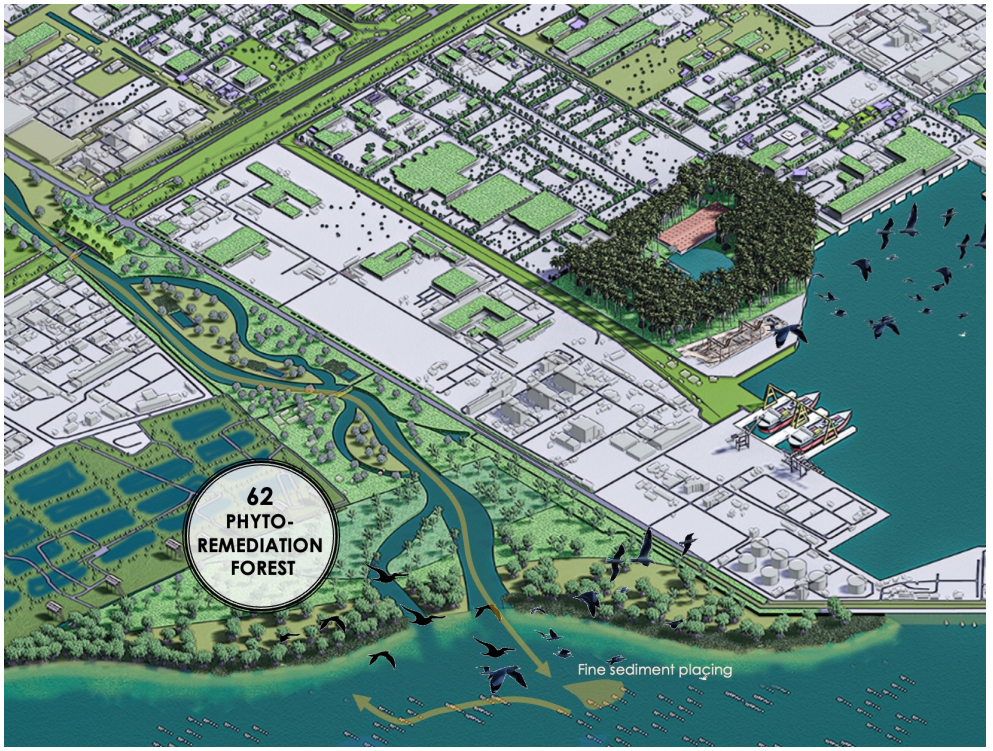
# NbS-62: PHYTOREMEDIATION FOREST CORRIDORS




Phytoremediation forest corridors use plants and trees to remove, stabilize, or degrade contaminants in soil, water, and air, aiding in ecosystem restoration. Hyperaccumulator plants play a key role through processes like phytoextraction (absorbing contaminants), phytostabilization (immobilizing pollutants), phytodegradation (breaking down toxins), and rhizofiltration (filtering water contaminants). Mangrove forests, especially along coastlines and estuaries, are highly effective in trapping sediments, reducing soil toxicity, and enriching landscapes with nutrients.

These corridors not only address pollution but also promote biodiversity, carbon sequestration, and soil health. They provide essential ecosystem services like flood control, coastal protection, and the restoration of degraded lands (e.g., post-mining areas or agricultural soils). Additionally, they enhance local livelihoods by supporting sustainable resource use, making them valuable for both environmental and community resilience.

**LANDSCAPES SUPPORTED**

## EbA (ECOSYSTEM-BASED APPROACHES)

- POLLUTION CONTROL & REMEDIATOIN
- SOIL & WATER QUALITY IMPROVEMENT
- EROSION & SEDIMENT CONTROL
- BIODIVERSITY CONSERVATION
- CLIMATE RESILIENCE
- COMMUNMITY BASED CO-BENEFITS

## MAIN PROBLEMS ADDRESSED

- SOIL EROSION
- BIODIVERSITY LOSS
- FLOOD CONTROL
- DISASTER RISK REDUCTION
- CARBON SEQUESTRATION

## ECOSYSTEM SERVICES AND ACTIONS

### SUPPORTING

- **Enhance soil formation and microbial activity** by fostering nutrient cycling and organic matter buildup through phytostimulation and litter decomposition.

### REGULATING

- **Filter pollutants and improve water quality** through rhizofiltration and phytostabilization, reducing sediment toxicity in wetlands and coastal areas.

### PROVISIONING

- **Provide biomass resources**, including wood, fodder, and non-timber forest products from phytoremediative vegetation.

### SOCIAL BENEFITS

- **Improve community health** by mitigating soil and water contamination and creating green spaces for recreation and cultural value.

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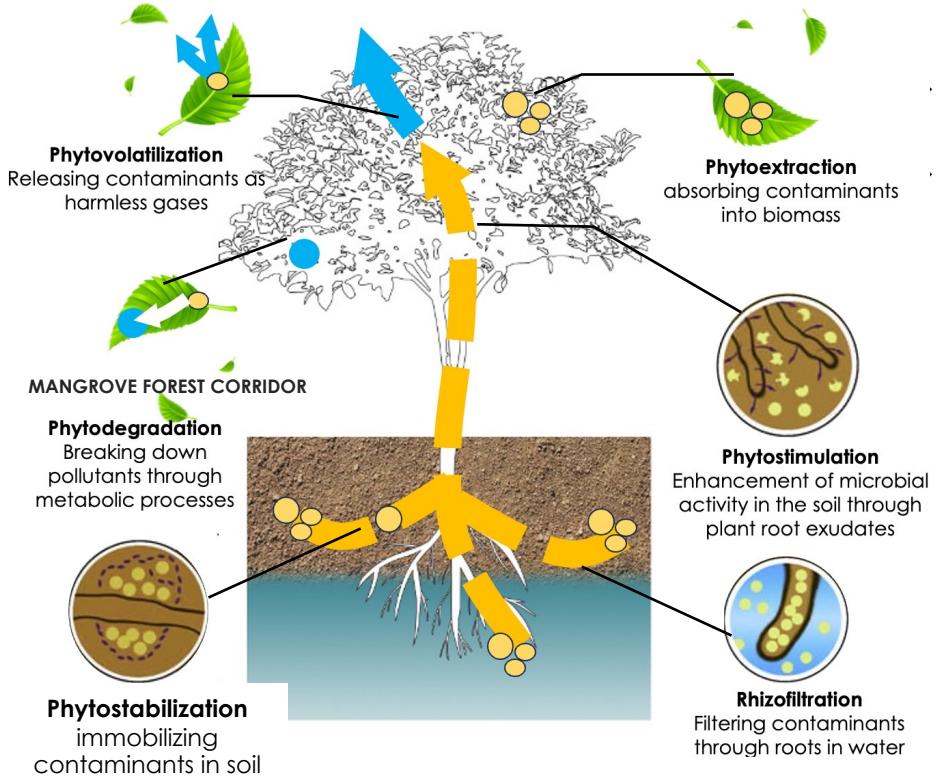


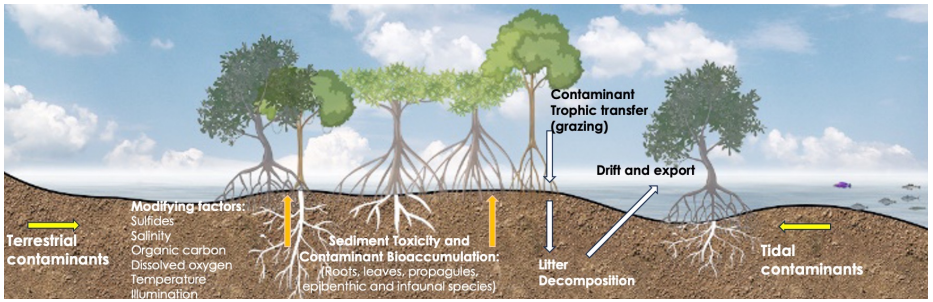


## PROJECT'S CHALLENGES & RISKS

- **Limited species adaptability**: Selecting the right hyperaccumulator plants for local soil, climate, and pollution conditions.
- **Long-term effectiveness**: Phytoremediation processes, such as phytoextraction and stabilization, often require extended timeframes to significantly reduce contaminants, delaying visible ecosystem benefits.
- **Contaminant re-release risks**: Improper management of harvested biomass from hyperaccumulators can lead to the re-release of toxic elements back into the environment.
- **Socioeconomic conflicts**: Balancing land use for phytoremediation corridors with community needs for agriculture, infrastructure, or resource extraction can cause disputes and hinder project implementation.

## NbS co-BENEFITS AND THEIR INDICATORS

- **Enhanced Soil Health**
  Phytoextraction reduces toxic heavy metals, indicated by a measurable 20-50% decrease in soil contamination levels over 5 years.
- **Erosion Control**
  Stabilized soil reduces sediment loss, indicated by a 30-50% reduction in annual soil erosion rates in treated areas.
- **Biodiversity Conservation**
  Restored habitats support native species, indicated by a 15-30% increase in flora and fauna diversity within 3 years.
- **Carbon Sequestration**
  Forest corridors absorb atmospheric $CO_2$, indicated by 5-10 tons of carbon stored per hectare annually.
- **Improved Water Quality**
  Rhizofiltration reduces pollutants in runoff, demonstrated by a 30-60% decline in waterborne heavy metals and nitrates near project sites.
- **Community Livelihood Support**
  Agroforestry or forest-based products generate income, indicated by a 10-20% increase in household earnings from sustainable forest resources.

## COST ANALYSIS

- **Direct Costs**
  Establishment costs for phytoremediation species and planting range from $1,500–2,500/ha depending on site conditions.
- **Indirect Costs**
  Monitoring, maintenance, and capacity-building programs can cost an additional $500–800/ha/year.
- **Time Horizon**
  10–20 years, using a 4–7% discount rate to account for long-term environmental benefits.
- **Direct Benefits**
  Saving of $2,000–5,000/ha in future land rehabilitation and clean-up costs.
- **Indirect Benefits**
  Enhanced biodiversity, carbon sequestration, and community livelihoods provide ecosystem service values of $5,000–8,000/ha/year.
- **Risk Assessment**
  Costs related to potential plant failure, pest outbreaks, or stakeholder disputes are estimated at $200–500/ha/year as contingency planning.

## REFERENCES:

**Indonesia**, East Kalimantan mining sites reclamation using hyperaccumulator plants for nickel, lead, and mercury detoxification.
**Philippines,** Palawan Forest and Coastal Restoration Phytoremediation corridors.

## IMPLEMENTATION OPPORTUNITIES:

**Indonesia**, Sumatra Palm Oil plantations.
Laos, Bolaven Plateau post-mining region.
**Malaysia**, Sarawak degraded peatland forests from mining.