



**DEVELOPMENT
CORRIDORS
PARTNERSHIP**

IMPACT ASSESSMENT FOR CORRIDORS: FROM INFRASTRUCTURE TO DEVELOPMENT CORRIDORS

Edited by:
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2022

The Development Corridors Partnership

The Development Corridors Partnership (DCP) is a research and capacity development initiative. It is a collaboration between institutions from China, Kenya, Tanzania and the UK. The main objective is to deliver effective research and capacity-building to help improve corridor planning and management. It aims to ensure that development corridor decision-making is based on sound scientific evidence and effective use of available planning tools and procedures, to ensure that risks are

avoided and opportunities exploited. The DCP comprises partners from the University of York, the University of Cambridge, London School of Economics, Sokoine University of Agriculture, the University of Nairobi, as well as the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), African Conservation Centre, the World Wide Fund for Nature (WWF), the Chinese Academy of Agricultural Sciences and the Chinese Academy of International Trade and Economic Cooperation (CAITEC).

DCP Partners:



For the purposes of this publication, DCP collaboration was extended to experts representing Netherlands Commission for Environmental Assessment, the Centre for Energy, Petroleum and Mineral Law and Policy at the University of Dundee, the University of Queensland, the Columbia Centre on Sustainable Investment, the GOBI

Framework for Sustainable Infrastructure Initiative (comprising the University of Oxford, University of Central Asia and the Independent Research Institute of Mongolia), The Biodiversity Consultancy, the Wildlife Institute of India, the Endangered Wildlife Trust and Ecotecnia Ingenieros Consultores SRL.

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Foreword

In the course of a long and varied working life, I have been privileged to work with, or learn from, a stimulating panoply of individuals who are committed to contributing to the economic, social, and environmental development of all aspects of the United Nations Sustainable Development Goals.

Jon Hobbs and Diego Juffe-Bignoli are, thankfully, two of these individuals. I was delighted to learn that they had come together to produce, for the Development Corridors Partnership, a rich and stimulating collection of research reports, case studies and assessments relating to the array of efforts made under the rubric of 'development corridors'. They were determined to express the conviction that decisions made, primarily by governments, regarding the planning and building of Corridors, really must be informed by an evidence-based understanding of the consequences - positive or negative - of these decisions. And they have succeeded. But Jon Hobbs will never read these words. He was hospitalized after the bulk of the work was complete, and, to the deep sadness and regret of all who knew him, he passed away at the end of September, 2021.

Jon and Diego sought out and recruited a daunting array of researchers, scholars and stakeholders to shed light on the processes currently underlying the world of development corridors today. They certainly succeeded.

The work was initiated before the onset of the COVID-19 pandemic, and as governments turn to the formidable challenge of restoring

economic vitality without further damage to the climate, it becomes even more imperative that impact assessment be understood, embraced and improved. Jon and Diego have shown us the way forward for a journey which absolutely must be embarked upon.

They would be first to recognise that the Development Corridors Partnership as a whole must be commended for showing - in many different ways and places - that, not only is the need for impact assessment clear and present, but so are the skills and commitment of researchers, scholars and stakeholders. These are to be found in an impressive coming together of universities, civil society organizations and business groups, and communities.

All are part of an outstanding initiative, funded by the UK Research and Innovation Council, and managed by the UNEP-WCMC. This initiative has been embraced by some of the best minds that have been turned to the task of ensuring that - while we attempt to bring economic and social benefits to people, in line with the United Nations Sustainable Development Goals - we do not risk significant environmental and social costs, and thus actually undermine long-term development successes.

So, I urge you to read this book, and figure out how you might improve your own contribution to the challenges ahead. Jon and Diego have set out a case. It needs to be taken up, not set aside; acted on, not just talked about. It is in your hands.

John Harker

Chair of the Development Corridors Partnership Independent Advisory Board,
Nova Scotia, Canada.

Dedicated to the memory of Jon Hobbs
who was the architect and driving force of this book

Executive Summary

Driven by increasing globalisation, the development aspirations of nations, and the need to access resources, an infrastructure boom is impacting many regions of our planet. New infrastructure projects are traversing diverse landscapes over hundreds of kilometres, often crossing international borders and penetrating into remote areas previously unaffected by industrialisation and urbanisation. These large-scale projects, mostly spanning several regions in a same country, but often linear and transnational in nature, are generically called corridors. Depending on the nature and objectives, they can be transport, infrastructure, growth, resource or economic corridors.

The rapid development of corridors globally presents environmental planning professionals with numerous challenges. **The primary need is to ensure that decisions about these developments are informed by an evidence-based understanding of their consequences - both positive and negative.** This will enable infrastructure development to meet development needs without adversely impacting ecological systems or human welfare. Improving the quality of infrastructure policies, plans, programmes and projects, by ensuring they include the necessary environmental and social scrutiny, is urgently required now - and will be for the foreseeable future. This challenge is the unifying theme of this publication.

Using insights from Africa, Asia and South America, this sourcebook compiles 24 contributed papers written in 2021, covering many facets of the

opportunities and challenges presented by the rapidly growing number of infrastructure and corridor developments around the world. Prevailing planning practices are reviewed through case studies along with the efficacy of some of the available tools to conduct systematic and comprehensive impact assessments. The latter includes Strategic Environmental Impact Assessment (SEA) and Environmental Impact Assessment (EIA).

As the title suggests the underlying thesis of this publication is that, where they are justified, **there are significant benefits in ensuring that corridors that contain single purpose infrastructure developments (utility, infrastructure or transport) progress through a carefully planned sequential process of diversification and expansion to ensure the maximisation of benefits in full-blown 'development corridors'.** In this book, development corridors are therefore aspirational. They comprise areas identified as priorities for investment to catalyse economic growth and development. They should be developed with multiple stakeholders and social, economic and environmental interests and interdependencies in mind. With the integration of sustainability principles and appropriate environmental and social standards, development corridors could become true '(sustainable) development corridors'. They should be planned to maximise positive opportunities and minimise negative risks. Without this, today's short-term successes will become tomorrow's challenges and long-term human welfare and ecosystem integrity will be undermined.

Overview of contents

This book brings together a wide range of perspectives from experts, researchers, and practitioners around the world with the purpose to foster greater collaboration and increase our global understanding of corridors and their benefits and potential negative impacts. 13 of the 24 chapters are written by independent experts and researchers from Australia, Bolivia, Brazil, China, India, Kenya, Mongolia, South Africa, Tanzania, UK, and the USA. The book also includes 11 chapters containing material gathered by the Development Corridors Partnership, a programme of work led by UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and funded by the UK Government via their Global Challenges Research Fund.

The collection of papers in this sourcebook is divided into five sections. First an introductory section where we introduce some key terms and definitions that underpin this work ([Chapter 1](#)). We then explore some key principles and aspirations of corridors such as delivering the Sustainable Development Goals ([Chapter 2](#)), ensuring theory and practice align ([Chapter 3](#)), ensuring financial sustainability ([Chapter 4](#)), properly assessing environmental sensitivity ([Chapter 5](#)) respecting human

rights ([Chapter 6](#)), or maximising, co-benefits ([Chapter 7](#)).

In the next three sections, we present 15 case studies from three continents: Africa, Asia, and Latin America. These case studies explore key challenges and lessons learned from specific planned, ongoing, and already implemented developments. They are presented as individual stories that readers can explore.

The final and fifth section aims to summarise lessons learned from a 4-year research and capacity building programme specifically aiming to understand the key challenges and opportunities around corridors and that has been the major driving force of this work: The Development Corridors Partnership project (DCP). DCP is a collaborative partnership across UK, Kenya, Tanzania and China, funded by the UK Research and Innovation Global Challenges Research Fund (see [Chapter 23](#)).

The book finishes with an overview of the lessons learned from the contributed papers included in this book and develops ten principles for corridor planning and delivering a meaningful and comprehensive impact assessment ([Chapter 24](#)), which we summarise here as ten key messages.

Key messages

1

Corridors must seek to achieve positive sustainability outcomes:

The mindset underwriting environmental planning of most infrastructure developments has been to mitigate negative impacts. The planning of few existing corridors is based on their role in supporting a sustainability vision for a country or region in which they are situated. Corridor developments must therefore be based on sustainability principles and support progress towards national, regional and international sustainable development goals. A true development corridor will seek to do good, as well as to mitigate negative impacts.

2

Integrated and inter-disciplinary approaches are needed:

Corridor developments are extensive, complex, multifaceted features traversing many landscapes. They can bring about significant transformational change to physical, economic, social, and cultural systems, and serve as interconnecting features. Yet engagement in corridor planning is often constrained by limited disciplinary and institutional involvement, with projects often superimposed upon communities. Corridor developments need diverse expertise and experience in their planning and management, including local stakeholder knowledge, avoiding disciplinary, institutional, or sectoral silos, that can result in policy conflicts, contradictions, and inconsistencies.

3

Corridor proponents should clearly demonstrate consideration of alternatives:

Corridor options should not be limited to a preferred proposal favoured by an elite. Corridor developments must consider all feasible alternatives (including maintenance of the status quo and no corridor development) and make the risks and opportunities of each option explicit and transparent through meaningful consultation. An important requirement in all corridor planning is to justify the need for a wide choice of options and an explanation of the potential benefits it will bring and to whom, in comparison with the alternatives. Any necessary trade-offs and how any significant potential negative impacts will be effectively managed, and opportunities created must be explained.

4

Public participation and stakeholder engagement should be at the core of corridor planning:

Corridor planning frequently fails to include meaningful participation of all stakeholders. Corridors can profoundly affect the lives and rights of indigenous peoples and local communities, potentially for generations. A common failing is that the first opportunity for local stakeholders to engage arises only after all strategic decisions have already been made and the only option remaining is for them to react negatively to a fait accompli. The meaningful engagement of all stakeholders is necessary to ensure their role is more than reactive. The way corridors are viewed by different stakeholders must be identified, understood, and addressed. Corridor developments must ensure that all interested and affected people are provided with adequate information about a proposal and have meaningful ways to engage in decision-making processes from the outset of strategic planning.

5

Mainstreaming and tiering are fundamental for corridor success:

Corridor planning requires a tiered assessment process, ensuring that environmental and social issues are considered alongside financial and technical considerations from the start of strategic planning or programme development, right through to project specifics. Conceptual corridor planning is frequently dominated by technical and financial suitability criteria with environmental, social, cultural, and human rights sensitivity issues being considered, at best, as externalities, retrospectively, once issues and problems arise. Strategic planning is important because it is when the full range of options is still open for discussion. It also establishes the parameters that will frame and implement a corridor plan or programme. Environmental and social considerations (and the interactions between them) should be considered early in strategic decision-making alongside (and to inform) technical, financial, and economic considerations.

6

An iterative process is needed:

Corridors exist in dynamic environments and need to be responsive to changing circumstances and priorities. Planning must adjust as circumstances and available information changes. The process should identify, map, and engage all interested and affected stakeholders from the earliest stage of corridor planning and throughout the planning and management of the corridor. New concerns and evidence will likely emerge as a corridor development progresses. Corridor planning frequently places undue emphasis on the production of a report (Environmental Impact Report) and its influence on the decision to proceed. The process may not be so linear in nature. It may involve many adjustments and decisions as new evidence emerges and predictions improve. A good-quality report and recommendations is necessary, but they are dependent upon a comprehensive process of ongoing dialogue and engagement with all stakeholders.

7

Corridors must ensure effective use of available tools:

Many corridor environmental impact assessments fail to meet required international standards. Corridor planning and management should make systematic and adequate use of available impact assessment procedures, methods, techniques, and tools to ensure good-quality decisions. The available procedures discussed in this publication (notably Strategic Environmental Assessment and Environmental Impact Assessment) and their associated methods, tools and techniques should be used when appropriate to help ensure that a systematic process identifies all significant potential benefits and development outcomes, and that they outweigh the costs and risks to affected people and their livelihoods and environments. The objectivity and quality of corridor decisions are dependent upon the effective use of the available tools.

8

Plan corridors with resilience and adaptability in mind:

Prevention will always be better than cure in addressing the negative impacts of corridors, and this should be the priority. However, some circumstances dictate an inevitability of negative impacts. Corridors, therefore, need to be designed to be made resilient to anticipated changes and adaptation measures may be necessary as 'coping' mechanisms or to offset unavoidable impacts, such as the impacts caused by climate change. The suitability of measures will require ongoing monitoring and adaptation as needs arise.

9

Seek impact, influence, and implementation capacity:

The decision to proceed with a corridor is ultimately the responsibility of decision makers. They are usually the representatives of all stakeholders' interests and custodians of their natural resources. Any impact assessment report must provide adequate information to ensure sufficiently good-quality decisions. If they are to be effectively implement the recommendations provided. Attempts to improve the performance of planning and associated assessment processes of corridors must tackle the ways in which outcomes are shaped by political contexts and institutional capacities. Approaches to working on assessment processes should integrate political economy analyses and institutional capacity assessment from the outset and on an ongoing basis. Resulting insights should inform the design and implementation of interventions intended to improve planning practice.

10

Evolve from Infrastructure to Development Corridors:

The prospects for linear infrastructure projects to evolve into comprehensive development corridors are often left to chance and spontaneity. Infrastructure projects are often developed in isolation and in an incremental way. For infrastructure projects to progress and become true development corridors, the transition must be systematically sequenced into planning from the start. Assessments must include consideration of potential induced, secondary, synergistic, transboundary, and cumulative impacts likely to result from the corridor development. The progression from infrastructure to development corridors must be based on a systematic, comprehensive, and integrated assessment of the potential positive environmental, social and economic opportunities and the rigorous avoidance or management of negative impacts.

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The Role of Lender Safeguards in Addressing Biodiversity Risks Associated with Large-scale Infrastructure Projects

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ABSTRACT

International finance institutions have developed safeguards to mitigate environmental and social risks associated with the developments they are financing. The International Finance Corporation's Performance Standard 6 (PS6) is widely recognised and adopted as an international good practice benchmark. Other lenders' safeguards are increasingly convergent on PS6 in requiring application of the Mitigation Hierarchy, identification of high-value biodiversity features based on clear criteria, measurable outcomes such as 'no net loss' or 'net gain', and robust action planning and monitoring. These provisions go well beyond the regulatory Environmental Impact Assessment (EIA) requirements in most countries.

These good practice approaches provide a rigorous framework for reducing biodiversity risk and impacts but are often not well applied to infrastructure corridor development. This is owing to technical challenges related to corridors' scale, perceived extra costs that can disadvantage lenders with high standards, a piece-meal approach to mitigation and use of unproven mitigation measures.

By incorporating international good-practice approaches in regulatory frameworks, governments can address the gaps in current EIA processes, improve biodiversity outcomes and support the achievement of conservation goals. Standardising mitigation requirements across countries will also enable a more coordinated and effective mitigation

strategy to be applied along corridors that cross international borders. At the scale of development corridors, a proactive and strategic approach is also needed through early 'upstream' planning with input from a broad range of stakeholders. Landscape-level planning, through Strategic Environmental Assessment or other means, can effectively reduce risks of future developments, enable effective avoidance, better address cumulative impacts and improve the outcomes of biodiversity offsets.

4.1 Lender safeguards for biodiversity

Biodiversity loss is now recognized as one of the major threats to global economic activity, alongside climate action failure, and presents material risks to individual companies (World Economic Forum 2021). In response to this, international finance institutions have developed safeguards to facilitate sustainable development, while mitigating risk associated with the developments they are financing. Biodiversity risks to lenders include:⁷¹

- **Systemic risks related to the destruction of nature, societies' response, and the associated disruption of society and businesses;**
- **Transition risk associated with more stringent regulations or social norms that penalize harm to nature, resulting in litigation, reputational damage and market risks; and**
- **Physical risk due to the depletion of natural resources disrupting delivery of ecosystem services, production processes and supply chains.**

Lender safeguards were first introduced in the late 1970s and by the 1990s, most multilateral development banks had adopted some type of formal environmental policy and procedures (Horberry 2015). Since then, these policies and standards have evolved to include biodiversity features, becoming more comprehensive and systematic. A key development was the International Finance Corporation's (IFC's) Sustainability Framework, including the Policy and Performance Standards on Environmental and Social Sustainability, adopted in 2006 and significantly updated in 2012 (International Finance Corporation 2012). This included Performance Standard 6 (PS6) on Biodiversity and Living Natural Resources and the associated guidance note, which was updated in 2019 based on implementation experience (International Finance Corporation 2019).



71 Also see TBC 2015; Global Canopy & Vivid Economics 2020

IFC PS6 has become an international benchmark for identifying and managing biodiversity risk. PS6 is applied by many lenders, including over 100 major commercial financial institutions that have adopted the Equator Principles and are responsible for the bulk of project financing in developing countries (World Wide Fund for Nature [WWF] and The Biodiversity Consultancy [TBC] in prep.). While Multilateral Development Banks (MDBs) each have their own safeguard framework, there is extensive consensus across biodiversity standards, with many converging on IFC PS6 (Horberry 2015; WWF and TBC) and key biodiversity areas.⁷² Measurable outcomes for priority biodiversity features,

such as no net loss or net gain, are generally required for priority biodiversity features.

A key component of all safeguard frameworks is the application of the mitigation hierarchy (see Box 4.1). This is a central concept in biodiversity risk management and emphasizes early planning for avoidance, then minimization, restoration and (as a last resort) offsetting of potential impacts (Cross Sector Biodiversity Institute and TBC 2015). Requirements for planning, implementing and monitoring mitigation actions are stipulated in order to verify compliance and measure progress towards biodiversity goals (Fig. 4.2).

BOX 4.1 THE MITIGATION HIERARCHY

The mitigation hierarchy is a tool to help users limit, as far as possible, the negative impacts of development projects on biodiversity. It is used by developers when planning and implementing projects, to provide a logical and effective approach to protecting and conserving biodiversity, and maintaining important ecosystem services. It involves a sequence of four key actions: avoid, minimize, restore and offset (Fig. 4.1).

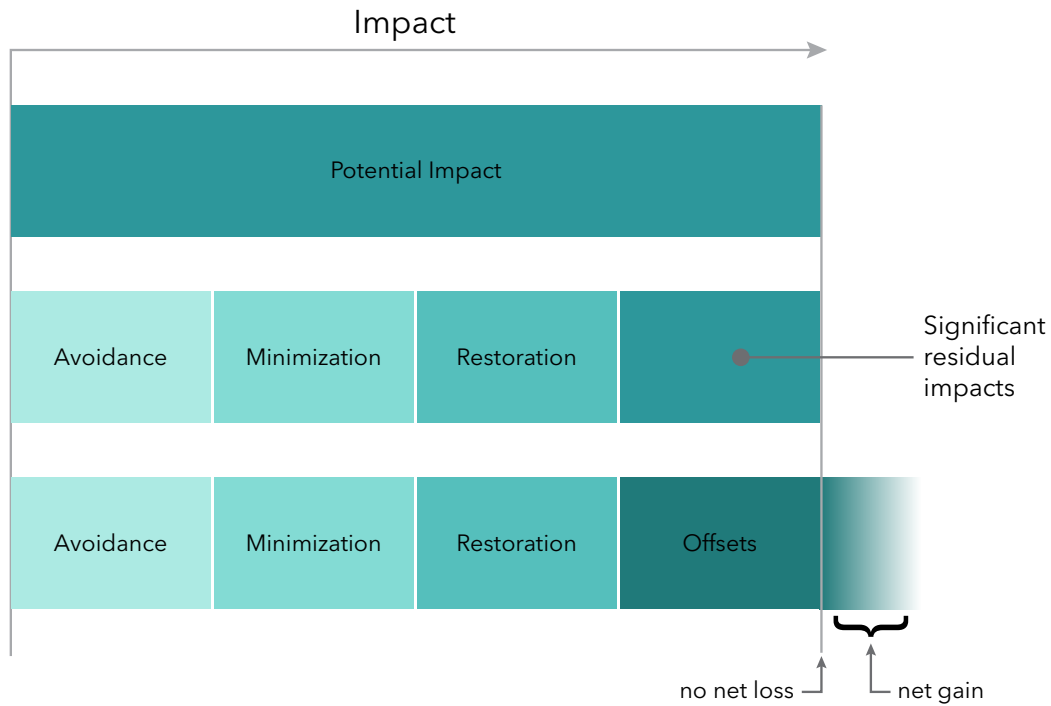
Rigorous application of the mitigation hierarchy can aid in the sustainable management of living, natural resources by establishing a mechanism to balance conservation needs with development priorities. Applying the mitigation hierarchy is an iterative process. It may often be necessary to review infrastructure routing and design to ensure that key risks are avoided and residual impacts are driven down to as low a level as acceptable. Offsets should only be considered after all options to avoid, minimize and restore biodiversity have been exhausted.

The mitigation hierarchy can be applied throughout a project's life cycle, from early planning and design, through to construction and operations. Effective application includes routing to avoid sensitive areas, design modifications such as installing under- and overpasses, and continual evaluation and improvement, with the aim of driving early avoidance and minimization, and reducing or even completely avoiding the need for remedial actions.

For more information on applying the mitigation hierarchy, see Cross Sector Biodiversity Institute and TBC (2015).

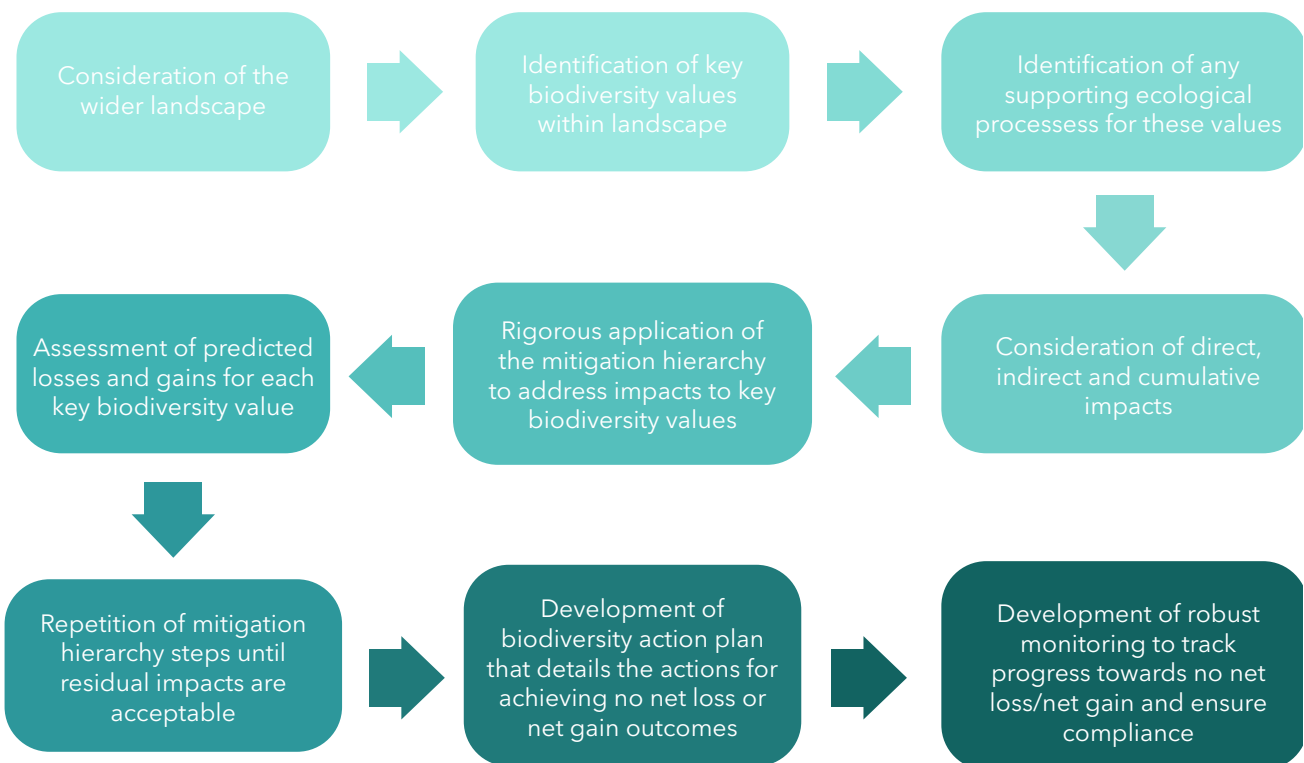
⁷² <http://www.keybiodiversityareas.org/>

Figure 4.1 Application of the mitigation hierarchy to achieve no net loss or net gain for biodiversity



Source: Cross Sector Biodiversity Initiative and TBC (2015).

Figure 4.2 Good practice safeguards go beyond traditional Environmental Impact Assessment (EIA) requirements to ensure rigorous assessment of biodiversity values and impacts, and drive mitigation to reduce these to within acceptable levels; ongoing monitoring and adaptive management go beyond the EIA process and are critical to stay on track to deliver no net loss or net gain outcomes



4.2 Challenges in applying lender safeguards

When applied as intended, lender safeguards provide a rigorous framework for addressing biodiversity risk and reducing biodiversity impacts. Although lender safeguards are widely adopted, they are not always well applied to infrastructure corridor development. Challenges of effective and consistent application include:

Technical challenges related to assessing and mitigating risks at appropriate scale;

- » **An uneven playing field due to the perceived stringency and costs of rigorous mitigation, potentially putting lenders with high standards at a disadvantage to lenders who do not have such robust requirements;**
- » **Piecemeal mitigation rather than strategic, landscape-level planning to avoid the most sensitive areas;**
- » **Implementation of ineffective or unproven mitigation measures, leading to avoidable impacts.**

These issues are briefly covered in more detail in the following sections, including a subsection on recommendations to address the issue.

4.2.1. Technical issues

Identification of biodiversity risks during the early stages of infrastructure planning can enable avoidance of high conservation value areas and identification of cost-effective mitigation options at appropriate ecological and management scales.

Recommendations

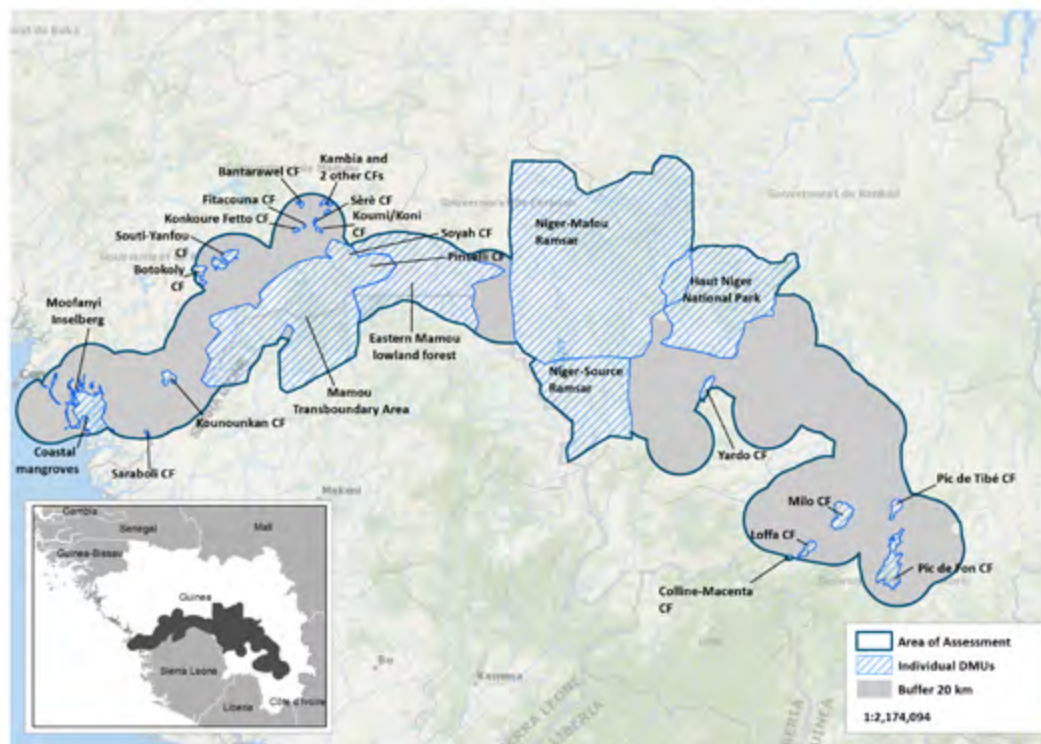
IFC's PS6 requires definition of an ecologically appropriate area of analysis for identification of priority biodiversity features. This area is used as a basis for applying quantitative criteria to assess the presence of critical habitats for species or ecosystems within the project's

area of influence. For linear infrastructure, identifying both the area of influence and area of analysis can be particularly challenging. Infrastructure corridors often have a relatively narrow direct footprint that extends over long distances, potentially cutting across varied habitats and ecological zones with a wide variety of flora and fauna associated with changing altitude, soils and climatic regimes. An ecological, landscape-level approach to defining areas of analysis may capture a very large area for consideration. On the other hand, arbitrarily constraining the area of analysis (e.g. to a fixed buffer distance around the corridor) may miss risks and fail to identify the importance of an area for certain biodiversity.

The area of influence of an infrastructure corridor may also be challenging to define. This is likely to extend well beyond the direct footprint, but may vary along the length of the corridor depending on the type of infrastructure (e.g. roads versus transmission lines), ecological, geographic and social context. Potential impacts beyond the footprint could result from, for example, habitat fragmentation, barriers to animal movement, introduction of invasive alien species, downstream impacts on aquatic systems, or increased habitat loss and degradation resulting from induced access into previously little-disturbed habitats.

Ensure the area of analysis is sufficiently broad to include species and ecosystems in the full project area of influence, considering potential indirect impacts associated with infrastructure construction, operation and closure. For example, a buffer width of 20 km to each side of the linear infrastructure was used for the 700 km railway line for the proposed Simandou iron ore project in Guinea, West Africa (Fig. 4.3). This buffer was further expanded where it intersected with distinct areas of ecological significance or administrative coherence (e.g. various protected areas), to ensure an effective landscape-scale assessment.

Figure 4.3 Area of assessment used to assess biodiversity for the Simandou project, Guinea. A 20 km buffer was applied around the project infrastructure corridor. Separate Discrete Management Units (DMUs) were defined where the buffer intersected with distinct areas of ecological significance or administrative coherence. These are presented the overall broad area of influence covered c. 26,800 km²



Source: TBC (2015).

4.2.2 Uneven lender requirements

Despite the convergence of standards across major development banks, many other lenders have weak or no specific safeguard provisions for biodiversity, relying on the Environmental Impact Assessment (EIA) permitting processes established in national regulation (WWF and TBC in prep.). In many developing countries where infrastructure corridors are planned, regulations are less stringent than lenders' safeguards, while national environmental agencies have weak capacity for enforcement.

Governments and private developers may view rigorous safeguards as overly bureaucratic, onerous and unpragmatic, requiring unnecessary extra costs and time. While good-practice safeguards in fact deal effectively with environmental and social risks and liabilities that can cause

delay, increase the costs of and/or derail projects, these risks are not always recognized by decision makers, or may be overridden by short-term political considerations. This can drive infrastructure finance towards lenders with less rigorous requirements and potentially lead to significant unmitigated biodiversity impacts.

As the case studies in this volume show, much finance of large-scale infrastructure corridors is not tied to good-practice biodiversity safeguards. For example, of the 65 financiers involved in China's Belt and Road Initiative (BRI), only 17 have biodiversity safeguards, and only 12 of these were aligned with best practice, such as IFC PS6 (Narain *et al.* 2020). As a result, significant impacts are likely to remain unmitigated, despite close to 370,000 km² of the wider corridor overlapping with critical and natural habitat.

Recommendations

Lender safeguards such as IFC's PS6 provide a framework that governments can adapt and adopt to enshrine biodiversity safeguard concepts into regulation, ensuring better consideration of biodiversity issues and providing a clear and consistent mitigation framework for developers to operate in. This process is envisaged in the World Bank's (International Bank for Reconstruction and Development [IBRD]'s) Environmental and Social Framework (where Environmental and Social Standard 6 is aligned with IFC PS6), which devolves safeguard implementation to national level, where standards are sufficiently convergent and capacity is adequate.

Standardizing mitigation policies across countries overlapping with linear infrastructure will also enable a more coordinated and therefore effective mitigation strategy to be applied across the corridor.

Many governments have, as yet, failed to mainstream their commitments under the Convention on Biological Diversity and other multilateral environmental agreements into economic decision-making (Whitehorn *et al.* 2019). Further, many existing or planned government—offset policies are deficient in robust design and effective implementation. The Global Inventory of Biodiversity Offset Policies⁵ database suggests that less than a quarter of countries that enable or require compensation allow offsets only as a last resort, and only 10 per cent apply international best practice principles for offsets (zu Ermgassen *et al.* 2019). Strengthening these provisions would provide an opportunity to support more effective and consistent mitigation practice through strict application of the mitigation hierarchy (Milner-Gulland *et al.* 2020). Nonet loss or net gain policies that are set in line with defined conservation targets can help governments to achieve national conservation goals under their international biodiversity commitments (Maron *et al.* 2020).

4.2.3 Non-strategic mitigation

When well implemented, lender safeguards are a valuable and effective means for assessing and mitigating biodiversity risks. However, in practice, they are essentially used as a reactive mechanism that addresses risk in a piecemeal, project-by-project way. This has many drawbacks. Opportunities for avoidance may be missed and landscape-scale issues such as ecological connectivity overlooked. Cumulative impacts are not taken into account. Offsets may also be less effective and face higher risks of failure where they are implemented individually and without accounting for wider conservation priorities.

While this can be an issue for many large projects, infrastructure corridors in particular are at a scale where a more strategic and integrated approach to biodiversity management is required.

Recommendations

To effectively account for and mitigate the wide range of social and environmental sensitivities within the wider landscape, large infrastructure projects need to be developed within a framework of wider landscape-level planning that identifies and, as far as possible, avoids areas of high biodiversity sensitivity, considering other social and economic constraints and trade-offs.

Strategic environmental assessment (SEA) is a procedure for this that is increasingly established in some regulatory frameworks.

SEAs consider the environmental and socioeconomic implications of policies, programmes or plans, at a broader level than project-specific EIAs.

To be effective, SEAs need to be enshrined into national legislation, with clear requirements for their implementation. Conducting an SEA is an important first step, but is of limited value if its findings are not implemented. In practice, SEA recommendations may often be disregarded or overridden, especially

when perceived as counter to political and economic priorities. For example, although a SEA was undertaken for Kenya's segment of the Lamu Port -South Sudan-Ethiopia corridor, implementation of impact-mitigation measures was inadequate, and resulted in a number of biodiversity issues, including fragmentation of conservation areas and blockage of large mammal migratory corridors, including for elephants (Nyumba *et al.* 2019).

It is important that SEAs or similar landscape-scale assessments are undertaken collaboratively, with a broad range of biodiversity specialists, conservation non-governmental organizations and other stakeholders, so as to explore trade offs and develop effective mitigation measures that are integrated into early project planning, with rigorous review and monitoring processes in place to help ensure effective implementation. In the absence of existing spatial plans or a regulatory SEA process, investors in infrastructure corridors arguably have a responsibility to support governments with spatial planning (including capacity development where necessary) to ensure that biodiversity risks are appropriately assessed and managed. Where infrastructure corridors cross borders, coordinated efforts are needed between governments to develop landscape-level mitigation strategies.

Offsets should only be used as a last resort, after all other options to avoid, minimize and restore have been exhausted, and residual impacts are reduced to acceptable levels. Where offsets are required, they should be considered within the context of national strategic planning and prioritization frameworks including, for example, national biodiversity strategies and action plans. Strategic landscape-scale planning can help identify priority areas for offsets and enable an aggregated approach, whereby resources from multiple projects are pooled into a single offset to address residual impacts from multiple developments. Aggregated offsets have the benefit of increasing the likelihood of success, while spreading risks and costs across several

developers. This can also enable a move beyond project-specific no net loss/net gain goals to contribute explicitly to jurisdictional targets such as those under the post-2020 strategic framework of the Convention on Biological Diversity (Simmonds *et al.* 2019). Through this approach, offset requirements would be determined based on the current state of biodiversity being impacted by the development (*et al.*). Biodiversity targets can be set through SEA processes, providing a clear and transparent basis for compensation from development.

Even when an SEA or other spatial planning process has identified areas prioritized for development, risk screening will be needed to identify site-specific sensitivities. For developers, early risk screening provides an important tool to inform infrastructure planning and inform early mitigation and EIA scoping as part of project design (TBC 2017). Screening enables avoidance of impacts to sensitive features and helps identify cost-effective mitigation options and methods to minimize impacts (e.g. routing options, technological alternatives, placement and design of over- and underpasses to maintain habitat connectivity, etc.).

4.2.4 Limited evidence base for mitigation measures

The investment of tens of trillions of dollars into linear infrastructure projects in Africa and Asia will penetrate into previously remote and intact areas and create significant additional risks to threatened biodiversity. Effective mitigation approaches to address some of the most significant impacts are urgently needed, but they must account for the local ecological and social context. Where impacts cannot be fully avoided, there are a number of approaches to minimize the biodiversity impacts of the components of infrastructure corridors, such as roads, railways, pipelines and electrical transmission lines. Good international practice, aligned with lender safeguards, requires specification and monitoring of avoidance and minimization measures within a biodiversity action plan (International Finance Corporation 2019).

Most minimization measures for linear infrastructure have so far been used and tested in a North American or European context, where the species and ecological context may be very different from other parts of the world. The transfer of technology to a different setting can have unexpected and unintended consequences. For example, the Standard Gauge Railway project in Kenya created underpasses to maintain connectivity between Tsavo East and West National Parks in Kenya. However, a proliferation of illegal settlements blocked many of the underpasses, restricting movement of animals and increasing risk of conflict between humans and wildlife (Nyumba *et al.* 2021).

Testing and adaptation of mitigation strategies are needed to understand which measures are effective and cost-effective to apply (see e.g. Collinson *et al.* 2019 for a review of research on road impacts and mitigation in Africa and Rajvanshi and Mathur ([Chapter 17](#)) on Indian experiences).

Recommendations

There is an urgent need for testing mitigation approaches in the field through wide application, improved monitoring and sharing of data. Lenders have an

important role to play in developing capacity of government agencies and national practitioners to document the effectiveness of mitigation measures. Research findings need to be freely accessible to developers and practitioners through central depositories and engagement platforms. Conservation Evidence (<https://www.conservationevidence.com/>) provides a valuable platform that brings together assessments of the effectiveness of conservation and mitigation actions, but evidence from the developing world is still largely lacking.

Engagement and lesson-sharing between international and local wildlife specialists can also offer insights into local contexts and help identify practical solutions that account for site-specific factors. The African Linear Infrastructure and Ecology Conference, (<https://endangeredwildlifetrust.wordpress.com/2019/03/15/inaugural-african-linear-infrastructure-and-ecology-conference/>), International Conference On Ecology and Transportation (ICOET) (<https://icoet.net/about>) and Transport Ecology (<https://transportecology.info/about>) provide examples of effective solutions for such interdisciplinary engagement and sharing of findings.



4.3 Conclusions

Lender safeguards can play a key role in addressing biodiversity risks associated with infrastructure corridors. IFC's PS6 provides the benchmark for good practice, and has seen wide adoption or convergence by international lenders. Rigorous application of the mitigation hierarchy, to achieve no net loss and net gain outcomes where appropriate, is central to PS6 and similar safeguards.

There are technical challenges in applying some aspects of PS6 to infrastructure corridors, owing to their linear spatial configuration. The overall approach to assessing, mitigating and monitoring biodiversity risk and impact remains entirely valid, however. By incorporating these concepts and approaches in regulatory frameworks, governments can address the gaps in current EIA processes, provide a level playing field for financiers and developers, improve biodiversity outcomes and support the achievement of conservation goals.

Like EIA, biodiversity safeguards are a largely reactive and project-specific mechanism. The scale of infrastructure corridors requires a more proactive and strategic approach through early upstream planning at the regional or national level, with input from a broad range of stakeholders. Landscape-level planning, through SEA or other means, can effectively reduce risks of future developments, enable effective avoidance, better address cumulative impacts and improve the outcomes of biodiversity offsets.

Impacts that cannot be fully avoided can often be minimized substantially. The evidence base for minimization approaches is growing, but still largely confined to the developed world. Field testing of mitigation approaches, data transparency and lesson-sharing between actors can all help build an information base for mitigation that works, and avoid the repeated (and sometimes costly) use of ineffective techniques.

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