IENE
Infrastructure & Ecology Network Europe

— IENE POLICY BRIEF —

Integrating Amphibian Conservation into Transport Infrastructure Projects and Reporting under the Taskforce on Nature-related Financial Disclosures (TNFD)

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— Summary —

Amphibians constitute one of the most endangered vertebrate classes, with an estimated 40% species at risk of extinction. Amphibians are particularly threatened by habitat destruction, pollution, climate change, and invasive species. Transport infrastructure (TI) reinforces these threats and therefore contributes to their decline. The Kunming-Montreal Global Biodiversity Framework (GBF) adopted by member states of the European Union in 2022 specifically requires the TI sector to evaluate impacts on biodiversity and disclose biodiversity-related risks (Target 15). In this context, the Infrastructure and Ecology Network Europe (IENE) proposes measures in this policy brief for the TI sector to support amphibian conservation while aligning with emerging European targets, and disclosure and reporting frameworks such as the Taskforce on Nature-related Financial Disclosures (TNFD) and Science Based Targets Network (SBTN).

— Key policy recommendations —

Integrate amphibian biodiversity conservation into the governance, strategy, impact management, and targets of transport infrastructure (TI) projects.

Conduct preliminary studies to evaluate the presence and habitat range of amphibians in the vicinity of TI projects and identify migration/movement corridors through connectivity analyses and field surveys.

Prioritise avoidance of impacts on amphibian habitats and populations. When impacts cannot be avoided, combine multiple mitigation measures to reduce direct and indirect mortality, barrier effects, and the spread of invasive species. Move beyond mitigation to restorative measures (i.e., net positive outcomes) at the local (site), metapopulation, and landscape level.

Adapt hydraulic management and structural design to the ecological needs of amphibians, ensuring connectivity across the TI.

Promote amphibian conservation by raising awareness among TI users and local communities, through education and the creation of protected and connected habitats.

Monitor populations across short, medium, and long term, before and after TI construction ; maintain amphibian passages, guiding fencing, and natural or artificial waterbodies.

Document TI's environmental impacts and implemented restoration measures to feed into mandatory reporting requirements under frameworks such as the Corporate Sustainability Reporting Directive (CSRD), the European Sustainability Reporting Standards (ESRS). Where appropriate, align with the Taskforce on Nature-related Financial Disclosures (TNFD) and Science Based Targets Network (SBTN) principles.

— Context of this policy brief —

In light of the current biodiversity crisis, it is the responsibility of organisations within the transport infrastructure (TI) sector, like all major stakeholders, to **reassess their impacts on nature** and take decisive action towards a sustainable world. One of the key achievements of the Convention on Biological Diversity (CBD) COP15 was the unprecedented recognition of the necessity to **engage the private sector** in understanding their responsibilities regarding global biodiversity decline; notably, Target 15 of the GBF requires companies to 'regularly monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity'. To this extent, the Taskforce on Nature-related Financial Disclosures (TNFD) and Science Based Targets Network (SBTN) provide emerging frameworks for the private sector to identify, set targets, and report their impacts on biodiversity (Box 1), and promote a **paradigm shift** towards **environmentally-conscious practices in the private sector.**

In this context, this policy brief aims to guide the implementation of mitigation measures to reduce the negative impact of TI on amphibians. Amphibians are an animal class of over 8500 species, of which 40.7% are globally endangered. Urbanisation is a major cause of their decline, with **infrastructure development affecting 40% of threatened amphibians.** TI reinforces and compounds four of the five direct drivers of biodiversity loss identified by the **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)**, namely land use change, pollution, climate change, and the spread of invasive alien species. This brief focuses on roads and railways, which constitute the predominant TI responsible for amphibian declines. Global road networks span over 36 million kilometers, with 50% of the European land area being less than 1.5 kms away from a road. Given extensive **scientific evidence** of the **negative impacts of roads and railways** on amphibian populations, it is crucial to (1) prioritise avoidance of negative impacts on amphibians from the outset; (2) integrate research-based mitigation measures into TI building projects when impacts are inevitable; (3) abandon projects for which the residual impact after application of mitigation measures cannot be compensated.

This policy brief emphasises that **amphibian-directed interventions** and measures occurring at a project level **can be accounted for within both SBTN and TNFD**. By integrating these actions and outcomes into their Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS), organisations not only comply with **regulatory requirements** but also embody the **principles of transparency** and accountability advocated by TNFD and SBTN, showcasing a proactive stance towards sustainable development and nature conservation that can **positively impact stakeholders and investors.**

Box 1 : Understanding TNFD and SBTN Frameworks for Nature-Positive Business Strategies.

TNFD is an enabling framework for businesses and financial institutions to report and act on nature-related risks, aiming to redirect financial flows towards sustainable and nature-positive outcomes. In contrast, SBTN provides specific, science-based targets for companies to reduce their environmental impacts on biodiversity, climate, water, and land use. While TNFD emphasises disclosure and financial risk management related to nature, SBTN provides tangible targets and metrics for direct environmental impact reduction.

The TNFD four pillars :

— Governance
Understand the organisation's governance of nature-related dependencies, impacts, risks, and opportunities.

— Strategy
Assess the effects of nature-related dependencies, impacts, risks and opportunities on the organisation's business model, strategy and financial planning.

— Risk and Impact management
Describe the process used by the organisation to identify, assess, prioritise and monitor nature-related dependencies, impacts, risks and opportunities.

— Metrics and Targets
Disclose the metrics and targets used to assess and manage material nature-related dependencies, impacts, risks and opportunities.

The **LEAP** (Locate, Evaluate, Assess, Prepare) process provides a structured approach for organisations to operationalise all four pillars of the TNFD framework, i.e., identify, evaluate, manage, and report nature-related risks and opportunities.

The LEAP process interacts with the TNFD pillars:

— Locate
Identify how and where the organisation's activities intersect with nature, which is critical to informing the Governance and Strategy pillars through clarification of the scope of nature-related considerations.

— Evaluate
Assess and understand the significance of nature-related impacts and dependencies, which contributes directly to the Strategy pillar by informing strategic planning.

— Assess
Prioritise and capture risks within the organisation's risk management processes, aligning closely with the Risk Management pillar by ensuring that nature-related risks are adequately managed.

— Prepare
Set targets, monitor progress and plan for disclosure, which supports the Metrics and Targets pillar by establishing metrics for tracking and reporting nature-related issues. Utilising the SBTN framework will provide specific and quantifiable targets for companies to reduce their impacts on nature.

The **SBTN** provides a comprehensive framework designed to guide businesses in setting science-based environmental targets. This approach enables companies to align their operations and strategies with ecological limits and thresholds, ensuring they contribute positively to biodiversity, water, land, and climate. By adopting the SBTN framework, businesses can make measurable commitments towards their sustainability policies, and play a wider global role in the preservation and conservation of natural resources and nature.

The impact of TI on amphibians

— Landuse Change

Transport infrastructure destroys and fragments natural habitats.

In addition to direct vehicle **collision mortality** (roadkill), which affects the demographics of local populations, the development of TI leads to **direct habitat loss** for amphibians through the destruction of aquatic breeding habitats and of terrestrial foraging and hibernation habitats. Moreover, the presence of TI results in **habitat fragmentation** which decreases individual and population-level dispersal. Most amphibians migrate between forest cover or scrubland and aquatic breeding sites for reproduction. By fragmenting populations and **impeding migration**, TI creates barriers to gene flow, eventually causing inbreeding, loss of fitness and declines in local populations. In addition, agricultural re-parcelling and urban development accompanying the creation of new TI can be detrimental to amphibians.

— Pollution

Transport infrastructure degrades habitat quality.

TI causes direct **pollution of water and soils** with the application of de-icing salts and of herbicides on verges. In comparison to railways, roads additionally release dust, hydrocarbons, and heavy metals during the operation phase, as well as concrete slurry laitance during their construction. These contaminants lead to a significant mortality in amphibians due to toxin absorption and bioaccumulation. In addition, **light and noise disturbance** associated with the use of roads also has an adverse impact on amphibian behaviour; for example, traffic noise induces stress and alters breeding calls.

— Climate Change

Transport infrastructure alters local climates.

Aside from contributing to global greenhouse gas emissions, the construction of TI can lead to local deforestation, which in turn can provoke **increased evaporation and drought** to which amphibians are vulnerable due to their highly permeable skin. Road surfaces generally absorb more solar radiation than natural surfaces, leading to **localised warming**; being ectotherms, amphibians may be attracted to road heat, thus causing direct mortality. TI can also alter natural **water flow patterns**, leading to increased runoff, drought, and changes in local hydrology, which can negatively affect amphibian habitats.

— Invasive Species

Transport infrastructure facilitates the spread of invasive species.

By providing movement and potential colonisation conduits, TI can lead to the **introduction and spread of non-native species** into new locations. Global biodiversity scenarios predict that the rate of biological invasions in Europe is likely to increase.

Invasive alien species **threaten nearly half of Europe's amphibians.** For example, the lethal chytrid fungi *Batrachochytrium sp.*, which are responsible for declines in over 500 amphibian species and for the extinction of almost 100 amphibian species worldwide, are currently spreading globally – notably through the **pet trade**. Other aquatic invasive species include predators such as American crayfish (*Procambarus clarkii)*. Non-native species of amphibians can also compete or hybridise with native populations and may act as vectors of disease. While the most harmful are the African clawed frog (*Xenopus laevis*) and the American Bullfrog (*Lithobates catesbeianus*), a full list of all invasive alien amphibians in Europe is available on the **CROAA portal**. Invasive alien fauna may also degrade habitats, thus intensifying amphibian habitat loss.

Policy recommendations

The following broad recommendations are aligned with the respective TNFD pillars to facilitate planning, actions, and interventions to support downstream corporate reporting. Box 2 provides a granular example where amphibian conservation is integrated throughout the life of a TI project using the LEAP process.

Governance

- Consult with ecological/**conservation scientists** during the territorial planning stage to avoid impacts on amphibians, and at feasibility stages of TI construction/maintenance planning to integrate research-based recommendations into all stages of the TI project.

- Engage with biodiversity-/**amphibian-focused NGOs** (*e.g.*, Bufo, Natagora, Ravon, LPO, SNPN, ...) and with regional biological record centres to be informed of the local distribution of amphibians, and of potential ongoing conservation initiatives.

- Build internal capacity and awareness by providing mandatory **training** in ecofriendly practices and by inviting amphibian-focused NGOs to give **outreach talks** about the local herpetofauna present at the TI construction site, etc.

- Develop **dedicated services** to facilitate the integration of biodiversity issues within the remit of TI managers. Such services should ensure that the TI company abides by (inter)national legislation; promote and link to reporting and target-setting (Box 1); adhere to good practice guidelines and set meaningful biodiversity targets to ensure local amphibian populations thrive; take ownership and responsibility for the oversight of the mitigation and awareness activities. Teams may be composed of ecologists, hydrologists, land managers, etc, with **cross-disciplinary expertise**.

- Refer to **good practice manuals and handbooks** such as the **Biodiversity and Infrastructure. A handbook for action** (www.biodiversityinfrastructure.org) and the **Transport-Ecology portal** (www.transportecology.info).

Strategy

- Adopt **sustainable construction and maintenance approaches** into the entire life cycle of the TI: build, maintain and repair with recycled materials or consider alternatives to tarmacadam, concrete, and steel. For example, gravel tracks cause lower amphibian mortality than paved roads, so they should be given consideration when creating temporary/service/haul roads. Suitable alternatives to de-icing salts and herbicides should be considered and supported. Lastly, the decommissioning of obsolete TI (or sections of TI) should be encouraged and planned at a territorial scale.

• Ensure TI financial planning integrates both direct and indirect impacts on local amphibian populations. **Plan and budget for hard engineered interventions** for mitigating the impact of the TI on amphibians (e.g., tunnels, slot drains, fencing, etc). Primary biodiversity surveys should always be undertaken well in advance of TI construction; scheme phasing (i.e., feasibility evaluation, zoning, etc) should be approached through an amphibian-focused lens (in combination with other sensitive ecological receptors). Funding should also be allocated to the long-term maintenance and improvement of engineered interventions created for mitigating TI impacts.

• Establish **meaningful targets** for mitigating TI impacts on local amphibian populations and integrate them to the TI project. For example, through the timely creation of amphibian crossings and of new habitat elements, and in certain cases by translocating populations to receptor sites (see Metrics and targets).

• Encourage TI **users to adopt proactive practices** : for example, along rural roads, promote speed reduction through signalling, temporarily close roads during amphibian migrations and conduct outreach in the media/ through signage to increase drivers' awareness of the presence of amphibians nearby.

• Comply with **biosecurity protocols** during the construction and maintenance of TI; if part of the work is delegated to (sub)contractors, ensure contractual adherence to such protocols. For example, disinfecting equipment and spraying operator footwear (e.g., with 70° alcohol, 4% bleach, or 1% Virkon) between sites of intervention is key to **reducing the risk of transfer of pathogens** between wild amphibian populations.

• Support the reduction of threats of emerging diseases and of illegal trade of endangered species by facilitating the **enforcement of controls and inspections** following guidelines and health protection measures for the trade of amphibians set by the European Union.

• Financially support **amphibian conservation organisations** such as the International Union for Conservation of Nature (IUCN) Amphibian Specialist Group, and the Species on EDGE fund, or similar organisations within relevant territories.

Risk and Impact management

• Undertake detailed **assessments of the diversity** of local fauna and flora before the territorial planning stage. If amphibian populations are detected near a project site, extensive inventories should be conducted beyond the territory of the site to identify options to relocate the project. When avoidance/relocation is not possible, home-range/metapopulation extent should be evaluated and a connectivity analysis conducted to **identify migration corridors** between breeding and hibernation sites, and **dispersal corridors** between subpopulations.

• Evaluate the potential effects of TI works on **local hydrology**, their implications on the supply of waterbodies, and the risk of spread of invasive species through potential new aquatic corridors

• It is assumed that for most TI an Environmental Impact Assessment will be carried out to evaluate the impacts of the construction and operation on a **wider range of ecological and environmental receptors** (e.g., human health, landscape, etc).

• Plan construction and maintenance **work around the seasonal activities** of local fauna when feasible. For example, many European amphibians migrate to waterbodies in the spring where they breed until the end of the summer; works in forested areas/land clearance/vegetation management may therefore be best conducted during this time. Temporary (or permanent) measures (such as population relocation) should be implemented where construction/maintenance project constraints conflict with the presence of amphibians. All such activities should be undertaken in collaboration with local NGOs and scientists with expertise on the focal species.

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Metrics and Targets

• The **baseline target** should be **to maintain stable populations** and prevent further declines/reverse downward trends. TI managers are encouraged to set objectives beyond simple habitat mitigation, and to actively participate in improving and increasing amphibian conservation status (i.e., create a net positive impact) in collaboration with organisations and specialists engaged in amphibian monitoring and conservation. This can be achieved by constructing additional wetland and terrestrial habitats in conjunction with improving landscape connectivity to facilitate recolonisation of locally extinct species. The SBTN resources provide guidance on how to set targets across biodiversity at large, but also for freshwater and land-use specifically, and the IUCN established a European Red List of threatened amphibians. The IUCN Amphibian Specialist Group or relevant regional groups, can be contacted to explore the possibility of working on a translocation or reintroduction project.

• Set **targets formulated around local species**. The abundance of each amphibian species present along the TI should be ascertained and monitored through repeated surveys, before and after the construction of the TI. This should also extend throughout the life of the TI through long-term monitoring. Such surveys should be conducted in line with approved survey protocols (e.g., preferentially during the spring and summer, when amphibians are most active) and using a diversity of methods (e.g., trapping, call surveys, cover boards/refugia close to ponds, egg mass counts in waterbodies, etc) to detect as many species as possible (whether they are non-calling breeders, arboreal, or else).

• Create **suitable amphibian crossings** to limit direct mortality and maintain a level of connectivity allowing gene flow between sub-populations on either side of the TI. Appropriately designed amphibian tunnels in association with guiding fences along roads and railways are effective structures to facilitate amphibian movements (see 'Amphibian passages' in the IENE Biodiversity and Infrastructure Handbook). The location of the crossings should be based on knowledge of migration routes (determined during baseline population surveys, and/or using landscape structure or zones of highest roadkill rates if a road already exists). More information can be found in the CEREMA and the Animex Wildlife Fencing Guide.

• Create **new habitats** as a compensatory measure for the destruction of habitats by the TI, and to reduce the risk that amphibians need to cross the TI to migrate between their aquatic and terrestrial phases. For example, create new breeding ponds, suitable terrestrial habitat, and hibernation sites. Extensive guidelines for habitat creation are provided in the Amphibian Habitat Management Handbook. It is important that both natural and compensatory ponds present along the TI should always be protected to prevent new access from TI users since the release of pet-fish, pet-turtles, and pet-amphibians into the wild is a major threat to local amphibian populations due to predation, competition and the potential for disease-transmission. In addition, establishing a legal status for these compensatory habitats would guarantee their long-term preservation.

• Actively participate in **education and outreach**: inform TI users (in stations and at service areas) through billboards, applications and flyers, about the local herpetofauna, the importance of amphibian conservation, and initiatives undertaken by the TI company to mitigate their impact on amphibians. Creating awareness about such initiatives, and informing the general public/TI users/local populations and stakeholders (from the area crossed by the TI) on how they can help amphibians is usually very well received; a few examples are provided by the Amphibian Survival Alliance.

Box 2 : Example application of the LEAP process throughout the life of a TI project supporting amphibian conservation.

This example demonstrates how the sequential LEAP process can be used to integrate amphibian conservation into operational practices complying with the technical constraints of a TI project, and align with the TNFD and SBTN frameworks. Further measures to implement within each TNFD pillar are detailed in the 'Policy recommendations' section above.

— Build internal capacity :
First, ***'Prepare'*** the **Governance** of the company by creating services dedicated to the integration of biodiversity in the TI project; adapt the **Strategy** of the company to allocate budget for biodiversity surveys, sustainable construction approaches and for future hard engineering projects to mitigate impacts of the TI.

— Conduct early surveys and assessments :
Engage with conservation scientists and local NGOs to undertake ecological surveys focusing on amphibians in the TI project area. Identify (***'Locate'***) potential impacts of the TI on biodiversity and ***'Evaluate'*** nature-related risks and dependencies to prepare for future **Risk and Impact management**.

— Plan construction work :
Design the TI with amphibian preservation in mind; incorporate crossings that facilitate safe passage, as well as features that mitigate the barrier effect. ***'Assess'*** **Risks** and integrate (***'Prepare'***) measures to reduce them in the TI company's **Strategy** – e. g., planning construction work around the amphibian life cycle.

— Implement science-based conservation measures :
Collaborate with amphibian experts, local conservation groups, regulatory agencies, and use SBTN resources to ***'Prepare'*** and set quantifiable **Targets** to mitigate the **Impact** of the TI and maintain / enhance local amphibian populations.

— Apply adaptive management :
Using multiple **Metrics**, monitor amphibian populations before, during, and after TI construction to ***'Assess'*** the effectiveness of conservation measures at reaching established **Targets**, and adjust these measures as necessary. ***'Evaluate'*** the **Risk** of illegal trade of endangered species along the TI and facilitate the enforcement of controls and inspections.

— Embed conservation objectives
Into the project's environmental management system, ensuring (***'Prepare'***) that measures to protect amphibians are implemented, monitored, and maintained throughout the project lifecycle. Embed durable financial support to conservation NGOs through donations into the **Strategy** of the TI company.

— Transparently report,
Publicly or as part of CSRD outputs, on the TI's **Impacts** on amphibians, the contributions towards SBTN **Targets**, and the effectiveness of conservation measures, adhering to TNFD guidelines for transparent accountability.

By integrating this guidance, infrastructure projects can address the specific needs of amphibians as sensitive ecological receptors, aligning operational practices with the broader goals of TNFD and SBTN for nature conservation and sustainable development, while connecting with wider mandatory corporate reporting.

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Links :

Biodiversity and Infrastructure. A handbook for action

www.iene.info