River Revitalisation for the Triple Bottom Line: International Best Practice and Applications in Hong Kong

David Gallacher

November 25th, 2017
Contents

- River Degradation and Revitalisation
- Hong Kong Context
- Case Studies
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River Degradation - Pollution

Fen River, China

Photo: http://voices.nationalgeographic.org/2013/06/10/can-we-end-the-global-water-crisis/
River Degradation – Flood Control and Channelization

Tokyo, Japan
River Revitalization – The Triple Bottom Line

Revitalizing rivers to maximize direct and indirect environmental, social and economic values and benefits

South Platte River, Denver

Photo: http://www.gizmodo.co.uk/2014/06/7-cities-making-their-urban-rivers-swimmable-again/
The Triple Bottom Line

Environment

- Ecological Value
- Flood Management
- Erosion Control
- Water Quality Improvement
- Air Quality Improvement
- Carbon Sequestration
- Reduced Urban Heat Island

Hong Kong Newt (*Paramesotriton hongkongensis*)

Photo: https://commons.wikimedia.org/wiki/File:Hong_Kong_Newt_(Paramesotriton_hongkongensis)
The Triple Bottom Line

Social
- Public Enjoyment
- Walkability, Cycling and Recreation
- Civic Pride and Environmental Responsibility
- Public Events
- Improved Health
- Education Opportunities

Photo: https://www.trinityhs.org/student-life/blazers-in-the-know/2016-high-school-expeditions/

Chicago River, USA
The Triple Bottom Line

**Economic**
- Direct Employment
- Land and Property Value
- Private Sector Investment
- Avoided Cost for Stormwater Management
- Avoided Costs for Air Pollution Control
- Avoided Costs for Health Care

San Antonio River, USA

Photo: http://www.travelandleisure.com/slideshows/americas-coolest-river-walks#1
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Hong Kong Context

• Upland streams well protected.

• Historically, lowland rivers and drainage channels impacted by:
  – Point and non-point source pollution.
  – Water abstraction: 17 local reservoirs with total capacity of 586.05 m$^3$ million.
  – Flood control and channelization
Hong Kong Context

- 1980-1990 – trapezoidal, concrete lined channels to maximize conveyance
Hong Kong Context

- 1980-1990 – trapezoidal, concrete lined channels to maximize conveyance

- 1990-2000 – Adoption of grasscrete/gabion and other landscape/ ecological enhancement features.
Hong Kong Context

• 1980-1990 – trapezoidal, concrete lined channels to maximize conveyance

• 1990-2000 – Adoption of grasscrete/gabion and other landscape/ ecological enhancement features.

• 2000-2010 – Improved ecological enhancement measures.
Hong Kong Context

• 2015 CE Policy Address 2015 “We will adopt the concept of revitalising water bodies in large-scale drainage improvement works and planning drainage networks for NDAs so as to build a better environment for the public.”

• Policy Agenda 2015 “….promoting greening, biodiversity, beautification and water friendliness in addition to achieving efficient drainage, with a view to building sustainable drainage facilities and providing a better living environment.”

• 15-20 revitalisation projects under consideration.

Proposed revitalization of Kai Tak Nullah
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Case Studies: River Lea, London UK
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The site topography was re-profiled as part of development:

- Some areas raised over 9m, other areas deepened and widened to form wetland bowl within the River Lea.

- The Park is protected against fluvial flooding and manages flooding generated by a 100 year return period rainfall event plus Climate Change allowance.

- Extensive Sustainable Drainage Systems (SuDS, also called Water Sensitive Urban Design, WSUD) to manage runoff generated from the project site.
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- **Natural Water Balance**
  - Precipitation → Evaporation-Transpiration → Runoff → Infiltration

- **Urban Water Balance**
  - Precipitation → Infiltration → Reduced Evaporation-Transpiration → Reduced Quality Runoff → Wastewater Discharge

- **WSUD Water Balance**
  - Precipitation → Evaporation-Transpiration → Reduced Potable Water Consumption → Wastewater Reuse → Stormwater Discharge → Infiltration → Runoff

**Key:**
- Natural State
- Altered State

*Hoban & Wong, 2006*
Case Studies: Urban Stormwater Management, Singapore

- Urban stormwater management features retrofitted to existing drainage systems.

- Linear Wetland collects polluted urban stormwater runoff and cleanses it before discharge into adjacent water channel.

- Provides landscape enhancement alongside existing drainage channels with limited space for more extensive restoration.
Case Studies: Urban Stormwater Management, Singapore

**Active:**
- Providing new community space
- Bring people closer to waters
- Developing a sense of ownership of waters

**Beautiful:**
- Integrating reservoirs and waterways with the urban landscape
- Going beyond flood control and water storage
- Creating aesthetically pleasing lifestyle attractions

**Clean:**
- Improving water quality
- Public education
Case Studies: Urban Stormwater Management, Singapore
Case Studies: Urban Stormwater Management, Singapore

Marina Bay, Singapore

- Develop a customized sustainable development framework to measure, evaluate and monitor the sustainability performance of new CBD.

- Identify gaps and areas for improvements, and develop workable and integrated sustainable design and engineering solutions that can be implemented.
An Integrated Master Planning Approach – Sustainable Systems Integration Model/Method (SSIM™)

A model and methodology for quantifying, evaluating, balancing and costing a wide variety of sustainability strategies to determine the combinations best suited for environmental, social, and economic objectives.

- Addresses eco-system services, energy, transportation, buildings, water, and socio-economics as a holistic system
- Assess sustainability performance of alternative packages
- Quantifies cost and benefit for sustainable outcomes
- Tool to create low-carbon, financially viable project

Case Studies: Urban Stormwater Management, Singapore
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An Integrated Master Planning Approach
– Sustainable Systems Integration Model/Method (SSIM™)

Energy

Water & Storm Water

Urban Heat Island

Landscape & Ecology

Waste - Horticultural Waste

Transport-Walkability
Case Studies: Urban Stormwater Management, Singapore

Idea 1: New Opportunities to Live, Work & Play

Idea 2: Extend the City to Greater Southern Waterfront

Idea 3: Expand the Network of Public Spaces

Idea 4: Capitalise on our Blue Assets

Idea 5: Create a Continuous Waterfront

Idea 6: Connect Green and Open Spaces
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Best Practice and Applications in Hong Kong

- Technical solutions available

Shui Chuen O Estate, Hong Kong
Best Practice and Applications in Hong Kong

- Not just about the river channel – catchment level approach
Best Practice and Applications in Hong Kong

- Collaboration – Public Engagement and Support
Best Practice and Applications in Hong Kong

• Setting Objectives and Data Acquisition
Best Practice and Applications in Hong Kong

- Monitoring, maintenance and adaptive management
Best Practice and Applications in Hong Kong

- Collaboration – Government
Best Practice and Applications in Hong Kong

- Collaboration – Multi-disciplinary design and construction
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