



Building Inclusive Urban Resilience

STRENGTHENING ASEAN CITIES THROUGH COLLABORATIVE ACTION AND
EMPOWERMENT OF VULNERABLE GROUPS

What are Nature-based Solutions and why are they relevant?

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Agenda

1. What are Nature-based Solutions?
2. Types of urban Nature-based Solutions
3. Examples of urban Nature-based Solutions



1 WHAT ARE NATURE- BASED SOLUTIONS?

What are Nature-based Solutions?

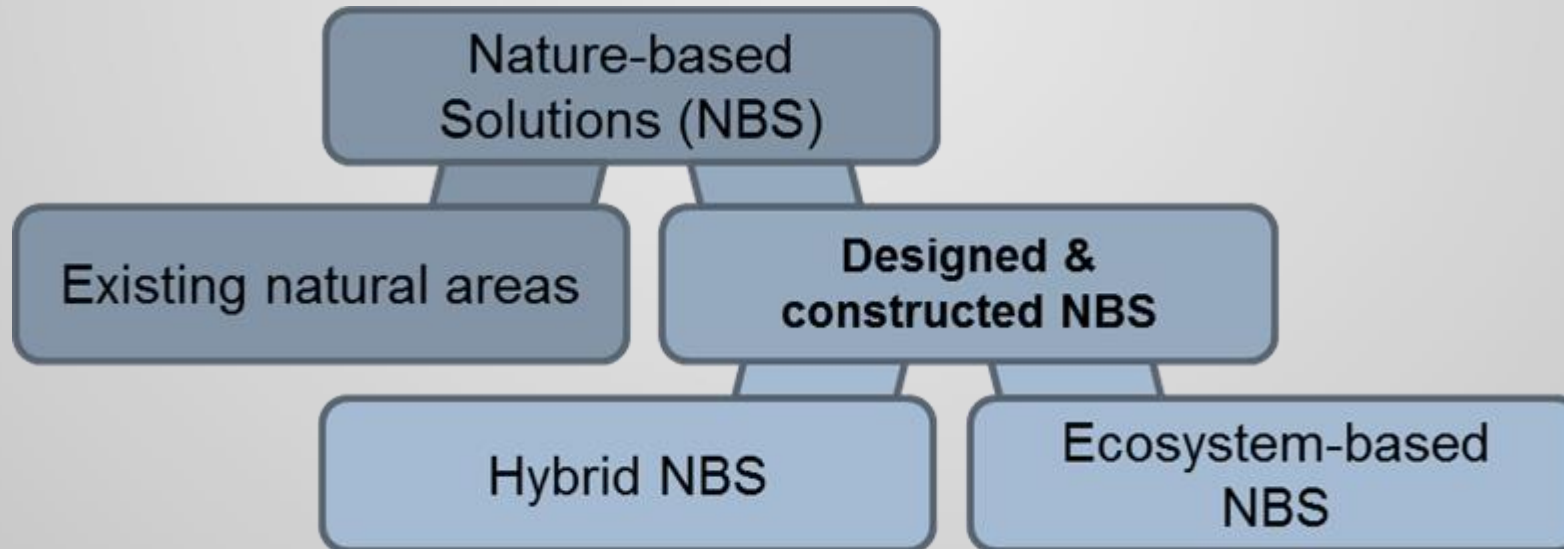
Nature-based Solutions (NBS):

Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience (EC).

Source: EU Commission

Nature-based solutions: 2 “perspectives”

- Existing nature areas → derive ecosystem services from existing ecosystems (*restoration/conservation* approach)
- Designing and constructing natural solutions → design specifically for certain ecosystem services (*installation* approach)





Hybrid solutions

- ✓ Less to not dependent on the site conditions within the city
- ✓ Usually focus on 1 or 2 benefits
- ✓ Often needs little space
- ✓ Have clear business cases

Ecosystem-based solutions

- ✓ Highly connected with local and regional site conditions (soil, groundwater and disturbance)
- ✓ Have multiple benefits
- ✓ Often need more space than hybrid solutions
- ✓ Have complex business cases



2 TYPES OF URBAN NATURE- BASED SOLUTIONS

Types of urban Nature-based solutions:



Protection, restoration and sustainable use of forest landscapes

Secures water supply, erosion control and risk reduction



Urban Forests



Terraces and Slopes



River and Stream Renaturation



Building Solutions



Open Green Spaces



Green Corridors



Urban Farming



Bioretention Areas



Natural Inland Wetlands



Constructed Inland Wetlands



River Floodplains



Mangrove Forests



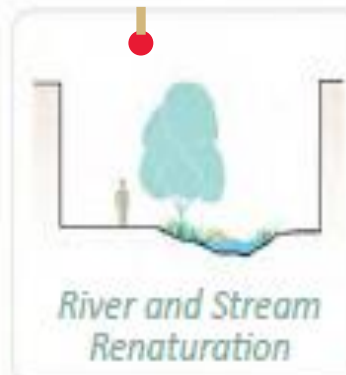
Salt Marshes



Sandy Shores

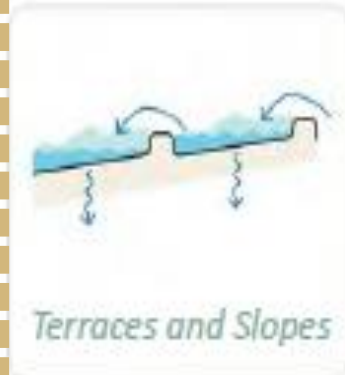
Providing space for rivers to naturally flow

Enables flood protection, water security



Urban green and blue spaces

Empowers climate regulation,
better human health,
social development, green jobs





Urban Forests



Terraces and Slopes



River and Stream Renaturation



Building Solutions



Open Green Spaces

Sustainable management of agroforestry systems
Offers food security, water regulation, economic and social development



Green Corridors



Urban Farming



Bioretention Areas



Natural Inland Wetlands



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River Floodplains



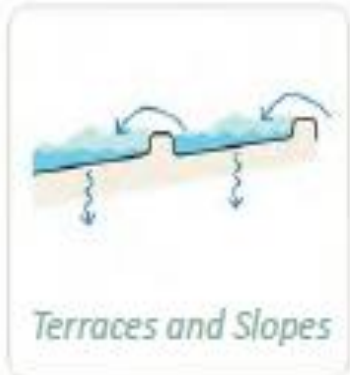
Mangrove Forests



Salt Marshes



Sandy Shores



Protection, restoration and management of wetlands
Provides water storage, flood protection, food production





Urban Forests



Terraces and Slopes



River and Stream Renaturation



Building Solutions



Open Green Spaces



Green Corridors



Urban Farming



Bioretention Areas



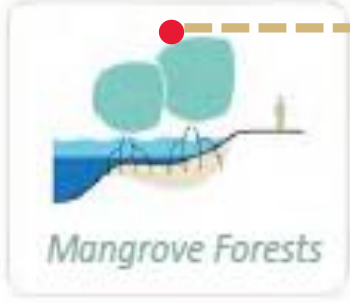
Natural Inland Wetlands



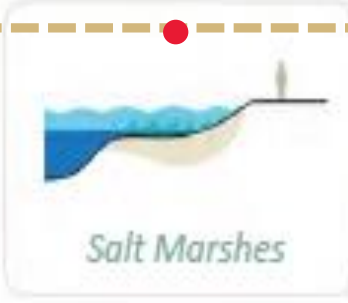
Constructed Inland Wetlands



River Floodplains



Mangrove Forests



Salt Marshes



Sandy Shores

Protection or restoration of coastal ecosystems

Brings community resilience, disaster risk reduction, economic development



Cheonggyecheon stream, South Korea

COP-26: Make Nature-Based Solutions a Top Adaptation Priority – Commentaries (buildingsandcities.org)



Qunli Stormwater Park, China

Qunli Stormwater Wetland Park / Turenscape | ArchDaily



Green Facades, Germany

Düsseldorf Modern architecture: Ko – Bogen 2, detail of green facade with step of plant wall cover the building at Ko – Bogen 2. DUSSELDORF, GERMANY. APRIL 16, 2022. Stock-Foto | Adobe Stock



CityTree by Green City Solutions, UK

Wie ein flacher Baum aus Moos die Stadtluft verbessert | National Geographic



3 EXAMPLES OF URBAN NATURE-BASED SOLUTIONS

Nanyang Technology University School of Art, Design and Media,
Singapore

Thammasat University, Thailand
Centenary Park, Thailand

Tiny Forests, UK

Green Roofs



Fukoka Prefectural International Hall, Japan



Extensive Green Roofs with a thin growing medium (livingroofs.org)

Most regular are the green roofs with vegetation layer adjusted to the local climate, used for aesthetical value and roof insulation. These roofs are called 'extensive green roofs' and usually only accessed for maintenance.

Green roofs can be designed as leisure areas. Especially large office buildings and houses have installed these. They can be regarded as rooftop parks. An inspiring example is Nanyang Technological University School of Art, Design and Media, Singapore. More: Greenroofs.com



Nanyang Technological University (NTU) School of Art, Design and Media (ADM) - Greenroofs.com



<http://www.daktuinen.nl/rotterdam-dakakker/>

More and more green roofs are used for urban agriculture. Local food production in cities. Two innovative examples are 'Dakakker' in Rotterdam (NL) and Thammasat University (Thailand).

Multiple benefits:



Storm water
buffer



Rooftop
insulation



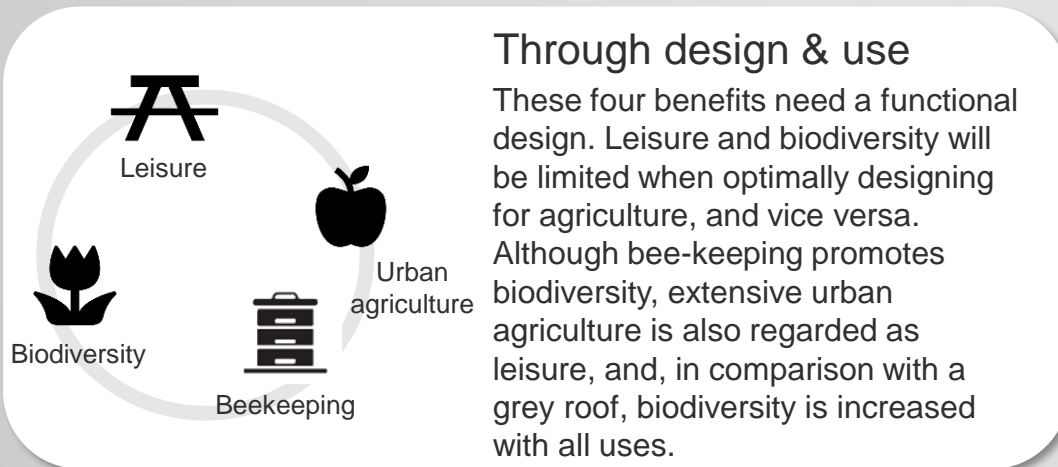
Esthetical
values



Noise
reduction

By construction & design

Any type of green roof will supply these four benefits. The effectiveness of storm water buffer is dependent on the thickness of the sandy layer which also improves roof insulation. Shrubs and trees often are the best noise reducers.



Heat
reduction



CO₂ fixation

Improved through design & maintenance

Both benefits are dependent on living plants and water availability during periods of high temperature (reached by irrigation).



Enhanced water quality



Air purification

Additional benefits

Both these benefits are not that pronounced. Water is filtrated by the sandy layer and floating particles in the air are caught off by vegetation.

Disadvantages

- ✓ Quite costly (costs Europe & ASEAN)
- ✓ High maintenance

Incentives for

Municipality a) Stormwater management, b) Creating green spaces for leisure, c) Biodiversity, d) Insulation of buildings

House-owner a) Insulation, b) Esthetical value

Citizens a) Creating green spaces for leisure, b) Urban farming

Insurance company Roof protection

Thammasat University, Thailand

Thammasat University Urban Rooftop Farm (TURF) - Featured Project - YouTube



Centenary Park in Bangkok, Thailand (44,800 m²)



A combination of:

- ✓ Green roofs (incl. water storage tanks under the roof)
- ✓ Artificial wetlands
- ✓ Rainwater retention (gradient of 6% from west to east, with a pond at the end)

To address:

- ✓ Flooding
- ✓ Urban Heat

Costs:

- ✓ Construction 27 million euros
- ✓ Maintenance around 0.29 euros/m²

Tiny Forests

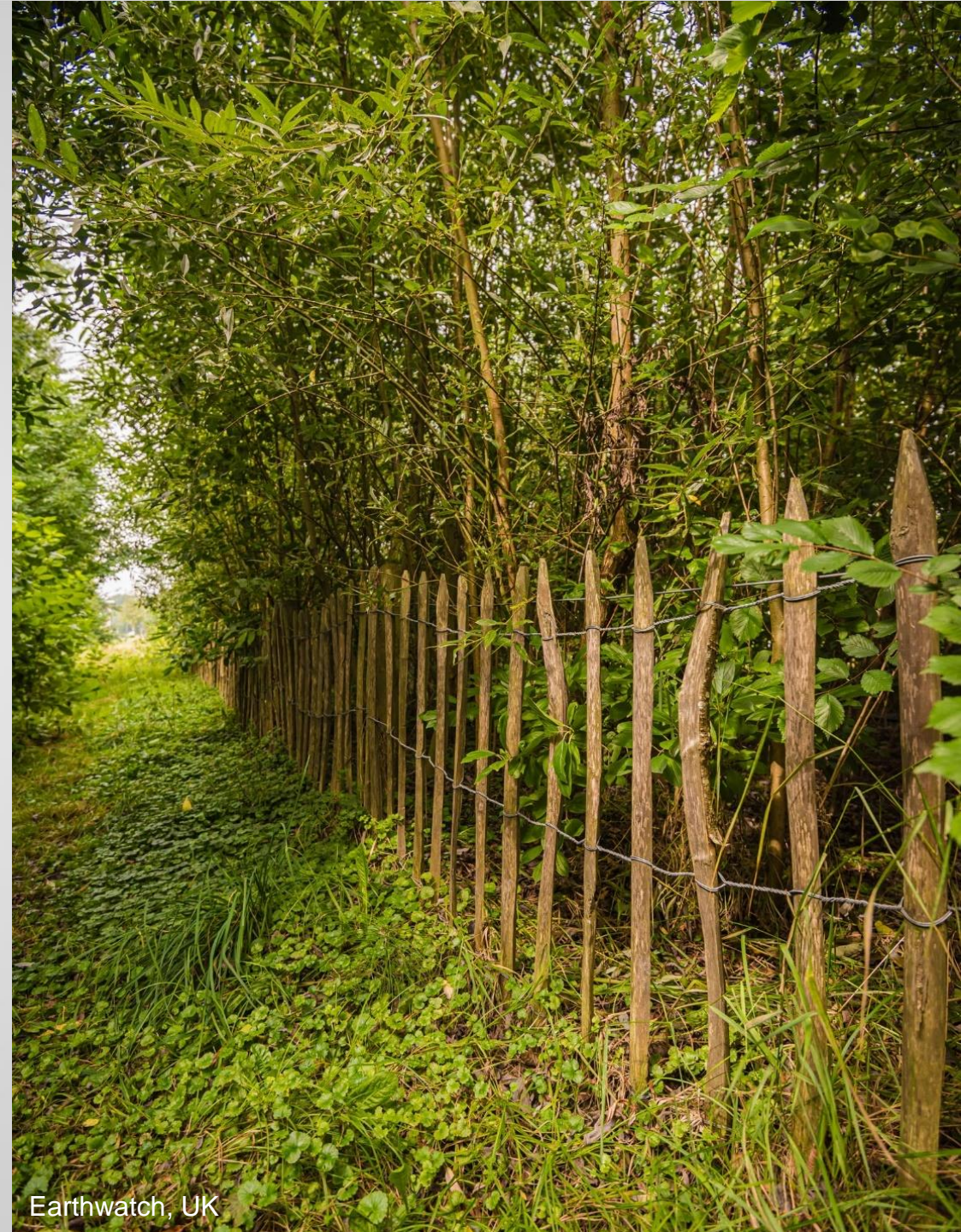


Tiny Forest: an ecosystem-based NBS

A Tiny Forest is a dense, fast-growing, native woodland around the size of a tennis court (approx. 200 m²), which is combined with an engagement programme to support community ownership and provide social benefits.

Characteristics of a Tiny Forest

- ▲ Fast growth
- ▲ Low mortality
- ▲ Mix of several forest layers
- ▲ Low maintenance





- ▲ Green space for urban residents
- ▲ Engagement
- ▲ Education
- ▲ Bringing nature to neighbourhoods

- 
- ▲ Carbon capture
 - ▲ Biodiversity enhancement
 - ▲ Thermal comfort
 - ▲ Flood mitigation
 - ▲ Human health and well-being
 - ▲ Air quality improvement
 - ▲ Noise pollution mitigation

Case: over 200 sites in UK, implemented by Earthwatch

Tiny Forest | Super Tiny. Super Powerful

A closer look at a Tiny Forest



600 trees planted densely in a tennis-court size plot, maximising benefits per m² of land



Planting method encourages **accelerated forest development** and uses **no chemicals or fertilisers**



Low management and maintenance requirements after the first two years



Rich biodiversity, capable of attracting over 500 animal and plant species within the first 3 years



A nature-rich **accessible green space** and **outdoor classroom** for people to reconnect with nature



Monitoring data gathered by citizen scientists to help understand how Tiny Forests develop, and quantify the **climate benefits**

Community engagement to capitalise education, health & well-being services

Volunteering opportunities giving people a sense of purpose in caring for and maintaining their forest

A living, breathing place for people to relax, enjoy and appreciate nature

Educating and inspiring young people as an outdoor classroom

Bringing a nature-rich green space to people that may not otherwise be able to access nature

Enabling social connections through volunteer planting and monitoring events

Financing model of UK Tiny Forests:

- ✓ Tiny Forests sold as **solution packages**: biodiversity & community
Includes the forest preparation & planting, community engagement & platform facilitation
- ✓ **Corporate companies** lining up to finance them for social responsibility
- ✓ **Municipalities** provide land and security
- ✓ Main incentives financiers: **improving living conditions & biodiversity boost**
- ✓ Unexpected: companies like to be part in **unique citizen science** programme
- ✓ Main incentive citizens to participate: **nature on your doorstep & biodiversity boost**

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