Mitigating the Effects of Transport Infrastructure Development on Ecosystems

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2017), and international trade (Hopcraft, Bigurube, Lembeli, & Borner, 2015). By

45-50% of populations will still reside in rural homes, especially in poorer nations (Chinowsky, Schweikert, Strzepek, & Strzepek, 2015). Often, a lack of connection to urban areas is a driver of poverty. Reliable transport infrastructure can help alleviate

et al, 2015). For example, tourist revenue from the Serengeti-Ngorongoro ecosystem in Tanzania, a protected area famous for its annual wildebeest migration, brings in over 100 million USD each year (Hopcraft et al, 2015). A road such as the proposed Serengeti Route would bisect the area of wildebeest migration and disrupt the ecosystem. Degradation of this area would reduce tourist economies and foreign capital which, in turn, woul

those who rely on the ecosystem resources (Hopcraft et al, 2015).

Balancing infrastruct

that allow for increased ecosystem services to humans as well as benefits to wildlife (Angelstam et al, 2017).

<u>Corridors</u>

One of the most common ways to implement green infrastructure is with corridors (Sn Q et al, 2016). As defined by Van de Perre, Adriaensen, Songorwa, and

protected areas either

- (i) through which animals are known or believed to move,
- (ii) that are connected by (or can potentially be reconnected by) natural vegetation, or
- (iii)

Wildlife corridors are frequently used to connect green infrastructure and protected areas (Sh Q et al, 2016) to help mitigate the effects of habitat fragmentation from transport infrastructure (Coffin, 2007). Increasing functional movement between protected areas mitigates the effects of climate change on vulnerable species, helps conserve biodiversity, and maintains ecosystem services (Karlson et al, 2014). Corridors should be planned to overcome the barrier effect of nearby transport infrastructure (Karlson et al, 2014), to be useful for a majority of local species (Garmendia et al, 2016), and to account for range distribution changes due to climate change (Sn Q et al, 2016).

Corridors can maintain or expand gene pool flow, help facilitate movement, and provide habitat for range shifts, as well as enable other processes that require large spaces (Sn Q et al, 2016). Unfortunately, new roads are breaking up wildlife corridors worldwide, creating ecological islands of isolated populations in protected areas and affecting genetic diversity (Van de Perre et al, 2014, Beben, 2012).

To counter this problematic trend, U.S. Representative Don Beyer, Jr (D-VA) introduced the Wildlife Corridors Conservation Act of in December 2016 (HR-6448), which would promote the creation of corridors with a National Wildlife Corridors System to protect and restore native wildlife and plants (Wildlands Network, 2017). As of December 2017, the bill is still in the subcommittee on conservation and forestry (Library of Congress, 2016).

Similarly, in Ukraine there is a plan in place to increase forest coverage, but the rate of habitat gain has been deemed far too low to have a discernable effect (Angelstam et al, 2017). While the creation of corridors after the building of infrastructure is beneficial, natural 0.0-27(i/v2G[that)-82Gk)-14p(i/v2G(A)-2aed)7ttura3(),)-309(W)-42

surrounding ecosystems. To understand the multifaceted and complex issues, this discipline uses multiple lenses including ecological, geographical, engineering, and planning, among others (Coffin, 2007).

One of the main problems that prevents the effective implementation of green infrastructure is the knowledge gap regarding ecosystem services and biodiversity. This can be dearly observed in many transport infrastructure planning situations (Angelstam et al, 2017). Data showing the benefits of green infrastructure to humans and ecosystems, however, can provide key knowledge and can bolster support from other parties, including community members and decision makers (Lovell & Taylor, 2013). To be sustainable in the long term, transport infrastructure and GI planning should be collaborative, strategic, dynamic, and adaptive (Herzog, 2016).

Conclusion

While building infrastructure is vital to economic development and poverty alleviation, the benefits of natural ecosystems to both the economy of a country and the well-being of its citizens should not be forgotten. Using green infrastructure during development can maintain and support the services provided by a specific ecosystem (Coutts & Hahn, 2015). Wildlife corridors are necessary to connect protected land areas, and wildlife crossings and fences can help connect fragmented habitats. While there are ways to mitigate the negative effects of roads on ecosystems after they are built, a proactive approach that preserves natural corridors will help with long-term sustainability of the transport infrastructure and the ecosystem services of an ecosystem. Successful and sustainable projects require collaboration between governments, policy makers, infrastructure planners, ecologists, and the community. There are ways to balance human needs and ecosystem needs when it comes to building infrastructure, especially roads. It may not be easy, but unless we want to continue to be affected the negative impacts of roads on ecosystems and wildlife, we need to take informed action now.

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