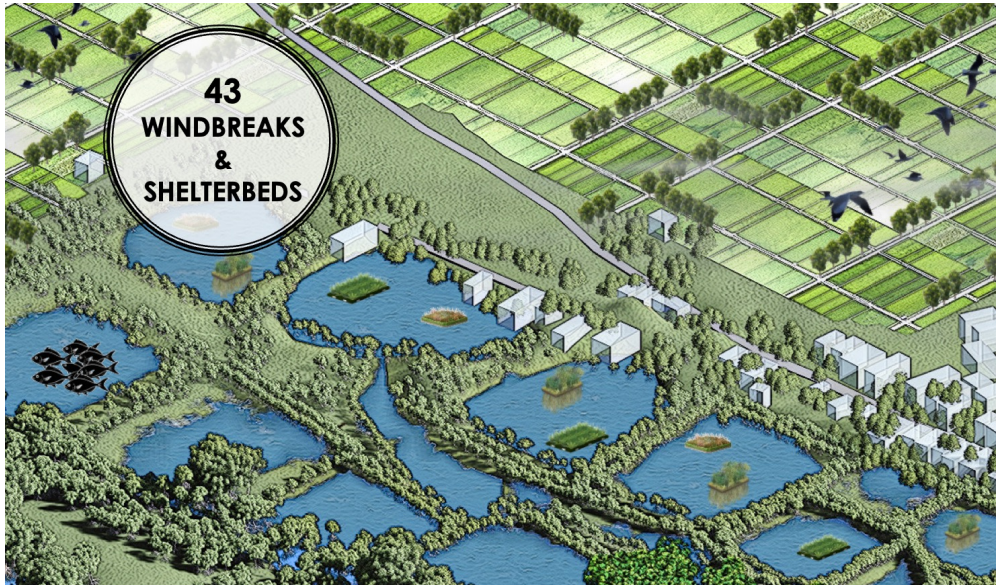
NbS-43: WINDBREAKS AND SHELTERBELTS



Windbreaks and shelterbelts are strategically planted rows of trees, shrubs, or vegetation designed to reduce wind speed, manage soil erosion, and enhance microclimates in rural farmlands and sandy shorelines.

In agricultural settings, windbreaks protect crops from wind damage, reduce evapotranspiration, and improve soil fertility through organic matter accumulation, supporting regenerative agriculture and sustainable yields. On sandy shorelines and dunes, shelterbelts stabilize sediments, prevent coastal erosion, and create natural barriers against storm surges. Types include single-row windbreaks (effective for smaller farmlands), multi-row shelterbelts (ideal for broader climate resilience), and dune vegetation belts (adapted for coastal landscapes). Technically, these structures reduce wind velocity by 30–50% and alter wind directions, fostering calmer microenvironments while serving as habitats for biodiversity. Contextually, they provide multifunctional benefits, including carbon sequestration, enhanced water retention, and livelihoods through agroforestry or coastal eco-tourism. With careful species selection (e.g., Casuarina, Acacia, and mangroves) and community engagement, windbreaks and shelterbelts contribute to climate resilience, sustainable landscapes, and socio-economic benefits for rural and coastal areas in Southeast Asia.

LANDSCAPES SUPPORTED

EbA (ECOSYSTEM-BASED APPROACHES)

- INTEGRATED LANDSCAPE MANAGEMENT
- ECOSYSTEM RESTORATION
- AGROFORESTRY SYSTEMS
- BIODIVERSITY CONSERVATION
- COASTAL ZONE MANAGEMENT

MAIN PROBLEMS ADDRESSED

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

ECOSYSTEM SERVICES AND ACTIONS

SUPPORTING

- Enhance soil formation and fertility by reducing erosion and improving organic matter through leaf litter deposition.

REGULATING

- Act as natural barriers to reduce wind velocity, prevent soil erosion, and limit the spread of airborne sand and salt in coastal and farmland areas.

PROVISIONING

- Provide timber, fuelwood, and non-timber products (e.g., fruits, nuts, and medicinal plants) for local communities.

SOCIAL BENEFITS

- Improve agricultural yields by creating favourable microclimates and protecting crops, while also offering aesthetic and recreational value to rural landscapes.

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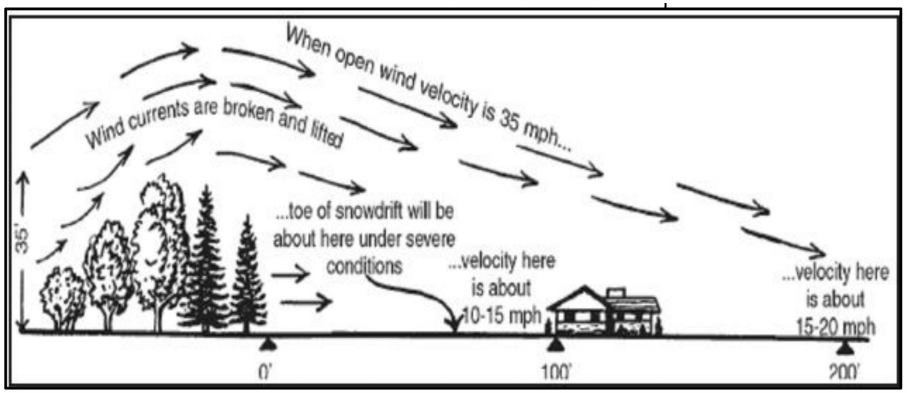

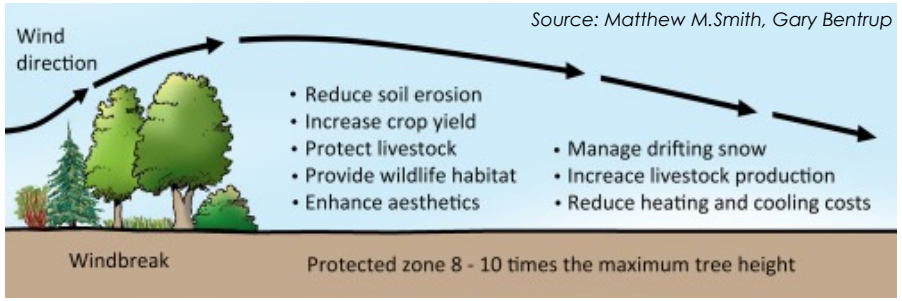

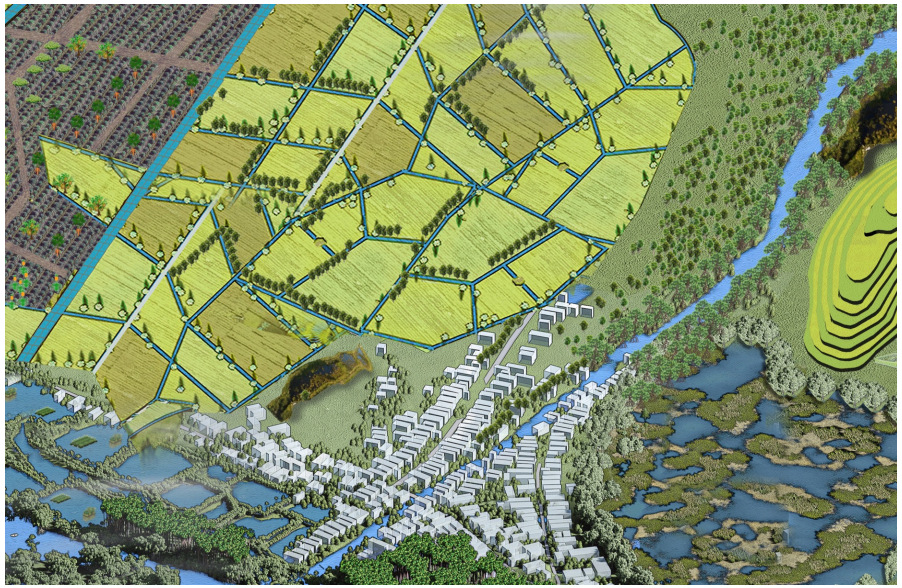

PROJECT'S CHALLENGES & RISKS

- **Land Competition**: Limited availability of land in densely populated or heavily farmed regions may restrict the implementation of windbreaks and shelterbelts.
- **Maintenance and Upkeep**: Regular maintenance, including pruning and replanting, can be labor-intensive and costly for communities with limited resources.
- **Climate Suitability**: Selecting species that thrive under specific tropical or coastal conditions can be challenging, leading to potential failure of plantings in unsuitable areas.
- **Pests and Diseases**: Monoculture shelterbelts may attract pests or diseases that can spread to nearby agricultural fields, reducing their effectiveness.

NbS co-BENEFITS AND THEIR INDICATORS

- **Improved Agricultural Productivity**
  Reduction in crop damage from wind and soil erosion increases average yields by 10–20%.
- **Carbon Sequestration**
  Shelterbelt trees absorb up to 5–10 metric tons of CO_2 per hectare annually.
- **Biodiversity Enhancement**
  Increased habitat diversity supports a 30–40% rise in local bird and pollinator populations.
- **Microclimate Regulation**
  Wind velocity reduced by up to 50%, improving thermal comfort, reducing evapotranspiration in farms.
- **Livelihood Support**
  Agroforestry-integrated windbreaks provide additional income source (timber, fruits, fuelwood).
- **Soil Conservation**
  Erosion rates drop by 50–70% in fields protected by windbreaks, preserving arable land and reducing sedimentation in waterways.

COST ANALYSIS

- **Direct Costs**
  Tree planting, fencing, and maintenance, range from $2k–$5k/ha depending on site conditions.
- **Indirect Costs**
  Opportunity costs of land use for windbreaks may result in $500–$1,5k/ha in forgone agricultural income annually.
- **Time Horizon**
  Benefits typically accrue over 10–30 years, with discount rates of 5–10% commonly applied in Southeast Asia.
- **Direct Benefits**
  Increased agricultural productivity and timber revenues provide $1k–$3k/ha/year after establishment.
- **Indirect Benefits**
  Soil conservation, carbon sequestration, and enhanced biodiversity contribute non-market values.
- **Risk Assessment**
  Risks include tree mortality from drought or pests, requiring an additional contingency budget of 10–20% of direct costs.

REFERENCES:

China's Three-North Large-scale Shelterbelt Program (Great Green Wall).
Vietnam , Mekong Delta Agroforestry Initiative.
India, Tamil Nadu Coastal Shelterbelt Project.

IMPLEMENTATION OPPORTUNITIES:

Myanmar, Dryland Farming Areas of Central.
Vietnam , Mekong Delta.
Indonesia, Sandy Shorelines of Central Java.
Philippines, Coastal Areas of Luzon.