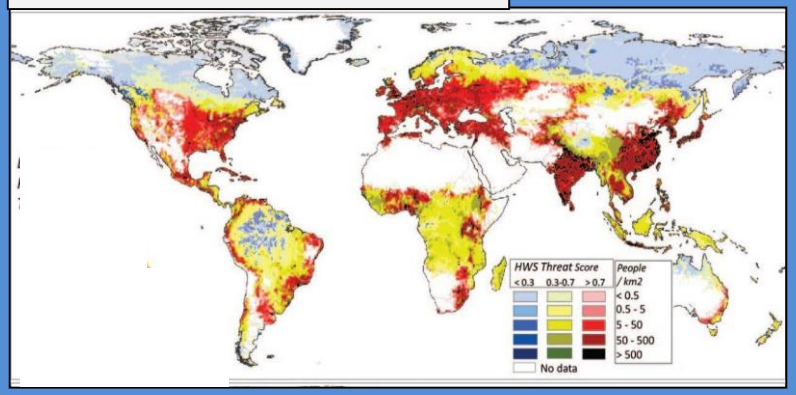
TWAP TRANSBOUNDARY WATERS ASSESSMENT PROGRAMME

UNEP

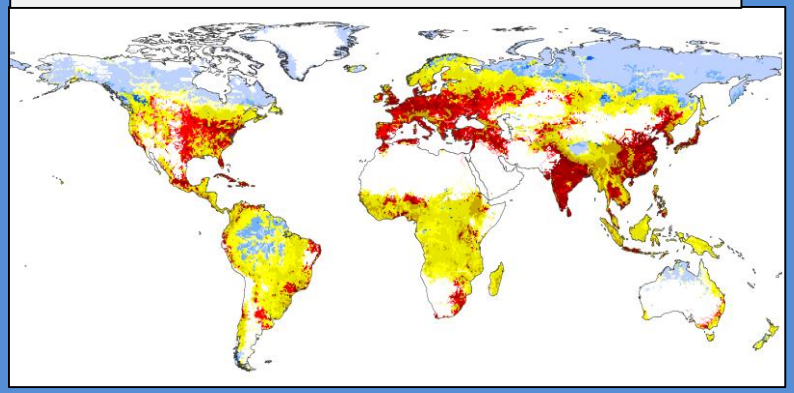
gef

The Impact of Pollution Source Containment

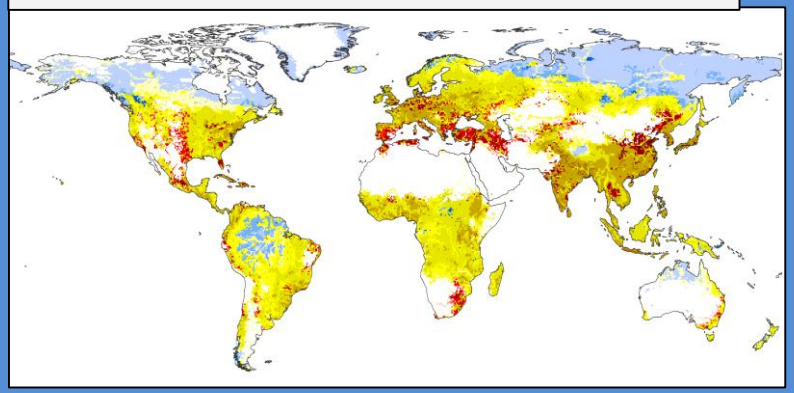
Observed Threat



Threat w/ Full Pollution Control



Threat w/ Land Stewardship



Black-red: Poor HWS ***Blue: High HWS***

 # People Served by Riverine Water Sources

High Threat	Populations Exposed*	
• *Observed*	**4.6B**	**75%**
• *w/ Pollution Control*	**3.8B**	**62%**
• *w/ Land Management*	**1.2B**	**19%**

*Threshold of 0.7 *(high threat)*

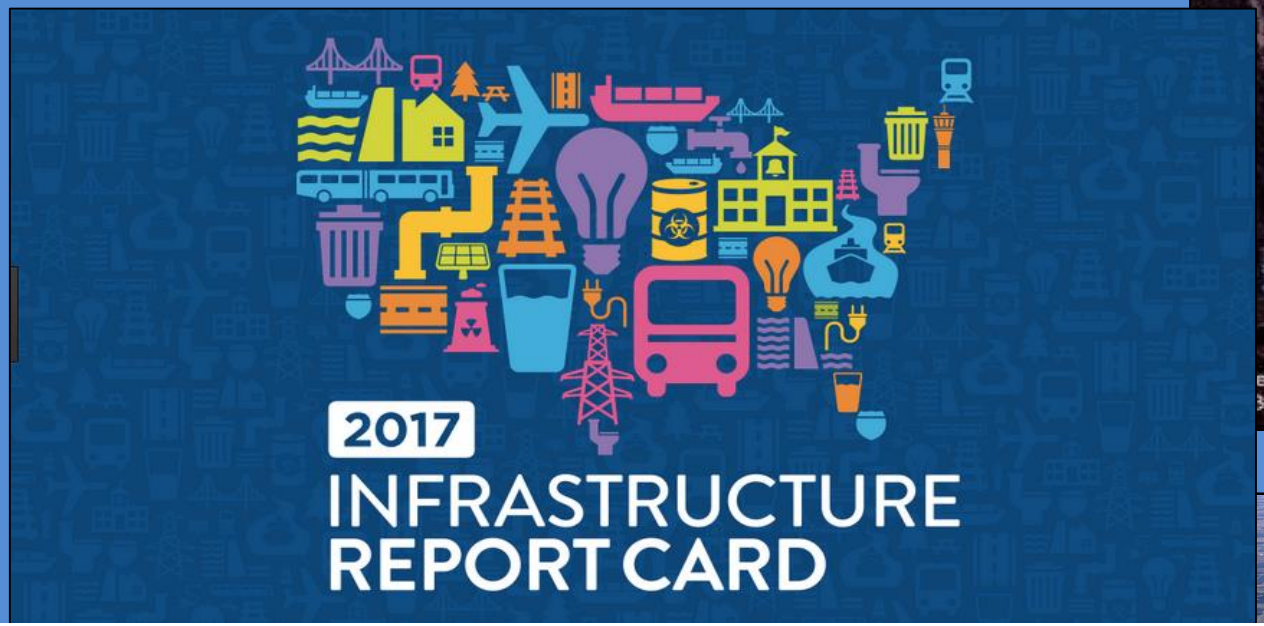
The Issue Is / Could Be / Should Be
One of Grey plus Green Solutions

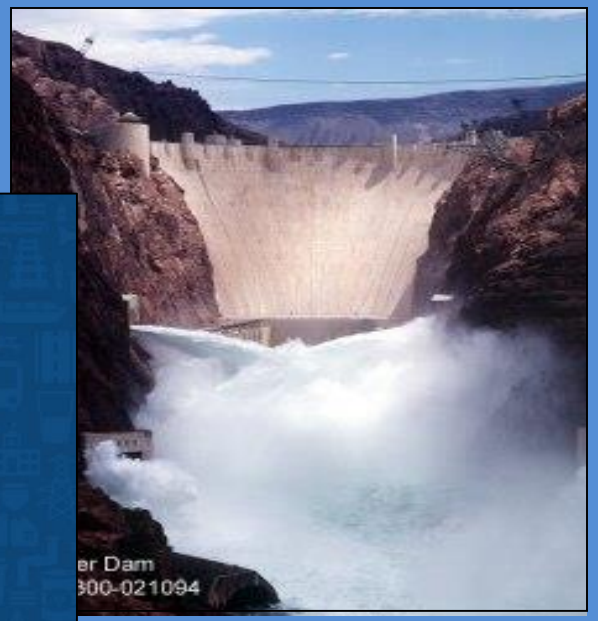
Two Pathways toward Reducing Threat

WATER

Water security: Gray or green?

Grey Infrastructure: Problems Even in Rich Nations



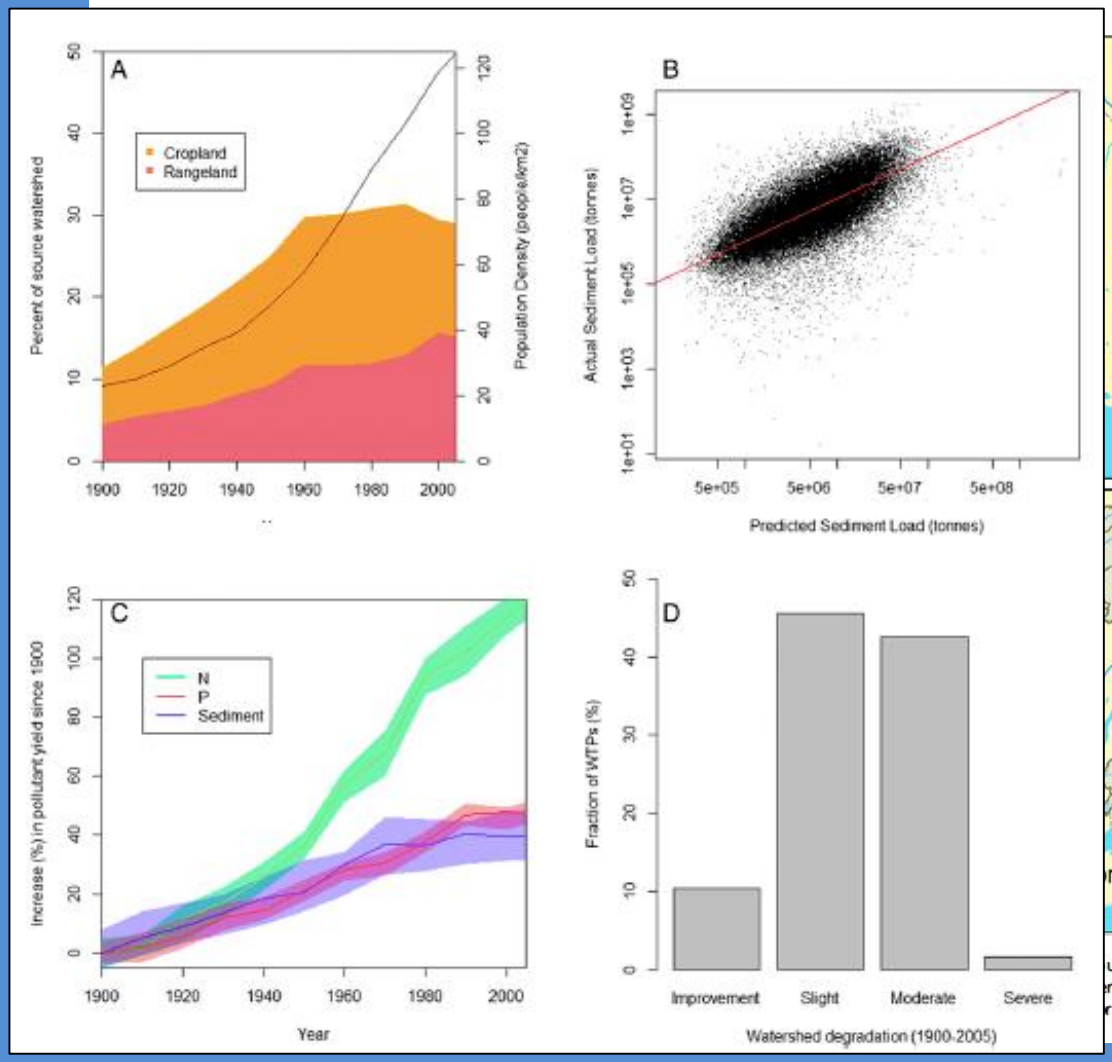


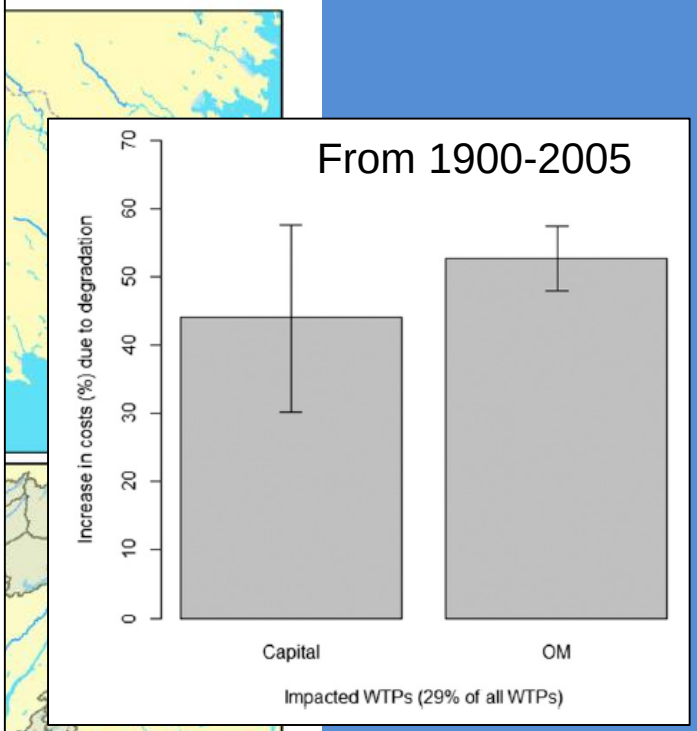
Grades by Category

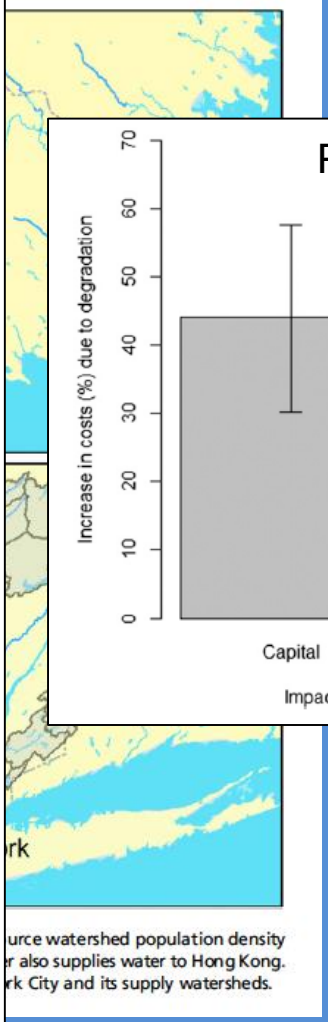
American Society of Civil Engineers

		D	D			D	D
							D+

Green Infrastructure: Problems Even in Watersheds Supplying Drinking Water







*McDonald et al. (2016), *PNAS*

A White Paper for the UN/World Bank High Level Panel on Water
Sub-Domain: Environment and Water

G Model
ECOHYD 195 1–17

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Original Research Article

Ecosystem-based water security and the sustainable development goals

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BLENDED GREY-GREEN INFRASTRUCTURE APPROACHES TO WATER SECURITY IN TWO WATER QUALITY-RELATED ECOSYSTEM SERVICE DOMAINS

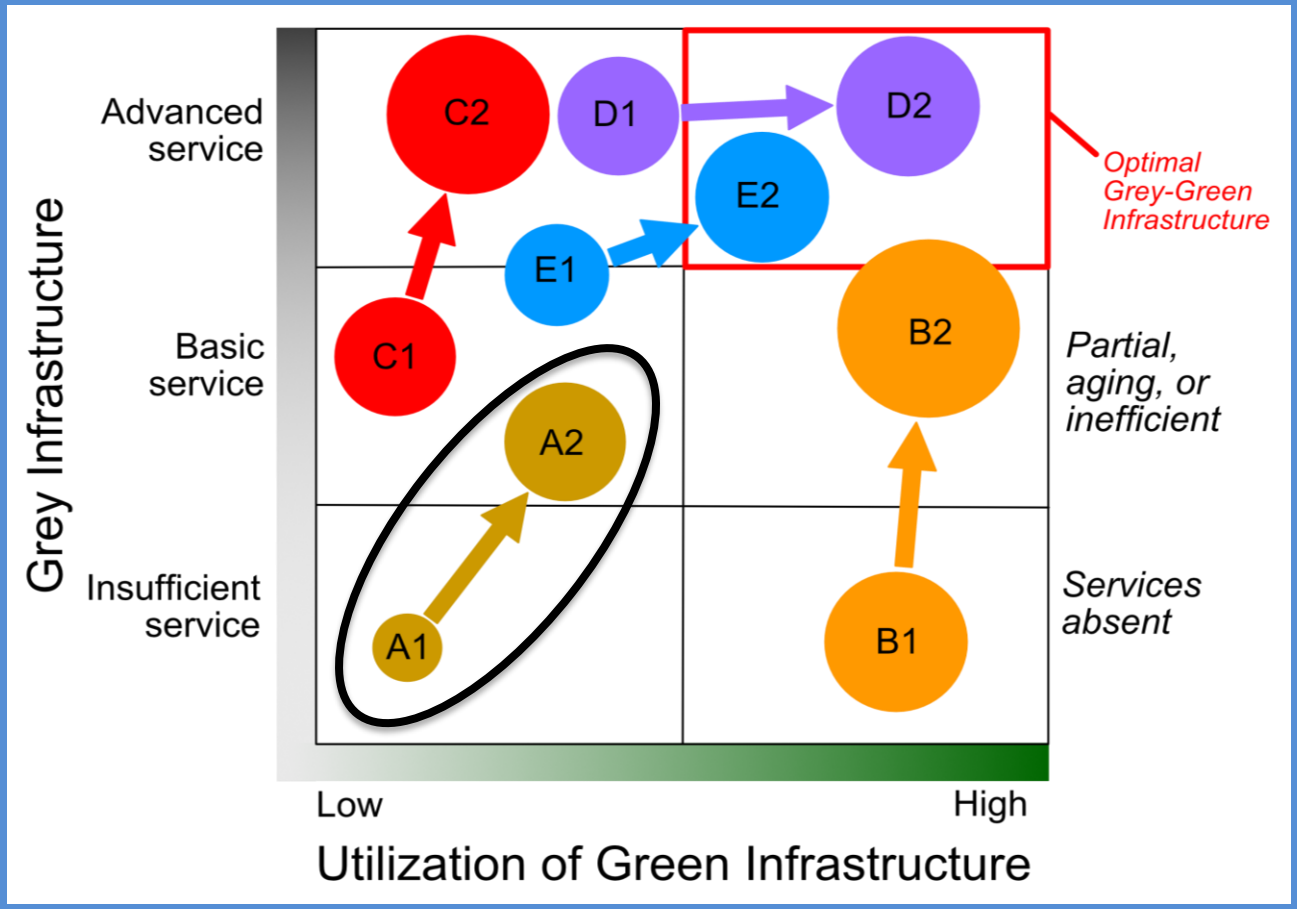
Environmental Service	Actions to Create Optimal Composite Grey-Green Infrastructure
Drinking water for cities	**Green**: Increase areas under watershed protection (especially upstream sustaining ecosystems) through riparian forest protection, re/afforestation of upstream ecosystems **Grey**: Modernize drinking water treatment facilities; increase levels of treatment in sanitation systems (for receiving water integrity, which is often used as water supply downstream); minimize/avoid water losses (e.g. leaking pipes)
Water quality/pollution mitigation	**Green**: Develop and expand wetland areas, bioswales, and other natural infrastructure **Grey**: Modernize wastewater treatment plants to improve levels of treatment and efficiency gains

6.1 Clean Drinking Water

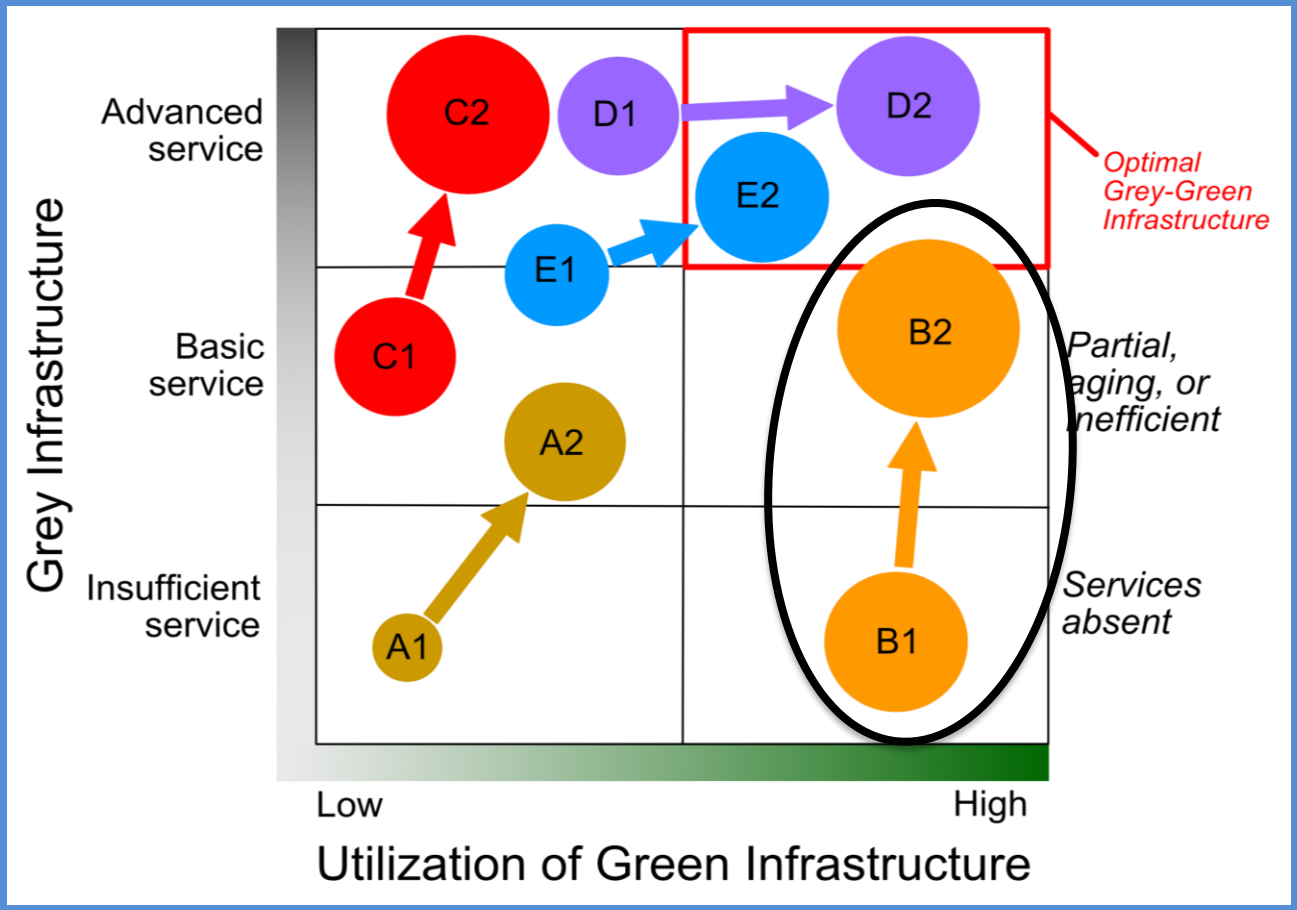
6.2 Sanitation and Hygiene

6.3 Pollution Control

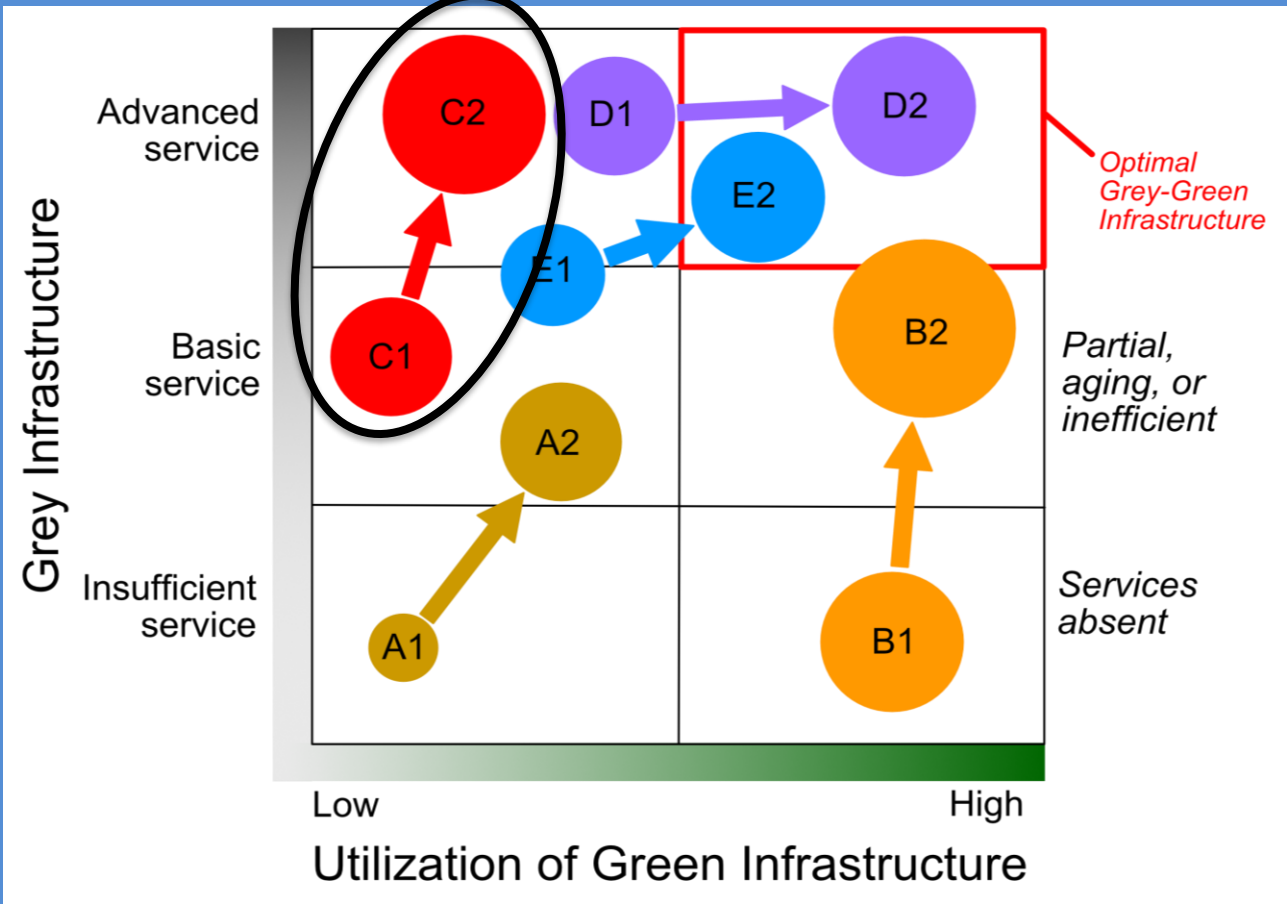
6.6 Ecosystem Protection & Restoration



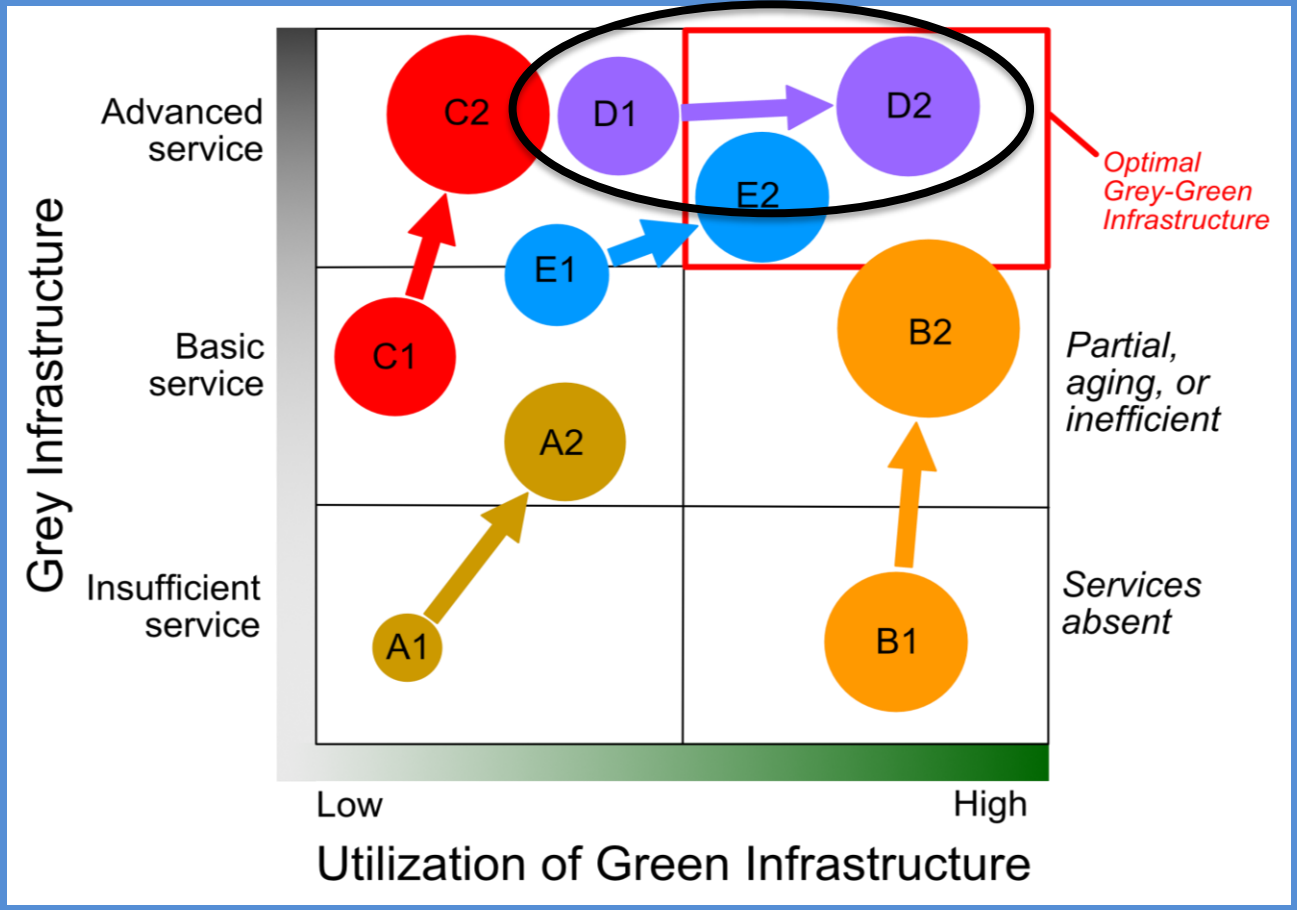
A1/A2: Currently very limited grey infrastructure to meet basic demands, with limited use of green infrastructure. Due to these and financial constraints, only modest gains in grey-green infrastructure. *Example: Kabul, Afghanistan*.



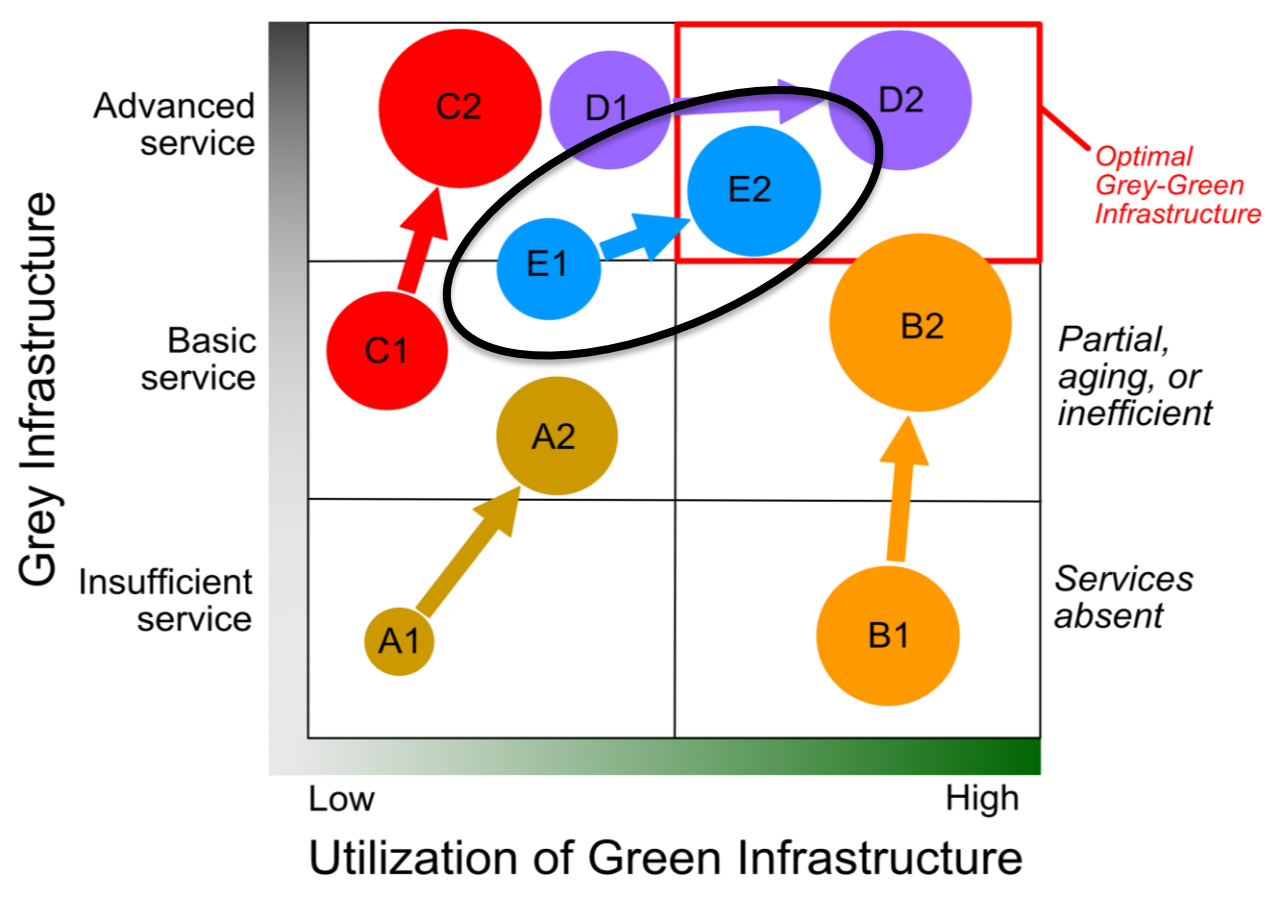
B1/B2: Currently an abundance of green infrastructure, but no efficient or available grey infrastructure. Future improvements by capitalizing on green & modernizing grey infrastructure for gains in efficiency. *Example: Kampala, Uganda*.



C1/C2: Today grey infrastructure meets demand, but limited green infrastructure in surrounding areas. Future benefits achieved by rehabilitating land for green infrastructure coupled to improvements in grey infrastructure efficiency. *Example: Beijing, China*.



D1/D2: Currently has moderate use of green infrastructure, coupled with advanced/efficient grey infrastructure. Future system improved by rehabilitating/expanding green infra-structure. *Example: New York City, USA.*



E1/E2: Currently basic grey infrastructure w/ low-to-moderate green infrastructure. Future benefits through modest improvements in grey & green infrastructure (e.g., reduce pipe leaks, expand protected green areas). *Example: Rio de Janeiro, Brazil*.

Conclusions

- Substantial numbers of people affected by from incomplete pollution control and degraded ecosystems…..*an economic handicap*
- Traditional response has been grey or traditional engineering approaches
- Huge untapped potential for using “green” and blending it with “gray” engineering to help achieve water security during the SDG era

Additional information:

- environment.asrc.cuny.edu
- water-future.org

*An int'l effort beginning to better quantify grey-green infrastructure for water security (OECD, WaterFuture, WWAP)**

*** Seminar**: ***Sustainable Infrastructure for Inclusive Green Growth***

Convened by: *AfDB, Daegu Metropolitan City, IWMI, SIWI and WWAP*

Wednesday, 29 August | 11:00–12:30

Room FH **Congress Hall C**

Contact: <environment@asrc.cuny.edu>
<crossroads@ccny.cuny.edu>