

NbS-16 RIVER STREAM RESTORATION AND CULVERTING



LANDSCAPES SUPPORTED



EbA (ECOSYSTEM-BASED APPROACHES)

- ECOLOGICAL RESTORATION
- ECO-DRR
- CLIMATE ADAPTATION
- INTEGRATED WATER RESOURCE MANAGEMENT
- URBAN BIODIVERSITY CONSERVATION
- SUSTAINABLE URBAN DRAINAGE SYSTEMS
- NATURE-COMPATIBLE INFRASTRUCTURE

MAIN PROBLEMS ADDRESSED



BIODIVERSITY LOSS



FLOOD CONTROL



URBAN HEAT ISLAND



DISASTER RISK
REDUCTION



AIR QUALITY
IMPROVEMENT

River stream restoration and daylighting (or deculverting) involves uncovering buried streams or restoring degraded rivers to their natural states, thereby addressing urban flooding, enhancing biodiversity, and improving urban and rural resilience to climate events in Southeast Asia. Techniques include full channel restoration (removal of culverts and concrete), stream naturalization (reintroducing meanders, riparian vegetation, and wetlands), and partial daylighting (exposing sections of buried streams while maintaining infrastructure). Iconic examples like the Cheonggyecheon River Restoration in Seoul, South Korea, demonstrate how transforming a culverted urban river into a vibrant green corridor can significantly reduce urban heat, improve air quality, and enhance social cohesion.

In rural areas, river daylighting projects such as restoring irrigation canals or small river streams support agricultural sustainability and aquifer recharge. These projects promote ecological connectivity, mitigate urban heat islands, and create recreational green spaces, making cities and rural landscapes more livable and resilient. In Southeast Asia, such initiatives are particularly valuable for cities like Jakarta, Bangkok, and Hanoi, where heavy rainfall, urbanization, and aging drainage systems necessitate innovative flood management. The approach also revitalizes biodiversity, supports local economies through ecotourism, and fosters environmental stewardship.

ECOSYSTEM SERVICES AND ACTIONS

SUPPORTING

- Habitat creation:** Restores natural habitats for aquatic and riparian species, promoting biodiversity.

PROVISIONING

- Water resource enhancement:** Improves water quality and availability for agricultural, domestic, or industrial use.

REGULATING

- Flood mitigation:** Enhances natural water retention, reduces urban flooding, and stabilizes streambanks.

SOCIAL BENEFITS

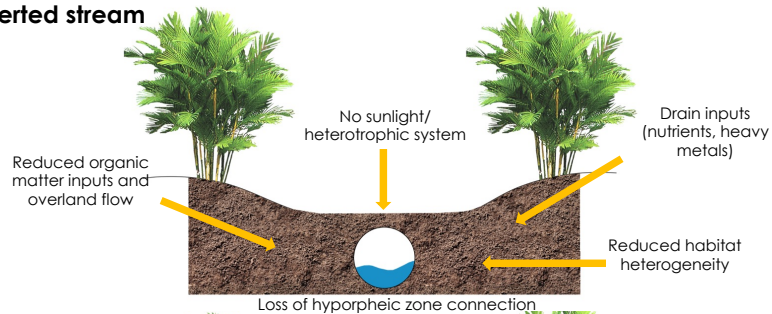
- Recreational spaces:** Provides green and blue spaces for community interaction, health, and well-being.
- Cultural revitalization:** Reconnects communities with historical and cultural significance of waterways.

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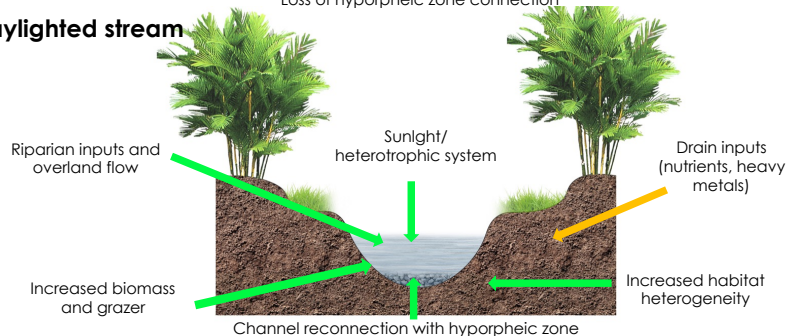
Seoul, Cheonggyecheon Stream Restoration



Culverted stream



Daylighted stream



PROJECT'S CHALLENGES & RISKS

- ❖ **High implementation costs:** River stream restoration and daylighting projects often require substantial investment in infrastructure, land acquisition, and long-term maintenance.
- ❖ **Community opposition:** Local communities and industries may resist changes to existing river infrastructure, especially if they perceive disruptions to current use or property values.
- ❖ **Urbanization constraints:** In densely urbanized areas, available space for stream restoration may be limited, complicating the integration of natural features.

NbS co-BENEFITS AND THEIR INDICATORS

- **Biodiversity Enhancement**
Increased biodiversity index in restored river sections.
- **Flood Resilience**
Reduced frequency of local flooding events after restoration.
- **Water Quality Improvement**
Increased water quality metrics, such as lower concentrations of pollutants (e.g., nitrogen, phosphates).
- **Urban Livability**
Increased public use and satisfaction of green spaces along restored rivers.
- **Climate Mitigation**
Reduced urban heat island effect and carbon footprint in surrounding areas.
- **Economic Revitalization**
Increased local economic activity, such as tourism revenue or property price growth.

COST ANALYSIS

- **Direct Costs**
Excavation, landscaping, and infrastructure costs range from \$1 million to \$10 million per km.
- **Indirect Costs**
Vegetation upkeep and flood management systems costs can reach \$200,000 annually.
- **Time Horizon**
10- to 50-year time horizon, with a discount rate of 3% to 5%.
- **Direct Benefits**
Benefits from increased biodiversity, improved water quality, and reduced flooding.
- **Indirect Benefits**
Increased property values, tourism revenue, and enhanced social well-being from green spaces.
- **Risk Assessment**
Disruption of existing infrastructure, unexpected flooding, and ecological imbalances.

REFERENCES:

South Korea, Seoul, Cheonggyecheon Stream Restoration.
Singapore, Kallang River Daylighting.
USA, Los Angeles River Revitalization.

IMPLEMENTATION OPPORTUNITIES:

Thailand, Bangkok has several covered and heavily modified waterways, including the Klongs (canals).
Vietnam, Ho Chi Minh City's network of canals.
Manila's Pasig River, which is heavily encumbered by pollution and urban development.
Jakarta's Ciliwung River.