

Mangroves: Coastal defences for urban disaster resilience

A city's key ally in coastal protection with multiple co-benefits

Urban planners face complex challenges in land-use and resilience planning, balancing economic development with climate change and nature conservation. Mangrove forests can play a key role in combining these interests as they protect cities in the tropics and subtropics from climate and water-related hazards, but also provide cities with many economic and social benefits.

How do mangroves contribute to urban disaster resilience?

Mangrove ecosystems are critical buffers against extreme climate events and other shocks. Their dense vegetation reduces wave height, prevents erosion and absorbs storm energy. By facilitating accretion of sediment they can increase the height of the coastal strip helping to cope with sea-level-rise. In this way mangroves can protect critical infrastructure, such as airports and other economic assets, e.g. high rise buildings.

Co-benefits

Mangroves also provide other ecosystem services that benefit cities. They can be especially useful in reducing heat, offering a space for recreation and serve as wildlife habitat. Mangroves also sequester and store up to 10 times more carbon than terrestrial forests, support fisheries and provide food and raw material for livelihoods.

Therefore, restoring and protecting mangroves is a cost-effective strategy

to help cities provide safer and more prosperous environment to their inhabitants.

How can cities maximize mangroves' benefits?

Mangroves can optimally contribute to urban resilience and sustainable development if they are; well protected, their hydrology is intact and they are integrated into the urban fabric as part of blue-green infrastructure.

- Creating **parks** with walking and bicycle paths along rivers and streams
- **Connecting mangroves to the urban drainage system** as stormwater reservoirs, floodplains and drainage channels, coupled with green roofs and bioswales.
- **Integration** with traditionally engineered "grey" solutions, e.g. water plazas, drainage channels, dikes, levees or cheniers.
- **Application alongside other ecosystem solutions** e.g. restoration of biogenic reefs, floodplains and other wetlands.

Mangroves' potential in numbers

- Sedimentation rate up to 15mm/year (Alongi 2015)
- Reduce up to 70% of wave energy (non-storm conditions) (Whelchel et. al. 2018)
- Buffer waves of up to 4m (Whelchel et al. 2018)
- Lower storm surge height: by up to 50cm per km width of mangrove belt (Mc Ivor et. al 2012)
- Mangrove ecosystem services, worth US\$33,000-57,000 per hectare per year
- Store up to 10 times more carbon than tropical forests

Mangroves protecting Panama City's real estate

Disaster Risk Reduction benefits



Protection from wind waves and storm surge



Erosion and sediment control



Adaptation to sea level rise by soil accretion



Tsunami protection

Co-benefits



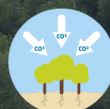
Recreation & Tourism



Biodiversity habitat



Fisheries production



Carbon storage & sequestration

How can urban planners incorporate mangroves into their decision-making?

- **Include mangroves** and their services as key components in your city's urban development and resilience plans.
- As part of spatial-or land-use planning, assign a specific **zoning** to mangrove areas and other key ecosystems, protecting them from urban development. Restore key ecosystems where they have been lost and create joint ownership and care of the area by involving communities and local conservation groups.
- Establish and enforce a **building code** that prevents conversion and degradation of key ecosystem zones, including the prevention of off-site impacts such as hydrological disturbance and pollution.
- When developing recreational areas for tourism in the city, include access

to mangroves via board walks and provide educational materials and eco-guides.

- When developing water infrastructure projects, apply a **comprehensive Cost Benefit Analysis (CBA)** that includes all mangrove benefits. When tendering, governments should demand that proposals maximize co-benefits for recreation, climate and biodiversity.
- When developing **connectivity** plans, incorporate bicycle and walking lanes that connect different areas of the city to the mangroves without needing a car or bus.
- In case mangroves have been destroyed, restore the hydrology and mangroves in places where they have existed before, with native species only! Mangroves best grow in areas where they have been before.

Protect your urban wetlands!

Wetlands International invites you to work with us to jointly transform cities into safer and more prosperous living spaces.

Urban planning exercise in Tacloban, Philippines



More information

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Mangroves for coastal defence - Guidelines for coastal managers & policy makers

Wetlands International & The Nature Conservancy <https://www.nature.org/media/oceansandcoasts/mangroves-for-coastal-defence.pdf>

Photos by Wetlands International
Panama / Global Office.

Mangrove Restoration: To Plant or Not to Plant

Wetlands International
<https://www.wetlands.org/publications/mangrove-restoration-to-plant-or-not-to-plant/>

Wetlands International is supported by the National Postcode Lottery of the Netherlands.

