



Nature for Water

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Green infrastructure & Grey infrastructure

- Anyone who considers where their clean water comes from recognizes the critical role of infrastructure to deliver and maintain a safe and sustainable water supply for all users.
- Today we know much more about the systems and impacts involved in supplying and managing water; from headwater protection to storm water management in urban areas, to flood mitigation and effective water treatment. There are also more options on the table for water management infrastructure. Part of this increase in alternatives includes conversations and actions around green infrastructure, including consideration of performance measures and cost effectiveness.
- Both green infrastructure and grey infrastructure can play an important role in water management However it is important to understand the differences and challenges these alternatives bring from economic, environmental, and social perspectives

Green infrastructure

Green infrastructure is the "strategic use of networks of natural lands, working landscapes, and other open spaces to conserve ecosystem values and functions and provide associated benefits to human populations"

Green infrastructure terminology can also be used in the context of low impact development (LID).

Grey infrastructure

Grey infrastructure refers to the humanengineered infrastructure for water resources such as water and wastewater treatment plants, pipelines, and reservoirs. Grey infrastructure typically refers to components of a centralized approach to water management

River Watershed Alliance - <u>Restoration Project</u>

Blue infrastructure

- Blue infrastructure is a term sometimes used to describe the use of proprietary, small footprint, high-efficiency devices installed and retrofitted within existing water collection systems. Blue infrastructure can be used to connect the benefits of green and grey infrastructure, and is especially practical in challenging redevelopment environments such as tightly spaced urban areas.
- Blue infrastructure aims to mimic green infrastructure's principles, for instance following natural drainage paths, and can serve as a grey infrastructure pre-treatment system or a space-efficient water treatment train

What are Blue Green Cities?

Another emerging term regarding infrastructure in urban areas is Blue Green Cities. This is used to describe work that aims to recreate a naturally-oriented water cycle while contributing to the amenity of the city by bringing water management and green infrastructure together

Examples of green and grey infrastructure

Green infrastructure examples:

- Rainwater harvesting
- Constructed wetlands Watershed restoration and riparian habitat creation/restoration
- Green roofs or rooftop gardens
- Roadside trees and permeable pavement are also examples of green infrastructure.

Grey infrastructure examples:

- Water and Wastewater Treatment Plants
- Lake Newell
- Potable water pipelines
- Flood mitigation berms

Wastewater Treatment Plant

Challenges of grey and green infrastructure

- Compared to green infrastructure, grey infrastructure currently has a clearer asset life, depreciation, and return on investment.
- Challenges surrounding grey infrastructure include funding and public investment, maintenance, and increased urbanization. Urbanization presents a water management challenge because the introduction of more hard surfaces, like concrete or asphalt, contributes to higher volumes of storm water runoff due to a reduction of infiltration. Due to its relative size, construction requirements, and finite life, grey infrastructure can also be seen as inflexible.
- Green infrastructure presents challenges in terms of measuring return on investment, risk management, and effectiveness in urban areas. Current regulation—or absence of regulation at the federal, provincial, and local levels also presents obstacles, as many green infrastructure projects don't fit traditional wastewater treatment construction models, so they may not be standards or building/urban codes to govern how the projects should be implemented
- As a largely untested concept, green infrastructure also faces scientific uncertainty, socio-political uncertainty/acceptance, and decision making uncertainty
- Knowledge and experience for people making decisions and designing and operating green infrastructure presents challenges for traditional approaches. For instance, green infrastructure is thought of more as an urban design, due to the scale and dispersed nature of the works, compared to a large, engineering-focused infrastructure project.

ROI

- Costs of infrastructure, either green or grey, include installation and capital costs, annual operation and maintenance (O&M) costs, opportunity costs, and transaction costs. Further, all types of infrastructure are associated with social costs and benefits, although these are universally hard to measure.
- Generally, there is no market-based evidence of fair value for water infrastructure assets, because of the specialised nature of these assets and the fact that they are rarely sold, except as part of a continuing business. Therefore, most water businesses estimate fair value based on the net present value (NPV) of expected incomes from the asset or on depreciated replacement cost

ROI

Traditionally, grey infrastructure costs also depend on the model of delivery, for instance:

Public-Private Partnership (P3)

In this model a government service or private venture is funded and operated through a partnership of government and one or more private companies.

BOOT (build-own-operate-transfer)

In this long term financing option a private entity (who owns the works) receives concession to finance, design, construct, and operate a facility.

DBOM (design-build-operate-maintain)

This combines the requirements of the project (i.e. design, construction, operation, and maintenance) into one single contract, with funding from the public sector.

Green infrastructure is not a replacement for grey infrastructure and vice versa

- There will always be a requirement for grey infrastructure to guarantee water quality for drinking, treatment of high volumes in small areas, and water transportation. However, depending on the specific localized conditions and objectives, green infrastructure may complement grey infrastructure to help reduce energy costs and create more liveable cities for the future.
- Importance of recognizing the value of a hybrid approach to water issues such as storm water management. For example, green infrastructure can reduce the pressure on grey infrastructure through naturally filtering out non-point source pollutants.
- Awareness of the various options available to tackle individual scenarios and localized environments is growing throughout the water industry, watershed and environmental organizations, and all levels of government.

Thank You!