



# LIVE LAYERED TECHNIQUES

ADDRESSED  
HAZARDSPROTECTED CRITICAL  
INFRASTRUCTURE

## ▼ Main components

- **Live poles, branches and rooted woody species** are placed tightly on horizontal terraces to reinforce loose soil layers. (Schiechl & Stern 1997)
- **Basal ends of the branches** are dug into a stable back-slope for rooting and shooting; the layer is covered with slope substrate from next and above terrace.
- High stabilising efficiency through **deep slope rooting** and interlocking of loose with **stable soil layers** (Stangl, 2007).

## ▼ Primary functions and key services

- **Bank stabilisation:** high efficiency through deep slope rooting and interlocking of loose with stable soil layers.
- **Instant and effective live soil reinforcement and slope anchorage:** reinforcing effects also in dead or non-vital structures.
- **Re-vegetation of damaged slopes and restoration of shallow landslide areas:** forms closed canopies which reduces rainwater infiltration and promotes soil water uptake and evapotranspiration.

With all the above, the NbS helps to protect critical infrastructure:

- Re-installation of **roadside embankments**
- **Dams, levees and dikes**

In addition, it provides protection services such as:

- Stabilisation of uphill riverbanks (to be used only above high water level)

## Ecosystem services

- ▶ **Natural hazard control**
- ▶ **Habitat re-installation**
- ▶ **Biodiversity**
- ▶ **Soil fertility**
- ▶ **Microclimate improvement**
- ▶ **Pollination**
- ▶ **Carbon sequestration:** significantly increased CO<sub>2</sub> capture and carbon storage in above- and below-ground biomass.

## ▶▶ What is it?

### **Live layered techniques**

(live reinforced soil, brush layering, hedge-brush layers, combined layer technique)

Life layering is a SWB technique to install layers of live stakes and poles, living branches and/or rooted shrubs for instant anchorage and reinforcement of loose or sliding soil layers. Layer techniques can be used as stand-alone NbS or in combination with natural fibre geotextile packs, wooden support structures (vegetated crib walls, contour logs, pile wall or slope grating), or even with concrete alternatives. Live material will form roots and shoots and establish bushy woody vegetation with closed canopies. (Stangl, 2007)



**Covering of layer construction with slope sediment, Veitschbach, Styria;**

Image Credit: [Rosemarie Stangl], [2022]. Used with permission.

**Natural forest community 26 years after hedge brush layer installation, Käsebach, Südtirol;**

Image Credit: [Florin Florineth, archive BOKU-IBLB], [2012]. Used with permission.

## Challenges this NbS addresses

- **Landslides**
- **Soil and wind erosion**
- **Slope protection**
- **Slope failure recovery**

## Environmental impacts (EU taxonomy)

- ☑ **Climate change mitigation**
- ☑ **Climate change adaptation**
- ☑ **Sustainable use and protection of water and marine resources**
- ☐ **Transition to a circular economy**
- ☑ **Pollution prevention and control**
- ☑ **Protection and restoration of biodiversity and ecosystems.**

## References

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