On behalf of:

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

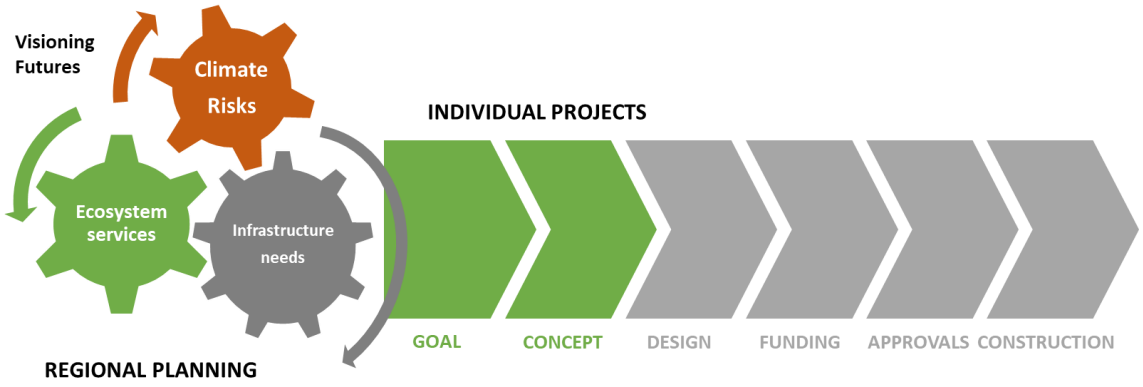
of the Federal Republic of Germany

Opportunities to Improve Infrastructure Planning for Social-ecological Resilience

> **"An unprecedented transformation of existing infrastructure systems is needed to achieve the world's climate and development objectives."**
> - OECD, 2018

Global institutions central to infrastructure finance and development have begun to work toward a shift to low-carbon, climate resilient, "sustainable" investments to meet larger goals in Paris Agreement NDCs, CBD Aichi Targets, and the sustainable development goals (SDGs). Through various collaborative initiatives and programs, influential institutions—from multilateral development banks to the G20—have diagnosed the many challenges and necessary changes across the infrastructure development cycle to reorient current and future investments toward these goals.[i] [ii] So far however, this push toward sustainable infrastructure has largely been driven by—and largely understood in terms of—decarbonization.

While essential to avoid the long-term worst-case scenarios of climate change, this focus on low-carbon options has left some critical gaps that risk compromising equally important needs to maintain and build resilience to the impacts of an already warming planet. More explicit considerations of natural capital, ecosystem services, and the numerous benefits they provide to local communities and regional economies, especially in conveying resilience, is needed. Forests that stabilize hillsides, slow water flows, or filter sediments under intense rainfall and wetlands that absorb and diffuse flood waters are just some examples of the many "resilience services" that must be better integrated throughout the infrastructure development cycle. This is most essential at the "upstream" stages of strategic spatial or regional land use planning (larger than any single urban area or city) well before infrastructure projects are proposed, designed, and financed (see figure below).



There is increasing awareness of the benefits of planning and designing for ecosystem services, particularly in the climate change adaptation field, where nature-based solutions are increasingly seen as either essential compliments to "grey" engineered approaches or cheaper, more robust alternatives.[iii] [iv] They are also recognized as important to reduce vulnerability for the world's most vulnerable populations, especially in marginalized rural communities with few options for costly engineered adaptation.[v] These options are, however, largely considered too late to most effectively balance trade-offs in managing social, ecological, and infrastructure systems resilience. Deeper understanding of the benefits from intact ecosystems—ecological or nature-based infrastructure—must be a part of land use planning processes that precede the inception of sector-specific master plans and infrastructure projects. Ministries of economy, finance, and planning and need to be able to make development planning and investing decisions based on more holistic evaluations of:

1) **the totality of services provided by ecosystems** and the reliance upon them by their citizens and both the local and larger economies; assessed at the appropriate landscape, basin, regional or in some cases national scales;
2) **current and future infrastructure needs based on these dependencies** and other critical trends like population growth, migration, and projected economic development;
3) **current impacts and likely future risks to 1 and 2 from continued warming** and the necessary pathways and planning steps to facilitate adaptation and resilience-building.

Such a "visioning futures" process has become an increasingly essential step in planning within various sectors given the uncertainties posed by climate change. Achieved through various methods like decision-making under deep uncertainty, scenario planning, and backcasting, these approaches are critical tools to facilitate planning for robustness, where assets are equally likely to continue to function under multiple possible future scenarios of additional warming and resulting impacts. These approaches have, however, rarely holistically included potential changes to landscape scale ecosystems and their cross-sectoral impacts or the benefits they provide as part of strategic or regional infrastructure planning processes. Though their under-riding science is still improving, following a precautionary principle approach where the best possible planning decisions can be made based on the information available is essential.

Opportunities

As many recent reports in the infrastructure sector have diagnosed, implementing such an approach to ensure the three basic components above are instituted as part of standard planning processes is no simple task. The following are additional opportunities for influential global institutions and country governments to improve upstream strategic planning to meet larger adaptation, mitigation, and biodiversity conservation goals in Paris Agreement NDCs, CBD Aichi Targets, and SDGs in priority low-income countries:

1. **Create funding sources** explicitly reserved to support more holistic, cross-sectoral landscape/regional scale planning to resource the following actions;
2. **Test and experiment holistic planning approaches on the ground** to develop model case studies to replicate and scale through collaborations between public services providers, international NGOs, academia, engineers, and planners, among other key actors;

3. **Create and expand existing national level investments** in natural capital programs that assess and establish critical baseline information on natural capital wealth and the ecosystem services it provides, especially those supporting adaptation and resilience;
4. **Expand and develop national regulatory frameworks** enshrining consideration of ecosystem services and climate risks in national policies, laws, and regulations governing spatial or strategic planning process, whether driven by large-scale infrastructure investments or otherwise;
5. **Develop standards through cross-sector collaboration** for whole landscape or regional planning approaches that explicitly consider ecosystem services and climate risks and connect to project level sustainability and resilience standards;
6. **Facilitate cross-sectoral collaboration and integration in planning processes** via trainings in futures thinking tools and approaches that include inter-ministerial participation from planning, finance, economic development, environment, public works and other essential ministries
7. **Increase investment in ecosystem service modeling science** to improve assessing and valuing "resilience services" in real dollar values under multiple climate futures and future economic development and population scenarios.

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[i] OECD. 2018. Financing Climate Futures: Rethinking Infrastructure. Policy Highlights. OECD, World Bank, and UN Environment. http://www.oecd.org/environment/cc/climate-futures/policy-highlights-financing-climate-futures.pdf

[ii] IDB. 2017. Crossing the Bridge to Sustainable Infrastructure Investing: Exploring ways to make it across. Mercer and IDB.

[iii] USAID. 2017. The Economics of Ecosystem-based Adaptation. Evidence Summary. https://www.climatelinks.org/file/3465/

[iv] Daigneault et al. 2016. Dredging versus hedging: Comparing hard infrastructure to ecosystem-based adaptation to flooding. Ecological Economics. Vol. 122: 25-35

[v] OHCHR. 2019. The Other Infrastructure Gap: Sustainability. Office of the High Commission on Human Rights and the Heinrich Bol Foundation. 2019.