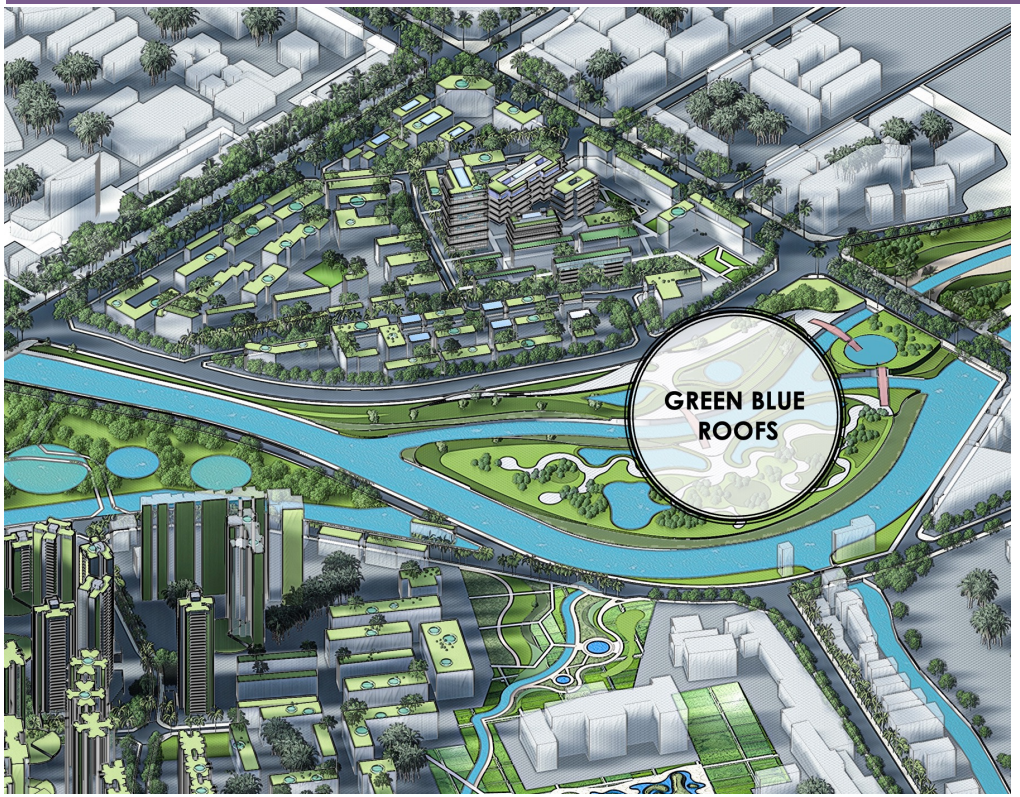
NbS-27: GREEN & BLUE ROOFS AND FACADES



Green and blue roofs, along with vegetated facades can mitigate urban heat island effects and enhance resilience to climate events, as they integrate vegetation layers that provide cooling through evapotranspiration and shade, reducing ambient and building temperatures. Blue roofs incorporate water retention systems to manage stormwater, effectively mitigating risks from intense rainfall and cloudbursts. In Southeast Asia, where rapid urbanization, high humidity, and frequent extreme weather events amplify vulnerability to climate impacts, they can support urban farming, enhance biodiversity by attracting pollinators, and host solar panels to optimize energy generation, all while providing recreational spaces for urban dwellers. These hybrid NbS can also incorporate smart technologies for dynamic water storage management, helping cities to address seasonal flooding. Socially and economically, green and blue roofs can improve urban liveability by creating aesthetic landscapes, reducing energy costs for cooling, and supporting local economies through urban agriculture or green jobs. Integrating native, drought-tolerant, and water-absorbent plant species that enhance functionality and reduce maintenance needs, green roofs foster climate resilience by promoting sustainable urban ecosystems and increasing community adaptation capacity.

LANDSCAPES SUPPORTED

EbA (ECOSYSTEM-BASED APPROACHES)

URBAN HEAT MITIGATION | STORMWATER MANAGEMENT | BIODIVERSITY ENHANCEMENT | WATER CYCLE REGULATION | FLOOD RESILIENCE | ENERGY EFFICIENCY

MAIN PROBLEMS ADDRESSED

FLOOD CONTROL

AIR QUALITY IMPROVEMENT

URBAN HEAT ISLAND

ECOSYSTEM SERVICES AND ACTIONS

SUPPORTING

- Habitat creation for biodiversity, including pollinators and urban wildlife.
- Soil formation and nutrient cycling through planted systems and organic matter accumulation.

REGULATING

- Mitigating the urban heat island effect through evapotranspiration and shading.
- Managing stormwater by retaining and slowing runoff, reducing urban flooding risks.

PROVISIONING

- Supporting urban agriculture and rooftop farming for local food production.
- Capturing and storing rainwater for reuse in irrigation or building systems.

SOCIAL BENEFITS

- Providing green recreational spaces that improve mental health and community cohesion.
- Enhancing urban aesthetics and property values, creating more attractive and livable cities.

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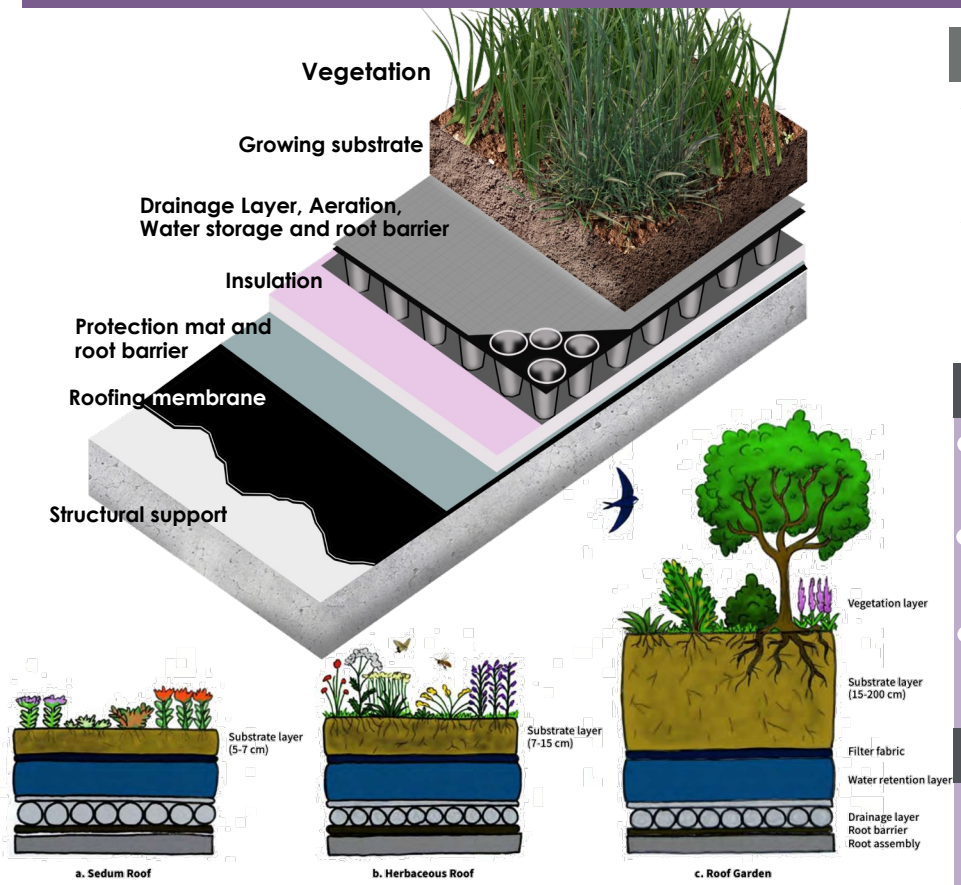
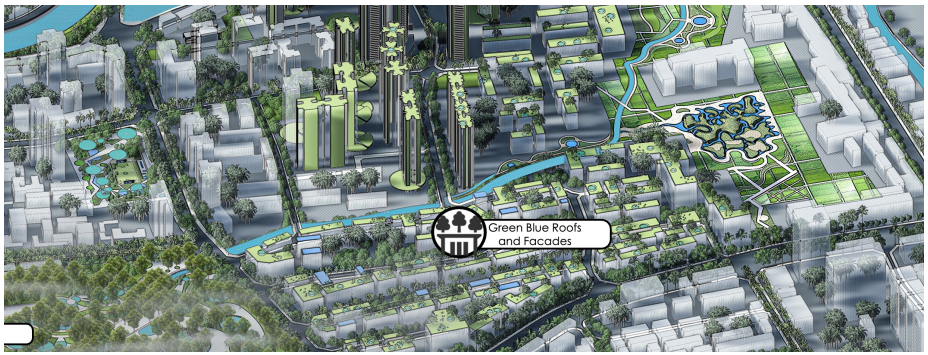


Green roof layer scenarios and landscape and climate functions : Sedum roof, Herbaceous roof and roof garden



PROJECT'S CHALLENGES & RISKS

- **High Maintenance Costs**: Regular upkeep, including irrigation, pest control, and structural inspections, can be expensive and resource-intensive.
- **Structural Limitations**: Many buildings in Southeast Asia, especially older or informal structures, may lack the load-bearing capacity to support green or blue roof systems.
- **Climate-Specific Plant Selection**: Identifying and sourcing resilient native plants that can thrive in extreme heat and humidity while withstanding heavy rains can be challenging.

NbS co-BENEFITS AND THEIR INDICATORS

- **Urban Heat Island Mitigation**
  Reduction in surface temperatures by 2–4°C, measurable via infrared thermal imaging.
- **Stormwater Management**
  Retention of rainfall, monitored through water runoff volume sensors.
- **Improved Air Quality**
  Reduction in particulate matter (PM2.5) levels, tracked using air quality monitors near installations.
- **Biodiversity Enhancement**
  Increase in pollinator visits and bird species diversity, assessed through regular biodiversity surveys.
- **Energy Efficiency**
  Decrease in building cooling energy demand by 10–15%, measured through energy consumption logs.
- **Social Well-being**
  Increased use of rooftop spaces for recreation or urban farming, quantified through user surveys and activity counts.

COST ANALYSIS

- **Direct Costs**
  Installation costs range from $75 to $250 /m2 for green roofs and $150 to $400 /m2 for blue roofs.
- **Indirect Costs**
  Maintenance expenses, including irrigation and structural inspections, typically range from $5 to $15/m2 annually.
- **Time Horizon**
  Project lifespan of 20–50 years, with discount rates between 3–7% for long-term sustainability projects in Southeast Asia.
- **Direct Benefits**
  Energy savings of $1–$3/m2/year from reduced cooling needs, and stormwater fee reductions ranging from $0.50 to $2/m2/year
- **Indirect Benefits**
  Enhanced property values and avoided health costs due to better air quality.
- **Risk Assessment**
  structural damage from improper design or maintenance.

REFERENCES:

Singapore : Marina Barrage Green Roof 10,000 m2 rooftop garden and Kampung Admiralty, vertical urban village.
Netherlands, Smart Green-Blue Roofs of Resilio Project, Amsterdam.

IMPLEMENTATION OPPORTUNITIES:

Jakarta: Menteng and Sudirman areas.
Metro Manila: Quezon City and Makati.
Bangkok: Sukhumvit and Silom.
Cambodia, Phnom Penh: Tonle Bassac, BKK1.
Myanmar, Yangon central urban districts: Dagon Township.