UN Environment-DHI Centre on Water and Environment
CTCN CLIMATE TECHNOLOGY CENTRE & NETWORK
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Riparian buffers

Challenge: Water pollution **Adaptation response:** Limiting nutrient leakage

Description

Riparian buffers are strips of vegetation along the banks of waterways (lakes, rivers, streams, etc.) that protect the water from potential pollutants from the surrounding land area, such as those from agricultural land and activities. Riparian buffers stop sediments and pollutants through biological processes in which the vegetation actively absorbs the nutrients, or physiochemical processes in which nutrients, other pollutants and sediments bind to the soil or clay in the buffers. The buffers are predominately forested with native trees, but can also contain smaller native bushes and shrubs.

Riparian buffers are often naturally present, but they are under pressure in many areas due to human activities such as urbanization and agriculture. They can also be "man-made" when trees and shrub seedlings are planted along waterways to catalyse the growth of a buffer zone. The area can also be left untouched to encourage natural regeneration, although this may take a long time and species composition cannot be as controlled.

Riparian buffers play an important role in climate change adaptation. The shade over the waterways provided by the vegetation decreases fluctuations in water temperature, which can negatively affect water quality, while their ability to purify runoff and slow water flow (mitigate downstream flooding) is particularly important in the context of climate change..

Implementation

Measuring and documenting water quality before buffer implementation is important for evaluating the project's efficiency and impacts. Additional analysis includes a retention capacity assessment on trapping pollutants and sediment. Implementation might include launching protective measures for existing growth, or establishment of a new buffer zone and vegetation. Preparatory steps for the soil to avoid presence of unwanted competition, particularly weeds and grasses, might also be necessary. Over time little maintenance is typically needed, though it could include unwanted vegetation removal, as well as monitoring downstream water quality impacts.

Environmental Benefits

- Helps maintain ambient water quality by absorbing pollutants and sediments washed out from surrounding land. Farmland in particular contains heavy loads of nutrient pollutants that can cause eutrophication and possibly even anoxic conditions if they enter the water.
- Slows down water flow during storms, protecting the areas downstream against flooding.
- Provides shading, reducing the water temperature increases.
- Stabilizes (vegetation root system) banks and soil surrounding the waterways, reducing soil erosion risks. This prevents sediment from being washed into the water, affecting water quality.
- Creates habitats for a wide range of species, increasing biodiversity.

Socioeconomic Benefits

- Provides recreational and aesthetic value to local communities.

- Contributes to high ambient water quality and stable soil conditions, which in turn provide food security and economic benefits (agriculture and fish) to local communities.

Opportunities and Barriers

Opportunities:

- Little and low cost maintenance and management once mature
- Biodiversity benefits
- Socioeconomic benefits, including recreational opportunities
- Technically simple and low cost implementation

Barriers:

- When too many dead leaves and other organic matter fall from the riparian buffer into the waterway, it can affect oxygen and pH levels, which in turn can have negative affects on water biota
- Planting trees with little leaf loss and low tannin levels (which is a source of toxicity) requires expert knowledge and detailed planning
- Land ownership rights must be acquired for riparian buffers in some cases. The need to make alternative arrangements with private land owners made can complicate implementation and add additional costs
- Completely degraded or newly planted buffers may require many years to reach full maturity and provide maximum benefit

Implementation considerations*

Technological maturity:	4-5
Initial investment:	2-4
Operational costs:	1-2
Implementation timeframe:	2-4

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* This adaptation technology brief includes a general assessment of four dimensions relating to implementation of the technology. It represents an indicative assessment scale of 1-5 as follows:
Technological maturity: 1 - in early stages of research and development, to 5 – fully mature and widely used
Initial investment: 1 – very low cost, to 5 – very high cost investment needed to implement technology
Operational costs: 1 – very low/no cost, to 5 – very high costs of operation and maintenance
Implementation timeframe: 1 – very quick to implement and reach desired capacity, to 5 – significant time investments needed to establish and/or reach full capacity
This assessment is to be used as an indication only and is to be seen as relative to the other technologies included in this guide. More specific costs and timelines are to be identified as relevant for the specific technology and geography.

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