# POLICY BRIEF #1 - 2025

## ADAPTIVE ECOSYSTEM RESTORATION TO MITIGATE ZOONOTIC RISKS

In light of rising ecosystem restoration needs and activities, Horizon Europe project BEPREP has developed an adaptive process for assessment of ecosystem restoration and has identified six critical considerations that pave the way towards restoration-induced landscape immunity. Adaptive ecosystem restoration offers a proactive strategy to reduce zoonotic pathogen transmission and disease risks by re-establishing ecological integrity, enhancing biodiversity, increasing ecosystem resilience, and regulating pathogen dynamics.

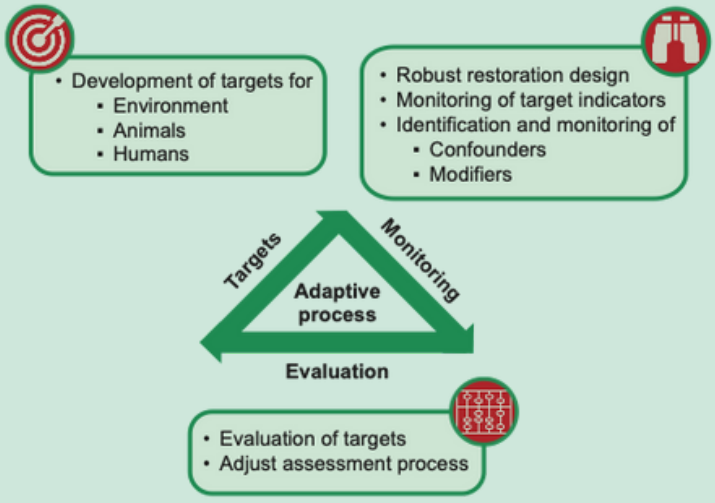
BEPREP's roadmap and considerations accepted and soon to be published in *Nature Ecology & Evolution* are essential for guiding policymakers, nature conservation organizations, and practitioners in taking timely action to avoid unintended consequences and promote faster ecosystem recovery.

## CONCLUSION

Failure to account for the six considerations makes the scientific contribution of ecosystem restorations less valuable and may even jeopardize efforts to reverse the global biodiversity decline.

## POLICY RECOMMENDATIONS

1. Assessment of zoonotic disease targets must be One Health based
2. Time lags between ecosystem restoration and recovery need to be considered
3. Trophic rewilding can improve restoration outcomes but is a poor substitute for proper ecosystem restoration towards post-restoration ecosystem functioning
4. Ecosystem restorations require a robust study design that applies a replicated before-after-control-impact (BACI) approach
5. Confounding and modifying environmental drivers need to be monitored along with target indicators
6. Stakeholder engagement and co-creation with communities is crucial for the restoration outcome




*The envisioned One Health based adaptive process for assessment of ecosystem restoration*

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## CONTEXT

The epidemic potential of infectious diseases, particularly zoonoses with a wildlife reservoir, is a rising concern for global health security and mammals, along with birds, constitute the majority of species that serve as reservoirs for zoonotic pathogens.

Pathogen richness is generally positively correlated with species richness and composition. However, high biodiversity has been shown to reduce overall infection rates in wildlife populations, primarily due to the higher prevalence of non-reservoir species in species-rich communities. The phenomenon, known as the "dilution effect", occurs when non-reservoir species disrupt pathogen amplification through various mechanisms. The protective effects of biodiversity against transmission of zoonotic pathogens are increasingly threatened, in part due to anthropogenic influences, such as, climate change, habitat loss, urbanization, pollution, deforestation and forest fragmentation. The growing investment in ecosystem restoration along with legal enforcement such as the European restoration law provide the opportunity to reach multi-functional ecosystem targets, including low pathogen transmission and disease risk, a term that has been phrased as “landscape immunity”.

Although ecosystem restoration is increasingly recognized as a critical strategy to counteract biodiversity loss and its associated disease risks, the process of transforming degraded and ecosystems loaden with zoonotic hazard into biodiversity-rich and healthy ones, requires practical guidance that hitherto is largely missing.

## THE PROCESS OF ADAPTIVE ECOSYSTEM RESTORATION

The suggested One Health process relies on the six considerations and is founded in stakeholder engagement and co-creation. SMART (specific, measurable, achievable, relevant, and time-based) targets are developed for environment (diversity, climate, land use), animals (species community structure, pathogen and disease prevalence, vectors and reservoir abundance), and humans (pathogen prevalence, cases of disease, exposure). Based on a robust restoration design that applies a replicated BACI approach, the indicators of the targets as well as identified confounders (factors that potentially can bias the restoration outcome, such as environmental contaminants and light pollution) and modifiers (factors that modify the cause-and-effect relationship of the restoration and the targets, such as long-term changes in climatic and hydrological regime) are monitored. Targets are then evaluated by quantifying the impact of ecosystem restoration on target indicators with uncertainty, significance, and interactions. The assessment process will be adjusted according to evaluation results.

## REFERENCE

Ecke, F, Semenza, C.J., Buzan, E., Costa, F., Giorgi, E., Guo, J., Kirkpatrick, L. Knauf, S., Meheretu, Y., Singh, N. Sjödin, H., Timperley, M., Treskova, M., Ulrich, R.G., Zeppelini, C.G. and Joacim Rocklöv (in print) Adaptive Ecosystem Restoration to Mitigate Zoonotic Risks. Nature Ecology & Evolution.

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